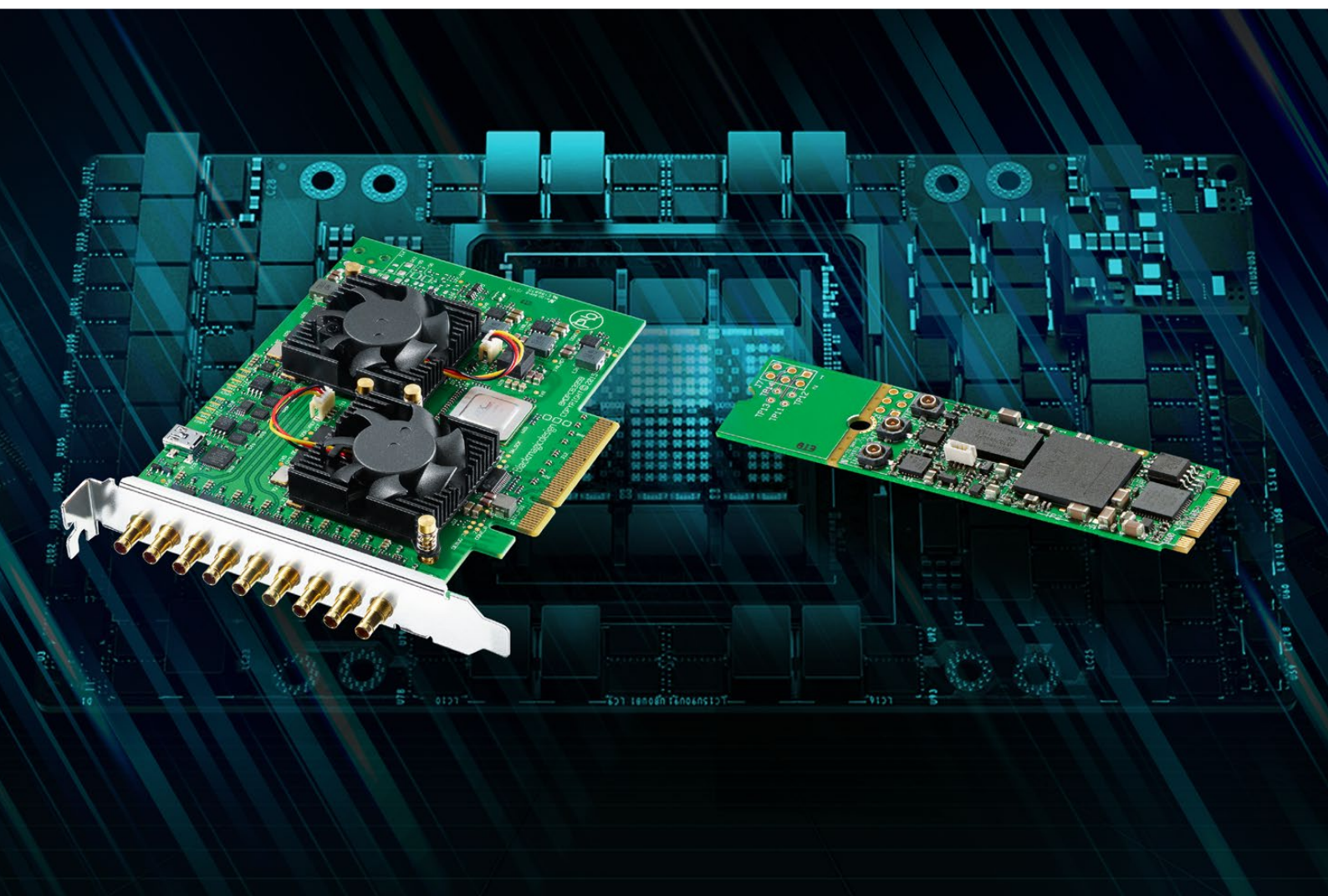


# DeckLink SDK Manual



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# Introduction

## Welcome

Thanks for downloading the Blackmagic Design DeckLink Software Developers Kit.

## Overview

The DeckLink SDK provides a stable, cross-platform interface to Blackmagic Design capture and playback products.

The SDK provides both low-level control of hardware and high-level interfaces to allow developers to easily perform common tasks.

The SDK consists of a set of interface descriptions & sample applications which demonstrate the use of the basic features of the hardware.

The details of the SDK are described in this document. The SDK supports Microsoft Windows, macOS and Linux platforms.

The libraries supporting the Blackmagic SDK are shipped as part of the product installers for each supported product line. Applications built against the interfaces shipped in the SDK will dynamically link against the library installed on the end-user's system.

The SDK interface is modeled on Microsoft's Component Object Model (COM). On Microsoft Windows platforms, it is provided as a native COM interface registered with the operating system. On other platforms application code is provided to allow the same COM style interface to be used.

The COM model provides a paradigm for creating flexible and extensible interfaces with minimal overhead.

You can download the DeckLink SDK from the Blackmagic Design support center at: [www.blackmagicdesign.com/support](http://www.blackmagicdesign.com/support)

The product family is Capture and Playback.

The Blackmagic Design Developer website provides video tutorials and FAQs for developing software for Desktop Video products.

Please visit at [www.blackmagicdesign.com/developer](http://www.blackmagicdesign.com/developer)

If you're looking for detailed answers regarding technologies used by Blackmagic Design, such as codecs, core media, APIs, SDK and more, visit the Blackmagic Software Developers Forum. The forum is a helpful place for you to engage with both Blackmagic support staff and other forum members who can answer developer specific questions and provide further information. The Software Developers Forum can be found within the Blackmagic Design Forum at [forum.blackmagicdesign.com](http://forum.blackmagicdesign.com)

If you wish to ask questions outside of the software developers forum, please contact us at: [developer@blackmagicdesign.com](mailto:developer@blackmagicdesign.com)

# Section 1 — API Design

## 1.1 API Design

### 1.1.1 Supported Products

The DeckLink SDK provides programmatic access to a wide variety of Blackmagic Design products. The term “DeckLink” is used as a generic term to refer to the supported products.

Playback and Capture support is provided for devices in the DeckLink, Intensity, UltraStudio and Teranex product lines. Capture support is provided for the Cintel Scanner, Cinema Camera and Hyperdeck Studio products.

### 1.1.2 Supported Operating Systems

The DeckLink SDK is supported on macOS, Windows and Linux operating systems. The release notes supplied with the DeckLink packages include details of supported operating system versions.

### 1.1.3 3rd Party Product and Feature Support

#### 1.1.3.1 NVIDIA GPUDirect support

NVIDIA GPUDirect is supported on Windows and Linux for x86\_64 architecture where those platforms are also supported by NVIDIA. GPUDirect support requires the use of the DVP library supplied by NVIDIA.

See the `LoopThroughWithOpenGLCompositing` for a detailed example of integrating the DeckLink API and NVIDIA GPUDirect.

#### 1.1.3.2 AMD DirectGMA support

AMD DirectGMA is supported on Windows and Linux for x86\_64 architecture where those platforms are also supported by AMD. DirectGMA support requires the use of the `GL_AMD_pinned_memory` GL extension supported by compatible AMD OpenGL drivers.

See the `LoopThroughWithOpenGLCompositing` for a detailed example of integrating the DeckLink API and AMD DirectGMA.

### 1.1.4 Object Interfaces

The API provides high-level interfaces to allow capture & playback of audio and video with frame buffering and scheduling as well as low-level interfaces for controlling features available on different capture card models.

Functionality within the API is accessed via “object interfaces”. Each object in the system may inherit from and be accessed via a number of object interfaces. Typically the developer is able to interact with object interfaces and leave the underlying objects to manage themselves.

Each object interface class has a Globally Unique ID (GUID) called an “Interface ID”. On platforms with native COM support, an IID may be used to obtain a handle to an exported interface object from the OS, which is effectively an entry point to an installed API.

Each interface may have related interfaces that are accessed by providing an IID to an existing object interface (see `IUnknown::QueryInterface`). This mechanism allows new interfaces to be added to the API without breaking API or ABI compatibility.

## 1.1.5 Reference Counting

The API uses reference counting to manage the life cycle of object interfaces. The developer may need to add or remove references on object interfaces (see `IUnknown::AddRef` and `IUnknown::Release`) to influence their life cycle as appropriate in the application.

## 1.1.6 Interface Stability

The SDK provides a set of stable interfaces for accessing Blackmagic Design hardware. Whilst the published interfaces will remain stable, developers need to be aware of some issues they may encounter as new products, features and interfaces become available.

### 1.1.6.1 New Interfaces

Major pieces of new functionality may be added to the SDK as a whole new object interface. Already released applications will not be affected by the additional functionality. Developers making use of the new functionality should be sure to check the return of `CoCreateInstance` and/or `QueryInterface` as these interfaces will not be available on users systems which are running an older release of the Blackmagic drivers.

Developers can choose to either reduce the functionality of their application when an interface is not available, or to notify the user that they must install a later version of the Blackmagic drivers.

### 1.1.6.2 Updated Interfaces

As new functionality is added to the SDK, some existing interfaces may need to be modified or extended. To maintain compatibility with released software, the original interface will be deprecated but will remain available and maintain its unique identifier (IID). The replacement interface will have a new identifier and remain as similar to the original as possible.

### 1.1.6.3 Deprecated Interfaces

Interfaces which have been replaced with an updated version, or are no longer recommended for use are “deprecated”. Deprecated interfaces are moved out of the main interface description files into an interface description file named according to the release in which the interface was deprecated. Deprecated interfaces are also renamed with a suffix indicating the release prior to the one in which they were deprecated.

It is recommended that developers update their applications to use the most recent SDK interfaces when they release a new version of their applications. As an interim measure, developers may include the deprecated interface descriptions, and updating the names of the interfaces in their application to access the original interface functionality.

### 1.1.6.4 Removed Interfaces

Interfaces that have been deprecated for some time may eventually be removed in a major driver update if they become impractical to support.



## 1.2 Interface Reference

Every object interface subclasses the **IUnknown** interface.

### 1.2.1 IUnknown Interface

Each API interface is a subclass of the standard COM base class – **IUnknown**. The **IUnknown** object interface provides reference counting and the ability to look up related interfaces by interface ID. The interface ID mechanism allows interfaces to be added to the API without impacting existing applications.

Public Member Functions	
Method	Description
QueryInterface	Provides access to supported child interfaces of the object.
AddRef	Increments the reference count of the object.
Release	Decrements the reference count of the object. When the final reference is removed, the object is freed.

#### 1.2.1.1 IUnknown::QueryInterface method

The **QueryInterface** method looks up a related interface of an object interface.

##### Syntax

```
HRESULT QueryInterface(REFIID id, void **outputInterface);
```

##### Parameters

Name	Direction	Description
id	in	Interface ID of interface to lookup
outputInterface	out	New object interface or NULL on failure

##### Return Values

Value	Description
E_NOINTERFACE	Interface was not found.
S_OK	Success.

### 1.2.1.2 IUnknown::AddRef method

The **AddRef** method increments the reference count for an object interface.

#### Syntax

```
ULONG      AddRef();
```

#### Return Values

Value	Description
Count	New reference count – for debug purposes only.

### 1.2.1.3 IUnknown::Release method

The **Release** method decrements the reference count for an object interface. When the last reference is removed from an object, the object will be destroyed.

#### Syntax

```
ULONG      Release();
```

#### Return Values

Value	Description
Count	New reference count – for debug purposes only.

## Section 2 — DeckLink API

### 2.1 Using the DeckLink API in a project

The supplied sample applications provide examples of how to include the DeckLink API in a project on each supported platform.

To use the DeckLink API in your project, one or more files need to be included:

<b>Windows</b>	DeckLink X.Y\Win\Include\DeckLinkAPI.idl
<b>macOS</b>	DeckLink X.Y\Mac\Include\DeckLinkAPI.h DeckLink X.Y\Mac\Include\DeckLinkAPIDispatch.cpp
<b>Linux</b>	DeckLink X.Y\Linux\Include\DeckLinkAPI.h DeckLink X.Y\Linux\Include\DeckLinkAPIDispatch.cpp

You can also include the optional header file “DeckLinkAPIVersion.h”. It defines two macros containing the SDK version numbers which can be used at runtime by your application to compare the version of the DeckLink API it is linked to with the version of the SDK used at compile time.

### 2.2 Sandboxing support on macOS

The DeckLink API can be accessed from sandboxed applications if the following requirements are met:

- Application is built against macOS 10.7 or later
- Ensure App Sandbox capability is added in your application target’s Signings and Capabilities settings,
- Insert the following properties into your application’s entitlements file:

Key	Type	Value
com.apple.security.temporary-exception.mach-lookup.global-name	String	com.blackmagic-design.desktopvideo. <b>DeckLinkHardwareXPService</b>
com.apple.security.temporary-exception.shared-preference.read-only	String	com.blackmagic-design.desktopvideo. <b>prefspanel</b>

Refer to the entitlements file in the SignalGenerator sample application in the SDK.

Further information can be found in the App Sandbox Design Guide available on Apple’s Developer site.

### 2.3 Accessing DeckLink devices

Most DeckLink API object interfaces are accessed via the **IDeckLinkIterator** object. How a reference to an **IDeckLinkIterator** is obtained varies between platforms depending on their level of support for COM.

## 2.3.1 Windows

The main entry point to the DeckLink API is the **IDeckLinkIterator** interface. This interface should be obtained from COM using `CoCreateInstance`:

```
IDeckLinkIterator *deckLinkIterator = NULL;  
  
CoCreateInstance (CLSID_CDeckLinkIterator, NULL, CLSCTX_ALL,  
IID_IDeckLinkIterator, (void*)&deckLinkIterator);
```

On success, `CoCreateInstance` returns an HRESULT of `S_OK` and `deckLinkIterator` points to a new **IDeckLinkIterator** object interface.

## 2.3.2 macOS and Linux

On platforms without native COM support, a C entry point is provided to access an **IDeckLinkIterator** object:

```
IDeckLinkIterator *deckLinkIterator = CreateDeckLinkIteratorInstance();
```

On success, `deckLinkIterator` will point to a new **IDeckLinkIterator** object interface otherwise it will be set to `NULL`.

## 2.4 High level interface

The DeckLink API provides a framework for video & audio streaming which greatly simplifies the task of capturing or playing out video and audio streams. This section provides an overview of how to use these interfaces.

### 2.4.1 Capture

An application performing a standard streaming capture operation should perform the following steps:

- If desired, enumerate the supported capture video modes by calling **IDeckLinkInput::GetDisplayModeIterator**. For each reported capture mode, call **IDeckLinkInput::DoesSupportVideoMode** to check if the combination of the video mode and pixel format is supported.
- **IDeckLinkInput::EnableVideoInput**
- **IDeckLinkInput::EnableAudioInput**
- **IDeckLinkInput::SetCallback**
- **IDeckLinkInput::StartStreams**  
While streams are running:  
Receive calls to **IDeckLinkInputCallback::VideoInputFrameArrived**  
with video frame and corresponding audio packet
- **IDeckLinkInput::StopStreams**

If audio is not required, the call to **IDeckLinkInput::EnableAudioInput** may be omitted and the **IDeckLinkInputCallback::VideoInputFrameArrived** callback will receive `NULL` audio packets.

## 2.4.2 Playback

An application performing a standard streaming playback operation should perform the following steps:

- **IDeckLinkOutput::DoesSupportVideoMode** to check if the combination of the video mode and pixel format is supported.
- **IDeckLinkOutput::EnableVideoOutput**
- **IDeckLinkOutput::EnableAudioOutput**
- **IDeckLinkOutput::SetScheduledFrameCompletionCallback**
- **IDeckLinkOutput::SetAudioCallback**
- **IDeckLinkOutput::BeginAudioPreroll**  
While more frames or audio need to be pre-rolled:
  - **IDeckLinkOutput::ScheduleVideoFrame**  
Return audio data from **IDeckLinkAudioOutputCallback::RenderAudioSamples**  
When audio preroll is complete, call **IDeckLinkOutput::EndAudioPreroll**
- **IDeckLinkOutput::StartScheduledPlayback**  
While playback is running:
  - Schedule more video frames from **IDeckLinkVideoOutputCallback::ScheduledFrameCompleted**
  - Schedule more audio from **IDeckLinkAudioOutputCallback::RenderAudioSamples**
  - If audio is not required, the call to **IDeckLinkOutput::EnableAudioOutput**, **IDeckLinkOutput::SetAudioCallback** and **IDeckLinkOutput::BeginAudioPreroll** may be omitted.
  - If pre-roll is not required initial **IDeckLinkOutput::ScheduleVideoFrame** calls and the call to **IDeckLinkOutput::BeginAudioPreroll** and **IDeckLinkOutput::EndAudioPreroll** may be omitted.

## 2.4.3 3D Functionality

3D (dual-stream) capture and playback is supported by certain DeckLink devices such as the DeckLink 4K Extreme. The 3D functionality is only available over HDMI or SDI, where Channel A and Channel B represent the left and right eyes. The 3D packing must be manually set when connecting to pre-HDMI 1.4 devices. When capturing from an HDMI 1.4 compliant source, the 3D packing format will automatically be detected, and cannot be overridden. When outputting to an HDMI 1.4 compliant device / monitor, the packing format will be adjusted according to the device / monitor's capabilities, but can be manually changed. Refer to the **IDeckLinkConfiguration** Interface and **BMDVideo3DPackingFormat** sections for more information on getting and setting the packing format.

**NOTE** Automatic mode detection is not available for UHD and DCI 4K 3D dual-link SDI modes.

### 2.4.3.1 3D Capture

An application performing a streaming 3D capture operation should perform the following steps:

- If desired, enumerate the supported capture video modes by calling **IDeckLinkInput::GetDisplayModeIterator**. For each reported capture mode, check for the presence of the **bmdDisplayModeSupports3D** flag in the return value of **IDeckLinkDisplayMode::GetFlag** indicating that this mode is supported for 3D capture. Call **IDeckLinkInput::DoesSupportVideoMode** with the **bmdVideoInputDualStream3D** flag to check if the combination of the video mode and pixel format is supported.
- Call **IDeckLinkInput::EnableVideoInput** with the **bmdVideoInputDualStream3D** flag.
- **IDeckLinkInput::EnableAudioInput**
- **IDeckLinkInput::SetCallback**
- **IDeckLinkInput::StartStreams**

While streams are running:

Receive calls to **IDeckLinkInputCallback::VideoInputFrameArrived** with left eye video frame and corresponding audio packet.

Inside the callback:

Call **IDeckLinkVideoInputFrame::QueryInterface** with **IID\_IDeckLinkVideoFrame3DExtensions** **IDeckLinkVideoFrame3DExtensions::GetFrameForRightEye** The returned frame object must be released by the caller when no longer required.

- **IDeckLinkInput::StopStreams**

### 2.4.3.2 3D Playback

To support 3D playback, your application must provide the API with a video frame object which implements the **IDeckLinkVideoFrame** interface and returns a valid object implementing the **IDeckLinkVideoFrame3DExtensions** interface when its **QueryInterface** method is called with **IID\_IDeckLinkVideoFrame3DExtensions**. This can be achieved by providing your own class which:

- Subclasses both **IDeckLinkVideoFrame** and **IDeckLinkVideoFrame3DExtensions** interfaces
- Returns a pointer to itself (cast to **IDeckLinkVideoFrame3DExtensions**) when its **QueryInterface** method is called with **IID\_IDeckLinkVideoFrame3DExtensions**.
- Implements all the methods in the **IDeckLinkVideoFrame** and **IDeckLinkVideoFrame3DExtensions** classes.

An application performing a streaming 3D playback operation should perform the following steps:

Check if 3D is supported for the desired video mode with

**IDeckLinkOutput::DoesSupportVideoMode** called with **bmdVideoOutputDualStream3D**.

- Call **IDeckLinkOutput::EnableVideoOutput** with the **bmdVideoOutputDualStream3D** flag set.
- **IDeckLinkOutput::EnableAudioOutput**
- **IDeckLinkOutput::SetScheduledFrameCompletionCallback**
- **IDeckLinkOutput::SetAudioCallback**
- **IDeckLinkOutput::BeginAudioPreroll**

While more frames or audio need to be pre-rolled:

Create a video frame object that subclasses **IDeckLinkVideoFrame** and **IDeckLinkVideoFrame3DExtensions** as explained above.

- **IDeckLinkOutput::ScheduleVideoFrame**  
Return audio data from **IDeckLinkAudioOutputCallback::RenderAudioSamples**  
When audio preroll is complete, call **IDeckLinkOutput::EndAudioPreroll**

- **IDeckLinkOutput::StartScheduledPlayback**

While playback is running:

Schedule more video frames from **IDeckLinkVideoOutputCallback::ScheduledFrameCompleted**

Schedule more audio from **IDeckLinkAudioOutputCallback::RenderAudioSamples**

If audio is not required, the call to **IDeckLinkOutput::EnableAudioOutput**,

**IDeckLinkOutput::SetAudioCallback** and **IDeckLinkOutput::BeginAudioPreroll** may be omitted.

If pre-roll is not required initial **IDeckLinkOutput::ScheduleVideoFrame** calls and the call to

**IDeckLinkOutput::BeginAudioPreroll** and **IDeckLinkOutput::EndAudioPreroll** may be omitted.

## 2.4.4 DeckLink Device Notification

A callback notification can be provided to an application when a Thunderbolt or USB 3.0 based DeckLink device is connected or disconnected.

An application that supports connection notification should perform the following steps:

- Create a callback class that subclasses **IDeckLinkDeviceNotificationCallback** and implements all of its methods. The callback class will be called asynchronously from an API private thread. Create an instance of the callback class.
- Call **IDeckLinkDiscovery::InstallDeviceNotifications** and provide the **IDeckLinkDeviceNotificationCallback** object.
- **IDeckLinkDeviceNotificationCallback::DeckLinkDeviceArrived** is called for all currently-connected devices.
- When a DeckLink device is connected after the initial reporting of devices then **IDeckLinkDeviceNotificationCallback::DeckLinkDeviceArrived** will be called.
- When a DeckLink device is removed, **IDeckLinkDeviceNotificationCallback::DeckLinkDeviceRemoved** is called on an API-private thread.
- Before the application exits, call **IDeckLinkDiscovery::UninstallDeviceNotifications**.

## 2.4.5 Streaming Encoder

Streaming encoder functionality is supported by certain DeckLink devices such as the H.264 Pro Recorder. Uncompressed video and audio streams may be encoded into a compressed bitstream and made available to suitable applications involving compressed video and audio.

### 2.4.5.1 Streaming Encoder Capture

An application performing a typical streaming encoder capture operation should perform the following steps:

- Enumerate the preset video encoding modes by calling **IBMDStreamingDeviceInput::GetVideoEncodingModePresetIterator**.  
For each reported video encoding mode call **IBMDStreamingDeviceInput::GetCurrentDetectedVideoInputMode** and **IBMDStreamingDeviceInput::DoesSupportVideoEncodingMode** to check if the current video input mode and video encoding mode are supported.
- If desired, call **IBMDStreamingVideoEncodingMode::CreateMutableVideoEncodingMode** to change the encoder bitrate or other encoder settings.
- **IBMDStreamingDeviceInput::SetVideoEncodingMode**
- **IBMDStreamingDeviceInput::SetCallback**
- **IBMDStreamingDeviceInput::StartCapture**  
While capture is running:  
receive calls to **IBMDStreamingH264InputCallback::MPEG2TSPacketArrived** with MPEG transport stream data to process both compressed video and audio alternatively, receive calls to **IBMDStreamingH264InputCallback::H264NALPacketArrived** and **IBMDStreamingH264InputCallback::H264AudioPacketArrived** to process compressed video and audio data separately
- **IBMDStreamingDeviceInput::StopCapture**

## 2.4.6 Automatic Mode Detection

The automatic mode detection feature will notify an application when a property of the video input signal changes. This feature is supported on certain DeckLink devices. For an example of using automatic mode detection, please refer the AutomaticModeDetection sample in the DeckLink SDK.

To use this feature please refer to the following steps:

- Call **IDeckLinkProfileAttributes::GetFlag** with the **BMDDeckLinkSupportsInputFormatDetection** flag to check that the DeckLink hardware supports the automatic format detection feature.
- Create a callback class that subclasses from **IDeckLinkInputCallback** and implements all of its methods. The **IDeckLinkInputCallback::VideoInputFormatChanged** method will be called when a change in the property of the video signal has been detected.
- Install a callback by calling **IDeckLinkInput::SetCallback** and referencing an instance of your callback class.
- Call **IDeckLinkInput::EnableVideoInput** with an initial video mode and pixel format and set the **bmdVideoInputEnableFormatDetection** flag.
- Call **IDeckLinkInput::EnableAudioInput**.
- Call **IDeckLinkInput::StartStreams** to begin capture.

While the input streams are running:

If a change in a property of the input video signal is detected then

**IDeckLinkInputCallback::VideoInputFormatChanged** will be called in your callback object with the new video properties provided in the parameters.

If the video mode or pixel format has changed, then the following sequence could be used to restart capture with the new settings:

**IDeckLinkInput::PauseStreams** Call **IDeckLinkInput::EnableVideoInput** with the detected video mode and pixel format. **IDeckLinkInput::FlushStreams** **IDeckLinkInput::StartStreams**

- Call **IDeckLinkInput::StopStreams** to stop capture.
- Call **IDeckLinkInput::DisableVideoInput**
- Call **IDeckLinkInput::DisableAudioInput**

## 2.4.7 Ancillary Data functionality

The capture or output of vertical ancillary data (VANC) is supported by certain DeckLink device models. Ancillary Data support is only available for SDI, Optical SDI, Ethernet and Optical Ethernet connections. The lines of VANC that are accessible are dependent upon the model of the DeckLink device. Currently horizontal ancillary data (HANC) access is not supported.

### 2.4.7.1 VANC Capture

An application performing VANC data capture should perform the following steps:

- **IDeckLinkInput::EnableVideoInput**  
Call **IDeckLinkProfileAttributes::GetFlag** with the **BMDDeckLinkVANCRequires10BitYUVVideoFrames** flag to check whether the DeckLink hardware supports VANC only when the active picture and ancillary data are both 10-bit YUV pixel format.
- **IDeckLinkInput::EnableAudioInput**
- **IDeckLinkInput::SetCallback**
- **IDeckLinkInput::StartStreams**

While streams are running:

Receive calls to **IDeckLinkInputCallback::VideoInputFrameArrived**

Inside the callback:

Call **IDeckLinkVideoFrame::QueryInterface** with **IID\_IDeckLinkVideoFrameAncillaryPackets**.



As the **IDeckLinkVideoFrameAncillaryPackets** object has a reference to the **IDeckLinkVideoFrame** input frame, ensure that it is released in a timely manner, otherwise the capture will run out of available frames.

If the DID/SDID for the ancillary packet is known, then call

**IDeckLinkVideoFrameAncillaryPackets::GetFirstPacketByID**.

Check that **S\_OK** is returned to confirm an ancillary packet with matching DID/SDID is found.

Otherwise, enumerate the ancillary packets in the video frame by calling

**IDeckLinkVideoFrameAncillaryPackets::GetPacketIterator**.

- **IDeckLinkAncillaryPacket::GetBytes**

The output packet payload will be converted to the requested **BMDAncillaryPacketFormat**

## 2.4.7.2 VANC Output

- Call **IDeckLinkOutput::EnableVideoOutput** with the **bmdVideoOutputVANC** flag set.  
Call **IDeckLinkProfileAttributes::GetFlag** with the **BMDDeckLinkVANCRequires10BitYUVVideoFrames** flag to check whether the DeckLink hardware supports VANC only when the active picture and ancillary data are both 10-bit YUV pixel format.
- Create an ancillary packet object that subclasses **IDeckLinkAncillaryPacket**, implementing all methods of the **IDeckLinkAncillaryPacket** class.
- **IDeckLinkAncillaryPacket::GetBytes**  
Implement to provide pointer to packet data in playback operation.  
The packet payload data shall be implemented with at least one **BMDAncillaryPacketFormat**.  
The driver will automatically convert to the correct format on output.
- **IDeckLinkOutput::CreateVideoFrame**  
Call **IDeckLinkVideoFrame::QueryInterface** with **IID\_IDeckLinkVideoFrameAncillaryPackets**.  
As the **IDeckLinkVideoFrameAncillaryPackets** object has a reference to the **IDeckLinkVideoFrame** input frame, ensure that it is released in a timely manner, otherwise the playback will run out of available frames.
- **IDeckLinkVideoFrameAncillaryPackets::AttachPacket**  
Attach ancillary packet to video frame for playback.
- **IDeckLinkOutput::ScheduleVideoFrame**
- **IDeckLinkOutput::StartScheduledPlayback**

**NOTE** For applications outputting custom video frame objects that implement the **IDeckLinkVideoFrame** interface (for example for 3D playback or HDR metadata output), the class must provide a valid object when its **QueryInterface** is called with **IID\_IDeckLinkVideoFrameAncillaryPackets**. The return object interface from **QueryInterface** should be obtained with **CoCreateInstance** with **CLSID\_CDeckLinkVideoFrameAncillaryPackets** (Windows) or **CreateVideoFrameAncillaryPacketsInstance** (macOS and Linux).

## 2.4.8 Keying

Alpha keying allows an application to either superimpose a key frame over an incoming video feed (internal keying) or to send fill and key to an external keyer (external keying).

The alpha keying functionality is supported on certain DeckLink models.

For an example of using the keying functionality please refer to GdiKeyer sample application in the DeckLink SDK.

An application performing keying should use the following steps:

- Call **IDeckLinkProfileAttributes::GetFlag** using **BMDDeckLinkSupportsInternalKeying** or **BMDDeckLinkSupportsExternalKeying** to check that the DeckLink hardware supports internal/external keying
- Create video frames with pixel formats that have alpha channels (such as **bmdFormat8BitARGB** or **bmdFormat8BitBGRA**).
- **IDeckLinkOutput::EnableVideoOutput**  
Call **IDeckLinkKeyer::Enable** with FALSE for internal keying or TRUE for external keying  
Set a fixed level of blending using **IDeckLinkKeyer::SetLevel**  
Alternatively set ramp up or down blending using **IDeckLinkKeyer::RampUp** or **IDeckLinkKeyer::RampDown**  
The level of blending of each pixel will depend on the value in the alpha channel and the keying level setting.
- **IDeckLinkOutput::SetScheduledFrameCompletionCallback**
- Pre-roll video frames using **IDeckLinkOutput::ScheduleVideoFrame**
- **IDeckLinkOutput::StartScheduledPlayback**  
While playback is running schedule video frames from **DeckLinkVideoOutputCallback::ScheduledFrameCompleted**  
When playback has finished:  
**IDeckLinkKeyer::Disable** **IDeckLinkOutput::DisableVideoOutput**

## 2.4.9 Timecode/Timecode user bits

The capture and output of VITC and RP188 timecodes are supported on certain DeckLink models. VITC timecodes are only supported with SD video modes. On non-4K DeckLink devices, RP188 timecodes are only supported with HD video modes.

To use this feature please refer to the following points:

### 2.4.9.1 Timecode Capture

An application performing timecode capture should perform the following steps. For an example of timecode capture please refer to the CapturePreview sample application in the DeckLink SDK.

- For HDMI capture, call **IDeckLinkProfileAttributes::GetFlag** using **BMDDeckLinkSupportsHDMITimecode** to check that the DeckLink hardware supports HDMI timecode
- **IDeckLinkInput::EnableVideoInput**
- **IDeckLinkInput::EnableAudioInput**
- **IDeckLinkInput::SetCallback**
- **IDeckLinkInput::StartStreams**  
While streams are running:  
Receive calls to **IDeckLinkInputCallback::VideoInputFrameArrived** with video frame and corresponding audio packet  
Call **IDeckLinkVideoInputFrame::GetTimecode**

- **IDeckLinkTimecode::GetFlags**
- **IDeckLinkTimecode::GetTimecodeUserBits**  
(User bits are not supported for HDMI timecode)
- **IDeckLinkInput::StopStreams**
- **IDeckLinkInput::DisableVideoInput**

### 2.4.9.2 Timecode Output

An application performing timecode output should perform the following steps. For an example of timecode output please refer to the Linux SignalGenerator sample application in the DeckLink SDK.

- For HDMI output, call **IDeckLinkProfileAttributes::GetFlag** using **BMDDeckLinkSupportsHDMITimecode** to check that the DeckLink hardware supports HDMI timecode
- Call **IDeckLinkOutput::EnableVideoOutput** with either **bmdVideoOutputVITC** or **bmdVideoOutputRP188**
- **IDeckLinkOutput::EnableAudioOutput**
- **IDeckLinkOutput::SetScheduledFrameCompletionCallback**
- **IDeckLinkOutput::SetAudioCallback**
- **IDeckLinkOutput::BeginAudioPreroll**  
While more frames or audio need to be pre-rolled:  
Create video frames with **IDeckLinkOutput::CreateVideoFrame**  
Set the timecode into the frame with **IDeckLinkMutableVideoFrame::SetTimecode** or **IDeckLinkMutableVideoFrame::SetTimecodeFromComponents**
- **IDeckLinkOutput::ScheduleVideoFrame**  
Return audio data from **IDeckLinkAudioOutputCallback::RenderAudioSamples**  
When audio preroll is complete, call **IDeckLinkOutput::EndAudioPreroll**
- **IDeckLinkOutput::StartScheduledPlayback**  
While playback is running:  
Create video frames and set the timecode.  
Schedule more video frames from **IDeckLinkVideoOutputCallback::ScheduledFrameCompleted**  
Schedule more audio from **IDeckLinkAudioOutputCallback::RenderAudioSamples**
- **IDeckLinkOutput::StopScheduledPlayback**
- **IDeckLinkOutput::DisableVideoOutput**

### 2.4.10 H.265 Capture

Certain DeckLink devices support encoded (e.g. H.265) capture in addition to regular uncompressed capture.

**NOTE** the Encoded Capture interface is distinct from the H.264 only 'Streaming Encoder' interface.

### 2.4.10.1 Encoded Capture

An application performing an encoded capture operation should perform the following steps:

- Obtain a reference to the **IDeckLinkEncoderInput** interface from **IDeckLinkInput** via **QueryInterface**
- If desired, enumerate the supported encoded capture video modes by calling **IDeckLinkEncoderInput::GetDisplayModelerator**.
- For each reported capture mode, call **IDeckLinkEncoderInput::DoesSupportVideoMode** to check if the combination of the video mode and pixel format is supported.
- **IDeckLinkEncoderInput::EnableVideoInput**
- **IDeckLinkEncoderInput::EnableAudioInput**
- **IDeckLinkEncoderInput::SetCallback**
- **IDeckLinkEncoderInput::StartStreams**
  - While streams are running:
    - receive calls to **IDeckLinkEncoderInputCallback::VideoPacketArrived** with encoded video packets
    - receive calls to **IDeckLinkEncoderInputCallback::AudioPacketArrived** with audio packets
- **IDeckLinkInput::StopStreams**

If audio is not required, the call to **IDeckLinkEncoderInput::EnableAudioInput** may be omitted and the **IDeckLinkEncoderInputCallback::AudioPacketArrived** callback will not be called.

### 2.4.11 Device Profiles

Certain DeckLink devices such as the DeckLink 8K Pro, the DeckLink Quad 2 and the DeckLink Duo 2 support multiple profiles to configure the capture and playback behavior of its sub-devices.

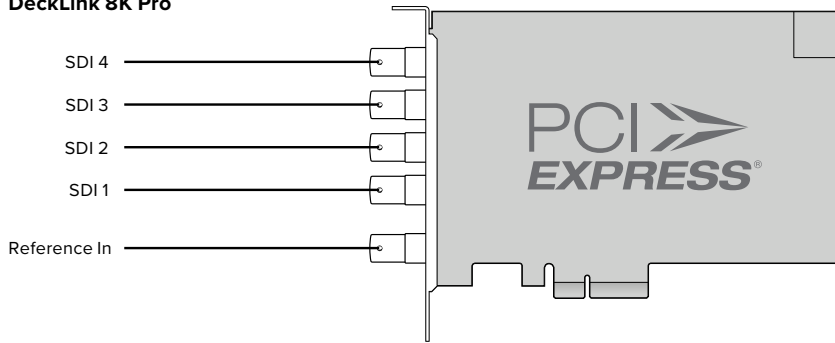
For the DeckLink Duo 2 and DeckLink Quad 2, a profile is shared between any 2 sub-devices that utilize the same connectors. For the DeckLink 8K Pro, a profile is shared between all 4 sub-devices. Any sub-devices that share a profile are considered to be part of the same profile group. To enumerate the sub-devices in a group, the **IDeckLinkProfile::GetPeers** method should be used.

A change in profile is applied to all sub-devices in the group. The following is a list of items that are affected by a profile change:

- Profile ID attribute **BMDDeckLinkProfileID**.
- SDI link configuration attributes **BMDDeckLinkSupportsDualLinkSDI** and **BMDDeckLinkSupportsQuadLinkSDI**.
- Supported Display Modes. An application should recheck the outputs of **IDeckLinkInput::DoesSupportVideoMode** and **IDeckLinkOutput::DoesSupportVideoMode**.
- Keying support attributes **BMDDeckLinkSupportsInternalKeying** and **BMDDeckLinkSupportsExternalKeying**.
- Sub-devices may change duplex mode or become inactive. An application can check the duplex mode with attribute **BMDDeckLinkDuplex**.
- Other attributes accessible by the **IDeckLinkProfileAttributes** object interface.

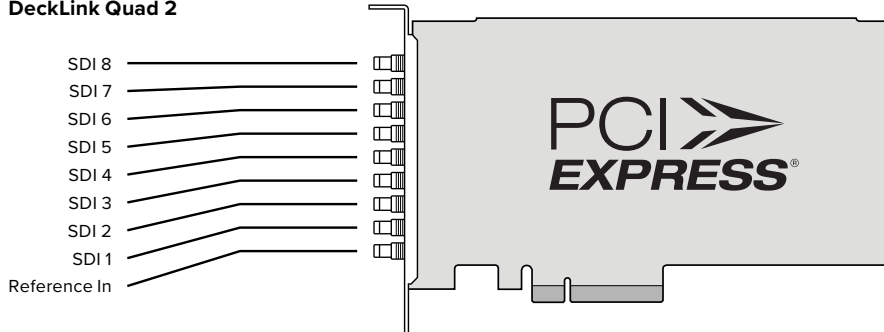
The tables and illustrations below demonstrate the grouping of sub-devices and how the relationship to physical connectors varies with different profiles.

### DeckLink 8K Pro

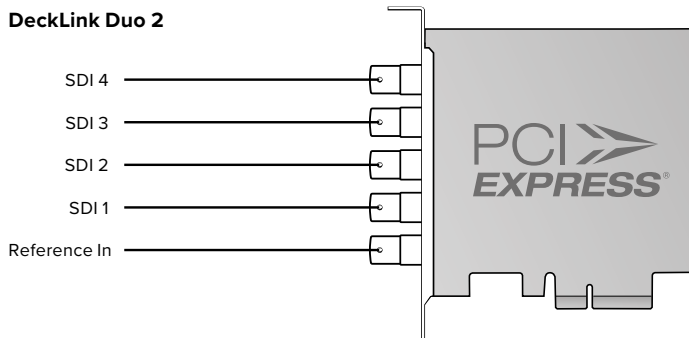


Sub-device index	4 sub-devices profile (bmdProfileFourSubDevicesHalfDuplex)	2 sub-devices profile (bmdProfileTwoSubDevicesFullDuplex)	1 sub-device full-duplex profile (bmdProfileOneSubDevicesFullDuplex)	1 sub-device half-duplex profile (bmdProfileOneSubDevicesHalfDuplex)
0	SDI 1 (in/out)	SDI 1 (in/key) SDI 2 (out/fill)	SDI 1 (CH-B in) SDI 2 (CH-A in) SDI 3 (CH-B out/key) SDI 4 (CH-A out/fill)	SDI 1 (CH-D in/out) SDI 2 (CH-C in/out) SDI 3 (CH-B in/out/key) SDI 4 (CH-A in/out/fill)
1	SDI 3 (in/out)	SDI 3 (in/key) SDI 4 (out/fill)	—	—
2	SDI 2 (in/out)	—	—	—
3	SDI 4 (in/out)	—	—	—

### DeckLink Quad 2



Sub-device index	2 sub-devices profile (bmdProfileTwoSubDevicesHalfDuplex)	1 sub-device profile (bmdProfileOneSubDeviceFullDuplex)
0	SDI 1	SDI 1 (in/key) & SDI 2 (out/fill)
1	SDI 3	SDI 3 (in/key) & SDI 4 (out/fill)
2	SDI 5	SDI 5 (in/key) & SDI 6 (out/fill)
3	SDI 7	SDI 7 (in/key) & SDI 8 (out/fill)
4	SDI 2	—
5	SDI 4	—
6	SDI 6	—
7	SDI 8	—



Sub-device index	2 sub-device profile (bmdProfileTwoSubDevicesHalfDuplex)	1 sub-device profile (bmdProfileOneSubDeviceFullDuplex)
0	SDI 1	SDI 1 (in/key) & SDI 2 (out/fill)
1	SDI 3	SDI 3 (in/key) & SDI 4 (out/fill)
2	SDI 2	—
3	SDI 4	—

### 2.4.11.1 Determine the current profile ID

An application can determine the current profile for an **IDeckLink** device by performing the following steps:

- Call **IDeckLink::QueryInterface** with **IID\_DeckLinkProfileAttributes**.
- Call **IDeckLinkProfileAttributes::GetInt** with identifier **BMDDeckLinkProfileID** to obtain the ID of the current profile.

### 2.4.11.2 List the available profiles

An application can list the available profiles for an **IDeckLink** device by performing the following steps:

- Obtain an **IDeckLinkProfileManager** interface object by calling **IDeckLink::QueryInterface** with **IID\_IDeckLinkProfileManager**.  
If result is **E\_NOINTERFACE**, then the DeckLink device has only one profile (the current profile).
- Obtain a **IDeckLinkProfileIterator** by calling **IDeckLinkProfileManager::GetProfiles** and enumerate the supported profiles for the device by calling **IDeckLinkProfileIterator::Next**.
- For each returned **IDeckLinkProfile** interface object:  
Call **IDeckLinkProfile::QueryInterface** with **IID\_DeckLinkProfileAttributes**.  
Call **IDeckLinkProfileAttributes::GetInt** with identifier **BMDDeckLinkProfileID** to obtain the profile ID.

### 2.4.11.3 Select a new profile

An application can select a new profile for an **IDeckLink** device by performing the following steps:

- Obtain an **IDeckLinkProfileManager** interface object by calling **IDeckLink::QueryInterface** with **IID\_IDeckLinkProfileManager**.
- Obtain an **IDeckLinkProfile** interface object by calling **IDeckLinkProfileManager::GetProfile** with the required **BMDDeckLinkProfileID**.
- Activate the required profile with **IDeckLinkProfile::SetActive**.

#### 2.4.11.4 Handle a profile change notification

A callback can be provided to an application when a profile is changed. If the application does not implement a profile callback, the running streams may be halted unprompted by the driver if the profile changes.

An application that supports profile changing notification should perform the following steps:

- Create a callback class that subclasses from `IDeckLinkProfileCallback` and implement all of its methods. The callback calls will be called asynchronously from an API private thread.
- Obtain an `IDeckLinkProfileManager` interface object by calling `IDeckLink::QueryInterface` with `IID_IDeckLinkProfileManager`.
- Install the callback by calling `IDeckLinkProfileManager::SetCallback` and referencing your `IDeckLinkProfileCallback` object.

During profile change:

Receive call to `IDeckLinkProfileCallback::ProfileChanging`, stop any active streams if required as determined by the `streamsWillBeForcedToStop` argument.

Receive call to `IDeckLinkProfileCallback::ProfileActivated`, when the new profile is active. The application should rescan any attributes and display modes for the new profile.

**NOTE** Profile change callbacks will occur if another application has changed the active profile of the device.

#### 2.4.12 HDR Metadata

HDR Metadata capture and playback is supported by certain DeckLink devices such as the DeckLink 4K Extreme 12G. An application performing capture or playback with HDR Metadata should first verify support of this feature by calling `IDeckLinkAttribute::GetFlag` with attribute `BMDDeckLinkSupportsHDRMetadata`. The `IDeckLinkVideoFrameMetadataExtensions` object interface provides methods to query metadata associated with a video frame.

##### 2.4.12.1 CEA/SMPTE Static HDR Capture

When capturing CEA Static HDR Metadata from an HDMI source, an application should first write to the HDMI EDID with the supported dynamic range standards. This can be achieved with the following steps:

- Obtain a reference to the `IDeckLinkHDMIInputEDID` interface from `IDeckLink` via `IUnknown::QueryInterface`.
- Configure the supported dynamic range standards by calling `IDeckLinkHDMIInputEDID::SetInt` with configuration item `bmdDeckLinkHDMIInputEDIDDynamicRange` with one or more values defined by `BMDDynamicRange`.
- Write the supported dynamic range EDID value to DeckLink hardware by calling `IDeckLinkHDMIInputEDID::WriteToEDID`.

An application performing capture of video frames with HDR Metadata should perform the following steps:

- `IDeckLinkInput::EnableVideoInput`
- `IDeckLinkInput::SetCallback`
- `IDeckLinkInput::StartStreams`

While streams are running:

Receive calls to `IDeckLinkInputCallback::VideoInputFrameArrived`

Inside the callback:

Check that video frame has HDR Metadata by ensuring `IDeckLinkVideoFrame::GetFlags` has `bmdFrameContainsHDRMetadata` flag.

Call `IDeckLinkVideoInputFrame::QueryInterface` with `IID_IDeckLinkVideoFrameMetadataExtensions`.

- `IDeckLinkVideoFrameMetadataExtensions::Get*` methods can be called to access HDR Metadata items. See `BMDDeckLinkFrameMetadataID` enumerator for a full list of supported HDR Metadata items.
- The `IDeckLinkVideoFrameMetadataExtensions` object must be released by the caller when no longer required.

### 2.4.12.2 CEA/SMPTE Static HDR Playback

In order to output HDR metadata, your application must provide the API with a custom video frame object which implements the `IDeckLinkVideoFrame` interface and returns a valid object implementing the `IDeckLinkVideoFrameMetadataExtensions` interface when its `QueryInterface` method is called with `IID_IDeckLinkVideoFrameMetadataExtensions`. This can be achieved by providing your own class which:

- Subclasses both `IDeckLinkVideoFrame` and `IDeckLinkVideoFrameMetadataExtensions` interfaces.
- Returns a pointer to itself (cast to `IDeckLinkVideoFrameMetadataExtensions`) when its `QueryInterface` method is called with `IID_IDeckLinkVideoFrameMetadataExtensions`.
- Implements all the methods in the `IDeckLinkVideoFrame` class.
- Specify the HDR metadata items to be queried by implementing methods in the `IDeckLinkVideoFrameMetadataExtensions` class. See `BMDDeckLinkFrameMetadataID` enumerator for a full list of supported HDR Metadata items.
- Reveal the presence of HDR Metadata in custom frame by returning flag `bmdFrameContainsHDRMetadata` when video frame flags are queried with `IDeckLinkVideoFrame::GetFlags`

An application performing output with HDR Metadata should perform the following steps:

- `IDeckLinkOutput::EnableVideoOutput`
- `IDeckLinkOutput::SetScheduledFrameCompletionCallback`  
While more frames or audio need to be pre-rolled:  
Create a custom video frame object that subclasses `IDeckLinkVideoFrame` and `IDeckLinkVideoFrameMetadataExtensions` as explained above.
- `IDeckLinkOutput::ScheduleVideoFrame`
- `IDeckLinkOutput::StartScheduledPlayback`  
While playback is running:  
Schedule more custom video frames from `IDeckLinkVideoOutputCallback::ScheduledFrameCompleted`

### 2.4.12.3 Dolby Vision® Playback

In order to output Dolby Vision, applications must provide the API with a custom video frame object which implements the `IDeckLinkVideoFrame` interface and returns a valid object implementing the `IDeckLinkVideoFrameMetadataExtensions` interface when its `IUnknown::QueryInterface` method is called with `IID_IDeckLinkVideoFrameMetadataExtensions`. This can be achieved by creating your own class which:

- Subclasses both `IDeckLinkVideoFrame` and `IDeckLinkVideoFrameMetadataExtensions` interfaces.
- Implements all the methods in the `IUnknown` interface. `IUnknown::QueryInterface` should provide casts of itself to `IDeckLinkVideoFrame`, `IDeckLinkVideoFrameMetadataExtensions` and `IUnknown` as requested.
- Implements all the methods in the `IDeckLinkVideoFrame` interface. Method `IDeckLinkVideoFrame::GetBytes` should output a 12-bit RGB PQ video buffer that will be converted to Dolby Vision in the colorspace conversion pipeline.



- Provides Dolby Vision metadata by implementing the **IDeckLinkVideoFrameMetadataExtensions::GetBytes** method. When the metadata ID input parameter is **bmdDeckLinkFrameMetadataDolbyVision**, the method should output a pointer to the byte buffer consisting of the Dolby Vision metadata. Desktop Video implements Dolby Vision HDMI Transmission, it does not however depend upon the structure of this data. For details concerning the structure of this data refer to the latest release of Dolby Vision Metadata For Source and Sink Connections provided by Dolby.
- Provides the frame colorspace by implementing the **IDeckLinkVideoFrameMetadataExtensions::GetInt** method and handling metadata ID input **bmdDeckLinkFrameMetadataColorspace**.
- Implements all of the other methods for the **IDeckLinkVideoFrameMetadataExtensions** interface by returning **E\_NOTIMPL**.
- Reveals the presence of Dolby Vision metadata in the custom frame by returning flag **bmdFrameContainsDolbyVisionMetadata** when video frame flags are queried with **IDeckLinkVideoFrame::GetFlags**. This flag must continue to be present in all frames until output is disabled.

An application performing output with HDR Metadata should perform the following steps:

- Check that the supported Dolby Vision version of the connected HDMI sink is compatible with the Dolby Vision metadata by calling **IDeckLinkStatus::GetFloat** with status item **bmdDeckLinkStatusSinkSupportsDolbyVision**.
- Check if Dolby Vision is supported for the desired video mode with **IDeckLinkOutput::DoesSupportVideoMode** called with **bmdSupportedVideoModeDolbyVision**.
- Configure the source colorspace of the output conversion pipeline by calling **IDeckLinkConfiguration::SetInt** with configuration item **bmdDeckLinkConfigVideoOutputConversionColorspaceSource** with a **BMDColorspace** value that matches the colorspace of the output frame.
- Configure the destination colorspace of the output conversion pipeline by calling **IDeckLinkConfiguration::SetInt** with configuration item **bmdDeckLinkConfigVideoOutputConversionColorspaceDestination** with **bmdColorspaceDolbyVisionNative**.
- Configure the Dolby Vision Content Mapping version by calling **IDeckLinkConfiguration::SetFloat** with configuration item **bmdDeckLinkConfigDolbyVisionCMVersion**.
- Configure the Dolby Vision mastering monitor luminance by calling **IDeckLinkConfiguration::SetFloat** with configuration items **bmdDeckLinkConfigDolbyVisionMasterMinimumNits** and **bmdDeckLinkConfigDolbyVisionMasterMaximumNits**.
- Call **IDeckLinkOutput::EnableVideoOutput** with video output flag **bmdVideoOutputDolbyVision**. The output will switch to Dolby Vision once the first frame is displayed.
- If output callbacks are required, call **IDeckLinkOutput::SetScheduledFrameCompletionCallback** with a class that implements **IDeckLinkVideoOutputCallback**.

While more frames or audio need to be pre-rolled:

- Create a custom video frame object that subclasses **IDeckLinkVideoFrame** and **IDeckLinkVideoFrameMetadataExtensions** as explained above.
- Output the custom video frame with **IDeckLinkOutput::ScheduleVideoFrame**.

When sufficient frames have been pre-rolled:

- **IDeckLinkOutput::StartScheduledPlayback**

While playback is running:

- Schedule more custom video frames with **IDeckLinkOutput::ScheduleVideoFrame**. This can be called within the **IDeckLinkVideoOutputCallback::ScheduledFrameCompleted** callback context or otherwise.

## 2.4.13 Synchronized Capture/Playback

Multiple DeckLink devices or sub-devices can be grouped to synchronously start and stop capture or playback.

### 2.4.13.1 Synchronized Capture

All sources providing the signal to the capture devices must have their clocks synchronized. This can be achieved by providing the sources with a common reference input. However it is not required that the reference input is proved to the DeckLink capture devices. All sources should be configured with the same frame rate.

- An application performing synchronized capture should perform the following steps:
  - For each device to synchronize for capture.
- Call `IDeckLinkProfileAttributes::GetFlag` with the `BMDDeckLinkSupportsSynchronizeToCaptureGroup` flag to check that the DeckLink hardware supports grouping for synchronized capture.
- Call `IDeckLinkConfiguration::SetInt` with the `bmdDeckLinkConfigCaptureGroup` configuration ID, along with a common integer value for the capture group. This setting is persistent until system reboot.
- Obtain `IDeckLinkInput` interface and enable each input in the capture group.
- `IDeckLinkInput::EnableVideoInput`, with the `bmdVideoInputSynchronizeToCaptureGroup` flag.
- `IDeckLinkInput::EnableAudioInput`
- `IDeckLinkInput::SetCallback`
  - For each input in the capture group, call `IDeckLinkStatus::GetFlag` with the `bmdDeckLinkStatusVideoInputSignalLocked` status ID to ensure that the input is locked.
- To start the synchronized capture call `IDeckLinkInput::StartStreams` on any input device in the group.
- To stop synchronized capture, call `IDeckLinkInput::StopStreams` on any input device in the group.

### 2.4.13.2 Synchronized Playback

Each output device in the synchronised playback group requires a common reference. The exception is the DeckLink 8K Pro, where all sub-devices can synchronize to each other without needing a common reference input. All output devices should be configured with the same frame rate.

An application performing synchronized playback should perform the following steps

- For each device to synchronize for playback,
- Call `IDeckLinkProfileAttributes::GetFlag` with the `BMDDeckLinkSupportsSynchronizeToPlaybackGroup` flag to check that the DeckLink hardware supports grouping for synchronized playback.
- Call `IDeckLinkConfiguration::SetInt` with the `bmdDeckLinkConfigPlaybackGroup` configuration ID, along with a common integer value for the playback group. This setting is persistent until system reboot.
- Obtain `IDeckLinkOutput` interface and enable each output in the playback group.
- `IDeckLinkOutput::DoesSupportVideoMode` to check if the combination of the video mode and pixel format is supported.
- `IDeckLinkOutput::EnableVideoOutput`, with the `bmdVideoOutputSynchronizeToPlaybackGroup` flag.
- `IDeckLinkOutput::EnableAudioOutput`
- `IDeckLinkOutput::SetScheduledFrameCompletionCallback`
- `IDeckLinkOutput::SetAudioCallback`
- `IDeckLinkOutput::BeginAudioPreroll`
- If a common reference is required, for each output in the playback group, call `IDeckLinkStatus::GetFlag` with the `bmdDeckLinkStatusReferenceSignalLocked` status ID to ensure that the output is locked to the reference input.
- To start the synchronized playback call `IDeckLinkOutput::StartScheduledPlayback` on any output in the group.
- To stop synchronized playback, call `IDeckLinkOutput::StopScheduledPlayback` on any output in the group.

## 2.4.14 Video Frame Conversion

The DeckLink API provides SIMD accelerated conversions operations for converting the pixel format of a video frame. An application performing pixel format conversion should perform the following steps.

- Create the destination frame with the required pixel format
- If the DeckLink device has an output interface, the destination video frame can be created with **IDeckLinkOutput::CreateVideoFrame**.
- If there is no **IDeckLinkOutput** interface available, create a class that subclasses **IDeckLinkVideoFrame** and implement all methods with the following requirements.
- **IDeckLinkVideoFrame::GetWidth** and **IDeckLinkVideoFrame::GetHeight** should return resolution that is same as source video frame.
- **IDeckLinkVideoFrame::GetPixelFormat** should return required pixel format (see **BMDPixelFormat**).
- **IDeckLinkVideoFrame::GetRowBytes** should return the number of bytes in row for the destination pixel format.
- **IDeckLinkVideoFrame::GetBytes** should return a buffer large enough to hold the destination frame.
- Get an instance of the **IDeckLinkVideoConversion** object interface by calling **CoCreateInstance** with **CLSID\_CDeckLinkVideoConversion** (Windows) or **CreateVideoConversionInstance** (macOS and Linux).
- Call **IDeckLinkVideoConversion::ConvertFrame** with the source and destination video frames.

## 2.5 Interface Reference

### 2.5.1 IDeckLinkIterator Interface

The **IDeckLinkIterator** interface is used to enumerate the available DeckLink devices.

A reference to an **IDeckLinkIterator** object interface may be obtained from **CoCreateInstance** on platforms with native COM support or from **CreateDeckLinkIteratorInstance** on other platforms.

The **IDeckLink** interface(s) returned may be used to access the related interfaces which provide access to the core API functionality.

#### Related Interfaces

Interface	Interface ID	Description
IDeckLink	IID_IDeckLink	<b>IDeckLinkIterator::Next</b> returns <b>IDeckLink</b> interfaces representing each attached DeckLink device.

Public Member Functions	
Method	Description
Next	Returns an <b>IDeckLink</b> object interface corresponding to an individual DeckLink device.

## 2.5.1.1 IDeckLinkIterator::Next method

The **Next** method creates an object representing a physical DeckLink device and assigns the address of the IDeckLink interface of the newly created object to the decklinkInstance parameter.

### Syntax

```
HRESULT Next (IDeckLink *decklinkInstance);
```

### Parameters

Name	Direction	Description
decklinkInstance	out	Next IDeckLink object interface

### Return Values

Value	Description
S_FALSE	No (more) devices found
E_FAIL	Failure
S_OK	Success

## 2.5.2 IDeckLink Interface

The **IDeckLink** object interface represents a physical DeckLink device attached to the host computer.

**IDeckLink** object interfaces are obtained from **IDeckLinkIterator**. **IDeckLink** may be queried to obtain the related **IDeckLinkOutput**, **IDeckLinkInput** and **IDeckLinkConfiguration** interfaces.

### Related Interfaces

Interface	Interface ID	Description
IDeckLinkIterator	IID_IDeckLinkIterator	<b>IDeckLinkIterator::Next</b> returns <b>IDeckLink</b> interfaces representing each attached DeckLink device.
IDeckLinkOutput	IID_IDeckLinkOutput	An <b>IDeckLinkOutput</b> object interface may be obtained from <b>IDeckLink</b> using <b>QueryInterface</b>
IDeckLinkInput	IID_IDeckLinkInput	An <b>IDeckLinkInput</b> object interface may be obtained from <b>IDeckLink</b> using <b>QueryInterface</b>
IDeckLinkConfiguration	IID_IDeckLinkConfiguration	An <b>IDeckLinkConfiguration</b> object interface may be obtained from <b>IDeckLink</b> using <b>QueryInterface</b>
IDeckLinkProfileAttributes	IID_IDeckLinkProfileAttributes	An <b>IDeckLinkProfileAttributes</b> object interface may be obtained from <b>IDeckLink</b> using <b>QueryInterface</b> .
IDeckLinkKeyer	IID_IDeckLinkKeyer	An <b>IDeckLinkKeyer</b> object interface may be obtained from <b>IDeckLink</b> using <b>QueryInterface</b> .
IDeckLinkDeckControl	IID_IDeckLinkDeckControl	An <b>IDeckLinkDeckControl</b> object may be obtained from <b>IDeckLink</b> using <b>QueryInterface</b>
IDeckLinkHDMIInputEDID	IID_IDeckLinkHDMIInputEDID	An <b>IDeckLinkHDMIInputEDID</b> object may be obtained from <b>IDeckLink</b> using <b>QueryInterface</b>

Public Member Functions	
Method	Description
GetModelName	Method to get DeckLink device model name.
GetDisplayName	Method to get a device name suitable for user interfaces

### 2.5.2.1 IDeckLink::GetModelName method

The `GetModelName` method can be used to get DeckLink device model name.

#### Syntax

```
HRESULT GetModelName (string *modelName);
```

#### Parameters

Name	Direction	Description
modelName	out	Hardware model name. This allocated string must be freed by the caller when no longer required.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.2.2 IDeckLink::GetDisplayName method

The `GetDisplayName` method returns a string suitable for display in a user interface. If the device has a custom label specified (see `bmdDeckLinkConfigDeviceInformationLabel`), the label will be used as the display name for the device.

Otherwise, the string is made of the model name (as returned by `GetModelName`) followed by an increasing number (starting from 1) if more than one instance of a device is present in the system. If not, the returned string is simply the model name.

#### Syntax

```
HRESULT GetDisplayName (string *displayName);
```

#### Parameters

Name	Direction	Description
displayName	out	The device's display name. This allocated string must be freed by caller when no longer required

#### Return Values

Value	Description
E_FAIL	Failed to allocate the string
S_OK	Success

### 2.5.3 IDeckLinkOutput interface

The `IDeckLinkOutput` object interface allows an application to output a video and audio stream from a DeckLink device.

An `IDeckLinkOutput` interface can be obtained from an `IDeckLink` object interface using `QueryInterface`. If `QueryInterface` for an output interface is called on an input only device, then `QueryInterface` will fail and return `E_NOINTERFACE`.

## Related Interfaces

Interface	Interface ID	Description
IDeckLinkOutput	IID_IDeckLinkOutput	An <b>IDeckLinkOutput</b> object interface may be obtained from <b>IDeckLink</b> using <b>QueryInterface</b>
IDeckLinkDisplayModeIterator	IID_IDeckLinkDisplayModeIterator	<b>IDeckLinkOutput::GetDisplayModeIterator</b> returns an <b>IDeckLinkDisplayModeIterator</b> object interface
IDeckLinkVideoFrame	IID_IDeckLinkVideoFrame	<b>IDeckLinkOutput::CreateVideoFrame</b> may be used to create a new <b>IDeckLinkVideoFrame</b> object interface
IDeckLinkVideoOutputCallback	IID_IDeckLinkVideoOutputCallback	An <b>IDeckLinkVideoOutputCallback</b> object interface may be registered with <b>IDeckLinkOutput::SetScheduledFrameCompletionCallback</b>
IDeckLinkAudioOutputCallback	IID_IDeckLinkAudioOutputCallback	An <b>IDeckLinkAudioOutputCallback</b> object interface may be registered with <b>IDeckLinkOutput::SetAudioCallback</b>
IDeckLinkDisplayMode	IID_IDeckLinkDisplayMode	<b>IDeckLinkOutput::GetDisplayMode</b> returns an <b>IDeckLinkDisplayMode</b> interface object

Public Member Functions	
Method	Description
DoesSupportVideoMode	Check whether a given video mode is supported for output
GetDisplayMode	Get a display mode object based on identifier
GetDisplayModeIterator	Get an iterator to enumerate the available output display modes
SetScreenPreviewCallback	Register screen preview callback
EnableVideoOutput	Enable video output
DisableVideoOutput	Disable video output
SetVideoOutputFrameMemoryAllocator	Register custom memory allocator
CreateVideoFrame	Create a video frame
CreateAncillaryData	Create ancillary buffer
DisplayVideoFrameSync	Display a video frame synchronously
ScheduleVideoFrame	Schedule a video frame for display
SetScheduledFrameCompletionCallback	Register completed frame callback
GetBufferedVideoFrameCount	Gets number of frames queued.
EnableAudioOutput	Enable audio output
DisableAudioOutput	Disable audio output
WriteAudioSamplesSync	Play audio synchronously
BeginAudioPreroll	Start pre-rolling audio
EndAudioPreroll	Stop pre-rolling audio
ScheduleAudioSamples	Schedule audio samples for play-back
GetBufferedAudioSampleFrameCount	Returns the number of audio sample frames currently buffered for output
FlushBufferedAudioSamples	Flush buffered audio
SetAudioCallback	Register audio output callback

Public Member Functions	
Method	Description
StartScheduledPlayback	Start scheduled playback
StopScheduledPlayback	Stop scheduled playback
GetScheduledStreamTime	Returns the elapsed time since scheduled playback began.
IsScheduledPlaybackRunning	Determine if the video output scheduler is running
GetHardwareReferenceClock	Get scheduling time
GetReferenceStatus	Provides reference genlock status

### 2.5.3.1 IDeckLinkOutput::DoesSupportVideoMode method

The **DoesSupportVideoMode** method indicates whether a given display mode is supported on output. Modes may be supported, unsupported or supported with conversion. If the requested video mode cannot be output then the video will be converted into a supported video mode indicated by `actualMode`.

**NOTE** When using HDMI as an output connection, the **DoesSupportVideoMode** method does not account for the actual supported modes of the connected HDMI sink. To check whether an output mode will be supported by an HDMI sink, an application can additionally decode the received EDID obtained by **IDeckLinkStatus::GetBytes** with status item **bmdDeckLinkStatusReceivedEDID**.

#### Syntax

```
HRESULT DoesSupportVideoMode (BMDVideoConnection connection,
    BMDDisplayMode requestedMode, BMDPixelFormat requestedPixelFormat,
    BMDVideoOutputConversionMode conversion, BMDSupportedVideoModeFlags flags,
    BMDDisplayMode *actualMode, bool *supported);
```

#### Parameters

Name	Direction	Description
connection	in	Output connection to check (see <b>BMDVideoConnection</b> for details).
requestedMode	in	Display mode to check
requestedPixelFormat	in	Pixel format to check
conversionMode	in	Output conversion mode to check (see <b>BMDVideoOutputConversionMode</b> for details)
flags	in	Output video mode flags (see <b>BMDSupportedVideoModeFlags</b> for details).
actualMode	out	If this parameter is not NULL and the display mode is supported or supported with conversion, the actual display mode is returned.
supported	out	Pixel format to check

#### Return Values

Value	Description
E_INVALIDARG	Invalid value for parameters <code>requestedMode</code> or <code>requestedPixelFormat</code> , or parameter <code>supported</code> variable is NULL.
E_FAIL	Failure
S_OK	Success

### 2.5.3.2 IDeckLinkOutput::GetDisplayMode method

The `GetDisplayMode` method returns the `IDeckLinkDisplayMode` object interface for an output display mode identifier.

#### Syntax

```
HRESULT GetDisplayMode (BMDDisplayMode displayMode,  
IDeckLinkDisplayMode *resultDisplayMode);
```

#### Parameters

Name	Direction	Description
displayMode	in	The display mode ID (See <code>BMDDisplayMode</code> ).
resultDisplayMode	out	Pointer to the display mode with matching ID. The object must be released by the caller when no longer required.

#### Return Values

Value	Description
E_INVALIDARG	Parameter active status variable is NULL
E_FAIL	Failure
S_OK	Success

### 2.5.3.3 IDeckLinkOutput::IsScheduledPlaybackRunning method

The `IsScheduledPlaybackRunning` method is called to determine if the driver's video output scheduler is currently active.

#### Syntax

```
HRESULT IsScheduledPlaybackRunning (boolean *active)
```

#### Parameters

Name	Direction	Description
active	out	Active status of driver video output scheduler

#### Return Values

Value	Description
E_INVALIDARG	Parameter active status variable is NULL
E_FAIL	Failure
S_OK	Success



### 2.5.3.4 IDeckLinkOutput::GetDisplayModeIterator method

The `GetDisplayModeIterator` method returns an iterator which enumerates the available display modes.

#### Syntax

```
HRESULT GetDisplayModeIterator (IDeckLinkDisplayModeIterator *iterator);
```

#### Parameters

Name	Direction	Description
iterator	out	Display mode iterator

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.3.5 IDeckLinkOutput::SetScreenPreviewCallback method

The `SetScreenPreviewCallback` method is called to register an instance of an `IDeckLinkScreenPreviewCallback` object. The registered object facilitates the updating of an on-screen preview of a video stream being played.

#### Syntax

```
HRESULT SetScreenPreviewCallback (IDeckLinkScreenPreviewCallback *previewCallback)
```

#### Parameters

Name	Direction	Description
previewCallback	in	The <code>IDeckLinkScreenPreview</code> object to be registered.

#### Return Values

Value	Description
E_OUTOFMEMORY	Unable to create kernel event (Windows only)
E_FAIL	Failure
S_OK	Success

### 2.5.3.6 IDeckLinkOutput::EnableVideoOutput method

The **EnableVideoOutput** method enables video output. Once video output is enabled, frames may be displayed immediately with **DisplayVideoFrameSync** or scheduled with **ScheduleVideoFrame**.

#### Syntax

```
HRESULT EnableVideoOutput (BMDDisplayMode displayMode, BMDVideoOutputFlags flags);
```

#### Parameters

Name	Direction	Description
displayMode	in	Display mode for video output
flags	in	Flags to control ancillary data and video output features.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_ACCESSDENIED	Unable to access the hardware
E_OUTOFMEMORY	Unable to create a new frame

### 2.5.3.7 IDeckLinkOutput::DisableVideoOutput method

The **DisableVideoOutput** method disables video output.

#### Syntax

```
HRESULT DisableVideoOutput ();
```

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.3.8 IDeckLinkOutput::SetVideoOutputFrameMemoryAllocator method

The `SetVideoOutputFrameMemoryAllocator` method sets a custom memory allocator for video frame allocations during playback. The use of a custom memory allocator is optional.

#### Syntax

```
HRESULT SetVideoOutputFrameMemoryAllocator  
(IDeckLinkMemoryAllocator *theAllocator);
```

#### Parameters

Name	Direction	Description
theAllocator	in	Allocator object with an <code>IDeckLinkMemoryAllocator</code> interface

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.3.9 IDeckLinkOutput::CreateVideoFrame method

The `CreateVideoFrame` method creates a video frame for output (see `IDeckLinkMutableVideoFrame` for more information).

#### Syntax

```
HRESULT CreateVideoFrame (long width, long height, long rowBytes, BMDPixelFormat  
pixelFormat, BMDFrameFlags flags, IDeckLinkMutableVideoFrame *outFrame);
```

#### Parameters

Name	Direction	Description
width	in	frame width in pixels
height	in	frame height in pixels
rowBytes	in	bytes per row
pixelFormat	in	pixel format
flags	in	frame flags
outFrame	out	newly created video frame

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.3.10 IDeckLinkOutput::CreateAncillaryData method

The `CreateAncillaryData` method creates an ancillary buffer that can be attached to an `IDeckLinkMutableVideoFrame`.

#### Syntax

```
HRESULT CreateAncillaryData (BMDPixelFormat pixelFormat,  
                             IDeckLinkVideoFrameAncillary* outBuffer);
```

#### Parameters

Name	Direction	Description
pixelFormat	in	Pixel format for ancillary data
outBuffer	out	New video frame ancillary buffer

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_ACCESSDENIED	Video output is not enabled.

### 2.5.3.11 IDeckLinkOutput::DisplayVideoFrameSync method

The `DisplayVideoFrameSync` method is used to provide a frame to display as the next frame output. It should not be used during scheduled playback.

Video output must be enabled with `EnableVideoOutput` before frames can be displayed.

#### Syntax

```
HRESULT DisplayVideoFrameSync (IDeckLinkVideoFrame *theFrame);
```

#### Parameters

Name	Direction	Description
theFrame	in	frame to display – after call return, the frame may be released

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_ACCESSDENIED	The video output is not enabled.
E_INVALIDARG	The frame attributes are invalid.

### 2.5.3.12 IDeckLinkOutput::ScheduleVideoFrame method

The **ScheduleVideoFrame** method is used to schedule a frame for asynchronous playback at a specified time.

Video output must be enabled with **EnableVideoOutput** before frames can be displayed. Frames may be scheduled before calling **StartScheduledPlayback** to preroll. Once playback is initiated, new frames can be scheduled from **IDeckLinkVideoOutputCallback**.

#### Syntax

```
HRESULT ScheduleVideoFrame (IDeckLinkVideoFrame *theFrame,  
BMDTimeValue displayTime, BMDTimeValue displayDuration,  
BMDTimeScale timeScale);
```

#### Parameters

Name	Direction	Description
theFrame	in	frame to display
displayTime	in	time at which to display the frame in timeScale units
displayDuration	in	duration for which to display the frame in timeScale units
timeScale	in	time scale for displayTime and displayDuration

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_ACCESSDENIED	The video output is not enabled.
E_INVALIDARG	The frame attributes are invalid.
E_OUTOFMEMORY	Too many frames are already scheduled

### 2.5.3.13 IDeckLinkOutput::SetScheduledFrameCompletionCallback method

The **SetScheduledFrameCompletionCallback** method configures a callback which will be called when each scheduled frame is completed.

#### Syntax

```
HRESULT SetScheduledFrameCompletionCallback  
(IDeckLinkVideoOutputCallback *theCallback);
```

#### Parameters

Name	Direction	Description
theCallBack	in	Callback object implementing the <b>IDeckLinkVideoOutputCallback</b> object interface

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.3.14 IDeckLinkOutput::GetBufferedVideoFrameCount method

The `GetBufferedVideoFrameCount` method gets the number of frames queued.

#### Syntax

```
HRESULT GetBufferedVideoFrameCount (uint32_t *bufferedFrameCount);
```

#### Parameters

Name	Direction	Description
bufferedFrameCount	out	The frame count.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.3.15 IDeckLinkOutput::EnableAudioOutput method

The `EnableAudioOutput` method puts the hardware into a specified audio output mode. Once audio output is enabled, sample frames may be output immediately using `WriteAudioSamplesSync` or as part of scheduled playback using `ScheduleAudioSamples`.

#### Syntax

```
HRESULT EnableAudioOutput (BMDAudioSampleRate sampleRate, BMDAudioSampleType sampleType, uint32_t channelCount, BMDAudioOutputStreamType streamType);
```

#### Parameters

Name	Direction	Description
sampleRate	in	Sample rate to output
sampleType	in	Sample type to output
channelCount	in	Number of audio channels to output – only 2, 8, 16, 32 or 64 channel output is supported.
streamType	in	Type of audio output stream.

#### Return Values

Value	Description
E_FAIL	Failure
E_INVALIDARG	Invalid number of channels requested
S_OK	Success
E_ACCESSDENIED	Unable to access the hardware or audio output not enabled.
E_OUTOFMEMORY	Unable to create internal object

### 2.5.3.16 IDeckLinkOutput::DisableAudioOutput method

The **DisableAudioOutput** method disables the hardware audio output mode.

#### Syntax

```
HRESULT DisableAudioOutput ();
```

#### Parameters

none.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.3.17 IDeckLinkOutput::WriteAudioSamplesSync method

The **WriteAudioSamplesSync** method is used to play audio sample frames immediately. Audio output must be configured with **EnableAudioOutput**. **WriteAudioSamplesSync** should not be called during scheduled playback.

#### Syntax

```
HRESULT WriteAudioSamplesSync (void *buffer, uint32_t sampleFrameCount,  
uint32_t *sampleFramesWritten);
```

#### Parameters

Name	Direction	Description
buffer	in	Buffer containing audio sample frames. Audio channel samples must be interleaved into a sample frame and sample frames must be contiguous.
sampleFrameCount	in	Number of sample frames available
sampleFramesWritten	out	Actual number of sample frames queued

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.3.18 IDeckLinkOutput::BeginAudioPreroll method

The **BeginAudioPreroll** method requests the driver begin polling the registered **IDeckLinkAudioOutputCallback::RenderAudioSamples** object interface for audio-preroll.

#### Syntax

```
HRESULT BeginAudioPreroll ();
```

#### Parameters

none.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.3.19 IDeckLinkOutput::EndAudioPreroll method

The **EndAudioPreroll** method requests the driver stop polling the registered **IDeckLinkAudioOutputCallback** object interface for audio-preroll.

#### Syntax

```
HRESULT EndAudioPreroll ();
```

#### Parameters

none.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success



### 2.5.3.20 IDeckLinkOutput::ScheduleAudioSamples method

The **ScheduleAudioSamples** method is used to provide audio sample frames for scheduled playback. Audio output must be enabled with **EnableAudioOutput** before frames may be scheduled.

**NOTE** When the output parameter `sampleFramesWritten` is NULL, **ScheduleAudioSamples** will block until all audio samples are written to the scheduling buffer. If the `sampleFramesWritten` parameter is non-NULL, the call to **ScheduleAudioSamples** is non-blocking. In this case, the `sampleFramesWritten` output value reflects the actual number of samples written to the scheduling buffer which may be less than the parameter `sampleFrameCount`.

#### Syntax

```
HRESULT ScheduleAudioSamples (void *buffer, uint32_t sampleFrameCount, BMDTimeValue streamTime, BMDTimeScale timeScale, uint32_t *sampleFramesWritten);
```

#### Parameters

Name	Direction	Description
buffer	in	Buffer containing audio sample frames. Audio channel samples must be interleaved into a sample frame and sample frames must be contiguous.
sampleFrameCount	in	Number of sample frames available
streamTime	in	Time for audio playback in units of timeScale. To queue samples to play back immediately after currently buffered samples both <b>streamTime</b> and <b>timeScale</b> may be set to zero when using <b>bmdAudioOutputStreamContinuous</b> .
timeScale	in	Time scale for the audio stream.
sampleFramesWritten	out	Actual number of sample frames scheduled

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_ACCESSDENIED	Either audio output has not been enabled or an audio sample write is in progress.
E_INVALIDARG	No timescale has been provided. A timescale is necessary as the audio packets are time-stamped.

### 2.5.3.21 IDeckLinkOutput::GetBufferedAudioSampleFrameCount method

The `GetBufferedAudioSampleFrameCount` method returns the number of audio sample frames currently buffered for output. This method may be used to determine how much audio is currently buffered before scheduling more audio with `ScheduleAudioSamples`.

#### Syntax

```
HRESULT GetBufferedAudioSampleFrameCount (uint32_t *bufferedSampleFrameCount)
```

#### Parameters

Name	Direction	Description
bufferedSampleFrameCount	out	Number of audio frames currently buffered.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.3.22 IDeckLinkOutput::FlushBufferedAudioSamples method

The `FlushBufferedAudioSamples` method discards any buffered audio sample frames.

`FlushBufferedAudioSamples` should be called when changing playback direction. Buffered audio is implicitly flushed when stopping audio playback with `StopScheduledPlayback` or `DisableAudioOutput`.

#### Syntax

```
HRESULT FlushBufferedAudioSamples ();
```

#### Parameters

none.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.3.23 IDeckLinkOutput::SetAudioCallback method

The **SetAudioCallback** method configures a callback which will be called regularly to allow the application to queue audio for scheduled playback.

**TIP** Use of this method is optional – audio may alternately be queued from **IDeckLinkVideoOutputCallback::ScheduledFrameCompleted**.

#### Syntax

```
HRESULT SetAudioCallback (IDeckLinkAudioOutputCallback *theCallback);
```

#### Parameters

Name	Direction	Description
theCallBack	in	Callback object implementing the <b>IDeckLinkAudioOutputCallback</b> object interface

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.3.24 IDeckLinkOutput::StartScheduledPlayback method

The **StartScheduledPlayback** method starts scheduled playback. Frames may be pre-rolled by scheduling them before starting playback. **SetScheduledFrameCompletionCallback** may be used to register a callback to be called when each frame is completed.

Scheduled playback starts immediately when **StartScheduledPlayback** is called, setting the current scheduler time to the **playbackStartTime** parameter. Scheduled frames are output as the current scheduler time reaches the scheduled frame's display time.

#### Syntax

```
HRESULT StartScheduledPlayback (BMDTimeValue playbackStartTime,  
BMDTimeScale timeScale, double playbackSpeed);
```

#### Parameters

Name	Direction	Description
playbackStartTime	in	Time at which the playback starts in units of timeScale
timeScale	in	Time scale for playbackStartTime and playbackSpeed.
playbackSpeed	in	Speed at which to play back : 1.0 is normal playback, -1.0 is reverse playback. Fast or slow forward or reverse playback may also be specified.

### Return Values

Value	Description
E_INVALIDARG	Either parameters playbackStartTime or timeScale are invalid
E_ACCESSDENIED	The video output is not enabled
E_FAIL	Failure
S_OK	Success

### 2.5.3.25 IDeckLinkOutput::StopScheduledPlayback method

The **StopScheduledPlayback** method stops scheduled playback immediately or at a specified time. Any frames or audio scheduled after the stop time will be flushed.

#### Syntax

```
HRESULT StopScheduledPlayback (BMDTimeValue stopPlaybackAtTime,  
BMDTimeValue *actualStopTime, BMDTimeScale timeScale);
```

#### Parameters

Name	Direction	Description
stopPlaybackAtTime	in	Playback time at which to stop in units of timeScale. Specify 0 to stop immediately.
actualStopTime	out	Playback time at which playback actually stopped in units of timeScale. Specify NULL to stop immediately
timeScale	in	Time scale for stopPlaybackAtTime and actualStopTime. Specify 0 to stop immediately.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.3.26 IDeckLinkOutput::GetScheduledStreamTime method

The **GetScheduledStreamTime** method returns the elapsed time since scheduled playback began.

#### Syntax

```
HRESULT GetScheduledStreamTime (BMDTimeScale desiredTimeScale,  
BMDTimeValue *streamTime, double *playbackSpeed);
```

#### Parameters

Name	Direction	Description
desiredTimeScale	in	Time scale for elapsedTimeSinceSchedulerBegan
streamTime	out	Frame time
playbackSpeed	out	Scheduled playback speed

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_ACCESSDENIED	Video output is not enabled

### 2.5.3.27 IDeckLinkOutput::GetReferenceStatus method

The `GetReferenceStatus` method provides the genlock reference status of the DeckLink device.

#### Syntax

```
HRESULT GetReferenceStatus (BMDReferenceStatus *referenceStatus)
```

#### Parameters

Name	Direction	Description
referenceStatus	out	A bit-mask of the reference status. (See <code>BMDReferenceStatus</code> for more details).

### Return Values

Value	Description
E_FAIL	Failure
E_POINTER	The parameter is invalid.
S_OK	Success

### 2.5.3.28 IDeckLinkOutput::GetHardwareReferenceClock method

The `GetHardwareReferenceClock` method returns a clock that is locked to the rate at which the DeckLink hardware is outputting frames. The absolute values returned by this method are meaningless, however the relative differences between subsequent calls can be used to determine elapsed time. This method can be called while video output is enabled (see `IDeckLinkOutput::EnableVideoOutput` for details).

#### Syntax

```
HRESULT GetHardwareReferenceClock (BMDTimeScale desiredTimeScale,  
BMDTimeValue *hardwareTime, BMDTimeValue *timeInFrame,  
BMDTimeValue *ticksPerFrame);
```

#### Parameters

Name	Direction	Description
desiredTimeScale	in	Desired time scale
hardwareTime	out	Hardware reference time (in units of desiredTimeScale)
timeInFrame	out	Time in frame (in units of desiredTimeScale)
ticksPerFrame	out	Number of ticks for a frame (in units of desiredTimeScale)

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.3.29 IDeckLinkOutput::GetFrameCompletionReferenceTimestamp method

The **GetFrameCompletionReferenceTimestamp** method is called to determine the time that the frame has been output. The method outputs a timestamp that is locked to the system clock.

The timestamp is valid if this method is called within the **ScheduledFrameCompleted** callback and if the frame referenced by the Frame pointer has not been re-scheduled.

#### Syntax

```
HRESULT GetFrameCompletionReferenceTimestamp (IDeckLinkVideoFrame *theFrame,
                                             BMDTimeScale desiredTimeScale, BMDTimeValue *frameCompletionTimestamp)
```

#### Parameters

Name	Direction	Description
theFrame	in	The video frame
desiredTimeScale	in	Desired timescale
frameCompletionTimestamp	out	Timestamp that the frame completed (in units of desiredTimeScale).

#### Return Values

Value	Description
E_UNEXPECTED	A timestamp for the specified frame is not available.
S_OK	Success

## 2.5.4 IDeckLinkInput Interface

The **IDeckLinkInput** object interface allows an application to capture a video and audio stream from a DeckLink device.

An **IDeckLinkInput** interface can be obtained from an **IDeckLink** object interface using **QueryInterface**. If **QueryInterface** for an input interface is called on an output only device, then **QueryInterface** will fail and return **E\_NOINTERFACE**.

Video capture operates in a push model with each video frame being delivered to an **IDeckLinkInputCallback** object interface. Audio capture is optional and can be handled by using the same callback.

**NOTE** Non-4K DeckLink devices and sub-devices are half-duplex. Therefore either capture or render can be enabled, but not simultaneously.

#### Related Interfaces

Interface	Interface ID	Description
IDeckLink	IID_IDeckLink	An <b>IDeckLinkInput</b> object interface may be obtained from <b>IDeckLink</b> using <b>QueryInterface</b>
IDeckLinkDisplayModelIterator	IID_IDeckLinkDisplayModelIterator	<b>IDeckLinkInput::GetDisplayModelIterator</b> returns an <b>IDeckLinkDisplayModelIterator</b> object interface
IDeckLinkInputCallback	IID_IDeckLinkInputCallback	An <b>IDeckLinkInputCallback</b> object interface may be registered with <b>IDeckLinkInput::SetCallback</b>
IDeckLinkDisplayMode	IID_IDeckLinkDisplayMode	<b>IDeckLinkInput::GetDisplayMode</b> returns an <b>IDeckLinkDisplayMode</b> interface object

Public Member Functions	
Method	Description
DoesSupportVideoMode	Check whether a given video mode is supported for input
GetDisplayMode	Get a display mode object based on identifier
GetDisplayModelerator	Get an iterator to enumerate the available input display modes
SetScreenPreviewCallback	Register screen preview callback
EnableVideoInput	Configure video input
GetAvailableVideoFrameCount	Query number of available video frames
DisableVideoInput	Disable video input
EnableAudioInput	Configure audio input
DisableAudioInput	Disable audio input
GetAvailableAudioSampleFrameCount	Query the buffered audio sample frame count
StartStreams	Start synchronized capture
StopStreams	Stop synchronized capture
PauseStreams	Pause synchronized capture
FlushStreams	Removes any buffered video and audio frames.
SetCallback	Register input callback
GetHardwareReferenceClock	Get the hardware system clock
SetVideoInputFrameMemoryAllocator	Register custom memory allocator for input video frames

## 2.5.4.1 IDeckLinkInput::DoesSupportVideoMode method

The **DoesSupportVideoMode** method indicates whether a given display mode is supported on input.

### Syntax

```
HRESULT DoesSupportVideoMode (BMDVideoConnection connection, BMDDisplayMode requestedMode, BMDPixelFormat requestedPixelFormat, BMDVideoInputConversionMode conversion, BMDSupportedVideoModeFlags flags, bool *supported);
```

### Parameters

Name	Direction	Description
connection	in	Input connection to check (see <b>BMDVideoConnection</b> for details).
requestedMode	in	Display mode to check
requestedPixelFormat	in	Pixel format to check
conversionMode	in	Input conversion mode to check (see <b>BMDVideoInputConversionMode</b> for details)
flags	in	Input video mode flags (see <b>BMDSupportedVideoModeFlags</b> for details).
actualMode	out	If this parameter is not NULL and the display mode is supported or supported with conversion, the actual display mode is returned.
supported	out	Returns true if the display mode is supported.

### Return Values

Value	Description
E_INVALIDARG	Either parameter requestedMode has an invalid value or parameter supported variable is NULL.
E_FAIL	Failure
S_OK	Success



## 2.5.4.2 IDeckLinkInput::GetDisplayMode method

The `GetDisplayMode` method returns the `IDeckLinkDisplayMode` object interface for an input display mode identifier.

### Syntax

```
HRESULT GetDisplayMode (BMDDisplayMode displayMode,  
IDeckLinkDisplayMode *resultDisplayMode);
```

### Parameters

Name	Direction	Description
displayMode	in	The display mode ID (See <code>BMDDisplayMode</code> )
resultDisplayMode	out	Pointer to the display mode with matching ID. The object must be released by the caller when no longer required.

### Return Values

Value	Description
E_INVALIDARG	Either parameter <code>displayMode</code> has an invalid value or parameter <code>resultDisplayMode</code> variable is NULL.
E_OUTOFMEMORY	Insufficient memory to create the result display mode object.
S_OK	Success

## 2.5.4.3 IDeckLinkInput::GetDisplayModeIterator method

The `GetDisplayModeIterator` method returns an iterator which enumerates the available display modes.

### Syntax

```
HRESULT GetDisplayModeIterator(IDeckLinkDisplayModeIterator** iterator)
```

### Parameters

Name	Direction	Description
iterator	out	Display mode iterator

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.4.4 IDeckLinkInput::SetScreenPreviewCallback method

The **SetScreenPreviewCallback** method is called to register an instance of an **IDeckLinkScreenPreviewCallback** object. The registered object facilitates the updating of an on-screen preview of a video stream being captured.

### Syntax

```
HRESULT SetScreenPreviewCallback (IDeckLinkScreenPreviewCallback *previewCallback)
```

### Parameters

Name	Direction	Description
previewCallback	in	The IDeckLinkScreenPreview object to be registered.

### Return Values

Value	Description
S_OK	Success

## 2.5.4.5 IDeckLinkInput::EnableVideoInput method

The **EnableVideoInput** method configures video input and puts the hardware into video capture mode. Video input (and optionally audio input) is started by calling **StartStreams**.

### Syntax

```
HRESULT EnableVideoInput (BMDDisplayMode displayMode,  
BMDPixelFormat pixelFormat, BMDVideoInputFlags flags);
```

### Parameters

Name	Direction	Description
displayMode	in	Video mode to capture
pixelFormat	in	Pixel format to capture
flags	in	Capture flags

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	Is returned on invalid mode or video flags
E_ACCESSDENIED	Unable to access the hardware or input stream currently active
E_OUTOFMEMORY	Unable to create a new frame

### 2.5.4.6 IDeckLinkInput::GetAvailableVideoFrameCount method

The `GetAvailableVideoFrameCount` method provides the number of available input frames.

#### Syntax

```
HRESULT GetAvailableVideoFrameCount (uint32_t *availableFrameCount);
```

#### Parameters

Name	Direction	Description
availableFrameCount	out	Number of available input frames.

#### Return Values

Value	Description
S_OK	Success

### 2.5.4.7 IDeckLinkInput::DisableVideoInput method

The `DisableVideoInput` method disables the hardware video capture mode.

#### Syntax

```
HRESULT DisableVideoInput ();
```

#### Parameters

none.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.4.8 IDeckLinkInput::EnableAudioInput method

The `EnableAudioInput` method configures audio input and puts the hardware into audio capture mode. Synchronized audio and video input is started by calling `StartStreams`.

#### Syntax

```
HRESULT EnableAudioInput (BMDAudioSampleRate sampleRate,  
                          BMDAudioSampleType sampleType, uint32_t channelCount);
```

#### Parameters

Name	Direction	Description
sampleRate	in	Sample rate to capture
sampleType	in	Sample type to capture
channelCount	in	Number of audio channels to capture – only 2, 8, 16, 32 or 64 channel capture is supported.

#### Return Values

Value	Description
E_FAIL	Failure
E_INVALIDARG	Invalid number of channels requested
S_OK	Success

### 2.5.4.9 IDeckLinkInput::DisableAudioInput method

The `DisableAudioInput` method disables the hardware audio capture mode.

#### Syntax

```
HRESULT DisableAudioInput ();
```

#### Parameters

none.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.4.10 IDeckLinkInput::GetAvailableAudioSampleFrameCount method

The `GetAvailableAudioSampleFrameCount` method returns the number of audio sample frames currently buffered.

Use of this method is only required when using pull model audio – the same audio data is made available to `IDeckLinkInputCallback` and may be ignored.

#### Syntax

```
HRESULT GetAvailableAudioSampleFrameCount  
(uint32_t *availableSampleFrameCount);
```

#### Parameters

Name	Direction	Description
availableSampleFrameCount	out	The number of buffered audio frames currently available.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.4.11 **IDeckLinkInput::SetVideoInputFrameMemoryAllocator** method

The **SetVideoInputFrameMemoryAllocator** method sets a custom memory allocator for video frame allocations during capture. Use of a custom memory allocator is optional.

#### Syntax

```
HRESULT SetVideoInputFrameMemoryAllocator  
(IDeckLinkMemoryAllocator *theAllocator);
```

#### Parameters

Name	Direction	Description
theAllocator	in	Allocator object with an <b>IDeckLinkMemoryAllocator</b> interface

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.4.12 **IDeckLinkInput::StartStreams** method

The **StartStreams** method starts synchronized video and audio capture as configured with **EnableVideoInput** and optionally **EnableAudioInput**.

#### Syntax

```
HRESULT StartStreams ();
```

#### Parameters

none.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_ACCESSDENIED	Input stream is already running.
E_UNEXPECTED	Video and Audio inputs are not enabled.

### 2.5.4.13 IDeckLinkInput::StopStreams method

The **StopStreams** method stops synchronized video and audio capture.

#### Syntax

```
HRESULT StopStreams ();
```

#### Parameters

none.

#### Return Values

Value	Description
S_OK	Success
E_ACCESSDENIED	Input stream already stopped.

### 2.5.4.14 IDeckLinkInput::FlushStreams method

The **FlushStreams** method removes any buffered video and audio frames.

#### Syntax

```
HRESULT FlushStreams ();
```

#### Parameters

none.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.4.15 IDeckLinkInput::PauseStreams method

The **PauseStreams** method pauses synchronized video and audio capture. Capture time continues while the streams are paused but no video or audio will be captured. Paused capture may be resumed by calling **PauseStreams** again. Capture may also be resumed by calling **StartStreams** but capture time will be reset.

#### Syntax

```
HRESULT PauseStreams ();
```

#### Parameters

none.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.4.16 **IDeckLinkInput::SetCallback** method

The **SetCallback** method configures a callback which will be called for each captured frame. Synchronized capture is started with **StartStreams**, stopped with **StopStreams** and may be paused with **PauseStreams**.

### Syntax

```
HRESULT SetCallback (IDeckLinkInputCallback *theCallback);
```

### Parameters

Name	Direction	Description
theCallBack	in	callback object implementing the <b>IDeckLinkInputCallback</b> object interface

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.4.17 **IDeckLinkInput::GetHardwareReferenceClock** method

The **GetHardwareReferenceClock** method returns a clock that is locked to the system clock. The absolute values returned by this method are meaningless, however the relative differences between subsequent calls can be used to determine elapsed time. This method can be called while video input is enabled (see **IDeckLinkInput::EnableVideoInput** for details).

### Syntax

```
HRESULT GetHardwareReferenceClock (BMDTimeScale desiredTimeScale, BMDTimeValue *hardwareTime, BMDTimeValue *timeInFrame, BMDTimeValue *ticksPerFrame);
```

### Parameters

Name	Direction	Description
desiredTimeScale	in	Desired time scale
hardwareTime	out	Hardware reference time (in units of desiredTimeScale)
timeInFrame	out	Time in frame (in units of desiredTimeScale)
ticksPerFrame	out	Number of ticks for a frame (in units of desiredTimeScale)

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.5 IDeckLinkVideoFrame Interface

The `IDeckLinkVideoFrame` object interface represents a video frame.

The `GetWidth`, `GetHeight` methods may be used to determine the pixel dimensions of the frame buffer. Pixels on a given row are packed according to the pixel format returned by `GetPixelFormat` see `BMDPixelFormat` for details. Note that in some formats (HD720 formats, for example), there is padding between rows always use `GetRowBytes` to account for the row length, including padding.

**TIP** Developers may sub-class `IDeckLinkVideoFrame` to provide an implementation which fits well with their application's structure.

### Related Interfaces

Interface	Interface ID	Description
<code>IDeckLinkVideoFrame3DExtensions</code>	<code>IID_IDeckLinkVideoFrame3DExtensions</code>	An <code>IDeckLinkVideoFrame3DExtensions</code> object interface may be obtained from <code>IDeckLinkVideoFrame</code> using <code>QueryInterface</code>
<code>IDeckLinkGLScreenPreviewHelper</code>	<code>IID_IDeckLinkGLScreenPreviewHelper</code>	An <code>IDeckLinkVideoFrame</code> object interface is set for OpenGL preview with <code>IDeckLinkGLScreenPreviewHelper::SetFrame</code>
<code>IDeckLinkDX9ScreenPreviewHelper</code>	<code>IID_IDeckLinkDX9ScreenPreviewHelper</code>	An <code>IDeckLinkVideoFrame</code> object interface is set for DirectX preview with <code>IDeckLinkDX9ScreenPreviewHelper::SetFrame</code>
<code>IDeckLinkVideoOutputCallback</code>	<code>IID_IDeckLinkVideoOutputCallback</code>	An <code>IDeckLinkVideoFrame</code> object interface is passed to <code>IDeckLinkVideoOutputCallback::ScheduledFrameCompleted</code>
<code>IDeckLinkOutput</code>	<code>IID_IDeckLinkOutput</code>	An <code>IDeckLinkVideoFrame</code> object interface is displayed synchronously with <code>IDeckLinkOutput::DisplayVideoFrameSync</code>
<code>IDeckLinkOutput</code>	<code>IID_IDeckLinkOutput</code>	An <code>IDeckLinkVideoFrame</code> object interface is scheduled for playback with <code>IDeckLinkOutput::ScheduleVideoFrame</code>
<code>IDeckLinkVideoFrameAncillaryPackets</code>	<code>IID_IDeckLinkVideoFrameAncillaryPackets</code>	An <code>IDeckLinkVideoFrameAncillaryPackets</code> object interface may be obtained from <code>IDeckLinkVideoFrame</code> using <code>QueryInterface</code>
<code>IDeckLinkMutableVideoFrame</code>	<code>IID_IDeckLinkMutableVideoFrame</code>	<code>IDeckLinkMutableVideoFrame</code> subclasses <code>IDeckLinkVideoFrame</code>
<code>IDeckLinkMetalScreenPreviewHelper</code>	<code>IID_IDeckLinkMetalScreenPreviewHelper</code>	An <code>IDeckLinkVideoFrame</code> object interface is set for Metal preview with <code>IDeckLinkMetalScreenPreviewHelper::SetFrame</code>
<code>IDeckLinkVideoFrameMetadataExtensions</code>	<code>IID_IDeckLinkVideoFrameMetadataExtensions</code>	An <code>IDeckLinkVideoFrameMetadataExtensions</code> object interface may be obtained from <code>IDeckLinkVideoFrame</code> using <code>QueryInterface</code>
<code>IDeckLinkVideoFrameAncillary</code>	<code>IID_IDeckLinkVideoFrameAncillary</code>	<code>IDeckLinkVideoFrame::GetAncillaryData</code> outputs an <code>IDeckLinkVideoFrameAncillary</code> object interface
<code>IDeckLinkVideoInputFrame</code>	<code>IID_IDeckLinkVideoInputFrame</code>	<code>IDeckLinkVideoInputFrame</code> subclasses <code>IDeckLinkVideoFrame</code>
<code>IDeckLinkWPFDX9ScreenPreviewHelper</code>	<code>IID_IDeckLinkWPFDX9ScreenPreviewHelper</code>	An <code>IDeckLinkVideoFrame</code> object interface is set for DirectX preview with <code>IDeckLinkWPFDX9ScreenPreviewHelper::SetFrame</code>
<code>IDeckLinkTimecode</code>	<code>IID_IDeckLinkTimecode</code>	<code>IDeckLinkVideoFrame::GetTimecode</code> outputs an <code>IDeckLinkTimecode</code> object interface



IDeckLinkScreenPreviewCallback	IID_ IDeckLinkScreenPreviewCallback	An <b>IDeckLinkVideoFrame</b> object interface is provided for rendering by <b>IDeckLinkScreenPreviewCallback::DrawFrame</b>
IDeckLinkVideoConversion	IID_IDeckLinkVideoConversion	An <b>IDeckLinkVideoFrame</b> object interface is the source video frame for <b>IDeckLinkVideoConversion::ConvertFrame</b>
IDeckLinkVideoConversion	IID_IDeckLinkVideoConversion	An <b>IDeckLinkVideoFrame</b> object interface is the destination video frame for <b>IDeckLinkVideoConversion::ConvertFrame</b>

Public Member Functions	
Method	Description
GetWidth	Get video frame width in pixels
GetHeight	Get video frame height in pixels
GetRowBytes	Get bytes per row for video frame
GetPixelFormat	Get pixel format for video frame
GetFlags	Get frame flags
GetBytes	Get pointer to frame data
GetTimecode	Gets timecode information
GetAncillaryData	Gets ancillary data

### 2.5.5.1 IDeckLinkVideoFrame::GetWidth method

The **GetWidth** method returns the width of a video frame.

#### Syntax

```
long GetWidth ();
```

#### Return Values

Value	Description
Width	Video frame width in pixels

### 2.5.5.2 IDeckLinkVideoFrame::GetHeight method

The **GetHeight** method returns the height of a video frame.

#### Syntax

```
long GetHeight ();
```

#### Return Values

Value	Description
Height	Video frame height in pixels

### 2.5.5.3 IDeckLinkVideoFrame::GetRowBytes method

The `GetRowBytes` method returns the number of bytes per row of a video frame.

#### Syntax

```
long GetRowBytes ();
```

#### Return Values

Value	Description
BytesCount	Number of bytes per row of video frame

### 2.5.5.4 IDeckLinkVideoFrame::GetPixelFormat method

The `GetPixelFormat` method returns the pixel format of a video frame.

#### Syntax

```
BMDPixelFormat GetPixelFormat ();
```

#### Return Values

Value	Description
PixelFormat	Pixel format of video frame ( <b>BMDPixelFormat</b> )

### 2.5.5.5 IDeckLinkVideoFrame::GetFlags method

The `GetFlags` method returns status flags associated with a video frame.

#### Syntax

```
BMDFrameFlags GetFlags ();
```

#### Return Values

Value	Description
FrameFlags	Video frame flags ( <b>BMDFrameFlags</b> )

### 2.5.5.6 IDeckLinkVideoFrame::GetBytes method

The `GetBytes` method allows direct access to the data buffer of a video frame.

#### Syntax

```
HRESULT GetBytes (void **buffer);
```

#### Parameters

Name	Direction	Description
buffer	out	Pointer to raw frame buffer – only valid while object remains valid.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.5.7 **IDeckLinkVideoFrame::GetTimecode** method

The **GetTimecode** method returns the value specified in the ancillary data for the specified timecode type. If the specified timecode type is not found or is invalid, **GetTimecode** returns **S\_FALSE**.

#### Syntax

```
HRESULT GetTimecode (BMDTimecodeFormat format, IDeckLinkTimecode *timecode)
```

#### Parameters

Name	Direction	Description
format	in	<b>BMDTimecodeFormat</b> to query
timecode	out	Pointer to <b>IDeckLinkTimecode</b> interface object containing the requested timecode or NULL if requested timecode is not available. This object must be released by the caller when no longer required.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_ACCESSDENIED	An invalid or unsupported timecode format was requested.
S_FALSE	The requested timecode format was not present or valid in the ancillary data.

### 2.5.5.8 **IDeckLinkVideoFrame::GetAncillaryData** method

The **GetAncillaryData** method returns a pointer to a video frame's ancillary data.

#### Syntax

```
HRESULT GetAncillaryData (IDeckLinkVideoFrameAncillary *ancillary)
```

#### Parameters

Name	Direction	Description
ancillary	out	Pointer to a new <b>IDeckLinkVideoFrameAncillary</b> object. This object must be released by the caller when no longer required.

#### Return Values

Value	Description
S_OK	Success
S_FALSE	No ancillary data present.

### 2.5.6 **IDeckLinkVideoOutputCallback** Interface

The **IDeckLinkVideoOutputCallback** object interface is a callback class which is called for each frame as its processing is completed by the DeckLink device.

An object with an **IDeckLinkVideoOutputCallback** object interface may be registered as a callback with the **IDeckLinkOutput** object interface.

**IDeckLinkVideoOutputCallback** should be used to monitor frame output statuses and queue a replacement frame to maintain streaming playback. If the application is managing its own frame buffers, they should be disposed or reused inside the **ScheduledFrameCompleted** callback.

## Related Interfaces

Interface	Interface ID	Description
IDeckLinkOutput	IID_IDeckLinkOutput	An IDeckLinkVideoOutputCallback object interface may be registered with IDeckLinkOutput::SetScheduledFrame CompletionCallback

Public Member Functions	
Method	Description
ScheduledFrameCompleted	Called when playback of a scheduled frame is completed
ScheduledPlaybackHasStopped	Called when playback has stopped.

### 2.5.6.1 IDeckLinkVideoOutputCallback::ScheduledFrameCompleted method

The **ScheduledFrameCompleted** method is called when a scheduled video frame playback is completed. This method is abstract in the base interface and must be implemented by the application developer. The result parameter (required by COM) is ignored by the caller.

The **IDeckLinkVideoOutputCallback** methods are called on a dedicated callback thread. To prevent video frames from being either dropped or delayed, ensure that any application processing on the callback thread takes less time than a frame time. If the application processing time is greater than a frame time, multiple threads should be used.

#### Syntax

```
HRESULT ScheduledFrameCompleted (IDeckLinkVideoFrame* completedFrame,  
                                BMDOutputFrameCompletionResult result);
```

#### Parameters

Name	Direction	Description
completedFrame	in	Completed frame
result	in	Frame completion result (see <b>BMDOutputFrameCompletionResult</b> for details).

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.6.2 IDeckLinkVideoOutputCallback::ScheduledPlaybackHasStopped method

The **ScheduledPlaybackHasStopped** method is called when a scheduled playback has stopped.

#### Syntax

```
HRESULT ScheduledPlaybackHasStopped(void)
```

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.7 IDeckLinkMutableVideoFrame Interface

The **IDeckLinkMutableVideoFrame** object interface represents a video frame created for output. Methods are provided to attach ancillary data and set timecodes within the frame.

**IDeckLinkMutableVideoFrame** is a subclass of **IDeckLinkVideoFrame** and inherits all its methods. It is created by the **IDeckLinkOutput::CreateVideoFrame** method.

### Related Interfaces

Interface	Interface ID	Description
IDeckLinkVideoFrame	IID_IDeckLinkVideoFrame	IDeckLinkMutableVideoFrame subclasses IDeckLinkVideoFrame

Public Member Functions	
Method	Description
SetFlags	Set flags applicable to a video frame
SetTimecode	Set timecode
SetTimecodeFromComponents	Set components of specified timecode type
SetAncillaryData	Set frame ancillary data
SetTimecodeUserBits	Set the timecode user bits

### 2.5.7.1 IDeckLinkMutableVideoFrame::SetFlags method

The **SetFlags** method sets output flags associated with a video frame.

#### Syntax

```
HRESULT SetFlags (BMDFrameFlags newFlags);
```

#### Parameters

Name	Direction	Description
newFlags	in	BMDFrameFlags to set see BMDFrameFlags for details.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.7.2 IDeckLinkMutableVideoFrame::SetTimecode method

The `SetTimecode` method sets the specified timecode type for the frame.

### Syntax

```
HRESULT SetTimecode (BMDTimecodeFormat format, IDeckLinkTimecode* timecode);
```

### Parameters

Name	Direction	Description
format	in	BMDTimecodeFormat to update
timecode	in	IDeckLinkTimecode object interface containing timecode to copy.

### Return Values

Value	Description
E_UNEXPECTED	Unexpected timecode. Ensure that VITC1 has been set.
S_OK	Success

## 2.5.7.3 IDeckLinkMutableVideoFrame::SetTimecodeFromComponents method

The `SetTimecodeFromComponents` method sets the components of the specified timecode type for the frame.

### Syntax

```
HRESULT SetTimecodeFromComponents (BMDTimecodeFormat format, uint8_t hours, uint8_t minutes, uint8_t seconds, uint8_t frames, BMDTimecodeFlags flags);
```

### Parameters

Name	Direction	Description
format	in	BMDTimecodeFormat to update
hours	in	Value of hours component of timecode
minutes	in	Value of minutes component of timecode
seconds	in	Value of seconds component of timecode
frames	in	Value of frames component of timecode
flags	in	Timecode flags (see <b>BMDTimecodeFlags</b> for details)

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.7.4 IDeckLinkMutableVideoFrame::SetAncillaryData method

The `SetAncillaryData` method sets frame ancillary data. An `IDeckLinkVideoFrameAncillary` may be created using the `IDeckLinkOutput::CreateAncillaryData` method.

### Syntax

```
HRESULT SetAncillaryData (IDeckLinkVideoFrameAncillary* ancillary);
```

### Parameters

Name	Direction	Description
ancillary	in	IDeckLinkVideoFrameAncillary data to output with the frame.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.7.5 IDeckLinkMutableVideoFrame::SetTimecodeUserBits method

The `SetTimecodeUserBits` method sets the timecode user bits.

### Syntax

```
HRESULT SetTimecodeUserBits (BMDTimecodeFormat format,  
BMDTimecodeUserBits userBits)
```

### Parameters

Name	Direction	Description
format	in	The format of the timecode.
userBits	in	The user bits to set.

### Return Values

Value	Description
E_NOTIMPL	Not implemented
E_INVALIDARG	The format parameter is invalid.
E_UNEXPECTED	Timecode object is not present. (See: <code>IDeckLinkMutableVideoFrame::SetTimecode</code> )

## 2.5.8 IDeckLinkVideoFrame3DExtensions Interface

The `IDeckLinkVideoFrame3DExtensions` interface allows linking of video frames in left eye / right eye pairs, to support 3D capture and playback.

**NOTE** This interface is applicable only to DeckLink devices which support 3D features, such the DeckLink 4K Extreme.

All frames belonging to a 3D stream carry an `IDeckLinkVideoFrame3DExtensions` object, which indicates whether this frame is a left or right-eye frame and allows access to the right eye frame if this frame is a left eye frame.

To output in 3D video mode, `IDeckLinkOutput::EnableVideoOutput` is called with video output flag `bmdVideoOutputDualStream3D`. The application must provide video frame objects which implement both the `IDeckLinkVideoFrame` and `IDeckLinkVideoFrame3DExtensions` interfaces.

To capture a 3D signal, `IDeckLinkInput::EnableVideoInput` is called with video input flag `bmdVideoInputDualStream3D`. An `IDeckLinkVideoFrame3DExtensions` object can be obtained from `IDeckLinkVideoInputFrame` using `QueryInterface`.

### Related Interfaces

Interface	Interface ID	Description
<code>IDeckLinkVideoFrame</code>	<code>IID_IDeckLinkVideoFrame</code>	An <code>IDeckLinkVideoFrame3DExtensions</code> object interface may be obtained from <code>IDeckLinkVideoFrame</code> using <code>QueryInterface</code>

### Public Member Functions

Method	Description
<code>Get3DPackingFormat</code>	The indication of whether the frame represents the left or the right eye.
<code>GetFrameForRightEye</code>	Get the right eye frame of a 3D pair.

### 2.5.8.1 IDeckLinkVideoFrame3DExtensions::Get3DPackingFormat method

The `Get3DPackingFormat` method indicates whether the video frame belongs to the left eye or right eye stream.

#### Syntax

```
BMDVideo3DPackingFormat Get3DPackingFormat (void)
```

#### Return Values

Value	Description
Packing format	Either <code>bmdVideo3DPackingRightOnly</code> or <code>bmdVideo3DPackingLeftOnly</code> . See <code>BMDVideo3DPackingFormat</code> for more details.



## 2.5.8.2 IDeckLinkVideoFrame3DExtensions::GetFrameForRightEye method

The `GetFrameForRightEye` method accesses the right eye frame of a 3D pair.

### Syntax

```
HRESULT GetFrameForRightEye (IDeckLinkVideoFrame* *rightEyeFrame)
```

### Parameters

Name	Direction	Description
rightEyeFrame	out	The right eye frame. This object must be released by the caller when no longer required.

### Return Values

Value	Description
E_INVALIDARG	The parameter is invalid.
S_FALSE	This frame is the right eye frame.
S_OK	Success

## 2.5.9 IDeckLinkAudioOutputCallback Interface

The `IDeckLinkAudioOutputCallback` object interface is a callback class called regularly during playback to allow the application to check for the amount of audio currently buffered and buffer more audio if required.

An `IDeckLinkAudioOutputCallback` object interface may be registered with `IDeckLinkOutput::SetAudioCallback`.

### Related Interfaces

Interface	Interface ID	Description
IDeckLinkOutput	IID_IDeckLinkOutput	An <code>IDeckLinkAudioOutputCallback</code> object interface may be registered with <code>IDeckLinkOutput::SetAudioCallback</code>

### Public Member Functions

Method	Description
RenderAudioSamples	Called to allow buffering of more audio samples if required

## 2.5.9.1 IDeckLinkAudioOutputCallback::RenderAudioSamples method

The **RenderAudioSamples** method is called at a rate of 50Hz during playback. When audio preroll is enabled with a call to **IDeckLinkOutput::BeginAudioPreroll**.

During preroll (preroll is TRUE) call **IDeckLinkOutput::ScheduleAudioSamples** to schedule sufficient audio samples for the number of video frames that have scheduled.

During playback (preroll is FALSE) check the count of buffered audio samples with **IDeckLinkOutput::GetBufferedAudioSampleFrameCount** and when required, schedule more audio samples with **IDeckLinkOutput::ScheduleAudioSamples**.

### Syntax

```
HRESULT RenderAudioSamples (boolean preroll);
```

### Parameters

Name	Direction	Description
preroll	in	Flag specifying whether driver is currently pre-rolling (TRUE) or playing (FALSE).

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.10 IDeckLinkInputCallback Interface

The **IDeckLinkInputCallback** object interface is a callback class which is called for each captured frame.

An object with an **IDeckLinkInputCallback** interface may be registered as a callback with the **IDeckLinkInput** object interface.

### Related Interfaces

Interface	Interface ID	Description
IDeckLinkInput	IID_IDeckLinkInput	An <b>IDeckLinkInputCallback</b> object interface may be registered with <b>IDeckLinkInput::SetCallback</b>
IDeckLinkVideoInputFrame	IID_DeckLinkVideoInputFrame	An <b>IDeckLinkVideoInputFrame</b> object interface is passed to <b>IDeckLinkInputCallback::VideoInputFrameArrived</b>
IDeckLinkAudioInputPacket	IID_DeckLinkAudioInputPacket	An <b>IDeckLinkAudioInputPacket</b> object interface is passed to <b>IDeckLinkInputCallback::VideoInputFrameArrived</b>

Public Member Functions	
Method	Description
VideoInputFrameArrived	Called when new video data is available
VideoInputFormatChanged	Called when a video input format change is detected

## 2.5.10.1 IDeckLinkInputCallback::VideoInputFrameArrived method

The **VideoInputFrameArrived** method is called when a video input frame or an audio input packet has arrived. This method is abstract in the base interface and must be implemented by the application developer. The result parameter (required by COM) is ignored by the caller.

### Syntax

```
HRESULT VideoInputFrameArrived (IDeckLinkVideoInputFrame *videoFrame,  
IDeckLinkAudioInputPacket *audioPacket);
```

### Parameters

Name	Direction	Description
videoFrame	in	<p>The video frame that has arrived. The video frame is only valid for the duration of the callback.</p> <p>To hold on to the video frame beyond the callback call <b>AddRef</b>, and to release the video frame when it is no longer required call <b>Release</b>.</p> <p>The video frame will be NULL under the following circumstances:</p> <p>On Intensity Pro with progressive NTSC only, every video frame will have two audio packets.</p> <p>With 3:2 pulldown there are five audio packets for each four video frames.</p> <p>If video processing is not fast enough, audio will still be delivered.</p>
audioPacket	in	<p>New audio packet-only valid if audio capture has been enabled with <b>IDeckLinkInput::EnableAudioInput</b></p> <p>The audio packet will be NULL under the following circumstances:</p> <p>Audio input is not enabled.</p> <p>If video processing is sufficiently delayed old video may be received with no audio.</p>

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.10.2 IDeckLinkInputCallback::VideoInputFormatChanged method

The `VideoInputFormatChanged` method is called when a video input format change has been detected by the hardware.

To enable this feature, the `bmdVideoInputEnableFormatDetection` flag must be set when calling `IDeckLinkInput::EnableVideoInput()`.

**NOTE** The video format change detection feature is not currently supported on all hardware. Check the `BMDDeckLinkSupportsInputFormatDetection` attribute to determine if this feature is supported for a given device and driver (see `IDeckLinkProfileAttributes` Interface for details).

### Syntax

```
HRESULT VideoInputFormatChanged (BMDVideoInputFormatChangedEvents notificationEvents,  
IDeckLinkDisplayMode *newDisplayMode, BMDDetectedVideoInputFormatFlags  
detectedSignalFlags);
```

### Parameters

Name	Direction	Description
notificationEvents	in	The notification events enable input detection
newDisplayMode	in	The new display mode.
detectedSignalFlags	in	The detected signal flags

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.11 IDeckLinkVideoInputFrame Interface

The `IDeckLinkVideoInputFrame` object interface represents a video frame which has been captured by an `IDeckLinkInput` object interface. `IDeckLinkVideoInputFrame` is a subclass of `IDeckLinkVideoFrame` and inherits all its methods.

Objects with an `IDeckLinkVideoInputFrame` interface are passed to the `IDeckLinkInputCallback::VideoInputFrameArrived` callback.

### Related Interfaces

Interface	Interface ID	Description
<code>IDeckLinkInput</code>	<code>IID_IDeckLinkInput</code>	New input frames are returned to <code>IDeckLinkInputCallback::VideoInputFrameArrived</code> by the <code>IDeckLinkInput</code> interface
<code>IDeckLinkVideoFrame</code>	<code>IID_IDeckLinkVideoFrame</code>	<code>IDeckLinkVideoInputFrame</code> subclasses <code>IDeckLinkVideoFrame</code>

Public Member Functions	
Method	Description
<code>GetStreamTime</code>	Get video frame timing information
<code>GetHardwareReferenceTimestamp</code>	Get hardware reference timestamp

### 2.5.11.1 IDeckLinkVideoInputFrame::GetStreamTime method

The **GetStreamTime** method returns the time and duration of a captured video frame for a given timescale.

#### Syntax

```
HRESULT GetStreamTime (BMDTimeValue *frameTime,  
                      BMDTimeValue *frameDuration, BMDTimeScale timeScale);
```

#### Parameters

Name	Direction	Description
frameTime	out	Frame time (in units of timeScale)
frameDuration	out	Frame duration (in units of timeScale)
timeScale	in	Time scale for output parameters

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.11.2 IDeckLinkVideoInputFrame::GetHardwareReferenceTimestamp method

The **GetHardwareReferenceTimestamp** method returns frame time and frame duration for a given timescale.

#### Syntax

```
HRESULT GetHardwareReferenceTimestamp (BMDTimeScale timeScale,  
                                     BMDTimeValue *frameTime, BMDTimeValue *frameDuration);
```

#### Parameters

Name	Direction	Description
timeScale	in	The time scale see <b>BMDTimeScale</b> for details.
frameTime	out	The frame time see <b>BMDTimeValue</b> for details.
frameDuration	out	The frame duration see <b>BMDTimeValue</b> for details.

#### Return Values

Value	Description
E_INVALIDARG	Timescale is not set
S_OK	Success

## 2.5.12 IDeckLinkAudioInputPacket Interface

The `IDeckLinkAudioInputPacket` object interface represents a packet of audio which has been captured by an `IDeckLinkInput` object interface.

Objects with an `IDeckLinkAudioInputPacket` object interface are passed to the `IDeckLinkInputCallback::VideoInputFrameArrived` callback.

Audio channel samples are interleaved into a sample frame and sample frames are contiguous.

### Related Interfaces

Interface	Interface ID	Description
<code>IDeckLinkInputCallback</code>	<code>IID_IDeckLinkInputCallback</code>	New audio packets are returned to the <code>IDeckLinkInputCallback::VideoInputFrameArrived</code> callback

### Public Member Functions

Method	Description
<code>GetSampleFrameCount</code>	Get number of sample frames in packet
<code>GetBytes</code>	Get pointer to raw audio frame sequence
<code>GetPacketTime</code>	Get corresponding video timestamp

### 2.5.12.1 IDeckLinkAudioInputPacket::GetSampleFrameCount method

The `GetSampleFrameCount` method returns the number of sample frames in the packet.

#### Syntax

```
long GetSampleFrameCount ();
```

#### Return Values

Value	Description
Count	Audio packet size in sample frames

### 2.5.12.2 IDeckLinkAudioInputPacket::GetBytes method

The `GetBytes` method returns a pointer to the data buffer of the audio packet.

#### Syntax

```
HRESULT GetBytes (void *buffer);
```

#### Parameters

Name	Direction	Description
buffer	out	pointer to audio data – only valid while object remains valid

#### Return Values

Value	Description
<code>E_FAIL</code>	Failure
<code>S_OK</code>	Success

### 2.5.12.3 IDeckLinkAudioInputPacket::GetPacketTime method

The `GetPacketTime` method returns the time stamp of the video frame corresponding to the specified audio packet.

#### Syntax

```
HRESULT GetPacketTime (BMDTimeValue *packetTime, BMDTimeScale timeScale);
```

#### Parameters

Name	Direction	Description
packetTime	out	Video frame time corresponding to audio packet in timeScale units
timeScale	in	Time scale for time stamp to be returned

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.13 IDeckLinkDisplayModelerator Interface

The `IDeckLinkDisplayModelerator` object interface is used to enumerate the available display modes for a DeckLink device.

An `IDeckLinkDisplayModelerator` object interface may be obtained from an `IDeckLinkInput` or `IDeckLinkOutput` object interface using the `GetDisplayModelerator` method.

**NOTE** The `IDeckLinkDisplayModelerator` will enumerate all display modes regardless of the current profile. An application should call the `DoesSupportVideoMode` method in the `IDeckLinkInput`, `IDeckLinkOutput` or `IDeckLinkEncoderInput` interfaces to ensure that a display mode is supported for a given profile.

Interface	Interface ID	Description
<code>IDeckLinkInput</code>	<code>IID_IDeckLinkInput</code>	<code>IDeckLinkInput::GetDisplayModelerator</code> returns an <code>IDeckLinkDisplayModelerator</code> object interface
<code>IDeckLinkOutput</code>	<code>IID_IDeckLinkOutput</code>	<code>IDeckLinkOutput::GetDisplayModelerator</code> returns an <code>IDeckLinkDisplayModelerator</code> object interface
<code>IDeckLinkEncoderInput</code>	<code>IID_IDeckLinkEncoderInput</code>	<code>IDeckLinkEncoderInput::GetDisplayModelerator</code> returns an <code>IDeckLinkDisplayModelerator</code> object interface
<code>IDeckLinkDisplayMode</code>	<code>IID_IDeckLinkDisplayMode</code>	<code>IDeckLinkDisplayModelerator::Next</code> returns an <code>IDeckLinkDisplayMode</code> object interface for each available display mode

Public Member Functions	
Method	Description
<code>Next</code>	Returns a pointer to an <code>IDeckLinkDisplayMode</code> interface for an available display mode

### 2.5.13.1 IDeckLinkDisplayModeIterator::Next method

The **Next** method returns the next available **IDeckLinkDisplayMode** interface.

#### Syntax

```
HRESULT Next (IDeckLinkDisplayMode *displayMode);
```

#### Parameters

Name	Direction	Description
displayMode	out	IDeckLinkDisplayMode object interface or NULL when no more display modes are available.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.14 IDeckLinkDisplayMode Interface

The **IDeckLinkDisplayMode** object interface represents a supported display mode.

The **IDeckLinkDisplayModeIterator** object interface enumerates supported display modes, returning **IDeckLinkDisplayMode** object interfaces.

#### Related Interfaces

Interface	Interface ID	Description
IDeckLinkOutput	IID_IDeckLinkOutput	IDeckLinkOutput::GetDisplayMode returns an IDeckLinkDisplayMode interface object
IDeckLinkInput	IID_IDeckLinkInput	IDeckLinkInput::GetDisplayMode returns an IDeckLinkDisplayMode interface object
IDeckLinkEncoderInput	IID_IDeckLinkEncoderInput	IDeckLinkEncoderInput::GetDisplayMode returns an IDeckLinkDisplayMode interface object
IDeckLinkDisplayModeIterator	IID_IDeckLinkDisplayModeIterator	IDeckLinkDisplayModeIterator::Next returns an IDeckLinkDisplayMode object interface for each available display mode

Public Member Functions	
Method	Description
GetWidth	Get video frame width in pixels
GetHeight	Get video frame height in pixels
GetName	Get descriptive text
GetDisplayMode	Get corresponding <b>BMDDisplayMode</b>
GetFrameRate	Get the frame rate of the display mode
GetFieldDominance	Gets the field dominance of the frame
GetFlags	Returns flags associated with display modes (see <b>BMDDisplaymodeFlags</b> for more details).



### 2.5.14.1 IDeckLinkDisplayMode::GetWidth method

The `GetWidth` method returns the width of a video frame in the display mode.

#### Syntax

```
long GetWidth ();
```

#### Return Values

Value	Description
Width	Video frame width in pixels

### 2.5.14.2 IDeckLinkDisplayMode::GetHeight method

The `GetHeight` method returns the height of a video frame in the display mode.

#### Syntax

```
long GetHeight ();
```

#### Return Values

Value	Description
Height	Video frame height in pixels

### 2.5.14.3 IDeckLinkDisplayMode::GetName method

The `GetName` method returns a string describing the display mode.

#### Syntax

```
HRESULT GetName (string *name);
```

#### Parameters

Name	Direction	Description
name	out	Descriptive string. This allocated string must be freed by the caller when no longer required.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.14.4 IDeckLinkDisplayMode::GetDisplayMode method

The `GetDisplayMode` method returns the corresponding `BMDDisplayMode` for the selected display mode.

#### Syntax

```
BMDDisplayMode GetDisplayMode ();
```

#### Return Values

Value	Description
mode	<code>BMDDisplayMode</code> corresponding to the display mode

### 2.5.14.5 IDeckLinkDisplayMode::GetFrameRate method

The `GetFrameRate` method returns the frame rate of the display mode. The frame rate is represented as the two integer components of a rational number for accuracy. The actual frame rate can be calculated by  $\text{timeScale} / \text{frameDuration}$ .

#### Syntax

```
HRESULT GetFrameRate (BMDTimeValue *frameDuration, BMDTimeScale *timeScale);
```

#### Parameters

Name	Direction	Description
frameDuration	out	Frame duration time value
timeScale	out	Frame rate time scale

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.14.6 IDeckLinkDisplayMode::GetFieldDominance method

The `GetFieldDominance` method gets the field dominance of the frame.

#### Syntax

```
BMDFieldDominance GetFieldDominance ();
```

#### Return Values

Value	Description
FieldDominance	The field dominance see <code>BMDFieldDominance</code> for details.

## 2.5.14.7 IDeckLinkDisplayMode::GetFlags method

The `GetFlags` method returns flags associated with display modes.

### Syntax

```
BMDDisplayModeFlags GetFlags ();
```

### Return Values

Value	Description
Flags	The display mode flags see <code>BMDDisplaymodeFlags</code> for details.

## 2.5.15 IDeckLinkConfiguration Interface

The `IDeckLinkConfiguration` object interface allows querying and modification of DeckLink configuration parameters.

An `IDeckLinkConfiguration` object interface can be obtained from the `IDeckLink` interface using `QueryInterface`.

The configuration settings are globally visible (not limited to the current process). Changes will persist until the `IDeckLinkConfiguration` object is released, unless `WriteConfigurationToPreferences` is called. In which case, the changes will be made permanent and will persist across restarts.

### Related Interfaces

Interface	Interface ID	Description
<code>IDeckLink</code>	<code>IID_IDeckLink</code>	DeckLink device interface

Public Member Functions	
Method	Description
<code>SetFlag</code>	Sets a boolean value into the configuration setting associated with the given <code>BMDDeckLinkConfigurationID</code> .
<code>GetFlag</code>	Gets the current boolean value of a setting associated with the given <code>BMDDeckLinkConfigurationID</code> .
<code>SetInt</code>	Sets the current <code>int64_t</code> value into the configuration setting associated with the given <code>BMDDeckLinkConfigurationID</code> .
<code>GetInt</code>	Gets the current <code>int64_t</code> value of a setting associated with the given <code>BMDDeckLinkConfigurationID</code> .
<code>SetFloat</code>	Sets the current double value into the configuration setting associated with the given <code>BMDDeckLinkConfigurationID</code> .
<code>GetFloat</code>	Gets the current double value of a setting associated with the given <code>BMDDeckLinkConfigurationID</code> .
<code>SetString</code>	Sets the current string value into the configuration setting with the given <code>BMDDeckLinkConfigurationID</code> .
<code>GetString</code>	Gets the current string value of a setting associated with the given <code>BMDDeckLinkConfigurationID</code> .
<code>WriteConfigurationToPreferences</code>	Saves the current settings to system preferences so that they will persist across system restarts.

### 2.5.15.1 IDeckLinkConfiguration::SetFlag method

The **SetFlag** method sets a boolean value into the configuration setting associated with the given **BMDDeckLinkConfigurationID**.

#### Syntax

```
HRESULT SetFlag (BMDDeckLinkConfigurationID cfgID, boolean value);
```

#### Parameters

Name	Direction	Description
cfgID	in	The ID of the configuration setting.
value	in	The boolean value to set into the selected configuration setting.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no flag type configuration setting for this operation corresponding to the given <b>BMDDeckLinkConfigurationID</b> .
E_NOTIMPL	The request is correct however it is not supported by the DeckLink hardware.

### 2.5.15.2 IDeckLinkConfiguration::GetFlag method

The **GetFlag** method gets the current boolean value of a configuration setting associated with the given **BMDDeckLinkConfigurationID**.

#### Syntax

```
HRESULT GetFlag (BMDDeckLinkConfigurationID cfgID, boolean *value);
```

#### Parameters

Name	Direction	Description
cfgID	in	The ID of the configuration setting.
value	out	The boolean value that is set in the selected configuration setting.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no flag type configuration setting for this operation corresponding to the given <b>BMDDeckLinkConfigurationID</b> .
E_NOTIMPL	The request is correct however it is not supported by the DeckLink hardware.

### 2.5.15.3 IDeckLinkConfiguration::SetInt method

The **SetInt** method sets the current `int64_t` value of a configuration setting associated with the given **BMDDeckLinkConfigurationID**.

#### Syntax

```
HRESULT SetInt (BMDDeckLinkConfigurationID cfgID, int64_t value);
```

#### Parameters

Name	Direction	Description
cfgID	in	The ID of the configuration setting.
value	in	The integer value to set into the selected configuration setting.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no integer type configuration setting for this operation corresponding to the given <b>BMDDeckLinkConfigurationID</b> .
E_NOTIMPL	The request is correct however it is not supported by the DeckLink hardware.

### 2.5.15.4 IDeckLinkConfiguration::GetInt method

The **GetInt** method gets the current `int64_t` value of a configuration setting associated with the given **BMDDeckLinkConfigurationID**.

#### Syntax

```
HRESULT GetInt (BMDDeckLinkConfigurationID cfgID, int64_t *value);
```

#### Parameters

Name	Direction	Description
cfgID	in	The ID of the configuration setting.
value	out	The integer value that is set in the selected configuration setting.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no integer type configuration setting for this operation corresponding to the given <b>BMDDeckLinkConfigurationID</b> .
E_NOTIMPL	The request is correct however it is not supported by the DeckLink hardware.

### 2.5.15.5 IDeckLinkConfiguration::SetFloat method

The **SetFloat** method sets the current double value of a configuration setting associated with the given **BMDDeckLinkConfigurationID**.

#### Syntax

```
HRESULT SetFloat (BMDDeckLinkConfigurationID cfgID, double value);
```

#### Parameters

Name	Direction	Description
cfgID	in	The ID of the configuration setting.
value	in	The double value to set into the selected configuration setting.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no float type configuration setting for this operation corresponding to the given <b>BMDDeckLinkConfigurationID</b> .
E_NOTIMPL	The request is correct however it is not supported by the DeckLink hardware.

### 2.5.15.6 IDeckLinkConfiguration::GetFloat method

The **GetFloat** method gets the current double value of a configuration setting associated with the given **BMDDeckLinkConfigurationID**.

#### Syntax

```
HRESULT GetFloat (BMDDeckLinkConfigurationID cfgID, double *value);
```

#### Parameters

Name	Direction	Description
cfgID	in	The ID of the configuration setting.
value	out	The double value that is set in the selected configuration setting.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no float type configuration setting for this operation corresponding to the given <b>BMDDeckLinkConfigurationID</b> .
E_NOTIMPL	The request is correct however it is not supported by the DeckLink hardware.

## 2.5.15.7 IDeckLinkConfiguration::SetString method

The **SetString** method sets the current string value of a configuration setting associated with the given **BMDDeckLinkConfigurationID**.

### Syntax

```
HRESULT SetString (BMDDeckLinkConfigurationID cfgID, string value);
```

### Parameters

Name	Direction	Description
cfgID	in	The ID of the configuration setting.
value	in	The string to set into the selected configuration setting.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no string type configuration setting for this operation corresponding to the given <b>BMDDeckLinkConfigurationID</b> .
E_NOTIMPL	The request is correct however it is not supported by the DeckLink hardware.

## 2.5.15.8 IDeckLinkConfiguration::GetString method

The **GetString** method gets the current string value of a configuration setting associated with the given **BMDDeckLinkConfigurationID**.

### Syntax

```
HRESULT GetString (BMDDeckLinkConfigurationID cfgID, string *value);
```

### Parameters

Name	Direction	Description
cfgID	in	The ID of the configuration setting.
value	out	The string set in the selected configuration setting. This allocated string must be freed by the caller when no longer required.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no string type configuration setting for this operation corresponding to the given <b>BMDDeckLinkConfigurationID</b> .
E_NOTIMPL	The request is correct however it is not supported by the DeckLink hardware.

## 2.5.15.9 IDeckLinkConfiguration::WriteConfigurationToPreferences method

The `WriteConfigurationToPreferences` method saves the current settings to system preferences so they will persist across system restarts.

**NOTE** This method requires administrative privileges. Configuration settings changed through this interface will be reverted when the interface is released unless this method is called.

### Syntax

```
HRESULT WriteConfigurationToPreferences ();
```

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_ACCESSDENIED	Insufficient privileges to write to system preferences.

## 2.5.16 IDeckLinkAPIInformation Interface

The `IDeckLinkAPIInformation` object interface provides global API information. A reference to an `IDeckLinkAPIInformation` object interface may be obtained from `CoCreateInstance` on platforms with native COM support or from `CreateDeckLinkAPIInformationInstance` on other platforms.

Public Member Functions	
Method	Description
GetFlag	Gets a boolean flag associated with specified <code>BMDDeckLinkAPIInformationID</code>
GetInt	Gets an <code>int64_t</code> associated with specified <code>BMDDeckLinkAPIInformationID</code>
GetFloat	Gets a float associated with specified <code>BMDDeckLinkAPIInformationID</code>
GetString	Gets a string associated with specified <code>BMDDeckLinkAPIInformationID</code>



### 2.5.16.1 IDeckLinkAPIInformation::GetFlag method

The `GetFlag` method gets a boolean flag associated with a given `BMDDeckLinkAPIInformationID`.

#### Syntax

```
HRESULT GetFlag (BMDDeckLinkAPIInformationID cfgID, bool *value);
```

#### Parameters

Name	Direction	Description
cfgID	in	BMDDeckLinkAPIInformationID to get flag value.
value	out	Value of flag corresponding to cfgID.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no flag type attribute corresponding to cfgID.

### 2.5.16.2 IDeckLinkAPIInformation::GetInt method

The `GetInt` method gets an `int64_t` value associated with a given `BMDDeckLinkAPIInformationID`.

#### Syntax

```
HRESULT GetInt (BMDDeckLinkAPIInformationID cfgID, int64_t *value);
```

#### Parameters

Name	Direction	Description
cfgID	in	BMDDeckLinkAPIInformationID to get int value.
value	out	Value of int corresponding to cfgID.

#### Return Values

Value	Description
S_OK	Success
E_INVALIDARG	There is no int type attribute corresponding to cfgID.

### 2.5.16.3 IDeckLinkAPIInformation::GetFloat method

The `GetFloat` method gets a float value associated with a given `BMDDeckLinkAPIInformationID`.

#### Syntax

```
HRESULT GetFloat (BMDDeckLinkAPIInformationID cfgID, double *value);
```

#### Parameters

Name	Direction	Description
cfgID	in	<code>BMDDeckLinkAPIInformationID</code> to get float value.
value	out	Value of float corresponding to <code>cfgID</code> .

#### Return Values

Value	Description
<code>S_OK</code>	Success
<code>E_INVALIDARG</code>	There is no float type attribute corresponding to <code>cfgID</code> .

### 2.5.16.4 IDeckLinkAPIInformation::GetString method

The `GetString` method gets a string value associated with a given `BMDDeckLinkAPIInformationID`.

#### Syntax

```
HRESULT GetString (BMDDeckLinkAPIInformationID cfgID, String *value);
```

#### Parameters

Name	Direction	Description
cfgID	in	<code>BMDDeckLinkAPIInformationID</code> to get string value.
value	out	Value of string corresponding to <code>cfgID</code> .

#### Return Values

Value	Description
<code>S_OK</code>	Success
<code>E_INVALIDARG</code>	There is no string type attribute corresponding to <code>cfgID</code> .
<code>E_OUTOFMEMORY</code>	Unable to allocate memory for string

## 2.5.17 IDeckLinkProfileAttributes Interface

The **IDeckLinkProfileAttributes** object interface provides details about the capabilities of a profile for a DeckLink card. The detail types that are available for various capabilities are: flag, int, float, and string. The DeckLink Attribute ID section lists the hardware capabilities and associated attributes identifiers that can be queried using this object interface.

### Related Interfaces

Interface	Interface ID	Description
IDeckLink	IID_IDeckLink	An <b>IDeckLinkProfileAttributes</b> object interface may be obtained from <b>IDeckLink</b> using <b>QueryInterface</b>
IDeckLinkProfile	IID_IDeckLinkProfile	An <b>IDeckLinkProfileAttributes</b> object interface may be obtained from <b>IDeckLinkProfile</b> using <b>QueryInterface</b> .

Public Member Functions	
Method	Description
GetFlag	Gets a boolean flag corresponding to a <b>BMDDeckLinkAttributeID</b>
GetInt	Gets an <b>int64_t</b> corresponding to a <b>BMDDeckLinkAttributeID</b>
GetFloat	Gets a float corresponding to a <b>BMDDeckLinkAttributeID</b>
GetString	Gets a string corresponding to a <b>BMDDeckLinkAttributeID</b>

### 2.5.17.1 IDeckLinkProfileAttributes::GetFlag method

The **GetFlag** method gets a boolean flag associated with a given **BMDDeckLinkAttributeID**. (See **BMDDeckLinkAttributeID** for a list of attribute IDs)

#### Syntax

```
HRESULT GetFlag (BMDDeckLinkAttributeID cfgID, boolean *value);
```

#### Parameters

Name	Direction	Description
cfgID	in	<b>BMDDeckLinkAttributeID</b> to get flag value.
value	out	The value corresponding to cfgID.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no flag type attribute corresponding to cfgID.

### 2.5.17.2 IDeckLinkProfileAttributes::GetInt method

The `GetInt` method gets an `int64_t` value associated with a given `BMDDeckLinkAttributeID`.

#### Syntax

```
HRESULT GetInt (BMDDeckLinkAttributeID cfgID, int64_t *value);
```

#### Parameters

Name	Direction	Description
cfgID	in	<code>BMDDeckLinkAttributeID</code> to get int value.
value	out	The value corresponding to <code>cfgID</code> .

#### Return Values

Value	Description
<code>E_FAIL</code>	Failure
<code>S_OK</code>	Success
<code>E_INVALIDARG</code>	There is no int type attribute corresponding to <code>cfgID</code> .

### 2.5.17.3 IDeckLinkProfileAttributes::GetFloat method

The `GetFloat` method gets a float value associated with a given `BMDDeckLinkAttributeID`.

#### Syntax

```
HRESULT GetFloat (BMDDeckLinkAttributeID cfgID, double *value);
```

#### Parameters

Name	Direction	Description
cfgID	in	<code>BMDDeckLinkAttributeID</code> to get float value.
value	out	The value corresponding to <code>cfgID</code> .

#### Return Values

Value	Description
<code>E_FAIL</code>	Failure
<code>S_OK</code>	Success
<code>E_INVALIDARG</code>	There is no float type attribute corresponding to <code>cfgID</code> .

## 2.5.17.4 IDeckLinkProfileAttributes::GetString method

The `GetString` method gets a string value associated with a given `BMDDeckLinkAttributeID`.

### Syntax

```
HRESULT GetString (BMDDeckLinkAttributeID cfgID, string *value);
```

### Parameters

Name	Direction	Description
cfgID	in	<code>BMDDeckLinkAttributeID</code> to get string value.
value	out	The value corresponding to <code>cfgID</code> . This allocated string must be freed by the caller when no longer required.

### Return Values

Value	Description
<code>E_FAIL</code>	Failure
<code>S_OK</code>	Success
<code>E_INVALIDARG</code>	There is no string type attribute corresponding to <code>cfgID</code> .

## 2.5.18 IDeckLinkMemoryAllocator Interface

The `IDeckLinkMemoryAllocator` object interface is a callback class used to provide control over the memory intensive video frame allocations required during playback and capture. An object with the `IDeckLinkMemoryAllocator` object interface may be registered as a callback with the `IDeckLinkOutput` or `IDeckLinkInput` interfaces.

During playback or capture, calls will be made to this interface object to manage memory buffers for storing video frame data. Memory buffers may be allocated and released more frequently than once per video frame played back or captured, such as when video format conversion is performed.

**TIP** Implementation of this interface is optional if this callback is not registered, a default allocator will be used.

### Related Interfaces

Interface	Interface ID	Description
<code>IDeckLinkOutput</code>	<code>IID_IDeckLinkOutput</code>	An <code>IDeckLinkMemoryAllocator</code> object interface may be registered with <code>IDeckLinkOutput::SetVideoOutputFrameMemoryAllocator</code>
<code>IDeckLinkInput</code>	<code>IID_IDeckLinkInput</code>	An <code>IDeckLinkMemoryAllocator</code> object interface may be registered with <code>IDeckLinkInput::SetVideoInputFrameMemoryAllocator</code>

Public Member Functions	
Method	Description
<code>AllocateBuffer</code>	Called to allocate memory for a frame
<code>ReleaseBuffer</code>	Called to release a previously allocated frame
<code>Commit</code>	Called to notify the allocator that frame buffers will be required
<code>Decommit</code>	Called to notify the allocator that frame buffers will no longer be required (until next call to <code>Commit</code> ).

### 2.5.18.1 IDeckLinkMemoryAllocator::AllocateBuffer method

The **AllocateBuffer** method is called by the owner interface to allocate a buffer for a video frame. This method is abstract in the base interface and must be implemented by the application developer.

#### Syntax

```
HRESULT AllocateBuffer (unsigned long bufferSize, void *allocatedBuffer);
```

#### Parameters

Name	Direction	Description
bufferSize	in	Size of the memory to be allocated for a new video frame
allocatedBuffer	out	Address of newly allocated buffer NOTE: Returned address for buffer must be aligned on a 16-byte boundary.

#### Return Values

Value	Description
S_OK	Success
E_OUTOFMEMORY	There is insufficient memory to allocate a buffer of the requested size.

### 2.5.18.2 IDeckLinkMemoryAllocator::ReleaseBuffer method

The **ReleaseBuffer** method is called by the owner interface to release previously allocated memory. This method is abstract in the base interface and must be implemented by the application developer.

#### Syntax

```
HRESULT ReleaseBuffer (void *buffer);
```

#### Parameters

Name	Direction	Description
buffer	in	Pointer to the buffer to be released

#### Return Values

Value	Description
S_OK	Success

### 2.5.18.3 IDeckLinkMemoryAllocator::Commit method

The **Commit** method is called by the owner interface to notify the allocator that frame buffers will be required. The allocator should allocate any structures required for memory pool management in this callback. This method is abstract in the base interface and must be implemented by the application developer.

#### Syntax

```
HRESULT Commit ();
```

#### Parameters

none.

#### Return Values

Value	Description
S_OK	Success
E_OUTOFMEMORY	There is insufficient memory to allocate a buffer of the requested size.

### 2.5.18.4 IDeckLinkMemoryAllocator::Decommit method

The **Decommit** method is called by the owner interface to notify the allocator that frame buffers will no longer be required. The allocator should de-allocate any structures required for memory pool management in this callback. The owner interface will call the Commit method again before allocating more frames. This method is abstract in the base interface and must be implemented by the application developer.

#### Syntax

```
HRESULT Decommit ();
```

#### Parameters

none.

#### Return Values

Value	Description
S_OK	Success

## 2.5.19 IDeckLinkKeyer Interface

The **IDeckLinkKeyer** object interface allows configuration of the keying functionality available on most DeckLink cards. An **IDeckLinkKeyer** object interface can be obtained from the **IDeckLink** interface using **QueryInterface**.

### Related Interfaces

Interface	Interface ID	Description
IDeckLink	IID_IDeckLink	DeckLink device interface

Public Member Functions	
Method	Description
Enable	Turn on keyer.
SetLevel	Set the level that the image is blended into the frame.
RampUp	Progressively blends in an image over a given number of frames
RampDown	Progressively blends out an image over a given number of frames
Disable	Turn off keyer

### 2.5.19.1 IDeckLinkKeyer::Enable method

The **Enable** method turns on the keyer functionality.

If external keying is selected, the mask is output on CH A and the key on CH B. The following table lists the hardware that support various keyer capabilities. Currently capture of mask/key on dual channel inputs is not supported.

The following table displays hardware which supports the keyer functionality.

Device	Internal	External	SD	HD to p30	HD to p60	UHD to p30	UHD to p60
DeckLink Duo	yes	no	yes	no	—	—	—
DeckLink Quad	yes	no	yes	no	—	—	—
DeckLink SDI 4K	yes	no	yes	yes	yes	no	—
DeckLink Studio 4K	yes	yes*	yes	yes	yes	no	—
DeckLink 4K Extreme	yes	yes	yes	yes	yes	no	—
DeckLink 4K Extreme 12G	yes	yes	yes	yes	yes	yes	yes
DeckLink 4K Pro	yes	yes	yes	yes	yes	yes	yes
DeckLink Duo 2	yes	yes	yes	yes	yes	—	—
DeckLink Quad 2	yes	yes	yes	yes	yes	—	—
DeckLink 8K Pro	yes	yes	yes	yes	yes	yes	yes
DeckLink IP/SDI HD	yes***	no	yes	yes	yes	—	—
DeckLink IP HD	yes	no	yes	yes	yes	—	—
DeckLink IP HD Optical	yes	no	yes	yes	yes	—	—
UltraStudio 4K	yes	yes	yes	yes	yes	no	—
UltraStudio 4K Extreme	yes	yes	yes	yes	yes	yes	yes**
UltraStudio 4K Extreme 3	yes	yes	yes	yes	yes	yes	yes



Device	Internal	External	SD	HD to p30	HD to p60	UHD to p30	UHD to p60
UltraStudio 4K Mini	yes	yes	yes	yes	yes	yes	no
UltraStudio HD Mini	yes	yes	yes	yes	yes	—	—

= Video mode not supported for playback

\* = SD Only

\*\* = Over PCIe only

\*\*\* = Ethernet input only

**TIP** The `IDeckLinkOutput::DoesSupportVideoMode` method with video mode flag `bmdSupportedVideoModeKeying` should be used to determine whether keying is supported on a device with a particular display mode.

### Syntax

```
HRESULT Enable (boolean isExternal);
```

### Parameters

Name	Direction	Description
isExternal	in	Specifies internal or external keying.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.19.2 IDeckLinkKeyer::SetLevel method

The `SetLevel` method sets the level that the image is blended onto the frame. 0 is no blend, 255 is completely blended onto the frame.

### Syntax

```
HRESULT SetLevel (uint8_t level);
```

### Parameters

Name	Direction	Description
level	in	The level that the image is to be blended onto the frame.

### Return Values

Value	Description
S_OK	Success

### 2.5.19.3 IDeckLinkKeyer::RampUp method

The **RampUp** method progressively blends in an image over a given number of frames from 0 to 255.

#### Syntax

```
HRESULT RampUp (uint32_t numberOfFrames);
```

#### Parameters

Name	Direction	Description
numberOfFrames	in	The number of frames that the image is progressively blended in.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.19.4 IDeckLinkKeyer::RampDown method

The **RampDown** method progressively blends out an image over a given number of frames from 255 to 0.

#### Syntax

```
HRESULT RampDown (uint32_t numberOfFrames);
```

#### Parameters

Name	Direction	Description
numberOfFrames	in	The number of frames that the image is progressively blended out.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.19.5 IDeckLinkKeyer::Disable method

The **Disable** method turns off the keyer functionality.

#### Syntax

```
HRESULT Disable();
```

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.20 IDeckLinkVideoFrameAncillary Interface

The **IDeckLinkVideoFrameAncillary** object interface represents the ancillary data associated with a video frame. CEA-708 closed-captions are encoded with data bits in the 2 least-significant-bits of each 10 bit pixel component. These bits are not preserved when capturing in an 8 bit pixel format. To capture or output CEA-708 captions, a 10 bit pixel format such as **bmdFormat10BitYUV** must be used.

**NOTE** The **IDeckLinkVideoFrameAncillary** object interface is for existing designs or where the ancillary data does not conform to SMPTE 291M type 2 ANC packet format. For new designs with VANC packets, the use of **IDeckLinkVideoFrameAncillaryPackets** object interface is preferred.

### Related Interfaces

Interface	Interface ID	Description
IDeckLinkOutput	IID_IDeckLinkOutput	An <b>IDeckLinkVideoFrameAncillary</b> object can be obtained with <b>IDeckLinkOutput::CreateAncillaryData</b> .
IDeckLinkVideoFrame	IID_IDeckLinkVideoFrame	An <b>IDeckLinkVideoFrameAncillary</b> object can be obtained from <b>IDeckLinkVideoFrame::GetAncillaryData</b> .
IDeckLinkMutableVideoFrame	IID_IDeckLinkMutableVideoFrame	An <b>IDeckLinkVideoFrameAncillary</b> object be set into a video frame using <b>IDeckLinkMutableVideoFrame::SetAncillaryData</b> .

Public Member Functions	
Method	Description
GetPixelFormat	Gets pixel format of a video frame.
GetDisplayMode	Gets corresponding <b>BMDDisplayMode</b> for the selected display mode.
GetBufferForVerticalBlankingLine	Access vertical blanking line buffer.

### 2.5.20.1 IDeckLinkVideoFrameAncillary::GetPixelFormat method

The **GetPixelFormat** method gets the pixel format of a video frame.

#### Syntax

```
BMDPixelFormat GetPixelFormat ();
```

#### Return Values

Value	Description
PixelFormat	Pixel format of video frame ( <b>BMDPixelFormat</b> )

### 2.5.20.2 IDeckLinkVideoFrameAncillary::GetDisplayMode method

The **GetDisplayMode** method returns the corresponding **BMDDisplayMode** for the selected display mode.

#### Syntax

```
BMDDisplayMode GetDisplayMode ();
```

#### Return Values

Value	Description
mode	<b>BMDDisplayMode</b> corresponding to the display mode.

### 2.5.20.3 IDeckLinkVideoFrameAncillary::GetBufferForVerticalBlankingLine method

The **GetBufferForVerticalBlankingLine** method allows access to a specified vertical blanking line within the ancillary for the associated frame.

Ancillary lines are numbered from one. For NTSC video, the top ancillary lines are numbered starting from four, with lines 1 to 3 referring to the ancillary lines at the bottom of the picture, as per convention.

The pointer returned by **GetBufferForVerticalBlankingLine** is in the same format as the associated active picture data and is valid while the **IDeckLinkVideoFrameAncillary** object interface is valid.

#### Syntax

```
HRESULT GetBufferForVerticalBlankingLine (uint32_t lineNumber, void* *buffer)
```

#### Parameters

Name	Direction	Description
lineNumber	in	Ancillary line number to access.
buffer	out	Pointer into ancillary buffer for requested line or NULL if line number was invalid.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	An invalid ancillary line number was requested

## 2.5.21 IDeckLinkVideoFrameAncillaryPackets Interface

The `IDeckLinkVideoFrameAncillaryPackets` object interface represents the collection of ancillary data packets associated with a video frame. It is the preferred interface for the capture and output of SMPTE 291M Type 2 VANC packets, replacing legacy `IDeckLinkVideoFrameAncillary` interface.

An `IDeckLinkVideoFrameAncillaryPackets` interface may be obtained from an `IDeckLinkVideoFrame` object interface using `QueryInterface`.

### Related Interfaces

Interface	Interface ID	Description
<code>IDeckLinkVideoFrame</code>	<code>IID_IDeckLinkVideoFrame</code>	An <code>IDeckLinkVideoFrameAncillaryPacket</code> object interface may be obtained from <code>IDeckLinkVideoFrame</code> using <code>QueryInterface</code>
<code>IDeckLinkAncillaryPacketIterator</code>	<code>IID_IDeckLinkAncillaryPacketIterator</code>	<code>IDeckLinkVideoFrameAncillaryPackets::GetPacketIterator</code> returns an <code>IDeckLinkAncillaryPacketIterator</code> object interface
<code>IDeckLinkAncillaryPacket</code>	<code>IID_IDeckLinkAncillaryPacket</code>	<code>IDeckLinkVideoFrameAncillaryPackets::GetFirstPacketByID</code> returns an <code>IDeckLinkAncillaryPacket</code> object interface

Public Member Functions	
Method	Description
<code>GetPacketIterator</code>	Get a iterator that enumerates the available ancillary packets
<code>GetFirstPacketByID</code>	Get the first ancillary packet matching a given DID/SDID pair
<code>AttachPacket</code>	Add an ancillary packet to the video frame
<code>DetachPacket</code>	Remove an ancillary packet from the video frame
<code>DetachAllPackets</code>	Remove all ancillary packets from the video frame.

### 2.5.21.1 IDeckLinkVideoFrameAncillaryPackets::GetPacketIterator method

The `GetPacketIterator` method returns an iterator that enumerates the available ancillary packets for a video frame.

#### Syntax

```
HRESULT GetPacketIterator (IDeckLinkAncillaryPacketIterator *iterator);
```

#### Parameters

Name	Direction	Description
<code>iterator</code>	out	Pointer to ancillary packet iterator. This object must be released by the caller when no longer required.

#### Return Values

Value	Description
<code>S_OK</code>	Success
<code>E_INVALIDARG</code>	Parameter iterator variable is NULL
<code>E_OUTOFMEMORY</code>	Unable to create iterator

### 2.5.21.2 IDeckLinkVideoFrameAncillaryPackets::GetFirstPacketByID method

The `GetFirstPacketByID` method returns the first ancillary packet in the video frame matching a given DID/SDID pair.

#### Syntax

```
HRESULT GetFirstPacketByID (uint8_t DID, uint8_t SDID,  
IDeckLinkAncillaryPacket *packet);
```

#### Parameters

Name	Direction	Description
DID	in	Data ID (DID)
SDID	in	Secondary Data ID (SDID)
packet	out	Pointer to ancillary packet. This object must be released by the caller when no longer required.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	Parameter packet variable is NULL

### 2.5.21.3 IDeckLinkVideoFrameAncillaryPackets::AttachPacket method

The `AttachPacket` method adds an ancillary packet to the video frame.

#### Syntax

```
HRESULT AttachPacket (IDeckLinkAncillaryPacket *packet);
```

#### Parameters

Name	Direction	Description
packet	in	Ancillary packet to attach

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	Parameter packet variable is NULL or has invalid data stream index
E_OUTOFMEMORY	Unable to allocate memory for packet

## 2.5.21.4 IDeckLinkVideoFrameAncillaryPackets::DetachPacket method

The **DetachPacket** method removes an ancillary packet from the video frame.

### Syntax

```
HRESULT DetachPacket (IDeckLinkAncillaryPacket *packet)
```

### Parameters

Name	Direction	Description
packet	in	Ancillary packet to detach

### Return Values

Value	Description
S_FALSE	Packet not found
S_OK	Success

## 2.5.21.5 IDeckLinkVideoFrameAncillaryPackets::DetachAllPackets method

The **DetachAllPackets** method removes all ancillary packets from the video frame.

### Syntax

```
HRESULT DetachAllPackets ();
```

### Return Values

Value	Description
S_OK	Success

## 2.5.22 IDeckLinkAncillaryPacketIterator Interface

The **IDeckLinkAncillaryPacketIterator** object interface is used to enumerate the available ancillary packets in a video frame.

A reference to an **IDeckLinkAncillaryPacketIterator** object interface for an input video frame may be obtained by calling **GetPacketIterator** on a **IDeckLinkVideoFrameAncillaryPackets** object interface.

### Related Interfaces

Interface	Interface ID	Description
IDeckLinkVideoFrameAncillaryPackets	IID_IDeckLinkVideoFrameAncillaryPackets	<b>IDeckLinkVideoFrameAncillaryPackets::GetPacketIterator</b> returns an <b>IDeckLinkAncillaryPacketIterator</b> object interface
IDeckLinkAncillaryPacket	IID_IDeckLinkAncillaryPacket	<b>IDeckLinkAncillaryPacketIterator::Next</b> returns <b>IDeckLinkAncillaryPacket</b> interfaces representing each ancillary packet in a video frame

Public Member Functions	
Method	Description
Next	Returns an <b>IDeckLinkAncillaryPacket</b> object interface corresponding to an individual ancillary packet.

### 2.5.22.1 IDeckLinkAncillaryPacketIterator::Next method

The **Next** method creates an object representing an ancillary data packet and assigns the address of the IDeckLinkAncillaryPacket interface of the newly created object to the packet parameter.

#### Syntax

```
HRESULT Next (IDeckLinkAncillaryPacket *packet);
```

#### Parameters

Name	Direction	Description
packet	out	Pointer to IDeckLinkAncillaryPacket interface object or NULL when no more ancillary packets are available. This object must be released by the caller when no longer required.

#### Return Values

Value	Description
S_FALSE	No (more) packets found
S_OK	Success
E_INVALIDARG	Parameter packet variable is NULL

### 2.5.23 IDeckLinkAncillaryPacket Interface

The IDeckLinkAncillaryPacket object interface represents an ancillary data packet within a Video Frame. A reference to an IDeckLinkAncillaryPacket object interface can either be obtained with a known DID/SDID by calling GetFirstPacketByID on a IDeckLinkVideoFrameAncillaryPackets or via the IDeckLinkAncillaryPacketIterator interface.

**TIP** Developers may subclass IDeckLinkAncillaryPacket to implement a specific VANC data packet type.

#### Related Interfaces

Interface	Interface ID	Description
IDeckLinkAncillaryPacketIterator	IID_IDeckLinkAncillaryPacketIterator	IDeckLinkAncillaryPacketIterator::Next returns IDeckLinkAncillaryPacket interfaces representing each ancillary packet in a video frame
IDeckLinkVideoFrameAncillaryPackets	IID_IDeckLinkVideoFrameAncillaryPackets	IDeckLinkVideoFrameAncillaryPackets::GetFirstPacketByID returns an IDeckLinkAncillaryPacket object interface

Public Member Functions	
Method	Description
GetBytes	Get pointer to ancillary packet data
GetDID	Get Data ID (DID) for ancillary packet
GetSDID	Get Secondary Data ID (SDID) for ancillary packet
GetLineNumber	Get the video frame line number of ancillary packet
GetDataStreamIndex	Get the data stream index for ancillary packet



### 2.5.23.1 IDeckLinkAncillaryPacket::GetBytes method

The `GetBytes` method allows direct access to the data buffer of the ancillary packet.

**TIP** When subclassing `IDeckLinkAncillaryPacket`, implement `GetBytes` with support of at least one type of `BMDAncillaryPacketFormat`. Specify `NULL` for either output parameter if unwanted.

#### Syntax

```
HRESULT GetBytes (BMDAncillaryPacketFormat format, const void *data, uint32_t *size);
```

#### Parameters

Name	Direction	Description
format	in	Requested format of data buffer output ( <b>BMDAncillaryPacketFormat</b> )
data	out	Pointer to ancillary packet data buffer. The pointer is valid while <b>IDeckLinkAncillaryPacket</b> object remains valid.
size	out	Number of elements in the data buffer. When the requested format is <b>bmdAncillaryPacketFormatYCbCr10</b> , this value will be the size in pixels. For other ancillary packet formats, it will be the length of the buffer in units of the format's type size.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_NOTIMPL	Format not implemented

### 2.5.23.2 IDeckLinkAncillaryPacket::GetDID method

The `GetDID` method returns the Data ID (DID) of the ancillary packet.

#### Syntax

```
uint8_t GetDID ();
```

#### Return Values

Value	Description
DID	Data ID (DID) of the ancillary packet

### 2.5.23.3 IDeckLinkAncillaryPacket::GetSDID method

The `GetSDID` method returns the SecondaryData ID (SDID) of the ancillary packet.

#### Syntax

```
uint8_t GetSDID ();
```

#### Return Values

Value	Description
SDID	Secondary Data ID (SDID) of the ancillary packet

### 2.5.23.4 **IDeckLinkAncillaryPacket::GetLineNumber** method

The **GetLineNumber** method returns the video frame line number of an ancillary packet. When subclassing **IDeckLinkAncillaryPacket** for VANC output, if **GetLineNumber** returns 0, the ancillary packet will be assigned a line automatically determined by the driver.

#### Syntax

```
uint32_t GetLineNumber ();
```

#### Return Values

Value	Description
LineNumber	Video frame line number of the ancillary packet

### 2.5.23.5 **IDeckLinkAncillaryPacket::GetDataStreamIndex** method

The **GetDataStreamIndex** method returns a data stream index of the ancillary packet.

This function should only return 0 for SD modes. In HD and above, this function will normally return 0 to output the ancillary packet in luma color channel. However this function can return 1 to encode a second data stream in the chroma color channel, but this should only occur when the first data stream is completely full.

#### Syntax

```
uint8_t GetDataStreamIndex ();
```

#### Return Values

Value	Description
DataStreamIndex	Data stream index for the ancillary packet

## 2.5.24 **IDeckLinkTimecode** Interface

The **IDeckLinkTimecode** object interface represents a video timecode and provides methods to access the timecode or its components.

#### Related Interfaces

Interface	Interface ID	Description
IDeckLinkVideoFrame	IID_IDeckLinkVideoFrame	<b>IDeckLinkVideoFrame::GetTimecode</b> returns an <b>IDeckLinkTimecode</b> object interface

Public Member Functions	
Method	Description
GetBCD	Get timecode in BCD
GetComponents	Get timecode components
GetString	Get timecode as formatted string
GetFlags	Get timecode flags
GetTimecodeUserBits	Get timecode user bits.

## 2.5.24.1 IDeckLinkTimecode::GetBCD method

The `GetBCD` method returns the timecode in Binary Coded Decimal representation.

### Syntax

```
BMDTimecodeBCD GetBCD();
```

### Return Values

Value	Description
Timecode	Timecode value in BCD format (See <code>BMDTimecodeBCD</code> for details)

## 2.5.24.2 IDeckLinkTimecode::GetComponents method

The `GetComponents` method returns individual components of the timecode. Specify NULL for any unwanted parameters.

### Syntax

```
HRESULT GetComponents (uint8_t *hours, uint8_t *minutes,  
                      uint8_t *seconds, uint8_t *frames);
```

### Parameters

Name	Direction	Description
hours	out	Hours component of timecode
minutes	out	Minutes component of timecode
seconds	out	Seconds component of timecode
frames	out	Frames component of timecode

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.24.3 IDeckLinkTimecode::GetString method

The `GetString` method returns the timecode formatted as a standard timecode string.

#### Syntax

```
HRESULT GetString (string *timecode);
```

#### Parameters

Name	Direction	Description
timecode	out	Timecode formatted as a standard timecode string: "HH:MM:SS:FF". This allocated string must be freed by the caller when no longer required

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.24.4 IDeckLinkTimecode::GetFlags method

The `GetFlags` method returns the flags accompanying a timecode.

#### Syntax

```
BMDTimecodeFlags GetFlags()
```

#### Return Values

Value	Description
TimecodeFlags	Timecode flags (see <code>BMDTimecodeFlags</code> for details)

### 2.5.24.5 IDeckLinkTimecode::GetTimecodeUserBits method

The `GetTimecodeUserBits` method returns the timecode user bits.

#### Syntax

```
HRESULT GetTimecodeUserBits (BMDTimecodeUserBits *userBits);
```

#### Parameters

Name	Direction	Description
userBits	out	The user bits.

#### Return Values

Value	Description
E_POINTER	The userBits parameter is NULL.
S_OK	Success

## 2.5.25 IDeckLinkScreenPreviewCallback Interface

The `IDeckLinkScreenPreviewCallback` object interface is a callback class which is called to facilitate updating of an on-screen preview of a video stream being played or captured.

An object with the `IDeckLinkScreenPreviewCallback` object interface may be registered as a callback with the `IDeckLinkInput` or `IDeckLinkOutput` interfaces.

**TIP** During playback or capture, frames will be delivered to the preview callback. A dedicated preview thread waits for the next available frame before calling the callback. The frame delivery rate may be rate limited by the preview callback it is not required to maintain full frame rate and missing frames in preview will have no impact on capture or playback.

### Related Interfaces

Interface	Interface ID	Description
<code>IDeckLinkInput</code>	<code>IID_IDeckLinkInput</code>	An <code>IDeckLinkScreenPreviewCallback</code> object interface may be registered with <code>IDeckLinkInput::SetScreenPreviewCallback</code>
<code>IDeckLinkOutput</code>	<code>IID_IDeckLinkOutput</code>	An <code>IDeckLinkScreenPreviewCallback</code> object interface may be registered with <code>IDeckLinkOutput::SetScreenPreviewCallback</code>

### Public Member Functions

Method	Description
<code>DrawFrame</code>	Called when a new frame is available for the preview display

## 2.5.25.1 IDeckLinkScreenPreviewCallback::DrawFrame method

The `DrawFrame` method is called on every frame boundary while scheduled playback is running.

**FOR EXAMPLE** Scheduled NTSC which runs at 29.97 frames per second, will result in the preview callback's `DrawFrame()` method being called 29.97 times per second while scheduled playback is running.

The return value (required by COM) is ignored by the caller.

**NOTE** If the frame to be drawn to the preview hasn't changed since the last time the callback was called, the frame parameter will be `NULL`.

### Syntax

```
HRESULT DrawFrame(IDeckLinkVideoFrame *theFrame);
```

### Parameters

Name	Direction	Description
<code>theFrame</code>	in	Video frame to preview

### Return Values

Value	Description
<code>E_FAIL</code>	Failure
<code>S_OK</code>	Success

## 2.5.26 IDeckLinkGLScreenPreviewHelper Interface

The **IDeckLinkGLScreenPreviewHelper** object interface may be used with a simple **IDeckLinkScreenPreviewCallback** implementation to provide OpenGL based preview rendering which is decoupled from the incoming or outgoing video stream being previewed.

A reference to an **IDeckLinkGLScreenPreviewHelper** interface may be obtained from **CoCreateInstance** on platforms with native COM support or from **CreateOpenGLScreenPreviewHelper** (OpenGL 2.0) or **CreateOpenGL3ScreenPreviewHelper** (OpenGL 3.2) on other platforms.

Typical usage of **IDeckLinkGLScreenPreviewHelper** is as follows:

- Configure an OpenGL context as an orthographic projection using code similar to the following:  
glViewport(0, 0, (GLsizei)newSize.width, (GLsizei)newSize.height);  
glMatrixMode(GL\_PROJECTION);  
glLoadIdentity();  
glOrtho(-1.0, 1.0, -1.0, 1.0, -1.0, 1.0);  
glMatrixMode(GL\_MODELVIEW);
- Create an **IDeckLinkGLScreenPreviewHelper** object interface using **CoCreateInstance** or **CreateOpenGLScreenPreviewHelper**  
Call **IDeckLinkGLScreenPreviewHelper::InitializeGL** from the OpenGL context
- When repainting the **OpenGL** context, call **IDeckLinkGLScreenPreviewHelper::PaintGL**.  
The preview image will be drawn between (-1,-1) and (1,1) in the GL space.
- Add any graphical overlays on the preview window as desired.
- Create a subclass of **IDeckLinkScreenPreviewCallback** which calls  
**IDeckLinkGLScreenPreviewHelper::SetFrame** from  
**IDeckLinkScreenPreviewCallback::DrawFrame**
- Register an instance of the **IDeckLinkScreenPreviewCallback** subclass with  
**IDeckLinkInput::SetScreenPreviewCallback** or  
**IDeckLinkOutput::SetScreenPreviewCallback** as appropriate.

### Related Interfaces

Interface	Interface ID	Description
IDeckLinkScreenPreview	IID_IDeckLinkScreenPreview	<b>IDeckLinkGLScreenPreviewHelper::SetFrame</b> may be called from <b>IDeckLinkScreenPreview::DrawFrame</b>

Public Member Functions	
Method	Description
InitializeGL	Initialize GL previewing
PaintGL	Repaint the GL preview
SetFrame	Set the preview frame to display on the next PaintGL call
Set3DPreviewFormat	Set the 3D preview format.

### 2.5.26.1 IDeckLinkGLScreenPreviewHelper::InitializeGL method

The **InitializeGL** method should be called from the preview OpenGL context during initialization of that context.

#### Syntax

```
HRESULT InitializeGL();
```

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.26.2 IDeckLinkGLScreenPreviewHelper::PaintGL method

The **PaintGL** method should be called from the preview OpenGL context whenever the preview frame needs to be repainted. Frames to be displayed should be provided to **IDeckLinkGLScreenPreviewHelper::SetFrame**.

**PaintGL** and **SetFrame** allow OpenGL updates to be decoupled from new frame availability.

#### Syntax

```
HRESULT PaintGL();
```

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.26.3 IDeckLinkGLScreenPreviewHelper::SetFrame method

The **SetFrame** method is used to set the preview frame to display on the next call to **IDeckLinkGLScreenPreviewHelper::PaintGL**.

Depending on the rate and timing of calls to **SetFrame** and **PaintGL**, some frames may not be displayed or may be displayed multiple times.

#### Syntax

```
HRESULT SetFrame(IDeckLinkVideoFrame *theFrame)
```

#### Parameters

Name	Direction	Description
theFrame	in	Video frame to preview

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.26.4 IDeckLinkGLScreenPreviewHelper::Set3DPreviewFormat

The `Set3DPreviewFormat` method is used to set the 3D preview format.

### Syntax

```
HRESULT Set3DPreviewFormat(BMD3DPreviewFormat *previewFormat);
```

### Parameters

Name	Direction	Description
previewFormat	in	The 3D preview format. See the Linked frame preview format ( <code>BMD3DPreviewFormat</code> ) section for more details.

### Return Values

Value	Description
S_OK	Success

## 2.5.27 IDeckLinkCocoaScreenPreviewCallback Interface

The `IDeckLinkCocoaScreenPreviewCallback` object interface is a cocoa callback class which is called to facilitate updating of an on-screen preview of a video stream being played or captured.

An `IDeckLinkCocoaScreenPreviewCallback` object can be created by calling `CreateCocoaScreenPreview`. This object can be registered as a callback with `IDeckLinkInput::SetScreenPreviewCallback` or `IDeckLinkOutput::SetScreenPreviewCallback` as appropriate.

**TIP** During playback or capture, frames will be delivered to the preview callback. A dedicated preview thread waits for the next available frame before calling the callback. The frame delivery rate may be rate limited by the preview callback it is not required to maintain full frame rate and missing frames in preview will have no impact on capture or playback.

### Related Interfaces

Interface	Interface ID	Description
<code>IDeckLinkInput</code>	<code>IID_IDeckLinkInput</code>	An <code>IDeckLinkCocoaScreenPreviewCallback</code> object interface may be registered with <code>IDeckLinkInput::SetScreenPreviewCallback</code>
<code>IDeckLinkOutput</code>	<code>IID_IDeckLinkOutput</code>	An <code>IDeckLinkCocoaScreenPreviewCallback</code> object interface may be registered with <code>IDeckLinkOutput::SetScreenPreviewCallback</code>



## 2.5.28 IDeckLinkDX9ScreenPreviewHelper Interface

The **IDeckLinkDX9ScreenPreviewHelper** object interface may be used with a simple **IDeckLinkScreenPreviewCallback** implementation to provide DirectX based preview rendering which is decoupled from the incoming or outgoing video stream being previewed.

A reference to an **IDeckLinkDX9ScreenPreviewHelper** object is obtained from **CoCreateInstance**.

Typical usage of **IDeckLinkDX9ScreenPreviewHelper** is as follows:

- Create an **IDeckLinkDX9ScreenPreviewHelper** object interface using **CoCreateInstance**.
- If 3D preview is required, call **IDeckLinkDX9ScreenPreviewHelper::Set3DPreviewFormat**
- Setup Direct 3D parameters:
 

```
D3DPRESENT_PARAMETERS          d3dpp;
IDirect3DDevice9*              dxDevice;
d3dpp.BackBufferFormat = D3DFMT_UNKNOWN;
d3dpp.BackBufferCount = 2;
d3dpp.Windowed = TRUE;
d3dpp.SwapEffect = D3DSWAPEFFECT_DISCARD;
d3dpp.hDeviceWindow = hwnd;
d3dpp.PresentationInterval = D3DPRESENT_INTERVAL_DEFAULT;
```
- Create a new device:
 

```
CreateDevice(D3DADAPTER_DEFAULT, D3DDEVTYPE_HAL, hwnd, D3DCREATE_HARDWARE_VERTEXPROCESSING | D3DCREATE_MULTITHREADED, &d3dpp, &dxDevice);
```
- Call **IDeckLinkDX9ScreenPreviewHelper::Initialize** (**dxDevice**)
 

When repainting, call the following methods:

```
dxDevice->BeginScene();
```
- **IDeckLinkDX9ScreenPreviewHelper::Render**();
 

```
dxDevice->EndScene();
```
- Create a subclass of **IDeckLinkScreenPreviewCallback** which calls **IDeckLinkDX9ScreenPreviewHelper::SetFrame** from **IDeckLinkScreenPreviewCallback::DrawFrame**.
- Register an instance of the **IDeckLinkScreenPreviewCallback** subclass with **IDeckLinkInput::SetScreenPreviewCallback** or **IDeckLinkOutput::SetScreenPreviewCallback** as appropriate.

### Related Interfaces

Interface	Interface ID	Description
IDeckLinkScreenPreview	IID_IDeckLinkScreenPreview	<b>IDeckLinkDX9ScreenPreviewHelper::SetFrame</b> may be called from <b>IDeckLinkScreenPreview::DrawFrame</b>

Public Member Functions	
Method	Description
Initialize	Initialize DirectX previewing.
Render	Repaint the DirectX preview.
SetFrame	Set the preview frame for display.
Set3DPreviewFormat	Set the 3D preview format.

### 2.5.28.1 IDeckLinkDX9ScreenPreviewHelper::Initialize method

The **Initialize** method sets the **IDirect3DDevice9** object to be used by the DeckLink API's preview helper.

#### Syntax

```
HRESULT Initialize (void *device);
```

#### Parameters

Name	Direction	Description
device	in	The <b>IDirect3DDevice9</b> object

#### Return Values

Value	Description
S_OK	Success

### 2.5.28.2 IDeckLinkDX9ScreenPreviewHelper::Render method

The **Render** method should be called whenever the preview frame needs to be repainted. The frames to be displayed should be provided to **IDeckLinkDX9ScreenPreviewHelper::SetFrame**.

#### Syntax

```
HRESULT Render (RECT *rc)
```

#### Parameters

Name	Direction	Description
rc	in	The display surface rectangle. If rc is NULL, the whole view port / surface is used. If the rc dimensions have changed, the display texture will be resized.

#### Return Values

Value	Description
S_OK	Success

### 2.5.28.3 IDeckLinkDX9ScreenPreviewHelper::SetFrame method

The **SetFrame** method will set a 2D or 3D **IDeckLinkVideoFrame** into a texture. This method is used to set the preview frame to display on the next call to **IDeckLinkDX9ScreenPreviewHelper::Render**. Depending on the rate and timing of calls to **SetFrame** and **Render**, some frames may not be displayed or may be displayed multiple times.

#### Syntax

```
HRESULT SetFrame (IDeckLinkVideoFrame *primaryFrame);
```

#### Parameters

Name	Direction	Description
primaryFrame	in	The video frame to preview.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.28.4 IDeckLinkDX9ScreenPreviewHelper::Set3DPreviewFormat method

The `Set3DPreviewFormat` method is used to set the 3D preview format.

### Syntax

```
HRESULT Set3DPreviewFormat (BMD3DPreviewFormat previewFormat);
```

### Parameters

Name	Direction	Description
previewFormat	in	The 3D preview format. See the 'Frame preview format' section ( <code>BMD3DPreviewFormat</code> ) for more details.

### Return Values

Value	Description
S_OK	Success

## 2.5.29 IDeckLinkDeckControl Interface

The `IDeckLinkDeckControl` object interface provides the capability to control a deck via the RS422 port (if available) of a DeckLink device.

An `IDeckLinkDeckControl` object interface can be obtained from the `IDeckLink` interface using `QueryInterface`.

### Related Interfaces

Interface	Interface ID	Description
<code>IDeckLinkDeckControl</code>	<code>IID_IDeckLinkDeckControl</code>	An <code>IDeckLinkDeckControl</code> object interface may be obtained from <code>IDeckLink</code> using <code>QueryInterface</code> .
<code>IDeckLinkDeckControlStatusCallback</code>	<code>IID_IDeckLinkDeckControlStatusCallback</code>	An <code>IDeckLinkDeckControlStatusCallback</code> object interface may be registered with <code>IDeckLinkDeckControl::SetCallback</code> .

Public Member Functions	
Method	Description
Open	Open a connection to the deck.
Close	Close the connection to the deck.
GetCurrentState	Get the current state of the deck.
SetStandby	Put the deck into standby mode.
SendCommand	Send a custom command to the deck.
Play	Send a play command to the deck.
Stop	Send a stop command to the deck.
TogglePlayStop	Toggle between play and stop mode.
Eject	Send an eject command to the deck.
GoToTimecode	Set the deck to go the specified timecode on the tape.
FastForward	Send a fast forward command to the deck.
Rewind	Send a rewind command to the deck.

Public Member Functions	
Method	Description
StepForward	Send a step forward command to the deck.
StepBack	Send a step back command to the deck.
Jog	Send a jog forward / reverse command to the deck.
Shuttle	Send a shuttle forward / reverse command to the deck.
GetTimecodeString	Get a timecode from deck in string format.
GetTimecode	Get a timecode from deck in IDeckLinkTimeCode format.
GetTimecodeBCD	Get a timecode from deck in BMDTimecodeBCD format.
SetPreroll	Set the preroll period.
GetPreroll	Get the preroll period.
SetCaptureOffset	Set the field accurate capture timecode offset.
GetCaptureOffset	Current capture timecode offset
SetExportOffset	Set the field accurate export timecode offset.
GetExportOffset	Get the current setting of the field accurate export timecode offset.
GetManualExportOffset	Get the recommended delay fields of the current deck.
StartExport	Start an export to tape.
StartCapture	Start a capture.
GetDeviceID	Get deck device ID.
Abort	Stop current deck operation.
CrashRecordStart	Send a record command to the deck.
CrashRecordStop	Send a stop record command to the deck.
SetCallback	Set a deck control status callback.

## 2.5.29.1 IDeckLinkDeckControl::Open method

The **Open** method configures a deck control session and opens a connection to a deck. This command will fail if a RS422 serial port is not available on the DeckLink device.

The application should wait for a **IDeckLinkDeckControlStatusCallback::DeckControlStatusChanged** callback notification with the **bmdDeckControlStatusDeckConnected** bit set before using the rest of the deck control functionality.

### Syntax

```
HRESULT Open (BMDTimeScale timeScale, BMDTimeValue timeValue,  
             boolean timecodeIsDropFrame, BMDDeckControlError *error)
```

### Parameters

Name	Direction	Description
timeScale	in	The time scale.
timeValue	in	The time value in units of BMDTimeScale.
timecodeIsDropFrame	in	Timecode is drop frame (TRUE) or a non drop frame (FALSE).
error	out	The error code from the deck see BMDDeckControlError for details.

### Return Values

Value	Description
E_FAIL	Failure check error parameter.
S_OK	Success
E_INVALIDARG	One or more parameters are invalid.

## 2.5.29.2 IDeckLinkDeckControl::Close method

The **Close** method will optionally place the deck in standby mode before closing the connection.

### Syntax

```
HRESULT Close (boolean standbyOn)
```

### Parameters

Name	Direction	Description
standbyOn	in	Place the deck into standby mode (TRUE) before disconnection.

### Return Values

Value	Description
S_OK	Success

### 2.5.29.3 IDeckLinkDeckControl::GetCurrentState method

The `GetCurrentState` method will get the current state of the deck.

#### Syntax

```
HRESULT GetCurrentState (BMDDeckControlMode *mode, BMDDeckControlVTRControlState *vtrControlState, BMDDeckControlStatusFlags *flags);
```

#### Parameters

Name	Direction	Description
mode	out	The deck control mode see <code>BMDDeckControlMode</code> for details.
vtrControlState	out	The deck control state see <code>BMDDeckControlVTRControlState</code> for details.
flags	out	The deck control status flags see <code>BMDDeckControlStatusFlags</code> for details.

#### Return Values

Value	Description
S_OK	Success
E_INVALIDARG	One or more parameters are invalid.

### 2.5.29.4 IDeckLinkDeckControl::SetStandby method

The `SetStandby` method will send a “set standby” command to the deck.

The `IDeckLinkDeckControl` object must be in VTR control mode for this command to succeed.

#### Syntax

```
HRESULT SetStandby (boolean standbyOn);
```

#### Parameters

Name	Direction	Description
standbyOn	in	Set standby on (TRUE) , or set standby off (FALSE)

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.29.5 IDeckLinkDeckControl::SendCommand method

The **SendCommand** method will send a custom command to the deck. A custom command operation cannot occur if there is an export-to-tape, capture or a custom command operation in progress. The supplied custom command must conform to the Sony 9 Pin protocol and must not include the checksum byte. It will be generated by this interface and added to the command. The deck's response (minus the checksum) is stored in the provided buffer.

### Syntax

```
HRESULT SendCommand (uint8_t *inBuffer, uint32_t inBufferSize, uint8_t *outBuffer,
                    uint32_t *outDataSize, uint32_t outBufferSize, BMDDeckControlError *error);
```

### Parameters

Name	Direction	Description
inBuffer	in	The buffer containing the command packet to transmit.
inBufferSize	in	The size of the buffer containing the command packet to transmit.
outBuffer	out	The buffer to contain the response packet.
outDataSize	out	The size of the response data.
outBufferSize	out	The size of the buffer that will contain the response packet.
error	out	The error code sent by the deck see <b>BMDDeckControlError</b> for details.

### Return Values

Value	Description
E_INVALIDARG	One or more parameters are invalid.
E_UNEXPECTED	A previous custom command is still being processed.
E_FAIL	Failure check error parameter
S_OK	Success

## 2.5.29.6 IDeckLinkDeckControl::Play method

The **Play** method will send a "play" command to the deck. The **IDeckLinkDeckControl** object must be in VTR control mode for this command to succeed.

### Syntax

```
HRESULT Play (BMDDeckControlError *error);
```

### Parameters

Name	Direction	Description
error	out	The error code sent by the deck see <b>BMDDeckControlError</b> for details.

### Return Values

Value	Description
E_FAIL	Failure check error parameter.
S_OK	Success
E_INVALIDARG	The parameter is invalid.

## 2.5.29.7 IDeckLinkDeckControl::Stop method

The **Stop** method will send a “stop” command to the deck. The **IDeckLinkDeckControl** object must be in VTR control mode for this command to succeed.

### Syntax

```
HRESULT Stop (BMDDeckControlError *error);
```

### Parameters

Name	Direction	Description
error	out	The error code sent by the deck see <b>BMDDeckControlError</b> for details.

### Return Values

Value	Description
E_FAIL	Failure check error parameter.
S_OK	Success
E_INVALIDARG	The parameter is invalid.

## 2.5.29.8 IDeckLinkDeckControl::TogglePlayStop method

The **TogglePlayStop** method will send a “play” command to the deck, if the deck is currently paused or stopped. If the deck is currently playing, a “pause” command will be sent to the deck. The **IDeckLinkDeckControl** object must be in VTR control mode for this command to succeed.

### Syntax

```
HRESULT TogglePlayStop (BMDDeckControlError *error);
```

### Parameters

Name	Direction	Description
error	out	The error code sent by the deck see <b>BMDDeckControlError</b> for details.

### Return Values

Value	Description
E_FAIL	Failure check error parameter.
S_OK	Success
E_INVALIDARG	The parameter is invalid.



## 2.5.29.9 IDeckLinkDeckControl::Eject method

The `Eject` method will send an “eject tape” command to the deck.

The `IDeckLinkDeckControl` object must be in VTR control mode for this command to succeed.

### Syntax

```
HRESULT Eject (BMDDeckControlError *error);
```

### Parameters

Name	Direction	Description
error	out	The error code sent by the deck see <code>BMDDeckControlError</code> for details.

### Return Values

Value	Description
E_FAIL	Failure check error parameter.
S_OK	Success
E_INVALIDARG	The parameter is invalid.

## 2.5.29.10 IDeckLinkDeckControl::GoToTimecode method

The `GoToTimecode` method will send a “go to timecode” command to the deck.

### Syntax

```
HRESULT GoToTimecode (BMDTimecodeBCD timecode, BMDDeckControlError *error);
```

### Parameters

Name	Direction	Description
timecode	in	The timecode to go to.
error	out	The error code sent by the deck -see <code>BMDDeckControlError</code> for details.

### Return Values

Value	Description
E_FAIL	Failure check error parameter.
S_OK	Success
E_INVALIDARG	One or more parameters are invalid.

### 2.5.29.11 IDeckLinkDeckControl::FastForward method

The **FastForward** method will send a “fast forward” command to the deck. The **IDeckLinkDeckControl** object must be in VTR control mode for this command to succeed.

#### Syntax

```
HRESULT FastForward (boolean viewTape, BMDDeckControlError *error);
```

#### Parameters

Name	Direction	Description
viewTape	in	View the tape (TRUE) or enable automatic selection of “tape view” or “end to end view” (FALSE)
error	out	The error code sent by the deck see <b>BMDDeckControlError</b> for details.

#### Return Values

Value	Description
E_FAIL	Failure check error parameter.
S_OK	Success
E_INVALIDARG	One or more parameters are invalid.

### 2.5.29.12 IDeckLinkDeckControl::Rewind method

The **Rewind** method will send a “rewind” command to the deck. The **IDeckLinkDeckControl** object must be in VTR control mode for this command to succeed.

#### Syntax

```
HRESULT Rewind (boolean viewTape, BMDDeckControlError *error);
```

#### Parameters

Name	Direction	Description
viewTape	in	View the tape (TRUE) or enable automatic selection of “tape view” or “end to end view” (FALSE)
error	out	The error code sent by the deck see <b>BMDDeckControlError</b> for details.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	One or more parameters are invalid.

### 2.5.29.13 IDeckLinkDeckControl::StepForward method

The **StepForward** method will send a “step forward” command to the deck. The **IDeckLinkDeckControl** object must be in VTR control mode for this command to succeed.

#### Syntax

```
HRESULT StepForward (BMDDeckControlError *error);
```

#### Parameters

Name	Direction	Description
error	out	The error code sent by the deck see <b>BMDDeckControlError</b> for details.

#### Return Values

Value	Description
E_FAIL	Failure check error parameter.
S_OK	Success
E_INVALIDARG	The parameter is invalid.

### 2.5.29.14 IDeckLinkDeckControl::StepBack method

The **StepBack** method will send a “step back” command to the deck. The **IDeckLinkDeckControl** object must be in VTR control mode for this command to succeed.

#### Syntax

```
HRESULT StepBack (BMDDeckControlError *error);
```

#### Parameters

Name	Direction	Description
error	out	The error code sent by the deck see <b>BMDDeckControlError</b> for details.

#### Return Values

Value	Description
E_FAIL	Failure check error parameter.
S_OK	Success
E_INVALIDARG	The parameter is invalid.

## 2.5.29.15 IDeckLinkDeckControl::Jog method

The **Jog** method will send a “jog playback” command to the deck.

The **IDeckLinkDeckControl** object must be in VTR control mode for this command to succeed.

### Syntax

```
HRESULT Jog (double rate, BMDDeckControlError *error);
```

### Parameters

Name	Direction	Description
rate	in	The rate at which to jog playback. A value greater than 0 will enable forward playback, value less than 0 will enable reverse playback. The rate range is from -50.0 to 50.0
error	out	The error code sent by the deck see <b>BMDDeckControlError</b> for details.

### Return Values

Value	Description
E_FAIL	Failure check error parameter.
S_OK	Success
E_INVALIDARG	One or more parameters are invalid.

## 2.5.29.16 IDeckLinkDeckControl::Shuttle method

The **Shuttle** method will send a “shuttle” playback command to the deck.

The **IDeckLinkDeckControl** object must be in VTR control mode for this command to succeed.

### Syntax

```
HRESULT Shuttle (double rate, BMDDeckControlError *error);
```

### Parameters

Name	Direction	Description
rate	in	The rate at which to shuttle playback. A value greater than 0 will enable forward playback, a value less than 0 will enable reverse playback. The rate range is from -50.0 to 50.0
error	out	The error code sent by the deck see <b>BMDDeckControlError</b> for details.

### Return Values

Value	Description
E_FAIL	Failure check error parameter.
S_OK	Success
E_INVALIDARG	One or more parameters are invalid.

### 2.5.29.17 IDeckLinkDeckControl::GetTimecodeString method

The `GetTimecodeString` method will return the current timecode in string format.

#### Syntax

```
HRESULT GetTimecodeString (string currentTimeCode, BMDDeckControlError *error);
```

#### Parameters

Name	Direction	Description
currentTimeCode	out	The current timecode in string format.
error	out	The error code sent by the deck see <b>BMDDeckControlError</b> for details.

#### Return Values

Value	Description
E_FAIL	Failure check error parameter.
S_OK	Success
E_INVALIDARG	One or more parameters are invalid.

### 2.5.29.18 IDeckLinkDeckControl::GetTimecode method

The `GetTimecode` method will return the current timecode in **IDeckLinkTimecode** format.

#### Syntax

```
HRESULT GetTimecode (IDeckLinkTimecode currentTimecode, BMDDeckControlError *error);
```

#### Parameters

Name	Direction	Description
currentTimeCode	out	The current timecode in <b>IDeckLinkTimecode</b> format.
error	out	The error code sent by the deck see <b>BMDDeckControlError</b> for details.

#### Return Values

Value	Description
E_FAIL	Failure check error parameter.
S_OK	Success
E_INVALIDARG	One or more parameters are invalid.

### 2.5.29.19 IDeckLinkDeckControl::GetTimecodeBCD method

The `GetTimecodeBCD` method will return the current timecode in BCD format.

#### Syntax

```
HRESULT GetTimecodeBCD (BMDTimecodeBCD *currentTimecode, BMDDeckControlError *error);
```

#### Parameters

Name	Direction	Description
currentTimeCode	out	The timecode in BCD format.
error	out	The error code sent by the deck see <b>BMDDeckControlError</b> for details.

### Return Values

Value	Description
E_FAIL	Failure check error parameter.
S_OK	Success
E_INVALIDARG	One or more parameters are invalid.

## 2.5.29.20 IDeckLinkDeckControl::SetPreroll method

The `SetPreroll` method will set the preroll time period.

### Syntax

```
HRESULT SetPreroll (uint32_t prerollSeconds);
```

### Parameters

Name	Direction	Description
prerollSeconds	in	The preroll period in seconds to set.

### Return Values

Value	Description
S_OK	Success

## 2.5.29.21 IDeckLinkDeckControl::GetPreroll method

The `GetPreroll` method will get the preroll period setting.

### Syntax

```
HRESULT GetPreroll (uint32_t *prerollSeconds);
```

### Parameters

Name	Direction	Description
prerollSeconds	out	The current preroll period.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	The parameter is invalid.

### 2.5.29.22 IDeckLinkDeckControl::SetCaptureOffset method

The capture offset may be used to compensate for a deck specific offset between the inpoint and the time at which the capture starts.

#### Syntax

```
HRESULT SetCaptureOffset (int32_t captureOffsetFields);
```

#### Parameters

Name	Direction	Description
captureOffsetFields	in	The timecode offset to set in fields.

#### Return Values

Value	Description
S_OK	Success

### 2.5.29.23 IDeckLinkDeckControl::GetCaptureOffset method

The `GetCaptureOffset` method will return the current setting of the field accurate capture timecode offset in fields.

#### Syntax

```
HRESULT GetCaptureOffset (int32_t *captureOffsetFields);
```

#### Parameters

Name	Direction	Description
captureOffsetFields	out	The current timecode offset in fields.

#### Return Values

Value	Description
S_OK	Success
E_INVALIDARG	The parameter is invalid.

### 2.5.29.24 IDeckLinkDeckControl::SetExportOffset method

The `SetExportOffset` method will set the current export timecode offset in fields. This method permits fine control of the timecode offset to tailor for the response of an individual deck by adjusting the number of fields prior to the in or out point where an export will begin or end.

#### Syntax

```
HRESULT SetExportOffset (int32_t exportOffsetFields);
```

#### Parameters

Name	Direction	Description
exportOffsetFields	in	The timecode offset in fields.

#### Return Values

Value	Description
S_OK	Success

### 2.5.29.25 IDeckLinkDeckControl::GetExportOffset method

The `GetExportOffset` method will return the current setting of the export offset in fields.

#### Syntax

```
HRESULT GetExportOffset (int32_t * exportOffsetFields);
```

#### Parameters

Name	Direction	Description
exportOffsetFields	out	The current timecode offset in fields.

#### Return Values

Value	Description
S_OK	Success
E_INVALIDARG	The parameter is invalid.

### 2.5.29.26 IDeckLinkDeckControl::GetManualExportOffset method

The `GetManualExportOffset` method will return the manual export offset for the current deck. This is only applicable for manual exports and may be adjusted with the main export offset if required.

#### Syntax

```
HRESULT GetManualExportOffset (int32_t * deckManualExportOffsetFields);
```

#### Parameters

Name	Direction	Description
deckManualExportOffsetFields	out	The current timecode offset.

#### Return Values

Value	Description
S_OK	Success
E_INVALIDARG	The parameter is invalid.



## 2.5.29.27 IDeckLinkDeckControl::StartExport method

The **StartExport** method starts an export to tape operation using the given parameters. Prior to calling this method, the output interface should be set up as normal (refer to the **Playback** and **IDeckLinkOutput** interface sections).

**StartScheduledPlayback** should be called in the **bmdDeckControlPrepareForExportEvent** event in **IDeckLinkDeckControlStatusCallback::DeckControlEventReceived** callback. The callback object should be set using **IDeckLinkDeckControl::SetCallback**. A connection to the deck should then be opened using **IDeckLinkDeckControl::Open**. The preroll period can be set using **IDeckLinkDeckControl::SetPreroll** and an offset period set using **IDeckLinkDeckControl::SetExportOffset**.

After **StartExport** is called, the export will commence when the current time code equals the “inTimecode”. Scheduled frames are exported until the current timecode equals the “outTimecode”. During this period the **IDeckLinkDeckControlStatusCallback** will be called when deck control events occur.

At the completion of the export operation the **bmdDeckControlExportCompleteEvent** in the **IDeckLinkDeckControlStatusCallback::DeckControlEventReceived** will occur several frames from the “outTimecode”.

Resources may be released at this point or another export may be commenced.

### Syntax

```
HRESULT StartExport (BMDTimecodeBCD inTimecode, BMDTimecodeBCD outTimecode,
                    BMDDeckControlExportModeOpsFlags exportModeOps, BMDDeckControlError *error);
```

### Parameters

Name	Direction	Description
inTimecode	in	The timecode to start the export sequence.
outTimecode	in	The timecode to stop the export sequence.
exportModeOps	in	The export mode operations see <b>BMDDeckControlExportModeOpsFlags</b> for details.
error	out	The error code sent by the deck see <b>BMDDeckControlError</b> for details.

### Return Values

Value	Description
E_FAIL	Failure check error parameter.
S_OK	Success
E_INVALIDARG	The parameter is invalid.

## 2.5.29.28 IDeckLinkDeckControl::StartCapture method

The **StartCapture** method starts a capture operation using the given parameters. Prior to calling this method, the input interface should be set up as normal (refer to the **Capture** and **IDeckLinkInput** interface sections), **IDeckLinkDeckControl** should be configured (see description below) and a connection to the deck established using **IDeckLinkDeckControl::Open**.

A callback object should be set using **IDeckLinkDeckControl::SetCallback** and an offset period set using **IDeckLinkDeckControl::SetCaptureOffset**.

After **StartCapture** is called, the application must wait until the **bmdDeckControlPrepareForCaptureEvent** event is received via **IDeckLinkDeckControlStatusCallback::DeckControlEventReceived** callback. Reception of that event signals that the serial timecodes attached to the **IDeckLinkVideoFrame** objects (received via **IDeckLinkInputCallback::VideoInputFrameArrived**) can be used to determine if the frame is between the **inTimecode** and **outTimecode** timecodes.

The application must take into account that the serial timecode values should be adjusted by the value set using **IDeckLinkDeckControl::SetCaptureOffset**.

During this period **IDeckLinkDeckControlStatusCallback** will be called when deck control events occur.

At the completion of the capture operation the **bmdDeckControlCaptureCompleteEvent** event in the **IDeckLinkDeckControlStatus Callback::DeckControlEventReceived** method will occur several frames from the “**outTimecode**”. Resources may be released at this point. **IDeckLinkDeckControl** will return to VTR control mode.

### Syntax

```
HRESULT StartCapture (boolean useVITC, BMDTimecodeBCD inTimecode,
                    BMDTimecodeBCD outTimecode, BMDDeckControlError *error);
```

### Parameters

Name	Direction	Description
useVITC	in	If true use VITC as the source of timecodes.
inTimecode	in	The timecode to start the capture sequence.
outTimecode	in	The timecode to stop the capture sequence.
error	out	Error code sent by the deck see <b>BMDDeckControlError</b> for details.

### Return Values

Value	Description
E_FAIL	Failure check error parameter.
S_OK	Success
E_INVALIDARG	One or more parameters are invalid.

## 2.5.29.29 IDeckLinkDeckControl::GetDeviceID method

The `GetDeviceID` method gets the device ID returned by the deck.  
The `IDeckLinkDeckControl` must be in VTR control mode for this command to succeed.

### Syntax

```
HRESULT GetDeviceID (uint16_t *deviceId, BMDDeckControlError *error);
```

### Parameters

Name	Direction	Description
deviceId	out	The code for the device model.
error	out	The error code sent by the deck see <code>BMDDeckControlError</code> for details.

### Return Values

Value	Description
E_FAIL	Failure check error parameter.
S_OK	Success
E_INVALIDARG	One or more parameters are invalid.

## 2.5.29.30 IDeckLinkDeckControl::Abort method

The `Abort` operation is synchronous. Completion is signaled with a `bmdDeckControlAbortedEvent` event.

### Syntax

```
HRESULT Abort (void);
```

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.29.31 IDeckLinkDeckControl::CrashRecordStart method

The `CrashRecordStart` method sets the deck to record. The `IDeckLinkDeckControl` object must be in VTR control mode for this command to succeed.

### Syntax

```
HRESULT CrashRecordStart (BMDDeckControlError *error);
```

### Parameters

Name	Direction	Description
error	out	The error code sent by the deck see <code>BMDDeckControlError</code> for details.

### Return Values

Value	Description
E_FAIL	Failure check error parameter.
S_OK	Success
E_INVALIDARG	The parameter is invalid.

### 2.5.29.32 IDeckLinkDeckControl::CrashRecordStop method

The `CrashRecordStop` method stops the deck record operation.

The `IDeckLinkDeckControl` object must be in VTR control mode for this command to succeed.

#### Syntax

```
HRESULT CrashRecordStop (BMDDeckControlError *error);
```

#### Parameters

Name	Direction	Description
error	out	The error code sent by the deck see <code>BMDDeckControlError</code> for details.

#### Return Values

Value	Description
E_FAIL	Failure check error parameter.
S_OK	Success
E_INVALIDARG	The parameter is invalid.

### 2.5.29.33 IDeckLinkDeckControl::SetCallback method

The `SetCallback` method installs a callback object to be called when deck control events occur.

#### Syntax

```
HRESULT SetCallback (IDeckLinkDeckControlStatusCallback *callback);
```

#### Parameters

Name	Direction	Description
callback	in	The callback object implementing the <code>IDeckLinkDeckControlStatusCallback</code> object interface

#### Return Values

Value	Description
S_OK	Success

## 2.5.30 IDeckLinkDeckControlStatusCallback Interface

The `IDeckLinkDeckControlStatusCallback` object interface is a callback class which is called when the Deck control status has changed.

An object with the `IDeckLinkDeckControlStatusCallback` object interface may be registered as a callback with the `IDeckLinkDeckControl` interface.

### Related Interfaces

Interface	Interface ID	Description
<code>IDeckLinkDeckControl</code>	<code>IID_IDeckLinkDeckControl</code>	An <code>IDeckLinkDeckControlStatusCallback</code> object interface may be registered with <code>IDeckLinkDeckControl::SetCallback</code>

### Public Member Functions

Method	Description
<code>TimecodeUpdate</code>	Called when there is a change to the timecode.
<code>VTRControlStateChanged</code>	Called when the control state of the deck changes.
<code>DeckControlEventReceived</code>	Called when a deck control event occurs.
<code>DeckControlStatusChanged</code>	Called when deck control status has changed.

### 2.5.30.1 IDeckLinkDeckControlStatusCallback::TimecodeUpdate method

The `TimecodeUpdate` method is called when there is a change to the timecode.

Timecodes may be missed when playing at non 1x speed. This method will not be called during capture, and the serial timecode attached to each frame delivered by the API should be used instead.

#### Syntax

```
HRESULT TimecodeUpdate (BMDTimecodeBCD currentTimecode);
```

#### Parameters

Name	Direction	Description
<code>currentTimecode</code>	in	The current timecode.

#### Return Values

Value	Description
<code>E_FAIL</code>	Failure
<code>S_OK</code>	Success

### 2.5.30.2 IDeckLinkDeckControlStatusCallback::VTRControlStateChanged method

The **VTRControlStateChanged** method is called when there is a change in the deck control state. Refer to **BMDDeckControlVTRControlState** for the possible states. This method is only called while in VTR control mode.

#### Syntax

```
HRESULT VTRControlStateChanged  
(BMDDeckControlVTRControlState newState, BMDDeckControlError error);
```

#### Parameters

Name	Direction	Description
newState	in	The new deck control state see <b>BMDDeckControlVTRControlState</b> for details.
error	in	The deck control error code.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.30.3 IDeckLinkDeckControlStatusCallback::DeckControlEventReceived method

The **DeckControlEventReceived** method is called when a deck control event occurs.

#### Syntax

```
HRESULT DeckControlEventReceived  
(BMDDeckControlEvent event, BMDDeckControlError error);
```

#### Parameters

Name	Direction	Description
event	in	The deck control event that has occurred see <b>BMDDeckControlEvent</b> for details.
error	in	The deck control error that has occurred.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.30.4 IDeckLinkDeckControlStatusCallback::DeckControlStatusChanged method

The `DeckControlStatusChanged` method is called when the deck control status has changed.

### Syntax

```
HRESULT DeckControlStatusChanged (BMDDeckControlStatusFlags flags, uint32_t mask);
```

### Parameters

Name	Direction	Description
flags	in	The deck control current status see <code>BMDDeckControlStatusFlags</code> for details.
mask	in	The deck control status event flag(s) that has changed.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.31 IDeckLinkDiscovery Interface

The `IDeckLinkDiscovery` object interface is used to install or remove the callback for receiving DeckLink device discovery notifications. A reference to an `IDeckLinkDiscovery` object interface may be obtained from `CoCreateInstance` on platforms with native COM support or from `CreateDeckLinkDiscoveryInstance` on other platforms.

### Related Interfaces

Interface	Interface ID	Description
<code>IDeckLinkDeviceNotificationCallback</code>	<code>IID_IDeckLinkDeviceNotificationCallback</code>	A device notification callback can be installed with <code>IDeckLinkDiscovery::InstallDeviceNotifications</code> or uninstalled with <code>IDeckLinkDiscovery::UninstallDeviceNotifications</code>

Public Member Functions	
Method	Description
<code>InstallDeviceNotifications</code>	Install DeckLink device notifications callback
<code>UninstallDeviceNotifications</code>	Remove DeckLink device notifications callback

### 2.5.31.1 IDeckLinkDiscovery::InstallDeviceNotifications method

The `InstallDeviceNotifications` method installs the `IDeckLinkDeviceNotificationCallback` callback which will be called when a new DeckLink device becomes available.

#### Syntax

```
HRESULT InstallDeviceNotifications  
(IDeckLinkDeviceNotificationCallback* deviceCallback);
```

#### Parameters

Name	Direction	Description
deviceCallback	in	Callback object implementing the <code>IDeckLinkDeviceNotificationCallback</code> object interface.

#### Return Values

Value	Description
E_INVALIDARG	The parameter variable is NULL
E_FAIL	Failure
S_OK	Success

### 2.5.31.2 IDeckLinkDiscovery::UninstallDeviceNotifications method

The `UninstallDeviceNotifications` method removes the DeckLink device notifications callback. When this method returns, it guarantees there are no ongoing callbacks to the `IDeckLinkDeviceNotificationCallback` instance.

#### Syntax

```
HRESULT UninstallDeviceNotifications (void);
```

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.32 IDeckLinkDeviceNotificationCallback

The `IDeckLinkDeviceNotificationCallback` object interface is callback which is called when a DeckLink device arrives or is removed.

Public Member Functions	
Method	Description
DeckLinkDeviceArrived	A DeckLink device has arrived.
DeckLinkDeviceRemoved	A DeckLink device has been removed.



## 2.5.32.1 IDeckLinkDeviceNotificationCallback::DeckLinkDeviceArrived method

The **DeckLinkDeviceArrived** method is called when a new DeckLink device becomes available. This method will be called on an API private thread.

This method is abstract in the base interface and must be implemented by the application developer. The result parameter (required by COM) is ignored by the caller.

### Syntax

```
HRESULT DeckLinkDeviceArrived (IDeckLink* deckLinkDevice);
```

### Parameters

Name	Direction	Description
deckLinkDevice	in	DeckLink device. The <b>IDeckLink</b> reference will be released when the callback returns. To hold on to it beyond the callback, call <b>AddRef</b> . Your application then owns the <b>IDeckLink</b> reference and is responsible for managing the <b>IDeckLink</b> object's lifetime. The reference can be released at any time (including in the <b>DeckLinkDeviceRemoved</b> callback) by calling <b>Release</b> .

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.32.2 IDeckLinkDeviceNotificationCallback::DeckLinkDeviceRemoved method

The **DeckLinkDeviceRemoved** method is called when a DeckLink device is disconnected. This method will be called on an API private thread.

This method is abstract in the base interface and must be implemented by the application developer. The result parameter (required by COM) is ignored by the caller.

### Syntax

```
HRESULT DeckLinkDeviceRemoved (IDeckLink* deckLinkDevice);
```

### Parameters

Name	Direction	Description
deckLinkDevice	in	DeckLink device.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.33 IDeckLinkNotification Interface

The **IDeckLinkNotification** object interface is used to install or remove the callback for receiving DeckLink device notifications.

An **IDeckLinkNotification** object interface may be obtained from **IDeckLink** using **QueryInterface**.

### Related Interfaces

Interface	Interface ID	Description
IDeckLink	IID_IDeckLink	An <b>IDeckLinkNotification</b> object interface may be obtained from <b>IDeckLink</b> using <b>QueryInterface</b>
IDeckLinkNotificationCallback	IID_IDeckLinkNotificationCallback	An <b>IDeckLinkNotificationCallback</b> object can be subscribed using <b>IDeckLinkNotification::Subscribe</b> or unsubscribed using <b>IDeckLinkNotification::Unsubscribe</b>

### Public Member Functions

Method	Description
Subscribe	Subscribe a notification. Please see <b>BMDNotifications</b> for more details.
Unsubscribe	Unsubscribe a notification

### 2.5.33.1 IDeckLinkNotification::Subscribe method

The **Subscribe** method registers a callback object for a given topic.

#### Syntax

```
HRESULT Subscribe (BMDNotifications topic,  
IDeckLinkNotificationCallback *theCallback);
```

#### Parameters

Name	Direction	Description
topic	in	The notification event type.
theCallback	in	The callback object implementing the <b>IDeckLinkNotificationCallback</b> object interface.

#### Return Values

Value	Description
E_INVALIDARG	The callback parameter variable is NULL
E_FAIL	Failure
S_OK	Success

## 2.5.33.2 IDeckLinkNotification::Unsubscribe method

The **Unsubscribe** method removes a notification event type from a callback object.

### Syntax

```
HRESULT Unsubscribe (BMDNotifications topic, IDeckLinkNotificationCallback  
*theCallback);
```

### Parameters

Name	Direction	Description
topic	in	The notification event type.
theCallback	in	The callback object implementing the <b>IDeckLinkNotificationCallback</b> object interface.

### Return Values

Value	Description
E_INVALIDARG	The callback parameter variable is NULL
E_FAIL	Failure
S_OK	Success

## 2.5.34 IDeckLinkNotificationCallback Interface

The **IDeckLinkNotificationCallback** object interface is used to notify the application about a subscribed event.

### Related Interfaces

Interface	Interface ID	Description
IDeckLinkNotification	IID_IDeckLinkNotification	An <b>IDeckLinkNotificationCallback</b> object can be subscribed using <b>IDeckLinkNotification::Subscribe</b> . An <b>IDeckLinkNotificationCallback</b> object can be unsubscribed using <b>IDeckLinkNotification::Unsubscribe</b> .

Public Member Functions	
Method	Description
Notify	Called when a subscribed notification event has occurred.

## 2.5.34.1 IDeckLinkNotificationCallback::Notify method

The **Notify** method is called when subscribed notification occurs.

This method is abstract in the base interface and must be implemented by the application developer. The result parameter (required by COM) is ignored by the caller.

### Syntax

```
HRESULT Notify(BMDNotifications topic, uint64_t param1, uint64_t param2);
```

### Parameters

Name	Direction	Description
topic	in	The type of notification. Please see <b>BMDNotifications</b> for more details.
param1	in	The first parameter of the notification.
param2	in	The second parameter of the notification.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.35 IDeckLinkEncoderInput Interface

The **IDeckLinkEncoderInput** object interface allows an application to capture an encoded video and audio stream from a DeckLink device.

An **IDeckLinkEncoderInput** interface can be obtained from an **IDeckLink** object interface using **QueryInterface**. If **QueryInterface** for an input interface is called on a device which does not support encoded capture, then **QueryInterface** will fail and return **E\_NOINTERFACE**.

Encoded Video capture operates in a push model with encoded video data delivered to an **IDeckLinkEncoderInputCallback** object interface. Audio capture is optional and can be handled by using the same callback object.

### Related Interfaces

Interface	Interface ID	Description
IDeckLink	IID_IDeckLink	An <b>IDeckLinkEncoderInput</b> object interface may be obtained from <b>IDeckLink</b> using <b>QueryInterface</b>
IDeckLinkDisplayModelerator	IID_IDeckLinkDisplayModelerator	<b>IDeckLinkEncoderInput::GetDisplayModelerator</b> returns an <b>IDeckLinkDisplayModelerator</b> object interface
IDeckLinkEncoderInputCallback	IID_IDeckLinkEncoderInputCallback	An <b>IDeckLinkEncoderInputCallback</b> object interface may be registered with <b>IDeckLinkEncoderInput::SetCallback</b>
IDeckLinkDisplayMode	IID_IDeckLinkDisplayMode	<b>IDeckLinkEncoderInput::GetDisplayMode</b> returns an <b>IDeckLinkDisplayMode</b> interface object

Public Member Functions	
Method	Description
DoesSupportVideoMode	Check whether a given video mode is supported for input
GetDisplayMode	Get a display mode object based on identifier

Public Member Functions	
Method	Description
GetDisplayModelerator	Get an iterator to enumerate the available input display modes
EnableVideoInput	Configure video input
DisableVideoInput	Disable video input
GetAvailablePacketsCount	Query number of available encoded packets
SetMemoryAllocator	Register custom memory allocator for encoded video packets
EnableAudioInput	Configure audio input
DisableAudioInput	Disable audio input
GetAvailableAudioSampleFrameCount	Query audio buffer status
StartStreams	Start encoded capture
StopStreams	Stop encoded capture
PauseStreams	Pause encoded capture
FlushStreams	Removes any buffered video and audio frames.
SetCallback	Register input callback
GetHardwareReferenceClock	Get the hardware system clock

### 2.5.35.1 IDeckLinkEncoderInput::DoesSupportVideoMode method

The **DoesSupportVideoMode** method indicates whether a given display mode is supported on encoder input.

#### Syntax

```
HRESULT DoesSupportVideoMode
(BMDVideoConnection connection, BMDDisplayMode requestedMode,
BMDPixelFormat requestedCodec, uint32_t requestedCodecProfile,
BMDSupportedVideoModeFlags flags, bool *supported);
```

#### Parameters

Name	Direction	Description
connection	in	Input connection to check (see <b>BMDVideoConnection</b> for details).
requestedMode	in	Display mode to check.
requestedCodec	in	Encoded pixel format to check.
requestedCodecProfile	in	Codec profile to check.
flags	in	Input video mode flags (see <b>BMDSupportedVideoModeFlags</b> for details).
supported	out	Returns true if the display mode is supported.

#### Return Values

Value	Description
E_INVALIDARG	Either parameter requestedMode has an invalid value or parameter supported variable is NULL.
E_FAIL	Failure
S_OK	Success

## 2.5.35.2 IDeckLinkEncoderInput::GetDisplayMode method

The `GetDisplayMode` method returns the `IDeckLinkDisplayMode` object interface for an input display mode identifier.

### Syntax

```
HRESULT GetDisplayMode (BMDDisplayMode displayMode,  
IDeckLinkDisplayMode *resultDisplayMode);
```

### Parameters

Name	Direction	Description
displayMode	in	The display mode ID (See <code>BMDDisplayMode</code> ).
resultDisplayMode	out	Pointer to the display mode with matching ID. The object must be released by the caller when no longer required.

### Return Values

Value	Description
E_INVALIDARG	Either parameter <code>displayMode</code> has an invalid value or parameter <code>resultDisplayMode</code> variable is NULL.
E_OUTOFMEMORY	Insufficient memory to create the result display mode object.
S_OK	Success

## 2.5.35.3 IDeckLinkEncoderInput::GetDisplayModeIterator

The `GetDisplayModeIterator` method returns an iterator which enumerates the available display modes.

### Syntax

```
HRESULT GetDisplayModeIterator (IDeckLinkDisplayModeIterator *iterator);
```

### Parameters

Name	Direction	Description
iterator	out	display mode iterator

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.35.4 IDeckLinkEncoderInput::EnableVideoInput

The **EnableVideoInput** method configures video input and puts the hardware into encoded video capture mode. Video input (and optionally audio input) is started by calling **StartStreams**.

### Syntax

```
HRESULT EnableVideoInput (BMDDisplayMode displayMode,  
                          BMDPixelFormat pixelFormat, BMDVideoInputFlags flags);
```

### Parameters

Name	Direction	Description
displayMode	in	Video mode to capture
pixelFormat	in	Encoded pixel format to capture
flags	in	Capture flags

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	Is returned on invalid mode or video flags
E_ACCESSDENIED	Unable to access the hardware or input stream currently active
E_OUTOFMEMORY	Unable to create a new frame

## 2.5.35.5 IDeckLinkEncoderInput::DisableVideoInput

The **DisableVideoInput** method disables the hardware video capture mode.

### Syntax

```
HRESULT DisableVideoInput ();
```

### Parameters

none.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.35.6 IDeckLinkEncoderInput::EnableAudioInput

The **EnableAudioInput** method configures audio input and puts the hardware into audio capture mode. Encoded audio and video input is started by calling **StartStreams**.

### Syntax

```
HRESULT EnableAudioInput (BMDAudioFormat audioFormat, BMDAudioSampleRate sampleRate, BMDAudioSampleType sampleType, uint32_t channelCount);
```

### Parameters

Name	Direction	Description
audioFormat	in	Audio format to encode.
sampleRate	in	Sample rate to capture
sampleType	in	Sample type to capture
channelCount	in	Number of audio channels to capture – only 2, 8 or 16 channel capture is supported.

### Return Values

Value	Description
E_FAIL	Failure
E_INVALIDARG	Invalid audio format or number of channels requested
E_ACCESSDENIED	Unable to access the hardware or input stream currently active
S_OK	Success

## 2.5.35.7 IDeckLinkEncoderInput::DisableAudioInput

The **DisableAudioInput** method disables the hardware audio capture mode.

### Syntax

```
HRESULT DisableAudioInput ();
```

### Parameters

none.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success



### 2.5.35.8 IDeckLinkEncoderInput::StartStreams

The **StartStreams** method starts encoded video and audio capture as configured with **EnableVideoInput** and optionally **EnableAudioInput**.

#### Syntax

```
HRESULT StartStreams ();
```

#### Parameters

none.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_ACCESSDENIED	Input stream is already running.
E_UNEXPECTED	Video and Audio inputs are not enabled.

### 2.5.35.9 IDeckLinkEncoderInput::StopStreams

The **StopStreams** method stops encoded video and audio capture.

#### Syntax

```
HRESULT StopStreams ();
```

#### Parameters

none.

#### Return Values

Value	Description
E_ACCESSDENIED	Input stream already stopped.
S_OK	Success

### 2.5.35.10 IDeckLinkEncoderInput::PauseStreams

The **PauseStreams** method pauses encoded video and audio capture. Capture time continues while the streams are paused but no video or audio will be captured. Paused capture may be resumed by calling **PauseStreams** again. Capture may also be resumed by calling **StartStreams** but capture time will be reset.

#### Syntax

```
HRESULT PauseStreams ();
```

#### Parameters

none.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.35.11 IDeckLinkEncoderInput::FlushStreams

The **FlushStreams** method removes any buffered video packets and audio frames.

#### Syntax

```
HRESULT FlushStreams ();
```

#### Parameters

none.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.35.12 IDeckLinkEncoderInput::SetCallback

The **SetCallback** method configures a callback which will be called as new encoded video, and audio packets become available. Encoder capture is started with **StartStreams**, stopped with **StopStreams** and may be paused with **PauseStreams**.

#### Syntax

```
HRESULT SetCallback (IDeckLinkEncoderInputCallback *theCallback);
```

#### Parameters

Name	Direction	Description
theCallback	in	Callback object implementing the <b>IDeckLinkEncoderInputCallback</b> object interface

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.35.13 **IDeckLinkEncoderInput::GetHardwareReferenceClock**

The **GetHardwareReferenceClock** method returns a clock that is locked to the system clock. The absolute values returned by this method are meaningless, however the relative differences between subsequent calls can be used to determine elapsed time. This method can be called while video input is enabled (see **IDeckLinkEncoderInput::EnableVideoInput** for details).

#### **Syntax**

```
HRESULT GetHardwareReferenceClock (BMDTimeScale desiredTimeScale, BMDTimeValue *hardwareTime, BMDTimeValue *timeInFrame, BMDTimeValue *ticksPerFrame);
```

#### **Parameters**

<b>Name</b>	<b>Direction</b>	<b>Description</b>
desiredTimeScale	in	Desired time scale
hardwareTime	out	Hardware reference time (in units of desiredTimeScale)
timeInFrame	out	Time in frame (in units of desiredTimeScale)
ticksPerFrame	out	Number of ticks for a frame (in units of desiredTimeScale)

#### **Return Values**

<b>Value</b>	<b>Description</b>
E_FAIL	Failure
S_OK	Success

### 2.5.35.14 **IDeckLinkEncoderInput::SetMemoryAllocator**

The **SetMemoryAllocator** method sets a custom memory allocator for encoded video packet allocations during capture. Use of a custom memory allocator is optional.

#### **Syntax**

```
HRESULT SetMemoryAllocator (IDeckLinkMemoryAllocator *theAllocator);
```

#### **Parameters**

<b>Name</b>	<b>Direction</b>	<b>Description</b>
theAllocator	in	Allocator object with an <b>IDeckLinkMemoryAllocator</b> interface

#### **Return Values**

<b>Value</b>	<b>Description</b>
E_FAIL	Failure
S_OK	Success

### 2.5.35.15 IDeckLinkEncoderInput::GetAvailableAudioSampleFrameCount

The `GetAvailableAudioSampleFrameCount` method returns the number of audio sample frames currently buffered. Use of this method is only required when using pull model audio – the same audio data is made available via `IDeckLinkEncoderInputCallback` and may be ignored.

#### Syntax

```
HRESULT GetAvailableAudioSampleFrameCount (uint32_t *availableSampleFrameCount);
```

#### Parameters

Name	Direction	Description
availableSampleFrameCount	out	The number of buffered audio frames currently available.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.35.16 IDeckLinkEncoderInput::GetAvailablePacketsCount method

The `GetAvailablePacketsCount` method provides the number of encoded video packets that are queued to be delivered to the `IDeckLinkEncoderInputCallback::VideoPacketArrived` callback.

#### Syntax

```
HRESULT GetAvailablePacketsCount(uint32_t* availablePacketsCount)
```

#### Parameters

Name	Direction	Description
availablePacketsCount	out	Number of available encoded packets

#### Return Values

Value	Description
S_OK	Success

## 2.5.36 IDeckLinkEncoderInputCallback Interface

The `IDeckLinkEncoderInputCallback` object interface is a callback class which is called to provide encoded video packets and audio data during an encoded capture operation.

### Related Interfaces

Interface	Interface ID	Description
IDeckLinkEncoderInput	IID_IDeckLinkEncoderInput	An <code>IDeckLinkEncoderInputCallback</code> object interface may be registered with <code>IDeckLinkEncoderInput::SetCallback</code>
IDeckLinkEncoderVideoPacket	IID_IDeckLinkEncoderVideoPacket	An <code>IDeckLinkEncoderVideoPacket</code> object interface is passed to <code>IDeckLinkEncoderInputCallback::VideoPacketArrived</code>
IDeckLinkEncoderAudioPacket	IID_IDeckLinkEncoderAudioPacket	An <code>IDeckLinkEncoderAudioPacket</code> object interface is passed to <code>IDeckLinkEncoderInputCallback::AudioPacketArrived</code>

Public Member Functions	
Method	Description
VideoInputSignalChanged	Called when a video input signal change is detected
VideoPacketArrived	Called when new video data is available
AudioPacketArrived	Called when new audio data is available

### 2.5.36.1 IDeckLinkEncoderInputCallback::VideoInputSignalChanged method

The `VideoInputSignalChanged` method is called when a video signal change has been detected by the hardware.

To enable this feature, the `bmdVideoInputEnableFormatDetection` flag must be set when calling `IDeckLinkEncoderInput::EnableVideoInput()`.

#### Syntax

```
HRESULT VideoInputSignalChanged (BMDVideoInputFormatChangedEvents notificationEvents,  
IDeckLinkDisplayMode *newDisplayMode,  
BMDDetectedVideoInputFormatFlags detectedSignalFlags);
```

#### Parameters

Name	Direction	Description
notificationEvents	in	The notification events
newDisplayMode	in	The new display mode.
detectedSignalFlags	in	The detected signal flags.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.36.2 IDeckLinkEncoderInputCallback::VideoPacketArrived

The **VideoPacketArrived** method is called when an encoded packet has arrived. The method is abstract in the base interface and must be implemented by the application developer. The result parameter (required by COM) is ignored by the caller.

When encoded capture is started using **bmdFormatH265**, this callback is used to deliver VCL and non-VCL NAL units.

#### Syntax

```
HRESULT VideoPacketArrived (IDeckLinkEncoderVideoPacket* videoPacket);
```

#### Parameters

Name	Direction	Description
videoPacket	in	The encoded packet that has arrived. The packet is only valid for the duration of the callback. To hold on to the packet beyond the callback call <b>AddRef</b> , and to release the packet when it is no longer required call <b>Release</b> .

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.36.3 IDeckLinkEncoderInputCallback::AudioPacketArrived

The **AudioPacketArrived** method is called when audio capture is enabled with **IDeckLinkEncoderInput::EnableAudioInput**, and an audio packet has arrived. The method is abstract in the base interface and must be implemented by the application developer.

The result parameter (required by COM) is ignored by the caller.

#### Syntax

```
HRESULT AudioPacketArrived (IDeckLinkEncoderAudioPacket* audioPacket);
```

#### Parameters

Name	Direction	Description
audioPacket	in	The audio packet that has arrived. The audio packet is only valid for the duration of the callback. To hold on to the audio packet beyond the callback call <b>AddRef</b> , and to release the audio packet when it is no longer required call <b>Release</b> .

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.37 IDeckLinkEncoderPacket Interface

The `IDeckLinkEncoderPacket` object interface represents an encoded data packet.

The `GetSize` method may be used to determine the size of the encoded packet.

### Related Interfaces

Interface	Interface ID	Description
<code>IDeckLinkEncoderVideoPacket</code>	<code>IID_IDeckLinkEncoderVideoPacket</code>	<code>IDeckLinkEncoderVideoPacket</code> subclasses <code>IDeckLinkEncoderPacket</code>
<code>IDeckLinkEncoderAudioPacket</code>	<code>IID_IDeckLinkEncoderAudioPacket</code>	<code>IDeckLinkEncoderAudioPacket</code> subclasses <code>IDeckLinkEncoderPacket</code>

Public Member Functions	
Method	Description
<code>GetBytes</code>	Get pointer to encoded packet data
<code>GetSize</code>	Get size of encoded packet data
<code>GetStreamTime</code>	Get video packet timing information
<code>GetPacketType</code>	Get video packet type

### 2.5.37.1 IDeckLinkEncoderPacket::GetBytes method

The `GetBytes` method allows direct access to the data buffer of an encoded packet.

#### Syntax

```
HRESULT GetBytes (void *buffer);
```

#### Parameters

Name	Direction	Description
<code>buffer</code>	out	Pointer to raw encoded buffer – only valid while object remains valid.

#### Return Values

Value	Description
<code>E_FAIL</code>	Failure
<code>S_OK</code>	Success

### 2.5.37.2 IDeckLinkEncoderPacket::GetSize method

The `GetSize` method returns the number of bytes in the encoded packet.

#### Syntax

```
long GetSize ();
```

#### Return Values

Value	Description
<code>BytesCount</code>	Number of bytes in the encoded packet buffer

### 2.5.37.3 IDeckLinkEncoderPacket::GetStreamTime method

The `GetStreamTime` method returns the time of an encoded video packet for a given timescale.

#### Syntax

```
HRESULT GetStreamTime (BMDTimeValue *frameTime, BMDTimeScale timeScale);
```

#### Parameters

Name	Direction	Description
frameTime	out	Frame time (in units of timeScale)
timeScale	in	Time scale for output parameters

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.37.4 IDeckLinkEncoderPacket::GetPacketType method

The `GetPacketType` method returns the packet type of the encoded packet.

#### Syntax

```
BMDPacketType GetPacketType ();
```

#### Return Values

Value	Description
PacketType	Packet type of encoded packet ( <b>BMDPacketType</b> )

### 2.5.38 IDeckLinkEncoderVideoPacket Interface

The `IDeckLinkEncoderVideoPacket` object interface represents an encoded video packet which has been captured by an `IDeckLinkEncoderInput` object interface. `IDeckLinkEncoderVideoPacket` is a subclass of `IDeckLinkEncoderPacket` and inherits all its methods.

The data in the encoded packet is encoded according to the pixel format returned by `GetPixelFormat` – see `BMDPixelFormat` for details.

Objects with an `IDeckLinkEncoderPacket` interface are passed to the `IDeckLinkEncoderInputCallback::VideoPacketArrived` callback.

#### Related Interfaces

Interface	Interface ID	Description
<code>IDeckLinkEncoderInput</code>	<code>IID_IDeckLinkEncoderInput</code>	Encoded input packets are passed to <code>IDeckLinkEncoderInputCallback::VideoPacketArrived</code> by the <code>IDeckLinkEncoderInput</code> interface
<code>IDeckLinkEncoderPacket</code>	<code>IID_IDeckLinkEncoderPacket</code>	<code>IDeckLinkEncoderVideoPacket</code> subclasses <code>IDeckLinkEncoderPacket</code>
<code>IDeckLinkH265NALPacket</code>	<code>IID_IDeckLinkH265NALPacket</code>	<code>IDeckLinkH265NALPacket</code> is available from <code>IDeckLinkEncoderVideoPacket</code> via <code>QueryInterface</code>



Public Member Functions	
Method	Description
GetPixelFormat	Get pixel format for video packet
GetHardwareReferenceTimestamp	Get hardware reference timestamp
GetTimecode	Gets timecode information

### 2.5.38.1 IDeckLinkEncoderVideoPacket::GetPixelFormat method

The `GetPixelFormat` method returns the pixel format of the encoded packet.

#### Syntax

```
BMDPixelFormat GetPixelFormat ();
```

#### Return Values

Value	Description
PixelFormat	Pixel format of encoded packet( <b>BMDPixelFormat</b> )

### 2.5.38.2 IDeckLinkEncoderVideoPacket::GetHardwareReferenceTimestamp method

The `GetHardwareReferenceTimestamp` method returns frame time and frame duration for a given timescale.

#### Syntax

```
HRESULT GetHardwareReferenceTimestamp (BMDTimeScale timeScale,
BMDTimeValue *frameTime, BMDTimeValue *frameDuration);
```

#### Parameters

Name	Direction	Description
timeScale	in	The time scale see <b>BMDTimeScale</b> for details.
frameTime	out	The frame time see <b>BMDTimeValue</b> for details.
frameDuration	out	The frame duration see <b>BMDTimeValue</b> for details.

#### Return Values

Value	Description
E_INVALIDARG	Timescale is not set
S_OK	Success

### 2.5.38.3 IDeckLinkEncoderVideoPacket::GetTimecode method

The `GetTimecode` method returns the value specified in the ancillary data for the specified timecode type. If the specified timecode type is not found or is invalid, `GetTimecode` returns `S_FALSE`.

#### Syntax

```
HRESULT GetTimecode (BMDTimecodeFormat format, IDeckLinkTimecode *timecode);
```

#### Parameters

Name	Direction	Description
format	in	BMDTimecodeFormat to query
timecode	out	New IDeckLinkTimecode object interface containing the requested timecode or NULL if requested timecode is not available.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_ACCESSDENIED	An invalid or unsupported timecode format was requested.
S_FALSE	The requested timecode format was not present or valid in the ancillary data.

### 2.5.39 IDeckLinkEncoderAudioPacket Interface

The `IDeckLinkEncoderAudioPacket` object interface represents an encoded audio packet which has been captured by an `IDeckLinkEncoderInput` object interface. `IDeckLinkEncoderAudioPacket` is a subclass of `IDeckLinkEncoderPacket` and inherits all its methods.

**NOTE** The data in the encoded packet is encoded according to the audio format returned by `GetAudioFormat` (see `BMDAudioFormat` for details).

Objects with an `IDeckLinkEncoderAudioPacket` interface are passed to the `IDeckLinkEncoderInputCallback::VideoEncoderAudioPacketArrived` callback.

#### Related Interfaces

Interface	Interface ID	Description
IDeckLinkEncoderInput	IID_IDeckLinkEncoderInput	Encoded audio packets are passed to <code>IDeckLinkEncoderInputCallback::AudioPacketArrived</code> by the <code>IDeckLinkEncoderInput</code> interface
IDeckLinkEncoderPacket	IID_IDeckLinkEncoderPacket	<code>IDeckLinkEncoderAudioPacket</code> subclasses <code>IDeckLinkEncoderPacket</code>

Public Member Functions	
Method	Description
GetAudioFormat	Get audio format for packet

## 2.5.39.1 IDeckLinkEncoderAudioPacket::GetAudioFormat method

The `GetAudioFormat` method returns the audio format of the encoded packet

### Syntax

```
BMDAudioFormat GetAudioFormat ();
```

### Return Values

Value	Description
AudioFormat	Audio format of encoded packet ( <b>BMDAudioFormat</b> )

## 2.5.40 IDeckLinkH265NALPacket Interface

The `IDeckLinkH265NALPacket` object interface represents a H.265 encoded packet which has been captured by an `IDeckLinkEncoderVideoPacket` object interface. An `IDeckLinkH265NALPacket` instance can be obtained from `IDeckLinkEncoderVideoPacket` via `QueryInterface` when the captured pixel format is `bmdFormatH265`, otherwise `QueryInterface` will fail and return `E_NOINTERFACE`.

### Related Interfaces

Interface	Interface ID	Description
<code>IDeckLinkEncoderVideoPacket</code>	<code>IID_IDeckLinkEncoderVideoPacket</code>	<code>IDeckLinkH265NALPacket</code> is available from <code>IDeckLinkEncoderVideoPacket</code> via <code>QueryInterface</code>

Public Member Functions	
Method	Description
<code>GetUnitType</code>	The H.265 NAL unit type
<code>GetBytesNoPrefix</code>	The H.265 encoded buffer without the NAL start code prefix.
<code>GetSizeNoPrefix</code>	The size of the encoded buffer without the NAL start code prefix.

## 2.5.40.1 IDeckLinkH265NALPacket::GetUnitType method

The `GetUnitType` method returns the H.265 NAL packet unit type.

### Syntax

```
HRESULT GetUnitType (uint8_t *unitType);
```

### Parameters

Name	Direction	Description
<code>unitType</code>	out	H.265 NAL unit type

### Return Values

Value	Description
<code>E_INVALIDARG</code>	If <code>unitType</code> is not provided
<code>S_OK</code>	Success

### 2.5.40.2 IDeckLinkH265NALPacket::GetBytesNoPrefix method

The `GetBytesNoPrefix` method allows direct access to the data buffer of an encoded packet without the NAL start code prefix.

#### Syntax

```
HRESULT GetBytesNoPrefix (void *buffer);
```

#### Parameters

Name	Direction	Description
buffer	out	Pointer to raw encoded buffer without start code prefix – only valid while object remains valid.

#### Return Values

Value	Description
S_OK	Success

### 2.5.40.3 IDeckLinkH265NALPacket::GetSizeNoPrefix method

The `GetSizeNoPrefix` method returns the number of bytes in the encoded packet without the NAL start code prefix.

#### Syntax

```
long GetSizeNoPrefix ();
```

#### Return Values

Value	Description
BytesCount	Number of bytes in the encoded packet buffer without the start code prefix

## 2.5.41 IDeckLinkEncoderConfiguration Interface

The `IDeckLinkEncoderConfiguration` object interface allows querying and modification of DeckLink encoder configuration parameters.

An `IDeckLinkEncoderConfiguration` object interface can be obtained from the `IDeckLinkEncoderInput` interface using `QueryInterface`.

#### Related Interfaces

Interface	Interface ID	Description
<code>IDeckLinkEncoderInput</code>	<code>IID_IDeckLinkEncoderInput</code>	DeckLink encoder input interface

Public Member Functions	
Method	Description
<code>SetFlag</code>	Sets a boolean value into the configuration setting associated with the given <code>BMDDeckLinkEncoderConfigurationID</code> .
<code>GetFlag</code>	Gets the current boolean value of a setting associated with the given <code>BMDDeckLinkEncoderConfigurationID</code> .
<code>SetInt</code>	Sets the current <code>int64_t</code> value into the configuration setting associated with the given <code>BMDDeckLinkEncoderConfigurationID</code> .
<code>GetInt</code>	Gets the current <code>int64_t</code> value of a setting associated with the given <code>BMDDeckLinkEncoderConfigurationID</code> .
<code>SetFloat</code>	Sets the current double value into the configuration setting associated with the given <code>BMDDeckLinkEncoderConfigurationID</code> .

Public Member Functions	
Method	Description
GetFloat	Gets the current double value of a setting associated with the given <b>BMDDeckLinkEncoderConfigurationID</b> .
SetString	Sets the current string value into the configuration setting with the given <b>BMDDeckLinkEncoderConfigurationID</b> .
GetString	Gets the current string value of a setting associated with the given <b>BMDDeckLinkEncoderConfigurationID</b> .
GetBytes	Gets the current byte array value of a setting associated with the given <b>BMDDeckLinkEncoderConfigurationID</b> .

### 2.5.41.1 **IDeckLinkEncoderConfiguration::SetFlag** method

The **SetFlag** method sets a boolean value into the configuration setting associated with the given **BMDDeckLinkEncoderConfigurationID**.

#### Syntax

```
HRESULT SetFlag (BMDDeckLinkEncoderConfigurationID cfgID, bool *value);
```

#### Parameters

Name	Direction	Description
cfgID	in	The ID of the configuration setting.
value	in	The boolean value to set into the selected configuration setting.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no flag type configuration setting for this operation corresponding to the given <b>BMDDeckLinkEncoderConfigurationID</b> .

### 2.5.41.2 **IDeckLinkEncoderConfiguration::GetFlag** method

The **GetFlag** method gets the current boolean value of a configuration setting associated with the given **BMDDeckLinkEncoderConfigurationID**.

#### Syntax

```
HRESULT GetFlag (BMDDeckLinkEncoderConfigurationID cfgID, bool *value);
```

#### Parameters

Name	Direction	Description
cfgID	in	The ID of the configuration setting.
value	out	The boolean value that is set in the selected configuration setting.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no flag type configuration setting for this operation corresponding to the given <b>BMDDeckLinkEncoderConfigurationID</b> .

### 2.5.41.3 IDeckLinkEncoderConfiguration::SetInt method

The **SetInt** method sets the current `int64_t` value of a configuration setting associated with the given **BMDDeckLinkEncoderConfigurationID**.

#### Syntax

```
HRESULT SetInt (BMDDeckLinkEncoderConfigurationID cfgID, int64_t *value);
```

#### Parameters

Name	Direction	Description
cfgID	in	The ID of the configuration setting.
value	in	The integer value to set into the selected configuration setting.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no integer type configuration setting for this operation corresponding to the given <b>IDeckLinkEncoderConfiguration</b> .

### 2.5.41.4 IDeckLinkEncoderConfiguration::GetInt method

The **GetInt** method gets the current `int64_t` value of a configuration setting associated with the given **BMDDeckLinkEncoderConfigurationID**.

#### Syntax

```
HRESULT GetInt (BMDDeckLinkEncoderConfigurationID cfgID, int64_t *value);
```

#### Parameters

Name	Direction	Description
cfgID	in	The ID of the configuration setting.
value	out	The integer value that is set in the selected configuration setting.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no integer type configuration setting for this operation corresponding to the given <b>BMDDeckLinkEncoderConfigurationID</b> .

## 2.5.41.5 IDeckLinkEncoderConfiguration::SetFloat method

The **SetFloat** method sets the current double value of a configuration setting associated with the given **BMDDeckLinkEncoderConfigurationID**.

### Syntax

```
HRESULT SetFloat (BMDDeckLinkEncoderConfigurationID cfgID, double *value);
```

### Parameters

Name	Direction	Description
cfgID	in	The ID of the configuration setting.
value	in	The double value to set into the selected configuration setting.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no float type configuration setting for this operation corresponding to the given <b>BMDDeckLinkEncoderConfigurationID</b> .

## 2.5.41.6 IDeckLinkEncoderConfiguration::GetFloat method

The **GetFloat** method gets the current double value of a configuration setting associated with the given **BMDDeckLinkEncoderConfigurationID**.

### Syntax

```
HRESULT GetFloat (BMDDeckLinkEncoderConfigurationID cfgID, double *value);
```

### Parameters

Name	Direction	Description
cfgID	in	The ID of the configuration setting.
value	out	The double value that is set in the selected configuration setting.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no float type configuration setting for this operation corresponding to the given <b>BMDDeckLinkEncoderConfigurationID</b> .

## 2.5.41.7 IDeckLinkEncoderConfiguration::SetString method

The `SetString` method sets the current string value of a configuration setting associated with the given `BMDDeckLinkEncoderConfigurationID`.

### Syntax

```
HRESULT SetString (BMDDeckLinkEncoderConfigurationID cfgID, string *value);
```

### Parameters

Name	Direction	Description
cfgID	in	The ID of the configuration setting.
value	in	The string to set into the selected configuration setting.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no string type configuration setting for this operation corresponding to the given <code>BMDDeckLinkEncoderConfigurationID</code> .

## 2.5.41.8 IDeckLinkEncoderConfiguration::GetString method

The `GetString` method gets the current string value of a configuration setting associated with the given `BMDDeckLinkEncoderConfigurationID`.

### Syntax

```
HRESULT GetString (BMDDeckLinkEncoderConfigurationID cfgID, string *value);
```

### Parameters

Name	Direction	Description
cfgID	in	The ID of the configuration setting.
value	out	The string set in the selected configuration setting. This allocated string must be freed by the caller when no longer required.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no string type configuration setting for this operation corresponding to the given <code>BMDDeckLinkEncoderConfigurationID</code> .



## 2.5.41.9 IDeckLinkEncoderConfiguration::GetBytes method

The **GetBytes** method gets the encoder configuration data in a format represented by the given **BMDDeckLinkEncoderConfigurationID**. To determine the size of the buffer required, call **GetBytes** by initially passing **buffer** as **NULL**. **GetBytes** will return **S\_OK** and **bufferSize** will be updated to the required size.

### Syntax

```
HRESULT GetBytes (BMDDeckLinkEncoderConfigurationID cfgID,  
void *buffer, uint32_t *bufferSize);
```

### Parameters

Name	Direction	Description
cfgID	in	The ID of the configuration data format.
buffer	out	The buffer in which to return the configuration data, or <b>NULL</b> to determine the required buffer size.
bufferSize	in, out	The size of the provided buffer. Will be updated to the number of bytes returned.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no encoder configuration data format corresponding to the given <b>BMDDeckLinkEncoderConfigurationID</b> .
E_OUTOFMEMORY	The provided buffer is too small.

## 2.5.42 IDeckLinkStatus Interface

The **IDeckLinkStatus** object interface allows querying of status information associated with a DeckLink device.

The DeckLink Status ID section lists the status information and associated identifiers that can be queried using this object interface. An **IDeckLinkStatus** object interface can be obtained from an **IDeckLink** object interface using **QueryInterface**.

An application may be notified of changes to status information by subscribing to the **bmdStatusChanged** topic using the **IDeckLinkNotification** interface. See **BMDNotifications** for more information.

For an example demonstrating how status information can be queried and monitored, please see the **StatusMonitor** sample in the DeckLink SDK.

### Related Interfaces

Interface	Interface ID	Description
IDeckLink	IID_IDeckLink	An <b>IDeckLinkStatus</b> object interface may be obtained from <b>IDeckLink</b> using <b>QueryInterface</b>

Public Member Functions	
Method	Description
GetFlag	Gets the current boolean value of a status associated with the given <b>BMDDeckLinkStatusID</b> .
GetInt	Gets the current int64_t value of a status associated with the given <b>BMDDeckLinkStatusID</b> .
GetFloat	Gets the current double value of a status associated with the given <b>BMDDeckLinkStatusID</b> .
GetString	Gets the current string value of a status associated with the given <b>BMDDeckLinkStatusID</b> .
GetBytes	Gets the current byte array value of a status associated with the given <b>BMDDeckLinkStatusID</b> .

### 2.5.42.1 IDeckLinkStatus::GetFlag method

The **GetFlag** method gets the current boolean value of a status associated with the given **BMDDeckLinkStatusID**.

#### Syntax

```
HRESULT GetFlag (BMDDeckLinkStatusID statusID, bool *value);
```

#### Parameters

Name	Direction	Description
statusID	in	The <b>BMDDeckLinkStatusID</b> of the status information item.
value	out	The boolean value corresponding to the statusID.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no flag type status corresponding to the given <b>BMDDeckLinkStatusID</b> .
E_NOTIMPL	The request is correct however it is not supported by the DeckLink hardware.

### 2.5.42.2 IDeckLinkStatus::GetInt method

The **GetInt** method gets the current int64\_t value of a status associated with the given **BMDDeckLinkStatusID**.

#### Syntax

```
HRESULT GetInt (BMDDeckLinkStatusID statusID, int64_t *value);
```

#### Parameters

Name	Direction	Description
statusID	in	The <b>BMDDeckLinkStatusID</b> of the status information item.
value	out	The integer value corresponding to the statusID.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no integer type status corresponding to the given <b>BMDDeckLinkStatusID</b> .
E_NOTIMPL	The request is correct however it is not supported by the DeckLink hardware.

### 2.5.42.3 IDeckLinkStatus::GetFloat method

The **GetFloat** method gets the current double value of a status associated with the given **BMDDeckLinkStatusID**.

#### Syntax

```
HRESULT GetFloat (BMDDeckLinkStatusID statusID, double *value);
```

#### Parameters

Name	Direction	Description
statusID	in	The <b>BMDDeckLinkStatusID</b> of the status information item.
value	out	The double value corresponding to the statusID.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no float type status corresponding to the given <b>BMDDeckLinkStatusID</b> .
E_NOTIMPL	The request is correct however it is not supported by the DeckLink hardware.

### 2.5.42.4 IDeckLinkStatus::GetString method

The **GetString** method gets the current string value of a status associated with the given **BMDDeckLinkStatusID**.

#### Syntax

```
HRESULT GetString (BMDDeckLinkStatusIt statusID, string *value);
```

#### Parameters

Name	Direction	Description
statusID	in	The <b>BMDDeckLinkStatusID</b> of the status information item.
value	out	The string value corresponding to the statusID. This allocated string must be freed by the caller when no longer required.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no string type status corresponding to the given <b>BMDDeckLinkStatusID</b> .
E_NOTIMPL	The request is correct however it is not supported by the DeckLink hardware.

## 2.5.42.5 IDeckLinkStatus::GetBytes method

The **GetBytes** method gets the current byte array value of a status associated with the given **BMDDeckLinkStatusID**.

**NOTE** If the size of the buffer is not sufficient, `bufferSize` will be updated to the required buffer size.

### Syntax

```
HRESULT GetBytes (BMDDeckLinkStatusID statusID, void *buffer, uint32_t *bufferSize);
```

### Parameters

Name	Direction	Description
statusID	in	The <b>BMDDeckLinkStatusID</b> of the status information item.
buffer	out	The buffer in which to return the status data.
bufferSize	in, out	The size of the provided buffer. Will be updated to the number of bytes returned.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no byte array type status corresponding to the given <b>BMDDeckLinkStatusID</b> .

## 2.5.43 IDeckLinkVideoFrameMetadataExtensions Interface

The **IDeckLinkVideoFrameMetadataExtensions** object interface allows querying of frame metadata associated with an **IDeckLinkVideoFrame**.

An **IDeckLinkVideoFrameMetadataExtensions** object interface may be obtained from an **IDeckLinkVideoFrame** object interface using **QueryInterface** if the **IDeckLinkVideoFrame** implements this optional interface.

An **IDeckLinkVideoFrame** object interface with the **bmdFrameContainsHDRMetadata** flag may use this interface to query the HDR metadata parameters associated with the video frame.

### Related Interfaces

Interface	Interface ID	Description
<b>IDeckLinkVideoFrame</b>	<b>IID_IDeckLinkVideoFrame</b>	An <b>IDeckLinkVideoFrameMetadataExtensions</b> object interface may be obtained from <b>IDeckLinkVideoFrame</b> using <b>QueryInterface</b>

Public Member Functions	
Method	Description
GetInt	Gets the current int64_t value of a metadata item associated with the given <b>BMDDeckLinkFrameMetadataID</b> .
GetFloat	Gets the current double value of a metadata item associated with the given <b>BMDDeckLinkFrameMetadataID</b> .
GetFlag	Gets the current boolean value of a metadata item associated with the given <b>BMDDeckLinkFrameMetadataID</b> .
GetString	Gets the current string value of a metadata item associated with the given <b>BMDDeckLinkFrameMetadataID</b> .
GetBytes	Gets a pointer to data of a metadata item associated with the given <b>BMDDeckLinkFrameMetadataID</b> .

### 2.5.43.1 IDeckLinkVideoFrameMetadataExtensions::GetInt method

The **GetInt** method gets the current int64\_t value of a metadata item associated with the given **BMDDeckLinkFrameMetadataID**.

#### Syntax

```
HRESULT GetInt (BMDDeckLinkFrameMetadataID metadataID, int64_t *value);
```

#### Parameters

Name	Direction	Description
metadataID	in	The <b>BMDDeckLinkFrameMetadataID</b> of the metadata information item.
value	out	The integer value corresponding to the metadataID.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no integer type metadata item corresponding to the given <b>BMDDeckLinkFrameMetadataID</b> .

### 2.5.43.2 IDeckLinkVideoFrameMetadataExtensions::GetFloat method

The **GetFloat** method gets the current double value of a metadata item associated with the given **BMDDeckLinkFrameMetadataID**.

#### Syntax

```
HRESULT GetFloat (BMDDeckLinkFrameMetadataID metadataID, double *value);
```

#### Parameters

Name	Direction	Description
metadataID	in	The <b>BMDDeckLinkFrameMetadataID</b> of the metadata information item.
value	out	The double value corresponding to the metadataID.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no float type metadata item corresponding to the given <b>BMDDeckLinkFrameMetadataID</b> .

### 2.5.43.3 IDeckLinkVideoFrameMetadataExtensions::GetFlag method

The **GetFlag** method gets the current boolean value of a metadata item associated with the given **BMDDeckLinkFrameMetadataID**.

#### Syntax

```
HRESULT GetFlag (BMDDeckLinkFrameMetadataID metadataID, bool* value);
```

#### Parameters

Name	Direction	Description
metadataID	in	The <b>BMDDeckLinkFrameMetadataID</b> of the metadata information item.
value	out	The boolean value corresponding to the metadataID.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no flag type metadata item corresponding to the given <b>BMDDeckLinkFrameMetadataID</b> .

### 2.5.43.4 IDeckLinkVideoFrameMetadataExtensions::GetString method

The **GetString** method gets the current string value of a metadata item associated with the given **BMDDeckLinkFrameMetadataID**.

#### Syntax

```
HRESULT GetString (BMDDeckLinkFrameMetadataID metadataID, string *value);
```

#### Parameters

Name	Direction	Description
metadataID	in	The <b>BMDDeckLinkFrameMetadataID</b> of the metadata information item.
value	out	The string value corresponding to the metadataID. This allocated string must be freed by the caller when no longer required.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no string type metadata item corresponding to the given <b>BMDDeckLinkFrameMetadataID</b> .

### 2.5.43.5 IDeckLinkVideoFrameMetadataExtensions::GetBytes method

The **GetBytes** method gets a pointer to data of a metadata item associated with the given **BMDDeckLinkFrameMetadataID**. To determine the size of the buffer required, call **GetBytes** by initially passing buffer as NULL. **GetBytes** will return S\_OK and bufferSize will be updated to the required size.

#### Syntax

```
HRESULT GetBytes(BMDDeckLinkFrameMetadataID metadataID,  
void* buffer,  
uint32_t* bufferSize)
```

#### Parameters

Name	Direction	Description
metadataID	in	The <b>BMDDeckLinkFrameMetadataID</b> of the metadata information item.
buffer	out	The buffer in which to return the metadata data, or NULL to determine the required buffer size.
bufferSize	in, out	The size of the provided buffer. Will be updated to the number of bytes returned.

#### Return Values

Value	Description
E_INVALIDARG	Parameter bufferSize variable is NULL.
E_OUTOFMEMORY	The provided buffer is too small.
E_UNEXPECTED	There is no byte data type metadata item corresponding to the given <b>BMDDeckLinkFrameMetadataID</b> .
E_FAIL	Failure
S_OK	Success

### 2.5.44 IDeckLinkVideoConversion Interface

The **IDeckLinkVideoConversion** object interface provides the capability to copy an image from a source frame into a destination frame converting between the formats as required.

A reference to an **IDeckLinkVideoConversion** object interface may be obtained from **CoCreateInstance** on platforms with native COM support or from **CreateVideoConversionInstance** on other platforms.

Public Member Functions	
Method	Description
ConvertFrame	Copies and converts a source frame into a destination frame.

## 2.5.44.1 IDeckLinkVideoConversion::ConvertFrame method

The **ConvertFrame** method copies the source frame (srcFrame) to the destination frame (dstFrame). The frame dimension and pixel format of the video frame will be converted if possible. The return value for this method should be checked to ensure that the desired conversion is supported.

The **IDeckLinkVideoFrame** object for the destination frame, with the desired properties, can be created using **IDeckLinkOutput::CreateVideoFrame**. Alternatively the destination frame can be created by subclassing **IDeckLinkVideoFrame** and setting properties directly in the subclassed object.

### Syntax

```
HRESULT ConvertFrame (IDeckLinkVideoFrame* srcFrame, IDeckLinkVideoFrame* dstFrame)
```

### Parameters

Name	Direction	Description
srcFrame	in	The properties of the source frame
dstFrame	in	The properties of the destination frame

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_NOTIMPL	Conversion not currently supported
E_OUTOFMEMORY	The provided buffer is too small. <b>bufferSize</b> is updated to the required size.

## 2.5.45 IDeckLinkHDMIInputEDID Interface

The **IDeckLinkHDMIInputEDID** object interface allows configuration of EDID parameters, ensuring that an attached HDMI source outputs a stream that can be accepted by the DeckLink HDMI input.

An **IDeckLinkHDMIInputEDID** object interface may be obtained from an **IDeckLink** object interface using **QueryInterface**. The EDID items will become visible to an HDMI source connected to a DeckLink HDMI input after **WriteToEDID** method is called.

The EDID settings of an **IDeckLinkHDMIInputEDID** interface remains active while the application holds a reference to the interface. Releasing **IDeckLinkHDMIInputEDID** object interface will restore EDID to default values.

### Related Interfaces

Interface	Interface ID	Description
IDeckLink	IID_IDeckLink	An <b>IDeckLinkHDMIInputEDID</b> object interface may be obtained from an <b>IDeckLink</b> object interface using <b>QueryInterface</b> .

Public Member Functions	
Method	Description
SetInt	Sets the current int64_t value of an EDID item associated with the given <b>BMDDeckLinkHDMIInputEDIDID</b> .
GetInt	Gets the current int64_t value of an EDID item associated with the given <b>BMDDeckLinkHDMIInputEDIDID</b> .
WriteToEDID	Writes the values for all EDID items to DeckLink hardware



## 2.5.45.1 IDeckLinkHDMIInputEDID::SetInt method

The **SetInt** method sets the current int64\_t value of an EDID item associated with the given **BMDDeckLinkHDMIInputEDIDID**.

### Syntax

```
HRESULT SetInt (BMDDeckLinkHDMIInputEDIDID cfgID, int64_t value);
```

### Parameters

Name	Direction	Description
cfgID	in	The ID of the EDID item
dstFrame	in	The integer value to set into the selected EDID item

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no integer type EDID item for this operation corresponding to the given <b>BMDDeckLinkHDMIInputEDID</b>

## 2.5.45.2 IDeckLinkHDMIInputEDID::GetInt method

The **GetInt** method gets the current int64\_t value of an EDID item associated with the given **BMDDeckLinkHDMIInputEDIDID**.

### Syntax

```
HRESULT GetInt (BMDDeckLinkHDMIInputEDIDID cfgID, int64_t *value);
```

### Parameters

Name	Direction	Description
cfgID	in	The ID of the EDID item
value	out	The integer value to set into the selected EDID item

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	There is no integer type EDID item for this operation corresponding to the given <b>BMDDeckLinkHDMIInputEDID</b> .

### 2.5.45.3 IDeckLinkHDMIInputEDID::WriteToEDID method

The `WriteToEDID` method writes the values for all EDID items to DeckLink hardware.

#### Syntax

```
HRESULT WriteToEDID ();
```

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_ACCESSDENIED	Unable to access DeckLink hardware

### 2.5.46 IDeckLinkProfileManager Interface

The `IDeckLinkProfileManager` object interface allows an application to control the profiles for a DeckLink device that has multiple profiles.

An `IDeckLinkProfileManager` interface can be obtained from an `IDeckLink` object interface using `QueryInterface`.

**NOTE** If a DeckLink device only has a single profile, then `QueryInterface` will fail and return `E_NOINTERFACE`.

#### Related Interfaces

Interface	Interface ID	Description
<code>IDeckLink</code>	<code>IID_IDeckLink</code>	An <code>IDeckLinkProfileManager</code> object interface may be obtained from <code>IDeckLink</code> using <code>QueryInterface</code>
<code>IDeckLinkProfileIterator</code>	<code>IID_IDeckLinkProfileIterator</code>	<code>IDeckLinkProfileManager::GetProfiles</code> returns an <code>IDeckLinkProfileIterator</code> object interface
<code>IDeckLinkProfile</code>	<code>IID_IDeckLinkProfile</code>	<code>IDeckLinkProfileManager::GetProfile</code> returns an <code>IDeckLinkProfile</code> object interface
<code>IDeckLinkProfileCallback</code>	<code>IID_IDeckLinkProfileCallback</code>	An <code>IDeckLinkProfileCallback</code> object interface may be registered with <code>IDeckLinkProfileManager::SetCallback</code>

#### Public Member Functions

Method	Description
<code>GetProfiles</code>	Returns an iterator to enumerate the profiles
<code>GetProfile</code>	Returns the profile object associated with the given identifier
<code>SetCallback</code>	Registers profile change callback

## 2.5.46.1 IDeckLinkProfileManager::GetProfiles method

The **GetProfiles** method returns an iterator which enumerates the available profiles in the profile group represented by the **IDeckLinkProfileManager** object.

### Syntax

```
HRESULT GetProfiles (IDeckLinkProfileIterator *profileIterator);
```

### Parameters

Name	Direction	Description
profileIterator	out	Profile iterator. This object must be released by the caller when no longer required.

### Return Values

Value	Description
E_INVALIDARG	Parameter profileIterator variable is NULL.
E_OUTOFMEMORY	Insufficient memory to create the iterator.
S_OK	Success

## 2.5.46.2 IDeckLinkProfileManager::GetProfile method

The **GetProfile** method gets the **IDeckLinkProfile** interface object for a profile with the given **BMDProfileID**.

### Syntax

```
HRESULT GetProfile (BMDProfileID profileID, IDeckLinkProfile *profile);
```

### Parameters

Name	Direction	Description
profileID	in	The ID of the requested profile (see <b>BMDProfileID</b> ).
profile	out	Pointer to the profile with the matching ID. This object must be released by the caller when no longer required.

### Return Values

Value	Description
E_INVALIDARG	Either the parameter profile variable is NULL or there is no profile for this DeckLink device with the given <b>BMDProfileID</b> .
S_OK	Success

### 2.5.46.3 IDeckLinkProfileManager::SetCallback method

The **SetCallback** method is called to register an instance of an **IDeckLinkProfileCallback** object. The registered object facilitates the notification of change in active profile.

#### Syntax

```
HRESULT SetCallback (IDeckLinkProfileCallback *callback);
```

#### Parameters

Name	Direction	Description
callback	in	The <b>IDeckLinkProfileCallback</b> object to be registered.

#### Return Values

Value	Description
S_OK	Success

### 2.5.47 IDeckLinkProfileIterator Interface

The **IDeckLinkProfileIterator** object interface is used to enumerate the available profiles for the DeckLink device.

A reference to an **IDeckLinkProfileIterator** object interface may be obtained by calling **GetProfiles** on an **IDeckLinkProfileManager** object interface.

#### Related Interfaces

Interface	Interface ID	Description
IDeckLinkProfileManager	IID_IDeckLinkProfileManager	<b>IDeckLinkProfileManager::GetProfiles</b> returns an <b>IDeckLinkProfileIterator</b> object interface
IDeckLinkProfile	IID_IDeckLinkProfile	<b>IDeckLinkProfile::GetPeers</b> outputs an <b>IDeckLinkProfileIterator</b> object interface to provide access to peer profiles
IDeckLinkProfile	IID_IDeckLinkProfile	<b>IDeckLinkProfileIterator::Next</b> returns <b>IDeckLinkProfile</b> interfaces representing each profile for a DeckLink device

Public Member Functions	
Method	Description
Next	Returns an <b>IDeckLinkProfile</b> interface corresponding to an individual profile for the DeckLink device

## 2.5.47.1 IDeckLinkProfileIterator::Next method

The Next method returns the next available **IDeckLinkProfile** interface.

### Syntax

```
HRESULT Next (IDeckLinkProfile *profile);
```

### Parameters

Name	Direction	Description
profile	out	Pointer to <b>IDeckLinkProfile</b> interface object or NULL when no more profiles are available. This object must be released by the caller when no longer required.

### Return Values

Value	Description
S_FALSE	No (more) profiles found.
S_OK	Success
E_INVALIDARG	Parameter profile variable is NULL.

## 2.5.48 IDeckLinkProfile Interface

The **IDeckLinkProfile** object interface represents a supported profile for a sub-device.

When multiple profiles exist for a DeckLink sub-device, the **IDeckLinkProfileIterator** object interface enumerates the supported profiles, returning **IDeckLinkProfile** object interfaces. When switching between profiles, notification is provided with the **IDeckLinkProfileCallback** interface object. An application will need to rescan attributes and display modes after a change in profile.

The current active profile, or the solitary profile when the DeckLink has no **IDeckLinkProfileManager** interface, can be obtained from an **IDeckLink** object interface using **QueryInterface**.

The **GetPeers** method returns an **IDeckLinkProfileIterator** that enumerates the **IDeckLinkProfiles** interface objects for the peer sub-devices in the same profile group. When a profile is activated on a sub-devices with **IDeckLinkProfileManager::SetActive** method, all peer sub-devices will be activated with the new profile simultaneously.

### Related Interfaces

Interface	Interface ID	Description
<b>IDeckLink</b>	<b>IID_IDeckLink</b>	An <b>IDeckLinkProfile</b> object interface may be obtained from <b>IDeckLink</b> using <b>QueryInterface</b>
<b>IDeckLink</b>	<b>IID_IDeckLink</b>	<b>IDeckLinkProfile::GetDevice</b> returns an <b>IDeckLink</b> object interface
<b>IDeckLinkProfileIterator</b>	<b>IID_IDeckLinkProfileIterator</b>	<b>IDeckLinkProfileIterator::Next</b> returns an <b>IDeckLinkProfile</b> object interface for each available profile.
<b>IDeckLinkProfileIterator</b>	<b>IID_IDeckLinkProfileIterator</b>	<b>IDeckLinkProfile::GetPeers</b> returns an <b>IDeckLinkProfileIterator</b> object interface
<b>IDeckLinkProfileManager</b>	<b>IID_IDeckLinkProfileManager</b>	<b>IDeckLinkProfileManager::GetProfile</b> returns an <b>IDeckLinkProfile</b> object interface
<b>IDeckLinkProfileCallback</b>	<b>IID_IDeckLinkProfileCallback</b>	An <b>IDeckLinkProfile</b> object interface is passed to both the <b>IDeckLinkProfileManager::ProfileChanging</b> and <b>IDeckLinkProfileManager::ProfileActivated</b> callbacks
<b>IDeckLinkProfileAttributes</b>	<b>IID_IDeckLinkProfileAttributes</b>	An <b>IDeckLinkProfileAttributes</b> object interface may be obtained from <b>IDeckLinkProfile</b> using <b>QueryInterface</b>

Public Member Functions	
Method	Description
GetDevice	Get the DeckLink device associated with this profile
IsActive	Determine whether profile is the active profile of the group
SetActive	Sets the profile to be the active profile of the group
GetPeers	Returns an iterator to enumerate the profiles of its peer sub-devices

### 2.5.48.1 IDeckLinkProfile::GetDevice method

The **GetDevice** method returns a reference to the IDeckLink interface associated with the profile.

#### Syntax

```
HRESULT GetDevice (IDeckLink *device);
```

#### Parameters

Name	Direction	Description
device	out	The DeckLink device associated with the profile. This object must be released by the caller when no longer required.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.5.48.2 IDeckLinkProfile::IsActive method

The **IsActive** method is called to determine whether the IDeckLinkProfile object is the active profile of the profile group.

#### Syntax

```
HRESULT IsActive (bool *isActive);
```

#### Parameters

Name	Direction	Description
isActive	out	When returns true, the IDeckLinkProfile is the active profile.

#### Return Values

Value	Description
E_INVALIDARG	Parameter isActive variable is NULL
E_FAIL	Failure
S_OK	Success

### 2.5.48.3 IDeckLinkProfile::SetActive method

The **SetActive** method sets the active profile for the profile group. The active profile is saved to system preferences immediately so that the setting will persist across system restarts.

#### Syntax

```
HRESULT SetActive ();
```

#### Return Values

Value	Description
E_ACCESSDENIED	Profile group is already in transition
E_FAIL	Failure
S_OK	Success

### 2.5.48.4 IDeckLinkProfile::GetPeers method

The **GetPeers** method returns an **IDeckLinkProfileIterator** that enumerates the **IDeckLinkProfiles** interface objects for all other sub-devices in the same profile group that share the same **BMDProfileID**.

#### Syntax

```
HRESULT GetPeers (IDeckLinkProfileIterator *profileIterator);
```

#### Parameters

Name	Direction	Description
profileIterator	out	Peer profile iterator. This object must be released by the caller when no longer required.

#### Return Values

Value	Description
E_INVALIDARG	Parameter profileIterator variable is NULL
E_OUTOFMEMORY	Insufficient memory to create iterator
E_FAIL	Failure
S_OK	Success

### 2.5.49 IDeckLinkProfileCallback Interface

The **IDeckLinkProfileCallback** object interface is a callback class which is called when the profile is about to change and when a new profile has been activated.

When a DeckLink device has more than 1 profile, an object with an **IDeckLinkProfileCallback** interface may be registered as a callback with the **IDeckLinkProfileManager** object interface by calling **IDeckLinkProfileManager::SetCallback** method.

#### Related Interfaces

Interface	Interface ID	Description
IDeckLinkProfileManager	IID_IDeckLinkProfileManager	An <b>IDeckLinkProfileCallback</b> object interface may be registered with <b>IDeckLinkProfileManager::SetCallback</b>
IDeckLinkProfile	IID_IDeckLinkProfile	An <b>IDeckLinkProfile</b> object interface is passed to both the <b>IDeckLinkProfileManager::ProfileChanging</b> and <b>IDeckLinkProfileManager::ProfileActivated</b> callbacks

Public Member Functions	
Method	Description
ProfileChanging	Called when the profile is about to change
ProfileActivated	Called when a new profile has been activated

### 2.5.49.1 IDeckLinkProfileCallback::ProfileChanging method

The **ProfileChanging** method is called when the profile is about to change. This method is abstract in the base interface and must be implemented by the application developer. The result parameter (required by COM) is ignored by the caller.

**TIP** The profile change will not complete until the application returns from the callback. When the **streamsWillBeForcedToStop** input is set to true, the new profile is incompatible with the current profile and any active streams will be forcibly stopped on return. The **ProfileChanging** callback provides the application the opportunity to stop the streams instead.

#### Syntax

```
HRESULT ProfileChanging (IDeckLinkProfile *profileToBeActivated,
    bool streamsWillBeForcedToStop);
```

#### Parameters

Name	Direction	Description
profileToBeActivated	in	The profile to be activated.
streamsWillBeForcedToStop	in	When true, the profile to be activated is incompatible with the current profile and the DeckLink hardware will forcibly stop any current streams.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success



## 2.5.49.2 IDeckLinkProfileCallback::ProfileActivated method

The **ProfileActivated** method is called when the new profile has been activated. This method is abstract in the base interface and must be implemented by the application developer. The result parameter (required by COM) is ignored by the caller.

**TIP** When a profile has been activated, rescan appropriate **IDeckLinkProfileAttributes** and check display mode support with **DoesSupportVideoMode** for the new profile.

### Syntax

```
HRESULT ProfileActivated (IDeckLinkProfile *activatedProfile);
```

### Parameters

Name	Direction	Description
activatedProfile	in	The profile that has been activated.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.50 IDeckLinkMetalScreenPreviewHelper Interface

The **IDeckLinkMetalScreenPreviewHelper** interface may be used with a simple **IDeckLinkScreenPreviewCallback** implementation to provide a Metal-based preview rendering which is decoupled from the incoming or outgoing video stream being previewed.

A reference to an **IDeckLinkMetalScreenPreviewHelper** interface may be obtained from a call to **CreateMetalScreenPreviewHelper()**.

**IDeckLinkMetalScreenPreviewHelper** is typically used from within a Metal-aware view, such as **MTKView**.

Typical use of **IDeckLinkMetalScreenPreviewHelper** is as follows:

- Create an **IDeckLinkMetalScreenPreviewHelper** object interface using **CreateMetalScreenPreviewHelper**
- Call **IDeckLinkMetalScreenPreviewHelper::Initialize** with the target device

```
device = MTLCreateSystemDefaultDevice();
deckLinkMetalPreview->Initialize((void*) device);
```
- Create a Metal command queue to process Metal commands.

```
commandQueue = [device newCommandQueue];
```
- To re-draw the Metal preview, create a Metal command buffer and call **IDeckLinkMetalScreenPreviewHelper::Draw**. This will encode the necessary commands to the command buffer. Finally present a drawable to the command buffer and commit.

```
id<MTLCommandBuffer> commandBuffer = [commandQueue commandBuffer];
// Note that renderPassDescriptor and drawable objects below are obtained
from the Metal-aware view (eg MTKView).
deckLinkMetalPreview->Draw((void*) commandBuffer, (void*)
renderPassDescriptor, nil);
[commandBuffer presentDrawable:drawable];
[commandBuffer commit];
```

- Any graphical overlays or text can be added to the command buffer after call to **IDeckLinkMetalScreenPreviewHelper::Draw**.
- Create a subclass of **IDeckLinkScreenPreviewCallback** which calls **IDeckLinkMetalScreenPreviewHelper::SetFrame** from **IDeckLinkScreenPreviewCallback::DrawFrame**
- Register an instance of the **IDeckLinkScreenPreviewCallback** subclass with **IDeckLinkInput::SetScreenPreviewCallback** or **IDeckLinkOutput::SetScreenPreviewCallback** as appropriate.

#### Related Interfaces

Interface	Interface ID	Description
IDeckLinkVideoFrame	IID_IDeckLinkVideoFrame	An <b>IDeckLinkVideoFrame</b> object interface is set for Metal preview with <b>IDeckLinkMetalScreenPreviewHelper::SetFrame</b>

Public Member Functions	
Method	Description
Initialize	Initialize Metal Preview.
Draw	Draw the Metal preview.
SetFrame	Set the preview frame to display on the next Draw call.
Set3DPreviewFormat	Set the 3D preview format.

### 2.5.50.1 IDeckLinkMetalScreenPreviewHelper::Initialize method

The **Initialize** method should be called to initialize the Metal preview to use the given device.

#### Syntax

```
HRESULT Initialize(void* device)
```

#### Parameters

Name	Direction	Description
device	in	Metal device object of type id<MTLDevice>.

#### Return Values

Value	Description
E_POINTER	Device argument is null
E_INVALIDARG	Device argument is invalid
E_FAIL	Failure
S_OK	Success

## 2.5.50.2 IDeckLinkMetalScreenPreviewHelper::Draw method

The **Draw** method encodes commands to a MTLCommandBuffer to draw a frame.

This should typically be called from the drawing method of the Metal-aware view. In the case of MTKView, this would be the drawRect method when that method has been overridden by a subclass, or drawInMtkView on the view's delegate if the subclass doesn't override it.

**IDeckLinkMetalScreenPreviewHelper::Draw** must be called with valid MTLCommandBuffer and MFLRenderPassDescriptor parameters. The viewport parameter is optional, and allows to restrict the drawing of the preview to a viewport within the view. Pass nil if not required.

**Draw** and **SetFrame** allow Metal updates to be decoupled from new frame availability.

### Syntax

```
HRESULT Draw(void* cmdBuffer,
             void* renderPassDescriptor,
             void* viewport)
```

### Parameters

Name	Direction	Description
cmdBuffer	in	Metal command buffer object of type id<MTLCommandBuffer>.
renderPassDescriptor	in	Metal render pass descriptor object of type MTLRenderPassDescriptor*.
viewport	in	Viewport of type MTLViewPort*. Set to nil if not required.

### Return Values

Value	Description
E_POINTER	Required argument is null
E_INVALIDARG	Invalid argument received
E_FAIL	Failure
S_OK	Success

### 2.5.50.3 IDeckLinkMetalScreenPreviewHelper::SetFrame method

The **SetFrame** method is used to set the preview frame to display on the next call to **IDeckLinkMetalScreenPreviewHelper::Draw**.

A null frame pointer can be provided - this will clear the preview.

Depending on the rate and timing of calls to **SetFrame** and **Draw**, some frames may not be displayed or may be displayed multiple times.

#### Syntax

```
HRESULT SetFrame(IDeckLinkVideoFrame* theFrame)
```

#### Parameters

Name	Direction	Description
theFrame	in	Video Frame to preview

#### Return Values

Value	Description
E_INVALIDARG	The preview frame is invalid
E_FAIL	Failure
S_OK	Success

### 2.5.50.4 IDeckLinkMetalScreenPreviewHelper::Set3DPreviewFormat method

The **Set3DPreviewFormat** method is used to set the 3D preview format.

#### Syntax

```
HRESULT Set3DPreviewFormat(BMD3DPreviewFormat previewFormat)
```

#### Parameters

Name	Direction	Description
previewFormat	in	The 3D preview format. See <b>BMD3DPreviewFormat</b> for more details.

#### Return Values

Value	Description
E_INVALIDARG	The preview format is invalid
E_FAIL	Failure
S_OK	Success

## 2.5.51 IDeckLinkWPFDX9ScreenPreviewHelper Interface

The `IDeckLinkWPFDX9ScreenPreviewHelper` interface may be used with a simple `IDeckLinkScreenPreviewCallback` implementation to provide DirectX based preview rendering in WPF applications inferring the `D3DImage` surface.

A reference to an `IDeckLinkWPFDX9ScreenPreviewHelper` object is obtained from `CoCreateInstance`.

For examples demonstrating how to interface an `IDeckLinkWPFDX9ScreenPreviewHelper` object with `D3DImage` in a WPF application, see the `CapturePreviewCSharp` and `SignalGenCSharp` samples in the DeckLink SDK.

### Related Interfaces

Interface	Interface ID	Description
<code>IDeckLinkVideoFrame</code>	<code>IID_IDeckLinkVideoFrame</code>	An <code>IDeckLinkVideoFrame</code> object interface is set for DirectX preview with <code>IDeckLinkWPFDX9ScreenPreviewHelper::SetFrame</code>

Public Member Functions	
Method	Description
<code>Initialize</code>	Initialize DirectX device for previewing.
<code>Render</code>	Repaint the DirectX surface.
<code>SetSurfaceSize</code>	Set the size of render surface.
<code>SetFrame</code>	Set the preview frame for display.
<code>Set3DPreviewFormat</code>	Set the 3D preview format.
<code>GetBackBuffer</code>	Get reference to renderer back-buffer

### 2.5.51.1 IDeckLinkWPFDX9ScreenPreviewHelper::Initialize method

The `Initialize` method prepares a DirectX 9 3D device to be used by the DeckLink API's WPF preview helper.

#### Syntax

```
HRESULT Initialize()
```

#### Return Values

Value	Description
<code>E_FAIL</code>	Failure
<code>S_OK</code>	Success

## 2.5.51.2 IDeckLinkWPFDX9ScreenPreviewHelper::Render method

The **Render** method should be called whenever the preview frame needs to be repainted. The frames to be displayed should be provided to **IDeckLinkWPFDX9ScreenPreviewHelper::SetFrame**.

### Syntax

```
HRESULT Render()
```

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.51.3 IDeckLinkWPFDX9ScreenPreviewHelper::SetSurfaceSize method

The **SetSurfaceSize** method is used to set the size of render surface.

### Syntax

```
HRESULT SetSurfaceSize(uint32_t width,  
                      uint32_t height)
```

### Parameters

Name	Direction	Description
width	in	Width of surface in pixels.
height	in	Height of surface in pixels.

### Return Values

Value	Description
E_INVALIDARG	Invalid value for parameters width or height
E_FAIL	Failure
S_OK	Success

## 2.5.51.4 IDeckLinkWPFDX9ScreenPreviewHelper::SetFrame method

The **SetFrame** method will load a 2D or 3D **IDeckLinkVideoFrame** into a texture. This method is used to set the preview frame to display on the next call to **IDeckLinkWPFDX9ScreenPreviewHelper::Render**.

Depending on the rate and timing of calls to **SetFrame** and **Render**, some frames may not be displayed or may be displayed multiple times.

### Syntax

```
HRESULT SetFrame(IDeckLinkVideoFrame* theFrame)
```

### Parameters

Name	Direction	Description
theFrame	in	The video frame to preview.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.5.51.5 IDeckLinkWPFDX9ScreenPreviewHelper::Set3DPreviewFormat method

The **Set3DPreviewFormat** method is used to set the 3D preview format.

### Syntax

```
HRESULT Set3DPreviewFormat(BMD3DPreviewFormat previewFormat)
```

### Parameters

Name	Direction	Description
previewFormat	in	The 3D preview format. See <b>BMD3DPreviewFormat</b> for more details.

### Return Values

Value	Description
S_OK	Success

## 2.5.51.6 IDeckLinkWPFDX9ScreenPreviewHelper::GetBackBuffer method

The **GetBackBuffer** method outputs the renderer back buffer than can be copied to front buffer in WPF render thread.

### Syntax

```
HRESULT GetBackBuffer(void** backBuffer)
```

### Parameters

Name	Direction	Description
backBuffer	out	Pointer to renderer back-buffer.

### Return Values

Value	Description
E_POINTER	The backBuffer parameter is invalid.
E_FAIL	Failure
S_OK	Success

## 2.6 Streaming Interface Reference

### 2.6.1 IBMDStreamingDiscovery Interface

The **IBMDStreamingDiscovery** object interface is used to install or remove the callback for receiving streaming device discovery notifications.

A reference to an **IBMDStreamingDiscovery** object interface may be obtained from **CoCreateInstance** on platforms with native COM support or from **CreateBMDStreamingDiscoveryInstance** on other platforms.

Public Member Functions	
Method	Description
InstallDeviceNotifications	Install device notifications callback
UninstallDeviceNotifications	Remove device notifications callback



## 2.6.1.1 **IBMDStreamingDiscovery::InstallDeviceNotifications** method

The **InstallDeviceNotifications** method installs the callback which will be called when a new streaming device becomes available.

**NOTE** Only one callback may be installed at a time.

### Syntax

```
HRESULT InstallDeviceNotifications  
(IBMDStreamingDeviceNotificationCallback* theCallback);
```

### Parameters

Name	Direction	Description
theCallback	in	Callback object implementing the <b>IBMDStreamingDeviceNotificationCallback</b> object interface

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	The callback parameter is invalid.
E_UNEXPECTED	An unexpected internal error has occurred.

## 2.6.1.2 **IBMDStreamingDiscovery::UninstallDeviceNotifications** method

The **UninstallDeviceNotifications** method removes the device notifications callback.

### Syntax

```
HRESULT UninstallDeviceNotifications ();
```

### Return Values

Value	Description
S_OK	Success
E_UNEXPECTED	An unexpected internal error has occurred.

## 2.6.2 **IBMDStreamingDeviceNotificationCallback** Interface

The **IBMDStreamingDeviceNotificationCallback** object interface is a callback class which is called when a streaming device arrives, is removed or undergoes a mode change.

### Related Interfaces

Interface	Interface ID	Description
IBMDStreamingDiscovery	IID_IBMDStreamingDiscovery	An <b>IBMDStreamingDeviceNotificationCallback</b> object interface may be installed with <b>IBMDStreamingDiscovery::InstallDeviceNotifications</b>

Public Member Functions	
Method	Description
StreamingDeviceArrived	Streaming device arrived
StreamingDeviceRemoved	Streaming device removed
StreamingDeviceModeChanged	Streaming device mode changed

### 2.6.2.1 IBMDStreamingDeviceNotificationCallback::StreamingDeviceArrived method

The **StreamingDeviceArrived** method is called when a new streaming device becomes available.

The result parameter (required by COM) is ignored by the caller.

#### Syntax

```
HRESULT StreamingDeviceArrived (IDeckLink* device);
```

#### Parameters

Name	Direction	Description
device	in	streaming device

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.6.2.2 IBMDStreamingDeviceNotificationCallback::StreamingDeviceRemoved method

The **StreamingDeviceRemoved** method is called when a streaming device is removed.

The result parameter (required by COM) is ignored by the caller.

#### Syntax

```
HRESULT StreamingDeviceRemoved (IDeckLink* device);
```

#### Parameters

Name	Direction	Description
device	in	streaming device

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.6.2.3 **IBMDStreamingDeviceNotificationCallback::StreamingDeviceModeChanged method**

The **StreamingDeviceModeChanged** method is called when a streaming device's mode has changed.

The result parameter (required by COM) is ignored by the caller.

#### Syntax

```
HRESULT StreamingDeviceModeChanged (IDeckLink* device,
    BMDStreamingDeviceMode mode);
```

#### Parameters

Name	Direction	Description
device	in	streaming device
mode	in	new streaming device mode after the mode change occurred

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.6.3 **IBMDStreamingVideoEncodingMode Interface**

The **IBMDStreamingVideoEncodingMode** object interface represents a streaming video encoding mode.

The encoding mode encapsulates all the available encoder settings such as video codec settings and audio codec settings. To make changes to encoder settings use the

**IBMDStreamingMutableVideoEncodingMode** object interface obtained via the **CreateMutableVideoEncodingMode** method.

#### Related Interfaces

Interface	Interface ID	Description
IBMDStreamingVideoEncodingModePresetIterator	IID_IBMDStreamingVideoEncodingModePresetIterator	<b>IBMDStreamingVideoEncodingModePresetIterator::Next</b> returns an <b>IBMDStreamingVideoEncodingMode</b> object interface for each available video encoding mode.
IBMDStreamingMutableVideoEncodingMode	IID_IBMDStreamingMutableVideoEncodingMode	A mutable subclass of <b>IBMDStreamingVideoEncodingMode</b> may be created using <b>CreateMutableVideoEncodingMode</b>

Public Member Functions	
Method	Description
GetName	Get the name describing the video encoding mode.
GetPresetID	Get the unique ID representing the video encoding mode.
GetSourcePositionX	Get the x coordinate of the origin of the video source rectangle.
GetSourcePositionY	Get the y coordinate of the origin of the video source rectangle.
GetSourceWidth	Get the width of the video source rectangle.
GetSourceHeight	Get the height of the video source rectangle.

Public Member Functions	
Method	Description
GetDestWidth	Get the width of the video destination rectangle.
GetDestHeight	Get the height of the video destination rectangle.
GetFlag	Get the current value of a boolean encoding mode setting.
GetInt	Get the current value of a int64_t encoding mode setting.
GetFloat	Get the current value of a double encoding mode setting.
GetString	Get the current value of a string encoding mode setting.
CreateMutableVideoEncodingMode	Create a mutable copy of the IBMDStreamingVideoEncodingMode object interface.

### 2.6.3.1 IBMDStreamingVideoEncodingMode::GetName method

The **GetName** method returns a string describing the video encoding mode.

#### Syntax

```
HRESULT GetName (string name);
```

#### Parameters

Name	Direction	Description
name	out	Video encoding name. This allocated string must be freed by the caller when no longer required.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_POINTER	The name parameter is invalid.

### 2.6.3.2 IBMDStreamingVideoEncodingMode::GetPresetID method

The **GetPresetID** method returns the unique ID representing the preset video mode.

#### Syntax

```
unsigned int GetPresetID ();
```

#### Return Values

Value	Description
id	Unique ID of preset video mode.

### 2.6.3.3 **IBMDStreamingVideoEncodingMode::GetSourcePositionX** method

The **GetSourcePositionX** method returns the x coordinate of the origin of the source rectangle used for encoding video.

#### **Syntax**

```
unsigned int    GetSourcePositionX ();
```

#### **Return Values**

Value	Description
xPosition	The x coordindate in pixels for source rectangle origin.

### 2.6.3.4 **IBMDStreamingVideoEncodingMode::GetSourcePositionY** method

The **GetSourcePositionY** method returns the y coordinate of the origin of the source rectangle used for encoding video.

#### **Syntax**

```
unsigned int    GetSourcePositionY ();
```

#### **Return Values**

Value	Description
yPosition	The y coordindate in pixels for source rectangle origin.

### 2.6.3.5 **IBMDStreamingVideoEncodingMode::GetSourceWidth** method

The **GetSourceWidth** method returns the width of the source rectangle used for encoding video.

#### **Syntax**

```
unsigned int    GetSourceWidth ();
```

#### **Return Values**

Value	Description
width	Width in pixels of the source rectangle.

### 2.6.3.6 **IBMDStreamingVideoEncodingMode::GetSourceHeight** method

The **GetSourceHeight** method the height of the source rectangle used for encoding video.

#### **Syntax**

```
unsigned int    GetSourceHeight ();
```

#### **Return Values**

Value	Description
height	Height in pixels of the source rectangle.

### 2.6.3.7 **IBMDStreamingVideoEncodingMode::GetDestWidth** method

The **GetDestWidth** method returns the width of the destination rectangle used when encoding video. If the destination rectangle is different to the source rectangle the video will be scaled when encoding.

#### **Syntax**

```
unsigned int    GetDestWidth ();
```

#### **Return Values**

Value	Description
width	Width in pixels of the destination rectangle.

### 2.6.3.8 **IBMDStreamingVideoEncodingMode::GetDestHeight** method

The **GetDestHeight** method returns the height of the destination rectangle used when encoding video. If the destination rectangle is different to the source rectangle the video will be scaled when encoding.

#### **Syntax**

```
unsigned int    GetDestHeight ();
```

#### **Return Values**

Value	Description
height	Height in pixels of the destination rectangle.

### 2.6.3.9 **IBMDStreamingVideoEncodingMode::GetFlag** method

The **GetFlag** method gets the current value of the boolean configuration setting associated with the given **BMDStreamingEncodingModePropertyID**.

#### **Syntax**

```
HRESULT    GetFlag(BMDStreamingEncodingModePropertyID cfgID, boolean* value);
```

#### **Parameters**

Name	Direction	Description
cfgID	in	<b>BMDStreamingEncodingModePropertyID</b> to get flag value.
value	out	The value corresponding to cfgID.

#### **Return Values**

Value	Description
S_OK	Success
E_INVALIDARG	One or more parameters are invalid.

### 2.6.3.10 **IBMDStreamingVideoEncodingMode::GetInt** method

The **GetInt** method gets the current value of the int64\_t configuration setting associated with the given **BMDStreamingEncodingModePropertyID**.

#### Syntax

```
HRESULT GetInt (BMDStreamingEncodingModePropertyID cfgID, int64_t* value);
```

#### Parameters

Name	Direction	Description
cfgID	in	<b>BMDStreamingEncodingModePropertyID</b> to get integer value.
value	out	The value corresponding to cfgID.

#### Return Values

Value	Description
S_OK	Success
E_INVALIDARG	One or more parameters are invalid.

### 2.6.3.11 **IBMDStreamingVideoEncodingMode::GetFloat** method

The **GetFloat** gets the current value of the double configuration setting associated with the given **BMDStreamingEncodingModePropertyID**.

#### Syntax

```
HRESULT GetFloat (BMDStreamingEncodingModePropertyID cfgID, double* value);
```

#### Parameters

Name	Direction	Description
cfgID	in	<b>BMDStreamingEncodingModePropertyID</b> to get double value.
value	out	The value corresponding to cfgID.

#### Return Values

Value	Description
S_OK	Success
E_INVALIDARG	One or more parameters are invalid.

### 2.6.3.12 **IBMDStreamingVideoEncodingMode::GetString** method

The **GetString** current value of the string configuration setting associated with the given **BMDStreamingEncodingModePropertyID**.

#### Syntax

```
HRESULT GetString (BMDStreamingEncodingModePropertyID cfgID, string value);
```

#### Parameters

Name	Direction	Description
cfgID	in	<b>BMDStreamingEncodingModePropertyID</b> to get string value.
value	out	The value corresponding to <b>cfgID</b> . This allocated string must be freed by the caller when no longer required.

#### Return Values

Value	Description
S_OK	Success
E_INVALIDARG	One or more parameters are invalid.
E_OUTOFMEMORY	Unable to allocate memory for string.

### 2.6.3.13 **IBMDStreamingVideoEncodingMode::CreateMutableVideoEncodingMode** method

The **CreateMutableVideoEncodingMode** method creates a new object interface which is a mutable copy of the **IBMDStreamingVideoEncodingMode** object interface.

**IBMDStreamingMutableVideoEncodingMode** is a subclass of **IBMDStreamingVideoEncodingMode** and inherits all its methods. It provides additional methods to change settings for the encoding of video and audio streams.

#### Syntax

```
HRESULT CreateMutableVideoEncodingMode  
(IBMDStreamingMutableVideoEncodingMode* newEncodingMode);
```

#### Parameters

Name	Direction	Description
newEncodingMode	out	A new mutable encoding mode object interface.

#### Return Values

Value	Description
S_OK	Success
E_POINTER	The <b>newEncodingMode</b> parameter is invalid.
E_OUTOFMEMORY	Unable to allocate memory for new object interface.



## 2.6.4 IBMDStreamingMutableVideoEncodingMode Interface

The **IBMDStreamingMutableVideoEncodingMode** object interface represents a mutable streaming video encoding mode.

Methods are provided to set video codec settings and audio codec settings. Use this object interface if you wish to perform cropping or scaling of the input video frame, adjust the video or audio bit rate and to change other video or audio codec settings.

### Related Interfaces

Interface	Interface ID	Description
IBMDStreamingVideoEncodingMode	IID_IBMDStreamingVideoEncodingMode	An <b>IBMDStreamingMutableVideoEncodingMode</b> object interface may be created from an <b>IBMDStreamingVideoEncodingMode</b> interface object using its <b>CreateMutableVideoEncodingMode</b> method.

Public Member Functions	
Method	Description
SetSourceRect	Set the video source rectangle.
SetDestSize	Set the size of the video destination rectangle.
SetFlag	Set the value for a boolean encoding mode setting.
SetInt	Set the value for an int64_t encoding mode setting.
SetFloat	Set the value for a double encoding mode setting.
SetString	Set the value for a string encoding mode setting.

### 2.6.4.1 IBMDStreamingMutableVideoEncodingMode::SetSourceRect method

The **SetSourceRect** method sets the source rectangle used for encoding video.

Cropping of the input video frame can be achieved by using a source rectangle that is different to the input video frame dimensions.

When no source rectangle is set, the source rectangle of the parent **IBMDStreamingVideoEncodingMode** object interface will be used by the encoder.

#### Syntax

```
HRESULT SetSourceRect (uint32_t posX, uint32_t posY,  
                        uint32_t width, uint32_t height);
```

#### Parameters

Name	Direction	Description
posX	in	X coordinate of source rectangle origin.
posY	in	Y coordinate of source rectangle origin.
width	in	Width of source rectangle.
height	in	Height of source rectangle.

#### Return Values

Value	Description
S_OK	Success

## 2.6.4.2 **IBMDStreamingMutableVideoEncodingMode::SetDestSize** method

The **SetDestSize** method sets the destination rectangle used for encoding video.

When the destination rectangle size is set to a different size to the source rectangle size, scaling will be performed by the encoder.

When no destination rectangle size is set, the source rectangle size of the parent **IBMDStreamingVideoEncodingMode** object interface will be used by the encoder.

### Syntax

```
HRESULT SetDestSize (uint32_t width, uint32_t height);
```

### Parameters

Name	Direction	Description
width	in	Width of destination rectangle.
height	in	Height of destination rectangle.

### Return Values

Value	Description
S_OK	Success

## 2.6.4.3 **IBMDStreamingMutableVideoEncodingMode::SetFlag** method

The **SetFlag** method sets a boolean value into the configuration setting associated with the given **BMDStreamingEncodingModePropertyID**.

### Syntax

```
HRESULT SetFlag (BMDStreamingEncodingModePropertyID cfgID, boolean value);
```

### Parameters

Name	Direction	Description
cfgID	in	The ID of the configuration setting.
value	in	The boolean value to set into the selected configuration setting.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	One or more parameters are invalid.

## 2.6.4.4 **IBMDStreamingMutableVideoEncodingMode::SetInt** method

The **SetInt** method sets an `int64_t` value into the configuration setting associated with the given **BMDStreamingEncodingModePropertyID**.

### Syntax

```
HRESULT SetInt (BMDStreamingEncodingModePropertyID cfgID, int64_t value);
```

### Parameters

Name	Direction	Description
cfgID	in	The ID of the configuration setting.
value	in	The integer value to set into the selected configuration setting.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	One or more parameters are invalid.

## 2.6.4.5 **IBMDStreamingMutableVideoEncodingMode::SetFloat** method

The **SetFloat** method sets a double value into the configuration setting associated with the given **BMDStreamingEncodingModePropertyID**.

### Syntax

```
HRESULT SetFloat (BMDStreamingEncodingModePropertyID cfgID, double value);
```

### Parameters

Name	Direction	Description
cfgID	in	The ID of the configuration setting.
value	in	The double value to set into the selected configuration setting.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	One or more parameters are invalid.

## 2.6.4.6 **IBMDStreamingMutableVideoEncodingMode::SetString** method

The **SetString** method sets a string value into the configuration setting associated with the given **BMDStreamingEncodingModePropertyID**.

### Syntax

```
HRESULT SetString (BMDStreamingEncodingModePropertyID cfgID, string value);
```

### Parameters

Name	Direction	Description
cfgID	in	The ID of the configuration setting.
value	in	The string value to set into the selected configuration setting.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	One or more parameters are invalid.

## 2.6.5 **IBMDStreamingVideoEncodingMode::PresetIteratorInterface**

The **IBMDStreamingVideoEncodingModePresetIterator** object interface is used to enumerate the available preset video encoding modes.

A device may have a number of preset encoding modes. These are convenient encoding modes which can be used to encode video and audio into formats suitable for a number of commonly available playback devices.

A reference to an **IBMDStreamingVideoEncodingModePresetIterator** object interface may be obtained from an **IBMDStreamingDeviceInput** object interface using the **GetVideoEncodingModePresetIterator** method.

### Related Interfaces

Interface	Interface ID	Description
IBMDStreamingDeviceInput	IID_IBMDStreamingDeviceInput	<b>IBMDStreamingDeviceInput::GetVideoEncodingModePresetIterator</b> returns an <b>IBMDStreamingVideoEncodingModePresetIterator</b> object interface.

Public Member Functions	
Method	Description
Next	Returns a pointer to an <b>IBMDStreamingVideoEncodingMode</b> object interface for an available preset encoding mode.

## 2.6.5.1 **IBMDStreamingVideoEncodingModePresetIterator::Next** method

The **Next** method returns the next available **IBMDStreamingVideoEncodingMode** object interface.

### Syntax

```
HRESULT Next (IBMDStreamingVideoEncodingMode* videoEncodingMode);
```

### Parameters

Name	Direction	Description
videoEncodingMode	out	<b>IBMDStreamingVideoEncodingMode</b> object interface or NULL when no more video encoding modes are available.

### Return Values

Value	Description
S_OK	Success
S_FALSE	No (more) preset encoding modes are available.
E_POINTER	The videoEncodingMode parameter is invalid.

## 2.6.6 **IBMDStreamingDeviceInput** Interface

The **IBMDStreamingDeviceInput** object interface represents a physical streaming video encoder device.

### Related Interfaces

Interface	Interface ID	Description
IDeckLink	IID_IDeckLink	An <b>IBMDStreamingDeviceInput</b> object interface may be obtained from IDeckLink using <b>QueryInterface</b> .
IBMDStreamingDeviceNotificationCallback	IID_IBMDStreamingDeviceNotificationCallback	<b>IBMDStreamingDeviceNotificationCallback::StreamingDeviceArrived</b> returns an <b>IDeckLink</b> object interface representing a streaming video encoder device

Public Member Functions	
Method	Description
DoesSupportVideoInputMode	Indicates whether a video input mode is supported by the device
GetVideoInputModeIterator	Get an iterator to enumerate available video input modes
SetVideoInputMode	Set a display mode as the device's video input mode
GetCurrentDetectedVideoInputMode	Get the current video input mode detected by the device
GetVideoEncodingMode	Get the currently configured video encoding mode
GetVideoEncodingModePresetIterator	Get an iterator to enumerate available video encoding mode presets
DoesSupportVideoEncodingMode	Indicates whether a video encoding mode is supported by the device
SetVideoEncodingMode	Set a video encoding mode as the device's current video encoding mode
StartCapture	Start a video encoding capture
StopCapture	Stop a video encoding capture
SetCallback	Set a callback for receiving new video and audio packets

### 2.6.6.1 **IBMDStreamingDeviceInput::DoesSupportVideoInputMode** method

The **DoesSupportVideoInputMode** method indicates whether a given video input mode is supported on the device.

#### Syntax

```
HRESULT DoesSupportVideoInputMode (BMDDisplayMode inputMode, boolean* result);
```

#### Parameters

Name	Direction	Description
inputMode	in	BMDDisplayMode to test for input support.
result	out	Boolean value indicating whether the mode is supported.

#### Return Values

Value	Description
S_OK	Success
E_POINTER	The result parameter is invalid.
E_INVALIDARG	The inputMode parameter is invalid

### 2.6.6.2 **IBMDStreamingDeviceInput::GetVideoInputModeIterator** method

The **GetVideoInputModeIterator** method returns an iterator which enumerates the available video input modes.

#### Syntax

```
HRESULT GetVideoInputModeIterator (IDeckLinkDisplayModeIterator* iterator);
```

#### Parameters

Name	Direction	Description
iterator	out	Display mode iterator

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_POINTER	The iterator parameter is invalid.

### 2.6.6.3 **IBMDStreamingDeviceInput::SetVideoInputMode** method

The **SetVideoInputMode** method configures the device to use the specified video display mode for input.

#### **Syntax**

```
HRESULT SetVideoInputMode (BMDDisplayMode inputMode);
```

#### **Parameters**

Name	Direction	Description
inputMode	in	Display mode to set as the input display mode

#### **Return Values**

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	The inputMode parameter is invalid.

### 2.6.6.4 **IBMDStreamingDeviceInput::GetCurrentDetectedVideoInputMode** method

The **GetCurrentDetectedVideoInputMode** method returns the current video input display mode as detected by the device.

#### **Syntax**

```
HRESULT GetCurrentDetectedVideoInputMode (BMDDisplayMode* detectedMode);
```

#### **Parameters**

Name	Direction	Description
detectedMode	out	Display mode the device detected for video input

#### **Return Values**

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	The detectedMode parameter is invalid.

## 2.6.6.5 IBMDStreamingDeviceInput::GetVideoEncodingMode method

The `GetVideoEncodingMode` method returns the currently configured video encoding mode.

### Syntax

```
HRESULT GetVideoEncodingMode (IBMDStreamingVideoEncodingMode* encodingMode);
```

### Parameters

Name	Direction	Description
encodingMode	out	Current video encoding mode

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	The encodingMode parameter is invalid.

## 2.6.6.6 IBMDStreamingDeviceInput::GetVideoEncodingModePresetIterator method

The `GetVideoEncodingModePresetIterator` method returns an iterator which enumerates the available video encoding mode presets.

Different video display modes may have different encoding mode presets.

### Syntax

```
HRESULT GetVideoEncodingModePresetIterator (BMDDisplayMode inputMode,  
IBMDStreamingVideoEncodingModePresetIterator* iterator);
```

### Parameters

Name	Direction	Description
inputMode	in	The DisplayMode to iterate encoding mode presets for
iterator	out	Video encoding mode preset iterator

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	The iterator parameter is invalid.



## 2.6.6.7 **IBMDStreamingDeviceInput::DoesSupportVideoEncodingMode** method

The **DoesSupportVideoEncodingMode** method indicates whether a given video encoding mode is support by the device for the given input display mode. Modes may be supported, not supported or supported with changes. If a mode is supported with changes, the changed mode will be returned by the **changedEncodingMode** parameter.

### Syntax

```
HRESULT DoesSupportVideoEncodingMode (BMDDisplayMode inputMode,  
IBMDStreamingVideoEncodingMode* encodingMode, BMDStreamingEncodingSupport*  
result, IBMDStreamingVideoEncodingMode* changedEncodingMode);
```

### Parameters

Name	Direction	Description
inputMode	in	Display mode to be used with the video encoding mode
encodingMode	in	Video encoding mode to be tested for support
result	out	Indicates whether the mode is supported, not supported or supported with changes
changedEncodingMode	out	Changed encoding mode when the mode is supported with changes

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_POINTER	One or more out parameters are invalid
E_INVALIDARG	The encodingMode parameter is invalid

## 2.6.6.8 **IBMDStreamingDeviceInput::SetVideoEncodingMode** method

The **SetVideoEncodingMode** method sets the given video encoding mode as the device's current video encoding mode. It is necessary to set a video encoding mode before calling the **StartCapture** method.

### Syntax

```
HRESULT SetVideoEncodingMode (IBMDStreamingVideoEncodingMode* encodingMode);
```

### Parameters

Name	Direction	Description
encodingMode	in	Video encoding mode to be used by the device.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_INVALIDARG	The encodingMode parameter is invalid

### 2.6.6.9 **IBMDStreamingDeviceInput::StartCapture method**

The **StartCapture** method starts a capture on the device using the current video encoding mode.

If a callback implementing the **IBMDStreamingH264InputCallback** object interface has been set by the **SetCallback** method, calls will be made as new compressed video and audio packets are made available by the device.

#### **Syntax**

```
HRESULT StartCapture ();
```

#### **Parameters**

none.

#### **Return Values**

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.6.6.10 **IBMDStreamingDeviceInput::StopCapture method**

The **StopCapture** method stops a capture if a capture is currently in progress.

#### **Syntax**

```
HRESULT StopCapture ();
```

#### **Parameters**

none.

#### **Return Values**

Value	Description
E_FAIL	Failure
S_OK	Success

### 2.6.6.11 **IBMDStreamingDeviceInput::SetCallback method**

The **SetCallback** method configures a callback which will be called for new input from the device or when the device input changes.

An object shall be passed implementing the **IBMDStreamingH264InputCallback** object interface as the callback to receive callbacks. An existing callback can be removed by passing NULL in the callback parameter.

#### **Syntax**

```
HRESULT SetCallback (IUnknown* theCallback);
```

#### **Parameters**

Name	Direction	Description
theCallback	in	callback object implementing the <b>IUnknown</b> object interface

## Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.6.7 IBMDStreamingH264InputCallback Interface

The **IBMDStreamingH264InputCallback** object interface is a callback class which is called when encoded video and audio packets are available or when the video input to the streaming device changes.

Once a capture has been started with the **IBMDStreamingDeviceInput::StartCapture** method, compressed video and audio packets will become available asynchronously.

This callback object interface can also be used to detect changes to the video input display mode and changes to the video input connector, whether or not a capture is in progress.

### Related Interfaces

Interface	Interface ID	Description
IBMDStreamingDeviceInput	IID_IBMDStreamingDeviceInput	An <b>IBMDStreamingH264InputCallback</b> object interface may be installed with <b>IBMDStreamingDeviceInput::SetCallback</b>

### Public Member Functions

Method	Description
H264NALPacketArrived	Called when a NAL video packet is available
H264AudioPacketArrived	Called when an audio packet is available
MPEG2TSPacketArrived	Called when a transport stream packet is available
H264VideoInputConnectorScanningChanged	Called when the video input connect scanning mode has changed
H264VideoInputConnectorChanged	Called when the video input connect connector has changed
H264VideoInputModeChanged	Called when the video input display mode has changed

## 2.6.7.1 IBMDStreamingH264InputCallback::H264NALPacketArrived method

The **H264NALPacketArrived** method is called when an **IBMDStreamingH264NALPacket** becomes available from the streaming device while a capture is in progress.

The result parameter (required by COM) is ignored by the caller.

### Syntax

```
HRESULT H264NALPacketArrived(IBMDStreamingH264NALPacket* nalPacket);
```

### Parameters

Name	Direction	Description
nalPacket	in	NAL packet containing compressed video.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.6.7.2 IBMDStreamingH264InputCallback::H264AudioPacketArrived method

The **H264AudioPacketArrived** method is called when an **IBMDStreamingAudioPacket** becomes available from the streaming device while a capture is in progress.

The result parameter (required by COM) is ignored by the caller.

### Syntax

```
HRESULT H264AudioPacketArrived (IBMDStreamingAudioPacket* audioPacket);
```

### Parameters

Name	Direction	Description
audioPacket	in	Audio packet containing compressed audio.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.6.7.3 IBMDStreamingH264InputCallback::MPEG2TSPacketArrived method

The **MPEG2TSPacketArrived** method is called when an **IBMDStreamingMPEG2TSPacket** becomes available from the streaming device while a capture is in progress.

The result parameter (required by COM) is ignored by the caller.

### Syntax

```
HRESULT MPEG2TSPacketArrived (IBMDStreamingMPEG2TSPacket* tsPacket);
```

### Parameters

Name	Direction	Description
tsPacket	in	MPEG transport stream packet containing video or audio data.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.6.7.4 **IBMDStreamingH264InputCallback::H264VideoInputConnectorScanning Changed method**

The **H264VideoInputConnectorScanningChanged** method is called when the input connect scanning mode has changed.

This method will be called independently of capture state.

The result parameter (required by COM) is ignored by the caller.

### **Syntax**

```
HRESULT H264VideoInputConnectorScanningChanged ();
```

### **Parameters**

none.

### **Return Values**

<b>Value</b>	<b>Description</b>
E_FAIL	Failure
S_OK	Success

## 2.6.7.5 **IBMDStreamingH264InputCallback::H264VideoInputConnectorChanged method**

The **H264VideoInputConnectorChanged** method is called when the streaming device detects a change to the input connector.

This method will be called independently of capture state.

The result parameter (required by COM) is ignored by the caller.

### **Syntax**

```
HRESULT H264VideoInputConnectorChanged ();
```

### **Parameters**

none.

### **Return Values**

<b>Value</b>	<b>Description</b>
E_FAIL	Failure
S_OK	Success

## 2.6.7.6 IBMDStreamingH264InputCallback::H264VideoInputModeChanged method

The **H264VideoInputModeChanged** method is called when the streaming device detects a change to the video input display mode.

This method will be called independently of capture state.

The result parameter (required by COM) is ignored by the caller.

### Syntax

```
HRESULT H264VideoInputModeChanged ();
```

### Parameters

none.

### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success

## 2.6.8 IBMDStreamingH264NALPacket Interface

The **IBMDStreamingH264NALPacket** object interface represents an MPEG-4 AVC/H.264 Network Adaptation Layer (NAL) packet.

Objects with an **IBMDStreamingH264NALPacket** object interface are passed to the **IBMDStreamingH264InputCallback::H264NALPacketArrived** callback.

The MPEG-4 AVC/H.264 NAL packet contains the compressed H.264 video bitstream which can be passed to a suitable H.264 video decoder for decoding and display. For some applications it may be more convenient to process NAL video packets instead of processing video carried in transport stream packets.

### Related Interfaces

Interface	Interface ID	Description
IBMDStreamingH264InputCallback	IID_IBMDStreamingH264InputCallback	New MPEG-4 AVC/H.264 NAL packets are passed to the <b>IBMDStreamingH264InputCallback::H264NALPacketArrived</b> callback

Public Member Functions	
Method	Description
GetPayloadSize	Get number of bytes in the NAL packet
GetBytes	Get pointer to NAL packet data
GetBytesWithSizePrefix	Get pointer to NAL packet data prefixed by a 32bit size value
GetDisplayTime	Get display time for the NAL packet

### 2.6.8.1 **IBMDStreamingH264NALPacket::GetPayloadSize** method

The **GetPayloadSize** method gets the number of bytes in the NAL packet.

#### Syntax

```
long GetPayloadSize ();
```

#### Return Values

Value	Description
Count	NAL packet size in bytes

### 2.6.8.2 **IBMDStreamingH264NALPacket::GetBytes** method

The **GetBytes** method returns a pointer to the data buffer of the NAL packet.

#### Syntax

```
HRESULT GetBytes (void* buffer);
```

#### Parameters

Name	Direction	Description
buffer	out	Pointer to NAL packet data buffer – only valid while object remains valid.

#### Return Values

Value	Description
S_OK	Success
E_POINTER	The parameter is invalid.

### 2.6.8.3 **IBMDStreamingH264NALPacket::GetBytesWithSizePrefix** method

The **GetBytesWithSizePrefix** method returns a pointer to a data buffer starting with a 32bit unsigned integer containing the size of the NAL packet followed by the data buffer of the NAL packet. This arrangement may be required by some video decoders.

**NOTE** The size of the data buffer returned by **GetBytesWithSizePrefix** is 4 bytes larger than the size of the data buffer returned by **GetBytes**.

#### Syntax

```
HRESULT GetBytesWithSizePrefix (void* buffer);
```

#### Parameters

Name	Direction	Description
buffer	out	Pointer to NAL packet data buffer prefixed by size value – only valid while object remains

#### Return Values

Value	Description
S_OK	Success
E_POINTER	The parameter is invalid.

## 2.6.8.4 IBMDStreamingH264NALPacket::GetDisplayTime method

The **GetDisplayTime** method returns the time at which to display the video contained in the NAL packet. The display time is in units of the requested time scale.

### Syntax

```
HRESULT GetDisplayTime (uint64_t requestedTimeScale, uint64_t* displayTime);
```

### Parameters

Name	Direction	Description
requestedTimeScale	in	Time scale for the displayTime
displayTime	out	Time at which to display the video

### Return Values

Value	Description
S_OK	Success
E_POINTER	The displayTime parameter is invalid.

## 2.6.9 IBMDStreamingAudioPacket Interface

The **IBMDStreamingAudioPacket** object interface represents an audio packet.

Objects with an **IBMDStreamingAudioPacket** object interface are passed to the **IBMDStreamingH264InputCallback::H264AudioPacketArrived** callback.

The audio packet can contain compressed audio, such as MPEG-2 AAC audio, which can be passed to a suitable audio decoder for decoding and playback. For some applications it may be more convenient to process audio packets instead of processing audio carried in transport stream packets.

### Related Interfaces

Interface	Interface ID	Description
IBMDStreamingH264InputCallback	IID_IBMDStreamingH264InputCallback	New audio packets are passed to the <b>IBMDStreamingH264InputCallback::H264AudioPacketArrived</b> callback

Public Member Functions	
Method	Description
GetCodec	Get the codec describing the type of audio in the audio packet
GetPayloadSize	Get number of bytes in the audio packet
GetBytes	Get pointer to audio packet data
GetPlayTime	Get the play time for the audio in the audio packet



### 2.6.9.1 **IBMDStreamingAudioPacket::GetCodec** method

The **GetCodec** method returns the codec describing the audio in the packet.

#### **Syntax**

```
IBMDStreamingAudioCodec GetCodec ();
```

#### **Return Values**

<b>Value</b>	<b>Description</b>
Codec	The codec for the audio in the packet.

### 2.6.9.2 **IBMDStreamingAudioPacket::GetPayloadSize** method

The **GetPayloadSize** method gets the number of bytes in the audio packet.

#### **Syntax**

```
long GetPayloadSize ();
```

#### **Return Values**

<b>Value</b>	<b>Description</b>
Count	Audio packet size in bytes.

### 2.6.9.3 **IBMDStreamingAudioPacket::GetBytes** method

The **GetBytes** method returns a pointer to the data buffer of the audio packet.

#### **Syntax**

```
HRESULT GetBytes (void* buffer);
```

#### **Parameters**

<b>Name</b>	<b>Direction</b>	<b>Description</b>
buffer	out	Pointer to audio packet data buffer – only valid while object remains valid.

#### **Return Values**

<b>Value</b>	<b>Description</b>
S_OK	Success
E_POINTER	The parameter is invalid.

## 2.6.9.4 IBMDStreamingAudioPacket::GetPlayTime method

The **GetPlayTime** method returns the time at which to playback the audio contained in the audio packet. The play time is in units of the requested time scale.

### Syntax

```
HRESULT GetPlayTime (uint64_t requestedTimeScale, uint64_t* playTime);
```

### Parameters

Name	Direction	Description
requestedTimeScale	in	Time scale for the displayTime
playTime	out	Time at which to play the audio

### Return Values

Value	Description
S_OK	Success
E_POINTER	The parameter is invalid.

## 2.6.10 IBMDStreamingMPEG2TSPacket Interface

The **IBMDStreamingMPEG2TSPacket** object interface represents an MPEG-2 transport stream packet as defined by ISO/IEC 13818-1.

Objects with an **IBMDStreamingMPEG2TSPacket** object interface are passed to the **IBMDStreamingH264InputCallback::MPEG2TSPacketArrived** callback.

The MPEG-2 transport stream packet can contain compressed audio or video together with metadata for decoding and synchronizing audio and video streams. For some applications it may be more convenient to process transport stream packets as an alternative to processing NAL video packets and audio packets separately.

### Related Interfaces

Interface	Interface ID	Description
IBMDStreamingH264InputCallback	IID_IBMDStreamingH264InputCallback	New MPEG-2 transport stream packets are passed to the <b>IBMDStreamingH264InputCallback::MPEG2TSPacketArrived</b> callback

Public Member Functions	
Method	Description
GetPayloadSize	Get number of bytes in the MPEG-2 transport stream packet
GetBytes	Get pointer to MPEG-2 transport stream packet

### 2.6.10.1 **IBMDStreamingMPEG2TSPacket::GetPayloadSize** method

The **GetPayloadSize** method returns the number of bytes in the MPEG-2 transport stream packet including the header.

#### Syntax

```
long GetPayloadSize ();
```

#### Return Values

Value	Description
Count	The size of the MPEG TS packet in bytes.

### 2.6.10.2 **IBMDStreamingMPEG2TSPacket::GetBytes** method

The **GetBytes** method returns a pointer to the data buffer of the MPEG-2 transport stream packet.

#### Syntax

```
HRESULT GetBytes (void* buffer);
```

#### Parameters

Name	Direction	Description
buffer	out	Pointer to MPEG-2 transport stream packet data buffer only valid while object remains valid.

#### Return Values

Value	Description
E_FAIL	Failure
S_OK	Success
E_POINTER	The parameter is invalid

### 2.6.11 **IBMDStreamingH264NALParser** Interface

The **IBMDStreamingH264NALParser** object interface is used to retrieve video codec settings from a NAL packet.

A reference to an **IBMDStreamingH264NALParser** object interface may be obtained from **CoCreateInstance** on platforms with native COM support or from **CreateBMDStreamingH264NALParser** on other platforms.

#### Related Interfaces

Interface	Interface ID	Description
BMDStreamingH264NALPacket	IID_ IBMDStreamingH264NALPacket	The NAL packet to be parsed by a method in the <b>IBMDStreamingH264NALParser</b> object interface

Public Member Functions	
Method	Description
IsNALSequenceParameterSet	Get the packet's Sequence Parameter Set setting
IsNALPictureParameterSet	Get the packet's Picture Parameter Set setting
GetProfileAndLevelFromSPS	Get the packet's profile and level setting

### 2.6.11.1 **IBMDStreamingH264NALParser::IsNALSequenceParameterSet** method

The **IsNALSequenceParameterSet** method parses the specified NAL packet to determine if the Sequence Parameter Set (SPS) decoding parameter has been set in the NAL packet.

#### **Syntax**

```
HRESULT IsNALSequenceParameterSet (IBMDStreamingH264NALPacket* nal);
```

#### **Parameters**

Name	Direction	Description
nal	in	The NAL Packet to query for the state of the sequence parameter.

#### **Return Values**

Value	Description
S_OK	The sequence parameter of the NAL packet is set.
S_FALSE	The sequence parameter of the NAL packet is not set.

### 2.6.11.2 **IBMDStreamingH264NALParser::IsNALPictureParameterSet** method

The **IsNALPictureParameterSet** method parses the specified NAL packet to determine if the Picture Parameter Set (PPS) decoding parameter has been set in the NAL packet. This information can be used to configure a decoder for decoding the video contained in the NAL packet.

#### **Syntax**

```
HRESULT IsNALPictureParameterSet (IBMDStreamingH264NALPacket* nal);
```

#### **Parameters**

Name	Direction	Description
nal	in	The NAL Packet to query for the state of the picture parameter.

#### **Return Values**

Value	Description
S_OK	The picture parameter of the NAL packet is set.
S_FALSE	The picture parameter of the NAL packet is not set.

### 2.6.11.3 **IBMDStreamingH264NALParser::GetProfileAndLevelFromSPS** method

The **GetProfileAndLevelFromSPS** method parses the specified NAL packet and returns the H.264 profile, level and profile compatibility flags. These values can be used to determine if the video contained in the NAL packet can be decoded by a certain H.264 decoder.

#### **Syntax**

```
HRESULT GetProfileAndLevelFromSPS (IBMDStreamingH264NALPacket* nal,  
    uint32_t* profileIdc, uint32_t* profileCompatability, uint32_t* levelIdc);
```

#### **Parameters**

<b>Name</b>	<b>Direction</b>	<b>Description</b>
nal	in	The NAL Packet to query for the profile and level.
profileIdc	out	The H.264 profile for this NAL packet.
profileCompatability	out	The set of profile constraint flags for this NAL packet.
levelIdc	out	The H.264 level for this NAL packet.

#### **Return Values**

<b>Value</b>	<b>Description</b>
E_FAIL	Failure
S_OK	Success
E_POINTER	One or more parameters are invalid.

# Section 3 — Common Data Types

## 3.1 Basic Types

### **boolean**

**boolean** is represented differently on each platform by using its system type:

<b>Windows</b>	BOOL
<b>macOS</b>	bool
<b>Linux</b>	bool

### **string**

**string** are represented differently on each platform, using the most appropriate system type:

<b>Windows</b>	BSTR
<b>macOS</b>	CFStringRef
<b>Linux</b>	const char *

### **int64\_t**

The 64 bit integer type is represented differently on each platform, using the most appropriate system type:

<b>Windows</b>	LONGLONG
<b>macOS</b>	int64_t
<b>Linux</b>	int64_t

### **uint64\_t**

The 64 bit unsigned integer type is represented differently on each platform, using the most appropriate system type:

<b>Windows</b>	ULONGLONG
<b>macOS</b>	uint64_t
<b>Linux</b>	uint64_t

### **uint32\_t**

The 32 bit unsigned integer type is represented differently on each platform, using the most appropriate system type:

<b>Windows</b>	unsigned int
<b>macOS</b>	uint32_t
<b>Linux</b>	uint32_t

### **int32\_t**

The 32 bit integer type is represented differently on each platform, using the most appropriate system type:

<b>Windows</b>	int
<b>macOS</b>	int32_t
<b>Linux</b>	int32_t

### **uint16\_t**

The 16 bit unsigned integer type is represented differently on each platform, using the most appropriate system type:

<b>Windows</b>	unsigned short
<b>macOS</b>	uint16_t
<b>Linux</b>	uint16_t

### **uint8\_t**

The 8 bit unsigned integer type is represented differently on each platform, using the most appropriate system type:

<b>Windows</b>	unsigned char
<b>macOS</b>	uint8_t
<b>Linux</b>	uint8_t

## 3.2 Time Representation

The API uses a flexible scheme to represent time values which can maintain accuracy for any video or audio rate. Time is always represented as a time scale and a time value. The time scale is a unit of ticks per second specified by the API user. Time values are represented as a number of time units since playback or capture began. The API user should choose a time scale value appropriate to the type of video or audio stream being handled. Some examples are provided below:

<b>Stream Type</b>	<b>Suggested Time Scale</b>	<b>Frame Time Values</b>
24 fps video	24000	0, 1000, 2000, 3000...
23.98 fps video	24000	0, 1001, 2002, 3003...

### **BMDTimeScale**

**BMDTimeScale** is a large integer type which specifies the time scale for a time measurement in ticks per second.

### **BMDTimeValue**

**BMDTimeValue** is a large integer type which represents a time in units of **BMDTimeScale**.

### **BMDTimecodeUserBits**

**BMDTimecodeUserBits** is a 32-bit unsigned integer representing timecode user bits.

### 3.3 Display Modes

`BMDDisplayMode` enumerates the video modes supported for output and input.

Mode	Width	Height	Frames per Second	Fields per Frame	Suggested Time Scale	Frame Duration
<code>bmdModeNTSC</code>	720	486	30/1.001	2	30000	1001
<code>bmdModeNTSC2398</code>	720	486	30/1.001*	2	24000*	1001
<code>bmdModeNTSCp</code>	720	486	60/1.001	1	60000	1001
<code>bmdModePAL</code>	720	576	25	2	25000	1000
<code>bmdModePALp</code>	720	576	50	1	50000	1000
<code>bmdModeHD720p50</code>	1280	720	50	1	50000	1000
<code>bmdModeHD720p5994</code>	1280	720	60/1.001	1	60000	1001
<code>bmdModeHD720p60</code>	1280	720	60	1	60000	1000
<code>bmdModeHD1080p2398</code>	1920	1080	24/1.001	1	24000	1001
<code>bmdModeHD1080p24</code>	1920	1080	24	1	24000	1000
<code>bmdModeHD1080p25</code>	1920	1080	25	1	25000	1000
<code>bmdModeHD1080p2997</code>	1920	1080	30/1.001	1	30000	1001
<code>bmdModeHD1080p30</code>	1920	1080	30	1	30000	1000
<code>bmdModeHD1080p4795</code>	1920	1080	48/1.001	1	48000	1001
<code>bmdModeHD1080p48</code>	1920	1080	48	1	48000	1000
<code>bmdModeHD1080i50</code>	1920	1080	25	2	25000	1000
<code>bmdModeHD1080i5994</code>	1920	1080	30/1.001	2	30000	1001
<code>bmdModeHD1080i6000</code>	1920	1080	30	2	30000	1000
<code>bmdModeHD1080p50</code>	1920	1080	50	1	50000	1000
<code>bmdModeHD1080p5994</code>	1920	1080	60/1.001	1	60000	1001
<code>bmdModeHD1080p6000</code>	1920	1080	60	1	60000	1000
<code>bmdModeHD1080p9590</code>	1920	1080	96/1.001	1	96000	1001
<code>bmdModeHD1080p96</code>	1920	1080	96	1	96000	1000
<code>bmdModeHD1080p100</code>	1920	1080	100	1	100000	1000
<code>bmdModeHD1080p11988</code>	1920	1080	120/1.001	1	120000	1001
<code>bmdModeHD1080p120</code>	1920	1080	120	1	120000	1000
<code>bmdMode2k2398</code>	2048	1556	24/1.001	1	24000	1001
<code>bmdMode2k24</code>	2048	1556	24	1	24000	1000
<code>bmdMode2k25</code>	2048	1556	25	1	25000	1000
<code>bmdMode2kDCI2398</code>	2048	1080	24/1.001	1	24000	1001
<code>bmdMode2kDCI24</code>	2048	1080	24	1	24000	1000
<code>bmdMode2kDCI25</code>	2048	1080	25	1	25000	1000



<b>Mode</b>	<b>Width</b>	<b>Height</b>	<b>Frames per Second</b>	<b>Fields per Frame</b>	<b>Suggested Time Scale</b>	<b>Frame Duration</b>
bmdMode2kDCI2997	2048	1080	30/1.001	1	30000	1001
bmdMode2kDCI30	2048	1080	30	1	30000	1000
bmdMode2kDCI4795	2048	1080	48/1.001	1	48000	1001
bmdMode2kDCI48	2048	1080	48	1	48000	1000
bmdMode2kDCI50	2048	1080	50	1	50000	1000
bmdMode2kDCI5994	2048	1080	60/1.001	1	60000	1001
bmdMode2kDCI60	2048	1080	60	1	60000	1000
bmdMode2kDCI9590	2048	1080	96/1.001	1	96000	1001
bmdMode2kDCI96	2048	1080	96	1	96000	1000
bmdMode2kDCI100	2048	1080	100	1	100000	1000
bmdMode2kDCI11988	2048	1080	120/1.001	1	120000	1001
bmdMode2kDCI120	2048	1080	120	1	120000	1000
bmdMode4K2160p2398	3840	2160	24/1.001	1	24000	1001
bmdMode4K2160p24	3840	2160	24	1	24000	1000
bmdMode4K2160p25	3840	2160	25	1	25000	1000
bmdMode4K2160p2997	3840	2160	30/1.001	1	30000	1001
bmdMode4K2160p30	3840	2160	30	1	30000	1000
bmdMode4K2160p4795	3840	2160	48/1.001	1	48000	1001
bmdMode4K2160p48	3840	2160	48	1	48000	1000
bmdMode4K2160p50	3840	2160	50	1	50000	1000
bmdMode4K2160p5994	3840	2160	60/1.001	1	60000	1001
bmdMode4K2160p60	3840	2160	60	1	60000	1000
bmdMode4K2160p9590	3840	2160	96/1.001	1	96000	1001
bmdMode4K2160p96	3840	2160	96	1	96000	1000
bmdMode4K2160p100	3840	2160	100	1	100000	1000
bmdMode4K2160p11988	3840	2160	120/1.001	1	120000	1001
bmdMode4K2160p120	3840	2160	120	1	120000	1000
bmdMode4kDCI2398	4096	2160	24/1.001	1	24000	1001
bmdMode4kDCI24	4096	2160	24	1	24000	1000
bmdMode4kDCI25	4096	2160	25	1	25000	1000
bmdMode4kDCI2997	4096	2160	30/1.001	1	30000	1000
bmdMode4kDCI30	4096	2160	30	1	30000	1000
bmdMode4kDCI4795	4096	2160	48/1.001	1	48000	1001
bmdMode4kDCI48	4096	2160	48	1	48000	1000

<b>Mode</b>	<b>Width</b>	<b>Height</b>	<b>Frames per Second</b>	<b>Fields per Frame</b>	<b>Suggested Time Scale</b>	<b>Frame Duration</b>
bmdMode4kDCI50	4096	2160	50	1	50000	1000
bmdMode4kDCI5994	4096	2160	60/1.001	1	60000	1001
bmdMode4kDCI9590	4096	2160	96/1.001	1	96000	1001
bmdMode4kDCI96	4096	2160	96	1	96000	1000
bmdMode4kDCI100	4096	2160	100	1	100000	1000
bmdMode4kDCI11988	4096	2160	120/1.001	1	120000	1001
bmdMode4kDCI120	4096	2160	120	1	120000	1000
bmdMode8K4320p2398	7680	4320	24/1.001	1	24000	1001
bmdMode8K4320p24	7680	4320	24	1	24000	1000
bmdMode8K4320p25	7680	4320	25	1	25000	1000
bmdMode8K4320p2997	7680	4320	30/1.001	1	30000	1001
bmdMode8K4320p30	7680	4320	30	1	30000	1000
bmdMode8K4320p4795	7680	4320	48/1.001	1	48000	1001
bmdMode8K4320p48	7680	4320	48	1	48000	1000
bmdMode8K4320p50	7680	4320	50	1	50000	1000
bmdMode8K4320p5994	7680	4320	60/1.001	1	60000	1001
bmdMode8K4320p60	7680	4320	60	1	60000	1000
bmdMode8kDCI2398	8192	4320	24/1.001	1	24000	1001
bmdMode8kDCI24	8192	4320	24	1	24000	1000
bmdMode8kDCI25	8192	4320	25	1	25000	1000
bmdMode8kDCI2997	8192	4320	30/1.001	1	30000	1001
bmdMode8kDCI30	8192	4320	30	1	30000	1000
bmdMode8kDCI4795	8192	4320	48/1.001	1	48000	1001
bmdMode8kDCI48	8192	4320	48	1	48000	1000
bmdMode8kDCI50	8192	4320	50	1	50000	1000
bmdMode8kDCI5994	8192	4320	60/1.001	1	60000	1001
bmdMode8kDCI60	8192	4320	60	1	60000	1000
bmdMode640x480p60	640	480	60	1	60000	1000
bmdMode800x600p60	800	600	60	1	60000	1000
bmdMode1440x900p50	1440	900	50	1	50000	1000
bmdMode1440x900p60	1440	900	60	1	60000	1000
bmdMode1440x1080p50	1440	1080	50	1	50000	1000
bmdMode1440x1080p60	1440	1080	60	1	60000	1000
bmdMode1600x1200p50	1600	1200	50	1	50000	1000

Mode	Width	Height	Frames per Second	Fields per Frame	Suggested Time Scale	Frame Duration
bmdMode1600x1200p60	1600	1200	60	1	60000	1000
bmdMode1920x1200p50	1920	1200	50	1	50000	1000
bmdMode1920x1200p60	1920	1200	60	1	60000	1000
bmdMode1920x1440p50	1920	1440	50	1	50000	1000
bmdMode1920x1440p60	1920	1440	60	1	60000	1000
bmdMode2560x1440p50	2560	1440	50	1	50000	1000
bmdMode2560x1440p60	2560	1440	60	1	60000	1000
bmdMode2560x1600p50	2560	1600	50	1	50000	1000
bmdMode2560x1600p60	2560	1600	60	1	60000	1000

**NOTE** **bmdModeNTSC2398** mode will be played out on the SDI output with a frame rate of 29.97 frames per second with 3:2 pull down. Some cards may not support all of these modes.

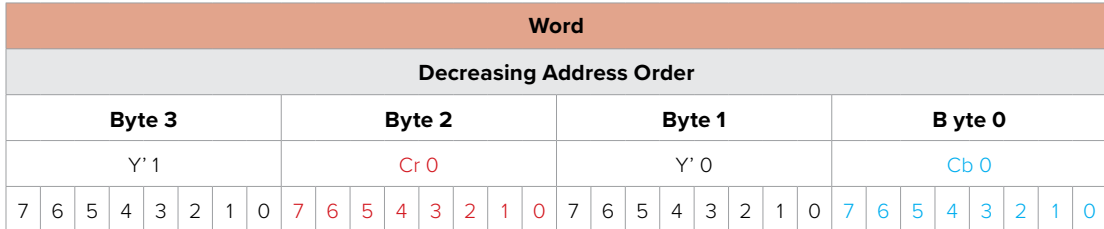
**NOTE** VANC data widths are the same as the display mode width, with the exception of UHD 4K/8K modes (1080 pixels) and DCI 4K/8K modes (2048 pixels).

## 3.4 Pixel Formats

**BMDPixelFormat** enumerates the pixel formats supported for output and input.

### **bmdFormat8BitYUV** : '2vuy' 4:2:2 Representation

Four 8-bit unsigned components (CCIR 601) are packed into one 32-bit **little-endian** word.



int framesize = (Width \* 16 / 8) \* Height  
 = rowbytes \* Height

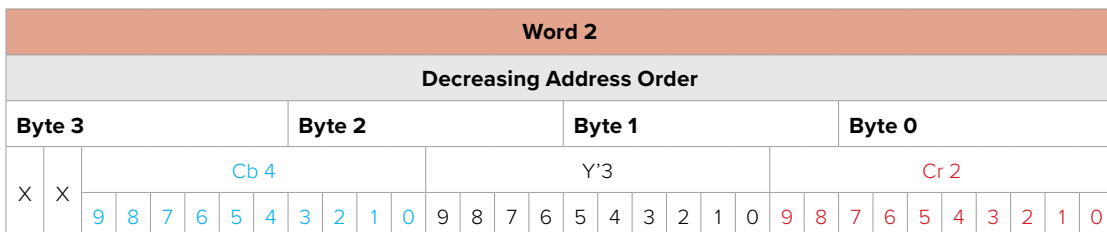
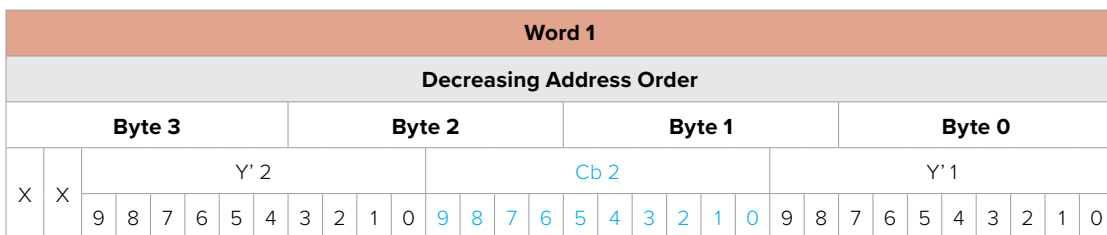
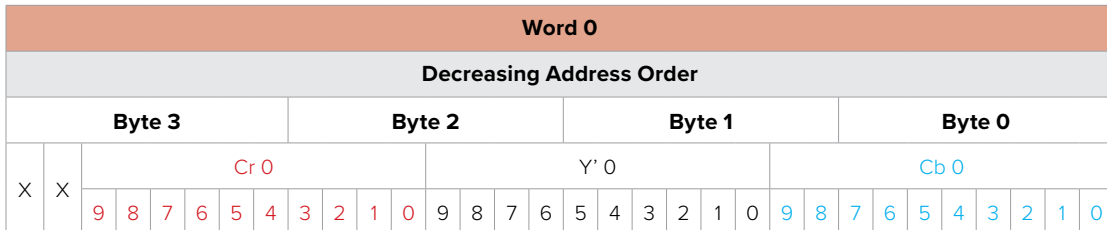
In this format, two pixels fit into 32 bits or 4 bytes, so one pixel fits into 16 bits or 2 bytes.

For the row bytes calculation, the image width is multiplied by the number of bytes per pixel.

For the frame size calculation, the row bytes are simply multiplied by the number of rows in the frame.

### **bmdFormat10BitYUV** : 'v210' 4:2:2 Representation

Twelve 10-bit unsigned components are packed into four 32-bit **little-endian** words.



Word 3																															
Decreasing Address Order																															
Byte 3					Byte 2					Byte 1					Byte 0																
X X		Y' 5					Cr 4					Y' 4																			
		9	8	7	6	5	4	3	2	1	0	9	8	7	6	5	4	3	2	1	0	9	8	7	6	5	4	3	2	1	0

int framesize = ((Width + 47) / 48) \* 128 \* Height  
= rowbytes \* Height

In this format, each line of video must be aligned on a 128 byte boundary. Six pixels fit into 16 bytes so 48 pixels fit in 128 bytes.

For the row bytes calculation the image width is rounded to the nearest 48 pixel boundary and multiplied by 128.

For the frame size calculation the row bytes are simply multiplied by the number of rows in the frame.

### bmdFormat10BitYUVA: 'Ay10' 4:2:2 raw

Six 10-bit unsigned components are packed into two 32-bit big-endian words. The alpha channel is valid and full range.

int rowBytes = ((width + 63) / 64) \* 256

int frameSize = rowBytes \* height

In this format each line of video must be aligned to a 256 byte boundary. One pixel fits into 4 bytes so 64 pixels fit into 256 bytes.

For the row bytes calculation, the image width is rounded to the nearest 64 pixel boundary and multiplied by 256.

For the frame size calculation, the row bytes are simply multiplied by the number of rows in the frame.

On all connectors using YCbCr, or HDMI, playback without keying enabled will drop the alpha and capture will set the alpha to the peak nominal value.

Word 0																															
Decreasing Address Order																															
Byte 3								Byte 2								Byte 1								Byte 0							
Y'0								Cb0				Y'0				A0				X X		A0									
7	6	5	4	3	2	1	0	5	4	3	2	1	0	9	8	3	2	1	0	9	8	7	6	X	X	9	8	7	6	5	4

Word 1																															
Decreasing Address Order																															
Byte 3								Byte 2								Byte 1								Byte 0							
Y'1								Cr0				Y'1				A0				X X		A0									
7	6	5	4	3	2	1	0	5	4	3	2	1	0	9	8	3	2	1	0	9	8	7	6	X	X	9	8	7	6	5	4

### bmdFormat8BitARGB : ARGB (or ARGB32) 4:4:4:4 raw

Four 8-bit unsigned components are packed into one 32-bit little-endian word.  
Alpha channel is valid.

Word																															
Decreasing Address Order																															
Byte 3								Byte 2								Byte 1								Byte 0							
B								G								R								A							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

`int framesize` = (Width \* 32 / 8) \* Height  
= rowbytes \* Height

In this format, each pixel fits into 32 bits or 4 bytes. For the row bytes calculation the image width is multiplied by the number of bytes per pixel.

For the frame size calculation, the row bytes are simply multiplied by the number of rows in the frame.

On all connectors using YCbCr, or HDMI, playback without keying enabled will drop the alpha and capture will set the alpha to the peak nominal value.

### bmdFormat8BitBGRA : BGRA (or RGB32) 4:4:4:x raw

Four 8-bit unsigned components are packed into one 32-bit little-endian word. The alpha channel may be valid.

Word																															
Decreasing Address Order																															
Byte 3								Byte 2								Byte 1								Byte 0							
X								R								G								B							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

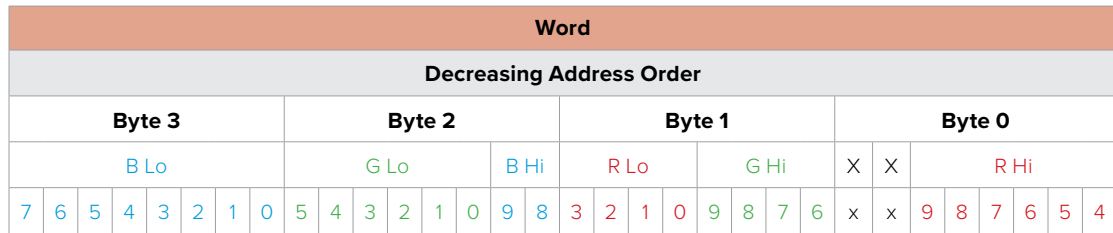
`int framesize` = (Width \* 32 / 8) \* Height  
= rowbytes \* Height

In this format, each pixel fits into 32 bits or 4 bytes. For the row bytes calculation, the image width is multiplied by the number of bytes per pixel. For the frame size calculation, the row bytes are simply multiplied by the number of rows in the frame.

On all connectors using YCbCr, or HDMI, playback without keying enabled will drop the alpha and capture will set the alpha to the peak nominal value.

### bmdFormat10BitRGB : 'r210' 4:4:4 raw

Three 10-bit unsigned components are packed into one 32-bit big-endian word.



```
int framesize = ((Width + 63) / 64) * 256 * Height
              = rowbytes * Height
```

In this format each line of video must be aligned a 256 byte boundary. One pixel fits into 4 bytes so 64 pixels fit into 256 bytes.

For the row bytes calculation, the image width is rounded to the nearest 64 pixel boundary and multiplied by 256.

For the frame size calculation, the row bytes are simply multiplied by the number of rows in the frame.

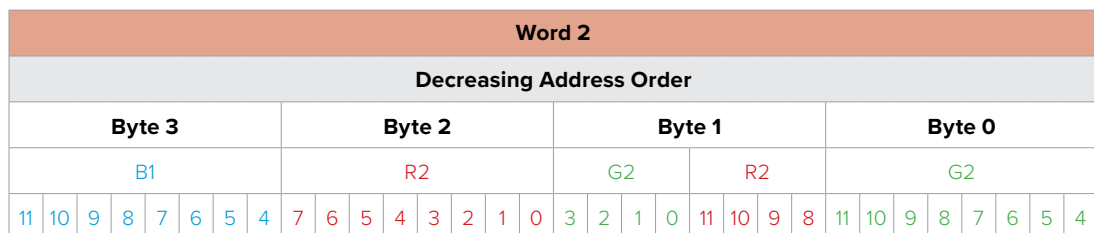
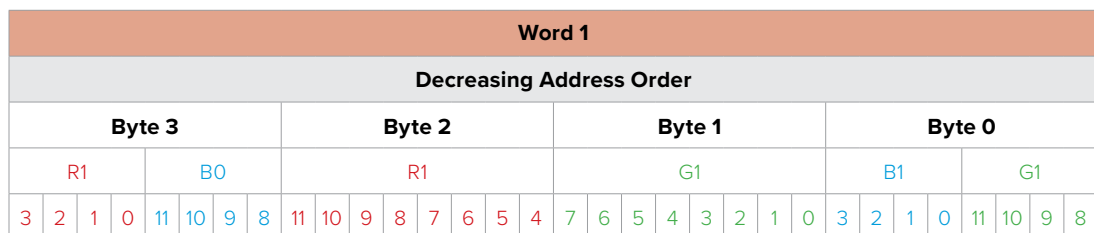
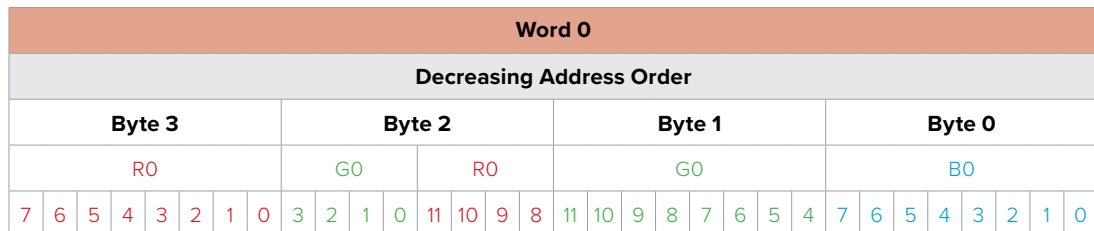
### bmdFormat12BitRGB : 'R12B'

Big-endian RGB 12-bit per component with full range (0-4095). Packed as 12-bit per component.

This 12-bit pixel format is compatible with SMPTE 268M Digital Moving-Picture Exchange version 1, Annex C, Method C4 packing.

```
int framesize = ((Width * 36) / 8) * Height
              = rowbytes * Height
```

In this format, 8 pixels fit into 36 bytes.



Word 3																															
Decreasing Address Order																															
Byte 3				Byte 2				Byte 1				Byte 0																			
B2				R3				B2				R3				G3															
7	6	5	4	3	2	1	0	3	2	1	0	11	10	9	8	11	10	9	8	7	6	5	4	7	6	5	4	3	2	1	0

Word 4																															
Decreasing Address Order																															
Byte 3				Byte 2				Byte 1				Byte 0																			
B3				G3				B3				R4				G4				R4											
3	2	1	0	11	10	9	8	11	10	9	8	7	6	5	4	7	6	5	4	3	2	1	0	3	2	1	0	11	10	9	8

Word 5																															
Decreasing Address Order																															
Byte 3				Byte 2				Byte 1				Byte 0																			
G4				B4				R5				B4				R5															
11	10	9	8	7	6	5	4	7	6	5	4	3	2	1	0	11	10	9	8	11	10	9	8	7	6	5	4	7	6	5	4

Word 6																																			
Decreasing Address Order																																			
Byte 3				Byte 2				Byte 1				Byte 0																							
G5				B5				G5				B5				R6																			
7	6	5	4	3	2	1	0	11	10	9	8	11	10	9	8	7	6	5	4	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

Word 7																															
Decreasing Address Order																															
Byte 3				Byte 2				Byte 1				Byte 0																			
G6				R6				G6				B6				R7				B6											
3	2	1	0	11	10	9	8	11	10	9	8	7	6	5	4	7	6	5	4	3	2	1	0	3	2	1	0	11	10	9	8

Word 8																															
Decreasing Address Order																															
Byte 3				Byte 2				Byte 1				Byte 0																			
R7				G7				B7				G7				B7															
11	10	9	8	7	6	5	4	7	6	5	4	3	2	1	0	11	10	9	8	11	10	9	8	7	6	5	4	7	6	5	4



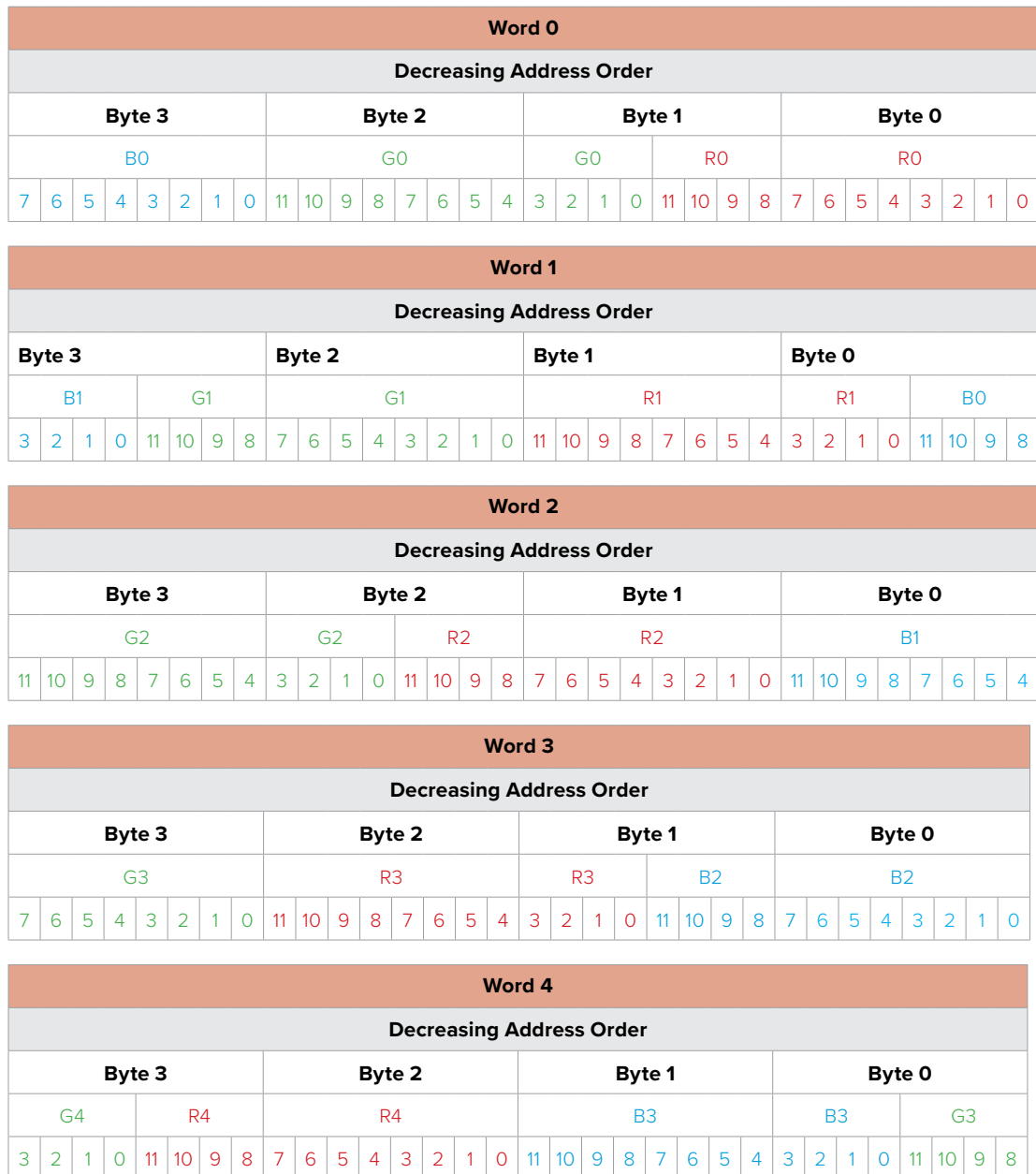
## bmdFormat12BitRGBLE : 'R12L'

Little-endian RGB 12-bit per component with full range (0-4095). Packed as 12-bit per component.

This 12-bit pixel format is compatible with SMPTE 268M Digital Moving-Picture Exchange version 1, Annex C, Method C4 packing.

```
int framesize = ((Width * 36) / 8) * Height
              = rowbytes * Height
```

In this format, 8 pixels fit into 36 bytes.



Word 5																															
Decreasing Address Order																															
Byte 3								Byte 2								Byte 1								Byte 0							
R5								R5				B4				B4				G4											
11	10	9	8	7	6	5	4	3	2	1	0	11	10	9	8	7	6	5	4	3	2	1	0	11	10	9	8	7	6	5	4

Word 6																															
Decreasing Address Order																															
Byte 3								Byte 2								Byte 1								Byte 0							
R6								B5								B5				G5				G5							
7	6	5	4	3	2	1	0	11	10	9	8	7	6	5	4	3	2	1	0	11	10	9	8	7	6	5	4	3	2	1	0

Word 7																															
Decreasing Address Order																															
Byte 3								Byte 2								Byte 1								Byte 0							
R7				B6				B6								G6								G6				R6			
3	2	1	0	11	10	9	8	7	6	5	4	3	2	1	0	11	10	9	8	7	6	5	4	3	2	1	0	11	10	9	8

Word 8																															
Decreasing Address Order																															
Byte 3								Byte 2								Byte 1								Byte 0							
B7								B7				G7				G7								R7							
11	10	9	8	7	6	5	4	3	2	1	0	11	10	9	8	7	6	5	4	3	2	1	0	11	10	9	8	7	6	5	4

### bmdFormat10BitRGBXLE : 'R10I' 4:4:4 raw

Three 10-bit unsigned components are packed into one 32-bit little-endian word.

Word																															
Decreasing Address Order																															
Byte 3								Byte 2								Byte 1								Byte 0							
R								R		G						G		B				B				X		X			
9	8	7	6	5	4	3	2	1	0	9	8	7	6	5	4	3	2	1	0	9	8	7	6	5	4	3	2	1	0	x	x

$$\begin{aligned} \text{int framesize} &= ((\text{Width} + 63) / 64) * 256 * \text{Height} \\ &= \text{rowbytes} * \text{Height} \end{aligned}$$

In this format each line of video must be aligned a 256 byte boundary. One pixel fits into 4 bytes so 64 pixels fit into 256 bytes.

For the row bytes calculation, the image width is rounded to the nearest 64 pixel boundary and multiplied by 256.

For the frame size calculation, the row bytes are simply multiplied by the number of rows in the frame.

### bmdFormat10BitRGBX : 'R10b' 4:4:4 raw

Three 10-bit unsigned components are packed into one 32-bit big-endian word.

Word																															
Decreasing Address Order																															
Byte 3								Byte 2								Byte 1								Byte 0							
B				X	X	G				B				R	G				R												
5	4	3	2	1	0	x	x	3	2	1	0	9	8	7	6	1	0	9	8	7	6	5	4	9	8	7	6	5	4	3	2

```
int framesize = ((Width + 63) / 64) * 256 * Height
              = rowbytes * Height
```

In this format each line of video must be aligned a 256 byte boundary. One pixel fits into 4 bytes so 64 pixels fit into 256 bytes.

For the row bytes calculation, the image width is rounded to the nearest 64 pixel boundary and multiplied by 256.

For the frame size calculation, the row bytes are simply multiplied by the number of rows in the frame.

- **bmdFormatH265** : 'hev1'  
This pixel format represents compressed H.265 encoded video data.
- This pixel format is compatible with ITU-T H.265 High Efficiency Video Coding.
- **bmdFormatDNxHR** : 'AVdh'  
This pixel format represents compressed DNxHR encoded video data.
- **bmdFormatUnspecified**  
This represents any pixel format for the purpose of checking display mode support with the **IDeckLinkInput::DoesSupportVideoMode** and **IDeckLinkOutput::DoesSupportVideoMode** methods.

## 3.5 Field Dominance

**BMDFieldDominance** enumerates settings applicable to video fields.

- **bmdUnknownFieldDominance**  
Indeterminate field dominance.
- **bmdLowerFieldFirst**  
The first frame starts with the lower field (the second-from-the-top scan line).
- **bmdUpperFieldFirst**  
The first frame starts with the upper field (the top scan line).
- **bmdProgressiveFrame**  
A complete frame containing all scan lines.
- **bmdProgressiveSegmentedFrame**  
A progressive frame encoded as a PsF (See **IDeckLinkDisplayMode::GetFieldDominance** for details)

## 3.6 Frame Flags

**BMDFrameFlags** enumerates a set of flags applicable to a video frame.

- **bmdFrameFlagDefault**  
No other flags applicable.
- **bmdFrameFlagFlipVertical**  
Frame should be flipped vertically on output
- **bmdFrameFlagMonitorOutOnly**  
Output this frame on Monitor Output only and black/silence on all other outputs. Only available when **BMDDeckLinkHasMonitorOut** attribute is True.
- **bmdFrameContainsHDRMetadata**  
Frame contains HDR metadata (See **IDeckLinkVideoFrameMetadataExtensions**)
- **bmdFrameContainsDolbyVisionMetadata**  
Frame contains Dolby Vision metadata (see **IDeckLinkVideoFrameMetadataExtensions**)
- **bmdFrameCapturedAsPsF**  
Frame captured as PsF
- **bmdFrameHasNoInputSource**  
No input source was detected – frame is invalid

## 3.7 Video Input Flags

**BMDVideoInputFlags** enumerates a set of flags applicable to video input.

- **bmdVideoInputFlagDefault**  
No other flags applicable
- **bmdVideoInputEnableFormatDetection**  
Enable video input mode detection.  
(See **IDeckLinkInputCallback::VideoInputFormatChanged** for details)
- **bmdVideoInputDualStream3D**  
Set the DeckLink device to capture the 3D mode version of the selected **BMDDisplayMode** display mode.
- **bmdVideoInputSynchronizeToCaptureGroup**  
Enable grouping with other DeckLink devices to synchronize the capture start and stop

## 3.8 Video Output Flags

**BMDVideoOutputFlags** enumerates flags which control the output of video data.

- **bmdVideoOutputFlagDefault**  
No flags applicable.
- **bmdVideoOutputRP188**  
Output RP188 timecode. If supplied see: **IDeckLinkMutableVideoFrame::SetTimecode**
- **bmdVideoOutputVANC**  
Output VANC data. If supplied see: **IDeckLinkMutableVideoFrame::SetAncillaryData**
- **bmdVideoOutputVITC**  
Output VITC timecode data. If supplied see: **IDeckLinkMutableVideoFrame::SetTimecode**
- **bmdVideoOutputDualStream3D**  
Set the DeckLink device to output the 3D version of the selected **BMDDisplayMode** display mode.
- **bmdVideoOutputSynchronizeToPlaybackGroup**  
Enable grouping with other DeckLink devices to synchronize the playback start and stop.
- **bmdVideoOutputDolbyVision**  
Enable Dolby Vision.

## 3.9 Output Frame Completion Results Flags

**BMDOutputFrameCompletionResult** enumerates the possible frame output completion statuses.

- **bmdOutputFrameCompleted**  
Frame was displayed normally
- **bmdOutputFrameDisplayedLate**  
Frame was displayed late
- **bmdOutputFrameDropped**  
Frame was dropped
- **bmdOutputFrameFlushed**  
Frame was flushed

Frames are “flushed” when they have been scheduled but are no longer needed due to an action initiated by the API user e.g. a speed or direction change. If frame scheduling falls behind frame output, the hardware will output the least late frame available. When this happens, the frame will receive a completion status of “displayed late”. Frames that are never displayed due to a less late frame being available will receive a completion status of “dropped”.

## 3.10 Frame Preview Format

**BMD3DPreviewFormat** enumerates the dual preview formats available for the DeckLink screen preview.

The OpenGL based preview format can be set using

**IDeckLinkGLScreenPreviewHelper::Set3DPreviewFormat.**

The DirectX based preview format can be set using

**IDeckLinkDX9ScreenPreviewHelper::Set3DPreviewFormat.**

- **bmd3DPreviewFormatDefault**  
Preview frames in the default top-bottom format.
- **bmd3DPreviewFormatLeftOnly**  
Preview the left eye frame only.
- **bmd3DPreviewFormatRightOnly**  
Preview the right eye frame only.
- **bmd3DPreviewFormatSideBySide**  
Preview the frames frame in side by side format
- **bmd3DPreviewFormatTopBottom**  
Preview the frames in top-bottom format.

## 3.11 Video IO Support

**BMDVideoIOSupport** enumerates the capture and playback capabilities of a device.

- **bmdDeviceSupportsCapture**  
The DeckLink device supports capture operations.
- **bmdDeviceSupportsPlayback**  
The DeckLink device supports playback operation.

## 3.12 Video Connection Modes

**BMDVideoConnection** enumerates the possible video connection interfaces.

- **bmdVideoConnectionUnspecified**  
Unspecified video connection, for purpose of checking video mode support with **IDeckLinkInput::DoesSupportVideoMode** and **IDeckLinkOutput::DoesSupportVideoMode** methods.
- **bmdVideoConnectionSDI**  
SDI video connection
- **bmdVideoConnectionHDMI**  
HDMI video connection
- **bmdVideoConnectionOpticalSDI**  
Optical SDI connection
- **bmdVideoConnectionComponent**  
Component video connection
- **bmdVideoConnectionComposite**  
Composite video connection
- **bmdVideoConnectionSVideo**  
S-Video connection
- **bmdVideoConnectionEthernet**  
Ethernet connection
- **bmdVideoConnectionOpticalEthernet**  
Optical Ethernet connection

## 3.13 Link Configuration

**BMDLinkConfiguration** enumerates the SDI video link configuration on a DeckLink device.

- **bmdLinkConfigurationSingleLink**  
A single link video connection. A single video stream uses one connector.
- **bmdLinkConfigurationDualLink**  
A dual-link video connection. A single video stream uses two connectors.
- **bmdLinkConfigurationQuadLink**  
A quad-link video connection. A single video stream uses four connectors

## 3.14 Audio Sample Rates

**BMDAudioSampleRate** enumerates the possible audio sample rates.

- **bmdAudioSampleRate48kHz**  
48 kHz sample rate

## 3.15 Audio Sample Types

**BMDAudioSampleType** enumerates the possible audio sample types.

- **bmdAudioSampleType16bitInteger**  
16 bit audio sample
- **bmdAudioSampleType32bitInteger**  
32 bit audio sample

## 3.16 DeckLink Information ID

**BMDDeckLinkAPIInformationID** enumerates a set of information details which may be queried (see **IDeckLinkAPIInformation** Interface for details).

Name	Type	Description	
<b>BMDDeckLinkAPIVersion</b>	String	The user viewable API version number. This allocated string must be freed by the caller when no longer required.	
<b>BMDDeckLinkAPIVersion</b>	Int	The API version number. Format:	
<b>Word</b>			
<b>Decreasing Address Order</b>			
<b>Byte 4</b>	<b>Byte 3</b>	<b>Byte 2</b>	<b>Byte 1</b>
Major Version	Minor Version	Sub Version	Extra

## 3.17 DeckLink Attribute ID

**BMDDeckLinkAttributeID** enumerates a set of attributes of a DeckLink device which may be queried (see **IDeckLinkProfileAttributes** Interface for details).

Name	Type	Description
<b>BMDDeckLinkProfileID</b>	Int	The Profile ID for the current <b>IDeckLinkProfileAttributes</b> . See <b>BMDProfileID</b> for more information
<b>BMDDeckLinkSupportsInternalKeying</b>	Flag	True if internal keying is supported on this device.
<b>BMDDeckLinkSupportsExternalKeying</b>	Flag	True if external keying is supported on this device.
<b>BMDDeckLinkSerialPortDeviceName</b>	String	The operating system name of the RS422 serial port on this device. This allocated string must be freed by the caller when no longer required.
<b>BMDDeckLinkMaximumAudioChannels</b>	Int	The maximum number of audio channels embedded on digital connections supported by this device.
<b>BMDDeckLinkMaximumHDMIAudioChannels</b>	Int	The maximum number of audio channels embedded on HDMI supported by this device.
<b>BMDDeckLinkMaximumAnalogAudioInputChannels</b>	Int	The maximum number of input analog audio channels supported by this device.
<b>BMDDeckLinkMaximumAnalogAudioOutputChannels</b>	Int	The maximum number of output analog audio channels supported by this device.
<b>BMDDeckLinkSupportsInputFormatDetection</b>	Flag	True if input format detection is supported on this device.
<b>BMDDeckLinkHasReferenceInput</b>	Flag	True if the DeckLink device has a genlock reference source input connector.
<b>BMDDeckLinkHasSerialPort</b>	Flag	True if device has a serial port.
<b>BMDDeckLinkNumberOfSubDevices</b>	Int	Some DeckLink hardware devices contain multiple independent sub-devices. This attribute will be equal to one for most devices, or two or more on a card with multiple sub-devices (eg DeckLink Duo).
<b>BMDDeckLinkSubDeviceIndex</b>	Int	Some DeckLink hardware devices contain multiple independent sub-devices. This attribute indicates the index of the sub-device, starting from zero.

Name	Type	Description
<b>BMDDeckLinkVideoOutputConnections</b>	Int	The video output connections supported by the hardware (see <b>BMDVideoConnection</b> for more details). Multiple video output connections can be active simultaneously.
<b>BMDDeckLinkAudioOutputConnections</b>	Int	The audio output connections supported by the hardware (see <b>BMDAudioConnection</b> for more details). Multiple audio output connections can be active simultaneously. Devices with one or more types of analog connection will have the <b>bmdAudioConnectionAnalog</b> flag set. Devices with individually selectable XLR/RCA connectors will additionally have the <b>bmdAudioConnectionAnalogXLR</b> and <b>bmdAudioConnectionAnalogRCA</b> flags set.
<b>BMDDeckLinkVideoInputConnections</b>	Int	The video input connections supported by the hardware (see <b>BMDVideoConnection</b> for more details).
<b>BMDDeckLinkAudioInputConnections</b>	Int	The audio input connections supported by the hardware (see <b>BMDAudioConnection</b> for more details).
<b>BMDDeckLinkHasAnalogVideoOutputGain</b>	Flag	True if analog video output gain adjustment is supported on this device.
<b>BMDDeckLinkCanOnlyAdjustOverallVideoOutputGain</b>	Flag	True if only the overall video output gain can be adjusted. In this case, only the luma gain can be accessed with the <b>IDeckLinkConfiguration</b> interface, and it controls all three gains (luma, chroma blue and chroma red).
<b>BMDDeckLinkHasVideoInputAntiAliasingFilter</b>	Flag	True if there is an antialiasing filter on the analog video input of this device.
<b>BMDDeckLinkHasBypass</b>	Flag	True if this device has loop-through bypass function.
<b>BMDDeckLinkVideoInputGainMinimum</b>	Float	The minimum video input gain in dB for this device.
<b>BMDDeckLinkVideoInputGainMaximum</b>	Float	The maximum video input gain in dB for this device.
<b>BMDDeckLinkVideoOutputGainMinimum</b>	Float	The minimum video output gain in dB for this device.
<b>BMDDeckLinkVideoOutputGainMaximum</b>	Float	The maximum video output gain in dB for this device.
<b>BMDDeckLinkVideoIOSupport</b>	Int	The capture and/or playback capability of the device. (See <b>BMDVideoIOSupport</b> for more information)
<b>BMDDeckLinkSupportsClockTimingAdjustment</b>	Flag	True if this device supports clock timing adjustment (see <b>bmdDeckLinkConfigClockTimingAdjustment</b> ).
<b>BMDDeckLinkPersistentID</b>	Int	A device specific 32 bit unique identifier.
<b>BMDDeckLinkDeviceGroupID</b>	Int	A 32 bit identifier used to group sub-devices belonging to the same DeckLink hardware device. Supported if the sub-device supports <b>BMDDeckLinkPersistentID</b>
<b>BMDDeckLinkTopologicalID</b>	Int	An identifier for DeckLink devices. This feature is supported on a given device if <b>S_OK</b> is returned. The ID will persist across reboots assuming that devices are not disconnected or moved to a different slot.
<b>BMDDeckLinkSupportsFullFrameReferenceInputTimingOffset</b>	Flag	True if the DeckLink device supports genlock offset adjustment wider than +/511 pixels (see <b>bmdDeckLinkConfigReferenceInputTimingOffset</b> for more information).
<b>BMDDeckLinkSupportsSMPTELevelAOutput</b>	Flag	True if SMPTE Level A output is supported on this device.
<b>BMDDeckLinkSupportsDualLinkSDI</b>	Flag	True if SDI dual-link is supported on this device.



Name	Type	Description
<b>BMDDeckLinkSupportsQuadLinkSDI</b>	Flag	True if SDI quad-link is supported on this device.
<b>BMDDeckLinkSupportsIdleOutput</b>	Flag	True if this device supports idle output. (see <b>BMDIdleVideoOutputOperation</b> for idle output options).
<b>BMDDeckLinkDeckControlConnections</b>	Int	The deck control connections supported by the hardware (see <b>BMDDeckControlConnection</b> for more information).
<b>BMDDeckLinkMicrophoneInputGainMinimum</b>	Float	The minimum microphone input gain in dB for this device.
<b>BMDDeckLinkMicrophoneInputGainMaximum</b>	Float	The maximum microphone input gain in dB for this device.
<b>BMDDeckLinkDeviceInterface</b>	Int	The active device interface (see <b>BMDDeviceInterface</b> for more information)
<b>BMDDeckLinkHasLTCTimecodeInput</b>	Flag	True if this device has a dedicated LTC input.
<b>BMDDeckLinkVendorName</b>	String	Hardware vendor name. Returned as a static string which must not be freed by the caller.
<b>BMDDeckLinkDisplayName</b>	String	The device's display name. See <b>IDeckLink::GetDisplayName</b> .
<b>BMDDeckLinkModeName</b>	String	Hardware Model Name. See <b>IDeckLink::GetModelName</b> .
<b>BMDDeckLinkSupportsHDRMetadata</b>	Flag	True if the device supports transport of HDR metadata.
<b>BMDDeckLinkAudioInputRCAChannelCount</b>	Int	Number of input audio RCA channels supported by this device.
<b>BMDDeckLinkAudioInputXLRChannelCount</b>	Int	Number of input audio XLR channels supported by this device.
<b>BMDDeckLinkAudioOutputRCAChannelCount</b>	Int	Number of output audio RCA channels supported by this device.
<b>BMDDeckLinkAudioOutputXLRChannelCount</b>	Int	Number of output audio XLR channels supported by this device.
<b>BMDDeckLinkDeviceHandle</b>	String	String representing an unique identifier for the device. The format of the string is "RevisionID:PersistentID:TopologicalID".
<b>BMDDeckLinkSupportsColorspaceMetadata</b>	Flag	True if the device supports transport of Colorspace metadata. See <b>bmdDeckLinkFrameMetadataColorspace</b> and <b>BMDColorspace</b> for more information.
<b>BMDDeckLinkDuplex</b>	Int	The duplex mode for the corresponding profile. See <b>BMDDuplexMode</b> for more information
<b>BMDDeckLinkSupportsHighFrameRateTimecode</b>	Flag	True if High Frame Rate Timecode (HFRTC) is supported by the device.
<b>BMDDeckLinkSupportsSynchronizeToCaptureGroup</b>	Flag	True if the device can be grouped with other input devices for synchronized capture.
<b>BMDDeckLinkSupportsSynchronizeToPlaybackGroup</b>	Flag	True if the device can be grouped with other output devices for synchronized playback.
<b>BMDDeckLinkSupportsHDMITimecode</b>	Flag	True if HDMI LTC timecode is supported by the device.
<b>BMDDeckLinkVANCRequires10BitYUVVideoFrames</b>	Flag	True if the device supports VANC only when the active picture is also 10-bit YUV. See <b>BMDAncillaryPacketFormat</b> for more information.
<b>BMDDeckLinkMinimumPrerollFrames</b>	Int	The minimum number of preroll video frames required by the device for scheduled playback
<b>BMDDeckLinkSupportedDynamicRange</b>	Int	The high dynamic range transfer functions supported by this device. See <b>BMDDynamicRange</b> for more information.
<b>BMDDeckLinkSupportsAutoSwitchingPPsFOnInput</b>	Flag	True if the DeckLink device supports PsF mode detection on capture.

Name	Type	Description
<code>BMDDeckLinkEthernetMACAddress</code>	string	For devices with Ethernet, the local MAC address.
<code>BMDDeckLinkHasMonitorOut</code>	Flag	True if the device has Monitor Out capability.
<code>BMDDeckLinkMezzanineType</code>	Int	The mezzanine board currently attached to this device. See <code>BMDMezzanineType</code> for more information.

## 3.18 DeckLink Configuration ID

`BMDDeckLinkConfigurationID` enumerates the set of configuration settings of a DeckLink device which may be queried or set (see `IDeckLinkConfiguration` Interface for details).

Name	Type	Description
<code>bmdDeckLinkConfigOutput1080pAsPsF</code>	Flag	If set, output 1080 or 2K progressive modes as PsF.
<code>bmdDeckLinkConfigCapture1080pAsPsF</code>	Flag	If set, capture 1080 or 2K progressive modes as PsF.
<code>bmdDeckLinkConfigHDMI3DPackingFormat</code>	Int(64)	The 3D packing format setting. See <code>BMDVideo3DPackingFormat</code> for more details.
<code>bmdDeckLinkConfigAnalogAudioConsumerLevels</code>	Flag	If set true the analog audio levels are set to maximum gain on audio input and maximum attenuation on audio output. If set false the selected analog input and output gain levels are used.
<code>bmdDeckLinkConfigFieldFlickerRemoval</code>	Flag	Sets field flicker removal when paused functionality. True if enabled.
<code>bmdDeckLinkConfigHD1080p24ToHD1080i5994Conversion</code>	Flag	True if HD 1080p24 to HD 1080i5994 conversion is enabled.
<code>bmdDeckLinkConfig444SDIVideoOutput</code>	Flag	True if 444 video output is enabled.
<code>bmdDeckLinkConfigBlackVideoOutputDuringCapture</code>	Flag	True if black output during capture is enabled. This feature is only supported on legacy DeckLink devices.
<code>bmdDeckLinkConfigLowLatencyVideoOutput</code>	Flag	Reduces output latency on some older products. On newer products, this option will have no effect.
<code>bmdDeckLinkConfigReferenceInputTimingOffset</code>	Int(64)	Adjust genlock timing pixel offset. If the device supports wide genlock offset adjustment (see <code>BMDDeckLinkSupportsFullFrameReferenceInputTimingOffset</code> attribute) then the supported range is between +/-half the count of total pixels in the video frame. Otherwise the supported range is +/-511.
<code>bmdDeckLinkConfigCapturePassThroughMode</code>	Int(64)	The capture pass through mode specifies how the monitoring video output is generated while capture is in progress. See <code>BMDDeckLinkCapturePassthroughMode</code> for the available modes.
<code>bmdDeckLinkConfigVideoOutputConnection</code>	Int(64)	The output video connection. See <code>BMDVideoConnection</code> for more details. Enabling video output on one connection will enable output on other available output connections which are compatible. The status of active output connection can be queried with this setting. Multiple video output connections can be active simultaneously. When querying the enabled video outputs, the returned integer is a bitmask of <code>BMDVideoConnection</code> where the corresponding bit is set for each active output connection. When setting active video outputs, only one video output connection can be enabled per call, ie, the integer argument must refer to a single video output connection. Enabling multiple output connections simultaneously requires multiple calls.

Name	Type	Description
<code>bmdDeckLinkConfigVideoOutputConversionMode</code>	Int(64)	Settings for video output conversion. The possible output modes are enumerated by <b>BMDVideoOutputConversionMode</b> .
<code>bmdDeckLinkConfigAnalogVideoOutputFlags</code>	Int(64)	Settings for analog video output. <b>BMDAnalogVideoFlags</b> enumerates the available analog video flags.
<code>bmdDeckLinkConfigVideoInputConnection</code>	Int(64)	The input video connection. Only one video input connection can be active at a time. See <b>BMDVideoConnection</b> for more details.
<code>bmdDeckLinkConfigAnalogVideoInputFlags</code>	Int(64)	The analog video input flags. See <b>BMDAnalogVideoFlags</b> for more details.
<code>bmdDeckLinkConfigVideoInputConversionMode</code>	Int(64)	The video input conversion mode. See <b>BMDVideoInputConversionMode</b> for more details.
<code>bmdDeckLinkConfig32PullDownSequenceInitialTimecodeFrame</code>	Int(64)	The A-frame setting for NTSC 23.98, which is used to appropriately adjust the timecode. The frame setting range is between 0 and 29.
<code>bmdDeckLinkConfigVANCSourceLine1Mapping</code>	Int(64)	The configuration of up to three lines of VANC to be transferred to or from the active picture on capture or output. The acceptable range is between 0 and 30. A value of 0 will disable the capture of that line.
<code>bmdDeckLinkConfigVANCSourceLine2Mapping</code>	Int(64)	The acceptable range is between 0 and 30. A value of 0 will disable the capture of the line.
<code>bmdDeckLinkConfigVANCSourceLine3Mapping</code>	Int(64)	The acceptable range is between 0 and 30. A value of 0 will disable the capture of the line.
<code>bmdDeckLinkConfigAudioInputConnection</code>	Int(64)	The configuration of the audio input connection. See <b>BMDAudioConnection</b> for more details.
<code>bmdDeckLinkConfigAnalogAudioInputScaleChannel1</code> <code>bmdDeckLinkConfigAnalogAudioInputScaleChannel2</code> <code>bmdDeckLinkConfigAnalogAudioInputScaleChannel3</code> <code>bmdDeckLinkConfigAnalogAudioInputScaleChannel4</code>	Float	The analog audio input scale in dB. The supported range is between -12.00 and 12.00.
<code>bmdDeckLinkConfigDigitalAudioInputScale</code>	Float	The digital audio input scale in dB. The acceptable range is between -12.00 and 12.00.
<code>bmdDeckLinkConfigAudioOutputAESAnalogSwitch</code>	Int(64)	The AES / analog audio output selection switch. This is applicable only to cards that support switchable analog audio outputs.
<code>bmdDeckLinkConfigAnalogAudioOutputScaleChannel1</code> <code>bmdDeckLinkConfigAnalogAudioOutputScaleChannel2</code> <code>bmdDeckLinkConfigAnalogAudioOutputScaleChannel3</code> <code>bmdDeckLinkConfigAnalogAudioOutputScaleChannel4</code>	Float	The analog audio output scale in dB. The acceptable range is between -12.00 and 12.00.
<code>bmdDeckLinkConfigDigitalAudioOutputScale</code>	Float	The digital audio output scale in dB. The acceptable range is between -12.00 and 12.00.
<code>bmdDeckLinkConfigDownConversionOnAllAnalogOutput</code>	Flag	Enable down conversion on all analog outputs.
<code>bmdDeckLinkConfigSMPTELevelAOutput</code>	Flag	Enable SMPTE level A output.
<code>bmdDeckLinkConfigDeviceInformationLabel</code>	string	Set the label of the device. This can only be set if the device has a persistent ID. This information will be saved onto the local machine but not onto the device. This information will also appear in Product Notes section of the Desktop Video Utility.

Name	Type	Description
<code>bmdDeckLinkConfigDeviceInformationSerialNumber</code>	string	Set the serial number of the device. This can only be set if the device has a persistent ID. This information will be saved onto the local machine but not onto the device. This information will also appear in Product Notes section of the Desktop Video Utility.
<code>bmdDeckLinkConfigDeviceInformationCompany</code>	string	Set the device's seller name. This can only be set if the device has a persistent ID. This information will be saved onto the local machine but not onto the device. This information will also appear in Product Notes section of the Desktop Video Utility.
<code>bmdDeckLinkConfigDeviceInformationPhone</code>	string	Set the device's seller phone number. This can only be set if the device has a persistent ID. This information will be saved onto the local machine but not onto the device. This information will also appear in Product Notes section of the Desktop Video Utility.
<code>bmdDeckLinkConfigDeviceInformationEmail</code>	string	Set the device's seller email address. This can only be set if the device has a persistent ID. This information will be saved onto the local machine but not onto the device. This information will also appear in Product Notes section of the Desktop Video Utility.
<code>bmdDeckLinkConfigDeviceInformationDate</code>	string	Set the device's purchase date. This can only be set if the device has a persistent ID. This information will be saved onto the local machine but not onto the device. This information will also appear in Product Notes section of the Desktop Video Utility.
<code>bmdDeckLinkConfigVideoOutputIdleOperation</code>	Int(64)	Video output idle control. See <b>BMDIdleVideoOutputOperation</b> for more details.
<code>bmdDeckLinkConfigSwapSerialRxTx</code>	Flag	If set to true, the Rx and Tx lines of the RS422 port on the DeckLink device will be swapped.
<code>bmdDeckLinkConfigBypass</code>	Int(64)	The state of the bypass feature. This parameter can be set to a value of -1 for normal operation or zero to bypass the card. A timeout of up to 65 seconds may be specified in milliseconds. If the timeout is reached without the parameter being reset, the card will be bypassed automatically. The actual timeout will be approximately the time requested.
<code>bmdDeckLinkConfigClockTimingAdjustment</code>	Int(64)	Clock frequency adjustment for fine output control. The acceptable range is from -127 to 127 PPM (Parts Per Million).
<code>bmdDeckLinkConfigVideoInputScanning</code>	Flag	The video input connector scanning on the H.264 Pro Recorder. True if enabled.
<code>bmdDeckLinkConfigUseDedicatedLTCInput</code>	Flag	Use the timecode from the LTC input rather than from the SDI stream.
<code>bmdDeckLinkConfigDefaultVideoOutputMode</code>	Int(64)	The default video output mode. The <code>bmdDeckLinkConfigDefaultVideoOutputModeFlags</code> must be set for 3D video modes before using this setting. See <code>BMDDisplayMode</code> for more details.
<code>bmdDeckLinkConfigDefaultVideoOutputModeFlags</code>	Int(64)	The default video output mode 2D or 3D flag setting. See <code>bmdVideoOutputFlagDefault</code> and <code>bmdVideoOutputDualStream3D</code> for more details.

Name	Type	Description
<b>bmdDeckLinkConfigSDIOutputLinkConfiguration</b>	Int(64)	The SDI link configuration for a single output video stream. See <b>BMDLinkConfiguration</b> for more information.
<b>bmdDeckLinkConfigVideoOutputComponentLumaGain</b>	Float	The component video output luma gain in dB. The accepted range can be determined by using the <b>BMDDeckLinkVideoOutputGainMinimum</b> and <b>BMDDeckLinkVideoOutputGainMaximum</b> attributes with <b>IDeckLinkProfileAttributes</b> interface.
<b>bmdDeckLinkConfigVideoOutputComponent ChromaBlueGain</b>	Float	The component video output chroma blue gain in dB. The accepted range can be determined by using the <b>BMDDeckLinkVideoOutputGainMinimum</b> and <b>BMDDeckLinkVideoOutputGainMaximum</b> attributes with <b>IDeckLinkProfileAttributes</b> interface.
<b>bmdDeckLinkConfigVideoOutputComponent ChromaRedGain</b>	Float	The component video output chroma red gain in dB. The accepted range can be determined by using the <b>BMDDeckLinkVideoOutputGainMinimum</b> and <b>BMDDeckLinkVideoOutputGainMaximum</b> attributes with <b>IDeckLinkProfileAttributes</b> interface.
<b>bmdDeckLinkConfigVideoOutputCompositeLumaGain</b>	Float	The composite video output luma gain in dB. The accepted range can be determined by using the <b>BMDDeckLinkVideoOutputGainMinimum</b> and <b>BMDDeckLinkVideoOutputGainMaximum</b> attributes with <b>IDeckLinkProfileAttributes</b> interface.
<b>bmdDeckLinkConfigVideoOutputComposite ChromaGain</b>	Float	The composite video output chroma gain in dB. The accepted range can be determined by using the <b>BMDDeckLinkVideoOutputGainMinimum</b> and <b>BMDDeckLinkVideoOutputGainMaximum</b> attributes with <b>IDeckLinkProfileAttributes</b> interface.
<b>bmdDeckLinkConfigVideoOutputSVideoLumaGain</b>	Float	The s-video output luma gain in dB. The accepted range can be determined by using the <b>BMDDeckLinkVideoOutputGainMinimum</b> and <b>BMDDeckLinkVideoOutputGainMaximum</b> attributes with <b>IDeckLinkProfileAttributes</b> interface.
<b>bmdDeckLinkConfigVideoOutputSVideoChromaGain</b>	Float	The s-video output chroma gain in dB. The accepted range can be determined by using the <b>BMDDeckLinkVideoOutputGainMinimum</b> and <b>BMDDeckLinkVideoOutputGainMaximum</b> attributes with <b>IDeckLinkProfileAttributes</b> interface.
<b>bmdDeckLinkConfigVideoInputComponentLumaGain</b>	Float	The component video input luma gain in dB. The accepted range can be determined by using the <b>BMDDeckLinkVideoInputGainMinimum</b> and <b>BMDDeckLinkVideoInputGainMaximum</b> attributes with <b>IDeckLinkProfileAttributes</b> interface.
<b>bmdDeckLinkConfigVideoInputComponent ChromaBlueGain</b>	Float	The component video input chroma blue gain in dB. The accepted range can be determined by using the <b>BMDDeckLinkVideoInputGainMinimum</b> and <b>BMDDeckLinkVideoInputGainMaximum</b> attributes with <b>IDeckLinkProfileAttributes</b> interface.
<b>bmdDeckLinkConfigVideoInputComponent ChromaRedGain</b>	Float	The component video input chroma red gain in dB. The accepted range can be determined by using the <b>BMDDeckLinkVideoInputGainMinimum</b> and <b>BMDDeckLinkVideoInputGainMaximum</b> attributes with <b>IDeckLinkProfileAttributes</b> interface.
<b>bmdDeckLinkConfigVideoInputCompositeLumaGain</b>	Float	The composite video input luma gain in dB. The accepted range can be determined by using the <b>BMDDeckLinkVideoInputGainMinimum</b> and <b>BMDDeckLinkVideoInputGainMaximum</b> attributes with <b>IDeckLinkProfileAttributes</b> interface.

Name	Type	Description
<code>bmdDeckLinkConfigVideoInputCompositeChromaGain</code>	Float	The composite video input chroma gain in dB. The accepted range can be determined by using the <b>BMDDeckLinkVideoInputGainMinimum</b> and <b>BMDDeckLinkVideoInputGainMaximum</b> attributes with <b>IDeckLinkProfileAttributes</b> interface.
<code>bmdDeckLinkConfigVideoInputSVideoLumaGain</code>	Float	The s-video input luma gain in dB. The accepted range can be determined by using the <b>BMDDeckLinkVideoInputGainMinimum</b> and <b>BMDDeckLinkVideoInputGainMaximum</b> attributes with <b>IDeckLinkProfileAttributes</b> interface.
<code>bmdDeckLinkConfigVideoInputSVideoChromaGain</code>	Float	The s-video input chroma gain in dB. The accepted range can be determined by using the <b>BMDDeckLinkVideoInputGainMinimum</b> and <b>BMDDeckLinkVideoInputGainMaximum</b> attributes with <b>IDeckLinkProfileAttributes</b> interface.
<code>bmdDeckLinkConfigInternalKeyingAncillaryDataSource</code>	Int(64)	Set the source of VANC and timecode for output signal when internal keying is enabled (See <b>BMDInternalKeyingAncillaryDataSource</b> ).
<code>bmdDeckLinkConfigMicrophonePhantomPower</code>	Flag	If set to true, the Microphone input will provide +48V Phantom Power.
<code>bmdDeckLinkConfigMicrophoneInputGain</code>	Float	The microphone input gain in dB. The acceptable range can be determined via <b>BMDDeckLinkMicrophoneInputGainMinimum</b> and <b>BMDDeckLinkMicrophoneInputGainMaximum</b> . If set to 0dB, the microphone input will be muted.
<code>bmdDeckLinkConfigHeadphoneVolume</code>	Float	Set the headphone volume, acceptable range is between 0.0 (mute), to 1.0 (full volume)
<code>bmdDeckLinkConfigDeckControlConnection</code>	Int(64)	The active RS422 deck control connection. See <b>BMDDeckControlConnection</b> for more information.
<code>bmdDeckLinkConfigSDIInput3DPayloadOverride</code>	Flag	If set to true, the device will capture two genlocked SDI streams with matching video modes as a 3D stream.
<code>bmdDeckLinkConfigRec2020Output</code>	Flag	If set to true, device will output Rec.709 frames in Rec.2020 colorspace (See <b>BMDColorspace</b> )
<code>bmdDeckLinkConfigQuadLinkSDIVideoOutputSquareDivisionSplit</code>	Flag	If set to true, Quad-link SDI is output in Square Division Quad Split mode.
<code>bmdDeckLinkConfigCaptureGroup</code>	Int(64)	Any 32-bit number to identify a capture group. All devices supporting synchronized capture with the same group number are started and stopped together.
<code>bmdDeckLinkConfigPlaybackGroup</code>	Int(64)	Any 32-bit number to identify a playback group. All devices supporting synchronized playback with the same group number are started and stopped together.
<code>bmdDeckLinkConfigHDMITimecodePacking</code>	Int(64)	Set the HDMI timecode packing format for the video output stream (See <b>BMDHDMITimecodePacking</b> ).
<code>bmdDeckLinkConfigSwapHDMICH3AndCh4OnInput</code>	Flag	If set, HDMI audio input channels 3 and 4 are swapped to support 5.1 audio channel ordering
<code>bmdDeckLinkConfigSwapHDMICH3AndCh4OnOutput</code>	Flag	If set, HDMI audio output channels 3 and 4 are swapped to support 5.1 audio channel ordering
<code>bmdDeckLinkConfigReferenceOutputMode</code>	Int(64)	The reference output video mode for DeckLink devices where reference output does not follow SDI output (see <b>BMDDisplayMode</b> ). Supports interlaced/progressive modes up to 1080p30.
<code>bmdDeckLinkConfigEthernetUseDHCP</code>	Flag	For devices with Ethernet. The local interface assigns a local IP address via DHCP, otherwise static.

Name	Type	Description
<code>bmdDeckLinkConfigEthernetPTPFollowerOnly</code>	Flag	For devices that use PTP. Prevents the device from negotiating to become a PTP leader. False by default.
<code>bmdDeckLinkConfigEthernetPTPUseUDPEncapsulation</code>	Flag	For devices that use PTP. Sets if UDP Encapsulation will be used, otherwise Ethernet Encapsulation will be used.
<code>bmdDeckLinkConfigEthernetPTPPriority1</code>	Int(64)	For devices that use PTP. Sets PTP's Priority1 field. The supported range is 0 to 255 with default value 128.
<code>bmdDeckLinkConfigEthernetPTPPriority2</code>	Int(64)	For devices that use PTP. Sets PTP's Priority2 field. The supported range is 0 to 255 with default value 128.
<code>bmdDeckLinkConfigEthernetPTPDomain</code>	Int(64)	For devices that use PTP. Sets PTP's Domain field. The supported range is 0 to 127 with default value 127.
<code>bmdDeckLinkConfigEthernetStaticLocalIPAddress</code>	string	For devices with Ethernet. Manual local IP address. Used when <code>bmdDeckLinkConfigEthernetUseDHCP</code> is false.
<code>bmdDeckLinkConfigEthernetStaticSubnetMask</code>	string	For devices with Ethernet. Manual subnet mask. Used when <code>bmdDeckLinkConfigEthernetUseDHCP</code> is false.
<code>bmdDeckLinkConfigEthernetStaticGatewayIPAddress</code>	string	For devices with Ethernet. Manual gateway IP address. Used when <code>bmdDeckLinkConfigEthernetUseDHCP</code> is false.
<code>bmdDeckLinkConfigEthernetStaticPrimaryDNS</code>	string	For devices with Ethernet. Manual primary DNS. Used when <code>bmdDeckLinkConfigEthernetUseDHCP</code> is false.
<code>bmdDeckLinkConfigEthernetStaticSecondaryDNS</code>	string	For devices with Ethernet. Manual secondary DNS. Used when <code>bmdDeckLinkConfigEthernetUseDHCP</code> is false.
<code>bmdDeckLinkConfigEthernetVideoOutputAddress</code>	string	For devices with Ethernet. Set the output address for the video flow. Omission of either dotted-decimal IP or colon-port represents auto for either, or empty string for both. Get the actual used address from <code>bmdDeckLinkStatusEthernetVideoOutputAddress</code> status item.
<code>bmdDeckLinkConfigEthernetAudioOutputAddress</code>	string	For devices with Ethernet. Set the output address for the audio flow. Omission of either dotted-decimal IP or colon-port represents auto for either, or empty string for both. Get the actual used address from <code>bmdDeckLinkStatusEthernetAudioOutputAddress</code> status item.
<code>bmdDeckLinkConfigEthernetAncillaryOutputAddress</code>	string	For devices with Ethernet. Set the output address for the ancillary flow. Omission of either dotted-decimal IP or colon-port represents auto for either, or empty string for both. Get the actual used address from <code>bmdDeckLinkStatusEthernetAncillaryOutputAddress</code> status item.
<code>bmdDeckLinkConfigEthernetAudioOutputChannelOrder</code>	string	For devices with Ethernet. Sets the output audio SDP channel-order with the convention defined by ST 2110-30.
<code>bmdDeckLinkConfigOutputValidateEDIDForDolbyVision</code>	Flag	If set (default), process the sink EDID and potentially fail operations that aren't supported.
<code>bmdDeckLinkConfigVideoOutputConversionColorspaceDestination</code>	Int(64)	For colorspace conversion, the destination <b>BMDColorspace</b> .
<code>bmdDeckLinkConfigVideoOutputConversionColorspaceSource</code>	Int(64)	For colorspace conversion, the source <b>BMDColorspace</b> . Frames in other colorspace will not be converted.
<code>bmdDeckLinkConfigDolbyVisionCMVersion</code>	Float	A float representing the Dolby Vision content mapping version to use when Dolby Vision output is enabled.
<code>bmdDeckLinkConfigDolbyVisionMasterMinimumNits</code>	Float	A float representing the mastering monitor minimum brightness in nits.
<code>bmdDeckLinkConfigDolbyVisionMasterMaximumNits</code>	Float	A float representing the mastering monitor maximum brightness in nits.

## 3.19 Audio Output Stream Type

**BMDAudioOutputStreamType** enumerates the Audio output stream type (see **IDeckLinkOutput::EnableAudioOutput** for details).

- **bmdAudioOutputStreamContinuous**  
Audio stream is continuous.
- **bmdAudioOutputStreamTimestamped**  
Audio stream is time stamped.

## 3.20 Analog Video Flags

**BMDAnalogVideoFlags** enumerates a set of flags applicable to analog video.

- **bmdAnalogVideoFlagCompositeSetup75**  
This flag is only applicable to NTSC composite video and sets the black level to 7.5 IRE, which is used in the USA, rather than the default of 0.0 IRE which is used in Japan.
- **bmdAnalogVideoFlagComponentBetacamLevels**  
This flag is only applicable to the component analog video levels. It sets the levels of the color difference channels in accordance to the SMPTE standard or boosts them by a factor of 4/3 for the Betacam format.

## 3.21 Audio Connection Modes

**BMDAudioConnection** enumerates the possible audio connection interfaces.

- **bmdAudioConnectionEmbedded**  
Embedded SDI or HDMI audio connection
- **bmdAudioConnectionAESEBU**  
AES/EBU audio connection
- **bmdAudioConnectionAnalog**  
Analog audio connection
- **bmdAudioConnectionAnalogXLR**  
Analog XLR audio connection
- **bmdAudioConnectionAnalogRCA**  
Analog RCA audio connection
- **bmdAudioConnectionMicrophone**  
Analog Microphone audio connection
- **bmdAudioConnectionHeadphones**  
Analog Headphone audio connection

## 3.22 Audio Output Selection switch

**BMDAudioOutputAnalogAESSwitch** enumerates the settings of the audio output Analog / AES switch.

Refer to the **IDeckLinkConfiguration** interface to get and set analog / AES switch settings.

- **bmdAudioOutputSwitchAESEBU**  
AES / EBU audio output.
- **bmdAudioOutputSwitchAnalog**  
Analog audio output.



## 3.23 Output Conversion Modes

**BMDVideoOutputConversionMode** enumerates the possible video output conversions.

- **bmdNoVideoOutputConversion**  
No video output conversion
- **bmdVideoOutputLetterboxDownconversion**  
Down-converted letterbox SD output
- **bmdVideoOutputAnamorphicDownconversion**  
Down-converted anamorphic SD output
- **bmdVideoOutputHD720toHD1080Conversion**  
HD720 to HD1080 conversion output
- **bmdVideoOutputHardwareLetterboxDownconversion**  
Simultaneous output of HD and down-converted letterbox SD
- **bmdVideoOutputHardwareAnamorphicDownconversion**  
Simultaneous output of HD and down-converted anamorphic SD
- **bmdVideoOutputHardwareCenterCutDownconversion**  
Simultaneous output of HD and center cut SD
- **bmdVideoOutputHardware720p1080pCrossconversion**  
The simultaneous output of 720p and 1080p cross-conversion
- **bmdVideoOutputHardwareAnamorphic720pUpconversion**  
The simultaneous output of SD and up-converted anamorphic 720p
- **bmdVideoOutputHardwareAnamorphic1080iUpconversion**  
The simultaneous output of SD and up-converted anamorphic 1080i
- **bmdVideoOutputHardwareAnamorphic149To720pUpconversion**  
The simultaneous output of SD and up-converted anamorphic widescreen aspect ratio 14:9 to 720p.
- **bmdVideoOutputHardwareAnamorphic149To1080iUpconversion**  
The simultaneous output of SD and up-converted anamorphic widescreen aspect ratio 14:9 to 1080i.
- **bmdVideoOutputHardwarePillarbox720pUpconversion**  
The simultaneous output of SD and up-converted pillarbox 720p
- **bmdVideoOutputHardwarePillarbox1080iUpconversion**  
The simultaneous output of SD and up-converted pillarbox 1080i

## 3.24 Input Conversion Modes

**BMDVideoInputConversionMode** enumerates the possible video input conversions.

- **bmdNoVideoInputConversion**  
No video input conversion
- **bmdVideoInputLetterboxDownconversionFromHD1080**  
HD1080 to SD video input down conversion
- **bmdVideoInputAnamorphicDownconversionFromHD1080**  
Anamorphic from HD1080 to SD video input down conversion
- **bmdVideoInputLetterboxDownconversionFromHD720**  
Letter box from HD720 to SD video input down conversion
- **bmdVideoInputAnamorphicDownconversionFromHD720**  
Anamorphic from HD720 to SD video input down conversion
- **bmdVideoInputLetterboxUpconversion**  
Letterbox video input up conversion
- **bmdVideoInputAnamorphicUpconversion**  
Anamorphic video input up conversion

## 3.25 Video Input Format Changed Events

**BMDVideoInputFormatChangedEvents** enumerates the properties of the video input signal format that have changed. (See **IDeckLinkInputCallback::VideoInputFormatChanged** for details).

- **bmdVideoInputDisplayModeChanged**  
Either the video input display mode (see **BMDDisplayMode** for details) or detected video input dual stream 3D has changed (see **BMDDetectedVideoInputFormatFlags** for details).
- **bmdVideoInputFieldDominanceChanged**  
Video input field dominance has changed (see **BMDFieldDominance** for details)
- **bmdVideoInputColorspaceChanged**  
Video input color space or depth has changed (see **BMDDetectedVideoInputFormatFlags** for details)

## 3.26 Detected Video Input Format Flags

**BMDDetectedVideoInputFormatFlags** enumerates the video input signal (See **IDeckLinkInputCallback::VideoInputFormatChanged** for details)

- **bmdDetectedVideoInputYCbCr422**  
The video input detected is YCbCr 4:2:2 representation.
- **bmdDetectedVideoInputRGB444**  
The video input detected is RGB 4:4:4 representation.
- **bmdDetectedVideoInputDualStream3D**  
The video input detected is dual stream 3D video.
- **bmdDetectedVideoInput12BitDepth**  
The video input detected is 12-bit color depth.
- **bmdDetectedVideoInput10BitDepth**  
The video input detected is 10-bit color depth.
- **bmdDetectedVideoInput8BitDepth**  
The video input detected is 8-bit color depth.

## 3.27 Capture Pass Through Mode

**BMDDeckLinkCapturePassthroughMode** enumerates whether the video output is electrical connected to the video input or if the clean switching mode is enabled.

- **bmdDeckLinkCapturePassthroughModeDirect**  
In direct mode the monitoring video output is directly electrically connected to the video input.
- **bmdDeckLinkCapturePassthroughModeCleanSwitch**  
In clean switch mode, the captured video is played back out the monitoring outputs allowing a clean switch between monitoring and playback if the video modes are compatible. The monitoring output signal is affected by the options specified on capture and some latency is introduced between capture and monitoring.
- **bmdDeckLinkCapturePassthroughModeDisabled**  
In disabled mode the video input is not displayed out the monitoring outputs, which instead display black frames or the last frame played, dependant on the configuration of the Idle Output setting (see **BMDIdleVideoOutputOperation**).

## 3.28 Display Mode Characteristics

**BMDDisplayModeFlags** enumerates the possible characteristics of an **IDeckLinkDisplayMode** object.

- **bmdDisplayModeSupports3D**  
The 3D equivalent of this display mode is supported by the installed DeckLink device.
- **bmdDisplayModeColorspaceRec601**  
This display mode uses the Rec. 601 standard for encoding interlaced analogue video signals in digital form.
- **bmdDisplayModeColorspaceRec709**  
This display mode uses the Rec. 709 standard for encoding high definition video content.
- **bmdDisplayModeColorspaceRec2020**  
This display mode uses the Rec. 2020 standard for encoding ultra-high definition video content.

## 3.29 Video 3D packing format

The **BMDVideo3DPackingFormat** enumerates standard modes where two frames are packed into one.

- **bmdVideo3DPackingSidebySideHalf**  
Frames are packed side-by-side as a single stream.
- **bmdVideo3DPackingLinebyLine**  
The two eye frames are packed on alternating lines of the source frame.
- **bmdVideo3DPackingTopAndBottom**  
The two eye frames are packed into the top and bottom half of the source frame.
- **bmdVideo3DPackingFramePacking**  
Frame packing is a standard HDMI 1.4a 3D mode (Top / Bottom full).
- **bmdVideo3DPackingLeftOnly**  
Only the left eye frame is displayed.
- **bmdVideo3DPackingRightOnly**  
Only the right eye frame is displayed.

## 3.30 Timecode Format

**BMDTimecodeFormat** enumerates the possible video frame timecode formats.

- **bmdTimecodeRP188VITC1**  
RP188 VITC1 timecode (DBB1=1) on line 9.
- **bmdTimecodeRP188VITC2**  
RP188 VITC2 timecode (DBB1=2) on line 571.
- **bmdTimecodeRP188LTC**  
RP188 LTC timecode (DBB1=0) on line 10, or the dedicated LTC input if **bmdDeckLinkConfigUseDedicatedLTCInput** is true.
- **bmdTimecodeRP188HighFrameRate**  
RP188 HFR timecode (DBB1=8xh)
- **bmdTimecodeRP188Any**  
In capture mode the first valid RP188 timecode will be returned. In playback mode the timecode is set as RP188 VITC1.
- **bmdTimecodeVITC**  
VITC timecode field 1.
- **bmdTimecodeVITCField2**  
VITC timecode field 2.
- **bmdTimecodeSerial**  
Serial timecode.

### 3.31 Timecode Flags

**BMDTimecodeFlags** enumerates the possible flags that accompany a timecode.

- **bmdTimecodeFlagDefault**  
timecode is a non-drop timecode
- **bmdTimecodeIsDropFrame**  
timecode is a drop timecode
- **bmdTimecodeFieldMark**  
timecode field mark flag used with frame rates above 30 FPS
- **bmdTimecodeColorFrame**  
timecode color frame frame flag
- **bmdTimecodeEmbedRecordingTrigger**  
timecode embeds recording trigger
- **bmdTimecodeRecordingTriggered**  
timecode recording is triggered flag

### 3.32 Timecode BCD

**BMDTimecodeBCD** is a 32-bit unsigned integer timecode encoded as HHMMSSFF. Each four bits represent a single decimal digit:

digit	bit 3	bit 2	bit 1	bit 0
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1

Word																							
Decreasing Address Order																							
Byte 4				Byte 3				Byte 2				Byte 1											
Tens of hours		hours		Tens of minutes		minutes		Tens of seconds		seconds		Tens of frames		frames									
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

### 3.33 Deck Control Mode

**BMDDeckControlMode** enumerates the possible deck control modes.

- **bmdDeckControlNotOpened**  
Deck control is not opened
- **bmdDeckControlVTRControlMode**  
Deck control VTR control mode
- **bmdDeckControlExportMode**  
Deck control export mode
- **bmdDeckControlCaptureMode**  
Deck control capture mode

### 3.34 Deck Control Event

**BMDDeckControlEvent** enumerates the possible deck control events.

- **bmdDeckControlAbortedEvent**  
This event is triggered when a capture or edit-to-tape operation is aborted.
- **bmdDeckControlPrepareForExportEvent**  
This export-to-tape event is triggered a few frames before reaching the in-point. At this stage, **IDeckLinkOutput::StartScheduledPlayback()** must be called.
- **bmdDeckControlExportCompleteEvent**  
This export-to-tape event is triggered a few frames after reaching the out-point. At this point, it is safe to stop playback. Upon reception of this event the deck's control mode is set back to **bmdDeckControlVTRControlMode**.
- **bmdDeckControlPrepareForCaptureEvent**  
This capture event is triggered a few frames before reaching the in-point. The serial timecode attached to **IDeckLinkVideoInputFrames** is now valid.
- **bmdDeckControlCaptureCompleteEvent**  
This capture event is triggered a few frames after reaching the out-point. Upon reception of this event the deck's control mode is set back to **bmdDeckControlVTRControlMode**.

### 3.35 Deck Control VTR Control States

**BMDDeckControlVTRControlState** enumerates the possible deck control VTR control states.

- **bmdDeckControlNotInVTRControlMode**  
The deck is currently not in VTR control mode.
- **bmdDeckControlVTRControlPlaying**  
The deck is currently playing.
- **bmdDeckControlVTRControlRecording**  
The deck is currently recording.
- **bmdDeckControlVTRControlStill**  
The deck is currently paused.
- **bmdDeckControlVTRControlShuttleForward**  
The deck is currently in shuttle forward mode.
- **bmdDeckControlVTRControlShuttleReverse**  
The deck is currently in shuttle reverse mode.
- **bmdDeckControlVTRControlJogForward**  
The deck is currently in jog (one frame at a time) forward mode.
- **bmdDeckControlVTRControlJogReverse**  
The deck is currently in jog (one frame at a time) reverse mode.
- **bmdDeckControlVTRControlStopped**  
The deck is currently stopped.

### 3.36 Deck Control Status Flags

**BMDDeckControlStatusFlags** enumerates the possible deck control status flags.

- **bmdDeckControlStatusDeckConnected**  
The deck has been connected (TRUE) / disconnected (FALSE).
- **bmdDeckControlStatusRemoteMode**  
The deck is in remote (TRUE) / local mode (FALSE).
- **bmdDeckControlStatusRecordInhibited**  
Recording is inhibited (TRUE) / allowed (FALSE).
- **bmdDeckControlStatusCassetteOut**  
The deck does not have a cassette (TRUE).

### 3.37 Deck Control Export Mode Ops Flags

**BMDDeckControlExportModeOpsFlags** enumerates the possible deck control edit-to-tape and export-to-tape mode operations.

- **bmdDeckControlExportModeInsertVideo**  
Insert video
- **bmdDeckControlExportModeInsertAudio1**  
Insert audio track 1
- **bmdDeckControlExportModeInsertAudio2**  
Insert audio track 2
- **bmdDeckControlExportModeInsertAudio3**  
Insert audio track 3
- **bmdDeckControlExportModeInsertAudio4**  
Insert audio track 4
- **bmdDeckControlExportModeInsertAudio5**  
Insert audio track 5
- **bmdDeckControlExportModeInsertAudio6**  
Insert audio track 6
- **bmdDeckControlExportModeInsertAudio7**  
Insert audio track 7
- **bmdDeckControlExportModeInsertAudio8**  
Insert audio track 8
- **bmdDeckControlExportModeInsertAudio9**  
Insert audio track 9
- **bmdDeckControlExportModeInsertAudio10**  
Insert audio track 10
- **bmdDeckControlExportModeInsertAudio11**  
Insert audio track 11
- **bmdDeckControlExportModeInsertAudio12**  
Insert audio track 12
- **bmdDeckControlExportModeInsertTimeCode**  
Insert timecode
- **bmdDeckControlExportModeInsertAssemble**  
Enable assemble editing.
- **bmdDeckControlExportModeInsertPreview**  
Enable preview auto editing
- **bmdDeckControlUseManualExport**  
Use edit on/off (TRUE) or autoedit (FALSE). Edit on/off is currently not supported.

## 3.38 Deck Control error

**BMDDeckControlError** enumerates the possible deck control errors.

- **bmdDeckControlNoError**
- **bmdDeckControlModeError**  
The deck is not in the correct mode for the desired operation.  
Eg. A play command is issued, but the current mode is not VTRControlMode
- **bmdDeckControlMissedInPointError**  
The in point was missed while prerolling as the current timecode has passed the begin in / capture timecode.
- **bmdDeckControlDeckTimeoutError**  
Deck control timeout error.
- **bmdDeckControlCommandFailedError**  
A deck control command request has failed.
- **bmdDeckControlDeviceAlreadyOpenedError**  
The deck control device is already open.
- **bmdDeckControlFailedToOpenDeviceError**  
Deck control failed to open the serial device.
- **bmdDeckControlInLocalModeError**  
The deck in local mode and is no longer controllable.
- **bmdDeckControlEndOfTapeError**  
Deck control has reached or is trying to move past the end of the tape.
- **bmdDeckControlUserAbortError**  
Abort an export-to-tape or capture operation.
- **bmdDeckControlNoTapeInDeckError**  
There is currently no tape in the deck.
- **bmdDeckControlNoVideoFromCardError**  
A capture or export operation was attempted when the input signal was invalid.
- **bmdDeckControlNoCommunicationError**  
The deck is not responding to requests.
- **bmdDeckControlBufferTooSmallError**  
When sending a custom command, either the internal buffer is too small for the provided custom command (reduce the size of the custom command), or the buffer provided for the command's response is too small (provide a larger one).
- **bmdDeckControlBadChecksumError**  
When sending a custom command, the deck's response contained an invalid checksum.
- **bmdDeckControlUnknownError**  
Deck control unknown error.

## 3.39 Genlock Reference Status

**BMDReferenceStatus** enumerates the genlock reference statuses of the DeckLink device.

- **bmdReferenceUnlocked**  
Genlock reference lock has not been achieved.
- **bmdReferenceNotSupportedByHardware**  
The DeckLink device does not have a genlock input connector.
- **bmdReferenceLocked**  
Genlock reference lock has been achieved.

## 3.40 Idle Video Output Operation

**BMDIdleVideoOutputOperation** enumerates the possible output modes when idle.

- **bmdIdleVideoOutputBlack**  
When not playing video, the device will output black frames.
- **bmdIdleVideoOutputLastFrame**  
When not playing video, the device will output the last frame played.

## 3.41 Device Busy State

**BMDDeviceBusyState** enumerates the possible busy states for a device.

- **bmdDeviceCaptureBusy**  
The device is currently being used for capture.
- **bmdDevicePlaybackBusy**  
The device is currently being used for playback.
- **bmdDeviceSerialPortBusy**  
The device's serial port is currently being used.

## 3.42 DeckLink Device Notification

**BMDNotifications** enumerates the possible notifications for DeckLink devices.

- **bmdPreferencesChanged**  
The preferences have changed. This occurs when **IDeckLinkConfiguration::WriteToPreferences** is called, or when the preference settings are saved in the Blackmagic Design Control Panel. The param1 and param2 parameters are 0.
- **bmdStatusChanged**  
A status information item has changed. The param1 parameter contains the **BMDDeckLinkStatusID** of the status information item which changed; param2 is 0. Use the **IDeckLinkStatus** interface to retrieve the new status.

## 3.43 Streaming Device Mode

**BMDStreamingDeviceMode** enumerates the possible device modes for the streaming device.

- **bmdStreamingDeviceIdle**  
The streaming device is idle.
- **bmdStreamingDeviceEncoding**  
The streaming device is encoding.
- **bmdStreamingDeviceStopping**  
The streaming device is stopping.
- **bmdStreamingDeviceUnknown**  
The streaming device is in an unknown state.



## 3.44 Streaming Device Encoding Frame Rates

**BMDStreamingEncodingFrameRate** enumerates the possible encoded frame rates of the streaming device.

- **bmdStreamingEncodedFrameRate50i**  
The encoded interlaced frame rate is 50 fields per second.
- **bmdStreamingEncodedFrameRate5994i**  
The encoded interlaced frame rate is 59.94 fields per second.
- **bmdStreamingEncodedFrameRate60i**  
The encoded interlaced frame rate is 60 fields per second.
- **bmdStreamingEncodedFrameRate2398p**  
The encoded progressive frame rate is 23.98 frames per second.
- **bmdStreamingEncodedFrameRate24p**  
The encoded progressive frame rate is 24 frames per second.
- **bmdStreamingEncodedFrameRate25**  
The encoded progressive frame rate is 25 frames per second.
- **bmdStreamingEncodedFrameRate2997p**  
The encoded progressive frame rate is 29.97 frames per second.
- **bmdStreamingEncodedFrameRate30p**  
The encoded progressive frame rate is 30 frames per second.
- **bmdStreamingEncodedFrameRate50p**  
The encoded progressive frame rate is 50 frames per second.
- **bmdStreamingEncodedFrameRate5994p**  
The encoded progressive frame rate is 59.94 frames per second.
- **bmdStreamingEncodedFrameRate60p**  
The encoded progressive frame rate is 60 frames per second.

## 3.45 Streaming Device Encoding Support

**BMDStreamingEncodingSupport** enumerates the possible types of support for an encoding mode.

- **bmdStreamingEncodingModeNotSupported**  
The encoding mode is not supported.
- **bmdStreamingEncodingModeSupported**  
The encoding mode is supported.
- **bmdStreamingEncodingModeSupportedWithChanges**  
The encoding mode is supported with changes to encoding parameters.

## 3.46 Streaming Device Codecs

**BMDStreamingVideoCodec** enumerates the possible codecs that are supported by the streaming device.

- **bmdStreamingVideoCodecH264**  
The H.264/AVC video compression codec.

### 3.47 Streaming Device H264 Profile

**BMDStreamingH264Profile** enumerates the possible H.264 video coding profiles that are available on the streaming device. Profiles indicate the complexity of algorithms and coding tools required by a decoder, with Baseline Profile requiring the lowest complexity decoder to decode the encoded video.

- **bmdStreamingH264ProfileHigh**  
High Profile
- **bmdStreamingH264ProfileMain**  
Main Profile
- **bmdStreamingH264ProfileBaseline**  
Baseline Profile

### 3.48 Streaming Device H264 Level

**BMDStreamingH264Level** enumerates the possible H.264 video coding levels that are available on the streaming device. Levels indicate bitrate and resolution constraints on a video decoder. Higher levels require a decoder capable of decoding higher bitrates and resolutions than lower levels.

- **bmdStreamingH264Level12**  
Level 1.2
- **bmdStreamingH264Level13**  
Level 1.3
- **bmdStreamingH264Level2**  
Level 2
- **bmdStreamingH264Level21**  
Level 2.1
- **bmdStreamingH264Level22**  
Level 2.2
- **bmdStreamingH264Level3**  
Level 3
- **bmdStreamingH264Level31**  
Level 3.1
- **bmdStreamingH264Level32**  
Level 3.2
- **bmdStreamingH264Level4**  
Level 4
- **bmdStreamingH264Level41**  
Level 4.1
- **bmdStreamingH264Level42**  
Level 4.2

### 3.49 Streaming Device H264 Entropy Coding

**BMDStreamingH264EntropyCoding** enumerates the possible entropy coding options.

- **bmdStreamingH264EntropyCodingCAVLC**  
Context-adaptive variable-length coding.
- **bmdStreamingH264EntropyCodingCABAC**  
Context-adaptive binary arithmetic coding.

## 3.50 Streaming Device Audio Codec

**BMDStreamingAudioCodec** enumerates the possible audio codecs.

- **bmdStreamingAudioCodecAAC**  
MPEG Advanced Audio Coding (AAC).

## 3.51 Streaming Device Encoding Mode Properties

**BMDStreamingEncodingModePropertyID** enumerates the possible properties of the encoding mode.

- **bmdStreamingEncodingPropertyVideoFrameRate**  
Video frame rate as a **BMDStreamingEncodingFrameRate** value
- **bmdStreamingEncodingPropertyVideoBitRateKbps**  
Video codec bitrate in kilobits per second
- **bmdStreamingEncodingPropertyH264Profile**  
Video codec profile as a **BMDStreamingH264Profile** value
- **bmdStreamingEncodingPropertyH264Level**  
Video codec level as a **BMDStreamingH264Level** value
- **bmdStreamingEncodingPropertyH264EntropyCoding**  
Video codec entropy coding as a **BMDStreamingH264EntropyCoding** value
- **bmdStreamingEncodingPropertyH264HasBFFrames**  
Boolean value indicating whether B-Frames will be output by encoding mode
- **bmdStreamingEncodingPropertyAudioCodec**  
Audio codec as a **BMDStreamingAudioCodec** value
- **bmdStreamingEncodingPropertyAudioSampleRate**  
Audio sampling rate in Hertz
- **bmdStreamingEncodingPropertyAudioChannelCount**  
Number of audio channels
- **bmdStreamingEncodingPropertyAudioBitRateKbps**  
Audio codec bitrate in kilobits per second

## 3.52 Audio Formats

**BMDAudioFormat** enumerates the audio formats supported for encoder capture

- **bmdAudioFormatPCM**  
Signed PCM samples, see **BMDAudioSampleRate** for the available sample rates and **BMDAudioSampleType** for the available sample sizes.

## 3.53 Deck Control Connection

**BMDDeckControlConnection** enumerates the possible deck control connections.

- **bmdDeckControlConnectionRS422Remote1**  
First RS422 deck control connection
- **bmdDeckControlConnectionRS422Remote2**  
Second RS422 deck control connection

## 3.54 Video Encoder Frame Coding Mode

**BMDVideoEncoderFrameCodingMode** enumerates the frame coding mode options.

- **bmdVideoEncoderFrameCodingModeInter**  
Video frame data is compressed with reference to neighbouring video frame data.
- **BmdVideoEncoderFrameCodingModeIntra**  
Video frame data is compressed relative to the current frame only.

## 3.55 DeckLink Encoder Configuration ID

**BMDDeckLinkEncoderConfigurationID** enumerates the set of video encoder configuration settings which may be set or queried (see **IDeckLinkEncoderConfiguration** for details).

Name	Type	Description
<b>bmdDeckLinkEncoderConfigPreferredBitDepth</b>	Int(64)	Video encoder bit depth. Acceptable values are 8, 10, representing 8bit, 10bit respectively.
<b>bmdDeckLinkEncoderConfigFrame CodingMode</b>	Int(64)	Video encoder frame coding mode. See <b>BMDVideoEncoderFrameCodingMode</b> for more information.
<b>bmdDeckLinkEncoderConfigH265TargetBitrate</b>	Int(64)	H.265 target bitrate. Acceptable range is between 2500 (2.5Mbit/s) and 50000000 (50Mbit/s).
<b>bmdDeckLinkEncoderConfigMPEG4 SampleDescription</b>	Bytes	Codec configuration data represented as a full MPEG4 sample description (aka SampleEntry of an 'stsd' atom-box). Useful for MediaFoundation, QuickTime, MKV and more. <b>Note:</b> The buffer returned by this configuration item is only valid while encoded video input is enabled (i.e. <b>IDeckLinkEncoderInput::EnableVideoInput</b> has been called).
<b>bmdDeckLinkEncoderConfigMPEG4Codec SpecificDesc</b>	Bytes	Codec configuration data represented as sample description extensions only (atom stream, each with size and fourCC header). Useful for AVFoundation, VideoToolbox, MKV and more. <b>Note:</b> The buffer returned by this configuration item is only valid while encoded video input is enabled (i.e. <b>IDeckLinkEncoderInput::EnableVideoInput</b> has been called).
<b>bmdDeckLinkEncoderConfigDNxHRCompressionID</b>	Int(64)	DNxHR Compression ID.
<b>bmdDeckLinkEncoderConfigDNxHRLevel</b>	Int(64)	DNxHR Level. <b>BMDDNxHRLevel</b> enumerates the available DNxHR levels.

## 3.56 Device Interface

**BMDDeviceInterface** enumerates the possible interfaces by which the device is connected.

- **bmdDeviceInterfacePCI**  
PCI
- **bmdDeviceInterfaceUSB**  
USB
- **bmdDeviceInterfaceThunderbolt**  
Thunderbolt

## 3.57 Packet Type

**BMDPacketType** enumerates the possible **IDeckLinkEncoderPacket** types.

- **bmdPacketTypeStreamInterruptedMarker**  
A packet of this type marks when a video stream was interrupted.
- **bmdPacketTypeStreamData**  
Regular stream data.

## 3.58 DeckLink Status ID

**BMDDeckLinkStatusID** enumerates the set of status information for a DeckLink device which may be queried (see the **IDeckLinkStatus** interface for details).

Name	Type	Description
<b>bmdDeckLinkStatusDetectedVideoInputMode</b>	Int	The detected video input mode ( <b>BMDDisplayMode</b> ), available on devices which support input format detection.
<b>bmdDeckLinkStatusDetectedVideoInputFormatFlags</b>	Int	The detected video input format flags ( <b>BMDDetectedVideoInputFormatFlags</b> ), available on devices which support input format detection.
<b>bmdDeckLinkStatusDetectedVideoInputFieldDominance</b>	Int	The field dominance of the detected video input mode ( <b>BMDFieldDominance</b> ).
<b>bmdDeckLinkStatusDetectedVideoInputColorspace</b>	Int	The colorspace of the detected video input ( <b>BMDColorspace</b> ).
<b>bmdDeckLinkStatusDetectedVideoInputDynamicRange</b>	Int	The dynamic range of the detected video input ( <b>BMDDynamicRange</b> ).
<b>bmdDeckLinkStatusDetectedSDILinkConfiguration</b>	Int	The SDI video link configuration of the detected video input ( <b>BMDLinkConfiguration</b> ).
<b>bmdDeckLinkStatusCurrentVideoInputMode</b>	Int	The current video input mode ( <b>BMDDisplayMode</b> ).
<b>bmdDeckLinkStatusCurrentVideoInputPixelFormat</b>	Int	The current video input pixel format ( <b>BMDPixelFormat</b> ).
<b>bmdDeckLinkStatusCurrentVideoInputFlags</b>	Int	The current video input flags ( <b>BMDDeckLinkVideoStatusFlags</b> ).
<b>bmdDeckLinkStatusCurrentVideoOutputMode</b>	Int	The current video output mode ( <b>BMDDisplayMode</b> ).
<b>bmdDeckLinkStatusCurrentVideoOutputFlags</b>	Int	The current video output flags ( <b>BMDDeckLinkVideoStatusFlags</b> ).
<b>bmdDeckLinkStatusEthernetLinkMbps</b>	Int	For devices with Ethernet, the speed of the link in Mbps.
<b>bmdDeckLinkStatusPCIExpressLinkWidth</b>	Int	PCIe link width, x1, x4, etc.
<b>bmdDeckLinkStatusPCIExpressLinkSpeed</b>	Int	PCIe link speed, Gen. 1, Gen. 2, etc.
<b>bmdDeckLinkStatusLastVideoOutputPixelFormat</b>	Int	The last video output pixel format ( <b>BMDPixelFormat</b> ).
<b>bmdDeckLinkStatusReferenceSignalMode</b>	Int	The detected reference input mode ( <b>BMDDisplayMode</b> ), available on devices which support reference input format detection.
<b>bmdDeckLinkStatusBusy</b>	Int	The current busy state of the device. (See <b>BMDDeviceBusyState</b> for more information).
<b>bmdDeckLinkStatusVideoInputSignalLocked</b>	Flag	True if the video input signal is locked.
<b>bmdDeckLinkStatusReferenceSignalLocked</b>	Flag	True if the reference input signal is locked.
<b>bmdDeckLinkStatusReferenceSignalFlags</b>	Int	The detected reference input flags ( <b>BMDDeckLinkVideoStatusFlags</b> ), available on devices which support reference input format detection.

Name	Type	Description
<code>bmdDeckLinkStatusInterchangeablePanelType</code>	Int	The interchangeable panel installed ( <b>BMDPanelType</b> ).
<code>bmdDeckLinkStatusReceivedEDID</code>	Bytes	The received EDID of a connected HDMI sink device.
<code>bmdDeckLinkStatusDeviceTemperature</code>	Int	The on-board temperature (°C).
<code>bmdDeckLinkStatusEthernetLink</code>	Int	For devices with Ethernet, the state of the link ( <b>BMDEthernetLinkState</b> ).
<code>bmdDeckLinkStatusEthernetLocalIPAddress</code>	String	For devices with Ethernet, the current negotiated or static local IP address. Valid if <code>bmdDeckLinkStatusEthernetLink</code> is <b>bmdEthernetLinkStateConnectedBound</b> . For other link states, this returns <code>S_FALSE</code> and an empty string.
<code>bmdDeckLinkStatusEthernetSubnetMask</code>	String	For devices with Ethernet, the current negotiated or static subnet mask. Valid if <code>bmdDeckLinkStatusEthernetLink</code> is <b>bmdEthernetLinkStateConnectedBound</b> . For other link states, this returns <code>S_FALSE</code> and an empty string.
<code>bmdDeckLinkStatusEthernetGatewayIPAddress</code>	String	For devices with Ethernet, the current negotiated or static gateway IP address. Valid if <code>bmdDeckLinkStatusEthernetLink</code> is <b>bmdEthernetLinkStateConnectedBound</b> . For other link states, or unassigned, this returns <code>S_FALSE</code> and an empty string.
<code>bmdDeckLinkStatusEthernetPrimaryDNS</code>	String	For devices with Ethernet, the current negotiated or static primary DNS IP address. Valid if <code>bmdDeckLinkStatusEthernetLink</code> is <b>bmdEthernetLinkStateConnectedBound</b> . For other link states, or unassigned, this returns <code>S_FALSE</code> and an empty string.
<code>bmdDeckLinkStatusEthernetSecondaryDNS</code>	String	For devices with Ethernet, the current negotiated or static secondary DNS IP address. Valid if <code>bmdDeckLinkStatusEthernetLink</code> is <b>bmdEthernetLinkStateConnectedBound</b> . For other link states, or unassigned, this returns <code>S_FALSE</code> and an empty string.
<code>bmdDeckLinkStatusEthernetPTPGrandmasterIdentity</code>	String	For devices with Ethernet, the current negotiated PTP grandmaster clock identity. If no PTP lock then this returns <code>S_FALSE</code> and an empty string.
<code>bmdDeckLinkStatusEthernetVideoOutputAddress</code>	String	For devices with Ethernet, the video output destination address
<code>bmdDeckLinkStatusEthernetAudioOutputAddress</code>	String	For devices with Ethernet, the audio output destination address
<code>bmdDeckLinkStatusEthernetAncillaryOutputAddress</code>	String	For devices with Ethernet, the ancillary output destination address
<code>bmdDeckLinkStatusEthernetAudioInputChannelOrder</code>	String	For devices with Ethernet, the input audio SDP channel-order as per ST 2110-30.
<code>bmdDeckLinkStatusHDMIOutputActualMode</code>	Int	The actual HDMI output mode ( <b>BMDDisplayMode</b> ). HDMI output can drop down to lower modes such as when dropping from FRL to lower FRL rates or TMDS protocol when errors are encountered, this value indicates the actual mode being transmitted.
<code>bmdDeckLinkStatusHDMIOutputActualFormatFlags</code>	Int	Format flags representing the actual HDMI output ( <b>BMDFormatFlags</b> ). HDMI output can change to other formats such as when dropping from FRL to lower FRL rates or TMDS protocol when errors are encountered, this value indicates the actual format being transmitted.
<code>bmdDeckLinkStatusHDMIOutputFRLRate</code>	Int	The output FRL rate or 0 for TMDS.
<code>bmdDeckLinkStatusHDMIInputFRLRate</code>	Int	The input FRL rate or 0 for TMDS.
<code>bmdDeckLinkStatusHDMIOutputTMDSLineRate</code>	Int	The line rate of HDMI output (MHz). Valid when using TMDS protocol only.
<code>bmdDeckLinkStatusSinkSupportsDolbyVision</code>	Flag	Reports the Dolby Vision content mapping version supported by the sink.

## 3.59 Video Status Flags

**BMDDeckLinkVideoStatusFlags** enumerates status flags associated with a video signal.

- **bmdDeckLinkVideoStatusPsF**  
Progressive frames are encoded as PsF.
- **bmdDeckLinkVideoStatusDualStream3D**  
The video signal is dual stream 3D video.

## 3.60 Duplex Mode

**BMDDuplexMode** enumerates the duplex mode associated with a profile.

- **bmdDuplexFull**  
Capable of simultaneous playback and capture.
- **bmdDuplexHalf**  
Capable of playback or capture but not both simultaneously.
- **bmdDuplexSimplex**  
Capable of playback only or capture only.
- **bmdDuplexInactive**  
Device is inactive for this profile.

## 3.61 Frame Metadata ID

**BMDDeckLinkFrameMetadataID** enumerates the set of video frame metadata which may be queried from the **IDeckLinkVideoFrameMetadataExtensions** interface.

Name	Type	Description
<b>bmdDeckLinkFrameMetadataHRElectroOpticalTransferFunc</b>	Int	EOTF in range 0-7 as per CEA 861.3
<b>bmdDeckLinkFrameMetadataHDRDisplayPrimariesRedX</b>	Float	Red display primaries in range 0.0 1.0
<b>bmdDeckLinkFrameMetadataHDRDisplayPrimariesRedY</b>	Float	Red display primaries in range 0.0 1.0
<b>bmdDeckLinkFrameMetadataHDRDisplayPrimariesGreenX</b>	Float	Green display primaries in range 0.0 1.0
<b>bmdDeckLinkFrameMetadataHDRDisplayPrimariesGreenY</b>	Float	Green display primaries in range 0.0 1.0
<b>bmdDeckLinkFrameMetadataHDRDisplayPrimariesBlueX</b>	Float	Blue display primaries in range 0.0 1.0
<b>bmdDeckLinkFrameMetadataHDRDisplayPrimariesBlueY</b>	Float	Blue display primaries in range 0.0 1.0
<b>bmdDeckLinkFrameMetadataHDRWhitePointX</b>	Float	White point in range 0.0 1.0
<b>bmdDeckLinkFrameMetadataHDRWhitePointY</b>	Float	White point in range 0.0 1.0
<b>bmdDeckLinkFrameMetadataHDRMaxDisplay MasteringLuminance</b>	Float	Max display mastering luminance in range 1 cd/m2 65535 cd/m2
<b>bmdDeckLinkFrameMetadataHDRMinDisplay MasteringLuminance</b>	Float	Min display mastering luminance in range 0.0001 cd/m2 6.5535 cd/m2
<b>bmdDeckLinkFrameMetadataHDRMaximum ContentLightLevel</b>	Float	Maximum Content Light Level in range 1 cd/m2 65535 cd/m2
<b>bmdDeckLinkFrameMetadataHDRMaximumFrame AverageLightLevel</b>	Float	Maximum Frame Average Light Level in range 1 cd/m2 65535 cd/m2
<b>bmdDeckLinkFrameMetadataColorspace</b>	Int	Colorspace of video frame (see <b>BMDColorspace</b> )
<b>bmdDeckLinkFrameMetadataDolbyVision</b>	Bytes	Dolby Vision Metadata

## 3.62 DNxHR Levels

**BMDDNxHRLevel** enumerates the available DNxHR levels.

- **bmdDNxHRLevelSQ**  
DNxHR Standard Quality
- **bmdDNxHRLevelLB**  
DNxHR Low Bandwidth
- **bmdDNxHRLevelHQ**  
DNxHR High Quality (8 bit)
- **bmdDNxHRLevelHQX**  
DNxHR High Quality (12 bit)
- **bmdDNxHRLevel444**  
DNxHR 4:4:4

## 3.63 Panel Type

**BMDPanelType** enumerates the type of interchangeable panel installed

- **bmdPanelNotDetected**  
No panel detected
- **bmdPanelTeranexMiniSmartPanel**  
Teranex Mini Smart Panel detected

## 3.64 Ancillary Packet Format

**BMDAncillaryPacketFormat** enumerates the possible data formats of the ancillary packet.

- **bmdAncillaryPacketFormatUInt8**  
8-bit unsigned integer
- **bmdAncillaryPacketFormatUInt16**  
16-bit unsigned integer
- **bmdAncillaryPacketFormatYCbCr10**  
Native v210 pixel format (see **bmdFormat10BitYUV** for packing structure).

## 3.65 Colorspace

**BMDColorspace** enumerates the colorspace for a video frame.

- **bmdColorspaceRec601**  
Rec. 601 colorspace
- **bmdColorspaceRec709**  
Rec. 709 colorspace
- **bmdColorspaceRec2020**  
Rec. 2020 colorspace
- **bmdColorspaceDolbyVisionNative**  
Colorspace defined by Dolby Vision version and metadata. Not supported for output unless used as **bmdDeckLinkConfigVideoOutputConversionColorspaceDestination** with 12-bit RGB frames
- **bmdColorspaceP3D65**  
P3 colorspace with D65 white point. Not natively supported for output. Frames can only be provided when this is set as **bmdDeckLinkConfigVideoOutputConversionColorspaceSource** and converted to **bmdDeckLinkConfigVideoOutputConversionColorspaceDestination**.
- **bmdColorspaceUnknown**  
Primary use is for disabling **bmdDeckLinkConfigVideoOutputConversionColorspaceDestination**



## 3.66 HDMI Input EDID ID

**BMDDeckLinkHDMIInputEDIDID** enumerates the set of EDID items for a DeckLink HDMI input (see the **IDeckLinkHDMIInputEDID** interface for details).

Name	Type	Description
<b>bmdDeckLinkHDMIInputEDIDDynamicRange</b>	Int	The dynamic range standards supported by the DeckLink HDMI input (see <b>BMDDynamicRange</b> for more details)

## 3.67 Dynamic Range

**BMDDynamicRange** enumerates the possible dynamic range standards.

- **bmdDynamicRangeSDR**  
Standard Dynamic Range
- **bmdDynamicRangeHDRStaticPQ**  
High Dynamic Range PQ (SMPTE ST 2084)
- **bmdDynamicRangeHDRStaticHLG**  
High Dynamic Range HLG (ITU-R BT.2100-0)

## 3.68 Supported Video Mode Flags

**BMDSupportedVideoModeFlags** enumerates the possible video mode flags when checking support with **IDeckLinkInput::DoesSupportVideoMode**, **IDeckLinkOutput::DoesSupportVideoMode** and **IDeckLinkEncoderInput::DoesSupportVideoMode** methods.

- **bmdSupportedVideoModeDefault**  
Check whether video mode is supported by device
- **bmdSupportedVideoModeKeying**  
Check whether keying is supported with video mode
- **bmdSupportedVideoModeDualStream3D**  
Check whether dual-stream 3D is supported with video mode
- **bmdSupportedVideoModeSDISingleLink**  
Check whether video mode is supported with single-link SDI connection
- **bmdSupportedVideoModeSDIDualLink**  
Check whether video mode is supported with dual-link SDI connection
- **bmdSupportedVideoModeSDIQuadLink**  
Check whether video mode is supported with quad-link SDI connection
- **bmdSupportedVideoModeInAnyProfile**  
Check whether video mode is supported with any device profile (by default only the current profile is checked)
- **bmdSupportedVideoModePsF**  
Check whether device supports PsF interpretation of video mode (refer also to **bmdDeckLinkConfigOutput1080pAsPsF** or **bmdDeckLinkConfigCapture1080pAsPsF**)
- **bmdSupportedVideoModeDolbyVision**  
Check whether video mode is supported with Dolby Vision

## 3.69 Profile Identifier

**BMDProfileID** enumerates the possible profiles for a device.

- **bmdProfileOneSubDeviceFullDuplex**  
Device with a single sub-device in full-duplex mode
- **bmdProfileOneSubDeviceHalfDuplex**  
Device with a single sub-device in half-duplex mode
- **bmdProfileTwoSubDevicesFullDuplex**  
Device with two sub-devices in full-duplex mode
- **bmdProfileTwoSubDevicesHalfDuplex**  
Device with two sub-devices in half-duplex mode
- **bmdProfileFourSubDevicesHalfDuplex**  
Device with four sub-devices in half-duplex mode

## 3.70 HDMI Timecode Packing

**BMDHDMITimecodePacking** enumerates the packing form of timecode for HDMI. IEEE OUI Vendor IDs can be found at <http://standards-oui.ieee.org/oui.txt>

- **bmdHDMITimecodePackingIEEEOUI000085**
- **bmdHDMITimecodePackingIEEEOUI080046**
- **bmdHDMITimecodePackingIEEEOUI5CF9F0**

## 3.71 Internal Keying Ancillary Data Source

**BMDInternalKeyingAncillaryDataSource** enumerates the source for VANC and timecode data when performing internal keying.

- **bmdInternalKeyingUsesAncillaryDataFromInputSignal**  
Output signal sources VANC and timecode from input signal
- **bmdInternalKeyingUsesAncillaryDataFromKeyFrame**  
Output signal sources VANC and timecode from key frame

## 3.72 Ethernet Link State

**BMEthernetLinkState** enumerates the state of the Ethernet link.

- **bmdEthernetLinkStateDisconnected**  
The physical Ethernet link is disconnected
- **bmdEthernetLinkStateConnectedUnbound**  
Ethernet is connected but not bound to an IP configuration
- **bmdEthernetLinkStateConnectedBound**  
Ethernet is connected and bound to an IP configuration

## 3.73 Mezzanine Type

**BMDMezzanineType** enumerates the possible mezzanine boards which can be optionally attached to some DeckLink devices.

**NOTE** Applications should check the available interfaces using **BMDDeckLinkVideoOutputConnections** and **BMDDeckLinkVideoInputConnections** for a particular subdevice rather than expecting interfaces here to be available on any particular subdevice.

- **bmdMezzanineTypeNone**  
No mezzanine board
- **bmdMezzanineTypeHDMI14OpticalSDI**  
Mezzanine board with HDMI 1.4 and Optical SDI
- **bmdMezzanineTypeQuadSDI**  
Mezzanine board with four SDI connectors
- **bmdMezzanineTypeHDMI20OpticalSDI**  
Mezzanine board with HDMI 2.0 and Optical SDI
- **bmdMezzanineTypeHDMI21RS422**  
Mezzanine boards with HDMI 2.1 and RS422

## 3.74 Video Format Flags

**BMDFormatFlags** enumerates the possible flags for a pixel format.

- **bmdFormatRGB444**  
The video is RGB 4:4:4 representation.
- **bmdFormatYUV444**  
The video is YUV 4:4:4 representation.
- **bmdFormatYUV422**  
The video is YUV 4:2:2 representation.
- **bmdFormatYUV420**  
The video is YUV 4:2:0 representation.
- **bmdFormat8BitDepth**  
The video is 8-bit color depth.
- **bmdFormat10BitDepth**  
The video is 10-bit color depth.
- **bmdFormat12BitDepth**  
The video is 12-bit color depth.

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