

# DirectInput

This section provides information about the Microsoft® DirectInput® component of the Microsoft DirectX® application programming interface (API). The DirectInput API is used to process data from a keyboard, mouse, joystick, or other game controller.

For an overview of the documentation, see Roadmap.

## Roadmap

Information on using Microsoft® DirectInput® is presented in the following sections. Use this page to guide you through the documentation based on your level of experience as a DirectInput developer.

**What's New in DirectInput.** Summary of features new to this version of Microsoft® DirectX®. Read this section if you've used Microsoft DirectInput® before but want to take advantage of the new capabilities.

**Introduction to DirectInput.** High-level overview of the capabilities of DirectInput and the steps you'll take to implement it. Start with this section if you're new to DirectInput.

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### [\[C++\]](#)

**Understanding DirectInput.** Introduction to the objects and interfaces of DirectInput and how they are related to the Microsoft Windows® message system. Read this section if you're new to DirectInput.

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### [\[Visual Basic\]](#)

**Understanding DirectInput.** Introduction to the objects and classes of DirectInput and how they are related to the Microsoft Windows® message system. Read this section if you're new to DirectInput.

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### [\[C++\]](#)

**Using DirectInput.** Guide to the application programming interface (API). This section contains more detailed conceptual information than the previous two sections, as well as information about the API elements you'll use for setting up devices, retrieving data, and implementing force-feedback effects. If you're a novice, at least familiarize yourself with the contents of this section. Later, you can refer to topics as you need them. Use this section in conjunction with the DirectInput C/C++ Reference.

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[\[Visual Basic\]](#)

Using DirectInput. Guide to the application programming interface (API). This section contains more detailed conceptual information than the previous two sections, as well as information about the API elements you'll use for setting up devices, retrieving data, and implementing force-feedback effects. If you're a novice, at least familiarize yourself with the contents of this section. Later, you can refer to topics as you need them. Use this section in conjunction with the DirectInput Visual Basic Reference.

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Programming Tips and Tools. Advanced programming topics and a guide to the DirectInput tools provided with the DirectX software development kit (SDK).

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[\[C++\]](#)

DirectInput C/C++ Tutorials. Step-by-step tutorials, often based on samples in the SDK. If you learn best from sample code, this is a good place to start after reading Introduction to DirectInput and Understanding DirectInput.

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[\[Visual Basic\]](#)

DirectInput Visual Basic Tutorials. Step-by-step tutorials, often based on samples in the SDK. If you learn best from sample code, this is a good place to start after reading Introduction to DirectInput and Understanding DirectInput.

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[\[C++\]](#)

DirectInput C/C++ Samples. A guide to the DirectInput C/C++ samples included in the SDK, illustrating the use and capabilities of DirectInput.

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[\[Visual Basic\]](#)

DirectInput Visual Basic Samples. A guide to the DirectInput Visual Basic samples included in the SDK, illustrating the use and capabilities of DirectInput.

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[\[C++\]](#)

DirectInput C/C++ Reference

Reference information for the API. Use this section when you need to know the details of an interface, method, structure, macro, or other element.

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[\[Visual Basic\]](#)

DirectInput Visual Basic Reference. Reference information for the API. Use this section when you need to know the details of a class, method, type, macro, or other element.

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## What's New in DirectInput

The following are some of the new features in Microsoft® DirectInput®.

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### [C++]

#### Action mapping

Microsoft DirectInput for Microsoft DirectX® 8.0 introduces a major new feature: action mapping. Action mapping enables you to establish a connection between input actions and input devices that does not depend on the existence of particular device objects (such as specific buttons or axes). Action mapping simplifies the input loop and reduces the need for custom game drivers, custom device profilers, and custom configuration user interfaces in games.

For more information, see Action Mapping.

#### New DirectInput object features

The DirectInput object is now represented by the **IDirectInput8** interface. A new helper function, **DirectInput8Create**, creates the object and retrieves this interface. **IDirectInput8** has a new CLSID and cannot be obtained by calling **QueryInterface** on an interface to objects of the class **CLSID\_DirectInput** used in earlier DirectX versions.

#### New keyboard properties

Two keyboard properties have been added: **DIPROP\_KEYNAME**, which retrieves a localized key name, and **DIPROP\_SCANCODE**, which retrieves the scan code.

#### Joystick slider data in rgfSlider array

Joystick slider data which was assigned to the Z axis of a **DIJOYSTATE** or **DIJOYSTATE2** structure under earlier DirectX versions will now be found in the **rgfSlider** array of those same structures.

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### [Visual Basic]

#### Action mapping

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For more information, see Action Mapping.

**New DirectInput object features**

The DirectInput object is now represented by the **DirectInput8** class, which is obtained by using the **DirectX8.DirectInputCreate** method.

**New keyboard properties**

Two keyboard properties have been added: **DIPROP\_KEYNAME**, which retrieves a localized key name, and **DIPROP\_SCANCODE**, which retrieves the scan code.

**Joystick slider data in rgSlider array**

Joystick slider data which was assigned to the Z axis of a **DIJOYSTATE** or **DIJOYSTATE2** type under earlier DirectX versions will now be found in the **slider** array of those same types.

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## Introduction to DirectInput

Microsoft® DirectInput® is an API for input devices including the mouse, keyboard, joystick, and other game controllers, as well as for force-feedback (input/output) devices.

This section provides a brief overview of the capabilities of DirectInput and how to set it up in an application. Information is contained in the following topics.

- The Power of DirectInput
- Getting Started with DirectInput

For a more comprehensive view of how DirectInput works, see Understanding DirectInput.

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**[C++]**

For a step-by-step guide to using the DirectInput application programming interface (API), see the following topics.

- Using DirectInput
  - DirectInput C/C++ Tutorials
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**[Visual Basic]**

For a step-by-step guide to using the DirectInput application programming interface (API), see the following topics.

- Using DirectInput
  - DirectInput Visual Basic Tutorials
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## The Power of DirectInput

Apart from providing services for devices not supported by the Microsoft® Win32® API, Microsoft DirectInput® gives faster access to input data by communicating directly with the hardware drivers rather than relying on Microsoft Windows® messages.

DirectInput enables an application to retrieve data from input devices even when the application is in the background. It also provides full support for any type of input device, as well as for force feedback.

Through action mapping, applications can retrieve input data without needing to know what kind of device is being used to generate it.

The extended services and improved performance of DirectInput make it a valuable tool for games, simulations, and other real-time interactive applications running under Windows.

DirectInput does not provide any advantages for applications that use the keyboard for text entry or the mouse for navigation. For more information, see *Interaction with Windows*.

## Getting Started with DirectInput

This topic is an overview of what is involved in setting up and using Microsoft® DirectInput® in a simple application.

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### [\[C++\]](#)

For details and examples of these steps, see *Using DirectInput and DirectInput C/C++ Tutorials*.

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### [\[Visual Basic\]](#)

For details and examples of these steps, see *Using DirectInput and DirectInput Visual Basic Tutorials*.

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### Note

To understand DirectInput, it is essential to understand the following terms.

- **DirectInput object:** The root DirectInput interface.
- **Device:** A keyboard, mouse, joystick, or other input device.
- **DirectInputDevice object:** Code representing a keyboard, mouse, joystick, or other input device.
- **Device object:** Code representing a key, button, trigger, and so on found on a DirectInput device object. Also called *device object instance*.

The following steps represent a simple implementation of DirectInput in which the application takes responsibility for ascertaining what device object (button, axis, and so on) generated each item of data.

1. **Create the DirectInput object.** You use methods of this object to enumerate devices and create DirectInput device objects.
2. **Enumerate devices.** This is not an essential step if you intend to use only the system mouse or keyboard. To ascertain what other input devices are available on the user's system, have DirectInput enumerate them. Each time DirectInput finds a device that matches the criteria you set, it gives you the opportunity to examine the device's capabilities. It also retrieves a unique identifier that you can use to create a DirectInput device object representing the device.
3. **Create a DirectInputDevice object for each device you want to use.** To do this, you need the unique identifier retrieved during enumeration. For the system mouse or keyboard, you can use a standard GUID.
4. **Set up the device.** For each device, first set the cooperative level, which determines the way the device is shared with other applications or the system. You must also set the data format used for identifying device objects, such as buttons and axes, within data packets. If you intend to retrieve buffered data—that is, events rather than states—you also need to set a buffer size. Optionally, at this stage you can retrieve information about the device and tailor the application's behavior accordingly. You can also set properties such as the range of values returned by joystick axes.
5. **Acquire the device.** At this stage you tell DirectInput that you are ready to receive data from the device.
6. **Retrieve data.** At regular intervals, typically on each pass through the message loop or rendering loop, get either the current state of each device or a record of events that have taken place since the last retrieval. If you prefer, you can have DirectInput notify you whenever an event occurs.
7. **Act on the data.** The application can respond either to the state of buttons and axes or to events such as a key being pressed or released.
8. **Close DirectInput.** Before exiting, your application should unacquire all devices and release them, then release the DirectInput object.

This is not the only approach to implementing DirectInput. To take advantage of the great variety of input devices available now and in the future, and to simplify configuration for the user, you can use action mapping.

By setting an action map for a device, you let DirectInput decide which device object to use for each application action. For example, instead of specifying that the throttle in your racing game must always be controlled by the y-axis, you can create an action called `AXIS_THROTTLE` and have DirectInput assign that action to the most appropriate axis available on the device. When you retrieve events, you identify them by their associated actions rather than by the device objects that generated them.

For more information, see Action Mapping.

## Understanding DirectInput

This section covers the underlying structure of Microsoft® DirectInput® and its relationship to the Microsoft Windows® message system.

- DirectInput Objects
- Interaction with Windows

For practical information on how to implement the elements of DirectInput introduced here, see Using DirectInput.

## DirectInput Objects

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### [C++]

An input-only Microsoft® DirectInput® implementation consists of the DirectInput object, which supports the **IDirectInput8** COM interface, and a DirectInputDevice object for each input device that provides data. Each DirectInputDevice object in turn has *device objects*, which are individual controls or switches such as keys, buttons, or axes. Device objects are also called *device object instances*.

Each DirectInputDevice object represents one input device, such as a mouse, keyboard, or joystick. In the DirectInput API, the word *joystick* means any type of input device other than a mouse or keyboard. A piece of hardware that is really a combination of different types of input devices, such as a keyboard with a touchpad, can be represented by two or more DirectInputDevice objects. A force-feedback device is represented by a single joystick object that handles both input and output.

DirectInputDevice objects instantiate the **IDirectInputDevice8** interface. The application ascertains the number and type of device objects available by using the **IDirectInputDevice8::EnumObjects** method. Individual device objects are not encapsulated as code objects, but are described in **DIDEVICEOBJECTINSTANCE** structures.

Force-feedback effects are represented by the **IDirectInputEffect** interface. Methods of this interface are used to create, modify, start, and stop effects.

All DirectInput interfaces are available in ANSI and Unicode versions. If "UNICODE" is defined during compilation, the Unicode versions are used.

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### [Visual Basic]

An input-only Microsoft® DirectInput® implementation consists of a single **DirectInput8** object along with **DirectInputDevice8** objects for each input device that is being used by the application. The DirectInputDevice8 object is used for retrieving the input data.

Any available device, regardless of whether it is being used by DirectInput, can also be represented by a **DirectInputDeviceInstance8** object, which can be used to retrieve miscellaneous information about that device.

Each DirectInputDevice8 object represents one input device, such as a mouse, keyboard, or joystick. (The DirectInput API uses the term *joystick* for all game controllers other than a mouse or a keyboard.) A piece of hardware that is really a combination of different types of input devices, such as a keyboard with a touchpad, can be represented by two or more DirectInputDevice8 objects. A force-feedback device is represented by a single joystick object that handles both input and output.

Each device in turn has *device objects*, which are individual controls or switches, such as keys, buttons, or axes. Each device object is represented by an instance of the **DirectInputDeviceObjectInstance** class, whose methods can be used to retrieve information about the device object. (The input data, however, is always retrieved by **DirectInputDevice8**.)

Devices and device objects can be enumerated, and the resulting collections are represented by **DirectInput8.GetDIDevices** and **DirectInputDevice8.GetDeviceObjectsEnum** objects.

Force-feedback effects are represented by the **DirectInputEffect** class. Methods of this interface are used to create, modify, start, and stop effects.

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## Interaction with Windows

Because Microsoft® DirectInput® works directly with the device drivers, it either suppresses or ignores Microsoft Windows® mouse and keyboard messages. It also ignores mouse and keyboard settings made by the user in Control Panel. It does, however, use the calibrations set for a joystick or other game controller.

DirectInput does not recognize keyboard character repeat settings. When using buffered data, DirectInput interprets each press and release as a single event with no repetition. When using immediate data, DirectInput is concerned only with the present physical state of the keys, not with keyboard events as interpreted by Windows.

DirectInput does not perform any character conversion or translation. For example, the SHIFT key is treated like any other key, not as a modifier of another keypress. Keys return the same identifiers regardless of the user's system language settings.

Under Windows 2000, acquiring the keyboard in exclusive mode prevents any applications that are subsequently launched from receiving keyboard data.

Because DirectInput works directly with the mouse driver, it bypasses the subsystem of Windows that interprets mouse data for windowed applications. Applications that rely on the Windows cursor for navigation should continue to use the standard Windows mouse messages and Microsoft® Win32® functions.



When using the system mouse in exclusive mode, DirectInput suppresses mouse messages, and therefore Windows is unable to show the standard cursor.

DirectInput ignores Control Panel settings such as acceleration and swapped buttons. However, DirectInput recognizes settings in the driver itself. For example, if the user has a three-button mouse and uses the driver-utility software to make the middle button a double-click shortcut, DirectInput reports a click of the middle button as two clicks of the primary button.

## Using DirectInput

This section is a guide to implementing Microsoft® DirectInput®. For a broader overview, see Understanding DirectInput.

The following topics are discussed.

- Creating DirectInput
- DirectInput Device Enumeration
- DirectInput Devices
- DirectInput Device Data
- Action Mapping
- Force Feedback

## Creating DirectInput

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### [C++]

The first step in any Microsoft® DirectInput® application is obtaining the **IDirectInput8** interface. You can do this most easily by calling the **DirectInput8Create** function.

You should create a single Microsoft® DirectInput object and not release it until the application terminates.

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### [Visual Basic]

The first step in any Microsoft® DirectInput® application is creating the **DirectInput8** object. Do this by using the **DirectX8.DirectInputCreate** method.

You should create a single **DirectInput8** object and not destroy it until the application terminates.

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## DirectInput Device Enumeration

Microsoft® DirectInput® can query the system for all available input devices, determine whether they are connected, and return information about them. This process is called enumeration.

### [C++]

If your application is using only the standard keyboard or mouse, or both, you do not need to enumerate the available input devices. As explained under Creating a DirectInput Device, you can use predefined global variables when calling the **IDirectInput8::CreateDevice** method.

For all other input devices, and for systems with multiple keyboards or mouse devices, call **IDirectInput8::EnumDevices** or **IDirectInput8::EnumDevicesBySemantics** to enumerate available devices and find one that is suitable. You might also want to enumerate in order to give the user a choice of available devices.

The following is a sample implementation of the **IDirectInput8::EnumDevices** method:

```
/* lpdi is a valid IDirectInput8 interface pointer. */

GUID KeyboardGUID = GUID_SysKeyboard;

lpdi->EnumDevices(DIDEVTYPE_KEYBOARD,
    DIEnumDevicesCallback,
    &KeyboardGUID,
    DIEDFL_ATTACHEDONLY);
```

The first parameter determines what types of devices are to be enumerated. It is NULL if you want to enumerate all devices, regardless of type; otherwise it is one of the DIDEVTYPE\_\* values described in **DIDEVICEINSTANCE**.

The second parameter is a pointer to a callback function to be called once for each device enumerated. This function can be declared by any name; the documentation uses the placeholder name **DIEnumDevicesCallback**.

The third parameter to the **EnumDevices** method is any 32-bit value that you want to pass into the callback function. In this example, it is a pointer to a variable of type **GUID**, passed in so that the callback can assign a keyboard instance identifier to this variable.

The fourth parameter is a flag to request enumeration of either all devices or only those that are attached (DIEDFL\_ALLDEVICES or DIEDFL\_ATTACHEDONLY).

If your application is using more than one input device, the callback function is a good place to initialize each device as it is enumerated. (For an example, see Tutorial 3: Using the Joystick.) You obtain the instance GUID of the device from the callback

function. You can also perform other processing here, such as looking for particular subtypes of devices or adding the device name to a list box.

The following sample callback function checks for the presence of an enhanced keyboard and stops the enumeration as soon as it finds one. It assigns the instance GUID of the last keyboard found to the *KeyboardGUID* variable (the address of which was passed in the *pvRef* variable by the call to **EnumDevices** in the previous example), which can then be passed to **IDirectInput8::CreateDevice**.

```
BOOL hasEnhanced;

BOOL CALLBACK DEnumKbdCallback(LPCDIDEVICEINSTANCE lpddi,
                               LPVOID pvRef)
{
    *(GUID*) pvRef = lpddi->guidInstance;
    if (GET_DIDEVICE_SUBTYPE(lpddi->dwDevType) ==
        DIDEVTYPEKEYBOARD_PCENH)
    {
        hasEnhanced = TRUE;
        return DIENUM_STOP;
    }
    return DIENUM_CONTINUE;
} // End of callback
```

The first parameter points to a **DIDEVICEINSTANCE** structure containing information about the device. This structure is created by DirectInput.

The second parameter points to data passed in from **EnumDevices**. In this case, it is a pointer to the variable *KeyboardGUID*. This variable was assigned a default value earlier, but it is given a new value each time a device is enumerated. It is not important what instance GUID you use for a single keyboard, but the code does illustrate a technique for retrieving an instance GUID from the callback.

Rather than saving the instance GUID so that you can create the DirectInputDevice later, you can save the device created by DirectInput during enumeration. For more information, see *Creating a DirectInput Device*.

The return value in the example indicates that enumeration is to stop if the sought-for device has been found, or continue otherwise. Enumeration automatically stops as soon as all devices have been enumerated.

For more information on enumerating devices by using **IDirectInput8::EnumDevicesBySemantics**, see *Action Mapping*.

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#### [\[Visual Basic\]](#)

If your application is using only the standard keyboard or mouse, or both, you do not need to enumerate the available input devices. See *Creating a DirectInput Device*.

For all other input devices, and for systems with multiple keyboards or mouse devices, call **DirectInput8.GetDIDevices** to build a collection of available devices. This method returns a **DirectInputEnumDevices8** object representing the collection. Each device in the collection can be retrieved as a **DirectInputDeviceInstance8** object by using the **DirectInputEnumDevices8.GetItem** method. The following example shows how to build a collection of game controllers and display them in a list box named *lstJoysticks*.

```
Dim diDevEnum As DirectInputEnumDevices8

Set diDevEnum = di.GetDIDevices(DI8DEVCLASS_GAMECTRL, DIEDFL_ATTACHEDONLY)

Dim i As Integer
For i = 1 To diDevEnum.GetCount
    Call lstJoysticks.AddItem(diDevEnum.GetItem(i).GetInstanceName)
Next i
```

At the very least, you must retrieve the unique identifier for a nonstandard device from the enumeration by calling **DirectInputDeviceInstance8.GetGuidInstance** before you can create a **DirectInputDevice8** object for that device. You might also want to enumerate devices in order to look for particular types and subtypes (by using **DirectInputDeviceInstance8.GetDevType**) or to populate a list box that enables the user to select a game controller.

You might even want to search for a device with particular capabilities. To do this, create a **DirectInputDevice8** object for each candidate in order to examine it further by using the **DirectInputDevice8.GetCapabilities** method.

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## DirectInput Devices

This section contains information about the code objects that represent devices such as a mouse, keyboards, or joysticks. The following topics are covered:

- Device Setup
- Creating a DirectInput Device
- Device Capabilities
- Cooperative Levels
- Device Object Enumeration
- Device Data Formats
- Device Properties
- Acquiring Devices

For information on how to retrieve and interpret data from devices, see DirectInput Device Data.

## Device Setup

Your application must obtain a Microsoft® DirectInput® device object for each device from which it expects input. It must also prepare each device for use, which requires, at the very least, setting the data format and acquiring the device. You might also want to carry out other preparatory tasks such as getting information about the devices and changing their properties.

The following tasks are part of the setup process. Certain steps are always required. Other steps may be necessary if you need further information about devices or need to change default values.

1. Create the DirectInput device (required). See [Creating a DirectInput Device](#).
2. Get the device capabilities (optional).
3. Enumerate the keys, buttons, and axes on the device (optional). See [Device Object Enumeration](#).
4. Set the cooperative level (highly recommended).
5. Set the data format (required).
6. Set the device properties (you must at least set the buffer size if you intend to get buffered data).
7. When ready to read data, acquire the device (required). See [Acquiring Devices](#).

## Creating a DirectInput Device

To get input data from a device, you first have to create an object to represent that device.

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### [C++]

The **IDirectInput8::CreateDevice** method is used to obtain a pointer to the **IDirectInputDevice8** interface. Methods of this interface are then used to manipulate the device and obtain data.

The following code example, where *lpdi* is a pointer to the **IDirectInput8** interface, creates a keyboard device:

```
LPDIRECTINPUTDEVICE8 lpdiKeyboard;  
lpdi->CreateDevice(GUID_SysKeyboard, &lpdiKeyboard, NULL);
```

The first parameter in **CreateDevice** is an instance GUID that identifies the instance of the device for which the interface is to be created. Microsoft® DirectInput® has two predefined GUIDs, *GUID\_SysMouse* and *GUID\_SysKeyboard*, which represent the system mouse and keyboard. You can pass one of these identifiers into the **CreateDevice** method. The global variable *GUID\_Joystick* should not be used as a parameter for **CreateDevice** because it is a product GUID, not an instance GUID.

### Note

If the computer has more than one mouse, input from all of them is combined to form the system device. The same is true for multiple keyboards.

DirectInput provides four other predefined GUIDs primarily for testing.

- GUID\_SysKeyboardEm
- GUID\_SysKeyboardEm2
- GUID\_SysMouseEm
- GUID\_SysMouseEm2.

Passing one of these GUIDs to **CreateDevice** grants access to the system keyboard or mouse through an emulation layer, at either level 1 or level 2. These GUIDs always represent the system mouse or keyboard. They are aliases for GUID\_SysKeyboard and GUID\_SysMouse, so they are not enumerated by **IDirectInput8::EnumDevices** or **IDirectInput8::EnumDevicesBySemantics** unless the DIEDFL\_INCLUDEALIASES flag is passed.

For devices other than the system mouse or keyboard, use the instance GUID for the device returned by **EnumDevices** or **EnumDevicesBySemantics**. The instance GUID for a device is always the same. You can allow the user to select a device from a list of those enumerated, then save the GUID to a configuration file and use it again in future sessions.

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#### [\[Visual Basic\]](#)

The **DirectInput8.CreateDevice** method is used to obtain a **DirectInputDevice8** object. Methods of this interface are then used to manipulate the device and obtain data.

The following code example, where *di* is the **DirectInput8** object, creates a keyboard device:

```
Dim diDev As DirectInputDevice
Set diDev = di.CreateDevice("GUID_SysKeyboard")
```

The parameter is an alias for a GUID that identifies the instance of the device for which the interface is to be created. Microsoft® DirectInput® provides two predefined GUIDs, represented by the strings *GUID\_SysMouse* and *GUID\_SysKeyboard*, which stand for the system mouse and keyboard. You can pass either of these to the **CreateDevice** method.

#### **Note**

If the computer has more than one mouse, input from all of them is combined to form the system device. The same is true for multiple keyboards.

For devices other than the system mouse or keyboard, use the instance GUID for the device obtained from **DirectInputDeviceInstance8.GetGuidInstance**. The instance GUID for a device is always the same. You can allow the user to select a device from a list of those enumerated, then save the GUID to a configuration file and use it again in future sessions.

In the following code example, it is presumed that the application has enumerated devices and found a suitable one, *diDevInstance*, which is to be created as a

**DirectInputDevice:**

```
Dim guid As String
guid = diDevInstance.GetGuidInstance
Set diDev = di.CreateDevice(guid)
```

For more information on obtaining the **DirectInputDeviceInstance8** object, see DirectInput Device Enumeration.

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## Device Capabilities

Before you begin asking for input from a device, you need to know something about its capabilities. Does the joystick have a point-of-view hat? Is the mouse currently attached to the user's computer?

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### [C++]

Such questions are answered with a call to the

**IDirectInputDevice8::GetCapabilities** method, which returns the data in a **DIDEVCAPS** structure. As with other such structures in Microsoft® DirectX®, you must initialize the **dwSize** member before passing this structure to the method.

### Note

To optimize speed or memory usage, you can use the smaller **DIDEVCAPS\_DX3** structure instead. For structure details, see Dinput.h in the Microsoft Software Development Kit (SDK).

The following code example checks whether the mouse is attached and whether it has a third axis (presumably a wheel). Assume that *lpdiMouse* is a valid Microsoft DirectInput® device.

```
DIDEVCAPS DIMouseCaps;
HRESULT hr;
BOOLEAN WheelAvailable;

DIMouseCaps.dwSize = sizeof(DIDEVCAPS);
hr = lpdiMouse->GetCapabilities(&DIMouseCaps);
WheelAvailable = ((DIMouseCaps.dwFlags & DIDC_ATTACHED)
    && (DIMouseCaps.dwAxes > 2));
```

Another way to check for a button or axis is to call

**IDirectInputDevice8::GetObjectInfo** for that object. If the call returns **DIERR\_OBJECTNOTFOUND**, the object is not present. The following code determines whether there is a z-axis, even if it is not the third axis:

```
DIDeviceObjectInstance didoi;  
  
didoi.dwSize = sizeof(DIDeviceObjectInstance);  
hr = lpdiMouse->GetObjectInfo(&didoi, DIMOFS_Z, DIPH_BYOFFSET);  
WheelAvailable = SUCCEEDED(hr);
```

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### [Visual Basic]

Such questions are answered with a call to the **DirectInputDevice8.GetCapabilities** method, which returns the data in a **DIDEVCAPS** type.

The following code example checks whether the mouse is attached and whether it has a third axis (presumably a wheel):

```
/* diMouse is a valid DirectInputDevice object. */  
  
Dim WheelAvailable As Boolean  
Dim dicaps as DIDEVCAPS  
  
Call diDev.GetCapabilities(dicaps)  
WheelAvailable = ((dicaps.IFlags And DIDC_ATTACHED) _  
    And (dicaps.IAxes > 2))
```

Another way to check for a certain button or axis is to call **DirectInputDevice8.GetObjectInfo** for that object. If the call raises the error **DIERR\_NOTFOUND**, the object is not present. The following code determines whether there is a z-axis, even if it is not the third axis:

```
Dim didoi As DirectInputDeviceObjectInstance  
On Error GoTo NOTFOUND  
Set didoi = diDev.GetObjectInfo(DIMOFS_Z, DIPH_BYOFFSET)  
On Error GoTo 0  
  
.  
.  
.  
  
NOTFOUND:  
If Err.Number = DIERR_NOTFOUND Then MsgBox "No z-axis found."  
End If
```

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## Cooperative Levels

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### [C++]

The cooperative level of a device determines how the input is shared with other applications and with the Microsoft® Windows® system. You set it by using the



**IDirectInputDevice8::SetCooperativeLevel** method, as in the following code example:

```
/* hwnd is the top-level window handle. */  
lpdiDevice->SetCooperativeLevel(hwnd,  
    DISCL_NONEXCLUSIVE | DISCL_FOREGROUND)
```

The parameters are the handle to the top-level window associated with the device (generally the application window) and one or more flags.

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#### [Visual Basic]

The cooperative level of a device determines how the input is shared with other applications and with the Microsoft® Windows® system. You set it by using the **DirectInputDevice8.SetCooperativeLevel** method, as in the following code example:

```
'hwnd is the top-level window handle.  
Call diDevice.SetCooperativeLevel(hWnd,  
    DISCL_NONEXCLUSIVE Or DISCL_FOREGROUND)
```

The parameters are the handle to the top-level window associated with the device (generally the application window) and one or more flags.

#### Note

The **hWnd** property of a form does not become valid until the form is shown. If you are initializing the Microsoft® DirectInput® device in the **Load** method of the application's main form, you must call **Show** before attempting to set the cooperative level.

---

Although DirectInput provides a default setting, you should still explicitly set the cooperative level because this is the only way to give DirectInput the window handle. Without this handle, DirectInput cannot react to situations that involve window messages, such as joystick recalibration.

The valid flag combinations are shown in the following table.

Flags	Notes
DISCL_NONEXCLUSIVE DISCL_BACKGROUND	The default setting
DISCL_NONEXCLUSIVE DISCL_FOREGROUND	
DISCL_EXCLUSIVE	
DISCL_EXCLUSIVE DISCL_FOREGROUND	

DISCL_EXCLUSIVE	Not valid for keyboard or mouse
DISCL_BACKGROUND	

For the keyboard, you can also include DISCL\_NOWINKEY in combination with DISCL\_NONEXCLUSIVE. This flag disables the Windows logo key so that users cannot inadvertently break out of the application. In exclusive mode, the Windows logo key is always disabled.

**Note**

Even if the cooperative level for the application is disabling the Windows logo key passively through an exclusive cooperative level, or actively through use of the DISCL\_NOWINKEY flag, that key will be active while the default action mapping UI is displayed.

The cooperative level has two main components: whether the device is being used in the foreground or the background, and whether it is being used exclusively or nonexclusively.

**Foreground vs. Background**

A foreground cooperative level means that the input device is available only when the application is in the foreground or, in other words, has the input focus. If the application moves to the background, the device is automatically unacquired, or made unavailable.

A background cooperative level really means foreground and background. A device with a background cooperative level can be acquired and used by an application at any time.

You will usually want to have foreground access only because most applications are not designed to respond to input that takes place when another program is in the foreground.

While developing an application, it is useful to employ conditional compilation so that the background cooperative level is always set for debugging. This prevents your application from losing access to the device every time it moves to the background as you switch to the debugging environment.

**Exclusive vs. Nonexclusive**

In most cases, the fact that your application is using a device at the exclusive level does not mean that other applications cannot get data from the device. However, it does mean that no other application can also acquire the device exclusively.

Consider the example of a music player that accepts input from a hand-held remote-control device, even when the application is running in the background. Now suppose you run a similar application that plays movies in response to signals from the same remote control. What happens when the user presses **Play**? Both programs start playing, which is probably not what the user wants. To prevent this from happening,

each application should have the DISCL\_EXCLUSIVE flag set so that only one of them can be running at a time.

To use force-feedback effects, an application must have exclusive access to the device.

---

#### [C++]

Windows itself requires exclusive access to the system mouse. The reason is that system mouse events such as a click on an inactive window could force an application to unacquire the device, with potentially harmful results such as a loss of data from the input buffer. So when an application has exclusive access to the system mouse, created by passing GUID\_SysMouse to **IDirectInput8::CreateDevice**, Windows is not allowed any access and no mouse messages are generated. A further side effect is that the cursor disappears.

---

#### [Visual Basic]

Windows itself requires exclusive access to the system mouse. The reason is that system mouse events such as a click on an inactive window could force an application to unacquire the device, with potentially harmful results such as a loss of data from the input buffer. So when an application has exclusive access to the system mouse, created by passing GUID\_SysMouse to **DirectInput8.CreateDevice**, Windows is not allowed any access and no mouse messages are generated. A further side effect is that the cursor disappears.

---

When an application has exclusive access to the keyboard, DirectInput suppresses all keyboard messages except CTRL+ALT+DEL and, on Windows 95 and Windows 98, ALT+TAB. Under Windows 2000, no application launched subsequently to the exclusive-mode DirectInput application can get keyboard data.

## Device Object Enumeration

It might be necessary for your application to determine what buttons or axes are available on a given device. To do this, you enumerate the device objects in much the same way as you enumerate devices.

#### Note

Because of limitations imposed by device drivers, enumeration of keyboard keys and indicator lights is not reliable. Objects might falsely be reported as present. You can get basic information about available keys from the device subtype, but there is no way to determine whether extra objects such as the menu key are available, other than asking the user for input.

---

#### [C++]

To some extent, **IDirectInputDevice8::EnumObjects** overlaps the functionality of **IDirectInputDevice8::GetCapabilities**. Either method can be used to determine how

many buttons or axes are available. However, **EnumObjects** is intended for cataloging all the available objects rather than checking for a particular one.

Like **IDirectInput8::EnumDevices**, the **EnumObjects** method has a callback function that enables you to do other processing on each object—for example, adding it to a list or creating a corresponding element on a user interface.

The following sample callback simply extracts the name of each object so that it can be added to a string list or array. This standard callback is documented under the placeholder name **DIDEnumDeviceObjectsCallback**, but you can give it any name you like. Remember, this function is called once for each object enumerated.

```
char szName[MAX_PATH];

BOOL CALLBACK DIDEnumDeviceObjectsCallback(
    LPCDIDDEVICEOBJECTINSTANCE lpddoi,
    LPVOID pvRef)
{
    lstrcpy(szName, lpddoi->tszName);
    // Now add szName to a list or array.
    .
    .
    .
    return DIENUM_CONTINUE;
}
```

The first parameter points to a structure containing information about the object. This structure is created for you by Microsoft® DirectInput®.

The second parameter is an application-defined pointer to data, equivalent to the second parameter to **EnumObjects**. In the example, this parameter is not used.

The return value in this case indicates that enumeration is to continue as long as there are objects to be enumerated.

Now here's the call to the **EnumObjects** method, which puts the callback function to work.

```
lpdiMouse->EnumObjects(DIDEnumDeviceObjectsCallback,
    NULL, DIDFT_ALL);
```

The first parameter is the address of the callback function. The second parameter can be a pointer to any data you want to use or modify in the callback. The example does not use this parameter and so passes NULL. The third parameter is a flag to indicate which type or types of objects are to be included in the enumeration. In the example, all objects are to be enumerated. To restrict the enumeration, you can use one or more of the other DIDFT\_\* flags listed at **IDirectInputDevice8::EnumObjects**.

## Note

Some of the DIDFT\_\* flags are combinations of others; for example, DIDFT\_AXIS is equivalent to DIDFT\_ABSAXIS | DIDFT\_RELAXIS.

---

#### [Visual Basic]

You enumerate device objects by calling **DirectInputDevice8.GetDeviceObjectsEnum**, which returns an instance of the **DirectInputEnumDeviceObjects** class representing the collection of available device objects that match the requested parameters.

The following code example enumerates axes on a device:

' diDev is a DirectInputDevice object.

```
Dim diEnumObjects As DirectInputEnumDeviceObjects
Set diEnumObjects = diDev.GetDeviceObjectsEnum(DIDFT_AXIS)
```

The parameter is a combination of flags (just one, in this case) to indicate which type or types of objects to include in the enumeration.

#### Note

Some of the **CONST\_DIDFTFLAGS** flags are combinations of others; for example, DIDFT\_AXIS is equivalent to DIDFT\_ABSAXIS Or DIDFT\_RELAXIS.

To obtain information about a particular device object, call the methods of a **DirectInputDeviceObjectInstance** object obtained by calling **DirectInputEnumDeviceObjects.GetItem**. Information available for a device object includes its name, its type, and its offset in the data structure for the device.

The following code lists the names of the axes enumerated in the previous example:

```
Dim diDevObjInstance As DirectInputDeviceObjectInstance
Dim i As Integer
For i = 1 To diEnumObjects.GetCount
    Set diDevObjInstance = diEnumObjects.GetItem(i)
    Call List1.AddItem(diDevObjInstance.GetName)
Next i
```

---

## Device Data Formats

If you are not using Action Mapping, setting the data format for a device is an essential step before you can acquire and begin using the device. This is true even if you do not intend to retrieve immediate (state) data from the device. Microsoft® DirectInput® uses the data format in many methods to identify particular device objects.

**[C++]**

The **IDirectInputDevice8::SetDataFormat** method tells DirectInput what device objects will be used and how the data will be arranged.

The examples in the reference for the **DIDATAFORMAT** and **DIOBJECTDATAFORMAT** structures show how to set up custom data formats for nonstandard devices. Fortunately, this step is not necessary for the joystick, keyboard, and mouse. DirectInput provides five global variables, *c\_dfDIJoystick*, *c\_dfDIJoystick2*, *c\_dfDIKeyboard*, *c\_dfDIMouse*, and *c\_dfDIMouse2*, which can be passed in to **SetDataFormat** to create a standard data format for these devices.

In the following code example, *lpdiMouse* is an initialized pointer to a DirectInputDevice object:

```
lpdiMouse->SetDataFormat(&c_dfDIMouse);
```

**Note**

You cannot change the **dwFlags** member in the predefined **DIDATAFORMAT** global variables (for example, to change the property of an axis), because they are **const** variables. To change properties, use the **IDirectInputDevice8::SetProperty** method after setting the data format, but before acquiring the device.

**[Visual Basic]**

The **DirectInputDevice8.SetCommonDataFormat** and **DirectInputDevice8.SetDataFormat** methods tell Microsoft® DirectInput® what device objects will be used and how the data will be arranged.

For standard devices—the mouse, keyboard, and any game controller whose input data can be described in a **DIJOYSTATE** or **DIJOYSTATE2** type—you can set the data format by calling the **SetCommonDataFormat** method, passing in a constant from the **CONST\_DICOMMONDATAFORMATS** enumeration. The common data formats are adequate for most applications.

For specialized devices, you must pass a description of the data format to the **SetDataFormat** method. The following code example sets the data format for a device with two axes, both of which require a **Long** for their data, and no buttons:

```
Dim dx As New DirectX8
Dim di As DirectInput8
Dim did As DirectInputDevice8
Dim fd As DIDATAFORMAT
Dim fda(1) As DIOBJECTDATAFORMAT
```

```
Private Sub Form_Load()
    Set di = dx.DirectInputCreate()
```

---

```
Set did = di.CreateDevice("GUID_SysMouse")
```

```
fDA(0).IFlags = DIDOI_POLLED  
fDA(0).IOfs = 0  
fDA(0).IType = DIDFT_RELAXIS  
fDA(0).strGuid = "GUID_XAxis"
```

```
fDA(1).IFlags = DIDOI_POLLED  
fDA(1).IOfs = 4  
fDA(1).IType = DIDFT_RELAXIS  
fDA(1).strGuid = "GUID_YAxis"
```

```
fD.dataSize = 8  
fD.IFlags = DIDF_RELAXIS  
fD.IObjSize = 4  
fD.numObjs = 2
```

```
did.SetDataFormat fD, fDA()
```

```
End Sub
```

---

## Device Properties

---

### [C++]

Properties of Microsoft® DirectInput® devices include the size of the data buffer, the range and granularity of values returned from an axis, whether axis data is relative or absolute, and the dead zone and saturation values for a joystick axis. Specialized devices can have other properties as well. For a list of properties defined by DirectInput, see **IDirectInputDevice8::GetProperty**.

With one exception—the gain property of a force-feedback device—properties can be changed only when the device is in an unacquired state.

Before calling the **IDirectInputDevice8::SetProperty** or the **IDirectInputDevice8::GetProperty** method you must set up a property structure that consists of a **DIPROPHEADER** structure and one or more elements for data. There is potentially a great variety of properties for input devices, and **SetProperty** must be able to work with all sorts of structures defining those properties. The purpose of the **DIPROPHEADER** structure is to define the size of the property structure and how the data is to be interpreted.

DirectInput includes the following predefined property structures:

- **DIPROPDWORD** defines a structure containing a **DIPROPHEADER** and a **DWORD** data member for properties that require a single value, such as a buffer size.
- **DIPROP\_RANGE** is for range properties, which require two values (maximum and minimum). It consists of a **DIPROPHEADER** and two **LONG** data members.
- **DIPROPGUIDANDPATH** is a specialized property structure enabling applications to perform operations on a Human Interface Device (HID) that are not supported by DirectInput. The structure consists of a **DIPROPHEADER**, a **GUID**, and a Unicode string for the path.
- **DIPROPSTRING** is for Unicode string properties. The structure comprises a **DIPROPHEADER** and a Unicode string.

For **SetProperty**, the data members of the property structure are the values that you want to set. For **GetProperty**, the current value is returned in these members.

Before the call to **GetProperty** or **SetProperty**, the **DIPROPHEADER** structure must be initialized with the following:

- The size of the property structure.
- The size of the **DIPROPHEADER** structure itself.
- An object identifier.
- A value indicating how the object identifier should be interpreted.

When getting or setting properties for a whole device, the object identifier **dwObj** is 0, and the **dwHow** member is **DIPH\_DEVICE**. If you want to get or set properties for a device object (for example, a particular axis), the combination of **dwObj** and **dwHow** values identifies the object. For details, see **DIPROPHEADER**.

After setting up the property structure, pass the address of its header into **GetProperty** or **SetProperty**, along with an identifier for the property that you want to obtain or change.

The following values are used to identify the property passed to **SetProperty** and **GetProperty**. For more information, see **IDirectInputDevice8::GetProperty**.

- **DIPROP\_BUFFERSIZE**. See also Buffered and Immediate Data. The buffer size can also be set by using the **IDirectInputDevice8::SetActionMap** method.
- **DIPROP\_AXISMODE**. See also Relative and Absolute Axis Coordinates.
- **DIPROP\_CALIBRATIONMODE**
- **DIPROP\_GRANULARITY**
- **DIPROP\_FFGAIN**
- **DIPROP\_FFLOAD**
- **DIPROP\_AUTOCENTER**
- **DIPROP\_RANGE**



- DIPROP\_DEADZONE
- DIPROP\_SATURATION

For more information about the last three properties, see also Interpreting Joystick Axis Data.

The following code example sets the buffer size for a device to hold up to 10 data items:

```
DIPROPDWORD dipdw;  
HRESULT hr;  
dipdw.diph.dwSize = sizeof(DIPROPDWORD);  
dipdw.diph.dwHeaderSize = sizeof(DIPROPHEADER);  
dipdw.diph.dwObj = 0;  
dipdw.diph.dwHow = DIPH_DEVICE;  
dipdw.dwData = 10;  
hr = lpdiDevice->SetProperty(DIPROP_BUFFERSIZE, &dipdw.diph);
```

---

#### [\[Visual Basic\]](#)

Properties of Microsoft® DirectInput® devices include the size of the data buffer, the range and granularity of values returned from an axis, whether axis data is relative or absolute, and the dead zone and saturation values for a joystick axis. Specialized devices can have other properties as well. For a list of properties defined by DirectInput, see **DirectInputDevice8.GetProperty**.

With one exception—the gain property of a force-feedback device—properties can be changed only when the device is in an unacquired state.

The **DirectInputDevice8.SetProperty** and **DirectInputDevice8.GetProperty** methods take two parameters: a GUID alias in string form that identifies the property being set, and data of type **Any**. The data is actually passed in one of the following types:

- **DIPROPLONG** is for properties that require a single value, such as a buffer size. The property data consists of a single **Long**.
- **DIPROP RANGE** is for range properties, which require two values (maximum and minimum). The property data consists of two **Long** data members.

For **SetProperty**, the data members of the property types are the values you want to set. For **GetProperty**, the current value is returned in these members.

In addition to the actual property data, both these types contain two other members: **IHow** and **IObj**.

The values in **IHow** and **IObj** work together, with **IHow** signifying the system that is used to identify the device object whose property is being set or retrieved, and **IObj** identifying the device object.

If **IHow** is **DIPH\_BYID**, the device object is described by a unique numerical identifier in **IObj**. This ID can be extracted from the value returned by **DirectInputDeviceObjectInstance.GetType** after device objects have been enumerated.

For most applications, it is simpler to identify the device object by its offset within the data structure established by **DirectInputDevice8.SetCommonDataFormat** or **DirectInputDevice8.SetDataFormat**. In this case, **IHow** is **DIPH\_BYOFFSET**, and **IObj** is the offset, in bytes. For the keyboard, mouse, and any game controller whose data can be returned in a **DIJOYSTATE** or **DIJOYSTATE2** type, the device object can be identified by a predefined constant. See **CONST\_DIKEYFLAGS**, **CONST\_DIMOUSEOFS**, and **CONST\_DIJOYSTICKOFS**.

The **IHow** member can also contain **DIPH\_DEVICE**, which means that the property belongs to the entire device, rather than a single device object. Buffer size is an example of such a property. When **IHow** is **DIPH\_DEVICE**, **IObj** is 0.

The following strings are used to identify the property passed to **SetProperty** and **GetProperty**. For more information, see **DirectInputDevice8.GetProperty**.

- **DIPROP\_AXISMODE**. See also Relative and Absolute Axis Coordinates.
- **DIPROP\_BUFFERSIZE**. See also Buffered and Immediate Data.
- **DIPROP\_DEADZONE**
- **DIPROP\_GRANULARITY**
- **DIPROP\_RANGE**
- **DIPROP\_SATURATION**

For more information about dead zone, range, and saturation, see also Interpreting Joystick Axis Data.

The following code example sets the buffer size for a device:

' diDev is a DirectInputDevice whose data format has been set.

```
Dim diProp As DIPROPLONG
diProp.IHow = DIPH_DEVICE
diProp.IObj = 0
diProp.IData = 10
Call diDev.SetProperty("DIPROP_BUFFERSIZE", diProp)
```

---

## Acquiring Devices

Acquiring a Microsoft® DirectInput® device means giving your application access to it. As long as a device is acquired, DirectInput is making its data available to your application. If the device is not acquired, you can manipulate its characteristics but not obtain any data.

Acquisition is not permanent. Your application might acquire and unacquire a device many times.

In certain cases, depending on the cooperative level, a device is unacquired automatically whenever the application moves to the background. The mouse is automatically unacquired when the user clicks a menu, because at this point Microsoft Windows® assumes control of the device.

You must unacquire a device before changing its properties. The only exception is that you can change the gain for a force-feedback device while it is in an acquired state.

The acquisition mechanism is needed for two reasons:

First, DirectInput must be able to tell the application when the flow of data from the device has been interrupted by the system. For instance, if the user has switched to another application with ALT+TAB and has used the input device in that application, your application needs to know that the input no longer belongs to it and that the state of the buffers might have changed. Or consider an application with the DISCL\_FOREGROUND cooperative level. The user holds down the SHIFT key and switches to another application. Then the user releases the key and switches back to the first application. As far as the first application is concerned, the SHIFT key is still down. The acquisition mechanism, by telling the application that input was lost, enables it to recover from these conditions.

Second, because your application can alter the properties of the device, without safeguards DirectInput would have to check the properties each time you wanted to retrieve data. This would be very inefficient. Even worse, a potential disaster could happen such as a hardware interrupt accessing a data buffer just as you were changing the buffer size. Therefore DirectInput requires your application to unacquire the device before changing properties. When you reacquire it, DirectInput checks the properties and decides on the optimal way of transferring data from the device to the application. This is done only once, so the data retrieval methods can be very fast.

---

#### [C++]

Because the most common cause of losing a device is that your application moves to the background, you may want to reacquire devices whenever your application is activated. Be careful, though, about relying on a WM\_ACTIVATE handler at startup time. The first WM\_ACTIVATE message will likely arrive when your window is being initialized before DirectInput has been set up. To ensure that the device is acquired at startup, call **IDirectInputDevice8::Acquire** as soon as the device has been initialized.

Even acquiring the device on activation of your program window might not cover all cases in which a device is unacquired, especially for devices other than the standard mouse or keyboard. Because your application might unacquire a device unexpectedly, you need a mechanism for checking the acquisition state before attempting to get data from the device. The Scrawl Sample does this in the **OnMouseInput** function, in which a DIERR\_INPUTLOST error triggers a message to reacquire the mouse. (See also Tutorial 2: Using the Mouse.)

#### [Visual Basic]

Because your application might unacquire a device unexpectedly, especially if you have set the exclusive cooperative level, you must ensure that the application tracks the state of acquisition. One technique is to check for the DIERR\_INPUTLOST error after attempting to retrieve data. If this error is raised, you know the device has been unacquired. If your application is getting input in response to event notification, an event is signaled when acquisition is lost.

See the ScrawlB sample for more information about how to manage device acquisition in exclusive mode.

---

Attempting to reacquire a device that is already acquired does no harm. Redundant calls to **Acquire** are ignored, and the device can always be unacquired with a single call to **Unacquire**.

---

#### [C++]

Windows does not have access to the mouse when your application is using it in exclusive mode. If you want Windows to acquire the mouse, you must release it. The Scrawl Sample responds to a right-click by unacquiring the mouse, putting the Windows cursor in the same spot as its own, displaying a shortcut menu, and letting Windows handle the input until a menu choice is made.

---

#### [Visual Basic]

Windows does not have access to the mouse when your application is using it in exclusive mode. If you want Windows to acquire the mouse, you must release it. The ScrawlB sample responds to a right-click button by unacquiring the mouse, putting the Windows cursor in the same spot as its own, displaying a shortcut menu, and letting Windows handle the input until a menu choice is made.

---

## DirectInput Device Data

This section covers the following basic concepts of getting data from Microsoft® DirectInput® devices.

- Buffered and Immediate Data
- Time Stamps and Sequence Numbers
- Polling and Event Notification

- Relative and Absolute Axis Coordinates

The following topics describe specific details about output data and mouse, keyboard, and joystick input data.

- Mouse Data
- Keyboard Data
- Joystick Data
- Output Data

DirectInput provides two mechanisms for identifying data retrieved from devices. Using the traditional mechanism, the application identifies the data as coming from a particular device object, such as the x-axis on a mouse or the F1 key on a keyboard. With the newer system, available for the first time in Microsoft DirectX® 8.0, DirectInput associates application-defined values (for instance, identifiers for particular game actions such as moving or shooting) with the most suitable device objects available. When data is retrieved, the application does not concern itself with the actual device or device object from which the data comes. It acts only on the meaning of that data.

Most of the information in this section applies to both mechanisms. For more information on the newer way of identifying device data, see Action Mapping.

## Buffered and Immediate Data

Microsoft® DirectInput® supplies two types of data: buffered and immediate. Buffered data is a record of events that are stored until an application retrieves them. Immediate data is a snapshot of the current state of a device.

You might use immediate data in an application that is concerned only with the current state of a device—for example, a flight combat simulation that responds to the current position of the joystick and the state of one or more buttons. Buffered data might be the better choice where events are more important than states—for example, in an application that responds to movement of the mouse and button clicks. You can also use both types of data, as you might, for example, if you wanted to get immediate data for joystick axes but buffered data for the buttons.

### Note

If you are using Action Mapping, you will want to retrieve buffered data because the buffered data packets contain the application-defined data associated with the input. Doing so means that you are responsible for tracking the position of absolute axes, since events but not states are reported in buffered data packets.

---

### [C++]

An application retrieves immediate data by calling the **IDirectInputDevice8::GetDeviceState** method. As the name implies, this method returns the current state of the device—for example, whether each button is up or down. The method provides no data about what has happened with the device since

the last call, apart from implicit information that you can derive by comparing the current state with the last one. For example, if a user presses and releases a button between two calls to **GetDeviceState**, your application will never be given this input. On the other hand, if the user is holding a button down, **GetDeviceState** continues reporting that fact until the user releases it.

This way of reporting the device state is different from the way Microsoft Windows® reports events with one-time messages such as WM\_LBUTTONDOWN. It is more like the results from the Microsoft Win32® **GetKeyboardState** function. If you are polling a device with **GetDeviceState**, you are responsible for determining what constitutes a button click, a double-click, a single keystroke, and so on, and for ensuring that your application does not keep responding to a button-down or key-down state when it's not appropriate to do so.

With buffered data, events are stored until you are ready to deal with them. Every time a button or key is pressed or an axis is moved, information about the event is placed in a **DIDEVICEOBJECTDATA** structure in the buffer. If the buffer overflows, new data is lost. Your application reads the buffer with a call to **IDirectInputDevice8::GetDeviceData**. You can read any number of items at a time.

Reading an item normally deletes it from the buffer, but you also have the choice of peeking without deleting.

To get buffered data, you must first set the buffer size with the **IDirectInputDevice8::SetProperty** or **IDirectInputDevice8::SetActionMap** method. (See the example under Device Properties.) Set the buffer size before acquiring the device for the first time. For reasons of efficiency, the default size of the buffer is 0, and you cannot obtain buffered data unless you change this value. The size of the buffer is measured in items of data for that type of device, not in bytes.

Check the value of the *pdwInOut* parameter after a call to the **GetDeviceData** method. The number of items retrieved from the buffer is returned in this variable.

#### Note

For devices that do not generate interrupts, such as analog joysticks, DirectInput does not obtain any data until you call the **IDirectInputDevice8::Poll** method. For more information, see Polling and Event Notification.

For examples of retrieving buffered data, see **IDirectInputDevice8::GetDeviceData**.

---

#### [Visual Basic]

An application retrieves immediate data by calling one of the following methods:

- **DirectInputDevice8.GetDeviceStateKeyboard**. For devices that retrieve data in a **DIKEYBOARDSTATE** type. (For this and the following three methods, the data format must have been set by using **DirectInputDevice8.SetCommonDataFormat**.)
- **DirectInputDevice8.GetDeviceStateMouse**. For devices that retrieve data in a **DIMOUSESTATE** type.

- **DirectInputDevice8.GetDeviceStateMouse2**. For devices that retrieve data in a **DIMOUSESTATE2** type.
- **DirectInputDevice8.GetDeviceStateJoystick**. For devices that retrieve data in a **DIJOYSTATE** type.
- **DirectInputDevice8.GetDeviceStateJoystick2**. For devices that retrieve data in a **DIJOYSTATE2** type.
- **DirectInputDevice8.GetDeviceState**. For devices that use custom data formats, as set by using **DirectInputDevice8.SetDataFormat**.

As the names imply, each of these methods returns the current state of the device—for example, whether each button is up or down. The method provides no data about what has happened with the device since the last call, apart from implicit information that you can derive by comparing the current state with the last one. For example if a user presses and releases a button between two calls to the method, your application will never be given this input. On the other hand, if the user is holding a button down, the method continues reporting that fact until the user releases it.

This way of reporting the device state is different from the way Microsoft Visual Basic® reports events with one-time events such as **Click** and **Keydown**. If you are polling a device with one of the **GetDeviceState** methods, you are responsible for determining what constitutes a button click, a double-click, a single keystroke, and so on, and for ensuring that your application does not keep responding to a button-down or key-down state when it is not appropriate to do so.

With buffered data, events are stored until you are ready to deal with them. Every time a button or key is pressed or an axis is moved, information about the event is placed in a **DIDEVICEOBJECTDATA** type in the buffer. Your application reads the buffer with a call to **DirectInputDevice8.GetDeviceData**. You can read any number of items at a time.

Reading an item normally deletes it from the buffer, but you also have the choice of retrieving without deleting by setting the **DIGDD\_PEEK** flag.

To get buffered data, you must first set the buffer size by using the **DirectInputDevice8.SetProperty** or **DirectInputDevice8.SetActionMap** method. (See the example under Device Properties.) Set the buffer size before acquiring the device for the first time. For reasons of efficiency, the default size of the buffer is 0, and you cannot obtain buffered data unless you change this value. The size of the buffer is measured in items of data for that type of device, not in bytes.

The return value of **GetDeviceData** tells you the number of items retrieved from the buffer. If the buffer has overflowed, no data is returned, and **GetDeviceData** raises an error, which the application should trap.

### Note

For devices that do not generate interrupts, such as analog joysticks, **DirectInput** does not obtain any data until you call the **DirectInputDevice8.Poll** method. For more information, see Polling and Event Notification.

See also:

- Time Stamps and Sequence Numbers
- Mouse Data
- Keyboard Data
- Joystick Data

## Time Stamps and Sequence Numbers

---

### [C++]

When Microsoft® DirectInput® input data is buffered (see Buffered and Immediate Data), each **DIDEVICEOBJECTDATA** structure contains not only information about the type of event and the device object associated with it. It also contains a time stamp and a sequence number.

The **dwTimeStamp** member contains the system time, in milliseconds, at which the event took place. This is equivalent to the value that would have been returned by the Microsoft Win32® **GetTickCount** function, but at a higher resolution.

The **dwSequence** member contains a sequence number assigned by DirectInput. The DirectInput system keeps a single sequence counter, which is incremented by each buffered event from any device. (Simultaneous events on the same device, such as diagonal mouse movements, increment the count only once.) Use this number to compare events from different devices and see which came first. The **DISEQUENCE\_COMPARE** macro, used for comparing DirectInput sequence numbers, takes wraparound into account.

---

### [Visual Basic]

When Microsoft® DirectInput® input data is buffered (see Buffered and Immediate Data), each **DIDEVICEOBJECTDATA** type contains not only information about the type of event and the device object associated with it. It also contains a time stamp and a sequence number.

The **ITimeStamp** member contains the system time, in milliseconds, at which the event took place. This is equivalent to the value that would have been returned by the Microsoft Win32® **GetTickCount** function, but at a higher resolution.

The **ISequence** member contains a sequence number assigned by DirectInput. The DirectInput system keeps a single sequence counter, which is incremented by each buffered event from any device. (Simultaneous events on the same device, such as diagonal mouse movements, increment the count only once.) Use this number to compare events from different devices and see which came first.

---



**Note**

Events are always placed in the buffer in chronological order, so you don't need to check the sequence numbers to sort the events from a single device.

## Polling and Event Notification

There are two ways to find out whether input data is available: polling and event notification.

Polling a device means regularly getting the current state of the device objects or checking the contents of the event buffer. Polling is typically used by real-time games that are never idle, but instead are constantly updating and rendering the game world.

### Polling

---

**[C++]**

In a C++ application, polling would typically be done within the message loop.

Some joysticks and other game devices, or particular objects on them, do not generate hardware interrupts and do not return any data or signal any events until you call the **IDirectInputDevice8::Poll** method. (This behind-the-scenes polling is not to be confused with the kind of application polling just discussed. **Poll** does not retrieve any data, but merely makes data available.)

To find out whether it is necessary to call **Poll** each time you want to retrieve data, first set the data format for the device, then call the **IDirectInputDevice8::GetCapabilities** method and check for the **DIDC\_POLLEDDATAFORMAT** flag in the **DIDEVCAPS** structure.

Do not confuse the **DIDC\_POLLEDDATAFORMAT** flag with the **DIDC\_POLLEDDEVICE** flag. The latter is set if any object on the device requires polling, regardless of data format. You can then find out whether this is the case for a particular object by calling the **IDirectInputDevice8::GetObjectInfo** method and checking for the **DIDOI\_POLLED** flag in the **DIDeviceObjectInstance** structure.

The **DIDC\_POLLEDDEVICE** flag describes the worst case for the device, not the actual situation. For example, a Human Interface Device (HID) mouse with software-controllable resolution might be marked as **DIDC\_POLLEDDEVICE** because reading the resolution information requires polling. If you want to retrieve only the standard button and axis data, polling the device under these conditions is not necessary. However, there is no harm in calling the **IDirectInputDevice8::Poll** method for any input device. If the call is unnecessary, it has no effect and is very fast.

---

**[Visual Basic]**

In a Microsoft® Visual Basic® application, polling would typically be done in the **Sub Main** procedure.

Some joysticks and other game devices, or particular objects on them, do not generate hardware interrupts and do not return any data or signal any events until you call the **DirectInputDevice8.Poll** method. (This behind-the-scenes polling is not to be confused with the kind of application polling just discussed. **Poll** does not retrieve any data, but merely makes data available.)

To find out whether it is necessary to call **Poll** each time you want to retrieve data, first set the data format for the device, then call the **DirectInputDevice8.GetCapabilities** method and check for the **DIDC\_POLLEDDATAFORMAT** flag in the **DIDEVCAPS** type.

Do not confuse the **DIDC\_POLLEDDATAFORMAT** flag with the **DIDC\_POLLEDDEVICE** flag. The latter is set if any object on the device requires polling. You can then find out whether this is the case for a particular object by calling the **DirectInputDevice8.GetObjectInfo** method to get a **DirectInputDeviceObjectInstance** object, and then checking for the **DIDOI\_POLLED** flag in the valued returned by **DirectInputDeviceObjectInstance.GetFlags**.

The **DIDC\_POLLEDDEVICE** flag describes the worst case for the device, not the actual situation. For example, an HID mouse with software-controllable resolution might be marked as **DIDC\_POLLEDDEVICE** because reading the resolution information requires polling. If you want to retrieve only the standard button and axis data, polling the device under these conditions is not necessary. However, there is no harm in calling the **Poll** method for any input device. If the call is unnecessary, it has no effect and is very fast.

---

## Event Notification

---

### [C++]

Event notification is suitable for applications such as the Scrawl Sample that wait for input before doing anything.

To use event notification, set up a thread-synchronization object with the Microsoft® Win32® **CreateEvent** function, and then associate this event with the device by passing its handle to the **IDirectInputDevice8::SetEventNotification** method. The event is then signaled by Microsoft DirectInput® whenever the state of the device changes. Your application can receive notification of the event with a Win32 function such as **WaitForSingleObject**, and then respond by checking the input buffer to find out what the event was. For code examples, see the Scrawl sample and **IDirectInputDevice8::SetEventNotification**.

---

### [Visual Basic]

Event notification is suitable for applications such as the ScrawlB Sample that wait for input before doing anything.

To use event notification, implement **DirectXEvent8** in the form or module in which you want to retrieve data. Then create an event handle by using **DirectX8.CreateEvent**, and pass this handle to **DirectInputDevice8.SetEventNotification**. Now, whenever an input event occurs on the device, the **DirectXEvent8.DXCallback** method is called, and in your implementation of this method you can retrieve either the device state or buffered data just as you would if you were doing so in **Sub Main**.

---

## Relative and Absolute Axis Coordinates

Axis coordinates can be returned as relative values—that is, the amount by which they have changed since the application last retrieved the device state or, in the case of buffered input, since the last item was put in the buffer.

Absolute axis coordinates are a running total of all the relative coordinates returned by the system since the device was acquired. In other words, they show the position of the axis in relation to a fixed point.

By default, mouse axes are reported as relative coordinates and joystick axes as absolute coordinates. You can change the coordinate system for a device by setting a property. For more information, see Device Properties.

## Mouse Data

---

### [C++]

To set up the mouse device for data retrieval, first call the **IDirectInputDevice8::SetDataFormat** method with the *c\_dfDIMouse* or *c\_dfDIMouse2* global variable as the parameter value. Use *c\_dfDIMouse2* if you want to support more than four mouse buttons.

For maximum performance in a full-screen application, set the cooperative level to **DISCL\_EXCLUSIVE** | **DISCL\_FOREGROUND**. Note that the exclusive setting causes the Microsoft® Windows® cursor to disappear. The **DISCL\_FOREGROUND** setting causes the application to lose access to the mouse when you switch to a debugging window. Changing to **DISCL\_BACKGROUND** enables you to debug the application more easily, but at a cost in performance.

---

### [Visual Basic]

To set up the mouse device for data retrieval, first call the **DirectInputDevice8.SetCommonDataFormat** method with **DIFORMAT\_MOUSE** as the parameter value.

For maximum performance in a full-screen application, set the cooperative level to **DISCL\_EXCLUSIVE** Or **DISCL\_FOREGROUND**. Note that the exclusive setting causes the Microsoft® Windows® cursor to disappear. The **DISCL\_FOREGROUND**

setting causes the application to lose access to the mouse when you switch to the Microsoft Visual Basic® development environment. Changing to DISCL\_BACKGROUND enables you to debug the application more easily, but at a cost in performance.

---

The following sections give more information about retrieval and interpretation of immediate and buffered mouse data:

- Immediate Mouse Data
- Buffered Mouse Data
- Interpreting Mouse Axis Data
- Checking for Lost Mouse Input

## See Also

Device Data Formats, Cooperative Levels

### Immediate Mouse Data

---

#### [C++]

To retrieve the current state of the mouse, call

**IDirectInputDevice8::GetDeviceState** with a pointer to a **DIMOUSESTATE** or a **DIMOUSESTATE2** structure, depending on the data format. The mouse state returned in the structure includes axis data and the state of each of the buttons.

The first three members of the structure hold the axis coordinates. (See Interpreting Mouse Axis Data.)

The **rgbButtons** member is an array of bytes, one for each of four or eight buttons. For a traditional mouse, the first element in the array is generally the left button, the second is the right button, and the third is the middle button. The high bit is set if the button is down, and it is clear if the button is up or not present.

---

#### [Visual Basic]

To retrieve the current state of the mouse, call

**DirectInputDevice8.GetDeviceStateMouse** or **DirectInputDevice8.GetDeviceStateMouse2**, passing in a **DIMOUSESTATE** or **DIMOUSESTATE2** type. The mouse state returned in the type includes axis data and the state of each of the buttons.

The **x**, **y**, and **z** members of the **DIMOUSESTATE** and **DIMOUSESTATE2** types hold the axis coordinates. (See Interpreting Mouse Axis Data.) The **buttons** member is an array of bytes, one for each button. The first element in the array is generally the left button, the second is the right button, the third is the middle button. The high bit is set if the button is down, and it is clear if the button is up or not present.

## See also

Buffered and Immediate Data

### Buffered Mouse Data

To retrieve buffered data from the mouse, you must first set the buffer size (see Device Properties). The default size of the buffer is 0, so this step is essential.

---

#### [C++]

You must also declare an array of **DIDEVICEOBJECTDATA** structures. This array can have up to the same number of elements as the buffer size. You do not have to retrieve the entire contents of the buffer with a single call. You can have just one element in the array and retrieve events one at a time until the buffer is empty.

After acquiring the device, you can examine and flush events in the buffer at any time by using the **IDirectInputDevice8::GetDeviceData** method. (See Buffered and Immediate Data.) On return, each element in the **DIDEVICEOBJECTDATA** array represents a change in state for a single object on the mouse. For example, if the user presses button 0 and moves the mouse diagonally, the array passed to **GetDeviceData** (if it has at least three elements, and *pdwInOut* is at least 3) will have three elements filled in—an element for button 0 being pressed, an element for the change in the x-axis, and an element for the change in the y-axis—and the value of *pdwInOut* will be set to 3.

You can determine which object an element in the array refers to by checking the **dwOfs** member of the **DIDEVICEOBJECTDATA** structure against the values returned by the following macros:

- **DIMOFS\_BUTTON0** to **DIMOFS\_BUTTON7**
- **DIMOFS\_X**
- **DIMOFS\_Y**
- **DIMOFS\_Z**

Each of these values is derived from the offset of the data for the object in a **DIMOUSESTATE** or **DIMOUSESTATE2** structure. For example, **DIMOFS\_BUTTON0** is equivalent to the offset of **rgbButtons[0]** in the **DIMOUSESTATE** structure. **DIMOFS\_BUTTON4** to **DIMOFS\_BUTTON7** are supported only for **DIMOUSESTATE2**. With the macros you can use simple comparisons to determine which device object is associated with an item in the buffer. For example:

```
DIDEVICEOBJECTDATA *lpdidod;  
int n;  
.  
.
```

```
/* MouseBuffer is an array of DIDEVICEOBJECTDATA structures
   that has been set by a call to GetDeviceData.
   n is incremented in a loop that examines all filled elements
   in the array. */
lpdidod = &MouseBuffer[n];
if ((int) lpdidod->dwOfs == DIMOFS_BUTTON0)
    && (lpdidod->dwData & 0x80)
{
    ; // Do something in response to left button press.
}
```

The data for the change of state of the device object is located in the **dwData** member of the **DIDEVICEOBJECTDATA** structure. For axes, the coordinate value is returned in this member. For button objects, only the low byte of **dwData** is significant. The high bit of this byte is set if the button was pressed, and it is clear if the button was released. In other words, the button was pressed if (**dwData & 0x80**) is nonzero.

If you are using Action Mapping, ignore the value in **dwOfs** and instead retrieve the application-defined data associated with the event from the **uAppData** member.

For more information on the other members of the **DIDEVICEOBJECTDATA** structure, see Time Stamps and Sequence Numbers.

---

#### [\[Visual Basic\]](#)

You must also declare an array of **DIDEVICEOBJECTDATA** types. This array can have up to the same number of elements as the buffer size. You do not have to retrieve the entire contents of the buffer with a single call. You can have just one element in the array and retrieve events one at a time until the buffer is empty.

After acquiring the device, you can examine and flush the buffer at any time by using the **DirectInputDevice8.GetDeviceData** method. (See Buffered and Immediate Data.) On return, each element in the **DIDEVICEOBJECTDATA** array represents a change in state for a single object on the mouse. For instance, if the user presses button 0 and moves the mouse diagonally, the array passed to **GetDeviceData** (if it has at least three elements) will have three elements filled in—an element for button 0 being pressed, an element for the change in the x-axis, and an element for the change in the y-axis—and the return value of the method will be 3.

You can determine which object an element in the array refers to by checking the **IOfs** member of the **DIDEVICEOBJECTDATA** type against the constants in the **CONST\_DIMOUSEOFS** enumeration. Each of these values is derived from the offset of the data for the object in a **DIMOUSESTATE** or **DIMOUSESTATE2** type. For example, **DIMOFS\_BUTTON0** is equivalent to the offset of **buttons(0)** in the **DIMOUSESTATE** type. **DIMOFS\_BUTTON4** to **DIMOFS\_BUTTON7** are supported only for **DIMOUSESTATE2**.

The data for the change of state of the device object is located in the **IData** member of the **DIDeviceObjectData** type. For axes, the coordinate value is returned in this member. For button objects, only the low byte of **IData** is significant. The high bit of this byte is set if the button was pressed, and it is clear if the button was released. In other words, the button was pressed if (**IData And &H80**) is nonzero.

For more information on the other members of the **DIDeviceObjectData** type, see Time Stamps and Sequence Numbers.

The following code example retrieves the entire contents of the buffer (which contains *BufferSize* elements) and responds to various events:

```
' objDIDev is a DirectInputDevice object.
Dim diDeviceData(1 To BufferSize) As DIDeviceObjectData
Dim NumEvents As Integer
Dim i As Integer

NumEvents = objDIDev.GetDeviceData(diDeviceData, 0)
For i = 1 To NumEvents
    Select Case diDeviceData(i).IOfs
        Case DIMOFS_X
            ' Respond to x-axis movement.

        Case DIMOFS_Y
            ' Respond to y-axis movement.

        Case DIMOFS_BUTTON0
            If diDeviceData(i).IData And &H80 Then
                ' Respond to left button pressed.
            Else
                ' Respond to left button released.
            End If

    End Select
Next i
```

---

## Interpreting Mouse Axis Data

The data returned for the x-axis and y-axis of a mouse indicates the movement of the mouse itself, not the cursor. The units of measurement are based on the values returned by the mouse hardware and have nothing to do with pixels or any other form of screen measurement. Because Microsoft® DirectInput® communicates directly with the mouse driver, the values for mouse speed and acceleration set by the user in Control Panel do not affect this data.

Axis data returned from the mouse can be either relative or absolute. (See Relative and Absolute Axis Coordinates.) Because a mouse is a relative device—unlike a joystick, it does not have a home position—relative data is returned by default.

---

#### [C++]

The axis mode, which specifies whether relative or absolute data should be returned, is a property that can be changed before the device is acquired. (See Device Properties.) To set the axis mode to absolute, call **IDirectInputDevice8::SetProperty** with the `DIPROP_AXISMODE` value in the *rguidProp* parameter and with `DIPROPAXISMODE_ABS` in the **dwData** member of the **DIPROPDWORD** structure.

---

#### [Visual Basic]

The axis mode, which specifies whether relative or absolute data should be returned, is a property that can be changed before the device is acquired. (See Device Properties.) To set the axis mode to absolute, call **DirectInputDevice8.SetProperty** with "DIPROP\_AXISMODE" in the *guid* parameter and with `DIPROPAXISMODE_ABS` in the **IData** member of the **DIPROPLONG** type.

---

When the axis mode for the mouse is set to relative, the axis coordinate represents the number of units that the device has been moved along the axis since the last value was returned. A negative value indicates that the mouse was moved to the left for the x-axis, or away from the user for the y-axis, or that the z-axis (the wheel) was rotated toward the user. Positive values indicate movement in the opposite direction.

When the axis mode is set to absolute, the coordinates are simply a running total of all relative motions received by DirectInput. The axis coordinates are not initialized to any particular value when the device is acquired, so your application should treat absolute values as relative to an unknown origin. You can record the current absolute position whenever the device is acquired and save it as the virtual origin. This virtual origin can then be subtracted from subsequent absolute coordinates retrieved from the device to compute the relative distance that the mouse has moved from the point of acquisition.

The data returned for the axis coordinates is also affected by the granularity property of the device. For the x-axis and y-axis of the mouse, granularity is normally 1. In other words, the minimum change in value is 1. For the wheel axis, it might be larger.

## Checking for Lost Mouse Input

---

#### [C++]

When you have set the cooperative level to `DISCL_FOREGROUND` and the focus switches to another application (or even to the menu in your own application), Microsoft® Windows® might force your application to unacquire the mouse. For this reason, you should check for the `DIERR_INPUTLOST` return value from the **IDirectInputDevice8::GetDeviceData** or the



**IDirectInputDevice8::GetDeviceState** method, and attempt to reacquire the mouse if necessary. (See Acquiring Devices.)

**Note**

You should not attempt to reacquire the mouse on getting a DIERR\_NOTACQUIRED error. If you do, you could get caught in an infinite loop—acquisition would again fail, you would get another DIERR\_NOTACQUIRED error, and so on.

---

[\[Visual Basic\]](#)

When you have set the cooperative level to DISCL\_FOREGROUND and the focus switches to another application (or even to the menu in your own application), Microsoft® Windows® might force your application to unacquire the mouse. For this reason, you should check for the DIERR\_INPUTLOST return value from the **DirectInputDevice8.GetDeviceData** or the **DirectInputDevice8.GetDeviceStateMouse** method, and attempt to reacquire the mouse if necessary. (See Acquiring Devices.)

**Note**

You should not attempt to reacquire the mouse on getting a DIERR\_NOTACQUIRED error. If you do, you could get caught in an infinite loop: acquisition would again fail, you would get another DIERR\_NOTACQUIRED error, and so on.

---

## Keyboard Data

When using Microsoft® DirectInput®, consider the keyboard not as a text input device but as a game pad with many buttons. When your application requires text input, do not use DirectInput methods. It is far easier to retrieve the data from the normal Microsoft Windows® messages, which enable you take advantage of services such as character repeat and translation of physical keys to virtual keys. This is particularly important for languages other than English, which can require special translations of key presses.

---

[\[C++\]](#)

To set up the keyboard device for data retrieval, you must first call the **IDirectInputDevice8::SetDataFormat** method with the *c\_dfDIKeyboard* global variable as the parameter. (See Device Data Formats.)

---

[\[Visual Basic\]](#)

To set up the keyboard device for data retrieval, you must first call the **DirectInputDevice8.SetCommonDataFormat** method with **DIFORMAT\_KEYBOARD** as the parameter.

---

The following sections give more information about obtaining and interpreting keyboard data:

- Immediate Keyboard Data
- Buffered Keyboard Data
- Interpreting Keyboard Data
- Checking for Lost Keyboard Input

## Immediate Keyboard Data

---

### [C++]

To retrieve the current state of the keyboard, call the **IDirectInputDevice8::GetDeviceState** method with a pointer to an array of 256 bytes that will hold the returned data.

The **GetDeviceState** method behaves in the same way as the Microsoft® Win32® **GetKeyboardState** function. It returns a snapshot of the current state of the keyboard. Each key is represented by a byte in the array of 256 bytes whose address was passed as the *lpvData* parameter. If the high bit of the byte is set, the key is down. The array is most conveniently indexed with the Microsoft® DirectInput® Keyboard Device Constants. (See also Interpreting Keyboard Data.)

The following code example calls a function in response to the ESC key being down. Assume that *lpdiKeyboard* is an acquired DirectInput device.

```
BYTE diKeys[256];
if (lpdiKeyboard->GetDeviceState(256, diKeys) == DI_OK)
{
    if (diKeys[DIK_ESCAPE] & 0x80) DoSomething();
}
```

---

### [Visual Basic]

To retrieve the current state of the keyboard, call the **DirectInputDevice8.GetDeviceStateKeyboard** method, passing a **DIKEYBOARDSTATE** type.

The **GetDeviceState** method returns a snapshot of the current state of the keyboard. Each key is represented by an element in the array of 256 bytes that makes up the **DIKEYBOARDSTATE** type. If the high bit of the byte is set, the key is down. The array is most conveniently indexed with the members of the **CONST\_DIKEYFLAGS** enumeration. (See also Interpreting Keyboard Data.)

The following code example determines whether the ESC key is currently being pressed. Assume that *objDIDev* is a **DirectInputDevice8** object.

```
Dim KeyState As DIKEYBOARDSTATE

Call objDIDev.GetDeviceStateKeyboard(KeyState)
If (KeyState.Key(DIK_ESCAPE) And &H80) Then
    ' Key is down.
End If
```

---

## Buffered Keyboard Data

To retrieve buffered data from the keyboard, you must first set the buffer size (see Device Properties). This step is essential because the default size of the buffer is 0.

---

### [C++]

You must also declare an array of **DIDeviceObjectData** structures. This array can have up to the same number of elements as the buffer size. You do not have to retrieve the entire contents of the buffer with a single call. You can have just one element in the array and retrieve events one at a time until the buffer is empty.

After acquiring the keyboard device, you can examine and flush the buffer at any time by using the **IDirectInputDevice8::GetDeviceData** method. (See Buffered and Immediate Data.)

Each element in the **DIDeviceObjectData** array represents a change in state for a single key—that is, a press or release. Because Microsoft® DirectInput® gets the data directly from the keyboard, any settings for character repeat in Control Panel are ignored. This means that a keystroke is counted only once, no matter how long the key is held down.

You can determine which key an element in the array refers to by checking the **dwOfs** member of the **DIDeviceObjectData** structure against the DirectInput Keyboard Device Constants. (See also Interpreting Keyboard Data.)

If you are using Action Mapping, ignore the value in **dwOfs** and instead retrieve the application-defined data associated with the key event from the **uAppData** member.

The data for the change of state of the key is located in the **dwData** member of the **DIDeviceObjectData** structure. Only the low byte of **dwData** is significant. The high bit of this byte is set if the key was pressed, and it is clear if it was released. In other words, the key was pressed if (**dwData & 0x80**) is nonzero.

---

### [Visual Basic]

You must also declare an array of **DIDeviceObjectData** types. This array can have up to the same number of elements as the buffer size. You do not have to

retrieve the entire contents of the buffer with a single call. You can have just one element in the array and retrieve events one at a time until the buffer is empty.

After acquiring the keyboard device, you can examine and flush the buffer at any time by using the **DirectInputDevice8.GetDeviceData** method. (See Buffered and Immediate Data.)

Each element in the **DIDeviceObjectData** array represents a change in state for a single key—that is, a press or release. Because Microsoft® DirectInput® gets the data directly from the keyboard, any settings for character repeat in Control Panel are ignored. This means that a keystroke is counted only once, no matter how long the key is held down.

You can determine which key an element in the array refers to by checking the **IOfs** member of the **DIDeviceObjectData** type against the constants in the **CONST\_DIKKEYFLAGS** enumeration. (See also Interpreting Keyboard Data.)

The data for the change of state of the key is located in the **IData** member of the **DIDeviceObjectData** type. Only the low byte of **IData** is significant. The high bit of this byte is set if the key was pressed, and it is clear if it was released. In other words, the key was pressed if (**IData And &H80**) is nonzero.

---

## Interpreting Keyboard Data

---

### [C++]

This topic covers the identification of keys for which data is reported by the **IDirectInputDevice8::GetDeviceState** and **IDirectInputDevice8::GetDeviceData** methods. For more information on interpreting the data from **GetDeviceData**, see Time Stamps and Sequence Numbers.

---

### [Visual Basic]

This topic covers the identification of keys for which data is reported by the **DirectInputDevice8.GetDeviceState** and **DirectInputDevice8.GetDeviceData** methods. For more information on interpreting the data from **GetDeviceData**, see Time Stamps and Sequence Numbers.

---

In one important respect, Microsoft® DirectInput® applications read the keyboard differently from the way Microsoft Windows® does. For DirectInput applications, keyboard data refers not to virtual keys but to the actual physical keys—that is, the scan codes. **DIK\_ENTER**, for example, refers only to the ENTER key on the main keyboard, not to the ENTER key on the numerical keypad.

Additionally, differences among keyboards can affect the way DirectInput applications interpret keyboard data. For example, DirectInput defines a constant for each key on the enhanced keyboard, as well as the additional keys on international

keyboards. Because NEC keyboards support different scan codes than the PC-enhanced keyboards, DirectInput translates NEC key-scan codes into PC-enhanced scan codes where possible.

Other keyboard differences to consider are:

- Not all PC-enhanced keyboards have the Windows logo keys (DIK\_LWIN, DIK\_RWIN, and DIK\_APPS), there is no way to determine whether the keys are physically available.
- Laptops and other small computers often do not implement a full set of keys. Instead, some keys (typically numeric keypad keys) are multiplexed with other keys, which are selected by an auxiliary mode key that does not generate a separate scan code.
- If the keyboard subtype indicates a PC XT or PC AT keyboard, the following keys are not available: DIK\_F11, DIK\_F12, and all the extended keys (DIK\_\* values greater than 0x7F). Furthermore, the PC XT keyboard lacks DIK\_SYSRQ.

---

#### [C++]

- Japanese keyboards, particularly the NEC PC-98 keyboards, contain a substantially different set of keys than U.S. keyboards. For more information, see DirectInput and Japanese Keyboards.
- 

#### [Visual Basic]

- Japanese keyboards, particularly the NEC PC-98 keyboards, contain a substantially different set of keys than U.S. keyboards. For more information, see DirectInput and Japanese Keyboards.
- 

## Checking for Lost Keyboard Input

---

#### [C++]

When you have set the cooperative level to DISCL\_FOREGROUND and the focus switches to another application, Microsoft® Windows® might force your application to unacquire the keyboard. For this reason, you should check for the DIERR\_INPUTLOST return value from the **IDirectInputDevice8::GetDeviceData** or **IDirectInputDevice8::GetDeviceState** methods and attempt to reacquire the keyboard, if necessary. (See Acquiring Devices.)

#### Note

You should not attempt to reacquire the keyboard on getting a DIERR\_NOTACQUIRED error. If you do, you could get caught in an infinite loop: acquisition would again fail, you would get another DIERR\_NOTACQUIRED error, and so on.

---

#### [Visual Basic]

Because Microsoft® Windows® might force your application to unacquire the keyboard when you have set the cooperative level to DISCL\_FOREGROUND and the focus switches to another application, you should check for the DIERR\_INPUTLOST return value from the **DirectInputDevice8.GetDeviceData** or the **DirectInputDevice8.GetDeviceStateKeyboard** method and attempt to reacquire the keyboard, if necessary. (See Acquiring Devices.)

#### Note

You should not attempt to reacquire the keyboard on getting a DIERR\_NOTACQUIRED error. If you do, you could get caught in an infinite loop: acquisition would fail, you would get another DIERR\_NOTACQUIRED error, and so on.

---

## Joystick Data

---

#### [C++]

To set up the joystick device for data retrieval, first call the **IDirectInputDevice8::SetDataFormat** method with the *c\_dfDIJoystick* or the *c\_dfDIJoystick2* global variable as the parameter value. (See Device Data Formats.)

Because some device drivers do not notify Microsoft® DirectInput® of changes in state until explicitly asked to do so, you should always call the **IDirectInputDevice8::Poll** method before attempting to retrieve data from the joystick. For more information, see Polling and Event Notification.

---

#### [Visual Basic]

To set up the joystick device for data retrieval, first call the **DirectInputDevice8.SetCommonDataFormat** method with DIFORMAT\_JOYSTICK or DIFORMAT\_JOYSTICK2 as the parameter value. (See Device Data Formats.)

Because some device drivers do not notify Microsoft® DirectInput® of changes in state until explicitly asked to do so, you should always call the **DirectInputDevice8.Poll** method before attempting to retrieve data from the joystick. For more information, see Polling and Event Notification.

---

The following sections cover retrieval and interpretation of data from a joystick or other similar input device such as a game pad or steering wheel:

- Immediate Joystick Data
- Buffered Joystick Data

- Interpreting Joystick Axis Data
- Checking for Lost Joystick Input

## Immediate Joystick Data

---

### [C++]

To retrieve the current state of the joystick, call the **IDirectInputDevice8::GetDeviceState** method with a pointer to a **DIJOYSTATE** or a **DIJOYSTATE2** structure, depending on whether the data format was set with *c\_dfDIJoystick* or *c\_dfDIJoystick2*. (See Device Data Formats.) The joystick state returned in the structure includes the coordinates of the axes, the state of the buttons, and the state of the point-of-view controllers.

The first seven members of the **DIJOYSTATE** structure hold the axis coordinates. The last of these seven, **rglSlider**, is an array of two values. (See Interpreting Joystick Axis Data.)

The **rgdwPOV** member contains the position of up to four point-of-view controllers in hundredths of a degree clockwise from north (or forward). The center (neutral) position is reported as  $-1$ . For controllers that have only five positions, the position is one of the following values:

- $-1$
- $0$
- $90 * DI\_DEGREES$
- $180 * DI\_DEGREES$
- $270 * DI\_DEGREES$

Some drivers report a value of 65,535, instead of  $-1$ , for the center position. You should check for a centered POV indicator as follows:

```
BOOL POVCentered = (LOWORD(dwPOV) == 0xFFFF);
```

The **rgbButtons** member is an array of bytes, one for each of 32 or 128 buttons, depending on the data format. For each button, the high bit is set if the button is down and it is clear if the button is up or not present.

The **DIJOYSTATE2** structure has additional members for information about the velocity, acceleration, force, and torque of the axes.

---

### [Visual Basic]

To retrieve the current state of the joystick, call the **DirectInputDevice8.GetDeviceStateJoystick** or the **DirectInputDevice8.GetDeviceStateJoystick2** method, depending on whether the data format was set with *DIFORMAT\_JOYSTICK* or *DIFORMAT\_JOYSTICK2*. (See Device Data Formats.) The joystick state returned in the *state* parameter includes

the coordinates of the axes, the state of the buttons, and the state of the point-of-view controllers.

The **POV** member of the **DIJOYSTATE** or the **DIJOYSTATE2** type contains the position of up to four point-of-view controllers in hundredths of a degree clockwise from north (or forward). The center position is reported as  $-1$ . For controllers that have only five positions, the position is one of the following values:

- $-1$
- $0$
- $9000$
- $18000$
- $27000$

Some drivers report a value of  $65,535$ , instead of  $-1$ , for the neutral position. You should check for a centered POV indicator as follows:

```
Dim POVCentered As Boolean
POVCentered = MyDijoystate.POV(0) And &HFFFF
```

The **buttons** member is an array of bytes, one for each of 32 or 128 buttons, depending on the data type. For each button, the high bit is set if the button is down, and it is clear if the button is up or not present.

The **DIJOYSTATE2** type has additional members for information about the velocity, acceleration, force, and torque of the axes.

For more information, see [Interpreting Joystick Axis Data](#).

---

## See also

[Buffered and Immediate Data](#)

### Buffered Joystick Data

---

#### [C++]

To retrieve buffered data from the joystick, first set the buffer size (see [Device Properties](#)) and declare an array of **DIDeviceObjectData** structures. This array can have up to the same number of elements as the buffer size. You do not have to retrieve the entire contents of the buffer with a single call. You can have just one element in the array and retrieve events one at a time until the buffer is empty.

After acquiring the device, you can examine and flush the buffer at any time with the **IDirectInputDevice8::GetDeviceData** method. (See [Buffered and Immediate Data](#).)

Each element in the **DIDeviceObjectData** array represents a change in state for a single object on the joystick. For instance, if the user presses button 0 and moves the stick diagonally, the array passed to **GetDeviceData** (if it has at least three



elements, and *pdwInOut* is at least 3) will have three elements filled in—an element for button 0 being pressed, an element for the change in the x-axis, and an element for the change in the y-axis—and the value of *pdwInOut* will be set to 3.

You can determine which object an element in the array refers to by checking the **dwOfs** member of the **DIDEVICEOBJECTDATA** structure against the following values:

- DIJOFS\_X
- DIJOFS\_Y
- DIJOFS\_Z
- DIJOFS\_Rx
- DIJOFS\_Ry
- DIJOFS\_Rz
- DIJOFS\_BUTTON0 to DIJOFS\_BUTTON31 or DIJOFS\_BUTTON(*n*)
- DIJOFS\_POV(*n*)
- DIJOFS\_SLIDER(*n*)

Each of these values is equivalent to the offset of the data for the object in a **DIJOYSTATE** structure. For example, DIJOFS\_BUTTON0 is equivalent to the offset of **rgbButtons[0]** in the **DIJOYSTATE** structure. You can use simple comparisons to determine which device object is associated with an item in the buffer. For example:

```
DIDEVICEOBJECTDATA *lpdidod;
int n;
.
.
.
/* JoyBuffer is an array of DIDEVICEOBJECTDATA structures
   that has been set by a call to GetDeviceData.
   n is incremented in a loop that examines all filled elements
   in the array. */
lpdidod = &JoyBuffer[n];
if ((int) lpdidod->dwOfs == DIJOFS_BUTTON0)
    && (lpdidod->dwData & 0x80))
{
    ; // Do something in response to press of primary button.
}
```

If the data format was set with *c\_dfDIJoystick2*, you can use the predefined offsets for all the device objects that exist in **DIJOYSTATE**, but you must supply your own offsets for device objects represented in the extra members of **DIJOYSTATE2**.

If you are using Action Mapping, ignore the value in **dwOfs** and instead retrieve the application-defined data associated with the event from the **uAppData** member.

The data for the change of state of the device object is located in the **dwData** member of the **DIDEVICEOBJECTDATA** structure. For axes, the coordinate value is returned in this member. For button objects, only the low byte of **dwData** is significant. The high bit of this byte is set if the button is pressed, and it is clear if the button is released.

For the other members, see Time Stamps and Sequence Numbers.

---

#### [\[Visual Basic\]](#)

To retrieve buffered data from the joystick, first set the buffer size (see Device Properties) and declare an array of **DIDEVICEOBJECTDATA** types. This array can have up to the same number of elements as the buffer size. You do not have to retrieve the entire contents of the buffer with a single call. You can have just one element in the array and retrieve events one at a time until the buffer is empty.

After acquiring the device, you can examine and flush the buffer at any time with the **DirectInputDevice8.GetDeviceData** method. (See Buffered and Immediate Data.)

Each element in the **DIDEVICEOBJECTDATA** array represents a change in state for a single object on the joystick. For instance, if the user presses button 0 and moves the stick diagonally, the array passed to **GetDeviceData** (if it has at least three elements) will have three elements filled in—an element for button 0 being pressed, an element for the change in the x-axis, and an element for the change in the y-axis—and the return value of the method will be 3.

You can determine which object an element in the array refers to by checking the **IOfs** member of the **DIDEVICEOBJECTDATA** type against the constants of the **CONST\_DIJOYSTICKOFS** enumeration. Each of these values is equivalent to the offset of the data for the object in a **DIJOYSTATE** type. For example, **DIJOFS\_BUTTON0** is equivalent to the offset of **buttons(0)** in the **DIJOYSTATE** type.

If the data format was set with **DIFORMAT\_JOYSTICK2**, you can use the offset constants for all the device objects that exist in **DIJOYSTATE**, but you must supply your own offsets for device objects represented in the extra members of **DIJOYSTATE2**. The internal organization of this type is the same as that of the equivalent C++ structure in the **Dinput.h** header file.

The data for the change of state of the device object is located in the **IData** member of the **DIDEVICEOBJECTDATA** type. For axes, the coordinate value is returned in this member. For button objects, only the low byte of **IData** is significant. The high bit of this byte is set if the button is pressed, and it is clear if the button is released.

For the other members, see Time Stamps and Sequence Numbers.

---

## Interpreting Joystick Axis Data

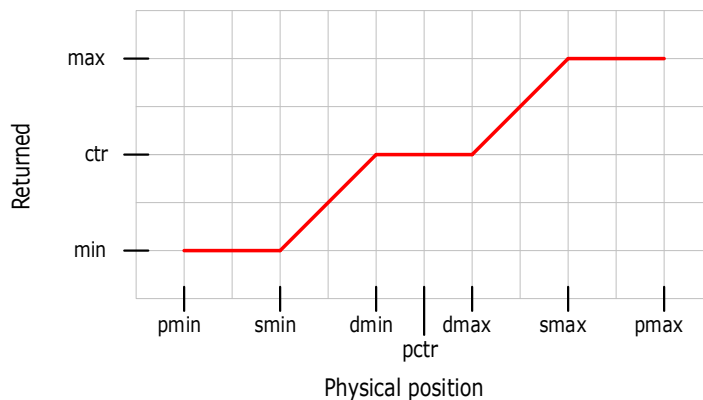
Axis values for the joystick are like those for the mouse. The value returned for the x-axis is greater as the stick moves to the right, and the value for the y-axis increases as the stick moves toward the user.

Data is in arbitrary units determined by the range property of the axis. For example, if the range for the stick's x-axis is from 0 through 10,000, a unit is one ten-thousandth of the stick's left-right travel, and the center position is 5,000. For some axes, the granularity property might be greater than 1. In this case, values are rounded off. For example, if the granularity is 10, values are reported as 0, 10, 20, and so on.

Axis data is also affected by the dead zone, a region around the center position in which motion is ignored. The dead zone provides tolerance for a slight deviation from the true center position for either or both axes of the stick. An axis value within the range of the dead zone is reported as true center.

The saturation property of an axis is a zone of tolerance at the minimum and maximum of the range. An axis value within this zone is reported as the minimum or maximum value. The purpose of the saturation property is to allow for slight differences between, for example, the minimum x-axis value reported at the top-left and bottom-left positions of the stick.

The following illustration shows the effect of the dead zone and the saturation zones. The vertical axis represents the returned axis values, where *min* and *max* are the lower and upper limits of the reported range and *ctr* is the reported center. The horizontal axis shows the physical position of the stick, where *pmin* and *pmax* are the extremes of the physical range, *pctr* is neutral position of the axis, *dmin* and *dmax* are the limits of the dead zone, and *smin* and *smax* are the boundaries of the lower and upper saturation zones. The lower saturation zone lies between *pmin* and *smin*, the upper saturation zone lies between *smax* and *pmax*, and the dead zone lies between *dmin* and *dmax*.



For more information on joystick properties, see the following:

- **IDirectInputDevice8::GetProperty**
  - **IDirectInputDevice8::SetProperty**
  - **DIPROP\_RANGE**
  - **DI\_ACTIONFORMAT**
- 

#### [\[Visual Basic\]](#)

For more information on joystick properties, see the following:

- **DirectInputDevice8.GetProperty**
  - **DirectInputDevice8.SetProperty**
  - **DIPROP\_RANGE**
  - **DI\_ACTIONFORMAT**
- 

Axis coordinates from the joystick can be either relative or absolute. (See Relative and Absolute Axis Coordinates.) Because a joystick is an absolute device—unlike a mouse, it cannot travel infinitely far along any axis—absolute data is returned by default. When the axis mode for the joystick is set to relative, the axis coordinate represents the number of units of movement along the axis since the last value was returned.

---

#### [\[C++\]](#)

The axis mode, which specifies whether relative or absolute data should be returned, is a property that can be changed before the device is acquired. (See Device Properties.) To set the axis mode to relative, call the **IDirectInputDevice8::SetProperty** method with the **DIPROP\_AXISMODE** value in the *rguidProp* parameter and with **DIPROP\_AXISMODE\_REL** in the **dwData** member of the **DIPROPDWORD** structure.

---

#### [\[Visual Basic\]](#)

The axis mode, which specifies whether relative or absolute data should be returned, is a property that can be changed before the device is acquired. (See Device Properties.) To set the axis mode to relative, call **DirectInputDevice8.SetProperty** with "DIPROP\_AXISMODE" in the *guid* parameter and with **DIPROP\_AXISMODE\_REL** in the **IData** member of the **DIPROPLONG** type.

---

---

## Using CPOINTS

---

### [C++]

The **CPOINT** structure is used to calibrate segments of the response curve of a device axis. Up to eight CPOINTS can be set through the **DIPROPCPOINTS** structure. Each **CPOINT** structure contains a raw data value representing the position of the joystick along the axis, and a logical value. When your application receives the raw value, the logical value is used to calculate the returned value that is actually used. Raw values that fall between specific CPOINT raw data values are interpolated to logical values based on a line drawn between the CPOINTS to either side of the value.

The following is an example of the effect of five CPOINTS applied to the response curve of a joystick's X axis. Before application of the **DIPROPCPOINTS** structure, the response graph for the example axis would appear as shown below, including saturation and dead zones.

A **DIPROPCPOINTS** structure is initialized as follows, assuming the physical range to be -500 to 500.

```
DIPROPCPOINTS dipcp;

dipcp.diph.dwSize = sizeof(DIPROPCPOINTS);
dipcp.diph.dwHeaderSize = sizeof(DIPROPHEADER);
dipcp.diph.dwObj = GUID_XAxis;
dipcp.diph.dwHow = DIPH_BYID;
dipcp.dwCPointsNum = 5;
dipcp.cp[0].IP = -500
dipcp.cp[0].dwLog = 0
dipcp.cp[1].IP = -300
dipcp.cp[1].dwLog = 1000
dipcp.cp[2].IP = -100
dipcp.cp[2].dwLog = 5000
dipcp.cp[3].IP = 200
dipcp.cp[3].dwLog = 9000
dipcp.cp[4].IP = 500
dipcp.cp[4].dwLog = 10000
```

Note that you do not need to know the actual maximum returned value as the values in the *dwLog* member of the **CPOINT** structure are expressed as a percentage of the total, multiplied by 10000 (the number of discrete divisions in the total range). For instance, the example sets the curve so that 10% of the maximum value is returned at the -300 point in the joystick's range.  $0.10 * 10000 = 1000$ , so that value is given to the *dwLog* member while -300 is assigned to the corresponding *IP* member.

After applying this **DIPROPCPOINTS** structure through **IDirectInputDevice8::SetProperty**, the curve responds as seen below.

[\[Visual Basic\]](#)

This topic does not apply to Microsoft® Visual Basic®.

---

## Checking for Lost Joystick Input

If your application is using the joystick in foreground mode (see Cooperative Levels), it will lose the device when the focus shifts to another application.

---

[\[C++\]](#)

Check for the `DIERR_INPUTLOST` return value from the **`IDirectInputDevice8::GetDeviceData`** or the **`IDirectInputDevice8::GetDeviceState`** method and attempt to reacquire the joystick, if necessary. (See Acquiring Devices.)

### Note

You should not attempt to reacquire the joystick on getting a `DIERR_NOTACQUIRED` error. If you do, you could get caught in an infinite loop: acquisition would fail again, you would get another `DIERR_NOTACQUIRED` error, and so on.

---

[\[Visual Basic\]](#)

Check for the `DIERR_INPUTLOST` return value from the **`DirectInputDevice8.GetDeviceData`** or the **`DirectInputDevice8.GetDeviceStateKeyboard`** method and attempt to reacquire the keyboard, if necessary. (See Acquiring Devices.)

### Note

You should not attempt to reacquire the keyboard on getting a `DIERR_NOTACQUIRED` error. If you do, you could get caught in an infinite loop: acquisition would fail, you would get another `DIERR_NOTACQUIRED` error, and so on.

---

Because access to the joystick is not lost except when your application moves to the background—unlike the mouse and keyboard, the joystick is never used by the Microsoft® Windows® system—an alternative method is to reacquire the device in response to a `WM_ACTIVATE` message.

## Output Data

---

[\[C++\]](#)

Some Human Interface Devices both generate input and accept output. The **IDirectInputDevice8::SendDeviceData** method is used to send packets of data to such devices.

**SendDeviceData** may be viewed as **IDirectInputDevice8::GetDeviceData** in reverse. As with that method, it uses the **DIDeviceObjectData** structure as the basic unit of data. In this case, however, the **dwOfs** member contains the instance ID of the device object associated with the data rather than its offset in the data format for the device. (Because offset identifiers exist only for device objects that provide input in the selected data format, an object that accepts only output might not even have an offset.) The **dwData** member contains whatever data is appropriate for the object. The **dwTimeStamp** and **dwSequence** members are not used and must be set to 0.

To send data to the device, set up an array of **DIDeviceObjectData** structures, fill the required number of elements with data, and then pass the array address and the number of elements used to **SendDeviceData**. Data for different device objects is combined into a single packet that is then sent to the device.

The form of the data packet is specific to the device, as is the treatment of unused fields in the packet. Some devices may treat fields as optional. In other words, if no data is supplied, the state of the object remains unchanged. More commonly, all fields are significant, even when you do not specifically supply data for them. For example, if you send data to a single keyboard LED, it is assumed that the data for the other two LEDs is 0 and that they are turned off. However, you can override this behavior by using the **DISDD\_CONTINUE** flag. In this case, the data for the other two LEDs is the value you most recently sent them.

The device object type identifiers are obtained from the **dwType** member of the **DIDeviceObjectInstance** structure after passing the HID usage page and usage code to **IDirectInputDevice8::GetObjectInfo**. For example, the type identifier of the Scroll Lock LED can be obtained by using the following code, where *pdev* is an **IDirectInputDevice8** interface pointer representing the keyboard.

```
DIDeviceObjectInstance didoi;
DWORD NumLockID;

HRESULT hr = pdev->GetObjectInfo(&didoi,
    DIMAKEUSAGEDWORD(0x07,0x53), DIPH_BYUSAGE);
NumLockID = didoi.dwType;
```

The following sample function, when called repeatedly, causes the LEDs on the keyboard to flash in a recurring pattern. It is assumed that the high bit of the data byte determines the state of the LED. The **DWORDs** *NumLockID*, *CapsLockID*, and *ScrollLockID* have all been obtained as shown above.

```
#define ARRAYSIZE 4
void FlashLEDs(void)
{
    static int    rgiBits[] = { 1, 2, 4, 2 };
```

```
static int      iLooper = 0;
DWORD          cdod = 3;           // Number of items
DIDEVICEOBJECTDATA rgdod[ARRAYSIZE-1];
HRESULT         hres;

// Must clear dwTimeStamp and dwSequence
ZeroMemory(rgdod, sizeof(rgdod));

rgdod[0].dwOfs = NumLockID;
rgdod[1].dwOfs = CapsLockID;
rgdod[2].dwOfs = ScrollLockID;

rgdod[0].dwData = (rgiBits[iLooper] & 1) ? 0x80 : 0;
// NumLock light on/off
rgdod[1].dwData = (rgiBits[iLooper] & 2) ? 0x80 : 0;
// CapsLock light on/off
rgdod[2].dwData = (rgiBits[iLooper] & 4) ? 0x80 : 0;
// ScrollLock light on/off

iLooper = (iLooper + 1) % ARRAYSIZE; // Loops from 0 to 3

hres = pdev->SendDeviceData(sizeof(DIDEVICEOBJECTDATA),
    rgdod, &cdod, 0);
}
```

---

#### [\[Visual Basic\]](#)

Some Human Interface Devices both generate input and accept output. The **DirectInputDevice8.SendDeviceData** method is used to send packets of data to such devices.

**SendDeviceData** can be viewed as **DirectInputDevice8.GetDeviceData** in reverse. As with that method, it uses the **DIDEVICEOBJECTDATA** type as the basic unit of data. In this case, however, the **IOfs** member contains the instance ID of the device object associated with the data, rather than its offset in the data format for the device. This ID can be extracted from the value returned by

**DirectInputDeviceObjectInstance.GetType** after device objects have been enumerated. (Because offset identifiers exist only for device objects that provide input in the selected data format, an object that accepts only output might not even have an offset.) The **IData** member contains whatever data is appropriate for the object. The **ITimeStamp** and **ISequence** members are not used and must be set to 0.

To send data to the device, first set up an array of **DIDEVICEOBJECTDATA** types, fill the required number of elements with data, and then pass its address and the number of elements used to **SendDeviceData**. Data for different device objects is combined into a single packet that is then sent to the device.



The form of the data packet is specific to the device, as is the treatment of unused fields in the packet. Some devices treat fields as optional. In other words, if no data is supplied, the state of the object remains unchanged. More commonly, all fields are significant, even when you do not specifically supply data for them. For example, if you send data to a single keyboard LED, it is assumed that the data for the other two LEDs is 0 and that they are turned off. However, you can override this behavior by using the DISDD\_CONTINUE flag. In this case, the data for the other two LEDs is the value you most recently sent them.

The device object type identifiers are obtained after passing the HID usage page and usage code to **DirectInputDevice8.GetObjectInfo**.

The following sample function, when called repeatedly, causes the LEDs on the keyboard to flash in a recurring pattern. It is assumed that the high bit of the data byte determines the state of the LED. The device object instance identifiers *NumLockID*, *CapsLockID*, and *ScrollLockID* have all been previously obtained, and *diDevKeyboard* is a previously defined DirectInputDevice8 object.

```
Private Sub FlashLEDs()
    Const ARRAYSIZE = 4
    Static rgiBits(ARRAYSIZE-1) As Integer
        rgiBits(0) = 1
        rgiBits(1) = 2
        rgiBits(2) = 4
        rgiBits(3) = 2
    Static iLooper As Integer
        iLooper = 0
    Dim cdod As Long
        cdod = 3 ' Number of items
    Dim rgdod(3) As DIDEVICEOBJECTDATA
    Dim i As Integer

    ' ITimeStamp and ISequence must be set to 0
    For i = 0 To 3
        rgdod(i).ITimeStamp = 0
        rgdod(i).ISequence = 0
    Next i

    rgdod(0).IOFs = NumLockID
    rgdod(1).IOFs = CapsLockID
    rgdod(2).IOFs = ScrollLockID

    Select Case (rgiBits(iLooper) And 1)
        Case Is = 0
            rgdod(0).IData = 0
        Case Is = 1
            rgdod(0).IData = &H80 ' NumLock light on/off
    End Select
```

```
Select Case (rgiBits(iLooper) And 2)
  Case Is = 0
    rgdod(1).IData = 0
  Case Is = 1
    rgdod(1).IData = &H80      ' CapsLock light on/off
End Select

Select Case (rgiBits(iLooper) And 4)
  Case Is = 0
    rgdod(2).IData = 0
  Case Is = 1
    rgdod(2).IData = &H80      ' ScrollLock light on/off
End Select

iLooper = (iLooper + 1) Mod ARRAYSIZE ' Loops from 0 to 3

Call diDevKeyboard.SendDeviceData(cdod, rgdod, 0)

End Sub
```

---

## Action Mapping

Traditionally, applications have done their own mapping of events to particular buttons and axes. A car-racing game, for example, might assume that the x-axis on the user's joystick or mouse was the most suitable control for steering the car. The only way to accommodate new or unusual devices was to provide configuration options so that the user could specify some other axis, such as a rotational axis, to use for steering. Moreover, the application had no way of knowing which installed device was the best fit for the game, so the user typically had to choose a device from a menu or make sure only the preferred device was attached.

Using action mapping, you no longer need to make assumptions about the best use of devices and device objects. Instead, your application binds actions to virtual controls wherever possible. Rather than getting data from the x-axis and steering the car to the left or the right accordingly, the application might get data from a virtual control called `DIAXIS_DRIVINGR_STEER`. Microsoft® DirectInput® assigns the virtual control to a physical control—that is, a device object. It does so by taking into account the application genre, user preferences, information from the device manufacturer, and the user's configuration of the device.

Action mapping also simplifies the input loop by returning data for all devices in a form independent of the particular device. A single action can be mapped to more

than one device, and the input loop can respond to the action the same way regardless of which device is being read.

The following topics contain more information on the steps required to implement action mapping.

- Preparing the Action Map
- Finding Matching Devices
- Configuring the Action Map
- User Configuration of the Device
- Retrieving Action Data
- Maintaining Files During Development

## Preparing the Action Map

---

### [C++]

The action map is a **DIACTIONFORMAT** structure containing information about application actions and their mapping to virtual controls or device objects. The structure is passed back and forth between the application and Microsoft® DirectInput® to establish the final mapping. This section explains how to initialize the map.

### 1. Define Application Actions

The first step in implementing DirectInput action mapping is to determine what input-driven actions in your application need to be mapped to device objects. For actions that can be performed either by an axis or by a button, you must define separate actions for both input types. It is recommended that you define button actions for all important functions, in case the device does not have the appropriate axes.

The following sample enumeration of action values might be defined by a car-racing game. Axis actions begin with "eA" and button actions with "eB".

```
enum eGameActions
{
    eA_STEER,      // Steering
    eB_STEER_LEFT, // Steer left
    eB_STEER_RIGHT, // Steer right
    eA_ACCELERATE, // Change speed
    eB_ACCELERATE, // Speed up
    eB_DECELERATE, // Slow down
    eA_BRAKE,      // Brake
    eB_BRAKE,      // Brake
    eB_UPSHIFT,    // Shift to higher gear
    eB_DOWNSHIFT,  // Shift to lower gear
    eB_CYCLEVIEW,  // Cycle to next view
}
```

---

```

eB_COURSEVIEW, // Toggle course view
eB_DRIVERVIEW, // View from driver's seat
eB_BRAKEBIAS,  // Brake bias
eA_VOLUME,     // Sound volume
eB_MUTE        // Toggle sound
};

```

```

#define NUM_MY_ACTIONS 16

```

In the example, actions are defined as enumerated values. However, they could be other 32-bit data types, such as pointers to functions. When you retrieve device data, you get whatever action value you have defined, and you can handle it in any way you like.

---

### [\[Visual Basic\]](#)

The action map is a **DICTIONFORMAT** type containing information about application actions and their mapping to virtual controls or device objects. The type is passed back and forth between the application and Microsoft® DirectInput® to establish the final mapping. This section explains how to initialize the map.

## 1. Define Application Actions

The first step in implementing DirectInput action mapping is to determine what input-driven actions in your application need to be mapped to device objects. For actions that can be performed either by an axis or by a button, you must define separate actions for both input types. It is recommended that you define button actions for all important functions, in case the device does not have the appropriate axes.

The following sample enumeration of action values might be defined by a car-racing game. Axis actions begin with "eA" and button actions with "eB".

```

Enum eGameActions
    eA_STEER      'Steering
    eB_STEER_LEFT 'Steer left
    eB_STEER_RIGHT 'Steer right
    eA_ACCELERATE 'Change speed
    eB_ACCELERATE 'Speed up
    eB_DECELERATE 'Slow down
    eA_BRAKE      'Brake
    eB_BRAKE      'Brake
    eB_UPSHIFT    'Shift to higher gear
    eB_DOWNSHIFT  'Shift to lower gear
    eB_CYCLEVIEW  'Cycle to next view
    eB_COURSEVIEW 'Toggle course view
    eB_DRIVERVIEW 'View from driver's seat
    eB_BRAKEBIAS  'Brake bias

```

```
eA_VOLUME    'Sound volume
eB_MUTE       'Toggle sound
End Enum
```

```
Const NUM_MY_ACTIONS = 16
```

In the example, actions are defined as enumerated values. However, they could be other 32-bit data types. When you retrieve device data, you get whatever action value you have defined, and you can handle it in any way you like.

---

[C++]

## 2. Define the Genre

The next step is to decide what genre your application belongs to. A genre defines a set of virtual controls. By selecting the proper genre, you can obtain the best possible fit of virtual controls to application actions. Manufacturers who choose to supply default mappings for their devices must support one or more of the genres defined by DirectInput. See Action Mapping Constants for a list of these genres.

---

[Visual Basic]

## 2. Define the Genre

The next step is to decide what genre your application belongs to. A genre defines a set of virtual controls. By selecting the proper genre, you can obtain the best possible fit of virtual controls to application actions. Manufacturers who choose to supply default mappings for their devices must support one or more of the genres defined by DirectInput. See Action Mapping Constants for a list of these genres.

---

For the game in the example, the obvious choice is the DIVIRTUAL\_DRIVING\_RACE genre, which contains the following virtual controls.

### Priority 1 Controls

```
DIAXIS_DRIVINGR_STEER
DIAXIS_DRIVINGR_ACCELERATE
DIAXIS_DRIVINGR_BRAKE
DIBUTTON_DRIVINGR_SHIFTUP
DIBUTTON_DRIVINGR_SHIFTDOWN
DIBUTTON_DRIVINGR_VIEW
DIBUTTON_DRIVINGR_MENU
```

### Priority 2 Controls

---

```

DIAXIS_DRIVINGR_ACCEL_AND_BRAKE
DIHATSWITCH_DRIVINGR_GLANCE
DIBUTTON_DRIVINGR_ACCELERATE_LINK
DIBUTTON_DRIVINGR_AIDS
DIBUTTON_DRIVINGR_BOOST
DIBUTTON_DRIVINGR_BRAKE
DIBUTTON_DRIVINGR_DASHBOARD
DIBUTTON_DRIVINGR_DEVICE
DIBUTTON_DRIVINGR_GLANCE_LEFT_LINK
DIBUTTON_DRIVINGR_GLANCE_RIGHT_LINK
DIBUTTON_DRIVINGR_MAP
DIBUTTON_DRIVINGR_PAUSE
DIBUTTON_DRIVINGR_PIT
DIBUTTON_DRIVINGR_STEER_LEFT_LINK
DIBUTTON_DRIVINGR_STEER_RIGHT_LINK

```

There is no difference in functionality between Priority 1 and Priority 2 controls. Priority 1 controls are those most likely to be supported by device manufacturers in their default mappings. However, there is no guarantee that any virtual control will be supported by a device.

---

[C++]

### 3. Assign Actions to Controls or Device Objects

The next step in creating the action map is to associate each application action with one or more of the virtual controls defined for the genre. You do this by declaring and initializing an array of **DIACTION** structures. Each structure in the array specifies the action value, the virtual control to associate with it, and a friendly name that describes the action. Leave other members as zero; they will be filled in later by DirectInput.

You can also use elements of the **DIACTION** array to map actions to particular keys or buttons on the keyboard or mouse or to channels on a Microsoft DirectPlay® voice device. By doing so, you can take advantage of the simplified input loop for all input, not just that from virtual controls. For example, suppose you map the application-defined action `eB_UPSHIFT` to both the `DIBUTTON_DRIVINGR_SHIFTUP` virtual control and to the Page Up key. When retrieving data, you get back `eB_UPSHIFT` whether the input came from a joystick button or the keyboard.

The following example declares an action map for the car-racing game.

```

DIACTION rgActions[]=
{
    //Genre-defined virtual axes

    {eA_STEER,    DIAXIS_DRIVINGR_STEER,    0, "Steer",    },
    {eA_ACCELERATE, DIAXIS_DRIVINGR_ACCELERATE, 0, "Accelerate", },
    {eA_BRAKE,    DIAXIS_DRIVINGR_BRAKE,    0, "Brake",    },

```

---

```
//Genre-defined virtual buttons
```

```
{eB_UPSHIFT,  DIBUTTON_DRIVINGR_SHIFTUP,  0, "Upshift",  },
{eB_DOWNSHIFT, DIBUTTON_DRIVINGR_SHIFTDOWN, 0, "DownShift", },
{eB_CYCLEVIEW, DIBUTTON_DRIVINGR_VIEW,     0, "Change View",},
```

```
// Actions not defined in the genre that can be assigned to any
// button or axis
```

```
{eA_VOLUME,  DIAXIS_ANY_1,          0, "Volume",  },
{eB_MUTE,     DIBUTTON_ANY(0),       0, "Toggle Sound",},
```

```
// Actions not defined in the genre that must be assigned to
// particular keys
```

```
{eB_DRIVERVIEW, DIKEYBOARD_1,        0, "Driver View",},
{eB_COURSEVIEW, DIKEYBOARD_C,        0, "Course View",},
{eB_BRAKEBIAS,  DIKEYBOARD_B,        0, "Brake Bias", },
```

```
// Actions mapped to keys as well as to virtual controls
```

```
{eB_UPSHIFT,  DIKEYBOARD_PRIOR,      0, "Upshift",  },
{eB_DOWNSHIFT, DIKEYBOARD_NEXT,      0, "Downshift", },
{eB_STEER_LEFT, DIKEYBOARD_LEFT,     0, "Steer Left", },
{eB_STEER_RIGHT, DIKEYBOARD_RIGHT,   0, "Steer Right",},
{eB_ACCELERATE, DIKEYBOARD_UP,       0, "Accelerate", },
{eB_DECELERATE, DIKEYBOARD_DOWN,     0, "Decelerate", },
{eB_BRAKE,     DIKEYBOARD_END,       0, "Brake",    },
```

```
// Actions mapped to buttons as well as to virtual controls and keys
```

```
{eB_UPSHIFT,  DIMOUSE_BUTTON0,       0, "Upshift",  },
{eB_DOWNSHIFT, DIMOUSE_BUTTON1,      0, "Downshift", },
};
```

In the example, some actions are mapped to actual keys by using Keyboard Mapping Constants. Similar mappings to the mouse buttons and axes can be made by using Mouse Mapping Constants.

The **DIACTION** array is contained within a **DIACTIONFORMAT** structure that also contains information about the genre, the application, and the desired scaling of axis data. Use the same instance of this structure throughout the action mapping process. Some members will not be used immediately, but you can fill in the entire structure before the next step, Finding Matching Devices.

---

---

[\[Visual Basic\]](#)

### 3. Assign Actions to Controls or Device Objects

The next step in creating the action map is to associate each application action with one or more of the virtual controls defined for the genre. You do this by declaring and initializing an array of **DIACTION** types. Each type in the array specifies the action value, the virtual control to associate with it, and a friendly name that describes the action. Leave other members as zero; they will be filled in later by DirectInput.

You can also use elements of the **DIACTION** array to map actions to particular keys or buttons on the keyboard or mouse or to channels on a Microsoft DirectPlay® voice device. By doing so, you can take advantage of the simplified input loop for all input, not just that from virtual controls. For example, suppose you map the application-defined action `eB_UPSHIFT` to both the `DIBUTTON_DRIVINGR_SHIFTUP` virtual control and to the Page Up key. When retrieving data, you get back `eB_UPSHIFT` whether the input came from a joystick button or the keyboard.

The following example begins the declaration of an action map for the car-racing game.

```
Dim rgActions(20) As DIACTION

' Genre-defined virtual axes
With rgActions(0)
    .AppData = eA_STEER
    .ISemantic = DIAXIS_DRIVINGR_STEER
    .IFlags = 0
    .ActionName = "Steer"
End With
With rgActions(1)
    .AppData = eA_ACCELERATE
    .ISemantic = DIAXIS_DRIVINGR_ACCELERATE
    .IFlags = 0
    .ActionName = "Accelerate"
End With
With rgActions(2)
    .AppData = eA_BRAKE
    .ISemantic = DIAXIS_DRIVINGR_BRAKE
    .IFlags = 0
    .ActionName = "Brake"
End With
'and so on.
```

It may be more efficient, however, to use a Sub procedure to assign the values to the **DIACTION** array in the **DIACTIONFORMAT** type directly as in the following example.

```
Dim m_diaf As DIACTIONFORMAT
```



Dim m\_NumberofSemantics As Long

Private Sub Form\_Load()

m\_NumberofSemantics = 0

AddAction eA\_STEER, DIAXIS\_DRIVINGR\_STEER, 0, "Steer"

AddAction eA\_ACCELERATE, DIAXIS\_DRIVINGR\_ACCELERATE, 0, "Accelerate"

AddAction eA\_BRAKE, DIAXIS\_DRIVINGR\_BRAKE, 0, "Brake"

' Genre-defined virtual buttons

AddAction eB\_UPSHIFT, DIBUTTON\_DRIVINGR\_SHIFTUP, 0, "Upshift"

AddAction eB\_DOWNSHIFT, DIBUTTON\_DRIVINGR\_SHIFTDOWN, 0, "DownShift"

AddAction eB\_CYCLEVIEW, DIBUTTON\_DRIVINGR\_VIEW, 0, "Change View"

' Actions not defined in the genre that can be assigned to any

' button or axis

AddAction eA\_VOLUME, DIAXIS\_ANY\_1, 0, "Volume"

AddAction eB\_MUTE, DIBUTTON\_ANY, 0, "Toggle Sound"

' Actions not defined in the genre that must be assigned to

' particular keys

AddAction eB\_DRIVERVIEW, DIKEYBOARD\_1, 0, "Driver View"

AddAction eB\_COURSEVIEW, DIKEYBOARD\_C, 0, "Course View"

AddAction eB\_BRAKEBIAS, DIKEYBOARD\_B, 0, "Brake Bias"

' Actions mapped to keys as well as to virtual controls

AddAction eB\_UPSHIFT, DIKEYBOARD\_PRIOR, 0, "Upshift"

AddAction eB\_DOWNSHIFT, DIKEYBOARD\_NEXT, 0, "Downshift"

AddAction eB\_STEER\_LEFT, DIKEYBOARD\_LEFT, 0, "Steer Left"

AddAction eB\_STEER\_RIGHT, DIKEYBOARD\_RIGHT, 0, "Steer Right"

AddAction eB\_ACCELERATE, DIKEYBOARD\_UP, 0, "Accelerate"

AddAction eB\_DECELERATE, DIKEYBOARD\_DOWN, 0, "Decelerate"

AddAction eB\_BRAKE, DIKEYBOARD\_END, 0, "Brake"

' Actions mapped to buttons as well as to virtual controls and keys

AddAction eB\_UPSHIFT, DIMOUSE\_BUTTON0, 0, "Upshift"

AddAction eB\_DOWNSHIFT, DIMOUSE\_BUTTON1, 0, "Downshift"

End Sub

```
Private Sub AddAction(user As Long, semantic As Long, _  
                    flags As Long, strName As String)  
ReDim Preserve m_diaf.ActionArray(m_NumberofSemantics)  
  
With m_diaf.ActionArray(m_NumberofSemantics)  
    .IAppData = user  
    .ISemantic = semantic  
    .IFlags = flags  
    .ActionName = strName  
End With  
m_NumberofSemantics = m_NumberofSemantics + 1  
  
End Sub
```

In the example, some actions are mapped to actual keys by using Keyboard Mapping Constants. Similar mappings to the mouse buttons and axes can be made by using Mouse Mapping Constants.

The **DIACTION** array is contained within the **DIACTIONFORMAT** type that also contains information about the genre, the application, and the desired scaling of axis data. Use the same instance of this type throughout the action mapping process. Some members will not be used immediately, but you can fill in the entire type before the next step, Finding Matching Devices.

---

## Finding Matching Devices

After you define the application actions and the virtual controls or device objects to which these actions are to be mapped, the next step is to enumerate devices on the system to find those that best support the desired virtual controls.

---

### [C++]

To do so, pass the **DIACTIONFORMAT** structure to **IDirectInput8::EnumDevicesBySemantics**. This method works in much the same way as **IDirectInput8::EnumDevices** and takes a similar callback function.

---

### [Visual Basic]

To do so, pass the **DIACTIONFORMAT** type to **DirectInput8.GetDevicesBySemantics**. This method works in much the same way as **DirectInput8.GetDIDevices**.

---

Devices that have been configured by the user to match certain controls are always enumerated first. For example, if a user has configured a wheel as the primary steering device for driving games, then the wheel is enumerated first whenever devices that support `DIAXIS_DRIVINGR_STEER` are requested, taking precedence over other capable devices such as joysticks that have not been configured by the user. Otherwise, the order in which available devices are enumerated is determined by the degree to which they match the requested controls.

---

#### [C++]

In the enumeration callback, you can retrieve the default action mapping for each device, change any mappings you don't like, give the user an opportunity to reconfigure the device, and apply the action map. These steps are covered in [Configuring the Action Map](#). Flags returned in the **`DIEnumDevicesBySemanticsCallback`** will provide information about why a particular device was enumerated. These flags will indicate whether a device has been used recently, is newly installed, or will accept mappings of priority 1 or priority 2 controls.

---

#### [Visual Basic]

Once you have the enumeration, you can retrieve the default action mapping for each device, change any mappings you don't like, give the user an opportunity to reconfigure the device, and apply the action map. These steps are covered in [Configuring the Action Map](#).

---

## Configuring the Action Map

---

#### [C++]

As each device is enumerated, you can obtain a pointer to it, retrieve the default action map, make changes in the default map, and apply the final mappings.

### 1. Obtaining the Device

Obtain the **`IDirectInputDevice8`** interface pointer for each enumerated device from the *lpdid* parameter of the enumeration callback. See **`DIEnumDevicesBySemanticsCallback`**. If you want to save the device interface for use in your application, call **`AddRef`** on the pointer and assign it to a global variable.

---

#### [Visual Basic]

As each device is enumerated, you can retrieve the default action map, make changes in the default map, and apply the final mappings.

## 1. Obtaining the Device

Once the enumeration is complete, you can use the **DirectInputEnumDevices8.GetItem** method to obtain an instance of the **DirectInputDeviceInstance8** class. **DirectInputDeviceInstance8.GetGuidInstance** enables the retrieval of the device GUID, which can in turn be passed to **DirectInput8.CreateDevice**. The resulting **DirectInputDevice8** object can then be saved to a global variable for use in your application, and its methods can be used to get or set any properties of the device that you may wish to examine or change before building the action map.

---

## 2. Obtaining the Default Action Map

[C++]

To obtain the default action map for the device, call **IDirectInputDevice8::BuildActionMap**. Microsoft® DirectInput® takes the list of virtual controls specified in your **DIACTIONFORMAT** structure and attempts to map these to physical device objects, returning the results in the same structure. You should examine the **dwHow** member of each **DIACTION** element to determine whether the control was successfully mapped. If it was, you can also ascertain what criterion was used in choosing the object—for example, configuration by the user or by the device manufacturer.

---

[Visual Basic]

To obtain the default action map for the device, call **DirectInputDevice8.BuildActionMap**. Microsoft® DirectInput® takes the list of virtual controls specified in your **DIACTIONFORMAT** type and attempts to map these to physical device objects, returning the results in the same type. You should examine the **IHow** member of each **DIACTION** element to determine whether the control was successfully mapped. If it was, you can also ascertain what criterion was used in choosing the object—for example, configuration by the user or by the device manufacturer.

---

## 3. Making Changes to the Action Map

[C++]

You now have the option of changing the default mappings, although it is not recommended that you do so. After examining the **dwSemantic** member of the **DIACTION** structure to determine which device object was mapped to an action, you can change that value. For example, if an action is mapped to **DIJOFS\_BUTTON9**, but you want that action to be mapped to the trigger button instead, change the value to **DIJOFS\_BUTTON0** before applying the action map.

#### [Visual Basic]

You now have the option of changing the default mappings, although it is not recommended that you do so. After examining the **ISemantic** member of the **DIACTION** type to determine which device object was mapped to an action, you can change that value. For example, if an action is mapped to **DIJOFS\_BUTTON9**, but you want that action to be mapped to the trigger button instead, change the value to **DIJOFS\_BUTTON0** before applying the action map.

---

### 4. Applying the Action Map

---

#### [C++]

When you are satisfied that the **DIACTIONFORMAT** structure contains suitable mappings for the device, call **IDirectInputDevice8::SetActionMap**. The value you assigned to the **uAppData** member of each **DIACTION** structure now becomes bound to the control specified in the **dwSemantic** member, which in turn is bound to a particular device object.

---

#### [Visual Basic]

When you are satisfied that the **DIACTIONFORMAT** type contains suitable mappings for the device, call **DirectInputDevice8.SetActionMap**. The value you assigned to the **lAppData** member of each **DIACTION** type now becomes bound to the control specified in the **ISemantic** member, which in turn is bound to a particular device object.

---

### 5. Mapping More than One Device

---

#### [C++]

Repeat steps 1 through 4 for each device you want to use in your application. Suppose you want to map actions to both a joystick and the keyboard. In the racing-game example, the action defined in the game as **eB\_DRIVERVIEW** was mapped to a keyboard key in the following element of the **DIACTION** array.

```
{eB_DRIVERVIEW, DIKEYBOARD_1, "Driver View", },
```

In that example, when **BuildActionMap** is called on any device that is not a keyboard, the **IHow** member of the **DIACTION** structure for that element is set to **DIAH\_UNMAPPED**. Continue examining the **IHow** member as each device in turn is enumerated, until a value other than **DIAH\_UNMAPPED** is returned. This indicates that the device being currently mapped is a keyboard and the action has been successfully mapped to the requested key.

Even actions that have been successfully mapped can be mapped to another device. In the example, eB\_UPSHIFT is given two **DIACTION** structures, as follows:

```
{eB_UPSHIFT, DIBUTTON_DRIVINGR_SHIFTUP, 0, "Upshift", },
...
{eB_UPSHIFT, DIKEYBOARD_PRIOR, 0, "Upshift", },
```

#### [Visual Basic]

Repeat steps 1 through 4 for each device you want to use in your application. Suppose you want to map actions to both a joystick and the keyboard. In the racing-game example, the action defined in the game as eB\_DRIVERVIEW was mapped to a keyboard key in the **DIACTION** array.

In that example, when **BuildActionMap** is called on any device that is not a keyboard, the **IHow** member of the **DIACTION** type for that element is set to **DIAH\_UNMAPPED**. Continue examining the **IHow** member as each device in turn is enumerated, until a value other than **DIAH\_UNMAPPED** is returned. This indicates that the device being currently mapped is a keyboard and the action has been successfully mapped to the requested key.

Even actions that have been successfully mapped can be mapped to another device. In the example, eB\_UPSHIFT is given two **DIACTION** types.

As devices are successively enumerated, the eB\_UPSHIFT action is mapped to a suitable button on one or more joysticks or other game controllers, and then again to the keyboard.

## 6. Displaying the Configuration

#### [C++]

To show the user how actions have been mapped to devices, pass the **DICD\_DEFAULT** flag to **IDirectInput8::ConfigureDevices**. The property sheet for the device, containing a graphical representation of mappings, is displayed in view-only mode as in the following diagram. For more information on the mechanics of displaying the image, refer to the Using Action Mapping tutorial.

#### [Visual Basic]

To show the user how actions have been mapped to devices, pass the **DICD\_DEFAULT** flag to **DirectInput8.ConfigureDevices**. The property sheet for the device, containing a graphical representation of mappings, is displayed in view-only mode as in the following diagram. For more information on the mechanics of displaying the image, refer to the Using Action Mapping tutorial.

If the device manufacturer has not provided a device image, the mapping will be presented in text mode as in the following diagram.

**Note**

Even if the cooperative level for the application is disabling the Microsoft® Windows® logo key passively through an exclusive cooperative level or actively through use of the DISCL\_NOWINKEY flag, that key will be active while the default action mapping UI is displayed.

For more information about this property sheet, see User Configuration of the Device.

## User Configuration of the Device

Microsoft® DirectInput® provides a property sheet that can be called from an application, enabling the user to configure devices for the application and view the current configuration. This property sheet can display various views of the device as provided by the manufacturer.

---

**[C++]**

To enable user configuration, pass a **DICONFIGUREDEVICESPARAMS** structure containing a pointer to the **DIACTIONFORMAT** structure describing the desired mapping, along with the DICD\_EDIT flag, to the **IDirectInput8::ConfigureDevices** method. Normally you would do this after calling

**IDirectInputDevice8::BuildActionMap** on all devices that will be used in the application.

---

**[Visual Basic]**

To enable user configuration, pass a **DICONFIGUREDEVICESPARAMS** type containing the **DIACTIONFORMAT** type describing the desired mapping, along with the DICD\_EDIT flag, to the **DirectInput8.ConfigureDevices** method. Normally you would do this after calling **DirectInputDevice8.BuildActionMap** on all devices that will be used in the application.

---

The following illustration shows a typical property sheet in edit mode.



If the device manufacturer has not provided a device image, the mapping will be presented in text mode as in the following diagram.

### Note

Even if the cooperative level for the application is disabling the Microsoft® Windows® logo key passively through an exclusive cooperative level or actively through use of the DISCL\_NOWINKEY flag, that key will be active while the default action mapping UI is displayed.

### [C++]

The property page for a device lists the friendly names that were provided by you in the **lptszActionName** member of each **DIACTION** structure. If you have already called **BuildActionMap** for a device, the page also shows these names as callouts on the image of the device, with lines pointing to the device objects to which the actions have been mapped.

The user now has the opportunity to reassign game actions by first choosing a control then choosing an action from the menu. When the user closes the property sheet, the method returns and the modifications are stored in the **DIACTIONFORMAT** structure that you passed in. You can now pass the same structure to



**IDirectInputDevice8::SetActionMap** in order to implement the new mapping scheme.

---

#### [Visual Basic]

The property page for a device lists the friendly names that were provided by you in the **ActionName** member of each **DIACTION** type. If you have already called **BuildActionMap** for a device, the page also shows these names as callouts on the image of the device, with lines pointing to the device objects to which the actions have been mapped.

The user now has the opportunity to reassign game actions by first choosing a control then choosing an action from the menu. When the user closes the property sheet, the method returns and the modifications are stored in the **DIACTIONFORMAT** type that you passed in. You can now pass the same type to **DirectInputDevice8.SetActionMap** in order to implement the new mapping scheme.

---

## Retrieving Action Data

---

#### [C++]

You retrieve buffered data from action-mapped devices just as you would from unmapped devices: by calling **IDirectInputDevice8::GetDeviceData**. However, instead of identifying device objects by examining the **dwOfs** member of the **DIDeviceObjectData** structure, you obtain the action associated with the object from the **uAppData** member. This is the same value you passed to the device in the **DIACTION** structure. It can be a simple identifier or a pointer to a function designed to handle the action.

---

#### [Visual Basic]

You retrieve buffered data from action-mapped devices just as you would from unmapped devices: by calling **DirectInputDevice8.GetDeviceData**. However, instead of identifying device objects by examining the **IOfs** member of the **DIDeviceObjectData** type, you obtain the action associated with the object from the **IUserData** member. This is the same value you passed to the device in the **DIACTION** type.

---

Remember that an action can be associated with more than one device. You still have to obtain data from both devices independently, but you can use the same routine to handle the data regardless of where it comes from.

---

#### [C++]

The following sample code, which might be part of the game loop in a driving simulation, retrieves data from all devices in the *g\_lpDiDevices* array. This array contains *g\_nDevices* elements.

```
for (int iDevice = 0; iDevice < g_nDevices; iDevice++)
{
    DIDEVICEOBJECTDATA didod;
    DWORD dwObjCount = 1;

    // Poll the device for data.
    g_lpDiDevices[iDevice]->Poll();

    // Retrieve the data.
    g_lpDiDevices[iDevice]->GetDeviceData( sizeof(didod),
                                           &didod,
                                           &dwObjCount, 0 );

    // Handle the actions regardless of what device returned them.
    switch(didod.uAppData)
    {
        case eA_STEER:
            SteerCar(didod.dwData);
            break;
        case eB_UPSHIFT
            if (didod.dwData & 0x80) ShiftGears(UPSHIFT);
            break;
        .
        .
        .

        default:
            break;
    }
}
```

### Note

Axis constants for specific genres, such as *DIAXIS\_DRIVINGR\_STEER* or *DIAXIS\_SPACESIM\_LATERAL*, are used for absolute joystick data. The action mapper attempts to map this virtual control to a device object that returns absolute data. The data returned from that device should be processed accordingly in the application. Device constants such as *DIMOUSE\_XAXIS*, however, are expected to return relative data.

When retrieving data, each potential source of data should be processed separately to keep one device object from possibly overwriting the data from another. For instance, the following **DIACTION** structures are used in an action map to control direction.

```
{INPUT_LEFTRIGHT_ABS_AXIS, DIAXIS_SPACESIM_LATERAL, 0, _T("Turn").},
```

```
{INPUT_LEFTRIGHT_REL_AXIS, DIMOUSE_XAXIS, 0, _T("Turn")},  
{INPUT_TURNLEFT, DIKEYBOARD_LEFT, 0, _T("Turn left")},  
{INPUT_TURNRIGHT, DIKEYBOARD_RIGHT, 0, _T("Turn right")},
```

The application's input loop processes data from these actions in the following case statement.

```
switch (adod[j].uAppData)  
{  
    case INPUT_LEFTRIGHT_ABS_AXIS:  
        g_dwAbsLR = adod[j].dwData  
        break;  
    case INPUT_LEFTRIGHT_REL_AXIS:  
        g_dwRelLR = adod[j].dwData;  
        break;  
    case INPUT_TURNLEFT:  
        g_bLeft = (adod[j].dwData != 0);  
        break;  
    case INPUT_TURNRIGHT:  
        g_bRight = (adod[j].dwData != 0)  
        break;  
}
```

Note that each data source is assigned to a separate variable rather than all data sources being assigned a generic "turn" variable. If they were to share a generic variable, holding down the LEFT ARROW key and then moving the joystick would cause the keyboard information to be lost. This is because the joystick data would overwrite the variable.

In addition to individual variables, there are many ways to process the data. Whatever method is used, care should be taken in the processing of data to avoid unexpectedly lost information.

---

#### [\[Visual Basic\]](#)

The following sample code, which might be part of the game loop in a driving simulation, retrieves data from all devices in the *m\_Devices* array. This array contains *m\_nDevices* elements.

```
Dim iDevice As Integer  
For iDevice = 1 To m_nDevices  
    Dim didod(BUFFERSIZE) As DIDEVICEOBJECTDATA  
  
    'Poll the device for data.  
    m_Devices(iDevice).Poll  
  
    'Determine how many pieces of data are available.
```

```

m_nItems = m_Devices(iDevice).GetDeviceData(didod, 0)

'Handle the actions regardless of what device returned them.
For i = 0 To m_nItems
    Select Case didod(i).UserData
        Case eA_STEER:
            Call SteerCar (didod(i).IData)
        Case eB_UPSHIFT:
            If (didod(i).IData & &H80) Then
                Call ShiftGears (UPSHIFT)
            .
            .
            .
    End Select
Next
Next

```

### Note

Axis constants for specific genres, such as DIAXIS\_DRIVINGR\_STEER or DIAXIS\_SPACESIM\_LATERAL, are used for absolute joystick data. The action mapper attempts to map this virtual control to a device object that returns absolute data. The data returned from that device should be processed accordingly in the application. Device constants such as DIMOUSE\_XAXIS, however, are expected to return relative data.

When retrieving data, each potential source of data should be processed separately to keep one device object from possibly overwriting the data from another. For instance, the following **DIACTION** types are used in an action map to control direction.

```

With rgActions(0)
    .IData = INPUT_LEFTRIGHT_ABS_AXIS
    .ISemantic = DIAXIS_SPACESIM_LATERAL
    .IFlags = 0
    .ActionName = "Turn"
End With
With rgActions(1)
    .IData = INPUT_LEFTRIGHT_REL_AXIS
    .ISemantic = DIMOUSE_XAXIS
    .IFlags = 0
    .ActionName = "Turn"
End With
With rgActions(2)
    .IData = INPUT_TURNLEFT
    .ISemantic = DIKEYBOARD_LEFT
    .IFlags = 0
    .ActionName = "Turn left"
End With
With rgActions(3)

```

```
.IAppData = INPUT_TURNRIGHT  
.ISemantic = DIKEYBOARD_RIGHT  
.IFlags = 0  
.ActionName = "Turn right"  
End With
```

The application's input loop processes data from these actions in the following case statement.

```
Select Case adod(j).IUserData  
  Case INPUT_LEFTRIGHT_ABS_AXIS:  
    g_dwAbsLR = adod(j).IData  
  Case INPUT_LEFTRIGHT_REL_AXIS:  
    g_dwRelLR = adod(j).IData  
  Case INPUT_TURNLEFT:  
    g_bLeft = (adod(j).IData <> 0)  
  case INPUT_TURNRIGHT:  
    g_bRight = (adod(j).IData <> 0)  
End Select
```

Note that each data source is assigned to a separate variable rather than all data sources being assigned a generic "turn" variable. If they to share a generic variable, holding down the LEFT ARROW key and then moving the joystick would cause the keyboard information to be lost. This is because the joystick data would overwrite the variable.

In addition to individual variables, there are many ways to process the data. Whatever method is used, care should be taken in the processing of data to avoid unexpectedly lost information.

---

## Maintaining Files During Development

During a development cycle, unused and out of date .ini files may accumulate due to frequent action map changes, Microsoft® DirectX® reinstallations, multiple users, and other normal development situations. These files could possibly cause unexpected mappings or reports of "recent" (DIEDBS\_RECENTDEVICE) for devices that would not be expected to return that value. For this reason, it is good practice to occasionally delete any unused .ini files. These files can be found in C:\Program Files\Common Files\DirectX\DirectInput\User Maps.

### Note

The procedure suggested above is meant to be performed only manually during a development cycle to ensure that the development environment is in a cleaner state. A shipping application should never delete user maps as this could result in the loss of a user's preferred settings.

## Force Feedback

Force feedback is the generation of push or resistance in an input/output device—for example, by motors mounted in the base of a joystick. Microsoft® DirectInput® enables you to generate force-feedback effects for devices that have compatible drivers.

The following sections introduce the elements of force feedback.

- Basic Concepts of Force Feedback
- Effect Enumeration
- Loading Effects from a File
- Information About a Supported Effect
- Creating an Effect
- Effect Direction
- Envelopes and Offsets
- Effect Playback
- Downloading and Unloading Effects
- Changing an Effect
- Gain
- Force-Feedback State
- Effect Object Enumeration
- Effect Types

## Basic Concepts of Force Feedback

A particular instance of force feedback is called an *effect*, and the push or resistance is called the *force*. Most effects fall into one of the following categories:

- Constant force. A steady force in a single direction.
- Ramp force. A force that steadily increases or decreases in magnitude.
- Periodic effect. A force that pulsates according to a defined wave pattern.
- Condition. A reaction to motion or position along an axis. Two examples are a friction effect that generates resistance to movement of the joystick, and a spring effect that pushes the stick back toward a certain position after it has been moved from that position.

The strength of the force is called its *magnitude*. Magnitude is measured in units ranging from 0 (no force) through 10,000 (maximum force for the device, defined for C/C++ and Visual Basic as DI\_FFNOMINALMAX). A negative value indicates

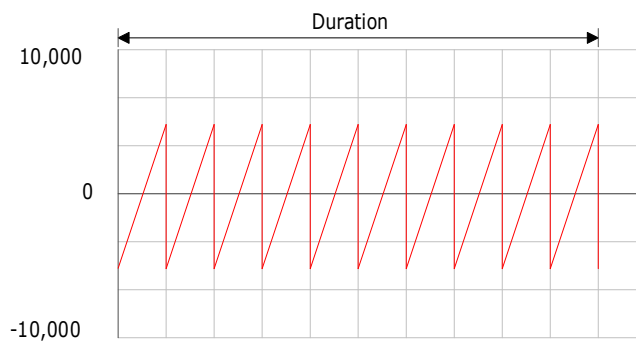
force in the opposite direction. Magnitudes are linear: a force of 10,000 is twice as great as one of 5,000.

Ramp forces have a beginning and ending magnitude. For a periodic effect, the basic magnitude is the force at the peak of the wave.

The *direction* of a force is the direction from which it comes. A positive force on a given axis pushes from the positive toward the negative.

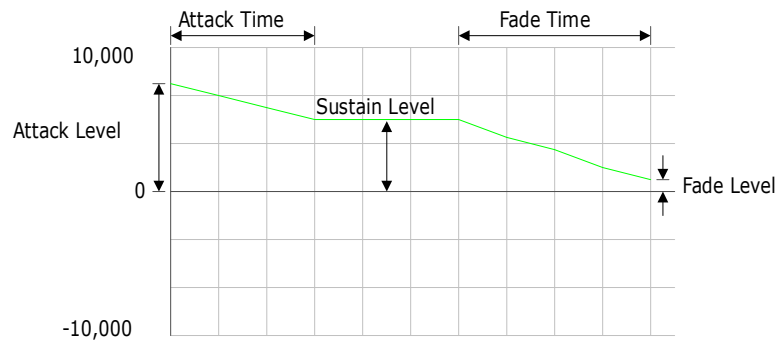
Effects also have *duration*, measured in microseconds. Periodic effects have a *period*, or the duration of one cycle, also measured in microseconds. The *phase* of a periodic effect is the point along the wave at which playback begins.

The following illustration represents a sawtooth periodic effect with a magnitude of 5,000, or half the maximum force for the device. The horizontal axis represents the duration of the effect, and the vertical axis represents the magnitude. Points above the center line represent positive force in the direction defined for the effect, and points below the center line represent negative force, or force in the opposite direction.

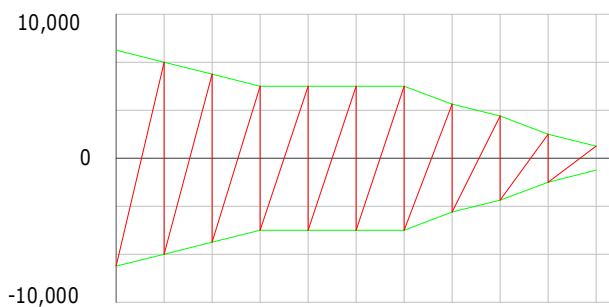


A force may be further shaped by an *envelope*. An envelope defines an *attack value* and a *fade value*, which modify the beginning and ending magnitude of the effect. Attack and fade also have duration, which determines how long the magnitude takes to reach or fall away from the *sustain value*, the magnitude in the middle portion of the effect.

The following diagram shows an envelope. The attack level is set to 8,000 and the fade level to 1,000. The sustain level is defined by the basic magnitude of the force to which the envelope is being applied; in the example, it is 5,000. In this case, the attack is greater than the sustain, giving the effect an initial strong kick. Both the attack and the fade level can be either greater or less than the sustain level.



The next diagram shows the result of the envelope being applied to the periodic effect in the first diagram. The envelope is mirrored on the negative side of the magnitude. An attack value of 8,000 means that the initial magnitude of the force in either direction is 80 percent of the maximum possible.



Periodic effects and conditions can also be modified by the addition of an *offset*, which defines the amount by which the waveform is shifted up or down from the base level. The practical effect of applying a positive offset to the sawtooth example would be to strengthen the positive force and weaken the negative one—in other words, the force would peak more strongly in one direction than in the other.

Finally, the overall magnitude of an effect can be scaled by *gain*, which is analogous to a volume control in audio. A single gain value can be applied to all effects for a device. You might want to do this to compensate for stronger or weaker forces on different hardware or to accommodate the user's preferences.

## Effect Enumeration

[\[C++\]](#)

The `IDirectInputDevice8::EnumEffects` method returns information about the support offered by the device for various kinds of effects.



It is important to distinguish between *supported effects* and *created effects*, or *effect objects*. A supported effect is a basic type which a device is capable of playing, such as a constant force. However, a constant force by itself has no properties such as magnitude, direction, duration, attack, or fade. These properties are set when you *create* a specific effect object in your application by shaping the raw effect type with an envelope or setting the values of a DIEFFECT structure. A supported effect can be represented by many effect objects, each with different parameters—for example, several constant forces, each with different duration, magnitude, and direction.

For information on enumerating created effects, see Effect Object Enumeration.

Like other Microsoft® DirectInput® enumerations, the

**IDirectInputDevice8::EnumEffects** method requires a callback function. This is documented with the placeholder name **DIEnumEffectsCallback**, but you can use a different name if you prefer. This function is called for each effect enumerated. Within the function you can obtain the GUID for each effect, get information about the extent of hardware support, and create one or more effect objects whose methods you can use to manipulate the effect.

The following code example sets the enumeration in motion. Assume that *g\_lpdid* is an initialized pointer to the **IDirectInputDevice8** interface of the device.

```
HRESULT hr = g_lpdid->EnumEffects(&DIEnumEffectsCallback,
    g_lpdid, DIEFT_ALL);
```

A skeletal callback is shown in the following code. The *pvRef* parameter of the callback could be any 32-bit value, but in this case it is a pointer to the device interface (the global *g\_lpdid* in the previous example), which is used for getting information about effects supported by the device and for creating effect objects.

```
BOOL CALLBACK DIEnumEffectsCallback(LPCDIEFFECTINFO pdei,
    LPVOID pvRef)
{
    HRESULT          hr;
    LPDIRECTINPUTDEVICE8 lpdid = (LPDIRECTINPUTDEVICE8)pvRef;
                                                // Pointer to calling device
    LPDIRECTINPUTEFFECT lpdEffect;    // Pointer to created effect
    DIEFFECT          diEffect;    // Params for created effect
    DICONSTANTFORCE    diConstantForce; // Type-specific parameters

    if (DIEFT_GETTYPE(pdei->dwEffType) == DIEFT_CONSTANTFORCE)
    {
        /* Here you can extract information about support for the
           effect type (from pdei), and tailor your effects
           accordingly. For example, the device might not support
           envelopes for this type of effect. */
    }
}
```

---

```

    .
    .
    // Create one or more constant force effects.
    // For each, you have to initialize a DICONSTANTFORCE
    // and a DIEFFECT structure.
    .
    .
    .
    hr = lpdid->CreateEffect(pdei->guid,
                           &diEffect,
                           &lpediEffect,
                           NULL);
    .
    .
    .
}
// And so on for other types of effect
.
.
.

return DIENUM_CONTINUE;
} // End of callback

```

For a detailed example of creating an effect, and for more information on how to initialize an effect, see [Creating an Effect](#).

---

#### [\[Visual Basic\]](#)

The **DirectInputDevice8.GetEffectsEnum** method enumerates effects supported by the device. It returns a **DirectInputEnumEffects** object representing the collection of supported effects. Methods of **DirectInputEnumEffects** can be used to get information about a particular effect.

It is important to distinguish between *supported effects* and *created effects*, or *effect objects*. A supported effect might be a constant force that can be shaped by an envelope. However, this effect has no properties such as magnitude, direction, duration, attack, or fade. You set these properties when you create an effect object in your application. A supported effect can be represented by many effect objects, each with different parameters—for example, several constant forces, each with different duration, magnitude, and direction.

The following code example shows how an application could enumerate hardware-specific effects, looking for a particular effect supported by the Microsoft® SideWinder® joystick. If the desired effect is not found, the application substitutes one of the standard effects:

```
Const BasketballDribble = _
```

---

```

        "{E84CD1AC-81FA-11D0-94AB-0080C74C7E95}"
Dim diEnumEffects As DirectInputEnumEffects
Dim EffGuid As String
Dim i As Integer

' diDev is a DirectInputDevice object.
Set diEnumEffects = didev.GetEffectsEnum(DIEFT_HARDWARE)
For i = 1 To diEnumEffects.GetCount
    If diEnumEffects.GetEffectGuid(i) = BasketballDribble Then
        EffGuid = BasketballDribble
        Exit For
    End If
Next i
If EffGuid <> BasketballDribble Then
    EffGuid = "GUID_Sine"
    ' Set parameters for emulated dribble here
    .
    .
    .
End If

```

Ultimately, *EffGuid* is passed to **DirectInputDevice8.CreateEffect**.

---

## Loading Effects from a File

---

### [C++]

Using the Force Editor supplied with the Microsoft® DirectX® SDK, or another application that uses the same file format, you can design effects and save them in a file. You can then use these effects in any application by loading them at run time.

To load effects, call the **IDirectInputDevice8::EnumEffectsInFile** method. By default, the enumeration is limited to the standard Microsoft DirectInput® effects, but you can enumerate other effects by setting the DIFEF\_INCLUDENONSTANDARD flag. By setting the DIFEF\_MODIFYIFNEEDED flag, you can also instruct DirectInput to modify the parameters of effects, if necessary, so that they work on the device. (For example, an effect authored for two axes can be made to work on a single-axis steering wheel.)

In the following code example, the first three standard effects are loaded from a file and created as DirectInputEffect objects.

```

// g_lpddid is a valid IDirectInputDevice8 pointer to a
// force feedback device.

```

```
// The array of effect pointers is declared globally.
LPDIRECTINPUTEFFECT pEff[3];

.
.
.
g_lpdid->EnumEffectsInFile("FEdit1.ffe",
                          EnumEffectsInFileProc,
                          NULL,
                          DIFEF_MODIFYIFNEEDED);

.
.
.
```

The following callback function is called once for each effect in the file or until it returns DIENUM\_STOP. Note that because the DIFEF\_MODIFYIFNEEDED flag was passed, the effect parameters may have been modified in *lpdife->lpDiEffect*. The callback creates the effect with these modified parameters.

```
BOOL CALLBACK EnumEffectsInFileProc(LPCDIFILEEFFECT lpdife,
                                   LPVOID pvRef)

{
    HRESULT hr;
    static int i;

    hr = g_lpdid->CreateEffect(lpdife->GuidEffect,
                              lpdife->lpDiEffect,
                              &pEff[i],
                              NULL);

    if (FAILED(hr))
    {
        // Error handling
    }
    if (++i > 2) return DIENUM_STOP;
    else return DIENUM_CONTINUE;
}
```

---

#### [Visual Basic]

Using the Force Editor supplied with the Microsoft® DirectX® SDK, or another application that uses the same file format, you can design effects and save them in a file. You can then use these effects in any application by loading them at run time.

To load effects, call the `DirectInputDevice8.CreateEffectFromFile` method. The resulting `DirectInputEffect` object may then be used normally.

---

## Information About a Supported Effect

---

### [C++]

The **IDirectInputDevice8::GetEffectInfo** method can be used to retrieve information about the device's support for an effect whose GUID is known. It retrieves the same information that is returned in the **DIEFFECTINFO** structure during enumeration. For more information, see [Effect Enumeration](#).

The following code fetches information about an effect whose GUID is stored in the *EffectGuid* variable, and determines whether the direction of the effect can be changed without stopping and restarting it:

```
DIEFFECTINFO diEffectInfo;
diEffectInfo.dwSize = sizeof(DIEFFECTINFO);
g_ipdid->GetEffectInfo(&diEffectInfo, EffectGuid);
if (diEffectInfo.dwDynamicParams & DIEP_DIRECTION)
{
    // Can reset parameter dynamically
}
```

---

### [Visual Basic]

In Microsoft® DirectX® for Microsoft Visual Basic®, information about a supported effect must be obtained from the **DirectInputEnumEffects** enumeration object. See [Effect Enumeration](#).

The following code example gets information about the first enumerated effect and determines whether the direction of the effect can be changed without stopping and restarting it. Assume that *diEnumEffects* is an initialized **DirectInputEnumEffects** object.

```
Dim params As Long
params = diEnumEffects.GetDynamicParams(1)
If params And DIEP_DIRECTION Then
    Debug.Print "Direction is dynamic."
End If
```

---

## Creating an Effect

[C++]

Create an effect object by using the **IDirectInputDevice8::CreateEffect** method, as in the following code example, where *g\_lpdiid* points to an instance of the interface. This example creates a very simple effect that pulls the joystick away from the user at full force for half a second.

```
HRESULT hr;
LPDIRECTINPUTEFFECT lpdiEffect; // receives pointer to created effect
DIEFFECT diEffect;             // parameters for created effect

DWORD  dwAxes[2] = { DIJOFS_X, DIJOFS_Y };
LONG   lDirection[2] = { 18000, 0 };

DICONSTANTFORCE diConstantForce;

diConstantForce.lMagnitude = DI_FFNOMINALMAX; // Full force

diEffect.dwSize      = sizeof(DIEFFECT);
diEffect.dwFlags     = DIEFF_POLAR | DIEFF_OBJECTOFFSETS;
diEffect.dwDuration  = (DWORD)(0.5 * DI_SECONDS);
diEffect.dwSamplePeriod = 0;           // = default
diEffect.dwGain      = DI_FFNOMINALMAX; // No scaling
diEffect.dwTriggerButton = DIEB_NOTRIGGER; // Not a button response
diEffect.dwTriggerRepeatInterval = 0;    // Not applicable
diEffect.cAxes       = 2;
diEffect.rgdwAxes     = &dwAxes[0];
diEffect.rglDirection = &lDirection[0];
diEffect.lpEnvelope   = NULL;
diEffect.cbTypeSpecificParams = sizeof(DICONSTANTFORCE);
diEffect.lpvTypeSpecificParams = &diConstantForce;

hr = g_lpdiid->CreateEffect(GUID_ConstantForce,
                           &diEffect,
                           &lpdiEffect,
                           NULL);
```

In the method call, the first parameter identifies the supported effect with which the created effect is to be associated. The example uses one of the predefined GUIDs found in *Dinput.h*. If you use a predefined GUID, the call fails if the device does not support the effect.

The second parameter sets the parameters as specified in the **DIEFFECT** structure. The third parameter receives a pointer to the effect object if the call is successful.

The **DIEFF\_POLAR** flag specifies the type of coordinates used for the direction of the force. (See Effect Direction.) It is combined with **DIEFF\_OBJECTOFFSETS**, which indicates that any buttons or axes used in other members are identified by their offsets within the **DIDATAFORMAT** structure for the device. The alternative is to use the **DIEFF\_OBJECTIDS** flag, signifying that buttons and axes are identified by the **dwType** member of the **DIDeviceObjectInstance** structure returned for the object when it was enumerated with the **IDirectInputDevice8::EnumObjects** method.

For more information on the members of the **DIEFFECT** structure, see Effect Direction.

---

#### [Visual Basic]

Create an effect object by using the **DirectInputDevice8.CreateEffect** method, as in the following code example, where *didev* is a **DirectInputDevice8** object. This example creates a very simple effect that pulls the joystick away from the user at full force for half a second.

```
Dim effectInfo As DIEFFECT
Dim objDIEffect As DirectInputEffect

With effectInfo
    .constantForce.IMagnitude = 10000
    .IGain = 10000
    .IDuration = 500000
    .x = 18000
    .ITriggerButton = -1 ' No trigger button
End With

didev.Acquire
Set objDIEffect = didev.CreateEffect("GUID_ConstantForce", effectInfo)
```

The first parameter to **CreateEffect** can be one of the predefined GUID aliases, or an actual GUID in string form known from hardware documentation or retrieved for an enumerated effect by using the **DirectInputEnumEffects.GetEffectGuid** method.

The relevant members of the **DIEFFECT** type vary according to the kind of effect. Constant forces are the simplest kind, requiring only a single type-specific parameter. The **IGain**, **IDuration**, and **ITriggerButton** members should be set for all effects because the default values of 0 are not usually suitable.

By default, the direction of the effect is expressed in polar coordinates, meaning that **DIEFFECT.x** holds the direction from which the force comes, in hundredths of a degree, and **DIEFFECT.y** must be 0.

---

Effects are automatically downloaded to the device when created, provided the device is not full and is acquired at the exclusive cooperative level.

## Effect Direction

### [C++]

Directions can be defined for one or more axes. As with the mouse and joystick, the x-axis increases from left to right, and the y-axis increases from far to near. For three-dimensional devices, the z-axis increases from up to down.

The direction of an effect is the direction from which it comes. An effect with a direction along the negative y-axis tends to push the stick along the positive y-axis (toward the user). If the user must push the stick toward the left to counteract an effect, the effect has a left direction; that is, it lies on the negative x-axis.

Direction can be expressed in *polar*, *spherical*, or *Cartesian* coordinates.

Polar coordinates are expressed as a single angle, in hundredths of a degree clockwise from whatever zero-point, or true north, has been established for the effect. Normally this is the negative y-axis; that is, away from the user. Thus an effect with a polar coordinate of 9,000 has a direction of east, or to the user's right, and the user must exert force to the right to counteract it.

Spherical coordinates are also in hundredths of a degree but can contain two or more angles. For each angle, the direction is rotated in the positive direction of the next axis. For a 3-D device, the first angle would normally be rotated from the positive x-axis toward the positive y-axis (clockwise from east), and the second angle would be rotated toward the positive z-axis (down). Thus a force with a direction of (0, 0) would be to the user's right and parallel to the tabletop. A direction of 27,000 for the first angle and 4,500 for the second would be directly away from the user (270 degrees clockwise from east) and angling toward the floor (45 degrees downward from the tabletop); to counteract a force with this direction, the user would have to push forward and down.

Cartesian coordinates are similar to 3-D vectors. If you draw a straight line on graph paper with an origin of (0, 0) at the center of the page, the direction of the line can be defined by the coordinates of any intersection that it crosses, regardless of the distance from the origin. A direction of (1, -2) and a direction of (5, -10) are exactly the same.

### Note

The coordinates used in creating force-feedback effects define only direction, not magnitude or distance.

When an effect is created or modified, the **cAxes**, **rgdwAxes**, and **rglDirection** members of the **DIEFFECT** structure are used to specify the direction of the force.

The **cAxes** member specifies the number of axes involved in the effect. This will also be the number of elements in each of the arrays pointed to by the next two members.



The array pointed to by **rgdwAxes** identifies the axes to which the effects will be applied. If the **DIEFF\_OBJECTOFFSETS** flag has been set, the axes are identified by the offsets within the data format structure. These offsets are most readily identified by using the **DIJOFS\_\*** defines. (For a list of these values, see Joystick Device Constants.)

Finally, the **rglDirection** member specifies the direction of the force.

### Note

The **cAxes** and **rgdwAxes** members cannot be modified once they have been set. An effect always has the same axis list.

Regardless of whether you are using Cartesian, polar, or spherical coordinates, you must provide exactly as many elements in **rglDirection** as there are axes in the array pointed to by **rgdwAxes**.

In the polar coordinate system, north (0 degrees) lies along the vector (0, -1), where the elements of the vector correspond to the elements in the axis list pointed to by **rgdwAxes**. Normally those axes are x and y, so north is directly along the negative y-axis; that is, away from the user. The last element of *rglDirection* must be 0.

In the example in Creating an Effect, the direction of a two-dimensional force is defined in polar coordinates. The force has a south direction—it comes from the direction of the user, so the user has to pull the stick to counteract it. The direction is 180 degrees clockwise from north, and can be assigned as follows:

```
LONG lDirection[2] = { 18000, 0 };
```

For greater clarity, the assignment could also be expressed this way:

```
LONG lDirection[2] = { 180 * DI_DEGREES, 0 };
```

For spherical coordinates, presuming that you are working with a three-axis device, the same direction is assigned as follows:

```
LONG lDirection[3] = { 90 * DI_DEGREES, 0, 0 }
```

The first angle is measured in hundredths of a degree from the (1, 0) direction, rotated in the direction of (0, 1); the second angle is measured in hundredths of a degree toward (0, 0, 1). The elements of the vector notation again correspond to elements in the array pointed to by the **rgdwAxes** member. Assume that the elements of this array represent the x, y, and z axes, in that order. The point of origin is at x = 1 and y = 0; that is, to the user's right. The direction of rotation is toward the positive y-axis (0, 1); that is, toward the user, or clockwise. The force in the example is 90 degrees clockwise from the right; that is, south. Because the second element of *lDirection* is 0, there is no rotation on the third axis.

How do you accomplish the same thing with Cartesian coordinates? Presuming that you have used the **DIEFF\_CARTESIAN** flag in the **dwFlags** member, you would specify the direction like this:

```
LONG lDirection[2] = { 0, 1 };
```

Here again, the elements of the array correspond to the axes listed in the array pointed to by **rgdwAxes**. The example sets the x-axis to 0 and the y-axis to 1; that is, the direction lies directly along the positive y-axis, or to the south.

The theory of effect directions can be difficult to grasp, but the practice is fairly straightforward. For code examples, see Examples of Setting Effect Direction.

---

#### [\[Visual Basic\]](#)

Microsoft® DirectX® for Microsoft Visual Basic® supports two-axis effects on the x-axis and y-axis.

The direction of an effect is the direction from which it comes. An effect with a direction along the negative y-axis tends to push the stick along the positive y-axis (toward the user). If the user must push the stick toward the left in order to counteract an effect, the effect has a left direction; that is, it lies on the negative x-axis.

Direction can be expressed in *polar* or *Cartesian* coordinates. By default, polar coordinates are used, and the direction is specified in the **x** member of the **DIEFFECT** type, with **y** always 0. To use Cartesian coordinates, you must specify **DIEFF\_CARTESIAN** in the **IFlags** member and supply values in both **x** and **y**.

Polar coordinates are expressed as a single angle, in hundredths of a degree clockwise from whatever zero-point, or true north, has been established for the effect. Normally this is the negative y-axis; that is, away from the user. Thus an effect with a polar coordinate of 9,000 has a direction of east, or to the user's right, and the user must exert force to the right to counteract it.

Cartesian coordinates are similar to 3-D vectors and are most useful for matching a force to the user's orientation in a 3-D environment. If you draw a straight line on graph paper with an origin of (0, 0) at the center of the page, the direction of the line can be defined by the coordinates of any intersection that it crosses, regardless of the distance from the origin. A direction of (1, -2) and a direction of (5, -10) are exactly the same.

#### **Note**

The coordinates used in creating force-feedback effects define only direction, not magnitude or distance.

In the example in Creating an Effect, the direction of a two-dimensional force is defined in polar coordinates. The force has a south direction—it comes from the direction of the user, so the user has to pull the stick to counteract it. The direction is 180 degrees clockwise from north, and was assigned as follows, where *effectInfo* is a valid **DIEFFECT** type.

```
effectInfo.x = 18000
```

The **effectInfo.y** member must be set to 0, which it is by default. For greater clarity, the assignment could also be expressed this way:

```
effectInfo.x = 180 * DI_DEGREES
```

How do you accomplish the same thing with Cartesian coordinates? Presuming that you have used the DIEFF\_CARTESIAN flag in the **IFlags** member, you would specify the direction like this:

```
effectInfo.x = 0
effectInfo.y = 1
```

As long as the **x** value is 0, any number in the **y** value will give the same effect because only direction is indicated, not magnitude. The theory of effect directions can be difficult to grasp, but the practice is fairly straightforward.

The following code example reverses the direction of a force represented by the **DirectInputEffect** object *dieff*, which was created using the global **DIEFFECT** type *effectInfo*:

```
effectInfo.IFlags = DIEFF_CARTESIAN
effectInfo.X = effectInfo.X * -1
effectInfo.Y = effectInfo.Y * -1
Call dieff.SetParameters(effectInfo, DIEP_DIRECTION)
```

For more code examples, see Examples of Setting Effect Direction.

---

## Examples of Setting Effect Direction

---

[C++]

### Single-Axis Effects

Setting up the direction for a single-axis effect is easy because there is nothing to specify. Put the DIEFF\_CARTESIAN flag in the **dwFlags** member of the **DIEFFECT** structure and set **rglDirection** to point to a single **LONG** containing the value 0.

The following code example sets up the direction and axis parameters for an x-axis effect:

```
DIEFFECT eff;
LONG lZero = 0;           // No direction
DWORD dwAxis = DIJOFS_X;  // X-axis effect

ZeroMemory(&eff, sizeof(DIEFFECT));
eff.cAxes = 1;           // One axis
eff.dwFlags = DIEFF_CARTESIAN | DIEFF_OBJECTOFFSETS; // Flags
eff.rglDirection = &lZero; // Direction
eff.rgdwAxes = &dwAxis;   // Axis for effect
```

## Two-Axis Effects with Polar Coordinates

Setting up the direction for a polar two-axis effect is only a little more complicated. Set the **DIEFF\_POLAR** flag in **dwFlags** and set **rglDirection** to point to an array of two **LONGs**. The first element in this array is the direction from which you want the effect to come. The second element in the array must be 0.

The following example sets up the direction and axis parameters for a two-axis effect coming from the east:

```
DIEFFECT eff;
LONG   rglDirection[2] = { 90 * DI_DEGREES, 0 };
DWORD  rgdwAxes[2]     = { DIJOFS_X, DIJOFS_Y }; // X- and y-axis

ZeroMemory(&eff, sizeof(DIEFFECT));
eff.cAxes = 2; // Two axes
eff.dwFlags = DIEFF_POLAR | DIEFF_OBJECTOFFSETS; // Flags
eff.rglDirection = rglDirection; // Direction
eff.rgdwAxes = rgdwAxes; // Axis for effect
```

## Two-Axis Effects with Cartesian Coordinates

Setting up the direction for a Cartesian two-axis effect is a bit trickier. Set the **DIEFF\_CARTESIAN** flag in **dwFlags**, and again set **rglDirection** to point to an array of two **LONGs**. This time the first element in the array is the x-coordinate of the direction vector, and the second is the y-coordinate.

The following code example sets up the direction and axis parameters for a two-axis effect coming from the east:

```
DIEFFECT eff;
LONG   rglDirection[2] = { 1, 0 }; // Positive x = east
DWORD  rgdwAxes[2]     = { DIJOFS_X, DIJOFS_Y }; // X- and y-axis

ZeroMemory(&eff, sizeof(DIEFFECT));
eff.cAxes = 2; // Two axes
eff.dwFlags = DIEFF_CARTESIAN | DIEFF_OBJECTOFFSETS; // Flags
eff.rglDirection = rglDirection; // Direction
eff.rgdwAxes = rgdwAxes; // Axis for effect
```

---

[\[Visual Basic\]](#)

## Single-Axis Effects with Cartesian Coordinates

Setting up the direction for a single-axis effect is easy because you need to specify only the direction of the axis. Put the **DIEFF\_CARTESIAN** flag in the **IFlags** member of the **DIEFFECT** structure and set the **x** or **y** member to either 1 or -1, depending on the direction you want the effect to come from.

The following code example sets an x-axis effect with a right to left direction:

```
Dim eff As DIEFFECT

eff.IFlags = DIEFF_CARTESIAN Or DIEFF_OBJECTOFFSETS
eff.x = 1
eff.y = 0
```

### Single-Axis Effects with Polar Coordinates

The same effect could be set up just as easily using polar coordinates. Put the DIEFF\_POLAR flag in the **IFlags** member of the **DIEFFECT** structure and set the **x** member to either 0, 90, 180, or 270 degrees.

The following code example sets the same x-axis effect as in the previous example:

```
Dim eff As DIEFFECT

eff.IFlags = DIEFF_POLAR Or DIEFF_OBJECTOFFSETS
eff.x = 90 * DI_DEGREES
eff.y = 0
```

### Two-Axis Effects with Polar Coordinates

Setting up the direction for a polar two-axis effect is no different than a polar one-axis effect. The only difference is that the range of degree values is not restricted to the four axis values.

The following code example sets an effect originating from the user's upper right:

```
Dim eff As DIEFFECT

eff.IFlags = DIEFF_POLAR Or DIEFF_OBJECTOFFSETS
eff.x = 45 * DI_DEGREES
eff.y = 0
```

### Two-Axis Effects with Cartesian Coordinates

Setting up the direction for a Cartesian two-axis effect is straightforward as well. First, set the DIEFF\_CARTESIAN flag in **IFlags**. The **x** and **y** members will be filled with the x and y coordinates of any point on a line of direction through that point and the origin (0,0).

The following code example sets the same effect as in the previous sample:

```
Dim eff As DIEFFECT

eff.IFlags = DIEFF_CARTESIAN Or DIEFF_OBJECTOFFSETS
eff.x = 1
eff.y = 2
```

## Envelopes and Offsets

You can modify the basic magnitude of some effects by applying an envelope and an offset. For an overview, see Basic Concepts of Force Feedback.

---

### [C++]

To apply an envelope when creating or modifying an effect, initialize a **DIENVELOPE** structure and put a pointer to it in the **lpEnvelope** member of the **DIEFFECT** structure.

The device driver determines which effects support envelopes. Typically, you can apply an envelope to a constant force, a ramp force, or a periodic effect, but not to a condition. To determine whether a particular effect supports an envelope, call the **IDirectInputDevice8::GetEffectInfo** method and check for the **DIEP\_ENVELOPE** flag in the **dwStaticParams** member of the **DIEFFECTINFO** structure.

To apply an offset, set the **IOffset** member of the **DIPERIODIC** or **DICONDITION** structure pointed to by the **lpvTypeSpecificParams** member of the **DIEFFECT** structure. For periodic effects, the absolute value of the offset plus the magnitude of the effect must not exceed **DI\_FFNOMINALMAX**.

---

### [Visual Basic]

To apply an envelope when creating or modifying an effect, set the **bUseEnvelope** member of the **DIEFFECT** type to True and initialize the **envelope** member, which is a **DIENVELOPE** type.

The device driver determines which effects support envelopes. Typically, you can apply an envelope to a constant force, a ramp force, or a periodic effect, but not to a condition. To determine whether a particular effect supports an envelope, call the **DirectInputEnumEffects.GetStaticParams** method and check for the **DIEP\_ENVELOPE** flag in the returned value.

To apply an offset, set the **IOffset** member of the **DIPERIODICFORCE** or **DICONDITION** type used in the **periodicForce**, **conditionX** or **conditionY** member of **DIEFFECT**. For periodic effects, the absolute value of the offset plus the magnitude of the effect must not exceed 10,000.

---

You cannot apply an offset to a constant force or ramp force. In these cases, you can achieve the same effect by altering the magnitude.

## Effect Playback

---

### [C++]

There are two principal ways to start playback of an effect: manually by a call to the **IDirectInputEffect::Start** method, or automatically in response to a button press. Playback also starts when you change an effect by calling the **IDirectInputEffect::SetParameters** method with the **DIEP\_START** flag.

Passing **INFINITE** in the *dwIterations* parameter of the **IDirectInputEffect::Start** method has the effect of playing the effect repeatedly, with the envelope being applied each time. If you want to repeat an effect without repeating the envelope—for example, to begin with a strong kick, then settle down to a steady throb—set *dwIterations* to 1, and set the **dwDuration** member of the **DIEFFECT** structure to **INFINITE**. (This is the structure passed to the **IDirectInputDevice8::CreateEffect** method.)

### Note

Some devices do not support multiple iterations of an effect, and they accept only the value 1 in the *dwIterations* parameter to the **Start** method. Always check the return value from **Start** to be sure the effect played successfully.

To associate an effect with a button press, set the **dwTriggerButton** member of the **DIEFFECT** structure. Also set the **dwTriggerRepeatInterval** member to the desired delay between playbacks when the button is held down. This is the interval, in microseconds, between the end of one playback and the start of the next.

### Note

On some devices, multiple effects cannot be triggered by the same button. If you associate more than one effect with a button, the last effect downloaded is the one triggered. Also, trigger repeat interval might not be supported.

To dissociate an effect from its trigger button, either call the **IDirectInputEffect::Unload** method or set the parameters for the effect with **dwTriggerButton** set to **DIEB\_NOTRIGGER**.

Triggered effects, like all others, are lost when the application loses access to the device. To make them active again, download them as soon as the application reacquires the device. See **Downloading and Unloading Effects**. This step is not necessary for effects not associated with a trigger, because they are automatically downloaded if necessary whenever the **Start** method is called.

If an effect has a finite duration and is started by a call to the **Start** method, it stops playing when the time has elapsed. If its duration was set to **INFINITE**, playback ends only when the **IDirectInputEffect::Stop** method is called. An effect associated with a trigger button starts when the button is pressed and stops when the button is released or the duration has elapsed, whichever comes sooner.

---

### [Visual Basic]

There are two principal ways to start playback of an effect: manually by a call to the **DirectInputEffect.Start** method, or automatically in response to a button press. Playback also starts when you change an effect by calling the **DirectInputEffect.SetParameters** method with the **DIEP\_START** flag.

Passing **-1** in the *iterations* parameter of the **Start** method has the effect of playing the effect repeatedly, with the envelope being applied each time. If you want to repeat an effect without repeating the envelope—for example, to begin with a strong kick, then settle down to a steady throb—set *iterations* to **1** and set the **IDuration** member of the **DIEFFECT** type to **-1**. (This is the type passed to the **DirectInputDevice8.CreateEffect** method.)

#### Note

Some devices do not support multiple iterations of an effect and accept only the value **1** in the *iterations* parameter to the **Start** method.

To associate an effect with a button press, set the **ITriggerButton** member of the **DIEFFECT** type. Also set the **ITriggerRepeatInterval** member to the desired delay between playbacks when the button is held down. This is the interval, in microseconds, between the end of one playback and the start of the next.

#### Note

On some devices, multiple effects cannot be triggered by the same button; if you associate more than one effect with a button; the last effect downloaded is the one triggered. Also, trigger repeat interval might not be supported.

To dissociate an effect from its trigger button, either call the **DirectInputEffect.Unload** method or set the parameters for the effect with **ITriggerButton** set to **-1** or **DIEB\_NOTRIGGER**.

Triggered effects, like all others, are lost when the application loses access to the device. To make them active again, download them as soon as the application reacquires the device. This step is not necessary for effects not associated with a trigger because they are automatically downloaded if necessary whenever the **Start** method is called.

If an effect has a finite duration and is started by a call to the **Start** method, it stops playing when the time has elapsed. If an effect has been instructed to play continually, playback ends only when the **DirectInputEffect.Stop** method is called. An effect associated with a trigger button starts when the button is pressed and stops when the button is released or the duration has elapsed, whichever comes sooner.

---

## Downloading and Unloading Effects

Before an effect can be played, it must be downloaded to the device. Downloading an effect means telling the driver to prepare the effect for playback. It is entirely up to the driver to determine how this is done. Generally, the driver places the parameters



of the effect in hardware memory to minimize the subsequent transfer of data between the device and the system. The consequent reduction in latency is particularly important for conditions and for effects played in response to a trigger, such as a fire button. Ideally the device does not have to communicate with the system at all in order to respond to axis movements and button presses.

Downloading is done automatically when you create an effect, provided the device is not full and is acquired at the exclusive cooperative level. By default, it is also done when you start the effect or change its parameters.

---

#### [C++]

If you specify the `DIEP_NODOWNLOAD` flag when changing parameters, you must subsequently use the **IDirectInputEffect::Download** method to download or update the effect.

When the device is unacquired—for example, when it has been acquired with the exclusive foreground cooperative level and the application moves to the background—effects are unloaded and must be downloaded again when the application regains the foreground. This is done automatically when you call the **IDirectInputEffect::Start** method, but you can choose to download all effects immediately on reacquiring the device. You always have to download effects associated with a trigger button because the **Start** method is not normally called for such effects.

If your application gets the `DIERR_DEVICEFULL` error when downloading an effect, you must make room for the new effect by unloading an old one. You can remove an effect from the device by calling the **IDirectInputEffect::Unload** method. You can also remove all effects by resetting the device through a call to the **IDirectInputDevice8::SendForceFeedbackCommand** method.

---

#### [Visual Basic]

If you specify the `DIEP_NODOWNLOAD` flag when changing parameters, you must subsequently use the **DirectInputEffect.Download** method to download or update the effect.

When the device is unacquired—for example, when it has been acquired with the exclusive foreground cooperative level and the application moves to the background—effects are unloaded and must be downloaded again when the application regains the foreground. This is done automatically when you call the **DirectInputEffect.Start** method, but you can choose to download all effects immediately on reacquiring the device. You always have to download effects associated with a trigger button because the **Start** method is not normally called for such effects.

If your application gets the `DIERR_DEVICEFULL` error when downloading an effect, you must make room for the new effect by unloading an old one. You can remove an effect from the device by calling the **DirectInputEffect.Unload** method. You can also remove all effects by resetting the device through a call to the **DirectInputDevice8.SendForceFeedbackCommand** method.

When you create a force-feedback device, the hardware and driver are reset, so any existing effects are cleared.

## Changing an Effect

---

### [C++]

You can modify the parameters of an effect, in some cases even while the effect is playing. Do this by using the **IDirectInputEffect::SetParameters** method.

The **dwDynamicParams** member of the **DIEFFECTINFO** structure tells you which effect parameters can be changed while an effect is playing. If you attempt to modify an effect parameter that cannot be modified while the effect is playing, and the effect is still playing, Microsoft® DirectInput® normally stops the effect, updates the parameters, and restarts the effect. You can override this default behavior by passing the **DIEP\_NOESTART** flag.

The following code example changes the magnitude of the constant force that was set in the example under Creating an Effect.

```
DIEFFECT    diEffect;        // Parameters for effect
DICONSTANTFORCE diConstantForce; // Type-specific parameters

diConstantForce.IMagnitude = 5000;
diEffect.dwSize = sizeof(DIEFFECT);
diEffect.cbTypeSpecificParams = sizeof(DICONSTANTFORCE);
diEffect.lpvTypeSpecificParams = &diConstantForce;
hr = lpdiEffect->SetParameters(&diEffect, DIEP_TYPESPECIFICPARAMS);
```

The **DIEP\_TYPESPECIFICPARAMS** flag ensures that the transfer of data from the **DIEFFECT** structure is restricted to the relevant members, so that you do not have to initialize the entire structure and so that the minimum possible amount of data needs to be sent to the device.

---

### [Visual Basic]

You can modify the parameters of an effect, in some cases even while the effect is playing. Do this by using the **DirectInputEffect.SetParameters** method.

To find which effect parameters can be changed while an effect is playing, call the **DirectInputEnumEffects.GetDynamicParams** method.

If you attempt to modify an effect parameter that cannot be modified while the effect is playing, and the effect is still playing, Microsoft® DirectInput® normally stops the effect, updates the parameters, and restarts the effect. You can override this default behavior by passing the **DIEP\_NOESTART** flag to **SetParameters**.

The following code example changes the magnitude of a constant force represented by the **DirectInputEffect** object *dieff*, which was created using the global **DIEFFECT** type *effectinfo*:

```
effectinfo.constantForce.lMagnitude = 5000  
Call dieff.SetParameters(effectinfo, DIEP_TYPESPECIFICPARAMS)
```

### Note

You must set the **DIEP\_TYPESPECIFICPARAMS** flag if you are changing the **condition**, **constantforce**, **periodicforce**, or **rampforce** members of **DIEFFECT**.

---

## Gain

You might want to scale the force of your effects according to the force exerted by different devices. For example, if an application's effects feel right on a device that puts out a maximum force of *n* newtons on a given axis, you might want to adjust the gain for a device that puts out more force. (You cannot use the gain to increase the maximum force of the axis, so you should set the basic effect magnitudes to values suitable for devices that put out less force.)

Gain can also be used to decrease the magnitude of a hardware-defined effect.

---

### [C++]

The actual force generated by a device object such as an axis or button is returned in the **dwFFMaxForce** member of the **DIDEVICEOBJECTINSTANCE** structure when objects are enumerated. (See Device Object Enumeration.)

You can set the gain for the entire device by using the **IDirectInputDevice8::SetProperty** method.

You must set the gain for individual effects when creating them by putting a value in the **dwGain** member of the **DIEFFECT** structure. (If **dwGain** is 0, the effect will not be felt.) You can change this value later by using **IDirectInputEffect::SetParameters**, passing **DIEP\_GAIN** in the *dwFlags* parameter.

---

### [Visual Basic]

You can set the gain for the entire device by using the **DirectInputDevice8.SetProperty** method.

You must set the gain for individual effects when creating them by putting a value in the **lGain** member of the **DIEFFECT** type. (If **lGain** is 0, the effect will not be felt.) You can change this value later by using **DirectInputEffect.SetParameters**, passing **DIEP\_GAIN** in the *flags* parameter.

---

The purpose of setting the device gain is to allow your application to have control over the strength of all effects all at once. For example, you might have a slider control in your application to enable the user to specify how strong the force-feedback effects should be, such as the master volume control on a sound mixer. When the device gain is set, your application does not need to adjust the gain of each individual effect to suit the user's preferences.

A gain value can be in the range from 0 through 10,000, where 10,000 indicates that magnitudes are not to be scaled, 7,500 means that forces are to be scaled to 75 percent of their nominal magnitudes, and so on.

## Force-Feedback State

---

### [C++]

The **IDirectInputDevice8::SendForceFeedbackCommand** method enables you to turn off the device's actuators (effectively causing it to ignore any effects that are being played), pause, stop, or continue playback of effects, and reset the device so that all downloaded effects are removed.

To retrieve the current force-feedback state, use the **IDirectInputDevice8::GetForceFeedbackState** method. This method returns information about whether the actuators are active, whether playback is paused, and whether the device has been reset. It also retrieves information about various switches and whether the device is currently powered.

---

### [Visual Basic]

The **DirectInputDevice8.SendForceFeedbackCommand** method enables you to turn off the device's actuators (effectively causing it to ignore any effects that are being played), pause, stop, or continue playback of effects, and reset the device so that all downloaded effects are removed.

To retrieve the current force-feedback state, use the **DirectInputDevice8.GetForceFeedbackState** method. This method returns information about whether the actuators are active, whether playback is paused, and whether the device has been reset. It also retrieves information about various switches and about whether the device is currently powered.

---

## Effect Object Enumeration

---

### [Visual Basic]

Enumeration of created effects is not supported under Microsoft® Visual Basic®.

---

### [C++]

When you need to examine or manipulate all the effects you have created, you can use the **IDirectInputDevice8::EnumCreatedEffectObjects** method. As no flags are currently defined for this method, you cannot restrict the enumeration to particular kinds of effects; all effects will be enumerated.

### Note

This method enumerates created effects, not effects supported by a device. For more information on the distinction between the two, see Effect Enumeration.

Like other Microsoft® DirectInput® enumerations, the **EnumCreatedEffectObjects** method requires a callback function. This standard callback is documented with the placeholder name **DIEnumCreatedEffectObjectsCallback**, but you can use a different name. The function is called for each effect enumerated. Within the function, you can perform any processing you want. However, it is not safe to create a new effect while enumeration is going on.

The following is a skeletal example of the callback function. The *pvRef* parameter of the callback can be any 32-bit value; in this case, it is a pointer to the **IDirectInputDevice8** interface that is performing the enumeration.

```
HRESULT hr;

BOOL CALLBACK DIEnumCreatedEffectObjectsCallback(
    LPDIRECTINPUTEFFECT peff, LPVOID pvRef);
{
    LPDIRECTINPUTDEVICE pdid = (IDirectInputDevice*)pvRef;
    // Pointer to calling device
    DIEFFECT          diEffect;    // Params for created effect

    diEffect.dwSize = sizeof(DIEFFECTINFO);
    peff->GetParameters(&diEffect, DIEP_ALLPARAMS);
    // Check or set parameters, or do anything else.
    .
    .
    .
} // End of callback
```

Here's the call that sets the enumeration in motion, passing in the DirectInputDevice pointer *lpdid*:

```
hr = lpdid->EnumCreatedEffectObjects(
    &DIEnumCreatedEffectObjectsCallback,
    &lpdid, 0);
```

---

## Effect Types

This section contains information specific to the following types of force-feedback effects:

- Constant Forces
- Ramp Forces
- Periodic Effects
- Conditions
- Custom Forces
- Device-Specific Effects

### Constant Forces

A constant force is a force with a defined magnitude and duration.

You can apply an envelope to a constant force to give it shape. For example, suppose you have an effect with a nominal magnitude of 2,000 and a duration of 2 seconds. Then you apply an envelope with the following values:

Parameter	Value
Attack time	0.5 second
Initial attack level	5,000
Fade time	1 second
Fade level	0

When you play the effect, you get the following:

Elapsed time	Magnitude
0.0	5,000
0.1	4,400
0.2	3,800
0.3	3,200
0.4	2,600
0.5	2,000
(Duration of sustain)	2,000
1.0:	2,000
1.1	1,800
1.2	1,600
1.3	1,400
1.4	1,200
1.5	1,000

---

1.6	800
1.7	600
1.8	400
1.9	200
2.0	0

You cannot apply an offset to a constant force.

---

#### [C++]

To create a constant force, pass `GUID_ConstantForce` to the **IDirectInputDevice8::CreateEffect** method. You can also pass any other GUID obtained by the **IDirectInputDevice8::EnumEffects** method, provided the low byte of the **dwEffType** member of the **DIEFFECTINFO** structure (**DIEFT\_GETTYPE(dwEfftype)**) is equal to **DIEFT\_CONSTANTFORCE**. In this way, you can use hardware-specific forces designed by the manufacturer such as a "constant" force that actually varies in magnitude in a seemingly random fashion to simulate turbulence.

A constant force uses a **DICONSTANTFORCE** structure to define the magnitude. A negative magnitude has the effect of reversing the direction of the force.

---

#### [Visual Basic]

To create a constant force, pass "GUID\_ConstantForce" to the **DirectInputDevice8.CreateEffect** method. You can also pass any other GUID obtained by the **DirectInputEnumEffects.GetEffectGuid** method, provided the low byte of the value returned by **DirectInputEnumEffects.GetType** is equal to **DIEFT\_CONSTANTFORCE**. In this way, you can use hardware-specific forces designed by the manufacturer such as a "constant" force that actually varies in magnitude in a seemingly random fashion to simulate turbulence.

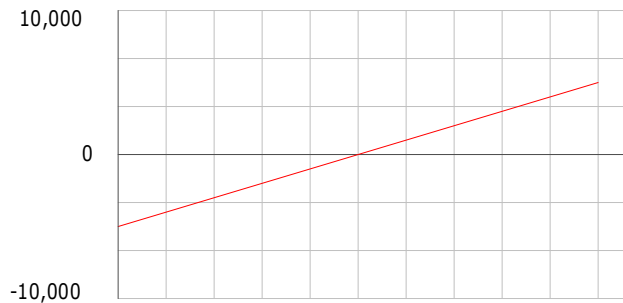
The magnitude of a constant force is contained in a **DICONSTANTFORCE** type in the **constantForce** member of **DIEFFECT**. A negative magnitude has the effect of reversing the direction of the force.

---

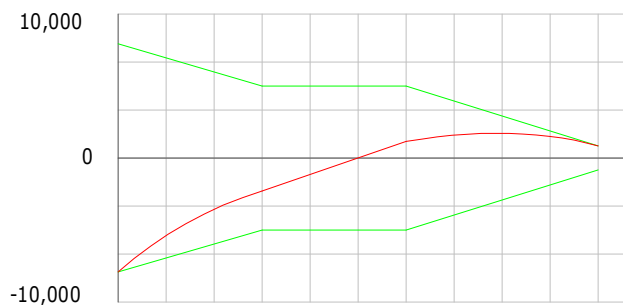
## Ramp Forces

A ramp force is a force with defined starting and ending magnitudes and a finite duration. A ramp force can continue in a single direction, or it can start as a strong push in one direction, weaken, stop, and then strengthen in the opposite direction.

The following illustration shows a ramp force that starts at a magnitude of -5,000 and ends at 5,000:



You can apply an envelope to a ramp force to shape it further. The following diagram shows the effect of applying an envelope, shown in green, to the ramp force in the previous diagram.



Note that during the sustain portion of the envelope, the magnitude of the effect follows the same straight line as before the envelope was applied. For the duration of the attack and fade, the slope of the ramp is modified by the attack and fade levels.

You cannot apply an offset to a ramp force.

#### [C++]

To create a ramp force, pass `GUID_RampForce` to the **IDirectInputDevice8::CreateEffect** method. You can also pass any other GUID obtained by the **IDirectInputDevice8::EnumEffects** method, provided the low byte of the **dwEffType** member of the **DIEFFECTINFO** structure (**DIEFT\_GETTYPE(dwEffType)**) is equal to **DIEFT\_RAMPFORCE**. In this way, you can use hardware-specific ramp forces designed by the manufacturer.

A ramp force uses a **DIRAMPFORCE** structure to define the starting and ending magnitude of the force, whereas the duration is taken from the **DIEFFECT** structure. Duration must never be set to **INFINITE**.



---

[\[Visual Basic\]](#)

To create a ramp force, pass "GUID\_RampForce" to the **DirectInputDevice8.CreateEffect** method. You can also pass any other GUID obtained by the **DirectInputEnumEffects.GetEffectGuid** method, provided the low byte of the value returned by **DirectInputEnumEffects.GetType** is equal to **DIEFT\_RAMPFORCE**. In this way, you can use hardware-specific ramp forces designed by the manufacturer.

The starting and ending magnitude of the force are defined in a **DIRAMPFORCE** type in the **rampForce** member of **DIEFFECT**. The duration cannot be infinite, and therefore **DIEFFECT.IDuration** must be a positive value.

---

## Periodic Effects

Periodic effects are waveform effects. Microsoft® DirectInput® defines the following waveforms:

- Square.
- Sine.
- Cosine.
- Triangle.
- SawtoothUp. The waveform drops vertically after it reaches maximum positive force. See Basic Concepts of Force Feedback for an example.
- SawtoothDown. The waveform rises vertically after it reaches maximum negative force.

An envelope can be applied to periodic effects. See the example in Basic Concepts of Force Feedback.

The phase of a periodic effect is the point along the waveform where the effect begins. Phase is measured in hundredths of a degree, from 0 to 35,999. The following table indicates where selected phase values (in degrees) lie along the various waveforms. *Max* is the top (+) or bottom (–) of the wave, and *Mid* is the midpoint, where no force is applied in either direction.

Waveform	0	90	180	270
Square	+Max	+Max	–Max	–Max
Sine	Mid	+Max	Mid	–Max
Triangle	+Max	Mid	–Max	Mid
SawtoothUp	–Max	–Max/2	Mid	+Max/2 (reaches +Max just before the cycle repeats)
SawtoothDown	+Max	+Max/2	Mid	–Max/2 (reaches –Max just before the

cycle repeats)

A driver may round off a phase value to the nearest supported value. For example, for a sine effect some drivers support only values of 0 and 9,000 (to create a cosine); for other effects, only values of 0 and 18,000 are supported.

---

#### [C++]

To create a periodic force, pass one of the following values in the *rguid* parameter of the **IDirectInputDevice8::CreateEffect** method:

- GUID\_Square
- GUID\_Sine
- GUID\_Triangle
- GUID\_SawtoothUp
- GUID\_SawtoothDown

You can also pass any other GUID obtained by the **IDirectInputDevice8::EnumEffects** method, provided the low byte of the **dwEffType** member of the **DIEFFECTINFO** structure (**DIEFT\_GETTYPE(dwEfftype)**) is equal to **DIEFT\_PERIODIC**. In this way, you can use hardware-specific forces designed by the manufacturer. For example, a hardware device might support a periodic effect that rotates the stick in a small circle.

The type-specific structure for periodic effects is **DIPERIODIC**.

Do not confuse the *period* of a periodic effect (**DIPERIODIC.dwPeriod**) with the *sample period* (**DIEFFECT.dwSamplePeriod**). The period is the length of time that it takes to go through a complete wave cycle. The sample period, as for all effects, is the minimum time between actual adjustments of magnitude.

---

#### [Visual Basic]

To create a periodic force, pass one of the following values in the *guid* parameter of the **DirectInputDevice8.CreateEffect** method:

- "GUID\_Square"
- "GUID\_Sine"
- "GUID\_Triangle"
- "GUID\_SawtoothUp"
- "GUID\_SawtoothDown"

You can also pass any other GUID obtained by the **DirectInputEnumEffects.GetEffectGuid** method, provided the low byte of the value returned by **DirectInputEnumEffects.GetType** is equal to **DIEFT\_PERIODIC**. In this way, you can use hardware-specific periodic forces designed by the manufacturer.

The type-specific parameters for periodic effects are contained in a **DIPERIODICFORCE** type in the **periodicForce** member of **DIEFFECT**.

Do not confuse the period of a periodic effect (**DIEFFECT.periodic.IPeriod**) with the sample period (**DIEFFECT.ISamplePeriod**). The period is the length of time it takes to go through a complete wave cycle. The sample period, as for all effects, is the minimum time between actual adjustments of magnitude.

---

## Conditions

Conditions are forces applied in response to current sensor values within the device. In other words, conditions require information about device motion, such as position or velocity of a joystick handle.

In general, conditions are not associated with individual events during a game or other application. They represent ambient phenomena, such as the stiffness or looseness of a flight stick, or the tendency of a steering wheel to return to a straight-ahead position.

A condition does not have a predefined magnitude. The magnitude is scaled in proportion to the movement or position of the input object.

Microsoft® DirectInput® defines the following types of condition effects:

- **Friction.** The force is applied when the axis is moved and depends on the defined friction coefficient.
- **Damper.** The force increases in proportion to the velocity with which the user moves the axis.
- **Inertia.** The force increases in proportion to the acceleration of the axis.
- **Spring.** The force increases in proportion to the distance of the axis from a defined neutral point.

Most hardware devices do not support the application of envelopes to conditions.

Conditions have the following type-specific parameters:

### *Offset*

The offset from the zero reading of the appropriate sensor value at which the condition begins to be applied. For a spring effect, the neutral point—that is, the point along the axis at which the spring would be considered at rest—would be defined by the offset for the condition. For a damper, the offset would define the greatest velocity value for which damping force is zero. Offset is not normally used for inertia or friction effects.

### *Coefficient*

A multiplier that scales the effect. For some devices, you can set separate coefficients for the positive and negative direction along the axis associated with the condition. For example, a flight stick controlling a damaged aircraft might move more easily to the right than to the left.

### *Saturation*

In force feedback, saturation is an expression of the maximum possible force for an effect. For example, suppose a flight stick has a spring condition on the x-axis. The offset is 0 and the coefficient is 10,000, so the maximum force is normally exerted when the stick is furthest from the center. But if you define a positive and negative saturation of 5,000, the force does not increase after the stick has been moved halfway to the right or left.

Not all devices support saturation.

### *Deadband*

The deadband is a zone around the offset of an axis at which the condition is not active. In the case of a spring that is at rest in the middle of an axis, the deadband enlarges this area of rest.

Not all devices support deadband.

Conditions can have duration, although in most cases you would probably want to set the duration to infinite (–1) and stop the effect only in response to some event in the application.

---

### [C++]

To create a condition, pass one of the following values in the *rguid* parameter of the **IDirectInputDevice8::CreateEffect** method:

- GUID\_Spring
- GUID\_Damper
- GUID\_Inertia
- GUID\_Friction

You can also pass any other GUID obtained by the **IDirectInputDevice8::EnumEffects** method, provided the low byte of the **dwEffType** member of the **DIEFFECTINFO** structure (**DIEFT\_GETTYPE(dwEffType)**) is equal to **DIEFT\_CONDITION**. In this way, you can use hardware-specific conditions designed by the manufacturer.

The type-specific structure for conditions is **DICONDITION**. For multiple-axis conditions, you can provide an array of such structures, one for each axis, or a single structure that defines the condition in the specified direction. In either case, you must set the **cbTypeSpecificParams** member of the **DIEFFECT** structure to the number of bytes used; that is, to **sizeof(DICONDITION) \* n**, where *n* is the number of structures provided. For more information on how to use either single or multiple structures, see the **DICONDITION** structure.

An application should call the **IDirectInputDevice8::GetEffectInfo** method or the **IDirectInputDevice8::EnumEffects** method and examine the **dwEffectType** member of the **DIEFFECTINFO** structure to determine whether both a positive and a negative coefficient and saturation for the effect are supported on the device. If the effect does not return the **DIEFT\_POSNEGCOEFFICIENTS** flag, it ignores the value in the **INegativeCoefficient** member, and the value in **IPositiveCoefficient** is applied

to the entire axis. Likewise, if the effect does not return the **DIEFT\_POSNEGSATURATION** flag, it ignores the value in **dwNegativeSaturation**, and the value in **dwPositiveSaturation** is used as the negative saturation level. Finally, if the effect does not return the **DIEFT\_SATURATION** flag, it ignores both the **dwPositiveSaturation** and **dwNegativeSaturation** values, and no saturation is applied.

You should also check **DIEFFECTINFO.dwEffectType** for the **DIEFT\_DEADBAND** flag, to see if deadband is supported for the condition. If it is not supported, the value in the **IDeadBand** member of the **DICONDITION** structure will be ignored.

You can set a coefficient to a negative value, and this has the effect of generating the force in the opposite direction. For example, for a spring effect, it would cause the spring to push away from the offset point rather than pulling toward it.

---

#### [\[Visual Basic\]](#)

To create a condition, pass one of the following values in the *rguid* parameter of the **DirectInputDevice8.CreateEffect** method:

- "GUID\_Spring"
- "GUID\_Damper"
- "GUID\_Inertia"
- "GUID\_Friction"

You can also pass any other GUID obtained by the **DirectInputEnumEffects.GetEffectGuid** method, provided the low byte of the value returned by **DirectInputEnumEffects.GetType** is equal to **DIEFT\_CONDITION**. In this way, you can use hardware-specific conditions designed by the manufacturer.

The type-specific parameters for a condition are described in a **DICONDITION** type in the **conditionX** and **conditionY** members of the **DIEFFECT** type.

An application should call the **DirectInputEnumEffects.GetType** method and examine the return value member to determine whether both a positive and a negative coefficient and saturation for the effect are supported on the device. If the effect does not return the **DIEFT\_POSNEGCOEFFICIENTS** flag, it ignores the value in **DICONDITION.INegativeCoefficient**, and the value in **IPositiveCoefficient** is applied to the entire axis. Likewise, if the effect does not return the **DIEFT\_POSNEGSATURATION** flag, it ignores the value in **INegativeSaturation** and the value in **IPositiveSaturation** is used as the negative saturation level. Finally, if the effect does not return the **DIEFT\_SATURATION** flag, it ignores both the **IPositiveSaturation** and **INegativeSaturation** values, and no saturation is applied.

You can set a coefficient to a negative value, and this has the effect of generating the force in the opposite direction. For example, for a spring effect, it would cause the spring to push away from the offset point, rather than pulling toward it.

You should also check the value returned by **GetType** for the **DIEFT\_DEADBAND** flag, to see if deadband is supported for the condition. If it is not supported, the value in the **IDeadBand** member of the **DICONDITION** type will be ignored.

To create a single-axis effect, set the coefficients for the unused axis to 0 in the **conditionX** or **conditionY** member of the **DIEFFECT** type.

DirectX® for Microsoft Visual Basic® does not support rotation of conditions.

---

## Custom Forces

Application writers can create their own effects by creating a custom force. A custom force is an array of constant force values played back by the device.

---

### [C++]

The type-specific structure for custom waveform effects is **DICUSTOMFORCE**.

Set the **dwSamplePeriod** member of the **DICUSTOMFORCE** structure and the **dwSamplePeriod** member of the **DIEFFECT** structure to the same value. This is the length of time, in milliseconds, for which each element in the array of forces is played.

The custom force is played repeatedly until the time set in the **dwDuration** member of the **DIEFFECT** structure has elapsed.

---

### [Visual Basic]

To create a custom force, first define an array of magnitudes, all in the range from –10,000 through 10,000. Then pass this array to the **DirectInputDevice8.CreateCustomEffect** method.

Set the *samplePeriod* parameter and the **ISamplePeriod** member of the **DIEFFECT** type to the same value. This is the length of time, in milliseconds, for which each element in the array of forces is played.

The custom force is played repeatedly until the time set in the **DIEFFECT.IDuration** has elapsed.

---

## Device-Specific Effects

Hardware drivers can support special effects that do not fit into the categories defined by Microsoft® DirectInput®. The type-specific parameters for these effects may be either hard-coded or modifiable by the application.

---

### [C++]

If type-specific parameters are modifiable, the application developer must obtain a header file declaring the data structure required by the effect.

The hardware vendor must provide a GUID identifying the device-specific effect and might provide a custom structure for the type-specific parameters of the effect. Your application then must initialize a **DIEFFECT** structure and a type-specific structure, as with any other effect. You then call the **IDirectInputDevice8::CreateEffect** method, passing the device-specific GUID and a pointer to the **DIEFFECT** structure.

When you obtain information about a device-specific effect in a **DIEFFECTINFO** structure, the low byte of the **dwEffType** member (**DIEFT\_GETTYPE(dwEffType)**) indicates into which of the predefined DirectInput effect categories (constant force, ramp force, periodic, or condition) the effect falls. If it does not fall into any of the predefined categories, the value is **DIEFT\_HARDWARE**.

If a device-specific effect falls into one of the predefined categories, the **lpvTypeSpecificParams** member of the **DIEFFECT** structure must point to the corresponding **DICONSTANTFORCE**, **DIRAMPFORCE**, **DIPERIODIC**, or **DICONDITION** structure, and the **cbTypeSpecificParams** member must be equal to the size of that structure.

If (**DIEFT\_GETTYPE(dwEffType)** == **DIEFT\_HARDWARE**), the values of the **lpvTypeSpecificParams** and **cbTypeSpecificParams** members depend on whether the effect requires custom type-specific parameters. If it does, these values must refer to the appropriate structure defined in the manufacturer's header file and declared and initialized by your application. If the effect does not require custom parameters—that is, if the **dwStaticParams** member of the **DIEFFECTINFO** structure for the hardware effect does not have the **DIEP\_TYPESPECIFICPARAMS** flag—**lpvTypeSpecificParams** must be **NULL** and **cbTypeSpecificParams** must be 0.

DirectInput passes the GUID and the **DIEFFECT** structure to the device driver for verification. If the GUID is unknown, the device returns **DIERR\_DEVICENOTREG**. If the GUID is known but the type-specific data is incorrect for that effect, the device returns **DIERR\_INVALIDPARAM**.

---

#### [\[Visual Basic\]](#)

Microsoft® DirectX® for Microsoft Visual Basic® does not support hardware effects that require custom type-specific parameters.

The hardware vendor must provide a GUID identifying the device-specific effect. Your application then must initialize a **DIEFFECT** type, as with any other effect. You then pass this type, along with the GUID, to the **DirectInputDevice8.CreateEffect** method.

When you obtain information about a device-specific effect in a **DirectInputEnumEffects** enumeration, the low byte of the return value of **DirectInputEnumEffects.GetType** indicates into which of the predefined DirectInput effect categories (constant force, ramp force, periodic, or condition) the

effect falls. If it does not fall into any of the predefined categories, the value is `DIEFT_HARDWARE`.

If a device-specific effect falls into one of the predefined categories, the **DIEFFECT** type must be initialized as it would be for a standard force of that category. For example, if the effect type is `DIEFT_CONSTANTFORCE`, the **constantForce** member must be initialized.

DirectInput passes the GUID and the **DIEFFECT** type to the device driver for verification. If the GUID is unknown, the device returns `DIERR_DEVICENOTREG`. If the GUID is known but the type-specific data is incorrect for that effect, the device returns `DIERR_INVALIDPARAM`.

---

## Programming Tips and Tools

This section covers specialized programming topics and an overview of tools provided with the Microsoft® DirectX® SDK that can help in understanding Microsoft DirectInput® data and in designing force-feedback effects.

Information is contained in the following topics.

- Designing for Previous Versions of DirectInput
- Preventing Response Delays During Debugging
- Force Editor

## Designing for Previous Versions of DirectInput

---

[C++]

In the **DirectInput8Create**, **IDirectInput8::Initialize**, **IDirectInputDevice8::Initialize**, and **IDirectInputEffect::Initialize** methods, you are required to pass the Microsoft® DirectInput® version number. This parameter specifies which version of Microsoft DirectX® the DirectInput subsystem should emulate.

Applications designed for the latest version of DirectInput should pass the value `DIRECTINPUT_VERSION` as defined in `Dinput.h`.

Applications designed to run under previous versions should pass a value corresponding to the version of DirectInput for which they were designed, with the



main version number in the high-order byte. For example, an application designed to run on DirectInput 3.0 should pass a value of 0x0300.

If you define `DIRECTINPUT_VERSION` as 0x0300 before including the `Dinput.h` header file, the header file generates structure definitions compatible with DirectInput 3.0.

If you do not define `DIRECTINPUT_VERSION` before including the `Dinput.h` header file, the header file generates structure definitions compatible with the current version of DirectInput. However, the DirectX 3-compatible structures are available under the same names with "`_DX3`" appended. For example, the DirectX 3-compatible **DIDEVCAPS** structure is called **DIDEVCAPS\_DX3**.

You must also use the appropriate versions of the `DirectInput` and `DirectInputDevice` interfaces. For versions of DirectX prior to DirectX 7.0, you must use **IDirectInput** and either **IDirectInputDevice** or **IDirectInputDevice2** (the latter is available for DirectX 5.0 or later.)

#### [\[Visual Basic\]](#)

If you want to design for Microsoft® DirectX® 7 (the only previous version of DirectX that supports Microsoft Visual Basic®), you must include the DirectX 7 for Visual Basic Type Library. Refer to the DirectX 7 documentation for more information.

## Preventing Response Delays During Debugging

When using the keyboard or mouse with Microsoft® DirectInput® under Microsoft Windows® 2000, you might notice short delays in response when you are stepping through code during a debugging session. This behavior occurs only in debug mode, so it is not seen by your application's end users. However, this behavior can be eliminated in debug mode as well by adding the Emulation value to the following registry key.

```
HKEY_LOCAL_MACHINE
SOFTWARE
Microsoft
DirectInput
```

Name	Type	Data
Emulation	DWORD	0x08 (for the mouse) 0x10 (for the keyboard) 0x18 (for both)

Without changing how DirectInput returns data, this value invokes an emulation mode that is not susceptible to those delays. The Microsoft Software Development Kit (SDK) includes two registry files—Mouse and Keyboard Emulation On.reg and Mouse and Keyboard Emulation Off.reg—to activate and deactivate this emulation mode. The files are located under (*SDK root*)\Samples\Multimedia\DirectInput\Bin.

**Note**

The Emulation value is supported only in debug mode when your device is using an Exclusive and Foreground cooperative level.

## Force Editor

### Description

The Force Editor application enables you to design force-feedback effects and test them singly or in combination. Effects can be saved to file and then loaded into Microsoft® DirectInput® applications.

### Path

Executable: (*SDK root*)\Bin\Dxutils\Fedit.exe

### User's Guide

The Force Editor has its own documentation. Once you've launched Fedit.exe, press F1 for online Help. The Help file can also be launched directly.

(*SDK root*)\Bin\Dxutils\Fedit.chm

## DirectInput C/C++ Tutorials

This section contains five tutorials, each providing step-by-step instructions for implementing basic Microsoft® DirectInput® functionality in a C or C++ application.

- Tutorial 1: Using the Keyboard  
The first tutorial shows how to add DirectInput keyboard support to an existing application.
- Tutorial 2: Using the Mouse  
The next tutorial takes you through the steps of providing DirectInput mouse support in an application. The tutorial is based on the Scrawl sample, and focuses on buffered data.
- Tutorial 3: Using the Joystick

This tutorial shows how to enumerate a joystick connected to a system, how to create and initialize a `DirectInputDevice` object in a callback function, and how to retrieve immediate data. Sample code is based on the `JoyStick` sample.

- Tutorial 4: Using Force Feedback

This tutorial illustrates the creation and manipulation of a simple effect on a force-feedback joystick.

- Tutorial 5: Using Action Mapping

The final tutorial takes you through the creation and application of an action map.

### Note

These tutorials are written using C++ style function calls. For instructions on writing Microsoft DirectX® function calls in a C environment, see *Using C to Access COM Objects*.

## Tutorial 1: Using the Keyboard

To prepare for keyboard input, first create an instance of a Microsoft® `DirectInput®` object. You then use the `IDirectInput8::CreateDevice` method to create an instance of an `IDirectInputDevice8` interface. The `IDirectInputDevice8` interface methods are used to manipulate the device, set its behavior, and retrieve data.

This tutorial divides the required tasks into the following steps.

- Step 1: Creating the `DirectInput` Object
- Step 2: Creating the `DirectInput` Keyboard Device
- Step 3: Setting the Keyboard Data Format
- Step 4: Setting the Keyboard Behavior
- Step 5: Gaining Access to the Keyboard
- Step 6: Retrieving Data from the Keyboard
- Step 7: Closing Down the `DirectInput` System

Adding `DirectInput` keyboard support to an application is relatively simple, so this tutorial is not based on the complete Keyboard sample application. All of the tutorial steps are illustrated by code fragments within the text. All related steps for initializing the system are gathered in Sample Function 1: `DI_Init`. Another function, Sample Function 2: `DI_Term`, is called whenever the system needs to be closed down. Much of the content of these functions are reused in subsequent tutorials.

### Step 1: Creating the `DirectInput` Object

The first step in setting up the Microsoft® `DirectInput®` system is to create a single `DirectInput` object as overall manager. This is done with a call to the `DirectInput8Create` function.

```
// HINSTANCE g_hinst; // initialized earlier
HRESULT      hr;
```

```
LPDIRECTINPUT8 g_lpDI;

hr = DirectInput8Create(g_hinst, DIRECTINPUT_VERSION,
    IID_IDirectInput8, (void**)&g_lpDI, NULL);
if FAILED(hr)
{
    // DirectInput not available; take appropriate action
}
```

The first parameter for **DirectInput8Create** is the instance handle to the application or DLL that is creating the object.

The second parameter tells the DirectInput object which version of the DirectInput system should be used. You can design your application to be compatible with earlier versions of DirectInput. For more information, see *Designing for Previous Versions of DirectInput*.

The third parameter determines which interface is returned. Most applications obtain the most recent version, by passing IID\_IDirectInput8.

The fourth parameter is the address of a variable that is initialized with a valid interface pointer if the call succeeds.

The last parameter specifies the address of the controlling object's **IUnknown** interface for use in COM aggregation. Because most applications do not use aggregation, the value of this parameter is usually NULL.

After creating a single DirectInput object as overall manager, go to Step 2: Creating the DirectInput Keyboard Device.

## Step 2: Creating the DirectInput Keyboard Device

After creating the Microsoft® DirectInput® object, your application must create the keyboard object—the device—and retrieve a pointer to an **IDirectInputDevice8** interface. The device performs most of the keyboard-related tasks, using the methods of the interface.

To do this your application must call the **IDirectInput8::CreateDevice** method, as shown in Sample Function 1: DI\_Init. **CreateDevice** accepts three parameters.

The first parameter is the GUID for the device being created. Because the system keyboard is used, your application should pass the *GUID\_SysKeyboard* predefined global variable.

The second parameter is the address of a variable that is initialized with the interface pointer if the call succeeds.

The third parameter specifies the address of the controlling object's **IUnknown** interface for use in COM aggregation. Because most applications do not use aggregation, the value of this parameter is usually NULL.

The following example attempts to retrieve a pointer to an **IDirectInputDevice8** interface. If this fails, it calls the **DI\_Term** application-defined sample function to deallocate existing DirectInput objects, if any.

### Note

In all the examples, *g\_lpdi* is the initialized pointer to the DirectInput object.

```
HRESULT          hr;
LPDIRECTINPUTDEVICE8 g_lpDIDevice

hr = g_lpDI->CreateDevice(GUID_SysKeyboard, &g_lpDIDevice, NULL);
if FAILED(hr) {
    DI_Term();
    return FALSE;
}
```

After creating the DirectInput keyboard device, go to Step 3: Setting the Keyboard Data Format.

## Step 3: Setting the Keyboard Data Format

After retrieving an **IDirectInputDevice8** pointer, your application must set the device's data format, as shown in Sample Function 1: *DI\_Init*. For keyboards, this is a very simple task. Call the **IDirectInputDevice8::SetDataFormat** method, specifying the data format provided by Microsoft® DirectInput® in the *c\_dfDIKeyboard* global variable.

The following example attempts to set the data format. If this fails, it calls the **DI\_Term** sample function to deallocate existing DirectInput objects, if any.

```
hr = g_lpDIDevice->SetDataFormat(&c_dfDIKeyboard);

if FAILED(hr) {
    DI_Term();
    return FALSE;
}
```

After setting the keyboard data format, go to Step 4: Setting the Keyboard Behavior.

## Step 4: Setting the Keyboard Behavior

Before your application can gain access to the keyboard, it must set the device's behavior using the **IDirectInputDevice8::SetCooperativeLevel** method, as shown in Sample Function 1: *DI\_Init*. This method accepts the handle to the window to be associated with the device and a combination of flags that determine the cooperative level. In this case the application is requesting foreground, nonexclusive access.

The following example attempts to set the device's cooperative level. If this fails, it calls the **DI\_Term** application-defined sample function to deallocate existing Microsoft® DirectInput® objects, if any.

```
// Set the cooperative level
hr = g_lpDIDevice->SetCooperativeLevel(g_hwndMain,
    DISCL_FOREGROUND | DISCL_NONEXCLUSIVE);

if FAILED(hr) {
    DI_Term();
    return FALSE;
}
```

After setting the keyboard behavior, go to Step 5: Gaining Access to the Keyboard.

## Step 5: Gaining Access to the Keyboard

After your application sets the keyboard's behavior, it can acquire access to the device by calling the **IDirectInputDevice8::Acquire** method. The application must acquire the device before retrieving data from it. The **Acquire** method accepts no parameters.

The following line of sample code acquires the keyboard device that was created in Step 2: Creating the DirectInput Keyboard Device.

```
if (g_lpDIDevice) g_lpDIDevice->Acquire();
```

Now that your application has acquired access to the keyboard, go to Step 6: Retrieving Data from the Keyboard.

## Step 6: Retrieving Data from the Keyboard

Once a device is acquired, your application can start retrieving data from it. The simplest way to do this is to call the **IDirectInputDevice8::GetDeviceState** method, which takes a snapshot of the device's state at the time of the call.

The **GetDeviceState** method accepts two parameters: the size of a buffer to be filled with device state data, and a pointer to that buffer. For keyboards, always declare a buffer of 256 unsigned bytes.

The following sample attempts to retrieve the state of the keyboard. If this fails, it calls an application-defined sample function to deallocate existing Microsoft® DirectInput® objects, if any. See Sample Function 2: **DI\_Term**.

After retrieving the keyboard's current state, your application can respond to specific keys that were pressed down at the time of the call. Each element in the buffer represents a key. If an element's high bit is 1, the key was down at the moment of the call; otherwise, the key was up. To check the state of a given key, use the **DirectInput Keyboard Device Constants** to index the buffer for a given key.

The following skeleton function, called from the main loop of a hypothetical spaceship game, uses the **IDirectInputDevice8::GetDeviceState** method to poll the keyboard. It then checks to see if the LEFT ARROW, RIGHT ARROW, UP ARROW or DOWN ARROW keys were pressed when the device state was retrieved. This is accomplished with the **KEYDOWN** macro defined in the body of the function. The macro accepts a buffer's variable name and an index value, then checks the byte at the specified index to see if the high bit is set and returns TRUE if it is.

```
void WINAPI ProcessKBInput()
{
    #define KEYDOWN(name, key) (name[key] & 0x80)

    char    buffer[256];
    HRESULT hr;

    hr = g_lpDIDevice->GetDeviceState(sizeof(buffer),(LPVOID)&buffer);
    if FAILED(hr)
    {
        // If it failed, the device has probably been lost.
        // Check for (hr == DIERR_INPUTLOST)
        // and attempt to reacquire it here.
        return;
    }

    // Turn the spaceship right or left
    if (KEYDOWN(buffer, DIK_RIGHT));
        // Turn right.
    else if (KEYDOWN(buffer, DIK_LEFT));
        // Turn left.

    // Thrust or stop the spaceship
    if (KEYDOWN(buffer, DIK_UP)) ;
        // Move the spaceship forward.
    else if (KEYDOWN(buffer, DIK_DOWN));
        // Stop the spaceship.
}
```

Now that your application can retrieve data from the keyboard, go to **Step 7: Closing Down the DirectInput System**.

## Step 7: Closing Down the DirectInput System

When an application is about to close, it should destroy all Microsoft® DirectInput® objects. This is a three-step process.

- Unacquire all DirectInput devices (**IDirectInputDevice8::Unacquire**)
- Release all DirectInput devices (**IDirectInputDevice8::Release**)

- Release the DirectInput object (**IDirectInput8::Release**)

For a sample function that closes down the DirectInput system, see Sample Function 2: **DI\_Term**.

## Sample Function 1: **DI\_Init**

This application-defined sample function creates a Microsoft® DirectInput® object, initializes it, and retrieves the necessary interface pointers, assigning them to global variables. When initialization is complete, it acquires the device.

If any part of the initialization fails, this function calls the **DI\_Term** application-defined sample function to deallocate DirectInput objects and interface pointers in preparation for terminating the program. See Sample Function 2: **DI\_Term**.

In addition to creating the DirectInput object, the **DI\_Init** function performs the tasks discussed in the following tutorial steps.

- Step 2: Creating the DirectInput Keyboard Device
- Step 3: Setting the Keyboard Data Format
- Step 4: Setting the Keyboard Behavior
- Step 5: Gaining Access to the Keyboard

The following is the **DI\_Init** function.

```
/* The following variables are presumed to be initialized:
HINSTANCE      g_hinst; // application instance
HWND           g_hwndMain; // application window
*/

LPDIRECTINPUT8  g_lpDI;
LPDIRECTINPUTDEVICE8 g_lpDIDevice;

BOOL WINAPI DI_Init()
{
    HRESULT hr;

    // Create the DirectInput object.
    hr = DirectInput8Create(g_hinst, DIRECTINPUT_VERSION,
                           IID_IDirectInput8, (void**)&g_lpDI, NULL);

    if FAILED(hr) return FALSE;

    // Retrieve a pointer to an IDirectInputDevice8 interface
    hr = g_lpDI->CreateDevice(GUID_SysKeyboard, &g_lpDIDevice, NULL);

    if FAILED(hr)
```



---

```

{
    DI_Term();
    return FALSE;
}

// Now that you have an IDirectInputDevice8 interface, get
// it ready to use.

// Set the data format using the predefined keyboard data
// format provided by the DirectInput object for keyboards.

hr = g_lpDIDevice->SetDataFormat(&c_dfDIKeyboard);

if FAILED(hr)
{
    DI_Term();
    return FALSE;
}

// Set the cooperative level
hr = g_lpDIDevice->SetCooperativeLevel(g_hwndMain,
                                     DISCL_FOREGROUND | DISCL_NONEXCLUSIVE);
if FAILED(hr)
{
    DI_Term();
    return FALSE;
}

// Get access to the input device.
hr = g_lpDIDevice->Acquire();
if FAILED(hr)
{
    DI_Term();
    return FALSE;
}

return TRUE;
}

```

## Sample Function 2: DI\_Term

This application-defined sample function deallocates existing Microsoft® DirectInput® interface pointers in preparation for program shutdown or in the event of a failure to properly initialize a device.

/\* The following variables are presumed initialized:

LPDIRECTINPUT8     g\_lpDI;

```
LPDIRECTINPUTDEVICE8 g_lpDIDevice;
*/

void WINAPI DI_Term()
{
    if (g_lpDI)
    {
        if (g_lpDIDevice)
        {
            // Always unacquire device before calling Release().
            g_lpDIDevice->Unacquire();
            g_lpDIDevice->Release();
            g_lpDIDevice = NULL;
        }
        g_lpDI->Release();
        g_lpDI = NULL;
    }
}
```

For additional DirectInput tutorials, see [DirectInput C/C++ Tutorials](#).

## Tutorial 2: Using the Mouse

This tutorial guides you through the process of setting up a mouse device and retrieving buffered input data. The examples are based on the Scrawl sample.

To prepare for mouse input, you first create an instance of a Microsoft® DirectInput® object. Then you use the **IDirectInput8::CreateDevice** method to create an instance of an **IDirectInputDevice8** interface. The **IDirectInputDevice8** interface methods are used to manipulate the device, set its behavior, and retrieve data.

The preliminary step of setting up the DirectInput system and the final step of closing it down are the same for any application and are covered in Tutorial 1: Using the Keyboard.

This tutorial divides the required tasks into the following steps.

- Step 1: Creating the DirectInput Mouse Device
- Step 2: Setting the Mouse Data Format
- Step 3: Setting the Mouse Behavior
- Step 4: Preparing for Buffered Input from the Mouse
- Step 5: Managing Access to the Mouse
- Step 6: Retrieving Buffered Data from the Mouse

### Note

When an application acquires the mouse at the exclusive cooperative level, Microsoft Windows® does not show a mouse pointer on the screen. For this, your application needs a simple sprite engine. The Scrawl sample application uses the Microsoft Win32® function **DrawIcon** to display a crosshair cursor.

## Step 1: Creating the DirectInput Mouse Device

After creating the Microsoft® DirectInput® object, your application should retrieve a pointer to an **IDirectInputDevice8** interface, which is used to perform most mouse-related tasks. To do this, call the **IDirectInput8::CreateDevice** method.

The first parameter of **CreateDevice** is the globally unique identifier (GUID) for the device your application is creating. In this case, because the system mouse is used, your application should pass the predefined global variable *GUID\_SysMouse*.

The second parameter is the address of a variable that is initialized with a valid **IDirectInputDevice8** interface pointer if the call succeeds.

The third parameter specifies the address of the controlling object's **IUnknown** interface for use in COM aggregation. Because most applications do not use aggregation, the value of this parameter is usually NULL.

The following sample code attempts to retrieve a pointer to an **IDirectInputDevice8** interface. If the call fails, FALSE is returned. It is assumed that *g\_pDI* is a valid pointer to **IDirectInput8**.

```
LPDIRECTINPUTDEVICE g_pMouse;
HRESULT             hr;

hr = g_pDI->CreateDevice(GUID_SysMouse, &g_pMouse, NULL);

if (FAILED(hr)) {
    return FALSE;
}
```

After creating the DirectInput mouse device, go to Step 2: Setting the Mouse Data Format.

## Step 2: Setting the Mouse Data Format

After retrieving an **IDirectInputDevice8** pointer, your application must set the device's data format. For mouse devices, this is a very simple task. Call the **IDirectInputDevice8::SetDataFormat** method, specifying the data format provided for your convenience by Microsoft® DirectInput® in the *c\_dfDIMouse* global variable.

The following code fragment attempts to set the device's data format. If the call fails, FALSE is returned.

```
hr = g_pMouse->SetDataFormat(&c_dfDIMouse);
```

```
if (FAILED(hr)) {  
    return FALSE;  
}
```

After setting the mouse data format, go to Step 3: Setting the Mouse Behavior.

## Step 3: Setting the Mouse Behavior

Before it can gain access to the mouse, your application must set the mouse device's behavior using the **IDirectInputDevice8::SetCooperativeLevel** method. This method accepts the handle to the window to be associated with the device. In Scrawl, the **DISCL\_EXCLUSIVE** flag is included to ensure that this application is the only one that can have exclusive access to the device. This flag is combined with **DISCL\_FOREGROUND** because Scrawl should not allow data input when another application is in the foreground.

The following code sample attempts to set the device's cooperative level. If this attempt fails, **FALSE** is returned. It is assumed that *hWnd* is a valid window handle.

```
hr = g_pMouse->SetCooperativeLevel(hWnd,  
    DISCL_EXCLUSIVE | DISCL_FOREGROUND);  
  
if (FAILED(hr)) {  
    return FALSE;  
}
```

After setting the mouse behavior, go to Step 4: Preparing for Buffered Input from the Mouse.

## Step 4: Preparing for Buffered Input from the Mouse

The Scrawl application demonstrates how to use event notification to find out about mouse activity, and how to read buffered input from the mouse. Both of these techniques require some setup. You can perform these steps at any time after creating the mouse device and before acquiring it.

First, create an event and associate it with the mouse device. You are instructing Microsoft® DirectInput® to notify the mouse device object whenever a hardware interrupt indicates that new data is available.

This is how it is done in Scrawl, where *g\_hevtMouse* is a global **HANDLE**.

```
g_hMouseEvent = CreateEvent(NULL, FALSE, FALSE, NULL);  
  
if (g_hMouseEvent == NULL) {  
    return FALSE;  
}
```

```
}

hr = g_pMouse->SetEventNotification(g_hMouseEvent);

if (FAILED(hr)) {
    return FALSE;
}
```

Now set the buffer size so that DirectInput can store any input data until you are ready to look at it. Note that by default the buffer size is zero, so this step is essential if you want to use buffered data.

It is not necessary to use buffered data with event notification. If you prefer, you can retrieve immediate data when an event is signaled.

To set the buffer size, initialize a **DIPROPDWORD** structure with information about itself and about the property you wish to set. Most of the values are boilerplate. The key value is the last one, **dwData**, which is initialized with the number of items you want the buffer to hold.

```
#define SAMPLE_BUFFER_SIZE 16

DIPROPDWORD dipdw;
// the header
dipdw.diph.dwSize    = sizeof(DIPROPDWORD);
dipdw.diph.dwHeaderSize = sizeof(DIPROPHEADER);
dipdw.diph.dwObj      = 0;
dipdw.diph.dwHow      = DIPH_DEVICE;
// the data
dipdw.dwData          = SAMPLE_BUFFER_SIZE;
```

You then pass the address of the header (the **DIPROPHEADER** structure within the **DIPROPDWORD** structure), along with the identifier of the property you want to change, to the **IDirectInputDevice8::SetProperty** method, as follows:

```
hr = g_pMouse->SetProperty(DIPROP_BUFFERSIZE, &dipdw.diph);

if (FAILED(hr)) {
    return FALSE;
}
```

The setup is now complete, and you are ready to acquire the mouse and start collecting data.

After preparing your application for buffered input from the mouse, go to Step 5: Managing Access to the Mouse.

## Step 5: Managing Access to the Mouse

Microsoft® DirectInput® provides the **IDirectInputDevice8::Acquire** and **IDirectInputDevice8::Unacquire** methods to manage device access. Your application must call the **Acquire** method to gain access to the device before requesting mouse information with the **IDirectInputDevice8::GetDeviceState** and **IDirectInputDevice8::GetDeviceData** methods.

Most of the time your application has the device in an acquired state. However, if you have only foreground access, the mouse is automatically unacquired whenever your application moves to the background. You are responsible for reacquiring it when you get the focus back again. This can be done in response to a WM\_ACTIVATE message.

Scrawl handles this message by setting a global variable, *g\_bActive*, according to whether the application is gaining or losing the focus. It then calls a helper function, **SetAcquire**, which acquires the mouse if *g\_bActive* is TRUE and unacquires it otherwise.

```
case WM_ACTIVATE:
    if (WA_INACTIVE == wParam)
        g_bActive = FALSE;
    else
        g_bActive = TRUE;

    // Set exclusive mode access to the mouse based on active state
    SetAcquire();
    return 0;
```

If you have exclusive access, your application might need to unacquire the mouse to enable the user to interact with Microsoft Windows®—for example, to access a menu or a dialog box. In Scrawl this can happen when the user opens the system menu with ALT+SPACEBAR.

The Scrawl window procedure has a handler for WM\_ENTERMENULOOP that responds by setting the global variable *g\_bActive* to FALSE and calling the **SetAcquire** function. This handler enables Windows to have the mouse and display its own cursor.

When the user is done using a menu, Windows sends the application a WM\_EXITSIZEMOVE message. In this case, the Scrawl window process sets *g\_bActive* appropriately and calls **SetAcquire**.

Scrawl also unacquires the mouse in response to a right-button click, which displays a shortcut menu. Although the mouse would get unacquired later, in the WM\_ENTERMENULOOP handler, it is unacquired here first so that the position of the Windows cursor can be set before the menu appears.

Finally, Scrawl tries to reacquire the mouse if it receives a DIERR\_INPUTLOST error after an attempt to retrieve data. This is in case the device has been unacquired

by some mechanism not covered elsewhere; for instance, if the user has pressed CTRL+ALT+DEL.

In summary, your application needs to acquire the mouse before it can get data from it. This needs to be done only once, as long as nothing happens to force your application to surrender access to it. In exclusive mode, you are responsible for giving up control of the mouse when Windows needs it. You are also responsible for reacquiring the mouse whenever your program needs access to it after losing it to Windows or another application.

Once your application can manage access to the mouse, go to Step 6: Retrieving Buffered Data from the Mouse.

## Step 6: Retrieving Buffered Data from the Mouse

Once the mouse is acquired, your application can begin to retrieve data from it.

In the Scrawl sample, retrieval is triggered by a signaled event. In the **WinMain** function, the application sleeps until **MsgWaitForMultipleObjects** indicates that there is either a signal or a message. If there is a signal associated with the mouse, the **OnMouseInput** function is called. This function is a good illustration of how buffered input is handled, as shown in the following process.

First, the function makes sure that the old cursor position is cleaned up. Note that Scrawl is maintaining its own cursor and is wholly responsible for drawing and erasing it.

```
VOID OnMouseInput(HWND hWnd)
{
    /* Invalidate the old cursor so that it will be erased */
    InvalidateCursorRect(hWnd);
```

Next, the function enters a loop to read and respond to the entire contents of the buffer. Because it retrieves just one item at a time, it needs only a single **DIDEVICEOBJECTDATA** structure to hold the data.

```
while (!bDone) {
    DIDEVICEOBJECTDATA od;
    DWORD dwElements = 1; // number of items to be retrieved
```

### Note

Another way to go about handling input would be to read the entire buffer at once and then loop through the retrieved items, responding to each one in turn. In that case, *dwElements* would be the size of the buffer, and *od* would be an array with the same number of elements.

The application calls the **IDirectInputDevice8::GetDeviceData** method in order to fetch the data. The second parameter tells Microsoft® DirectInput® where to put the

data, and the third tells it how many items are wanted. The final parameter would be `DIGDD_PEEK` if the data was to be left in the buffer, but in this case the data is not needed again, and so it is removed.

```
hr = g_pMouse->GetDeviceData(sizeof(DIDEVICEOBJECTDATA),
                             &od, &dwElements, 0);
```

Next, the application checks to see if access to the device has been lost and, if so, attempts to reacquire the mouse at the first opportunity. This step was discussed in Step 5: Managing Access to the Mouse.

```
if (hr == DIERR_INPUTLOST)
{
    SetAcquire();
    break;
}
```

Next, the application makes sure the call to the **GetDeviceData** method succeeded and that there was actually data to be retrieved. Note that after the call to **GetDeviceData** the *dwElements* variable shows how many items were actually retrieved.

```
/* Unable to read data or no data available */
if (FAILED(hr) || dwElements == 0)
{
    break;
}
```

If execution has proceeded to this point, the call succeeded and there is an item of data in the buffer. Now the application looks at the **dwOfs** member of the **DIDEVICEOBJECTDATA** structure to determine which object on the device reported a change of state, and it calls helper functions to respond appropriately. The value of the **dwData** member, which contains information about what occurred with the device object, is passed to these functions.

```
/* Look at the element to see what occurred */

switch (od.dwOfs)
{
    // Mouse horizontal motion
    case DIMOFS_X:
        UpdateCursorPosition(od.dwData, 0);
        break;

    // Mouse vertical motion
    case DIMOFS_Y:
        UpdateCursorPosition(0, od.dwData);
        break;
}
```



---

```

// DIMOFS_BUTTON0: Right button pressed or released
case DIMOFS_BUTTON0:
// DIMOFS_BUTTON1: Left button pressed or released
case DIMOFS_BUTTON1:
    // Is the right button or a swapped left button down?
    if((g_bSwapMouseButtons &&
        DIMOFS_BUTTON1 == od.dwOfs) ||
        (!g_bSwapMouseButtons &&
        DIMOFS_BUTTON0 == od.dwOfs))
    {
        if (od.dwData & 0x80) // Left button pressed, so
            // go into button-down mode
        {
            bDone = TRUE;
            OnLeftButtonDown(hWnd);
        }
        // Is the left button or a swapped right button down?
        if((g_bSwapMouseButtons &&
            DIMOFS_BUTTON0 == od.dwOfs) ||
            (!g_bSwapMouseButtons &&
            DIMOFS_BUTTON1 == od.dwOfs))
        {
            if(!(od.dwData & 0x80)) // button release, so
                // check shortcut menu
            {
                bDone = TRUE;
                OnRightButtonUp(hWnd);
            }
        }
        break;
    }
}

```

Finally, in the event that the cursor has been moved by one of the helper functions, the **OnMouseInput** sample function invalidates the screen rectangle occupied by the cursor.

```

// Invalidate the new cursor so that it will be drawn
InvalidateCursorRect(hWnd);
}

```

Scrawl also collects mouse data in the **OnLeftButtonDown** function. This is where the application keeps track of mouse movements while the primary button is being held down—that is, while the user is drawing. This function does not rely on event notification, but repeatedly polls the DirectInput buffer until the button is released.

Note that in the **OnLeftButtonDown** function no drawing is done until all pending data has been read. This is because each horizontal or vertical movement of the mouse is reported as a separate event. (Both events are, however, placed in the buffer at the same time.) If a line were immediately drawn in response to each separate axis movement, a diagonal mouse movement would produce two lines at right angles.

Another way you can be sure that the movement in both axes is taken into account before responding in your application is to check the sequence numbers of the x-axis item and the y-axis item. If the numbers are the same, the two events took place simultaneously. For more information, see Time Stamps and Sequence Numbers.

For additional DirectInput tutorials, see DirectInput C/C++ Tutorials.

## Tutorial 3: Using the Joystick

This tutorial shows you how to enumerate a joystick attached to a system and set it up for input. Code samples are based on the JoyStick sample.

The preliminary step of setting up the Microsoft® DirectInput® system and the final step of closing it down are the same for any application and are covered in Tutorial 1: Using the Keyboard.

The first step in this tutorial is to enumerate devices; that is, to see what joysticks are available. As part of this process you initialize each joystick device and set its desired characteristics. You then use the **IDirectInputDevice8** interface methods to retrieve data from each joystick.

This tutorial divides the required tasks into the following steps.

- Step 1: Enumerating the Joysticks
- Step 2: Creating the DirectInput Joystick Device
- Step 3: Setting the Joystick Data Format
- Step 4: Setting the Joystick Behavior
- Step 5: Gaining Access to the Joystick
- Step 6: Retrieving Data from the Joystick

### Step 1: Enumerating the Joysticks

After creating the Microsoft® DirectInput® system, call the **IDirectInput8::EnumDevices** method to enumerate the joysticks, as in the following sample code.

//g\_pDI is an initialized pointer to IDirectInput8

```
g_pDI->EnumDevices(DI8DEVCLASS_GAMECTRL, EnumJoysticksCallback,  
                  NULL, DIEDFL_ATTACHEDONLY)
```

The `DI8DEVCLASS_GAMECTRL` constant, passed as the first parameter, specifies the class of device to be enumerated.

*EnumJoysticksCallback* is the address of a callback function to be called each time a joystick is found. This is where the individual devices are created in Step 2: Creating the DirectInputJoystick Device.

The third parameter can be any 32-bit value that you want to make available to the callback function. In this case, nothing is being sent.

The last parameter, `DIEDFL_ATTACHEDONLY`, is a flag that restricts enumeration to devices that are attached to the computer.

When your application can enumerate the joysticks, go to Step 2: Creating the DirectInput Joystick Device.

## Step 2: Creating the DirectInput Joystick Device

After creating the Microsoft® DirectInput® object, the application must retrieve a pointer to an **IDirectInputDevice8** interface, which is used to perform most joystick-related tasks. In the JoyStick sample, this is done in the callback function **EnumJoysticksCallback**, which is called each time a joystick is enumerated.

The following sample code is the first part of the callback function.

```
BOOL CALLBACK EnumJoysticksCallback(const DIDEVICEINSTANCE*
                                   pdidInstance, VOID* pContext)
{
    HRESULT hr;

    // Obtain an interface to the enumerated joystick.
    hr = g_pDI->CreateDevice(pdidInstance->guidInstance,
                           &g_pJoystick, NULL);
    if(FAILED(hr))
        return DIENUM_CONTINUE;

    return DIENUM_STOP;
```

The **EnumJoysticksCallback** callback function parameters are as follows:

- A pointer to the device instance, supplied by the DirectInput system when the device is enumerated.
- A pointer to a 32-bit value that you supplied as a parameter to **IDirectInput8::EnumDevices**. This parameter could be any 32-bit value such as a pointer to an interface so that you could use its methods. In this case, however, `NULL` was passed.

The first task of the callback function is to create the device. The **IDirectInput8::CreateDevice** method accepts three parameters.

The first parameter is a reference to the globally unique identifier (GUID) for the instance of the device. In this case, the GUID is taken from the **DIDEVICEINSTANCE** structure supplied by DirectInput when it enumerated the device.

The second parameter is the address of the variable that is initialized with a valid interface pointer if the call succeeds.

The third parameter specifies the address of the controlling object's **IUnknown** interface for use in COM aggregation. The JoyStick sample does not use aggregation, so the parameter is NULL.

Note that if the device interface cannot be created, **DIENUM\_CONTINUE** is returned from the callback function. This flag instructs DirectInput to keep enumerating as long as there are devices to be enumerated.

After creating the DirectInput joystick device, go to Step 3: Setting the Joystick Data Format.

## Step 3: Setting the Joystick Data Format

Now that the application has a pointer to a Microsoft® DirectInput® device, it can call the **IDirectInputDevice8** methods to manipulate that device. The first step, which is essential, is to set the data format for the joystick. This step tells DirectInput how to format the input data.

```
if (FAILED(hr = g_pJoystick->SetDataFormat(&c_dfDIJoystick2)))  
    return hr;
```

The **IDirectInputDevice8::SetDataFormat** method takes one parameter, a pointer to a **DIDATAFORMAT** structure containing information about how the data for the device is to be formatted. For the joystick, you can use the predefined global variable *c\_dfDIJoystick2*, which signifies use of the **DIJOYSTATE2** structure to retrieve data.

After setting the joystick data format, go to Step 4: Setting the Joystick Behavior.

## Step 4: Setting the Joystick Behavior

The joystick device has been created, and its data format has been set. The next step is to set its cooperative level. As in the previous step, *g\_pJoystick* is a pointer to the device interface.

```
if (FAILED(hr = g_pJoystick->SetCooperativeLevel(hDlg,  
    DISCL_EXCLUSIVE | DISCL_FOREGROUND)))  
    return hr;
```

The first parameter to **IDirectInputDevice8::SetCooperativeLevel** is a window handle. In this case, the handle to the dialog box serving as the main program window is passed to the function.

The final parameter is a combination of flags describing the desired cooperative level. The Joystick sample requires input from the joystick only when it is the foreground application. Also, when the joystick sample is in the foreground, it should be the only application with exclusive access to the joystick. Therefore, the flags are set to **DISCL\_EXCLUSIVE | DISCL\_FOREGROUND**. See Cooperative Levels for a full explanation of these flags.

The next step is to gather information about the capabilities of the joystick. This information includes the number of axes, buttons, and other controllers, whether the device supports force feedback, and other details about the joystick's behavior and supported options.

A **DIDEVCAPS** structure is used to hold the capability information. The **dwSize** member of the **DIDEVCAPS** structure must first be initialized, then the address of the structure sent to **IDirectInputDevice8::GetCapabilities**. In the example below, *g\_diDevCaps* is a previously declared **DIDEVCAPS** structure.

```
g_diDevCaps.dwSize = sizeof(DIDEVCAPS);
if (FAILED(hr = g_pJoystick->GetCapabilities(&g_diDevCaps)))
    return hr;
```

At this point, you could proceed using the device defaults or you could customize the device properties. The Joystick sample enumerates the axes on the joystick and sets a range for each by calling **IDirectInputDevice8::EnumObjects**.

```
if (FAILED(hr = g_pJoystick->EnumObjects(EnumAxesCallback,
    (VOID*)hDlg, DIDFT_AXIS)))
    return hr;
```

The first parameter to the **EnumObjects** method, *EnumAxesCallback*, is the address of a callback function which processes the enumerated objects as desired.

The second parameter can be any 32-bit value that you might want to provide to the callback function. Here, the handle to the main dialog window is passed so that it can update the display to indicate which axes are found on the joystick.

The last parameter, **DIDFT\_AXIS**, tells the callback function to enumerate only device axes.

In the sample, the properties changed will be the range for any axis or slider detected (a slider is considered an axis).

By setting the range, you are telling DirectInput what maximum and minimum values you want returned for an axis. If you set a range of -1,000 to +1,000 for the x-axis, as in the example, you are asking that a value of -1,000 be returned when the stick is at the extreme left, +1,000 when it is at the extreme right, and zero when it is in the middle.

The following sample code sets the range of an enumerated axis. The *pdidoi* variable is the address of a **DIDEVICEOBJECTINSTANCE** structure passed by the system to the callback function. This variable contains information about the object currently being enumerated.

```
DIPROP_RANGE diprg;

diprg.diph.dwSize      = sizeof(DIPROP_RANGE);
diprg.diph.dwHeaderSize = sizeof(DIPROPHEADER);
diprg.diph.dwHow       = DIPH_BYID;
diprg.diph.dwObj       = pdidoi->dwType;
diprg.lMin             = -1000;
diprg.lMax             = +1000;
.
.
hr = g_pJoystick->SetProperty(DIPROP_RANGE, &diprg.diph);
if (FAILED(hr))
    return DIENUM_STOP;
```

The first task here is to set up the **DIPROP\_RANGE** structure *diprg*, whose address is passed into the **IDirectInputDevice8::SetProperty** method. Note that it is not the address of the structure itself that is passed but rather the address of its first member, which is a **DIPROPHEADER** structure. For more information, see Device Properties.

The property header is initialized with the following values.

- The size of the property structure
- The size of the header structure
- A flag to indicate how the **dwObj** member is to be interpreted.
- The value found in the **dwType** member of the **DIDEVICEOBJECTINSTANCE** structure indicating the object whose property is being changed.

The **lmin** and **lmax** members of the **DIPROP\_RANGE** structure are assigned the desired range values.

The application now calls the **IDirectInputDevice8::SetProperty** method. The first parameter is a flag indicating which property is being changed. The second parameter is the address of the **DIPROPHEADER** member of the property structure.

After setting the joystick behavior, go to Step 5: Gaining Access to the Joystick.

## Step 5: Gaining Access to the Joystick

After your application sets a joystick's behavior, it can acquire access to the device by calling the **IDirectInputDevice8::Acquire** method. The application must acquire the device before retrieving data from it. The **Acquire** method accepts no parameters.

The Joystick sample performs initial acquisition in the message loop as the application is activated. This loop also automatically reacquires the device whenever the application regains focus after having lost it. Acquisition is also performed if access to the joystick is lost or a `DIERR_INPUTLOST` error is returned when the application attempts to get input data. This is shown in the following code sample.

```
hr = g_pJoystick->Poll();
if (FAILED(hr))
{
    hr = g_pJoystick->Acquire();
    while(hr == DIERR_INPUTLOST)
        hr = g_pJoystick->Acquire();
    return S_OK;
}
```

Once your application can gain access to the joystick go to Step 6: Retrieving Data from the Joystick.

## Step 6: Retrieving Data from the Joystick

Because your application is more likely concerned with the position of the joystick axes than with their movement, you probably want to retrieve immediate rather than buffered data from the device. You can do this by polling with **IDirectInputDevice8::GetDeviceState**. Note that not all device drivers notify Microsoft® DirectInput® when the state of the device changes. Therefore, it is always good policy to call the **IDirectInputDevice8::Poll** method before checking the device state.

The Joystick application calls the following function from the Microsoft® Windows® message loop.

```
HRESULT UpdateInputState(HWND hDlg)
{
    HRESULT    hr;
    CHAR       strText[128]; // Device state text
    DIJOYSTATE2 js;          // Direct Input joystick state
    CHAR*      str;

    if (NULL == g_pJoystick)
        return S_OK;

    // Poll the device to read the current state
    hr = g_pJoystick->Poll();
    if (FAILED(hr))
    {
        // Attempt to reacquire joystick
    }
    hr = g_pJoystick->GetDeviceState(sizeof(DIJOYSTATE2), &js);
```

```
if (FAILED(hr))  
    return hr;
```

Note the call to **GetDeviceState**. The first parameter is the size of the structure in which the data is returned, and the second parameter is the address of this structure, which is of type **DIJOYSTATE2**. This structure holds data for up to six axes, 128 buttons, and four point-of-view hats. The sample program proceeds to look at the state of all axes and buttons, and one slider. This information is then displayed in the main dialog window.

Joystick buttons work just like keys or mouse buttons. If the high bit of the returned byte is 1, the button is pressed.

For additional DirectInput tutorials, see [DirectInput C/C++ Tutorials](#).

## Tutorial 4: Using Force Feedback

This tutorial takes you through the process of creating, playing, and modifying a simple effect on a force-feedback joystick. The effect is based on the feel of running a chain saw. Effects are created that simulate a chain saw starting with some difficulty, running normally, and cutting into wood.

The preliminary step of setting up the Microsoft® DirectInput® system and the final step of closing it down are essentially the same for any application and are covered in Tutorial 1: Using the Keyboard. However, when closing down the DirectInput force-feedback system, you are required to take the additional step of releasing any effects you have created.

This tutorial divides the required tasks into the following steps.

- Step 1: Enumerating Force-Feedback Devices
- Step 2: Creating the DirectInput Force-Feedback Device
- Step 3: Enumerating Supported Effects
- Step 4: Creating an Effect
- Step 5: Playing an Infinite Effect
- Step 6: Changing an Effect

### Step 1: Enumerating Force-Feedback Devices

The first step is to ensure that a force-feedback device is available on the system. You do this by calling the **IDirectInput8::EnumDevices** method. In the following example, the global pointer to the game device interface is initialized only if the enumeration has succeeded in finding at least one suitable device:

```
LPDIRECTINPUTDEVICE8 g_lpDIDevice = NULL;  
  
hr = g_lpDI->EnumDevices(DI8DEVTYPE_GAMECTRL,
```



```

        DEnumDevicesProc,
        NULL,
        DIEDFL_FORCEFEEDBACK | DIEDFL_ATTACHEDONLY);
if (FAILED(hr))
{
    // No force-feedback joystick available; take appropriate action.
}

```

In the example, *g\_lpDI* is an initialized pointer to the **IDirectInput8** interface. The first parameter to **EnumDevices** restricts the enumeration to joystick-type devices. The second parameter is the callback function that is called whenever Microsoft® DirectInput® identifies a device that qualifies for enumeration. The third parameter is for user-defined data to be passed in or out of the callback function; in this case it is not used. Finally, the flags further restrict the enumeration to devices attached to the system that support force feedback.

The callback function is a convenient place to initialize the device as soon as it has been found. (It is assumed that the first device found is the one you want to use.) You do this in Step 2: Creating the DirectInput Force-Feedback Device.

## Step 2: Creating the DirectInput Force-Feedback Device

To have Microsoft® DirectInput® enumerate devices, create a callback function of the same type as **DEnumDevicesCallback**. In Step 1 you passed the address of this function to the **IDirectInput8::EnumDevices** method.

DirectInput passes into the callback, as the first parameter, a pointer to a **DIDEVICEINSTANCE** structure that tells you what you need to know about the device. The structure member of most interest in the example is **guidInstance**, the unique identifier for the particular piece of hardware on the user's system. You must pass this GUID to the **IDirectInput8::CreateDevice** method.

The following code fragment is the first part of the callback, which extracts the GUID and creates the device object.

```

BOOL CALLBACK DEnumDevicesProc( LPCDIDEVICEINSTANCE lpddi,
                                LPVOID pvRef )
{
    HRESULT hr;
    GUID DeviceGuid = lpddi->guidInstance;

    // Create game device.

    hr = g_lpDI->CreateDevice(DeviceGuid, &g_lpDIDevice, NULL);

    if (FAILED(hr))
        // Continue enumerating until successful or finished

```

---

```
return DIENUM_CONTINUE;
```

The next steps of the callback function are similar to those for setting up any input device. Note that you need the exclusive cooperative level for any force-feedback device.

```
// Set cooperative level.
hr = g_lpDIDevice->SetCooperativeLevel(g_hwndMain,
                                       DISCL_EXCLUSIVE | DISCL_FOREGROUND);
if (FAILED(hr))
    return hr;

// set game data format
hr = g_lpDIDevice->SetDataFormat(&c_dfDIJoystick);
if (FAILED(hr))
    return hr;
```

Finally, you might want to turn off the device's autocenter feature. Autocenter is essentially a condition effect that uses the motors to simulate the springs in a standard joystick. It is a good idea to turn it off so that it does not interfere with other effects.

```
DIPROPDWORD DIPropAutoCenter;

DIPropAutoCenter.diph.dwSize    = sizeof(DIPropAutoCenter);
DIPropAutoCenter.diph.dwHeaderSize = sizeof(DIPROPHEADER);
DIPropAutoCenter.diph.dwObj     = 0;
DIPropAutoCenter.diph.dwHow     = DIPH_DEVICE;
DIPropAutoCenter.dwData         = DIPROPAUTOCENTER_OFF;

hr = g_lpDIDevice->SetProperty(DIPROP_AUTOCENTER,
                              &DIPropAutoCenter.diph);
if (FAILED(hr))
{
    // Handle the failure as appropriate
}

return DIENUM_STOP; // One is enough.
} // end DIEnumDevicesProc
```

Before using the device, you must acquire it. See Step 5: Gaining Access to the Joystick in Tutorial 3: Using the Joystick for an example of how to handle acquisition. Note that unlike other property changes, force-feedback effects can be downloaded to a device when it is in an acquired state.

After you have created the DirectInput force-feedback device, go to Step 3: Enumerating Supported Effects.

## Step 3: Enumerating Supported Effects

Now that you have successfully enumerated and created a force-feedback device, you can enumerate the effect types it supports.

Effect enumeration is not strictly necessary if you want to create only standard effects that will be available on any device, such as constant forces. When creating the effect object, you can identify the desired effect type simply by using one of the predefined GUIDs, such as *GUID\_ConstantForce*. For a complete list of these identifiers, see **IDirectInputDevice8::CreateEffect**.

Another more flexible approach is to enumerate supported effects of a particular type, then obtain the GUID for the effect from the callback function. You could use the callback to obtain more information about the device's support for the effect—for example, whether it supports an envelope—but in this tutorial you obtain only the effect GUID.

First, create the callback function that Microsoft® DirectInput® calls for each effect enumerated. For information on this standard callback, see **DIEnumEffectsCallback**. You can give the function any name you like.

```

BOOL EffectFound = FALSE; // global flag

BOOL CALLBACK DEnumEffectsProc(LPCDIEFFECTINFO pei, LPVOID pv)
{
    *((GUID *)pv) = pei->guid;
    EffectFound = TRUE;
    return DIENUM_STOP; // one is enough
}

```

The GUID variable pointed to by the application-defined value *pv* is assigned the value passed in the **DIEFFECTINFO** structure created by DirectInput for the effect.

To obtain the effect GUID, set the callback in motion by calling the **IDirectInputDevice8::EnumEffects** method, as follows:

```

HRESULT hr;
GUID guidEffect;

hr = g_lpDIDevice->EnumEffects(
    (LPDIENUMEFFECTSCALLBACK) DEnumEffectsProc,
    &guidEffect,
    DIEFT_PERIODIC);
if (FAILED(hr))
{
    // Note that success does not mean that any effects were found,
    // only that the process went smoothly.
}

```

Note that you pass the address of a GUID variable, *guidEffect*, to the **EnumEffects** method. This address is passed in turn to the callback as the *pv* parameter. You also restrict the enumeration to periodic effects by setting the flag **DIEFT\_PERIODIC**.

Once your application can enumerate supported effects, go to Step 4: Creating an Effect.

## Step 4: Creating an Effect

If the *EffectFound* value is no longer FALSE after effect enumeration, you can safely assume that Microsoft® DirectInput® has found support for at least one effect of the periodic type you requested by passing the **DIEFT\_PERIODIC** flag. Knowing the effect GUID, you can now create the effect object.

Before calling the **IDirectInputDevice8::CreateEffect** method, you set up the following arrays and structures.

- An array of axes that will be involved in the effect. For a joystick, this array normally consists of the identifiers for the x-axis and the y-axis.
- An array of values for setting the direction. The values differ according to both the number of axes and whether you want to use polar, spherical, or Cartesian coordinates. For a full explanation, see *Effect Direction*.
- A structure of type-specific parameters. In the example, because you are creating a periodic effect, this is of type **DIPERIODIC**.
- A **DIENVELOPE** structure for defining an envelope to be applied to the effect.
- A **DIEFFECT** structure to contain the basic parameters for the effect.

Arrays can be initialized when they, along with the structures, are declared.

```
DWORD    dwAxes[2] = {DIJOFS_X, DIJOFS_Y};
LONG     lDirection[2] = {0, 0};
```

```
DIPERIODIC diPeriodic;    // type-specific parameters
DIENVELOPE diEnvelope;    // envelope
DIEFFECT   diEffect;      // general parameters
```

Next, initialize the type-specific parameters. The values in this example create a full-force periodic effect with a period of one-twentieth of a second.

```
diPeriodic.dwMagnitude = DI_FFNOMINALMAX;
diPeriodic.lOffset = 0;
diPeriodic.dwPhase = 0;
diPeriodic.dwPeriod = (DWORD)(0.05 * DI_SECONDS);
```

To produce an effect of the chain-saw motor trying to start, briefly coughing into life, and then slowly dying, you set an envelope with an attack time of one-half second and a fade time of one second.

```

diEnvelope.dwSize = sizeof(DIENVELOPE);
diEnvelope.dwAttackLevel = 0;
diEnvelope.dwAttackTime = (DWORD)(0.5 * DI_SECONDS);
diEnvelope.dwFadeLevel = 0;
diEnvelope.dwFadeTime = (DWORD)(1.0 * DI_SECONDS);

```

Next, set up the basic effect parameters. These include flags to determine how the directions and device objects (buttons and axes) are identified, the sample period and gain for the effect, and pointers to the other data that you have just prepared. You also associate the effect with the joystick's fire button so that it is automatically played whenever that button is pressed.

```

diEffect.dwSize = sizeof(DIEFFECT);
diEffect.dwFlags = DIEFF_POLAR | DIEFF_OBJECTOFFSETS;
diEffect.dwDuration = (DWORD)(2 * DI_SECONDS);

diEffect.dwSamplePeriod = 0;           // = default
diEffect.dwGain = DI_FFNOMINALMAX;    // no scaling
diEffect.dwTriggerButton = DIJOFS_BUTTON0;
diEffect.dwTriggerRepeatInterval = 0;
diEffect.cAxes = 2;
diEffect.rgdwAxes = dwAxes;
diEffect.rglDirection = &IDirection[0];
diEffect.lpEnvelope = &diEnvelope;
diEffect.cbTypeSpecificParams = sizeof(diPeriodic);
diEffect.lpvTypeSpecificParams = &diPeriodic;

```

Finally, you can create the effect.

```

LPDIRECTINPUTEFFECT g_lpdiEffect; // global effect object

hr = g_lpDIDevice->CreateEffect(
    guidEffect,    // GUID from enumeration
    &diEffect,     // where the data is
    &g_lpdiEffect, // where to put interface pointer
    NULL);        // no aggregation

if (FAILED(hr))
{
    return hr;
}

```

Note that, by default, the effect is downloaded to the device as soon as it has been created, provided that the device is in an acquired state at the exclusive cooperative level. You should now be able to compile, run, press the fire button, and feel the sputtering of a chain saw that's out of gas.

After creating an effect object, go to Step 5: Playing an Infinite Effect.

## Step 5: Playing an Infinite Effect

The effect created in the previous step starts in response to the press of a button. To create an effect that is to be played in response to an explicit call, return to Step 4: Creating an Effect and modify the **dwTriggerButton** member of the **DIEFFECT** structure as follows:

```
diEffect.dwTriggerButton = DIEB_NOTRIGGER;
```

To make a chain saw that starts and keeps going, change the **dwDuration** member as follows:

```
diEffect.dwDuration = INFINITE;
```

Next, start the effect.

```
g_lpdiEffect->Start(1, 0);
```

The effect keeps running until you stop it.

```
g_lpdiEffect->Stop();
```

Note that it is not necessary to change the envelope you created in the previous step. The attack is played as the effect starts, but the fade value is ignored.

Once your application can play an infinite effect, go to Step 6: Changing an Effect.

## Step 6: Changing an Effect

Next, you modify the effect to simulate the slowing down of the engine as the saw bites into wood. Microsoft® DirectInput® enables you to modify the parameters of an effect while it is playing.

To change the effect, set up a new **DIEFFECT** structure or have access to the one you used to create the effect. If you are setting up a new structure with local scope, initialize only the **dwSize** member and any members that contain or point to data that is to be changed.

In this case, you want to change a type-specific parameter—the period of the effect—so you need to have access to the **DIPERIODIC** structure you used when creating the effect. Alternatively, you can create a local copy with all members initialized. Make sure that the address of the **DIPERIODIC** structure is in the **lpvTypeSpecificParams** member of the **DIEFFECT** structure.

First, set the new period of the effect.

```
diPeriodic.dwPeriod = (DWORD)(0.08 * DI_SECONDS);
```

Next, call the **IDirectInputEffect::SetParameters** method to make the changes.

```
hr = g_lpdiEffect->SetParameters(&diEffect, DIEP_TYPESPECIFICPARAMS);
```

Note the `DIEP_TYPESPECIFICPARAMS` flag that restricts the changes to a single member of the **DIEFFECT** structure.

You can control the way changes are handled by using other flags. For example, by using the `DIEP_NODOWNLOAD` flag you could change the parameters immediately after starting the effect but delay the implementation until a specific call to the **IDirectInputEffect::Download** method. For more information concerning use of the various control flags, see **IDirectInputEffect::SetParameters**.

For additional DirectInput tutorials, see DirectInput C/C++ Tutorials.

## Tutorial 5: Using Action Mapping

This tutorial guides you through the setup, modification, and application of an action map. Examples are based written as though they were to be used in a space combat game.

The preliminary step of setting up the Microsoft® DirectInput® system and the final step of closing it down are the same for any application and are covered in Tutorial 1: Using the Keyboard. The keyboard, a mouse, and a joystick are all used in the sample, so each of those devices needs to be set up.

This tutorial divides the required tasks into the following steps.

- Step 1: Defining the Game Actions
- Step 2: Defining the Action Map
- Step 3: Mapping Actions to Devices
- Step 4: Configuring and Applying the Action Map
- Step 5: Displaying the Action Map
- Step 6: User Configuration of the Action Map
- Step 7: Retrieval of Action Mapped Data

### Step 1: Defining the Game Actions

The first step toward creating an action map is the definition of the game actions. These actions are specific to the application and are defined by the developer. In the case of this example, the actions chosen reflect its needs as a space combat simulator. These values can be defined in many ways as the developer sees fit. They could be defined as an enumeration, as in the Preparing the Action Map overview, or they could be defined as constants as in this code fragment.

```
#define INPUT_LEFTRIGHT_AXIS  1L
#define INPUT_UPDOWN_AXIS    2L
#define INPUT_TURNLEFT       3L
#define INPUT_TURNRIGHT      4L
#define INPUT_FORWARDTHRUST  5L
```

---

```
#define INPUT_REVERSETHRUST 6L
#define INPUT_FIREWEAPONS 7L
#define INPUT_ENABLESHIELD 8L
#define INPUT_DISPLAYGAMEMENU 9L
#define INPUT_QUITGAME 10L
```

Once these values are defined, they can be assigned to genre-specific action-mapping constants. This is done in Step 2: Defining the Action Map.

## Step 2: Defining the Action Map

Next, each game action should be assigned to at least one virtual control or device object. These controls are defined as action-mapping constants and are defined by genre and subgenre. In this case, the best choice is the Space Combat subgenre of the flight-games genre. This subgenre makes the following constants available.

### Priority 1 Controls

```
DIAXIS_SPACESIM_LATERAL
DIAXIS_SPACESIM_MOVE
DIAXIS_SPACESIM_THROTTLE
DIBUTTON_SPACESIM_FIRE
DIBUTTON_SPACESIM_MENU
DIBUTTON_SPACESIM_TARGET
DIBUTTON_SPACESIM_WEAPONS
```

### Priority 2 Controls

```
DIAXIS_SPACESIM_CLIMB
DIAXIS_SPACESIM_ROTATE
DIBUTTON_SPACESIM_BACKWARD_LINK
DIBUTTON_SPACESIM_DEVICE DIBUTTON_SPACESIM_DISPLAY
DIBUTTON_SPACESIM_FASTER_LINK
DIBUTTON_SPACESIM_FIRESECONDARY
DIBUTTON_SPACESIM_FORWARD_LINK
DIBUTTON_SPACESIM_GEAR
DIBUTTON_SPACESIM_GLANCE_DOWN_LINK
DIBUTTON_SPACESIM_GLANCE_LEFT_LINK
DIBUTTON_SPACESIM_GLANCE_RIGHT_LINK
DIBUTTON_SPACESIM_GLANCE_UP_LINK
DIBUTTON_SPACESIM_LEFT_LINK DIBUTTON_SPACESIM_LOWER
DIBUTTON_SPACESIM_PAUSE DIBUTTON_SPACESIM_RAISE
DIBUTTON_SPACESIM_RIGHT_LINK
DIBUTTON_SPACESIM_SLOWER_LINK
DIBUTTON_SPACESIM_TURN_LEFT_LINK
DIBUTTON_SPACESIM_TURN_RIGHT_LINK
DIBUTTON_SPACESIM_VIEW
DIHATSWITCH_SPACESIM_GLANCE
```



Priority 1 controls are those controls that, at the minimum, should be mapped to a device object if possible. Priority 2 controls are less critical to basic game operation and may be mapped as needed.

Game actions are assigned to action-mapping constant controls in an array of **DIACTION** structures. Each **DIACTION** structure contains at least one game action, its associated action-mapping constant, any necessary flags, and either a friendly name or ID string for the action. The remaining **DIACTION** members are not used at this point. The following code sample shows definition of the array of **DIACTION** structures.

```
#define NUMBER_OF_ACTIONS 18

DIACTION g_rgGameAction[NUMBER_OF_ACTIONS] =
{
    // Device input pre-defined by DInput, according to genre
    {INPUT_LEFTRIGHT_AXIS, DIAXIS_SPACESIM_LATERAL, 0, "Turn"},
    {INPUT_UPDOWN_AXIS, DIAXIS_SPACESIM_MOVE, 0, "Move"},
    {INPUT_FIREWEAPONS, DIBUTTON_SPACESIM_FIRE, 0, "Shoot"},
    {INPUT_ENABLESHIELD, DIBUTTON_SPACESIM_GEAR, 0, "Shield"},
    {INPUT_DISPLAYGAMEMENU, DIBUTTON_SPACESIM_DISPLAY, 0, "Display"},
    {INPUT_QUITGAME, DIBUTTON_SPACESIM_MENU, 0, "Quit Game"},

    // Keyboard input mappings
    {INPUT_TURNLEFT, DIKEYBOARD_LEFT, 0, "Turn left", },
    {INPUT_TURNRIGHT, DIKEYBOARD_RIGHT, 0, "Turn right", },
    {INPUT_FORWARDTHRUST, DIKEYBOARD_UP, 0, "Forward thrust", },
    {INPUT_REVERSETHRUST, DIKEYBOARD_DOWN, 0, "Reverse thrust", },
    {INPUT_FIREWEAPONS, DIKEYBOARD_F, 0, "Fire weapons", },
    {INPUT_ENABLESHIELD, DIKEYBOARD_S, 0, "Enable shields", },
    {INPUT_DISPLAYGAMEMENU, DIKEYBOARD_D, DIA_APPFIXED,
        "Display game menu"), },
    {INPUT_QUITGAME, DIKEYBOARD_ESCAPE, DIA_APPFIXED, "Quit game", },

    // Mouse input mappings
    {INPUT_LEFTRIGHT_AXIS, DIMOUSE_XAXIS, 0, "Turn", },
    {INPUT_UPDOWN_AXIS, DIMOUSE_YAXIS, 0, "Move", },
    {INPUT_FIREWEAPONS, DIMOUSE_BUTTON0, 0, "Fire weapons", },
    {INPUT_ENABLESHIELD, DIMOUSE_BUTTON1, 0, "Enable shields", },
};
```

A **DIACTIONFORMAT** structure is then initialized to contain the **DIACTION** array *g\_rgGameAction* defined above. The **DIACTIONFORMAT** structure also defines the genre, buffer size, axis scaling, and a friendly name for the action map. The *g\_AppGuid* value is a GUID defined in the application to identify the action map. For more information on creating GUIDs, see Using GUIDS.

```
DIACTIONFORMAT diaf;
```

```

diaf.dwSize      = sizeof(DIACTIONFORMAT);
diaf.dwActionSize = sizeof(DIACTION);
diaf.dwDataSize  = NUMBER_OF_ACTIONS * sizeof(DWORD);
diaf.dwNumActions = NUMBER_OF_ACTIONS;
diaf.guidActionMap = g_AppGuid;
diaf.dwGenre     = DIVIRTUAL_SPACESIM;
diaf.rgoAction   = g_rgGameAction;
diaf.dwBufferSize = 16;
diaf.lAxisMin    = -100;
diaf.lAxisMax    = 100;
diaf.tszActionMap = "DI Test";

```

This **DIACTIONFORMAT** structure is matched against enumerated devices to find the best match in Step 3: Mapping Actions to Devices.

## Step 3: Mapping Actions to Devices

Once the desired mapping has been defined, it must be applied to physical devices. `IDirectInput8::EnumDevicesBySemantics` begins this process in the following code fragment, where *m\_pDI* is a previously defined `IDirectInput8` object.

`HRESULT hr;`

```

hr = m_pDI->EnumDevicesBySemantics(m_strUserName, &m_diaf,
                                   EnumSuitableDevicesCB, this, 0L);

```

The first parameter, *m\_strUserName* is useful in the case of multiple users who might have different mapping preferences. However, in the case of this example, this value is `NULL`, indicating the user currently logged onto the system.

The second parameter is the address of the **DIACTIONFORMAT** structure containing the mapping information.

The third parameter is the address of a callback function that is called for each device found on the system. The function used in the sample is based on the **DIEnumDevicesBySemanticsCallback** function.

The fourth parameter could be any 32-bit value that you want to make available to the callback function. Here, this is a **this** pointer to the class object used by the MultiMapper sample for the various action-mapping setup and manipulation functions. This gives the callback function access to the class' functions.

The final parameter is used for flags. None are used in this example.

The **EnumSuitableDevicesCB** callback function calls the application-defined function **AddDevices**, which in turn calls the **IDirectInputDevice8::BuildActionMap** function on the device *pdidDevice* currently being enumerated. This call is shown in the following code fragment.

```

hr = pdidDevice->BuildActionMap( &m_diaf, m_strUserName, 0L );

```

The first parameter is once again the address of the **DIACTIONFORMAT** structure containing the action map.

The second parameter is again the name of the user if desired, though NULL in this case.

The final parameter holds control flags, with none being passed in this case.

**BuildActionMap** takes the list of control assignments specified in the **DIACTIONFORMAT** structure and attempts to map them to specific device objects on the device being enumerated. The results of the mapping are returned in the same structure. Each pass maps different controls depending on the nature of the currently enumerated device. A keyboard, for instance, maps controls that specify a mapping to a particular key, but leaves controls that specify buttons, sliders, or axes unmapped. If a joystick is enumerated next, **BuildActionMap** ignores those controls mapped to keyboard keys, but it attempts to map the buttons, sliders, and axes to the joystick's device objects.

The results of this default mapping can be examined and manipulated. This is done in Step 4: Configuring and Applying the Action Map.

## Step 4: Configuring and Applying the Action Map

Once the mapping has been returned in the **DIACTIONFORMAT** structure, it can be manipulated before being applied by **IDirectInputDevice8::SetActionMap**.

The **dwHow** member of each **DIACTION** structure might be examined at this point to determine both whether the mapping was successful and what the criteria were in selecting the device object to which that action was mapped. For instance, you can determine if the mapping was specified by the hardware manufacturer or requested by the user.

The actual mapping itself may be changed as well by editing the **dwSemantic** member of the appropriate **DIACTION** structure returned in the default mapping. You can choose to make those changes, but it is not recommended that you do so.

Once the action map configuration is finalized, it must be applied to the device to bind the physical controls to the game actions. This is done by calling **SetActionMap** as follows:

```
hr = pDidDevice->SetActionMap( &m_diaf, m_strUserName, 0L );
```

Action maps, once created, can be displayed for and easily altered by the user. This is explained in Step 5: Displaying the Action Map.

## Step 5: Displaying the Action Map

In addition to the advantage of action mapping in enabling the developer to define game actions independently of specific controller hardware, action mapping also benefits the user by providing a user interface (UI) for easy reconfiguration.

The UI can be displayed in two forms, text-only or graphics. In addition, each of those two options can be viewed in two modes: view-only or edit.

To display the UI, some preliminary setup is involved. First, a **DICOLORSET** structure is declared and initialized. This structure, as its name implies, describes the color set used to display the UI. The following code fragment shows the setup of this structure.

```
DICOLORSET dics;
ZeroMemory(&dics, sizeof(DICOLORSET));
dics.dwSize = sizeof(DICOLORSET);
```

By using the **ZeroMemory** function to set the memory block to zeroes, it indicates that the default color scheme should be used. Beyond this, the only element that requires initialization is the **dwSize** member, which is set equal to the size of the **DICOLORSET** structure.

The **DICOLORSET** structure is then included as part of a larger **DICONFIGUREDEVICESPARAMS** structure as seen in this code fragment.

```
DICONFIGUREDEVICESPARAMS dicdp;
ZeroMemory(&dicdp, sizeof(dicdp));
dicdp.dwSize = sizeof(dicdp);
dicdp.dwcUsers = 1;
dicdp.lpszUserNames = m_strUserName;

dicdp.dwcFormats = 1;
dicdp.lprgFormats = &m_diaf;
dicdp.hwnd = m_hWnd;
dicdp.lpUnkDDSTarget = NULL;
```

The **DICONFIGUREDEVICESPARAMS** structure is declared and its allotted memory is set to contain nothing but zeroes. Once again, the **dwSize** member is set to the size of the structure. Only the currently logged user is being used in this example, so **dwcUsers** is set to 1. Recall that the *m\_strUserName* variable is set to NULL so that the user's name is the name of the user currently logged onto the system.

Only one **DIACTIONFORMAT** structure containing the action map is being passed, so **dwcFormats** is set to 1 and the address of the **DIACTIONFORMAT** structure is passed as **lprgFormats**.

The **hwnd** variable is assigned the handle of the application window and the **lpUnkDDSTarget** is set to NULL to indicate that the Microsoft® Windows®

Graphics Device Interface (GDI) functions should be used to draw the configuration user interface image.

The initialized **DICONFIGUREDEVICESPARAMS** structure is then passed to `IDirectInput8::ConfigureDevices` as illustrated in this code fragment.

```
hr = m_pDI->ConfigureDevices(NULL, &dicdp, dwFlags, NULL);
```

The first and last parameters, which are used with an optional callback function, are set to `NULL` as they are not used in this sample.

The second parameter is the address of the **DICONFIGUREDEVICESPARAMS** structure containing the data to be displayed and other auxiliary information.

The third parameter is used for flags that determine whether the display is in read-only or edit mode. If you want to display the configuration for informational purposes without giving the user the option of changing it, you use the `DICD_DEFAULT` flag in this parameter. However, in this sample the **dwFlags** variable had been set earlier to `DICD_EDIT`, so the display allows user configuration. This is discussed in Step 6: User Configuration of the Action Map.

## Step 6: User Configuration of the Action Map

At this point, the user configuration interface is displayed. If the device manufacturer has provided a graphic, users see an image of the device with labels indicating the action assigned to each device object. If no graphic is available, a simple text list of available device objects with their associated actions is displayed. An example of the former is shown here.

Users can now reassign controllers to actions as they see fit. Any changes made will be reflected in the `DIACTIONFORMAT` structure. Once the user interface is closed, the new action map must be sent to `IDirectInputDevice8::SetActionMap` before it can be implemented.

Using the data associated with the controls in an action map is described in Step 7: Retrieval of Action Mapped Data.

## Step 7: Retrieval of Action Mapped Data

Action mapping was designed with buffered data in mind and will most often be used in that manner. The only difference between retrieving data from an action-mapped device and a device with no mapping is where you get it. Without action mapping, you would look to the **dwOfs** member of the `DIDeviceObjectData` structure to determine which device object reported a change. However, with action mapping, you look to the **uAppData** member. Data is found in the **dwData** member.

For more detailed information on the retrieval of action-mapped data, see Retrieving Action Data.

## DirectInput Visual Basic Tutorials

This section contains the following tutorials, each providing step-by-step instructions for implementing Microsoft® DirectInput® in a Microsoft Visual Basic® application.

- Tutorial 1: Using the Keyboard

The first tutorial shows how to add DirectInput keyboard support to an existing application, using event polling.

- Tutorial 2: Using the Mouse

The next tutorial takes you through the steps of providing DirectInput mouse support in an application, using the exclusive cooperative level and event notification. The tutorial is based on the ScrawlB sample, and focuses on buffered data.

- Tutorial 3: Using the Joystick

This tutorial shows how to enumerate all the joysticks connected to a system, how to create and initialize DirectInputDevice objects for each of them in a callback function, and how to retrieve immediate data.

- Tutorial 4: Using Force Feedback

This tutorial shows how to implement simple force-feedback effects in an application.

- Tutorial 5: Using Action Mapping

The final tutorial shows how to set up, apply, and use the new Action Mapping functionality of DirectInput.

## Tutorial 1: Using the Keyboard

To prepare for keyboard input, you first create a **DirectInput8** object. Then you create a **DirectInputDevice8** object representing the keyboard. The **DirectInputDevice8** class methods are used to set the behavior of the device and retrieve data.

The tutorial divides the required tasks into the following steps.

- Step 1: Creating the DirectInput8 Object and the Keyboard Device
- Step 2: Setting the Keyboard Parameters
- Step 3: Gaining Access to the Keyboard
- Step 4: Retrieving Immediate Data from the Keyboard
- Step 5: Closing Down the DirectInput System

## Step 1: Creating the DirectInput8 Object and the Keyboard Device

The first step in setting up the Microsoft® DirectInput® system is to create a single **DirectInput8** object as overall manager. This is done with a call to the **DirectX8.DirectInputCreate** method, typically in the **Load** event handler for the main form or in **Sub Main**.

```
Dim dx As New DirectX8
Dim di As DirectInput8
```

```
Set di = dx.DirectInputCreate()
```

The keyboard is then created as a standard device by passing the keyboard GUID alias to **DirectInput8.CreateDevice**.

```
Dim didev As DirectInputDevice8
Set didev = di.CreateDevice("GUID_SysKeyboard")
```

Once the keyboard device is created, its methods will be used to set its data format and cooperative level in Step 2: Setting the Keyboard Parameters.

## Step 2: Setting the Keyboard Parameters

After creating a **DirectInputDevice8**, your application must set the device's data format. For keyboards, as with other standard devices, this is a very simple task. Call the **DirectInputDevice8.SetCommonDataFormat** method, specifying the data format provided by Microsoft® DirectInput® by using the **DIFORMAT\_KEYBOARD** constant as the parameter. You must set the data format even if you intend to retrieve buffered data.

```
Call didev.SetCommonDataFormat(DIFORMAT_KEYBOARD)
```

DirectInput identifies the device objects by their offset within the data format. In the case of the keyboard, keys are identified by their offsets within the **DIKEYBOARDSTATE** type.

Before your application can gain access to the keyboard, it must set the device's behavior using the **DirectInputDevice8.SetCooperativeLevel** method, as follows:

```
didev.SetCooperativeLevel Me.hWnd, _
    DISCL_NONEXCLUSIVE Or DISCL_BACKGROUND
```

This method accepts the handle to the window to be associated with the device, and exactly two flags (either **DISCL\_EXCLUSIVE** or **DISCL\_NONEXCLUSIVE**, plus either **DISCL\_FOREGROUND** or **DISCL\_BACKGROUND**), indicating the desired cooperative level. However, DirectInput does not support exclusive access to

keyboard devices, so the `DISCL_NONEXCLUSIVE` flag must always be used in the case of keyboards as it is here.

The example also sets the background cooperative level, so input will be available regardless of whether the form is in the foreground. Note also that keystrokes continue to be passed through to whatever application has the focus. Most applications don't need input when they're in the background, and in such cases the `DISCL_FOREGROUND` flag should be set instead.

Now that the keyboard device has been created and set up, it must be acquired. This is shown in Step 3: Gaining Access to the Keyboard.

### Step 3: Gaining Access to the Keyboard

After your application sets the keyboard's behavior, it can acquire access to the device by calling the **`DirectInputDevice8.Acquire`** method. The application must acquire the device before retrieving data from it. The **`Acquire`** method accepts no parameters.

Call `didev.Acquire`

In the sample, the application is unlikely to fail to acquire the keyboard, or to lose it later, because it is using the background, nonexclusive cooperative level. However, in general it is good practice to handle errors on calls to **`Acquire`** as well as when attempting to retrieve data.

You are now ready to begin receiving data from the keyboard. This is shown in Step 4: Retrieving Immediate Data from the Keyboard.

### Step 4: Retrieving Immediate Data from the Keyboard

Once a device is acquired, your application can start retrieving data from it. The simplest way to do this is to call the **`DirectInputDevice8.GetDeviceStateKeyboard`** method, which takes a snapshot of the device's state at the time of the call.

The **`GetDeviceStateKeyboard`** method accepts as its single parameter a **`DIKEYBOARDSTATE`** type, which simply contains an array of 256 bytes.

The following sample code retrieves the state of the keyboard.

```
Dim state As DIKEYBOARDSTATE
Call didev.GetDeviceStateKeyboard(state)
```

After retrieving the keyboard's current state, your application may respond to specific keys that were pressed at the time of the call. Each element in the buffer represents a key. If an element's high bit is set equal to 1, the key was pressed at the moment of the call. Otherwise, the key was up. To check the state of a given key, use the constants of the **`CONST_DIKEYFLAGS`** enumeration to index the buffer for a given key.



The following sample code shows how an application might move a vehicle around in response to the arrow keys.

```
If state.Key(DIK_UP) And &H80 Then
    ' Move the vehicle up
End If
if state.Key(DIK_DOWN) And &H80 Then
    ' Move the vehicle down
End If
' And so on.
```

The following form could also be used.

```
If state.Key(DIK_UP) Then
    ' Move the vehicle up
End If
```

Keep in mind that DIK\_UP is a single key, the dedicated up arrow key. DirectInput treats the 8 key on the numerical keypad as a distinct key, and gives it the same identifier regardless of whether NUM LOCK is on. In order to allow input from either of the arrow keys, you would have to write code as in the following sample.

```
If state.Key(DIK_UP) Or state.Key(DIK_NUMPAD8) Then
    ' Move the vehicle up
End If
```

## Step 5: Closing Down the DirectInput System

When an application is about to close, it should release all Microsoft® DirectInput® devices. This is done using the **DirectInputDevice8.Unacquire** method, generally in the **Unload** event handler as shown in the following code sample.

```
Private Sub Form_Unload(Cancel As Integer)
    didev.Unacquire
End Sub
```

## Tutorial 2: Using the Mouse

This tutorial focuses on using the mouse at the exclusive cooperative level and shows how to retrieve buffered data in response to notifications. The sample code is based on the ScrawlB sample.

The tutorial is divided into the following steps.

- Step 1: Setting Up the Mouse
- Step 2: Setting Up Notifications
- Step 3: Managing Exclusive Access to the Mouse

- Step 4: Retrieving Buffered Data from the Mouse

## Step 1: Setting Up the Mouse

First steps in setting up the mouse for use under Microsoft® DirectInput® are similar to those taken in Tutorial 1: Using the Keyboard. In the ScrawlB sample, initialization takes place in **Sub Main** after some global declarations.

```
Public objDX As New DirectX8
Public objDI As DirectInput8
.
.
Set objDIDev = objDI.CreateDevice("guid_SysMouse")
Call objDIDev.SetCommonDataFormat(DIFORMAT_MOUSE)
Call objDIDev.SetCooperativeLevel(frmCanvas.hwnd, _
    DISCL_FOREGROUND Or DISCL_EXCLUSIVE)
```

As opposed to the instance of the keyboard, DirectInput takes exclusive control of the mouse. The result is that as long as the application has the mouse in the acquired state, Microsoft Windows® does not generate mouse messages or display the system cursor. Note that DISCL\_EXCLUSIVE must be combined with DISCL\_FOREGROUND; it is not possible for an application to have exclusive access to the mouse and also receive input when it loses the focus.

Because the ScrawlB sample application is taking full responsibility for the mouse, it must also track the position of its private cursor, and it must scale movement of the cursor to movements of the mouse. The following global variables are used to store the cursor coordinates (in pixels relative to the upper left corner of the main form) and movement scaling.

```
Public g_cursorx As Long
Public g_cursory As Long
Public g_Sensitivity
```

In **Sub Main**, the application sets the buffer size so that it can receive buffered data, using the **DirectInputDevice8.SetProperty** method.

```
Dim diProp As DIPROPLONG
diProp.lHow = DIPH_DEVICE
diProp.lObj = 0
diProp.lData = BufferSize ' BufferSize is a constant

Call objDIDev.SetProperty("DIPROP_BUFFERSIZE", diProp)
```

You are now ready to specify how mouse events will trigger data retrieval in Step 2: Setting Up Notifications

## Step 2: Setting Up Notifications

Rather than polling for mouse input in **Sub Main**, the ScrawlB sample application relies on Microsoft® DirectInput® to notify it whenever a mouse event takes place. As part of initialization, the application gets an event handle and passes it to **DirectInputDevice8.SetEventNotification**.

Dim EventHandle As Long

```
EventHandle = objDX.CreateEvent(frmCanvas)
Call objDIDev.SetEventNotification(EventHandle)
```

DirectInput will now notify any object that implements the **DirectXEvent8** class. In the case of ScrawlB, the implementing object is the *frmCanvas* form, whose declarations section contains the following line.

Implements DirectXEvent8

This line causes *frmCanvas* to inherit all the methods of the **DirectXEvent8** class. The only method implemented by that class is **DirectXEvent8.DXCallback**, and the inheriting class must implement this method. DirectInput calls this method whenever an input event is signaled.

The implementation of **DXCallback** is covered under Step 4: Retrieving Buffered Data from the Mouse.

There are responsibilities involved in maintaining an exclusive access level. They are covered in Step 3: Managing Exclusive Access to the Mouse

## Step 3: Managing Exclusive Access to the Mouse

The ScrawlB sample demonstrates using the mouse with the exclusive foreground cooperative level. At this level, Microsoft® Windows® does not track the mouse while it is acquired by the application. There are three major consequences for the application.

- It is entirely responsible for displaying a cursor if one is needed, and for moving it at an appropriate speed in response to Microsoft DirectInput® data.
- It loses acquisition when the user switches to another application by using the keyboard, and must reacquire the mouse when the user switches back.
- It must provide a means for Windows to get the mouse back whenever the user needs to use the system cursor—for example, to navigate a menu within the application.

ScrawlB handles the first responsibility by keeping a private record of mouse movements, adjusted by a user-defined sensitivity value, and displaying an icon that serves as a cursor for drawing.

ScrawlB loses acquisition of the mouse involuntarily whenever the application window moves to the background. When it comes to the foreground again, the application automatically reacquires the mouse by calling

**DirectInputDevice8.Acquire** in the **MouseMove** event handler, which is called whenever Windows sends a mouse message to the application. This happens as soon as the system cursor moves over the client window, or the client window gains the focus under the system cursor. Once ScrawlB reacquires the mouse, of course, no more Windows mouse messages are sent, so the **Form\_MouseMove** method is not called in response to subsequent mouse events.

In order to enable the user to navigate the shortcut menu, or to display the system cursor for some other purpose such as resizing the window, ScrawlB calls the **DirectInputDevice8.Unacquire** method whenever the user opens the menu. When the menu is closed, **Form\_MouseMove** is called and the mouse is reacquired, unless the user has chosen **Suspend** from the menu, in which case a flag is set. This flag prevents **Form\_MouseMove** from reacquiring, so that the user can continue using the system cursor.

The sample application demonstrates one more technique for releasing the mouse. If the user opens the system menu by pressing ALT+SPACE, Windows sends a **WM\_ENTERMENULOOP** message. This message is intercepted by a subclassed window procedure, which then unacquires the mouse. As long as Windows is using the system cursor for navigating the menu or enabling the user to move or resize the window, it sends no mouse messages to *frmCanvas*, so the application doesn't attempt to reacquire the mouse in **Form\_MouseMove**. A similar technique could be used for intercepting other Windows messages such as **WM\_ACTIVATE** or **WM\_ACTIVATEAPP**, so that the application could fully control acquisition and unacquisition of the mouse in response to gaining and losing the focus.

You are now ready to receive data from the mouse in Step 4: Retrieving Buffered Data from the Mouse

## Step 4: Retrieving Buffered Data from the Mouse

The ScrawlB sample retrieves buffered mouse data inside the **DirectXEvent8.DXCallback** method implemented by *frmCanvas*. This method is called each time an input event is signaled.

The method declares an array of the same size as the buffer Microsoft® DirectInput® is using to store the data. This is the size that was set previously by a call to **DirectInputDevice8.SetProperty**.

```
Dim diDeviceData(1 To BufferSize) As DIDEVICEOBJECTDATA
```

Also required are a variable to receive the number of items actually retrieved, a loop counter, and a variable to track the previous sequence number of an event.

```
Dim NumItems As Integer
```

```
Dim i As Integer
Static OldSequence As Long
```

The application now retrieves all the data available, in a single call to **DirectInputDevice8.GetDeviceData**.

```
On Error GoTo INPUTLOST
NumItems = objDIDev.GetDeviceData(diDeviceData, 0)
On Error GoTo 0
```

Note the error trap. One of the events that DirectInput will signal is loss of acquisition. If the user switches to another application, for instance, ScrawlB will no longer have the mouse in the acquired state. An event will be signaled and **GetDeviceData** will be called, but the method will fail because data can be retrieved only from a device that is in an acquired state.

The application next iterates through the retrieved items and examines the data in the **DIDeviceObjectData** type, comparing the **IOfs** member against the constants for the various buttons and axes that are of interest. For the x-axis, for instance, the application extracts the change in axis position from the **IData** member and uses this to adjust the cursor position, taking into account the user-defined sensitivity, as in the following code sample.

```
For i = 1 To NumItems
    Select Case diDeviceData(i).IOfs
        Case DIMOFS_X
            g_cursorx = g_cursorx + diDeviceData(i).IData * _
                g_Sensitivity
```

The application also examines the sequence number and compares it with the previous one. If two axis events have the same sequence number, the mouse has been moved diagonally. To avoid a staircase effect, it is not desirable to update the cursor position or draw a line until both movements have been taken into account.

```
If OldSequence <> diDeviceData(i).ISequence Then
    UpdateCursor
    OldSequence = diDeviceData(i).ISequence
Else
    OldSequence = 0
End If
```

For the buttons, the method determines the event type by checking the appropriate bit in **IData**. If the bit is set, the mouse button was pressed; otherwise, it was released. Remember, **GetDeviceData** does not return the current state of the device, so it is up to the application to keep a private record of whether a button is being held down. For the left button, ScrawlB keeps this information in the *Drawing* variable.

```
Case DIMOFS_BUTTON0
    If diDeviceData(i).IData And &H80 Then
```

---

```

        Drawing = True

        ' Keep record for Line function
        CurrentX = g_cursorx
        CurrentY = g_cursory

        ' Draw point in case button-up follows immediately
        PSet (g_cursorx, g_cursory)
    Else
        Drawing = False
    End If
End Select
Next i

```

## Tutorial 3: Using the Joystick

This tutorial shows how to create a joystick device, set its properties, and retrieve immediate data. The example code is based on the Joystick sample.

The tutorial divides the required tasks into the following steps.

- Step 1: Enumerating Devices and Creating the Joystick
- Step 2: Getting Joystick Capabilities
- Step 3: Setting Joystick Properties
- Step 4: Retrieving Immediate Data from the Joystick

### Step 1: Enumerating Devices and Creating the Joystick

Because there is no such thing as a system joystick in the same sense that there can be a system keyboard or mouse, in order to create a **DirectInputDevice8** object for a joystick you first need to obtain an instance GUID, or globally unique identifier. Generally, this is done by enumerating the available joysticks, presenting the user with a choice, and then obtaining the information for the selected device.

As with all devices, the DirectInput system must first be created.

```

Dim dx As New DirectX8
Dim di As DirectInput8

Set di = dx.DirectInputCreate()

```

The next step is enumeration of devices using the **DirectInput8.GetDIDevices** method. As a parameter to this method, flags are passed indicating that the application

should enumerate only game controller devices that are physically attached to the system. The results of this enumeration are stored in an instance of the **DirectInputEnumDevices8** class.

```
Dim diDev As DirectInputDevice8
Dim diDevEnum As DirectInputEnumDevices8

Set diDevEnum = di.GetDIDevices( _
    DI8DEVCLASS_GAMECTRL, DI8DFL_ATTACHEDONLY)
```

Once the enumeration is complete, assuming at least one joystick was found, that information can be manipulated. In the case of the Joystick sample, the devices are added to a list box from which the user can make a choice. The **DirectInputEnumDevices8.GetCount** method specifies how many items are contained in the enumeration.

```
'Add attached joysticks to the list box
Dim i As Integer
For i = 1 To diDevEnum.GetCount
    Call lstJoySticks.AddItem( _
        diDevEnum.GetItem(i).GetInstanceName)
Next
```

**GetInstance** returns a friendly name for the device.

At this point, the Joystick sample initializes an event handle to associate with the device. This is used at the end of Step 2: Getting Joystick Capabilities.

```
Dim EventHandle as Long
EventHandle = dx.CreateEvent(Me)
```

When the user selects a joystick from the list, the device is created and initialized in the `lstJoySticks_Click` procedure. Because there are no standard GUIDs to pass to **DirectInput8.CreateDevice**, as there are for the system keyboard and system mouse, the GUID of the device instance must be extracted by using the **DirectInputDeviceInstance8.GetGuidInstance** method. Note that as with all enumerated collections in Microsoft DirectX® for Microsoft Visual Basic®, the device enumeration is 1-based. Therefore, the index is one greater than the index of the selected item in the list box. The list box must also be unsorted.

```
Set diDev = di.CreateDevice(diDevEnum.GetItem( _
    lstJoySticks.ListIndex + 1).GetGuidInstance)
```

The joystick must also be initialized for cooperative level and format. In this case, the `DIFORMAT_JOYSTICK` format is used. Another format, `DIFORMAT_JOYSTICK2` is also available for joysticks with a larger assortment of controls.

```
diDev.SetCommonDataFormat DIFORMAT_JOYSTICK
diDev.SetCooperativeLevel Me.hWnd, _
```

---

DISCL\_BACKGROUND Or DISCL\_NONEXCLUSIVE

You must set the data format before attempting to enumerate objects on the device or manipulate its properties.

Once the joystick is in place, its capabilities are explored in Step 2: Getting Joystick Capabilities

## Step 2: Getting Joystick Capabilities

Getting basic information about the buttons, axes, and point-of-view controllers on the device requires a simple call to **DirectInputDevice8.GetCapabilities**.

```
Dim joyCaps As DIDEVCAPS
diDev.GetCapabilities joyCaps
```

The Joystick sample needs only the number of buttons and point-of-view controllers on the device. Although the **DIDEVCAPS** type also reports the number of axes on the device, it does not reveal anything about what those axes are. For this information, the sample calls its own **IdentifyAxes** procedure. It first declares its variables and initializes an array that will hold Boolean values indicating the presence or absence of each possible axis.

```
Sub IdentifyAxes(diDev As DirectInputDevice8)

    Dim didoEnum As DirectInputEnumDeviceObjects
    Dim dido As DirectInputDeviceObjectInstance
    Dim i As Integer

    For i = 1 To 8
        AxisPresent(i) = False
    Next
```

The procedure goes on to enumerate device objects on the device. The **DIDFT\_AXIS** value will restrict the enumeration to axes.

```
Set didoEnum = diDev.GetDeviceObjectsEnum(DIDFT_AXIS)
```

Each **DirectInputDeviceObjectInstance** is then queried for its offset within the data format that was established earlier by the call to **DirectInputDevice8.SetCommonDataFormat**. This offset identifies the conventional role or type of the axis; for instance, a **GUID\_RzAxis** likely corresponds to a twisting motion on the main stick. Keep in mind, though, that device drivers are free to assign any designation to an axis. It is always a good idea to allow users to change the mapping of the axes to actions within your application.

```
Dim sGuid as String
For i = 1 To didoEnum.GetCount
```



```

Set dido = didoEnum.GetItem(i)
sGuid = didoEnum.GetItem(i)

Select Case sGuid
    Case "GUID_Xaxis"
        AxisPresent(1) = True
    Case "GUID_Yaxis"
        AxisPresent(2) = True
' and so on
.
.
.
    End Select
Next
End Sub

```

The application now passes the event handle created earlier to the device, so that notifications will be sent to the form when an input event takes place.

```
Call diDev.SetEventNotification(EventHandle)
```

Next, you set the joystick properties in Step 3: Setting Joystick Properties.

### Step 3: Setting Joystick Properties

Property changes are made through the **DirectInputDevice8.SetProperty** method, and must be made after the data format of the device is established, but before it is acquired.

Because different devices might return different ranges of axis values, it is a good idea to set a range that will apply to all devices. The Joystick sample requests that all axis values be within the range 0 to 10,000.

Properties are set using different types for different properties. For an axis value, use the **DIPROP\_RANGE** type. This property type structure is then applied by calling **SetProperty**.

```

Dim DiProp_Range As DIPROP_RANGE

With DiProp_Range
    .IHow = DIPH_DEVICE
    .IMin = 0
    .IMax = 10000
End With
diDev.SetProperty "DIPROP_RANGE", DiProp_Range

```

The **DIPH\_DEVICE** flag is used to indicate that the property applies to all axes on the device. The Joystick sample also sets the dead zone and saturation zones for the

joystick. In this case, it is not desirable to set these values for other axes such as a throttle or rudder. The **IHow** member of the property type is set to indicate that the property change applies to a device object identified by its offset within the data format, and the **IObj** member is set to that offset value. In this case, the **DIPROPLONG** type is used to send values of type Long through **SetProperty**. The following sample code demonstrates this for the dead zone property.

```
Dim DiProp_Dead As DIPROPLONG

With DiProp_Dead
    .IData = 1000
    .IHow = DIPH_BYOFFSET

' Set for x-axis
    .IObj = DIJOFS_X
    diDev.SetProperty "DIPROP_DEADZONE", DiProp_Dead

' Set for y-axis
    .IObj = DIJOFS_Y
    diDev.SetProperty "DIPROP_DEADZONE", DiProp_Dead
End With
```

The value in **IData** is the proportion of the range of travel, in units of 10,000, that is set up as a dead zone. Because 1000 is one-tenth of 10,000, it specifies that one-tenth of the range of travel of the x-axis and y-axis, balanced at the center, will be reported as still being in the center (in this case, a value of 5000).

### Note

Dead zone and saturation values are always calculated in units of 10,000, regardless of the actual range of values reported by the device.

The saturation zones for the device are set similarly. In this case, **IData** is 9500, because it represents the proportion of the range of travel that lies outside the saturation zones at the extremities. In other words, the top and bottom 5 percent of the raw values returned by the joystick is reported as the minimum or maximum range value set for the device (in this case, 0 or 10,000).

You are now ready to get data from the device in Step 4: Retrieving Immediate Data from the Joystick.

## Step 4: Retrieving Immediate Data from the Joystick

Now that the necessary properties have been set, the device can be acquired and data can be collected from the joystick. In the Joystick sample, the device is polled in a loop after its properties have been set. This uses the **DirectInputDevice8.Poll**

method. In a real-world multimedia application, polling would take place in the main game loop or rendering loop.

```
diDev.Acquire
```

```
While DoEvents
```

```
    diDev.Poll
```

```
Wend
```

The sample application does not actually retrieve immediate data each time the device is polled. To avoid unnecessary screen updates, it relies on notification, and the call to **Poll** is only to ensure that notifications are issued by devices that do not generate interrupts. Polling is not necessary for some game devices (such as HIDs), but it is as efficient to make a redundant call to **DirectInputDevice8.Poll** as to check a flag for the device before calling **Poll**.

Notifications are handled, as usual, in the implementation of the **DirectXEvent8.DXCallback** method. Each time this procedure is called, the application knows that a joystick event has occurred. At this point the application could call **DirectInputDevice8.GetDeviceData** to retrieve any pending axis changes or button events. However, with a game controller it is more common to retrieve the state of the entire device. Therefore, the sample uses **DirectInputDevice8.GetDeviceStateJoystick**, called from within the callback function.

```
Dim js As DIJOYSTATE
```

```
diDev.GetDeviceStateJoystick js
```

The values in the **DIJOYSTATE** type contain the state of all the device objects on the joystick. Because Step 2: Getting Joystick Capabilities checked which buttons, axes, and point-of-view controllers are actually present, you know which members in the type to ignore.

## Tutorial 4: Using Force Feedback

This tutorial shows how to test for the presence of a force-feedback device, how to create and play an effect, and how to change the parameters of an effect as it is playing.

The tutorial divides the tasks into the following steps.

- Step 1: Initializing the Force-Feedback Device
- Step 2: Setting Device Properties
- Step 3: Creating an Effect
- Step 4: Modifying an Effect

## Step 1: Initializing the Force-Feedback Device

In order to implement force feedback, you must first determine whether an appropriate device is available, and if so, create a **DirectInputDevice8** object for it. This tutorial presumes an application requiring a device that can play effects on both the x-axis and y-axis.

The following example starts, as usual, by creating a **DirectInput8** object, then using that object to enumerate the available devices into a **DirectInputEnumDevices8** object. The enumeration is restricted to attached devices of type **DI8DEVTYPE\_JOYSTICK**.

```
Dim dx As DirectX8
Dim di As DirectInput8

Dim diDev As DirectInputDevice8
Dim diEnumDev As DirectInputEnumDevices8
Dim diDevInst As DirectInputDeviceInstance8
Dim diDevObjEnum As DirectInputEnumDeviceObjects
Dim devobj As DirectInputDeviceObjectInstance

Dim devcaps As DIDEVCAPS
Dim ForceX As Boolean, ForceY As Boolean
Dim FoundForce As Boolean
Dim eftype As Long
Dim strObjGuid As String

Dim i As Integer, iAxes As Integer

Set di = dx.DirectInputCreate
Set diEnumDev = di.GetDIDevices(DI8DEVTYPE_JOYSTICK, _
                                DIEDFL_ATTACHEDONLY)
```

The example now iterates through the available devices until it finds one that has force-feedback capabilities.

```
For i = 1 To diEnumDev.GetCount
    Set diDevInst = diEnumDev.GetItem(i)
    Set diDev = di.CreateDevice(diDevInst.GetGuidInstance)
    Call diDev.GetCapabilities(devcaps)
    If devcaps.IfFlags And DIDC_FORCEFEEDBACK Then
        'Process the force-feedback device
```

Next, because the example requires that both the X and Y axes must support force feedback, all axes on the device are enumerated in a **DirectInputEnumDeviceObjects** collection.

```
Set diDevObjEnum = diDev.GetDeviceObjectsEnum(DIDFT_AXIS)
```

The collection of axes present is then inspected, looking for the x-axis and y-axis, and checking to see whether they support force-feedback effects.

```
ForceX = False
ForceY = False
For iAxes = 1 To diDevObjEnum.GetCount
    Set devobj = diDevObjEnum.GetItem(iAxes)
    strObjGuid = devobj.GetGuidType
    If strObjGuid = "GUID_XAxis" Then
        If devobj.GetFlags And DIDOI_FFACTUATOR Then
            ForceX = True
        End If
    ElseIf strObjGuid = "GUID_YAxis" Then
        If devobj.GetFlags And DIDOI_FFACTUATOR Then
            ForceY = True
        End If
    End If
    FoundForce = ForceX And ForceY
    If FoundForce Then Exit For
Next iAxes

Next i 'Next device

If Not FoundForce Then
    MsgBox "Two force feedback axes required."
End If
```

Now that a suitable device is assured, its properties are set in Step 2: Setting Device Properties.

## Step 2: Setting Device Properties

Presuming that you have found a suitable force-feedback device, the **DirectInputDevice8** object created in the last step in order to check capabilities can be left in place. It requires some further normal initialization, as covered in Tutorial 3: Using the Joystick: setting the data format and cooperative level, and setting the range properties for input. Note that the cooperative level must include **DISCL\_EXCLUSIVE**. Although an actual application probably does not require background access to the device, the **DISCL\_BACKGROUND** flag makes debugging easier because you will not lose acquisition when you switch to the code window.

```
Call didev.SetCommonDataFormat(DIFORMAT_JOYSTICK2)
Call didev.SetCooperativeLevel(Me.hWnd, _
    DISCL_BACKGROUND Or DISCL_EXCLUSIVE)
' Set range properties...
```

For force feedback, it is often good practice to disable the autocenter property of the device, so that the default spring action will not interfere with effects you create. This is done by sending a **DIPROPLONG** type through the `DirectInputDevice8.SetProperty` method, setting the `DIPROP_AUTOCENTER` property to 0.

```
Dim prop As DIPROPLONG
prop.lData = 0
prop.lHow = DIPH_DEVICE
prop.lObj = 0
Call didev.SetProperty("DIPROP_AUTOCENTER", prop)
```

Once you have configured the device as desired, it can be acquired.

```
didev.Acquire
```

Now that you have a force-feedback device ready, you need to create an effect to use with it. This is covered in Step 3: Creating an Effect.

### Step 3: Creating an Effect

The effect created in this example simulates the pull of a stationary object, such as a magnet, on a movable object, such as an iron ball. The movable object is controlled by the joystick. At the beginning of the simulation, the iron ball is due south of the magnet and experiencing one-half the maximum pull.

The pull of the magnet is simulated by a constant force. The first step is to set up the **DIEFFECT** type that describes the force.

```
Dim EffectInfo as DIEFFECT
With EffectInfo
    .constantForce.lMagnitude = 5000
    .lDuration = -1 ' Infinite
    .x = 18000
    .lGain = 10000 ' Play at full magnitude
    .lTriggerButton = -1 ' No trigger button
End With
```

By setting the **x** parameter to 18,000, you specify a force originating from a spot 180 degrees from due north. In other words, a force moving from due south toward due north, away from the user. For an in-depth discussion of effect directions, see [Effect Direction](#)

All other members of **DIEFFECT** are either not relevant to a constant force or are valid with a value of 0.

Now that the effect has been defined, it can be created using the **DirectInputDevice8.CreateEffect** method.

```
Dim di_effect As DirectInputEffect
```

```
Set di_effect = didev.CreateEffect("GUID_ConstantForce", EffectInfo)
```

If the device is in an acquired state at this time, the effect is automatically downloaded. If not, the effect will be downloaded when it is started using the **DirectInputEffect.Start** method.

```
di_effect.Start(1, 0)
```

Only one iteration of the effect is needed because it has infinite duration and no flags are required.

While a constant unchanging effect can be useful, an effect might also change as it plays or in reaction to user input. This is discussed in Step 4: Modifying an Effect.

## Step 4: Modifying an Effect

As the user moves the iron ball around using the joystick, the application adjusts the direction and magnitude of the effect. First, however, you should check whether the device enables changing the direction of the effect without stopping and restarting the effect. Microsoft® DirectInput® will stop and restart the effect automatically if necessary, but by doing this yourself, you might avoid unseemly breaks in continuity.

In order to examine the capabilities for any effect, you first enumerate supported effects. To do so, use the **DirectInputDevice8.GetEffectsEnum** method, which resolves to a **DirectInputEnumEffects** type. The **DIEFT\_CONSTANTFORCE** flag enables you to restrict the enumeration to supported only constant force effects.

```
Dim diEnumEffects As DirectInputEnumEffects
Set diEnumEffects = didev.GetEffectsEnum(DIEFT_CONSTANTFORCE)
```

Next, examine the enumeration for the particular effect you are interested in. If the enumerated effect meets the criteria, call the

**DirectInputEnumEffects.GetDynamicParams** method to examine the effect for parameters that can be changed without stopping and restarting. Examine the flags returned by **GetDynamicParams**, comparing them against known values from **CONST\_DIEPFLAGS**. In the case of the following example, the *params* variable containing the result flags is compared against **DIEP\_DIRECTION** to ensure that the direction of the effect can be changed while the effect is running.

```
Dim params As Long
Dim i As Long

For i = 1 To diEnumEffects.GetCount
    ' Look for the standard constant force. There could be others.

    If diEnumEffects.GetEffectGuid(i) = "GUID_ConstantForce" Then
        params = diEnumEffects.GetDynamicParams(i)
        Exit For
    End If
```

Next i

```
If Not (params And DIEP_DIRECTION) Then
    ' Cannot change direction dynamically. Take remedial action such
    ' as limiting points at which modifications will be made.
End If
```

Similarly, to learn whether you can change the magnitude of the effect dynamically, perform the following check.

```
If Not (params And DIEP_TYPESPECIFICPARAMS)
    ' Cannot change type-specific parameters dynamically.
End If
```

The application modifies the effect each time the device has been polled for input and the iron ball has moved. Assume that the new magnitude is stored in *CurrentMag*, and the new direction (in degrees) in *CurrentBearing*. To make the necessary changes, you need to initialize only those members of **DIEFFECT** that are relevant.

```
EffectInfo.constantForce.IMagnitude = CurrentMag
EffectInfo.x = CurrentBearing * DI_DEGREES
```

You now pass the **DIEFFECT** type with the new data to **DirectInputEffect.SetParameters** along with flags indicating which members contain valid data.

```
di_effect.SetParameters(EffectInfo, _
    DIEP_DIRECTION Or DIEP_TYPESPECIFICPARAMS)
```

The **DIEP\_TYPESPECIFICPARAMS** flag indicates that any member containing information particular to that type of effect is valid. In the case of a constant force, this means the **constantForce** member.

## Tutorial 5: Using Action Mapping

This tutorial guides you through the setup, modification, and application of an action map. Code samples are based on the ActionMapper sample, which is designed as though it were a space combat game.

Preliminary steps of setting up the Microsoft® DirectInput® system are the same for any application and are covered in detail in the other tutorials. The keyboard, mouse, and a joystick (if present) are all used in the sample, so each of those devices needs to be set up.

The tutorial divides the tasks into the following steps.

- Step 1: Defining the Game Actions
- Step 2: Defining the Action Map



- Step 3: Mapping Actions to Devices
- Step 4: Configuring and Applying the Action Map
- Step 5: Displaying the Action Map
- Step 6: User Configuration of the Action Map
- Step 7: Retrieval of Action Mapped Data

## Step 1: Defining the Game Actions

The first step toward creating an action map is the definition of the game actions. These actions are specific to the application and are defined by the developer. In the case of the ActionMapper sample, the actions chosen reflect its needs as a space combat simulator. These values can be defined in many ways as the developer sees fit. They could be defined as an enumeration, as in the Preparing the Action Map overview, or they could be defined as constants, as in the following code fragment from the ActionMapper sample.

```
Const INPUT_LEFTRIGHT_AXIS = 1
Const INPUT_UPDOWN_AXIS = 2
Const INPUT_TURNLEFT = 4
Const INPUT_TURNRIGHT = 5
Const INPUT_FORWARDTHRUST = 6
Const INPUT_REVERSETHRUST = 7
Const INPUT_FIREWEAPONS = 8
Const INPUT_ENABLESHIELD = 9
Const INPUT_DISPLAYGAMEMENU = 10
Const INPUT_QUITGAME = 11
```

Once these values are defined, they can be assigned to genre-specific action-mapping constants. This is shown in Step 2: Defining the Action Map.

## Step 2: Defining the Action Map

Next, each game action should be assigned to at least one virtual control or device object. These controls are defined as action-mapping constants, and they are defined by genre and subgenre. In the case of the ActionMapper sample, the best choice is the Space Combat subgenre of the flight games genre. This subgenre makes the following constants available.

### Priority 1 Controls

```
DIAXIS_SPACESIM_LATERAL
DIAXIS_SPACESIM_MOVE
DIAXIS_SPACESIM_THROTTLE
DIBUTTON_SPACESIM_FIRE
DIBUTTON_SPACESIM_MENU
```

DIBUTTON\_SPACESIM\_TARGET  
DIBUTTON\_SPACESIM\_WEAPONS

### Priority 2 Controls

DIAXIS\_SPACESIM\_CLIMB  
DIAXIS\_SPACESIM\_ROTATE  
DIBUTTON\_SPACESIM\_BACKWARD\_LINK  
DIBUTTON\_SPACESIM\_DEVICE DIBUTTON\_SPACESIM\_DISPLAY  
DIBUTTON\_SPACESIM\_FASTER\_LINK  
DIBUTTON\_SPACESIM\_FIRESECONDARY  
DIBUTTON\_SPACESIM\_FORWARD\_LINK  
DIBUTTON\_SPACESIM\_GEAR  
DIBUTTON\_SPACESIM\_GLANCE\_DOWN\_LINK  
DIBUTTON\_SPACESIM\_GLANCE\_LEFT\_LINK  
DIBUTTON\_SPACESIM\_GLANCE\_RIGHT\_LINK  
DIBUTTON\_SPACESIM\_GLANCE\_UP\_LINK  
DIBUTTON\_SPACESIM\_LEFT\_LINK DIBUTTON\_SPACESIM\_LOWER  
DIBUTTON\_SPACESIM\_PAUSE DIBUTTON\_SPACESIM\_RAISE  
DIBUTTON\_SPACESIM\_RIGHT\_LINK  
DIBUTTON\_SPACESIM\_SLOWER\_LINK  
DIBUTTON\_SPACESIM\_TURN\_LEFT\_LINK  
DIBUTTON\_SPACESIM\_TURN\_RIGHT\_LINK  
DIBUTTON\_SPACESIM\_VIEW  
DIHATSWITCH\_SPACESIM\_GLANCE

Priority 1 controls are those controls that, at the minimum, should be mapped to a device object if possible. Priority 2 controls are less critical to basic game operation and may be mapped as needed.

Game actions are assigned to action-mapping constant controls in an array of **DIACTION** types. Each **DIACTION** type contains at least one game action, its associated action-mapping constant, any necessary flags, and a friendly name for the action. The remaining **DIACTION** members are not used at this point. The following code sample shows the array of **DIACTION** types defined in the ActionMapper sample. Note that *CInputMapper* is a class used and defined by the ActionMapper sample to contain many of the standard action-mapping procedures. In this case it uses its own **AddAction** function to add each new **DIACTION** type to an array of them contained in a **DIACTIONFORMAT** type.

```
Dim m_mapper As New CInputMapper
```

```
With m_mapper
```

```
.AddAction INPUT_LEFTRIGHT_AXIS, DIAXIS_SPACESIM_LATERAL, 0, "Turn"  
.AddAction INPUT_UPDOWN_AXIS, DIAXIS_SPACESIM_MOVE, 0, "Move"  
.AddAction INPUT_FIREWEAPONS, DIBUTTON_SPACESIM_FIRE, 0, "Shoot"  
.AddAction INPUT_ENABLESHIELD, DIBUTTON_SPACESIM_GEAR, 0, "Shield"  
.AddAction INPUT_DISPLAYGAMEMENU, DIBUTTON_SPACESIM_DISPLAY, 0, "Display"  
.AddAction INPUT_QUITGAME, DIBUTTON_SPACESIM_MENU, 0, "Quit Game"
```

' Keyboard input mappings

```
.AddAction INPUT_FORWARDTHRUST, DIKEYBOARD_UP, 0, "Forward thrust"
.AddAction INPUT_REVERSETHRUST, DIKEYBOARD_DOWN, 0, "Reverse thrust"
.AddAction INPUT_FIREWEAPONS, DIKEYBOARD_F, 0, "Fire weapons"
.AddAction INPUT_ENABLESHIELD, DIKEYBOARD_S, 0, "Enable shields"
.AddAction INPUT_DISPLAYGAMEMENU, DIKEYBOARD_D, 0, "Display game menu"
.AddAction INPUT_QUITGAME, DIKEYBOARD_ESCAPE, 0, "Quit game"
.AddAction INPUT_TURNRIGHT, DIKEYBOARD_RIGHT, 0, "Right Turn"
.AddAction INPUT_TURNLEFT, DIKEYBOARD_LEFT, 0, "Left Turn"
```

' Mouse input mappings

```
.AddAction INPUT_LEFTRIGHT_AXIS, DIMOUSE_XAXIS, 0, "Turn"
.AddAction INPUT_UPDOWN_AXIS, DIMOUSE_YAXIS, 0, "Move"
.AddAction INPUT_FIREWEAPONS, DIMOUSE_BUTTON0, 0, "Fire weapons"
.AddAction INPUT_ENABLESHIELD, DIMOUSE_BUTTON1, 0, "Enable shields"
End With
```

The **DIACTIONFORMAT** type containing the array of **DIACTION** types will be used to find a device that can best be used with it. This is shown in Step 3: Mapping Actions to Devices.

## Step 3: Mapping Actions to Devices

The ActionMapper sample uses its class function *CreateDevicesFromMap* to, among other things, measure the action map defined above against available devices. To do so, it first assigns values to the other members of the **DIACTIONFORMAT** type containing the array of **DIACTION** types. The values used in the sample have been passed as parameters to the **CreateDevicesFromMap** method. For clarity, the following code sample uses the actual values rather than the parameter names.

```
m_diaf.guidActionMap = "{20CAA014-60BC-4399-BDD3-84AD65A38A1C}"
m_diaf.lGenre = DIVIRTUAL_SPACESIM
m_diaf.lBufferSize = 16
m_diaf.lAxisMax = 100
m_diaf.lAxisMin = -100
m_diaf.ActionMapName = "Semantic Mapper VB Sample"
m_diaf.lActionCount = 18
```

The **guidActionMap** value is defined by the program. For more information on creating GUIDs, see Using GUIDS.

Once the desired mapping has been defined, it must be applied to physical devices. **DirectInput8.GetDevicesBySemantics** begins this process in the following code fragment, where *m\_DI* is a previously defined **DirectInput8** object, *m\_DIEnum* is a previously defined **DirectInputEnumDevices8** object, and *m\_strUserName* is a previously defined string containing a friendly identifier for the user.

---

```
Set m_DIEnum = m_DI.GetDevicesBySemantics(m_strUserName, m_diaf, 0)
```

Flags could be used to limit the enumeration to a more specific search, but in this case no flags are set.

The results of the enumeration are examined individually and devices are created for each keyboard, mouse, and joystick found. In the following code sample, *devinst* is a previously defined **DirectInputDeviceInstance8** object, *m\_Devices* is a previously defined array of **DirectInputDevice8** objects, and *m\_DeviceTypes* is a previously defined array of **Long** values.

```
For i = 1 To m_DIEnum.GetCount

    Set devinst = m_DIEnum.GetItem(i)
    Set m_Devices(i) = m_DI.CreateDevice(devinst.GetGuidInstance)
    m_DeviceTypes(i) = devinst.GetDevType
    Set devinst = Nothing
```

The loop continues by checking whether the enumerated device currently under examination is a mouse. If so, the **AXISMODE** property is set to relative. Other properties could be set within this loop as well, but in the case of the **ActionMapper** sample, this is all that will be done here.

```
If m_DeviceTypes(i) = DI8DEVTYPE_MOUSE Then
    Dim dipl As DIPROPLONG
    dipl.IHow = DIPH_DEVICE
    dipl.IData = DIPROPAXISMODE_REL
    m_Devices(i).SetProperty "DIPROP_AXISMODE", dipl
End If
```

**DirectInputDevice8.BuildActionMap** takes the list of control assignments specified in the **DIACTIONFORMAT** type and attempts to map them to specific device objects on the device being enumerated for the user specified in the *m\_strUserName* parameter. The results of the mapping are returned in the same structure. Each pass maps different controls depending on the nature of the enumerated device currently being examined. A keyboard, for instance, maps controls that specify a mapping to a particular key, but it leaves controls that specify buttons, sliders, or axes unmapped. If a joystick is enumerated next, **BuildActionMap** ignores those controls mapped to keyboard keys, but it attempts to map the buttons, sliders, and axes to the joystick's device objects.

```
m_Devices(i).BuildActionMap m_diaf, m_strUserName, 0
```

Once again, no flags are used in this instance.

The results of this default mapping can be examined and manipulated. This is done in Step 4: Configuring and Applying the Action Map.

## Step 4: Configuring and Applying the Action Map

Once the mapping has been returned in the **DIACTIONFORMAT** type, it can be manipulated before being applied by **DirectInputDevice8.SetActionMap**.

The **IHow** member of each **DIACTION** type contained within the **DIACTIONFORMAT** type might be examined at this point to determine both whether the mapping was successful and what the criteria were in selecting the device object to which that action was mapped. For instance, you can determine if the mapping was specified by the hardware manufacturer or requested by the user.

You can change the actual mapping itself by editing the **ISemantic** member of the appropriate **DIACTION** structure returned in the default mapping. However, making these changes is not recommended.

Once the action-map configuration is finalized, it must be applied to the device to bind the physical controls to the game actions. This is done by calling the **DirectInputDevice8.SetActionMap** method as follows.

```
m_Devices(i).SetActionMap m_diaf, m_strUserName, 0
```

The parameters once again consist of the **DIACTIONFORMAT** type, the user name, and no flags.

Action maps, once created, can be displayed for and easily altered by the user. This is explained in Step 5: Displaying the Action Map.

## Step 5: Displaying the Action Map

In addition to the advantage of action mapping in enabling the developer to define game actions independently of specific controller hardware, action mapping also benefits the user by providing a user interface (UI) for easy reconfiguration.

The UI can be displayed in two forms, text-only or graphics. In addition, each of those two options can be viewed in two modes: view-only or edit.

To display the UI, some preliminary setup is involved. A **DICONFIGUREDEVICESPARAMS** type is used to hold the property sheet information. **DICONFIGUREDEVICESPARAMS** contains an array of **DIACTIONFORMAT** types used for any mappings that have been defined, an array of user names to match to those action maps, and counts for both of the arrays. For this example, only one mapping and one user have been defined above. The initialization of the **DICONFIGUREDEVICESPARAMS** type is shown in the following sample code.

```
Dim m_cdParams As DICONFIGUREDEVICESPARAMS
```

```
m_cdParams.ActionFormats(0) = m_diaf
```

```
m_cdParams.FormatCount = 1  
m_cdParams.UserNames(0) = m_strUserName  
m_cdParams.UserCount = 1
```

Once that structure is initialized, call **DirectInput8.ConfigureDevices** to display the UI as shown in the following sample code.

```
m_DI.ConfigureDevices 0, m_cdParams, DICD_EDIT
```

All that the sample is passing to **ConfigureDevices** is the **DICONFIGUREDEVICESPARAMS** type and a flag indicating that the UI allows user configuration. This is discussed in Step 6: User Configuration of the Action Map.

## Step 6: User Configuration of the Action Map

At this point, the user configuration interface is displayed. If the device manufacturer has provided a graphic, users see an image of the device with labels indicating the action assigned to each device object. If no graphic is available, a simple text list of available device objects with their associated actions is displayed. An example of the former is shown here.

Users can now reassign controllers to actions as they see fit. Any changes made will be reflected in the **DIACTIONFORMAT** type. Once the user interface is closed, the new action map must be sent to **DirectInputDevice8.SetActionMap** before it can be implemented.

Using the data associated with the controls in an action map is described in Step 7: Retrieval of Action Mapped Data.

## Step 7: Retrieval of Action Mapped Data

Action mapping was designed with buffered data in mind and will most often be used in that manner. The only difference between retrieving data from an action-mapped device and a device with no mapping is where you get it. Without action mapping, you would look to the **IOfs** member of the **DIDEVICEOBJECTDATA** type to determine which device object reported a change. However, with action mapping, you look to the **IUserData** member. Data is found as usual in the **IData** member.

## DirectInput C/C++ Samples

The following sample programs demonstrate the use and capabilities of Microsoft® DirectInput®:

- DIconfig Sample
- FFConst Sample
- JoyStick Sample
- Keyboard Sample
- Mouse Sample
- MultiMapper Sample
- ReadFFE Sample
- Scrawl Sample

Although Microsoft 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](#).

## DIconfig Sample

### Description

The DIconfig code demonstrates the implementation of a configuration user interface based upon the Microsoft® DirectInput® Mapper technology. This sample code is very complex and is intended to be used more as a reference implementation than as a learning tool.

### Path

Source: *(SDK root)*\Samples\Multimedia\DirectInput\DIconfig

Executable: None (see Programming Notes).

### User's Guide

This sample does not create an executable file, so there are no end-user instructions.

### Programming Notes

This code generates Diconfig.dll, a binary file that contains all of the functionality used in the default Mapper UI. This code is very complex and is intended as a reference implementation of a DirectInput-based configuration user interface.

For more information about this sample, see the comments within the sample code itself. The following major features are supported.

- Display of device images.
- Reconfiguration of devices.
- Support for multiple device views to illustrate alternate viewing angles.

- Support for control activation overlays.
- Use of the **GetImageInfo** method.
- Device ownership for multiuser applications on the same computer.
- Persistence of user settings through the **SetActionMap** method.

## FFConst Sample

### Description

The FFCnst sample program applies raw forces to a force-feedback input device, illustrating how a simulator-type application can use force feedback to generate forces computed by a physics engine.

You must have a force-feedback device connected to your system in order to run the application.

### Path

Source: *(SDK root)*\Samples\Multimedia\DirectInput\FFConst

Executable: *(SDK root)*\Samples\Multimedia\DirectInput\Bin\FFConst.exe

### User's Guide

When you run the application, it displays a window with a crosshair and a black spot in it. Click anywhere within the window's client area to move the black spot. (Note that moving the device itself does not do anything.) FFCnst exerts a constant force on the device from the direction of the spot, in proportion to the distance from the crosshair. You can also hold down the mouse button and move the spot continuously.

### Programming Notes

This sample program enumerates the input devices and acquires the first force-feedback device that it finds. If none are detected, it displays a message and terminates.

When the user moves the black spot, the **joySetForcesXY** function converts the cursor coordinates to a force direction and magnitude. This data is used to modify the parameters of the constant force effect.

## Joystick Sample

### Description

The Joystick sample program obtains and displays joystick data.



## Path

Source: *(SDK root)\Samples\Multimedia\DirectInput\Joystick*

Executable: *(SDK root)\Samples\Multimedia\DirectInput\Bin\Joystick.exe*

## User's Guide

Observe how the displayed data changes when you move and twist the stick, rotate the throttle wheel, and press buttons in various combinations.

## Programming Notes

The application polls the joystick for immediate data in response to a timer set inside the dialog procedure.

# Keyboard Sample

## Description

The Keyboard sample program enables the exploration of Foreground versus Background and Exclusive versus Non-Exclusive cooperative levels, and Buffered versus Immediate data retrieval from the keyboard.

## Path

Source: *(SDK root)\Samples\Multimedia\DirectInput\Keyboard*

Executable: *(SDK root)\Samples\Multimedia\DirectInput\Bin\Keyboard.exe*

## User's Guide

Through the user interface, any combination of cooperative level and data styles can be created and the resulting keyboard behavior observed. Each setting is explained as it is selected, and the expected behavior is predicted when the device is created.

## Programming Notes

Note that holding down a key in immediate mode holds that key indefinitely as subsequent snapshots of the keyboard are taken by Microsoft® DirectInput®. This is an optical illusion because DirectInput is taking individual snapshots at the rate of twelve times a second, but it demonstrates that, in immediate mode, only the state of the keyboard at that time is considered, while anything that has happened between snapshots is ignored.

Holding down a key in buffered mode briefly displays the data indicating that the key has been pressed, then quickly clears that data as it is flushed from the buffer.

Releasing the key generates another briefly displayed key-up event. This is a significant difference from immediate mode.

## Mouse Sample

### Description

The Mouse sample program enables the exploration of Foreground versus Background and Exclusive versus Non-Exclusive cooperative levels, and Buffered versus Immediate data retrieval from the mouse.

### Path

Source: *(SDK root)*\Samples\Multimedia\DirectInput\Mouse

Executable: *(SDK root)*\Samples\Multimedia\DirectInput\Bin\Mouse.exe

### User's Guide

Through the user interface, any combination of cooperative level and data styles can be created and the resulting keyboard behavior observed. Each setting is explained as it is selected, and the expected behavior is predicted when the device is created.

### Programming Notes

To release the mouse, press ENTER.

Note that in immediate mode, all device objects are visible and you can see the data change as the mouse is moved. This is an optical illusion because Microsoft® DirectInput® is taking individual snapshots at the rate of twelve times a second, but it demonstrates that, in immediate mode, only the state of the device at that time is considered, while anything that has happened between device snapshots is ignored.

Holding down a button in buffered mode briefly displays the data indicating that the button has been pressed, then quickly clears that data as it is flushed from the buffer. Releasing the button generates another briefly displayed button up event. This is a significant difference from immediate mode.

## MultiMapper Sample

### Description

The MultiMapper sample program shows how to set up, apply, and retrieve data using the Action Mapping functionality. It also demonstrates remapping through the user interface.

## Path

Source: *(SDK root)\Samples\Multimedia\DirectInput\MultiMapper*

Executable: *(SDK root)\Samples\Multimedia\DirectInput\MultiMapper.exe*

## User's Guide

First, assign a number of players. The MultiMapper sample program accepts up to four. There must be one device, including the keyboard and the mouse, for each player. If more players are chosen than there are devices available, the program automatically scales back to the maximum number of players based on the devices attached.

The MultiMapper sample program is designed as though it were a space combat application. Each player is assigned a basic set of actions such as turning, firing, and activating thrusters. These actions are then mapped to device controls. Activation of those controls is then reflected by data in the display window.

To activate the action mapping user interface, press D. Each device has a separate tab for mapping that particular device. Double-clicking a device object label activates the list of possible actions to be assigned to that device object. Make a selection from the action list to map that action to the selected device object. You can also reassign devices among players.

## Programming Notes

If a controller such as a joystick or a wheel is attached to the system, it displays a graphic of the device with actions as callouts to each device object. The display of this graphic depends on the presence of a provided bitmap for that device.

# ReadFFE Sample

## Description

The ReadFFE sample program enumerates and plays all of the Microsoft® DirectInput® Force Feedback effects stored in a DirectInput effects file created by the Force Editor.

## Path

Source: *(SDK root)\Samples\Multimedia\DirectInput\ReadFFE*

Executable: *(SDK root)\Samples\Multimedia\DirectInput\ReadFFE.exe*

Media: *(SDK root)\Samples\Multimedia\Media\\*.ffe*

## User's Guide

Click **Read File** and open an existing Force Feedback Effects (FFE) file. If it was successfully read, click **Play Effects** to play the effects on the force-feedback device. FFE files can be authored using the Force Feedback Editor utility packaged with the Microsoft DirectX® SDK.

## Programming Notes

For each file effect enumerated, the **EnumAndCreateEffectsCallback** function initializes an **IDirectInputEffect** pointer and adds it to a linked list. The **OnPlayEffects** function traverses this list and plays all effects.

## Scrawl Sample

### Description

The Scrawl application demonstrates using the mouse in exclusive mode in a windowed application. It functions in the same way as a pencil tool in a paint program.

### Path

Source: *(SDK root)\Samples\Multimedia\DirectInput\Scrawl*

Executable: *(SDK root)\Samples\Multimedia\DirectInput\Bin\Scrawl.exe*

## User's Guide

To draw, hold down the left mouse button and move the mouse. Click the right mouse button to invoke a shortcut menu. From the shortcut menu you can clear the client window, set the mouse sensitivity, or close the application. If the mouse buttons have been switched through Control Panel settings, Scrawl will detect and mimic this behavior. Note that Microsoft® DirectInput® ignores Control Panel settings and the application itself must make the switch.

## Programming Notes

The Scrawl sample program demonstrates many aspects of DirectInput programming, including the following:

- Using the mouse in non-exclusive mode in a windowed application.
- Releasing the mouse when Microsoft Windows® needs to use it for menu access.
- Reacquiring the mouse when Windows no longer needs it.
- Reading buffered device data.
- Deferring screen updates until movement on both axes has been fully processed.

- Displaying event notifications of device activity.
- Restricting the cursor to an arbitrary region.
- Scaling raw mouse coordinates before using them.
- Using relative axis mode.

## DirectInput Visual Basic Samples

The following sample programs demonstrate the use and capabilities of Microsoft® DirectInput®:

- ActionMapper Sample
- ForceFeedback Sample
- Joystick Sample
- Keyboard Sample
- ScrawlB Sample

## ActionMapper Sample

### Description

The ActionMapper sample program demonstrates the retrieval of action-mapped data. It also enables reconfiguration of the keyboard, mouse, and other controller action mappings through the user interface.

### Path

Source: *(SDK root)*\Samples\Multimedia\VBSamples\DirectInput\ActionMapper

Executable: Source: *(SDK root)*

\Samples\Multimedia\VBSamples\DirectInput\Bin\VB\_ActionMapper.exe

### User's Guide

The initial display gives a text feedback of axis movements and button or key presses from the mouse, keyboard, or other controller attached to the system. An EXCLUSIVE | FOREGROUND cooperative level is used so that the mouse cursor is hidden.

Pressing the D key displays the configuration user interface with tabs for the mouse, keyboard, and any other present controller device. If a graphic is available for the controller, it is displayed with callouts indicating which action is associated with

which control. Double-clicking a callout label activates the menu of possible actions to apply to that control. To return to the initial screen with the new mappings, click OK.

To terminate the program, press the ESC key from the initial screen.

## Programming Notes

You will need to modify ActionMap.cls. For the purpose of this sample, it queries for any and all input devices, and it does not distinguish the source of the input.

However, you will usually modify the class to respond to only one given input, or to differentiate the input devices into different players or purposes.

This sample makes use of common DirectX code that is shared with other samples on the DirectX SDK. All common classes and modules can be found in the following directory:

*(SDK root)\Samples\Multimedia\VBSamples\Common*

## ForceFeedback Sample

### Description

The ForceFeedback sample program is a simple force-feedback editor that enables you to create an effect, set parameters, and play the effect.

### Path

Source: *(SDK root)\Samples\Multimedia\VBSamples\DirectInput\Feedback*

Executable: *(SDK root)*

*\Samples\Multimedia\VBSamples\DirectInput\Bin\VB\_ForceFeedback.exe*

### User's Guide

Select an effect type from the list, and modify the parameters. Play the effect by pressing the primary button on the joystick.

## Programming Notes

The ForceFeedback sample program shows how to turn off the autocenter property and how to create and modify effects. Changes in effect parameters are applied immediately.

## Joystick Sample

### Description

The Joystick sample program shows how to enumerate joysticks, set joystick properties, and get immediate data.

### Path

Source: *(SDK root)*\Samples\Multimedia\VBSamples\DirectInput\Joystick

Executable: *(SDK root)*

\Samples\Multimedia\VBSamples\DirectInput\Bin\VB\_Joystick.exe

### User's Guide

Select a joystick from the list. The data from the axes and buttons is displayed. Observe how the displayed data changes when you move and twist the stick, rotate the throttle wheel, and press buttons in various combinations.

### Programming Notes

The list box is unsorted so that the selection can easily be retrieved from the **DirectInputEnumDevices8** collection.

## Keyboard Sample

### Description

The Keyboard sample program shows how to create a keyboard device and retrieve immediate data from it.

### Path

Source: *(SDK root)*\Samples\Multimedia\VBSamples\Dinput\Src\Keyboard

Executable: *(SDK root)*\Samples\Multimedia\VBSamples\Dinput\Bin\Keyboard.exe

### User's Guide

As you press one or more keys while the application has focus, the names of the keys (from **CONST\_DIKEYFLAGS**) are displayed in the list box.

### Programming Notes

The background cooperative level is used, so keys are read even when the application does not have the input focus.

## ScrawlB Sample

### Description

The ScrawlB sample program illustrates using Microsoft® DirectInput® to create a simple drawing program. It shows how to use the mouse in exclusive mode, how to use event notification for mouse events, how to retrieve and interpret buffered data, and how to use callback functions to receive mouse movement events.

### Path

Source: (*SDK root*)\Samples\Multimedia\VBSamples\DirectInput\Scrawl

Executable: (*SDK root*)

\Samples\Multimedia\VBSamples\DirectInput\Bin\VB\_ScrawlB.exe

### User's Guide

Hold down the left button while dragging the mouse to draw. Click the right button to see a shortcut menu. Choosing **Release Mouse** (or pressing and releasing ALT) releases the system cursor so that you can move or resize the window or click on another application. Click on the client window again to resume drawing.

### Programming Notes

The application subclasses the Display window to capture WM\_ENTERMENULOOP messages. This is the best way to find out if the user has opened the system menu by pressing ALT+SPACEBAR, so that ScrawlB can release the mouse through a call to SetWindowLong. However, subclassing can lead to difficulties when debugging. Note that failure to comment out these lines while running the sample from within the Visual Basic environment will result in undefined behavior.

The *frmCanvas* module implements **DirectXEvent8** in order to be able to process input events. The Microsoft® Visual Basic® **MouseMove** event is also used by this form for getting Microsoft Windows® mouse events when Microsoft DirectInput® does not have access to the mouse. When this event is triggered, the application knows that the cursor is back in the client window, so the mouse can be reacquired.

## DirectInput C/C++ Reference

Reference material for the Microsoft® DirectInput® C/C++ application programming interface (API) is divided into the following categories.

- Interfaces



- Callback Functions
- Functions
- Macros
- Structures
- Device Constants
- Action Mapping Constants
- Return Values

## Interfaces

This section contains references for methods of the following Microsoft® DirectInput® interfaces.

- **IDirectInput8**
- **IDirectInputDevice8**
- **IDirectInputEffect**

### Note

All DirectInput methods have corresponding macros that expand to C or C++ syntax depending on which language is defined. These macros are found in the Dinput.h header file and are not documented separately.

## IDirectInput8

Applications use the methods of the **IDirectInput8** interface to enumerate, create, and retrieve the status of Microsoft® DirectInput® devices, initialize the DirectInput object, and invoke an instance of the Microsoft Windows® Control Panel.

**IDirectInput8** supersedes the **IDirectInput**, **IDirectInput2**, and **IDirectInput7** interfaces used in earlier versions of Microsoft DirectX®.

**IDirectInput8** is an interface to a new class of object, represented by the class identifier CLSID\_DirectInput8, and cannot be obtained by calling QueryInterface on an interface to objects of class CLSID\_DirectInput. Instead, obtain the **IDirectInput8** interface by using the **DirectInput8Create** function.

The methods of the **IDirectInput8** interface can be organized into the following groups.

### Device Management

### ConfigureDevices

### CreateDevice

### EnumDevices

### EnumDevicesBySemantics

### FindDevice

	<b>GetDeviceStatus</b>
<b>Miscellaneous</b>	<b>Initialize</b>
	<b>RunControlPanel</b>

The **IDirectInput** interface, like all COM interfaces, inherits the **IUnknown** interface methods. The **IUnknown** interface supports the following three methods:

<b>IUnknown</b>	<b>AddRef</b>
	<b>QueryInterface</b>
	<b>Release</b>

The **LPDIRECTINPUT8** type is defined as a pointer to the **IDirectInput8** interface:

```
typedef struct IDirectInput8 *LPDIRECTINPUT8;
```

## 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 Dinput.h.

## IDirectInput8::ConfigureDevices

Displays property pages for connected input devices and enables the user to map actions to device controls.

```
HRESULT IDirectInput8::ConfigureDevices(
    LPDICONFIGUREDEVICESCALLBACK lpdiCallback,
    LPDICONFIGUREDEVICESPARAMS lpdiCDParams,
    DWORD dwFlags,
    LPVOID pvRefData
);
```

## Parameters

*lpdiCallback*

Address of a callback function to be called each time the contents of the surface change. See **DIConfigureDevicesCallback**. Pass NULL if the application does not handle the display of the property sheet. In this case, Microsoft® DirectInput® displays the property sheet and returns control to the application when the user closes the property sheet. If you supply a callback pointer, you must also supply a valid surface pointer in the **lpUnkDDSTarget** member of the **DICONFIGUREDEVICESPARAMS** structure.

*lpdiCDParams*

Address of a **DICONFIGUREDEVICESPARAMS** structure that contains information about users and genres for the game, as well as information about how the user interface is displayed.

*dwFlags*

**DWORD** value that specifies the mode in which the control panel should be invoked. *DwFlags* must be one of the following values.

DICD\_DEFAULT

Open the property sheet in view-only mode.

DICD\_EDIT

Open the property sheet in edit mode. This mode enables the user to change action-to-control mappings. After the call returns, the application should assume current devices are no longer valid, release all device interfaces, and reinitialize them by calling **IDirectInput8::EnumDevicesBySemantics**.

*pvRefData*

Application-defined value to pass to the callback function.

## Return Values

If the method succeeds, the return value is **DI\_OK**.

If the method fails, the return value can be one of the following.

**DIERR\_INVALIDPARAM**

**DIERR\_OUTOFMEMORY**

## Remarks

Hardware vendors provide bitmaps and other display information for their device.

Before calling the method, an application can modify the text labels associated with each action by changing the value in the **lpszActionName** member of the **DIACTION** structure.

Configuration is stored for each user of each device for each game. The information can be retrieved by the **IDirectInputDevice8::BuildActionMap** method.

By default, acceleration is supported for these pixel formats:

**A1R5G5B5**

16-bit pixel format with 5 bits reserved for each color and 1 bit reserved for alpha (transparent texel).

**A8R8G8B8**

32-bit ARGB pixel format with alpha.

**R9G8B8**

24-bit RGB pixel format.

**X1R5G5B5**

16-bit pixel format with 5 bits reserved for each color.

**X8R8G8B8**

32-bit RGB pixel format with 8 bits reserved for each color.

Other formats will result in color conversion and dramatically slow the frame rate.

**Note**

Even if the cooperative level for the application is disabling the Microsoft Windows® logo key passively through an exclusive cooperative level or actively through use of the DISCL\_NOWINKEY flag, that key will be active while the default action mapping UI is displayed.

**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 Dinput.h.

**IDirectInput8::CreateDevice**

Creates and initializes an instance of a device based on a given GUID, and obtains an **IDirectInputDevice8** interface.

```
HRESULT CreateDevice(
    REFGUID rguid,
    LPDIRECTINPUTDEVICE *lpDirectInputDevice,
    LPUNKNOWN pUnkOuter
);
```

**Parameters**

*rguid*

Reference to (C++) or address of (C) the instance GUID for the desired input device (see Remarks). The GUID is retrieved through the **IDirectInput8::EnumDevices** method, or it can be one of the following predefined GUIDs:

**GUID\_SysKeyboard**

The default system keyboard.

**GUID\_SysMouse**

The default system mouse.

For the preceding GUID values to be valid, your application must define **INITGUID** before all other preprocessor directives at the beginning of the source file, or link to Dxguid.lib.

*lpDirectInputDevice*

Address of a variable to receive the **IDirectInputDevice8** interface pointer if successful.

*pUnkOuter*

Address of the controlling object's **IUnknown** interface for COM aggregation, or NULL if the interface is not aggregated. Most callers pass NULL.

## Return Values

If the method succeeds, the return value is **DI\_OK**.

If the method fails, the return value can be one of the following:

**DIERR\_DEVICENOTREG**

**DIERR\_INVALIDPARAM**

**DIERR\_NOINTERFACE**

**DIERR\_NOTINITIALIZED**

**DIERR\_OUTOFMEMORY**

## Remarks

Calling this method with *pUnkOuter* = NULL is equivalent to creating the object by **CoCreateInstance**(&*CLSID\_DirectInputDevice*, NULL, *CLSCTX\_INPROC\_SERVER*, *riid*, *lpIUnknown*) and then initializing it with **Initialize**.

Calling this method with *pUnkOuter* != NULL is equivalent to creating the object by **CoCreateInstance**(&*CLSID\_DirectInputDevice*, *pUnkOuter*, *CLSCTX\_INPROC\_SERVER*, &*IID\_IUnknown*, *lpIUnknown*). The aggregated object must be initialized manually.

## 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 *Dinput.h*.

## IDirectInput8::EnumDevices

Enumerates available devices.

```
HRESULT EnumDevices(  
    DWORD dwDevType,  
    LPDIENUMCALLBACK lpCallback,  
    LPVOID pvRef,  
    DWORD dwFlags  
);
```

---

## Parameters

### *dwDevType*

Device type filter.

To restrict the enumeration to a particular type of device, set this parameter to a DI8DEVTYPE\_\* value. See **DIDEVICEINSTANCE**.

To enumerate a class of devices, use one of the following values.

DI8DEVCLASS\_ALL

All devices.

DI8DEVCLASS\_DEVICE

All devices that do not fall into another class.

DI8DEVCLASS\_GAMECTRL

All game controllers.

DI8DEVCLASS\_KEYBOARD

All keyboards. Equivalent to DI8DEVTYPE\_KEYBOARD.

DI8DEVCLASS\_POINTER

All devices of type DI8DEVTYPE\_MOUSE and  
DI8DEVTYPE\_SCREENPOINTER.

### *lpCallback*

Address of a callback function to be called once for each device enumerated. See **DIEnumDevicesCallback**.

### *pvRef*

Application-defined 32-bit value to be passed to the enumeration callback each time it is called.

### *dwFlags*

Flag value that specifies the scope of the enumeration. This parameter can be one or more of the following values:

DIEDFL\_ALLDEVICES

All installed devices are enumerated. This is the default behavior.

DIEDFL\_ATTACHEDONLY

Only attached and installed devices.

DIEDFL\_FORCEFEEDBACK

Only devices that support force feedback.

DIEDFL\_INCLUDEALIASES

Include devices that are aliases for other devices.

DIEDFL\_INCLUDEHIDDEN

Include hidden devices. For more information about hidden devices, see **DIDEVCAPS**.

DIEDFL\_INCLUDEPHANTOMS

Include phantom (placeholder) devices.

## Return Values

If the method succeeds, the return value is `DI_OK`.

If the method fails, the return value can be one of the following error values:

`DIERR_INVALIDPARAM`  
`DIERR_NOTINITIALIZED`

## Remarks

All installed devices can be enumerated, even if they are not present. For example, a flight stick might be installed on the system but not currently plugged into the computer. Set the *dwFlags* parameter to indicate whether only attached or all installed devices should be enumerated. If the `DIEDFL_ATTACHEDONLY` flag is not present, all installed devices are enumerated.

A preferred device type can be passed as a *dwDevType* filter so that only the devices of that type are enumerated.

## 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 `Dinput.h`.

## See Also

`IDirectInput8::EnumDevicesBySemantics`

## IDirectInput8::EnumDevicesBySemantics

Enumerates devices that most closely match the application-specified action map.

```
HRESULT EnumDevicesBySemantics(
    LPCTSTR pszUserName,
    LPDIACTIONFORMAT lpdiActionFormat,
    LPDIENUMDEVICESBYSEMANTICSCB lpCallback,
    LPVOID pvRef,
    DWORD dwFlags
);
```

## Parameters

*pszUserName*

String identifying the current user, or `NULL` to specify the user logged onto the system. The user name is taken into account when enumerating devices. A device

with user mappings is preferred to a device without any user mappings. By default, devices in use by other users are not enumerated for this user.

*lpdiActionFormat*

Address of a **DIACTIONFORMAT** structure that specifies the action map for which suitable devices are enumerated.

*lpCallback*

Address of a callback function to be called once for each device enumerated. See **DIEnumDevicesBySemanticsCallback**.

*pvRef*

Application-defined 32-bit value to pass to the enumeration callback each time it is called.

*dwFlags*

Flag value that specifies the scope of the enumeration. This parameter can be one or more of the following values.

**DIEDBSFL\_ATTACHEDONLY**

Only attached and installed devices are enumerated.

**DIEDBSFL\_AVAILABLEDEVICES**

Only unowned, installed devices are enumerated.

**DIEDBSFL\_FORCEFEEDBACK**

Only devices that support force feedback are enumerated.

**DIEDBSFL\_MULTIMICEKEYBOARDS**

Only secondary (non-system) keyboard and mouse devices.

**DIEDBSFL\_NONGAMINGDEVICES**

Only HID-compliant devices whose primary purpose is not as a gaming device. Devices such as USB speakers and multimedia buttons on some keyboards would fall within this value.

**DIEDBSFL\_THISUSER**

All installed devices for the user identified by *ptszUserName*, and all unowned devices, are enumerated.

**DIEDBSFL\_VALID** is also defined in *Dinput.h*, but is not used by applications.

## Return Values

If the method succeeds, the return value is **DI\_OK**.

If the method fails, the return value can be one of the following error values.

**DIERR\_INVALIDPARAM**

**DIERR\_NOTINITIALIZED**

## Remarks

The keyboard and mouse are enumerated last.



## 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 Dinput.h.

## See Also

**IDirectInput8::EnumDevices**, Action Mapping.

## IDirectInput8::FindDevice

Retrieves the instance GUID of a device that has been newly attached to the system. It is called in response to a Microsoft® Win32® device management notification.

```
HRESULT FindDevice(  
    REFGUID rguidClass,  
    LPCTSTR pszName,  
    LPGUID pguidInstance  
);
```

## Parameters

*rguidClass*

Unique identifier of the device class for the device that the application is to locate. The application obtains the class GUID from the device arrival notification. For more information, see the documentation on the DBT\_DEVICEARRIVAL event in the Microsoft Platform Software Development Kit (SDK).

*pszName*

Name of the device. The application obtains the name from the device arrival notification.

*pguidInstance*

Address of a variable to receive the instance GUID for the device, if the device is found. This value can be passed to IDirectInput8::CreateDevice.

## Return Values

If the method succeeds, the return value is DI\_OK.

If the method fails, the return value can be DIERR\_DEVICENOTREG. Failure results if the GUID and name do not correspond to a device class that is registered with Microsoft® DirectInput®. For example, they might refer to a storage device, rather than an input device.

## 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 Dinput.h.

## IDirectInput8::GetDeviceStatus

Retrieves the status of a specified device.

```
HRESULT GetDeviceStatus(  
    REFGUID rguidInstance  
);
```

### Parameters

*rguidInstance*

Reference to (C++) or address of (C) the GUID identifying the instance of the device whose status is being checked.

### Return Values

If the method succeeds, the return value is DI\_OK if the device is attached to the system, or DI\_NOTATTACHED otherwise.

If the method fails, the return value can be one of the following error values:

```
DIERR_GENERIC  
DIERR_INVALIDPARAM  
DIERR_NOTINITIALIZED
```

## 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 Dinput.h.

## IDirectInput8::Initialize

Initializes a Microsoft® DirectInput® object. Applications normally do not need to call this method. The **DirectInput8Create** function automatically initializes the DirectInput object after creating it.

```
HRESULT Initialize(  
    HINSTANCE hinst,
```

```
DWORD dwVersion
);
```

## Parameters

*hinst*

Instance handle to the application or dynamic-link library (DLL) that is creating the DirectInput object. DirectInput uses this value to determine whether the application or DLL has been certified and to establish any special behaviors that might be necessary for backwards compatibility.

It is an error for a DLL to pass the handle of the parent application. For example, a Microsoft ActiveX® control embedded in a Web page that uses DirectInput must pass its own instance handle, and not the handle of the Web browser. This ensures that DirectInput recognizes the control and can enable any special behaviors that might be necessary.

*dwVersion*

Version number of DirectInput for which the application is designed. This value is normally DIRECTINPUT\_VERSION. Passing the version number of a previous version causes DirectInput to emulate that version.

## Return Values

If the method succeeds, the return value is DI\_OK.

If the method fails, the return value can be one of the following error values:

```
DIERR_BETADIRECTINPUTVERSION
DIERR_OLDDIRECTINPUTVERSION
```

## 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 Dinput.h.

## IDirectInput8::RunControlPanel

Runs Control Panel to enable the user to install a new input device or modify configurations.

```
HRESULT RunControlPanel(
    HWND hwndOwner,
    DWORD dwFlags
);
```

## Parameters

*hwndOwner*

Handle of the window to be used as the parent window for the subsequent user interface. If this parameter is NULL, no parent window is used.

*dwFlags*

Currently not used and must be set to 0.

## Return Values

If the method succeeds, the return value is `DI_OK`.

If the method fails, the return value can be one of the following error values:

`DIERR_INVALIDPARAM`

`DIERR_NOTINITIALIZED`

## 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 `Dinput.h`.

## See Also

**IDirectInputDevice8::RunControlPanel**

# IDirectInputDevice8

Applications use the methods of the **IDirectInputDevice8** interface to gain and release access to Microsoft® DirectInput® devices, manage device properties and information, set behavior, perform initialization, create and play force-feedback effects, and invoke a device's control panel.

The **IDirectInputDevice8** interface is obtained by using the **IDirectInput8::CreateDevice** method. For an example, see [Creating a DirectInput Device](#).

**IDirectInputDevice8** supersedes the **IDirectInputDevice**, **IDirectInputDevice2**, and **IDirectInputDevice7** interfaces used in previous versions of Microsoft® DirectX®, but does not inherit from them. Methods that share names with those from older interfaces perform similar services, but may not have exactly the same functionality or behavior. You cannot obtain the earlier interfaces by using **QueryInterface**.

The methods of the **IDirectInputDevice8** interface can be organized into the following groups.

---

<b>Accessing input devices</b>	<b>Acquire</b>
	<b>Unacquire</b>
<b>Action mapping</b>	<b>BuildActionMap</b>
	<b>GetImageInfo</b>
	<b>SetActionMap</b>
<b>Device information</b>	<b>GetCapabilities</b>
	<b>GetDeviceData</b>
	<b>GetDeviceInfo</b>
	<b>GetDeviceState</b>
	<b>Poll</b>
	<b>SetDataFormat</b>
	<b>SetEventNotification</b>
<b>Device objects</b>	<b>EnumObjects</b>
	<b>GetObjectInfo</b>
<b>Device properties</b>	<b>GetProperty</b>
	<b>SetCooperativeLevel</b>
	<b>SetProperty</b>
<b>Force feedback</b>	<b>CreateEffect</b>
	<b>EnumCreatedEffectObjects</b>
	<b>EnumEffects</b>
	<b>EnumEffectsInFile</b>
	<b>Escape</b>
	<b>GetEffectInfo</b>
	<b>GetForceFeedbackState</b>
	<b>SendForceFeedbackCommand</b>
	<b>WriteEffectToFile</b>
<b>Miscellaneous</b>	<b>Initialize</b>
	<b>RunControlPanel</b>
	<b>SendDeviceData</b>

The **IDirectInputDevice8** interface, like all COM interfaces, inherits the **IUnknown** interface methods. The **IUnknown** interface supports the following three methods:

<b>IUnknown</b>	<b>AddRef</b>
	<b>QueryInterface</b>
	<b>Release</b>

The **LPDIRECTINPUTDEVICE8** type is defined as a pointer to the **IDirectInputDevice8** interface:

```
typedef struct IDirectInputDevice8 *LPDIRECTINPUTDEVICE8;
```

## 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 Dinput.h.

## See Also

**IDirectInputDevice8**

## IDirectInputDevice8::Acquire

Obtains access to the input device.

**HRESULT Acquire();**

## Parameters

None.

## Return Values

If the method succeeds, the return value is DI\_OK, or S\_FALSE if the device was already acquired.

If the method fails, the return value can be one of the following error values:

DIERR\_INVALIDPARAM  
DIERR\_NOTINITIALIZED  
DIERR\_OTHERAPPHASPRIO

## Remarks

Before a device can be acquired, a data format must be set by using the **IDirectInputDevice8::SetDataFormat** method or **IDirectInputDevice8::SetActionMap** method. If the data format has not been set, **Acquire** returns DIERR\_INVALIDPARAM.

Devices must be acquired before calling the **IDirectInputDevice8::GetDeviceState** or **IDirectInputDevice8::GetDeviceData** methods for that device.

Device acquisition does not use a reference count. Therefore, if an application calls the **IDirectInputDevice8::Acquire** method twice, then calls the **IDirectInputDevice8::Unacquire** method once, the device is unacquired.

## 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 Dinput.h.

## IDirectInputDevice8::BuildActionMap

Builds an action map for the device and retrieves information about it.

```
HRESULT BuildActionMap(  
    LPDIACTIONFORMAT lpdiaf,  
    LPCWSTR lpszUserName  
    DWORD dwFlags  
);
```

### Parameters

*lpdiaf*

Address of a **DIACTIONFORMAT** structure that receives information about the action map.

*lpszUserName*

Pointer to a string that specifies the name of the user for whom mapping is requested. If NULL, the current user is assumed.

*dwFlags*

Flags to control the mapping. This can be one of the following values.

**DIDBAM\_DEFAULT**

Overwrite all mappings except application-specified mappings; that is, mappings that have the **DIA\_APPMAPPED** flag in the **DIACTION** structure.

**DIDBAM\_HWDEFAULTS**

Overwrite all mappings, including application-specified mappings. This flag is similar to **DIDBAM\_INITIALIZE**, but automatically overrides user-mapped actions with the defaults specified by the device driver or Microsoft® DirectInput®.

**DIDBAM\_INITIALIZE**

Overwrite all mappings, including application-specified mappings.

**DIDBAM\_PRESERVE**

Preserve current mappings assigned for this device or any other configured device.

### Return Values

If the method succeeds, the return value is **DI\_OK**, **DI\_NOEFFECT**, or **DI\_WRITEPROTECT**. See Remarks.

If the method fails, the return value can be one of the following error values.

DIERR\_INVALIDPARAM

DIERR\_MAPFILEFAIL

#### Remarks

The method returns DI\_NOEFFECT if no mappings were created for the device. For example, a keyboard or mouse will not provide mappings for genre-specific actions.

If DIERR\_INVALIDPARAM is returned, one or more of the mappings was not valid. The **dwHow** member of the **DIACTION** structure is set to DIAH\_ERROR. The application can iterate through the action map to find and correct errors.

If DIEFF\_MAPFILEFAIL is returned, an error has occurred either reading the vendor supplied file for the device or reading or writing the user configuration file for the device.

## 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 Dinput.h.

## See Also

IDirectInputDevice8::SetActionMap, IDirectInputDevice8::SetDataFormat

## IDirectInputDevice8::CreateEffect

Creates and initializes an instance of an effect identified by the effect GUID.

```
HRESULT CreateEffect(
    REFGUID rguid,
    LPCDIEFFECT lpeff,
    LPDIRECTINPUTEFFECT *ppdeff,
    LPUNKNOWN punkOuter
);
```

## Parameters

*rguid*

Reference to (C++) or address of (C) the GUID identifying the effect to be created. This can be a predefined effect GUID, or it can be a GUID obtained from **IDirectInputDevice8::EnumEffects**.

The following standard effect GUIDs are defined:

- GUID\_ConstantForce



- GUID\_RampForce
- GUID\_Square
- GUID\_Sine
- GUID\_Triangle
- GUID\_SawtoothUp
- GUID\_SawtoothDown
- GUID\_Spring
- GUID\_Damper
- GUID\_Inertia
- GUID\_Friction
- GUID\_CustomForce

*lpdeff*

**DIEFFECT** structure that provides parameters for the created effect. This parameter is optional. If it is NULL, the effect object is created without parameters. The application must then call the

**IDirectInputEffect::SetParameters** method to set the parameters of the effect before it can download the effect.

*ppdeff*

Address of a variable to receive a pointer to the **IDirectInputEffect** interface if successful.

*punkOuter*

Controlling unknown for COM aggregation. The value is NULL if the interface is not aggregated. Most callers pass NULL.

## Return Values

If the method succeeds, the return value is DI\_OK.

If the method fails, the return value can be one of the following error values:

DIERR\_DEVICEFULL  
DIERR\_DEVICENOTREG  
DIERR\_INVALIDPARAM  
DIERR\_NOTINITIALIZED

If the return value is S\_OK, the effect was created, and the parameters of the effect were updated, but the effect was not necessarily downloaded. For it to be downloaded, the device must be acquired in exclusive mode.

## 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 Dinput.h.

## IDirectInputDevice8::EnumCreatedEffect Objects

Enumerates all the currently created effects for this device. Effects created by **IDirectInputDevice8::CreateEffect** are enumerated.

```
HRESULT EnumCreatedEffectObjects(  
    LPDIENUMCREATEEFFECTOBJECTSCALLBACK lpCallback,  
    LPVOID pvRef,  
    DWORD fl  
);
```

### Parameters

*lpCallback*

Address of an application-defined callback function. Microsoft® DirectInput® provides the prototype function **DIEnumCreatedEffectObjectsCallback**.

*pvRef*

Reference data (context) for callback.

*fl*

No flags are currently defined. This parameter must be 0.

### Return Values

If the method succeeds, the return value is **DI\_OK**.

If the method fails, the return value can be one of the following error values:

**DIERR\_INVALIDPARAM**  
**DIERR\_NOTINITIALIZED**

### Remarks

The results are unpredictable if you create or destroy an effect while an enumeration is in progress. However, the callback function can safely release the effect passed to it.

### 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 Dinput.h.

## IDirectInputDevice8::EnumEffects

Enumerates all the effects supported by the force-feedback system on the device. The enumerated GUIDs can represent predefined effects, as well as effects peculiar to the device manufacturer.

```
HRESULT EnumEffects(  
    LPDIENUMEFFECTSCALLBACK lpCallback,  
    LPVOID pvRef,  
    DWORD dwEffType  
);
```

### Parameters

*lpCallback*

Address of an application-defined callback function. The declaration of this function must conform to that of the **DIEnumEffectsCallback** prototype.

*pvRef*

A 32-bit application-defined value to be passed to the callback function. This parameter can be any 32-bit type; it is declared as **LPVOID** for convenience.

*dwEffType*

Effect type filter. Use one of the **DIEFT\_\*** values to indicate the effect type to be enumerated, or **DIEFT\_ALL** to enumerate all effect types. For a list of these values, see **DIEFFECTINFO**.

### Return Values

If the method succeeds, the return value is **DI\_OK**.

If the method fails, the return value can be one of the following error values:

```
DIERR_INVALIDPARAM  
DIERR_NOTINITIALIZED
```

If the callback stops the enumeration prematurely, the enumeration is considered to have succeeded.

### Remarks

An application can use the **dwEffType** member of the **DIEFFECTINFO** structure to obtain general information about the effect, such as its type and which envelope and condition parameters are supported by the effect.

To exploit an effect to its fullest, contact the device manufacturer to obtain information on the semantics of the effect and its effect-specific parameters.

## 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 Dinput.h.

## IDirectInputDevice8::EnumEffectsInFile

Enumerates all the effects in a file created by the Force Editor utility or another application using the same file format.

```
HRESULT EnumEffectsInFile(
    LPCSTR lpzFileName,
    LPNUMEFFECTSINFILECALLBACK pec,
    LPVOID pvRef,
    DWORD dwFlags
);
```

### Parameters

*lpzFileName*

Name of the RIFF file.

*pec*

Address of an application-defined callback function. The declaration of this function must conform to that of the **DIEnumEffectsInFileCallback** prototype.

*pvRef*

Application-defined value to be passed to the callback function. This parameter can be any 32-bit type.

*dwFlags*

Can be **DIFEF\_DEFAULT** ( = 0 ) or one or both of the following values:

**DIFEF\_INCLUDENONSTANDARD**

Include effect types that are not defined by Microsoft® DirectInput®.

**DIFEF\_MODIFYIFNEEDED**

Instruct DirectInput to modify the authored effect, if necessary, so that it plays on the current device. For example, by default, an effect authored for two axes does not play on a single-axis device. Setting this flag allows the effect to play on a single axis. The parameters are modified in the **DIEFFECT** structure pointed to by the **lpDiEffect** member of the **DIFILEEFFECT** structure passed to the callback.

### Return Values

If the method succeeds, the return value is **DI\_OK**.

If the method fails, the return value can be one of the following error values:

DIERR\_INVALIDPARAM  
DIERR\_NOTINITIALIZED

If the callback stops the enumeration prematurely, the enumeration is considered to have succeeded.

## 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 Dinput.h.

## See Also

**IDirectInputDevice8::WriteEffectToFile**, Loading Effects from a File

# IDirectInputDevice8::EnumObjects

Enumerates the input and output objects available on a device.

```
HRESULT EnumObjects(  
    LPDIENUMDEVICEOBJECTSCALLBACK lpCallback,  
    LPVOID pvRef,  
    DWORD dwFlags  
);
```

## Parameters

*lpCallback*

Address of a callback function that receives DirectInputDevice objects. Microsoft® DirectInput® provides a prototype of this function as **DIEnumDeviceObjectsCallback**.

*pvRef*

Reference data (context) for callback.

*dwFlags*

Flags that specify the types of object to be enumerated. Each of the following values restricts the enumeration to objects of the described type:

DIDFT\_ABSAXIS

An absolute axis.

DIDFT\_ALIAS

Controls identified by a Human Interface Device usage alias. This flag applies only to HID-compliant USB devices.

DIDFT\_ALL

All objects.

**DIDFT\_AXIS**

An axis, either absolute or relative.

**DIDFT\_BUTTON**

A push button or a toggle button.

**DIDFT\_COLLECTION**

A Human Interface Device (HID) link collection. HID link collections do not generate data of their own.

**DIDFT\_ENUMCOLLECTION(*n*)**

An object that belongs to HID link collection number *n*.

**DIDFT\_FFACTUATOR**

An object that contains a force-feedback actuator. In other words, forces can be applied to this object.

**DIDFT\_FFEFFECTTRIGGER**

An object that can be used to trigger force-feedback effects.

**DIDFT\_NOCOLLECTION**

An object that does not belong to any HID link collection; in other words, an object for which the **wCollectionNumber** member of the **DIDDEVICEOBJECTINSTANCE** structure is 0.

**DIDFT\_NODATA**

An object that does not generate data.

**DIDFT\_OUTPUT**

An object to which data can be sent by using the **IDirectInputDevice8::SendDeviceData** method.

**DIDFT\_POV**

A point-of-view controller.

**DIDFT\_PSHBUTTON**

A push button. A push button is reported as down when the user presses it and as up when the user releases it.

**DIDFT\_RELAXIS**

A relative axis.

**DIDFT\_TGLBUTTON**

A toggle button. A toggle button is reported as down when the user presses it and remains so until the user presses the button a second time.

**DIDFT\_VENDORDEFINED**

An object of a type defined by the manufacturer.

## Return Values

If the method succeeds, the return value is **DI\_OK**.

If the method fails, the return value can be one of the following error values:

**DIERR\_INVALIDPARAM**

**DIERR\_NOTINITIALIZED**

## Remarks

The `DIDFT_FFACTUATOR` and `DIDFT_FFEFFECTTRIGGER` flags in the *dwFlags* parameter restrict enumeration to objects that meet all the criteria defined by the included flags. For all the other flags, an object is enumerated if it meets the criterion defined by any included flag in this category. For example, (`DIDFT_FFACTUATOR` | `DIDFT_FFEFFECTTRIGGER`) restricts enumeration to force-feedback trigger objects, and (`DIDFT_FFEFFECTTRIGGER` | `DIDFT_TGLBUTTON` | `DIDFT_PSHBUTTON`) restricts enumeration to buttons of any kind that can be used as effect triggers.

Applications should not rely on this method to determine whether certain keyboard keys or indicator lights are present, as these objects might be enumerated even though they are not present. Although the basic set of available objects can be determined from the device subtype, there is no reliable way of determining whether extra objects such as the menu key are available.

## 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 `Dinput.h`.

## IDirectInputDevice8::Escape

Sends a hardware-specific command to the force-feedback driver.

```
HRESULT Escape(  
    LPDIEFFESCAPE pesc  
);
```

## Parameters

*pesc*

**DIEFFESCAPE** structure that describes the command to be sent. On success, the **cbOutBuffer** member contains the number of bytes of the output buffer actually used.

## Return Values

If the method succeeds, the return value is `DI_OK`.

If the method fails, the return value can be one of the following error values:

`DIERR_DEVICEFULL`  
`DIERR_NOTINITIALIZED`

Other device-specific error codes are also possible. Ask the hardware manufacturer for details.

## Remarks

Because each driver implements different escapes, it is the application's responsibility to ensure that it is sending the escape to the correct driver by comparing the value of the **guidFFDriver** member of the **DIDeviceInstance** structure against the value the application is expecting.

## 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 Dinput.h.

## IDirectInputDevice8::GetCapabilities

Obtains the capabilities of the DirectInputDevice object.

```
HRESULT GetCapabilities(  
    LPDIDEVCAPS lpDIDevCaps  
);
```

## Parameters

*lpDIDevCaps*

Address of a **DIDEVCAPS** structure to be filled with the device capabilities. The **dwSize** member of this structure must be initialized before calling this method.

## Return Values

If the method succeeds, the return value is **DI\_OK**.

If the method fails, the return value can be one of the following error values:

**DIERR\_INVALIDPARAM**  
**DIERR\_NOTINITIALIZED**  
**E\_POINTER**

## Remarks

For compatibility with Microsoft® DirectX® 3, it is also valid to pass a **DIDEVCAPS\_DX3** structure with the **dwSize** member initialized to **sizeof(DIDEVCAPS\_DX3)**.



## 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 Dinput.h.

## IDirectInputDevice8::GetDeviceData

Retrieves buffered data from the device.

```
HRESULT GetDeviceData(  
    DWORD cbObjectData,  
    LPDIDEVICEOBJECTDATA rgdod,  
    LPDWORD pdwInOut,  
    DWORD dwFlags  
);
```

### Parameters

*cbObjectData*

Size of the **DIDEVICEOBJECTDATA** structure, in bytes.

*rgdod*

Array of **DIDEVICEOBJECTDATA** structures to receive the buffered data.

The number of elements in this array must be equal to the value of the *pdwInOut* parameter. If this parameter is NULL, the buffered data is not stored anywhere, but all other side-effects take place.

*pdwInOut*

On entry, the number of elements in the array pointed to by the *rgdod* parameter.

On exit, the number of elements actually obtained.

*dwFlags*

Flags that control the manner in which data is obtained. This value can be 0 or the following flag:

**DIGDD\_PEEK**

Do not remove the items from the buffer. A subsequent

**IDirectInputDevice8::GetDeviceData** call will read the same data.

Normally, data is removed from the buffer after it is read.

### Return Values

If the method succeeds, the return value is **DI\_OK** or **DI\_BUFFEROVERFLOW**.

If the method fails, the return value can be one of the following error values:

**DIERR\_INPUTLOST**

**DIERR\_INVALIDPARAM**

DIERR\_NOTACQUIRED  
 DIERR\_NOTBUFFERED  
 DIERR\_NOTINITIALIZED

## Remarks

Before device data can be obtained, you must set the data format and the buffer size by using the **IDirectInputDevice8::SetDataFormat** and **IDirectInputDevice8::SetProperty** methods, or by using the **IDirectInputDevice8::SetActionMap** method. You must also acquire the device by using the **IDirectInputDevice8::Acquire** method.

The following code example reads up to ten buffered data elements, removing them from the device buffer as they are read.

```
DIDeviceObjectData rgdod[10];
DWORD dwItems = 10;
hres = IDirectInputDevice8_GetDeviceData(
    sizeof(DIDeviceObjectData),
    rgdod,
    &dwItems,
    0);
if (SUCCEEDED(hres)) {
    // dwItems = number of elements read (could be zero)
    if (hres == DI_BUFFEROVERFLOW) {
        // Buffer had overflowed.
    }
}
```

Your application can flush the buffer and retrieve the number of flushed items by specifying NULL for the *rgdod* parameter and a pointer to a variable containing INFINITE for the *pdwInOut* parameter. The following code example illustrates how this can be done:

```
dwItems = INFINITE;
hres = IDirectInputDevice8_GetDeviceData(
    pdid,
    sizeof(DIDeviceObjectData),
    NULL,
    &dwItems,
    0);
if (SUCCEEDED(hres)) {
    // Buffer successfully flushed
    // dwItems = number of elements flushed
    if (hres == DI_BUFFEROVERFLOW) {
        // Buffer had overflowed.
    }
}
```

```
}

```

Your application can query for the number of elements in the device buffer by setting the *rgdod* parameter to NULL, setting *pdwInOut* to INFINITE and setting *dwFlags* to DIGDD\_PEEK. The following code example illustrates how this can be done:

```
dwItems = INFINITE;
hres = IDirectInputDevice8_GetDeviceData(
    pdid,
    sizeof(DIDEVICEOBJECTDATA),
    NULL,
    &dwItems,
    DIGDD_PEEK);
if (SUCCEEDED(hres)) {
    // dwItems = number of elements in buffer
    if (hres == DI_BUFFEROVERFLOW) {
        // Buffer overflow occurred; not all data
        // was successfully captured.
    }
}
```

To query about whether a buffer overflow has occurred, set the *rgdod* parameter to NULL and the *pdwInOut* parameter to 0. The following code example illustrates how this can be done:

```
dwItems = 0;
hres = IDirectInputDevice8_GetDeviceData(
    pdid,
    sizeof(DIDEVICEOBJECTDATA),
    NULL,
    &dwItems,
    0);
if (hres == DI_BUFFEROVERFLOW) {
    // Buffer overflow occurred
}
```

## 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 Dinput.h.

## See Also

**IDirectInputDevice8::Poll**, Polling and Event Notification

---

## IDirectInputDevice8::GetDeviceInfo

Obtains information about the device's identity.

```
HRESULT GetDeviceInfo(  
    LPDIDEVICEINSTANCE pdidi  
);
```

### Parameters

*pdidi*

Address of a **DIDEVICEINSTANCE** structure to be filled with information about the device's identity. An application must initialize the structure's **dwSize** member before calling this method.

### Return Values

If the method succeeds, the return value is **DI\_OK**.

If the method fails, the return value can be one of the following error values:

```
DIERR_INVALIDPARAM  
DIERR_NOTINITIALIZED  
E_POINTER
```

### Remarks

For compatibility with Microsoft® DirectX 3®, it is also valid to pass a **DIDEVICEINSTANCE\_DX3** structure with the **dwSize** member initialized to **sizeof(DIDEVICEINSTANCE\_DX3)**.

### 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 **Dinput.h**.

## IDirectInputDevice8::GetDeviceState

Retrieves immediate data from the device.

```
HRESULT GetDeviceState(  
    DWORD cbData,  
    LPVOID lpvData  
);
```

## Parameters

*cbData*

Size of the buffer in the *lpvData* parameter, in bytes.

*lpvData*

Address of a structure that receives the current state of the device. The format of the data is established by a prior call to the

**IDirectInputDevice8::SetDataFormat** method.

## Return Values

If the method succeeds, the return value is **DI\_OK**.

If the method fails, the return value can be one of the following error values:

**DIERR\_INPUTLOST**  
**DIERR\_INVALIDPARAM**  
**DIERR\_NOTACQUIRED**  
**DIERR\_NOTINITIALIZED**  
**E\_PENDING**

## Remarks

Before device data can be obtained, set the cooperative level by using the **IDirectInputDevice8::SetCooperativeLevel** method, then set the data format by using **IDirectInputDevice8::SetDataFormat**, and acquire the device by using the **IDirectInputDevice8::Acquire** method.

The five predefined data formats require corresponding device state structures according to the following table:

Data format	State structure
<i>c_dfDIMouse</i>	<b>DIMOUSESTATE</b>
<i>c_dfDIMouse2</i>	<b>DIMOUSESTATE2</b>
<i>c_dfDIKeyboard</i>	array of 256 bytes
<i>c_dfDIJoystick</i>	<b>DIJOYSTATE</b>
<i>c_dfDIJoystick2</i>	<b>DIJOYSTATE2</b>

For example, if you passed the *c\_dfDIMouse* format to the **IDirectInputDevice8::SetDataFormat** method, you must pass a **DIMOUSESTATE** structure to the **IDirectInputDevice8::GetDeviceState** method.

## 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 Dinput.h.

## See Also

**IDirectInputDevice8::Poll**, Polling and Event Notification, Buffered and Immediate Data

## IDirectInputDevice8::GetEffectInfo

Obtains information about an effect.

```
HRESULT GetEffectInfo(  
    LPDIEFFECTINFO pdei,  
    REFGUID rguid  
);
```

## Parameters

*pdei*

**DIEFFECTINFO** structure that receives information about the effect. The caller must initialize the **dwSize** member of the structure before calling this method.

*rguid*

Reference to (C++) or address of (C) the GUID identifying the effect for which information is being requested.

## Return Values

If the method succeeds, the return value is **DI\_OK**.

If the method fails, the return value can be one of the following error values:

**DIERR\_DEVICENOTREG**  
**DIERR\_INVALIDPARAM**  
**DIERR\_NOTINITIALIZED**  
**E\_POINTER**

## Note

If this method is called on a non-Force Feedback device, **E\_POINTER** will be returned.

## 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 Dinput.h.

## IDirectInputDevice8::GetForceFeedbackState

Retrieves the state of the device's force-feedback system.

```
HRESULT GetForceFeedbackState(  
    LPDWORD pdwOut  
);
```

### Parameters

*pdwOut*

Location for flags that describe the current state of the device's force-feedback system.

The value is a combination of the following constants:

**DIGFFS\_ACTUATORSOFF**

The device's force-feedback actuators are disabled.

**DIGFFS\_ACTUATORSON**

The device's force-feedback actuators are enabled.

**DIGFFS\_DEVICELOST**

The device suffered an unexpected failure and is in an indeterminate state. It must be reset either by unacquiring and reacquiring the device, or by sending a **DISFFC\_RESET** command.

**DIGFFS\_EMPTY**

The device has no downloaded effects.

**DIGFFS\_PAUSED**

Playback of all active effects has been paused.

**DIGFFS\_POWEROFF**

The force-feedback system is not currently available. If the device cannot report the power state, neither **DIGFFS\_POWERON** nor **DIGFFS\_POWEROFF** is returned.

**DIGFFS\_POWERON**

Power to the force-feedback system is currently available. If the device cannot report the power state, neither **DIGFFS\_POWERON** nor **DIGFFS\_POWEROFF** is returned.

**DIGFFS\_SAFETYSWITCHOFF**

The safety switch is currently off; that is, the device cannot operate. If the device cannot report the state of the safety switch, neither **DIGFFS\_SAFETYSWITCHON** nor **DIGFFS\_SAFETYSWITCHOFF** is returned.

**DIGFFS\_SAFETYSWITCHON**

The safety switch is currently on; that is, the device can operate. If the device cannot report the state of the safety switch, neither

DIGFFS\_SAFETYSWITCHON nor DIGFFS\_SAFETYSWITCHOFF is returned.

#### DIGFFS\_STOPPED

No effects are playing, and the device is not paused.

#### DIGFFS\_USERFFSWITCHOFF

The user force-feedback switch is currently off; that is, the device cannot operate. If the device cannot report the state of the user force-feedback switch, neither DIGFFS\_USERFFSWITCHON nor DIGFFS\_USERFFSWITCHOFF is returned.

#### DIGFFS\_USERFFSWITCHON

The user force-feedback switch is currently on; that is, the device can operate. If the device cannot report the state of the user force-feedback switch, neither DIGFFS\_USERFFSWITCHON nor DIGFFS\_USERFFSWITCHOFF is returned.

Future versions of Microsoft® DirectInput® can define additional flags. Applications should ignore any flags that are not currently defined.

## Return Values

If the method succeeds, the return value is DI\_OK.

If the method fails, the return value can be one of the following error values:

DIERR\_INPUTLOST

DIERR\_INVALIDPARAM

DIERR\_NOTEXCLUSIVEACQUIRED

DIERR\_NOTINITIALIZED

DIERR\_UNSUPPORTED

## Remarks

The device must be acquired at the exclusive cooperative level for this method to succeed.

## 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 Dinput.h.

## IDirectInputDevice8::GetImageInfo

Retrieves information about a device image for use in a configuration property sheet.

**HRESULT GetImageInfo(**



---

```
LPDIDEVICEIMAGEINFOHEADER lpdiDevImageInfoHeader
);
```

## Parameters

*lpdiDevImageInfoHeader*

Address of a **DIDEVICEIMAGEINFOHEADER** structure that receives information about the device image.

## Return Values

If the method succeeds, the return value is **DI\_OK**.

If the method fails, the return value can be one of the following error values.

```
DIERR_INVALIDPARAM
DIERR_MAPFILEFAIL
DIERR_MOREDATA
DIERR_NOTINITIALIZED
DIERR_OBJECTNOTFOUND
```

## 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 *Dinput.h*.

## IDirectInputDevice8::GetObjectInfo

Retrieves information about a device object, such as a button or axis.

```
HRESULT GetObjectInfo(
    LPDIDEVICEOBJECTINSTANCE pdidoi,
    DWORD dwObj,
    DWORD dwHow
);
```

## Parameters

*pdidoi*

Address of a **DIDEVICEOBJECTINSTANCE** structure to be filled with information about the object. The structure's **dwSize** member must be initialized before this method is called.

*dwObj*

Value that identifies the object whose information is to be retrieved. The value set for this parameter depends on the value specified in the *dwHow* parameter.

*dwHow*

Value that specifies how the *dwObj* parameter should be interpreted. This value can be one of the following:

Value	Meaning
DIPH_BYOFFSET	The <i>dwObj</i> parameter is the offset into the current data format of the object whose information is being accessed.
DIPH_BYID	The <i>dwObj</i> parameter is the object type/instance identifier. This identifier is returned in the <b>dwType</b> member of the <b>DIDEVICEOBJECTINSTANCE</b> structure returned from a previous call to the <b>IDirectInputDevice8::EnumObjects</b> method.
DIPH_BYUSAGE	The <i>dwObj</i> parameter contains the HID Usage Page and Usage values of the object, combined by the <b>DIMAKEUSAGEDWORD</b> macro.

## Return Values

If the method succeeds, the return value is **DI\_OK**.

If the method fails, the return value can be one of the following error values:

**DIERR\_INVALIDPARAM**  
**DIERR\_NOTINITIALIZED**  
**DIERR\_OBJECTNOTFOUND**  
**E\_POINTER**

## Remarks

For compatibility with Microsoft® DirectX® 3, it is also valid to pass a **DIDEVICEOBJECTINSTANCE\_DX3** structure with the **dwSize** member initialized to **sizeof(DIDEVICEOBJECTINSTANCE\_DX3)**.

## 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 **Dinput.h**.

## IDirectInputDevice8::GetProperty

Retrieves information about the input device.

```

HRESULT GetProperty(
    REFGUID rguidProp,
    LPDIPROPHEADER pdiph
);

```

## Parameters

### *rguidProp*

Reference to (C++) or address of (C) the GUID identifying the property to be retrieved. This can be one of the predefined values or a pointer to a GUID that identifies the property. The following properties are predefined for an input device:

#### DIPROP\_APPDATA

Retrieves the application-defined value associated with an in-game action, as a **DIPROPPOINTER**.

#### DIPROP\_AUTOCENTER

Determines whether device objects are self-centering. The value returned can be DIPROPAutoCenter\_Off or DIPROPAutoCenter\_On. See **IDirectInputDevice8::SetProperty** for more information.

#### DIPROP\_AXISMODE

Retrieves the axis mode. The retrieved value can be DIPROP\_AXISMODE\_ABS or DIPROP\_AXISMODE\_REL.

#### DIPROP\_BUFFERSIZE

Retrieves the input buffer size.

The buffer size determines the amount of data that the buffer can hold between calls to the **IDirectInputDevice8::GetDeviceData** method before data is lost. This value can be set to 0 to indicate that the application will not be reading buffered data from the device. If the buffer size in the **dwData** member of the **DIPROPDWORD** structure is too large to be supported by the device, the largest possible buffer size is set. To determine whether the requested buffer size was set, retrieve the buffer-size property, and compare the result with the value that you previously attempted to set.

#### DIPROP\_CALIBRATIONMODE

For use by device drivers; not used by applications.

#### DIPROP\_CPOINTS

Retrieves calibration points used for the adjustment of incoming raw data as a **DIPROPCPOINTS** structure.

#### DIPROP\_DEADZONE

Retrieves a value for the dead zone of a joystick, in the range from 0 through 10,000, where 0 indicates that there is no dead zone, 5,000 indicates that the dead zone extends over 50 percent of the physical range of the axis on both sides of center, and 10,000 indicates that the entire physical range of the axis is dead. When the axis is within the dead zone, it is reported as being at the center of its range.

#### DIPROP\_FFGAIN

Retrieves the gain of the device. See **IDirectInputDevice8::SetProperty** for more information.

#### DIPROP\_FFLOAD

Retrieves the memory load for the device. This setting applies to the entire device, rather than to any particular object, so the **dwHow** member of the associated **DIPROPDWORD** structure must be **DIPH\_DEVICE**. The retrieved value is in the range from 0 through 100, indicating the percentage of device memory in use. The device must be acquired in exclusive mode. If it is not, the method will fail with a return value of **DIERR\_NOTEXCLUSIVEACQUIRED**.

#### DIPROP\_GETPORTDISPLAYNAME

Retrieves the human-readable display name of the port to which this device is connected. Not generally used by applications. If no friendly name is returned, the method returns **S\_FALSE**.

#### DIPROP\_GRANULARITY

Retrieves the input granularity. Granularity represents the smallest distance over which the object reports movement. Most axis objects have a granularity of one; that is, all values are possible. Some axes have a larger granularity. For example, the wheel axis on a mouse can have a granularity of 20; that is, all reported changes in position are multiples of 20. In other words, when the user turns the wheel slowly, the device reports a position of 0, then 20, then 40, and so on. This is a read-only property.

#### DIPROP\_GUIDANDPATH

Retrieves the class GUID and device interface (path) for the device. This property lets advanced applications perform operations on a HID that are not supported by Microsoft® DirectInput®. For more information, see the reference for the **DIPROPGUIDANDPATH** structure.

#### DIPROP\_INSTANCENAME

Retrieves the friendly instance name of the device. For more information, see **IDirectInputDevice8::SetProperty**.

#### DIPROP\_JOYSTICKID

Retrieves the instance number of a joystick. This property is not implemented for the mouse or keyboard.

#### DIPROP\_KEYNAME

Retrieves the localized key name for a keyboard key, as a **DIPROPSTRING**.

#### DIPROP\_LOGICALRANGE

Retrieves the range of the raw data returned for axes on a HID. Devices can return negative values.

#### DIPROP\_PHYSICALRANGE

Retrieves the range of data for axes as suggested by the manufacturer of a HID. Values can be negative. Normally DirectInput® returns values from 0 through 0xFFFF, but the range can be made to conform to the manufacturer's suggested range by using **DIPROP\_RANGE**.

#### DIPROP\_PRODUCTNAME

Retrieves the friendly product name of the device. For more information, see **IDirectInputDevice8::SetProperty**.

#### DIPROP\_RANGE

Retrieves the range of values an object can possibly report. For some devices, this is a read-only property.

#### DIPROP\_SATURATION

Retrieves a value for the saturation zones of a joystick, in the range from 0 through 10,000. The saturation level is the point at which the axis is considered to be at its most extreme position. For example, if the saturation level is set to 9,500, the axis reaches the extreme of its range when it has moved 95 percent of the physical distance from its center position (or from the dead zone).

#### DIPROP\_SCANCODE

Retrieves the scan code for a keyboard key, as a **DIPROPDWORD**.

#### DIPROP\_USERNAME

Retrieves the user name for a user currently assigned to a device, as a DIPROPSTRING. User names are set by calling **IDirectInputDevice8::SetActionMap**. If no user name is set, the method returns S\_FALSE.

#### *pdiph*

Address of the **DIPROPHEADER** portion of a larger property-dependent structure that contains the **DIPROPHEADER** structure as a member. The following structures are used for properties:

#### **DIPROPDWORD**

Used for properties represented by a single numerical value.

#### **DIPROPGUIDANDPATH**

Used for DIPROP\_GUIDANDPATH.

#### **DIPROP\_RANGE**

Used for properties represented by a pair of numerical values. Currently, the only such property is DIPROP\_RANGE.

#### **DIPROPSTRING**

Used for string properties.

## Return Values

If the method succeeds, the return value is DI\_OK or S\_FALSE.

If the method fails, the return value can be one of the following error values:

DIERR\_INVALIDPARAM

DIERR\_NOTEXCLUSIVEACQUIRED

DIERR\_NOTINITIALIZED

DIERR\_OBJECTNOTFOUND

DIERR\_UNSUPPORTED

## Remarks

The following C example shows how to obtain the value of the DIPROP\_BUFFERSIZE property:

```
DIPROPDWORD dipdw; // DIPROPDWORD contains a DIPROPHEADER structure.
HRESULT hr;
dipdw.diph.dwSize      = sizeof(DIPROPDWORD);
dipdw.diph.dwHeaderSize = sizeof(DIPROPHEADER);
dipdw.diph.dwObj       = 0; // device property
dipdw.diph.dwHow       = DIPH_DEVICE;

hr = IDirectInputDevice8_GetProperty(pdid, DIPROP_BUFFERSIZE, &dipdw.diph);
if (SUCCEEDED(hr)) {
    // The dipdw.dwData member contains the buffer size.
}
```

## 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 Dinput.h.

## See Also

**IDirectInputDevice8::SetProperty**

## IDirectInputDevice8::Initialize

Initializes a DirectInputDevice object. The **IDirectInput8::CreateDevice** method automatically initializes a device after creating it; applications normally do not need to call this method.

```
HRESULT Initialize(
    HINSTANCE hinst,
    DWORD dwVersion,
    REFGUID rguid
);
```

## Parameters

*hinst*

Instance handle to the application or DLL that is creating the DirectInputDevice object. Microsoft® DirectInput® uses this value to determine whether the application or DLL has been certified and to establish any special behaviors that might be necessary for backward compatibility.

It is an error for a DLL to pass the handle to the parent application. For example, a Microsoft ActiveX® control embedded in a Web page that uses DirectInput must pass its own instance handle, and not the handle to the Web browser. This ensures that DirectInput recognizes the control and can enable any special behaviors that may be necessary.

*dwVersion*

Version number of DirectInput for which the application is designed. This value is normally `DIRECTINPUT_VERSION`. Passing the version number of a previous version causes DirectInput to emulate that version.

*rguid*

Reference to (C++) or address of (C) the GUID identifying the instance of the device with which the interface should be associated. The **IDirectInput8::EnumDevices** method can be used to determine which instance GUIDs are supported by the system.

## Return Values

If the method succeeds, the return value is `DI_OK` or `S_FALSE`.

If the method fails, the return value can be one of the following error values:

`DIERR_ACQUIRED`  
`DIERR_DEVICENOTREG`

If the method returns `S_FALSE`, the device had already been initialized with the instance GUID passed in though *rGUID*.

## Remarks

If this method fails, the underlying object should be considered to be in an indeterminate state and must be reinitialized before use.

## 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 `Dinput.h`.

## IDirectInputDevice8::Poll

Retrieves data from polled objects on a Microsoft® DirectInput® device. If the device does not require polling, calling this method has no effect. If a device that requires polling is not polled periodically, no new data is received from the device. Calling this method causes DirectInput to update the device state, generate input events (if buffered data is enabled), and set notification events (if notification is enabled).

**HRESULT Poll()**

## Parameters

None.

## Return Values

If the method succeeds, the return value is `DI_OK`, or `DI_NOEFFECT` if the device does not require polling.

If the method fails, the return value can be one of the following error values:

- `DIERR_INPUTLOST`
- `DIERR_NOTACQUIRED`
- `DIERR_NOTINITIALIZED`

## Remarks

Before a device data can be polled, the data format must be set by using the **IDirectInputDevice8::SetDataFormat** or **IDirectInputDevice8::SetActionMap** method, and the device must be acquired by using the **IDirectInputDevice8::Acquire** method.

## 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 `Dinput.h`.

## See Also

Polling and Event Notification

## IDirectInputDevice8::RunControlPanel

Runs the Microsoft® DirectInput® control panel associated with this device. If the device does not have a control panel associated with it, the default device control panel is launched.

```
HRESULT RunControlPanel(  
    HWND hwndOwner,  
    DWORD dwFlags  
);
```



## Parameters

*hwndOwner*

Parent window handle. If this parameter is NULL, no parent window is used.

*dwFlags*

Not currently used. Zero is the only valid value.

## Return Values

If the method succeeds, the return value is `DI_OK`.

If the method fails, the return value can be one of the following error values:

`DIERR_INVALIDPARAM`

`DIERR_NOTINITIALIZED`

## 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 `Dinput.h`.

## IDirectInputDevice8::SendDeviceData

Sends data to a device that accepts output. The device must be in an acquired state.

```
HRESULT SendDeviceData(
    DWORD cbObjectData,
    LPCDIDEVICEOBJECTDATA rgdod,
    LPDWORD pdwInOut,
    DWORD fl
);
```

## Parameters

*cbObjectData*

Size, in bytes, of a single **DIDEVICEOBJECTDATA** structure.

*rgdod*

Array of **DIDEVICEOBJECTDATA** structures containing the data to send to the device. It must consist of *\*pdwInOut* elements.

The **dwOfs** field of each **DIDEVICEOBJECTDATA** structure must contain the device object identifier (as obtained from the **dwType** field of the **DIDEVICEOBJECTINSTANCE** structure) for the device object to which the data is directed. The **dwTimeStamp** and **dwSequence** members must be 0.

*pdwInOut*

On entry, the variable pointed to by this parameter contains the number of elements in the array pointed to by *rgdod*. On exit, it contains the number of elements sent to the device.

*fl*

Flags controlling the manner in which data is sent. This can be 0 or the following value:

DISDD\_CONTINUE

The device data sent is overlaid on the previously sent device data. See Remarks.

## Return Values

If the method succeeds, the return value is DI\_OK.

If the method fails, the return value can be one of the following error values:

DIERR\_INPUTLOST

DIERR\_NOTACQUIRED

DIERR\_REPORTFULL

DIERR\_UNPLUGGED

## Remarks

There is no guarantee that the individual data elements will be sent in a particular order. However, data sent by successive calls to **IDirectInputDevice8::SendDeviceData** is not interleaved. Furthermore, if multiple pieces of data are sent to the same object with a single call, it is unspecified which piece of data is sent.

Consider, for example, a device that can be sent data in packets, each packet describing two pieces of information; call them A and B. Suppose the application attempts to send three data elements: B = 2, A = 1, and B = 0.

The actual device is sent a single packet. The A field of the packet contains the value 1, and the B field of the packet is either 2 or 0.

If the data must to be sent to the device exactly as specified, three calls to **IDirectInputDevice8::SendDeviceData** should be performed, each call sending one data element.

In response to the first call, the device is sent a packet in which the A field is blank and the B field contains the value 2.

In response to the second call, the device is sent a packet in which the A field contains the value 1, and the B field is blank.

Finally, in response to the third call, the device is sent a packet in which the A field is blank and the B field contains the value 0.

If the DISDD\_CONTINUE flag is set, the device data sent is overlaid on the previously sent device data. Otherwise, the device data sent does not include the previously sent device data.

For example, suppose a device supports two button outputs, Button0 and Button1. If an application first calls **IDirectInputDevice8::SendDeviceData** passing "Button0 pressed", a packet of the form "Button0 pressed, Button1 not pressed" is sent to the device. If the application then makes another call, passing "Button1 pressed" and the DISDD\_CONTINUE flag, a packet of the form "Button0 pressed, Button1 pressed" is sent to the device. However, if the application had not passed the DISDD\_CONTINUE flag, the packet sent to the device would have been "Button0 not pressed, Button1 pressed".

## 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 Dinput.h.

## IDirectInputDevice8::SendForceFeedbackCommand

Sends a command to the device's force-feedback system.

```
HRESULT SendForceFeedbackCommand(  
    DWORD dwFlags  
);
```

## Parameters

*dwFlags*

Single value indicating the desired change in state. The value can be one of the following:

DISFFC\_CONTINUE

Paused playback of all active effects is to be continued. It is an error to send this command when the device is not in a paused state.

DISFFC\_PAUSE

Playback of all active effects is to be paused. This command also stops the clock-on effects so that they continue playing to their full duration when restarted.

While the device is paused, new effects cannot be started, and existing ones cannot be modified. Doing so can cause the subsequent DISFFC\_CONTINUE command to fail to perform properly.

To abandon a pause and stop all effects, use the DISFFC\_STOPALL or DISFCC\_RESET commands.

**DISFFC\_RESET**

The device's force-feedback system is to be put in its startup state. All effects are removed from the device, are no longer valid, and must be recreated if they are to be used again. The device's actuators are disabled.

**DISFFC\_SETACTUATORSOFF**

The device's force-feedback actuators are to be disabled. While the actuators are off, effects continue to play but are ignored by the device. Using the analogy of a sound playback device, they are muted, rather than paused.

**DISFFC\_SETACTUATORSON**

The device's force-feedback actuators are to be enabled.

**DISFFC\_STOPALL**

Playback of any active effects is to be stopped. All active effects are reset, but are still being maintained by the device and are still valid. If the device is in a paused state, that state is lost.

This command is equivalent to calling the **IDirectInputEffect::Stop** method for each effect playing.

## Return Values

If the method succeeds, the return value is **DI\_OK**.

If the method fails, the return value can be one of the following error values:

**DIERR\_INPUTLOST**

**DIERR\_INVALIDPARAM**

**DIERR\_NOTEXCLUSIVEACQUIRED**

**DIERR\_NOTINITIALIZED**

**DIERR\_UNSUPPORTED**

## Remarks

The device must be acquired at the exclusive cooperative level for this method to succeed.

## 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 `Dinput.h`.

## IDirectInputDevice8::SetActionMap

Sets the data format for a device and maps application-defined actions to device objects. It also sets the buffer size for buffered data.

**Note**

The device must be unacquired prior to calling this method.

```
HRESULT SetActionMap(  
    LPCDIACTIONFORMAT lpdiActionFormat,  
    LPCWSTR lpszUserName,  
    DWORD dwFlags  
);
```

**Parameters**

*lpdiActionFormat*

Address of a **DIACTIONFORMAT** structure containing information about the action map to be applied.

*lpszUserName*

Unicode string that specifies the name of the user for which the action map is being set. A value of NULL specifies the user currently logged into the system.

*dwFlags*

**DWORD** value that specifies how the action map is applied. This can be one of the following values.

**DIDSAM\_DEFAULT**

Set the action map for this user. If the map differs from the current map, the new settings are saved to disk.

**DIDSAM\_FORCESAVE**

Always save the configuration to disk.

**DIDSAM\_NOUSER**

Reset user ownership for this device in the default configuration property sheet. Resetting user ownership does not remove the current action map.

**Return Values**

If the method succeeds, the return value can be one of the following error values:

**DI\_OK**

**DI\_SETTINGSNOTSAVED**

**DI\_WRITEPROTECT**

If the method fails, the return value can be one of the following error values.

**DIERR\_ACQUIRED**

**DIERR\_INVALIDPARAM**

## Remarks

This method provides the mechanism to change action-to-control mapping from the device defaults. An application must use this method to map its in-game actions to virtual controls.

The user name passed to this method binds a set of action mappings for a device to a specific user. Settings are automatically saved to disk when they differ from the currently applied map. Applications that accept input from multiple users should be very careful when applying action maps to the system mouse or keyboard, as the action maps for each user may conflict.

The method can be called only when the device is not acquired.

## 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 Dinput.h.

## See Also

**IDirectInputDevice8::BuildActionMap**

## IDirectInputDevice8::SetCooperativeLevel

Establishes the cooperative level for this instance of the device. The cooperative level determines how this instance of the device interacts with other instances of the device and the rest of the system.

```
HRESULT SetCooperativeLevel(  
    HWND hwnd,  
    DWORD dwFlags  
);
```

## Parameters

*hwnd*

Window handle to be associated with the device. This parameter must be a valid top-level window handle that belongs to the process. The window associated with the device must not be destroyed while it is still active in a Microsoft® DirectInput® device.

*dwFlags*

Flags that describe the cooperative level associated with the device. The following flags are defined:

**DISCL\_BACKGROUND**

The application requires background access. If background access is granted, the device can be acquired at any time, even when the associated window is not the active window.

**DISCL\_EXCLUSIVE**

The application requires exclusive access. If exclusive access is granted, no other instance of the device can obtain exclusive access to the device while it is acquired. However, nonexclusive access to the device is always permitted, even if another application has obtained exclusive access.

An application that acquires the mouse or keyboard device in exclusive mode should always unacquire the devices when it receives WM\_ENTERSIZEMOVE and WM\_ENTERMENULOOP messages. Otherwise, the user cannot manipulate the menu or move and resize the window.

**DISCL\_FOREGROUND**

The application requires foreground access. If foreground access is granted, the device is automatically unacquired when the associated window moves to the background.

**DISCL\_NONEXCLUSIVE**

The application requires nonexclusive access. Access to the device does not interfere with other applications that are accessing the same device.

**DISCL\_NOWINKEY**

Disable the Windows logo key. Setting this flag ensures that the user cannot inadvertently break out of the application. Note, however, that DISCL\_NOWINKEY has no effect when the default action mapping UI is displayed, and the Microsoft Windows® logo key will operate normally as long as that UI is present.

Applications must specify either DISCL\_FOREGROUND or DISCL\_BACKGROUND; it is an error to specify both or neither. Similarly, applications must specify either DISCL\_EXCLUSIVE or DISCL\_NONEXCLUSIVE.

**Return Values**

If the method succeeds, the return value is DI\_OK.

If the method fails, the return value can be one of the following error values:

DIERR\_INVALIDPARAM

DIERR\_NOTINITIALIZED

E\_HANDLE

## Remarks

If the system mouse is acquired in exclusive mode, the pointer is removed from the screen until the device is unacquired. This applies only to a mouse created by passing GUID\_SysMouse to **IDirectInput8::CreateDevice**.

Applications must call this method before acquiring the device by using the **IDirectInputDevice8::Acquire** method.

## 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 Dinput.h.

## See Also

Cooperative Levels

# IDirectInputDevice8::SetDataFormat

Sets the data format for the Microsoft® DirectInput® device.

```
HRESULT SetDataFormat(
    LPCDIDATAFORMAT lpdf
);
```

## Parameters

*lpdf*

Address of a structure that describes the format of the data that the DirectInputDevice should return. An application can define its own **DIDATAFORMAT** structure or use one of the following predefined global variables:

- *c\_dfDIKeyboard*
- *c\_dfDIMouse*
- *c\_dfDIMouse2*
- *c\_dfDIJoystick*
- *c\_dfDIJoystick2*

## Return Values

If the method succeeds, the return value is DI\_OK.

If the method fails, the return value can be one of the following error values:



DIERR\_ACQUIRED  
DIERR\_INVALIDPARAM  
DIERR\_NOTINITIALIZED

## Remarks

The data format must be set before the device can be acquired by using the **IDirectInputDevice8::Acquire** method. It is necessary to set the data format only once. The data format cannot be changed while the device is acquired.

If the application is using action mapping, the data format is set instead by the call to **IDirectInputDevice8::SetActionMap**.

## 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 Dinput.h.

## See Also

**IDirectInputDevice8::GetDeviceState**

## IDirectInputDevice8::SetEventNotification

Specifies an event that is to be set when the device state changes. It is also used to turn off event notification.

```
HRESULT SetEventNotification(  
    HANDLE hEvent  
);
```

## Parameters

*hEvent*

Handle to the event that is to be set when the device state changes. Microsoft® DirectInput® uses the Microsoft® Win32® **SetEvent** function on the handle when the state of the device changes. If the *hEvent* parameter is NULL, notification is disabled.

The application can create the handle as either a manual-reset or autoreset event by using the Microsoft® Win32® **CreateEvent** function. If the event is created as an autoreset event, the operating system automatically resets the event once a wait has been satisfied. If the event is created as a manual-reset event, it is the application's responsibility to call the Win32 **ResetEvent** function to reset it.

DirectInput does not call the Win32 **ResetEvent** function for event notification handles. Most applications create the event as an automatic-reset event.

## Return Values

If the method succeeds, the return value is `DI_OK` or `DI_POLLEDDEVICE`.

If the method fails, the return value can be one of the following error values:

`DIERR_ACQUIRED`  
`DIERR_HANDLEEXISTS`  
`DIERR_INVALIDPARAM`  
`DIERR_NOTINITIALIZED`

## Remarks

A device state change is defined as any of the following:

- A change in the position of an axis
- A change in the state (pressed or released) of a button
- A change in the direction of a POV control
- Loss of acquisition

Do not call the Win32 **CloseHandle** function on the event while it has been selected into a `DirectInputDevice` object. You must call this method with the *hEvent* parameter set to `NULL` before closing the event handle.

The event notification handle cannot be changed while the device is acquired. If the function is successful, the application can use the event handle like any other Win32 event handle.

The following code example checks whether the handle is currently set without blocking:

```
dwResult = WaitForSingleObject(hEvent, 0);
if (dwResult == WAIT_OBJECT_0) {
    // Event is set. If the event was created as
    // autoreset, it has also been reset.
}
```

The following code example illustrates blocking indefinitely until the event is set. This behavior is strongly discouraged because the thread does not respond to the system until the wait is satisfied. In particular, the thread does not respond to Windows® messages.

```
dwResult = WaitForSingleObject(hEvent, INFINITE);
if (dwResult == WAIT_OBJECT_0) {
    // Event has been set. If the event was created
```

```

    // as autoreset, it has also been reset.
}

```

The following code example illustrates a typical message loop for a message-based application that uses two events:

```

HANDLE ah[2] = { hEvent1, hEvent2 };

while (TRUE) {

    dwResult = MsgWaitForMultipleObjects(2, ah, FALSE,
        INFINITE, QS_ALLINPUT);
    switch (dwResult) {
    case WAIT_OBJECT_0:
        // Event 1 has been set. If the event was created as
        // autoreset, it has also been reset.
        ProcessInputEvent1();
        break;

    case WAIT_OBJECT_0 + 1:
        // Event 2 has been set. If the event was created as
        // autoreset, it has also been reset.
        ProcessInputEvent2();
        break;

    case WAIT_OBJECT_0 + 2:
        // A Windows message has arrived. Process
        // messages until there aren't any more.
        while(PeekMessage(&msg, NULL, 0, 0, PM_REMOVE)){
            if (msg.message == WM_QUIT) {
                goto exitapp;
            }
            TranslateMessage(&msg);
            DispatchMessage(&msg);
        }
        break;

    default:
        // Unexpected error.
        Panic();
        break;
    }
}

```

The following code example illustrates a typical application loop for a non-message-based application that uses two events:

```

HANDLE ah[2] = { hEvent1, hEvent2 };

```

```
DWORD dwWait = 0;

while (TRUE) {

    dwResult = MsgWaitForMultipleObjects(2, ah, FALSE,
                                         dwWait, QS_ALLINPUT);
    dwWait = 0;

    switch (dwResult) {
    case WAIT_OBJECT_0:
        // Event 1 has been set. If the event was
        // created as autoreset, it has also
        // been reset.
        ProcessInputEvent1();
        break;

    case WAIT_OBJECT_0 + 1:
        // Event 2 has been set. If the event was
        // created as autoreset, it has also
        // been reset.
        ProcessInputEvent2();
        break;

    case WAIT_OBJECT_0 + 2:
        // A Windows message has arrived. Process
        // messages until there aren't any more.
        while(PeekMessage(&msg, NULL, 0, 0, PM_REMOVE)){
            if (msg.message == WM_QUIT) {
                goto exitapp;
            }
            TranslateMessage(&msg);
            DispatchMessage(&msg);
        }
        break;

    default:
        // No input or messages waiting.
        // Do a frame of the game.
        // If the game is idle, tell the next wait
        // to wait indefinitely for input or a message.
        if (!DoGame()) {
            dwWait = INFINITE;
        }
        break;
    }
}
```

## 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 Dinput.h.

## See Also

Polling and Event Notification

## IDirectInputDevice8::SetProperty

Sets properties that define the device behavior. These properties include input buffer size and axis mode.

```
HRESULT SetProperty(
    REFGUID rguidProp,
    LPCDIPROPHEADER pdiph
);
```

## Parameters

*rguidProp*

Reference to (C++) or address of (C) the GUID identifying the property to be set. This can be one of the predefined values, or a pointer to a GUID that identifies the property. The following property values are predefined for an input device:

**DIPROP\_APPDATA**

Sets the application-defined value associated with an in-game action, as a **DIPROPPOINTER**.

**DIPROP\_AUTOCENTER**

Specifies whether device objects are self-centering. This setting applies to the entire device, rather than to any particular object, so the **dwHow** member of the associated **DIPROPDWORD** structure must be **DIPH\_DEVICE**.

The **dwData** member can be one of the following values.

**DIPROPAUTOCENTER\_OFF**: The device should not automatically center when the user releases the device. An application that uses force feedback should disable autocentering before playing effects.

**DIPROPAUTOCENTER\_ON**: The device should automatically center when the user releases the device.

Not all devices support the autocenter property.

**DIPROP\_AXISMODE**

Sets the axis mode. The value being set (**DIPROPAXISMODE\_ABS** or **DIPROPAXISMODE\_REL**) must be specified in the **dwData** member of the associated **DIPROPDWORD** structure. See the description of the *pdiph* parameter for more information.

This setting applies to the entire device, so the **dwHow** member of the associated **DIPROPDWORD** structure must be set to **DIPH\_DEVICE**.

#### DIPROP\_BUFFERSIZE

Sets the input buffer size. The value being set must be specified in the **dwData** member of the associated **DIPROPDWORD** structure. See Remarks.

This setting applies to the entire device, so the **dwHow** member of the associated **DIPROPDWORD** structure must be set to **DIPH\_DEVICE**.

#### DIPROP\_CALIBRATIONMODE

Enables the application to specify whether Microsoft® DirectInput® should retrieve calibrated or uncalibrated data from an axis. By default, DirectInput retrieves calibrated data.

Setting the calibration mode for the entire device is equivalent to setting it for each axis individually.

The **dwData** member of the **DIPROPDWORD** structure can be one of the following values:

**DIPROPCALIBRATIONMODE\_COOKED**: DirectInput should return data after applying calibration information. This is the default mode.

**DIPROPCALIBRATIONMODE\_RAW**: DirectInput should return raw, uncalibrated data. This mode is typically used only by Control Panel-type applications. Note that raw data might include negative values.

Setting a device into raw mode causes the dead zone, saturation, and range settings to be ignored.

#### DIPROP\_CPOINTS

Sets calibration points used for the adjustment of incoming raw data. The values being set must be specified as **CPOINT** types in the **cp** array of the associated **DIPROPCPOINTS** structure.

This setting applies to individual device objects, so the **dwHow** member of the associated **DIPROPHEADER** structure must be set to either **DIPH\_BYID** or **DIPH\_BYOFFSET**.

#### DIPROP\_DEADZONE

Sets the value for the dead zone of a joystick, in the range from 0 through 10,000, where 0 indicates that there is no dead zone, 5,000 indicates that the dead zone extends over 50 percent of the physical range of the axis on both sides of center, and 10,000 indicates that the entire physical range of the axis is dead. When the axis is within the dead zone, it is reported as being at the center of its range.

This setting can be applied to either the entire device or to a specific axis.

#### DIPROP\_FFGAIN

Sets the gain for the device. This setting applies to the entire device, rather than to any particular object, so the **dwHow** member of the associated **DIPROPDWORD** structure must be **DIPH\_DEVICE**.

The **dwData** member contains a gain value that is applied to all effects created on the device. The value is an integer in the range from 0 through 10,000, specifying the amount by which effect magnitudes should be scaled for the

device. For example, a value of 10,000 indicates that all effect magnitudes are to be taken at face value. A value of 9,000 indicates that all effect magnitudes are to be reduced to 90% of their nominal magnitudes.

Setting a gain value is useful when an application wants to scale down the strength of all force-feedback effects uniformly, based on user preferences.

Unlike other properties, the gain can be set when the device is in an acquired state.

#### DIPROP\_INSTANCENAME

This property exists for advanced applications that want to change the friendly instance name of a device (as returned in the **tszInstanceName** member of the **DIDEVICEINSTANCE** structure) to distinguish it from similar devices that are plugged in simultaneously. Most applications should have no need to change the friendly name.

This setting applies to the entire device, so the **dwHow** member of the associated **DIPROPDWORD** structure must be set to **DIPH\_DEVICE**.

The *pdiph* parameter must be a pointer to the **diph** member of a **DIPROPSTRING** structure.

#### DIPROP\_PRODUCTNAME

This property exists for advanced applications that want to change the friendly product name of a device (as returned in the **tszProductName** member of the **DIDEVICEINSTANCE** structure) to distinguish it from similar devices which are plugged in simultaneously. Most applications should have no need to change the friendly name.

This setting applies to the entire device, so the **dwHow** member of the associated **DIPROPDWORD** structure must be set to **DIPH\_DEVICE**.

The *pdiph* parameter must be a pointer to the **diph** member of a **DIPROPSTRING** structure.

#### DIPROP\_RANGE

Sets the range of values an object can possibly report. The minimum and maximum values are taken from the **IMin** and **IMax** members of the associated **DIPROPDWORD** structure.

For some devices, this is a read-only property.

You cannot set a reverse range; **IMax** must be greater than **IMin**.

#### DIPROP\_SATURATION

Sets the value for the saturation zones of a joystick, in the range from 0 through 10,000. The saturation level is the point at which the axis is considered to be at its most extreme position. For example, if the saturation level is set to 9,500, the axis reaches the extreme of its range when it has moved 95 percent of the physical distance from its center position (or from the dead zone).

This setting can be applied to either the entire device or a specific axis.

*pdiph*

Address of the **DIPROPHEADER** structure contained within the type-specific property structure.

## Return Values

If the method succeeds, the return value is `DI_OK` or `DI_PROPNOEFFECT`.

If the method fails, the return value can be one of the following error values:

- `DIERR_INVALIDPARAM`
- `DIERR_NOTINITIALIZED`
- `DIERR_OBJECTNOTFOUND`
- `DIERR_UNSUPPORTED`

## Remarks

The buffer size determines the amount of data that the buffer can hold between calls to the **IDirectInputDevice8::GetDeviceData** method before data is lost. This value may be set to 0 to indicate that the application does not read buffered data from the device. If the buffer size in the **dwData** member of the **DIPROPDWORD** structure is too large to be supported by the device, the largest possible buffer size is set. To determine whether the requested buffer size was set, retrieve the buffer-size property and compare the result with the value that you previously attempted to set.

## 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 `Dinput.h`.

## See Also

**IDirectInputDevice8::GetProperty**

## IDirectInputDevice8::Unacquire

Releases access to the device.

**HRESULT Unacquire();**

## Parameters

None.

## Return Values

The return value is `DI_OK` if the device was unacquired, or `DI_NOEFFECT` if the device was not in an acquired state.



## 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 Dinput.h.

## IDirectInputDevice8::WriteEffectToFile

Saves information about one or more force-feedback effects to a file that can be read by using **IDirectInputDevice8::EnumEffectsInFile**. This method is chiefly of interest to those wanting to write their own force-authoring applications.

```
HRESULT WriteEffectToFile(
    LPCSTR lpzFileName,
    DWORD dwEntries,
    LPCDIFILEEFFECT rgDiFileEft,
    DWORD dwFlags
);
```

### Parameters

*lpzFileName*

Name of the RIFF file.

*dwEntries*

Number of structures in the *rgDiFileEft* array.

*rgDiFileEft*

Array of **DIFILEEFFECT** structures.

*dwFlags*

Flags which control how the effect should be written. This can be **DIFEF\_DEFAULT** (= 0) or the following value:

**DIFEF\_INCLUDENONSTANDARD**

Includes effects that are not defined by Microsoft® DirectInput®. If this flag is not specified, only effects with GUIDs defined in Dinput.h, such as **GUID\_ConstantForce**, are written.

### Return Values

If the method succeeds, it returns **DI\_OK**.

If it fails, the return value can be **DIERR\_INVALIDPARAM**.

## 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 Dinput.h.

## See Also

**IDirectInputDevice8::EnumEffectsInFile**

# IDirectInputEffect

Applications use the methods of the **IDirectInputEffect** interface to manage effects of force-feedback devices.

The interface is obtained by using the **IDirectInputDevice8::CreateEffect** method.

The methods of the **IDirectInputEffect** interface can be organized into the following groups.

<b>Effect information</b>	<b>GetEffectGuid</b>
	<b>GetEffectStatus</b>
	<b>GetParameters</b>
<b>Effect manipulation</b>	<b>Download</b>
	<b>Initialize</b>
	<b>SetParameters</b>
	<b>Start</b>
	<b>Stop</b>
<b>Miscellaneous</b>	<b>Unload</b>
	<b>Escape</b>

The **IDirectInputEffect** interface, like all COM interfaces, inherits the **IUnknown** interface methods. The **IUnknown** interface supports the following three methods:

<b>IUnknown</b>	<b>AddRef</b>
	<b>QueryInterface</b>
	<b>Release</b>

The **LPDIRECTINPUTEFFECT** type is defined as a pointer to the **IDirectInputEffect** interface:

```
typedef struct IDirectInputEffect *LPDIRECTINPUTEFFECT;
```

## 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 Dinput.h.

---

## IDirectInputEffect::Download

Places the effect on the device. If the effect is already on the device, the existing effect is updated to match the values set by the **IDirectInputEffect::SetParameters** method.

**HRESULT** Download(void);

### Parameters

None.

### Return Values

If the method succeeds, the return value is DI\_OK or S\_FALSE.

If the method fails, the return value can be one of the following error values:

DIERR\_DEVICEFULL  
DIERR\_EFFECTPLAYING  
DIERR\_INCOMPLETEEFFECT  
DIERR\_INPUTLOST  
DIERR\_INVALIDPARAM  
DIERR\_NOTEXCLUSIVEACQUIRED  
DIERR\_NOTINITIALIZED

If the method returns S\_FALSE, the effect has already been downloaded to the device.

### Remarks

It is valid to update an effect while it is playing. The semantics of such an operation are explained in the reference for **IDirectInputEffect::SetParameters**.

### 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 Dinput.h.

## IDirectInputEffect::Escape

Sends a hardware-specific command to the driver.

**HRESULT** Escape(  
LPDIEFFESCAPE *pesc*

```
);
```

## Parameters

*pesc*

**DIEFFESCAPE** structure that describes the command to be sent. On success, the **cbOutBuffer** member contains the number of bytes of the output buffer used.

## Return Values

If the method succeeds, the return value is **DI\_OK**.

If the method fails, the return value can be one of the following error values:

**DIERR\_NOTINITIALIZED**

**DIERR\_DEVICEFULL**

Other device-specific error codes are also possible. Ask the hardware manufacturer for details.

## Remarks

Because each driver implements different escapes, it is the application's responsibility to ensure that it is sending the escape to the correct driver by comparing the value of the **guidFFDriver** member of the **DIDeviceInstance** structure against the value the application is expecting.

## 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 **Dinput.h**.

## IDirectInputEffect::GetEffectGuid

Retrieves the GUID for the effect represented by the **IDirectInputEffect** object.

```
HRESULT GetEffectGuid(  
    LPGUID pguid  
);
```

## Parameters

*pguid*

**GUID** structure that is filled by the method.

## Return Values

If the method succeeds, the return value is `DI_OK`.

If the method fails, the return value can be one of the following error values:

`DIERR_INVALIDPARAM`  
`DIERR_NOTINITIALIZED`

## Remarks

Additional information about the effect can be obtained by passing the GUID to `IDirectInputDevice8::GetEffectInfo`.

## 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 `Dinput.h`.

## IDirectInputEffect::GetEffectStatus

Retrieves the status of an effect.

```
HRESULT GetEffectStatus(  
    LPDWORD pdwFlags  
);
```

## Parameters

*pdwFlags*

Status flags for the effect. The value can be 0 or one or more of the following constants:

`DIEGES_PLAYING`  
The effect is playing.  
`DIEGES_EMULATED`  
The effect is emulated.

## Return Values

If the method succeeds, the return value is `DI_OK`.

If the method fails, the return value can be one of the following error values:

`DIERR_INVALIDPARAM`  
`DIERR_NOTINITIALIZED`

## 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 Dinput.h.

## IDirectInputEffect::GetParameters

Retrieves information about an effect.

```
HRESULT GetParameters(  
    LPDIEFFECT peff,  
    DWORD dwFlags  
);
```

### Parameters

*peff*

Address of a **DIEFFECT** structure that receives effect information. The **dwSize** member must be filled in by the application before calling this method.

*dwFlags*

Flags that specify which parts of the effect information are to be retrieved. The value can be 0 or one or more of the following constants:

**DIEP\_ALLPARAMS**

The union of all other **DIEP\_\*** flags, indicating that all members of the **DIEFFECT** structure are being requested.

**DIEP\_ALLPARAMS\_DX5**

The union of all other **DIEP\_\*** flags except the **DIEP\_STARTDELAY** flag.

**DIEP\_AXES**

The **cAxes** and **rgdwAxes** members should receive data. The **cAxes** member on entry contains the size (in **DWORDs**) of the buffer pointed to by the **rgdwAxes** member. If the buffer is too small, the method returns **DIERR\_MOREDATA** and sets **cAxes** to the necessary size of the buffer.

**DIEP\_DIRECTION**

The **cAxes** and **rglDirection** members should receive data. The **cAxes** member on entry contains the size (in **DWORDs**) of the buffer pointed to by the **rglDirection** member. If the buffer is too small, the **GetParameters** method returns **DIERR\_MOREDATA** and sets **cAxes** to the necessary size of the buffer.

The **dwFlags** member must include at least one of the coordinate system flags (**DIEFF\_CARTESIAN**, **DIEFF\_POLAR**, or **DIEFF\_SPHERICAL**).

Microsoft® DirectInput® returns the direction of the effect in one of the coordinate systems you specified, converting between coordinate systems as necessary. On exit, exactly one of the coordinate system flags is set in the **dwFlags** member, indicating which coordinate system DirectInput used. In

particular, passing all three coordinate system flags retrieves the coordinates in exactly the same format in which they were set.

#### DIEP\_DURATION

The **dwDuration** member should receive data.

#### DIEP\_ENVELOPE

The **lpEnvelope** member points to a **DIENVELOPE** structure that should receive data. If the effect does not have an envelope associated with it, the **lpEnvelope** member is set to NULL.

#### DIEP\_GAIN

The **dwGain** member should receive data.

#### DIEP\_SAMPLEPERIOD

The **dwSamplePeriod** member should receive data.

#### DIEP\_STARTDELAY

The **dwStartDelay** member should receive data.

#### DIEP\_TRIGGERBUTTON

The **dwTriggerButton** member should receive data.

#### DIEP\_TRIGGERREPEATINTERVAL

The **dwTriggerRepeatInterval** member should receive data.

#### DIEP\_TYPESPECIFICPARAMS

The **lpvTypeSpecificParams** member points to a buffer whose size is specified by the **cbTypeSpecificParams** member. On return, the buffer is filled in with the type-specific data associated with the effect, and the **cbTypeSpecificParams** member contains the number of bytes copied. If the buffer supplied by the application is too small to contain all the type-specific data, the method returns **DIERR\_MOREDATA**, and the **cbTypeSpecificParams** member contains the required size of the buffer in bytes.

## Return Values

If the method succeeds, the return value is **DI\_OK**.

If the method fails, the return value can be one of the following error values:

**DIERR\_INVALIDPARAM**

**DIERR\_MOREDATA**

**DIERR\_NOTINITIALIZED**

## Remarks

Common errors resulting in a **DIERR\_INVALIDPARAM** error include not setting the **dwSize** member of the **DIEFFECT** structure, passing invalid flags, or not setting up the members in the **DIEFFECT** structure properly in preparation for receiving the effect information. For example, if information is to be retrieved in the **dwTriggerButton** member, the **dwFlags** member must be set to either

DIEFF\_OBJECTIDS or DIEFF\_OBJECTOFFSETS so that DirectInput knows how to describe the button.

## 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 Dinput.h.

## IDirectInputEffect::Initialize

Initializes a DirectInputEffect object.

```
HRESULT Initialize(  
    HINSTANCE hinst,  
    DWORD dwVersion,  
    REFGUID rguid  
);
```

### Parameters

*hinst*

Instance handle to the application or DLL that is creating the DirectInputEffect object. Microsoft® DirectInput® uses this value to determine whether the application or DLL has been certified and to establish any special behaviors that might be necessary for backward compatibility. It is an error for a DLL to pass the handle to the parent application.

*dwVersion*

Version number of DirectInput for which the application is designed. This value is normally DIRECTINPUT\_VERSION. Passing the version number of a previous version causes DirectInput to emulate that version.

*rguid*

Reference to (C++) or address of (C) the GUID identifying the effect with which the interface is associated. The **IDirectInputDevice8::EnumEffects** method can be used to determine which effect GUIDs are supported by the device.

### Return Values

If the method succeeds, the return value is DI\_OK.

If the method fails, the return value can be DIERR\_DEVICENOTREG.

### Remarks

If this method fails, the underlying object should be considered to be an indeterminate state and needs to be reinitialized before it can be subsequently used.



The **IDirectInputDevice8::CreateEffect** method automatically initializes the effect after creating it. Applications normally do not need to call the **Initialize** method.

## 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 Dinput.h.

## IDirectInputEffect::SetParameters

Sets the characteristics of an effect.

```
HRESULT SetParameters(  
    LPCDIEFFECT peff,  
    DWORD dwFlags  
);
```

### Parameters

*peff*

**DIEFFECT** structure that contains effect information. The **dwSize** member must be filled in by the application before calling this method, as well as any members specified by corresponding bits in the *dwFlags* parameter.

*dwFlags*

Flags that specify which portions of the effect information are to be set and how the downloading of the parameters should be handled. The value can be 0 or one or more of the following constants:

**DIEP\_AXES**

The **cAxes** and **rgdwAxes** members contain data.

**DIEP\_DIRECTION**

The **cAxes** and **rglDirection** members contain data. The **dwFlags** member specifies (with **DIEFF\_CARTESIAN** or **DIEFF\_POLAR**) the coordinate system in which the values should be interpreted.

**DIEP\_DURATION**

The **dwDuration** member contains data.

**DIEP\_ENVELOPE**

The **lpEnvelope** member points to a **DIENVELOPE** structure that contains data. To detach any existing envelope from the effect, pass this flag and set the **lpEnvelope** member to **NULL**.

**DIEP\_GAIN**

The **dwGain** member contains data.

**DIEP\_NODOWNLOAD**

Suppress the automatic **IDirectInputEffect::Download** that is normally performed after the parameters are updated. See Remarks.

#### DIEP\_NORESTART

Suppress the stopping and restarting of the effect to change parameters. See Remarks.

#### DIEP\_SAMPLEPERIOD

The **dwSamplePeriod** member contains data.

#### DIEP\_START

The effect is to be started (or restarted if it is currently playing) after the parameters are updated. By default, the play state of the effect is not altered.

#### DIEP\_STARTDELAY

The **dwStartDelay** member contains data.

#### DIEP\_TRIGGERBUTTON

The **dwTriggerButton** member contains data.

#### DIEP\_TRIGGERREPEATINTERVAL

The **dwTriggerRepeatInterval** member contains data.

#### DIEP\_TYPESPECIFICPARAMS

The **lpvTypeSpecificParams** and **cbTypeSpecificParams** members of the **DIEFFECT** structure contain the address and size of type-specific data for the effect.

## Return Values

If the method succeeds, the return value is one of the following:

DI\_DOWNLOADSKIPPED  
DI\_EFFECTRESTARTED  
DI\_OK  
DI\_TRUNCATED  
DI\_TRUNCATEDANDRESTARTED

If the method fails, the return value can be one of the following error values:

DIERR\_NOTINITIALIZED  
DIERR\_INCOMPLETEEFFECT  
DIERR\_INPUTLOST  
DIERR\_INVALIDPARAM  
DIERR\_EFFECTPLAYING

## Remarks

The **dwDynamicParams** member of the **DIEFFECTINFO** structure for the effect specifies which parameters can be dynamically updated while the effect is playing.

The **IDirectInputEffect::SetParameters** method automatically downloads the effect, but this behavior can be suppressed by setting the **DIEP\_NODOWNLOAD** flag. If automatic download has been suppressed, you can manually download the effect by invoking the **IDirectInputEffect::Download** method.

If the effect is playing while the parameters are changed, the new parameters take effect as if they were the parameters when the effect started.

For example, suppose a periodic effect with a duration of three seconds is started. After two seconds, the direction of the effect is changed. The effect then continues for one additional second in the new direction. The envelope, phase, amplitude, and other parameters of the effect continue smoothly, as if the direction had not changed.

In the same situation, if after two seconds the duration of the effect were changed to 1.5 seconds, the effect would stop.

Normally, if the driver cannot update the parameters of a playing effect, the driver is permitted to stop the effect, update the parameters, and then restart the effect. Passing the **DIEP\_NOESTART** flag suppresses this behavior. If the driver cannot update the parameters of an effect while it is playing, the error code **DIERR\_EFFECTPLAYING** is returned, and the parameters are not updated.

No more than one of the **DIEP\_NODOWNLOAD**, **DIEP\_START**, and **DIEP\_NOESTART** flags should be set. (It is also valid to pass none of them.)

These three flags control download and playback behavior as follows:

If **DIEP\_NODOWNLOAD** is set, the effect parameters are updated but not downloaded to the device.

If the **DIEP\_START** flag is set, the effect parameters are updated and downloaded to the device, and the effect is started just as if the **IDirectInputEffect::Start** method had been called with the *dwIterations* parameter set to 1 and with no flags. (Combining the update with **DIEP\_START** is slightly faster than calling **Start** separately, because it requires less information to be transmitted to the device.)

If neither **DIEP\_NODOWNLOAD** nor **DIEP\_START** is set and the effect is not playing, the parameters are updated and downloaded to the device.

If neither **DIEP\_NODOWNLOAD** nor **DIEP\_START** is set and the effect is playing, the parameters are updated if the device supports on-the-fly updating. Otherwise the behavior depends on the state of the **DIEP\_NOESTART** flag. If it is set, the error code **DIERR\_EFFECTPLAYING** is returned. If it is clear, the effect is stopped, the parameters are updated, and the effect is restarted.

## 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 *Dinput.h*.

## IDirectInputEffect::Start

Begins playing an effect. If the effect is already playing, it is restarted from the beginning. If the effect has not been downloaded or has been modified since its last download, it is downloaded before being started. This default behavior can be suppressed by passing the DIES\_NODOWNLOAD flag.

```
HRESULT Start(  
    DWORD dwIterations,  
    DWORD dwFlags  
);
```

### Parameters

#### *dwIterations*

Number of times to play the effect in sequence. The envelope is re-articulated with each iteration.

To play the effect exactly once, pass 1. To play the effect repeatedly until explicitly stopped, pass INFINITE. To play the effect until explicitly stopped without re-articulating the envelope, modify the effect parameters with the **IDirectInputEffect::SetParameters** method, and change the **dwDuration** member to INFINITE.

#### *dwFlags*

Flags that describe how the effect should be played by the device. The value can be 0 or one or more of the following values:

##### DIES\_SOLO

All other effects on the device should be stopped before the specified effect is played. If this flag is omitted, the effect is mixed with existing effects already started on the device.

##### DIES\_NODOWNLOAD

Do not automatically download the effect.

### Return Values

If the method succeeds, the return value is DI\_OK.

If the method fails, the return value can be one of the following error values:

DIERR\_INCOMPLETEEFFECT

DIERR\_INVALIDPARAM

DIERR\_NOTEXCLUSIVEACQUIRED

DIERR\_NOTINITIALIZED

DIERR\_UNSUPPORTED

## Remarks

The device must be acquired at the exclusive cooperative level for this method to succeed.

Not all devices support multiple iterations.

## 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 Dinput.h.

## IDirectInputEffect::Stop

Stops playing an effect.

**HRESULT Stop(void);**

## Return Values

If the method succeeds, the return value is DI\_OK.

If the method fails, the return value can be one of the following error values:

DIERR\_NOTEXCLUSIVEACQUIRED

DIERR\_NOTINITIALIZED

## Remarks

The device must be acquired at the exclusive cooperative level for this method to succeed.

## 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 Dinput.h.

## IDirectInputEffect::Unload

Removes the effect from the device. If the effect is playing, it is automatically stopped before it is unloaded.

**HRESULT Unload(void);**

## Return Values

If the method succeeds, the return value is `DI_OK`.

If the method fails, the return value can be one of the following error values:

`DIERR_INPUTLOST`  
`DIERR_INVALIDPARAM`  
`DIERR_NOTEXCLUSIVEACQUIRED`  
`DIERR_NOTINITIALIZED`

## 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 `Dinput.h`.

## Callback Functions

The following seven functions are prototype callback functions for use with various enumeration methods. Applications can declare one of these callback functions under any name and define it in any way, but the parameter and return types must be the same as in the prototype.

- **`DIDeclareDeviceCallback`**
- **`DIEnumCreatedEffectObjectsCallback`**
- **`DIEnumDeviceObjectsCallback`**
- **`DIEnumDevicesBySemanticsCallback`**
- **`DIEnumDevicesCallback`**
- **`DIEnumEffectsCallback`**
- **`DIEnumEffectsInFileCallback`**

## DIDeclareDeviceCallback

Application-defined callback function that is called each time the property sheet image is refreshed. This function needs to be supplied only when the application is displaying the property sheet within its own window.

**`BOOL CALLBACK DIDeclareDeviceCallback(`**  
    **`IUnknown FAR* lpDDSTarget,`**  
    **`LPVOID pvRef`**

---

);

## Parameters

*lpDDSTarget*

Pointer to the **IUnknown** interface of the surface in the **lpUnkDDSTarget** member of the **DICONFIGUREDEVICESPARAMS** structure that was passed to **IDirectInput8::ConfigureDevices**.

*pvRef*

Application-defined value passed to **IDirectInput8::ConfigureDevices** as the *pvRef* parameter.

## Return Values

Can return TRUE or FALSE. DirectInput® does not use the return value.

## 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 Dinput.h.

**Import Library:** Use Dinput8.lib.

# DIEnumCreatedEffectObjectsCallback

Application-defined callback function that receives DirectInputDevice effects as a result of a call to the **IDirectInputDevice8::EnumCreatedEffectObjects** method.

```
BOOL CALLBACK DIEnumCreatedEffectObjectsCallback(
    LPDIRECTINPUTEFFECT peff,
    LPVOID pvRef
);
```

## Parameters

*peff*

Address of an effect object that has been created.

*pvRef*

The application-defined value passed to **EnumCreatedEffectObjects** as the *pvRef* parameter.

## Return Values

Returns `DIENUM_CONTINUE` to continue the enumeration or `DIENUM_STOP` to stop the enumeration.

## 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 `Dinput.h`.

**Import Library:** User-defined.

# DIDeviceObjectsCallback

Application-defined callback function that receives `DirectInputDevice` objects as a result of a call to the `IDirectInputDevice8::EnumObjects` method.

```
BOOL CALLBACK DIDeviceObjectsCallback(  
    LPCDIDeviceObjectInstance lpddoi,  
    LPVOID pvRef  
);
```

## Parameters

*lpddoi*

`DIDeviceObjectInstance` structure that describes the object being enumerated.

*pvRef*

The application-defined value passed to `EnumObjects` as the *pvRef* parameter.

## Return Values

Returns `DIENUM_CONTINUE` to continue the enumeration or `DIENUM_STOP` to stop the enumeration.

## 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 `Dinput.h`.

**Import Library:** User-defined.



# DIEnumDevicesBySemanticsCallback

Application-defined callback function that receives DirectInput® devices as a result of a call to the **IDirectInput8::EnumDevicesBySemantics** method.

```
BOOL CALLBACK DIEnumDevicesBySemanticsCallback(  
    LPCDIDEVICEINSTANCE lpddi,  
    LPDIRECTINPUTDEVICE8 lpdid,  
    DWORD dwFlags,  
    DWORD dwRemaining,  
    LPVOID pvRef  
);
```

## Parameters

*lpddi*

Address of a **DIDEVICEINSTANCE** structure that describes the device instance.

*lpdid*

Pointer to the **IDirectInputDevice8** interface for the device.

*dwFlags*

Flags that provide information about why the device is being enumerated. This can be a combination of action-mapping flags and one usage flag. At least one action-mapping flag is always present.

The following action-mapping flags are defined.

**DIEDBS\_MAPPEDPRI1**

The device is being enumerated because priority 1 actions can be mapped to the device.

**DIEDBS\_MAPPEDPRI2**

The device is being enumerated because priority 2 actions can be mapped to the device.

The following usage flags are defined.

**DIEDBS\_RECENTDEVICE**

The device is being enumerated because the commands described by the action-mapping flags were recently used.

**DIEDBS\_NEWDEVICE**

The device is being enumerated because the device was installed recently. Devices described by this flag have not been used with this game before.

*dwRemaining*

Number of devices, after this one, remaining to be enumerated.

*pvRef*

The application-defined value passed to **IDirectInput8::EnumDevicesBySemantics** as the *pvRef* parameter.

## Return Values

Returns **DIENUM\_CONTINUE** to continue the enumeration or **DIENUM\_STOP** to stop the enumeration.

## Remarks

If a single hardware device can function as more than one DirectInput® device type, it is enumerated as each device type that it supports. For example, a keyboard with a built-in mouse is enumerated twice: once as a keyboard and once as a mouse. The product GUID is the same for each device, however.

## 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 *Dinput.h*.

**Import Library:** User-defined.

## See Also

**DIEnumDevicesCallback**

# DIEnumDevicesCallback

Application-defined callback function that receives DirectInput® devices as a result of a call to the **IDirectInput8::EnumDevices** method.

```
BOOL CALLBACK DIEnumDevicesCallback(  
    LPCDIDEVICEINSTANCE lpddi,  
    LPVOID pvRef  
);
```

## Parameters

*lpddi*

Address of a **DIDEVICEINSTANCE** structure that describes the device instance.

*pvRef*

The application-defined value passed to **EnumDevices** or **EnumDevicesBySemantics** as the *pvRef* parameter.

## Return Values

Returns `DIENUM_CONTINUE` to continue the enumeration or `DIENUM_STOP` to stop the enumeration.

## Remarks

If a single hardware device can function as more than one `DirectInput` device type, it is enumerated as each device type that it supports. For example, a keyboard with a built-in mouse is enumerated twice: once as a keyboard and once as a mouse. The product GUID is the same for each device, however.

## 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 `Dinput.h`.

**Import Library:** User-defined.

## See Also

`DIDebugDeviceBySemanticsCallback`

# DIDEnumEffectsCallback

Application-defined callback function used with the `IDirectInputDevice8::EnumEffects` method.

```
BOOL CALLBACK DIDEnumEffectsCallback(
    LPCDIEFFECTINFO pdei,
    LPVOID pvRef
);
```

## Parameters

*pdei*

**DIEFFECTINFO** structure that describes the enumerated effect.

*pvRef*

The application-defined value passed to **EnumEffects** as the *pvRef* parameter.

## Return Values

Returns `DIENUM_CONTINUE` to continue the enumeration, or `DIENUM_STOP` to stop it.

## 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 Dinput.h.

**Import Library:** User-defined.

## DIEnumEffectsInFileCallback

Application-defined callback function used with the **IDirectInputDevice8::EnumEffectsInFile** method.

```
BOOL CALLBACK DIEnumEffectsInFileCallback(  
    LPCDIFILEEFFECT lpDiFileEf,  
    LPVOID pvRef  
);
```

### Parameters

*lpDiFileEf*

**DIFILEEFFECT** structure that describes the enumerated effect.

*pvRef*

The application-defined value passed to **EnumEffectsInFile** as the *pvRef* parameter.

### Return Values

Returns **DIENUM\_CONTINUE** to continue the enumeration, or **DIENUM\_STOP** to stop it.

## 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 Dinput.h.

**Import Library:** User-defined.

## Functions

This section is a reference for DirectInput® functions other than COM interface methods and callback functions.

The following function falls into this category:

- **DirectInput8Create**

# DirectInput8Create

Creates a DirectInput® object and returns an **IDirectInput8** or later interface.

```
HRESULT WINAPI DirectInput8Create(  
    HINSTANCE hinst,  
    DWORD dwVersion,  
    REFIID riidIIf,  
    LPVOID* ppvOut,  
    LPUNKNOWN punkOuter  
);
```

## Parameters

*hinst*

Instance handle to the application or DLL that is creating the DirectInput object. DirectInput uses this value to determine whether the application or DLL has been certified and to establish any special behaviors that might be necessary for backward compatibility.

It is an error for a DLL to pass the handle to the parent application. For example, an ActiveX® control embedded in a Web page that uses DirectInput must pass its own instance handle, and not the handle to the Web browser. This ensures that DirectInput recognizes the control and can enable any special behaviors that might be necessary.

*dwVersion*

Version number of DirectInput for which the application is designed. This value is normally **DIRECTINPUT\_VERSION**. If the application defines **DIRECTINPUT\_VERSION** before including *Dinput.h*, the value must be greater than 0x0700. For earlier versions, use **DirectInputCreateEx**, which is in *Dinput.lib*.

*riidIIf*

Unique identifier of the desired interface. For DirectX 8.0, this value is **IID\_IDirectInput8A** or **IID\_IDirectInput8W**. Passing the **IID\_IDirectInput8** define selects the ANSI or Unicode version of the interface, depending on whether **UNICODE** is defined during compilation.

*ppvOut*

Address of a pointer to a variable to receive the interface pointer if the call succeeds.

*punkOuter*

Pointer to the address of the controlling object's **IUnknown** interface for COM aggregation, or **NULL** if the interface is not aggregated. Most callers pass **NULL**. If aggregation is requested, the object returned in *\*ppvOut* is a pointer to **IUnknown**, as required by COM aggregation.

## Return Values

If the function succeeds, the return value is `DI_OK`.

If the function fails, the return value can be one of the following error values:

`DIERR_BETADIRECTINPUTVERSION`  
`DIERR_INVALIDPARAM`  
`DIERR_OLDDIRECTINPUTVERSION`  
`DIERR_OUTOFMEMORY`

## Remarks

The `DirectInput` object created by this function is implemented in `Dinput8d.dll`. Versions of interfaces earlier than DirectX 8.0 cannot be obtained in this implementation. To use earlier versions, create the `DirectInput` object by using **`DirectInputCreate`** or **`DirectInputCreateEx`**, which are in `Dinput.lib`.

Calling the function with `punkOuter = NULL` is equivalent to creating the object through **`CoCreateInstance(&CLSID_DirectInput8, punkOuter, CLSCTX_INPROC_SERVER, &IID_IDirectInput8W, lpplDirectInput)`**, then initializing it with **`IDirectInput8::Initialize`**.

Calling the function with `punkOuter != NULL` is equivalent to creating the object through **`CoCreateInstance(&CLSID_DirectInput8, punkOuter, CLSCTX_INPROC_SERVER, &IID_IUnknown, lpplDirectInput)`**. The aggregated object must be initialized manually.

## 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 `Dinput.h`.

**Import Library:** Use `Dinput8.lib`.

## Macros

This section describes the following macros used in Microsoft® `DirectInput®`.

- **`DIDFT_GETINSTANCE`**
- **`DIDFT_GETTYPE`**
- **`DIDFT_MAKEINSTANCE`**
- **`DIEFT_GETTYPE`**
- **`DIMAKEUSAGEDWORD`**
- **`DISEQUENCE_COMPARE`**

- **GET\_DIDEVICE\_SUBTYPE**
- **GET\_DIDEVICE\_TYPE**

Dinput.h also defines macros for C calls to all the methods of the **IDirectInput8** and **IDirectInputDevice8** interfaces. These macros eliminate the need for pointers to method tables. For example, the following is a C call to the **IDirectInputDevice8::Release** method.

```
lpdid->lpVtbl->Release(lpdid);
```

The equivalent macro call looks like this.

```
IDirectInputDevice8_Release(lpdid);
```

All these macros take the same parameters as the method calls themselves.

## DIDFT\_GETINSTANCE

The **DIDFT\_GETINSTANCE** macro extracts the object instance number code from a data format type.

```
DIDFT_GETINSTANCE(n) LOWORD((n) >> 8)
```

### Parameters

*n*

Microsoft® DirectInput® data format type. The possible values for this parameter are identical to those found in the **dwType** member of the **DIOBJECTDATAFORMAT** 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 Dinput.h.

### See Also

**DIDFT\_MAKEINSTANCE**, **DIDFT\_GETTYPE**

## DIDFT\_GETTYPE

The **DIDFT\_GETTYPE** macro extracts the object type code from a data format type.

```
DIDFT_GETTYPE(n) LOBYTE(n)
```

## Parameters

*n*

Microsoft® DirectInput® data format type. The possible values for this parameter are identical to those found in the **dwType** member of the **DIOBJECTDATAFORMAT** 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 Dinput.h.

## See Also

**DIDFT\_GETINSTANCE**

# DIDFT\_MAKEINSTANCE

The **DIDFT\_MAKEINSTANCE** macro creates an instance identifier of a device object for packing in the **dwType** member of the **DIOBJECTDATAFORMAT** structure.

**DIDFT\_MAKEINSTANCE**(*n*) ((WORD)(*n*) << 8)

## Parameters

*n*

Instance of the object; for example, 1 for button 1 of a mouse.

## 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 Dinput.h.

## See Also

**DIDFT\_GETINSTANCE**

# DIEFT\_GETTYPE

The **DIEFT\_GETTYPE** macro extracts the effect type code from an effect format type.



---

DIEFT\_GETTYPE(n) LOBYTE(n)

## Parameters

*n*

Microsoft® DirectInput® effect format type. The possible values for this parameter are identical to those found in the **dwEffType** member of the **DIEFFECTINFO** 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 Dinput.h.

# DIMAKEUSAGEDWORD

The **DIMAKEUSAGEDWORD** macro combines the usage page and usage codes for a device object representing a Human Interface Device, for passing to the **IDirectInputDevice8::GetObjectInfo** method.

```
DWORD DIMAKEUSAGEDWORD(  
    WORD UsagePage,  
    WORD Usage  
);
```

## Parameters

*UsagePage*

Usage page of the device object.

*Usage*

Usage of the device object.

## Remarks

This macro is declared in Dinput.h as follows:

```
#define DIMAKEUSAGEDWORD(UsagePage, Usage) \  
    ((DWORD)MAKELONG(Usage, UsagePage))
```

## Requirements

**Windows NT/2000:** Requires Windows® 2000.

**Windows 95/98:** Requires Windows 98.

**Header:** Declared in Dinput.h.

## DISEQUENCE\_COMPARE

The **DISEQUENCE\_COMPARE** macro compares two Microsoft® DirectInput® sequence numbers, compensating for wraparound.

```
DISEQUENCE_COMPARE(dwSequence1, cmp, dwSequence2) \  
((int)((dwSequence1) - (dwSequence2)) cmp 0)
```

### Parameters

*dwSequence1*

First sequence number to compare.

*cmp*

One of the following comparison operators: ==, !=, <, >, <=, or >=.

*dwSequence2*

Second sequence number to compare.

### Return Values

Returns a nonzero value if the result of the comparison specified by the *cmp* parameter is true, or zero otherwise.

### Remarks

The following example checks whether the *dwSequence1* parameter value precedes the *dwSequence2* parameter value chronologically.

```
BOOL Sooner = (DISEQUENCE_COMPARE(dwSequence1, <, dwSequence2));
```

## 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 Dinput.h.

## GET\_DIDEVICE\_SUBTYPE

The **GET\_DIDEVICE\_SUBTYPE** macro extracts the device subtype code from a device type description code.

---

GET\_DIDEVICE\_SUBTYPE(dwDevType) HIBYTE(dwDevType)

## Parameters

*dwDevType*

Microsoft® DirectInput® device type description code. The possible values for this parameter are identical to those found in the **dwDevType** member of the **DIDEVICEINSTANCE** structure.

## Remarks

The interpretation of the subtype code depends on the primary 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 Dinput.h.

## See Also

GET\_DIDEVICE\_TYPE, DIDEVICEINSTANCE

# GET\_DIDEVICE\_TYPE

The **GET\_DIDEVICE\_TYPE** macro extracts the device primary type code from a device type description code.

GET\_DIDEVICE\_TYPE(dwDevType) LOBYTE(dwDevType)

## Parameters

*dwDevType*

Microsoft® DirectInput® device type description code. Possible values for this parameter are identical to those found in the **dwDevType** member of the **DIDEVICEINSTANCE** 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 Dinput.h.

## See Also

GET\_DIDEVICE\_SUBTYPE, DIDEVICEINSTANCE

## Structures

This section contains information on the following structures used with Microsoft® DirectInput®.

- **DIACTION**
- **DIACTIONFORMAT**
- **DICOLORSET**
- **DICONDITION**
- **DICONFIGUREDEVICESPARAMS**
- **DICONSTANTFORCE**
- **DICUSTOMFORCE**
- **DIDATAFORMAT**
- **DIDEVCAPS**
- **DIDEVICEIMAGEINFO**
- **DIDEVICEIMAGEINFOHEADER**
- **DIDEVICEINSTANCE**
- **DIDEVICEOBJECTDATA**
- **DIDEVICEOBJECTINSTANCE**
- **DIEFFECT**
- **DIEFFECTINFO**
- **DIEFFESCAPE**
- **DIENVELOPE**
- **DIFILEEFFECT**
- **DIJOYSTATE**
- **DIJOYSTATE2**
- **DIMOUSESTATE**
- **DIMOUSESTATE2**
- **DIOBJECTDATAFORMAT**
- **DIPERIODIC**
- **DIPROPCPOINTS**
- **DIPROPDWORD**
- **DIPROPGUIDANDPATH**
- **DIPROPHEADER**

- **DIPROPPOINTER**
- **DIPROP RANGE**
- **DIPROPSTRING**
- **DIRAMPFORCE**

### Note

The memory for all DirectX structures must be initialized to 0 before use. In addition, all structures that contain a **dwSize** member should set the member to the size of the structure, in bytes, before use. The following example performs these tasks on a common structure, **DIDEVCAPS**:

```
DIDEVCAPS didevcaps; // Can't use this yet

ZeroMemory(&didevcaps, sizeof(didevcaps));
didevcaps.dwSize = sizeof(didevcaps);

// Now the structure Can be used.
.
```

## CPOINT

Describes a calibration point. An array of **CPOINT** structures is contained by a **DIPROPCPOINTS** structure.

```
typedef struct _CPOINT
{
    LONG IP;
    DWORD dwLog;
} CPOINT, *PCPOINT;
```

### Members

#### IP

Raw data

#### dwLog

Scaling value to be associated with the **IP** number. The percentage of the maximum value multiplied by 10000.

### 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 Dinput.h.

## See Also

Using CPOINTS

# DIACTION

Describes a mapping of one game action to one device semantic. An array of **DIACTION** structures is contained by a **DIACTIONFORMAT** structure.

```
typedef struct _DIACTION {
    UINT_PTR    uAppData;
    DWORD       dwSemantic;
    DWORD       dwFlags;
    union {
        LPCSTR  lpszActionName;
        UINT    uResIdString;
    };
    GUID        guidInstance;
    DWORD       dwObjID;
    DWORD       dwHow;
} DIACTION, *LPDIACTION;

typedef const DIACTION *LPDICTION;
```

## Members

### uAppData

Address of an application-defined **UINT** value to be returned to the application by **IDirectInputDevice8::GetDeviceData** when the state of the control associated with the action changes. This value is returned in the **uAppData** member of the **DIDeviceObjectData** structure. It is typically an identifier for the application-specific action associated with the device object, but can also be a function pointer.

### dwSemantic

For a joystick, a predefined action mapping constant for this application genre representing a virtual control or a constant for a control not defined in the genre. For a keyboard, mouse, or Microsoft® DirectPlay® voice device, a constant that represents a particular device object. See Action Mapping Constants.

### dwFlags

Flags used to request specific attributes or processing. Can be zero or one or more of the following values.

**DIA\_APPFIXED**

The action cannot be remapped by Microsoft DirectInput®.

**DIA\_APPMAPPED**

The **dwObjID** member is valid, and **IDirectInputDevice8::BuildActionMap** will not override the application-defined mapping.

**DIA\_APPNOMAP**

This action is not to be mapped.

**DIA\_FORCEFEEDBACK**

The action must be mapped to an actuator or trigger.

**DIA\_NORANGE**

The default range is not to be set for this action. This flag can be set only for absolute axis actions.

**lpszActionName**

Application-defined name of the action. This string is displayed by the device property sheet when **IDirectInput8::ConfigureDevices** is called.

**uResIdString**

Resource identifier for the string for this action. The module instance for this resource is specified in the **hInstString** member of the **DIACTIONFORMAT** structure that contains this structure.

**guidInstance**

Device instance GUID if a specific device is requested. Otherwise GUID\_NULL.

**dwObjID**

Control identifier. Use the **DIDFT\_GETINSTANCE** and **DIDFT\_GETTYPE** macros to retrieve the instance and type from this value.

**dwHow**

When the structure is returned by **IDirectInputDevice8::BuildActionMap**, this member receives a value to indicate the mapping mechanism used by DirectInput to configure the action. The following values are defined.

**DIAH\_APPREQUESTED**

The mapping was configured by the application, which specified the device (**guidInstance**) and device object (**dwObjID**) when calling **BuildActionMap**.

**DIAH\_DEFAULT**

The mapping was determined by DirectInput in the absence of other mapping information.

**DIAH\_ERROR**

An error occurred. The action cannot be matched to a control on the device. The action will be ignored when the action map is set.

**DIAH\_HWAPP**

The mapping was specified by the hardware manufacturer for this game.

**DIAH\_HWDEFAULT**

The mapping was specified by the hardware manufacturer for this genre.

**DIAH\_UNMAPPED**

No suitable device object was found.

**DIAH\_USERCONFIG**

The mapping was configured by the user.

This member is ignored when the action map is passed to **IDirectInputDevice8::SetActionMap**.

## 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 Dinput.h.

## See Also

**IDirectInput8::EnumDevicesBySemantics**, **IDirectInputDevice8::SetActionMap**, **IDirectInput8::ConfigureDevices**, **IDirectInputDevice8::BuildActionMap**, Action Mapping

# DIACTIONFORMAT

Contains information about the calling application and acts as a container for an array of **DIACTION** structures that define action-to-control mappings for a genre.

```
typedef struct {
    DWORD          dwSize;
    DWORD          dwActionSize;
    DWORD          dwDataSize;
    DWORD          dwNumActions;
    LPDIACTION     rgoAction;
    GUID           guidActionMap;
    DWORD          dwGenre;
    DWORD          dwBufferSize;
    OPTIONAL LONG  lAxisMin;
    OPTIONAL LONG  lAxisMax;
    OPTIONAL HINSTANCE hInstString;
    FILETIME       ftTimeStamp;
    DWORD          dwCRC;
    TCHAR          tszActionMap[MAX_PATH];
} DIACTIONFORMAT;
```

## Members

### dwSize

**DWORD** value that specifies the size of the **DIACTIONFORMAT** structure, in bytes.

### dwActionSize

**DWORD** value that specifies the size of the **DIACTION** structure, in bytes.

### dwDataSize

**DWORD** value that specifies the size of the device data to be returned by the device for immediate device data, in bytes. This member should be **dwNumActions** multiplied by four.

### dwNumActions



**DWORD** value that specifies the number of elements in the **rgoAction** array.

**rgoAction**

Address of an array of **DIACTION** structures, each of which describes how an action maps to a virtual control or device object, and how the mapping information should be displayed to the user.

**guidActionMap**

GUID that identifies the action map. Device manufacturers can use this value to tune mappings for a specific title.

**dwGenre**

**DWORD** value that specifies the genre of the application. For possible values, see Action Mapping Constants.

**dwBufferSize**

**DWORD** value that specifies the number of input data packets in the buffer for each device to which this action map is to be applied. The buffer size must be set to a value greater than zero in order to retrieve data by using **IDirectInputDevice8::GetDeviceData**. Applications that set this member to the desired buffer size before calling **IDirectInputDevice8::SetActionMap** do not need to set the **DIPROP\_BUFFERSIZE** property by using **IDirectInputDevice8::SetProperty**.

**lAxisMin**

Minimum value for the range of scaled data to be returned for all axes. This value is ignored for a specific action axis if the **DIA\_NORANGE** flag is set in **DIACTION.dwFlags**.

This value is valid only for axis actions and should be set to zero for all other actions. It is used as the **DIPROP\_RANGE.IMin** value to set the range property on an absolute axis when the action map is applied using **IDirectInputDevice8::SetActionMap**.

**lAxisMax**

Maximum value for the range of scaled data to be returned for all axes. This value is ignored for a specific action axis if the **DIA\_NORANGE** flag is set in **DIACTION.dwFlags**.

This value is valid only for axis actions and should be set to zero for all other actions. It is used as the **DIPROP\_RANGE.IMax** value to set the range property on an absolute axis when the action map is applied using **IDirectInputDevice8::SetActionMap**.

**hInstString**

Handle of the module containing string resources for action names, as specified in the **uResIdString** member of the **DIACTION** structure for each action. Can be zero if action names are specified in the **lpszActionName** member of the **DIACTION** structure for each action.

**ftTimeStamp**

**FILETIME** structure that receives the time at which this action map was last written to disk. See Remarks.

**dwCRC**

Cyclic redundancy check for this map. Used internally by Microsoft® DirectInput® to determine when a set of mappings should be saved to disk.

#### **tszActionMap**

Null-terminated string, of maximum length MAX\_PATH, that specifies the friendly name for this action map. This string appears in the drop-down list box in the default property sheet.

### **Remarks**

The **ftTimeStamp** member can contain special values that apply to new and unused devices. New devices have never been enumerated for this application and have never had an action map applied to them. Unused devices have been enumerated for the application before but have never had an action map applied. New devices always have DIAFTS\_NEWDEVICELOW and DIAFTS\_NEWDEVICEHIGH in the low and high **DWORD**s respectively of the **FILETIME** structure. Unused devices have DIAFTS\_UNUSEDDEVICELOW and DIAFTS\_UNUSEDDEVICEHIGH in these positions.

Applications should not use **ftTimeStamp** to check for new devices. Instead, they should look for the DIEDBS\_RECENTDEVICE and DIEDBS\_NEWDEVICE flags in the enumeration callback. For more information, see **DIDEnumDevicesBySemanticsCallback**.

### **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 Dinput.h.

### **See Also**

**IDirectInput8::EnumDevicesBySemantics**, **IDirectInputDevice8::SetActionMap**, **IDirectInput8::ConfigureDevices**, **IDirectInputDevice8::BuildActionMap**, Action Mapping

## **DICOLORSET**

Describes a set of colors used to draw the device configuration user interface. It is part of the **DICONFIGUREDEVICESPARAMS** structure.

```
typedef struct _DICOLORSET {
    DWORD    dwSize
    D3DCOLOR cTextFore;
    D3DCOLOR cTextHighlight;
    D3DCOLOR cCalloutLine;
    D3DCOLOR cCalloutHighlight;
```

```
D3DCOLOR cBorder;  
D3DCOLOR cControlFill;  
D3DCOLOR cHighlightFill;  
D3DCOLOR cAreaFill;  
} DICOLORSET, *LPDICOLORSET;
```

```
typedef const DICOLORSET *LPCDICOLORSET;
```

## Members

### **dwSize**

Size of this structure, in bytes.

### **cTextFore**

Foreground text color.

### **cTextHighlight**

Foreground color for highlighted text.

### **cCalloutLine**

Color used to display callout lines.

### **cCalloutHighlight**

Color used to display callout lines.

### **cBorder**

Border color, used to display lines around controls such as tabs and buttons.

### **cControlFill**

Fill color for controls such as tabs and buttons.

### **cHighlightFill**

Fill color for highlighted controls.

### **cAreaFill**

Fill color for areas outside controls such as tabs and buttons.

## Remarks

Text background color is always transparent.

## 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 Dinput.h.

## See Also

**D3DCOLOR**

# DICONDITION

Contains type-specific information for effects that are marked as DIEFT\_CONDITION.

A pointer to an array of **DICONDITION** structures for an effect is passed in the **lpvTypeSpecificParams** member of the **DIEFFECT** structure. The number of elements in the array must be either one, or equal to the number of axes associated with the effect.

```
typedef struct DICONDITION {
    LONG IOffset;
    LONG IPositiveCoefficient;
    LONG INegativeCoefficient;
    DWORD dwPositiveSaturation;
    DWORD dwNegativeSaturation;
    LONG IDeadBand;
} DICONDITION, *LPDICONDITION;
```

```
typedef const DICONDITION *LPCDICONDITION;
```

## Members

### IOffset

Offset for the condition, in the range from –10,000 through 10,000.

### IPositiveCoefficient

Coefficient constant on the positive side of the offset, in the range from –10,000 through 10,000.

### INegativeCoefficient

Coefficient constant on the negative side of the offset, in the range from –10,000 through 10,000.

If the device does not support separate positive and negative coefficients, the value of **INegativeCoefficient** is ignored, and the value of **IPositiveCoefficient** is used as both the positive and negative coefficients.

### dwPositiveSaturation

Maximum force output on the positive side of the offset, in the range from 0 through 10,000.

If the device does not support force saturations, the value of this member is ignored.

### dwNegativeSaturation

Maximum force output on the negative side of the offset, in the range from 0 through 10,000.

If the device does not support force saturation, the value of this member is ignored.

If the device does not support separate positive and negative saturation, the value of **dwNegativeSaturation** is ignored, and the value of **dwPositiveSaturation** is used as both the positive and negative saturation.

#### **IDeadBand**

Region around **IOffset** in which the condition is not active, in the range from 0 through 10,000. In other words, the condition is not active between **IOffset** minus **IDeadBand** and **IOffset** plus **IDeadBand**.

### **Remarks**

Different types of conditions interpret the parameters differently, but the basic idea is that force resulting from a condition is equal to  $A(q - q_0)$  where  $A$  is a scaling coefficient,  $q$  is some metric, and  $q_0$  is the neutral value for that metric.

The preceding simplified formula must be adjusted if a nonzero deadband is provided. If the metric is less than **IOffset - IDeadBand**, the resulting force is given by the following formula:

$$force = \text{INegativeCoefficient} * (q - (\text{IOffset} - \text{IDeadBand}))$$

Similarly, if the metric is greater than **IOffset + IDeadBand**, the resulting force is given by the following formula:

$$force = \text{IPositiveCoefficient} * (q - (\text{IOffset} + \text{IDeadBand}))$$

A spring condition uses axis position as the metric.

A damper condition uses axis velocity as the metric.

An inertia condition uses axis acceleration as the metric.

If the number of **DICONDITION** structures in the array is equal to the number of axes for the effect, the first structure applies to the first axis, the second applies to the second axis, and so on. For example, a two-axis spring condition with **IOffset** set to 0 in both **DICONDITION** structures would have the same effect as the joystick self-centering spring. When a condition is defined for each axis in this way, the effect must not be rotated.

If there is a single **DICONDITION** structure for an effect with more than one axis, the direction along which the parameters of the **DICONDITION** structure are in effect is determined by the direction parameters passed in the **rglDirection** field of the **DIEFFECT** structure. For example, a friction condition rotated 45 degrees (in polar coordinates) would resist joystick motion in the northeast-southwest direction but would have no effect on joystick motion in the northwest-southeast direction.

### **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 Dinput.h.

# DICONFIGUREDEVICESPARAMS

Contains information for the device configuration property sheet. It is used by the **IDirectInput8::ConfigureDevices** method.

```
typedef struct _DICONFIGUREDEVICESPARAMS {
    DWORD          dwSize;
    DWORD          dwcUsers;
    LPSTR          lpszUserNames;
    DWORD          dwcFormats;
    LPDICTIONFORMAT lprgFormats;
    HWND           hwnd;
    DICOLOSET      dics;
    IUnknown FAR * lpUnkDDSTarget;
} DICONFIGUREDEVICESPARAMS, *LPDICONFIGUREDEVICESPARAMS;
```

## Members

### dwSize

Size of this structure, in bytes.

### dwcUsers

Count of user names in the buffer at **lpszUserNames**. If **lpszUserNames** is NULL (to indicate that default user names should be used), the value in this member is ignored. If the **dwcUsers** value exceeds the number of entries actually in the buffer, the method fails, returning **DIERR\_INVALIDPARAM**.

### lpszUserNames

Pointer to a buffer containing a series of null-terminated name strings, the final element being designated by a double-null terminator. The **lpszUserNames** parameter can be set to NULL to instruct the use of default names. If the application passes more names than the **dwcUsers** count indicates, only the names within the count are used. If an application specifies names that are different from the names currently assigned to devices, ownership is revoked for all devices, a default name is created for the mismatched name, and the interface shows **(No User)** for all devices.

### dwcFormats

Count of structures in the array at **lprgFormats**.

### lprgFormats

Pointer to an array of **DICTIONFORMAT** structures that contains action-mapping information for each genre used by the game. On input, this array contains action-to-control mappings and strings to display as callouts for each mapping. The configuration interface displays the genres in its drop-down list in the same order as in the array.

### hwnd

Handle to the top-level window of the calling application. The member is needed only for applications that run in windowed mode, and is otherwise ignored.

dics

**DICOLORSET** structure that describes the color scheme to apply to the configuration user interface. Passing a zero-initialized **DICOLORSET** structure causes the default color scheme to be used.

#### **lpUnkDDSTarget**

Pointer to the **IUnknown** interface for a Microsoft® DirectDraw® or Microsoft Direct3D® target surface object that will be filled to contain an image of the configuration user interface. The image represents the current state of the user interface at the time that the **DIEnumDevicesBySemanticsCallback** function is invoked. The target surface will retain any alpha information passed as part of the **DICOLORSET** structure above, and also any alpha information encoded into the device image by the hardware manufacturer. The target surface object referred to by the **IUnknown** interface must support either **IDirect3DSurface8** or **IDirectDrawSurface7**. Full-screen applications using DirectDraw must have target surfaces created using the **DDSCAPS\_SYSTEMMEMORY** flag.

Applications that are not using DirectDraw and applications that are using DirectDraw but are windowed rather than using the full screen may pass **NULL** in this parameter. This will cause Microsoft DirectInput® to use the Windows Graphics Device Interface (GDI) functions to draw the configuration user interface image.

## 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 **Dinput.h**.

## DICONSTANTFORCE

Contains type-specific information for effects that are marked as **DIEFT\_CONSTANTFORCE**.

The structure describes a constant force effect.

A pointer to a single **DICONSTANTFORCE** structure for an effect is passed in the **lpvTypeSpecificParams** member of the **DIEFFECT** structure.

```
typedef struct DICONSTANTFORCE {
    LONG IMagnitude;
} DICONSTANTFORCE, *LPDICONSTANTFORCE;
```

```
typedef const DICONSTANTFORCE *LPCDICONSTANTFORCE;
```

### Members

**IMagnitude**

The magnitude of the effect, in the range from –10,000 through 10,000. If an envelope is applied to this effect, the value represents the magnitude of the sustain. If no envelope is applied, the value represents the amplitude of the entire effect.

## 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 Dinput.h.

## DICUSTOMFORCE

Contains type-specific information for effects that are marked as DIEFT\_CUSTOMFORCE.

The structure describes a custom or user-defined force.

A pointer to a **DICUSTOMFORCE** structure for an effect is passed in the **lpvTypeSpecificParams** member of the **DIEFFECT** structure.

```
typedef struct DICUSTOMFORCE {
    DWORD cChannels;
    DWORD dwSamplePeriod;
    DWORD cSamples;
    LPLONG rgfForceData;
} DICUSTOMFORCE, *LPDICUSTOMFORCE;
```

```
typedef const DICUSTOMFORCE *LPCDICUSTOMFORCE;
```

## Members

### cChannels

Number of channels (axes) affected by this force.

The first channel is applied to the first axis associated with the effect, the second to the second, and so on. If there are fewer channels than axes, nothing is associated with the extra axes.

If there is only a single channel, the effect is rotated in the direction specified by the **rglDirection** member of the **DIEFFECT** structure. If there is more than one channel, rotation is not allowed.

Not all devices support rotation of custom effects.

### dwSamplePeriod

Sample period, in microseconds.

### cSamples

Total number of samples in the **rgfForceData**. It must be an integral multiple of the **cChannels**.



**rglForceData**

Pointer to an array of force values representing the custom force. If multiple channels are provided, the values are interleaved. For example, if **cChannels** is 3, the first element of the array belongs to the first channel, the second to the second, and the third to the third.

## 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 Dinput.h.

# DIDATAFORMAT

Describes a device's data format. This structure is used with the **IDirectInputDevice8::SetDataFormat** method.

```
typedef struct DIDATAFORMAT {
    DWORD dwSize;
    DWORD dwObjSize;
    DWORD dwFlags;
    DWORD dwDataSize;
    DWORD dwNumObjs;
    LPDIOBJECTDATAFORMAT rgodf;
} DIDATAFORMAT, *LPDIDATAFORMAT;
```

```
typedef const DIDATAFORMAT *LPCDIDATAFORMAT;
```

## Members

**dwSize**

Size of this structure, in bytes.

**dwObjSize**

Size of the **DIOBJECTDATAFORMAT** structure, in bytes.

**dwFlags**

Flags describing other attributes of the data format. This value can be one of the following:

**DIDF\_ABSAXIS**

The axes are in absolute mode. Setting this flag in the data format is equivalent to manually setting the axis mode property, using the **IDirectInputDevice8::SetProperty** method. This cannot be combined with DIDF\_RELAXIS flag.

**DIDF\_RELAXIS**

The axes are in relative mode. Setting this flag in the data format is equivalent to manually setting the axis mode property using the

**IDirectInputDevice8::SetProperty** method. This cannot be combined with the **DIDF\_ABSAXIS** flag.

#### **dwDataSize**

Size of a data packet returned by the device, in bytes. This value must be a multiple of 4 and must exceed the largest offset value for an object's data within the data packet.

#### **dwNumObjs**

Number of objects in the **rgodf** array.

#### **rgodf**

Address to an array of **DIOBJECTDATAFORMAT** structures. Each structure describes how one object's data should be reported in the device data. Typical errors include placing two pieces of information in the same location and placing one piece of information in more than one location.

## **Remarks**

Applications do not typically need to create a **DIDATAFORMAT** structure. An application can use one of the predefined global data format variables, *c\_dfDIMouse*, *c\_dfDIMouse2*, *c\_dfDIKeyboard*, *c\_dfDIJoystick*, or *c\_dfDIJoystick2*.

The following code example sets a data format that can be used by applications that need two axes (reported in absolute coordinates) and two buttons:

```
// Suppose an application uses the following
// structure to read device data.
```

```
typedef struct MYDATA {
    LONG  IX;           // X-axis goes here.
    LONG  IY;           // Y-axis goes here.
    BYTE  bButtonA;     // One button goes here.
    BYTE  bButtonB;     // Another button goes here.
    BYTE  bPadding[2];  // Must be DWORD multiple in size.
} MYDATA;
```

```
// Then, it can use the following data format.
```

```
DIOBJECTDATAFORMAT rgodf[] = {
    { &GUID_XAxis, FIELD_OFFSET(MYDATA, IX),
      DIDFT_AXIS | DIDFT_ANYINSTANCE, 0, },
    { &GUID_YAxis, FIELD_OFFSET(MYDATA, IY),
      DIDFT_AXIS | DIDFT_ANYINSTANCE, 0, },
    { &GUID_Button, FIELD_OFFSET(MYDATA, bButtonA),
      DIDFT_BUTTON | DIDFT_ANYINSTANCE, 0, },
    { &GUID_Button, FIELD_OFFSET(MYDATA, bButtonB),
      DIDFT_BUTTON | DIDFT_ANYINSTANCE, 0, },
};
```

```
#define numObjects (sizeof(rgodf) / sizeof(rgodf[0]))

DIDATAFORMAT df = {
    sizeof(DIDATAFORMAT),    // Size of this structure
    sizeof(DIOBJECTDATAFORMAT), // Size of object data format
    DIDE_ABSAXIS,            // Absolute axis coordinates
    sizeof(MYDATA),          // Size of device data
    numObjects,              // Number of objects
    rgodf,                   // And here they are
};
```

## 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 Dinput.h.

## See Also

### DIACTIONFORMAT

# DIDEVCAPS

Describes a Microsoft® DirectInput® device's capabilities. This structure is used with the **IDirectInputDevice8::GetCapabilities** method.

```
typedef struct DIDEVCAPS {
    DWORD dwSize;
    DWORD dwFlags;
    DWORD dwDevType;
    DWORD dwAxes;
    DWORD dwButtons;
    DWORD dwPOVs;
    DWORD dwFFSamplePeriod;
    DWORD dwFFMinTimeResolution;
    DWORD dwFirmwareRevision;
    DWORD dwHardwareRevision;
    DWORD dwFFDriverVersion;
} DIDEVCAPS, *LPDIDEVCAPS;
```

## Members

### dwSize

Size of this structure, in bytes. This member must be initialized by the application before a call to the **IDirectInputDevice8::GetCapabilities** method.

**dwFlags**

Flags associated with the device. This value can be a combination of the following:

**DIDC\_ALIAS**

The device is a duplicate of another DirectInput device. Alias devices are by default not enumerated by **IDirectInput8::EnumDevices**.

**DIDC\_ATTACHED**

The device is physically attached.

**DIDC\_DEADBAND**

The device supports deadband for at least one force-feedback condition.

**DIDC\_EMULATED**

If this flag is set, the data is coming from a user mode device interface, such as a Human Interface Device (HID), or by some other ring 3 means. If it is not set, the data is coming directly from a kernel mode driver.

**DIDC\_FORCEFEEDBACK**

The device supports force feedback.

**DIDC\_FFFADE**

The force-feedback system supports the fade parameter for at least one effect. If the device does not support fade, the fade level and fade time members of the **DIENVELOPE** structure are ignored by the device.

After a call to the **IDirectInputDevice8::GetEffectInfo** method, an individual effect sets the **DIEFT\_FFFADE** flag if fade is supported for that effect.

**DIDC\_FFATTACK**

The force-feedback system supports the attack parameter for at least one effect. If the device does not support attack, the attack level and attack time members of the **DIENVELOPE** structure are ignored by the device.

After a call to the **IDirectInputDevice8::GetEffectInfo** method, an individual effect sets the **DIEFT\_FFATTACK** flag if attack is supported for that effect.

**DIDC\_HIDDEN**

Fictitious device created by a device driver so that it can generate keyboard and mouse events. Such devices are not normally enumerated by **IDirectInput8::EnumDevices** or configured by **IDirectInput8::ConfigureDevices**.

**DIDC\_PHANTOM**

Placeholder for a device that might exist in the future. Phantom devices are by default not enumerated by **IDirectInput8::EnumDevices**.

**DIDC\_POLLEDDATAFORMAT**

At least one object in the current data format is polled, rather than interrupt-driven. For these objects, the application must explicitly call the **IDirectInputDevice8::Poll** method to obtain data.

**DIDC\_POLLEDDEVICE**

At least one object on the device is polled, rather than interrupt-driven. For these objects, the application must explicitly call the

**IDirectInputDevice8::Poll** method to obtain data. HID devices can contain a mixture of polled and nonpolled objects.

#### DIDC\_POSNEGCOEFFICIENTS

The force-feedback system supports two coefficient values for conditions (one for the positive displacement of the axis and one for the negative displacement of the axis) for at least one condition. If the device does not support both coefficients, the negative coefficient in the **DICONDITION** structure is ignored.

After a call to the **IDirectInputDevice8::GetEffectInfo** method, an individual condition sets the **DIEFT\_POSNEGCOEFFICIENTS** flag if separate positive and negative coefficients are supported for that condition.

#### DIDC\_POSNEGSATURATION

The force-feedback system supports a maximum saturation for both positive and negative force output for at least one condition. If the device does not support both saturation values, the negative saturation in the **DICONDITION** structure is ignored.

After a call to the **IDirectInputDevice8::GetEffectInfo** method, an individual condition sets the **DIEFT\_POSNEGSATURATION** flag if separate positive and negative saturation are supported for that condition.

#### DIDC\_SATURATION

The force-feedback system supports the saturation of condition effects for at least one condition. If the device does not support saturation, the force generated by a condition is limited only by the maximum force that the device can generate.

After a call to the **IDirectInputDevice8::GetEffectInfo** method, an individual condition sets the **DIEFT\_SATURATION** flag if saturation is supported for that condition.

#### DIDC\_STARTDELAY

The force-feedback system supports the start delay parameter for at least one effect. If the device does not support start delays, the **dwStartDelay** member of the **DIEFFECT** structure is ignored.

#### dwDevType

Device type specifier. This member can contain values identical to those in the **dwDevType** member of the **DIDEVICEINSTANCE** structure.

#### dwAxes

Number of axes available on the device.

#### dwButtons

Number of buttons available on the device.

#### dwPOVs

Number of point-of-view controllers available on the device.

#### dwFFSamplePeriod

Minimum time between playback of consecutive raw force commands, in microseconds.

#### dwFFMinTimeResolution

Minimum time, in microseconds, that the device can resolve. The device rounds any times to the nearest supported increment. For example, if the value of **dwFFMinTimeResolution** is 1000, the device would round any times to the nearest millisecond.

**dwFirmwareRevision**

Firmware revision of the device.

**dwHardwareRevision**

Hardware revision of the device.

**dwFFDriverVersion**

Version number of the device driver.

## Remarks

The semantics of version numbers are left to the manufacturer of the device. The only guarantee is that newer versions have larger numbers.

## 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 Dinput.h.

## See Also

DIDeviceInstance

# DIDeviceImageInfo

Carries information required to display a device image or an overlay image with a callout. This structure is passed to the **IDirectInputDevice8::GetImageInfo** method as an array within a **DIDeviceImageInfoHeader** structure.

```
typedef struct _DIDeviceImageInfo {
    TCHAR    tszImagePath[MAX_PATH];
    DWORD    dwFlags;
    // The following are valid if DIDIFT_OVERLAY is present
    // in dwFlags
    DWORD    dwViewID;
    RECT     rcOverlay;
    DWORD    dwObjID;
    DWORD    dwcValidPts;
    POINT    rgptCalloutLine[5];
    RECT     rcCalloutRect;
    DWORD    dwTextAlign;
} DIDeviceImageInfo, * LPDIDeviceImageInfo;
```

## Members

### **tszImagePath**

Fully qualified path to the file that contains an image of the device. The file format is given in **dwFlags**. If no image is available for the device, this member will be set to NULL. If so, the application is responsible for enumerating controls on the device and displaying a default listing of actions to device controls (similar to the method used by most applications before Microsoft® DirectX® 8.0).

### **dwFlags**

Flag that describes the intended use of the image.

#### **DIDIFT\_CONFIGURATION**

The file is used to display the current configuration of actions on the device. Overlay image coordinates are relative to the upper-left corner of the configuration image.

#### **DIDIFT\_OVERLAY**

The file (if provided) is an overlay for a configuration image. The **dwViewID**, **rcOverlay**, **dwObjID**, **rgptCalloutLine**, **rcCalloutRect**, and **dwTextAlign** members are valid and contain data used to display the overlay and callout information for a single control on the device. If no file is provided (null path string), all other pertinent members are relevant except **rcOverlay**.

### **dwViewID**

For device view images (DIDIFT\_CONFIGURATION), this is the ID of the device view. For device control overlays (DIDIFT\_OVERLAY), this value refers to the device view (by ID) over which an image and callout information should be displayed.

### **rcOverlay**

Rectangle, using coordinates relative to the top-left pixel of the device configuration image, in which the overlay image should be painted. This member is valid only if the DIDIFT\_OVERLAY flag is present in **dwFlags**.

### **dwObjID**

Control identifier, as a combination of DIDIFT\_\* flags and an instance value, to which an overlay image corresponds for this device. Applications use the DIDIFT\_GETINSTANCE and DIDIFT\_GETTYPE macros to decode this value to its constituent parts. This member is valid only if the DIDIFT\_OVERLAY flag is present in **dwFlags**.

### **dwcValidPts**

Number of points in the array at **rgptCalloutLine**.

### **rgptCalloutLine**

Array of **POINT** structures that specify coordinates of the points describing a callout line. A callout line connects a device control to a caption for the game action. Each line can have from one to four segments. This member is valid only if the DIDIFT\_OVERLAY flag is present in **dwFlags**.

### **rcCalloutRect**

**RECT** structure that describes the rectangle in which the game action string is displayed. If the string cannot fit within the rectangle, the application is

responsible for handling clipping. This member is valid only if the DIDIFT\_OVERLAY flag is present in **dwFlags**.

#### **dwTextAlign**

DWORD value that specifies the alignment of the text in the rectangle described by the **rcCalloutRect** member. Must be one horizontal alignment flag combined with one vertical alignment flag.

The following horizontal alignment flags are defined.

DIDAL\_LEFTALIGNED

Text is aligned on the left border.

DIDAL\_CENTERED

Text is horizontally centered.

DIDAL\_RIGHTALIGNED

Text is aligned on the right border.

The following vertical alignment flags are defined.

DIDAL\_MIDDLE

The text is vertically centered.

DIDAL\_TOPALIGNED

The text is aligned on the top border.

DIDAL\_BOTTOMALIGNED

The text is aligned on the bottom border.

This member is valid only if the DIDIFT\_OVERLAY flag is present in **dwFlags**.

### **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 Dinput.h.

## **DIDeviceImageInfoHeader**

Contains information about device images. Used in the **IDirectInputDevice8::GetImageInfo** method.

```
typedef struct _DIDeviceImageInfoHeader{
    DWORD dwSize;
    DWORD dwSizeImageInfo;
    DWORD dwcViews;
    DWORD dwcButtons;
    DWORD dwcAxes;
    DWORD dwcPOVs;
    DWORD dwBufferSize;
    DWORD dwBufferUsed;
    DIDeviceImageInfo *lpImageInfoArray;
```



---

```
} DIDEVICEIMAGEINFOHEADER, *LPDIDEVICEIMAGEINFOHEADER;
```

## Members

### **dwSize**

**DWORD** value that specifies the size of this structure, in bytes. Must be initialized before the structure can be used.

### **dwSizeImageInfo**

**DWORD** value that specifies the size of the **DIDEVICEIMAGEINFO** structure, in bytes. Must be initialized before this structure can be used.

### **dwcViews**

**DWORD** variable that receives the number of views of this device.

### **dwcButtons**

**DWORD** variable that receives the number of buttons on the device.

### **dwcAxes**

**DWORD** variable that receives the number of axes on the device.

### **dwcPOVs**

**DWORD** variable that receives the number of point-of-view controllers on the device.

### **dwBufferSize**

**DWORD** value that specifies the size, in bytes, of the buffer at **lprgImageInfo**. When set to zero, the **IDirectInputDevice8::GetImageInfo** method ignores all other members and returns the minimum buffer size required to hold information for all images.

### **dwBufferUsed**

**DWORD** value that receives the size, in bytes, of the memory used in the buffer at **lprgImageInfo**. When **dwBufferSize** is set to zero, the **IDirectInputDevice8::GetImageInfo** method sets this member to the minimum size needed to hold information for all images.

### **lprgImageInfoArray**

Pointer to a buffer that receives an array of **DIDEVICEIMAGEINFO** structures describing all the device images and views, overlay images, and callout-string coordinates.

## Remarks

The buffer at **lprgImageInfoArray** must be large enough to hold all required image information structures. Applications can query for the required size by calling the **IDirectInputDevice8::GetImageInfo** method with the **dwBufferSize** member set to zero. After the call, **dwBufferUsed** contains the amount of memory, in bytes, that was modified.

## 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 Dinput.h.

## DIDEVICEINSTANCE

Describes an instance of a Microsoft® DirectInput® device. This structure is used with the **IDirectInput8::EnumDevices**, **IDirectInput8::EnumDevicesBySemantics**, and **IDirectInputDevice8::GetDeviceInfo** methods.

```
typedef struct DIDEVICEINSTANCE {
    DWORD dwSize;
    GUID guidInstance;
    GUID guidProduct;
    DWORD dwDevType;
    TCHAR tszInstanceName[MAX_PATH];
    TCHAR tszProductName[MAX_PATH];
    GUID guidFFDriver;
    WORD wUsagePage;
    WORD wUsage;
} DIDEVICEINSTANCE, *LPDIDEVICEINSTANCE;

typedef const DIDEVICEINSTANCE *LPCDIDEVICEINSTANCE;
```

## Members

### dwSize

Size of this structure, in bytes. This member must be initialized before the structure is used.

### guidInstance

Unique identifier for the instance of the device. An application can save the instance GUID into a configuration file and use it at a later time. Instance GUIDs are specific to a particular computer. An instance GUID obtained from one computer is unrelated to instance GUIDs on another.

### guidProduct

Unique identifier for the product. This identifier is established by the manufacturer of the device.

### dwDevType

Device type specifier. The least-significant byte of the device type description code specifies the device type. The next-significant byte specifies the device subtype. This value can also be combined with **DIDEVTYPE\_HID**, which specifies a Human Interface Device (HID).

### tszInstanceName[MAX\_PATH]

Friendly name for the instance. For example, "Joystick 1."

**tszProductName[MAX\_PATH]**

Friendly name for the product.

**guidFFDriver**

Unique identifier for the driver being used for force feedback. The driver's manufacturer establishes this identifier.

**wUsagePage**

If the device is a Human Interface Device (HID), this member contains the HID usage page code.

**wUsage**

If the device is a Human Interface Device (HID), this member contains the HID usage code.

## Remarks

The following device types and subtypes are defined for use in the **dwDevType** member.

**DI8DEVTYPE\_1STPERSON**

First-person action game device. The following subtypes are defined.

**DI8DEVTYPE1STPERSON\_LIMITED**

Device that does not provide the minimum number of device objects for action mapping.

**DI8DEVTYPE1STPERSON\_SHOOTER**

Device designed for first-person shooter games.

**DI8DEVTYPE1STPERSON\_SIXDOF**

Device with six degrees of freedom; that is, three lateral axes and three rotational axes.

**DI8DEVTYPE1STPERSON\_UNKNOWN**

Unknown subtype.

**DI8DEVTYPE\_DEVICE**

Device that does not fall into another category.

**DI8DEVTYPE\_DEVICECTRL**

Input device used to control another type of device from within the context of the application. The following subtypes are defined.

**DI8DEVTYPEDEVICECTRL\_COMMSSELECTION**

Control used to make communications selections.

**DI8DEVTYPEDEVICECTRL\_COMMSSELECTION\_HARDWIRED**

Device that must use its default configuration and cannot be remapped.

**DI8DEVTYPEDEVICECTRL\_UNKNOWN**

Unknown subtype.

**DI8DEVTYPE\_DRIVING**

Device for steering. The following subtypes are defined.

**DI8DEVTYPEDRIVING\_COMBINEDPEDALS**

Steering device that reports acceleration and brake pedal values from a single axis.

**DI8DEVTYPEDRIVING\_DUALPEDALS**

Steering device that reports acceleration and brake pedal values from separate axes.

**DI8DEVTYPEDRIVING\_HANDHELD**

Hand-held steering device.

**DI8DEVTYPEDRIVING\_LIMITED**

Steering device that does not provide the minimum number of device objects for action mapping.

**DI8DEVTYPEDRIVING\_THREEPEDALS**

Steering device that reports acceleration, brake, and clutch pedal values from separate axes.

**DI8DEVTYPE\_FLIGHT**

Controller for flight simulation. The following subtypes are defined.

**DI8DEVTYPEFLIGHT\_LIMITED**

Flight controller that does not provide the minimum number of device objects for action mapping.

**DI8DEVTYPEFLIGHT\_RC**

Flight device based on a remote control for model aircraft.

**DI8DEVTYPEFLIGHT\_STICK**

Joystick.

**DI8DEVTYPEFLIGHT\_YOKE**

Yoke.

**DI8DEVTYPE\_GAMEPAD**

Gamepad. The following subtypes are defined.

**DI8DEVTYPEGAMEPAD\_LIMITED**

Gamepad that does not provide the minimum number of device objects for action mapping.

**DI8DEVTYPEGAMEPAD\_STANDARD**

Standard gamepad that provides the minimum number of device objects for action mapping.

**DI8DEVTYPEGAMEPAD\_TILT**

Gamepad that can report x-axis and y-axis data based on the attitude of the controller.

**DI8DEVTYPE\_JOYSTICK**

Joystick. The following subtypes are defined.

**DI8DEVTYPEJOYSTICK\_LIMITED**

Joystick that does not provide the minimum number of device objects for action mapping.

**DI8DEVTYPEJOYSTICK\_STANDARD**

Standard joystick that provides the minimum number of device objects for action mapping.

**DI8DEVTYPE\_KEYBOARD**

Keyboard or keyboard-like device. The following subtypes are defined.

**DI8DEVTYPEKEYBOARD\_UNKNOWN**

Subtype could not be determined.

**DI8DEVTYPEKEYBOARD\_PCXT**

IBM PC/XT 83-key keyboard.

**DI8DEVTYPEKEYBOARD\_OLIVETTI**

Olivetti 102-key keyboard.

**DI8DEVTYPEKEYBOARD\_PCAT**

IBM PC/AT 84-key keyboard.

**DI8DEVTYPEKEYBOARD\_PCENH**

IBM PC Enhanced 101/102-key or Microsoft Natural® keyboard.

**DI8DEVTYPEKEYBOARD\_NOKIA1050**

Nokia 1050 keyboard.

**DI8DEVTYPEKEYBOARD\_NOKIA9140**

Nokia 9140 keyboard.

**DI8DEVTYPEKEYBOARD\_NEC98**

Japanese NEC PC98 keyboard.

**DI8DEVTYPEKEYBOARD\_NEC98LAPTOP**

Japanese NEC PC98 laptop keyboard.

**DI8DEVTYPEKEYBOARD\_NEC98106**

Japanese NEC PC98 106-key keyboard.

**DI8DEVTYPEKEYBOARD\_JAPAN106**

Japanese 106-key keyboard.

**DI8DEVTYPEKEYBOARD\_JAPANAX**

Japanese AX keyboard.

**DI8DEVTYPEKEYBOARD\_J3100**

Japanese J3100 keyboard.

**DI8DEVTYPE\_MOUSE**

A mouse or mouse-like device (such as a trackball). The following subtypes are defined.

**DI8DEVTYPEMOUSE\_ABSOLUTE**

Mouse that returns absolute axis data.

**DI8DEVTYPEMOUSE\_FINGERSTICK**

Fingerstick.

**DI8DEVTYPEMOUSE\_TOUCHPAD**

Touchpad.

**DI8DEVTYPEMOUSE\_TRACKBALL**

Trackball.

DI8DEVTYPEMOUSE\_TRADITIONAL

Traditional mouse.

DI8DEVTYPEMOUSE\_UNKNOWN

Subtype could not be determined.

DI8DEVTYPE\_REMOTE

Remote-control device. The following subtype is defined.

DI8DEVTYPEREMOTE\_UNKNOWN

Subtype could not be determined.

DI8DEVTYPE\_SCREENPOINTER

Screen pointer. The following subtypes are defined.

DI8DEVTYPESCREENPTR\_UNKNOWN

Unknown subtype.

DI8DEVTYPESCREENPTR\_LIGHTGUN

Light gun.

DI8DEVTYPESCREENPTR\_LIGHTPEN

Light pen.

DI8DEVTYPESCREENPTR\_TOUCH

Touch screen.

DI8DEVTYPE\_SUPPLEMENTAL

Specialized device with functionality unsuitable for the main control of an application, such as pedals used with a wheel. The following subtypes are defined.

DI8DEVTYPESUPPLEMENTAL\_2NDHANDCONTROLLER

Secondary handheld controller.

DI8DEVTYPESUPPLEMENTAL\_COMBINEDPEDALS

Device whose primary function is to report acceleration and brake pedal values from a single axis.

DI8DEVTYPESUPPLEMENTAL\_DUALPEDALS

Device whose primary function is to report acceleration and brake pedal values from separate axes.

DI8DEVTYPESUPPLEMENTAL\_HANDTRACKER

Device that tracks hand movement.

DI8DEVTYPESUPPLEMENTAL\_HEADTRACKER

Device that tracks head movement.

DI8DEVTYPESUPPLEMENTAL\_RUDDERPEDALS

Device with rudder pedals.

DI8DEVTYPESUPPLEMENTAL\_SHIFTER

Device that reports gear selection from an axis.

DI8DEVTYPESUPPLEMENTAL\_SHIFTSTICKGATE

Device that reports gear selection from button states.

**DI8DEVTYPESUPPLEMENTAL\_SPLITTHROTTLE**

Device whose primary function is to report at least two throttle values. It may have other controls.

**DI8DEVTYPESUPPLEMENTAL\_THREEPEDALS**

Device whose primary function is to report acceleration, brake, and clutch pedal values from separate axes.

**DI8DEVTYPESUPPLEMENTAL\_THROTTLE**

Device whose primary function is to report a single throttle value. It may have other controls.

**DI8DEVTYPESUPPLEMENTAL\_UNKNOWN**

Unknown subtype.

Versions of DirectInput earlier than Microsoft DirectX® 8.0 have a somewhat different scheme of device types and subtypes. See the **DIDEVTYPExxx** defines in **Dinput.h**.

## 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 **Dinput.h**.

## DIDeviceObjectData

Contains buffered device information. This structure is used with the **IDirectInputDevice8::GetDeviceData** and the **IDirectInputDevice8::SendDeviceData** methods.

```
typedef struct DIDeviceObjectData {
    DWORD    dwOfs;
    DWORD    dwData;
    DWORD    dwTimeStamp;
    DWORD    dwSequence;
    UINT_PTR uAppData;
} DIDeviceObjectData, *LPDIDeviceObjectData;

typedef const DIDeviceObjectData *LPCDIDeviceObjectData;
```

### Members

#### dwOfs

For **GetDeviceData**, the offset into the current data format of the object whose data is being reported; that is, the location in which the **dwData** would have been stored if the data had been obtained by a call to the

**IDirectInputDevice8::GetDeviceState** method. If the device is accessed as a mouse, keyboard, or joystick, the **dwOfs** member is one of the mouse device

constants, keyboard device constants, or joystick device constants. If a custom data format has been set, it is an offset relative to the custom data format.

This member can be ignored if Action Mapping is being used. Instead, retrieve the action value from **uAppData**.

For **SendDeviceData**, the instance ID of the object to which the data is being sent, as obtained from the **dwType** member of a **DIDeviceObjectInstance** structure.

#### **dwData**

Data obtained from or sent to the device.

For axis input, if the device is in relative axis mode, the relative axis motion is reported. If the device is in absolute axis mode, the absolute axis coordinate is reported.

For button input, only the low byte of **dwData** is significant. The high bit of the low byte is set if the button was pressed; it is clear if the button was released.

#### **dwTimeStamp**

System time at which the input event was generated, in milliseconds. This value wraps around approximately every 50 days. See Remarks.

When the structure is used with the **SendDeviceData** method, this member must be 0.

#### **dwSequence**

Microsoft® DirectInput® sequence number for this event. All input events are assigned an increasing sequence number. This enables events from different devices to be sorted chronologically. Because this value can wrap around, care must be taken when comparing two sequence numbers. The **DISEQUENCE\_COMPARE** macro can be used to perform this comparison safely.

When the structure is used with the **SendDeviceData** method, this member must be 0.

#### **uAppData**

Application-defined action value assigned to this object in the last call to **IDirectInputDevice8::SetActionMap**. This is the value in the **uAppData** member of the **DIACTION** structure associated with the object. Ignore this value if you are not using action mapping.

When the structure is used with the **SendDeviceData** method, this member must be zero.

### **Remarks**

The system time returned in **dwTimeStamp** comes from the same clock used by the Microsoft® Win32® **GetTickCount** or **timeGetTime** functions, but it produces potentially more precise values. For example, on Microsoft® Windows® 95, the **GetTickCount** timer is updated only every 55 milliseconds, but the **dwTimeStamp** value is accurate to within 1 millisecond. Therefore, if you call **GetTickCount** and it returns  $n$ , and you then receive an event with a timestamp of  $n + nI$ , you cannot



assume that the event took place exactly *n* milliseconds after the call to **GetTickCount**.

## 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 Dinput.h.

# DIDeviceObjectInstance

Describes a device object instance. This structure is used with the **IDirectInputDevice8::EnumObjects** method to provide the **DIEnumDeviceObjectsCallback** callback function with information about a particular object associated with a device, such as an axis or button. It is also used with the **IDirectInputDevice8::GetObjectInfo** method to retrieve information about a device object.

```
typedef struct DIDeviceObjectInstance {
    DWORD dwSize;
    GUID guidType;
    DWORD dwOfs;
    DWORD dwType;
    DWORD dwFlags;
    TCHAR tszName[MAX_PATH];
    DWORD dwFFMaxForce;
    DWORD dwFFForceResolution;
    WORD wCollectionNumber;
    WORD wDesignatorIndex;
    WORD wUsagePage;
    WORD wUsage;
    DWORD dwDimension;
    WORD wExponent;
    WORD wReportId;
} DIDeviceObjectInstance, *LPDIDeviceObjectInstance;

typedef const DIDeviceObjectInstance
*LPCDIDeviceObjectInstance;
```

## Members

### dwSize

Size of the structure, in bytes. During enumeration, the application can inspect this value to determine how many members of the structure are valid. When the structure is passed to the **IDirectInputDevice8::GetObjectInfo** method, this member must be initialized to **sizeof(DIDeviceObjectInstance)**.

**guidType**

Unique identifier that indicates the object type. This member is optional. If present, it can be one of the following values:

**GUID\_XAxis**

The horizontal axis. For example, it can represent the left-right motion of a mouse.

**GUID\_YAxis**

The vertical axis. For example, it can represent the forward-backward motion of a mouse.

**GUID\_ZAxis**

The z-axis. For example, it can represent the rotation of a mouse wheel or the movement of a joystick throttle control.

**GUID\_RxAxis**

Rotation around the x-axis.

**GUID\_RyAxis**

Rotation around the y-axis.

**GUID\_RzAxis**

Rotation around the z-axis (often a rudder control).

**GUID\_Slider**

A slider axis.

**GUID\_Button**

A mouse button.

**GUID\_Key**

A keyboard key.

**GUID\_POV**

A point-of-view indicator.

**GUID\_Unknown**

Unknown.

Other object types might be defined in the future.

**dwOfs**

Offset within the data format at which data is reported for this object. This value can be used to identify the object in method calls and structures that accept the **DIPH\_BYOFFSET** flag. See Remarks.

**dwType**

Device type that describes the object. It is a combination of **DIDFT\_\*** flags that describe the object type (axis, button, and so on) and contains the object instance number in the middle 16 bits. Use the **DIDFT\_GETINSTANCE** macro to extract the object instance number. For the **DIDFT\_\*** flags, see

**IDirectInputDevice8::EnumObjects**.

**dwFlags**

Flags describing other attributes of the data format. This value can be one of the following:

**DIDOI\_ASPECTACCEL**

The object reports acceleration information.

#### **DIDOI\_ASPECTFORCE**

The object reports force information.

#### **DIDOI\_ASPECTMASK**

The bits that are used to report aspect information. An object can represent at most one aspect.

#### **DIDOI\_ASPECTPOSITION**

The object reports position information.

#### **DIDOI\_ASPECTVELOCITY**

The object reports velocity information.

#### **DIDOI\_FFACTUATOR**

The object can have force-feedback effects applied to it.

#### **DIDOI\_FFEFFECTTRIGGER**

The object can trigger playback of force-feedback effects.

#### **DIDOI\_GUIDISUSAGE**

The **pguid** member of the **DIOBJECTDATAFORMAT** structure contains the desired usage page and usage in a packed **DWORD**. See **DIMAKEUSAGEDWORD**.

#### **DIDOI\_POLLED**

The object does not return data until the **IDirectInputDevice8::Poll** method is called.

#### **tszName[MAX\_PATH]**

Name of the object; for example, "X-Axis" or "Right Shift."

#### **dwFFMaxForce**

The magnitude of the maximum force that can be created by the actuator associated with this object. Force is expressed in newtons and measured in relation to where the hand would be during normal operation of the device.

#### **dwFFForceResolution**

The force resolution of the actuator associated with this object. The returned value represents the number of gradations, or subdivisions, of the maximum force that can be expressed by the force-feedback system from 0 (no force) to maximum force.

#### **wCollectionNumber**

The Human Interface Device (HID) link collection to which the object belongs.

#### **wDesignatorIndex**

An index that refers to a designator in the HID physical descriptor. This number can be passed to functions in the HID parsing library (Hidpi.h) to obtain additional information about the device object.

#### **wUsagePage**

The Human Interface Device (HID) usage page associated with the object, if known. HIDs always report a usage page. Non-HID devices can optionally report a usage page; if they do not, the value of this member is 0.

#### **wUsage**

The HID usage associated with the object, if known. HID's always report a usage. Non-HID's can optionally report a usage; if they do not, the value of this member is 0.

#### **dwDimension**

A Human Interface Device (HID) code for the dimensional units in which the object's value is reported, if known, or 0 if not known.

#### **wExponent**

The exponent to associate with the dimension, if known. Dimensional units are always integral, so an exponent might be needed to convert them to nonintegral types.

#### **wReportId**

Reserved.

### **Remarks**

If a data format has been set for the device, the value in **dwOfs** is the offset of the object's data within that format. If no format has been set, the value is the offset within the raw data returned by the device. Applications should not use this value unless a data format has been set.

Applications can use the **wUsagePage** and **wUsage** members to obtain additional information about how the object was designed to be used. For example, if **wUsagePage** has the value 0x02 (vehicle controls) and **wUsage** has the value 0xB9 (elevator trim), the object was designed to be the elevator trim control on a flight stick. A flight simulator application can use this information to provide more reasonable defaults for objects on the device. HID usage codes are determined by the USB standards committee.

### **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 Dinput.h.

## **DIEFFECT**

Used by the **IDirectInputDevice8::CreateEffect** method to initialize a new **IDirectInputEffect** object. It is also used by the **IDirectInputEffect::SetParameters** and **IDirectInputEffect::GetParameters** methods.

```
typedef struct DIEFFECT {
    DWORD   dwSize;
    DWORD   dwFlags;
    DWORD   dwDuration;
    DWORD   dwSamplePeriod;
```

---

```

    DWORD   dwGain;
    DWORD   dwTriggerButton;
    DWORD   dwTriggerRepeatInterval;
    DWORD   cAxes;
    LPDWORD  rgdAxes;
    LPLONG   rglDirection;
    LPDIENVELOPE lpEnvelope;
    DWORD   cbTypeSpecificParams;
    LPVOID   lpvTypeSpecificParams;
    DWORD   dwStartDelay;
} DIEFFECT, *LPDIEFFECT;

```

```
typedef const DIEFFECT *LPCDIEFFECT;
```

## Members

### dwSize

Specifies the size, in bytes, of the structure. This member must be initialized before the structure is used.

### dwFlags

Flags associated with the effect. This value can be a combination of one or more of the following values:

#### DIEFF\_CARTESIAN

The values of **rglDirection** are to be interpreted as Cartesian coordinates.

#### DIEFF\_OBJECTIDS

The values of **dwTriggerButton** and **rgdAxes** are object identifiers as obtained by **IDirectInputDevice8::EnumObjects**.

#### DIEFF\_OBJECTOFFSETS

The values of **dwTriggerButton** and **rgdAxes** are data format offsets.

#### DIEFF\_POLAR

The values of **rglDirection** are to be interpreted as polar coordinates.

#### DIEFF\_SPHERICAL

The values of **rglDirection** are to be interpreted as spherical coordinates.

### dwDuration

The total duration of the effect, in microseconds. If this value is INFINITE, the effect has infinite duration. If an envelope has been applied to the effect, the attack is applied, followed by an infinite sustain.

### dwSamplePeriod

The period at which the device should play back the effect, in microseconds. A value of 0 indicates that the default playback sample rate should be used.

If the device is not capable of playing back the effect at the specified rate, it chooses the supported rate that is closest to the requested value.

Setting a custom **dwSamplePeriod** can be used for special effects. For example, playing a sine wave at an artificially large sample period results in a rougher texture.

**dwGain**

The gain to be applied to the effect, in the range from 0 through 10,000. The gain is a scaling factor applied to all magnitudes of the effect and its envelope.

**dwTriggerButton**

The identifier or offset of the button to be used to trigger playback of the effect. The flags DIEFF\_OBJECTIDS and DIEFF\_OBJECTOFFSETS determine the semantics of the value. If this member is set to DIEB\_NOTRIGGER, no trigger button is associated with the effect.

**dwTriggerRepeatInterval**

The interval, in microseconds, between the end of one playback and the start of the next when the effect is triggered by a button press and the button is held down. Setting this value to INFINITE suppresses repetition.

Support for trigger repeat for an effect is indicated by the presence of the DIEP\_TRIGGERREPEATINTERVAL flag in the **dwStaticParams** member of the **DIEFFECTINFO** structure.

**cAxes**

Number of axes involved in the effect. This member must be filled in by the caller if changing or setting the axis list or the direction list.

The number of axes for an effect cannot be changed once it has been set.

**rgdwAxes**

Pointer to a **DWORD** array (of **cAxes** elements) containing identifiers or offsets identifying the axes to which the effect is to be applied. The flags DIEFF\_OBJECTIDS and DIEFF\_OBJECTOFFSETS determine the semantics of the values in the array.

The list of axes associated with an effect cannot be changed once it has been set.

No more than 32 axes can be associated with a single effect.

**rglDirection**

Pointer to a **LONG** array (of **cAxes** elements) containing either Cartesian coordinates, polar coordinates, or spherical coordinates. The flags DIEFF\_CARTESIAN, DIEFF\_POLAR, and DIEFF\_SPHERICAL determine the semantics of the values in the array.

If Cartesian, each value in **rglDirection** is associated with the corresponding axis in **rgdwAxes**.

If polar, the angle is measured in hundredths of degrees from the (0, -1) direction, rotated in the direction of (1, 0). This usually means that north is away from the user, and east is to the user's right. The last element is not used.

If spherical, the first angle is measured in hundredths of a degree from the (1, 0) direction, rotated in the direction of (0, 1). The second angle (if the number of axes is three or more) is measured in hundredths of a degree toward (0, 0, 1). The third angle (if the number of axes is four or more) is measured in hundredths of a degree toward (0, 0, 0, 1), and so on. The last element is not used.

**Note**

The **rglDirection** array must contain **cAxes** entries, even if polar or spherical coordinates are given. In these cases, the last element in the **rglDirection** array is reserved for future use and must be 0.

#### **lpEnvelope**

Optional pointer to a **DIENVELOPE** structure that describes the envelope to be used by this effect. Not all effect types use envelopes. If no envelope is to be applied, the member should be set to NULL.

#### **cbTypeSpecificParams**

Number of bytes of additional type-specific parameters for the corresponding effect type.

#### **lpvTypeSpecificParams**

Pointer to type-specific parameters, or NULL if there are no type-specific parameters.

If the effect is of type **DIEFT\_CONDITION**, this member contains a pointer to an array of **DICONDITION** structures that define the parameters for the condition. A single structure may be used, in which case the condition is applied in the direction specified in the **rglDirection** array. Otherwise, there must be one structure for each axis, in the same order as the axes in **rgdwAxes** array. If a structure is supplied for each axis, the effect should not be rotated; you should use the following values in the **rglDirection** array:

- **DIEFF\_SPHERICAL**: 0, 0, ...
- **DIEFF\_POLAR**: 9000, 0, ...
- **DIEFF\_CARTESIAN**: 1, 0, ...

If the effect is of type **DIEFT\_CUSTOMFORCE**, this member contains a pointer to a **DICUSTOMFORCE** structure that defines the parameters for the custom force.

If the effect is of type **DIEFT\_PERIODIC**, this member contains a pointer to a **DIPERIODIC** structure that defines the parameters for the effect.

If the effect is of type **DIEFT\_CONSTANTFORCE**, this member contains a pointer to a **DICONSTANTFORCE** structure that defines the parameters for the constant force.

If the effect is of type **DIEFT\_RAMPFORCE**, this member contains a pointer to a **DIRAMPFORCE** structure that defines the parameters for the ramp force.

#### **dwStartDelay**

Time (in microseconds) that the device should wait after a **IDirectInputEffect::Start** call before playing the effect. If this value is 0, effect playback begins immediately. This member is not present in versions prior to Microsoft® DirectX® 7.0.

## 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 Dinput.h.

## DIEFFECTINFO

Used by the **IDirectInputDevice8::EnumEffects** and **IDirectInputDevice8::GetEffectInfo** methods to return information about a particular effect supported by a device.

```
typedef struct DIEFFECTINFO {
    DWORD dwSize;
    GUID guid;
    DWORD dwEffType;
    DWORD dwStaticParams;
    DWORD dwDynamicParams;
    TCHAR tszName[MAX_PATH];
} DIEFFECTINFO, *LPDIEFFECTINFO;

typedef const DIEFFECTINFO *LPCDIEFFECTINFO;
```

### Members

#### dwSize

Size of the structure in bytes. During enumeration, the application can inspect this value to determine how many members of the structure are valid. This member must be initialized before the structure is passed to the **IDirectInputDevice8::GetEffectInfo** method.

#### guid

Identifier of the effect.

#### dwEffType

Zero or more of the following values:

##### DIEFT\_ALL

Valid only for **IDirectInputDevice8::EnumEffects**. Enumerate all effects, regardless of type. This flag cannot be combined with any of the other flags.

##### DIEFT\_CONDITION

The effect represents a condition. When creating or modifying a condition, the **lpvTypeSpecificParams** member of the **DIEFFECT** structure must point to an array of **DICONDITION** structures (one per axis), and the **cbTypeSpecificParams** member must be set to **cAxis \* sizeof(DICONDITION)**.

Not all devices support all the parameters of conditions. Check the effect capability flags to determine which capabilities are available.

The flag can be passed to **IDirectInputDevice8::EnumEffects** to restrict the enumeration to conditions.

##### DIEFT\_CONSTANTFORCE



The effect represents a constant-force effect. When creating or modifying a constant-force effect, the **lpvTypeSpecificParams** member of the **DIEFFECT** must point to a **DICONSTANTFORCE** structure, and the **cbTypeSpecificParams** member must be set to **sizeof(DICONSTANTFORCE)**.

The flag can be passed to **IDirectInputDevice8::EnumEffects** to restrict the enumeration to constant-force effects.

#### DIEFT\_CUSTOMFORCE

The effect represents a custom-force effect. When creating or modifying a custom-force effect, the **lpvTypeSpecificParams** member of the **DIEFFECT** structure must point to a **DICUSTOMFORCE** structure, and the **cbTypeSpecificParams** member must be set to **sizeof(DICUSTOMFORCE)**.

The flag can be passed to **IDirectInputDevice8::EnumEffects** to restrict the enumeration to custom-force effects.

#### DIEFT\_DEADBAND

The effect generator for this condition effect supports the **IDeadBand** parameter.

#### DIEFT\_FFATTACK

The effect generator for this effect supports the attack envelope parameter. If the effect generator does not support attack, the attack level and attack time parameters of the **DIENVELOPE** structure are ignored by the effect.

If neither **DIEFT\_FFATTACK** nor **DIEFT\_FFFADE** is set, the effect does not support an envelope, and any provided envelope is ignored.

#### DIEFT\_FFFADE

The effect generator for this effect supports the fade parameter. If the effect generator does not support fade, the fade level and fade time parameters of the **DIENVELOPE** structure are ignored by the effect.

If neither **DIEFT\_FFATTACK** nor **DIEFT\_FFFADE** is set, the effect does not support an envelope, and any provided envelope is ignored.

#### DIEFT\_HARDWARE

The effect represents a hardware-specific effect. For additional information on using a hardware-specific effect, consult the hardware documentation.

The flag can be passed to the **IDirectInputDevice8::EnumEffects** method to restrict the enumeration to hardware-specific effects.

#### DIEFT\_PERIODIC

The effect represents a periodic effect. When creating or modifying a periodic effect, the **lpvTypeSpecificParams** member of the **DIEFFECT** structure must point to a **DIPERIODIC** structure, and the **cbTypeSpecificParams** member must be set to **sizeof(DIPERIODIC)**.

The flag can be passed to **IDirectInputDevice8::EnumEffects** to restrict the enumeration to periodic effects.

#### DIEFT\_POSNEGCOEFFICIENTS

The effect generator for this effect supports two coefficient values for conditions, one for the positive displacement of the axis and one for the negative displacement of the axis. If the device does not support both coefficients, the negative coefficient in the **DICONDITION** structure is ignored, and the positive coefficient is used in both directions.

#### **DIEFT\_POSNEGSATURATION**

The effect generator for this effect supports a maximum saturation for both positive and negative force output. If the device does not support both saturation values, the negative saturation in the **DICONDITION** structure is ignored, and the positive saturation is used in both directions.

#### **DIEFT\_RAMPFORCE**

The effect represents a ramp-force effect. When creating or modifying a ramp-force effect, the **lpvTypeSpecificParams** member of the **DIEFFECT** structure must point to a **DIRAMPFORCE** structure, and the **cbTypeSpecificParams** member must be set to **sizeof(DIRAMPFORCE)**.

The flag can be passed to **IDirectInputDevice8::EnumEffects** to restrict the enumeration to ramp-force effects.

#### **DIEFT\_SATURATION**

The effect generator for this effect supports the saturation of condition effects. If the effect generator does not support saturation, the force generated by a condition is limited only by the maximum force that the device can generate.

#### **DIEFT\_STARTDELAY**

The effect has a delay before it plays rather than beginning immediately. This can be used to offset effects so that they play in sequence.

### **dwStaticParams**

Zero or more **DIEP\_\*** values describing the parameters supported by the effect. For example, if **DIEP\_ENVELOPE** is set, the effect supports an envelope. For a list of possible values, see **IDirectInputEffect::GetParameters**.

It is not an error for an application to attempt to use effect parameters that are not supported by the device. The unsupported parameters are ignored.

This information is provided to enable the application to tailor its use of force feedback to the capabilities of the specific device.

### **dwDynamicParams**

Zero or more **DIEP\_\*** values denoting parameters of the effect that can be modified while the effect is playing. For a list of possible values, see **IDirectInputEffect::GetParameters**.

If an application attempts to change a parameter while the effect is playing and the driver does not support modifying that effect dynamically, the driver is permitted to stop the effect, update the parameters, then restart it. For more information, see **IDirectInputEffect::SetParameters**.

### **tszName[MAX\_PATH]**

Name of the effect; for example, "Sawtooth up" or "Constant force".

## Remarks

Use the **DIEFT\_GETTYPE** macro to extract the effect type from the **dwEffType** flags.

## 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 Dinput.h.

# DIEFFESCAPE

Used by the **IDirectInputDevice8::Escape** and **IDirectInputEffect::Escape** methods to pass hardware-specific data directly to the device driver.

```
typedef struct DIEFFESCAPE {  
    DWORD dwSize;  
    DWORD dwCommand;  
    LPVOID lpvInBuffer;  
    DWORD cbInBuffer;  
    LPVOID lpvOutBuffer;  
    DWORD cbOutBuffer;  
} DIEFFESCAPE, *LPDIEFFESCAPE;
```

## Members

### dwSize

Size of the structure in bytes. This member must be initialized before the structure is used.

### dwCommand

Driver-specific command number. Consult the driver documentation for a list of valid commands.

### lpvInBuffer

Buffer containing the data required to perform the operation.

### cbInBuffer

Size, in bytes, of the **lpvInBuffer** buffer.

### lpvOutBuffer

Buffer in which the operation's output data is returned.

### cbOutBuffer

On entry, the size in bytes of the **lpvOutBuffer** buffer. On exit, the number of bytes actually produced by the command.

## Remarks

Because each driver implements different escapes, it is the application's responsibility to ensure that it is talking to the correct driver by comparing the **guidFFDriver** member in the **DIDEVICEINSTANCE** structure against the value the application is expecting.

## 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 Dinput.h.

## DIENVELOPE

Used by the **DIEFFECT** structure to specify the optional envelope parameters for an effect. The sustain level for the envelope is represented by the **dwMagnitude** member of the **DIPERIODIC** structure and the **IMagnitude** member of the **DICONSTANTFORCE** structure. The sustain time is represented by **dwDuration** member of the **DIEFFECT** structure.

```
typedef struct DIENVELOPE {
    DWORD dwSize;
    DWORD dwAttackLevel;
    DWORD dwAttackTime;
    DWORD dwFadeLevel;
    DWORD dwFadeTime;
} DIENVELOPE, *LPDIENVELOPE;
```

```
typedef const DIENVELOPE *LPCDIENVELOPE;
```

## Members

### dwSize

Size, in bytes, of the structure. This member must be initialized before the structure is used.

### dwAttackLevel

Amplitude for the start of the envelope, relative to the baseline, in the range from 0 through 10,000. If the effect's type-specific data does not specify a baseline, the amplitude is relative to 0.

### dwAttackTime

The time, in microseconds, to reach the sustain level.

### dwFadeLevel

Amplitude for the end of the envelope, relative to the baseline, in the range from 0 through 10,000. If the effect's type-specific data does not specify a baseline, the amplitude is relative to 0.

**dwFadeTime**

The time, in microseconds, to reach the fade level.

**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 Dinput.h.

## DIFILEEFFECT

Describes data for a force-feedback effect stored in a file. It is used in conjunction with the **IDirectInputDevice8::EnumEffectsInFile** and **IDirectInputDevice8::WriteEffectToFile** methods.

```
typedef struct DIFILEEFFECT{
    DWORD    dwSize;
    GUID      GuidEffect;
    LPCDIEFFECT lpDiEffect;
    CHAR      szFriendlyName[MAX_PATH];
}DIFILEEFFECT, *LPDIFILEEFFECT;
```

**Members****dwSize**

Size, in bytes, of the structure. This member must be initialized before the structure is used.

**GuidEffect**

Unique identifier of the effect type. This can be one of the standard GUIDs defined in Dinput.h, such as GUID\_ConstantForce, or one created by the designer.

**lpDiEffect**

Pointer to a **DIEFFECT** structure containing information about the effect.

**szFriendlyName**

Name of the effect.

**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 Dinput.h.

# DIJOYSTATE

Describes the state of a joystick device. This structure is used with the **IDirectInputDevice8::GetDeviceState** method.

```
typedef struct DIJOYSTATE {
    LONG    IX;
    LONG    IY;
    LONG    IZ;
    LONG    IRx;
    LONG    IRy;
    LONG    IRz;
    LONG    rglSlider[2];
    DWORD   rgdwPOV[4];
    BYTE    rgbButtons[32];
} DIJOYSTATE, *LPDIJOYSTATE;
```

## Members

### IX

X-axis, usually the left-right movement of a stick.

### IY

Y-axis, usually the forward-backward movement of a stick.

### IZ

Z-axis, often the throttle control. If the joystick does not have this axis, the value is 0.

### IRx

X-axis rotation. If the joystick does not have this axis, the value is 0.

### IRy

Y-axis rotation. If the joystick does not have this axis, the value is 0.

### IRz

Z-axis rotation (often called the rudder). If the joystick does not have this axis, the value is 0.

### rglSlider[2]

Two additional axes, formerly called the u-axis and v-axis, whose semantics depend on the joystick. Use the **IDirectInputDevice8::GetObjectInfo** method to obtain semantic information about these values.

### rgdwPOV[4]

Direction controllers, such as point-of-view hats. The position is indicated in hundredths of a degree clockwise from north (away from the user). The center position is normally reported as -1; but see Remarks. For indicators that have only five positions, the value for a controller is -1, 0, 9,000, 18,000, or 27,000.

### rgbButtons[32]

Array of buttons. The high-order bit of the byte is set if the corresponding button is down, and clear if the button is up or does not exist.

## Remarks

You must prepare the device for joystick-style access by calling the **IDirectInputDevice8::SetDataFormat** method, passing the *c\_dfDIJoystick* global data format variable.

If an axis is in relative mode, the appropriate member contains the change in position. If it is in absolute mode, the member contains the absolute axis position.

Some drivers report the centered position of the POV indicator as 65,535. Determine whether the indicator is centered as follows:

```
BOOL POVCentered = (LOWORD(dwPOV) == 0xFFFF);
```

## Note

Under Microsoft® DirectX® 7, sliders on some joysticks could be assigned to the Z axis, with subsequent code retrieving data from that member. Using DirectX 8, those same sliders will be assigned to the **rglSlider** array. This should be taken into account when porting applications to DirectX 8. Make any necessary alterations to ensure that slider data is retrieved from the **rglSlider** array.

## 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 Dinput.h.

## See Also

**DIJOYSTATE2**

# DIJOYSTATE2

Describes the state of a joystick device with extended capabilities. This structure is used with the **IDirectInputDevice8::GetDeviceState** method.

```
typedef struct DIJOYSTATE2 {
    LONG    IX;
    LONG    IY;
    LONG    IZ;
    LONG    IRx;
    LONG    IRy;
    LONG    IRz;
    LONG    rglSlider[2];
    DWORD   rgdwPOV[4];
    BYTE    rgbButtons[128];
    LONG    IVX;
```

---

```

LONG IVY;
LONG IVZ;
LONG IVRx;
LONG IVRy;
LONG IVRz;
LONG rglVSlider[2];
LONG IAX;
LONG IAY;
LONG IAZ;
LONG IARx;
LONG IARy;
LONG IARz;
LONG rglASlider[2];
LONG IFX;
LONG IFY;
LONG IFZ;
LONG IFRx;
LONG IFRy;
LONG IFRz;
LONG rglFSlider[2];
} DIJOYSTATE2, *LPDIJOYSTATE2;

```

## Members

### IX

X-axis, usually the left-right movement of a stick.

### IY

Y-axis, usually the forward-backward movement of a stick.

### IZ

Z-axis, often the throttle control. If the joystick does not have this axis, the value is 0.

### IRx

X-axis rotation. If the joystick does not have this axis, the value is 0.

### IRy

Y-axis rotation. If the joystick does not have this axis, the value is 0.

### IRz

Z-axis rotation (often called the rudder). If the joystick does not have this axis, the value is 0.

### rglSlider[2]

Two additional axis values (formerly called the u-axis and v-axis) whose semantics depend on the joystick. Use the **IDirectInputDevice8::GetObjectInfo** method to obtain semantic information about these values.

### rgdwPOV[4]



Direction controllers, such as point-of-view hats. The position is indicated in hundredths of a degree clockwise from north (away from the user). The center position is normally reported as  $-1$ ; but see Remarks. For indicators that have only five positions, the value for a controller is  $-1$ ,  $0$ ,  $9,000$ ,  $18,000$ , or  $27,000$ .

**rgbButtons[128]**

Array of buttons. The high-order bit of the byte is set if the corresponding button is down, and clear if the button is up or does not exist.

**IVX**

X-axis velocity.

**IVY**

Y-axis velocity.

**IVZ**

Z-axis velocity.

**IVRx**

X-axis angular velocity.

**IVRy**

Y-axis angular velocity.

**IVRz**

Z-axis angular velocity.

**rglVSlider[2]**

Extra axis velocities.

**IAX**

X-axis acceleration.

**IAY**

Y-axis acceleration.

**IAZ**

Z-axis acceleration.

**IARx**

X-axis angular acceleration.

**IARy**

Y-axis angular acceleration.

**IARz**

Z-axis angular acceleration.

**rglASlider[2]**

Extra axis accelerations.

**IFX**

X-axis force.

**IFY**

Y-axis force.

**IFZ**

Z-axis force.

**IFRx**

X-axis torque.

**IFRy**

Y-axis torque.

**IFRz**

Z-axis torque.

**rglFSlider[2]**

Extra axis forces.

**Remarks**

You must prepare the device for access to a joystick with extended capabilities by calling the **IDirectInputDevice8::SetDataFormat** method, passing the *c\_dfDIJoystick2* global data format variable.

If an axis is in relative mode, the appropriate member contains the change in position. If it is in absolute mode, the member contains the absolute axis position.

Some drivers report the centered position of the POV indicator as 65,535. Determine whether the indicator is centered as follows:

```
BOOL POVCentered = (LOWORD(dwPOV) == 0xFFFF);
```

**Note**

Under Microsoft® DirectX® 7, sliders on some joysticks could be assigned to the Z axis, with subsequent code retrieving data from that member. Using DirectX 8, those same sliders will be assigned to the **rglSlider** array. This should be taken into account when porting applications to DirectX 8. Make any necessary alterations to ensure that slider data is retrieved from the **rglSlider** array.

**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 *Dinput.h*.

**See Also**

**DIJOYSTATE**

**DIMOUSESTATE**

Describes the state of a mouse device that has up to four buttons, or another device that is being accessed as if it were a mouse device. This structure is used with the **IDirectInputDevice8::GetDeviceState** method.

```
typedef struct DIMOUSESTATE {
    LONG IX;
```

```
    LONG IY;  
    LONG IZ;  
    BYTE rgbButtons[4];  
} DIMOUSESTATE, *LPDIMOUSESTATE;
```

## Members

### IX

X-axis.

### IY

Y-axis.

### IZ

Z-axis, typically a wheel. If the mouse does not have a z-axis, the value is 0.

### rgbButtons

Array of buttons. The high-order bit of the byte is set if the corresponding button is down.

## Remarks

You must prepare the device for mouse-style access by calling the **IDirectInputDevice8::SetDataFormat** method, passing the *c\_dfDIMouse* global data format variable.

The mouse is a relative-axis device, so the absolute axis positions for mouse axes are simply accumulated relative motion. Therefore, the value of the absolute axis position is not meaningful except in comparison with other absolute axis positions.

If an axis is in relative mode, the appropriate member contains the change in position. If it is in absolute mode, the member contains the absolute axis position.

## 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 Dinput.h.

## See Also

DIMOUSESTATE2

# DIMOUSESTATE2

Describes the state of a mouse device that has up to eight buttons, or another device that is being accessed as if it were a mouse device. This structure is used with the **IDirectInputDevice8::GetDeviceState** method.

```
typedef struct DIMOUSESTATE {  
    LONG IX;  
    LONG IY;  
    LONG IZ;  
    BYTE rgbButtons[8];  
} DIMOUSESTATE, *LPDIMOUSESTATE;
```

## Members

### IX

X-axis.

### IY

Y-axis.

### IZ

Z-axis, typically a wheel. If the mouse does not have a z-axis, the value is 0.

### rgbButtons

Array of buttons. The high-order bit of the byte is set if the corresponding button is down.

## Remarks

You must prepare the device for mouse-style access by calling the **IDirectInputDevice8::SetDataFormat** method, passing the *c\_dfDIMouse2* global data format variable.

The mouse is a relative-axis device, so the absolute axis positions for mouse axes are simply accumulated relative motion. Therefore, the value of the absolute axis position is not meaningful except in comparison with other absolute axis positions.

If an axis is in relative mode, the appropriate member contains the change in position. If it is in absolute mode, the member contains the absolute axis position.

## 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 Dinput.h.

## See Also

**DIMOUSESTATE**

# DIOBJECTDATAFORMAT

Describes a device object's data format for use with the **IDirectInputDevice8::SetDataFormat** method.

```
typedef struct DIOBJECTDATAFORMAT {
    const GUID * pguid;
    DWORD      dwOfs;
    DWORD      dwType;
    DWORD      dwFlags;
} DIOBJECTDATAFORMAT, *LPDIOBJECTDATAFORMAT;
```

```
typedef const DIOBJECTDATAFORMAT *LPCDIOBJECTDATAFORMAT;
```

## Members

### pguid

Unique identifier for the axis, button, or other input source. When requesting a data format, making this member NULL indicates that any type of object is permissible.

### dwOfs

Offset within the data packet where the data for the input source is stored. This value must be a multiple of 4 for **DWORD** size data, such as axes. It can be byte-aligned for buttons.

### dwType

Device type that describes the object. It is a combination of the following flags describing the object type (axis, button, and so forth) and containing the object-instance number in the middle 16 bits. When requesting a data format, the instance portion must be set to **DIDFT\_ANYINSTANCE** to indicate that any instance is permissible, or to **DIDFT\_MAKEINSTANCE(*n*)** to restrict the request to instance *n*. See the examples under Remarks.

#### DIDFT\_ABSAXIS

The object selected by the **SetDataFormat** method must be an absolute axis.

#### DIDFT\_AXIS

The object selected by the **SetDataFormat** method must be an absolute or relative axis.

#### DIDFT\_BUTTON

The object selected by the **SetDataFormat** method must be a push button or a toggle button.

#### DIDFT\_FFACTUATOR

The object selected by the **SetDataFormat** method must contain a force-feedback actuator; in other words, it must be possible to apply forces to the object.

#### DIDFT\_FFEFFECTTRIGGER

The object selected by the **SetDataFormat** method must be a valid force-feedback effect trigger.

**DIDFT\_POV**

The object selected by the **SetDataFormat** method must be a point-of-view controller.

**DIDFT\_PSHBUTTON**

The object selected by the **SetDataFormat** method must be a push button.

**DIDFT\_RELAXIS**

The object selected by **SetDataFormat** must be a relative axis.

**DIDFT\_TGLBUTTON**

The object selected by **SetDataFormat** must be a toggle button.

**DIDFT\_VENDORDEFINED**

The object selected by **SetDataFormat** must be of a type defined by the manufacturer.

**dwFlags**

Zero or more of the following values:

**DIDOI\_ASPECTACCEL**

The object selected by **SetDataFormat** must report acceleration information.

**DIDOI\_ASPECTFORCE**

The object selected by **SetDataFormat** must report force information.

**DIDOI\_ASPECTPOSITION**

The object selected by **SetDataFormat** must report position information.

**DIDOI\_ASPECTVELOCITY**

The object selected by **SetDataFormat** must report velocity information.

**Remarks**

A data format is made up of several **DIOBJECTDATAFORMAT** structures, one for each object (axis, button, and so on). An array of these structures is contained in the **DIDATAFORMAT** structure that is passed to

**IDirectInputDevice8::SetDataFormat**. An application typically does not need to create an array of **DIOBJECTDATAFORMAT** structures; rather, it can use one of the predefined data formats, *c\_dfDIMouse*, *c\_dfDIMouse2*, *c\_dfDIKeyboard*, *c\_dfDIJoystick*, or *c\_dfDIJoystick2*, which have predefined settings for **DIOBJECTDATAFORMAT**.

The following object data format specifies that Microsoft® DirectInput® should choose the first available axis and report its value in the **DWORD** at offset 4 in the device data.

```
DIOBJECTDATAFORMAT dfAnyAxis = {
    0,                // Wildcard
    4,                // Offset
    DIDFT_AXIS | DIDFT_ANYINSTANCE, // Any axis is okay.
    0,                // Ignore aspect
};
```

The following object data format specifies that the x-axis of the device should be stored in the **DWORD** at offset 12 in the device data. If the device has more than one x-axis, the first available one should be selected.

```
DIOBJECTDATAFORMAT dfAnyXAxis = {
    &GUID_XAxis,          // Must be an X axis
    12,                   // Offset
    DIDFT_AXIS | DIDFT_ANYINSTANCE, // Any X axis is okay.
    0,                    // Ignore aspect
};
```

The following object data format specifies that DirectInput should choose the first available button and report its value in the high bit of the byte at offset 16 in the device data.

```
DIOBJECTDATAFORMAT dfAnyButton = {
    0,                    // Wildcard
    16,                   // Offset
    DIDFT_BUTTON | DIDFT_ANYINSTANCE, // Any button is okay.
    0,                    // Ignore aspect
};
```

The following object data format specifies that button 0 of the device should be reported as the high bit of the byte stored at offset 18 in the device data.

If the device does not have a button 0, the attempt to set this data format fails.

```
DIOBJECTDATAFORMAT dfButton0 = {
    0,                    // Wildcard
    18,                   // Offset
    DIDFT_BUTTON | DIDFT_MAKEINSTANCE(0), // Button zero
    0,                    // Ignore aspect
};
```

## 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 Dinput.h.

## DIPERIODIC

Contains type-specific information for effects that are marked as **DIEFT\_PERIODIC**.

The structure describes a periodic effect.

A pointer to a single **DIPERIODIC** structure for an effect is passed in the **lpvTypeSpecificParams** member of the **DIEFFECT** structure.

```
typedef struct DIPERIODIC {
    DWORD dwMagnitude;
    LONG lOffset;
    DWORD dwPhase;
    DWORD dwPeriod;
} DIPERIODIC, *LPDIPERIODIC;

typedef const DIPERIODIC *LPCDIPERIODIC;
```

## Members

### **dwMagnitude**

Magnitude of the effect, in the range from 0 through 10,000. If an envelope is applied to this effect, the value represents the magnitude of the sustain. If no envelope is applied, the value represents the amplitude of the entire effect.

### **lOffset**

Offset of the effect. The range of forces generated by the effect is **lOffset** minus **dwMagnitude** to **lOffset** plus **dwMagnitude**. The value of the **lOffset** member is also the baseline for any envelope that is applied to the effect.

### **dwPhase**

Position in the cycle of the periodic effect at which playback begins, in the range from 0 through 35,999. See Remarks.

### **dwPeriod**

Period of the effect, in microseconds.

## Remarks

A device driver cannot provide support for all values in the **dwPhase** member. In this case, the value is rounded off to the nearest supported value.

## 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 Dinput.h.

## DIPROPCPOINTS

Sets calibration points for the current instance.

```
typedef struct DIPROPCPOINTS {
    DIPROPHEADER diph;
    DWORD dwCPointsNum;
```



```
CPOINT cp[MAXPOINTSNUM];
} DIPROPCPOINTS, *LPDIPROPCPOINTS;
```

```
typedef const DIPROPCPOINTS *LPCDIPROPCPOINTS;
```

## Members

### diph

**DIPROPHEADER** structure that must be initialized as follows:

Member	Value
<b>dwSize</b>	<b>sizeof(DIPROPCPOINTS)</b>
<b>dwHeaderSize</b>	<b>sizeof(DIPROPHEADER)</b>
<b>dwObj</b>	<p>If the <b>dwHow</b> member is <b>DIPH_BYID</b>, this member must be the identifier for the object whose property setting is to be set or retrieved.</p> <p>If the <b>dwHow</b> member is <b>DIPH_BYOFFSET</b>, this member must be a data format offset for the object whose property setting is to be set or retrieved. For example, if the <i>c_dfDIMouse</i> data format is selected, it must be one of the <b>DIMOFS_*</b> values.</p> <p>If the <b>dwHow</b> member is <b>DIPH_BYUSAGE</b>, the device must be a Human Interface Device (HID). The device object will be identified by the HID usage page and usage values in packed form.</p> <p>This property can be applied only to individual device objects, so <b>DIPH_DEVICE</b> cannot be used.</p>
<b>dwHow</b>	Specifies how the <b>dwObj</b> member should be interpreted. See the description of the <b>dwObj</b> member in this table for details.

### dwCPointsNum

Number of stored calibration points. No more than 8 calibration points may be used.

### cp[MAXPOINTSNUM]

Array of calibration points.

## DIPROPDWORD

Used to access **DWORD** properties.

```
typedef struct DIPROPDWORD {
    DIPROPHEADER diph;
    DWORD        dwData;
} DIPROPDWORD, *LPDIPROPDWORD;
```

```
typedef const DIPROPDWORD *LPCDIPROPDWORD;
```

## Members

### diph

**DIPROPHEADER** structure that must be initialized as follows:

Member	Value
<b>dwSize</b>	<b>sizeof(DIPROPDWORD)</b>
<b>dwHeaderSize</b>	<b>sizeof(DIPROPHEADER)</b>
<b>dwObj</b>	<p>If the <b>dwHow</b> member is <b>DIPH_DEVICE</b>, this member must be 0.</p> <p>If the <b>dwHow</b> member is <b>DIPH_BYID</b>, this member must be the identifier for the object whose property setting is to be set or retrieved.</p> <p>If the <b>dwHow</b> member is <b>DIPH_BYOFFSET</b>, this member must be a data format offset for the object whose property setting is to be set or retrieved. For example, if the <i>c_dfDIMouse</i> data format is selected, it must be one of the <b>DIMOFS_*</b> values.</p> <p>If the <b>dwHow</b> member is <b>DIPH_BYUSAGE</b>, the device must be a Human Interface Device (HID). The device object will be identified by the HID usage page and usage values in packed form.</p>
<b>dwHow</b>	Specifies how the <b>dwObj</b> member should be interpreted. See the description of the <b>dwObj</b> member in this table for details.

### dwData

Property-specific value being set or retrieved.

## 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 *Dinput.h*.

## See Also

**IDirectInputDevice8::GetProperty**, **IDirectInputDevice8::SetProperty**

# DIPROPGUIDANDPATH

Used to access properties whose values represent a GUID and a path.

```
typedef struct DIPROPGUIDANDPATH {
    DIPROPHEADER diph;
```

```

    GUID    guidClass;
    WCHAR    wszPath[MAX_PATH];
} DIPROPGUIDANDPATH, *LPDIPROPGUIDANDPATH;

typedef const DIPROPGUIDANDPATH *LPCDIPROPGUIDANDPATH;

```

## Members

### diph

**DIPROPHEADER** structure that must be initialized as follows:

Member	Value
<b>dwSize</b>	<b>sizeof(DIPROPGUIDANDPATH).</b>
<b>dwHeaderSize</b>	<b>sizeof(DIPROPHEADER).</b>
<b>dwObj</b>	For this structure, this member must be set to 0.
<b>dwHow</b>	Specifies how the <b>dwObj</b> member should be interpreted. For this structure, <b>dwHow</b> should be <b>DIPH_DEVICE</b> .

### guidClass

Class GUID for the object.

### wszPath

Returned path for the object. This is a Unicode string.

## Remarks

The **DIPROP\_GUIDANDPATH** property associated with the **DIPROPGUIDANDPATH** structure enables advanced applications to perform operations on a Human Interface Device (HID) that are not supported by Microsoft® DirectInput®.

The application calls the **IDirectInputDevice8::GetProperty** method with **DIPROP\_GUIDANDPATH** as the *rguidProp* parameter. The class GUID of the device is returned in the **guidClass** member of the **DIPROPGUIDANDPATH** structure, and the device interface path is returned in the **wszPath** member. The application can then call the **CreateFile** function on this path to access the device directly.

## Requirements

**Windows NT/2000:** Requires Windows® 2000.

**Windows 95/98:** Requires Windows 98.

**Header:** Declared in Dinput.h.

# DIPROPHEADER

Serves as a header for all property structures.

```
typedef struct DIPROPHEADER {
    DWORD    dwSize;
    DWORD    dwHeaderSize;
    DWORD    dwObj;
    DWORD    dwHow;
} DIPROPHEADER, *LPDIPROPHEADER;
```

```
typedef const DIPROPHEADER *LPCDIPROPHEADER;
```

## Members

### dwSize

Size of the enclosing structure. This member must be initialized before the structure is used.

### dwHeaderSize

Size of the **DIPROPHEADER** structure.

### dwObj

Object for which the property is to be accessed. The value set for this member depends on the value specified in the **dwHow** member.

### dwHow

Value that specifies how the **dwObj** member should be interpreted. This value can be one of the following:

Value	Meaning
DIPH_DEVICE	The <b>dwObj</b> member must be 0.
DIPH_BYOFFSET	The <b>dwObj</b> member is the offset into the current data format of the object whose property is being accessed.
DIPH_BYUSAGE	The <b>dwObj</b> member is the HID usage page and usage values in packed form.
DIPH_BYID	The <b>dwObj</b> member is the object type/instance identifier. This identifier is returned in the <b>dwType</b> member of the <b>DIDEVICEOBJECTINSTANCE</b> structure returned from a previous call to the <b>IDirectInputDevice8::EnumObjects</b> member.

## 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 Dinput.h.

# DIPROPPOINTER

Used in setting and retrieving data values of type `UINT_PTR`. This is typically a value associated with an application-specific action associated with a device object in an action map, but can also be a function pointer.

```
typedef struct DIPROPPOINTER {
    DIPROPHEADER diph;
    UINT_PTR    uData;
} DIPROPPOINTER, *LPDIPROPPOINTER;
```

```
typedef const DIPROPPOINTER *LPCDIPROPPOINTER;
```

## Members

### diph

**DIPROPHEADER** structure that must be initialized as follows:

Member	Value
<b>dwSize</b>	<b>sizeof(DIPROPPOINTER)</b>
<b>dwHeaderSize</b>	<b>sizeof(DIPROPHEADER)</b>
<b>dwObj</b>	<p>If the <b>dwHow</b> member is <code>DIPH_DEVICE</code>, this member must be 0.</p> <p>If the <b>dwHow</b> member is <code>DIPH_BYID</code>, this member must be the identifier for the object whose property setting is to be set or retrieved.</p> <p>If the <b>dwHow</b> member is <code>DIPH_BYOFFSET</code>, this member must be a data format offset for the object whose property setting is to be set or retrieved. For example, if the <i>c_dfDIMouse</i> data format is selected, it must be one of the <code>DIMOFS_*</code> values.</p> <p>If the <b>dwHow</b> member is <code>DIPH_BYUSAGE</code>, the device must be a Human Interface Device (HID). The device object will be identified by the HID usage page and usage values in packed form.</p>
<b>dwHow</b>	Specifies how the <b>dwObj</b> member should be interpreted. See the description of the <b>dwObj</b> member in this table for details.

### uData

Application-defined value of type `UINT_PTR`, which represents the `uAppData` value (from an action map) that is associated with a device control.

# DIPROP\_RANGE

Contains information about the range of an object within a device. This structure is used with the DIPROP\_RANGE flag set in the **IDirectInputDevice8::GetProperty** and **IDirectInputDevice8::SetProperty** methods.

```
typedef struct DIPROP_RANGE {
    DIPROPHEADER diph;
    LONG         lMin;
    LONG         lMax;
} DIPROP_RANGE, *LPDIPROP_RANGE;
```

```
typedef const DIPROP_RANGE *LPCDIPROP_RANGE;
```

## Members

### diph

**DIPROPHEADER** structure that must be initialized as follows:

Member	Value
<b>dwSize</b>	<b>sizeof(DIPROP_RANGE)</b>
<b>dwHeaderSize</b>	<b>sizeof(DIPROPHEADER)</b>
<b>dwObj</b>	<p>If the <b>dwHow</b> member is DIPH_DEVICE, this member must be 0.</p> <p>If the <b>dwHow</b> member is DIPH_BYID, this member must be the identifier for the object whose property setting is to be set or retrieved.</p> <p>If the <b>dwHow</b> member is DIPH_BYOFFSET, this member must be a data format offset for the object whose property setting is to be set or retrieved. For example, if the <i>c_dfDIMouse</i> data format is selected, it must be one of the DIMOFS_* values. Identifier of the object whose property is being retrieved or set.</p> <p>If the <b>dwHow</b> member is DIPH_BYUSAGE, the device must be a Human Interface Device (HID). The device object will be identified by the HID usage page and usage values in packed form.</p>
<b>dwHow</b>	<p>Specifies how the <b>dwObj</b> member should be interpreted. See the description of the <b>dwObj</b> member in this table for details.</p>

### lMin

Lower limit of the range. If the range of the device is unrestricted, this value is DIPROP\_RANGE\_NOMIN when the **IDirectInputDevice8::GetProperty** method returns.

### lMax

Upper limit of the range. If the range of the device is unrestricted, this value is DIPROPRANGE\_NOMAX when the **IDirectInputDevice8::GetProperty** method returns.

## Remarks

The range values for devices whose ranges are unrestricted wraparound.

## 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 Dinput.h.

## See Also

**IDirectInputDevice8::GetProperty**, **IDirectInputDevice8::SetProperty**

# DIPROPSTRING

Gets and retrieves properties as strings.

```
typedef struct DIPROPSTRING {
    DIPROPHEADER diph;
    WCHAR        wsz[MAX_PATH];
} DIPROPSTRING, * LPDIPROPSTRING;;

typedef const DIPROPSTRING *LPCDIPROPSTRING;
```

## Members

### diph

**DIPROPHEADER** structure that must be initialized as follows:

Member	Value
<b>dwSize</b>	<b>sizeof(DIPROPSTRING)</b>
<b>dwHeaderSize</b>	<b>sizeof(DIPROPHEADER)</b>
<b>dwObj</b>	<p>If the <b>dwHow</b> member is <b>DIPH_DEVICE</b>, this member must be 0.</p> <p>If the <b>dwHow</b> member is <b>DIPH_BYID</b>, this member must be the identifier for the object whose property setting is to be set or retrieved.</p> <p>If the <b>dwHow</b> member is <b>DIPH_BYOFFSET</b>, this member must be a data format offset for the object whose property setting is to be set or retrieved. For example, if the</p>

*c\_dfDIMouse* data format is selected, it must be one of the DIMOFS\_\* values.

If the **dwHow** member is DIPH\_BYUSAGE, the device must be a Human Interface Device (HID). The device object will be identified by the HID usage page and usage values in packed form.

**dwHow** Specifies how the **dwObj** member should be interpreted. See the description of the **dwObj** member in this table for details.

**wsz**

Unicode string that specifies or retrieves the property.

## Remarks

The DIPROP\_INSTANCENAME and DIPROP\_PRODUCTNAME properties associated with the **DIPROPSTRING** structure enable advanced applications to perform operations on a Human Interface Device (HID) that are not supported by Microsoft® DirectInput®.

## Requirements

**Windows NT/2000:** Requires Windows® 2000.

**Windows 95/98:** Requires Windows 98.

**Header:** Declared in Dinput.h.

## DIRAMPFORCE

Contains type-specific information for effects that are marked as **DIEFT\_RAMPFORCE**. The structure describes a ramp force effect.

A pointer to a single **DIRAMPFORCE** structure for an effect is passed in the **lpvTypeSpecificParams** member of the **DIEFFECT** structure.

```
typedef struct DIRAMPFORCE {
    LONG IStart;
    LONG IEnd;
} DIRAMPFORCE, *LPDIRAMPFORCE;
```

```
typedef const DIRAMPFORCE *LPCDIRAMPFORCE;
```

## Members

### IStart

Magnitude at the start of the effect, in the range from –10,000 through 10,000.

### IEnd

Magnitude at the end of the effect, in the range from –10,000 through 10,000.



## Remarks

The **dwDuration** for a ramp force effect cannot be INFINITE.

## 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 Dinput.h.

## Device Constants

This section is a reference for constants used to interpret data for keys, buttons, and axes.

- Keyboard Device Constants
- DirectInput and Japanese Keyboards
- Mouse Device Constants
- Joystick Device Constants

## Keyboard Device Constants

Keyboard device constants, defined in Dinput.h, represent offsets within a keyboard device's data packet, a 256-byte array. The data at a given offset is associated with a keyboard key. Typically, these values are used in the **dwOfs** member of the **DIDeviceObjectData**, **DIOBJECTDATAFORMAT** or **DIDeviceObjectInstance** structures, or as indices when accessing data within the array using array notation.

The standard keyboard device constants are listed in the following table.

Constant	Note
DIK_0	On main keyboard
DIK_1	On main keyboard
DIK_2	On main keyboard
DIK_3	On main keyboard
DIK_4	On main keyboard
DIK_5	On main keyboard
DIK_6	On main keyboard
DIK_7	On main keyboard
DIK_8	On main keyboard

DIK_9	On main keyboard
DIK_A	
DIK_ABNT_C1	On numeric pad of Brazilian keyboards
DIK_ABNT_C2	On numeric pad of Brazilian keyboards
DIK_ADD	PLUS SIGN (+) on numeric keypad
DIK_APOSTROPHE	
DIK_APPS	
DIK_AT	On Japanese keyboard
DIK_AX	On Japanese keyboard
DIK_B	
DIK_BACK	BACKSPACE
DIK_BACKSLASH	
DIK_C	
DIK_CALCULATOR	
DIK_CAPITAL	CAPS LOCK
DIK_COLON	On Japanese keyboard
DIK_COMMA	
DIK_CONVERT	On Japanese keyboard
DIK_D	
DIK_DECIMAL	PERIOD (decimal point) on numeric keypad
DIK_DELETE	
DIK_DIVIDE	Forward slash (/) on numeric keypad
DIK_DOWN	DOWN ARROW
DIK_E	
DIK_END	
DIK_EQUALS	On main keyboard
DIK_ESCAPE	
DIK_F	
DIK_F1	
DIK_F2	
DIK_F3	
DIK_F4	
DIK_F5	
DIK_F6	
DIK_F7	
DIK_F8	
DIK_F9	

DIK_F10	
DIK_F11	
DIK_F12	
DIK_F13	On NEC PC-98 Japanese keyboard
DIK_F14	On NEC PC-98 Japanese keyboard
DIK_F15	On NEC PC-98 Japanese keyboard
DIK_G	
DIK_GRAVE	Grave accent (`)
DIK_H	
DIK_HOME	
DIK_I	
DIK_INSERT	
DIK_J	
DIK_K	
DIK_KANA	On Japanese keyboard
DIK_KANJI	On Japanese keyboard
DIK_L	
DIK_LBRACKET	Left square bracket [
DIK_LCONTROL	Left CTRL
DIK_LEFT	LEFT ARROW
DIK_LMENU	Left ALT
DIK_LSHIFT	Left SHIFT
DIK_LWIN	Left Microsoft® Windows® logo key
DIK_M	
DIK_MAIL	
DIK_MEDIASELECT	Media Select key, which displays a selection of supported media players on the system
DIK_MEDIASTOP	
DIK_MINUS	On main keyboard
DIK_MULTIPLY	Asterisk (*) on numeric keypad
DIK_MUTE	
DIK_MYCOMPUTER	
DIK_N	
DIK_NEXT	PAGE DOWN
DIK_NEXTTRACK	Next track
DIK_NOCONVERT	On Japanese keyboard
DIK_NUMLOCK	

DIK_NUMPAD0	
DIK_NUMPAD1	
DIK_NUMPAD2	
DIK_NUMPAD3	
DIK_NUMPAD4	
DIK_NUMPAD5	
DIK_NUMPAD6	
DIK_NUMPAD7	
DIK_NUMPAD8	
DIK_NUMPAD9	
DIK_NUMPADCOMMA	On numeric keypad of NEC PC-98 Japanese keyboard
DIK_NUMPADENTER	
DIK_NUMPADEQUALS	On numeric keypad of NEC PC-98 Japanese keyboard
DIK_O	
DIK_OEM_102	On British and German keyboards
DIK_P	
DIK_PAUSE	
DIK_PERIOD	On main keyboard
DIK_PLAYPAUSE	
DIK_POWER	
DIK_PREVTRACK	Previous track; circumflex on Japanese keyboard
DIK_PRIOR	PAGE UP
DIK_Q	
DIK_R	
DIK_RBRACKET	Right square bracket ]
DIK_RCONTROL	Right CTRL
DIK_RETURN	ENTER on main keyboard
DIK_RIGHT	RIGHT ARROW
DIK_RMENU	Right ALT
DIK_RSHIFT	Right SHIFT
DIK_RWIN	Right Windows logo key
DIK_S	
DIK_SCROLL	SCROLL LOCK
DIK_SEMICOLON	
DIK_SLASH	Forward slash (/) on main keyboard
DIK_SLEEP	

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DIK_SPACE	SPACEBAR
DIK_STOP	On NEC PC-98 Japanese keyboard
DIK_SUBTRACT	MINUS SIGN (-) on numeric keypad
DIK_SYSRQ	
DIK_T	
DIK_TAB	
DIK_U	
DIK_UNDERLINE	On NEC PC-98 Japanese keyboard
DIK_UNLABELED	On Japanese keyboard
DIK_UP	UP ARROW
DIK_V	
DIK_VOLUMEDOWN	
DIK_VOLUMEUP	
DIK_W	
DIK_WAKE	
DIK_WEBBACK	
DIK_WEBFAVORITES	Displays the Microsoft Internet Explorer Favorites list, the Windows Favorites folder, or the Netscape Bookmarks list.
DIK_WEBFORWARD	
DIK_WEBHOME	
DIK_WEBREFRESH	
DIK_WEBSEARCH	
DIK_WEBSTOP	
DIK_X	
DIK_Y	
DIK_YEN	On Japanese keyboard
DIK_Z	

The following alternate names are available:

Alternate name	Regular name	Note
DIK_BACKSPACE	DIK_BACK	BACKSPACE
DIK_CAPSLOCK	DIK_CAPITAL	CAPS LOCK
DIK_CIRCUMFLEX	DIK_PREVTRACK	On Japanese keyboard
DIK_DOWNARROW	DIK_DOWN	On arrow keypad
DIK_LALT	DIK_LMENU	Left ALT
DIK_LEFTARROW	DIK_LEFT	On arrow keypad
DIK_NUMPADMINUS	DIK__SUBTRACT	MINUS SIGN (-) on numeric

DIK_NUMPADPERIOD	DIK_DECIMAL	keypad PERIOD (decimal point) on numeric keypad
DIK_NUMPADPLUS	DIK_ADD	PLUS SIGN (+) on numeric keypad
DIK_NUMPADSLASH	DIK_DIVIDE	Forward slash (/) on numeric keypad
DIK_NUMPADSTAR	DIK_MULTIPLY	Asterisk (*) on numeric keypad
DIK_PGDN	DIK_NEXT	On arrow keypad
DIK_PGUP	DIK_PRIOR	On arrow keypad
DIK_RALT	DIK_RMENU	Right ALT
DIK_RIGHTARROW	DIK_RIGHT	On arrow keypad
DIK_UPARROW	DIK_UP	On arrow keypad

For information on Japanese keyboards, see DirectInput and Japanese Keyboards.

## DirectInput and Japanese Keyboards

The following chart lists keys that are available on Japanese keyboards but not on standard U.S. keyboards, as well as keys that are available on U.S. keyboards but not on the various Japanese keyboards.

On Microsoft® Windows® 2000 and with some keyboards (such as the NEC PC-98) using other operating systems, the DIK\_CAPSLOCK, DIK\_KANJI, and DIK\_KANA keys are toggle buttons and not push buttons. These generate a down event when first pressed, then generate an up event when pressed a second time.

Japanese Keyboard	Additional keys	Missing keys
DOS/V 106, NEC PC-98 106	DIK_AT, DIK_CIRCUMFLEX, DIK_COLON, DIK_CONVERT, DIK_KANA, DIK_KANJI, DIK_NOCONVERT, DIK_YEN	DIK_APOSTROPHE, DIK_EQUALS, DIK_GRAVE
NEC PC-98	DIK_AT, DIK_CIRCUMFLEX, DIK_COLON, DIK_F13, DIK_F14, DIK_F15, DIK_KANA, DIK_KANJI, DIK_NOCONVERT,	DIK_APOSTROPHE, DIK_BACKSLASH, DIK_EQUALS, DIK_GRAVE, DIK_NUMLOCK, DIK_NUMPADENTER,

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	DIK_NUMPADCOMMA, DIK_NUMPADEQUALS, DIK_STOP, DIK_UNDERLINE, DIK_YEN	DIK_RCONTROL, DIK_RMENU, DIK_RSHIFT, DIK_SCROLL
AX	DIK_AX, DIK_CONVERT, DIK_KANJI, DIK_NOCONVERT, DIK_YEN	DIK_RCONTROL, DIK_RMENU
J-3100	DIK_KANA, DIK_KANJI, DIK_NOLABEL, DIK_YEN	DIK_RCONTROL, DIK_RMENU

## Mouse Device Constants

Mouse device constants, defined in `Dinput.h`, represent offsets within a mouse device's data packet, the **DIMOUSESTATE** or **DIMOUSESTATE2** structure. The data at a given offset is associated with a device object (button or axis). Typically, these values are used in the **dwOfs** member of the **DIDeviceObjectData**, **DIOBJECTDATAFORMAT** or **DIDeviceObjectInstance** structures.

The mouse device constants are the following:

Constant	Note
DIMOFS_BUTTON0	
DIMOFS_BUTTON1	
DIMOFS_BUTTON2	
DIMOFS_BUTTON3	
DIMOFS_BUTTON4	<b>DIMOUSESTATE2</b> only
DIMOFS_BUTTON5	<b>DIMOUSESTATE2</b> only
DIMOFS_BUTTON6	<b>DIMOUSESTATE2</b> only
DIMOFS_BUTTON7	<b>DIMOUSESTATE2</b> only
DIMOFS_X	
DIMOFS_Y	
DIMOFS_Z	

## Joystick Device Constants

Joystick device constants represent offsets within a joystick device's data packet, the **DIJOYSTATE** structure. The data at a given offset is associated with a device object; that is, a button or axis. Typically, these values are used in the **dwOfs** member

of the **DIDEVICEOBJECTDATA**, **DIOBJECTDATAFORMAT** or **DIDEVICEOBJECTINSTANCE** structures.

The following macros return a constant indicating the offset of the data for a particular button or axis relative to the beginning of the **DIJOYSTATE** structure.

Constant	Device object
DIJOFS_BUTTON0 <i>to</i> DIJOFS_BUTTON31 <i>or</i> DIJOFS_BUTTON( <i>n</i> )	Button
DIJOFS_POV( <i>n</i> )	Point-of-view indicator
DIJOFS_RX	X-axis rotation
DIJOFS_RY	Y-axis rotation
DIJOFS_RZ	Z-axis rotation (rudder)
DIJOFS_X	X-axis
DIJOFS_Y	Y-axis
DIJOFS_Z	Z-axis
DIJOFS_SLIDER( <i>n</i> )	Slider axis

## Action Mapping Constants

This section is a reference to the constants defined in `Dinput.h` for application genres and controls mapped to actions within each genre.

The control constants, such as `DIAXIS_FIGHTINGH_MOVE`, are used in the **dwSemantic** member of the **DIACTION** structure to associate the control with an action in the application.

The constants for the genres, such as `DIVIRTUAL_FIGHTING_HAND2HAND`, are used in the **dwGenre** member of the **DIACTIONFORMAT** structure.

Action mapping constants are provided for application genres in the following categories.

- Action Genres
- Arcade Genres
- CAD Genres
- Control Genres
- Driving Genres
- Flight Genres
- Sports Genres
- Strategy Genres



The **dwSemantic** member of the **DIACTION** structure member can map the action to a particular device object rather than a virtual control. Device object constants are provided in the following categories.

- Keyboard Mapping Constants
- Mouse Mapping Constants
- DirectPlay Voice Mapping Constants
- Any-Control Constants

## Action Genres

The following genres contain controls for fighting and action games.

- Hand-to-Hand
- Shooting
- Third-Person Action

### Hand-to-Hand

The **DIVIRTUAL\_FIGHTING\_HAND2HAND** genre contains controls for a first-person fighting game without guns.

#### Priority 1 Controls

**DIAXIS\_FIGHTINGH\_LATERAL**  
**DIAXIS\_FIGHTINGH\_MOVE**  
**DIBUTTON\_FIGHTINGH\_BLOCK**  
**DIBUTTON\_FIGHTINGH\_CROUCH**  
**DIBUTTON\_FIGHTINGH\_JUMP**  
**DIBUTTON\_FIGHTINGH\_KICK**  
**DIBUTTON\_FIGHTINGH\_MENU**  
**DIBUTTON\_FIGHTINGH\_PUNCH**  
**DIBUTTON\_FIGHTINGH\_SPECIAL1**  
**DIBUTTON\_FIGHTINGH\_SPECIAL2**

#### Priority 2 Controls

**DIAXIS\_FIGHTINGH\_ROTATE**  
**DIBUTTON\_FIGHTINGH\_BACKWARD\_LINK**  
**DIBUTTON\_FIGHTINGH\_DEVICE**  
**DIBUTTON\_FIGHTINGH\_DISPLAY**  
**DIBUTTON\_FIGHTINGH\_DODGE**  
**DIBUTTON\_FIGHTINGH\_FORWARD\_LINK**  
**DIBUTTON\_FIGHTINGH\_LEFT\_LINK**

DIBUTTON\_FIGHTINGH\_RIGHT\_LINK  
DIBUTTON\_FIGHTINGH\_PAUSE  
DIBUTTON\_FIGHTINGH\_SELECT  
DIHATSWITCH\_FIGHTINGH\_SLIDE

## Shooting

The DIVIRTUAL\_FIGHTING\_FPS genre contains controls for a first-person fighting game with guns.

### Priority 1 Controls

DIAXIS\_FPS\_LOOKUPDOWN  
DIAXIS\_FPS\_MOVE  
DIAXIS\_FPS\_ROTATE  
DIBUTTON\_FPS\_APPLY  
DIBUTTON\_FPS\_CROUCH  
DIBUTTON\_FPS\_FIRE  
DIBUTTON\_FPS\_JUMP  
DIBUTTON\_FPS\_MENU  
DIBUTTON\_FPS\_SELECT  
DIBUTTON\_FPS\_STRAFE  
DIBUTTON\_FPS\_WEAPONS

### Priority 2 Controls

DIAXIS\_FPS\_SIDESTEP  
DIBUTTON\_FPS\_BACKWARD\_LINK  
DIBUTTON\_FPS\_DEVICE  
DIBUTTON\_FPS\_DISPLAY  
DIBUTTON\_FPS\_DODGE  
DIBUTTON\_FPS\_FIRESECONDARY  
DIBUTTON\_FPS\_FORWARD\_LINK  
DIBUTTON\_FPS\_GLANCE\_DOWN\_LINK  
DIBUTTON\_FPS\_GLANCE\_UP\_LINK  
DIBUTTON\_FPS\_GLANCEL  
DIBUTTON\_FPS\_GLANCER  
DIBUTTON\_FPS\_PAUSE  
DIBUTTON\_FPS\_ROTATE\_LEFT\_LINK  
DIBUTTON\_FPS\_ROTATE\_RIGHT\_LINK  
DIHATSWITCH\_FPS\_GLANCE

## Third-Person Action

The DIVIRTUAL\_FIGHTING\_THIRDPERSON genre contains controls for a third-person action game.

### Priority 1 Controls

DIAXIS\_TPS\_MOVE

DIAXIS\_TPS\_TURN

DIBUTTON\_TPS\_ACTION

DIBUTTON\_TPS\_JUMP

DIBUTTON\_TPS\_MENU

DIBUTTON\_TPS\_RUN

DIBUTTON\_TPS\_SELECT

DIBUTTON\_TPS\_USE

### Priority 2 Controls

DIAXIS\_TPS\_STEP

DIBUTTON\_TPS\_BACKWARD\_LINK

DIBUTTON\_TPS\_DEVICE

DIBUTTON\_TPS\_DODGE

DIBUTTON\_TPS\_FORWARD\_LINK

DIBUTTON\_TPS\_GLANCE\_DOWN\_LINK

DIBUTTON\_TPS\_GLANCE\_LEFT\_LINK

DIBUTTON\_TPS\_GLANCE\_RIGHT\_LINK

DIBUTTON\_TPS\_GLANCE\_UP\_LINK

DIBUTTON\_TPS\_INVENTORY

DIBUTTON\_TPS\_PAUSE

DIBUTTON\_TPS\_STEPLEFT

DIBUTTON\_TPS\_STEPRIGHT

DIBUTTON\_TPS\_TURN\_LEFT\_LINK

DIBUTTON\_TPS\_TURN\_RIGHT\_LINK

DIBUTTON\_TPS\_VIEW

DIHATSWITCH\_TPS\_GLANCE

## Arcade Genres

The following genres contain controls for arcade-type games in which the object is to move a figure through a dangerous environment.

- Platform

- Side-to-Side

## Platform

The DIVIRTUAL\_ARCADE\_PLATFORM genre contains controls for an arcade-style game.

### Priority 1 Controls

DIAXIS\_ARCADEP\_LATERAL  
DIAXIS\_ARCADEP\_MOVE  
DIBUTTON\_ARCADEP\_CROUCH  
DIBUTTON\_ARCADEP\_FIRE  
DIBUTTON\_ARCADEP\_JUMP  
DIBUTTON\_ARCADEP\_MENU  
DIBUTTON\_ARCADEP\_SELECT  
DIBUTTON\_ARCADEP\_SPECIAL

### Priority 2 Controls

DIBUTTON\_ARCADEP\_BACK\_LINK  
DIBUTTON\_ARCADEP\_DEVICE  
DIBUTTON\_ARCADEP\_FIRESECONDARY  
DIBUTTON\_ARCADEP\_FORWARD\_LINK  
DIBUTTON\_ARCADEP\_LEFT\_LINK  
DIBUTTON\_ARCADEP\_PAUSE  
DIBUTTON\_ARCADEP\_RIGHT\_LINK  
DIBUTTON\_ARCADEP\_VIEW\_DOWN\_LINK  
DIBUTTON\_ARCADEP\_VIEW\_LEFT\_LINK  
DIBUTTON\_ARCADEP\_VIEW\_RIGHT\_LINK  
DIBUTTON\_ARCADEP\_VIEW\_UP\_LINK  
DIHATSWITCH\_ARCADEP\_VIEW

## Side-to-Side

The DIVIRTUAL\_ARCADE\_SIDE2SIDE genre contains controls for a two-dimensional arcade-style game.

### Priority 1 Controls

DIAXIS\_ARCADES\_LATERAL  
DIAXIS\_ARCADES\_MOVE  
DIBUTTON\_ARCADES\_ATTACK

DIBUTTON\_ARCADES\_CARRY  
DIBUTTON\_ARCADES\_MENU  
DIBUTTON\_ARCADES\_SELECT  
DIBUTTON\_ARCADES\_SPECIAL  
DIBUTTON\_ARCADES\_THROW

**Priority 2 Controls**

DIBUTTON\_ARCADES\_BACK\_LINK  
DIBUTTON\_ARCADES\_DEVICE  
DIBUTTON\_ARCADES\_FORWARD\_LINK  
DIBUTTON\_ARCADES\_LEFT\_LINK  
DIBUTTON\_ARCADES\_PAUSE  
DIBUTTON\_ARCADES\_RIGHT\_LINK  
DIBUTTON\_ARCADES\_VIEW\_DOWN\_LINK  
DIBUTTON\_ARCADES\_VIEW\_LEFT\_LINK  
DIBUTTON\_ARCADES\_VIEW\_RIGHT\_LINK  
DIBUTTON\_ARCADES\_VIEW\_UP\_LINK  
DIHATSWITCH\_ARCADES\_VIEW

## CAD Genres

The following genres contain controls for computer-assisted drafting applications.

- 2-D Object
- 3-D Model
- 3-D Navigation
- 3-D Object

### 2-D Object

The DIVIRTUAL\_CAD\_2DCONTROL genre contains controls to select and move objects in a two-dimensional drafting environment.

**Priority 1 Controls**

DIAXIS\_2DCONTROL\_LATERAL  
DIAXIS\_2DCONTROL\_MOVE  
DIAXIS\_2DCONTROL\_INOUT  
DIBUTTON\_2DCONTROL\_MENU  
DIBUTTON\_2DCONTROL\_SELECT  
DIBUTTON\_2DCONTROL\_SPECIAL  
DIBUTTON\_2DCONTROL\_SPECIAL1

DIBUTTON\_2DCONTROL\_SPECIAL2

**Priority 2 Controls**

DIAXIS\_2DCONTROL\_ROTATEZ

DIBUTTON\_2DCONTROL\_DEVICE

DIBUTTON\_2DCONTROL\_DISPLAY

DIBUTTON\_2DCONTROL\_PAUSE

DIHATSWITCH\_2DCONTROL\_HATSWITCH

## 3-D Model

The DIVIRTUAL\_CAD\_MODEL genre contains controls for modeling three-dimensional objects.

**Priority 1 Controls**

DIAXIS\_CADM\_LATERAL

DIAXIS\_CADM\_MOVE

DIAXIS\_CADM\_INOUT

DIBUTTON\_CADM\_MENU

DIBUTTON\_CADM\_SELECT

DIBUTTON\_CADM\_SPECIAL

DIBUTTON\_CADM\_SPECIAL1

DIBUTTON\_CADM\_SPECIAL2

**Priority 2 Controls**

DIAXIS\_CADM\_ROTATEX

DIAXIS\_CADM\_ROTATEY

DIAXIS\_CADM\_ROTATEZ

DIBUTTON\_CADM\_DEVICE

DIBUTTON\_CADM\_DISPLAY

DIBUTTON\_CADM\_PAUSE

DIHATSWITCH\_CADM\_HATSWITCH

## 3-D Navigation

The DIVIRTUAL\_CAD\_FLYBY genre contains control for fly-through navigation of three-dimensional environments.

**Priority 1 Controls**

DIAXIS\_CADF\_LATERAL

DIAXIS\_CADF\_MOVE  
DIAXIS\_CADF\_INOUT  
DIBUTTON\_CADF\_MENU  
DIBUTTON\_CADF\_SELECT  
DIBUTTON\_CADF\_SPECIAL  
DIBUTTON\_CADF\_SPECIAL1  
DIBUTTON\_CADF\_SPECIAL2

**Priority 2 Controls**

DIAXIS\_CADF\_ROTATEX  
DIAXIS\_CADF\_ROTATEY  
DIAXIS\_CADF\_ROTATEZ  
DIBUTTON\_CADF\_DEVICE  
DIBUTTON\_CADF\_DISPLAY  
DIBUTTON\_CADF\_PAUSE  
DIHATSWITCH\_CADF\_HATSWITCH

## 3-D Object

The DIVIRTUAL\_CAD\_3DCONTROL genre contains controls to select and move objects in a three-dimensional drafting environment.

**Priority 1 Controls**

DIAXIS\_3DCONTROL\_LATERAL  
DIAXIS\_3DCONTROL\_MOVE  
DIAXIS\_3DCONTROL\_INOUT  
DIBUTTON\_3DCONTROL\_MENU  
DIBUTTON\_3DCONTROL\_SELECT  
DIBUTTON\_3DCONTROL\_SPECIAL  
DIBUTTON\_3DCONTROL\_SPECIAL1  
DIBUTTON\_3DCONTROL\_SPECIAL2

**Priority 2 Controls**

DIAXIS\_3DCONTROL\_ROTATEX  
DIAXIS\_3DCONTROL\_ROTATEY  
DIAXIS\_3DCONTROL\_ROTATEZ  
DIBUTTON\_3DCONTROL\_DEVICE  
DIBUTTON\_3DCONTROL\_DISPLAY  
DIBUTTON\_3DCONTROL\_PAUSE  
DIHATSWITCH\_3DCONTROL\_HATSWITCH

## Control Genres

The following genres contain controls for use with Web browsers and remote-control devices.

- Browser
- Remote Control

### Browser

The DIVIRTUAL\_BROWSER\_CONTROL genre contains controls for a Web browser.

#### Priority 1 Controls

DIAXIS\_BROWSER\_LATERAL  
DIAXIS\_BROWSER\_MOVE  
DIAXIS\_BROWSER\_VIEW  
DIBUTTON\_BROWSER\_MENU  
DIBUTTON\_BROWSER\_REFRESH  
DIBUTTON\_BROWSER\_SELECT

#### Priority 2 Controls

DIBUTTON\_BROWSER\_DEVICE  
DIBUTTON\_BROWSER\_FAVORITES  
DIBUTTON\_BROWSER\_HISTORY  
DIBUTTON\_BROWSER\_HOME  
DIBUTTON\_BROWSER\_NEXT  
DIBUTTON\_BROWSER\_PAUSE  
DIBUTTON\_BROWSER\_PREVIOUS  
DIBUTTON\_BROWSER\_PRINT  
DIBUTTON\_BROWSER\_SEARCH  
DIBUTTON\_BROWSER\_STOP

### Remote Control

The DIVIRTUAL\_REMOTE\_CONTROL genre contains controls for remote-control devices used with equipment such as media players.

#### Priority 1 Controls

DIAXIS\_REMOTE\_SLIDER  
DIBUTTON\_REMOTE\_CHANGE  
DIBUTTON\_REMOTE\_CUE



DIBUTTON\_REMOTE\_MENU  
DIBUTTON\_REMOTE\_MUTE  
DIBUTTON\_REMOTE\_PLAY  
DIBUTTON\_REMOTE\_RECORD  
DIBUTTON\_REMOTE\_REVIEW  
DIBUTTON\_REMOTE\_SELECT

**Priority 2 Controls**

DIAXIS\_REMOTE\_SLIDER2  
DIBUTTON\_REMOTE\_ADJUST  
DIBUTTON\_REMOTE\_CABLE  
DIBUTTON\_REMOTE\_CD  
DIBUTTON\_REMOTE\_DEVICE  
DIBUTTON\_REMOTE\_DIGIT0  
DIBUTTON\_REMOTE\_DIGIT1  
DIBUTTON\_REMOTE\_DIGIT2  
DIBUTTON\_REMOTE\_DIGIT3  
DIBUTTON\_REMOTE\_DIGIT4  
DIBUTTON\_REMOTE\_DIGIT5  
DIBUTTON\_REMOTE\_DIGIT6  
DIBUTTON\_REMOTE\_DIGIT7  
DIBUTTON\_REMOTE\_DIGIT8  
DIBUTTON\_REMOTE\_DIGIT9  
DIBUTTON\_REMOTE\_DVD  
DIBUTTON\_REMOTE\_PAUSE  
DIBUTTON\_REMOTE\_TUNER  
DIBUTTON\_REMOTE\_TV  
DIBUTTON\_REMOTE\_VCR

## Driving Genres

The following genres are used in games where the players control vehicles in racing or combat.

- Combat Racing
- Mechanical Fighting
- Racing
- Tank

## Combat Racing

The DIVIRTUAL\_DRIVING\_COMBAT genre contains controls for a vehicle race game with combat.

### Priority 1 Controls

DIAXIS\_DRIVINGC\_ACCELERATE

DIAXIS\_DRIVINGC\_BRAKE

DIAXIS\_DRIVINGC\_STEER

DIBUTTON\_DRIVINGC\_FIRE

DIBUTTON\_DRIVINGC\_MENU

DIBUTTON\_DRIVINGC\_TARGET

DIBUTTON\_DRIVINGC\_WEAPONS

### Priority 2 Controls

DIAXIS\_DRIVINGC\_ACCEL\_AND\_BRAKE

DIBUTTON\_DRIVINGC\_ACCELERATE\_LINK

DIBUTTON\_DRIVINGC\_AIDS

DIBUTTON\_DRIVINGC\_BRAKE

DIBUTTON\_DRIVINGC\_DASHBOARD

DIBUTTON\_DRIVINGC\_DEVICE

DIBUTTON\_DRIVINGC\_FIRESECONDARY

DIBUTTON\_DRIVINGC\_GLANCE\_LEFT\_LINK

DIBUTTON\_DRIVINGC\_GLANCE\_RIGHT\_LINK

DIBUTTON\_DRIVINGC\_PAUSE

DIBUTTON\_DRIVINGC\_SHIFTDOWN

DIBUTTON\_DRIVINGC\_SHIFTUP

DIBUTTON\_DRIVINGC\_STEER\_LEFT\_LINK

DIBUTTON\_DRIVINGC\_STEER\_RIGHT\_LINK

DIHATSWITCH\_DRIVINGC\_GLANCE

## Mechanical Fighting

The DIVIRTUAL\_DRIVING\_MECHA genre contains controls for a walking vehicle in a mechanized-warfare game.

### Priority 1 Controls

DIAXIS\_MECHA\_ROTATE

DIAXIS\_MECHA\_STEER

DIAXIS\_MECHA\_THROTTLE

DIAXIS\_MECHA\_TORSO

DIBUTTON\_MECHA\_FIRE  
DIBUTTON\_MECHA\_JUMP  
DIBUTTON\_MECHA\_MENU  
DIBUTTON\_MECHA\_REVERSE  
DIBUTTON\_MECHA\_TARGET  
DIBUTTON\_MECHA\_WEAPONS  
DIBUTTON\_MECHA\_ZOOM

**Priority 2 Controls**

DIBUTTON\_MECHA\_BACK\_LINK  
DIBUTTON\_MECHA\_CENTER  
DIBUTTON\_MECHA\_DEVICE  
DIBUTTON\_MECHA\_FASTER\_LINK  
DIBUTTON\_MECHA\_FIRESECONDARY  
DIBUTTON\_MECHA\_FORWARD\_LINK  
DIBUTTON\_MECHA\_LEFT\_LINK  
DIBUTTON\_MECHA\_PAUSE  
DIBUTTON\_MECHA\_RIGHT\_LINK  
DIBUTTON\_MECHA\_ROTATE\_LEFT\_LINK  
DIBUTTON\_MECHA\_ROTATE\_RIGHT\_LINK  
DIBUTTON\_MECHA\_SLOWER\_LINK  
DIBUTTON\_MECHA\_VIEW  
DIHATSWITCH\_MECHA\_GLANCE

## Racing

The DIVIRTUAL\_DRIVING\_RACE genre contains controls for an auto-racing game without combat.

**Priority 1 Controls**

DIAXIS\_DRIVINGR\_ACCELERATE  
DIAXIS\_DRIVINGR\_BRAKE  
DIAXIS\_DRIVINGR\_STEER  
DIBUTTON\_DRIVINGR\_MENU  
DIBUTTON\_DRIVINGR\_SHIFTDOWN  
DIBUTTON\_DRIVINGR\_SHIFTUP  
DIBUTTON\_DRIVINGR\_VIEW

**Priority 2 Controls**

DIAXIS\_DRIVINGR\_ACCEL\_AND\_BRAKE

DIBUTTON\_DRIVINGR\_ACCELERATE\_LINK  
DIBUTTON\_DRIVINGR\_AIDS  
DIBUTTON\_DRIVINGR\_BOOST  
DIBUTTON\_DRIVINGR\_BRAKE  
DIBUTTON\_DRIVINGR\_DASHBOARD  
DIBUTTON\_DRIVINGR\_DEVICE  
DIBUTTON\_DRIVINGR\_GLANCE\_LEFT\_LINK  
DIBUTTON\_DRIVINGR\_GLANCE\_RIGHT\_LINK  
DIBUTTON\_DRIVINGR\_MAP  
DIBUTTON\_DRIVINGR\_PIT  
DIBUTTON\_DRIVINGR\_PAUSE  
DIBUTTON\_DRIVINGR\_STEER\_LEFT\_LINK  
DIBUTTON\_DRIVINGR\_STEER\_RIGHT\_LINK  
DIHATSWITCH\_DRIVINGR\_GLANCE

## Tank

The DIVIRTUAL\_DRIVING\_TANK genre contains controls for a military tank simulation.

### Priority 1 Controls

DIAXIS\_DRIVINGT\_ACCELERATE  
DIAXIS\_DRIVINGT\_BARREL  
DIAXIS\_DRIVINGT\_ROTATE  
DIAXIS\_DRIVINGT\_STEER  
DIBUTTON\_DRIVINGT\_FIRE  
DIBUTTON\_DRIVINGT\_MENU  
DIBUTTON\_DRIVINGT\_TARGET  
DIBUTTON\_DRIVINGT\_WEAPONS

### Priority 2 Controls

DIAXIS\_DRIVINGT\_ACCEL\_AND\_BRAKE  
DIAXIS\_DRIVINGT\_BRAKE  
DIBUTTON\_DRIVINGT\_ACCELERATE\_LINK  
DIBUTTON\_DRIVINGT\_BARREL\_UP\_LINK  
DIBUTTON\_DRIVINGT\_BARREL\_DOWN\_LINK  
DIBUTTON\_DRIVINGT\_BRAKE  
DIBUTTON\_DRIVINGT\_DASHBOARD  
DIBUTTON\_DRIVINGT\_DEVICE  
DIBUTTON\_DRIVINGT\_FIRESECONDARY

DIBUTTON\_DRIVINGT\_GLANCE\_LEFT\_LINK  
DIBUTTON\_DRIVINGT\_GLANCE\_RIGHT\_LINK  
DIBUTTON\_DRIVINGT\_PAUSE  
DIBUTTON\_DRIVINGT\_ROTATE\_LEFT\_LINK  
DIBUTTON\_DRIVINGT\_ROTATE\_RIGHT\_LINK  
DIBUTTON\_DRIVINGT\_STEER\_LEFT\_LINK  
DIBUTTON\_DRIVINGT\_STEER\_RIGHT\_LINK  
DIBUTTON\_DRIVINGT\_VIEW  
DIHATSWITCH\_DRIVINGT\_GLANCE

## Flight Genres

The following genres are used in games and simulations where the players control aircraft or spaceships.

- Air Combat
- Civilian Flight
- Helicopter Combat
- Space Combat

## Air Combat

The DIVIRTUAL\_FLYINGM\_MILITARY genre contains controls for a fixed-wing aerial combat simulation.

### Priority 1 Controls

DIAXIS\_FLYINGM\_BANK  
DIAXIS\_FLYINGM\_PITCH  
DIAXIS\_FLYINGM\_THROTTLE  
DIBUTTON\_FLYINGM\_FIRE  
DIBUTTON\_FLYINGM\_MENU  
DIBUTTON\_FLYINGM\_TARGET  
DIBUTTON\_FLYINGM\_WEAPONS

### Priority 2 Controls

DIAXIS\_FLYINGM\_BRAKE  
DIAXIS\_FLYINGM\_FLAPS  
DIAXIS\_FLYINGM\_RUDDER  
DIBUTTON\_FLYINGM\_BRAKE\_LINK  
DIBUTTON\_FLYINGM\_COUNTER

DIBUTTON\_FLYINGM\_DEVICE  
DIBUTTON\_FLYINGM\_DISPLAY  
DIBUTTON\_FLYINGM\_FASTER\_LINK  
DIBUTTON\_FLYINGM\_FIRESECONDARY  
DIBUTTON\_FLYINGM\_FLAPSDOWN  
DIBUTTON\_FLYINGM\_FLAPSUP  
DIBUTTON\_FLYINGM\_GEAR  
DIBUTTON\_FLYINGM\_GLANCE\_DOWN\_LINK  
DIBUTTON\_FLYINGM\_GLANCE\_LEFT\_LINK  
DIBUTTON\_FLYINGM\_GLANCE\_RIGHT\_LINK  
DIBUTTON\_FLYINGM\_GLANCE\_UP\_LINK  
DIBUTTON\_FLYINGM\_PAUSE  
DIBUTTON\_FLYINGM\_SLOWER\_LINK  
DIBUTTON\_FLYINGM\_VIEW  
DIHATSWITCH\_FLYINGM\_GLANCE

## Civilian Flight

The DIVIRTUAL\_FLYING\_CIVILIAN genre contains controls for noncombat flight simulations.

### Priority 1 Controls

DIAXIS\_FLYINGC\_BANK  
DIAXIS\_FLYINGC\_PITCH  
DIAXIS\_FLYINGC\_THROTTLE  
DIBUTTON\_FLYINGC\_DISPLAY  
DIBUTTON\_FLYINGC\_GEAR  
DIBUTTON\_FLYINGC\_MENU  
DIBUTTON\_FLYINGC\_VIEW

### Priority 2 Controls

DIAXIS\_FLYINGC\_BRAKE  
DIAXIS\_FLYINGC\_FLAPS  
DIAXIS\_FLYINGC\_RUDDER  
DIBUTTON\_FLYINGC\_BRAKE\_LINK  
DIBUTTON\_FLYINGC\_DEVICE  
DIBUTTON\_FLYINGC\_FASTER\_LINK  
DIBUTTON\_FLYINGC\_FLAPSDOWN  
DIBUTTON\_FLYINGC\_FLAPSUP  
DIBUTTON\_FLYINGC\_GLANCE\_DOWN\_LINK

DIBUTTON\_FLYINGC\_GLANCE\_LEFT\_LINK  
DIBUTTON\_FLYINGC\_GLANCE\_RIGHT\_LINK  
DIBUTTON\_FLYINGC\_GLANCE\_UP\_LINK  
DIBUTTON\_FLYINGC\_PAUSE  
DIBUTTON\_FLYINGC\_SLOWER\_LINK  
DIHATSWITCH\_FLYINGC\_GLANCE

## Helicopter Combat

The DIVIRTUAL\_FLYING\_HELICOPTER genre contains controls for a combat helicopter simulation.

### Priority 1 Controls

DIAXIS\_FLYINGH\_BANK  
DIAXIS\_FLYINGH\_COLLECTIVE  
DIAXIS\_FLYINGH\_PITCH  
DIBUTTON\_FLYINGH\_FIRE  
DIBUTTON\_FLYINGH\_MENU  
DIBUTTON\_FLYINGH\_TARGET  
DIBUTTON\_FLYINGH\_WEAPONS

### Priority 2 Controls

DIAXIS\_FLYINGH\_THROTTLE  
DIAXIS\_FLYINGH\_TORQUE  
DIBUTTON\_FLYINGH\_COUNTER  
DIBUTTON\_FLYINGH\_DEVICE  
DIBUTTON\_FLYINGH\_FASTER\_LINK  
DIBUTTON\_FLYINGH\_FIRESECONDARY  
DIBUTTON\_FLYINGH\_GEAR  
DIBUTTON\_FLYINGH\_GLANCE\_DOWN\_LINK  
DIBUTTON\_FLYINGH\_GLANCE\_LEFT\_LINK  
DIBUTTON\_FLYINGH\_GLANCE\_RIGHT\_LINK  
DIBUTTON\_FLYINGH\_GLANCE\_UP\_LINK  
DIBUTTON\_FLYINGH\_PAUSE  
DIBUTTON\_FLYINGH\_SLOWER\_LINK  
DIBUTTON\_FLYINGH\_VIEW  
DIHATSWITCH\_FLYINGH\_GLANCE

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## Space Combat

The DIVIRTUAL\_SPACESIM genre contains controls for a spaceship combat simulation.

### Priority 1 Controls

DIAXIS\_SPACESIM\_LATERAL  
DIAXIS\_SPACESIM\_MOVE  
DIAXIS\_SPACESIM\_THROTTLE  
DIBUTTON\_SPACESIM\_FIRE  
DIBUTTON\_SPACESIM\_MENU  
DIBUTTON\_SPACESIM\_TARGET  
DIBUTTON\_SPACESIM\_WEAPONS

### Priority 2 Controls

DIAXIS\_SPACESIM\_CLIMB  
DIAXIS\_SPACESIM\_ROTATE  
DIBUTTON\_SPACESIM\_BACKWARD\_LINK  
DIBUTTON\_SPACESIM\_DEVICE  
DIBUTTON\_SPACESIM\_DISPLAY  
DIBUTTON\_SPACESIM\_FASTER\_LINK  
DIBUTTON\_SPACESIM\_FIRESECONDARY  
DIBUTTON\_SPACESIM\_FORWARD\_LINK  
DIBUTTON\_SPACESIM\_GEAR  
DIBUTTON\_SPACESIM\_GLANCE\_DOWN\_LINK  
DIBUTTON\_SPACESIM\_GLANCE\_LEFT\_LINK  
DIBUTTON\_SPACESIM\_GLANCE\_RIGHT\_LINK  
DIBUTTON\_SPACESIM\_GLANCE\_UP\_LINK  
DIBUTTON\_SPACESIM\_LEFT\_LINK  
DIBUTTON\_SPACESIM\_LOWER  
DIBUTTON\_SPACESIM\_PAUSE  
DIBUTTON\_SPACESIM\_RAISE  
DIBUTTON\_SPACESIM\_RIGHT\_LINK  
DIBUTTON\_SPACESIM\_SLOWER\_LINK  
DIBUTTON\_SPACESIM\_TURN\_LEFT\_LINK  
DIBUTTON\_SPACESIM\_TURN\_RIGHT\_LINK  
DIBUTTON\_SPACESIM\_VIEW  
DIHATSWITCH\_SPACESIM\_GLANCE



## Sports Genres

The following genres contain controls for sports games and simulations.

- Baseball Batting
- Baseball Fielding
- Baseball Pitching
- Basketball Defense
- Basketball Offense
- Fishing
- Football Defense
- Football Offense
- Football Play
- Football Quarterback
- Golf
- Hockey Defense
- Hockey Goalie
- Hockey Offense
- Hunting
- Mountain Biking
- Racquet
- Skiing
- Soccer Defense
- Soccer Offense

## Baseball Batting

The DIVIRTUAL\_SPORTS\_BASEBALL\_BAT genre contains controls for a batter in a baseball game.

### Priority 1 Controls

DIAXIS\_BASEBALLB\_LATERAL

DIAXIS\_BASEBALLB\_MOVE

DIBUTTON\_BASEBALLB\_BUNT

DIBUTTON\_BASEBALLB\_BURST

DIBUTTON\_BASEBALLB\_CONTACT

DIBUTTON\_BASEBALLB\_MENU

DIBUTTON\_BASEBALLB\_NORMAL

DIBUTTON\_BASEBALLB\_POWER

DIBUTTON\_BASEBALLB\_SELECT

DIBUTTON\_BASEBALLB\_SLIDE

DIBUTTON\_BASEBALLB\_STEAL

**Priority 2 Controls**

DIBUTTON\_BASEBALLB\_BOX

DIBUTTON\_BASEBALLB\_BACK\_LINK

DIBUTTON\_BASEBALLB\_DEVICE

DIBUTTON\_BASEBALLB\_FORWARD\_LINK

DIBUTTON\_BASEBALLB\_LEFT\_LINK

DIBUTTON\_BASEBALLB\_NOSTEAL

DIBUTTON\_BASEBALLB\_PAUSE

DIBUTTON\_BASEBALLB\_RIGHT\_LINK

## Baseball Fielding

The DIVIRTUAL\_SPORTS\_BASEBALL\_FIELD genre contains controls for fielders in a baseball game.

**Priority 1 Controls**

DIAXIS\_BASEBALLF\_LATERAL

DIAXIS\_BASEBALLF\_MOVE

DIBUTTON\_BASEBALLF\_BURST

DIBUTTON\_BASEBALLF\_DIVE

DIBUTTON\_BASEBALLF\_JUMP

DIBUTTON\_BASEBALLF\_MENU

DIBUTTON\_BASEBALLF\_NEAREST

DIBUTTON\_BASEBALLF\_THROW1

DIBUTTON\_BASEBALLF\_THROW2

**Priority 2 Controls**

DIBUTTON\_BASEBALLF\_AIM\_LEFT\_LINK

DIBUTTON\_BASEBALLF\_AIM\_RIGHT\_LINK

DIBUTTON\_BASEBALLF\_BACK\_LINK

DIBUTTON\_BASEBALLF\_DEVICE

DIBUTTON\_BASEBALLF\_FORWARD\_LINK

DIBUTTON\_BASEBALLF\_PAUSE

DIBUTTON\_BASEBALLF\_SHIFTIN

DIBUTTON\_BASEBALLF\_SHIFTOUT

## Baseball Pitching

The DIVIRTUAL\_SPORTS\_BASEBALL\_PITCH genre contains controls for a pitcher in a baseball game.

### Priority 1 Controls

DIAXIS\_BASEBALLP\_LATERAL  
DIAXIS\_BASEBALLP\_MOVE  
DIBUTTON\_BASEBALLP\_BASE  
DIBUTTON\_BASEBALLP\_FAKE  
DIBUTTON\_BASEBALLP\_MENU  
DIBUTTON\_BASEBALLP\_PITCH  
DIBUTTON\_BASEBALLP\_SELECT  
DIBUTTON\_BASEBALLP\_THROW

### Priority 2 Controls

DIBUTTON\_BASEBALLP\_BACK\_LINK  
DIBUTTON\_BASEBALLP\_DEVICE  
DIBUTTON\_BASEBALLP\_FORWARD\_LINK  
DIBUTTON\_BASEBALLP\_LEFT\_LINK  
DIBUTTON\_BASEBALLP\_LOOK  
DIBUTTON\_BASEBALLP\_PAUSE  
DIBUTTON\_BASEBALLP\_RIGHT\_LINK  
DIBUTTON\_BASEBALLP\_WALK

## Basketball Defense

The DIVIRTUAL\_SPORTS\_BASKETBALL\_DEFENSE genre contains controls for defensive moves in a basketball game.

### Priority 1 Controls

DIAXIS\_BBALLD\_LATERAL  
DIAXIS\_BBALLD\_MOVE  
DIBUTTON\_BBALLD\_BURST  
DIBUTTON\_BBALLD\_FAKE  
DIBUTTON\_BBALLD\_JUMP  
DIBUTTON\_BBALLD\_MENU  
DIBUTTON\_BBALLD\_PLAY  
DIBUTTON\_BBALLD\_PLAYER  
DIBUTTON\_BBALLD\_SPECIAL  
DIBUTTON\_BBALLD\_STEAL

### **Priority 2 Controls**

DIBUTTON\_BBALD\_BACK\_LINK  
DIBUTTON\_BBALD\_DEVICE  
DIBUTTON\_BBALD\_FORWARD\_LINK  
DIBUTTON\_BBALD\_LEFT\_LINK  
DIBUTTON\_BBALD\_PAUSE  
DIBUTTON\_BBALD\_RIGHT\_LINK  
DIBUTTON\_BBALD\_SUBSTITUTE  
DIBUTTON\_BBALD\_TIMEOUT  
DIHATSWITCH\_BBALD\_GLANCE

## **Basketball Offense**

The DIVIRTUAL\_SPORTS\_BASKETBALL\_OFFENSE genre contains controls for the player who has the ball in a basketball game.

### **Priority 1 Controls**

DIAXIS\_BBALLO\_LATERAL  
DIAXIS\_BBALLO\_MOVE  
DIBUTTON\_BBALLO\_BURST  
DIBUTTON\_BBALLO\_CALL  
DIBUTTON\_BBALLO\_DUNK  
DIBUTTON\_BBALLO\_FAKE  
DIBUTTON\_BBALLO\_MENU  
DIBUTTON\_BBALLO\_PASS  
DIBUTTON\_BBALLO\_PLAYER  
DIBUTTON\_BBALLO\_SHOOT  
DIBUTTON\_BBALLO\_SPECIAL

### **Priority 2 Controls**

DIBUTTON\_BBALLO\_BACK\_LINK  
DIBUTTON\_BBALLO\_DEVICE  
DIBUTTON\_BBALLO\_FORWARD\_LINK  
DIBUTTON\_BBALLO\_JAB  
DIBUTTON\_BBALLO\_LEFT\_LINK  
DIBUTTON\_BBALLO\_PAUSE  
DIBUTTON\_BBALLO\_PLAY  
DIBUTTON\_BBALLO\_POST  
DIBUTTON\_BBALLO\_RIGHT\_LINK

DIBUTTON\_BBALLO\_SCREEN  
DIBUTTON\_BBALLO\_SUBSTITUTE  
DIBUTTON\_BBALLO\_TIMEOUT  
DIHATSWITCH\_BBALLO\_GLANCE

## Fishing

The DIVIRTUAL\_SPORTS\_FISHING genre contains controls for a sport-fishing simulation.

### Priority 1 Controls

DIAXIS\_FISHING\_LATERAL  
DIAXIS\_FISHING\_MOVE  
DIBUTTON\_FISHING\_BAIT  
DIBUTTON\_FISHING\_BINOCULAR  
DIBUTTON\_FISHING\_CAST  
DIBUTTON\_FISHING\_MAP  
DIBUTTON\_FISHING\_MENU  
DIBUTTON\_FISHING\_TYPE

### Priority 2 Controls

DIAXIS\_FISHING\_ROTATE  
DIBUTTON\_FISHING\_BACK\_LINK  
DIBUTTON\_FISHING\_CROUCH  
DIBUTTON\_FISHING\_DEVICE  
DIBUTTON\_FISHING\_DISPLAY  
DIBUTTON\_FISHING\_FORWARD\_LINK  
DIBUTTON\_FISHING\_JUMP  
DIBUTTON\_FISHING\_LEFT\_LINK  
DIBUTTON\_FISHING\_PAUSE  
DIBUTTON\_FISHING\_RIGHT\_LINK  
DIBUTTON\_FISHING\_ROTATE\_LEFT\_LINK  
DIBUTTON\_FISHING\_ROTATE\_RIGHT\_LINK  
DIHATSWITCH\_FISHING\_GLANCE

## Football Defense

The DIVIRTUAL\_SPORTS\_FOOTBALL\_DEFENSE genre contains controls for the defensive side in a North American football game.

### Priority 1 Controls

DIAXIS\_FOOTBALLD\_LATERAL  
DIAXIS\_FOOTBALLD\_MOVE  
DIBUTTON\_FOOTBALLD\_FAKE  
DIBUTTON\_FOOTBALLD\_JUMP  
DIBUTTON\_FOOTBALLD\_MENU  
DIBUTTON\_FOOTBALLD\_PLAY  
DIBUTTON\_FOOTBALLD\_SELECT  
DIBUTTON\_FOOTBALLD\_SUPERTACKLE  
DIBUTTON\_FOOTBALLD\_TACKLE

**Priority 2 Controls**

DIBUTTON\_FOOTBALLD\_AUDIBLE  
DIBUTTON\_FOOTBALLD\_BACK\_LINK  
DIBUTTON\_FOOTBALLD\_BULLRUSH  
DIBUTTON\_FOOTBALLD\_DEVICE  
DIBUTTON\_FOOTBALLD\_FORWARD\_LINK  
DIBUTTON\_FOOTBALLD\_LEFT\_LINK  
DIBUTTON\_FOOTBALLD\_PAUSE  
DIBUTTON\_FOOTBALLD\_RIGHT\_LINK  
DIBUTTON\_FOOTBALLD\_RIP  
DIBUTTON\_FOOTBALLD\_SPIN  
DIBUTTON\_FOOTBALLD\_SUBSTITUTE  
DIBUTTON\_FOOTBALLD\_SWIM  
DIBUTTON\_FOOTBALLD\_ZOOM

## **Football Offense**

The DIVIRTUAL\_SPORTS\_FOOTBALL\_OFFENSE genre contains controls for the ball carrier in a North American football game.

**Priority 1 Controls**

DIAXIS\_FOOTBALLO\_LATERAL  
DIAXIS\_FOOTBALLO\_MOVE  
DIBUTTON\_FOOTBALLO\_JUMP  
DIBUTTON\_FOOTBALLO\_LEFTARM  
DIBUTTON\_FOOTBALLO\_MENU  
DIBUTTON\_FOOTBALLO\_RIGHTARM  
DIBUTTON\_FOOTBALLO\_SPIN  
DIBUTTON\_FOOTBALLO\_THROW

### **Priority 2 Controls**

DIBUTTON\_FOOTBALLO\_BACK\_LINK  
DIBUTTON\_FOOTBALLO\_DEVICE  
DIBUTTON\_FOOTBALLO\_DIVE  
DIBUTTON\_FOOTBALLO\_FORWARD\_LINK  
DIBUTTON\_FOOTBALLO\_JUKE  
DIBUTTON\_FOOTBALLO\_LEFT\_LINK  
DIBUTTON\_FOOTBALLO\_PAUSE  
DIBUTTON\_FOOTBALLO\_RIGHT\_LINK  
DIBUTTON\_FOOTBALLO\_SHOULDER  
DIBUTTON\_FOOTBALLO\_SUBSTITUTE  
DIBUTTON\_FOOTBALLO\_TURBO  
DIBUTTON\_FOOTBALLO\_ZOOM

## **Football Play**

The DIVIRTUAL\_SPORTS\_FOOTBALL\_FIELD genre contains general controls for a North American football game.

### **Priority 1 Controls**

DIBUTTON\_FOOTBALLP\_HELP  
DIBUTTON\_FOOTBALLP\_MENU  
DIBUTTON\_FOOTBALLP\_PLAY  
DIBUTTON\_FOOTBALLP\_SELECT

### **Priority 2 Controls**

DIBUTTON\_FOOTBALLP\_DEVICE  
DIBUTTON\_FOOTBALLP\_PAUSE

## **Football Quarterback**

The DIVIRTUAL\_SPORTS\_FOOTBALL\_QBCK genre contains controls for the quarterback in a North American football game.

### **Priority 1 Controls**

DIAXIS\_FOOTBALLQ\_LATERAL  
DIAXIS\_FOOTBALLQ\_MOVE  
DIBUTTON\_FOOTBALLQ\_FAKE  
DIBUTTON\_FOOTBALLQ\_JUMP  
DIBUTTON\_FOOTBALLQ\_MENU  
DIBUTTON\_FOOTBALLQ\_PASS

DIBUTTON\_FOOTBALLQ\_SELECT  
DIBUTTON\_FOOTBALLQ\_SLIDE  
DIBUTTON\_FOOTBALLQ\_SNAP

**Priority 2 Controls**

DIBUTTON\_FOOTBALLQ\_AUDIBLE  
DIBUTTON\_FOOTBALLQ\_BACK\_LINK  
DIBUTTON\_FOOTBALLQ\_DEVICE  
DIBUTTON\_FOOTBALLQ\_FAKESNAP  
DIBUTTON\_FOOTBALLQ\_FORWARD\_LINK  
DIBUTTON\_FOOTBALLQ\_LEFT\_LINK  
DIBUTTON\_FOOTBALLQ\_MOTION  
DIBUTTON\_FOOTBALLQ\_PAUSE  
DIBUTTON\_FOOTBALLQ\_RIGHT\_LINK

## Golf

The DIVIRTUAL\_SPORTS\_GOLF genre contains controls for a golf game.

**Priority 1 Controls**

DIAXIS\_GOLF\_LATERAL  
DIAXIS\_GOLF\_MOVE  
DIBUTTON\_GOLF\_DOWN  
DIBUTTON\_GOLF\_FLYBY  
DIBUTTON\_GOLF\_MENU  
DIBUTTON\_GOLF\_SELECT  
DIBUTTON\_GOLF\_SWING  
DIBUTTON\_GOLF\_TERRAIN  
DIBUTTON\_GOLF\_UP

**Priority 2 Controls**

DIBUTTON\_GOLF\_BACK\_LINK  
DIBUTTON\_GOLF\_DEVICE  
DIBUTTON\_GOLF\_FORWARD\_LINK  
DIBUTTON\_GOLF\_LEFT\_LINK  
DIBUTTON\_GOLF\_PAUSE  
DIBUTTON\_GOLF\_RIGHT\_LINK  
DIBUTTON\_GOLF\_SUBSTITUTE  
DIBUTTON\_GOLF\_TIMEOUT  
DIBUTTON\_GOLF\_ZOOM



DIHATSWITCH\_GOLF\_SCROLL

## Hockey Defense

The DIVIRTUAL\_SPORTS\_HOCKEY\_DEFENSE genre contains controls for defensive moves in a hockey game.

### Priority 1 Controls

DIAXIS\_HOCKEYD\_LATERAL  
DIAXIS\_HOCKEYD\_MOVE  
DIBUTTON\_HOCKEYD\_BLOCK  
DIBUTTON\_HOCKEYD\_BURST  
DIBUTTON\_HOCKEYD\_FAKE  
DIBUTTON\_HOCKEYD\_MENU  
DIBUTTON\_HOCKEYD\_PLAYER  
DIBUTTON\_HOCKEYD\_STEAL

### Priority 2 Controls

DIBUTTON\_HOCKEYD\_BACK\_LINK  
DIBUTTON\_HOCKEYD\_DEVICE  
DIBUTTON\_HOCKEYO\_FORWARD\_LINK  
DIBUTTON\_HOCKEYO\_LEFT\_LINK  
DIBUTTON\_HOCKEYD\_PAUSE  
DIBUTTON\_HOCKEYO\_RIGHT\_LINK  
DIBUTTON\_HOCKEYD\_STRATEGY  
DIBUTTON\_HOCKEYD\_SUBSTITUTE  
DIBUTTON\_HOCKEYD\_TIMEOUT  
DIBUTTON\_HOCKEYD\_ZOOM  
DIHATSWITCH\_HOCKEYD\_SCROLL

## Hockey Goalie

The DIVIRTUAL\_SPORTS\_HOCKEY\_GOALIE genre contains controls for a goalkeeper in a hockey game.

### Priority 1 Controls

DIAXIS\_HOCKEYG\_LATERAL  
DIAXIS\_HOCKEYG\_MOVE  
DIBUTTON\_HOCKEYG\_BLOCK  
DIBUTTON\_HOCKEYG\_MENU  
DIBUTTON\_HOCKEYG\_PASS

DIBUTTON\_HOCKEYG\_POKE  
DIBUTTON\_HOCKEYG\_STEAL

**Priority 2 Controls**

DIBUTTON\_HOCKEYG\_BACK\_LINK  
DIBUTTON\_HOCKEYG\_DEVICE  
DIBUTTON\_HOCKEYG\_FORWARD\_LINK  
DIBUTTON\_HOCKEYG\_LEFT\_LINK  
DIBUTTON\_HOCKEYG\_PAUSE  
DIBUTTON\_HOCKEYG\_RIGHT\_LINK  
DIBUTTON\_HOCKEYG\_STRATEGY  
DIBUTTON\_HOCKEYG\_SUBSTITUTE  
DIBUTTON\_HOCKEYG\_TIMEOUT  
DIBUTTON\_HOCKEYG\_ZOOM  
DIHATSWITCH\_HOCKEYG\_SCROLL

## Hockey Offense

The DIVIRTUAL\_SPORTS\_HOCKEY\_OFFENSE genre contains controls for offensive moves in a hockey game.

**Priority 1 Controls**

DIAXIS\_HOCKEYO\_LATERAL  
DIAXIS\_HOCKEYO\_MOVE  
DIBUTTON\_HOCKEYO\_BURST  
DIBUTTON\_HOCKEYO\_FAKE  
DIBUTTON\_HOCKEYO\_MENU  
DIBUTTON\_HOCKEYO\_PASS  
DIBUTTON\_HOCKEYO\_SHOOT  
DIBUTTON\_HOCKEYO\_SPECIAL

**Priority 2 Controls**

DIBUTTON\_HOCKEYO\_BACK\_LINK  
DIBUTTON\_HOCKEYO\_DEVICE  
DIBUTTON\_HOCKEYO\_FORWARD\_LINK  
DIBUTTON\_HOCKEYO\_LEFT\_LINK  
DIBUTTON\_HOCKEYO\_PAUSE  
DIBUTTON\_HOCKEYO\_RIGHT\_LINK  
DIBUTTON\_HOCKEYO\_STRATEGY  
DIBUTTON\_HOCKEYO\_SUBSTITUTE

DIBUTTON\_HOCKEYO\_TIMEOUT  
DIBUTTON\_HOCKEYO\_ZOOM  
DIHATSWITCH\_HOCKEYO\_SCROLL

## Hunting

The DIVIRTUAL\_SPORTS\_HUNTING genre contains controls for a hunting simulation.

### Priority 1 Controls

DIAXIS\_HUNTING\_LATERAL  
DIAXIS\_HUNTING\_MOVE  
DIBUTTON\_HUNTING\_AIM  
DIBUTTON\_HUNTING\_BINOCULAR  
DIBUTTON\_HUNTING\_CALL  
DIBUTTON\_HUNTING\_FIRE  
DIBUTTON\_HUNTING\_MAP  
DIBUTTON\_HUNTING\_MENU  
DIBUTTON\_HUNTING\_SPECIAL  
DIBUTTON\_HUNTING\_WEAPON

### Priority 2 Controls

DIAXIS\_HUNTING\_ROTATE  
DIBUTTON\_HUNTING\_BACK\_LINK  
DIBUTTON\_HUNTING\_CROUCH  
DIBUTTON\_HUNTING\_DEVICE  
DIBUTTON\_HUNTING\_DISPLAY  
DIBUTTON\_HUNTING\_FIRESECONDARY  
DIBUTTON\_HUNTING\_FORWARD\_LINK  
DIBUTTON\_HUNTING\_JUMP  
DIBUTTON\_HUNTING\_LEFT\_LINK  
DIBUTTON\_HUNTING\_PAUSE  
DIBUTTON\_HUNTING\_RIGHT\_LINK  
DIBUTTON\_HUNTING\_ROTATE\_LEFT\_LINK  
DIBUTTON\_HUNTING\_ROTATE\_RIGHT\_LINK  
DIHATSWITCH\_HUNTING\_GLANCE

## Mountain Biking

The DIVIRTUAL\_SPORTS\_BIKING\_MOUNTAIN contains controls for a mountain-bike game.

### Priority 1 Controls

DIAXIS\_BIKINGM\_PEDAL  
DIAXIS\_BIKINGM\_TURN  
DIBUTTON\_BIKINGM\_CAMERA  
DIBUTTON\_BIKINGM\_JUMP  
DIBUTTON\_BIKINGM\_MENU  
DIBUTTON\_BIKINGM\_SELECT  
DIBUTTON\_BIKINGM\_SPECIAL1  
DIBUTTON\_BIKINGM\_SPECIAL2

### Priority 2 Controls

DIAXIS\_BIKINGM\_BRAKE  
DIBUTTON\_BIKINGM\_BRAKE\_BUTTON\_LINK  
DIBUTTON\_BIKINGM\_DEVICE  
DIBUTTON\_BIKINGM\_FASTER\_LINK  
DIBUTTON\_BIKINGM\_LEFT\_LINK  
DIBUTTON\_BIKINGM\_PAUSE  
DIBUTTON\_BIKINGM\_RIGHT\_LINK  
DIBUTTON\_BIKINGM\_SLOWER\_LINK  
DIBUTTON\_BIKINGM\_ZOOM  
DIHATSWITCH\_BIKINGM\_SCROLL

## Racquet

The DIVIRTUAL\_SPORTS\_RACQUET genre includes racquet games such as tennis, table tennis, and squash.

### Priority 1 Controls

DIAXIS\_RACQUET\_LATERAL  
DIAXIS\_RACQUET\_MOVE  
DIBUTTON\_RACQUET\_BACKSWING  
DIBUTTON\_RACQUET\_MENU  
DIBUTTON\_RACQUET\_SELECT  
DIBUTTON\_RACQUET\_SMASH  
DIBUTTON\_RACQUET\_SPECIAL  
DIBUTTON\_RACQUET\_SWING

**Priority 2 Controls**

DIBUTTON\_RACQUET\_BACK\_LINK  
DIBUTTON\_RACQUET\_DEVICE  
DIBUTTON\_RACQUET\_FORWARD\_LINK  
DIBUTTON\_RACQUET\_LEFT\_LINK  
DIBUTTON\_RACQUET\_PAUSE  
DIBUTTON\_RACQUET\_RIGHT\_LINK  
DIBUTTON\_RACQUET\_SUBSTITUTE  
DIBUTTON\_RACQUET\_TIMEOUT  
DIHATSWITCH\_RACQUET\_GLANCE

## Skiing

The DIVIRTUAL\_SPORTS\_SKIING contains controls for skiing games as well as for similar sports simulations such as snowboarding and skateboarding.

**Priority 1 Controls**

DIAXIS\_SKIING\_SPEED  
DIAXIS\_SKIING\_TURN  
DIBUTTON\_SKIING\_CAMERA  
DIBUTTON\_SKIING\_CROUCH  
DIBUTTON\_SKIING\_JUMP  
DIBUTTON\_SKIING\_MENU  
DIBUTTON\_SKIING\_SELECT  
DIBUTTON\_SKIING\_SPECIAL1  
DIBUTTON\_SKIING\_SPECIAL2

**Priority 2 Controls**

DIBUTTON\_SKIING\_DEVICE  
DIBUTTON\_SKIING\_FASTER\_LINK  
DIBUTTON\_SKIING\_LEFT\_LINK  
DIBUTTON\_SKIING\_PAUSE  
DIBUTTON\_SKIING\_RIGHT\_LINK  
DIBUTTON\_SKIING\_SLOWER\_LINK  
DIBUTTON\_SKIING\_ZOOM  
DIHATSWITCH\_SKIING\_GLANCE

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## Soccer Defense

The DIVIRTUAL\_SPORTS\_SOCCER\_DEFENSE contains controls for defensive moves in a soccer (international football) game.

### Priority 1 Controls

DIAXIS\_SOCCERD\_LATERAL  
DIAXIS\_SOCCERD\_MOVE  
DIBUTTON\_SOCCERD\_BLOCK  
DIBUTTON\_SOCCERD\_FAKE  
DIBUTTON\_SOCCERD\_MENU  
DIBUTTON\_SOCCERD\_PLAYER  
DIBUTTON\_SOCCERD\_SELECT  
DIBUTTON\_SOCCERD\_SLIDE  
DIBUTTON\_SOCCERD\_SPECIAL  
DIBUTTON\_SOCCERD\_STEAL

### Priority 2 Controls

DIBUTTON\_SOCCERD\_BACK\_LINK  
DIBUTTON\_SOCCERD\_CLEAR  
DIBUTTON\_SOCCERD\_DEVICE  
DIBUTTON\_SOCCERD\_FORWARD\_LINK  
DIBUTTON\_SOCCERD\_FOUL  
DIBUTTON\_SOCCERD\_GOALIECHARGE  
DIBUTTON\_SOCCERD\_HEAD  
DIBUTTON\_SOCCERD\_LEFT\_LINK  
DIBUTTON\_SOCCERD\_PAUSE  
DIBUTTON\_SOCCERD\_RIGHT\_LINK  
DIBUTTON\_SOCCERD\_SUBSTITUTE  
DIHATSWITCH\_SOCCERD\_GLANCE

## Soccer Offense

The DIVIRTUAL\_SPORTS\_SOCCER\_OFFENSE contains controls for offensive moves in a soccer (international football) game.

### Priority 1 Controls

DIAXIS\_SOCCERO\_BEND  
DIAXIS\_SOCCERO\_LATERAL  
DIAXIS\_SOCCERO\_MOVE  
DIBUTTON\_SOCCERO\_FAKE

DIBUTTON\_SOCCERO\_MENU  
DIBUTTON\_SOCCERO\_PASS  
DIBUTTON\_SOCCERO\_PLAYER  
DIBUTTON\_SOCCERO\_SELECT  
DIBUTTON\_SOCCERO\_SHOOT  
DIBUTTON\_SOCCERO\_SPECIAL1

**Priority 2 Controls**

DIBUTTON\_SOCCERO\_BACK\_LINK  
DIBUTTON\_SOCCERO\_CONTROL  
DIBUTTON\_SOCCERO\_DEVICE  
DIBUTTON\_SOCCERO\_FORWARD\_LINK  
DIBUTTON\_SOCCERO\_HEAD  
DIBUTTON\_SOCCERO\_LEFT\_LINK  
DIBUTTON\_SOCCERO\_PASSTHRU  
DIBUTTON\_SOCCERO\_PAUSE  
DIBUTTON\_SOCCERO\_RIGHT\_LINK  
DIBUTTON\_SOCCERO\_SHOOTHIGH  
DIBUTTON\_SOCCERO\_SHOOTLOW  
DIBUTTON\_SOCCERO\_SPRINT  
DIBUTTON\_SOCCERO\_SUBSTITUTE  
DIHATSWITCH\_SOCCERO\_GLANCE

## Strategy Genres

The following genres contain controls for strategy, role-playing, and adventure games.

- Role-Playing
- Turn-Based

## Role-Playing

The DIVIRTUAL\_STRATEGY\_ROLEPLAYING genre contains controls for a role-playing or adventure game in which navigation, problem-solving, and fighting with weapons and magic are common activities.

**Priority 1 Controls**

DIAXIS\_STRATEGYR\_LATERAL  
DIAXIS\_STRATEGYR\_MOVE  
DIBUTTON\_STRATEGYR\_APPLY

DIBUTTON\_STRATEGYR\_ATTACK  
DIBUTTON\_STRATEGYR\_CAST  
DIBUTTON\_STRATEGYR\_CROUCH  
DIBUTTON\_STRATEGYR\_GET  
DIBUTTON\_STRATEGYR\_JUMP  
DIBUTTON\_STRATEGYR\_MENU  
DIBUTTON\_STRATEGYR\_SELECT

**Priority 2 Controls**

DIAXIS\_STRATEGYR\_ROTATE  
DIBUTTON\_STRATEGYR\_BACK\_LINK  
DIBUTTON\_STRATEGYR\_DEVICE  
DIBUTTON\_STRATEGYR\_DISPLAY  
DIBUTTON\_STRATEGYR\_FORWARD\_LINK  
DIBUTTON\_STRATEGYR\_LEFT\_LINK  
DIBUTTON\_STRATEGYR\_MAP  
DIBUTTON\_STRATEGYR\_PAUSE  
DIBUTTON\_STRATEGYR\_RIGHT\_LINK  
DIBUTTON\_STRATEGYR\_ROTATE\_LEFT\_LINK  
DIBUTTON\_STRATEGYR\_ROTATE\_RIGHT\_LINK  
DIHATSWITCH\_STRATEGYR\_GLANCE

## Turn-Based

The DIVIRTUAL\_STRATEGY\_TURN genre contains controls for a turn-based strategy game.

**Priority 1 Controls**

DIAXIS\_STRATEGYT\_LATERAL  
DIAXIS\_STRATEGYT\_MOVE  
DIBUTTON\_STRATEGYT\_APPLY  
DIBUTTON\_STRATEGYT\_INSTRUCT  
DIBUTTON\_STRATEGYT\_MENU  
DIBUTTON\_STRATEGYT\_SELECT  
DIBUTTON\_STRATEGYT\_TEAM  
DIBUTTON\_STRATEGYT\_TURN

**Priority 2 Controls**

DIBUTTON\_STRATEGYT\_BACK\_LINK  
DIBUTTON\_STRATEGYT\_DEVICE



DIBUTTON\_STRATEGYT\_DISPLAY  
 DIBUTTON\_STRATEGYT\_FORWARD\_LINK  
 DIBUTTON\_STRATEGYT\_LEFT\_LINK  
 DIBUTTON\_STRATEGYT\_MAP  
 DIBUTTON\_STRATEGYT\_PAUSE  
 DIBUTTON\_STRATEGYT\_RIGHT\_LINK  
 DIBUTTON\_STRATEGYT\_ZOOM

## Keyboard Mapping Constants

The following constants are used in the **dwSemantic** member of the **DIACTION** structure to map an action to a physical key.

Constant	Note
DIKEYBOARD_0	On main keyboard
DIKEYBOARD_1	On main keyboard
DIKEYBOARD_2	On main keyboard
DIKEYBOARD_3	On main keyboard
DIKEYBOARD_4	On main keyboard
DIKEYBOARD_5	On main keyboard
DIKEYBOARD_6	On main keyboard
DIKEYBOARD_7	On main keyboard
DIKEYBOARD_8	On main keyboard
DIKEYBOARD_9	On main keyboard
DIKEYBOARD_A	
DIKEYBOARD_ABNT_C1	On numeric pad of Brazilian keyboards
DIKEYBOARD_ABNT_C2	On numeric pad of Brazilian keyboards
DIKEYBOARD_ADD	PLUS SIGN (+) on numeric keypad
DIKEYBOARD_APOSTROPHE	
DIKEYBOARD_APPS	
DIKEYBOARD_AT	On Japanese keyboard
DIKEYBOARD_AX	On Japanese keyboard
DIKEYBOARD_B	
DIKEYBOARD_BACK	BACKSPACE
DIKEYBOARD_BACKSLASH	
DIKEYBOARD_C	
DIKEYBOARD_CALCULATOR	
DIKEYBOARD_CAPITAL	CAPS LOCK

---

DIKEYBOARD_COLON	On Japanese keyboard
DIKEYBOARD_COMMA	
DIKEYBOARD_CONVERT	On Japanese keyboard
DIKEYBOARD_D	
DIKEYBOARD_DECIMAL	PERIOD (decimal point) on numeric keypad
DIKEYBOARD_DELETE	
DIKEYBOARD_DIVIDE	Forward slash (/) on numeric keypad
DIKEYBOARD_DOWN	DOWN ARROW
DIKEYBOARD_E	
DIKEYBOARD_END	
DIKEYBOARD_EQUALS	On main keyboard
DIKEYBOARD_ESCAPE	
DIKEYBOARD_F	
DIKEYBOARD_F1	
DIKEYBOARD_F2	
DIKEYBOARD_F3	
DIKEYBOARD_F4	
DIKEYBOARD_F5	
DIKEYBOARD_F6	
DIKEYBOARD_F7	
DIKEYBOARD_F8	
DIKEYBOARD_F9	
DIKEYBOARD_F10	
DIKEYBOARD_F11	
DIKEYBOARD_F12	
DIKEYBOARD_F13	On NEC PC-98 Japanese keyboard
DIKEYBOARD_F14	On NEC PC-98 Japanese keyboard
DIKEYBOARD_F15	On NEC PC-98 Japanese keyboard
DIKEYBOARD_G	
DIKEYBOARD_GRAVE	Grave accent (`)
DIKEYBOARD_H	
DIKEYBOARD_HOME	
DIKEYBOARD_I	
DIKEYBOARD_INSERT	
DIKEYBOARD_J	
DIKEYBOARD_K	
DIKEYBOARD_KANA	On Japanese keyboard
DIKEYBOARD_KANJI	On Japanese keyboard

---

DIKEYBOARD_L	
DIKEYBOARD_LBRACKET	Left square bracket [
DIKEYBOARD_LCONTROL	Left CTRL
DIKEYBOARD_LEFT	LEFT ARROW
DIKEYBOARD_LMENU	Left ALT
DIKEYBOARD_LSHIFT	Left SHIFT
DIKEYBOARD_LWIN	Left Microsoft® Windows® logo key
DIKEYBOARD_M	
DIKEYBOARD_MAIL	
DIKEYBOARD_MEDIASELECT	Media Select key, which displays a selection of supported media players on the system
DIKEYBOARD_MEDIASTOP	
DIKEYBOARD_MINUS	On main keyboard
DIKEYBOARD_MULTIPLY	Asterisk (*) on numeric keypad
DIKEYBOARD_MUTE	
DIKEYBOARD_MYCOMPUTER	
DIKEYBOARD_N	
DIKEYBOARD_NEXT	PAGE DOWN
DIKEYBOARD_NEXTTRACK	Next track
DIKEYBOARD_NOCONVERT	On Japanese keyboard
DIKEYBOARD_NUMLOCK	
DIKEYBOARD_NUMPAD0	
DIKEYBOARD_NUMPAD1	
DIKEYBOARD_NUMPAD2	
DIKEYBOARD_NUMPAD3	
DIKEYBOARD_NUMPAD4	
DIKEYBOARD_NUMPAD5	
DIKEYBOARD_NUMPAD6	
DIKEYBOARD_NUMPAD7	
DIKEYBOARD_NUMPAD8	
DIKEYBOARD_NUMPAD9	
DIKEYBOARD_NUMPADCOMMA	On numeric keypad of NEC PC-98 Japanese keyboard
DIKEYBOARD_NUMPADENTER	
DIKEYBOARD_NUMPADEQUALS	On numeric keypad of NEC PC-98 Japanese keyboard
DIKEYBOARD_O	
DIKEYBOARD_OEM_102	On British and German keyboards

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DIKEYBOARD_P	
DIKEYBOARD_PAUSE	
DIKEYBOARD_PERIOD	On main keyboard
DIKEYBOARD_PLAYPAUSE	
DIKEYBOARD_POWER	
DIKEYBOARD_PREVTRACK	Previous track; circumflex on Japanese keyboard
DIKEYBOARD_PRIOR	PAGE UP
DIKEYBOARD_Q	
DIKEYBOARD_R	
DIKEYBOARD_RBRACKET	Right square bracket ]
DIKEYBOARD_RCONTROL	Right CTRL
DIKEYBOARD_RETURN	ENTER on main keyboard
DIKEYBOARD_RIGHT	RIGHT ARROW
DIKEYBOARD_RMENU	Right ALT
DIKEYBOARD_RSHIFT	Right SHIFT
DIKEYBOARD_RWIN	Right Windows logo key
DIKEYBOARD_S	
DIKEYBOARD_SCROLL	SCROLL LOCK
DIKEYBOARD_SEMICOLON	
DIKEYBOARD_SLASH	Forward slash (/) on main keyboard
DIKEYBOARD_SLEEP	
DIKEYBOARD_SPACE	SPACEBAR
DIKEYBOARD_STOP	On NEC PC-98 Japanese keyboard
DIKEYBOARD_SUBTRACT	MINUS SIGN (-) on numeric keypad
DIKEYBOARD_SYSRQ	
DIKEYBOARD_T	
DIKEYBOARD_TAB	
DIKEYBOARD_U	
DIKEYBOARD_UNDERLINE	On NEC PC-98 Japanese keyboard
DIKEYBOARD_UNLABELED	On Japanese keyboard
DIKEYBOARD_UP	UP ARROW
DIKEYBOARD_V	
DIKEYBOARD_VOLUMEDOWN	
DIKEYBOARD_VOLUMEUP	
DIKEYBOARD_W	
DIKEYBOARD_WAKE	
DIKEYBOARD_WEBBACK	

DIKEYBOARD_WEBFAVORITES	Displays the Microsoft Internet Explorer Favorites list, the Windows Favorites folder, or the Netscape Bookmarks list.
DIKEYBOARD_WEBFORWARD	
DIKEYBOARD_WEBHOME	
DIKEYBOARD_WEBREFRESH	
DIKEYBOARD_WEBSEARCH	
DIKEYBOARD_WEBSTOP	
DIKEYBOARD_X	
DIKEYBOARD_Y	
DIKEYBOARD_YEN	On Japanese keyboard
DIKEYBOARD_Z	

## Mouse Mapping Constants

The following constants are used in the **dwSemantic** member of the **DIACTION** structure to map an action to a physical axis or button on a mouse.

DIMOUSE\_BUTTON0  
DIMOUSE\_BUTTON1  
DIMOUSE\_BUTTON2  
DIMOUSE\_BUTTON3  
DIMOUSE\_BUTTON4  
DIMOUSE\_BUTTON5  
DIMOUSE\_BUTTON6  
DIMOUSE\_BUTTON7  
DIMOUSE\_WHEEL  
DIMOUSE\_XAXIS  
DIMOUSE\_YAXIS  
DIMOUSE\_XAXISAB  
DIMOUSE\_YAXISAB

### Note

DIMOUSE\_XAXISAB and DIMOUSE\_YAXISAB represent the x-axis and y-axis on a mouse that returns absolute rather than relative axis data.

## DirectPlay Voice Mapping Constants

The following constants are used in the **dwSemantic** member of the **DIACTION** structure to map an action to a channel on Microsoft® a DirectPlay® voice device.

DIVOICE\_CHANNEL1  
 DIVOICE\_CHANNEL2  
 DIVOICE\_CHANNEL3  
 DIVOICE\_CHANNEL4  
 DIVOICE\_CHANNEL5  
 DIVOICE\_CHANNEL6  
 DIVOICE\_CHANNEL7  
 DIVOICE\_CHANNEL8  
 DIVOICE\_ALL  
 DIVOICE\_TEAM  
 DIVOICE\_PLAYBACKMUTE  
 DIVOICE\_RECORDMUTE  
 DIVOICE\_TRANSMIT  
 DIVOICE\_VOICECOMMAND

## Any-Control Constants

The following constants are used in the **dwSemantic** member of the **DIACTION** structure to map an action to any matching control on the device.

Constant	Device object
DIAXIS_ANY_1	Any axis
DIAXIS_ANY_2	Any axis
DIAXIS_ANY_3	Any axis
DIAXIS_ANY_4	Any axis
DIAXIS_ANY_A_1	Any accelerator
DIAXIS_ANY_A_2	Any accelerator
DIAXIS_ANY_B_1	Any brake
DIAXIS_ANY_B_2	Any brake
DIAXIS_ANY_C_1	Any clutch
DIAXIS_ANY_C_2	Any clutch
DIAXIS_ANY_R_1	Any r-axis
DIAXIS_ANY_R_2	Any r-axis

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DIAXIS_ANY_S_1	Any s-axis
DIAXIS_ANY_S_2	Any s-axis
DIAXIS_ANY_U_1	Any u-axis
DIAXIS_ANY_U_2	Any u-axis
DIAXIS_ANY_V_1	Any v-axis
DIAXIS_ANY_V_2	Any v-axis
DIAXIS_ANY_X_1	Any x-axis
DIAXIS_ANY_X_2	Any x-axis
DIAXIS_ANY_Y_1	Any y-axis
DIAXIS_ANY_Y_2	Any y-axis
DIAXIS_ANY_Z_1	Any z-axis
DIAXIS_ANY_Z_2	Any z-axis
DIBUTTON_ANY(x)	Any button
DIPOV_ANY_1	Any point-of-view controller
DIPOV_ANY_2	Any point-of-view controller
DIPOV_ANY_3	Any point-of-view controller
DIPOV_ANY_4	Any point-of-view controller

These constants can be used to map an application action to a virtual control that is not defined in a genre. Such actions are mapped after genre-specific actions. If the mapper has already mapped all matching controls to genre-specific actions, the any-control action is left unmapped.

Any-control actions are treated with equal priority. If a device has one x-axis and the action array specifies DIAXIS\_ANY\_1 and DIAXIS\_ANY\_X\_1, the action mapped to the x-axis is the one that appears first in the action array.

DIBUTTON\_ANY(x) can accept any value from 0 through 255. Do not use any given index more than once. For instance, the following set of **DIACTION** structures would be invalid.

```
{eB_MUTE,  DIBUTTON_ANY(0), 0, "Toggle Sound",},
{eB_VOLUP, DIBUTTON_ANY(0), 0, "Volume Up", },
{eB_VOLDOWN, DIBUTTON_ANY(0), 0, "Volume Down", },
```

The correct method would use different indexes as shown below.

```
{eB_MUTE,  DIBUTTON_ANY(0), 0, "Toggle Sound",}
{eB_VOLUP, DIBUTTON_ANY(1), 0, "Volume Up", }
{eB_VOLDOWN, DIBUTTON_ANY(2), 0, "Volume Down", }
```

## Return Values

The list below contains the **HRESULT** values that can be returned by Microsoft® DirectInput® methods and functions. Errors are represented by negative values and cannot be combined.

For a list of the error values each method or function can return, see the individual descriptions. Lists of error codes in the documentation are necessarily incomplete. For example, any DirectInput method can return DIERR\_OUTOFMEMORY even though the error code is not explicitly listed as a possible return value in the documentation for that method.

### DI\_BUFFEROVERFLOW

The device buffer overflowed and some input was lost. This value is equal to the S\_FALSE standard COM return value.

### DI\_DOWNLOADSKIPPED

The parameters of the effect were successfully updated, but the effect could not be downloaded because the associated device was not acquired in exclusive mode.

### DI\_EFFECTRESTARTED

The effect was stopped, the parameters were updated, and the effect was restarted.

### DI\_NOEFFECT

The operation had no effect. This value is equal to the S\_FALSE standard COM return value.

### DI\_NOTATTACHED

The device exists but is not currently attached. This value is equal to the S\_FALSE standard COM return value.

### DI\_OK

The operation completed successfully. This value is equal to the S\_OK standard COM return value.

### DI\_POLLEDDEVICE

The device is a polled device. As a result, device buffering does not collect any data and event notifications is not signaled until the **IDirectInputDevice8::Poll** method is called.

### DI\_PROPNOEFFECT

The change in device properties had no effect. This value is equal to the S\_FALSE standard COM return value.

### DI\_SETTINGSNOTSAVED

The action map was applied to the device, but the settings could not be saved.

### DI\_TRUNCATED

The parameters of the effect were successfully updated, but some of them were beyond the capabilities of the device and were truncated to the nearest supported value.

### DI\_TRUNCATEDANDRESTARTED

Equal to DI\_EFFECTRESTARTED | DI\_TRUNCATED.



**DI\_WRITEPROTECT**

A SUCCESS code indicating that settings cannot be modified.

**DIERR\_ACQUIRED**

The operation cannot be performed while the device is acquired.

**DIERR\_ALREADYINITIALIZED**

This object is already initialized

**DIERR\_BADDRIVERVER**

The object could not be created due to an incompatible driver version or mismatched or incomplete driver components.

**DIERR\_BETADIRECTINPUTVERSION**

The application was written for an unsupported prerelease version of DirectInput.

**DIERR\_DEVICEFULL**

The device is full.

**DIERR\_DEVICENOTREG**

The device or device instance is not registered with DirectInput. This value is equal to the REGDB\_E\_CLASSNOTREG standard COM return value.

**DIERR\_EFFECTPLAYING**

The parameters were updated in memory but were not downloaded to the device because the device does not support updating an effect while it is still playing.

**DIERR\_GENERIC**

An undetermined error occurred inside the DirectInput subsystem. This value is equal to the E\_FAIL standard COM return value.

**DIERR\_HANDLEEXISTS**

The device already has an event notification associated with it. This value is equal to the E\_ACCESSDENIED standard COM return value.

**DIERR\_HASEFFECTS**

The device cannot be reinitialized because effects are attached to it.

**DIERR\_INCOMPLETEEFFECT**

The effect could not be downloaded because essential information is missing. For example, no axes have been associated with the effect, or no type-specific information has been supplied.

**DIERR\_INPUTLOST**

Access to the input device has been lost. It must be reacquired.

**DIERR\_INVALIDPARAM**

An invalid parameter was passed to the returning function, or the object was not in a state that permitted the function to be called. This value is equal to the E\_INVALIDARG standard COM return value.

**DIERR\_MAPFILEFAIL**

An error has occurred either reading the vendor-supplied action-mapping file for the device or reading or writing the user configuration mapping file for the device.

**DIERR\_MOREDATA**

Not all the requested information fit into the buffer.

**DIERR\_NOAGGREGATION**

This object does not support aggregation.

**DIERR\_NOINTERFACE**

The object does not support the specified interface. This value is equal to the E\_NOINTERFACE standard COM return value.

**DIERR\_NOTACQUIRED**

The operation cannot be performed unless the device is acquired.

**DIERR\_NOTBUFFERED**

The device is not buffered. Set the DIPROP\_BUFFERSIZE property to enable buffering.

**DIERR\_NOTDOWNLOADED**

The effect is not downloaded.

**DIERR\_NOTEXCLUSIVEACQUIRED**

The operation cannot be performed unless the device is acquired in DISCL\_EXCLUSIVE mode.

**DIERR\_NOTFOUND**

The requested object does not exist.

**DIERR\_NOTINITIALIZED**

This object has not been initialized.

**DIERR\_OBJECTNOTFOUND**

The requested object does not exist.

**DIERR\_OLDDIRECTINPUTVERSION**

The application requires a newer version of DirectInput.

**DIERR\_OTHERAPPHASPRIO**

Another application has a higher priority level, preventing this call from succeeding. This value is equal to the E\_ACCESSDENIED standard COM return value. This error can be returned when an application has only foreground access to a device but is attempting to acquire the device while in the background.

**DIERR\_OUTOFMEMORY**

The DirectInput subsystem could not allocate sufficient memory to complete the call. This value is equal to the E\_OUTOFMEMORY standard COM return value.

**DIERR\_READONLY**

The specified property cannot be changed. This value is equal to the E\_ACCESSDENIED standard COM return value.

**DIERR\_REPORTFULL**

More information was requested to be sent than can be sent to the device.

**DIERR\_UNPLUGGED**

The operation could not be completed because the device is not plugged in.

**DIERR\_UNSUPPORTED**

The function called is not supported at this time. This value is equal to the E\_NOTIMPL standard COM return value.

**E\_HANDLE**

The HWND parameter is not a valid top-level window that belongs to the process.

E\_PENDING

Data is not yet available.

E\_POINTER

An invalid pointer, usually NULL, was passed as a parameter.

## DirectInput Visual Basic Reference

Reference material for the Microsoft® DirectInput® Microsoft Visual Basic® application programming interface (API) is divided into the following categories.

- Classes
- Types
- Enumerations
- Keyboard Keys
- Action Mapping Constants
- Error Codes

### Classes

This section contains references for methods of the following Microsoft® DirectInput® classes.

- **DirectInput8**
- **DirectInputDevice8**
- **DirectInputDeviceInstance8**
- **DirectInputDeviceObjectInstance**
- **DirectInputEffect**
- **DirectInputEnumDeviceObjects**
- **DirectInputEnumDevices8**
- **DirectInputEnumEffects**

## DirectInput8

#The **DirectInput8** class represents the Microsoft® DirectInput® system. An application should have a single object of this class, which is used to enumerate

---

# IDH\_DirectInput8\_dinput\_vb

available devices, create devices, and retrieve the status of devices, as well as to invoke an instance of the Microsoft Windows® Control Panel.

The **DirectInput8** object is obtained by using the **DirectX8.DirectInputCreate** method.

The **DirectInput8** class has the following methods:

<b>Action Mapping</b>	<b>ConfigureDevices</b>
	<b>GetDevicesBySemantics</b>
<b>Device Management</b>	<b>CreateDevice</b>
	<b>GetDeviceStatus</b>
	<b>GetDIDevices</b>
<b>Miscellaneous</b>	<b>RunControlPanel</b>

## DirectInput8.ConfigureDevices

#Displays property pages for connected input devices and enables the user to map actions to device controls.

```
object.ConfigureDevices( _  
    hEvent As Long, _  
    CDParams As DICONFIGUREDEVICESPARAMS, _  
    flags As Long)
```

### Parts

*object*

Resolves to a **DirectInput8** object.

*hEvent*

Handle to an event that is set each time a change is made to the display of the property sheet. Can be 0 or a value returned by **DirectX8.CreateEvent**.

*CDParams*

**DICONFIGUREDEVICESPARAMS** type that contains parameters for action mapping.

*flags*

Value that specifies the mode in which the control panel should be invoked. Must be one of the following values from the **CONST\_DICDFLAGS** enumeration.

DICD\_DEFAULT

Open the property sheet in view-only mode.

DICD\_EDIT

Open the property sheet in edit mode. This mode enables the user to change action-to-control mappings. After the call returns, the application should

---

# IDH\_DirectInput8.ConfigureDevices\_dinput\_vb

---

assume current devices are no longer valid, release all device interfaces, and reinitialize them by calling **DirectInput8.GetDevicesBySemantics**.

## Error Codes

If the method fails, an error is raised and **Err.Number** may be set to one of the following:

DIERR\_INVALIDPARAM  
DIERR\_OUTOFMEMORY

## Remarks

Hardware vendors provide bitmaps and other display information for their device.

Before calling the method, an application can modify the text labels associated with each action by changing the value in the **ActionName** member of the **DIACTION** type.

Configuration is stored for each user of each device for each game. The information can be retrieved by the **DirectInputDevice8.BuildActionMap** method.

By default, acceleration is supported for these pixel formats:

A1R5G5B5

16-bit pixel format with 5 bits reserved for each color and 1 bit reserved for alpha (transparent texel).

A8R8G8B8

32-bit ARGB pixel format with alpha.

R9G8B8

24-bit RGB pixel format.

X1R5G5B5

16-bit pixel format with 5 bits reserved for each color.

X8R8G8B8

32-bit RGB pixel format with 8 bits reserved for each color.

Other formats result in color conversion and dramatically slow the frame rate.

## Note

Even if the cooperative level for the application is disabling the Windows logo key passively through an exclusive cooperative level or actively through use of the DISCL\_NOWINKEY flag, that key is active while the default action mapping UI is displayed.

## DirectInput8.CreateDevice

#Creates and initializes an instance of a device based on a given GUID.

---

# IDH\_DirectInput8.CreateDevice\_dinput\_vb

---

*object*.CreateDevice(*guid* As String) As DirectInputDevice8

## Parts

*object*

Resolves to a **DirectInput8** object.

*guid*

The instance GUID for the desired input device. The GUID is retrieved from the **DirectInputDeviceInstance8** object returned by the **DirectInputEnumDevices8.GetItem** method, or it can be one of the following strings:

GUID\_SysKeyboard

The default system keyboard.

GUID\_SysMouse

The default system mouse.

## Return Values

Returns a **DirectInputDevice8** object.

## Error Codes

If the method fails, an error is raised and **Err.Number** may be set to one of the following:

DIERR\_DEVICENOTREG

DIERR\_INVALIDPARAM

DIERR\_NOINTERFACE

DIERR\_OUTOFMEMORY

## See Also

**DirectInput8**, Using GUIDs

## DirectInput8.GetDevicesBySemantics

#Enumerates devices that most closely match the application-specified action map.

```
object.GetDevicesBySemantics( _  
    str1 As String, _  
    format As DIACTIONFORMAT, _  
    flags As Long _  
) As DirectInputEnumDevices8
```

---

# IDH\_DirectInput8.GetDevicesBySemantics\_dinput\_vb

## Parts

*object*

Resolves to a **DirectInput8** object.

*str1*

String identifying the current user, or *vbNullString* to specify the user logged onto the system. The user name is taken into account when enumerating devices. A device with user mappings is preferred to a device without any user mappings. By default, devices in use by other users are not enumerated for this user.

*format*

**DIACTIONFORMAT** type that specifies the action map for which suitable devices are enumerated.

*flags*

Flag value that specifies the scope of the enumeration. Can be one or more values from the **CONST\_DIEDBSFLFLAGS** enumeration.

## Return Values

Returns a **DirectInputEnumDevices8** object that represents the collection of enumerated devices.

## Error Codes

If the method fails, an error is raised and **Err.Number** is set.

## Remarks

The keyboard and mouse are enumerated last.

## See Also

Action Mapping

## DirectInput8.GetDeviceStatus

#Determines whether a device is attached to the system.

*object*.**GetDeviceStatus**(*guid* As String) As Boolean

## Parts

*object*

Resolves to a **DirectInput8** object.

*guid*

---

# IDH\_DirectInput8.GetDeviceStatus\_dinput\_vb

The instance GUID for the desired input device. The GUID is retrieved by using the **DirectInputDeviceInstance8.GetGuidInstance** method on the object returned by **DirectInputEnumDevices8.GetItem** method, or it can be one of the following strings:

GUID\_SysKeyboard  
The default system keyboard.

GUID\_SysMouse  
The default system mouse.

## Return Values

Returns True if the device is attached, and False otherwise.

## Error Codes

If the method fails, an error is raised and **Err.Number** may be one of the following error codes.

DIERR\_GENERIC  
DIERR\_INVALIDPARAM

## See Also

**DirectInput8**, Using GUIDs

## DirectInput8.GetDIDevices

#Enumerates available devices.

```
object.GetDIDevices( _  
    deviceType As CONST_DI8DEVICETYPE, _  
    flags As CONST_DIENUMDEVICESFLAGS) _  
    As DirectInputEnumDevices8
```

## Parts

*object*  
Resolves to a **DirectInput8** object.

*deviceType*  
Value that specifies the type of device to enumerate. If this parameter is 0, all types are enumerated. Otherwise, it is one of the constants of the **CONST\_DI8DEVICETYPE** enumeration representing a class or type of device.

*flags*



Flag value that specifies the scope of the enumeration. This parameter contains one or more of the constants of the **CONST\_DIENUMDEVICESFLAGS** enumeration.

## Return Values

Returns a **DirectInputEnumDevices8** object.

## Error Codes

If the method fails, an error is raised and **Err.Number** is set.

## Remarks

All installed devices can be enumerated, even if they are not present. For example, a joystick may be installed on the system but not currently plugged into the computer.

If a single piece of hardware can function as more than one Microsoft® DirectInput® device type, it will be returned for each device type it supports. For example, a keyboard with a built-in mouse will be enumerated as a keyboard and as a mouse. The product GUID would be the same for each device, however.

## See Also

**DirectInput8**

# DirectInput8.RunControlPanel

#Runs the Microsoft® Windows® Control Panel to enable the user to install a new input device or modify configurations.

*object*.RunControlPanel(*hwndOwner* As Long)

## Parts

*object*

Resolves to a **DirectInput8** object.

*hwndOwner*

Handle to the window to be used as the parent window for the subsequent user interface. If this parameter is 0, no parent window is used.

## Error Codes

If the method fails, an error is raised and **Err.Number** is set.

---

# IDH\_DirectInput8.RunControlPanel\_dinput\_vb

---

## See Also

**DirectInput8**, **DirectInputDevice8.RunControlPanel**

# DirectInputDevice8

#Applications use the methods of the **DirectInputDevice8** class to gain and release access to Microsoft® DirectInput® devices, manage device properties and information, set behavior, perform initialization, and invoke a device's property sheet.

The **DirectInputDevice8** object is obtained by using the **DirectInput8.CreateDevice** method.

The methods of the **DirectInputDevice8** class can be organized into the following groups.

<b>Access</b>	<b>Acquire</b> <b>SetCooperativeLevel</b> <b>Unacquire</b>
<b>Action Mapping</b>	<b>BuildActionMap</b> <b>GetImageInfo</b> <b>GetImageInfoCount</b> <b>SetActionMap</b>
<b>Data Retrieval</b>	<b>GetDeviceData</b> <b>GetDeviceState</b> <b>GetDeviceStateJoystick</b> <b>GetDeviceStateJoystick2</b> <b>GetDeviceStateKeyboard</b> <b>GetDeviceStateMouse</b> <b>GetDeviceStateMouse2</b> <b>Poll</b> <b>SetEventNotification</b>
<b>Force Feedback</b>	<b>CreateCustomEffect</b> <b>CreateEffect</b> <b>CreateEffectFromFile</b> <b>GetEffectsEnum</b> <b>GetForceFeedbackState</b> <b>SendForceFeedbackCommand</b> <b>WriteEffectToFile</b>
<b>Objects</b>	<b>GetDeviceObjectsEnum</b>

---

# IDH\_DirectInputDevice8\_dinput\_vb

---

<b>Properties</b>	<b>GetObjectInfo</b>
	<b>GetCapabilities</b>
	<b>GetDeviceInfo</b>
	<b>GetProperty</b>
	<b>SetCommonDataFormat</b>
	<b>SetDataFormat</b>
	<b>SetProperty</b>
<b>Miscellaneous</b>	<b>RunControlPanel</b>
	<b>SendDeviceData</b>

## DirectInputDevice8.Acquire

#Obtains access to the input device.

*object.Acquire()*

### Parts

*object*

Resolves to a **DirectInputDevice8** object.

### Error Codes

If the method fails, an error is raised and **Err.Number** may be one of the following error codes.:

DIERR\_INVALIDPARAM  
DIERR\_OTHERAPPHASPRIO

### Remarks

Before a device can be acquired, a data format must be set by using the **DirectInputDevice8.SetDataFormat** or **DirectInputDevice8.SetCommonDataFormat** method.

A device must be acquired before input data can be retrieved from it.

### See Also

**DirectInputDevice8.Unacquire**

## DirectInputDevice8.BuildActionMap

#Builds an action map for the device and retrieves information about it.

# IDH\_DirectInputDevice8.Acquire\_dinput\_vb  
# IDH\_DirectInputDevice8.BuildActionMap\_dinput\_vb

---

```

object.BuildActionMap( _
    format As DIACTIONFORMAT, _
    username As String, _
    flags As Long)

```

## Parts

*object*

Resolves to a **DirectInputDevice8** object.

*format*

**DIACTIONFORMAT** type that receives properties of the action map.

*username*

String that specifies the name of the user for whom mapping is requested. If an empty string, the current user is assumed.

*flags*

Flags used to control the mapping. Can be one of the constants of the **CONST\_DIDBAMFLAGS** enumeration.

## Error Codes

If the method fails, an error is raised and **Err.Number** may be one of the following error codes.

```

DIERR_INVALIDPARAM
DIERR_MAPFILEFAIL

```

## Remarks

If **DIERR\_INVALIDPARAM** is raised, one or more of the mappings was not valid. The **IHow** member of the **DIACTION** type is set to **DIAH\_ERROR**. The application can iterate through the action map to find and correct errors.

## See Also

**DirectInputDevice8.SetActionMap**, **DirectInputDevice8.SetDataFormat**

## DirectInputDevice8.CreateCustomEffect

#Creates a force-feedback effect consisting of a series of constant forces of fixed duration.

```

object.CreateCustomEffect(effectinfo As DIEFFECT, _
    channels As Long, samplePeriod As Long, _
    nSamples As Long, sampledata() As Long) _

```

---

# IDH\_DirectInputDevice8.CreateCustomEffect\_dinput\_vb

## As DirectInputEffect

### Parts

#### *object*

Resolves to a **DirectInputDevice8** object.

#### *effectinfo*

**DIEFFECT** type containing general parameters of the effect.

#### *channels*

The number of channels (axes) affected by this force. Must be 1 or 2.

If there is only a single channel, then the effect will be rotated in the direction specified by the **x** member of the **DIEFFECT** type. Not all devices support rotation of custom effects.

If there is more than one channel, the first channel is applied to the x-axis and the second to the y-axis. Rotation is not allowed.

#### *samplePeriod*

The sample period in microseconds. See Remarks.

#### *nSamples*

Number of elements in the *sampledata* array.

#### *sampledata*

Array of magnitudes. If *channels* is greater than 1, then the values are interleaved. For example, if *channels* is 2, then the first element of the array is assigned to the x-axis, the second to the y-axis, the third to the x-axis, and so on.

### Remarks

In theory, *samplePeriod* is the length of time for which each magnitude in *sampledata* is valid, whereas **DIEFFECT.ISamplePeriod** is the length of time between samplings of the data (and the minimum time between changes in magnitude). Since each element in the array needs to be sampled exactly once on each iteration through the array, and some drivers ignore *samplePeriod* in any case, it is best to make the values of **ISamplePeriod** and *samplePeriod* identical.

### See Also

Custom Forces

## DirectInputDevice8.CreateEffect

#Creates a force-feedback effect. If the device is currently acquired at the exclusive cooperative level, the effect is also downloaded.

*object*.**CreateEffect**(*effectGuid* As String, \_  
*effectinfo* As **DIEFFECT**) As **DirectInputEffect**

---

# IDH\_DirectInputDevice8.CreateEffect\_dinput\_vb

## Parts

### *object*

Resolves to a **DirectInputDevice8** object.

### *effectGuid*

String representation of a GUID for an effect recognized by the hardware driver, or one of the following aliases for standard effects:

GUID\_ConstantForce  
GUID\_RampForce  
GUID\_Square  
GUID\_Sine  
GUID\_Triangle  
GUID\_SawtoothUp  
GUID\_SawtoothDown  
GUID\_Spring  
GUID\_Damper  
GUID\_Inertia  
GUID\_Friction

### *effectInfo*

**DIEFFECT** type containing the parameters for the effect.

## Return Values

Returns a **DirectInputEffect** object.

## Error Codes

If the method fails, an error is raised and **Err.Number** may be one of the following error codes.

DIERR\_DEVICEFULL  
DIERR\_DEVICENOTREG  
DIERR\_INVALIDPARAM  
DIERR\_NOTINITIALIZED

## Remarks

If no error is raised, the effect was created and the parameters of the effect were updated, but the effect was not necessarily downloaded. In order for it to be downloaded, the device must be acquired in exclusive mode.

## See Also

**DirectInputDevice8.CreateEffectFromFile**

**DirectInputEffect.Download**

DirectInputEffect.Start

## DirectInputDevice8.CreateEffectFromFile

#Creates a force-feedback effect whose parameters are stored in a file. If the device is currently acquired at the exclusive cooperative level, the effect is also downloaded.

```
object.CreateEffectFromFile( _  
    filename As String, _  
    flags As Long, _  
    effectName As String _  
) As DirectInputEffect
```

### Parts

*object*

Resolves to a **DirectInputDevice8** object.

*filename*

**String** that specifies the file name.

*flags*

Flags that specify how to create the effect. Can be one or more values from the **CONST\_DIEFFLAGS** enumeration.

*effectName*

Friendly name of the effect, assigned by the author.

### Return Values

Returns a **DirectInputEffect** object.

### Error Codes

If the method fails, an error is raised and **Err.Number** may be one of the following error codes.

```
DIERR_DEVICEFULL  
DIERR_DEVICENOTREG  
DIERR_INVALIDPARAM  
DIERR_NOTINITIALIZED
```

### Remarks

If no error is raised, the effect was created but not necessarily downloaded. In order for it to be downloaded, the device must be acquired in exclusive mode.

---

# IDH\_DirectInputDevice8.CreateEffectFromFile\_dinput\_vb

Effect files must be in the format used by the Force Editor (Fedit.exe) application supplied with the Microsoft® DirectInput® SDK.

## See Also

**DirectInputEffect.Download**, **DirectInputDevice8.WriteEffectToFile**

## DirectInputDevice8.GetCapabilities

#Retrieves the capabilities of the device.

*object*.**GetCapabilities**(*caps* As DIDEVCAPS)

### Parts

*object*

Resolves to a **DirectInputDevice8** object.

*caps*

A **DIDEVCAPS** type to be filled with the device capabilities.

### Error Codes

If the method fails, an error is raised and **Err.Number** is set.

## DirectInputDevice8.GetDeviceData

#Retrieves buffered data from the device.

*object*.**GetDeviceData**( \_  
    *deviceObjectDataArray*() As DIDEVICEOBJECTDATA, \_  
    *flags* As CONST\_DIDGDDFLAGS) As Long

### Parts

*object*

Resolves to a **DirectInputDevice8** object.

*deviceObjectDataArray*()

Array of **DIDEVICEOBJECTDATA** types to receive the buffered data.

*flags*

Flags that control the manner in which data is obtained. This value can be 0 or one of the constants of the **CONST\_DIDGDDFLAGS** enumeration.

### Return Values

Returns the number of buffered data elements actually returned in *deviceObjectDataArray*.

# IDH\_DirectInputDevice8.GetCapabilities\_dinput\_vb

# IDH\_DirectInputDevice8.GetDeviceData\_dinput\_vb



## Error Codes

If the method fails, an error is raised and **Err.Number** may be one of the following error codes.

DIERR\_INPUTLOST  
DIERR\_INVALIDPARAM  
DIERR\_NOTACQUIRED  
DIERR\_NOTBUFFERED

## Remarks

Before device data can be obtained, you must set the data format by using the **DirectInputDevice8.SetDataFormat** method, set the buffer size by using **DirectInputDevice8.SetProperty** method, and acquire the device by using the **DirectInputDevice8.Acquire** method.

You can use this method to retrieve one or more input events from the buffer you created by using **SetProperty**. You do not have to retrieve all pending events with a single call. You can, for example, pass in a *deviceObjectDataArray()* consisting of a single element and loop on **GetDeviceData** until no more data is returned.

If the buffer overflows, all pending data is lost and the DI\_BUFFEROVERFLOW error is raised.

## See Also

**DirectInputDevice8.Poll**, Polling and Event Notification

## DirectInputDevice8.GetDeviceInfo

\*Retrieves information about the device's identity.

*object*.GetDeviceInfo() As DirectInputDeviceInstance8

## Parts

*object*

Resolves to a **DirectInputDevice8** object.

## Return Values

Returns a **DirectInputDeviceInstance8** object

## Error Codes

If the method fails, an error is raised and **Err.Number** is set.

---

# IDH\_DirectInputDevice8.GetDeviceInfo\_dinput\_vb

## DirectInputDevice8.GetDeviceObjectsEnum

#Enumerates the input and output objects available on a device.

```
object.GetDeviceObjectsEnum( _  
    flags As CONST_DIDFTFLAGS) _  
    As DirectInputEnumDeviceObjects
```

### Parts

*object*

Resolves to a **DirectInputDevice8** object.

*flags*

Flags specifying the type of object to be enumerated. Can be one or more of the members of the **CONST\_DIDFTFLAGS** enumeration.

### Return Values

If the method succeeds, the return value is a **DirectInputEnumDeviceObjects** object that represents the collection of enumerated devices.

### Error Codes

If the method fails, an error is raised and **Err.Number** is set.

### Remarks

The **DIDFT\_FFACTUATOR** and **DIDFT\_FFEFFECTTRIGGER** flags restrict enumeration to objects that meet all the criteria defined by the included flags. For all the other flags, an object is enumerated if it meets the criterion defined by any included flag in this category. For example, (**DIDFT\_FFACTUATOR Or DIDFT\_FFEFFECTTRIGGER**) restricts enumeration to force-feedback trigger objects, and (**DIDFT\_FFEFFECTTRIGGER Or DIDFT\_TGLBUTTON Or DIDFT\_PSHBUTTON**) restricts enumeration to buttons of any kind that can be used as effect triggers.

Applications should not rely on enumeration to determine whether certain keyboard keys or indicator lights are present, as these objects might be enumerated even though they are not present. Although the basic set of available objects can be determined from the device subtype, there is no reliable way of determining whether extra objects such as the menu key are available.

---

## DirectInputDevice8.GetDeviceState

#Retrieves immediate data for a device other than a standard keyboard, mouse, or joystick.

*object*.GetDeviceState(*cb* As Long, *state* As Any)

### Parts

*object*

Resolves to a **DirectInputDevice8** object.

*cb*

Size of the array whose first element is passed as *state*.

*state*

First element of an array to receive device state information.

### Error Codes

If the method fails, an error is raised and **Err.Number** may be one of the following error codes.

DIERR\_INPUTLOST  
DIERR\_INVALIDPARAM  
DIERR\_NOTACQUIRED  
E\_PENDING

### Remarks

Before device data can be obtained, you must set the cooperative level by using the **DirectInputDevice8.SetCooperativeLevel** method, then set the data format by using **DirectInputDevice8.SetDataFormat**, and acquire the device by using the **DirectInputDevice8.Acquire** method.

### See Also

**DirectInputDevice8.GetDeviceStateJoystick**,  
**DirectInputDevice8.GetDeviceStateJoystick2**,  
**DirectInputDevice8.GetDeviceStateKeyboard**,  
**DirectInputDevice8.GetDeviceStateMouse**, **DirectInputDevice8.SetDataFormat**,  
Buffered and Immediate Data

---

## DirectInputDevice8.GetDeviceStateJoystick

#Retrieves immediate data from a joystick device.

*object*.GetDeviceStateJoystick(*state* As DIJOYSTATE)

### Parts

*object*

Resolves to a **DirectInputDevice8** object.

*state*

A **DIJOYSTATE** type that receives the current state of the device.

### Error Codes

If the method fails, an error is raised and **Err.Number** may be one of the following error codes.

DIERR\_INPUTLOST  
DIERR\_INVALIDPARAM  
DIERR\_NOTACQUIRED  
E\_PENDING

### Remarks

Before device data can be obtained, you must set the cooperative level by using the **DirectInputDevice8.SetCooperativeLevel** method, then set the data format by using **DirectInputDevice8.SetCommonDataFormat**, and acquire the device by using the **DirectInputDevice8.Acquire** method.

### See Also

**DirectInputDevice8.Poll** Polling and Event Notification

## DirectInputDevice8.GetDeviceStateJoystick2

#Retrieves immediate data from a joystick device with extended capabilities.

*object*.GetDeviceStateJoystick2(*state* As DIJOYSTATE2)

---

# IDH\_DirectInputDevice8.GetDeviceStateJoystick\_dinput\_vb

# IDH\_DirectInputDevice8.GetDeviceStateJoystick2\_dinput\_vb

## Parts

### *object*

Resolves to a **DirectInputDevice8** object.

### *state*

A **DIJOYSTATE2** type that receives the current state of the device. The format of the data is established by a prior call to the **DirectInputDevice8.SetDataFormat** method.

## Error Codes

If the method fails, an error is raised and **Err.Number** may be one of the following error codes.

DIERR\_INPUTLOST  
DIERR\_INVALIDPARAM  
DIERR\_NOTACQUIRED  
E\_PENDING

## Remarks

Before device data can be obtained, you must set the cooperative level by using the **DirectInputDevice8.SetCooperativeLevel** method, then set the data format by using **DirectInputDevice8.SetCommonDataFormat**, and acquire the device by using the **DirectInputDevice8.Acquire** method.

## See Also

**DirectInputDevice8.Poll**, Polling and Event Notification

## DirectInputDevice8.GetDeviceStateKeyboard oard

#Retrieves immediate data from a keyboard device.

*object*.GetDeviceStateKeyboard(*state* As DIKEYBOARDSTATE)

## Parts

### *object*

Resolves to a **DirectInputDevice8** object.

### *state*

A **DIKEYBOARDSTATE** type that receives the current state of the device.

---

# IDH\_DirectInputDevice8.GetDeviceStateKeyboard\_dinput\_vb

## Error Codes

If the method fails, an error is raised and **Err.Number** may be one of the following error codes.

DIERR\_INPUTLOST  
DIERR\_INVALIDPARAM  
DIERR\_NOTACQUIRED  
E\_PENDING

## Remarks

Before device data can be obtained, you must set the cooperative level by using the **DirectInputDevice8.SetCooperativeLevel** method, then set the data format by using **DirectInputDevice8.SetCommonDataFormat**, and acquire the device by using the **DirectInputDevice8.Acquire** method.

## See Also

**DirectInputDevice8.Poll**, Polling and Event Notification

# DirectInputDevice8.GetDeviceStateMouse

#Retrieves immediate data from a mouse device that has up to four buttons.

*object*.**GetDeviceStateMouse**(*state* As DIMOUSESTATE)

## Parts

*object*

Resolves to a **DirectInputDevice8** object.

*state*

A **DIMOUSESTATE** type that receives the state of the device.

## Error Codes

If the method fails, an error is raised and **Err.Number** may be one of the following error codes.

DIERR\_INPUTLOST  
DIERR\_INVALIDPARAM  
DIERR\_NOTACQUIRED  
E\_PENDING

---

# IDH\_DirectInputDevice8.GetDeviceStateMouse\_dinput\_vb

## Remarks

Before device data can be obtained, you must set the cooperative level by using the **DirectInputDevice8.SetCooperativeLevel** method, then set the data format by using **DirectInputDevice8.SetCommonDataFormat**, and acquire the device by using the **DirectInputDevice8.Acquire** method.

## See Also

**DirectInputDevice8.GetDeviceStateMouse2**, **DirectInputDevice8.Poll** Polling and Event Notification

# DirectInputDevice8.GetDeviceStateMouse2

#Retrieves immediate data from a mouse device that has up to eight buttons.

*object*.GetDeviceStateMouse2(*state* As DIMOUSESTATE2)

## Parts

*object*

Resolves to a **DirectInputDevice8** object.

*state*

A **DIMOUSESTATE2** type that receives the state of the device.

## Error Codes

If the method fails, an error is raised and **Err.Number** may be one of the following error codes.

DIERR\_INPUTLOST  
DIERR\_INVALIDPARAM  
DIERR\_NOTACQUIRED  
E\_PENDING

## Remarks

Before device data can be obtained, you must set the cooperative level by using the **DirectInputDevice8.SetCooperativeLevel** method, then set the data format by using **DirectInputDevice8.SetCommonDataFormat**, and acquire the device by using the **DirectInputDevice8.Acquire** method.

---

# IDH\_DirectInputDevice8.GetDeviceStateMouse2\_dinput\_vb

## See Also

**DirectInputDevice8.GetDeviceStateMouse**, **DirectInputDevice8.Poll**, Polling and Event Notification

## DirectInputDevice8.GetEffectsEnum

#Enumerates force-feedback effects supported by the device, including standard effects as well as effects designed by the device manufacturer.

```
object.GetEffectsEnum( _  
    effType As CONST_DIEFTFLAGS _  
    ) As DirectInputEnumEffects
```

## Parts

*object*

Resolves to a **DirectInputDevice8** object.

*effType*

One of the following flags from the **CONST\_DIEFTFLAGS** enumeration specifying the type of effect to be enumerated:

```
DIEFT_ALL  
DIEFT_CONDITION  
DIEFT_CONSTANTFORCE  
DIEFT_CUSTOMFORCE  
DIEFT_HARDWARE  
DIEFT_PERIODIC  
DIEFT_RAMPFORCE
```

## Return Values

Returns a **DirectInputEnumEffects** object whose methods can be used to retrieve information about the effects.

## Error Codes

If the method fails, an error is raised and **Err.Number** is set.

## DirectInputDevice8.GetForceFeedbackState

#Retrieves the state of the device's force-feedback system.

```
object.GetForceFeedbackState() As CONST_DIGFFSFLAGS
```

---

```
# IDH_DirectInputDevice8.GetEffectsEnum_dinput_vb
```

```
# IDH_DirectInputDevice8.GetForceFeedbackState_dinput_vb
```



## Parts

*object*

Resolves to a **DirectInputDevice8** object.

## Return Values

Returns flags from the **CONST\_DIGFFSFLAGS** enumeration that describe the current state of the device's force-feedback system.

Future versions of Microsoft® DirectInput® may define additional flags. Applications should ignore any flags that are not currently defined.

## Error Codes

If the method fails, an error is raised and **Err.Number** may be one of the following error codes.

DIERR\_INPUTLOST  
DIERR\_INVALIDPARAM  
DIERR\_NOTEXCLUSIVEACQUIRED  
DIERR\_NOTINITIALIZED  
DIERR\_UNSUPPORTED

## Remarks

The device must be acquired at the exclusive cooperative level for this method to succeed.

# DirectInputDevice8.GetImageInfo

#Retrieves information about a device image for use in a configuration property sheet.

*object*.**GetImageInfo**(*info* As **DIDeviceImageInfoHeader**)

## Parts

*object*

Resolves to a **DirectInputDevice8** object.

*info*

**DIDeviceImageInfoHeader** type that receives information about the device image.

## Error Codes

If the method fails, an error is raised and **Err.Number** may be one of the following error codes.

DIERR\_INVALIDPARAM  
 DIERR\_MAPFILEFAIL  
 DIERR\_MOREDATA  
 DIERR\_NOTINITIALIZED  
 DIERR\_OBJECTNOTFOUND

## See Also

**DirectInputDevice8.GetImageInfoCount**

## DirectInputDevice8.GetImageInfoCount

#Retrieves the number of images available for the device. This method is used to ascertain how many array elements must be allocated in the **Images** member of the **DIDeviceImageInfoHeader** type before the type is passed to the **DirectInputDevice8.GetImageInfo**.

*object*.GetImageInfoCount() As Long

## Parts

*object*

Resolves to a **DirectInputDevice8** object.

## Error Codes

If the method fails, an error is raised and **Err.Number** is set.

## DirectInputDevice8.GetObjectInfo

#Retrieves information about a device object such as a button or axis.

*object*.GetObjectInfo( \_  
   *obj* As Long, \_  
   *how* As CONST\_DIPHFLAGS) \_  
   As DirectInputDeviceObjectInstance

## Parts

*object*

---

# IDH\_DirectInputDevice8.GetImageInfoCount\_dinput\_vb  
 # IDH\_DirectInputDevice8.GetObjectInfo\_dinput\_vb

Resolves to a **DirectInputDevice8** object.

*obj*

Value that identifies the object whose information will be retrieved. The interpretation of this parameter depends on the value specified in the *how* parameter.

*how*

Value specifying how the *obj* parameter should be interpreted. This value can be one of the constants of the **CONST\_DIPHFLAGS** enumeration.

## Return Values

Returns a **DirectInputDeviceObjectInstance** object whose methods can be used to retrieve information about the object.

## Error Codes

If the method fails, an error is raised and **Err.Number** may be one of the following error codes.

DIERR\_INVALIDPARAM

DIERR\_OBJECTNOTFOUND

# DirectInputDevice8.GetProperty

#Retrieves information about the input device.

```
object.GetProperty( _  
    guid As String, _  
    propertyInfo As Any)
```

## Parts

*object*

Resolves to a **DirectInputDevice8** object.

*guid*

Identifier of the property to be retrieved. The following properties are defined for an input device and can be passed as strings:

DIPROP\_AUTOCENTER

Specifies whether device objects are self-centering. See

**DirectInputDevice8.SetProperty** for more information.

DIPROP\_AXISMODE

Retrieves the axis mode. The retrieved value can be

DIPROPAXISMODE\_ABS or DIPROPAXISMODE\_REL. (See the **CONST\_DINPUT** enumeration.)

DIPROP\_BUFFERSIZE

# IDH\_DirectInputDevice8.GetProperty\_dinput\_vb

Retrieves the input-buffer size. The buffer size determines the amount of data that the buffer can hold between calls to the

**DirectInputDevice8.GetDeviceData** method before data is lost. This value may be set to 0 to indicate that the application will not be reading buffered data from the device.

#### DIPROP\_DEADZONE

Retrieves a value for the dead zone of a joystick, in the range 0 to 10,000, where 0 indicates there is no dead zone, 5,000 indicates that the dead zone extends over 50 percent of the physical range of the axis on both sides of center, and 10,000 indicates that the entire physical range of the axis is dead. When the axis is within the dead zone, it is reported as being at the center of its range.

#### DIPROP\_FFGAIN

Retrieves the gain of the device. See **DirectInputDevice8.SetProperty** for more information.

#### DIPROP\_FFLOAD

Retrieves the memory load for the device. This setting applies to the entire device, rather than to any particular object, so the **IHow** member of the associated **DIPROPLONG** type must be **DIPH\_DEVICE**. The device must be acquired in exclusive mode. If it is not, the method will fail with a return value of **DIERR\_NOTEXCLUSIVEACQUIRED**.

The **IData** member contains a value in the range 0 to 100, indicating the percentage of device memory in use.

#### DIPROP\_GRANULARITY

Retrieves the input granularity. Granularity represents the smallest distance the object will report movement. Most axis objects have a granularity of 1, meaning that all values are possible. Some axes may have a larger granularity. For example, the wheel axis on a mouse may have a granularity of 20, meaning that all reported changes in position will be multiples of 20. In other words, when the user turns the wheel slowly, the device reports a position of 0, then 20, then 40, and so on.

This is a read-only property; you cannot set its value by calling the **DirectInputDevice8.SetProperty** method.

#### DIPROP\_RANGE

Retrieves the range of values an object can possibly report. The retrieved minimum and maximum values are set in the **IMin** and **IMax** members of the associated **DIPROPRANGE** type.

For some devices, this is a read-only property; you cannot set its value by calling the **DirectInputDevice8.SetProperty** method.

#### DIPROP\_SATURATION

Retrieves a value for the saturation zones of a joystick, in the range 0 to 10,000. The saturation level is the point at which the axis is considered to be at its most extreme position. For example, if the saturation level is set to 9,500, then the axis reaches the extreme of its range when it has moved 95

percent of the physical distance from its center position (or from the dead zone).

*propertyInfo*

A **DIPROPLONG** type to receive a single value, or a **DIPROPRANGE** type to receive a pair of values for the property. The **IObj**, **IHow**, and **ISize** members of the type must be initialized before the method is called.

## Error Codes

If the method fails, an error is raised and **Err.Number** may be one of the following error codes.

DIERR\_INVALIDPARAM  
DIERR\_NOTEXCLUSIVEACQUIRED  
DIERR\_NOTINITIALIZED  
DIERR\_OBJECTNOTFOUND  
DIERR\_UNSUPPORTED

## See Also

**DirectInputDevice8.SetProperty**

## DirectInputDevice8.Poll

#Makes data available from polled objects on a Microsoft® DirectInput® device. If the device does not require polling, then calling this method has no effect. If a device that requires polling is not polled periodically, no new data will be received from the device. Calling this method causes Microsoft® DirectInput® to update the device state, generate input events (if buffered data is enabled), and set notification events (if notification is enabled).

*object.Poll()*

## Parts

*object*

Resolves to a **DirectInputDevice8** object.

## Error Codes

If the method fails, an error is raised and **Err.Number** may be one of the following error codes.

DIERR\_INPUTLOST  
DIERR\_NOTACQUIRED

---

# IDH\_DirectInputDevice8.Poll\_dinput\_vb

## Remarks

Before a device data can be polled, the data format must be set by using the **DirectInputDevice8.SetDataFormat** or **DirectInputDevice8.SetCommonDataFormat** method, and the device must be acquired by using the **DirectInputDevice8.Acquire** method.

## See Also

Polling and Event Notification

## DirectInputDevice8.RunControlPanel

#Opens the Control Panel property sheet associated with this device. If the device does not have a property sheet associated with it, the default device property sheet is displayed.

*object*.RunControlPanel(*hwnd* As Long)

## Parts

*object*

Resolves to a **DirectInputDevice8** object.

*hwnd*

Handle to the parent window. If this parameter is 0, no parent window is used.

## Error Codes

If the method fails, an error is raised and **Err.Number** may be one of the following error codes.

DIERR\_INVALIDPARAM

## DirectInputDevice8.SendDeviceData

#Sends data to a device that accepts output. The device must be in an acquired state.

*object*.SendDeviceData(*count* As Long, \_  
    *data()* As DIDEVICEOBJECTDATA, \_  
    *flags* As CONST\_DESDDFLAGS) As Long

## Parts

*object*

---

# IDH\_DirectInputDevice8.RunControlPanel\_dinput\_vb

# IDH\_DirectInputDevice8.SendDeviceData\_dinput\_vb

Resolves to a **DirectInputDevice8** object.

*count*

Number of elements in *data*.

*data*

Array of **DIDEVICEOBJECTDATA** types containing the data to send to the device.

The **IOfs** field of each **DIDEVICEOBJECTDATA** type must contain the instance identifier (not the data offset) for the device object to which the data is directed. (See **DirectInputDeviceObjectInstance.GetType**.) The **ITimeStamp** and **ISequence** members must be 0.

*flags*

Flags controlling the manner in which data is sent. This may be 0 or the following value:

**DISDD\_CONTINUE**

The device data sent will be overlaid on the previously sent device data. See Remarks.

## Error Codes

If the method fails, an error is raised and **Err.Number** may be one of the following error codes.

**DIERR\_INPUTLOST**

**DIERR\_NOTACQUIRED**

**DIERR\_REPORTFULL**

**DIERR\_UNPLUGGED**

## Remarks

There is no guarantee that the individual data elements will be sent in a particular order. However, data sent by successive calls to **SendDeviceData** will not be interleaved. Furthermore, if multiple pieces of data are sent to the same object with a single call, it is unspecified which piece of data is sent.

Consider, for example, a device that can be sent data in packets, each packet describing two pieces of information, call them A and B. Suppose the application attempts to send three data elements: B = 2, A = 1, and B = 0.

The actual device will be sent a single packet. The A field of the packet will contain the value 1, and the B field of the packet will be either 2 or 0.

If the data must to be sent to the device exactly as specified, then three calls to **SendDeviceData** should be performed, each call sending one data element.

In response to the first call, the device will be sent a packet where the A field is blank and the B field contains the value 2.

In response to the second call, the device will be sent a packet where the A field contains the value 1, and the B field is blank.

Finally, in response to the third call, the device will be sent a packet where the A field is blank and the B field contains the value 0.

If the DISDD\_CONTINUE flag is set, then the device data sent will be overlaid on the previously sent device data. Otherwise, the device data sent will start from scratch.

For example, suppose a device supports two button outputs, Button0 and Button1. If an application first calls **SendDeviceData** passing "Button0 pressed", then a packet of the form "Button0 pressed, Button1 not pressed" is sent to the device. If the application then makes another call, passing "Button1 pressed" and the DISDD\_CONTINUE flag, then a packet of the form "Button0 pressed, Button1 pressed" is sent to the device. However, if the application had not passed the DISDD\_CONTINUE flag, the packet sent to the device would have been "Button0 not pressed, Button1 pressed".

## DirectInputDevice8.SendForceFeedbackCommand

#Sends a command to the device's force-feedback system.

*object*.SendForceFeedbackCommand(*flags* As Long)

### Parts

*object*

Resolves to a **DirectInputDevice8** object.

*flags*

A single value indicating the desired change in state. The value may be one of the members of the **CONST\_DISFFCFLAGS** enumeration.

### Error Codes

If the method fails, an error is raised and **Err.Number** may be one of the following error codes.

DIERR\_INPUTLOST  
DIERR\_NOTACQUIRED  
DIERR\_REPORTFULL  
DIERR\_UNPLUGGED

---

# IDH\_DirectInputDevice8.SendForceFeedbackCommand\_dinput\_vb



---

## DirectInputDevice8.SetActionMap

#Sets the data format for a device and maps application-defined actions to device objects. It also sets the buffer size for buffered data.

### Note

The device must be unacquired prior to calling this method.

*object*.**SetActionMap**(*format* As **DIACTIONFORMAT**, \_  
    *userName* As **String**, \_  
    *flags* As **Long**)

### Parts

*object*

Resolves to a **DirectInputDevice8** object.

*format*

**DIACTIONFORMAT** type that specifies information about the action map to be applied and about the buffer size for buffered device data.

*userName*

Value of type **String** that specifies the name of the user.

*flags*

Value of type **Long** that specifies how the action map is applied. Can be one of the constants of the **CONST\_DIDSAMFLAGS** enumeration.

### Error Codes

If the method fails, **Err.Number** can be set to one of the following values.

DIERR\_ACQUIRED

DIERR\_INVALIDPARAM

### Remarks

This method provides the mechanism to change action-to-control mapping from the device defaults. An application must use this method to map its actions to virtual controls.

The user name passed to this method binds a set of action mappings for a device to a specific user. Settings are automatically saved to disk when they differ from the currently applied map. Applications that accept input from multiple users should be very careful when applying action maps to the system mouse or keyboard, as the action maps for each user may conflict.

The method can be called only when the device is not acquired.

---

# IDH\_DirectInputDevice8.SetActionMap\_dinput\_vb

## See Also

**DirectInputDevice8.BuildActionMap**

## DirectInputDevice8.SetCommonDataFormat

#Sets the input data format for standard devices.

```
object.SetCommonDataFormat( _  
    format As CONST_DICOMMONDATAFORMATS)
```

## Parts

*object*

Resolves to a **DirectInputDevice8** object.

*format*

One of the **CONST\_DICOMMONDATAFORMATS** enumeration, identifying the data format to use for the device.

## Error Codes

If the method fails, an error is raised and **Err.Number** may be one of the following error codes.

```
DIERR_ACQUIRED  
DIERR_INVALIDPARAM
```

## Remarks

The data format must be set before the device can be acquired by using the **DirectInputDevice8.Acquire** method. It is necessary to set the data format only once. The data format cannot be changed while the device is acquired.

## See Also

**DirectInputDevice8.SetDataFormat**

## DirectInputDevice8.SetCooperativeLevel

#Establishes the cooperative level for this instance of the device. The cooperative level determines how this instance of the device interacts with other instances of the device and the rest of the system.

```
object.SetCooperativeLevel(hwnd As Long, _
```

---

```
# IDH_DirectInputDevice8.SetCommonDataFormat_dinput_vb
```

```
# IDH_DirectInputDevice8.SetCooperativeLevel_dinput_vb
```

*flags* As **CONST\_DISCLFLAGS**)

## Parts

*object*

Resolves to a **DirectInputDevice8** object.

*hwnd*

Window handle to be associated with the device. This parameter must be a valid top-level window handle that belongs to the process. The window associated with the device must not be destroyed while it is still active in a Microsoft® DirectInput® device.

*flags*

Flags that describe the cooperative level associated with the device. The flags are constants of the **CONST\_DISCLFLAGS** enumeration.

The following combinations of flags are valid.

Flags	Meaning	Valid for
DISCL_NONEXCLUSIVE Or DISCL_BACKGROUND	Others can acquire device in exclusive or nonexclusive mode; your application has access to data at all times.	All.
DISCL_NONEXCLUSIVE Or DISCL_FOREGROUND	Others can acquire device in exclusive or nonexclusive mode; your application has access to data only when in the foreground.	All.
DISCL_EXCLUSIVE Or DISCL_BACKGROUND	Others can acquire device in nonexclusive mode; your application has access to data at all times.	Joystick.
DISCL_EXCLUSIVE Or DISCL_FOREGROUND	Others can acquire device in nonexclusive mode; your application has access to data only when in the foreground.	All. Valid for mouse but prevents Microsoft® Windows® from displaying the cursor.

For keyboards, DISCL\_NOWINKEY can be also be included with DISCL\_NONEXCLUSIVE to disable the Windows logo key. the Windows logo key is always disabled when DISCL\_EXCLUSIVE is specified. Note, however, that DISCL\_NOWINKEY has no effect when the default action-mapping UI is displayed, and the Windows logo key operates normally as long as that UI is present.

## Error Codes

If the method fails, an error is raised and **Err.Number** may be one of the following error codes.

DIERR\_INVALIDPARAM  
DIERR\_INVALIDHANDLE

## Remarks

No two applications (or instances of the same application) can have a device acquired in exclusive mode at the same time. This is primarily a security feature; it prevents input intended for one application from going to another that may be running concurrently.

If the system mouse is acquired in exclusive mode, then the pointer will be removed from the screen until the device is unacquired.

Applications must call this method before acquiring the device by using the **DirectInputDevice8.Acquire** method.

## See Also

Cooperative Levels

# DirectInputDevice8.SetDataFormat

#Sets the data format for a Microsoft® DirectInput® device that is not a standard mouse, keyboard, or joystick.

*object*.SetDataFormat(*format* As **DIDATAFORMAT**, \_  
                  *formatArray*() As **DIOBJECTDATAFORMAT**)

## Parts

*object*

Resolves to a **DirectInputDevice8** object.

*format*

A **DIDATAFORMAT** type that describes the format of the data the device should return.

*formatArray*

Array of **DIOBJECTDATAFORMAT** types describing data formats for objects on the device.

## Error Codes

If the method fails, an error is raised and **Err.Number** may be one of the following error codes.

DIERR\_ACQUIRED  
DIERR\_INVALIDPARAM

---

# IDH\_DirectInputDevice8.SetDataFormat\_dinput\_vb

## Remarks

The data format must be set before the device can be acquired by using the **DirectInputDevice8.Acquire** method. It is necessary to set the data format only once. The data format cannot be changed while the device is acquired.

## See Also

**DirectInputDevice8.SetActionMap**, **DirectInputDevice8.SetCommonDataFormat**

# DirectInputDevice8.SetEventNotification

#Sets the event notification status. This method specifies an event that is to be set when the device state changes. It is also used to turn off event notification.

*object*.**SetEventNotification**(*hEvent* As Long)

## Parts

*object*

Resolves to a **DirectInputDevice8** object.

*hEvent*

Handle to the event that is to be set when the device state changes, or 0 to disable notification.

## Error Codes

If the method fails, an error is raised and **Err.Number** may be one of the following error codes.

DIERR\_ACQUIRED  
DIERR\_HANDLEEXISTS  
DIERR\_INVALIDPARAM

## Remarks

A device state change is defined as any of the following:

- A change in the position of an axis
- A change in the state (pressed or released) of a button
- A change in the direction of a POV control
- Loss of acquisition

---

# IDH\_DirectInputDevice8.SetEventNotification\_dinput\_vb

You must call this method with the *hEvent* parameter set to 0 before destroying the event.

The event notification handle cannot be changed while the device is acquired.

## See Also

Polling and Event Notification, **DirectXEvent8**

## DirectInputDevice8.SetProperty

#Sets properties that define the device behavior.

```
object.SetProperty( _  
    guid As String, _  
    propertyInfo As Any)
```

## Parts

*object*

Resolves to a **DirectInputDevice8** object.

*guid*

Identifier of the property to be set. The following property values are predefined for an input device and can be passed as strings:

**DIPROP\_AUTOCENTER**

Specifies whether device objects are self-centering. This setting applies to the entire device, rather than to any particular object, so the **IHow** member of the associated **DIPROPLONG** type must be **DIPH\_DEVICE**.

The **IData** member can be one of the following values from the **CONST\_DINPUT** enumeration.

**DIPROPAUTOCENTER\_OFF**: The device should not automatically center when the user releases the device. An application that uses force feedback should disable autocentering before playing effects.

**DIPROPAUTOCENTER\_ON**: The device should automatically center when the user releases the device.

Not all devices support the autocenter property.

**DIPROP\_AXISMODE**

Sets the axis mode. The value being set (either **DIPROPAXISMODE\_ABS** or **DIPROPAXISMODE\_REL** from the **CONST\_DINPUT** enumeration) must be specified in the **IData** member of the associated **DIPROPLONG** type.

This setting applies to the entire device, so the **IHow** member of the **DIPROPLONG** type must be set to **DIPH\_DEVICE**.

**DIPROP\_BUFFERSIZE**

Sets the input-buffer size. See Remarks.

---

# IDH\_DirectInputDevice8.SetProperty\_dinput\_vb

This setting applies to the entire device, so the **IHow** member of the associated **DIPROPLONG** type must be set to **DIPH\_DEVICE**.

#### DIPROP\_CALIBRATIONMODE

Enables the application to specify whether Microsoft® DirectInput® should retrieve calibrated or uncalibrated data from an axis. By default, DirectInput retrieves calibrated data.

Setting the calibration mode for the entire device is equivalent to setting it for each axis individually.

The **IData** member of the **DIPROPLONG** type may be one of the following values:

**DIPROPCALIBRATIONMODE\_COOKED**: DirectInput should return data after applying calibration information. This is the default mode.

**DIPROPCALIBRATIONMODE\_RAW**: DirectInput should return raw, uncalibrated data. This mode is typically used only by Control Panel-type applications.

Note that setting a device into raw mode causes the dead zone, saturation, and range settings to be ignored.

#### DIPROP\_DEADZONE

Sets the value for the dead zone of a joystick, in the range 0 to 10,000, where 0 indicates there is no dead zone, 5,000 indicates that the dead zone extends over 50 percent of the physical range of the axis on both sides of center, and 10,000 indicates that the entire physical range of the axis is dead. When the axis is within the dead zone, it is reported as being at the center of its range.

This setting can be applied to either the entire device or to a specific axis.

#### DIPROP\_RANGE

Sets the range of values an object can possibly report. The minimum and maximum values are taken from the **IMin** and **IMax** members of the associated **DIPROPRANGE** type.

For some devices, this is a read-only property.

You cannot set a reverse range; **IMax** must be greater than **IMin**.

#### DIPROP\_SATURATION

Sets the value for the saturation zones of a joystick, in the range 0 to 10,000. The saturation level is the point at which the axis is considered to be at its most extreme position. For example, if the saturation level is set to 9,500, then the axis reaches the extreme of its range when it has moved 95 percent of the physical distance from its center position (or from the dead zone).

This setting can be applied to either the entire device or to a specific axis.

#### *propertyInfo*

A **DIPROPLONG** type containing data for properties that take a single value, or a **DIPROPRANGE** type containing data for properties that take a pair of values.

## Error Codes

If the method fails, an error is raised and **Err.Number** may be one of the following error codes.

DIERR\_INVALIDPARAM  
DIERR\_OBJECTNOTFOUND  
DIERR\_UNSUPPORTED

## Remarks

The buffer size determines the amount of data that the buffer can hold between calls to the **DirectInputDevice8.GetDeviceData** method before data is lost. This value may be set to 0 to indicate that the application will not be reading buffered data from the device. If the buffer size in the **IData** member of the **DIPROPLONG** type is too large to be supported by the device, the largest possible buffer size is set. To determine whether the requested buffer size was set, retrieve the buffer-size property and compare the result with the value you previously attempted to set.

## See Also

**DirectInputDevice8.GetProperty**

## DirectInputDevice8.Unacquire

#Releases access to the device.

*object*.Unacquire()

## Parts

*object*

Resolves to a **DirectInputDevice8** object.

## Error Codes

None.

## See Also

**DirectInputDevice8.Acquire**

## DirectInputDevice8.WriteEffectToFile

#Writes a force-feedback effect to a file.

---

# IDH\_DirectInputDevice8.Unacquire\_dinput\_vb  
# IDH\_DirectInputDevice8.WriteEffectToFile\_dinput\_vb



```
object.WriteEffectToFile( _  
  filename As String, _  
  flags As Long, _  
  guid As String, _  
  name As String, _  
  CoverEffect As DIEFFECT)
```

## Parts

*object*

Resolves to a **DirectInputDevice8** object.

*filename*

Name of the RIFF file. If the file exists, it is overwritten.

*flags*

Flags which control how the effect should be written. Can be one of the following values from the **CONST\_DIFEFFLAGS** enumeration.

**DIFEF\_DEFAULT**

Do not write the effect if it is not a standard type.

**DIFEF\_INCLUDENONSTANDARD**

Write the effect even if it is not a standard type.

*guid*

Identifier of the effect type, such as "GUID\_RampForce". For a list of standard effects, see **DirectInputDevice8.CreateEffect**. For nonstandard effects, this parameter must be a string representation of the numerical GUID.

*name*

Friendly name of the effect.

*CoverEffect*

**DIEFFECT** type that specifies parameters of the effect.

## Error Codes

If the method fails, an error is raised and **Err.Number** may be one of the following error codes.

**DIERR\_INVALIDPARAM**

## Remarks

This method is chiefly of interest for force-authoring applications.

## See Also

**DirectInputDevice8.CreateEffectFromFile**

## DirectInputDeviceInstance8

#The **DirectInputDeviceInstance8** class is used to obtain information about an instance of a Microsoft® DirectInput® device.

An object of this class is returned by the **DirectInputDevice8.GetDeviceInfo** and **DirectInputEnumDevices8.GetItem** method.

The **DirectInputDeviceInstance8** class has the following methods:

<b>Information</b>	<b>GetDevType</b>
	<b>GetGuidFFDriver</b>
	<b>GetGuidInstance</b>
	<b>GetGuidProduct</b>
	<b>GetInstanceName</b>
	<b>GetProductName</b>
	<b>GetUsage</b>
	<b>GetUsagePage</b>

## DirectInputDeviceInstance8.GetDevType

#Retrieves the device type and subtype.

*object*.**GetDevType()** As Long

### Parts

*object*

Resolves to a **DirectInputDeviceInstance8** object.

### Return Values

Returns a device type specifier. This value is a combination of a type (in the least significant byte) and subtype (in the next most significant byte), optionally combined using **Or** with **DIDEVTYPE\_HID**, which specifies a Human Interface Device (HID). The following constants are from the **CONST\_DI8DEVICETYPE** and **CONST\_DI8DEVICESUBTYPE** enumerations.

**DI8DEVTYPE\_1STPERSON**

First-person action game device. The following subtypes are defined.

**DI8DEVTYPE1STPERSON\_LIMITED**

Device that does not provide the minimum number of device objects for action mapping.

**DI8DEVTYPE1STPERSON\_SHOOTER**

---

# **IDH\_DirectInputDeviceInstance8\_dinput\_vb**

# **IDH\_DirectInputDeviceInstance8.GetDevType\_dinput\_vb**

Device designed for first-person shooter games.

DI8DEVTYPE1STPERSON\_SIXDOF

Device with six degrees of freedom; that is, three lateral axes and three rotational axes.

DI8DEVTYPE1STPERSON\_UNKNOWN

Unknown subtype.

DI8DEVTYPE\_DEVICE

Device that does not fall into another category.

DI8DEVTYPE\_DEVICECTRL

Input device used to control another type of device from within the context of the application. The following subtypes are defined.

DI8DEVTYPEDEVICECTRL\_COMMSSELECTION

Control used to make communications selections.

DI8DEVTYPEDEVICECTRL\_HARDWIRED

Device which must use its default configuration and cannot be remapped.

DI8DEVTYPEDEVICECTRL\_UNKNOWN

Unknown subtype.

DI8DEVTYPE\_DRIVING

Device for steering. The following subtypes are defined.

DI8DEVTYPEDRIVING\_COMBINEDPEDALS

Steering device that reports acceleration and brake pedal values from a single axis.

DI8DEVTYPEDRIVING\_DUALPEDALS

Steering device that reports acceleration and brake pedal values from separate axes.

DI8DEVTYPEDRIVING\_HANDHELD

Hand-held steering device.

DI8DEVTYPEDRIVING\_THREEPEDALS

Steering device that reports acceleration, brake, and clutch pedal values from separate axes.

DI8DEVTYPE\_FLIGHT

Controller for flight simulation. The following subtypes are defined.

DI8DEVTYPEFLIGHT\_LIMITED

Flight controller that does not provide the minimum number of device objects for action mapping.

DI8DEVTYPEFLIGHT\_RC

Flight device based on a remote control for model aircraft.

DI8DEVTYPEFLIGHT\_STICK

Joystick.

DI8DEVTYPEFLIGHT\_YOKE

Yoke.

**DI8DEVTYPE\_GAMEPAD**

Gamepad. The following subtypes are defined.

**DI8DEVTYPEGAMEPAD\_LIMITED**

Gamepad that does not provide the minimum number of device objects for action mapping.

**DI8DEVTYPEGAMEPAD\_STANDARD**

Standard gamepad that provides the minimum number of device objects for action mapping.

**DI8DEVTYPEGAMEPAD\_TILT**

Gamepad that can report x-axis and y-axis data based on the attitude of the controller.

**DI8DEVTYPE\_JOYSTICK**

Joystick. The following subtypes are defined.

**DI8DEVTYPEJOYSTICK\_LIMITED**

Joystick that does not provide the minimum number of device objects for action mapping.

**DI8DEVTYPEGAMEPAD\_STANDARD**

Standard gamepad that provides the minimum number of device objects for action mapping.

**DI8DEVTYPEJOYSTICK\_STANDARD**

Standard joystick that provides the minimum number of device objects for action mapping.

**DI8DEVTYPE\_KEYBOARD**

Keyboard or keyboard-like device. The following subtypes are defined.

**DI8DEVTYPEKEYBOARD\_UNKNOWN**

Subtype could not be determined.

**DI8DEVTYPEKEYBOARD\_PCXT**

IBM PC/XT 83-key keyboard.

**DI8DEVTYPEKEYBOARD\_OLIVETTI**

Olivetti 102-key keyboard.

**DI8DEVTYPEKEYBOARD\_PCAT**

IBM PC/AT 84-key keyboard.

**DI8DEVTYPEKEYBOARD\_PCENH**

IBM PC Enhanced 101/102-key or Microsoft® Natural® keyboard.

**DI8DEVTYPEKEYBOARD\_NOKIA1050**

Nokia 1050 keyboard.

**DI8DEVTYPEKEYBOARD\_NOKIA9140**

Nokia 9140 keyboard.

**DI8DEVTYPEKEYBOARD\_NEC98**

Japanese NEC PC98 keyboard.

**DI8DEVTYPEKEYBOARD\_NEC98LAPTOP**

Japanese NEC PC98 laptop keyboard.

DI8DEVTYPEKEYBOARD\_NEC98106

Japanese NEC PC98 106-key keyboard.

DI8DEVTYPEKEYBOARD\_JAPAN106

Japanese 106-key keyboard.

DI8DEVTYPEKEYBOARD\_JAPANAX

Japanese AX keyboard.

DI8DEVTYPEKEYBOARD\_J3100

Japanese J3100 keyboard.

#### DI8DEVTYPE\_MOUSE

A mouse or mouse-like device (such as a trackball). The following subtypes are defined.

DI8DEVTYPEMOUSE\_ABSOLUTE

Mouse that returns absolute axis data.

DI8DEVTYPEMOUSE\_FINGERSTICK

Fingerstick.

DI8DEVTYPEMOUSE\_TOUCHPAD

Touchpad.

DI8DEVTYPEMOUSE\_TRACKBALL

Trackball.

DI8DEVTYPEMOUSE\_TRADITIONAL

Traditional mouse.

DI8DEVTYPEMOUSE\_UNKNOWN

Subtype could not be determined.

#### DI8DEVTYPE\_REMOTE

Remote-control device. The only defined subtype is

DI8DEVTYPEPEREMOTE\_UNKNOWN.

#### DI8DEVTYPE\_SCREENPOINTER

Screen pointer. The following subtypes are defined.

DI8DEVTYPESCREENPTR\_UNKNOWN

Unknown subtype.

DI8DEVTYPESCREENPTR\_LIGHTGUN

Light gun.

DI8DEVTYPESCREENPTR\_LIGHTPEN

Light pen.

DI8DEVTYPESCREENPTR\_TOUCH

Touch screen.

#### DI8DEVTYPE\_SUPPLEMENTAL

Specialized device with functionality unsuitable for the main control of an application, such as pedals used with a wheel. The following subtypes are defined.

**DI8DEVTYPESUPPLEMENTAL\_2NDHANDCONTROLLER**

Secondary handheld controller.

**DI8DEVTYPESUPPLEMENTAL\_COMBINEDPEDALS**

Device whose primary function is to report acceleration and brake pedal values from a single axis.

**DI8DEVTYPESUPPLEMENTAL\_DUALPEDALS**

Device whose primary function is to report acceleration and brake pedal values from separate axes.

**DI8DEVTYPESUPPLEMENTAL\_HANDTRACKER**

Device that tracks hand movement.

**DI8DEVTYPESUPPLEMENTAL\_HEADTRACKER**

Device that tracks head movement.

**DI8DEVTYPESUPPLEMENTAL\_RUDDERPEDALS**

Device with rudder pedals.

**DI8DEVTYPESUPPLEMENTAL\_SHIFTER**

Device that reports gear selection from an axis.

**DI8DEVTYPESUPPLEMENTAL\_SHIFTSTICKGATE**

Device that reports gear selection from button states.

**DI8DEVTYPESUPPLEMENTAL\_SPLITTHROTTLE**

Device whose primary function is to report at least two throttle values. It may have other controls.

**DI8DEVTYPESUPPLEMENTAL\_THREEPEDALS**

Device whose primary function is to report acceleration, brake, and clutch pedal values from separate axes.

**DI8DEVTYPESUPPLEMENTAL\_THROTTLE**

Device whose primary function is to report a single throttle value. It may have other controls.

**DI8DEVTYPESUPPLEMENTAL\_UNKNOWN**

Unknown subtype.

## Error Codes

If the method fails, an error is raised and **Err.Number** is set.

## Remarks

To look for a particular subtype of device such as a wheel, check both the type and the subtype.

---

## DirectInputDeviceInstance8.GetGuidFFDriver

#Retrieves the unique identifier for the force-feedback driver.

*object*.GetGuidFFDriver() As String

### Parts

*object*

Resolves to a **DirectInputDeviceInstance8** object.

### Return Values

Returns the GUID for the force feedback driver, in string form. This identifier is established by the manufacturer of the driver.

### Error Codes

If the method fails, an error is raised and **Err.Number** is set.

### See Also

Using GUIDs

## DirectInputDeviceInstance8.GetGuidInstance

#Retrieves the unique identifier for the instance of the device.

*object*.GetGuidInstance() As String

### Parts

*object*

Resolves to a **DirectInputDeviceInstance8** object.

### Return Values

Returns the GUID for the device instance, in string form.

### Error Codes

If the method fails, an error is raised and **Err.Number** is set.

---

# IDH\_DirectInputDeviceInstance8.GetGuidFFDriver\_dinput\_vb

# IDH\_DirectInputDeviceInstance8.GetGuidInstance\_dinput\_vb

## Remarks

An application can save the instance GUID into a configuration file and use it at a later time. Instance GUIDs are specific to a particular computer. An instance GUID obtained from one computer is unrelated to instance GUIDs on another.

## See Also

**DirectInputDeviceInstance8.GetGuidProduct**, Using GUIDs

## DirectInputDeviceInstance8.GetGuidProduct

#Retrieves the manufacturer's unique identifier for the device.

*object*.**GetGuidProduct()** As String

## Parts

*object*

Resolves to a **DirectInputDeviceInstance8** object.

## Return Values

Returns the GUID for the product, in string form. This identifier is established by the manufacturer of the device.

## Error Codes

If the method fails, an error is raised and **Err.Number** is set.

## See Also

**DirectInputDeviceInstance8.GetGuidInstance**, Using GUIDs

## DirectInputDeviceInstance8.GetInstanceName

#Retrieves the name of the device instance.

*object*.**GetInstanceName()** As String

## Parts

*object*

---

# IDH\_DirectInputDeviceInstance8.GetGuidProduct\_dinput\_vb

# IDH\_DirectInputDeviceInstance8.GetInstanceName\_dinput\_vb



Resolves to a **DirectInputDeviceInstance8** object.

## Return Values

Returns the friendly name for the instance—for example, "Joystick 1".

## Error Codes

If the method fails, an error is raised and **Err.Number** is set.

## See Also

**DirectInputDeviceInstance8.GetProductName**

# DirectInputDeviceInstance8.GetProductName

#Retrieves the product name of the device.

*object*.**GetProductName()** As String

## Parts

*object*

Resolves to a **DirectInputDeviceInstance8** object.

## Return Values

Returns the friendly name for the product—for example, "Microsoft® SideWinder®".

## Error Codes

If the method fails, an error is raised and **Err.Number** is set.

## See Also

**DirectInputDeviceInstance8.GetInstanceName**

# DirectInputDeviceInstance8.GetUsage

#Retrieves the usage code for Human Interface Devices (HIDs).

*object*.**GetUsage()** As Integer

---

# IDH\_DirectInputDeviceInstance8.GetProductName\_dinput\_vb

# IDH\_DirectInputDeviceInstance8.GetUsage\_dinput\_vb

## Parts

*object*

Resolves to a **DirectInputDeviceInstance8** object.

## Return Values

Returns the HID usage code for HID devices, or 0.

## Error Codes

If the method fails, an error is raised and **Err.Number** is set.

## See Also

**DirectInputDeviceInstance8.UsagePage**

# DirectInputDeviceInstance8.UsagePage

\*Retrieves the usage page for Human Interface Devices (HIDs).

*object.UsagePage()* As Integer

## Parts

*object*

Resolves to a **DirectInputDeviceInstance8** object.

## Return Values

Returns the usage page or 0 for non-HIDs.

## Error Codes

If the method fails, an error is raised and **Err.Number** is set.

## See Also

**DirectInputDeviceInstance8.Usage**

# DirectInputDeviceObjectInstance

\*The **DirectInputDeviceObjectInstance** class represents an object on a Microsoft® DirectInput® device, such as a button or axis.

---

# IDH\_DirectInputDeviceInstance8.UsagePage\_dinput\_vb

# IDH\_DirectInputDeviceObjectInstance\_dinput\_vb

A **DirectInputDeviceObjectInstance** object is returned by the **DirectInputDevice8.GetObjectInfo** and **DirectInputEnumDeviceObjects.GetItem** methods.

This class has the following methods:

<b>Information</b>	<b>GetCollectionNumber</b>
	<b>GetDesignatorIndex</b>
	<b>GetDimension</b>
	<b>GetExponent</b>
	<b>GetFlags</b>
	<b>GetGuidType</b>
	<b>GetName</b>
	<b>GetOfs</b>
	<b>GetType</b>
	<b>GetUsage</b>
	<b>GetUsagePage</b>

## DirectInputDeviceObjectInstance.GetCollectionNumber

#Retrieves the number of the HID link collection to which the device object belongs.

*object*.GetCollectionNumber() As Integer

### Parts

*object*

Resolves to a **DirectInputDeviceObjectInstance** object.

### Return Values

Returns the number of the collection or 0 if the object is not part of an HID.

### Error Codes

If the method fails, an error is raised and **Err.Number** is set.

## DirectInputDeviceObjectInstance.GetDesignatorIndex

#Retrieves the designator index for an object on a Human Interface Device (HID).

---

# IDH\_DirectInputDeviceObjectInstance.GetCollectionNumber\_dinput\_vb

# IDH\_DirectInputDeviceObjectInstance.GetDesignatorIndex\_dinput\_vb

*object*.GetDesignatorIndex() As Integer

### Parts

*object*

Resolves to a **DirectInputDeviceObjectInstance** object.

### Return Values

Returns an index that refers to a designator in the HID physical descriptor.

### Error Codes

If the method fails, an error is raised and **Err.Number** is set.

## DirectInputDeviceObjectInstance.GetDimension

#Retrieves a Human Interface Device (HID) code for the dimensional units in which the object's value is reported.

*object*.GetDimension() As Long

### Parts

*object*

Resolves to a **DirectInputDeviceObjectInstance** object.

### Return Values

Returns a code for the dimensional units in which the object's value is reported, if known, or 0 if not known.

### Error Codes

If the method fails, an error is raised and **Err.Number** is set.

### See Also

**DirectInputDeviceObjectInstance.GetExponent**

## DirectInputDeviceObjectInstance.GetExponent

#Retrieves the exponent to associate with the dimensional units of the device object.

---

# IDH\_DirectInputDeviceObjectInstance.GetDimension\_dinput\_vb

# IDH\_DirectInputDeviceObjectInstance.GetExponent\_dinput\_vb

---

*object*.GetExponent() As Integer

## Parts

*object*

Resolves to a **DirectInputDeviceObjectInstance** object.

## Return Values

Returns the exponent to associate with the dimension, if known. Dimensional units are always integral, so an exponent may be needed to convert them to non-integral types.

## Error Codes

If the method fails, an error is raised and **Err.Number** is set.

## See Also

**DirectInputDeviceObjectInstance.GetDimension**

# DirectInputDeviceObjectInstance.GetFlags

\*Retrieves the flags associated with the device object.

*object*.GetFlags() As CONST\_DIDEVICEOBJINSTANCEFLAGS

## Parts

*object*

Resolves to a **DirectInputDeviceObjectInstance** object.

## Return Values

Returns one or more members of the **CONST\_DIDEVICEOBJINSTANCEFLAGS** enumeration.

## Error Codes

If the method fails, an error is raised and **Err.Number** is set.

# DirectInputDeviceObjectInstance.GetGuidType

\*Retrieves the unique identifier of the object type.

# IDH\_DirectInputDeviceObjectInstance.GetFlags\_dinput\_vb

# IDH\_DirectInputDeviceObjectInstance.GetGuidType\_dinput\_vb

---

*object*.GetGuidType() As String

## Parts

*object*

Resolves to a **DirectInputDeviceObjectInstance** object.

## Return Values

Can return one of the following string identifiers, representing the unique identifier for the object type. If the object type has a GUID not represented in the following list, a string representing the actual GUID is returned. If the object type does not have a GUID, an empty string is returned.

GUID\_XAxis

The horizontal axis. For example, it may represent the left-right motion of a mouse.

GUID\_YAxis

The vertical axis. For example, it may represent the forward-backward motion of a mouse.

GUID\_ZAxis

The z-axis. For example, it may represent rotation of the wheel on a mouse, or movement of a throttle control on a joystick.

GUID\_RxAxis

Rotation around the x-axis.

GUID\_RyAxis

Rotation around the y-axis.

GUID\_RzAxis

Rotation around the z-axis (often a rudder control).

GUID\_Slider

A slider axis.

GUID\_Button

A button on a mouse.

GUID\_Key

A key on a keyboard.

GUID\_POV

A point-of-view indicator or "hat".

GUID\_Unknown

Unknown.

## Error Codes

If the method fails, an error is raised and **Err.Number** is set.

---

## DirectInputDeviceObjectInstance.GetName

#Retrieves the friendly name of the device object.

*object.GetName()* As String

### Parts

*object*

Resolves to a **DirectInputDeviceObjectInstance** object.

### Return Values

Returns the name of the object—for example, "X-Axis" or "Right Shift."

### Error Codes

If the method fails, an error is raised and **Err.Number** is set.

## DirectInputDeviceObjectInstance.GetOfs

#Retrieves the offset of the device object's data within the data format for the device.

*object.GetOfs()* As Long

### Parts

*object*

Resolves to a **DirectInputDeviceObjectInstance** object.

### Return Values

Returns the offset within the data format at which data is reported for this object. This value can be used to identify the object in method calls and types that accept the **DIPH\_BYOFFSET** flag.

### Error Codes

If the method fails, an error is raised and **Err.Number** is set.

### See Also

**DirectInputDevice8.GetObjectInfo**, **DIPROPLONG**, **DIPROPRANGE**

---

# IDH\_DirectInputDeviceObjectInstance.GetName\_dinput\_vb

# IDH\_DirectInputDeviceObjectInstance.GetOfs\_dinput\_vb

---

## DirectInputDeviceObjectInstance.GetType

#Retrieves the type and instance identifier of the object.

*object*.GetType() As Long

### Parts

*object*

Resolves to a **DirectInputDeviceObjectInstance** object.

### Return Values

Returns the device type that describes the object. This value is a combination of **CONST\_DIDFTFLAGS** flags that describe the object type (axis, button, and so forth) and contains the object instance number in the middle 16 bits.

### Error Codes

If the method fails, an error is raised and **Err.Number** is set.

### Remarks

To extract the object instance ID, use the following operation:

```
Dim ObjID as Long  
ObjID = (diObj.GetType And &HFFFF00) \ 256
```

## DirectInputDeviceObjectInstance.GetUsage

#Retrieves the Human Interface Device (HID) usage code for the device object.

*object*.GetUsage() As Integer

### Parts

*object*

Resolves to a **DirectInputDeviceObjectInstance** object.

### Return Values

Returns the HID usage associated with the object, if known. HIDs always report a usage. Non-HID devices might report a usage; if they do not, the return value is zero.

---

# IDH\_DirectInputDeviceObjectInstance.GetType\_dinput\_vb  
# IDH\_DirectInputDeviceObjectInstance.GetUsage\_dinput\_vb



## Error Codes

If the method fails, an error is raised and **Err.Number** is set.

## See Also

**DirectInputDeviceObjectInstance.GetUsagePage**

# DirectInputDeviceObjectInstance.GetUsagePage

#Retrieves the Human Interface Device (HID) usage page for the device object.

*object*.GetUsagePage() As Integer

## Parts

*object*

Resolves to a **DirectInputDeviceObjectInstance** object.

## Return Values

Returns the HID usage page associated with the object, if known. (HIDs) will always report a usage page. Non-HID devices might report a usage page; if they do not, the return value is zero.

## Error Codes

If the method fails, an error is raised and **Err.Number** is set.

## See Also

**DirectInputDeviceObjectInstance.GetUsage**

# DirectInputEffect

#An object of the **DirectInputEffect** class represents a force-feedback effect created by an application. The object is created by using the **DirectInputDevice8.CreateEffect** method.

This class has the following methods:

<b>Control</b>	<b>Download</b>
	<b>SetParameters</b>
	<b>Start</b>

---

# IDH\_DirectInputDeviceObjectInstance.GetUsagePage\_dinput\_vb

# IDH\_DirectInputEffect\_dinput\_vb

	<b>Stop</b>
	<b>Unload</b>
<b>Information</b>	<b>GetEffectGuid</b>
	<b>GetEffectStatus</b>
	<b>GetParameters</b>

## DirectInputEffect.Download

#Places the effect on the device. If the effect is already on the device, then the existing effect is updated to match the values set by the **DirectInputEffect.SetParameters** method.

*object*.Download()

### Parts

*object*

Resolves to a **DirectInputEffect** object.

### Error Codes

If the method fails, an error is raised and **Err.Number** may be set to one of the following:

```
DIERR_NOTINITIALIZED
DIERR_DEVICEFULL
DIERR_INCOMPLETEEFFECT
DIERR_INPUTLOST
DIERR_NOTEXCLUSIVEACQUIRED
DIERR_INVALIDPARAM
DIERR_EFFECTPLAYING
```

### Remarks

The device must be acquired at the exclusive cooperative level for this method to succeed.

It is valid to update an effect while it is playing. The semantics of such an operation are explained in the reference for **DirectInputEffect.SetParameters**.

## DirectInputEffect.GetEffectGuid

#Retrieves the GUID or GUID alias for the effect represented by the **DirectInputEffect** object.

*object*.GetEffectGuid() As String

```
# IDH_DirectInputEffect.Download_dinput_vb
# IDH_DirectInputEffect.GetEffectGuid_dinput_vb
```

## Parts

*object*

Resolves to a **DirectInputEffect** object.

## Return Values

Returns the GUID or alias that was passed to **DirectInputDevice8.CreateEffect**, such as "GUID\_ConstantForce".

## Error Codes

If the method fails, an error is raised and **Err.Number** is set.

## See Also

Using GUIDs

# DirectInputEffect.GetEffectStatus

#Retrieves the status of an effect.

*object.GetEffectStatus()* As Long

## Parts

*object*

Resolves to a **DirectInputEffect** object.

## Return Values

Returns status flags for the effect. The value may be zero, or one or more of the following constants of the **CONST\_DIEGESFLAGS** enumeration.

DIEGES\_PLAYING

The effect is playing.

DIEGES\_EMULATED

The effect is emulated.

## Error Codes

If the method fails, an error is raised and **Err.Number** is set.

# DirectInputEffect.GetParameters

#Retrieves information about an effect.

---

# IDH\_DirectInputEffect.GetEffectStatus\_dinput\_vb

# IDH\_DirectInputEffect.GetParameters\_dinput\_vb

---

*object*.GetParameters(*effectinfo* As DIEFFECT)

## Parts

*object*

Resolves to a **DirectInputEffect** object.

*effectinfo*

**DIEFFECT** type to receive the effect parameters.

## Error Codes

If the method fails, an error is raised and **Err.Number** may be set to one of the following:

DIERR\_INVALIDPARAM

DIERR\_MOREDATA

DIERR\_NOTINITIALIZED

## DirectInputEffect.SetParameters

\*Sets the characteristics of an effect.

*object*.SetParameters(*effectinfo* As DIEFFECT, \_  
*flags* As CONST\_DIEPFLAGS)

## Parts

*object*

Resolves to a **DirectInputEffect** object.

*effectinfo*

**DIEFFECT** type containing effect parameters.

*flags*

Flags from the **CONST\_DIEPFLAGS** enumeration specifying which portions of the effect information are to be set and how the downloading of the parameters should be handled.

## Error Codes

If the method fails, an error is raised and **Err.Number** may be set to one of the following:

DIERR\_NOTINITIALIZED

DIERR\_INCOMPLETEEFFECT

DIERR\_INPUTLOST

DIERR\_INVALIDPARAM

---

# IDH\_DirectInputEffect.SetParameters\_dinput\_vb

## DIERR\_EFFECTPLAYING

**Remarks**

To determine which parameters can be dynamically updated while the effect is playing, use the **DirectInputEnumEffects.GetDynamicParams** method.

The **DirectInputEffect.SetParameters** method automatically downloads the effect, but this behavior can be suppressed by setting the DIEP\_NODOWNLOAD flag. If automatic download has been suppressed, then you can manually download the effect by calling **DirectInputEffect.Download**.

If the effect is playing while the parameters are changed, then the new parameters take effect as if they were the parameters when the effect started.

For example, suppose a periodic effect with a duration of three seconds is started. After two seconds, the direction of the effect is changed. The effect will then continue for one additional second in the new direction. The envelope, phase, amplitude, and other parameters of the effect continue smoothly as if the direction had not changed.

In the same scenario, if after two seconds the duration of the effect were changed to 1.5 seconds, then the effect would stop.

Normally, if the driver cannot update the parameters of a playing effect, the driver is permitted to stop the effect, update the parameters, and then restart the effect. Passing the DIEP\_NORESTART flag suppresses this behavior. If the driver cannot update the parameters of an effect while it is playing, the error code DIERR\_EFFECTPLAYING is returned and the parameters are not updated.

No more than one of the DIEP\_NODOWNLOAD, DIEP\_START, and DIEP\_NORESTART flags should be set. (It is also valid to pass none of them.)

These three flags control download and playback behavior as follows:

If DIEP\_NODOWNLOAD is set, the effect parameters are updated but not downloaded to the device.

If the DIEP\_START flag is set, the effect parameters are updated and downloaded to the device, and the effect is started just as if the **DirectInputEffect.Start** method had been called with the *iterations* parameter set to 1 and with no flags. (Combining the update with DIEP\_START is slightly faster than calling **Start** separately, because it requires less information to be transmitted to the device.)

If neither DIEP\_NODOWNLOAD nor DIEP\_START is set and the effect is not playing, then the parameters are updated and downloaded to the device.

If neither DIEP\_NODOWNLOAD nor DIEP\_START is set and the effect is playing, then the parameters are updated if the device supports on-the-fly updating. Otherwise the behavior depends on the state of the DIEP\_NORESTART flag. If it is set, the error code DIERR\_EFFECTPLAYING is returned. If it is clear, the effect is stopped, the parameters are updated, and the effect is restarted.

## DirectInputEffect.Start

#Begins playing an effect. If the effect is already playing, it is restarted from the beginning. If the effect has not been downloaded or has been modified since its last download, then it will be downloaded before being started. This default behavior can be suppressed by passing the DIES\_NODOWNLOAD flag.

*object.Start(iterations As Long, flags As Long)*

### Parts

#### *object*

Resolves to a **DirectInputEffect** object.

#### *iterations*

Number of times to play the effect in sequence. The envelope is re-articulated with each iteration.

To play the effect exactly once, pass 1. To play the effect repeatedly until explicitly stopped, pass -1. To play the effect until explicitly stopped without re-articulating the envelope, modify the effect parameters with the **DirectInputEffect.SetParameters** method and change the **IDuration** member of **DIEFFECT** to -1.

#### *flags*

Flags from the **CONST\_DIESFLAGS** enumeration that describe how the effect should be played by the device. The value can be zero or one or more flags.

### Error Codes

If the method fails, an error is raised and **Err.Number** may be set to one of the following:

DIERR\_INVALIDPARAM  
DIERR\_INCOMPLETEEFFECT  
DIERR\_NOTEXCLUSIVEACQUIRED  
DIERR\_NOTINITIALIZED  
DIERR\_UNSUPPORTED

### Remarks

The device must be acquired at the exclusive cooperative level for this method to succeed.

Not all devices support multiple iterations.

---

# IDH\_DirectInputEffect.Start\_dinput\_vb

---

## DirectInputEffect.Stop

#Stops an effect that is playing.

*object*.Stop()

### Parts

*object*

Resolves to a **DirectInputEffect** object.

### Error Codes

If the method fails, an error is raised and **Err.Number** may be set to one of the following:

DIERR\_NOTEXCLUSIVEACQUIRED

DIERR\_NOTINITIALIZED

### Remarks

The device must be acquired at the exclusive cooperative level for this method to succeed.

## DirectInputEffect.Unload

#Removes the effect from the device. If the effect is playing, it is automatically stopped before it is unloaded.

*object*.Unload()

### Parts

*object*

Resolves to a **DirectInputEffect** object.

### Error Codes

If the method fails, an error is raised and **Err.Number** may be set to one of the following:

DIERR\_INPUTLOST

DIERR\_INVALIDPARAM

DIERR\_NOTEXCLUSIVEACQUIRED

DIERR\_NOTINITIALIZED

---

# IDH\_DirectInputEffect.Stop\_dinput\_vb

# IDH\_DirectInputEffect.Unload\_dinput\_vb

## Remarks

The device must be acquired at the exclusive cooperative level for this method to succeed.

# DirectInputEnumDeviceObjects

#The **DirectInputEnumDeviceObjects** class enumerates the Microsoft® DirectInputDevice8 objects installed on a system. This object is created and filled with data as a result of a call to **DirectInputDevice8.GetDeviceObjectsEnum** method.

This class has the following methods:

<b>Information</b>	<b>GetCount</b>
	<b>GetItem</b>

## DirectInputEnumDeviceObjects.GetCount

#Returns the number of items in the **DirectInputEnumDeviceObjects** collection.

*object*.GetCount() As Long

## Parts

*object*

Resolves to a **DirectInputEnumDeviceObjects** object.

## Return Values

Returns the number of device objects enumerated for the device.

## Error Codes

None.

## DirectInputEnumDeviceObjects.GetItem

#Retrieves an object describing the specified device object.

*object*.GetItem(*index* As Long) \_  
As DirectInputDeviceObjectInstance

---

# IDH\_DirectInputEnumDeviceObjects\_dinput\_vb  
# IDH\_DirectInputEnumDeviceObjects.GetCount\_dinput\_vb  
# IDH\_DirectInputEnumDeviceObjects.GetItem\_dinput\_vb



## Parts

### *object*

Resolves to a **DirectInputEnumDeviceObjects** object.

### *index*

Index of the enumerated item to retrieve.

## Return Values

Returns a **DirectInputDeviceObjectInstance** object whose methods can be used to retrieve information about the device object.

## Error Codes

If the method fails, an error is raised and **Err.Number** is set.

## Remarks

To get the number of entries in the **DirectInputEnumDeviceObjects** first call the **DirectInputEnumDeviceObjects.GetCount** method.

Applications should not rely on this method to determine whether certain keyboard keys or indicator lights are present, as these objects might be enumerated even though they are not present. Although the basic set of available objects can be determined from the device subtype, there is no reliable way of determining whether extra objects such as the menu key are available.

# DirectInputEnumDevices8

#The **DirectInputEnumDevices8** class enumerates the Microsoft® DirectInput® devices installed on a system. This object is created and filled with data as a result of a call to the **DirectInput8.GetDIDevices** and **DirectInput8.GetDevicesBySemantics** methods.

This class has the following methods:

### **GetCount**

### **GetItem**

## DirectInputEnumDevices8.GetCount

#Returns the number of Microsoft® DirectInput® devices in the **DirectInputEnumDevices8** collection.

*object*.**GetCount()** As Long

---

# IDH\_DirectInputEnumDevices8\_dinput\_vb

# IDH\_DirectInputEnumDevices8.GetCount\_dinput\_vb

## Parts

*object*

Resolves to a **DirectInputEnumDevices8** object.

## Return Values

Returns the number of DirectInput® devices in the **DirectInputEnumDevices8** collection.

## Error Codes

None.

# DirectInputEnumDevices8.GetItem

#Returns information about an enumerated device.

*object*.**GetItem**(*index* As Long) As DirectInputDeviceInstance8

## Parts

*object*

Resolves to a **DirectInputEnumDevices8** object.

*index*

Index of the device in the **DirectInputEnumDevices8** collection.

## Return Values

Returns a **DirectInputDeviceInstance8** object whose methods can be used to retrieve information about the device.

## Error Codes

If the method fails, an error is raised and **Err.Number** is set.

## Remarks

To get the number of entries in **DirectInputEnumDevices8** first call the **DirectInputEnumDevices8.GetCount** method.

## DirectInputEnumEffects

#An object of the **DirectInputEnumEffects** class represents a collection of supported force-feedback effects on a device, and is used for retrieving information about the effects. The object is created by using the **DirectInputDevice8.GetEffectsEnum** method.

The class has the following methods:

<b>Information</b>	<b>GetCount</b>
	<b>GetDynamicParams</b>
	<b>GetEffectGuid</b>
	<b>GetName</b>
	<b>GetStaticParams</b>
	<b>GetType</b>

### DirectInputEnumEffects.GetCount

#Returns the number of enumerated effects in the collection.

*object*.GetCount() As Long

#### Parts

*object*

Resolves to a **DirectInputEnumEffects** object.

#### Return Values

Returns the number of items in the collection.

#### Error Codes

If the method fails, it raises an error and **Err.Number** is set.

### DirectInputEnumEffects.GetDynamicParams

#Retrieves information about which effect parameters can be changed without stopping the effect, using the **DirectInputEffect.SetParameters** method.

*object*.GetDynamicParams(*i* As Long) As CONST\_DIEPFLAGS

---

# IDH\_DirectInputEnumEffects\_dinput\_vb

# IDH\_DirectInputEnumEffects.GetCount\_dinput\_vb

# IDH\_DirectInputEnumEffects.GetDynamicParams\_dinput\_vb

## Parts

*object*

Resolves to a **DirectInputEnumEffects** object.

*i*

Index (1-based) of the effect in the collection.

## Return Values

Returns flags from the **CONST\_DIEPFLAGS** enumeration specifying which parameters can be dynamically updated while the effect is playing.

## Error Codes

If the method fails, it raises an error and **Err.Number** is set.

## See Also

**DirectInputEffect.SetParameters**

# DirectInputEnumEffects.GetEffectGuid

#Retrieves the GUID for the supported effect. This GUID can be passed to the **DirectInputDevice8.CreateEffect** method.

*object*.**GetEffectGuid**(*i* As Long) As String

## Parts

*object*

Resolves to a **DirectInputEnumEffects** object.

*i*

Index (1-based) of the effect in the collection.

## Return Values

Returns the GUID in string form. For standard effects, the return value is an alias such as "GUID\_ConstantForce".

## Error Codes

If the method fails, it raises an error and **Err.Number** is set.

## See Also

Using GUIDs

---

# IDH\_DirectInputEnumEffects.GetEffectGuid\_dinput\_vb

---

## DirectInputEnumEffects.GetName

#Retrieves the name of the effect.

*object*.GetName(*i* As Long) As String

### Parts

*object*

Resolves to a **DirectInputEnumEffects** object.

*i*

Index (1-based) of the effect in the collection.

### Return Values

Returns the name of the effect, such as "Constant Force".

### Error Codes

If the method fails, it raises an error and **Err.Number** is set.

## DirectInputEnumEffects.GetStaticParams

#Retrieves information about effect parameters supported on the device.

*object*.GetStaticParams(*i* As Long) As CONST\_DIEPFLAGS

### Parts

*object*

Resolves to a **DirectInputEnumEffects** object.

*i*

Index (1-based) of the effect in the collection.

### Return Values

Returns flags from the **CONST\_DIEPFLAGS** enumeration specifying which parameters are supported by the effect.

### Error Codes

If the method fails, it raises an error and **Err.Number** is set.

---

# IDH\_DirectInputEnumEffects.GetName\_dinput\_vb

# IDH\_DirectInputEnumEffects.GetStaticParams\_dinput\_vb

---

## DirectInputEnumEffects.GetType

#Retrieves information about the type and capabilities of the effect.

*object*.GetType(*i* As Long) As CONST\_DIEFTFLAGS

### Parts

*object*

Resolves to a **DirectInputEnumEffects** object.

*i*

Index (1-based) of the effect in the collection.

### Return Values

Returns flags from the **CONST\_DIEFTFLAGS** enumeration giving information about the effect.

### Error Codes

If the method fails, it raises an error and **Err.Number** is set.

### Remarks

The effect type is stored in the low byte and can be retrieved by a bitwise **And** with &HFF.

## Types

This section contains information on the following types used with Microsoft® DirectInput®.

- **DIACTION**
- **DIACTIONFORMAT**
- **DICOLORSET**
- **DICONDITION**
- **DICONFIGUREDEVICESPARAMS**
- **DICONSTANTFORCE**
- **DIDATAFORMAT**
- **DIDEVCAPS**
- **DIDEVICEIMAGEINFO**
- **DIDEVICEIMAGEINFOHEADER**

---

# IDH\_DirectInputEnumEffects.GetType\_dinput\_vb

- **DIDEVICEOBJECTDATA**
- **DIEFFECT**
- **DIENVELOPE**
- **DIJOYSTATE**
- **DIJOYSTATE2**
- **DIKEYBOARDSTATE**
- **DIMOUSESTATE**
- **DIMOUSESTATE2**
- **DIOBJECTDATAFORMAT**
- **DIPERIODICFORCE**
- **DIPROPGUIDANDPATH**
- **DIPROPLONG**
- **DIPROPRANGE**
- **DIPROPSTRING**
- **DIRAMPFORCE**

## DIACTION

#Specifies and receives information about the mapping of a single application action to a device object or virtual control.

Type DIACTION  
    ActionName As String  
    IAppData As Long  
    IFlags As Long  
    IHow As Long  
    IObjId As Long  
    ISemantic As Long  
End Type

### Members

#### ActionName

Application-defined name of the action. This string is displayed by the device property sheet when **DirectInput8.ConfigureDevices** is called. If **sResIDString** is not an empty string, this member is ignored.

#### IAppData

Value to be returned to the application when the state of the control associated with the action changes. This value is returned in the **IUserData** member of the **DIDEVICEOBJECTDATA** type retrieved by **DirectInputDevice8.GetDeviceData**.

# IDH\_DIACTION\_dinput\_vb

**IFlags**

Flags used to request specific attributes or processing. Can be zero or one or more of the values in the **CONST\_DIAFLAGS** enumeration.

**IHow**

Mapping mechanism used by Microsoft® DirectInput® to configure the action.

This member receives one of the members of the **CONST\_DIAHFLAGS** enumeration when the type is returned by

**DirectInputDevice8.BuildActionMap**.

This member is ignored when the action map is passed to

**DirectInputDevice8.SetActionMap**.

**IObjId**

Control identifier.

**ISemantic**

For a joystick, a predefined action mapping constant for this application genre, representing a virtual control. See **CONST\_DIGENRE**.

This value can also be one of the **CONST\_DIMAPFLAGS** enumeration to map the action to a virtual control not defined in a genre.

For a keyboard, mouse, or Microsoft DirectPlay® voice device, this value is a constant that represents a particular device object.

**See Also**

**CONST\_DIKEYBOARDFLAGS**, **CONST\_DIMOUSEFLAGS**,  
**CONST\_DIVOICEFLAGS**

## DIACTIONFORMAT

\*Specifies and receives information about an action map.

```
Type DIACTIONFORMAT
  ActionArray() As DIACTION
  ActionMapName As String
  guidActionMap As String
  IActionCount As Long
  IAxisMax As Long
  IAxisMin As Long
  IBufferSize As Long
  IDataSize As Long
  IGenre As Long
End Type
```

---

# IDH\_DIACTIONFORMAT\_dinput\_vb



## Members

### **ActionArray**

Array of **DIACTION** types, each of which describes how an action maps to a virtual control or device object, and how the mapping information should be displayed to the user.

### **ActionMapName**

Friendly name for the action map.

### **guidActionMap**

GUID that identifies the action map. This value can be used by device manufacturers to tune mappings for a specific title.

### **IActionCount**

Number of elements in **ActionArray**.

### **IAxisMax**

Maximum value for the range of scaled data to be returned for all axes. This value is ignored for a specific action axis if the **DIA\_NORANGE** flag is set in the **DIACTION** type for that action. See Remarks.

### **IAxisMin**

Minimum value for the range of scaled data to be returned for all axes. This value is ignored for a specific action axis if the **DIA\_NORANGE** flag is set in the **DIACTION** type for that action. See Remarks.

### **IBufferSize**

Value that specifies the number of input data packets in the buffer for each device to which this action map is applied. See Remarks.

### **IDataSize**

Value that specifies the size of immediate data to be returned by the device, in bytes. When this type is passed to **DirectInputDevice8.SetActionMap**, this value should be four times the number of elements in the array of **DIACTION** types passed to the method.

### **IGenre**

Genre of the application. One of the members of the **CONST\_DIGENRE** enumeration whose names begin with **DIVIRTUAL**.

## Remarks

The **IAxisMax** and **IAxisMin** members are valid only for axis actions and should be set to zero for all other actions. Setting them before passing this type to **DirectInputDevice8.SetActionMap** is equivalent to setting the range properties by passing a **DIPROP\_RANGE** type to **DirectInputDevice8.SetProperty**.

The buffer size must be set to a value greater than zero if you want to retrieve data by using **DirectInputDevice8.GetDeviceData**. Applications that set the **IBufferSize** member to the desired buffer size before passing this type to **DirectInputDevice8.SetActionMap** do not need to set the **DIPROP\_BUFFERSIZE** property by using **DirectInputDevice8.SetProperty**.

# DICOLORSET

#Describes a set of colors used to draw the device configuration user interface. It is part of the **DICONFIGUREDEVICESPARAMS** TYPE.

```
Type DICOLORSET
  cAreaFill As Long
  cBorder As Long
  cCalloutHighlight As Long
  cCalloutLine As Long
  cControlFill As Long
  cHighlightFill As Long
  cTextFore As Long
  cTextHighlight As Long
End Type
```

## Members

### **cAreaFill**

Fill color for areas outside controls such as tabs and buttons.

### **cBorder**

Border color, used to display lines around controls such as tabs and buttons.

### **cCalloutHighlight**

Color used to display callout lines.

### **cCalloutLine**

Color used to display callout lines.

### **cControlFill**

Fill color for controls such as tabs and buttons.

### **cHighlightFill**

Fill color for highlighted controls.

### **cTextFore**

Foreground text color.

### **cTextHighlight**

Foreground color for highlighted text.

## Remarks

Text background color is always transparent.

# DICONDITION

#Describes parameters for a force-feedback condition in the **DIEFFECT** type.

Type DICONDITION

  IDeadBand As Long

  INegativeCoefficient As Long

  INegativeSaturation As Long

  IOffset As Long

  IPositiveCoefficient As Long

  IPositiveSaturation As Long

End Type

## Members

### IDeadBand

The region around **IOffset** where the condition is not active, in the range 0 to 10,000. In other words, the condition is not active between **IOffset - IDeadBand** and **IOffset + IDeadBand**.

### INegativeCoefficient

The coefficient constant on the negative side of the offset, in the range -10,000 to +10,000.

If the device does not support separate positive and negative coefficients, then the value of **INegativeCoefficient** is ignored and the value of **IPositiveCoefficient** is used as both the positive and negative coefficients.

### INegativeSaturation

The maximum force output on the negative side of the offset, in the range 0 to 10,000.

If the device does not support force saturations, then the value of this member is ignored.

If the device does not support separate positive and negative saturations, then the value of **INegativeSaturation** is ignored and the value of **IPositiveSaturation** is used as both the positive and negative saturations.

### IOffset

The offset for the condition, in the range -10,000 to +10,000.

### IPositiveCoefficient

The coefficient constant on the positive side of the offset, in the range -10,000 to +10,000.

### IPositiveSaturation

The maximum force output on the positive side of the offset, in the range 0 to 10,000.

If the device does not support force saturation, then the value of this member is ignored.

---

# IDH\_DICONDITION\_dinput\_vb

## Remarks

Different types of conditions will interpret the parameters differently, but the basic idea is that force resulting from a condition is equal to  $A(q - q_0)$  where  $A$  is a scaling coefficient,  $q$  is some metric, and  $q_0$  is the neutral value for that metric.

The preceding simplified formula must be adjusted if a nonzero dead band is provided. If the metric is less than **IOffset - IDeadBand**, then the resulting force is given by the following formula:

$$force = \text{INegativeCoefficient} * (q - (\text{IOffset} - \text{IDeadBand}))$$

Similarly, if the metric is greater than **IOffset + IDeadBand**, then the resulting force is given by the following formula:

$$force = \text{IPositiveCoefficient} * (q - (\text{IOffset} + \text{IDeadBand}))$$

A spring condition uses axis position as the metric.

A damper condition uses axis velocity as the metric.

An inertia condition uses axis acceleration as the metric.

## DICONFIGUREDEVICESPARAMS

#Contains information for the device configuration property sheet. It is used by the **DirectInput8.ConfigureDevices** method.

```
Type DICONFIGUREDEVICESPARAMS
    ActionFormats() As DIACTIONFORMAT
    DDSTarget As Unknown
    dics As DICOLORSET
    FormatCount As Long
    hwnd As Long
    UserCount As Long
    UserNames() As String
End Type
```

## Members

### ActionFormats

Array of **DIACTIONFORMAT** types that contains action-mapping information for each genre used by the game. On input, this array contains action-to-control mappings and strings to display as callouts for each mapping. The configuration interface displays the genres in its drop-down list in the same order as in the array.

### DDSTarget

---

# IDH\_DICONFIGUREDEVICESPARAMS\_dinput\_vb

**Direct3DSurface8** object for the configuration user interface. The device image is alpha-blended over the background surface onto the target surface.

Applications that are not using DirectDraw and applications that are using DirectDraw but are windowed rather than using the full screen may pass NULL in this parameter. This will cause Microsoft DirectInput® to use the Windows Graphics Device Interface (GDI) functions to draw the configuration user interface image.

#### **dics**

**DICOLORSET** type that describes the color scheme to apply to the configuration user interface.

#### **FormatCount**

Number of elements in the **ActionFormats** array.

#### **hwnd**

Handle to the top-level window of the calling application. The member is needed only for applications that run in windowed mode, and is otherwise ignored.

#### **UserCount**

Number of elements in the **UserNames** array. Zero is an invalid value. If the UserCount value exceeds the number of entries actually in the array at UserNames(), the method fails, returning DIERR\_INVALIDPARAM. If the UserNames array is set to NULL, the value in UserCount is ignored.

#### **UserNames**

Array of user names. This parameter can be set to NULL to request default names, the number of which is determined by **UserCount**. If the application passes more than **UserCount** names, only the names within the count are used. If an application specifies names that are different from the names currently assigned to devices, ownership is revoked for all devices, a default name is created for the mismatched name, and the interface shows “(No User)” for all devices.

## **DICONSTANTFORCE**

#Describes parameters for a constant force in the **DIEFFECT** type.

Type DICONSTANTFORCE

IMagnitude As Long

End Type

### **Members**

#### **IMagnitude**

Magnitude of the effect, in the range -10,000 to +10,000. If an envelope is applied to this effect, then the value represents the magnitude of the sustain. If no envelope is applied, then the value represents the amplitude of the entire effect.

---

# IDH\_DICONSTANTFORCE\_dinput\_vb

## DIDATAFORMAT

#Describes a device's data format. This type is used with the **DirectInputDevice8.SetDataFormat** method.

```
Type DIDATAFORMAT
    dataSize As Long
    IFlags As CONST_DIDATAFORMATFLAGS
    IObjSize As Long
    numObjs As Long
End Type
```

### Members

#### dataSize

Size of a data packet returned by the device, in bytes. This value must be a multiple of 4 and must exceed the largest offset value for an object's data within the data packet.

#### IFlags

Flags describing other attributes of the data format. This value can be one of the **CONST\_DIDATAFORMATFLAGS** enumeration.

#### IObjSize

Size of the **DIOBJECTDATAFORMAT** type, in bytes.

#### numObjs

Number of objects for which data is to be returned.

### Remarks

Applications need to create a **DIDATAFORMAT** type only for nonstandard devices. For the mouse, keyboard, and joystick, you set the data format by using **DirectInputDevice8.SetCommonDataFormat**.

## DIDEVCAPS

#Describes capabilities of a Microsoft® DirectInput® device. This type is used with the **DirectInputDevice8.GetCapabilities** method.

```
Type DIDEVCAPS
    IAxes As Long
    IButtons As Long
    IDevType As Long
    IDriverVersion As Long
    IFFMinTimeResolution As Long
    IFFSamplePeriod As Long
```

---

# IDH\_DIDATAFORMAT\_dinput\_vb

# IDH\_DIDEVCAPS\_dinput\_vb

---

IFirmwareRevision As Long  
IFlags As CONST\_DIDEVCAPSFLAGS  
IHardwareRevision As Long  
IPOVs As Long  
End Type

## Members

### IAxes

Number of axes available on the device.

### IButtons

Number of buttons available on the device.

### IDevType

A packed value containing information about the type and subtype of the device. The value is identical to that returned by the **DirectInputDeviceInstance8.GetDevType** method.

### IDriverVersion

The version number of the device driver.

### IFFMinTimeResolution

The minimum amount of time, in microseconds, that the device can resolve when playing force-feedback effects. The device rounds any times to the nearest supported increment. For example, if the value of **IFFMinTimeResolution** is 1000, then the device would round any times to the nearest millisecond.

### IFFSamplePeriod

The minimum time between playback of consecutive raw force commands.

### IFirmwareRevision

Specifies the firmware revision of the device.

### IFlags

Flags associated with the device. This value can be a combination of the constants of the **CONST\_DIDEVCAPSFLAGS** enumeration.

### IHardwareRevision

The hardware revision of the device.

### IPOVs

Number of point-of-view controllers available on the device.

## Remarks

The semantics of version numbers are left to the manufacturer of the device. The only guarantee is that newer versions will have larger numbers.

## DIDEVICEIMAGEINFO

\*Carries information required to display a device image, or an overlay image with a callout. This type is passed to the **DirectInputDevice8.GetImageInfo** method as an array within a **DIDEVICEIMAGEINFOHEADER** type.

```
Type DIDEVICEIMAGEINFO
    CalloutLine(0 To 4) As POINT
    CalloutRect As RECT
    flags As Long
    ImagePath As String
    ObjId As Long
    ViewID As Long
    OverlayRect As RECT
    TextAlign As Long
    ValidPts As Long
End Type
```

### Members

#### CalloutLine

Array of types that specify coordinates of the points describing a callout line. A callout line connects a device control to a caption for the game action. Each line can have one to four segments. This member is valid only if the **DIDIFT\_OVERLAY** flag is present in **flags**.

#### CalloutRect

Type that specifies coordinates of the rectangle in which the game action string is displayed. The application handles clipping. This member is valid only if the **DIDIFT\_OVERLAY** flag is present in **flags**.

#### flags

Flag that describes the intended use of the image. This member can be one of the following values from the **CONST\_DIDIFTFLAGS** enumeration.

##### DIDIFT\_CONFIGURATION

The file is used to display the current configuration of actions on the device. Overlay image coordinates are relative to the upper left corner of the configuration image.

##### DIDIFT\_OVERLAY

The file (if provided) is an overlay for a particular control on the configuration image. The **ViewID**, **OverlayRect**, **ObjID**, **CalloutLine**, **CalloutRect**, and **TextAlign** members are valid and contain data used to display the overlay and callout information for a single control on the device. If no file is provided (null path string), all other pertinent members are relevant except **rdOverlay**.

#### ImagePath

Fully qualified path to the file that contains an image of the device.

#### ObjId

# IDH\_DIDEVICEIMAGEINFO\_dinput\_vb



Control identifier, combining object type flags and an instance value, to which an overlay image corresponds for this device. For more information on this identifier, see **DirectInputDeviceObjectInstance.GetType**. This member is valid only if the DIDIFT\_OVERLAY flag is present in **flags**.

**OverlayOffset**

Offset of the device configuration image over which this overlay is to be displayed. This member is valid only if the DIDIFT\_OVERLAY flag is present in **flags**.

**OverlayRect**

Rectangle, using coordinates relative to the top-left pixel of the device configuration image, in which the overlay image should be painted. This member is valid only if the DIDIFT\_OVERLAY flag is present in **flags**.

**TextAlign**

Value that specifies the alignment of the text in the rectangle described by the **CalloutRect** member. Must be one horizontal alignment flag combined with one vertical alignment flag from the **CONST\_DIDALFLAGS** enumeration.

The following horizontal alignment flags are defined.

**DIDAL\_LEFTALIGNED**

Text is aligned on the left border.

**DIDAL\_CENTERED**

Text is horizontally centered.

**DIDAL\_RIGHTALIGNED**

Text is aligned on the right border.

The following vertical alignment flags are defined.

**DIDAL\_MIDDLE**

The text is vertically centered.

**DIDAL\_TOPALIGNED**

The text is aligned on the top border.

**DIDAL\_BOTTOMALIGNED**

The text is aligned on the bottom border.

This member is valid only if the DIDIFT\_OVERLAY flag is present in **flags**.

**ValidPts**

Number of points in the **CalloutLine** array.

**ViewID**

For device view images (DIDIFT\_CONFIGURATION), this is the ID of the device view. For device control overlays (DIDIFT\_OVERLAY), this value refers to the device view (by ID) over which an image and callout information should be displayed.

## DIDEVICEIMAGEINFOHEADER

#Contains information about device images. This type is passed to the **DirectInputDevice8.GetImageInfo** method. On return, it contains information about the device and the images that represent it in the device configuration property sheet.

Type DIDEVICEIMAGEINFOHEADER

Axes As Long

Buttons As Long

ImageCount As Long

Images() As DIDEVICEIMAGEINFO

POVs As Long

Views As Long

End Type

### Members

#### Axes

Number of axes on the device.

#### Buttons

Number of buttons on the device.

#### ImageCount

Number of elements in the **Images** array.

#### Images

Array of **DIDEVICEIMAGEINFO** types describing device images and views, overlay images, and callout-string coordinates.

#### POVs

Number of point-of-view controllers on the device.

#### Views

Number of views of this device.

### Remarks

Before passing this type to **DirectInputDevice8.GetImageInfo**, the application must initialize the **ImageCount** and **Images** members as follows:

' Assume that didev is a DirectInputDevice8 object

Dim count as Integer

Dim dilmageInfoHdr

count = didev.GetImageInfoCount

With dilmageInfoHdr

ImageCount = count

---

# IDH\_DIDEVICEIMAGEINFOHEADER\_dinput\_vb

```
ReDim Images(count)
End With
```

Members of the type other than **ImageCount** are filled with data by the method call.

## See Also

**DirectInputDevice8.GetImageInfoCount**

# DIDEVICEOBJECTDATA

#Contains raw buffered device information. This type is used with the **DirectInputDevice8.GetDeviceData** method.

```
Type DIDEVICEOBJECTDATA
    IData As Long
    IOfs As Long
    ISequence As Long
    ITimeStamp As Long
    IUserData As Long
End Type
```

## Members

### IData

Data obtained from the device.

For axis input, if the device is in relative axis mode, then the relative axis motion is reported. If the device is in absolute axis mode, then the absolute axis coordinate is reported.

For button input, only the low byte of **IData** is significant. The high bit of the low byte is set if the button went down; it is clear if the button went up.

### IOfs

Offset into the current data format of the object whose data is being reported—that is, the location where the data would have been stored if it had been obtained by a call to the **DirectInputDevice8.GetDeviceStateX** method where **X** refers to the specific device, for instance **GetDeviceStateMouse**. If the device is accessed as a keyboard, you can determine which key generated the event by comparing this value with the members of the **CONST\_DIKEYFLAGS** enumeration. For the mouse and joystick, the value in **IOfs** is equivalent to the byte offset of the button or axis within the **DIMOUSESTATE**, **DIJOYSTATE**, or **DIJOYSTATE2** type (depending on the data format that was established by using **DirectInputDevice8.SetCommonDataFormat**.) Constants for these offsets are contained in the **CONST\_DIMOUSEOFS** and **CONST\_DIJOYSTICKOFS** enumerations. If a custom data format has been set

---

```
# IDH_DIDEVICEOBJECTDATA_dinput_vb
```

by using **DirectInputDevice8.SetDataFormat**, then **IOfs** is the offset of the device object's place in the custom data format.

### **lSequence**

Microsoft® DirectInput® sequence number for this event. All input events are assigned an increasing sequence number. This allows events from different devices to be sorted chronologically. Because this value can wrap around, care must be taken when comparing two sequence numbers.

### **lTimeStamp**

System time at which the input event was generated, in milliseconds. This value wraps around approximately every 50 days.

### **lUserData**

Application-defined action value assigned to this object in the last call to **DirectInputDevice8.SetActionMap**. This is the value in the **lAppData** member of the **DIACTION** type associated with the object. Ignore this value if you are not using action mapping.

When the typestructure is used with the **SendDeviceData** method, this member must be zero.

## **DIEFFECT**

#Describes a force-feedback effect. It is passed to the **DirectInputDevice8.CreateEffect** and **DirectInputEffect.SetParameters** methods in order to set parameters for an effect. Existing parameters are retrieved in this type through the **DirectInputEffect.GetParameters** method.

### Type DIEFFECT

```

bUseEnvelope As Long
conditionFlags As CONST_DICONDITIONFLAGS
conditionX As DICONDITION
conditionY As DICONDITION
constantForce As DICONSTANTFORCE
envelope As DIENVELOPE
IDuration As Long
IFlags As Long
IGain As Long
ISamplePeriod As Long
IStartDelay As Long
ITriggerButton As Long
ITriggerRepeatInterval As Long
periodicForce As DIPERIODICFORCE
rampForce As DIRAMPFORCE
x As Long
y As Long
End Type
```

---

# IDH\_DIEFFECT\_dinput\_vb

## Members

### **bUseEnvelope**

True if the envelope described in the **envelope** member is to be applied to the effect.

### **conditionFlags**

Flags from the **CONST\_DICONDITIONFLAGS** enumeration that determine use of the **conditionX** and **conditionY** members.

### **conditionX**

**DICONDITION** type describing parameters of the condition on the x-axis. Ignored for other types of effects.

### **conditionY**

**DICONDITION** type describing parameters of the condition on the y-axis. Ignored for other types of effects.

### **constantForce**

**DICONSTANTFORCE** type describing parameters of a constant force. Ignored for other types of effects.

### **envelope**

**DIENVELOPE** type describing parameters of an envelope to be applied to the effect. Valid only if the **bUseEnvelope** member is True.

### **IDuration**

Duration of the effect, in microseconds. A value of -1 indicates infinite duration. If an envelope is applied to an effect of infinite duration, then the attack will be applied, followed by an infinite sustain.

### **IFlags**

Zero or more members of the **CONST\_DIEFFFLAGS** enumeration specifying how other members are to be interpreted.

### **IGain**

The gain to be applied to the effect, in the range 0 to 10,000. The gain is a scaling factor applied to all magnitudes of the effect and its envelope.

### **ISamplePeriod**

The period, in microseconds, at which the device samples the effect—in other words, the granularity of changes in force. A value of 0 indicates that the default playback sample rate should be used.

If the device is not capable of sampling the effect at the specified rate, it will choose the supported rate that is closest to the requested value.

Setting a custom sample period can be used for special effects. For example, playing a sine wave with an artificially large sample period results in a rougher texture.

### **IStartDelay**

Time, in microseconds, the device should wait after a **DirectInputEffect.Start** call before playing the effect. If this value is 0, then effect playback begins immediately.

### **ITriggerButton**

Offset value of the button that will trigger the effect. This should be one of the members of the **CONST\_DIJOYSTICKOFS** enumeration, or **DIEP\_NOTRIGGER** to indicate that the effect does not have a trigger button.

#### **ITriggerRepeatInterval**

The interval, in microseconds, between the end of one playback and the start of the next when the effect is triggered by a button press and the button is held down. Setting this value to -1 suppresses repetition.

Not all devices support trigger repeat.

#### **periodicForce**

**DIPERIODICFORCE** type describing parameters of a periodic effect. Ignored for other types of effects.

#### **rampForce**

**DIRAMPFORCE** type describing parameters of a ramp force. Ignored for other types of effects.

#### **x**

Direction of the effect. Normally, this is the amount by which the direction is rotated from north (usually the negative y-axis), in hundredths of degrees. Thus a value of 0 indicates a force pushing toward the user, a value of 9000 indicates a force pushing from the user's right, and so on. In this case, **y** should be 0.

If **IFlags** contains **DIEFF\_CARTESIAN**, this is a Cartesian value describing the relative amount of force on the x-axis. For example, if **x** = -1 and **y** = 1, the direction of the force is from the southwest. For more information, see Effect Direction.

#### **y**

If **IFlags** contains **DIEFF\_CARTESIAN**, this is a Cartesian value describing the relative amount of force on the y-axis. Otherwise it should be 0.

## **DIENVELOPE**

#Describes parameters for an envelope in the **DIEFFECT** type.

Type DIENVELOPE

  IAttackLevel As Long

  IAttackTime As Long

  IFadeLevel As Long

  IFadeTime As Long

End Type

### **Members**

#### **IAttackLevel**

Amplitude for the start of the envelope, relative to the baseline (offset), in the range 0 to 10,000. If the effect's type-specific data does not specify a baseline, then the amplitude is relative to zero.

---

# IDH\_DIENVELOPE\_dinput\_vb

**IAAttackTime**

The time, in microseconds, to reach the sustain level.

**IFadeLevel**

Amplitude for the end of the envelope, relative to the baseline, in the range 0 to 10,000. If the effect's type-specific data does not specify a baseline, then the amplitude is relative to zero.

**IFadeTime**

The time, in microseconds, to reach the fade level.

## DIJOYSTATE

#Describes the state of a joystick device. (This term includes other controllers such as game pads and steering wheels). This type is used with the **DirectInputDevice8.GetDeviceStateJoystick** method.

Type DIJOYSTATE

Buttons(0 To 31) As Byte

POV(0 To 3) As Long

rx As Long

ry As Long

rz As Long

slider(0 To 1) As Long

x As Long

y As Long

z As Long

End Type

### Members

**Buttons**

Array of buttons. The high-order bit of the byte is set if the corresponding button is down and clear if the button is up or does not exist.

**POV**

Direction controllers (such as point-of-view hats). The position is indicated in hundredths of degrees clockwise from north (away from the user). The center position is normally reported as -1; but see Remarks. For indicators that have only five positions, the value for a controller will be -1, 0, 9,000, 18,000, or 27,000.

**rx**

X-axis rotation. If the joystick does not have this, the value is 0.

**ry**

Y-axis rotation. If the joystick does not have this axis, the value is 0.

**rz**


---

# IDH\_DIJOYSTATE\_dinput\_vb

Z-axis rotation. If the joystick does not have this axis, the value is 0.

**slider**

Two additional axes whose semantics depend on the joystick. Use the **DirectInputDevice8.GetObjectInfo** method to obtain semantic information about these values.

**x**

X-axis, usually the left-right movement of a stick.

**y**

Y-axis, usually the forward-backward movement of a stick.

**z**

Z-axis, often the throttle control. If the joystick does not have this axis, the value is zero.

**Remarks**

You must prepare the device for joystick-style access by calling the **DirectInputDevice8.SetCommonDataFormat** method, passing the DIFORMAT\_JOYSTICK format constant.

If an axis is in relative mode, then the appropriate member contains the change in position. If it is in absolute mode, then the member contains the absolute axis position.

Some drivers report the centered position of the POV indicator as 65,535. You can determine whether an indicator is centered as follows:

```
Dim POVCentered as Boolean
POVCentered = MyDijoystate.POV(0) And &HFFFF
```

**Note**

Under Microsoft® DirectX® 7, sliders on some joysticks could be assigned to the Z axis, with subsequent code retrieving data from that member. Using DirectX 8, those same sliders will be assigned to the **slider** array. This should be taken into account when porting applications to DirectX 8. Make any necessary alterations to ensure that slider data is retrieved from the **slider** array.

**See Also****DIJOYSTATE2**

## DIJOYSTATE2

#Describes the state of a joystick device with extended capabilities. This type is used with the **DirectInputDevice8.GetDeviceStateJoystick2** method.

---

# IDH\_DIJOYSTATE2\_dinput\_vb



Most applications do not need to use this type, which is for highly specialized controllers including force-feedback devices. For standard game controllers, use the **DIJOYSTATE** type and obtain data by calling **DirectInputDevice8.GetDeviceStateJoystick**.

Type DIJOYSTATE2

arx As Long  
ary As Long  
arz As Long  
aslider (0 to 1) As Long  
ax As Long  
ay As Long  
az As Long  
Buttons(0 To 127) As Byte  
frx As Long  
fry As Long  
frz As Long  
fslider(0 To 1) As Long  
fx As Long  
fy As Long  
fz As Long  
POV(0 To 3) As Long  
rx As Long  
ry As Long  
rz As Long  
slider(0 To 1) As Long  
vrx As Long  
vry As Long  
vrz As Long  
vslider(0 To 1) As Long  
vx As Long  
vy As Long  
vz As Long  
x As Long  
y As Long  
z As Long  
End Type

## Members

**arx** X-axis angular acceleration.  
**ary** Y-axis angular acceleration.  
**arz** Z-axis angular acceleration.

**aslider**

Extra axis accelerations.

**ax**

X-axis acceleration.

**ay**

Y-axis acceleration.

**az**

Z-axis acceleration.

**Buttons**

Array of buttons. The high-order bit of the byte is set if the corresponding button is down and clear if the button is up or does not exist.

**frx**

X-axis torque.

**fry**

Y-axis torque.

**frz**

Z-axis torque.

**fslider**

Extra axis forces.

**fx**

X-axis force.

**fy**

Y-axis force.

**fz**

Z-axis force.

**POV**

Array of direction controllers, such as point-of-view hats. The position is indicated in hundredths of degrees clockwise from north (away from the user). The center position is normally reported as -1; but see Remarks. For indicators that have only five positions, the value for a controller will be -1, 0, 9,000, 18,000, or 27,000.

**rx**

X-axis rotation. If the joystick does not have this, the value is 0.

**ry**

Y-axis rotation. If the joystick does not have this axis, the value is 0.

**rz**

Z-axis rotation (often called the rudder). If the joystick does not have this axis, the value is zero.

**slider**

Two additional axes whose semantics depend on the joystick. Use the **DirectInputDevice8.GetObjectInfo** method to obtain semantic information about these values.

**vrx**

X-axis angular velocity.

**vry**

Y-axis angular velocity.

**vrz**

Z-axis angular velocity.

**vslider**

Array of extra axis velocities.

**vx**

X-axis velocity.

**vy**

Y-axis velocity.

**vz**

Z-axis velocity.

**x**

Information about the joystick x-axis (usually the left-right movement of a stick).

**y**

Information about the joystick y-axis (usually the forward-backward movement of a stick).

**z**

Information about the joystick z-axis (often the throttle control). If the joystick does not have this axis, the value is zero.

## Remarks

You must prepare the device for access to a joystick with extended capabilities by calling the **DirectInputDevice8.SetCommonDataFormat** method, passing the **DIFORMAT\_JOYSTICK2** data format variable.

If an axis is in relative mode, then the appropriate member contains the change in position. If it is in absolute mode, then the member contains the absolute axis position.

Some drivers report the centered position of the POV indicator as 65,535. You can determine whether an indicator is centered as follows:

Dim POVCentered as Boolean

POVCentered = MyDijoystate2.POV(0) And &HFFFF

## Note

Under Microsoft® DirectX® 7, sliders on some joysticks could be assigned to the Z axis, with subsequent code retrieving data from that member. Using DirectX 8, those same sliders will be assigned to the **slider** array. This should be taken into account when porting applications to DirectX 8. Make any necessary alterations to ensure that slider data is retrieved from the **slider** array.

## DIKEYBOARDSTATE

#Describes the state of keyboard keys. This type is used with the **DirectInputDevice8.GetDeviceStateKeyboard** method.

```
Type DIKEYBOARDSTATE
    key(0 To 255) As Byte
End Type
```

### Members

#### key

Array of key states. The array can be indexed by using members of the **CONST\_DIKEYFLAGS** enumeration. For each key, the high bit is set if the key is down, and clear if the key is up or does not exist.

### Remarks

The following example checks to see if the ESC key is being pressed:

```
Dim keyState as DIKEYBOARDSTATE
' diDevice is a valid DirectInputDevice8 object.

Call diDevice.GetDeviceStateKeyboard(keyState)
If (keyState.key(DIK_ESCAPE) And &H80) Then
    ' Key is down
End If
```

## DIMOUSESTATE

#Describes the state of a mouse device with up to four buttons. This type is used with the **DirectInputDevice8.GetDeviceStateMouse** method.

```
Type DIMOUSESTATE
    Buttons(0 To 3) As Byte
    IX As Long
    IY As Long
    IZ As Long
End Type
```

### Members

#### Buttons

Array of button states. The high-order bit of a byte is set if the corresponding button is down.

#### IX

X-axis.

```
# IDH_DIKEYBOARDSTATE_dinput_vb
```

```
# IDH_DIMOUSESTATE_dinput_vb
```

**IY**

Y-axis.

**IZ**

Z-axis, typically a wheel. If the mouse does not have a z-axis, then the value is 0.

**Remarks**

Immediate data is returned in this type from a device that has been prepared by passing the `DIFORMAT_MOUSE` constant to the **DirectInputDevice8.SetCommonDataFormat** method.

If an axis is in relative mode, then the appropriate member contains the change in position since the last call to this method. If the axis is in absolute mode, then the member contains the accumulated relative motion in relation to an arbitrary start point. The absolute axis position is not meaningful except in comparison with other absolute axis positions.

**See Also****DIMOUSESTATE2****DIMOUSESTATE2**

#Describes the state of a mouse device with up to 8 buttons. This type is used with the **DirectInputDevice8.GetDeviceStateMouse2** method.

Type DIMOUSESTATE2  
 Buttons(0 To 7) As Byte  
 IX As Long  
 IY As Long  
 IZ As Long  
 End Type

**Members****Buttons**

Array of button states. The high-order bit of a byte is set if the corresponding button is down.

**IX**

X-axis.

**IY**

Y-axis.

**IZ**

Z-axis, typically a wheel. If the mouse does not have a z-axis, the value is 0.

---

# IDH\_DIMOUSESTATE2\_dinput\_vb

## Remarks

Immediate data is returned in this type from a device that has been prepared by passing the `DIFORMAT_MOUSE2` constant to the **DirectInputDevice8.SetCommonDataFormat** method.

If an axis is in relative mode, then the appropriate member contains the change in position since the last call to this method. If the axis is in absolute mode, then the member contains the accumulated relative motion in relation to an arbitrary start point. The absolute axis position is not meaningful except in comparison with other absolute axis positions.

## See Also

**DIMOUSESTATE**

# DIOBJECTDATAFORMAT

#Describes a device object's data format for use with the **DirectInputDevice8.SetDataFormat** method.

```
Type DIOBJECTDATAFORMAT {
    IFlags As CONST_DIDEVICEOBJINSTANCEFLAGS
    IOfs As Long
    IType As CONST_DIDFTFLAGS
    strGuid As String
End Type
```

## Members

### IFlags

Zero or more of the following values from the **CONST\_DIDEVICEOBJINSTANCEFLAGS** enumeration.

**DIDOI\_ASPECTACCEL**

The object selected by **DirectInputDevice8.SetDataFormat** must report acceleration information.

**DIDOI\_ASPECTFORCE**

The object selected by **DirectInputDevice8.SetDataFormat** must report force information.

**DIDOI\_ASPECTPOSITION**

The object selected by **DirectInputDevice8.SetDataFormat** must report position information.

**DIDOI\_ASPECTVELOCITY**

The object selected by **DirectInputDevice8.SetDataFormat** must report velocity information.

### IOfs

# `IDH_DIOBJECTDATAFORMAT_dinput_vb`

Byte offset within the data packet where the data for the input source will be stored. This value must be a multiple of four for **Long** size data, such as axes. It can be byte-aligned for buttons.

### **IType**

Device type that describes the object. It is a combination of values from the **CONST\_DIDFTFLAGS** enumeration describing the object type (axis, button, and so forth) and containing the object-instance number in the middle 16 bits.

### **strGuid**

Unique identifier for the type of input source. An empty string indicates that any type of object is permissible.

The following strings can be used in place of actual GUID strings to identify the type of device object:

GUID\_XAxis  
 GUID\_YAxis  
 GUID\_ZAxis  
 GUID\_RxAxis  
 GUID\_RyAxis  
 GUID\_RzAxis  
 GUID\_Slider  
 GUID\_Button  
 GUID\_Key  
 GUID\_POV

## **DIPERIODICFORCE**

#Describes parameters for a periodic force in the **DIEFFECT** type.

Type DIPERIODICFORCE

IOffset As Long

IMagnitude As Long

IPeriod As Long

IPhase As Long

End Type

### **Members**

#### **IOffset**

The offset of the effect. The range of forces generated by the effect will be **IOffset - IMagnitude** to **IOffset + IMagnitude**. The value of the **IOffset** member is also the baseline for any envelope that is applied to the effect.

#### **IMagnitude**

The magnitude of the effect, in the range 0 to 10,000. If an envelope is applied to this effect, then the value represents the magnitude of the sustain. If no envelope is applied, then the value represents the amplitude of the entire effect.

#### **IPeriod**

# IDH\_DIPERIODICFORCE\_dinput\_vb

The period of the effect, in microseconds.

### **IPhase**

The position in the cycle of the periodic effect at which playback begins, in the range 0 to 35,999. See Remarks.

### **Remarks**

A device driver might not provide support for all values in the **IPhase** member. In this case the value will be rounded off to the nearest supported value.

## **DIPROPGUIDANDPATH**

#Describes properties whose values represent a GUID and a path. Used with the **DirectInputDevice8.GetProperty** method.

Type DIPROPGUIDANDPATH

GUID As String

IHow As Long

IObj As Long

Path As String

End Type

### **Members**

#### **GUID**

**String** that receives the GUID.

#### **IHow**

Value that specifies how the *IObj* parameter should be interpreted. This value may be one of the members of the **CONST\_DIPHFLAGS** enumeration.

If the property pertains to the entire device, **IHow** should be **DIPH\_DEVICE**.

#### **IObj**

Object for which the property is to be accessed.

If the **IHow** member is **DIPH\_BYID**, this member must be the identifier for the object whose property setting is to be set or retrieved. This value can be retrieved for the object by using the **DirectInputDeviceObjectInstance.GetType** method.

If the **IHow** member is **DIPH\_BYOFFSET**, this member must be a data format offset for the object whose property setting is to be set or retrieved. This value can be obtained by using the **DirectInputDeviceObjectInstance.GetOfs** method.

#### **Path**

**String** that receives the path.

---

# IDH\_DIPROPGUIDANDPATH\_dinput\_vb



# DIPROPLONG

#Contains property information that is set on or retrieved from the input device by using the **DirectInputDevice8.SetProperty** and **DirectInputDevice8.GetProperty** methods, where the property is a single value.

Type DIPROPLONG

IData As Long

IHow As Long

IObj As Long

End Type

## Members

### IData

The property-specific value being set or retrieved.

### IHow

Value specifying how the *IObj* parameter should be interpreted. This value may be one of the members of the **CONST\_DIPHFLAGS** enumeration.

If **IObj** is **DIPROP\_AXISMODE** or **DIPROP\_BUFFERSIZE**, **IHow** should be **DIPH\_DEVICE**, because these properties cannot be set for an individual object.

### IObj

Object for which the property is to be accessed.

If the **IHow** member is **DIPH\_BYID**, this member must be the identifier for the object whose property setting is to be set or retrieved. This value can be retrieved for the object by using the **DirectInputDeviceObjectInstance.GetType** method.

If the **IHow** member is **DIPH\_BYOFFSET**, this member must be a data format offset for the object whose property setting is to be set or retrieved. This value can be obtained by using the **DirectInputDeviceObjectInstance.GetOfs** method.

If **IHow** is **DIPH\_DEVICE**, this value should be 0.

## Remarks

All members must be initialized with the proper values before the type is passed to the **SetProperty** method. All members except **IData** must be initialized with the proper values before the type is passed to **GetProperty**.

## See Also

### DIPROPRANGE

---

# IDH\_DIPROPLONG\_dinput\_vb

---

# DIPROPRANGE

#Contains property information that is set on or retrieved from the input device by using the **DirectInputDevice8.SetProperty** and **DirectInputDevice8.GetProperty** methods, where the property is a range of values.

Type DIPROPRANGE

IHow As Long

IMax As Long

IMin As Long

IObj As Long

End Type

## Members

### IHow

Value specifying how the **IObj** member should be interpreted. This value may be one of the members of the **CONST\_DIPHFLAGS** enumeration.

### IMax

Upper limit of the range. If the range of the device is unrestricted, this value will be **DIPROPRANGE\_NOMAX** (from the **CONST\_DINPUT** enumeration) when the **DirectInputDevice8.GetProperty** method returns.

### IMin

Lower limit of the range. If the range of the device is unrestricted, this value will be **DIPROPRANGE\_NOMIN** (from the **CONST\_DINPUT** enumeration) when the **DirectInput8Device.GetProperty** method returns.

### IObj

Object for which the property is to be accessed.

If the **IHow** member is **DIPH\_BYID**, this member must be the identifier for the object whose property setting is to be set or retrieved. This value can be retrieved for the object by using the **DirectInputDeviceObjectInstance.GetType** method.

If the **IHow** member is **DIPH\_BYOFFSET**, this member must be a data format offset for the object whose property setting is to be set or retrieved. This value can be obtained by using the **DirectInputDeviceObjectInstance.GetOfs** method.

If **IHow** is **DIPH\_DEVICE**, this value should be 0.

## See Also

### DIPROPLONG

---

# IDH\_DIPROPRANGE\_dinput\_vb

## DIPROPSTRING

#Describes string properties. Used with the **DirectInputDevice8.GetProperty** and **DirectInputDevice8.SetProperty** methods.

```
Type DIPROPSTRING
    IHow As Long
    IObj As Long
    PropString As String
End Type
```

### Members

#### IHow

How the **IObj** member should be interpreted.

#### IObj

Identifier of the object whose property is being retrieved or set.

#### PropString

String that specifies or receives the property.

## DIRAMPFORCE

#Describes parameters for a ramp force in the **DIEFFECT** type.

```
Type DIRAMPFORCE
    IRangeEnd As Long
    IRangeStart As Long
End Type
```

### Members

#### IRangeEnd

The magnitude at the end of the effect, in the range -10,000 to +10,000.

#### IRangeStart

The magnitude at the start of the effect, in the range -10,000 to +10,000.

### Remarks

The duration of a ramp force effect must be finite.

---

```
# IDH_DIPROPSTRING_dinput_vb
# IDH_DIRAMPFORCE_dinput_vb
```

---

## Enumerations

Microsoft® DirectInput® uses enumerations to group constants in order to take advantage of the statement completion feature of Microsoft Visual Basic®. The enumerations used in DirectInput are as follows:

- **CONST\_DI8DEVICETYPE**
- **CONST\_DI8DEVICETYPE**
- **CONST\_DIAFLAGS**
- **CONST\_DIAHFLAGS**
- **CONST\_DICDFLAGS**
- **CONST\_DICOMMONDATAFORMATS**
- **CONST\_DICONDITIONFLAGS**
- **CONST\_DIDALFLAGS**
- **CONST\_DIDATAFORMATFLAGS**
- **CONST\_DIDBAMFLAGS**
- **CONST\_DIDEVCAPSFLAGS**
- **CONST\_DIDEVICEOBJINSTANCEFLAGS**
- **CONST\_DIDFTFLAGS**
- **CONST\_DIDGDDFLAGS**
- **CONST\_DIDIIFTFLAGS**
- **CONST\_DIDSAMFLAGS**
- **CONST\_DIEDBSFLFLAGS**
- **CONST\_DIEFFFLAGS**
- **CONST\_DIEFTFLAGS**
- **CONST\_DIEGESFLAGS**
- **CONST\_DIENUMDEVICESFLAGS**
- **CONST\_DIEPFLAGS**
- **CONST\_DIESFLAGS**
- **CONST\_DIFEFFLAGS**
- **CONST\_DIGENRE**
- **CONST\_DIGFFSFLAGS**
- **CONST\_DIJOYSTICKOFS**
- **CONST\_DIKEYBOARDFLAGS**
- **CONST\_DIKEYFLAGS**
- **CONST\_DIMAPFLAGS**
- **CONST\_DIMOUSEFLAGS**
- **CONST\_DIMOUSEOFS**

- **CONST\_DINPUT**
- **CONST\_DINPUTERR**
- **CONST\_DIPHFLAGS**
- **CONST\_DISCLFLAGS**
- **CONST\_DISDDFLAGS**
- **CONST\_DISFFCFLAGS**
- **CONST\_DVOICEFLAGS**

## CONST\_DI8DEVICESUBTYPE

\*Used to identify device subtypes. A packed value representing the device type and subtype is returned by the **DirectInputDeviceInstance8.GetDevType** method and in the **IDevType** member of the **DIDEVCAPS** type returned by **DirectInputDevice8.GetCapabilities**.

```
Enum CONST_DI8DEVICESUBTYPE
    DI8DEVTYPE_LIMITEDGAMESUBTYPE      = 256 (&H100)
    DI8DEVTYPE1STPERSON_LIMITED        = 256 (&H100)
    DI8DEVTYPE1STPERSON_SHOOTER        = 1024 (&H400)
    DI8DEVTYPE1STPERSON_SIXDOF         = 768 (&H300)
    DI8DEVTYPE1STPERSON_UNKNOWN        = 512 (&H200)
    DI8DEVTYPEDEVICECTRL_COMMSSELECTION = 768 (&H300)
    DI8DEVTYPEDEVICECTRL_HARDWIRED     = 1024 (&H400)
    DI8DEVTYPEDEVICECTRL_UNKNOWN       = 512 (&H200)
    DI8DEVTYPEDRIVING_COMBINEDPEDALS   = 512 (&H200)
    DI8DEVTYPEDRIVING_DUALPEDALS       = 768 (&H300)
    DI8DEVTYPEDRIVING_HANDHELD         = 1280 (&H500)
    DI8DEVTYPEDRIVING_LIMITED          = 256 (&H100)
    DI8DEVTYPEDRIVING_THREEPEDALS      = 1024 (&H400)
    DI8DEVTYPEFLIGHT_LIMITED           = 256 (&H100)
    DI8DEVTYPEFLIGHT_RC                = 1024 (&H400)
    DI8DEVTYPEFLIGHT_STICK             = 512 (&H200)
    DI8DEVTYPEFLIGHT_YOKE              = 768 (&H300)
    DI8DEVTYPEGAMEPAD_LIMITED          = 256 (&H100)
    DI8DEVTYPEGAMEPAD_STANDARD         = 512 (&H200)
    DI8DEVTYPEGAMEPAD_TILT             = 768 (&H300)
    DI8DEVTYPEJOYSTICK_LIMITED         = 256 (&H100)
    DI8DEVTYPEJOYSTICK_STANDARD        = 512 (&H200)
    DI8DEVTYPEKEYBOARD_J3100           = 3072 (&HC00)
    DI8DEVTYPEKEYBOARD_JAPAN106       = 2560 (&HA00)
    DI8DEVTYPEKEYBOARD_JAPANAX        = 2816 (&HB00)
    DI8DEVTYPEKEYBOARD_NEC98           = 1792 (&H700)
    DI8DEVTYPEKEYBOARD_NEC98106       = 2304 (&H900)
```

---

# IDH\_CONST\_DI8DEVICESUBTYPE\_dinput\_vb

---

```

DI8DEVTYPEKEYBOARD_NEC98LAPTOP    = 2048 (&H800)
DI8DEVTYPEKEYBOARD_NOKIA1050      = 1280 (&H500)
DI8DEVTYPEKEYBOARD_NOKIA9140      = 1536 (&H600)
DI8DEVTYPEKEYBOARD_OLIVETTI       = 512 (&H200)
DI8DEVTYPEKEYBOARD_PCAT           = 768 (&H300)
DI8DEVTYPEKEYBOARD_PCENH          = 1024 (&H400)
DI8DEVTYPEKEYBOARD_PCXT           = 256 (&H100)
DI8DEVTYPEKEYBOARD_UNKNOWN        = 0 (&H000)
DI8DEVTYPEMOUSE_ABSOLUTE          = 1536 (&H600)
DI8DEVTYPEMOUSE_FINGERSTICK       = 768 (&H300)
DI8DEVTYPEMOUSE_TOUCHPAD          = 1024 (&H400)
DI8DEVTYPEMOUSE_TRACKBALL         = 1280 (&H500)
DI8DEVTYPEMOUSE_TRADITIONAL       = 512 (&H200)
DI8DEVTYPEMOUSE_UNKNOWN           = 256 (&H100)
DI8DEVTYPEREMOTE_UNKNOWN          = 512 (&H200)
DI8DEVTYPESCREENPTR_LIGHTGUN      = 768 (&H300)
DI8DEVTYPESCREENPTR_LIGHTPEN      = 1024 (&H400)
DI8DEVTYPESCREENPTR_TOUCH         = 1280 (&H500)
DI8DEVTYPESCREENPTR_UNKNOWN       = 512 (&H200)
DI8DEVTYPESUPPLEMENTAL_2NDHANDCONTROLLER = 768 (&H300)
DI8DEVTYPESUPPLEMENTAL_COMBINEDPEDALS = 2560 (&HA00)
DI8DEVTYPESUPPLEMENTAL_DUALPEDALS = 2816 (&HB00)
DI8DEVTYPESUPPLEMENTAL_HANDTRACKER = 1280 (&H500)
DI8DEVTYPESUPPLEMENTAL_HEADTRACKER = 1024 (&H400)
DI8DEVTYPESUPPLEMENTAL_RUDDERPEDALS = 3328 (&HD00)
DI8DEVTYPESUPPLEMENTAL_SHIFTER   = 1792 (&H700)
DI8DEVTYPESUPPLEMENTAL_SHIFTSTICKGATE = 1536 (&H600)
DI8DEVTYPESUPPLEMENTAL_SPLITTHROTTLE = 2304 (&H900)
DI8DEVTYPESUPPLEMENTAL_THREEPEDALS = 3072 (&HC00)
DI8DEVTYPESUPPLEMENTAL_THROTTLE  = 2048 (&H800)
DI8DEVTYPESUPPLEMENTAL_UNKNOWN   = 512 (&H200)
DIDEVTYPE_HID                     = 65536 (&H10000)

```

End Enum

Constants

DI8DEVTYPEJOYSTICK\_ENHANCED

Joystick that has more axes or point-of-view controllers than a standard joystick.

DI8DEVTYPE1STPERSON\_LIMITED

Device that does not provide the minimum number of device objects for action mapping.

DI8DEVTYPE1STPERSON\_SHOOTER

Device designed for first-person shooter games.

DI8DEVTYPE1STPERSON\_SIXDOF

Device with six degrees of freedom; that is, three lateral axes and three rotational axes.

DI8DEVTYPE1STPERSON\_UNKNOWN

Unknown subtype.

DI8DEVTYPEDEVICECTRL\_COMMSSELECTION

Control used to make communications selections.

DI8DEVTYPEDEVICECTRL\_HARDWIRED

Device that must use its default configuration and cannot be remapped.

DI8DEVTYPEDEVICECTRL\_UNKNOWN

Unknown subtype.

DI8DEVTYPEDRIVING\_COMBINEDPEDALS

Steering device that reports acceleration and brake pedal values from a single axis.

DI8DEVTYPEDRIVING\_DUALPEDALS

Steering device that reports acceleration and brake pedal values from separate axes.

DI8DEVTYPEDRIVING\_HANDHELD

Hand-held steering device.

DI8DEVTYPEDRIVING\_LIMITED

Steering device that does not provide the minimum number of device objects for action mapping.

DI8DEVTYPEDRIVING\_THREEPEDALS

Steering device that reports acceleration, brake, and clutch pedal values from separate axes.

DI8DEVTYPEFLIGHT\_LIMITED

Flight controller that does not provide the minimum number of device objects for action mapping.

DI8DEVTYPEFLIGHT\_RC

Flight device based on a remote control for model aircraft.

DI8DEVTYPEFLIGHT\_STICK

Joystick.

DI8DEVTYPEFLIGHT\_YOKE

Yoke.

DI8DEVTYPEGAMEPAD\_LIMITED

Gamepad that does not provide the minimum number of device objects for action mapping.

DI8DEVTYPEGAMEPAD\_STANDARD

Standard gamepad that provides the minimum number of device objects for action mapping.

DI8DEVTYPEGAMEPAD\_TILT

Gamepad that can report x-axis and y-axis data based on the attitude of the controller.

DI8DEVTYPEJOYSTICK\_LIMITED

Joystick that does not provide the minimum number of device objects for action mapping.

---

**DI8DEVTYPEJOYSTICK\_STANDARD**

Standard joystick that provides the minimum number of device objects for action mapping.

**DI8DEVTYPEKEYBOARD\_J3100**

Japanese J3100 keyboard.

**DI8DEVTYPEKEYBOARD\_JAPAN106**

Japanese 106-key keyboard.

**DI8DEVTYPEKEYBOARD\_JAPANAX**

Japanese AX keyboard.

**DI8DEVTYPEKEYBOARD\_NEC98**

Japanese NEC PC98 keyboard.

**DI8DEVTYPEKEYBOARD\_NEC98106**

Japanese NEC PC98 106-key keyboard.

**DI8DEVTYPEKEYBOARD\_NEC98LAPTOP**

Japanese NEC PC98 laptop keyboard.

**DI8DEVTYPEKEYBOARD\_NOKIA1050**

Nokia 1050 keyboard.

**DI8DEVTYPEKEYBOARD\_NOKIA9140**

Nokia 9140 keyboard.

**DI8DEVTYPEKEYBOARD\_OLIVETTI**

Olivetti 102-key keyboard.

**DI8DEVTYPEKEYBOARD\_PCAT**

IBM PC/AT 84-key keyboard.

**DI8DEVTYPEKEYBOARD\_PCENH**

IBM PC Enhanced 101/102-key or Microsoft® Natural® keyboard.

**DI8DEVTYPEKEYBOARD\_PCXT**

IBM PC/XT 83-key keyboard.

**DI8DEVTYPEKEYBOARD\_UNKNOWN**

Unknown subtype.

**DI8DEVTYPEMOUSE\_ABSOLUTE**

Mouse that returns absolute axis data.

**DI8DEVTYPEMOUSE\_FINGERSTICK**

Fingerstick.

**DI8DEVTYPEMOUSE\_TOUCHPAD**

Touchpad.

**DI8DEVTYPEMOUSE\_TRACKBALL**

Trackball.

**DI8DEVTYPEMOUSE\_TRADITIONAL**

Traditional mouse.

**DI8DEVTYPEMOUSE\_UNKNOWN**

Unknown subtype.

**DI8DEVTYPEREMOTE\_UNKNOWN**



Remote-control device. This is the only defined remote-control device subtype.

DI8DEVTYPESCREENPTR\_LIGHTGUN

Light gun.

DI8DEVTYPESCREENPTR\_LIGHTPEN

Light pen.

DI8DEVTYPESCREENPTR\_TOUCH

Touch screen.

DI8DEVTYPESCREENPTR\_UNKNOWN

Unknown subtype.

DI8DEVTYPESUPPLEMENTAL\_2NDHANDCONTROLLER

Secondary hand-held controller.

DI8DEVTYPESUPPLEMENTAL\_COMBINEDPEDALS

Device whose primary function is to report acceleration and brake pedal values from a single axis.

DI8DEVTYPESUPPLEMENTAL\_DUALPEDALS

Device whose primary function is to report acceleration and brake pedal values from separate axes.

DI8DEVTYPESUPPLEMENTAL\_HANDTRACKER

Device that tracks hand movement.

DI8DEVTYPESUPPLEMENTAL\_HEADTRACKER

Device that tracks head movement.

DI8DEVTYPESUPPLEMENTAL\_RUDDERPEDALS

Device with rudder pedals.

DI8DEVTYPESUPPLEMENTAL\_SHIFTER

Device that reports gear selection from an axis.

DI8DEVTYPESUPPLEMENTAL\_SHIFTSTICKGATE

Device that reports gear selection from button states.

DI8DEVTYPESUPPLEMENTAL\_SPLITTHROTTLE

Device whose primary function is to report at least two throttle values. It may have other controls.

DI8DEVTYPESUPPLEMENTAL\_THREEPEDALS

Device whose primary function is to report acceleration, brake, and clutch pedal values from separate axes.

DI8DEVTYPESUPPLEMENTAL\_THROTTLE

Device whose primary function is to report a single throttle value. It may have other controls.

DI8DEVTYPESUPPLEMENTAL\_UNKNOWN

Unknown subtype.

DIDEVTYPE\_HID

Human Interface Device (HID).

## See Also

CONST\_DI8DEVICETYPE

# CONST\_DI8DEVICETYPE

\*Used to identify input device classes and types. One of these constants is passed as the *deviceType* parameter to the **DirectInput8.GetDIDevices** method to specify the class or type to enumerate. A packed value representing the device type and subtype is returned by the **DirectInputDeviceInstance8.GetDevType** method and in the **IDevType** member of the **DIDEVCAPS** type returned by **DirectInputDevice8.GetCapabilities**.

```
Enum CONST_DI8DEVICETYPE
    DI8DEVCLASS_ALL      = 0
    DI8DEVCLASS_DEVICE   = 1
    DI8DEVCLASS_GAMECTRL = 4
    DI8DEVCLASS_KEYBOARD = 3
    DI8DEVCLASS_POINTER  = 2
    DI8DEVTYPE_1STPERSON = 24 (&H18)
    DI8DEVTYPE_DEVICE    = 17 (&H11)
    DI8DEVTYPE_DEVICECTRL = 25 (&H19)
    DI8DEVTYPE_DRIVING   = 22 (&H16)
    DI8DEVTYPE_FLIGHT    = 23 (&H17)
    DI8DEVTYPE_GAMEPAD   = 21 (&H15)
    DI8DEVTYPE_JOYSTICK  = 20 (&H14)
    DI8DEVTYPE_KEYBOARD  = 19 (&H13)
    DI8DEVTYPE_MOUSE     = 18 (&H12)
    DI8DEVTYPE_REMOTE    = 27 (&H1B)
    DI8DEVTYPE_SCREENPOINTER = 26 (&H1A)
    DI8DEVTYPE_SUPPLEMENTAL = 28 (&H1C)
End Enum
```

## Constants

```
DI8DEVCLASS_ALL
    All devices.

DI8DEVCLASS_DEVICE
    All devices that do not fall into another class.

DI8DEVCLASS_GAMECTRL
    All game controllers.

DI8DEVCLASS_KEYBOARD
    All keyboards. Equivalent to DI8DEVTYPE_KEYBOARD.

DI8DEVCLASS_POINTER
```

---

# IDH\_CONST\_DI8DEVICETYPE\_dinput\_vb

All devices of type DI8DEVTYPE\_MOUSE and DI8DEVTYPE\_SCREENPOINTER.

DI8DEVTYPE\_1STPERSON

First-person action game device.

DI8DEVTYPE\_DEVICE

Device that does not fall into another category.

DI8DEVTYPE\_DEVICECTRL

Input device used to control another type of device from within the context of the application.

DI8DEVTYPE\_DRIVING

Device for steering.

DI8DEVTYPE\_FLIGHT

Controller for flight simulation.

DI8DEVTYPE\_GAMEPAD

Gamepad.

DI8DEVTYPE\_JOYSTICK

Joystick.

DI8DEVTYPE\_KEYBOARD

Keyboard or keyboard-like device.

DI8DEVTYPE\_MOUSE

A mouse or mouse-like device (such as a trackball).

DI8DEVTYPE\_REMOTE

Remote-control device.

DI8DEVTYPE\_SCREENPOINTER

Screen pointer.

DI8DEVTYPE\_SUPPLEMENTAL

Specialized device with functionality unsuitable for the main control of an application, such as pedals used with a wheel.

## See Also

CONST\_DI8DEVICESUBTYPE

## CONST\_DIAFLAGS

#Used in IFlags member of the DIACTION type to specify how actions are to be mapped.

Enum CONST\_DIAFLAGS

DIA\_APPMAPPED = 2

DIA\_APPNOMAP = 4

DIA\_FORCEFEEDBACK = 1

DIA\_NORANGE = 8

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---

End Enum

## Constants

DIA\_APPMAPPED

The **IObjID** member of the **DIACTION** type is valid, and **DirectInputDevice8.BuildActionMap** should not override the application-defined mapping.

DIA\_APPNOMAP

This action is not to be mapped.

DIA\_FORCEFEEDBACK

The action must be mapped to an actuator or trigger.

DIA\_NORANGE

The default range is not to be set for this action. This flag can be set only for absolute axis actions.

## CONST\_DIAHFLAGS

#Used in **IHow** member of the **DIACTION** type to report how actions were mapped.

Enum CONST\_DIAHFLAGS

DIAH\_APPREQUESTED = 2  
 DIAH\_DEFAULT = 32 (&H20)  
 DIAH\_ERROR = -2147483648 (&H80000000)  
 DIAH\_HWAPP = 4  
 DIAH\_HWDEFAULT = 8  
 DIAH\_UNMAPPED = 0  
 DIAH\_USERCONFIG = 1

End Enum

## Constants

DIAH\_APPREQUESTED

The mapping was configured by the application, which specified the device (**guidInstance**) and device object (**IObjID**) when calling **DirectInputDevice8.BuildActionMap**.

DIAH\_DEFAULT

The mapping was determined by Microsoft® DirectInput® in the absence of other mapping information.

DIAH\_ERROR

An error occurred. The action cannot be matched to a control on the device. The action will be ignored when the action map is set.

DIAH\_HWAPP

The mapping was specified by the hardware manufacturer for this game.

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# IDH\_CONST\_DIAHFLAGS\_dinput\_vb

**DIAH\_HWDEFAULT**

The mapping was specified by the hardware manufacturer for this genre.

**DIAH\_UNMAPPED**

No suitable device object was found.

**DIAH\_USERCONFIG**

The mapping was configured by the user.

## CONST\_DICDFLAGS

\*Used in the *flags* parameter of **DirectInput8.ConfigureDevices** to specify the mode for the property sheet.

Enum CONST\_DICDFLAGS

DICD\_DEFAULT = 0

DICD\_EDIT = 1

End Enum

### Constants

**DICD\_DEFAULT**

Open the property sheet in view-only mode.

**DICD\_EDIT**

Open the property sheet in edit mode. This mode enables the user to change action-to-control mappings. After the call returns, the application should assume current devices are no longer valid, release all device interfaces, and reinitialize them by calling **DirectInput8.GetDevicesBySemantics**.

## CONST\_DICOMMONDATAFORMATS

\*Specify the data format in the *format* parameter of the **DirectInputDevice8.SetCommonDataFormat** method.

Enum CONST\_DICOMMONDATAFORMATS

DIFORMAT\_JOYSTICK = 3

DIFORMAT\_JOYSTICK2 = 4

DIFORMAT\_KEYBOARD = 1

DIFORMAT\_MOUSE = 2

DIFORMAT\_MOUSE2 = 5

End Enum

### Constants

---

# IDH\_CONST\_DICDFLAGS\_dinput\_vb

# IDH\_CONST\_DICOMMONDATAFORMATS\_dinput\_vb

**DIFORMAT\_JOYSTICK**

Joystick whose state data can be received in a **DIJOYSTATE** type.

**DIFORMAT\_JOYSTICK2**

Joystick with extended capabilities whose state data can be received in a **DIJOYSTATE2** type.

**DIFORMAT\_KEYBOARD**

Keyboard whose state data can be received in a **DIKEYBOARDSTATE** type.

**DIFORMAT\_MOUSE**

Mouse whose state data can be received in a **DIMOUSESTATE** type.

**DIFORMAT\_MOUSE2**

Mouse whose state data can be received in a **DIMOUSESTATE2** type.

## CONST\_DICONDITIONFLAGS

#Used in the **conditionFlags** member of the **DIEFFECT** type to set the axes and direction of a force-feedback effect.

```
Enum CONST_DICONDITIONFLAGS
    DICONDITION_USE_BOTH_AXES = 1
    DICONDITION_USE_DIRECTION = 2
End Enum
```

### Constants

**DICONDITION\_USE\_BOTH\_AXES**

Use data from both the **conditionX** and **conditionY** members of the **DIEFFECT** type

**DICONDITION\_USE\_DIRECTION**

Use data from only the **conditionX** member of the **DIEFFECT** type.

## CONST\_DIDALFLAGS

#Used to specify text alignment in the action-mapping property sheet.

```
Enum CONST_DIDALFLAGS
    DIDAL_BOTTOMALIGNED = 8
    DIDAL_CENTERED      = 0
    DIDAL_LEFTALIGNED   = 1
    DIDAL_MIDDLE         = 0
    DIDAL_RIGHTALIGNED  = 2
    DIDAL_TOPALIGNED    = 4
End Enum
```

---

# IDH\_CONST\_DICONDITIONFLAGS\_dinput\_vb

# IDH\_CONST\_DIDALFLAGS\_dinput\_vb

#### Constants

##### DIDAL\_BOTTOMALIGNED

The text is aligned on the bottom border.

##### DIDAL\_CENTERED

The text is horizontally centered.

##### DIDAL\_LEFTALIGNED

The text is aligned on the left border.

##### DIDAL\_MIDDLE

The text is vertically centered.

##### DIDAL\_RIGHTALIGNED

The text is aligned on the right border.

##### DIDAL\_TOPALIGNED

The text is aligned on the top border.

## CONST\_DIDATAFORMATFLAGS

#Used in the **IFlags** member of the **DIDATAFORMAT** type to describe additional attributes of the data format.

Enum CONST\_DIDATAFORMATFLAGS

DIDF\_ABSAXIS = 1

DIDF\_RELAXIS = 2

End Enum

#### Constants

##### DIDF\_ABSAXIS

The axes are in absolute mode. Setting this flag in the data format is equivalent to manually setting the axis mode property using the

**DirectInputDevice8.SetProperty** method. This may not be combined with DIDF\_RELAXIS flag.

##### DIDF\_RELAXIS

The axes are in relative mode. Setting this flag in the data format is equivalent to manually setting the axis mode property using the

**DirectInputDevice8.SetProperty** method. This may not be combined with the DIDF\_ABSAXIS flag.

## CONST\_DIDBAMFLAGS

#Used in the **DirectInputDevice8.BuildActionMap** method.

Enum CONST\_DIDBAMFLAGS

DIDBAM\_DEFAULT = 0

---

# IDH\_CONST\_DIDATAFORMATFLAGS\_dinput\_vb

# IDH\_CONST\_DIDBAMFLAGS\_dinput\_vb

```

DIDBAM_HWDEFAULTS = 4
DIDBAM_INITIALIZE = 2
DIDBAM_PRESERVE  = 1
End Enum

```

## Constants

### DIDBAM\_DEFAULT

Overwrite all mappings except application-specified mappings; that is, mappings that have the DIA\_APPMAPPED flag in the **DIACTION** type.

### DIDBAM\_HWDEFAULTS

Overwrite all mappings, including application-specified mappings. This flag is similar to DIDBAM\_INITIALIZE, but automatically overrides user-mapped actions with the defaults specified by the device driver or Microsoft® DirectInput®.

### DIDBAM\_INITIALIZE

Overwrite all mappings, including application-specified mappings.

### DIDBAM\_PRESERVE

Preserve current mappings assigned for this device or any other configured device.

## CONST\_DIDEVCAPSFLAGS

\*Used in the **IFlags** member of the **DIDEVCAPS** type to describe the Microsoft® DirectInput® device.

### Enum CONST\_DIDEVCAPSFLAGS

```

DIDC_ALIAS      = 65536 (&H10000)
DIDC_ATTACHED   = 1
DIDC_DEADBAND   = 16384 (&H4000)
DIDC_EMULATED   = 4
DIDC_FFATTACK   = 512 (&H200)
DIDC_FFFADE     = 1024 (&H400)
DIDC_FORCEFEEDBACK = 256 (&H100)
DIDC_PHANTOM    = 131072 (&H20000)
DIDC_POLLEDDATAFORMAT = 8
DIDC_POLLEDDEVICE = 2
DIDC_POSNEGCOEFFICIENTS = 4096 (&H1000)
DIDC_POSNEGSATURATION = 8192 (&H2000)
DIDC_SATURATION  = 2048 (&H800)
End Enum

```

---

```
# IDH_CONST_DIDEVCAPSFLAGS_dinput_vb
```



## Constants

### DIDC\_ALIAS

The device is a duplicate of another DirectInput device. Alias devices are by default not enumerated by **DirectInput8.GetDIDevices**.

### DIDC\_ATTACHED

The device is physically attached.

### DIDC\_DEADBAND

The device supports deadband for at least one force-feedback condition.

### DIDC\_EMULATED

If this flag is set, the data is coming from a user mode device interface—such as a Human Interface Device (HID)—or by some other ring-3 means. If it is not set, the data is coming directly from a kernel mode driver.

### DIDC\_FFATTACK

The force-feedback system supports the attack parameter for at least one effect. If the device does not support attack then the **IAttackLevel** and **IAttackTime** members of the **DIENVELOPE** type will be ignored by the device.

### DIDC\_FFADE

The force-feedback system supports the fade parameter for at least one effect. If the device does not support fade then the **IFadeLevel** and **IFadeTime** members of the **DIENVELOPE** type will be ignored by the device.

### DIDC\_FORCEFEEDBACK

The device supports force feedback.

### DIDC\_PHANTOM

The device does not exist. It is a placeholder for a device that might exist in the future. Phantom devices are by default not enumerated by **DirectInput8.GetDIDevices**.

### DIDC\_POLLEDDATAFORMAT

At least one object in the current data format is polled rather than interrupt-driven. For these objects, the application must explicitly call the **DirectInputDevice8.Poll** method in order to obtain data.

### DIDC\_POLLEDDEVICE

At least one object on the device is polled rather than interrupt-driven. For these objects, the application must explicitly call the **DirectInputDevice8.Poll** method in order to obtain data. HID devices may contain a mixture of polled and non-polled objects.

### DIDC\_POSNEGCOEFFICIENTS

The force-feedback system supports two coefficient values for conditions (one for the positive displacement of the axis and one for the negative displacement of the axis) for at least one condition. If the device does not support both coefficients, then the negative coefficient in the **DICONDITION** type will be ignored.

### DIDC\_POSNEGSATURATION

The force-feedback system supports a maximum saturation for both positive and negative force output for at least one condition. If the device does not support

both saturation values, then the negative saturation in the **DICONDITION** type will be ignored.

#### DIDC\_SATURATION

The force-feedback system supports the saturation of condition effects for at least one condition. If the device does not support saturation, then the force generated by a condition is limited only by the maximum force that the device can generate.

### See Also

#### CONST\_DIEFTFLAGS

## CONST\_DIDEVICEOBJINSTANCEFL LAGS

\*Used to describe device object capabilities. Members of this enumeration are returned by the **DirectInputDeviceObjectInstance.GetFlags** method. They are also present in the **DIOBJECTDATAFORMAT** type passed to the **DirectInputDevice8.SetDataFormat** method

```
Enum CONST_DIDEVICEOBJINSTANCEFLAGS
    DIDOI_ASPECTACCEL    = 768 (&H300)
    DIDOI_ASPECTFORCE    = 1024 (&H400)
    DIDOI_ASPECTMASK     = 3840 (&HF00)
    DIDOI_ASPECTPOSITION = 256 (&H100)
    DIDOI_ASPECTVELOCITY = 512 (&H200)
    DIDOI_FFACTUATOR     = 1
    DIDOI_FFEFFECTTRIGGER = 2
    DIDOI_GUIDISUSAGE    = 4096 (&H1000)
    DIDOI_POLLED         = 32768 (&H8000)
End Enum
```

### Constants

#### DIDOI\_ASPECTACCEL

The object reports acceleration information.

#### DIDOI\_ASPECTFORCE

The object reports force information.

#### DIDOI\_ASPECTMASK

The bits that are used to report aspect information. An object can represent at most one aspect.

#### DIDOI\_ASPECTPOSITION

The object reports position information.

#### DIDOI\_ASPECTVELOCITY

---

# IDH\_CONST\_DIDEVICEOBJINSTANCEFLAGS\_dinput\_vb

The object reports velocity information.

DIDOI\_FFACTUATOR

The object can have force-feedback effects applied to it.

DIDOI\_FFEFFECTTRIGGER

The object can trigger playback of force-feedback effects.

DIDOI\_GUIDISUSAGE

**DIOBJECTDATAFORMAT.strGuid** contains Human Interface Device (HID) usage and usage page in packed form.

DIDOI\_POLLED

The object does not return data until the **DirectInputDevice8.Poll** method is called.

## CONST\_DIDFTFLAGS

#Used in the *flags* parameter of the **DirectInputDevice8.GetDeviceObjectsEnum** method to specify the type of device object to enumerate. These values are also returned by the **DirectInputDeviceObjectInstance.GetFlags** method to describe capabilities of the device object.

```
Enum CONST_DIDFTFLAGS
    DIDFT_ABSAXIS      =    2
    DIDFT_ALL          =    0
    DIDFT_ANYINSTANCE  = 16776960 (&HFFFF00)
    DIDFT_AXIS         =    3
    DIDFT_BUTTON       =   12
    DIDFT_COLLECTION   =   64 (&H40)
    DIDFT_FFACTUATOR   = 16777216 (&H1000000)
    DIDFT_FFEFFECTTRIGGER = 33554432 (&H2000000)
    DIDFT_INSTANCEMASK = 16776960 (&HFFFF00)
    DIDFT_NOCOLLECTION = 16776960 (&HFFFF00)
    DIDFT_NODATA       =   128 (&H80)
    DIDFT_OUTPUT       = 268435456 (&H10000000)
    DIDFT_POV          =   16 (&H10)
    DIDFT_PSHBUTTON    =    4
    DIDFT_RELAXIS      =    1
    DIDFT_TGLBUTTON    =    8
End Enum
```

### Constants

DIDFT\_ABSAXIS

Absolute axis.

DIDFT\_ALIAS

---

# IDH\_CONST\_DIDFTFLAGS\_dinput\_vb

Controls identified by a Human Interface Device (HID) usage alias. This flag applies only to HID-compliant USB devices.

**DIDFT\_ALL**

All objects.

**DIDFT\_ANYINSTANCE**

Use the first instance enumerated that meets other criteria such as **DIDFT\_AXIS** or **DIDFT\_BUTTON**.

**DIDFT\_AXIS**

Axis, either absolute or relative.

**DIDFT\_BUTTON**

Push button or a toggle button.

**DIDFT\_COLLECTION**

Human Interface Device (HID) link collection. HID link collections do not generate data of their own.

**DIDFT\_FFACTUATOR**

Object that contains a force-feedback actuator. In other words, forces can be applied to this object.

**DIDFT\_FFEFFECTTRIGGER**

Object that can be used to trigger force-feedback effects.

**DIDFT\_INSTANCEMASK**

Same as **DIDFT\_ANYINSTANCE**.

**DIDFT\_NOCOLLECTION**

Object that does not belong to any HID link collection; in other words, an object for which **DirectInputDeviceObjectInstance.GetCollectionNumber** returns 0.

**DIDFT\_NODATA**

Object that does not generate data.

**DIDFT\_OUTPUT**

Object to which data can be sent by using the **DirectInputDevice8.SendDeviceData** method.

**DIDFT\_POV**

Point-of-view controller.

**DIDFT\_PSHBUTTON**

Push button. A push button is reported as down when the user presses it and as up when the user releases it.

**DIDFT\_RELAXIS**

Relative axis.

**DIDFT\_TGLBUTTON**

Toggle button. A toggle button is reported as down when the user presses it and remains so until the user presses the button a second time.

**DIDFT\_VENDORDEFINED**

An object of a type defined by the manufacturer.

## CONST\_DIDGDDFLAGS

#Used in the *flags* parameter of the **DirectInputDevice8.GetDeviceData** method to control the manner in which data is obtained.

```
Enum CONST_DIDGDDFLAGS
    DIGDD_DEFAULT = 0
    DIGDD_PEEK    = 1
End Enum
```

### Constants

**DIGDD\_DEFAULT**  
Remove retrieved items from the buffer.

**DIGDD\_PEEK**  
Do not remove retrieved items from the buffer. A subsequent **GetDeviceData** call will read the same data.

## CONST\_DIDIFTFLAGS

#

Used in the *flags* member of the **DIDeviceImageInfo** type to specify the type of the file.

```
Enum CONST_DIDIFTFLAGS
    DIDIFT_CONFIGURATION = 1
    DIDIFT_OVERLAY      = 2
End Enum
```

### Constants

**DIDIFT\_CONFIGURATION**  
The file is used to display the current configuration of actions on the device. Overlay image coordinates are relative to the upper-left corner of the configuration image.

**DIDIFT\_OVERLAY**  
The file is an overlay for a configuration image. The **OverlayOffset**, **OverlayRect**, **ObjID**, **CalloutLine**, **CalloutRect**, and **TextAlign** members are valid and contain data used to display the overlay and callout information for a single control on the device.

---

```
# IDH_CONST_DIDGDDFLAGS_dinput_vb
# IDH_CONST_DIDIFTFLAGS_dinput_vb
```

## CONST\_DIDSAMFLAGS

#Used in the **DirectInputDevice8.SetActionMap** method.

```
Enum CONST_DIDSAMFLAGS
    DIDSAM_DEFAULT    = 0
    DIDSAM_NOUSER     = 1
    DIDSAM_FORCESAVE  = 2
End Enum
```

### Constants

DIDSAM\_DEFAULT

Set the action map for this user. If the map differs from the current map, the new settings are saved to disk.

DIDSAM\_FORCESAVE

Always save the configuration to disk.

DIDSAM\_NOUSER

Reset user ownership for this device in the default configuration property sheet. Resetting user ownership does not remove the current action map.

## CONST\_DIEDBSFLFLAGS

#Used in the **DirectInput8.GetDevicesBySemantics** method to specify the scope of the enumeration.

```
Enum CONST_DIEDBSFLFLAGS
    DIEDBSFL_ATTACHEDONLY    = 0
    DIEDBSFL_AVAILABLEDEVICES = 4096 (&H1000)
    DIEDBSFL_FORCEFEEDBACK   = 256 (&H100)
    DIEDBSFL_MULTIMICEKEYBOARDS = 8192 (&H2000)
    DIEDBSFL_NONGAMINGDEVICES = 16384 (&H4000)
    DIEDBSFL_THISUSER        = 16 (&H10)
    DIEDBSFL_VALID           = 4368 (&H1110)
End Enum
```

### Constants

DIEDBSFL\_ATTACHEDONLY

Only attached and installed devices are enumerated.

DIEDBSFL\_AVAILABLEDEVICES

Only unowned, installed devices are enumerated.

DIEDBSFL\_FORCEFEEDBACK

---

# IDH\_CONST\_DIDSAMFLAGS\_dinput\_vb

# IDH\_CONST\_DIEDBSFLFLAGS\_dinput\_vb

Only devices that support force feedback are enumerated.

#### DIEDBSFL\_MULTIMICEKEYBOARDS

Only secondary (non-system) keyboard and mouse devices.

#### DIEDBSFL\_NONGAMINGDEVICES

Only HID-compliant devices whose primary purpose is not as a gaming device. Devices such as USB speakers and multimedia buttons on some keyboards would fall within this value.

#### DIEDBSFL\_THISUSER

All installed devices for the user identified by *str1*, and all unowned devices, are enumerated.

#### DIEDBSFL\_VALID

Not used by applications.

## CONST\_DIEFFFLAGS

#Used in the **IFlags** member of the **DIEFFECT** type.

```
Enum CONST_DIEFFFLAGS
    DIEFF_CARTESIAN    = 16 (&H10)
    DIEFF_OBJECTOFFSETS = 2
    DIEFF_POLAR        = 32 (&H20)
End Enum
```

### Constants

#### DIEFF\_CARTESIAN

The direction of the effect is given in Cartesian coordinates. **DIEFFECT.x** and **DIEFFECT.y** contain valid values.

#### DIEFF\_OBJECTOFFSETS

The value of the **ITriggerButton** member of **DIEFFECT** is the offset of the button in the data structure for the device.

#### DIEFF\_POLAR

The direction of the effect is given in polar coordinates. **DIEFFECT.x** contains a valid value.

### Remarks

The default behavior of **DirectInputDevice8.CreateEffect** and **DirectInputDevice8.CreateCustomEffect** is to create the effect as if **DIEFFECT.IFlags** contained (DIEFF\_OBJECTOFFSETS Or DIEFF\_POLAR). In other words, it is not necessary to specify these flags.

---

# IDH\_CONST\_DIEFFFLAGS\_dinput\_vb

## CONST\_DIEFTFLAGS

\*Used to describe types and capabilities of force-feedback effects. These flags restrict effect enumeration in the **DirectInputDevice8.GetEffectsEnum** method to one or more of the primary types. They are also returned by the **DirectInputEnumEffects.GetType** method.

```
Enum CONST_DIEFTFLAGS
    DIEFT_ALL           = 0
    DIEFT_CONDITION     = 4
    DIEFT_CONSTANTFORCE = 1
    DIEFT_CUSTOMFORCE   = 5
    DIEFT_DEADBAND      = 16384 (&H4000)
    DIEFT_FFATTACK      = 512 (&H200)
    DIEFT_FFFADE        = 1024 (&H400)
    DIEFT_HARDWARE      = 255 (&HFF)
    DIEFT_PERIODIC      = 3
    DIEFT_POSNEGCOEFFICIENTS = 4096 (&H1000)
    DIEFT_POSNEGSATURATION = 8192 (&H2000)
    DIEFT_RAMPFORCE     = 2
    DIEFT_SATURATION     = 2048 (&H800)
End Enum
```

### Constants

**DIEFT\_ALL**  
All effects are to be enumerated.

**DIEFT\_CONDITION**  
The effect is a condition, or conditions are to be enumerated.

**DIEFT\_CONSTANTFORCE**  
The effect is a constant force, or constant forces are to be enumerated.

**DIEFT\_CUSTOMFORCE**  
The effect is a custom force, or custom forces are to be enumerated.

**DIEFT\_DEADBAND**  
The effect supports deadband.

**DIEFT\_FFATTACK**  
The effect supports attack.

**DIEFT\_FFFADE**  
The effect supports fade.

**DIEFT\_HARDWARE**  
The effect is specific to the hardware, or hardware effects are to be enumerated.

**DIEFT\_PERIODIC**  
The effect is periodic, or periodic effects are to be enumerated.

---

# IDH\_CONST\_DIEFTFLAGS\_dinput\_vb



**DIEFT\_POSNEGCOEFFICIENTS**

The condition supports different positive and negative coefficients.

**DIEFT\_POSNEGSATURATION**

The effect supports different positive and negative saturation.

**DIEFT\_RAMPFORCE**

The effect is a ramp force, or ramp forces are to be enumerated.

**DIEFT\_SATURATION**

The effect supports saturation.

**See Also****CONST\_DIDEVCAPSFLAGS**

## **CONST\_DIEGESFLAGS**

\*Returned by the **DirectInputEffect.GetEffectStatus** method.

Enum CONST\_DIEGESFLAGS

DIEGES\_EMULATED = 2

DIEGES\_PLAYING = 1

End Enum

**Constants****DIEGES\_EMULATED**

The effect is emulated.

**DIEGES\_PLAYING**

The effect is playing.

## **CONST\_DIENUMDEVICESFLAGS**

\*Used in the *flags* parameter of the **DirectInput8.GetDIDevices** method to indicate whether all devices or only attached devices are to be enumerated.

Enum CONST\_DIENUMDEVICESFLAGS

DIEDFL\_ALLDEVICES = 0

DIEDFL\_ATTACHEDONLY = 1

DIEDFL\_FORCEFEEDBACK = 256 (&H100)

DIEDFL\_INCLUDEALIASES = 65536 (&H10000)

DIEDFL\_INCLUDEHIDDEN = 262144 (&H40000)

DIEDFL\_INCLUDEPHANTOMS = 131072 (&H20000)

End Enum

---

# IDH\_CONST\_DIEGESFLAGS\_dinput\_vb

# IDH\_CONST\_DIENUMDEVICESFLAGS\_dinput\_vb

## Constants

DIEDFL\_ALLDEVICES

All installed devices. This is the default behavior.

DIEDFL\_ATTACHEDONLY

Only attached and installed devices.

DIEDFL\_FORCEFEEDBACK

Only devices that support force feedback.

DIEDFL\_INCLUDEALIASES

Include devices that are aliases for other devices.

DIEDFL\_INCLUDEHIDDEN

Include hidden devices. For more information about hidden devices, see

**CONST\_DIDEVCAPSFLAGS**.

DIEDFL\_INCLUDEPHANTOMS

Include phantom (placeholder) devices.

## CONST\_DIEPFLAGS

#Miscellaneous flags for effects. Some members are passed to the

**DirectInputEffect.SetParameters** method to specify which parameters are being set and the subsequent behavior of the effect. Some members are returned by the

**DirectInputEnumEffects.GetStaticParams** and

**DirectInputEnumEffects.GetDynamicParams** methods to describe support for the parameter.

Enum CONST\_DIEPFLAGS

```

DIEP_ALLPARAMS      =    1023 (&H3FF)
DIEP_AXES            =     32 (&H20)
DIEP_DIRECTION       =     64 (&H40)
DIEP_DURATION        =      1
DIEP_ENVELOPE        =    128 (&H80)
DIEP_GAIN            =      4
DIEP_NODOWNLOAD      = -2147483648 (&H80000000)
DIEP_NORESTART       = 1073741824 (&H40000000)
DIEP_SAMPLEPERIOD    =      2
DIEP_START           = 536870912 (&H20000000)
DIEP_STARTDELAY      =    512 (&H200)
DIEP_TRIGGERBUTTON   =      8
DIEP_TRIGGERREPEATINTERVAL =    16 (&H10)
DIEP_TYPESPECIFICPARAMS = 256 (&H100)

```

End Enum

---

# IDH\_CONST\_DIEPFLAGS\_dinput\_vb

---

## Constants

### DIEP\_ALLPARAMS

Not used.

### DIEP\_AXES

Not used

### DIEP\_DIRECTION

The **x** and **y** members of **DIEFFECT** are valid, or a direction parameter is supported. If you are setting or requesting effect parameters, you can specify that the direction is supplied or is to be returned in either Cartesian or polar coordinates by specifying **DIEFF\_CARTESIAN** or **DIEFF\_POLAR** in **DIEFFECT.IFlags**.

### DIEP\_DURATION

The **IDuration** member of **DIEFFECT** is valid, or the effect supports changing of the duration.

### DIEP\_ENVELOPE

The **envelope** member of **DIEFFECT** is valid, or the effect supports the application of an envelope.

### DIEP\_GAIN

The **IGain** member of **DIEFFECT** is valid, or the effect supports the application of gain.

### DIEP\_NODOWNLOAD

After setting parameters, the effect is not to be downloaded.

### DIEP\_NORESTART

Suppress the stopping and restarting of the effect in order to change parameters.

### DIEP\_SAMPLEPERIOD

The **ISamplePeriod** member of **DIEFFECT** is valid.

### DIEP\_START

Start the effect immediately.

### DIEP\_STARTDELAY

The **IStartDelay** member of **DIEFFECT** is valid, or the effect supports delayed start.

### DIEP\_TRIGGERBUTTON

The **ITriggerButton** member of **DIEFFECT** is valid, or the effect supports a trigger button.

### DIEP\_TRIGGERREPEATINTERVAL

The **ITriggerRepeatInterval** member of **DIEFFECT** is valid, or the effect supports trigger repeat.

### DIEP\_TYPESPECIFICPARAMS

The effect has type-specific parameters that can be changed by the application. This value is returned by **DirectInputEnumEffects.GetStaticParams** for all standard effects and for hardware-specific effects with application-modifiable parameters. Microsoft® DirectX® for Microsoft Visual Basic® supports hardware effects only if they do not have this flag set.

## CONST\_DIESFLAGS

#Used in the *flags* parameter of **DirectInputEffect.Start** to control behavior of force-feedback effect playback.

```
Enum CONST_DIESFLAGS
    DIES_NODOWNLOAD = -2147483648 (&H80000000)
    DIES_SOLO      =      1
End Enum
```

### Constants

DIES\_NODOWNLOAD

Do not automatically download the effect.

DIES\_SOLO

Stop all other effects before playing this effect. If this flag is omitted, the effect is mixed with effects already playing on the device.

## CONST\_DIFEFFLAGS

#Used in the *flags* member of the **DirectInputDevice8.CreateEffectFromFile** method.

```
Enum CONST_DIFEFFLAGS
    DIFEF_DEFAULT      = 0
    DIFEF_INCLUDENONSTANDARD = 1
    DIFEF_MODIFYIFNEEDED = 16 (&H10)
End Enum
```

### Constants

DIFEF\_DEFAULT

Do not create a nonstandard effect or modify the effect parameters.

DIFEF\_INCLUDENONSTANDARD

Create an effect type that is not predefined by Microsoft® DirectInput®. If this flag is not set, the method fails when called on such effects.

DIFEF\_MODIFYIFNEEDED

Instruct DirectInput® to modify the authored effect, if necessary, so that it plays on the current device. For example, by default, an effect authored for two axes does not play on a single-axis device. Setting this flag allows the effect to play on a single axis.

---

```
# IDH_CONST_DIESFLAGS_dinput_vb
```

```
# IDH_CONST_DIFEFFLAGS_dinput_vb
```

## CONST\_DIGENRE

\*Used in the **ISemantic** member of the **DIACTION** type to specify virtual controls and in the **IGenre** member of **DIACTIONFORMAT** to specify the application genre for action mapping.

For further details on any of the constants in this enumeration, see the appropriate section of the Action Mapping Constants page.

### Enum CONST\_DIGENRE

DIAXIS_2DCONTROL_INOUT	= 587301379 (&H23018203)
DIAXIS_2DCONTROL_LATERAL	= 587235841 (&H23008201)
DIAXIS_2DCONTROL_MOVE	= 587268610 (&H23010202)
DIAXIS_2DCONTROL_ROTATEZ	= 587350532 (&H23024204)
DIAXIS_3DCONTROL_INOUT	= 604078595 (&H24018203)
DIAXIS_3DCONTROL_LATERAL	= 604013057 (&H24008201)
DIAXIS_3DCONTROL_MOVE	= 604045826 (&H24010202)
DIAXIS_3DCONTROL_ROTATEX	= 604193284 (&H24034204)
DIAXIS_3DCONTROL_ROTATEY	= 604160517 (&H2402C205)
DIAXIS_3DCONTROL_ROTATEZ	= 604127750 (&H24024206)
DIAXIS_ARCADEP_LATERAL	= 570458625 (&H22008201)
DIAXIS_ARCADEP_MOVE	= 570491394 (&H22010202)
DIAXIS_ARCADES_LATERAL	= 553681409 (&H21008201)
DIAXIS_ARCADES_MOVE	= 553714178 (&H21010202)
DIAXIS_BASEBALLB_LATERAL	= 251691521 (&H0F008201)
DIAXIS_BASEBALLB_MOVE	= 251724290 (&H0F010202)
DIAXIS_BASEBALLF_LATERAL	= 285245953 (&H11008201)
DIAXIS_BASEBALLF_MOVE	= 285278722 (&H11010202)
DIAXIS_BASEBALLP_LATERAL	= 268468737 (&H10008201)
DIAXIS_BASEBALLP_MOVE	= 268501506 (&H10010202)
DIAXIS_BBALLD_LATERAL	= 318800385 (&H13008201)
DIAXIS_BBALLD_MOVE	= 318833154 (&H13010202)
DIAXIS_BBALLO_LATERAL	= 302023169 (&H12008201)
DIAXIS_BBALLO_MOVE	= 302055938 (&H12010202)
DIAXIS_BIKINGM_BRAKE	= 470041091 (&H1C044203)
DIAXIS_BIKINGM_PEDAL	= 469828098 (&H1C010202)
DIAXIS_BIKINGM_TURN	= 469795329 (&H1C008201)
DIAXIS_BROWSER_LATERAL	= 671121921 (&H28008201)
DIAXIS_BROWSER_MOVE	= 671154690 (&H28010202)
DIAXIS_BROWSER_VIEW	= 671187459 (&H28018203)
DIAXIS_CADF_INOUT	= 620855811 (&H25018203)
DIAXIS_CADF_LATERAL	= 620790273 (&H25008201)
DIAXIS_CADF_MOVE	= 620823042 (&H25010202)
DIAXIS_CADF_ROTATEX	= 620970500 (&H25034204)
DIAXIS_CADF_ROTATEY	= 620937733 (&H2502C205)

# IDH\_CONST\_DIGENRE\_dinput\_vb

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DIAXIS_CADF_ROTATEZ	= 620904966 (&H25024206)
DIAXIS_CADM_INOUT	= 637633027 (&H26018203)
DIAXIS_CADM_LATERAL	= 637567489 (&H26008201)
DIAXIS_CADM_MOVE	= 637600258 (&H26010202)
DIAXIS_CADM_ROTATEX	= 637747716 (&H26034204)
DIAXIS_CADM_ROTATEY	= 637714949 (&H2602C205)
DIAXIS_CADM_ROTATEZ	= 637682182 (&H26024206)
DIAXIS_DRIVINGC_ACCEL_AND_BRAKE	= 33638916 (&H02014A04)
DIAXIS_DRIVINGC_ACCELERATE	= 33788418 (&H02039202)
DIAXIS_DRIVINGC_BRAKE	= 33821187 (&H02041203)
DIAXIS_DRIVINGC_STEER	= 33589761 (&H03008A01)
DIAXIS_DRIVINGR_ACCEL_AND_BRAKE	= 16861700 (&H01014A04)
DIAXIS_DRIVINGR_ACCELERATE	= 17011202 (&H01039202)
DIAXIS_DRIVINGR_BRAKE	= 17043971 (&H01041203)
DIAXIS_DRIVINGR_STEER	= 16812545 (&H01008A01)
DIAXIS_DRIVINGT_ACCEL_AND_BRAKE	= 50416133 (&H03014A05)
DIAXIS_DRIVINGT_ACCELERATE	= 50565635 (&H03039203)
DIAXIS_DRIVINGT_BARREL	= 50397698 (&H03010202)
DIAXIS_DRIVINGT_BRAKE	= 50614788 (&H03045204)
DIAXIS_DRIVINGT_STEER	= 50366977 (&H03008A01)
DIAXIS_FIGHTINGH_LATERAL	= 134251009 (&H08008201)
DIAXIS_FIGHTINGH_MOVE	= 134283778 (&H08010202)
DIAXIS_FIGHTINGH_ROTATE	= 134365699 (&H08024203)
DIAXIS_FISHING_LATERAL	= 234914305 (&H0E008201)
DIAXIS_FISHING_MOVE	= 234947074 (&H0E010202)
DIAXIS_FISHING_ROTATE	= 235028995 (&H0E024203)
DIAXIS_FLYINGC_BANK	= 67144193 (&H04008A01)
DIAXIS_FLYINGC_BRAKE	= 67398148 (&H04046A04)
DIAXIS_FLYINGC_FLAPS	= 67459590 (&H04055A06)
DIAXIS_FLYINGC_PITCH	= 67176962 (&H04010A02)
DIAXIS_FLYINGC_RUDDER	= 67260933 (&H04025205)
DIAXIS_FLYINGC_THROTTLE	= 67342851 (&H04039203)
DIAXIS_FLYINGH_BANK	= 100698625 (&H06008A01)
DIAXIS_FLYINGH_COLLECTIVE	= 100764163 (&H06018A03)
DIAXIS_FLYINGH_PITCH	= 100731394 (&H06010A02)
DIAXIS_FLYINGH_THROTTLE	= 100915717 (&H0603DA05)
DIAXIS_FLYINGH_TORQUE	= 100817412 (&H06025A04)
DIAXIS_FLYINGM_BANK	= 83921409 (&H05008A01)
DIAXIS_FLYINGM_BRAKE	= 84173317 (&H05046205)
DIAXIS_FLYINGM_FLAPS	= 84234758 (&H05055206)
DIAXIS_FLYINGM_PITCH	= 83954178 (&H05010A02)
DIAXIS_FLYINGM_RUDDER	= 84036100 (&H05024A04)
DIAXIS_FLYINGM_THROTTLE	= 84120067 (&H05039203)
DIAXIS_FOOTBALLD_LATERAL	= 385909249 (&H17008201)
DIAXIS_FOOTBALLD_MOVE	= 385942018 (&H17010202)
DIAXIS_FOOTBALLO_LATERAL	= 369132033 (&H16008201)

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DIAXIS_FOOTBALLO_MOVE	= 369164802 (&H16010202)
DIAXIS_FOOTBALLQ_LATERAL	= 352354817 (&H15008201)
DIAXIS_FOOTBALLQ_MOVE	= 352387586 (&H15010202)
DIAXIS_FPS_LOOKUPDOWN	= 151093763 (&H09018203)
DIAXIS_FPS_MOVE	= 151060994 (&H09010202)
DIAXIS_FPS_ROTATE	= 151028225 (&H09008201)
DIAXIS_FPS_SIDESTEP	= 151142916 (&H09024204)
DIAXIS_GOLF_LATERAL	= 402686465 (&H18008201)
DIAXIS_GOLF_MOVE	= 402719234 (&H18010202)
DIAXIS_HOCKEYD_LATERAL	= 436240897 (&H1A008201)
DIAXIS_HOCKEYD_MOVE	= 436273666 (&H1A010202)
DIAXIS_HOCKEYG_LATERAL	= 453018113 (&H1B008201)
DIAXIS_HOCKEYG_MOVE	= 453050882 (&H1B010202)
DIAXIS_HOCKEYO_LATERAL	= 419463681 (&H19008201)
DIAXIS_HOCKEYO_MOVE	= 419496450 (&H19010202)
DIAXIS_HUNTING_LATERAL	= 218137089 (&H0D008201)
DIAXIS_HUNTING_MOVE	= 218169858 (&H0D010202)
DIAXIS_HUNTING_ROTATE	= 218251779 (&H0D024203)
DIAXIS_MECHA_ROTATE	= 687997443 (&H29020203)
DIAXIS_MECHA_STEER	= 687899137 (&H29008201)
DIAXIS_MECHA_THROTTLE	= 688095748 (&H29038204)
DIAXIS_MECHA_TORSO	= 687931906 (&H29010202)
DIAXIS_RACQUET_LATERAL	= 536904193 (&H20008201)
DIAXIS_RACQUET_MOVE	= 536936962 (&H20010202)
DIAXIS_REMOTE_SLIDER	= 654639617 (&H27050201)
DIAXIS_REMOTE_SLIDER2	= 654656002 (&H27054202)
DIAXIS_SKIING_SPEED	= 486605314 (&H1D010202)
DIAXIS_SKIING_TURN	= 486572545 (&H1D008201)
DIAXIS_SOCCERD_LATERAL	= 520126977 (&H1F008201)
DIAXIS_SOCCERD_MOVE	= 520159746 (&H1F010202)
DIAXIS_SOCCERO_BEND	= 503415299 (&H1E018203)
DIAXIS_SOCCERO_LATERAL	= 503349761 (&H1E008201)
DIAXIS_SOCCERO_MOVE	= 503382530 (&H1E010202)
DIAXIS_SPACESIM_CLIMB	= 117555716 (&H0701C204)
DIAXIS_SPACESIM_LATERAL	= 117473793 (&H07008201)
DIAXIS_SPACESIM_MOVE	= 117506562 (&H07010202)
DIAXIS_SPACESIM_ROTATE	= 117588485 (&H07024205)
DIAXIS_SPACESIM_THROTTLE	= 117670403 (&H07038203)
DIAXIS_STRATEGYR_LATERAL	= 184582657 (&H0B008201)
DIAXIS_STRATEGYR_MOVE	= 184615426 (&H0B010202)
DIAXIS_STRATEGYR_ROTATE	= 184697347 (&H0B024203)
DIAXIS_STRATEGYT_LATERAL	= 201359873 (&H0C008201)
DIAXIS_STRATEGYT_MOVE	= 201392642 (&H0C010202)
DIAXIS_TPS_MOVE	= 167838210 (&H0A010202)
DIAXIS_TPS_STEP	= 167821827 (&H0A00C203)
DIAXIS_TPS_TURN	= 167903745 (&H0A020201)

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DIBUTTON_2DCONTROL_DEVICE	= 587220222 (&H230044FE)
DIBUTTON_2DCONTROL_DISPLAY	= 587219973 (&H23004405)
DIBUTTON_2DCONTROL_MENU	= 587203837 (&H230004FD)
DIBUTTON_2DCONTROL_PAUSE	= 587220220 (&H230044FC)
DIBUTTON_2DCONTROL_SELECT	= 587203585 (&H23000401)
DIBUTTON_2DCONTROL_SPECIAL	= 587203587 (&H23000403)
DIBUTTON_2DCONTROL_SPECIAL1	= 587203586 (&H23000402)
DIBUTTON_2DCONTROL_SPECIAL2	= 587203588 (&H23000404)
DIBUTTON_3DCONTROL_DEVICE	= 603997438 (&H240044FE)
DIBUTTON_3DCONTROL_DISPLAY	= 603997189 (&H24004405)
DIBUTTON_3DCONTROL_MENU	= 603981053 (&H240004FD)
DIBUTTON_3DCONTROL_PAUSE	= 603997436 (&H240044FC)
DIBUTTON_3DCONTROL_SELECT	= 603980801 (&H24000401)
DIBUTTON_3DCONTROL_SPECIAL	= 603980803 (&H24000403)
DIBUTTON_3DCONTROL_SPECIAL1	= 603980802 (&H24000402)
DIBUTTON_3DCONTROL_SPECIAL2	= 603980804 (&H24000404)
DIBUTTON_ARCADEP_BACK_LINK	= 570508520 (&H220144E8)
DIBUTTON_ARCADEP_CROUCH	= 570426371 (&H22000403)
DIBUTTON_ARCADEP_DEVICE	= 570443006 (&H220044FE)
DIBUTTON_ARCADEP_FIRE	= 570426370 (&H22000402)
DIBUTTON_ARCADEP_FIRESECONDARY	= 570442758 (&H22004406)
DIBUTTON_ARCADEP_FORWARD_LINK	= 570508512 (&H220144E0)
DIBUTTON_ARCADEP_JUMP	= 570426369 (&H22000401)
DIBUTTON_ARCADEP_LEFT_LINK	= 570475748 (&H2200C4E4)
DIBUTTON_ARCADEP_MENU	= 570426621 (&H220004FD)
DIBUTTON_ARCADEP_PAUSE	= 570443004 (&H220044FC)
DIBUTTON_ARCADEP_RIGHT_LINK	= 570475756 (&H2200C4EC)
DIBUTTON_ARCADEP_SELECT	= 570426373 (&H22000405)
DIBUTTON_ARCADEP_SPECIAL	= 570426372 (&H22000404)
DIBUTTON_ARCADEP_VIEW_DOWN_LINK	= 570934504 (&H2207C4E8)
DIBUTTON_ARCADEP_VIEW_LEFT_LINK	= 570934500 (&H2207C4E4)
DIBUTTON_ARCADEP_VIEW_RIGHT_LINK	= 570934508 (&H2207C4EC)
DIBUTTON_ARCADEP_VIEW_UP_LINK	= 570934496 (&H2207C4E0)
DIBUTTON_ARCADES_ATTACK	= 553649155 (&H21000403)
DIBUTTON_ARCADES_BACK_LINK	= 553731304 (&H210144E8)
DIBUTTON_ARCADES_CARRY	= 553649154 (&H21000402)
DIBUTTON_ARCADES_DEVICE	= 553665790 (&H210044FE)
DIBUTTON_ARCADES_FORWARD_LINK	= 553731296 (&H210144E0)
DIBUTTON_ARCADES_LEFT_LINK	= 553698532 (&H2100C4E4)
DIBUTTON_ARCADES_MENU	= 553649405 (&H210004FD)
DIBUTTON_ARCADES_PAUSE	= 553665788 (&H210044FC)
DIBUTTON_ARCADES_RIGHT_LINK	= 553698540 (&H2100C4EC)
DIBUTTON_ARCADES_SELECT	= 553649157 (&H21000405)
DIBUTTON_ARCADES_SPECIAL	= 553649156 (&H21000404)
DIBUTTON_ARCADES_THROW	= 553649153 (&H21000401)
DIBUTTON_ARCADES_VIEW_DOWN_LINK	= 554157288 (&H2107C4E8)



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DIBUTTON\_ARCADES\_VIEW\_LEFT\_LINK = 554157284 (&H2107C4E4)  
DIBUTTON\_ARCADES\_VIEW\_RIGHT\_LINK = 554157292 (&H2107C4EC)  
DIBUTTON\_ARCADES\_VIEW\_UP\_LINK = 554157280 (&H2107C4E0)  
DIBUTTON\_BASEBALLB\_BACK\_LINK = 251741416 (&H0F0144E8)  
DIBUTTON\_BASEBALLB\_BOX = 251675658 (&H0F00440A)  
DIBUTTON\_BASEBALLB\_BUNT = 251659268 (&H0F000404)  
DIBUTTON\_BASEBALLB\_BURST = 251659270 (&H0F000406)  
DIBUTTON\_BASEBALLB\_CONTACT = 251659272 (&H0F000408)  
DIBUTTON\_BASEBALLB\_DEVICE = 251675902 (&H0F0044FE)  
DIBUTTON\_BASEBALLB\_FORWARD\_LINK = 251741408 (&H0F0144E0)  
DIBUTTON\_BASEBALLB\_LEFT\_LINK = 251708644 (&H0F00C4E4)  
DIBUTTON\_BASEBALLB\_MENU = 251659517 (&H0F0004FD)  
DIBUTTON\_BASEBALLB\_NORMAL = 251659266 (&H0F000402)  
DIBUTTON\_BASEBALLB\_NOSTEAL = 251675657 (&H0F004409)  
DIBUTTON\_BASEBALLB\_PAUSE = 251675900 (&H0F0044FC)  
DIBUTTON\_BASEBALLB\_POWER = 251659267 (&H0F000403)  
DIBUTTON\_BASEBALLB\_RIGHT\_LINK = 251708652 (&H0F00C4EC)  
DIBUTTON\_BASEBALLB\_SELECT = 251659265 (&H0F000401)  
DIBUTTON\_BASEBALLB\_SLIDE = 251659271 (&H0F000407)  
DIBUTTON\_BASEBALLB\_STEAL = 251659269 (&H0F000405)  
DIBUTTON\_BASEBALLF\_AIM\_LEFT\_LINK = 285263076 (&H1100C4E4)  
DIBUTTON\_BASEBALLF\_AIM\_RIGHT\_LINK = 285263084 (&H1100C4EC)  
DIBUTTON\_BASEBALLF\_BACK\_LINK = 285295848 (&H110144E8)  
DIBUTTON\_BASEBALLF\_BURST = 285213700 (&H11000404)  
DIBUTTON\_BASEBALLF\_DEVICE = 285230334 (&H110044FE)  
DIBUTTON\_BASEBALLF\_DIVE = 285213702 (&H11000406)  
DIBUTTON\_BASEBALLF\_FORWARD\_LINK = 285295840 (&H110144E0)  
DIBUTTON\_BASEBALLF\_JUMP = 285213701 (&H11000405)  
DIBUTTON\_BASEBALLF\_MENU = 285213949 (&H110004FD)  
DIBUTTON\_BASEBALLF\_NEAREST = 285213697 (&H11000401)  
DIBUTTON\_BASEBALLF\_PAUSE = 285230332 (&H110044FC)  
DIBUTTON\_BASEBALLF\_SHIFTIN = 285230087 (&H11004407)  
DIBUTTON\_BASEBALLF\_SHIFTOUT = 285230088 (&H11004408)  
DIBUTTON\_BASEBALLF\_THROW1 = 285213698 (&H11000402)  
DIBUTTON\_BASEBALLF\_THROW2 = 285213699 (&H11000403)  
DIBUTTON\_BASEBALLP\_BACK\_LINK = 268518632 (&H100144E8)  
DIBUTTON\_BASEBALLP\_BASE = 268436483 (&H10000403)  
DIBUTTON\_BASEBALLP\_DEVICE = 268453118 (&H100044FE)  
DIBUTTON\_BASEBALLP\_FAKE = 268436485 (&H10000405)  
DIBUTTON\_BASEBALLP\_FORWARD\_LINK = 268518624 (&H100144E0)  
DIBUTTON\_BASEBALLP\_LEFT\_LINK = 268485860 (&H1000C4E4)  
DIBUTTON\_BASEBALLP\_LOOK = 268452871 (&H10004407)  
DIBUTTON\_BASEBALLP\_MENU = 268436733 (&H100004FD)  
DIBUTTON\_BASEBALLP\_PAUSE = 268453116 (&H100044FC)  
DIBUTTON\_BASEBALLP\_PITCH = 268436482 (&H10000402)  
DIBUTTON\_BASEBALLP\_RIGHT\_LINK = 268485868 (&H1000C4EC)

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DIBUTTON_BASEBALLP_SELECT	= 268436481 (&H10000401)
DIBUTTON_BASEBALLP_THROW	= 268436484 (&H10000404)
DIBUTTON_BASEBALLP_WALK	= 268452870 (&H10004406)
DIBUTTON_BBALLD_BACK_LINK	= 318850280 (&H130144E8)
DIBUTTON_BBALLD_BURST	= 318768134 (&H13000406)
DIBUTTON_BBALLD_DEVICE	= 318784766 (&H130044FE)
DIBUTTON_BBALLD_FAKE	= 318768131 (&H13000403)
DIBUTTON_BBALLD_FORWARD_LINK	= 318850272 (&H130144E0)
DIBUTTON_BBALLD_JUMP	= 318768129 (&H13000401)
DIBUTTON_BBALLD_LEFT_LINK	= 318817508 (&H1300C4E4)
DIBUTTON_BBALLD_MENU	= 318768381 (&H130004FD)
DIBUTTON_BBALLD_PAUSE	= 318784764 (&H130044FC)
DIBUTTON_BBALLD_PLAY	= 318768135 (&H13000407)
DIBUTTON_BBALLD_PLAYER	= 318768133 (&H13000405)
DIBUTTON_BBALLD_RIGHT_LINK	= 318817516 (&H1300C4EC)
DIBUTTON_BBALLD_SPECIAL	= 318768132 (&H13000404)
DIBUTTON_BBALLD_STEAL	= 318768130 (&H13000402)
DIBUTTON_BBALLD_SUBSTITUTE	= 318784521 (&H13004409)
DIBUTTON_BBALLD_TIMEOUT	= 318784520 (&H13004408)
DIBUTTON_BBALLO_BACK_LINK	= 302073064 (&H120144E8)
DIBUTTON_BBALLO_BURST	= 301990919 (&H12000407)
DIBUTTON_BBALLO_CALL	= 301990920 (&H12000408)
DIBUTTON_BBALLO_DEVICE	= 302007550 (&H120044FE)
DIBUTTON_BBALLO_DUNK	= 301990914 (&H12000402)
DIBUTTON_BBALLO_FAKE	= 301990916 (&H12000404)
DIBUTTON_BBALLO_FORWARD_LINK	= 302073056 (&H120144E0)
DIBUTTON_BBALLO_JAB	= 302007307 (&H1200440B)
DIBUTTON_BBALLO_LEFT_LINK	= 302040292 (&H1200C4E4)
DIBUTTON_BBALLO_MENU	= 301991165 (&H120004FD)
DIBUTTON_BBALLO_PASS	= 301990915 (&H12000403)
DIBUTTON_BBALLO_PAUSE	= 302007548 (&H120044FC)
DIBUTTON_BBALLO_PLAY	= 302007306 (&H1200440A)
DIBUTTON_BBALLO_PLAYER	= 301990918 (&H12000406)
DIBUTTON_BBALLO_POST	= 302007308 (&H1200440C)
DIBUTTON_BBALLO_RIGHT_LINK	= 302040300 (&H1200C4EC)
DIBUTTON_BBALLO_SCREEN	= 302007305 (&H12004409)
DIBUTTON_BBALLO_SHOOT	= 301990913 (&H12000401)
DIBUTTON_BBALLO_SPECIAL	= 301990917 (&H12000405)
DIBUTTON_BBALLO_SUBSTITUTE	= 302007310 (&H1200440E)
DIBUTTON_BBALLO_TIMEOUT	= 302007309 (&H1200440D)
DIBUTTON_BIKINGM_BRAKE_BUTTON_LINK	= 470041832 (&H1C0444E8)
DIBUTTON_BIKINGM_CAMERA	= 469763074 (&H1C000402)
DIBUTTON_BIKINGM_DEVICE	= 469779710 (&H1C0044FE)
DIBUTTON_BIKINGM_FASTER_LINK	= 469845216 (&H1C0144E0)
DIBUTTON_BIKINGM_JUMP	= 469763073 (&H1C000401)
DIBUTTON_BIKINGM_LEFT_LINK	= 469812452 (&H1C00C4E4)

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DIBUTTON_BIKINGM_MENU	= 469763325 (&H1C0004FD)
DIBUTTON_BIKINGM_PAUSE	= 469779708 (&H1C0044FC)
DIBUTTON_BIKINGM_RIGHT_LINK	= 469812460 (&H1C00C4EC)
DIBUTTON_BIKINGM_SELECT	= 469763076 (&H1C000404)
DIBUTTON_BIKINGM_SLOWER_LINK	= 469845224 (&H1C0144E8)
DIBUTTON_BIKINGM_SPECIAL1	= 469763075 (&H1C000403)
DIBUTTON_BIKINGM_SPECIAL2	= 469763077 (&H1C000405)
DIBUTTON_BIKINGM_ZOOM	= 469779462 (&H1C004406)
DIBUTTON_BROWSER_DEVICE	= 671106302 (&H280044FE)
DIBUTTON_BROWSER_FAVORITES	= 671106054 (&H28004406)
DIBUTTON_BROWSER_HISTORY	= 671106057 (&H28004409)
DIBUTTON_BROWSER_HOME	= 671106053 (&H28004405)
DIBUTTON_BROWSER_MENU	= 671089917 (&H280004FD)
DIBUTTON_BROWSER_NEXT	= 671106055 (&H28004407)
DIBUTTON_BROWSER_PAUSE	= 671106300 (&H280044FC)
DIBUTTON_BROWSER_PREVIOUS	= 671106056 (&H28004408)
DIBUTTON_BROWSER_PRINT	= 671106058 (&H2800440A)
DIBUTTON_BROWSER_REFRESH	= 671089666 (&H28000402)
DIBUTTON_BROWSER_SEARCH	= 671106051 (&H28004403)
DIBUTTON_BROWSER_SELECT	= 671089665 (&H28000401)
DIBUTTON_BROWSER_STOP	= 671106052 (&H28004404)
DIBUTTON_CADF_DEVICE	= 620774654 (&H250044FE)
DIBUTTON_CADF_DISPLAY	= 620774405 (&H25004405)
DIBUTTON_CADF_MENU	= 620758269 (&H250004FD)
DIBUTTON_CADF_PAUSE	= 620774652 (&H250044FC)
DIBUTTON_CADF_SELECT	= 620758017 (&H25000401)
DIBUTTON_CADF_SPECIAL	= 620758019 (&H25000403)
DIBUTTON_CADF_SPECIAL1	= 620758018 (&H25000402)
DIBUTTON_CADF_SPECIAL2	= 620758020 (&H25000404)
DIBUTTON_CADM_DEVICE	= 637551870 (&H260044FE)
DIBUTTON_CADM_DISPLAY	= 637551621 (&H26004405)
DIBUTTON_CADM_MENU	= 637535485 (&H260004FD)
DIBUTTON_CADM_PAUSE	= 637551868 (&H260044FC)
DIBUTTON_CADM_SELECT	= 637535233 (&H26000401)
DIBUTTON_CADM_SPECIAL	= 637535235 (&H26000403)
DIBUTTON_CADM_SPECIAL1	= 637535234 (&H26000402)
DIBUTTON_CADM_SPECIAL2	= 637535236 (&H26000404)
DIBUTTON_DRIVINGC_ACCELERATE_LINK	= 33805536 (&H0203D4E0)
DIBUTTON_DRIVINGC_AIDS	= 33571847 (&H02004407)
DIBUTTON_DRIVINGC_BRAKE	= 33573896 (&H02004C08)
DIBUTTON_DRIVINGC_DASHBOARD	= 33571846 (&H02004406)
DIBUTTON_DRIVINGC_DEVICE	= 33572094 (&H020044FE)
DIBUTTON_DRIVINGC_FIRE	= 33557505 (&H02000C01)
DIBUTTON_DRIVINGC_FIRESECONDARY	= 33573897 (&H02004C09)
DIBUTTON_DRIVINGC_GLANCE_LEFT_LINK	= 34063588 (&H0207C4E4)
DIBUTTON_DRIVINGC_GLANCE_RIGHT_LINK	= 34063596 (&H0207C4EC)

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DIBUTTON\_DRIVINGC\_MENU = 33555709 (&H020004FD)  
DIBUTTON\_DRIVINGC\_PAUSE = 33572092 (&H020044FC)  
DIBUTTON\_DRIVINGC\_SHIFTDOWN = 33573893 (&H02004C05)  
DIBUTTON\_DRIVINGC\_SHIFTUP = 33573892 (&H02004C04)  
DIBUTTON\_DRIVINGC\_STEER\_LEFT\_LINK = 33606884 (&H0200CCE4)  
DIBUTTON\_DRIVINGC\_STEER\_RIGHT\_LINK = 33606892 (&H0200CCEC)  
DIBUTTON\_DRIVINGC\_TARGET = 33557507 (&H02000C03)  
DIBUTTON\_DRIVINGC\_WEAPONS = 33557506 (&H02000C02)  
DIBUTTON\_DRIVINGR\_ACCELERATE\_LINK = 17028320 (&H0103D4E0)  
DIBUTTON\_DRIVINGR\_AIDS = 16794630 (&H01004406)  
DIBUTTON\_DRIVINGR\_BOOST = 16794632 (&H01004408)  
DIBUTTON\_DRIVINGR\_BRAKE = 16796676 (&H01004C04)  
DIBUTTON\_DRIVINGR\_DASHBOARD = 16794629 (&H01004405)  
DIBUTTON\_DRIVINGR\_DEVICE = 16794878 (&H010044FE)  
DIBUTTON\_DRIVINGR\_GLANCE\_LEFT\_LINK = 17286372 (&H0107C4E4)  
DIBUTTON\_DRIVINGR\_GLANCE\_RIGHT\_LINK = 17286380 (&H0107C4EC)  
DIBUTTON\_DRIVINGR\_MAP = 16794631 (&H01004407)  
DIBUTTON\_DRIVINGR\_MENU = 16778493 (&H010004FD)  
DIBUTTON\_DRIVINGR\_PAUSE = 16794876 (&H010044FC)  
DIBUTTON\_DRIVINGR\_PIT = 16794633 (&H01004409)  
DIBUTTON\_DRIVINGR\_SHIFTDOWN = 16780290 (&H01000C02)  
DIBUTTON\_DRIVINGR\_SHIFTUP = 16780289 (&H01000C01)  
DIBUTTON\_DRIVINGR\_STEER\_LEFT\_LINK = 16829668 (&H0100CCE4)  
DIBUTTON\_DRIVINGR\_STEER\_RIGHT\_LINK = 16829676 (&H0100CCEC)  
DIBUTTON\_DRIVINGR\_VIEW = 16784387 (&H01001C03)  
DIBUTTON\_DRIVINGT\_ACCELERATE\_LINK = 50582752 (&H0303D4E0)  
DIBUTTON\_DRIVINGT\_BARREL\_DOWN\_LINK = 50414824 (&H030144E8)  
DIBUTTON\_DRIVINGT\_BARREL\_UP\_LINK = 50414816 (&H030144E0)  
DIBUTTON\_DRIVINGT\_BRAKE = 50351110 (&H03004C06)  
DIBUTTON\_DRIVINGT\_DASHBOARD = 50355205 (&H03005C05)  
DIBUTTON\_DRIVINGT\_DEVICE = 50349310 (&H030044FE)  
DIBUTTON\_DRIVINGT\_FIRE = 50334721 (&H03000C01)  
DIBUTTON\_DRIVINGT\_FIRESECONDARY = 50351111 (&H03004C07)  
DIBUTTON\_DRIVINGT\_GLANCE\_LEFT\_LINK = 50840804 (&H0307C4E4)  
DIBUTTON\_DRIVINGT\_GLANCE\_RIGHT\_LINK = 50840812 (&H0307C4EC)  
DIBUTTON\_DRIVINGT\_MENU = 50332925 (&H030004FD)  
DIBUTTON\_DRIVINGT\_PAUSE = 50349308 (&H030044FC)  
DIBUTTON\_DRIVINGT\_STEER\_LEFT\_LINK = 50384100 (&H0300CCE4)  
DIBUTTON\_DRIVINGT\_STEER\_RIGHT\_LINK = 50384108 (&H0300CCEC)  
DIBUTTON\_DRIVINGT\_TARGET = 50334723 (&H03000C03)  
DIBUTTON\_DRIVINGT\_VIEW = 50355204 (&H03005C04)  
DIBUTTON\_DRIVINGT\_WEAPONS = 50334722 (&H03000C02)  
DIBUTTON\_FIGHTINGH\_BACKWARD\_LINK = 134300904 (&H080144E8)  
DIBUTTON\_FIGHTINGH\_BLOCK = 134218755 (&H08000403)  
DIBUTTON\_FIGHTINGH\_CROUCH = 134218756 (&H08000404)  
DIBUTTON\_FIGHTINGH\_DEVICE = 134235390 (&H080044FE)

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DIBUTTON\_FIGHTINGH\_DISPLAY = 134235145 (&H08004409)  
DIBUTTON\_FIGHTINGH\_DODGE = 134235146 (&H0800440A)  
DIBUTTON\_FIGHTINGH\_FORWARD\_LINK = 134300896 (&H080144E0)  
DIBUTTON\_FIGHTINGH\_JUMP = 134218757 (&H08000405)  
DIBUTTON\_FIGHTINGH\_KICK = 134218754 (&H08000402)  
DIBUTTON\_FIGHTINGH\_LEFT\_LINK = 134268132 (&H0800C4E4)  
DIBUTTON\_FIGHTINGH\_MENU = 134219005 (&H080004FD)  
DIBUTTON\_FIGHTINGH\_PAUSE = 134235388 (&H080044FC)  
DIBUTTON\_FIGHTINGH\_PUNCH = 134218753 (&H08000401)  
DIBUTTON\_FIGHTINGH\_RIGHT\_LINK = 134268140 (&H0800C4EC)  
DIBUTTON\_FIGHTINGH\_SELECT = 134235144 (&H08004408)  
DIBUTTON\_FIGHTINGH\_SPECIAL1 = 134218758 (&H08000406)  
DIBUTTON\_FIGHTINGH\_SPECIAL2 = 134218759 (&H08000407)  
DIBUTTON\_FISHING\_BACK\_LINK = 234964200 (&H0E0144E8)  
DIBUTTON\_FISHING\_BAIT = 234882052 (&H0E000404)  
DIBUTTON\_FISHING\_BINOCULAR = 234882051 (&H0E000403)  
DIBUTTON\_FISHING\_CAST = 234882049 (&H0E000401)  
DIBUTTON\_FISHING\_CROUCH = 234898439 (&H0E004407)  
DIBUTTON\_FISHING\_DEVICE = 234898686 (&H0E0044FE)  
DIBUTTON\_FISHING\_DISPLAY = 234898438 (&H0E004406)  
DIBUTTON\_FISHING\_FORWARD\_LINK = 234964192 (&H0E0144E0)  
DIBUTTON\_FISHING\_JUMP = 234898440 (&H0E004408)  
DIBUTTON\_FISHING\_LEFT\_LINK = 234931428 (&H0E00C4E4)  
DIBUTTON\_FISHING\_MAP = 234882053 (&H0E000405)  
DIBUTTON\_FISHING\_MENU = 234882301 (&H0E0004FD)  
DIBUTTON\_FISHING\_PAUSE = 234898684 (&H0E0044FC)  
DIBUTTON\_FISHING\_RIGHT\_LINK = 234931436 (&H0E00C4EC)  
DIBUTTON\_FISHING\_ROTATE\_LEFT\_LINK = 235029732 (&H0E0244E4)  
DIBUTTON\_FISHING\_ROTATE\_RIGHT\_LINK = 235029740 (&H0E0244EC)  
DIBUTTON\_FISHING\_TYPE = 234882050 (&H0E000402)  
DIBUTTON\_FLYINGC\_BRAKE\_LINK = 67398880 (&H04046CE0)  
DIBUTTON\_FLYINGC\_DEVICE = 67126526 (&H040044FE)  
DIBUTTON\_FLYINGC\_DISPLAY = 67118082 (&H04002402)  
DIBUTTON\_FLYINGC\_FASTER\_LINK = 67359968 (&H0403D4E0)  
DIBUTTON\_FLYINGC\_FLAPSDOWN = 67134469 (&H04006405)  
DIBUTTON\_FLYINGC\_FLAPSUP = 67134468 (&H04006404)  
DIBUTTON\_FLYINGC\_GEAR = 67120131 (&H04002C03)  
DIBUTTON\_FLYINGC\_GLANCE\_DOWN\_LINK = 67618024 (&H0407C4E8)  
DIBUTTON\_FLYINGC\_GLANCE\_LEFT\_LINK = 67618020 (&H0407C4E4)  
DIBUTTON\_FLYINGC\_GLANCE\_RIGHT\_LINK = 67618028 (&H0407C4EC)  
DIBUTTON\_FLYINGC\_GLANCE\_UP\_LINK = 67618016 (&H0407C4E0)  
DIBUTTON\_FLYINGC\_MENU = 67110141 (&H040004FD)  
DIBUTTON\_FLYINGC\_PAUSE = 67126524 (&H040044FC)  
DIBUTTON\_FLYINGC\_SLOWER\_LINK = 67359976 (&H0403D4E8)  
DIBUTTON\_FLYINGC\_VIEW = 67118081 (&H04002401)  
DIBUTTON\_FLYINGH\_COUNTER = 100684804 (&H06005404)

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DIBUTTON\_FLYINGH\_DEVICE = 100680958 (&H060044FE)  
DIBUTTON\_FLYINGH\_FASTER\_LINK = 100916448 (&H0603DCE0)  
DIBUTTON\_FLYINGH\_FIRE = 100668417 (&H06001401)  
DIBUTTON\_FLYINGH\_FIRESECONDARY = 100682759 (&H06004C07)  
DIBUTTON\_FLYINGH\_GEAR = 100688902 (&H06006406)  
DIBUTTON\_FLYINGH\_GLANCE\_DOWN\_LINK = 101172456 (&H0607C4E8)  
DIBUTTON\_FLYINGH\_GLANCE\_LEFT\_LINK = 101172452 (&H0607C4E4)  
DIBUTTON\_FLYINGH\_GLANCE\_RIGHT\_LINK = 101172460 (&H0607C4EC)  
DIBUTTON\_FLYINGH\_GLANCE\_UP\_LINK = 101172448 (&H0607C4E0)  
DIBUTTON\_FLYINGH\_MENU = 100664573 (&H060004FD)  
DIBUTTON\_FLYINGH\_PAUSE = 100680956 (&H060044FC)  
DIBUTTON\_FLYINGH\_SLOWER\_LINK = 100916456 (&H0603DCE8)  
DIBUTTON\_FLYINGH\_TARGET = 100668419 (&H06001403)  
DIBUTTON\_FLYINGH\_VIEW = 100688901 (&H06006405)  
DIBUTTON\_FLYINGH\_WEAPONS = 100668418 (&H06001402)  
DIBUTTON\_FLYINGM\_BRAKE\_LINK = 84174048 (&H050464E0)  
DIBUTTON\_FLYINGM\_COUNTER = 83909636 (&H05005C04)  
DIBUTTON\_FLYINGM\_DEVICE = 83903742 (&H050044FE)  
DIBUTTON\_FLYINGM\_DISPLAY = 83911686 (&H05006406)  
DIBUTTON\_FLYINGM\_FASTER\_LINK = 84137184 (&H0503D4E0)  
DIBUTTON\_FLYINGM\_FIRE = 83889153 (&H05000C01)  
DIBUTTON\_FLYINGM\_FIRESECONDARY = 83905546 (&H05004C09)  
DIBUTTON\_FLYINGM\_FLAPSDOWN = 83907592 (&H05005408)  
DIBUTTON\_FLYINGM\_FLAPSUP = 83907591 (&H05005407)  
DIBUTTON\_FLYINGM\_GEAR = 83911689 (&H0500640A)  
DIBUTTON\_FLYINGM\_GLANCE\_DOWN\_LINK = 84395240 (&H0507C4E8)  
DIBUTTON\_FLYINGM\_GLANCE\_LEFT\_LINK = 84395236 (&H0507C4E4)  
DIBUTTON\_FLYINGM\_GLANCE\_RIGHT\_LINK = 84395244 (&H0507C4EC)  
DIBUTTON\_FLYINGM\_GLANCE\_UP\_LINK = 84395232 (&H0507C4E0)  
DIBUTTON\_FLYINGM\_MENU = 83887357 (&H050004FD)  
DIBUTTON\_FLYINGM\_PAUSE = 83903740 (&H050044FC)  
DIBUTTON\_FLYINGM\_SLOWER\_LINK = 84137192 (&H0503D4E8)  
DIBUTTON\_FLYINGM\_TARGET = 83889155 (&H05000C03)  
DIBUTTON\_FLYINGM\_VIEW = 83911685 (&H05006405)  
DIBUTTON\_FLYINGM\_WEAPONS = 83889154 (&H05000C02)  
DIBUTTON\_FOOTBALLD\_AUDIBLE = 385893387 (&H1700440B)  
DIBUTTON\_FOOTBALLD\_BACK\_LINK = 385959144 (&H170144E8)  
DIBUTTON\_FOOTBALLD\_BULLRUSH = 385893385 (&H17004409)  
DIBUTTON\_FOOTBALLD\_DEVICE = 385893630 (&H170044FE)  
DIBUTTON\_FOOTBALLD\_FAKE = 385876997 (&H17000405)  
DIBUTTON\_FOOTBALLD\_FORWARD\_LINK = 385959136 (&H170144E0)  
DIBUTTON\_FOOTBALLD\_JUMP = 385876995 (&H17000403)  
DIBUTTON\_FOOTBALLD\_LEFT\_LINK = 385926372 (&H1700C4E4)  
DIBUTTON\_FOOTBALLD\_MENU = 385877245 (&H170004FD)  
DIBUTTON\_FOOTBALLD\_PAUSE = 385893628 (&H170044FC)  
DIBUTTON\_FOOTBALLD\_PLAY = 385876993 (&H17000401)

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DIBUTTON\_FOOTBALLD\_RIGHT\_LINK = 385926380 (&H1700C4EC)  
DIBUTTON\_FOOTBALLD\_RIP = 385893386 (&H1700440A)  
DIBUTTON\_FOOTBALLD\_SELECT = 385876994 (&H17000402)  
DIBUTTON\_FOOTBALLD\_SPIN = 385893383 (&H17004407)  
DIBUTTON\_FOOTBALLD\_SUBSTITUTE = 385893389 (&H1700440D)  
DIBUTTON\_FOOTBALLD\_SUPERTACKLE = 385876998 (&H17000406)  
DIBUTTON\_FOOTBALLD\_SWIM = 385893384 (&H17004408)  
DIBUTTON\_FOOTBALLD\_TACKLE = 385876996 (&H17000404)  
DIBUTTON\_FOOTBALLD\_ZOOM = 385893388 (&H1700440C)  
DIBUTTON\_FOOTBALLO\_BACK\_LINK = 369181928 (&H160144E8)  
DIBUTTON\_FOOTBALLO\_DEVICE = 369116414 (&H160044FE)  
DIBUTTON\_FOOTBALLO\_DIVE = 369116169 (&H16004409)  
DIBUTTON\_FOOTBALLO\_FORWARD\_LINK = 369181920 (&H160144E0)  
DIBUTTON\_FOOTBALLO\_JUKE = 369116166 (&H16004406)  
DIBUTTON\_FOOTBALLO\_JUMP = 369099777 (&H16000401)  
DIBUTTON\_FOOTBALLO\_LEFT\_LINK = 369149156 (&H1600C4E4)  
DIBUTTON\_FOOTBALLO\_LEFTARM = 369099778 (&H16000402)  
DIBUTTON\_FOOTBALLO\_MENU = 369100029 (&H160004FD)  
DIBUTTON\_FOOTBALLO\_PAUSE = 369116412 (&H160044FC)  
DIBUTTON\_FOOTBALLO\_RIGHT\_LINK = 369149164 (&H1600C4EC)  
DIBUTTON\_FOOTBALLO\_RIGHTARM = 369099779 (&H16000403)  
DIBUTTON\_FOOTBALLO\_SHOULDER = 369116167 (&H16004407)  
DIBUTTON\_FOOTBALLO\_SPIN = 369099781 (&H16000405)  
DIBUTTON\_FOOTBALLO\_SUBSTITUTE = 369116171 (&H1600440B)  
DIBUTTON\_FOOTBALLO\_THROW = 369099780 (&H16000404)  
DIBUTTON\_FOOTBALLO\_TURBO = 369116168 (&H16004408)  
DIBUTTON\_FOOTBALLO\_ZOOM = 369116170 (&H1600440A)  
DIBUTTON\_FOOTBALLP\_DEVICE = 335561982 (&H140044FE)  
DIBUTTON\_FOOTBALLP\_HELP = 335545347 (&H14000403)  
DIBUTTON\_FOOTBALLP\_MENU = 335545597 (&H140004FD)  
DIBUTTON\_FOOTBALLP\_PAUSE = 335561980 (&H140044FC)  
DIBUTTON\_FOOTBALLP\_PLAY = 335545345 (&H14000401)  
DIBUTTON\_FOOTBALLP\_SELECT = 335545346 (&H14000402)  
DIBUTTON\_FOOTBALLQ\_AUDIBLE = 352338953 (&H15004409)  
DIBUTTON\_FOOTBALLQ\_BACK\_LINK = 352404712 (&H150144E8)  
DIBUTTON\_FOOTBALLQ\_DEVICE = 352339198 (&H150044FE)  
DIBUTTON\_FOOTBALLQ\_FAKE = 352322566 (&H15000406)  
DIBUTTON\_FOOTBALLQ\_FAKESNAP = 352338951 (&H15004407)  
DIBUTTON\_FOOTBALLQ\_FORWARD\_LINK = 352404704 (&H150144E0)  
DIBUTTON\_FOOTBALLQ\_JUMP = 352322563 (&H15000403)  
DIBUTTON\_FOOTBALLQ\_LEFT\_LINK = 352371940 (&H1500C4E4)  
DIBUTTON\_FOOTBALLQ\_MENU = 352322813 (&H150004FD)  
DIBUTTON\_FOOTBALLQ\_MOTION = 352338952 (&H15004408)  
DIBUTTON\_FOOTBALLQ\_PASS = 352322565 (&H15000405)  
DIBUTTON\_FOOTBALLQ\_PAUSE = 352339196 (&H150044FC)  
DIBUTTON\_FOOTBALLQ\_RIGHT\_LINK = 352371948 (&H1500C4EC)

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DIBUTTON\_FOOTBALLQ\_SELECT = 352322561 (&H15000401)  
DIBUTTON\_FOOTBALLQ\_SLIDE = 352322564 (&H15000404)  
DIBUTTON\_FOOTBALLQ\_SNAP = 352322562 (&H15000402)  
DIBUTTON\_FPS\_APPLY = 150995971 (&H09000403)  
DIBUTTON\_FPS\_BACKWARD\_LINK = 151078120 (&H090144E8)  
DIBUTTON\_FPS\_CROUCH = 150995973 (&H09000405)  
DIBUTTON\_FPS\_DEVICE = 151012606 (&H090044FE)  
DIBUTTON\_FPS\_DISPLAY = 151012360 (&H09004408)  
DIBUTTON\_FPS\_DODGE = 151012361 (&H09004409)  
DIBUTTON\_FPS\_FIRE = 150995969 (&H09000401)  
DIBUTTON\_FPS\_FIRESECONDARY = 151012364 (&H0900440C)  
DIBUTTON\_FPS\_FORWARD\_LINK = 151078112 (&H090144E0)  
DIBUTTON\_FPS\_GLANCE\_DOWN\_LINK = 151110888 (&H0901C4E8)  
DIBUTTON\_FPS\_GLANCE\_UP\_LINK = 151110880 (&H0901C4E0)  
DIBUTTON\_FPS\_GLANCEL = 151012362 (&H0900440A)  
DIBUTTON\_FPS\_GLANCER = 151012363 (&H0900440B)  
DIBUTTON\_FPS\_JUMP = 150995974 (&H09000406)  
DIBUTTON\_FPS\_MENU = 150996221 (&H090004FD)  
DIBUTTON\_FPS\_PAUSE = 151012604 (&H090044FC)  
DIBUTTON\_FPS\_ROTATE\_LEFT\_LINK = 151045348 (&H0900C4E4)  
DIBUTTON\_FPS\_ROTATE\_RIGHT\_LINK = 151045356 (&H0900C4EC)  
DIBUTTON\_FPS\_SELECT = 150995972 (&H09000404)  
DIBUTTON\_FPS\_STRAFE = 150995975 (&H09000407)  
DIBUTTON\_FPS\_WEAPONS = 150995970 (&H09000402)  
DIBUTTON\_GOLF\_BACK\_LINK = 402736360 (&H180144E8)  
DIBUTTON\_GOLF\_DEVICE = 402670846 (&H180044FE)  
DIBUTTON\_GOLF\_DOWN = 402654212 (&H18000404)  
DIBUTTON\_GOLF\_FLYBY = 402654214 (&H18000406)  
DIBUTTON\_GOLF\_FORWARD\_LINK = 402736352 (&H180144E0)  
DIBUTTON\_GOLF\_LEFT\_LINK = 402703588 (&H1800C4E4)  
DIBUTTON\_GOLF\_MENU = 402654461 (&H180004FD)  
DIBUTTON\_GOLF\_PAUSE = 402670844 (&H180044FC)  
DIBUTTON\_GOLF\_RIGHT\_LINK = 402703596 (&H1800C4EC)  
DIBUTTON\_GOLF\_SELECT = 402654210 (&H18000402)  
DIBUTTON\_GOLF\_SUBSTITUTE = 402670601 (&H18004409)  
DIBUTTON\_GOLF\_SWING = 402654209 (&H18000401)  
DIBUTTON\_GOLF\_TERRAIN = 402654213 (&H18000405)  
DIBUTTON\_GOLF\_TIMEOUT = 402670600 (&H18004408)  
DIBUTTON\_GOLF\_UP = 402654211 (&H18000403)  
DIBUTTON\_GOLF\_ZOOM = 402670599 (&H18004407)  
DIBUTTON\_HOCKEYD\_BACK\_LINK = 436290792 (&H1A0144E8)  
DIBUTTON\_HOCKEYD\_BLOCK = 436208644 (&H1A000404)  
DIBUTTON\_HOCKEYD\_BURST = 436208643 (&H1A000403)  
DIBUTTON\_HOCKEYD\_DEVICE = 436225278 (&H1A0044FE)  
DIBUTTON\_HOCKEYD\_FAKE = 436208645 (&H1A000405)  
DIBUTTON\_HOCKEYD\_FORWARD\_LINK = 436290784 (&H1A0144E0)



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DIBUTTON_HOCKEYD_LEFT_LINK	= 436258020 (&H1A00C4E4)
DIBUTTON_HOCKEYD_MENU	= 436208893 (&H1A0004FD)
DIBUTTON_HOCKEYD_PAUSE	= 436225276 (&H1A0044FC)
DIBUTTON_HOCKEYD_PLAYER	= 436208641 (&H1A000401)
DIBUTTON_HOCKEYD_RIGHT_LINK	= 436258028 (&H1A00C4EC)
DIBUTTON_HOCKEYD_STEAL	= 436208642 (&H1A000402)
DIBUTTON_HOCKEYD_STRATEGY	= 436225031 (&H1A004407)
DIBUTTON_HOCKEYD_SUBSTITUTE	= 436225033 (&H1A004409)
DIBUTTON_HOCKEYD_TIMEOUT	= 436225032 (&H1A004408)
DIBUTTON_HOCKEYD_ZOOM	= 436225030 (&H1A004406)
DIBUTTON_HOCKEYG_BACK_LINK	= 453068008 (&H1B0144E8)
DIBUTTON_HOCKEYG_BLOCK	= 452985860 (&H1B000404)
DIBUTTON_HOCKEYG_DEVICE	= 453002494 (&H1B0044FE)
DIBUTTON_HOCKEYG_FORWARD_LINK	= 453068000 (&H1B0144E0)
DIBUTTON_HOCKEYG_LEFT_LINK	= 453035236 (&H1B00C4E4)
DIBUTTON_HOCKEYG_MENU	= 452986109 (&H1B0004FD)
DIBUTTON_HOCKEYG_PASS	= 452985857 (&H1B000401)
DIBUTTON_HOCKEYG_PAUSE	= 453002492 (&H1B0044FC)
DIBUTTON_HOCKEYG_POKE	= 452985858 (&H1B000402)
DIBUTTON_HOCKEYG_RIGHT_LINK	= 453035244 (&H1B00C4EC)
DIBUTTON_HOCKEYG_STEAL	= 452985859 (&H1B000403)
DIBUTTON_HOCKEYG_STRATEGY	= 453002246 (&H1B004406)
DIBUTTON_HOCKEYG_SUBSTITUTE	= 453002248 (&H1B004408)
DIBUTTON_HOCKEYG_TIMEOUT	= 453002247 (&H1B004407)
DIBUTTON_HOCKEYG_ZOOM	= 453002245 (&H1B004405)
DIBUTTON_HOCKEYO_BACK_LINK	= 419513576 (&H190144E8)
DIBUTTON_HOCKEYO_BURST	= 419431427 (&H19000403)
DIBUTTON_HOCKEYO_DEVICE	= 419448062 (&H190044FE)
DIBUTTON_HOCKEYO_FAKE	= 419431429 (&H19000405)
DIBUTTON_HOCKEYO_FORWARD_LINK	= 419513568 (&H190144E0)
DIBUTTON_HOCKEYO_LEFT_LINK	= 419480804 (&H1900C4E4)
DIBUTTON_HOCKEYO_MENU	= 419431677 (&H190004FD)
DIBUTTON_HOCKEYO_PASS	= 419431426 (&H19000402)
DIBUTTON_HOCKEYO_PAUSE	= 419448060 (&H190044FC)
DIBUTTON_HOCKEYO_RIGHT_LINK	= 419480812 (&H1900C4EC)
DIBUTTON_HOCKEYO_SHOOT	= 419431425 (&H19000401)
DIBUTTON_HOCKEYO_SPECIAL	= 419431428 (&H19000404)
DIBUTTON_HOCKEYO_STRATEGY	= 419447815 (&H19004407)
DIBUTTON_HOCKEYO_SUBSTITUTE	= 419447817 (&H19004409)
DIBUTTON_HOCKEYO_TIMEOUT	= 419447816 (&H19004408)
DIBUTTON_HOCKEYO_ZOOM	= 419447814 (&H19004406)
DIBUTTON_HUNTING_AIM	= 218104834 (&H0D000402)
DIBUTTON_HUNTING_BACK_LINK	= 218186984 (&H0D0144E8)
DIBUTTON_HUNTING_BINOCULAR	= 218104836 (&H0D000404)
DIBUTTON_HUNTING_CALL	= 218104837 (&H0D000405)
DIBUTTON_HUNTING_CROUCH	= 218121225 (&H0D004409)

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DIBUTTON_HUNTING_DEVICE	= 218121470 (&H0D0044FE)
DIBUTTON_HUNTING_DISPLAY	= 218121224 (&H0D004408)
DIBUTTON_HUNTING_FIRE	= 218104833 (&H0D000401)
DIBUTTON_HUNTING_FIRESECONDARY	= 218121227 (&H0D00440B)
DIBUTTON_HUNTING_FORWARD_LINK	= 218186976 (&H0D0144E0)
DIBUTTON_HUNTING_JUMP	= 218121226 (&H0D00440A)
DIBUTTON_HUNTING_LEFT_LINK	= 218154212 (&H0D00C4E4)
DIBUTTON_HUNTING_MAP	= 218104838 (&H0D000406)
DIBUTTON_HUNTING_MENU	= 218105085 (&H0D0004FD)
DIBUTTON_HUNTING_PAUSE	= 218121468 (&H0D0044FC)
DIBUTTON_HUNTING_RIGHT_LINK	= 218154220 (&H0D00C4EC)
DIBUTTON_HUNTING_ROTATE_LEFT_LINK	= 218252516 (&H0D0244E4)
DIBUTTON_HUNTING_ROTATE_RIGHT_LINK	= 218252524 (&H0D0244EC)
DIBUTTON_HUNTING_SPECIAL	= 218104839 (&H0D000407)
DIBUTTON_HUNTING_WEAPON	= 218104835 (&H0D000403)
DIBUTTON_MECHA_BACK_LINK	= 687949032 (&H290144E8)
DIBUTTON_MECHA_CENTER	= 687883271 (&H29004407)
DIBUTTON_MECHA_DEVICE	= 687883518 (&H290044FE)
DIBUTTON_MECHA_FASTER_LINK	= 688112864 (&H2903C4E0)
DIBUTTON_MECHA_FIRE	= 687866881 (&H29000401)
DIBUTTON_MECHA_FIRESECONDARY	= 687883273 (&H29004409)
DIBUTTON_MECHA_FORWARD_LINK	= 687949024 (&H290144E0)
DIBUTTON_MECHA_JUMP	= 687866886 (&H29000406)
DIBUTTON_MECHA_LEFT_LINK	= 687916260 (&H2900C4E4)
DIBUTTON_MECHA_MENU	= 687867133 (&H290004FD)
DIBUTTON_MECHA_PAUSE	= 687883516 (&H290044FC)
DIBUTTON_MECHA_REVERSE	= 687866884 (&H29000404)
DIBUTTON_MECHA_RIGHT_LINK	= 687916268 (&H2900C4EC)
DIBUTTON_MECHA_ROTATE_LEFT_LINK	= 688014564 (&H290244E4)
DIBUTTON_MECHA_ROTATE_RIGHT_LINK	= 688014572 (&H290244EC)
DIBUTTON_MECHA_SLOWER_LINK	= 688112872 (&H2903C4E8)
DIBUTTON_MECHA_TARGET	= 687866883 (&H29000403)
DIBUTTON_MECHA_VIEW	= 687883272 (&H29004408)
DIBUTTON_MECHA_WEAPONS	= 687866882 (&H29000402)
DIBUTTON_MECHA_ZOOM	= 687866885 (&H29000405)
DIBUTTON_RACQUET_BACK_LINK	= 536954088 (&H200144E8)
DIBUTTON_RACQUET_BACKSWING	= 536871938 (&H20000402)
DIBUTTON_RACQUET_DEVICE	= 536888574 (&H200044FE)
DIBUTTON_RACQUET_FORWARD_LINK	= 536954080 (&H200144E0)
DIBUTTON_RACQUET_LEFT_LINK	= 536921316 (&H2000C4E4)
DIBUTTON_RACQUET_MENU	= 536872189 (&H200004FD)
DIBUTTON_RACQUET_PAUSE	= 536888572 (&H200044FC)
DIBUTTON_RACQUET_RIGHT_LINK	= 536921324 (&H2000C4EC)
DIBUTTON_RACQUET_SELECT	= 536871941 (&H20000405)
DIBUTTON_RACQUET_SMASH	= 536871939 (&H20000403)
DIBUTTON_RACQUET_SPECIAL	= 536871940 (&H20000404)

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DIBUTTON_RACQUET_SUBSTITUTE	= 536888327 (&H20004407)
DIBUTTON_RACQUET_SWING	= 536871937 (&H20000401)
DIBUTTON_RACQUET_TIMEOUT	= 536888326 (&H20004406)
DIBUTTON_REMOTE_ADJUST	= 654334990 (&H27005C0E)
DIBUTTON_REMOTE_CABLE	= 654334985 (&H27005C09)
DIBUTTON_REMOTE_CD	= 654334986 (&H27005C0A)
DIBUTTON_REMOTE_CHANGE	= 654320646 (&H27002406)
DIBUTTON_REMOTE_CUE	= 654320644 (&H27002404)
DIBUTTON_REMOTE_DEVICE	= 654329086 (&H270044FE)
DIBUTTON_REMOTE_DIGIT0	= 654332943 (&H2700540F)
DIBUTTON_REMOTE_DIGIT1	= 654332944 (&H27005410)
DIBUTTON_REMOTE_DIGIT2	= 654332945 (&H27005411)
DIBUTTON_REMOTE_DIGIT3	= 654332946 (&H27005412)
DIBUTTON_REMOTE_DIGIT4	= 654332947 (&H27005413)
DIBUTTON_REMOTE_DIGIT5	= 654332948 (&H27005414)
DIBUTTON_REMOTE_DIGIT6	= 654332949 (&H27005415)
DIBUTTON_REMOTE_DIGIT7	= 654332950 (&H27005416)
DIBUTTON_REMOTE_DIGIT8	= 654332951 (&H27005417)
DIBUTTON_REMOTE_DIGIT9	= 654332952 (&H27005418)
DIBUTTON_REMOTE_DVD	= 654334989 (&H27005C0D)
DIBUTTON_REMOTE_MENU	= 654312701 (&H270004FD)
DIBUTTON_REMOTE_MUTE	= 654312449 (&H27000401)
DIBUTTON_REMOTE_PAUSE	= 654329084 (&H270044FC)
DIBUTTON_REMOTE_PLAY	= 654320643 (&H27002403)
DIBUTTON_REMOTE_RECORD	= 654320647 (&H27002407)
DIBUTTON_REMOTE_REVIEW	= 654320645 (&H27002405)
DIBUTTON_REMOTE_SELECT	= 654312450 (&H27000402)
DIBUTTON_REMOTE_TUNER	= 654334988 (&H27005C0C)
DIBUTTON_REMOTE_TV	= 654334984 (&H27005C08)
DIBUTTON_REMOTE_VCR	= 654334987 (&H27005C0B)
DIBUTTON_SKIING_CAMERA	= 486540291 (&H1D000403)
DIBUTTON_SKIING_CROUCH	= 486540290 (&H1D000402)
DIBUTTON_SKIING_DEVICE	= 486556926 (&H1D0044FE)
DIBUTTON_SKIING_FASTER_LINK	= 486622432 (&H1D0144E0)
DIBUTTON_SKIING_JUMP	= 486540289 (&H1D000401)
DIBUTTON_SKIING_LEFT_LINK	= 486589668 (&H1D00C4E4)
DIBUTTON_SKIING_MENU	= 486540541 (&H1D0004FD)
DIBUTTON_SKIING_PAUSE	= 486556924 (&H1D0044FC)
DIBUTTON_SKIING_RIGHT_LINK	= 486589676 (&H1D00C4EC)
DIBUTTON_SKIING_SELECT	= 486540293 (&H1D000405)
DIBUTTON_SKIING_SLOWER_LINK	= 486622440 (&H1D0144E8)
DIBUTTON_SKIING_SPECIAL1	= 486540292 (&H1D000404)
DIBUTTON_SKIING_SPECIAL2	= 486540294 (&H1D000406)
DIBUTTON_SKIING_ZOOM	= 486556679 (&H1D004407)
DIBUTTON_SOCCERD_BACK_LINK	= 520176872 (&H1F0144E8)
DIBUTTON_SOCCERD_BLOCK	= 520094721 (&H1F000401)

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DIBUTTON_SOCCERD_CLEAR	= 520111114 (&H1F00440A)
DIBUTTON_SOCCERD_DEVICE	= 520111358 (&H1F0044FE)
DIBUTTON_SOCCERD_FAKE	= 520094723 (&H1F000403)
DIBUTTON_SOCCERD_FORWARD_LINK	= 520176864 (&H1F0144E0)
DIBUTTON_SOCCERD_FOUL	= 520111112 (&H1F004408)
DIBUTTON_SOCCERD_GOALIECHARGE	= 520111115 (&H1F00440B)
DIBUTTON_SOCCERD_HEAD	= 520111113 (&H1F004409)
DIBUTTON_SOCCERD_LEFT_LINK	= 520144100 (&H1F00C4E4)
DIBUTTON_SOCCERD_MENU	= 520094973 (&H1F0004FD)
DIBUTTON_SOCCERD_PAUSE	= 520111356 (&H1F0044FC)
DIBUTTON_SOCCERD_PLAYER	= 520094724 (&H1F000404)
DIBUTTON_SOCCERD_RIGHT_LINK	= 520144108 (&H1F00C4EC)
DIBUTTON_SOCCERD_SELECT	= 520094726 (&H1F000406)
DIBUTTON_SOCCERD_SLIDE	= 520094727 (&H1F000407)
DIBUTTON_SOCCERD_SPECIAL	= 520094725 (&H1F000405)
DIBUTTON_SOCCERD_STEAL	= 520094722 (&H1F000402)
DIBUTTON_SOCCERD_SUBSTITUTE	= 520111116 (&H1F00440C)
DIBUTTON_SOCCERO_BACK_LINK	= 503399656 (&H1E0144E8)
DIBUTTON_SOCCERO_CONTROL	= 503333900 (&H1E00440C)
DIBUTTON_SOCCERO_DEVICE	= 503334142 (&H1E0044FE)
DIBUTTON_SOCCERO_FAKE	= 503317507 (&H1E000403)
DIBUTTON_SOCCERO_FORWARD_LINK	= 503399648 (&H1E0144E0)
DIBUTTON_SOCCERO_HEAD	= 503333901 (&H1E00440D)
DIBUTTON_SOCCERO_LEFT_LINK	= 503366884 (&H1E00C4E4)
DIBUTTON_SOCCERO_MENU	= 503317757 (&H1E0004FD)
DIBUTTON_SOCCERO_PASS	= 503317506 (&H1E000402)
DIBUTTON_SOCCERO_PASSTHRU	= 503333898 (&H1E00440A)
DIBUTTON_SOCCERO_PAUSE	= 503334140 (&H1E0044FC)
DIBUTTON_SOCCERO_PLAYER	= 503317508 (&H1E000404)
DIBUTTON_SOCCERO_RIGHT_LINK	= 503366892 (&H1E00C4EC)
DIBUTTON_SOCCERO_SELECT	= 503317510 (&H1E000406)
DIBUTTON_SOCCERO_SHOOT	= 503317505 (&H1E000401)
DIBUTTON_SOCCERO_SHOOTHIGH	= 503333897 (&H1E004409)
DIBUTTON_SOCCERO_SHOOTLOW	= 503333896 (&H1E004408)
DIBUTTON_SOCCERO_SPECIAL1	= 503317509 (&H1E000405)
DIBUTTON_SOCCERO_SPRINT	= 503333899 (&H1E00440B)
DIBUTTON_SOCCERO_SUBSTITUTE	= 503333895 (&H1E004407)
DIBUTTON_SPACESIM_BACKWARD_LINK	= 117523688 (&H070144E8)
DIBUTTON_SPACESIM_DEVICE	= 117458174 (&H070044FE)
DIBUTTON_SPACESIM_DISPLAY	= 117457925 (&H07004405)
DIBUTTON_SPACESIM_FASTER_LINK	= 117687520 (&H0703C4E0)
DIBUTTON_SPACESIM_FIRE	= 117441537 (&H07000401)
DIBUTTON_SPACESIM_FIRESECONDARY	= 117457929 (&H07004409)
DIBUTTON_SPACESIM_FORWARD_LINK	= 117523680 (&H070144E0)
DIBUTTON_SPACESIM_GEAR	= 117457928 (&H07004408)

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DIBUTTON\_SPACESIM\_GLANCE\_DOWN\_LINK= 117949672  
(&H0707C4E8)  
DIBUTTON\_SPACESIM\_GLANCE\_LEFT\_LINK= 117949668 (&H0707C4E4)  
DIBUTTON\_SPACESIM\_GLANCE\_RIGHT\_LINK=117949676  
(&H0707C4EC)  
DIBUTTON\_SPACESIM\_GLANCE\_UP\_LINK = 117949664 (&H0707C4E0)  
DIBUTTON\_SPACESIM\_LEFT\_LINK = 117490916 (&H0700C4E4)  
DIBUTTON\_SPACESIM\_LOWER = 117457927 (&H07004407)  
DIBUTTON\_SPACESIM\_MENU = 117441789 (&H070004FD)  
DIBUTTON\_SPACESIM\_PAUSE = 117458172 (&H070044FC)  
DIBUTTON\_SPACESIM\_RAISE = 117457926 (&H07004406)  
DIBUTTON\_SPACESIM\_RIGHT\_LINK = 117490924 (&H0700C4EC)  
DIBUTTON\_SPACESIM\_SLOWER\_LINK = 117687528 (&H0703C4E8)  
DIBUTTON\_SPACESIM\_TARGET = 117441539 (&H07000403)  
DIBUTTON\_SPACESIM\_TURN\_LEFT\_LINK = 117589220 (&H070244E4)  
DIBUTTON\_SPACESIM\_TURN\_RIGHT\_LINK = 117589228 (&H070244EC)  
DIBUTTON\_SPACESIM\_VIEW = 117457924 (&H07004404)  
DIBUTTON\_SPACESIM\_WEAPONS = 117441538 (&H07000402)  
DIBUTTON\_STRATEGYR\_APPLY = 184550402 (&H0B000402)  
DIBUTTON\_STRATEGYR\_ATTACK = 184550404 (&H0B000404)  
DIBUTTON\_STRATEGYR\_BACK\_LINK = 184632552 (&H0B0144E8)  
DIBUTTON\_STRATEGYR\_CAST = 184550405 (&H0B000405)  
DIBUTTON\_STRATEGYR\_CROUCH = 184550406 (&H0B000406)  
DIBUTTON\_STRATEGYR\_DEVICE = 184567038 (&H0B0044FE)  
DIBUTTON\_STRATEGYR\_DISPLAY = 184566793 (&H0B004409)  
DIBUTTON\_STRATEGYR\_FORWARD\_LINK = 184632544 (&H0B0144E0)  
DIBUTTON\_STRATEGYR\_GET = 184550401 (&H0B000401)  
DIBUTTON\_STRATEGYR\_JUMP = 184550407 (&H0B000407)  
DIBUTTON\_STRATEGYR\_LEFT\_LINK = 184599780 (&H0B00C4E4)  
DIBUTTON\_STRATEGYR\_MAP = 184566792 (&H0B004408)  
DIBUTTON\_STRATEGYR\_MENU = 184550653 (&H0B0004FD)  
DIBUTTON\_STRATEGYR\_PAUSE = 184567036 (&H0B0044FC)  
DIBUTTON\_STRATEGYR\_RIGHT\_LINK = 184599788 (&H0B00C4EC)  
DIBUTTON\_STRATEGYR\_ROTATE\_LEFT\_LINK=184698084  
(&H0B0244E4)  
DIBUTTON\_STRATEGYR\_ROTATE\_RIGHT\_LINK=184698092  
(&HB0244EC)  
DIBUTTON\_STRATEGYR\_SELECT = 184550403 (&H0B000403)  
DIBUTTON\_STRATEGYT\_APPLY = 201327619 (&H0C000403)  
DIBUTTON\_STRATEGYT\_BACK\_LINK = 201409768 (&H0C0144E8)  
DIBUTTON\_STRATEGYT\_DEVICE = 201344254 (&H0C0044FE)  
DIBUTTON\_STRATEGYT\_DISPLAY = 201344008 (&H0C004408)  
DIBUTTON\_STRATEGYT\_FORWARD\_LINK = 201409760 (&H0C0144E0)  
DIBUTTON\_STRATEGYT\_INSTRUCT = 201327618 (&H0C000402)  
DIBUTTON\_STRATEGYT\_LEFT\_LINK = 201376996 (&H0C00C4E4)  
DIBUTTON\_STRATEGYT\_MAP = 201344007 (&H0C004407)

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DIBUTTON_STRATEGY_MENU	= 201327869 (&H0C0004FD)
DIBUTTON_STRATEGY_PAUSE	= 201344252 (&H0C0044FC)
DIBUTTON_STRATEGY_RIGHT_LINK	= 201377004 (&H0C00C4EC)
DIBUTTON_STRATEGY_SELECT	= 201327617 (&H0C000401)
DIBUTTON_STRATEGY_TEAM	= 201327620 (&H0C000404)
DIBUTTON_STRATEGY_TURN	= 201327621 (&H0C000405)
DIBUTTON_STRATEGY_ZOOM	= 201344006 (&H0C004406)
DIBUTTON_TPS_ACTION	= 167773186 (&H0A000402)
DIBUTTON_TPS_BACKWARD_LINK	= 167855336 (&H0A0144E8)
DIBUTTON_TPS_DEVICE	= 167789822 (&H0A0044FE)
DIBUTTON_TPS_DODGE	= 167789577 (&H0A004409)
DIBUTTON_TPS_FORWARD_LINK	= 167855328 (&H0A0144E0)
DIBUTTON_TPS_GLANCE_DOWN_LINK	= 168281320 (&H0A07C4E8)
DIBUTTON_TPS_GLANCE_LEFT_LINK	= 168281316 (&H0A07C4E4)
DIBUTTON_TPS_GLANCE_RIGHT_LINK	= 168281324 (&H0A07C4EC)
DIBUTTON_TPS_GLANCE_UP_LINK	= 168281312 (&H0A07C4E0)
DIBUTTON_TPS_INVENTORY	= 167789578 (&H0A00440A)
DIBUTTON_TPS_JUMP	= 167773189 (&H0A000405)
DIBUTTON_TPS_MENU	= 167773437 (&H0A0004FD)
DIBUTTON_TPS_PAUSE	= 167789820 (&H0A0044FC)
DIBUTTON_TPS_RUN	= 167773185 (&H0A000401)
DIBUTTON_TPS_SELECT	= 167773187 (&H0A000403)
DIBUTTON_TPS_STELEFT	= 167789575 (&H0A004407)
DIBUTTON_TPS_STEPRIGHT	= 167789576 (&H0A004408)
DIBUTTON_TPS_TURN_LEFT_LINK	= 167920868 (&H0A0244E4)
DIBUTTON_TPS_TURN_RIGHT_LINK	= 167920876 (&H0A0244EC)
DIBUTTON_TPS_USE	= 167773188 (&H0A000404)
DIBUTTON_TPS_VIEW	= 167789574 (&H0A004406)
DIHATSWITCH_2DCONTROL_HATSWITCH	= 587220481 (&H23004601)
DIHATSWITCH_3DCONTROL_HATSWITCH	= 603997697 (&H24004601)
DIHATSWITCH_ARCADEP_VIEW	= 570443265 (&H22004601)
DIHATSWITCH_ARCADES_VIEW	= 553666049 (&H21004601)
DIHATSWITCH_BBALLD_GLANCE	= 318785025 (&H13004601)
DIHATSWITCH_BBALLO_GLANCE	= 302007809 (&H12004601)
DIHATSWITCH_BIKINGM_SCROLL	= 469779969 (&H1C004601)
DIHATSWITCH_CADF_HATSWITCH	= 620774913 (&H25004601)
DIHATSWITCH_CADM_HATSWITCH	= 637552129 (&H26004601)
DIHATSWITCH_DRIVINGC_GLANCE	= 33572353 (&H02004601)
DIHATSWITCH_DRIVINGR_GLANCE	= 16795137 (&H01004601)
DIHATSWITCH_DRIVINGT_GLANCE	= 50349569 (&H03004601)
DIHATSWITCH_FIGHTINGH_SLIDE	= 134235649 (&H08004601)
DIHATSWITCH_FISHING_GLANCE	= 234898945 (&H0E004601)
DIHATSWITCH_FLYINGC_GLANCE	= 67126785 (&H04004601)
DIHATSWITCH_FLYINGH_GLANCE	= 100681217 (&H06004601)
DIHATSWITCH_FLYINGM_GLANCE	= 83904001 (&H05004601)
DIHATSWITCH_FPS_GLANCE	= 151012865 (&H09004601)

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DIHATSWITCH\_GOLF\_SCROLL = 402671105 (&H18004601)  
 DIHATSWITCH\_HOCKEYD\_SCROLL = 436225537 (&H1A004601)  
 DIHATSWITCH\_HOCKEYG\_SCROLL = 453002753 (&H1B004601)  
 DIHATSWITCH\_HOCKEYO\_SCROLL = 419448321 (&H19004601)  
 DIHATSWITCH\_HUNTING\_GLANCE = 218121729 (&H0D004601)  
 DIHATSWITCH\_MECHA\_GLANCE = 687883777 (&H29004601)  
 DIHATSWITCH\_RACQUET\_GLANCE = 536888833 (&H20004601)  
 DIHATSWITCH\_SKIING\_GLANCE = 486557185 (&H1D004601)  
 DIHATSWITCH\_SOCCERD\_GLANCE = 520111617 (&H1F004601)  
 DIHATSWITCH\_SOCCERO\_GLANCE = 503334401 (&H1E004601)  
 DIHATSWITCH\_SPACESIM\_GLANCE = 117458433 (&H07004601)  
 DIHATSWITCH\_STRATEGYR\_GLANCE = 184567297 (&H0B004601)  
 DIHATSWITCH\_TPS\_GLANCE = 167790081 (&H0A004601)  
 DIVIRTUAL\_ARCADE\_PLATFORM = 570425344 (&H22000000)  
 DIVIRTUAL\_ARCADE\_SIDE2SIDE = 553648128 (&H21000000)  
 DIVIRTUAL\_BROWSER\_CONTROL = 671088640 (&H28000000)  
 DIVIRTUAL\_CAD\_2DCONTROL = 587202560 (&H23000000)  
 DIVIRTUAL\_CAD\_3DCONTROL = 603979776 (&H24000000)  
 DIVIRTUAL\_CAD\_FLYBY = 620756992 (&H25000000)  
 DIVIRTUAL\_CAD\_MODEL = 637534208 (&H26000000)  
 DIVIRTUAL\_DRIVING\_COMBAT = 33554432 (&H02000000)  
 DIVIRTUAL\_DRIVING\_MECHA = 687865856 (&H29000000)  
 DIVIRTUAL\_DRIVING\_RACE = 16777216 (&H01000000)  
 DIVIRTUAL\_DRIVING\_TANK = 50331648 (&H03000000)  
 DIVIRTUAL\_FIGHTING\_FPS = 150994944 (&H09000000)  
 DIVIRTUAL\_FIGHTING\_HAND2HAND = 134217728 (&H08000000)  
 DIVIRTUAL\_FIGHTING\_THIRDPERSON = 167772160 (&H0A000000)  
 DIVIRTUAL\_FLYING\_CIVILIAN = 67108864 (&H04000000)  
 DIVIRTUAL\_FLYING\_HELICOPTER = 100663296 (&H06000000)  
 DIVIRTUAL\_FLYING\_MILITARY = 83886080 (&H05000000)  
 DIVIRTUAL\_REMOTE\_CONTROL = 654311424 (&H27000000)  
 DIVIRTUAL\_SPACESIM = 117440512 (&H07000000)  
 DIVIRTUAL\_SPORTS\_BASEBALL\_BAT = 251658240 (&H0F000000)  
 DIVIRTUAL\_SPORTS\_BASEBALL\_FIELD = 285212672 (&H11000000)  
 DIVIRTUAL\_SPORTS\_BASEBALL\_PITCH = 268435456 (&H10000000)  
 DIVIRTUAL\_SPORTS\_BASKETBALL\_DEFENSE=318767104  
 (&H13000000)  
 DIVIRTUAL\_SPORTS\_BASKETBALL\_OFFENSE=301989888  
 (&H12000000)  
 DIVIRTUAL\_SPORTS\_BIKING\_MOUNTAIN = 469762048 (&H1C000000)  
 DIVIRTUAL\_SPORTS\_FISHING = 234881024 (&H0E000000)  
 DIVIRTUAL\_SPORTS\_FOOTBALL\_DEFENSE = 385875968 (&H17000000)  
 DIVIRTUAL\_SPORTS\_FOOTBALL\_FIELD = 335544320 (&H14000000)  
 DIVIRTUAL\_SPORTS\_FOOTBALL\_OFFENSE = 369098752 (&H16000000)  
 DIVIRTUAL\_SPORTS\_FOOTBALL\_QBCK = 352321536 (&H15000000)  
 DIVIRTUAL\_SPORTS\_GOLF = 402653184 (&H18000000)

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DIVIRTUAL_SPORTS_HOCKEY_DEFENSE = 436207616 (&H1A000000)
DIVIRTUAL_SPORTS_HOCKEY_GOALIE  = 452984832 (&H1B000000)
DIVIRTUAL_SPORTS_HOCKEY_OFFENSE = 419430400 (&H19000000)
DIVIRTUAL_SPORTS_HUNTING        = 218103808 (&H0D000000)
DIVIRTUAL_SPORTS_RACQUET        = 536870912 (&H20000000)
DIVIRTUAL_SPORTS_SKIING         = 486539264 (&H1D000000)
DIVIRTUAL_SPORTS_SOCCER_DEFENSE = 520093696 (&H1F000000)
DIVIRTUAL_SPORTS_SOCCER_OFFENSE = 503316480 (&H1E000000)
DIVIRTUAL_STRATEGY_ROLEPLAYING  = 184549376 (&H0B000000)
DIVIRTUAL_STRATEGY_TURN         = 201326592 (&H0C000000)

```

End Enum

## CONST\_DIGFFSFLAGS

#Members of this enumeration describe the state of a force-feedback device. They are returned by the **DirectInputDevice8.GetForceFeedbackState** method.

Enum CONST\_DIGFFSFLAGS

```

DIGFFS_ACTUATORSOFF = 32 (&H20)
DIGFFS_ACTUATORSON  = 16 (&H10)
DIGFFS_DEVICELOST   = -2147483648 (&H80000000)
DIGFFS_EMPTY        = 1
DIGFFS_PAUSED        = 4
DIGFFS_POWEROFF      = 128 (&H80)
DIGFFS_POWERON       = 64 (&H40)
DIGFFS_SAFETYSWITCHOFF = 512 (&H200)
DIGFFS_SAFETYSWITCHON = 256 (&H100)
DIGFFS_STOPPED       = 2
DIGFFS_USERFFSWITCHOFF = 2048 (&H800)
DIGFFS_USERFFSWITCHON = 1024 (&H400)

```

End Enum

### Constants

DIGFFS\_ACTUATORSOFF

The device's force-feedback actuators are disabled.

DIGFFS\_ACTUATORSON

The device's force-feedback actuators are enabled.

DIGFFS\_DEVICELOST

The device suffered an unexpected failure and is in an indeterminate state. It must be reset either by unacquiring and reacquiring the device, or by sending a DISFFC\_RESET command.

DIGFFS\_EMPTY

The device has no downloaded effects.

---

# IDH\_CONST\_DIGFFSFLAGS\_dinput\_vb



**DIGFFS\_PAUSED**

Playback of all active effects has been paused.

**DIGFFS\_POWEROFF**

The force-feedback system is not currently available. If the device cannot report the power state, then neither DIGFFS\_POWERON nor DIGFFS\_POWEROFF will be returned.

**DIGFFS\_POWERON**

Power to the force-feedback system is currently available. If the device cannot report the power state, then neither DIGFFS\_POWERON nor DIGFFS\_POWEROFF will be returned.

**DIGFFS\_SAFETYSWITCHOFF**

The safety switch is currently off, meaning that the device cannot operate. If the device cannot report the state of the safety switch, then neither DIGFFS\_SAFETYSWITCHON nor DIGFFS\_SAFETYSWITCHOFF will be returned.

**DIGFFS\_SAFETYSWITCHON**

The safety switch is currently on, meaning that the device can operate. If the device cannot report the state of the safety switch, then neither DIGFFS\_SAFETYSWITCHON nor DIGFFS\_SAFETYSWITCHOFF will be returned.

**DIGFFS\_STOPPED**

No effects are playing and the device is not paused.

**DIGFFS\_USERFFSWITCHOFF**

The user force-feedback switch is currently off, meaning that the device cannot operate. If the device cannot report the state of the user force-feedback switch, then neither DIGFFS\_USERFFSWITCHON nor DIGFFS\_USERFFSWITCHOFF will be returned.

**DIGFFS\_USERFFSWITCHON**

The user force-feedback switch is currently on, meaning that the device can operate. If the device cannot report the state of the user force-feedback switch, then neither DIGFFS\_USERFFSWITCHON nor DIGFFS\_USERFFSWITCHOFF will be returned.

## **CONST\_DIJOYSTICKOFS**

\*Used to identify device objects in joystick data. The values of the constants are the offset of the data within the data format for immediate data. The same identifiers are used in buffered data packets.

Enum CONST\_DIJOYSTICKOFS

DIJOFS\_BUTTON0 = 48 (&H30)

DIJOFS\_BUTTON1 = 49 (&H31)

DIJOFS\_BUTTON2 = 50 (&H32)

---

# IDH\_CONST\_DIJOYSTICKOFS\_dinput\_vb

```
DIJOFS_BUTTON3 = 51 (&H33)
DIJOFS_BUTTON4 = 52 (&H34)
DIJOFS_BUTTON5 = 53 (&H35)
DIJOFS_BUTTON6 = 54 (&H36)
DIJOFS_BUTTON7 = 55 (&H37)
DIJOFS_BUTTON8 = 56 (&H38)
DIJOFS_BUTTON9 = 57 (&H39)
DIJOFS_BUTTON10 = 58 (&H3A)
DIJOFS_BUTTON11 = 59 (&H3B)
DIJOFS_BUTTON12 = 60 (&H3C)
DIJOFS_BUTTON13 = 61 (&H3D)
DIJOFS_BUTTON14 = 62 (&H3E)
DIJOFS_BUTTON15 = 63 (&H3F)
DIJOFS_BUTTON16 = 64 (&H40)
DIJOFS_BUTTON17 = 65 (&H41)
DIJOFS_BUTTON18 = 66 (&H42)
DIJOFS_BUTTON19 = 67 (&H43)
DIJOFS_BUTTON20 = 68 (&H44)
DIJOFS_BUTTON21 = 69 (&H45)
DIJOFS_BUTTON22 = 70 (&H46)
DIJOFS_BUTTON23 = 71 (&H47)
DIJOFS_BUTTON24 = 72 (&H48)
DIJOFS_BUTTON25 = 73 (&H49)
DIJOFS_BUTTON26 = 74 (&H4A)
DIJOFS_BUTTON27 = 75 (&H4B)
DIJOFS_BUTTON28 = 76 (&H4C)
DIJOFS_BUTTON29 = 77 (&H4D)
DIJOFS_BUTTON30 = 78 (&H4E)
DIJOFS_BUTTON31 = 79 (&H4F)
DIJOFS_POV0 = 32 (&H20)
DIJOFS_POV1 = 36 (&H24)
DIJOFS_POV2 = 40 (&H28)
DIJOFS_POV3 = 44 (&H2C)
DIJOFS_RX = 12
DIJOFS_RY = 16 (&H10)
DIJOFS_RZ = 20 (&H14)
DIJOFS_SLIDER0 = 24 (&H18)
DIJOFS_SLIDER1 = 28 (&H1C)
DIJOFS_X = 0
DIJOFS_Y = 4
DIJOFS_Z = 8
End Enum
```

## Constants

DIJOFS\_BUTTON(*n*)

Offset of the data for button *n*.

DIJOFS\_POV0, DIJOFS\_POV1, DIJOFS\_POV2, DIJOFS\_POV3

Offset of the data for the point-of-view controller.

DIJOFS\_RX, DIJOFS\_RY, DIJOFS\_RZ

Offset of the data for the axis rotation.

DIJOFS\_SLIDER0, DIJOFS\_SLIDER1

Offset of the data for the slider.

DIJOFS\_X, DIJOFS\_Y, DIJOFS\_Z

Offset of the data for the axis.

## CONST\_DIKEYBOARDFLAGS

\*Used to specify keys in the **ISemantic** member of the **DIACTION** type.

Enum CONST\_DIKEYBOARDFLAGS

DIKEYBOARD_0	= -2130705397 (&H8100040B)
DIKEYBOARD_1	= -2130705406 (&H81000402)
DIKEYBOARD_2	= -2130705405 (&H81000403)
DIKEYBOARD_3	= -2130705404 (&H81000404)
DIKEYBOARD_4	= -2130705403 (&H81000405)
DIKEYBOARD_5	= -2130705402 (&H81000406)
DIKEYBOARD_6	= -2130705401 (&H81000407)
DIKEYBOARD_7	= -2130705400 (&H81000408)
DIKEYBOARD_8	= -2130705399 (&H81000409)
DIKEYBOARD_9	= -2130705398 (&H8100040A)
DIKEYBOARD_A	= -2130705378 (&H8100041E)
DIKEYBOARD_ABNT_C1	= -2130705293 (&H81000473)
DIKEYBOARD_ABNT_C2	= -2130705282 (&H8100047E)
DIKEYBOARD_ADD	= -2130705330 (&H8100044E)
DIKEYBOARD_APOSTROPHE	= -2130705368 (&H81000428)
DIKEYBOARD_APPS	= -2130705187 (&H810004DD)
DIKEYBOARD_AT	= -2130705263 (&H81000491)
DIKEYBOARD_AX	= -2130705258 (&H81000496)
DIKEYBOARD_B	= -2130705360 (&H81000430)
DIKEYBOARD_BACK	= -2130705394 (&H8100040E)
DIKEYBOARD_BACKSLASH	= -2130705365 (&H8100042B)
DIKEYBOARD_C	= -2130705362 (&H8100042E)
DIKEYBOARD_CALCULATOR	= -2130705247 (&H810004A1)
DIKEYBOARD_CAPITAL	= -2130705350 (&H8100043A)
DIKEYBOARD_COLON	= -2130705262 (&H81000492)
DIKEYBOARD_COMMA	= -2130705357 (&H81000433)
DIKEYBOARD_CONVERT	= -2130705287 (&H81000479)
DIKEYBOARD_D	= -2130705376 (&H81000420)

# IDH\_CONST\_DIKEYBOARDFLAGS\_dinput\_vb

---

DIKEYBOARD\_DECIMAL = -2130705325 (&H81000453)  
DIKEYBOARD\_DELETE = -2130705197 (&H810004D3)  
DIKEYBOARD\_DIVIDE = -2130705227 (&H810004B5)  
DIKEYBOARD\_DOWN = -2130705200 (&H810004D0)  
DIKEYBOARD\_E = -2130705390 (&H81000412)  
DIKEYBOARD\_END = -2130705201 (&H810004CF)  
DIKEYBOARD\_EQUALS = -2130705395 (&H8100040D)  
DIKEYBOARD\_ESCAPE = -2130705407 (&H81000401)  
DIKEYBOARD\_F = -2130705375 (&H81000421)  
DIKEYBOARD\_F1 = -2130705349 (&H8100043B)  
DIKEYBOARD\_F2 = -2130705348 (&H8100043C)  
DIKEYBOARD\_F3 = -2130705347 (&H8100043D)  
DIKEYBOARD\_F4 = -2130705346 (&H8100043E)  
DIKEYBOARD\_F5 = -2130705345 (&H8100043F)  
DIKEYBOARD\_F6 = -2130705344 (&H81000440)  
DIKEYBOARD\_F7 = -2130705343 (&H81000441)  
DIKEYBOARD\_F8 = -2130705342 (&H81000442)  
DIKEYBOARD\_F9 = -2130705341 (&H81000443)  
DIKEYBOARD\_F10 = -2130705340 (&H81000444)  
DIKEYBOARD\_F11 = -2130705321 (&H81000457)  
DIKEYBOARD\_F12 = -2130705320 (&H81000458)  
DIKEYBOARD\_F13 = -2130705308 (&H81000464)  
DIKEYBOARD\_F14 = -2130705307 (&H81000465)  
DIKEYBOARD\_F15 = -2130705306 (&H81000466)  
DIKEYBOARD\_G = -2130705374 (&H81000422)  
DIKEYBOARD\_GRAVE = -2130705367 (&H81000429)  
DIKEYBOARD\_H = -2130705373 (&H81000423)  
DIKEYBOARD\_HOME = -2130705209 (&H810004C7)  
DIKEYBOARD\_I = -2130705385 (&H81000417)  
DIKEYBOARD\_INSERT = -2130705198 (&H810004D2)  
DIKEYBOARD\_J = -2130705372 (&H81000424)  
DIKEYBOARD\_K = -2130705371 (&H81000425)  
DIKEYBOARD\_KANA = -2130705296 (&H81000470)  
DIKEYBOARD\_KANJI = -2130705260 (&H81000494)  
DIKEYBOARD\_L = -2130705370 (&H81000426)  
DIKEYBOARD\_LBRACKET = -2130705382 (&H8100041A)  
DIKEYBOARD\_LCONTROL = -2130705379 (&H8100041D)  
DIKEYBOARD\_LEFT = -2130705205 (&H810004CB)  
DIKEYBOARD\_LMENU = -2130705352 (&H81000438)  
DIKEYBOARD\_LSHIFT = -2130705366 (&H8100042A)  
DIKEYBOARD\_LWIN = -2130705189 (&H810004DB)  
DIKEYBOARD\_M = -2130705358 (&H81000432)  
DIKEYBOARD\_MAIL = -2130705172 (&H810004EC)  
DIKEYBOARD\_MEDIASELECT = -2130705171 (&H810004ED)  
DIKEYBOARD\_MEDIASTOP = -2130705244 (&H810004A4)  
DIKEYBOARD\_MINUS = -2130705396 (&H8100040C)

---

DIKEYBOARD\_MULTIPLY = -2130705353 (&H81000437)  
DIKEYBOARD\_MUTE = -2130705248 (&H810004A0)  
DIKEYBOARD\_MYCOMPUTER = -2130705173 (&H810004EB)  
DIKEYBOARD\_N = -2130705359 (&H81000431)  
DIKEYBOARD\_NEXT = -2130705199 (&H810004D1)  
DIKEYBOARD\_NEXTTRACK = -2130705255 (&H81000499)  
DIKEYBOARD\_NOCONVERT = -2130705285 (&H8100047B)  
DIKEYBOARD\_NUMLOCK = -2130705339 (&H81000445)  
DIKEYBOARD\_NUMPAD0 = -2130705326 (&H81000452)  
DIKEYBOARD\_NUMPAD1 = -2130705329 (&H8100044F)  
DIKEYBOARD\_NUMPAD2 = -2130705328 (&H81000450)  
DIKEYBOARD\_NUMPAD3 = -2130705327 (&H81000451)  
DIKEYBOARD\_NUMPAD4 = -2130705333 (&H8100044B)  
DIKEYBOARD\_NUMPAD5 = -2130705332 (&H8100044C)  
DIKEYBOARD\_NUMPAD6 = -2130705331 (&H8100044D)  
DIKEYBOARD\_NUMPAD7 = -2130705337 (&H81000447)  
DIKEYBOARD\_NUMPAD8 = -2130705336 (&H81000448)  
DIKEYBOARD\_NUMPAD9 = -2130705335 (&H81000449)  
DIKEYBOARD\_NUMPADCOMMA = -2130705229 (&H810004B3)  
DIKEYBOARD\_NUMPADENTER = -2130705252 (&H8100049C)  
DIKEYBOARD\_NUMPADEQUALS = -2130705267 (&H8100048D)  
DIKEYBOARD\_O = -2130705384 (&H81000418)  
DIKEYBOARD\_OEM\_102 = -2130705322 (&H81000456)  
DIKEYBOARD\_P = -2130705383 (&H81000419)  
DIKEYBOARD\_PAUSE = -2130705211 (&H810004C5)  
DIKEYBOARD\_PERIOD = -2130705356 (&H81000434)  
DIKEYBOARD\_PLAYPAUSE = -2130705246 (&H810004A2)  
DIKEYBOARD\_POWER = -2130705186 (&H810004DE)  
DIKEYBOARD\_PREVTRACK = -2130705264 (&H81000490)  
DIKEYBOARD\_PRIOR = -2130705207 (&H810004C9)  
DIKEYBOARD\_Q = -2130705392 (&H81000410)  
DIKEYBOARD\_R = -2130705389 (&H81000413)  
DIKEYBOARD\_RBRACKET = -2130705381 (&H8100041B)  
DIKEYBOARD\_RCONTROL = -2130705251 (&H8100049D)  
DIKEYBOARD\_RETURN = -2130705380 (&H8100041C)  
DIKEYBOARD\_RIGHT = -2130705203 (&H810004CD)  
DIKEYBOARD\_RMENU = -2130705224 (&H810004B8)  
DIKEYBOARD\_RSHIFT = -2130705354 (&H81000436)  
DIKEYBOARD\_RWIN = -2130705188 (&H810004DC)  
DIKEYBOARD\_S = -2130705377 (&H8100041F)  
DIKEYBOARD\_SCROLL = -2130705338 (&H81000446)  
DIKEYBOARD\_SEMICOLON = -2130705369 (&H81000427)  
DIKEYBOARD\_SLASH = -2130705355 (&H81000435)  
DIKEYBOARD\_SLEEP = -2130705185 (&H810004DF)  
DIKEYBOARD\_SPACE = -2130705351 (&H81000439)  
DIKEYBOARD\_STOP = -2130705259 (&H81000495)

---

```

DIKEYBOARD_SUBTRACT = -2130705334 (&H8100044A)
DIKEYBOARD_SYSRQ    = -2130705225 (&H810004B7)
DIKEYBOARD_T        = -2130705388 (&H81000414)
DIKEYBOARD_TAB      = -2130705393 (&H8100040F)
DIKEYBOARD_U        = -2130705386 (&H81000416)
DIKEYBOARD_UNDERLINE = -2130705261 (&H81000493)
DIKEYBOARD_UNLABELED = -2130705257 (&H81000497)
DIKEYBOARD_UP       = -2130705208 (&H810004C8)
DIKEYBOARD_V        = -2130705361 (&H8100042F)
DIKEYBOARD_VOLUMEDOWN = -2130705234 (&H810004AE)
DIKEYBOARD_VOLUMEUP  = -2130705232 (&H810004B0)
DIKEYBOARD_W        = -2130705391 (&H81000411)
DIKEYBOARD_WAKE     = -2130705181 (&H810004E3)
DIKEYBOARD_WEBBACK  = -2130705174 (&H810004EA)
DIKEYBOARD_WEBFAVORITES = -2130705178 (&H810004E6)
DIKEYBOARD_WEBFORWARD = -2130705175 (&H810004E9)
DIKEYBOARD_WEBHOME  = -2130705230 (&H810004B2)
DIKEYBOARD_WEBREFRESH = -2130705177 (&H810004E7)
DIKEYBOARD_WEBSEARCH = -2130705179 (&H810004E5)
DIKEYBOARD_WEBSTOP  = -2130705176 (&H810004E8)
DIKEYBOARD_X        = -2130705363 (&H8100042D)
DIKEYBOARD_Y        = -2130705387 (&H81000415)
DIKEYBOARD_YEN      = -2130705283 (&H8100047D)
DIKEYBOARD_Z        = -2130705364 (&H8100042C)
End Enum

```

## Constants

```

DIKEYBOARD_(n)
    Number keys 0 through 9 on the main keyboard
DIKEYBOARD_A...DIKEYBOARD_Z
    Letter keys A through Z on the main keyboard
DIKEYBOARD_ABNT_C1, DIKEYBOARD_ABNT_C2
    On numeric keypad of Brazilian keyboards
DIKEYBOARD_ADD
    PLUS SIGN (+) on the numeric keypad
DIKEYBOARD_APOSTROPHE
    APOSTROPHE (') key
DIKEYBOARD_APPS

DIKEYBOARD_AT
    On Japanese keyboard
DIKEYBOARD_AX
    On Japanese keyboard

```

DIKEYBOARD\_BACK  
BACKSPACE key

DIKEYBOARD\_BACKSLASH  
BACKSLASH (\) key

DIKEYBOARD\_CALCULATOR  
Dedicated key that launches a calculator

DIKEYBOARD\_CAPITAL  
CAPS LOCK key

DIKEYBOARD\_COLON  
On Japanese keyboard

DIKEYBOARD\_COMMA  
COMMA (,) key

DIKEYBOARD\_CONVERT  
On Japanese keyboard

DIKEYBOARD\_DECIMAL  
Decimal point (PERIOD) on the numeric keypad

DIKEYBOARD\_DELETE  
DELETE key on the main keyboard (not DEL on the numeric keypad)

DIKEYBOARD\_DIVIDE  
FORWARD SLASH (/) on the numeric keypad

DIKEYBOARD\_DOWN, DIKEYBOARD\_UP  
DOWN ARROW, UP ARROW on the main keyboard (not the arrow keys on the numeric keypad)

DIKEYBOARD\_END  
END key on the main keyboard (not END on the numeric keypad)

DIKEYBOARD\_EQUALS  
EQUAL SIGN on the main keyboard

DIKEYBOARD\_ESCAPE  
ESC key

DIKEYBOARD\_F(*n*)  
Function keys F1 through F15

DIKEYBOARD\_GRAVE  
Grave accent (`)

DIKEYBOARD\_HOME  
HOME key on the main keyboard (not HOME on the numeric keypad)

DIKEYBOARD\_INSERT  
INSERT key on the main keyboard (not INS on the numeric keypad)

DIKEYBOARD\_KANA  
On Japanese keyboard

DIKEYBOARD\_KANJI  
On Japanese keyboard

DIKEYBOARD\_LBRACKET, DIKEYBOARD\_RBRACKET

Left ( [ ) and right ( ] ) SQUARE BRACKET keys  
DIKEYBOARD\_LCONTROL, DIKEYBOARD\_RCONTROL  
Left and right CTRL keys  
DIKEYBOARD\_LEFT, DIKEYBOARD\_RIGHT  
LEFT ARROW, RIGHT ARROW on the main keyboard (not the arrow keys on the numeric keypad)  
DIKEYBOARD\_LMENU, DIKEYBOARD\_RMENU  
Left and right ALT keys  
DIKEYBOARD\_LSHIFT, DIKEYBOARD\_RSHIFT  
Left and right SHIFT keys  
DIKEYBOARD\_LWIN, DIKEYBOARD\_RWIN  
Left and right Microsoft® Windows® logo keys  
DIKEYBOARD\_MAIL  
Dedicated key to launch an e-mail program  
DIKEYBOARD\_MEDIASELECT  
Media Select key, which displays a selection of supported media players on the system  
DIKEYBOARD\_MEDIASTOP  
Stops multimedia play  
DIKEYBOARD\_MINUS  
(HYPHEN) (-) (MINUS SIGN) on the main keyboard  
DIKEYBOARD\_MULTIPLY  
Asterisk (\*) on the numeric keypad  
DIKEYBOARD\_MUTE  
Mutes sound output  
DIKEYBOARD\_MYCOMPUTER  
Launches My Computer on applicable Windows systems  
DIKEYBOARD\_NEXT  
PAGE DOWN key on the main keyboard (not PGDN on the numeric keypad)  
DIKEYBOARD\_NEXTTRACK  
Advances to the next CD/DVD track  
DIKEYBOARD\_NOCONVERT  
On Japanese keyboard  
DIKEYBOARD\_NUMLOCK  
NUM LOCK key  
DIKEYBOARD\_NUMPAD(*n*)  
Number keys on the numeric keypad  
DIKEYBOARD\_NUMPADCOMMA  
COMMA (,) on the NEC PC98 numeric keypad  
DIKEYBOARD\_NUMPADENTER  
ENTER on the numeric keypad  
DIKEYBOARD\_NUMPADEQUALS



EQUAL SIGN on the numeric keypad of the NEC PC98 keyboard

DIKEYBOARD\_OEM\_102  
On British and German keyboards

DIKEYBOARD\_PAUSE  
PAUSE key

DIKEYBOARD\_PERIOD  
PERIOD on the main keyboard

DIKEYBOARD\_PLAYPAUSE  
Pauses multimedia play

DIKEYBOARD\_POWER  
System power key

DIKEYBOARD\_PREVTRACK  
Play the previous CD/DVD track; CIRCUMFLEX on Japanese keyboard

DIKEYBOARD\_PRIOR  
PAGE UP key on the main keyboard (not PGUP on the numeric keypad)

DIKEYBOARD\_RETURN  
ENTER on the main keyboard

DIKEYBOARD\_SCROLL  
SCROLL LOCK key

DIKEYBOARD\_SEMICOLON  
SEMICOLON (;) key

DIKEYBOARD\_SLASH  
FORWARD SLASH (/) on the main keyboard (not FORWARD SLASH on the numeric keypad)

DIKEYBOARD\_SLEEP  
Sends the system into sleep mode

DIKEYBOARD\_SPACE  
The SPACEBAR

DIKEYBOARD\_STOP  
On Japanese keyboard

DIKEYBOARD\_SUBTRACT  
MINUS SIGN on the numeric keypad

DIKEYBOARD\_SYSRQ  
SYSRQ key

DIKEYBOARD\_TAB  
TAB key

DIKEYBOARD\_UNDERLINE  
On Japanese keyboard

DIKEYBOARD\_UNLABELED  
On Japanese keyboard

DIKEYBOARD\_VOLUMEDOWN  
Decreases sound output level

DIKEYBOARD\_VOLUMEUP

Increases sound output level

DIKEYBOARD\_WAKE

Wakes the system out of sleep mode

DIKEYBOARD\_WEBBACK

Navigates a browser back one page in the history list

DIKEYBOARD\_WEBFAVORITES

Displays the Microsoft Internet Explorer Favorites list, the Windows Favorites folder, or the Netscape Bookmarks list

DIKEYBOARD\_WEBFORWARD

Instructs a browser to move to the next page in the history list

DIKEYBOARD\_WEBHOME

Instructs a browser to load the user's home page

DIKEYBOARD\_WEBREFRESH

Instructs a browser to reload the current page

DIKEYBOARD\_WEBSEARCH

Instructs a browser to launch a search engine

DIKEYBOARD\_WEBSTOP

Instructs a browser to stop loading the current page

DIKEYBOARD\_YEN

On Japanese keyboard

The constants in this enumeration correspond to the members of **CONST\_DIKEYFLAGS**, but their names begin with DIK rather than DIKEYBOARD and they have different values.

## CONST\_DIKEYFLAGS

#Used to identify keys in keyboard data.

Enum CONST\_DIKEYFLAGS

DIK\_0 = 11

DIK\_1 = 2

DIK\_2 = 3

DIK\_3 = 4

DIK\_4 = 5

DIK\_5 = 6

DIK\_6 = 7

DIK\_7 = 8

DIK\_8 = 9

DIK\_9 = 10

DIK\_A = 30 (&H1E)

DIK\_ABNT\_C1 = 115 (&H73)

---

# IDH\_CONST\_DIKEYFLAGS\_dinput\_vb

---

DIK\_ABNT\_C2 = 126 (&H7E)  
DIK\_ADD = 78 (&H4E)  
DIK\_APOSTROPHE = 40 (&H28)  
DIK\_APPS = 221 (&HDD)  
DIK\_AT = 145 (&H91)  
DIK\_AX = 150 (&H96)  
DIK\_B = 48 (&H30)  
DIK\_BACK = 14  
DIK\_BACKSLASH = 43 (&H2B)  
DIK\_BACKSPACE = 14  
DIK\_C = 46 (&H2E)  
DIK\_CALCULATOR = 161 (&HA1)  
DIK\_CAPITAL = 58 (&H3A)  
DIK\_CAPSLOCK = 58 (&H3A)  
DIK\_CIRCUMFLEX = 144 (&H90)  
DIK\_COLON = 146 (&H92)  
DIK\_COMMA = 51 (&H33)  
DIK\_CONVERT = 121 (&H79)  
DIK\_D = 32 (&H20)  
DIK\_DECIMAL = 83 (&H53)  
DIK\_DELETE = 211 (&HD3)  
DIK\_DIVIDE = 181 (&HB5)  
DIK\_DOWN = 208 (&HD0)  
DIK\_DOWNARROW = 208 (&HD0)  
DIK\_E = 18 (&H12)  
DIK\_END = 207 (&HCF)  
DIK\_EQUALS = 13  
DIK\_ESCAPE = 1  
DIK\_F = 33 (&H21)  
DIK\_F1 = 59 (&H3B)  
DIK\_F2 = 60 (&H3C)  
DIK\_F3 = 61 (&H3D)  
DIK\_F4 = 62 (&H3E)  
DIK\_F5 = 63 (&H3F)  
DIK\_F6 = 64 (&H40)  
DIK\_F7 = 65 (&H41)  
DIK\_F8 = 66 (&H42)  
DIK\_F9 = 67 (&H43)  
DIK\_F10 = 68 (&H44)  
DIK\_F11 = 87 (&H57)  
DIK\_F12 = 88 (&H58)  
DIK\_F13 = 100 (&H64)  
DIK\_F14 = 101 (&H65)  
DIK\_F15 = 102 (&H66)  
DIK\_G = 34 (&H22)  
DIK\_GRAVE = 41 (&H29)

---

DIK\_H = 35 (&H23)  
DIK\_HOME = 199 (&HC7)  
DIK\_I = 23 (&H17)  
DIK\_INSERT = 210 (&HD2)  
DIK\_J = 36 (&H24)  
DIK\_K = 37 (&H25)  
DIK\_KANA = 112 (&H70)  
DIK\_KANJI = 148 (&H94)  
DIK\_L = 38 (&H26)  
DIK\_LALT = 56 (&H38)  
DIK\_LBRACKET = 26 (&H1A)  
DIK\_LCONTROL = 29 (&H1D)  
DIK\_LEFT = 203 (&HCB)  
DIK\_LEFTARROW = 203 (&HCB)  
DIK\_LMENU = 56 (&H38)  
DIK\_LSHIFT = 42 (&H2A)  
DIK\_LWIN = 219 (&HDB)  
DIK\_M = 50 (&H32)  
DIK\_MAIL = 236 (&HEC)  
DIK\_MEDIASELECT = 237 (&HED)  
DIK\_MEDIASTOP = 164 (&HA4)  
DIK\_MINUS = 12  
DIK\_MULTIPLY = 55 (&H37)  
DIK\_MUTE = 160 (&HA0)  
DIK\_MYCOMPUTER = 235 (&HEB)  
DIK\_N = 49 (&H31)  
DIK\_NEXT = 209 (&HD1)  
DIK\_NEXTTRACK = 153 (&H99)  
DIK\_NOCONVERT = 123 (&H7B)  
DIK\_NUMLOCK = 69 (&H45)  
DIK\_NUMPAD0 = 82 (&H52)  
DIK\_NUMPAD1 = 79 (&H4F)  
DIK\_NUMPAD2 = 80 (&H50)  
DIK\_NUMPAD3 = 81 (&H51)  
DIK\_NUMPAD4 = 75 (&H4B)  
DIK\_NUMPAD5 = 76 (&H4C)  
DIK\_NUMPAD6 = 77 (&H4D)  
DIK\_NUMPAD7 = 71 (&H47)  
DIK\_NUMPAD8 = 72 (&H48)  
DIK\_NUMPAD9 = 73 (&H49)  
DIK\_NUMPADCOMMA = 179 (&HB3)  
DIK\_NUMPADENTER = 156 (&H9C)  
DIK\_NUMPADEQUALS = 141 (&H8D)  
DIK\_NUMPADMINUS = 74 (&H4A)  
DIK\_NUMPADPERIOD = 83 (&H53)  
DIK\_NUMPADPLUS = 78 (&H4E)

---

DIK\_NUMPADSLASH = 181 (&HB5)  
DIK\_NUMPADSTAR = 55 (&H37)  
DIK\_O = 24 (&H18)  
DIK\_OEM\_102 = 86 (&H56)  
DIK\_P = 25 (&H19)  
DIK\_PAUSE = 197 (&HC5)  
DIK\_PERIOD = 52 (&H34)  
DIK\_PGDN = 209 (&HD1)  
DIK\_PGUP = 201 (&HC9)  
DIK\_PLAYPAUSE = 162 (&HA2)  
DIK\_POWER = 222 (&HDE)  
DIK\_PREVTRACK = 144 (&H90)  
DIK\_PRIOR = 201 (&HC9)  
DIK\_Q = 16 (&H10)  
DIK\_R = 19 (&H13)  
DIK\_RALT = 184 (&HB8)  
DIK\_RBRACKET = 27 (&H1B)  
DIK\_RCONTROL = 157 (&H9D)  
DIK\_RETURN = 28 (&H1C)  
DIK\_RIGHT = 205 (&HCD)  
DIK\_RIGHTARROW = 205 (&HCD)  
DIK\_RMENU = 184 (&HB8)  
DIK\_RSHIFT = 54 (&H36)  
DIK\_RWIN = 220 (&HDC)  
DIK\_S = 31 (&H1F)  
DIK\_SCROLL = 70 (&H46)  
DIK\_SEMICOLON = 39 (&H27)  
DIK\_SLASH = 53 (&H35)  
DIK\_SLEEP = 223 (&HDF)  
DIK\_SPACE = 57 (&H39)  
DIK\_STOP = 149 (&H95)  
DIK\_SUBTRACT = 74 (&H4A)  
DIK\_SYSRQ = 183 (&HB7)  
DIK\_T = 20 (&H14)  
DIK\_TAB = 15  
DIK\_U = 22 (&H16)  
DIK\_UNDERLINE = 147 (&H93)  
DIK\_UNLABELED = 151 (&H97)  
DIK\_UP = 200 (&HC8)  
DIK\_UPARROW = 200 (&HC8)  
DIK\_V = 47 (&H2F)  
DIK\_VOLUMEDOWN = 174 (&HAE)  
DIK\_VOLUMEUP = 176 (&HB0)  
DIK\_W = 17 (&H11)  
DIK\_WAKE = 227 (&HE3)  
DIK\_WEBBACK = 234 (&HEA)

---

```
DIK_WEBFAVORITES = 230 (&HE6)
DIK_WEBFORWARD  = 233 (&HE9)
DIK_WEBHOME     = 178 (&HB2)
DIK_WEBREFRESH  = 231 (&HE7)
DIK_WEBSEARCH   = 229 (&HE5)
DIK_WEBSTOP     = 232 (&HE8)
DIK_X           = 45 (&H2D)
DIK_Y           = 21 (&H15)
DIK_YEN         = 125 (&H7D)
DIK_Z           = 44 (&H2C)
End Enum
```

## Constants

```
DIK_(n)
    Number keys 0 through 9 on the main keyboard
DIK_A...DIK_Z
    Letter keys A through Z on the main keyboard
DIK_ABNT_C1, DIK_ABNT_C2
    On numeric keypad of Brazilian keyboards
DIK_ADD
    PLUS SIGN (+) on the numeric keypad
DIK_APOSTROPHE
    APOSTROPHE (') key
DIK_APPS

DIK_AT
    On Japanese keyboard
DIK_AX
    On Japanese keyboard
DIK_BACK
    BACKSPACE key
DIK_BACKSLASH
    BACKSLASH (\) key
DIK_BACKSPACE
    BACKSPACE key (alias of DIK_BACKSLASH)
DIK_CALCULATOR
    Dedicated key that launches a calculator
DIK_CAPITAL
    CAPS LOCK key
DIK_CAPSLOCK
    CAPS LOCK key (alias of DIK_CAPITAL)
DIK_CIRCUMFLEX
```

On Japanese keyboard  
DIK\_COLON  
On Japanese keyboard  
DIK\_COMMA  
COMMA (,) key  
DIK\_CONVERT  
On Japanese keyboard  
DIK\_DECIMAL  
Decimal point (PERIOD) on the numeric keypad  
DIK\_DELETE  
DELETE key on the main keyboard (not DEL on the numeric keypad)  
DIK\_DIVIDE  
FORWARD SLASH (/) on the numeric keypad  
DIK\_DOWN, DIK\_UP  
DOWN ARROW, UP ARROW on main keyboard (not the arrow keys on the numeric keypad)  
DIK\_DOWNARROW, UPARROW  
DOWN ARROW, UP ARROW on main keyboard (not the arrow keys on the numeric keypad) (aliases of DIK\_DOWN and DIK\_UP)  
DIK\_END  
END key on the main keyboard (not END on the numeric keypad)  
DIK\_EQUALS  
EQUAL SIGN on the main keyboard  
DIK\_ESCAPE  
ESC key  
DIK\_F(n)  
Function keys F1 through F15  
DIK\_GRAVE  
Grave accent (`)  
DIK\_HOME  
HOME key on the main keyboard (not HOME on the numeric keypad)  
DIK\_INSERT  
INSERT key on the main keyboard (not INS on the numeric keypad)  
DIK\_KANA  
On Japanese keyboard  
DIK\_KANJI  
On Japanese keyboard  
DIK\_LALT, DIK\_RALT  
Left and right ALT keys (alias of DIK\_LMENU and DIK\_RMENU)  
DIK\_LBRACKET, DIK\_RBRACKET  
Left ( [ ) and right ( ] ) SQUAREBRACKET keys  
DIK\_LCONTROL, DIK\_RCONTROL

Left and right CTRL keys

DIK\_LEFT, DIK\_RIGHT

LEFT ARROW, RIGHT ARROW on the main keyboard (not the arrow keys on the numeric keypad)

DIK\_LEFTARROW, DIK\_RIGHTARROW

LEFT ARROW, RIGHT ARROW on the main keyboard (not the arrow keys on the numeric keypad) (aliases of DIK\_LEFT and DIK\_RIGHT)

DIK\_LMENU, DIK\_RMENU

Left and right ALT keys

DIK\_LSHIFT, DIK\_RSHIFT

Left and right SHIFT keys

DIK\_LWIN, DIK\_RWIN

Left and right Microsoft® Windows® logo keys

DIK\_MAIL

Dedicated key to launch an e-mail program

DIK\_MEDIASELECT

Media Select key, which displays a selection of supported media players on the system

DIK\_MEDIASTOP

Stops multimedia play

DIK\_MINUS

MINUS SIGN (hyphen) on the main keyboard

DIK\_MULTIPLY

Asterisk (\*) on the numeric keypad

DIK\_MUTE

Mutes sound output

DIK\_MYCOMPUTER

Launches **My Computer** on applicable Windows systems

DIK\_NEXT

PAGE DOWN key on the main keyboard (not PGDN on the numeric keypad)

DIK\_NEXTTRACK

Advances to the next CD/DVD track

DIK\_NOCONVERT

On Japanese keyboard

DIK\_NUMLOCK

NUM LOCK key

DIK\_NUMPAD(n)

Number keys on the numeric keypad

DIK\_NUMPADCOMMA

COMMA on the NEC PC98 numeric keypad

DIK\_NUMPADENTER

ENTER on the numeric keypad



DIK\_NUMPADEQUALS

EQUAL SIGN on the numeric keypad of the NEC PC98 keyboard

DIK\_NUMPADMINUS

MINUS SIGN on the numeric keypad (alias of DIK\_SUBTRACT)

DIK\_NUMPADPERIOD

Decimal point (PERIOD) on the numeric keypad (alias of DIK\_DECIMAL)

DIK\_NUMPADPLUS

PLUS SIGN (+) on the numeric keypad (alias of DIK\_ADD)

DIK\_NUMPADSLASH

FORWARD SLASH (/) on the numeric keypad (alias of DIK\_DIVIDE)

DIK\_NUMPADSTAR

ASTERISK (\*) on the numeric keypad (alias of DIK\_MULTIPLY)

DIK\_OEM\_102

On British and German keyboards

DIK\_PAUSE

PAUSE key

DIK\_PERIOD

PERIOD on the main keyboard (not the decimal point on the numeric keypad)

DIK\_PGDN, DIK\_PGUP

PAGE DOWN, PAGE UP keys on the main keyboard (not PGDN and PGUP on the numeric keypad) (aliases of DIK\_NEXT and DIK\_PRIOR)

DIK\_PLAYPAUSE

Pauses multimedia play

DIK\_POWER

System power key

DIK\_PREVTRACK

Play the previous CD/DVD track

DIK\_PRIOR

PAGE UP key on the main keyboard (not PGUP on the numeric keypad)

DIK\_RETURN

ENTER on the main keyboard

DIK\_SCROLL

SCROLL LOCK key

DIK\_SEMICOLON

SEMICOLON key

DIK\_SLASH

FORWARD SLASH (/) on the main keyboard (not FORWARD SLASH on the numeric keypad)

DIK\_SLEEP

Sends the system into sleep mode

DIK\_SPACE

The SPACEBAR

DIK\_STOP  
On Japanese keyboard

DIK\_SUBTRACT  
MINUS SIGN on the numeric keypad

DIK\_SYSRQ  
SYSRQ key

DIK\_TAB  
TAB key

DIK\_UNDERLINE  
On Japanese keyboard

DIK\_UNLABELED  
On Japanese keyboard

DIK\_VOLUMEDOWN  
Decreases sound output level

DIK\_VOLUMEUP  
Increases sound output level

DIK\_WAKE  
Wakes the system out of sleep mode

DIK\_WEBBACK  
Navigates a browser back one page in the history list

DIK\_WEBFAVORITES  
Displays the Internet Explorer Favorites list, the Windows Favorites folder, or the Netscape Bookmarks list

DIK\_WEBFORWARD  
Instructs a browser to move to the next page in the history list

DIK\_WEBHOME  
Instructs a browser to load the user's home page

DIK\_WEBREFRESH  
Instructs a browser to reload the current page

DIK\_WEBSEARCH  
Instructs a browser to launch a search engine

DIK\_WEBSTOP  
Instructs a browser to stop loading the current page

DIK\_YEN  
On Japanese keyboard

## Remarks

The constants in this enumeration that are not aliases correspond to the members of **CONST\_DIKEYBOARDFLAGS**, begin with DIK rather than DIKEYBOARD, and have different values.

## CONST\_DIMAPFLAGS

#Used in the **ISemantic** member of the **DIACTION** type to map an action to any matching control on the device.

These constants can be used to map an application action to a virtual control that is not defined in a genre. Such actions are mapped after genre-specific actions. If the mapper has already mapped all matching controls to genre-specific actions, the action is left unmapped.

Actions mapped with these constants are treated with equal priority. If a device has one x-axis and the action array specifies **DIAXIS\_ANY\_1** and **DIAXIS\_ANY\_X\_1**, the action mapped to the x-axis is the one that appears first in the action array.

Enum **CONST\_DIMAPFLAGS**

```

DIAXIS_ANY_1 = -16760319 (&HFF004201)
DIAXIS_ANY_2 = -16760318 (&HFF004202)
DIAXIS_ANY_3 = -16760317 (&HFF004203)
DIAXIS_ANY_4 = -16760316 (&HFF004204)
DIAXIS_ANY_A_1 = -16530943 (&HFF03C201)
DIAXIS_ANY_A_2 = -16530942 (&HFF03C202)
DIAXIS_ANY_B_1 = -16498175 (&HFF044201)
DIAXIS_ANY_B_2 = -16498174 (&HFF044202)
DIAXIS_ANY_C_1 = -16465407 (&HFF04C201)
DIAXIS_ANY_C_2 = -16465406 (&HFF04C202)
DIAXIS_ANY_R_1 = -16629247 (&HFF024201)
DIAXIS_ANY_R_2 = -16629246 (&HFF024202)
DIAXIS_ANY_S_1 = -16432639 (&HFF054201)
DIAXIS_ANY_S_2 = -16432638 (&HFF054202)
DIAXIS_ANY_U_1 = -16596479 (&HFF02C201)
DIAXIS_ANY_U_2 = -16596478 (&HFF02C202)
DIAXIS_ANY_V_1 = -16563711 (&HFF034201)
DIAXIS_ANY_V_2 = -16563710 (&HFF034202)
DIAXIS_ANY_X_1 = -16727551 (&HFF00C201)
DIAXIS_ANY_X_2 = -16727550 (&HFF00C202)
DIAXIS_ANY_Y_1 = -16694783 (&HFF014201)
DIAXIS_ANY_Y_2 = -16694782 (&HFF014202)
DIAXIS_ANY_Z_1 = -16662015 (&HFF01C201)
DIAXIS_ANY_Z_2 = -16662014 (&HFF01C202)
DIBUTTON_ANY = -16759808 (&HFF004400)
DIPOV_ANY_1 = -16759295 (&HFF004601)
DIPOV_ANY_2 = -16759294 (&HFF004602)
DIPOV_ANY_3 = -16759293 (&HFF004603)
DIPOV_ANY_4 = -16759292 (&HFF004604)

```

End Enum

---

# IDH\_CONST\_DIMAPFLAGS\_dinput\_vb

## Constants

DIAXIS\_ANY\_1

Any axis

DIAXIS\_ANY\_2

Any axis

DIAXIS\_ANY\_3

Any axis

DIAXIS\_ANY\_4

Any axis

DIAXIS\_ANY\_A\_1

Any accelerator

DIAXIS\_ANY\_A\_2

Any accelerator

DIAXIS\_ANY\_B\_1

Any brake

DIAXIS\_ANY\_B\_2

Any brake

DIAXIS\_ANY\_C\_1

Any clutch

DIAXIS\_ANY\_C\_2

Any clutch

DIAXIS\_ANY\_R\_1

Any r-axis

DIAXIS\_ANY\_R\_2

Any r-axis

DIAXIS\_ANY\_S\_1

Any s-axis

DIAXIS\_ANY\_S\_2

Any s-axis

DIAXIS\_ANY\_U\_1

Any u-axis

DIAXIS\_ANY\_U\_2

Any u-axis

DIAXIS\_ANY\_V\_1

Any v-axis

DIAXIS\_ANY\_V\_2

Any v-axis

DIAXIS\_ANY\_X\_1

Any x-axis

DIAXIS\_ANY\_X\_1

---

Any x-axis  
 DIAXIS\_ANY\_Y\_1  
 Any y-axis  
 DIAXIS\_ANY\_Y\_1  
 Any y-axis  
 DIAXIS\_ANY\_Z\_1  
 Any z-axis  
 DIAXIS\_ANY\_Z\_1  
 Any z-axis  
 DIBUTTON\_ANY  
 Any button  
 DIPOV\_ANY\_1  
 Any point-of-view controller  
 DIPOV\_ANY\_2  
 Any point-of-view controller  
 DIPOV\_ANY\_3  
 Any point-of-view controller  
 DIPOV\_ANY\_4  
 Any point-of-view controller

## CONST\_DIMOUSEFLAGS

#Used to specify mouse buttons and axes in the **ISemantic** member of the **DIACTION** type.

Enum CONST\_DIMOUSEFLAGS

DIMOUSE\_BUTTON0 = -2113928180 (&H8200040C)  
 DIMOUSE\_BUTTON1 = -2113928179 (&H8200040D)  
 DIMOUSE\_BUTTON2 = -2113928178 (&H8200040E)  
 DIMOUSE\_BUTTON3 = -2113928177 (&H8200040F)  
 DIMOUSE\_BUTTON4 = -2113928176 (&H82000410)  
 DIMOUSE\_BUTTON5 = -2113928175 (&H82000411)  
 DIMOUSE\_BUTTON6 = -2113928174 (&H82000412)  
 DIMOUSE\_BUTTON7 = -2113928173 (&H82000413)  
 DIMOUSE\_WHEEL = -2113928440 (&H82000308)  
 DIMOUSE\_XAXIS = -2113928448 (&H82000300)  
 DIMOUSE\_XAXISAB = -2113928704 (&H82000200)  
 DIMOUSE\_YAXIS = -2113928444 (&H82000304)  
 DIMOUSE\_YAXISAB = -2113928700 (&H82000204)

End Enum

---

# IDH\_CONST\_DIMOUSEFLAGS\_dinput\_vb

## Constants

DIMOUSE\_BUTTON(*n*)

Buttons 0 through 7.

DIMOUSE\_WHEEL, DIMOUSE\_XAXIS, DIMOUSE\_YAXIS

Axes that return relative data.

DIMOUSE\_XAXISAB, DIMOUSE\_YAXISAB

Axes that return absolute data.

## CONST\_DIMOUSEOFS

#Used to identify buttons and axes in mouse data. The values of the constants are the offset of the data within the data format for immediate data. The same identifiers are used in buffered data packets.

Enum CONST\_DIMOUSEOFS

DIMOFS\_BUTTON0 = 12

DIMOFS\_BUTTON1 = 13

DIMOFS\_BUTTON2 = 14

DIMOFS\_BUTTON3 = 15

DIMOFS\_BUTTON4 = 16 (&H10)

DIMOFS\_BUTTON5 = 17 (&H11)

DIMOFS\_BUTTON6 = 18 (&H12)

DIMOFS\_BUTTON7 = 19 (&H13)

DIMOFS\_X = 0

DIMOFS\_Y = 4

DIMOFS\_Z = 8

End Enum

## Constants

DIMOFS\_BUTTON(*n*)

Offset of the data for buttons 0 through 7.

DIMOFS\_X, DIMOFS\_Y, DIMOFS\_Z

Offset of the data for the axis.

## CONST\_DINPUT

#The **CONST\_DINPUT** enumeration contains various constants that are used throughout Microsoft® DirectInput®.

Enum CONST\_DINPUT

DIEB\_NOTRIGGER = -1 (&HFFFFFFF)

DIPROPAUTCENTER\_OFF = 0

# IDH\_CONST\_DIMOUSEOFS\_dinput\_vb

# IDH\_CONST\_DINPUT\_dinput\_vb

```

DIPROPAUTOCENTER_ON      =      1
DIPROPAXISMODE_ABS       =      0
DIPROPAXISMODE_REL       =      1
DIPROPCALIBRATIONMODE_COOKED =      0
DIPROPCALIBRATIONMODE_RAW  =      1
DIPROP_RANGE_NOMAX       = 2147483647 (&H7FFFFFFF)
DIPROP_RANGE_NOMIN       = -2147483648 (&H80000000)
End Enum

```

## Constants

### DIEB\_NOTRIGGER

Used in the **ITriggerButton** member of the **DIEFFECT** type to specify that the effect has no trigger button.

### DIPROPAUTOCENTER\_OFF

The device should not automatically center when the user releases it. See **DirectInputDevice8.SetProperty**.

### DIPROPAUTOCENTER\_ON

The device should automatically center when the user releases it. See **DirectInputDevice8.SetProperty**.

### DIPROPAXISMODE\_ABS

Used in **DirectInputDevice8.GetProperty** and **DirectInputDevice8.SetProperty** to represent absolute axis mode.

### DIPROPAXISMODE\_REL

Used in **DirectInputDevice8.GetProperty** and **DirectInputDevice8.SetProperty** to represent relative axis mode.

### DIPROPCALIBRATIONMODE\_COOKED

Used in **DirectInputDevice8.SetProperty** to set the **DIPROP\_CALIBRATIONMODE** property.

### DIPROPCALIBRATIONMODE\_RAW

Used in **DirectInputDevice8.SetProperty** to set the **DIPROP\_CALIBRATIONMODE** property.

### DIPROP\_RANGE\_NOMAX

Returned from **DirectInputDevice8.GetProperty** if the axis has no upper limit on its range.

### DIPROP\_RANGE\_NOMIN

Returned from **DirectInputDevice8.GetProperty** if the axis has no lower limit on its range.

## CONST\_DINPUTERR

#The **CONST\_DINPUTERR** enumeration contains the error codes for Microsoft® DirectInput®. All the error codes and definitions can be found in the Error Codes topic.

# IDH\_CONST\_DINPUTERR\_dinput\_vb

```

Enum CONST_DINPUTERR
    DI_OK                = 0
    DIERR_ACQUIRED        = -2147024726 (&H800700AA)
    DIERR_ALREADYINITIALIZED = -2147023649 (&H800704DF)
    DIERR_BADDRIVERVER    = -2147024777 (&H80070077)
    DIERR_BETADIRECTINPUTVERSION = -2147023743 (&H80070481)
    DIERR_DEVICEFULL      = -2147220991 (&H80040201)
    DIERR_DEVICENOTREG     = -2147221164 (&H80040154)
    DIERR_EFFECTPLAYING    = -2147220984 (&H80040208)
    DIERR_GENERIC          = -2147467259 (&H80004005)
    DIERR_HANDLEEXISTS     = -2147024891 (&H80070005)
    DIERR_HASEFFECTS       = -2147220988 (&H80040204)
    DIERR_INCOMPLETEEFFECT = -2147220986 (&H80040206)
    DIERR_INPUTLOST        = -2147024866 (&H8007001E)
    DIERR_INVALIDHANDLE    = -2147024890 (&H80070006)
    DIERR_INVALIDPARAM     = 5
    DIERR_MOREDATA         = -2147220990 (&H80040202)
    DIERR_NOAGGREGATION    = -2147467262 (&H80004002)
    DIERR_NOINTERFACE      = 430 (&H1AE)
    DIERR_NOTACQUIRED      = -2147024884 (&H8007000C)
    DIERR_NOTBUFFERED      = -2147220985 (&H80040207)
    DIERR_NOTDOWNLOADED    = -2147220989 (&H80040203)
    DIERR_NOTEXCLUSIVEACQUIRED = -2147220987 (&H80040205)
    DIERR_NOTFOUND         = -2147024894 (&H80070002)
    DIERR_NOTINITIALIZED   = -2147024875 (&H80070015)
    DIERR_OBJECTNOTFOUND   = -2147024894 (&H80070002)
    DIERR_OLDDIRECTINPUTVERSION = -2147023746 (&H8007047E)
    DIERR_OTHERAPPHASPRIO  = -2147024891 (&H80070005)
    DIERR_OUTOFMEMORY      = 7
    DIERR_READONLY         = -2147024891 (&H80070005)
    DIERR_REPORTFULL       = -2147220982 (&H8004020A)
    DIERR_UNPLUGGED        = -2147220983 (&H80040209)
    DIERR_UNSUPPORTED      = 445 (&H1BD)
    E_PENDING              = -2147024889 (&H80070007)
End Enum

```

## Constants

DI\_OK

Success.

DIERR\_ACQUIRED

The operation cannot be performed while the device is acquired.

DIERR\_ALREADYINITIALIZED

This object is already initialized.

DIERR\_BADDRIVERVER



The object could not be created due to an incompatible driver version or mismatched or incomplete driver components.

**DIERR\_BETADIRECTINPUTVERSION**

The application was written for an unsupported prerelease version of DirectInput.

**DIERR\_DEVICEFULL**

The device is full.

**DIERR\_DEVICENOTREG**

The device or device instance is not registered with DirectInput. This value is equal to the REGDB\_E\_CLASSNOTREG standard COM return value.

**DIERR\_EFFECTPLAYING**

The parameters were updated in memory but were not downloaded to the device because the device does not support updating an effect while it is still playing.

**DIERR\_GENERIC**

An undetermined error occurred inside the DirectInput subsystem. This value is equal to the E\_FAIL standard COM return value.

**DIERR\_HANDLEEXISTS**

The device already has an event notification associated with it. This value is equal to the E\_ACCESSDENIED standard COM return value.

**DIERR\_HASEFFECTS**

The device cannot be reinitialized because effects are attached to it.

**DIERR\_INCOMPLETEEFFECT**

The effect could not be downloaded because essential information is missing. For example, no axes have been associated with the effect, or no type-specific information has been supplied.

**DIERR\_INPUTLOST**

Access to the input device has been lost. It must be reacquired.

**DIERR\_INVALIDHANDLE**

An invalid window handle was passed to the method.

**DIERR\_INVALIDPARAM**

An invalid parameter was passed to the returning function, or the object was not in a state that permitted the function to be called. This value is equal to the E\_INVALIDARG standard COM return value.

**DIERR\_MOREDATA**

Not all the requested information fitted into the buffer.

**DIERR\_NOAGGREGATION**

This object does not support aggregation.

**DIERR\_NOINTERFACE**

The specified interface is not supported by the object. This value is equal to the E\_NOINTERFACE standard COM return value.

**DIERR\_NOTACQUIRED**

The operation cannot be performed unless the device is acquired.

**DIERR\_NOTBUFFERED**

The device is not buffered. Set the DIPROP\_BUFFERSIZE property to enable buffering.

#### DIERR\_NOTDOWNLOADED

The effect is not downloaded.

#### DIERR\_NOTEXCLUSIVEACQUIRED

The operation cannot be performed unless the device is acquired in DISCL\_EXCLUSIVE mode.

#### DIERR\_NOTFOUND

The requested object does not exist.

#### DIERR\_NOTINITIALIZED

The object has not been initialized.

#### DIERR\_OBJECTNOTFOUND

The requested object does not exist.

#### DIERR\_OLDDIRECTINPUTVERSION

The application requires a newer version of DirectInput.

#### DIERR\_OTHERAPPHASPRIO

Another application has a higher priority level, preventing this call from succeeding. This value is equal to the E\_ACCESSDENIED standard COM return value. This error can be returned when an application has only foreground access to a device but is attempting to acquire the device while in the background.

#### DIERR\_OUTOFMEMORY

The DirectInput subsystem couldn't allocate sufficient memory to complete the call. This value is equal to the E\_OUTOFMEMORY standard COM return value.

#### DIERR\_READONLY

The specified property cannot be changed. This value is equal to the E\_ACCESSDENIED standard COM return value.

#### DIERR\_REPORTFULL

More information was requested to be sent than can be sent to the device.

#### DIERR\_UNPLUGGED

The operation could not be completed because the device is not plugged in.

#### DIERR\_UNSUPPORTED

The function called is not supported at this time. This value is equal to the E\_NOTIMPL standard COM return value.

#### E\_PENDING

Data is not yet available.

## CONST\_DIPHFLAGS

\*Members of the **CONST\_DIPHFLAGS** enumeration are used to specify how a device object is identified. They are used in the **DirectInputDevice8.GetObjectInfo** method as well as in the **DIPROPLONG** and **DIPROPRANGE** types.

Enum **CONST\_DIPHFLAGS**

# **IDH\_CONST\_DIPHFLAGS\_dinput\_vb**

```

DIPH_BYID    = 2
DIPH_BYOFFSET = 1
DIPH_BYUSAGE  = 3
DIPH_DEVICE   = 0
End Enum

```

## Constants

### DIPH\_BYID

The device object is identified by the instance identifier obtained from the return value of the **DirectInputDeviceObjectInstance.GetType** method.

### DIPH\_BYOFFSET

The device object is identified by the offset into the current data format of the object whose information is being accessed.

### DIPH\_BYUSAGE

The device object is identified by the HID usage page and usage values in packed form.

### DIPH\_DEVICE

The property applies to the entire device, not to a particular object.

## CONST\_DISCLFLAGS

#The **CONST\_DISCLFLAGS** enumeration is used in the *flags* parameter of the **DirectInputDevice8.SetCooperativeLevel** method to determine how the device interacts with other instances of the device and the rest of the system.

```

Enum CONST_DISCLFLAGS
    DISCL_BACKGROUND  = 8
    DISCL_EXCLUSIVE    = 1
    DISCL_FOREGROUND  = 4
    DISCL_NONEXCLUSIVE = 2
    DISCL_NOWINKEY    = 16 (&H10)
End Enum

```

## Constants

### DISCL\_BACKGROUND

The application requires background access. If background access is granted, the device may be acquired at any time, even when the associated window is not the active window.

### DISCL\_EXCLUSIVE

The application requires exclusive access. If exclusive access is granted, no other instance of the device may obtain exclusive access to the device while it is acquired. Note, however, non-exclusive access to the device is always permitted, even if another application has obtained exclusive access.

---

# IDH\_CONST\_DISCLFLAGS\_dinput\_vb

If an application acquires the mouse or keyboard device in exclusive mode, the user will not be able to use the window menu or move and resize the window.

#### DISCL\_FOREGROUND

The application requires foreground access. If foreground access is granted, the device is automatically unacquired when the associated window moves to the background.

#### DISCL\_NONEXCLUSIVE

The application requires non-exclusive access. Access to the device will not interfere with other applications that are accessing the same device.

#### DISCL\_NOWINKEY

The Microsoft® Windows® logo key is disabled so that users cannot inadvertently break out of the application. This value can be combined with DISCL\_NONEXCLUSIVE. In exclusive mode, the Windows logo key is always disabled. Note, however, that DISCL\_NOWINKEY has no effect when the default action mapping UI is displayed, and the Windows logo key operates normally as long as that UI is present.

Applications must specify either DISCL\_FOREGROUND or DISCL\_BACKGROUND; it is an error to specify both or neither. Similarly, applications must specify either DISCL\_EXCLUSIVE or DISCL\_NONEXCLUSIVE.

## CONST\_DISDDFLAGS

#Members of the **CONST\_DISDDFLAGS** enumeration are passed to the **DirectInputDevice8.SendDeviceData** method.

```
Enum CONST_DISDDFLAGS
    DISDD_CONTINUE = 1
    DISDD_DEFAULT = 0
End Enum
```

### Constants

#### DISDD\_CONTINUE

Data will overlaid on existing data. For more information, see the Remarks section for **DirectInputDevice8.SendDeviceData** method.

#### DISDD\_DEFAULT

Data will not be overlaid on existing data.

---

```
# IDH_CONST_DISDDFLAGS_dinput_vb
```

## CONST\_DISFFCFLAGS

#Members of the **CONST\_DISFFCFLAGS** enumeration are used by the **DirectInputDevice8.SendForceFeedbackCommand** method to specify the command.

```
Enum CONST_DISFFCFLAGS
    DISFFC_CONTINUE      = 8
    DISFFC_PAUSE         = 4
    DISFFC_RESET         = 1
    DISFFC_SETACTUATORSOFF = 32 (&H20)
    DISFFC_SETACTUATORSON = 16 (&H10)
    DISFFC_STOPALL       = 2
End Enum
```

### Constants

#### DISFFC\_CONTINUE

Paused playback of all active effects is to be continued. It is an error to send this command when the device is not in a paused state.

#### DISFFC\_PAUSE

Playback of all active effects is to be paused. This command also stops the clock on effects, so that they continue playing to their full duration when restarted.

While the device is paused, new effects may not be started and existing ones may not be modified. Doing so may result in the subsequent DISFFC\_CONTINUE command failing to perform properly.

To abandon a pause and stop all effects, use the DISFFC\_STOPALL or DISFCC\_RESET commands.

#### DISFFC\_RESET

The device's force-feedback system is to be put in its startup state. All effects are removed from the device, are no longer valid, and must be recreated if they are to be used again. The device's actuators are disabled.

#### DISFFC\_SETACTUATORSOFF

The device's force-feedback actuators are to be disabled. While the actuators are off, effects continue to play but are ignored by the device. Using the analogy of a sound playback device, they are muted rather than paused.

#### DISFFC\_SETACTUATORSON

The device's force-feedback actuators are to be enabled.

#### DISFFC\_STOPALL

Playback of any active effects is to be stopped. All active effects will be reset, but are still being maintained by the device and are still valid. If the device is in a paused state, that state is lost.

This command is equivalent to calling the **DirectInputEffect.Stop** method for each effect playing.

---

# IDH\_CONST\_DISFFCFLAGS\_dinput\_vb

## CONST\_DIVOICEFLAGS

\*Used to specify voice device objects in the **ISemantic** member of the **DIACTION** type.

```
Enum CONST_DIVOICEFLAGS
    DIVOICE_ALL          = -2097150966 (&H8300040A)
    DIVOICE_CHANNEL1     = -2097150975 (&H83000401)
    DIVOICE_CHANNEL2     = -2097150974 (&H83000402)
    DIVOICE_CHANNEL3     = -2097150973 (&H83000403)
    DIVOICE_CHANNEL4     = -2097150972 (&H83000404)
    DIVOICE_CHANNEL5     = -2097150971 (&H83000405)
    DIVOICE_CHANNEL6     = -2097150970 (&H83000406)
    DIVOICE_CHANNEL7     = -2097150969 (&H83000407)
    DIVOICE_CHANNEL8     = -2097150968 (&H83000408)
    DIVOICE_PLAYBACKMUTE = -2097150964 (&H8300040C)
    DIVOICE_RECORDMUTE   = -2097150965 (&H8300040B)
    DIVOICE_TEAM         = -2097150967 (&H83000409)
    DIVOICE_TRANSMIT     = -2097150963 (&H8300040D)
    DIVOICE_VOICECOMMAND = -2097150960 (&H83000410)
End Enum
```

```
DIVOICE_ALL
    Broadcast voice input on all channels
DIVOICE_CHANNEL(n)
    Individual broadcast channels 1 through 8
DIVOICE_PLAYBACKMUTE
    Mute voice broadcast
DIVOICE_RECORDMUTE
    Mute recording
DIVOICE_TEAM
    Broadcast voice only to team members
DIVOICE_TRANSMIT
    Send broadcast
DIVOICE_VOICECOMMAND
    Accept voice input as voice command rather than broadcast data
```

## Keyboard Keys

This section contains information on the following topics:

# IDH\_CONST\_DIVOICEFLAGS\_dinput\_vb

- Keyboard Device Constants
- DirectInput and Japanese Keyboards

## Keyboard Device Constants

#Members of the **CONST\_DIKEYFLAGS** enumeration represent offsets within a keyboard device's data packet, a 256-byte array. The data at a given offset is associated with a keyboard key.

The standard keyboard device constants are listed in the following table in ascending order of data offset.

The **CONST\_DIKEYBOARDFLAGS** enumeration, used in action mapping, also contains constants for each of the keys in the table. The names of these constants begin with **DIKEYBOARD** rather than **DIK**.

Constant	Note
DIK_ESCAPE	
DIK_1	On main keyboard
DIK_2	On main keyboard
DIK_3	On main keyboard
DIK_4	On main keyboard
DIK_5	On main keyboard
DIK_6	On main keyboard
DIK_7	On main keyboard
DIK_8	On main keyboard
DIK_9	On main keyboard
DIK_0	On main keyboard
DIK_MINUS	On main keyboard
DIK_EQUALS	On main keyboard
DIK_BACK	BACKSPACE
DIK_TAB	
DIK_Q	
DIK_W	
DIK_E	
DIK_R	
DIK_T	
DIK_Y	
DIK_U	

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# IDH\_Keyboard\_Device\_Constants\_dinput\_vb

DIK_I	
DIK_O	
DIK_P	
DIK_LBRACKET	Left square bracket.
DIK_RBRACKET	Right square bracket
DIK_RETURN	ENTER on main keyboard
DIK_LCONTROL	Left CTRL
DIK_A	
DIK_S	
DIK_D	
DIK_F	
DIK_G	
DIK_H	
DIK_J	
DIK_K	
DIK_L	
DIK_SEMICOLON	
DIK_APOSTROPHE	
DIK_GRAVE	Grave accent (`)
DIK_LSHIFT	Left SHIFT
DIK_BACKSLASH	
DIK_Z	
DIK_X	
DIK_C	
DIK_V	
DIK_B	
DIK_N	
DIK_M	
DIK_COMMA	
DIK_PERIOD	On main keyboard
DIK_SLASH	Forward slash on main keyboard
DIK_RSHIFT	Right SHIFT key
DIK_MULTIPLY	Asterisk on numeric keypad
DIK_LMENU	Left ALT
DIK_SPACE	SPACEBAR
DIK_CAPITAL	CAPS LOCK
DIK_F1	
DIK_F2	



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DIK_F3	
DIK_F4	
DIK_F5	
DIK_F6	
DIK_F7	
DIK_F8	
DIK_F9	
DIK_F10	
DIK_NUMLOCK	
DIK_SCROLL	SCROLL LOCK
DIK_NUMPAD7	
DIK_NUMPAD8	
DIK_NUMPAD9	
DIK_SUBTRACT	MINUS SIGN on numeric keypad
DIK_NUMPAD4	
DIK_NUMPAD5	
DIK_NUMPAD6	
DIK_ADD	PLUS SIGN on numeric keypad
DIK_NUMPAD1	
DIK_NUMPAD2	
DIK_NUMPAD3	
DIK_NUMPAD0	
DIK_DECIMAL	PERIOD (decimal point) on numeric keypad
DIK_OEM_102	On British and German keyboards.
DIK_F11	
DIK_F12	
DIK_F13	
DIK_F14	
DIK_F15	
DIK_KANA	On Japanese keyboard
DIK_ABNT_C1	On numeric pad of Brazilian keyboards
DIK_CONVERT	On Japanese keyboard
DIK_NOCONVERT	On Japanese keyboard
DIK_YEN	On Japanese keyboard
DIK_ABNT_C2	On numeric pad of Brazilian keyboards
DIK_NUMPADEQUALS	On numeric keypad (NEC PC98)
DIK_PREVTRACK	Previous track; circumflex on Japanese keyboard
DIK_AT	On Japanese keyboard

DIK_COLON	On Japanese keyboard
DIK_UNDERLINE	On Japanese keyboard
DIK_KANJI	On Japanese keyboard
DIK_STOP	On Japanese keyboard
DIK_AX	On Japanese keyboard
DIK_UNLABELED	On Japanese keyboard
DIK_NEXTTRACK	Next track
DIK_NUMPADENTER	
DIK_RCONTROL	Right CTRL
DIK_MUTE	
DIK_CALCULATOR	
DIK_PLAYPAUSE	
DIK_MEDIASTOP	
DIK_VOLUMEDOWN	
DIK_VOLUMEUP	
DIK_WEBHOME	
DIK_NUMPADCOMMA	COMMA on NEC PC98 numeric keypad
DIK_DIVIDE	Forward slash on numeric keypad
DIK_SYSRQ	
DIK_RMENU	Right ALT
DIK_PAUSE	
DIK_HOME	
DIK_UP	UP ARROW
DIK_PRIOR	PAGE UP
DIK_LEFT	LEFT ARROW
DIK_RIGHT	RIGHT ARROW
DIK_END	
DIK_DOWN	DOWN ARROW
DIK_NEXT	PAGE DOWN
DIK_INSERT	
DIK_DELETE	
DIK_LWIN	Left Microsoft® Windows® logo key
DIK_RWIN	Right Windows logo key
DIK_APPS	
DIK_POWER	
DIK_SLEEP	
DIK_WAKE	
DIK_WEBSEARCH	

DIK\_WEBFAVORITES  
DIK\_WEBREFRESH  
DIK\_WEBSTOP  
DIK\_WEBFORWARD  
DIK\_WEBBACK  
DIK\_MYCOMPUTER  
DIK\_MAIL  
DIK\_MEDIASELECT

For information on Japanese keyboards, see DirectInput and Japanese Keyboards.

## DirectInput and Japanese Keyboards

#The following chart lists keys that are available on Japanese keyboards but not on standard U.S. keyboards, as well as keys that are available on U.S. keyboards but not on the various Japanese keyboards.

On Microsoft® Windows® 2000 and with some keyboards (such as the NEC PC-98) using other operating systems, the DIK\_CAPSLOCK, DIK\_KANJI, and DIK\_KANA keys are toggle buttons and not push buttons. These generate a Down event when first pressed, then generate an Up event when pressed a second time.

Japanese Keyboard	Additional Keys	Missing Keys
DOS/V 106, NEC PC-98 106	DIK_AT, DIK_CIRCUMFLEX, DIK_COLON, DIK_CONVERT, DIK_KANA, DIK_KANJI, DIK_NOCONVERT, DIK_YEN	DIK_APOSTROPHE, DIK_EQUALS, DIK_GRAVE
NEC PC-98	DIK_AT, DIK_CIRCUMFLEX, DIK_COLON, DIK_F13, DIK_F14, DIK_F15, DIK_KANA, DIK_KANJI, DIK_NOCONVERT, DIK_NUMPADCOMMA, DIK_NUMPADEQUALS, DIK_STOP,	DIK_APOSTROPHE, DIK_BACKSLASH, DIK_EQUALS, DIK_GRAVE, DIK_NUMLOCK, DIK_NUMPADENTER, DIK_RCONTROL, DIK_RMENU, DIK_RSHIFT,

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# IDH\_DirectInput\_and\_Japanese\_Keyboards\_dinput\_vb

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	DIK_UNDERLINE, DIK_YEN	DIK_SCROLL
AX	DIK_AX, DIK_CONVERT, DIK_KANJI, DIK_NOCONVERT, DIK_YEN	DIK_RCONTROL, DIK_RMENU
J-3100	DIK_KANA, DIK_KANJI, DIK_NOLABEL, DIK_YEN	DIK_RCONTROL, DIK_RMENU

## Action Mapping Constants

This section is a reference to the constants defined in the `CONST_DIGENRE` enumeration for application genres and controls mapped to actions within each genre.

The control constants, such as `DIAXIS_FIGHTINGH_MOVE`, are used in the **ActionName** member of the **DIACTION** structure to associate the control with an action in the application.

The constants for the genres, such as `DIVIRTUAL_FIGHTING_HAND2HAND`, are used in the **IGenre** member of the **DIACTIONFORMAT** structure.

Action mapping constants are provided for application genres in the following categories.

- Action Genres
- Arcade Genres
- CAD Genres
- Control Genres
- Driving Genres
- Flight Genres
- Sports Genres
- Strategy Genres

The **ActionName** member of the **DIACTION** structure member can map the action to a particular device object rather than a virtual control. Device object constants are provided in the following categories.

- Keyboard Mapping Constants
- Mouse Mapping Constants
- DirectPlay Voice Mapping Constants
- Any-Control Constants

# Action Genres

The following genres contain controls for fighting and action games.

- Hand-to-Hand
- Shooting
- Third-Person Action

## Hand-to-Hand

The DIVIRTUAL\_FIGHTING\_HAND2HAND genre contains controls for a first-person fighting game without guns.

### Priority 1 Controls

DIAXIS\_FIGHTINGH\_LATERAL  
DIAXIS\_FIGHTINGH\_MOVE  
DIBUTTON\_FIGHTINGH\_BLOCK  
DIBUTTON\_FIGHTINGH\_CROUCH  
DIBUTTON\_FIGHTINGH\_JUMP  
DIBUTTON\_FIGHTINGH\_KICK  
DIBUTTON\_FIGHTINGH\_MENU  
DIBUTTON\_FIGHTINGH\_PUNCH  
DIBUTTON\_FIGHTINGH\_SPECIAL1  
DIBUTTON\_FIGHTINGH\_SPECIAL2

### Priority 2 Controls

DIAXIS\_FIGHTINGH\_ROTATE  
DIBUTTON\_FIGHTINGH\_BACKWARD\_LINK  
DIBUTTON\_FIGHTINGH\_DEVICE  
DIBUTTON\_FIGHTINGH\_DISPLAY  
DIBUTTON\_FIGHTINGH\_DODGE  
DIBUTTON\_FIGHTINGH\_FORWARD\_LINK  
DIBUTTON\_FIGHTINGH\_LEFT\_LINK  
DIBUTTON\_FIGHTINGH\_PAUSE  
DIBUTTON\_FIGHTINGH\_RIGHT\_LINK  
DIBUTTON\_FIGHTINGH\_SELECT  
DIHATSWITCH\_FIGHTINGH\_SLIDE

## Shooting

The DIVIRTUAL\_FIGHTING\_FPS genre contains controls for a first-person fighting game with guns.

### Priority 1 Controls

DIAXIS\_FPS\_LOOKUPDOWN  
DIAXIS\_FPS\_MOVE  
DIAXIS\_FPS\_ROTATE  
DIBUTTON\_FPS\_APPLY  
DIBUTTON\_FPS\_CROUCH  
DIBUTTON\_FPS\_FIRE  
DIBUTTON\_FPS\_JUMP  
DIBUTTON\_FPS\_MENU  
DIBUTTON\_FPS\_SELECT  
DIBUTTON\_FPS\_STRAFE  
DIBUTTON\_FPS\_WEAPONS

### Priority 2 Controls

DIAXIS\_FPS\_SIDESTEP  
DIBUTTON\_FPS\_BACKWARD\_LINK  
DIBUTTON\_FPS\_DEVICE  
DIBUTTON\_FPS\_DISPLAY  
DIBUTTON\_FPS\_DODGE  
DIBUTTON\_FPS\_FIRESECONDARY  
DIBUTTON\_FPS\_FORWARD\_LINK  
DIBUTTON\_FPS\_GLANCE\_DOWN\_LINK  
DIBUTTON\_FPS\_GLANCE\_UP\_LINK  
DIBUTTON\_FPS\_GLANCEL  
DIBUTTON\_FPS\_GLANCER  
DIBUTTON\_FPS\_PAUSE  
DIBUTTON\_FPS\_ROTATE\_LEFT\_LINK  
DIBUTTON\_FPS\_ROTATE\_RIGHT\_LINK  
DIHATSWITCH\_FPS\_GLANCE

## Third-Person Action

The DIVIRTUAL\_FIGHTING\_THIRDPERSON genre contains controls for a third-person action game.

### Priority 1 Controls

DIAXIS\_TPS\_MOVE  
DIAXIS\_TPS\_TURN  
DIBUTTON\_TPS\_ACTION  
DIBUTTON\_TPS\_JUMP  
DIBUTTON\_TPS\_MENU  
DIBUTTON\_TPS\_RUN  
DIBUTTON\_TPS\_SELECT  
DIBUTTON\_TPS\_USE

### **Priority 2 Controls**

DIAXIS\_TPS\_STEP  
DIBUTTON\_TPS\_BACKWARD\_LINK  
DIBUTTON\_TPS\_DEVICE  
DIBUTTON\_TPS\_DODGE  
DIBUTTON\_TPS\_FORWARD\_LINK  
DIBUTTON\_TPS\_GLANCE\_DOWN\_LINK  
DIBUTTON\_TPS\_GLANCE\_LEFT\_LINK  
DIBUTTON\_TPS\_GLANCE\_RIGHT\_LINK  
DIBUTTON\_TPS\_GLANCE\_UP\_LINK  
DIBUTTON\_TPS\_INVENTORY  
DIBUTTON\_TPS\_PAUSE  
DIBUTTON\_TPS\_STEPLLEFT  
DIBUTTON\_TPS\_STEPRIGHT  
DIBUTTON\_TPS\_TURN\_LEFT\_LINK  
DIBUTTON\_TPS\_TURN\_RIGHT\_LINK  
DIBUTTON\_TPS\_VIEW  
DIHATSWITCH\_TPS\_GLANCE

## **Arcade Genres**

The following genres contain controls for arcade-type games in which the object is to move a figure through a dangerous environment.

- Platform
- Side-to-Side

### **Platform**

The DIVIRTUAL\_ARCADE\_PLATFORM genre contains controls for an arcade-style game.

#### **Priority 1 Controls**

DIAXIS\_ARCADEP\_LATERAL  
DIAXIS\_ARCADEP\_MOVE  
DIBUTTON\_ARCADEP\_CROUCH  
DIBUTTON\_ARCADEP\_FIRE  
DIBUTTON\_ARCADEP\_JUMP  
DIBUTTON\_ARCADEP\_MENU  
DIBUTTON\_ARCADEP\_SELECT  
DIBUTTON\_ARCADEP\_SPECIAL

#### **Priority 2 Controls**

DIBUTTON\_ARCADEP\_BACK\_LINK  
DIBUTTON\_ARCADEP\_DEVICE  
DIBUTTON\_ARCADEP\_FIRESECONDARY  
DIBUTTON\_ARCADEP\_FORWARD\_LINK  
DIBUTTON\_ARCADEP\_LEFT\_LINK  
DIBUTTON\_ARCADEP\_PAUSE  
DIBUTTON\_ARCADEP\_RIGHT\_LINK  
DIBUTTON\_ARCADEP\_VIEW\_DOWN\_LINK  
DIBUTTON\_ARCADEP\_VIEW\_LEFT\_LINK  
DIBUTTON\_ARCADEP\_VIEW\_RIGHT\_LINK  
DIBUTTON\_ARCADEP\_VIEW\_UP\_LINK  
DIHATSWITCH\_ARCADEP\_VIEW

## **Side-to-Side**

The DIVIRTUAL\_ARCADE\_SIDE2SIDE genre contains controls for a two-dimensional arcade-style game.

#### **Priority 1 Controls**

DIAXIS\_ARCADES\_LATERAL  
DIAXIS\_ARCADES\_MOVE  
DIBUTTON\_ARCADES\_ATTACK  
DIBUTTON\_ARCADES\_CARRY  
DIBUTTON\_ARCADES\_MENU  
DIBUTTON\_ARCADES\_SELECT  
DIBUTTON\_ARCADES\_SPECIAL  
DIBUTTON\_ARCADES\_THROW

#### **Priority 2 Controls**



DIBUTTON\_ARCADES\_BACK\_LINK  
DIBUTTON\_ARCADES\_DEVICE  
DIBUTTON\_ARCADES\_FORWARD\_LINK  
DIBUTTON\_ARCADES\_LEFT\_LINK  
DIBUTTON\_ARCADES\_PAUSE  
DIBUTTON\_ARCADES\_RIGHT\_LINK  
DIBUTTON\_ARCADES\_VIEW\_DOWN\_LINK  
DIBUTTON\_ARCADES\_VIEW\_LEFT\_LINK  
DIBUTTON\_ARCADES\_VIEW\_RIGHT\_LINK  
DIBUTTON\_ARCADES\_VIEW\_UP\_LINK  
DIHATSWITCH\_ARCADES\_VIEW

## CAD Genres

The following genres contain controls for computer-assisted drafting applications.

- 2-D Object
- 3-D Model
- 3-D Navigation
- 3-D Object

### 2-D Object

The DIVIRTUAL\_CAD\_2DCONTROL genre contains controls to select and move objects in a two-dimensional drafting environment.

#### Priority 1 Controls

DIAXIS\_2DCONTROL\_LATERAL  
DIAXIS\_2DCONTROL\_MOVE  
DIAXIS\_2DCONTROL\_INOUT  
DIBUTTON\_2DCONTROL\_MENU  
DIBUTTON\_2DCONTROL\_SELECT  
DIBUTTON\_2DCONTROL\_SPECIAL  
DIBUTTON\_2DCONTROL\_SPECIAL1  
DIBUTTON\_2DCONTROL\_SPECIAL2

#### Priority 2 Controls

DIAXIS\_2DCONTROL\_ROTATEZ  
DIBUTTON\_2DCONTROL\_DEVICE  
DIBUTTON\_2DCONTROL\_DISPLAY

DIBUTTON\_2DCONTROL\_PAUSE  
DIHATSWITCH\_2DCONTROL\_HATSWITCH

## 3-D Model

The DIVIRTUAL\_CAD\_MODEL genre contains controls for modeling three-dimensional objects.

### Priority 1 Controls

DIAXIS\_CADM\_LATERAL  
DIAXIS\_CADM\_MOVE  
DIAXIS\_CADM\_INOUT  
DIBUTTON\_CADM\_MENU  
DIBUTTON\_CADM\_SELECT  
DIBUTTON\_CADM\_SPECIAL  
DIBUTTON\_CADM\_SPECIAL1  
DIBUTTON\_CADM\_SPECIAL2

### Priority 2 Controls

DIAXIS\_CADM\_ROTATEX  
DIAXIS\_CADM\_ROTATEY  
DIAXIS\_CADM\_ROTATEZ  
DIBUTTON\_CADM\_DEVICE  
DIBUTTON\_CADM\_DISPLAY  
DIBUTTON\_CADM\_PAUSE  
DIHATSWITCH\_CADM\_HATSWITCH

## 3-D Navigation

The DIVIRTUAL\_CAD\_FLYBY genre contains control for fly-through navigation of three-dimensional environments.

### Priority 1 Controls

DIAXIS\_CADF\_LATERAL  
DIAXIS\_CADF\_MOVE  
DIAXIS\_CADF\_INOUT  
DIBUTTON\_CADF\_MENU  
DIBUTTON\_CADF\_SELECT  
DIBUTTON\_CADF\_SPECIAL  
DIBUTTON\_CADF\_SPECIAL1  
DIBUTTON\_CADF\_SPECIAL2

**Priority 2 Controls**

DIAXIS\_CADF\_ROTATEX  
DIAXIS\_CADF\_ROTATEY  
DIAXIS\_CADF\_ROTATEZ  
DIBUTTON\_CADF\_DEVICE  
DIBUTTON\_CADF\_DISPLAY  
DIBUTTON\_CADF\_PAUSE  
DIHATSWITCH\_CADF\_HATSWITCH

## 3-D Object

The DIVIRTUAL\_CAD\_3DCONTROL genre contains controls to select and move objects in a three-dimensional drafting environment.

**Priority 1 Controls**

DIAXIS\_3DCONTROL\_LATERAL  
DIAXIS\_3DCONTROL\_MOVE  
DIAXIS\_3DCONTROL\_INOUT  
DIBUTTON\_3DCONTROL\_MENU  
DIBUTTON\_3DCONTROL\_SELECT  
DIBUTTON\_3DCONTROL\_SPECIAL  
DIBUTTON\_3DCONTROL\_SPECIAL1  
DIBUTTON\_3DCONTROL\_SPECIAL2

**Priority 2 Controls**

DIAXIS\_3DCONTROL\_ROTATEX  
DIAXIS\_3DCONTROL\_ROTATEY  
DIAXIS\_3DCONTROL\_ROTATEZ  
DIBUTTON\_3DCONTROL\_DEVICE  
DIBUTTON\_3DCONTROL\_DISPLAY  
DIBUTTON\_3DCONTROL\_PAUSE  
DIHATSWITCH\_3DCONTROL\_HATSWITCH

## Control Genres

The following genres contain controls for use with Web browsers and remote-control devices.

- Browser
- Remote Control

## Browser

The DIVIRTUAL\_BROWSER\_CONTROL genre contains controls for a Web browser.

### Priority 1 Controls

DIAXIS\_BROWSER\_LATERAL  
DIAXIS\_BROWSER\_MOVE  
DIAXIS\_BROWSER\_VIEW  
DIBUTTON\_BROWSER\_MENU  
DIBUTTON\_BROWSER\_REFRESH  
DIBUTTON\_BROWSER\_SELECT

### Priority 2 Controls

DIBUTTON\_BROWSER\_DEVICE  
DIBUTTON\_BROWSER\_FAVORITES  
DIBUTTON\_BROWSER\_HISTORY  
DIBUTTON\_BROWSER\_HOME  
DIBUTTON\_BROWSER\_NEXT  
DIBUTTON\_BROWSER\_PAUSE  
DIBUTTON\_BROWSER\_PREVIOUS  
DIBUTTON\_BROWSER\_PRINT  
DIBUTTON\_BROWSER\_SEARCH  
DIBUTTON\_BROWSER\_STOP

## Remote Control

The DIVIRTUAL\_REMOTE\_CONTROL genre contains controls for remote-control devices used with equipment such as media players.

### Priority 1 Controls

DIAXIS\_REMOTE\_SLIDER  
DIBUTTON\_REMOTE\_CHANGE  
DIBUTTON\_REMOTE\_CUE  
DIBUTTON\_REMOTE\_MENU  
DIBUTTON\_REMOTE\_MUTE  
DIBUTTON\_REMOTE\_PLAY  
DIBUTTON\_REMOTE\_RECORD  
DIBUTTON\_REMOTE\_REVIEW  
DIBUTTON\_REMOTE\_SELECT

### **Priority 2 Controls**

DIAXIS\_REMOTE\_SLIDER2  
DIBUTTON\_REMOTE\_ADJUST  
DIBUTTON\_REMOTE\_CABLE  
DIBUTTON\_REMOTE\_CD  
DIBUTTON\_REMOTE\_DEVICE  
DIBUTTON\_REMOTE\_DIGIT0  
DIBUTTON\_REMOTE\_DIGIT1  
DIBUTTON\_REMOTE\_DIGIT2  
DIBUTTON\_REMOTE\_DIGIT3  
DIBUTTON\_REMOTE\_DIGIT4  
DIBUTTON\_REMOTE\_DIGIT5  
DIBUTTON\_REMOTE\_DIGIT6  
DIBUTTON\_REMOTE\_DIGIT7  
DIBUTTON\_REMOTE\_DIGIT8  
DIBUTTON\_REMOTE\_DIGIT9  
DIBUTTON\_REMOTE\_DVD  
DIBUTTON\_REMOTE\_PAUSE  
DIBUTTON\_REMOTE\_TUNER  
DIBUTTON\_REMOTE\_TV  
DIBUTTON\_REMOTE\_VCR

## **Driving Genres**

The following genres are used in games where the players control vehicles in racing or combat.

- Combat Racing
- Mechanical Fighting
- Racing
- Tank

## **Combat Racing**

The DIVIRTUAL\_DRIVING\_COMBAT genre contains controls for a vehicle race game with combat.

### **Priority 1 Controls**

DIAXIS\_DRIVINGC\_ACCELERATE  
DIAXIS\_DRIVINGC\_BRAKE

DIAXIS\_DRIVINGC\_STEER  
DIBUTTON\_DRIVINGC\_FIRE  
DIBUTTON\_DRIVINGC\_MENU  
DIBUTTON\_DRIVINGC\_TARGET  
DIBUTTON\_DRIVINGC\_WEAPONS

**Priority 2 Controls**

DIBUTTON\_DRIVINGC\_ACCELERATE-LINK  
DIBUTTON\_DRIVINGC\_AIDS  
DIBUTTON\_DRIVINGC\_BRAKE  
DIBUTTON\_DRIVINGC\_DASHBOARD  
DIBUTTON\_DRIVINGC\_DEVICE  
DIBUTTON\_DRIVINGC\_FIRESECONDARY  
DIBUTTON\_DRIVINGC\_GLANCE\_LEFT\_LINK  
DIBUTTON\_DRIVINGC\_GLANCE\_RIGHT\_LINK  
DIBUTTON\_DRIVINGC\_PAUSE  
DIBUTTON\_DRIVINGC\_SHIFTDOWN  
DIBUTTON\_DRIVINGC\_SHIFTUP  
DIBUTTON\_DRIVINGC\_STEER\_LEFT\_LINK  
DIBUTTON\_DRIVINGC\_STEER\_RIGHT\_LINK  
DIHATSWITCH\_DRIVINGC\_GLANCE

## Mechanical Fighting

The DIVIRTUAL\_DRIVING\_MECHA genre contains controls for a walking vehicle in a mechanized-warfare game.

**Priority 1 Controls**

DIAXIS\_MECHA\_ROTATE  
DIAXIS\_MECHA\_STEER  
DIAXIS\_MECHA\_THROTTLE  
DIAXIS\_MECHA\_TORSO  
DIBUTTON\_MECHA\_FIRE  
DIBUTTON\_MECHA\_JUMP  
DIBUTTON\_MECHA\_MENU  
DIBUTTON\_MECHA\_REVERSE  
DIBUTTON\_MECHA\_TARGET  
DIBUTTON\_MECHA\_WEAPONS  
DIBUTTON\_MECHA\_ZOOM

### **Priority 2 Controls**

DIBUTTON\_MECHA\_BACK\_LINK  
DIBUTTON\_MECHA\_CENTER  
DIBUTTON\_MECHA\_DEVICE  
DIBUTTON\_MECHA\_FASTER\_LINK  
DIBUTTON\_MECHA\_FIRESECONDARY  
DIBUTTON\_MECHA\_FORWARD\_LINK  
DIBUTTON\_MECHA\_LEFT\_LINK  
DIBUTTON\_MECHA\_PAUSE  
DIBUTTON\_MECHA\_RIGHT\_LINK  
DIBUTTON\_MECHA\_ROTATE\_LEFT\_LINK  
DIBUTTON\_MECHA\_ROTATE\_RIGHT\_LINK  
DIBUTTON\_MECHA\_SLOWER\_LINK  
DIBUTTON\_MECHA\_VIEW  
DIHATSWITCH\_MECHA\_GLANCE

## **Racing**

The DIVIRTUAL\_DRIVING\_RACE genre contains controls for an auto-racing game without combat.

### **Priority 1 Controls**

DIAXIS\_DRIVINGR\_ACCELERATE  
DIAXIS\_DRIVINGR\_BRAKE  
DIAXIS\_DRIVINGR\_STEER  
DIBUTTON\_DRIVINGR\_MENU  
DIBUTTON\_DRIVINGR\_SHIFTDOWN  
DIBUTTON\_DRIVINGR\_SHIFTUP  
DIBUTTON\_DRIVINGR\_VIEW

### **Priority 2 Controls**

DIAXIS\_DRIVINGR\_ACCEL\_AND\_BRAKE  
DIBUTTON\_DRIVINGR\_ACCELERATE\_LINK  
DIBUTTON\_DRIVINGR\_AIDS  
DIBUTTON\_DRIVINGR\_BOOST  
DIBUTTON\_DRIVINGR\_BRAKE  
DIBUTTON\_DRIVINGR\_DASHBOARD  
DIBUTTON\_DRIVINGR\_DEVICE  
DIBUTTON\_DRIVINGR\_GLANCE\_LEFT\_LINK  
DIBUTTON\_DRIVINGR\_GLANCE\_RIGHT\_LINK

DIBUTTON\_DRIVINGR\_MAP  
DIBUTTON\_DRIVINGR\_PAUSE  
DIBUTTON\_DRIVINGR\_PIT  
DIBUTTON\_DRIVINGR\_STEER\_LEFT\_LINK  
DIBUTTON\_DRIVINGR\_STEER\_RIGHT\_LINK  
DIHATSWITCH\_DRIVINGR\_GLANCE

## Tank

The DIVIRTUAL\_DRIVING\_TANK genre contains controls for a military tank simulation.

### Priority 1 Controls

DIAXIS\_DRIVINGT\_ACCELERATE  
DIAXIS\_DRIVINGT\_BARREL  
DIAXIS\_DRIVINGT\_STEER  
DIBUTTON\_DRIVINGT\_FIRE  
DIBUTTON\_DRIVINGT\_MENU  
DIBUTTON\_DRIVINGT\_TARGET  
DIBUTTON\_DRIVINGT\_WEAPONS

### Priority 2 Controls

DIAXIS\_DRIVINGT\_ACCEL\_AND\_BRAKE  
DIAXIS\_DRIVINGT\_BRAKE  
DIAXIS\_DRIVINGT\_ACCELERATE\_LINK  
DIAXIS\_DRIVINGT\_STEER\_LEFT\_LINK  
DIAXIS\_DRIVINGT\_STEER\_RIGHT\_LINK  
DIAXIS\_DRIVINGT\_BARREL\_UP\_LINK  
DIAXIS\_DRIVINGT\_BARREL\_DOWN\_LINK  
DIAXIS\_DRIVINGT\_GLANCE\_LEFT\_LINK  
DIAXIS\_DRIVINGT\_GLANCE\_RIGHT\_LINK  
DIBUTTON\_DRIVINGT\_BRAKE  
DIBUTTON\_DRIVINGT\_DASHBOARD  
DIBUTTON\_DRIVINGT\_DEVICE  
DIBUTTON\_DRIVINGT\_FIRESECONDARY  
DIBUTTON\_DRIVINGT\_PAUSE  
DIBUTTON\_DRIVINGT\_VIEW  
DIHATSWITCH\_DRIVINGT\_GLANCE



## Flight Genres

The following genres are used in games and simulations where the players control aircraft or spaceships.

- Air Combat
- Civilian Flight
- Helicopter Combat
- Space Combat

## Air Combat

The DIVIRTUAL\_FLYING\_MILITARY genre contains controls for a fixed-wing aerial combat simulation.

### Priority 1 Controls

DIAXIS\_FLYINGM\_BANK  
DIAXIS\_FLYINGM\_PITCH  
DIAXIS\_FLYINGM\_THROTTLE  
DIBUTTON\_FLYINGM\_FIRE  
DIBUTTON\_FLYINGM\_MENU  
DIBUTTON\_FLYINGM\_TARGET  
DIBUTTON\_FLYINGM\_WEAPONS

### Priority 2 Controls

DIAXIS\_FLYINGM\_BRAKE  
DIAXIS\_FLYINGM\_FLAPS  
DIAXIS\_FLYINGM\_RUDDER  
DIBUTTON\_FLYINGM\_BRAKE\_LINK  
DIBUTTON\_FLYINGM\_COUNTER  
DIBUTTON\_FLYINGM\_DEVICE  
DIBUTTON\_FLYINGM\_DISPLAY  
DIBUTTON\_FLYINGM\_FASTER\_LINK  
DIBUTTON\_FLYINGM\_FIRESECONDARY  
DIBUTTON\_FLYINGM\_FLAPSDOWN  
DIBUTTON\_FLYINGM\_FLAPSUP  
DIBUTTON\_FLYINGM\_GEAR  
DIBUTTON\_FLYINGM\_GLANCE\_DOWN\_LINK  
DIBUTTON\_FLYINGM\_GLANCE\_LEFT\_LINK  
DIBUTTON\_FLYINGM\_GLANCE\_RIGHT\_LINK  
DIBUTTON\_FLYINGM\_GLANCE\_UP\_LINK

DIBUTTON\_FLYINGM\_PAUSE  
DIBUTTON\_FLYINGM\_SLOWER\_LINK  
DIBUTTON\_FLYINGM\_VIEW  
DIHATSWITCH\_FLYINGM\_GLANCE

## Civilian Flight

The DIVIRTUAL\_FLYING\_CIVILIAN genre contains controls for noncombat flight simulations.

### Priority 1 Controls

DIAXIS\_FLYINGC\_BANK  
DIAXIS\_FLYINGC\_PITCH  
DIAXIS\_FLYINGC\_THROTTLE  
DIBUTTON\_FLYINGC\_DISPLAY  
DIBUTTON\_FLYINGC\_GEAR  
DIBUTTON\_FLYINGC\_MENU  
DIBUTTON\_FLYINGC\_VIEW

### Priority 2 Controls

DIAXIS\_FLYINGC\_BRAKE  
DIAXIS\_FLYINGC\_FLAPS  
DIAXIS\_FLYINGC\_RUDDER  
DIBUTTON\_FLYINGC\_BRAKE\_LINK  
DIBUTTON\_FLYINGC\_DEVICE  
DIBUTTON\_FLYINGC\_FASTER\_LINK  
DIBUTTON\_FLYINGC\_FLAPSDOWN  
DIBUTTON\_FLYINGC\_FLAPSUP  
DIBUTTON\_FLYINGC\_GLANCE\_DOWN\_LINK  
DIBUTTON\_FLYINGC\_GLANCE\_LEFT\_LINK  
DIBUTTON\_FLYINGC\_GLANCE\_RIGHT\_LINK  
DIBUTTON\_FLYINGC\_GLANCE\_UP\_LINK  
DIBUTTON\_FLYINGC\_PAUSE  
DIBUTTON\_FLYINGC\_SLOWER\_LINK  
DIHATSWITCH\_FLYINGC\_GLANCE

## Helicopter Combat

The DIVIRTUAL\_FLYING\_HELICOPTER genre contains controls for a combat helicopter simulation.

### Priority 1 Controls

DIAXIS\_FLYINGH\_BANK  
DIAXIS\_FLYINGH\_COLLECTIVE  
DIAXIS\_FLYINGH\_PITCH  
DIBUTTON\_FLYINGH\_FIRE  
DIBUTTON\_FLYINGH\_MENU  
DIBUTTON\_FLYINGH\_TARGET  
DIBUTTON\_FLYINGH\_WEAPONS

### Priority 2 Controls

DIAXIS\_FLYINGH\_THROTTLE  
DIAXIS\_FLYINGH\_TORQUE  
DIBUTTON\_FLYINGH\_COUNTER  
DIBUTTON\_FLYINGH\_DEVICE  
DIBUTTON\_FLYINGH\_FASTER\_LINK  
DIBUTTON\_FLYINGH\_FIRESECONDARY  
DIBUTTON\_FLYINGH\_GEAR  
DIBUTTON\_FLYINGH\_GLANCE\_DOWN\_LINK  
DIBUTTON\_FLYINGH\_GLANCE\_LEFT\_LINK  
DIBUTTON\_FLYINGH\_GLANCE\_RIGHT\_LINK  
DIBUTTON\_FLYINGH\_GLANCE\_UP\_LINK  
DIBUTTON\_FLYINGH\_PAUSE  
DIBUTTON\_FLYINGH\_SLOWER\_LINK  
DIBUTTON\_FLYINGH\_VIEW  
DIHATSWITCH\_FLYINGH\_GLANCE

## Space Combat

The DIVIRTUAL\_SPACESIM genre contains controls for a spaceship combat simulation.

### Priority 1 Controls

DIAXIS\_SPACESIM\_LATERAL  
DIAXIS\_SPACESIM\_MOVE  
DIAXIS\_SPACESIM\_THROTTLE  
DIBUTTON\_SPACESIM\_FIRE

DIBUTTON\_SPACESIM\_MENU  
DIBUTTON\_SPACESIM\_TARGET  
DIBUTTON\_SPACESIM\_WEAPONS

### **Priority 2 Controls**

DIAXIS\_SPACESIM\_CLIMB  
DIAXIS\_SPACESIM\_ROTATE  
DIBUTTON\_SPACESIM\_BACKWARD\_LINK  
DIBUTTON\_SPACESIM\_DEVICE  
DIBUTTON\_SPACESIM\_DISPLAY  
DIBUTTON\_SPACESIM\_FASTER\_LINK  
DIBUTTON\_SPACESIM\_FIRESECONDARY  
DIBUTTON\_SPACESIM\_FORWARD\_LINK  
DIBUTTON\_SPACESIM\_GEAR  
DIBUTTON\_SPACESIM\_GLANCE\_DOWN\_LINK  
DIBUTTON\_SPACESIM\_GLANCE\_LEFT\_LINK  
DIBUTTON\_SPACESIM\_GLANCE\_RIGHT\_LINK  
DIBUTTON\_SPACESIM\_GLANCE\_UP\_LINK  
DIBUTTON\_SPACESIM\_LEFT\_LINK  
DIBUTTON\_SPACESIM\_LOWER  
DIBUTTON\_SPACESIM\_PAUSE  
DIBUTTON\_SPACESIM\_RAISE  
DIBUTTON\_SPACESIM\_RIGHT\_LINK  
DIBUTTON\_SPACESIM\_SLOWER\_LINK  
DIBUTTON\_SPACESIM\_TURN\_LEFT\_LINK  
DIBUTTON\_SPACESIM\_TURN\_RIGHT\_LINK  
DIBUTTON\_SPACESIM\_VIEW  
DIHATSWITCH\_SPACESIM\_GLANCE

## **Sports Genres**

The following genres contain controls for sports games and simulations.

- Baseball Batting
- Baseball Fielding
- Baseball Pitching
- Basketball Defense
- Basketball Offense
- Fishing

- Football Defense
- Football Offense
- Football Play
- Football Quarterback
- Golf
- Hockey Defense
- Hockey Goalie
- Hockey Offense
- Hunting
- Mountain Biking
- Racquet
- Skiing
- Soccer Defense
- Soccer Offense

## Baseball Batting

The DIVIRTUAL\_SPORTS\_BASEBALL\_BAT genre contains controls for a batter in a baseball game.

### Priority 1 Controls

DIAXIS\_BASEBALLB\_LATERAL  
DIAXIS\_BASEBALLB\_MOVE  
DIBUTTON\_BASEBALLB\_BUNT  
DIBUTTON\_BASEBALLB\_BURST  
DIBUTTON\_BASEBALLB\_CONTACT  
DIBUTTON\_BASEBALLB\_MENU  
DIBUTTON\_BASEBALLB\_NORMAL  
DIBUTTON\_BASEBALLB\_POWER  
DIBUTTON\_BASEBALLB\_SELECT  
DIBUTTON\_BASEBALLB\_SLIDE  
DIBUTTON\_BASEBALLB\_STEAL

### Priority 2 Controls

DIBUTTON\_BASEBALLB\_BACK\_LINK  
DIBUTTON\_BASEBALLB\_BOX  
DIBUTTON\_BASEBALLB\_DEVICE  
DIBUTTON\_BASEBALLB\_FORWARD\_LINK  
DIBUTTON\_BASEBALLB\_LEFT\_LINK

DIBUTTON\_BASEBALLB\_NOSTEAL  
DIBUTTON\_BASEBALLB\_PAUSE  
DIBUTTON\_BASEBALLB\_RIGHT\_LINK

## Baseball Fielding

The DIVIRTUAL\_SPORTS\_BASEBALL\_FIELD genre contains controls for fielders in a baseball game.

### Priority 1 Controls

DIAXIS\_BASEBALLF\_LATERAL  
DIAXIS\_BASEBALLF\_MOVE  
DIBUTTON\_BASEBALLF\_BURST  
DIBUTTON\_BASEBALLF\_DIVE  
DIBUTTON\_BASEBALLF\_JUMP  
DIBUTTON\_BASEBALLF\_MENU  
DIBUTTON\_BASEBALLF\_NEAREST  
DIBUTTON\_BASEBALLF\_THROW1  
DIBUTTON\_BASEBALLF\_THROW2

### Priority 2 Controls

DIBUTTON\_BASEBALLF\_AIM\_LEFT\_LINK  
DIBUTTON\_BASEBALLF\_AIM\_RIGHT\_LINK  
DIBUTTON\_BASEBALLF\_BACK\_LINK  
DIBUTTON\_BASEBALLF\_DEVICE  
DIBUTTON\_BASEBALLF\_FORWARD\_LINK  
DIBUTTON\_BASEBALLF\_PAUSE  
DIBUTTON\_BASEBALLF\_SHIFTIN  
DIBUTTON\_BASEBALLF\_SHIFTOUT

## Baseball Pitching

The DIVIRTUAL\_SPORTS\_BASEBALL\_PITCH genre contains controls for a pitcher in a baseball game.

### Priority 1 Controls

DIAXIS\_BASEBALLP\_LATERAL  
DIAXIS\_BASEBALLP\_MOVE  
DIBUTTON\_BASEBALLP\_BASE  
DIBUTTON\_BASEBALLP\_FAKE  
DIBUTTON\_BASEBALLP\_MENU

DIBUTTON\_BASEBALLP\_PITCH  
DIBUTTON\_BASEBALLP\_SELECT  
DIBUTTON\_BASEBALLP\_THROW

**Priority 2 Controls**

DIBUTTON\_BASEBALLP\_BACK\_LINK  
DIBUTTON\_BASEBALLP\_DEVICE  
DIBUTTON\_BASEBALLP\_FORWARD\_LINK  
DIBUTTON\_BASEBALLP\_LEFT\_LINK  
DIBUTTON\_BASEBALLP\_LOOK  
DIBUTTON\_BASEBALLP\_PAUSE  
DIBUTTON\_BASEBALLP\_RIGHT\_LINK  
DIBUTTON\_BASEBALLP\_WALK

## **Basketball Defense**

The DIVIRTUAL\_SPORTS\_BASKETBALL\_DEFENSE genre contains controls for defensive moves in a basketball game.

**Priority 1 Controls**

DIAXIS\_BBALD\_LATERAL  
DIAXIS\_BBALD\_MOVE  
DIBUTTON\_BBALD\_BURST  
DIBUTTON\_BBALD\_FAKE  
DIBUTTON\_BBALD\_JUMP  
DIBUTTON\_BBALD\_MENU  
DIBUTTON\_BBALD\_PLAY  
DIBUTTON\_BBALD\_PLAYER  
DIBUTTON\_BBALD\_SPECIAL  
DIBUTTON\_BBALD\_STEAL

**Priority 2 Controls**

DIBUTTON\_BBALD\_BACK\_LINK  
DIBUTTON\_BBALD\_DEVICE  
DIBUTTON\_BBALD\_FORWARD\_LINK  
DIBUTTON\_BBALD\_LEFT\_LINK  
DIBUTTON\_BBALD\_PAUSE  
DIBUTTON\_BBALD\_RIGHT\_LINK  
DIBUTTON\_BBALD\_SUBSTITUTE  
DIBUTTON\_BBALD\_TIMEOUT

DIHATSWITCH\_BBALLO\_GLANCE

## Basketball Offense

The DIVIRTUAL\_SPORTS\_BASKETBALL\_OFFENSE genre contains controls for the player who has the ball in a basketball game.

### Priority 1 Controls

DIAXIS\_BBALLO\_LATERAL  
DIAXIS\_BBALLO\_MOVE  
DIBUTTON\_BBALLO\_BURST  
DIBUTTON\_BBALLO\_CALL  
DIBUTTON\_BBALLO\_DUNK  
DIBUTTON\_BBALLO\_FAKE  
DIBUTTON\_BBALLO\_MENU  
DIBUTTON\_BBALLO\_PASS  
DIBUTTON\_BBALLO\_PLAYER  
DIBUTTON\_BBALLO\_SHOOT  
DIBUTTON\_BBALLO\_SPECIAL

### Priority 2 Controls

DIBUTTON\_BBALLO\_BACK\_LINK  
DIBUTTON\_BBALLO\_DEVICE  
DIBUTTON\_BBALLO\_FORWARD\_LINK  
DIBUTTON\_BBALLO\_JAB  
DIBUTTON\_BBALLO\_LEFT\_LINK  
DIBUTTON\_BBALLO\_PAUSE  
DIBUTTON\_BBALLO\_PLAY  
DIBUTTON\_BBALLO\_POST  
DIBUTTON\_BBALLO\_RIGHT\_LINK  
DIBUTTON\_BBALLO\_SCREEN  
DIBUTTON\_BBALLO\_SUBSTITUTE  
DIBUTTON\_BBALLO\_TIMEOUT  
DIHATSWITCH\_BBALLO\_GLANCE

## Fishing

The DIVIRTUAL\_SPORTS\_FISHING genre contains controls for a sport-fishing simulation.

### Priority 1 Controls



DIAXIS\_FISHING\_LATERAL  
DIAXIS\_FISHING\_MOVE  
DIBUTTON\_FISHING\_BAIT  
DIBUTTON\_FISHING\_BINOCULAR  
DIBUTTON\_FISHING\_CAST  
DIBUTTON\_FISHING\_MAP  
DIBUTTON\_FISHING\_MENU  
DIBUTTON\_FISHING\_TYPE

**Priority 2 Controls**

DIAXIS\_FISHING\_ROTATE  
DIBUTTON\_FISHING\_BACK\_LINK  
DIBUTTON\_FISHING\_CROUCH  
DIBUTTON\_FISHING\_DEVICE  
DIBUTTON\_FISHING\_DISPLAY  
DIBUTTON\_FISHING\_FORWARD\_LINK  
DIBUTTON\_FISHING\_JUMP  
DIBUTTON\_FISHING\_LEFT\_LINK  
DIBUTTON\_FISHING\_PAUSE  
DIBUTTON\_FISHING\_RIGHT\_LINK  
DIBUTTON\_FISHING\_ROTATE\_LEFT\_LINK  
DIBUTTON\_FISHING\_ROTATE\_RIGHT\_LINK  
DIHATSWITCH\_FISHING\_GLANCE

## **Football Defense**

The DIVIRTUAL\_SPORTS\_FOOTBALL\_DEFENSE genre contains controls for the defensive side in a North American football game.

**Priority 1 Controls**

DIAXIS\_FOOTBALLD\_LATERAL  
DIAXIS\_FOOTBALLD\_MOVE  
DIBUTTON\_FOOTBALLD\_FAKE  
DIBUTTON\_FOOTBALLD\_JUMP  
DIBUTTON\_FOOTBALLD\_MENU  
DIBUTTON\_FOOTBALLD\_PLAY  
DIBUTTON\_FOOTBALLD\_SELECT  
DIBUTTON\_FOOTBALLD\_SUPERTACKLE  
DIBUTTON\_FOOTBALLD\_TACKLE

### **Priority 2 Controls**

DIBUTTON\_FOOTBALLD\_AUDIBLE  
DIBUTTON\_FOOTBALLD\_BACK\_LINK  
DIBUTTON\_FOOTBALLD\_BULLRUSH  
DIBUTTON\_FOOTBALLD\_DEVICE  
DIBUTTON\_FOOTBALLD\_FORWARD\_LINK  
DIBUTTON\_FOOTBALLD\_LEFT\_LINK  
DIBUTTON\_FOOTBALLD\_PAUSE  
DIBUTTON\_FOOTBALLD\_RIGHT\_LINK  
DIBUTTON\_FOOTBALLD\_RIP  
DIBUTTON\_FOOTBALLD\_SPIN  
DIBUTTON\_FOOTBALLD\_SUBSTITUTE  
DIBUTTON\_FOOTBALLD\_SWIM  
DIBUTTON\_FOOTBALLD\_ZOOM

## **Football Offense**

The DIVIRTUAL\_SPORTS\_FOOTBALL\_OFFENSE genre contains controls for the ball carrier in a North American football game.

### **Priority 1 Controls**

DIAXIS\_FOOTBALLO\_LATERAL  
DIAXIS\_FOOTBALLO\_MOVE  
DIBUTTON\_FOOTBALLO\_JUMP  
DIBUTTON\_FOOTBALLO\_LEFTARM  
DIBUTTON\_FOOTBALLO\_MENU  
DIBUTTON\_FOOTBALLO\_RIGHTARM  
DIBUTTON\_FOOTBALLO\_SPIN  
DIBUTTON\_FOOTBALLO\_THROW

### **Priority 2 Controls**

DIBUTTON\_FOOTBALLO\_BACK\_LINK  
DIBUTTON\_FOOTBALLO\_DEVICE  
DIBUTTON\_FOOTBALLO\_DIVE  
DIBUTTON\_FOOTBALLO\_FORWARD\_LINK  
DIBUTTON\_FOOTBALLO\_JUKE  
DIBUTTON\_FOOTBALLO\_LEFT\_LINK  
DIBUTTON\_FOOTBALLO\_PAUSE  
DIBUTTON\_FOOTBALLO\_RIGHT\_LINK  
DIBUTTON\_FOOTBALLO\_SHOULDER

DIBUTTON\_FOOTBALLO\_SUBSTITUTE  
DIBUTTON\_FOOTBALLO\_TURBO  
DIBUTTON\_FOOTBALLO\_ZOOM

## Football Play

The DIVIRTUAL\_SPORTS\_FOOTBALL\_FIELD genre contains general controls for a North American football game.

### Priority 1 Controls

DIBUTTON\_FOOTBALLP\_HELP  
DIBUTTON\_FOOTBALLP\_MENU  
DIBUTTON\_FOOTBALLP\_PLAY  
DIBUTTON\_FOOTBALLP\_SELECT

### Priority 2 Controls

DIBUTTON\_FOOTBALLP\_DEVICE  
DIBUTTON\_FOOTBALLP\_PAUSE

## Football Quarterback

The DIVIRTUAL\_SPORTS\_FOOTBALL\_QBCK genre contains controls for the quarterback in a North American football game.

### Priority 1 Controls

DIAXIS\_FOOTBALLQ\_LATERAL  
DIAXIS\_FOOTBALLQ\_MOVE  
DIBUTTON\_FOOTBALLQ\_FAKE  
DIBUTTON\_FOOTBALLQ\_JUMP  
DIBUTTON\_FOOTBALLQ\_MENU  
DIBUTTON\_FOOTBALLQ\_PASS  
DIBUTTON\_FOOTBALLQ\_SELECT  
DIBUTTON\_FOOTBALLQ\_SLIDE  
DIBUTTON\_FOOTBALLQ\_SNAP

### Priority 2 Controls

DIBUTTON\_FOOTBALLQ\_AUDIBLE  
DIBUTTON\_FOOTBALLQ\_BACK\_LINK  
DIBUTTON\_FOOTBALLQ\_DEVICE  
DIBUTTON\_FOOTBALLQ\_FAKESNAP

DIBUTTON\_FOOTBALLQ\_FORWARD\_LINK  
DIBUTTON\_FOOTBALLQ\_LEFT\_LINK  
DIBUTTON\_FOOTBALLQ\_MOTION  
DIBUTTON\_FOOTBALLQ\_PAUSE  
DIBUTTON\_FOOTBALLQ\_RIGHT\_LINK

## Golf

The DIVIRTUAL\_SPORTS\_GOLF genre contains controls for a golf game.

### Priority 1 Controls

DIAXIS\_GOLF\_LATERAL  
DIAXIS\_GOLF\_MOVE  
DIBUTTON\_GOLF\_DOWN  
DIBUTTON\_GOLF\_FLYBY  
DIBUTTON\_GOLF\_MENU  
DIBUTTON\_GOLF\_SELECT  
DIBUTTON\_GOLF\_SWING  
DIBUTTON\_GOLF\_TERRAIN  
DIBUTTON\_GOLF\_UP

### Priority 2 Controls

DIBUTTON\_GOLF\_BACK\_LINK  
DIBUTTON\_GOLF\_DEVICE  
DIBUTTON\_GOLF\_FORWARD\_LINK  
DIBUTTON\_GOLF\_LEFT\_LINK  
DIBUTTON\_GOLF\_PAUSE  
DIBUTTON\_GOLF\_RIGHT\_LINK  
DIBUTTON\_GOLF\_SUBSTITUTE  
DIBUTTON\_GOLF\_TIMEOUT  
DIBUTTON\_GOLF\_ZOOM  
DIHATSWITCH\_GOLF\_SCROLL

## Hockey Defense

The DIVIRTUAL\_SPORTS\_HOCKEY\_DEFENSE genre contains controls for defensive moves in a hockey game.

### Priority 1 Controls

DIAXIS\_HOCKEYD\_LATERAL  
DIAXIS\_HOCKEYD\_MOVE

DIBUTTON\_HOCKEYD\_BLOCK  
DIBUTTON\_HOCKEYD\_BURST  
DIBUTTON\_HOCKEYD\_FAKE  
DIBUTTON\_HOCKEYD\_MENU  
DIBUTTON\_HOCKEYD\_PLAYER  
DIBUTTON\_HOCKEYD\_STEAL

**Priority 2 Controls**

DIBUTTON\_HOCKEYD\_BACK\_LINK  
DIBUTTON\_HOCKEYD\_DEVICE  
DIBUTTON\_HOCKEYD\_FORWARD\_LINK  
DIBUTTON\_HOCKEYD\_LEFT\_LINK  
DIBUTTON\_HOCKEYD\_PAUSE  
DIBUTTON\_HOCKEYD\_RIGHT\_LINK  
DIBUTTON\_HOCKEYD\_STRATEGY  
DIBUTTON\_HOCKEYD\_SUBSTITUTE  
DIBUTTON\_HOCKEYD\_TIMEOUT  
DIBUTTON\_HOCKEYD\_ZOOM  
DIHATSWITCH\_HOCKEYD\_SCROLL

## Hockey Goalie

The DIVIRTUAL\_SPORTS\_HOCKEY\_GOALIE genre contains controls for a goalkeeper in a hockey game.

**Priority 1 Controls**

DIAXIS\_HOCKEYG\_LATERAL  
DIAXIS\_HOCKEYG\_MOVE  
DIBUTTON\_HOCKEYG\_BLOCK  
DIBUTTON\_HOCKEYG\_MENU  
DIBUTTON\_HOCKEYG\_PASS  
DIBUTTON\_HOCKEYG\_POKE  
DIBUTTON\_HOCKEYG\_STEAL

**Priority 2 Controls**

DIBUTTON\_HOCKEYG\_BACK\_LINK  
DIBUTTON\_HOCKEYG\_DEVICE  
DIBUTTON\_HOCKEYG\_FORWARD\_LINK  
DIBUTTON\_HOCKEYG\_LEFT\_LINK

DIBUTTON\_HOCKEYG\_PAUSE  
DIBUTTON\_HOCKEYG\_RIGHT\_LINK  
DIBUTTON\_HOCKEYG\_STRATEGY  
DIBUTTON\_HOCKEYG\_SUBSTITUTE  
DIBUTTON\_HOCKEYG\_TIMEOUT  
DIBUTTON\_HOCKEYG\_ZOOM  
DIHATSWITCH\_HOCKEYG\_SCROLL

## Hockey Offense

The DIVIRTUAL\_SPORTS\_HOCKEY\_OFFENSE genre contains controls for offensive moves in a hockey game.

### Priority 1 Controls

DIAXIS\_HOCKEYO\_LATERAL  
DIAXIS\_HOCKEYO\_MOVE  
DIBUTTON\_HOCKEYO\_BURST  
DIBUTTON\_HOCKEYO\_FAKE  
DIBUTTON\_HOCKEYO\_MENU  
DIBUTTON\_HOCKEYO\_PASS  
DIBUTTON\_HOCKEYO\_SHOOT  
DIBUTTON\_HOCKEYO\_SPECIAL

### Priority 2 Controls

DIBUTTON\_HOCKEYO\_BACK\_LINK  
DIBUTTON\_HOCKEYO\_DEVICE  
DIBUTTON\_HOCKEYO\_FORWARD\_LINK  
DIBUTTON\_HOCKEYO\_LEFT\_LINK  
DIBUTTON\_HOCKEYO\_PAUSE  
DIBUTTON\_HOCKEYO\_RIGHT\_LINK  
DIBUTTON\_HOCKEYO\_STRATEGY  
DIBUTTON\_HOCKEYO\_SUBSTITUTE  
DIBUTTON\_HOCKEYO\_TIMEOUT  
DIBUTTON\_HOCKEYO\_ZOOM  
DIHATSWITCH\_HOCKEYO\_SCROLL

## Hunting

The DIVIRTUAL\_SPORTS\_HUNTING genre contains controls for a hunting simulation.

### **Priority 1 Controls**

DIAXIS\_HUNTING\_LATERAL  
DIAXIS\_HUNTING\_MOVE  
DIBUTTON\_HUNTING\_AIM  
DIBUTTON\_HUNTING\_BINOCULAR  
DIBUTTON\_HUNTING\_CALL  
DIBUTTON\_HUNTING\_FIRE  
DIBUTTON\_HUNTING\_MAP  
DIBUTTON\_HUNTING\_MENU  
DIBUTTON\_HUNTING\_SPECIAL  
DIBUTTON\_HUNTING\_WEAPON

### **Priority 2 Controls**

DIAXIS\_HUNTING\_ROTATE  
DIBUTTON\_HUNTING\_BACK\_LINK  
DIBUTTON\_HUNTING\_CROUCH  
DIBUTTON\_HUNTING\_DEVICE  
DIBUTTON\_HUNTING\_DISPLAY  
DIBUTTON\_HUNTING\_FIRESECONDARY  
DIBUTTON\_HUNTING\_FORWARD\_LINK  
DIBUTTON\_HUNTING\_JUMP  
DIBUTTON\_HUNTING\_LEFT\_LINK  
DIBUTTON\_HUNTING\_PAUSE  
DIBUTTON\_HUNTING\_RIGHT\_LINK  
DIBUTTON\_HUNTING\_ROTATE\_LEFT\_LINK  
DIBUTTON\_HUNTING\_ROTATE\_RIGHT\_LINK  
DIHATSWITCH\_HUNTING\_GLANCE

## **Mountain Biking**

The DIVIRTUAL\_SPORTS\_BIKING\_MOUNTAIN contains controls for a mountain-bike game.

### **Priority 1 Controls**

DIAXIS\_BIKINGM\_PEDAL  
DIAXIS\_BIKINGM\_TURN  
DIBUTTON\_BIKINGM\_CAMERA  
DIBUTTON\_BIKINGM\_JUMP  
DIBUTTON\_BIKINGM\_MENU  
DIBUTTON\_BIKINGM\_SELECT

DIBUTTON\_BIKINGM\_SPECIAL1  
DIBUTTON\_BIKINGM\_SPECIAL2

**Priority 2 Controls**

DIAXIS\_BIKINGM\_BRAKE  
DIBUTTON\_BIKINGM\_BRAKE\_BUTTON\_LINK  
DIBUTTON\_BIKINGM\_DEVICE  
DIBUTTON\_BIKINGM\_FASTER\_LINK  
DIBUTTON\_BIKINGM\_LEFT\_LINK  
DIBUTTON\_BIKINGM\_PAUSE  
DIBUTTON\_BIKINGM\_RIGHT\_LINK  
DIBUTTON\_BIKINGM\_SLOWER\_LINK  
DIBUTTON\_BIKINGM\_ZOOM  
DIHATSWITCH\_BIKINGM\_SCROLL

## Racquet

The DIVIRTUAL\_SPORTS\_RACQUET genre includes racquet games such as tennis, table tennis, and squash.

**Priority 1 Controls**

DIAXIS\_RACQUET\_LATERAL  
DIAXIS\_RACQUET\_MOVE  
DIBUTTON\_RACQUET\_BACKSWING  
DIBUTTON\_RACQUET\_MENU  
DIBUTTON\_RACQUET\_SELECT  
DIBUTTON\_RACQUET\_SMASH  
DIBUTTON\_RACQUET\_SPECIAL  
DIBUTTON\_RACQUET\_SWING

**Priority 2 Controls**

DIBUTTON\_RACQUET\_BACK\_LINK  
DIBUTTON\_RACQUET\_DEVICE  
DIBUTTON\_RACQUET\_FORWARD\_LINK  
DIBUTTON\_RACQUET\_LEFT\_LINK  
DIBUTTON\_RACQUET\_PAUSE  
DIBUTTON\_RACQUET\_RIGHT\_LINK  
DIBUTTON\_RACQUET\_SUBSTITUTE  
DIBUTTON\_RACQUET\_TIMEOUT



DIHATSWITCH\_RACQUET\_GLANCE

## Skiing

The DIVIRTUAL\_SPORTS\_SKIING contains controls for skiing games as well as for similar sports simulations such as snowboarding and skateboarding.

### Priority 1 Controls

DIAXIS\_SKIING\_SPEED  
DIAXIS\_SKIING\_TURN  
DIBUTTON\_SKIING\_CAMERA  
DIBUTTON\_SKIING\_CROUCH  
DIBUTTON\_SKIING\_JUMP  
DIBUTTON\_SKIING\_MENU  
DIBUTTON\_SKIING\_SELECT  
DIBUTTON\_SKIING\_SPECIAL1  
DIBUTTON\_SKIING\_SPECIAL2

### Priority 2 Controls

DIBUTTON\_SKIING\_DEVICE  
DIBUTTON\_SKIING\_FASTER\_LINK  
DIBUTTON\_SKIING\_LEFT\_LINK  
DIBUTTON\_SKIING\_PAUSE  
DIBUTTON\_SKIING\_RIGHT\_LINK  
DIBUTTON\_SKIING\_SLOWER\_LINK  
DIBUTTON\_SKIING\_ZOOM  
DIHATSWITCH\_SKIING\_GLANCE

## Soccer Defense

The DIVIRTUAL\_SPORTS\_SOCCER\_DEFENSE contains controls for defensive moves in a soccer (international football) game.

### Priority 1 Controls

DIAXIS\_SOCCERD\_LATERAL  
DIAXIS\_SOCCERD\_MOVE  
DIBUTTON\_SOCCERD\_BLOCK  
DIBUTTON\_SOCCERD\_FAKE  
DIBUTTON\_SOCCERD\_MENU  
DIBUTTON\_SOCCERD\_PLAYER  
DIBUTTON\_SOCCERD\_SELECT

DIBUTTON\_SOCCERD\_SLIDE  
DIBUTTON\_SOCCERD\_SPECIAL  
DIBUTTON\_SOCCERD\_STEAL

**Priority 2 Controls**

DIBUTTON\_SOCCERD\_BACK\_LINK  
DIBUTTON\_SOCCERD\_CLEAR  
DIBUTTON\_SOCCERD\_DEVICE  
DIBUTTON\_SOCCERD\_FORWARD\_LINK  
DIBUTTON\_SOCCERD\_FOUL  
DIBUTTON\_SOCCERD\_GOALIECHARGE  
DIBUTTON\_SOCCERD\_HEAD  
DIBUTTON\_SOCCERD\_LEFT\_LINK  
DIBUTTON\_SOCCERD\_PAUSE  
DIBUTTON\_SOCCERD\_RIGHT\_LINK  
DIBUTTON\_SOCCERD\_SUBSTITUTE  
DIHATSWITCH\_SOCCERD\_GLANCE

## Soccer Offense

The DIVIRTUAL\_SPORTS\_SOCCER\_OFFENSE contains controls for offensive moves in a soccer (international football) game.

**Priority 1 Controls**

DIAXIS\_SOCCERO\_BEND  
DIAXIS\_SOCCERO\_LATERAL  
DIAXIS\_SOCCERO\_MOVE  
DIBUTTON\_SOCCERO\_FAKE  
DIBUTTON\_SOCCERO\_MENU  
DIBUTTON\_SOCCERO\_PASS  
DIBUTTON\_SOCCERO\_PLAYER  
DIBUTTON\_SOCCERO\_SELECT  
DIBUTTON\_SOCCERO\_SHOOT  
DIBUTTON\_SOCCERO\_SPECIAL1

**Priority 2 Controls**

DIBUTTON\_SOCCERD\_BACK\_LINK  
DIBUTTON\_SOCCERD\_FORWARD\_LINK  
DIBUTTON\_SOCCERD\_RIGHT\_LINK  
DIBUTTON\_SOCCERO\_CONTROL

DIBUTTON\_SOCCERO\_DEVICE  
DIBUTTON\_SOCCERO\_HEAD  
DIBUTTON\_SOCCERO\_LEFT\_LINK  
DIBUTTON\_SOCCERO\_PASSTHRU  
DIBUTTON\_SOCCERO\_PAUSE  
DIBUTTON\_SOCCERO\_SHOOTHIGH  
DIBUTTON\_SOCCERO\_SHOOTLOW  
DIBUTTON\_SOCCERO\_SPRINT  
DIBUTTON\_SOCCERO\_SUBSTITUTE  
DIHATSWITCH\_SOCCERO\_GLANCE

## Strategy Genres

The following genres contain controls for strategy, role-playing, and adventure games.

- Role-Playing
- Turn-Based

## Role-Playing

The DIVIRTUAL\_STRATEGY\_ROLEPLAYING genre contains controls for a role-playing or adventure game in which navigation, problem-solving, and fighting with weapons and magic are common activities.

### Priority 1 Controls

DIAXIS\_STRATEGYR\_LATERAL  
DIAXIS\_STRATEGYR\_MOVE  
DIBUTTON\_STRATEGYR\_APPLY  
DIBUTTON\_STRATEGYR\_ATTACK  
DIBUTTON\_STRATEGYR\_CAST  
DIBUTTON\_STRATEGYR\_CROUCH  
DIBUTTON\_STRATEGYR\_GET  
DIBUTTON\_STRATEGYR\_JUMP  
DIBUTTON\_STRATEGYR\_MENU  
DIBUTTON\_STRATEGYR\_SELECT

### Priority 2 Controls

DIAXIS\_STRATEGYR\_ROTATE  
DIBUTTON\_STRATEGYR\_BACK\_LINK  
DIBUTTON\_STRATEGYR\_DEVICE

DIBUTTON\_STRATEGYR\_DISPLAY  
DIBUTTON\_STRATEGYR\_FORWARD\_LINK  
DIBUTTON\_STRATEGYR\_LEFT\_LINK  
DIBUTTON\_STRATEGYR\_MAP  
DIBUTTON\_STRATEGYR\_PAUSE  
DIBUTTON\_STRATEGYR\_RIGHT\_LINK  
DIBUTTON\_STRATEGYR\_ROTATE\_LEFT\_LINK  
DIBUTTON\_STRATEGYR\_ROTATE\_RIGHT\_LINK  
DIHATSWITCH\_STRATEGYR\_GLANCE

## Turn-Based

The DIVIRTUAL\_STRATEGY\_TURN genre contains controls for a turn-based strategy game.

### Priority 1 Controls

DIAXIS\_STRATEGYT\_LATERAL  
DIAXIS\_STRATEGYT\_MOVE  
DIBUTTON\_STRATEGYT\_APPLY  
DIBUTTON\_STRATEGYT\_INSTRUCT  
DIBUTTON\_STRATEGYT\_MENU  
DIBUTTON\_STRATEGYT\_SELECT  
DIBUTTON\_STRATEGYT\_TEAM  
DIBUTTON\_STRATEGYT\_TURN

### Priority 2 Controls

DIBUTTON\_STRATEGYT\_BACK\_LINK  
DIBUTTON\_STRATEGYT\_DEVICE  
DIBUTTON\_STRATEGYT\_DISPLAY  
DIBUTTON\_STRATEGYT\_FORWARD\_LINK  
DIBUTTON\_STRATEGYT\_LEFT\_LINK  
DIBUTTON\_STRATEGYT\_MAP  
DIBUTTON\_STRATEGYT\_PAUSE  
DIBUTTON\_STRATEGYT\_RIGHT\_LINK  
DIBUTTON\_STRATEGYT\_ZOOM

## Keyboard Mapping Constants

The following constants are used in the **ActionName** member of the **DIACTION** type to map an action to a physical key.

Constant	Note
DIKEYBOARD_0	On main keyboard
DIKEYBOARD_1	On main keyboard
DIKEYBOARD_2	On main keyboard
DIKEYBOARD_3	On main keyboard
DIKEYBOARD_4	On main keyboard
DIKEYBOARD_5	On main keyboard
DIKEYBOARD_6	On main keyboard
DIKEYBOARD_7	On main keyboard
DIKEYBOARD_8	On main keyboard
DIKEYBOARD_9	On main keyboard
DIKEYBOARD_A	
DIKEYBOARD_ABNT_C1	On numeric pad of Brazilian keyboards
DIKEYBOARD_ABNT_C2	On numeric pad of Brazilian keyboards
DIKEYBOARD_ADD	PLUS SIGN (+) on numeric keypad
DIKEYBOARD_APOSTROPHE	
DIKEYBOARD_APPS	
DIKEYBOARD_AT	On Japanese keyboard
DIKEYBOARD_AX	On Japanese keyboard
DIKEYBOARD_B	
DIKEYBOARD_BACK	BACKSPACE
DIKEYBOARD_BACKSLASH	
DIKEYBOARD_C	
DIKEYBOARD_CALCULATOR	
DIKEYBOARD_CAPITAL	CAPS LOCK
DIKEYBOARD_COLON	On Japanese keyboard
DIKEYBOARD_COMMA	
DIKEYBOARD_CONVERT	On Japanese keyboard
DIKEYBOARD_D	
DIKEYBOARD_DECIMAL	PERIOD (decimal point) on numeric keypad
DIKEYBOARD_DELETE	
DIKEYBOARD_DIVIDE	Forward slash (/) on numeric keypad
DIKEYBOARD_DOWN	DOWN ARROW
DIKEYBOARD_E	
DIKEYBOARD_END	
DIKEYBOARD_EQUALS	On main keyboard
DIKEYBOARD_ESCAPE	

DIKEYBOARD_F	
DIKEYBOARD_F1	
DIKEYBOARD_F2	
DIKEYBOARD_F3	
DIKEYBOARD_F4	
DIKEYBOARD_F5	
DIKEYBOARD_F6	
DIKEYBOARD_F7	
DIKEYBOARD_F8	
DIKEYBOARD_F9	
DIKEYBOARD_F10	
DIKEYBOARD_F11	
DIKEYBOARD_F12	
DIKEYBOARD_F13	On NEC PC-98 Japanese keyboard
DIKEYBOARD_F14	On NEC PC-98 Japanese keyboard
DIKEYBOARD_F15	On NEC PC-98 Japanese keyboard
DIKEYBOARD_G	
DIKEYBOARD_GRAVE	Grave accent ( ` )
DIKEYBOARD_H	
DIKEYBOARD_HOME	
DIKEYBOARD_I	
DIKEYBOARD_INSERT	
DIKEYBOARD_J	
DIKEYBOARD_K	
DIKEYBOARD_KANA	On Japanese keyboard
DIKEYBOARD_KANJI	On Japanese keyboard
DIKEYBOARD_L	
DIKEYBOARD_LBRACKET	Left square bracket [
DIKEYBOARD_LCONTROL	Left CTRL
DIKEYBOARD_LEFT	LEFT ARROW
DIKEYBOARD_LMENU	Left ALT
DIKEYBOARD_LSHIFT	Left SHIFT
DIKEYBOARD_LWIN	Left Microsoft® Windows® logo key
DIKEYBOARD_M	
DIKEYBOARD_MAIL	
DIKEYBOARD_MEDIASELECT	
DIKEYBOARD_MEDIASTOP	
DIKEYBOARD_MINUS	On main keyboard

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DIKEYBOARD_MULTIPLY	Asterisk (*) on numeric keypad
DIKEYBOARD_MUTE	
DIKEYBOARD_MYCOMPUTER	
DIKEYBOARD_N	
DIKEYBOARD_NEXT	PAGE DOWN
DIKEYBOARD_NEXTTRACK	Next track
DIKEYBOARD_NOCONVERT	On Japanese keyboard
DIKEYBOARD_NUMLOCK	
DIKEYBOARD_NUMPAD0	
DIKEYBOARD_NUMPAD1	
DIKEYBOARD_NUMPAD2	
DIKEYBOARD_NUMPAD3	
DIKEYBOARD_NUMPAD4	
DIKEYBOARD_NUMPAD5	
DIKEYBOARD_NUMPAD6	
DIKEYBOARD_NUMPAD7	
DIKEYBOARD_NUMPAD8	
DIKEYBOARD_NUMPAD9	
DIKEYBOARD_NUMPADCOMMA	On numeric keypad of NEC PC-98 Japanese keyboard
DIKEYBOARD_NUMPADENTER	
DIKEYBOARD_NUMPADEQUALS	On numeric keypad of NEC PC-98 Japanese keyboard
DIKEYBOARD_O	
DIKEYBOARD_OEM_102	On British and German keyboards
DIKEYBOARD_P	
DIKEYBOARD_PAUSE	
DIKEYBOARD_PERIOD	On main keyboard
DIKEYBOARD_PLAYPAUSE	
DIKEYBOARD_POWER	
DIKEYBOARD_PREVTRACK	Previous track; circumflex on Japanese keyboard
DIKEYBOARD_PRIOR	PAGE UP
DIKEYBOARD_Q	
DIKEYBOARD_R	
DIKEYBOARD_RBRACKET	Right square bracket ]
DIKEYBOARD_RCONTROL	Right CTRL
DIKEYBOARD_RETURN	ENTER on main keyboard

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DIKEYBOARD_RIGHT	RIGHT ARROW
DIKEYBOARD_RMENU	Right ALT
DIKEYBOARD_RSHIFT	Right SHIFT
DIKEYBOARD_RWIN	Right Windows logo key
DIKEYBOARD_S	
DIKEYBOARD_SCROLL	SCROLL LOCK
DIKEYBOARD_SEMICOLON	
DIKEYBOARD_SLASH	Forward slash (/) on main keyboard
DIKEYBOARD_SLEEP	
DIKEYBOARD_SPACE	SPACEBAR
DIKEYBOARD_STOP	On NEC PC-98 Japanese keyboard
DIKEYBOARD_SUBTRACT	MINUS SIGN (-) on numeric keypad
DIKEYBOARD_SYSRQ	
DIKEYBOARD_T	
DIKEYBOARD_TAB	
DIKEYBOARD_U	
DIKEYBOARD_UNDERLINE	On NEC PC-98 Japanese keyboard
DIKEYBOARD_UNLABELED	On Japanese keyboard
DIKEYBOARD_UP	UP ARROW
DIKEYBOARD_V	
DIKEYBOARD_VOLUMEDOWN	
DIKEYBOARD_VOLUMEUP	
DIKEYBOARD_W	
DIKEYBOARD_WAKE	
DIKEYBOARD_WEBBACK	
DIKEYBOARD_WEBFAVORITES	
DIKEYBOARD_WEBFORWARD	
DIKEYBOARD_WEBHOME	
DIKEYBOARD_WEBREFRESH	
DIKEYBOARD_WEBSEARCH	
DIKEYBOARD_WEBSTOP	
DIKEYBOARD_X	
DIKEYBOARD_Y	
DIKEYBOARD_YEN	On Japanese keyboard
DIKEYBOARD_Z	



## Mouse Mapping Constants

The following constants are used in the **ActionName** member of the **DIACTION** type to map an action to a physical axis or button on a mouse.

DIMOUSE\_BUTTON0  
DIMOUSE\_BUTTON1  
DIMOUSE\_BUTTON2  
DIMOUSE\_BUTTON3  
DIMOUSE\_BUTTON4  
DIMOUSE\_BUTTON5  
DIMOUSE\_BUTTON6  
DIMOUSE\_BUTTON7  
DIMOUSE\_WHEEL  
DIMOUSE\_XAXIS  
DIMOUSE\_YAXIS  
DIMOUSE\_XAXISAB  
DIMOUSE\_YAXISAB

### Note

DIMOUSE\_XAXISAB and DIMOUSE\_YAXISAB represent the x-axis and y-axis on a mouse that returns absolute rather than relative axis data.

## DirectPlay Voice Mapping Constants

The following constants are used in the **ActionName** member of the **DIACTION** type to map an action to a channel on a Microsoft® DirectPlay® voice device.

DIVOICE\_CHANNEL1  
DIVOICE\_CHANNEL2  
DIVOICE\_CHANNEL3  
DIVOICE\_CHANNEL4  
DIVOICE\_CHANNEL5  
DIVOICE\_CHANNEL6  
DIVOICE\_CHANNEL7  
DIVOICE\_CHANNEL8  
DIVOICE\_ALL  
DIVOICE\_TEAM  
DIVOICE\_PLAYBACKMUTE  
DIVOICE\_RECORDMUTE

DIVOICE\_TRANSMIT  
DIVOICE\_VOICECOMMAND

## Any-Control Constants

The following constants are used in the **ActionName** member of the **DIACTION** type to map an action to any matching control on the device.

Constant	Device object
DIAXIS_ANY_1	Any axis
DIAXIS_ANY_2	Any axis
DIAXIS_ANY_3	Any axis
DIAXIS_ANY_4	Any axis
DIAXIS_ANY_A_1	Any accelerator
DIAXIS_ANY_A_2	Any accelerator
DIAXIS_ANY_B_1	Any brake
DIAXIS_ANY_B_2	Any brake
DIAXIS_ANY_C_1	Any clutch
DIAXIS_ANY_C_2	Any clutch
DIAXIS_ANY_R_1	Any r-axis
DIAXIS_ANY_R_2	Any r-axis
DIAXIS_ANY_S_1	Any s-axis
DIAXIS_ANY_S_2	Any s-axis
DIAXIS_ANY_U_1	Any u-axis
DIAXIS_ANY_U_2	Any u-axis
DIAXIS_ANY_V_1	Any v-axis
DIAXIS_ANY_V_2	Any v-axis
DIAXIS_ANY_X_1	Any x-axis
DIAXIS_ANY_X_2	Any x-axis
DIAXIS_ANY_Y_1	Any y-axis
DIAXIS_ANY_Y_2	Any y-axis
DIAXIS_ANY_Z_1	Any z-axis
DIAXIS_ANY_Z_2	Any z-axis
DIBUTTON_ANY	Any button
DIPOV_ANY_1	Any point-of-view controller
DIPOV_ANY_2	Any point-of-view controller
DIPOV_ANY_3	Any point-of-view controller
DIPOV_ANY_4	Any point-of-view controller

These constants can be used to map an application action to a virtual control that is not defined in a genre. Such actions are mapped after genre-specific actions. If the mapper has already mapped all matching controls to genre-specific actions, the any-control action is left unmapped.

Any-control actions are treated with equal priority. If a device has one x-axis and the action array specifies DIAXIS\_ANY\_1 and DIAXIS\_ANY\_X\_1, the action mapped to the x-axis is the one that appears first in the action array.

## Error Codes

This table lists the error codes that can be returned by DirectInput methods and functions. Errors are represented by negative values and cannot be combined.

For a list of the errors each method or function can raise, see the individual descriptions. Lists of error codes in the documentation are necessarily incomplete. For example, any DirectInput method can return DIERR\_OUTOFMEMORY even though the error code is not explicitly listed as a possible return value in the documentation for that method.

### DI\_OK

The operation completed successfully. This value is equal to the S\_OK standard COM return value.

### DIERR\_ACQUIRED

The operation cannot be performed while the device is acquired.

### DIERR\_ALREADYINITIALIZED

This object is already initialized

### DIERR\_BADDRIVERVER

The object could not be created due to an incompatible driver version or mismatched or incomplete driver components.

### DIERR\_BETADIRECTINPUTVERSION

The application was written for an unsupported prerelease version of DirectInput.

### DIERR\_DEVICEFULL

The device is full.

### DIERR\_DEVICENOTREG

The device or device instance is not registered with DirectInput. This value is equal to the REGDB\_E\_CLASSNOTREG standard COM return value.

### DIERR\_EFFECTPLAYING

The parameters were updated in memory but were not downloaded to the device because the device does not support updating an effect while it is still playing.

### DIERR\_GENERIC

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An undetermined error occurred inside the DirectInput subsystem. This value is equal to the E\_FAIL standard COM return value.

**DIERR\_HANDLEEXISTS**

The device already has an event notification associated with it. This value is equal to the E\_ACCESSDENIED standard COM return value.

**DIERR\_HASEFFECTS**

The device cannot be reinitialized because effects are attached to it.

**DIERR\_INCOMPLETEEFFECT**

The effect could not be downloaded because essential information is missing. For example, no axes have been associated with the effect, or no type-specific information has been supplied.

**DIERR\_INPUTLOST**

Access to the input device has been lost. It must be reacquired.

**DIERR\_INVALIDHANDLE**

An invalid window handle was passed to the method.

**DIERR\_INVALIDPARAM**

An invalid parameter was passed to the returning function, or the object was not in a state that permitted the function to be called. This value is equal to the E\_INVALIDARG standard COM return value.

**DIERR\_MAPFILEFAIL**

An error has occurred reading either the vendor-supplied action-mapping file for the device or reading or writing the user configuration file for the device.

**DIERR\_MOREDATA**

Not all the requested information fitted into the buffer.

**DIERR\_NOAGGREGATION**

This object does not support aggregation.

**DIERR\_NOINTERFACE**

The specified interface is not supported by the object. This value is equal to the E\_NOINTERFACE standard COM return value.

**DIERR\_NOTACQUIRED**

The operation cannot be performed unless the device is acquired.

**DIERR\_NOTBUFFERED**

The device is not buffered. Set the DIPROP\_BUFFERSIZE property to enable buffering.

**DIERR\_NOTDOWNLOADED**

The effect is not downloaded.

**DIERR\_NOTEXCLUSIVEACQUIRED**

The operation cannot be performed unless the device is acquired in DISCL\_EXCLUSIVE mode.

**DIERR\_NOTFOUND**

The requested object does not exist.

**DIERR\_NOTINITIALIZED**

The object has not been initialized.

DIERR\_OBJECTNOTFOUND

The requested object does not exist.

DIERR\_OLDDIRECTINPUTVERSION

The application requires a newer version of DirectInput.

DIERR\_OTHERAPPHASPRIO

Another application has a higher priority level, preventing this call from succeeding. This value is equal to the E\_ACCESSDENIED standard COM return value. This error can be returned when an application has only foreground access to a device but is attempting to acquire the device while in the background.

DIERR\_OUTOFMEMORY

The DirectInput subsystem couldn't allocate sufficient memory to complete the call. This value is equal to the E\_OUTOFMEMORY standard COM return value.

DIERR\_READONLY

The specified property cannot be changed. This value is equal to the E\_ACCESSDENIED standard COM return value.

DIERR\_REPORTFULL

More information was requested to be sent than can be sent to the device.

DIERR\_UNPLUGGED

The operation could not be completed because the device is not plugged in.

DIERR\_UNSUPPORTED

The function called is not supported at this time. This value is equal to the E\_NOTIMPL standard COM return value.

E\_PENDING

Data is not yet available.