USB Monitor Control Class Specification

Revision 1.0

January 5, 1998

Scope of this Revision

This revision is intended for implementation.

Revision History

Rev	Date	Filename	Comments
1.0	January 5, 1998	USBMON10.DOC	Initial release for implementation

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1. Introduction

1.1 Purpose

This document defines how a monitor with a USB Monitor Control interface interacts with a USB-enabled host system.

1.2 Scope

This document is intended to provide enough information to allow developers of monitors with USB Monitor Control interfaces to build compliant devices. This document will allow developers of USB-enabled operating environments to provide standard support for monitor control through a single Monitor Class device driver.

1.3 Related Documents

ACCESS.bus Industry Group, *ACCESS.busÔ Specifications*, Section 7, Monitor Device Protocol Specifications, Version 3.0 March 1995. ACCESS.bus Industry Group

Compaq, Digital Equipment Corporation, IBM PC Company, Intel, Microsoft, NEC, and Northern Telecom, *Universal Serial Bus Specification*, Version 1.0 - January 19, 1996. USB Implementers Forum (www.usb.org)

Universal Serial Bus Implementers Forum, *Device Class Definition for Human Interface Devices (HID)*, Firmware Specification, 1.0 - Final, June 21, 1997. (www.usb.org)

Video Electronics Standards Association, *VESA Display Information Format VDIF Standard*, Version Number 1.0, August 23, 1993, VESA (www.vesa.org)

Video Electronics Standards Association, *Extended Display Identification Data (EDIDÔ) Standard*, Version 2, Revision O, April 9, 1996, VESA (www.vesa.org)

Video Electronics Standards Association, *VESA Monitor Control Command Set*, (Proposal), VESA (www.vesa.org)

1.4 Terms and Abbreviations

ACCESS.bus	Serial interface bus that runs at a slower speed than USB.
DPMS	Acronym for Display Power Management Services.
EDID	Acronym for Extended Display Information Data. Describes monitor characteristics to host system.
HID	Acronym for Human Interface Device.
VCP	Acronym for Virtual Control Panel.
VDIF	Acronym for VESA Display Information Format. Describes monitor characteristics to host system.
VESA	Acronym for Video Electronics Standards Association.

2. Management Overview

The Universal Serial Bus Monitor Control Class focuses on the management and control of monitors. USB is not used to transfer the information actually displayed on the monitor. USB's available bandwidth is not sufficient for this task.

This specification defines a protocol for communications between monitor devices and host systems using USB. This protocol manages typical user controls such as brightness, contrast, size and position, as well as internal settings used to adjust the performance of the monitor for different video adapter modes. In addition, this specification describes how monitor power management is performed through USB.

There are a number of parameters that describe a monitor's characteristics to a host system. This information may be used to constrain the supported modes of a video adapter to those that are compatible with the monitor. When the host system inquires about these characteristics, the monitor returns the information requested. This allows the host environment to determine the monitor type and characteristics without end-user intervention.

The protocol of the USB Monitor Control Class has been designed within the constraints imposed by the *USB Device Class Definition for Human Interface Devices (HID) Specification*. A monitor is a HID device.

This allows host support for Monitor Class devices to be simpler as they may rely on a HID Class driver for direct access to their device; the devices need not be concerned with the interaction between the HID Class driver and lower-system software layers.

This specification builds on previous industry efforts by using reporting formats standardized by the Video Electronics Standard Association (VESA) and virtual control panel op-codes standardized by the ACCESS.bus Industry Group.

3. Background

Monitors typically provide a number of controls to allow end-users to adjust monitor performance to an individual’s preference. When a video adapter changes modes, a monitor may also require adjustment of those controls to compensate for changes in the characteristics of the video signal.

The Video Electronics Standard Association (VESA) describes a method of reporting a monitor’s timing information to allow video adapters to be optimally programmed. Two standards relating to monitor timing have been released. The VESA Display Information Format (VDIF) includes descriptive information about the monitor, operational limits, pre-adjusted timings and, optionally, gamma information from a calibration device.

VDIF permits one or more pre-adjusted timings for each operational limit specified and the gamma table, if present, can have a large number of entries. This means the amount of information returned varies in length and can actually require several Kbytes of information to be returned by the monitor.

More recently, VESA published another standard reporting format for describing the capabilities of a monitor: the Extended Display Identification Data (EDID™) Standard. This format is more compact.

Having a standard format for the information reported is important, but equally important is how a host system obtains this information. Neither the VDIF or EDID specifications specify how this is to be achieved. Also, the specifications do not describe how the information, if and when delivered, will be used.

VESA did develop two methods of host-to-monitor communications, known as DDC1/2B and DDC1/2AB. The first is a simple application of the Philips I^2C protocol for reading VDIF information from the monitor. The second is a superset of the first, and supports the reading of VDIF information and the control of the monitor from a host system. The ACCESS.bus Industry Group, as a part of the *ACCESS.bus Specifications*, published a section on Monitor Device Protocol Specifications for monitors that are compliant with VESA DDC1/2AB.

In some systems, VDIF or EDID data may be returned by the video BIOS. This requires a display adapter capable of communicating with the attached monitor to obtain the necessary information and operating systems that attempt to use the information. This specification provides another mechanism for obtaining this information from the monitor across USB. This is in addition to using USB for monitor control and status. Providing BIOS level support for returning VDIF and EDID information is not necessary if you adhere to this specification.

4. Monitor Class Overview

The *USB Monitor Control Specification* defines the connection between the host system and the monitor using two pipes: the device's default pipe and an interrupt pipe assigned to an interface with HID class coding. An example of an implementation of the overall monitor control architecture is illustrated in Figure 1.

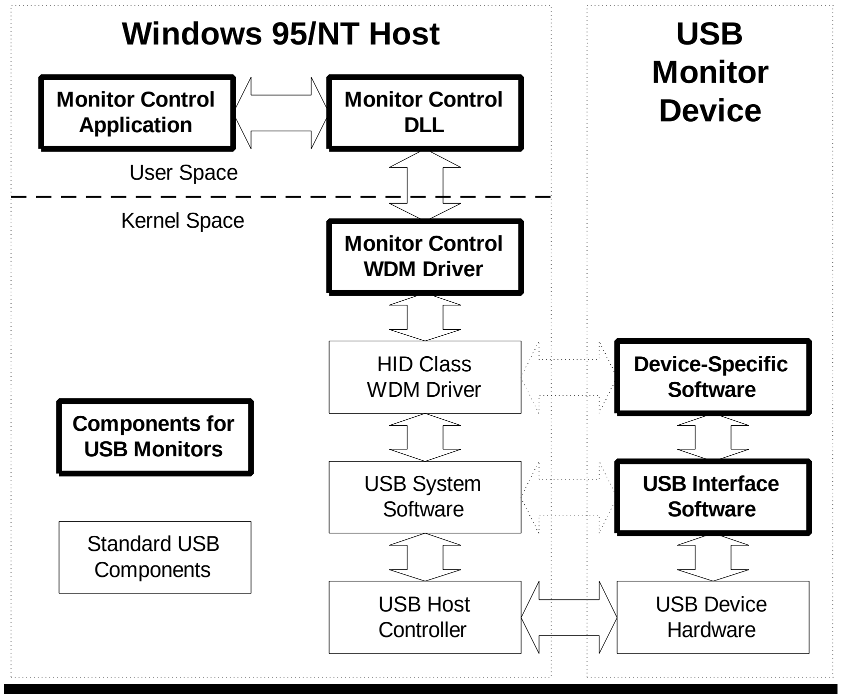

Figure 1 - Example of Monitor Control Architecture

Monitor Control is performed by using the services available to HID class devices. Within the HID class, all class-specific interaction with the device is carried out through data structures called reports. The HID defines three types of reports: Feature, Input, and Output.

While not mandated by specification, Feature reports are typically used to transfer what many operating systems called IOCTL, or I/O control, and status information. Other environments may refer to this type of information as "out-of-band" signaling.

Devices produce data and consume data provided by the host. Devices pass information to the host, typically as asynchronous notifications, using Input reports. The host uses Output reports to pass data to the device. These reports roughly correspond to what most systems call Read and Write data.

Building on this foundation, the USB Monitor Control Class uses Feature, Input, and Output reports to transfer data with HID Class Get_Report and Set_Report requests.

As part of the initialization of a monitor Control Panel application, the virtual controls the monitor supports must be determined to update an on-screen representation of the monitor controls. This information is described in Section 6.2.2 "Report Descriptor" in the *USB Device Class Definition for Human Interface Devices (HID) Specification.* The presence of a particular virtual control in the HID Report descriptor indicates the control is supported by the monitor. The HID Report description language also describes the maximum legal value for the virtual control.

When a video adapter changes the video mode, monitors often require different settings for virtual controls to deal with differences in the supplied video signal. Monitors typically provide preset values for a number of recognized video modes. When a particular mode is recognized by the monitor, it automatically changes the virtual controls to preset values associated with that mode. The end-user may then adjust the individual virtual controls to tune the performance of the monitor to an individual's preference.

Some monitors allow end-user customized settings to replace the pre-set values for the selected video mode. When the monitor receives a request from the host to write the Settings control, the monitor saves the current settings of all virtual controls as the values to be used whenever the monitor senses the current video mode.

Monitor control applications should note that not all video modes have a unique set of pre-set values for a monitor's virtual controls. Writing to the Settings control may result in a change to the values used for more than one video mode. At this time, the *USB Monitor Control Class Specification* does not provide support for determining which set of pre-set values is currently selected. Adjustments may only be made to the currently selected set of pre-set values for virtual controls.

When the monitor receives a request from the host to write ENUM_1 to the Settings virtual control, the monitor saves the current settings of all virtual controls as the values to be used whenever the monitor senses the current video mode.

Some monitors may allow factory default settings for the currently selected set of pre-sets to be restored. If so, the monitor restores factory defaults when a write of ENUM_2 is sent to the Settings virtual control. For compatibility, if this capability is not supported, the monitor simply responds as if it completed the request successfully.

5. Monitor Class Reference

This section is intended to be used as a reference for Monitor Descriptors, Requests, and Reports.

5.1 Monitor Descriptors

USB monitors are HID class devices. Therefore, they use the same set of descriptors as any HID device. These include all of the standard descriptors: device, configuration, interface, endpoint, and string descriptors. They also use a HID Descriptor associated with the interface containing the interrupt endpoint and a Report Descriptor as defined in the *Device Class Definition for Human Interface Devices (HID) Specification*.

5.2 Monitor Requests

USB monitors support standard USB requests, as appropriate for the monitor's implementation. USB monitors also utilize the HID class-specific requests Get_Report and Set_Report. USB monitors do not use any of the other HID class-specific requests, for example: Get_Idle, Set_Idle, Get_Protocol, and Set_Protocol.

HID class drivers do not provide any method of providing further extensions to HID class-specific requests. Because the USB monitor driver is intended to use a HID class driver for communications with the USB monitor device, the *USB Monitor Control Class Specification* does not have any class-specific requests. Defining such requests would have required that a monitor driver bypass the HID class driver and interact directly with the USB system software on the host. Such behavior would violate the spirit of a layered software architecture.

5.3 Monitor Reports

This section describes the reports supported by USB Monitor Control Class devices. All reports follow the definition of HID class reports of the same type. There are three types of reports:

- Feature
- Input
- Output

All types of reports may be specifically requested through the device's default pipe using a standard HID class request, Get_Report. Feature and Output reports may also be sent to the device using the standard HID class request, Set_Report. Input reports may also be received via the interrupt pipe for asynchronously reporting purposes.

Feature reports are used to get or set monitor device characteristics. Some Feature reports may only be appropriate for device-to-host transfers or get operations. Other Feature reports are used to change the configuration of the monitor.

Output reports are used to send commands to a monitor using controls that are write only (for example, Degauss). Input and Feature reports are used to report the current setting of a particular aspect of a configuration of a monitor. Controls defined in Feature reports that may be modified by external events should also be defined in an Input report. As previously noted, Input reports may be requested via the default pipe or sent to the host by the device when that particular aspect changes.

Within each report type, report IDs are unique. Report IDs may be re-used between report types. For example, there is only one Input report that uses ID 0. There may also be a single Feature and a single Output report that also uses ID 0. Report IDs are arbitrary and implementation-dependent.

5.3.1 Individual Monitor Reports

The controls that are contained in a particular report are implementation-dependent. Host-based software, typically a HID class device driver, is responsible for determining which report contains values for a particular monitor control.

A monitor manufacturer decides how many individual reports their monitor uses. It is possible to implement a monitor with one Feature report, one Input report, and one Output report. However, it is typically more efficient to provide multiple reports to partition the information exchanged between the host and the monitor into smaller more cohesive units. For more information, see the *USB Device Class Definition for Human Interface Devices (HID) Specification.*

5.4 Power Management

USB Monitors manage power drawn from the bus as defined by the USB Specification (suspend/resume). USB Monitors may implement USB Interface Power Management as described in the USB Common Class Specification. USB Monitors implementing USB Interface Power Management control manage power for the entire display device.

If a USB Monitor has multiple control channels for power management (i.e. DPMS and USB Interface Power Management), the monitor should adjust power consumption to the lowest power consuming state requested. For example, if USB Interface Power Management has selected the D1 power state and DPMS has selected the D2 power state, the monitor should be placed in the D2 power state. (For power state definitions, see the USB Common Class Specification).

5.5 Top-Level Collection

In order to identify a HID class device as a monitor, the device's HID Report Descriptor must contain a top-level collection with a usage of Monitor Control from the USB Monitor Usage Page. For more information, see the *USB Device Class Definition for Human Interface Devices (HID) Specification.*

6. Appendices - Usage Pages

USB Monitors use four usage pages assigned by the HID Class Working Group for usage IDs. The pages are:

Page	Description
0x80	USB Monitor
0x81	USB Enumerated Values
0x82	VESA Virtual Controls
0x83	Reserved

6.1.1 USB Monitor Usage Page

The USB Monitor Usage page contains USB Monitor usage values that are unique to USB connectivity.

Value	Virtual Control	Description
00h	Reserved	Reserved for future use.
01h	Monitor Control	USB Monitor Control HID Device.
02h	EDID Information	
03h	VDIF Information	
04h	VESA Version	The version of the VESA Monitor Command Set specification used by this device. If this field is set to zero (0), the monitor uses the virtual control usage values defined in this document. If this field is non-zero, it is a Binary-Coded Decimal (BCD) value representing the version number of the VESA Monitor Command Set specification used to define the monitor's virtual control and command usage values.

6.2 Monitor Enumerated Values [Usage Page]

A number of monitor controls use values that are or may be non-contiguous. For example, by VESA definition, an Input Source Selector control has values that range from zero to twenty-eight.

However, many monitors may not implement all of these inputs. If a monitor only provided DB-15HD/VGA1 and S-Video1 inputs, only the enumerated values one and sixteen would be valid.

Due to the nature of the HID class report description language, a defined usage value would typically have to be created for each value that might be returned. This would require a lot of new usage values to be defined; it would also require that either VESA change the mapping between constant (usage value) and meaning, or a separate usage page would have to be assigned to the values returned by every control that could have non-contiguous values.

To simplify the handling of non-contiguous controls, USB monitors use the Monitor Enumerated Values [Usage Page] for values that would map between zero and a number of non-contiguous values. Each potentially non-contiguous control is defined as an array with a set of values from the Monitor Enumerated Values [Usage Page]. For an Input Source Select control, ENUM_1 represents DB-15HD/VGA1 and ENUM_16 represents S-Video1.

It should be noted that the HID protocol actually communicates the index into the array of legal values when indicating the value of an array control. System software on the host for HID devices typically maps the index value back to a usage value. Continuing with our Input Source Select control that supported DB-15HD/VGA1 and S-Video1, the HID Report Descriptor would define an Input Source Select control as an array and the array could have one of two values: ENUM_1 or ENUM_16. The HID Report descriptor would indicate the Logical Minimum for the control is one and the Logical Maximum is two. To indicate the input source is DB-15HD/VGA1, the control would return one (the index of the first value in the array). To indicate the input source is S-Video1, the control would return two (the index of the second value in the array).

Value	Virtual Control	Description
00h	ENUM_0	No value selected, ignore
01h	ENUM_1	First enumerated value.
02h	ENUM_2	Second enumerated value.
03h	ENUM_3	Third enumerated value.
…	ENUM_x	x enumerated value.

Enumerated values use constants that are equal to the enumeration value they represent. The HID protocol uses the value zero (0) to indicate that no value is currently selected for an array field and this maps to the use of ENUM_0 for all non contiguous controls.

6.3 VESA Virtual Control Usage Page

Virtual Control Panel (VCP) op-codes values are assigned by VESA. At the time this specification was written, VESA was to issue an updated set of op-codes as defined by the *VESA Monitor Command Set Specification*. These values are similar to those used in the *ACCESS.bus Monitor Device Protocol Specifications*.

The USB Monitor Usage page contains a control called VESA Version. This static control identifies the revision of the *VESA Monitor Control Command Set Specification* used by the monitor for specifying usage values for monitor controls. Until the final VESA specification is released, the VESA Version shall be set to zero (0), and the following VESA Virtual Control Usages shall be used by USB Monitors. These controls are a subset of previous VESA virtual control definitions. It is expected that the VESA document will maintain the usage values of these controls and extend this list to include additional controls. All values not defined in the following tables are reserved for future use:

Contiguous Controls

Value	Virtual Control	Description
10h	Brightness	The black level luminance of the display.
12h	Contrast	The ratio between the maximum and minimum luminance values.
16h	Red Video Gain	The level of maximum luminance of red pixels. Setting sensitivity of the RED luminance output.
18h	Green Video Gain	The level of maximum luminance of green pixels.
1Ah	Blue Video Gain	The level of maximum luminance of blue pixels.
1Ch	Focus	Adjusts the apparent spot size.
20h	Horizontal Position	Moves the image toward the right side of the display.
22h	Horizontal Size	The distance between the left and right sides of the image.
24h	Horizontal Pincushion	Increasing (decreasing) this value causes the right and left sides of the image to become more (less) convex.
26h	Horizontal Pincushion Balance	Moves the center section of the image toward the right or left side of the display.
28h	Horizontal Misconvergence	Increasing (decreasing) this value will shift the red pixels to the right (left) across the image and the blue pixels left (right) across the image with respect to the green pixels.
2Ah	Horizontal Linearity	Shifts the density of pixels from the left and right ends to the center of the image.
2Ch	Horizontal Linearity Balance	Increasing (decreasing) this value shifts the density of pixels from the left (right) side to the right (left) side of the image.
30h	Vertical Position	Increasing (decreasing) this value moves the image toward the top (bottom) of the display.
32h	Vertical Size	The distance between the top and bottom of the image.
34h	Vertical Pincushion	Increasing (decreasing) this value causes the top and bottom sides of the image to become more (less) convex.

Value	Virtual Control	Description
36h	Vertical Pincushion Balance	Increasing (decreasing) this value moves the center section of the image toward the top (bottom) of the display.
38h	Vertical Misconvergence	Increasing (decreasing) this value shifts the red pixels up (down) across the image and the blue pixels down (up) across the image with respect to the green pixels.
3Ah	Vertical Linearity	Increasing (decreasing) this value shifts the density of scan lines from the ends (center) to the center (ends) of the image.
3Ch	Vertical Linearity Balance	Increasing (decreasing) this value shifts the density of scan lines from the top (bottom) end to the bottom (top) end of the image.
40h	Parallelogram Distortion (Key Balance)	Increasing (decreasing) this value shifts the top section of the image to the right (left) with respect to the bottom section of the image.
42h	Trapezoidal Distortion (Key)	The ratio between the horizontal size at the top of the image relative to the horizontal size at the bottom of the image.
44h	Tilt (Rotation)	Increasing (decreasing) this value rotates the image (counter) clockwise about the center point of the image.
46h	Top Corner Distortion Control	The distance between the left and right side at the top end of the image.
48h	Top Corner Distortion Balance	Increasing (decreasing) this value moves the top end of the image to the right (left).
4Ah	Bottom Corner Distortion Control	The distance between the left and right side at the bottom end of the image.
4Ch	Bottom Corner Distortion Balance	Increasing (decreasing) this value moves the bottom end of the image to the right (value).
56h	Horizontal Moiré	Adjusting this value controls the horizontal picture moiré cancellation.
58h	Vertical Moiré	Adjusting this value controls the vertical picture moiré cancellation.
6Ch	Red Video Black Level	The level of minimum luminance of red pixels. DC offset of the lowest level RED.
6Eh	Green Video Black Level	The level of minimum luminance of green pixels.
70h	Blue Video Black Level	The level of minimum luminance of blue pixels.

Non-contiguous Controls (Read/Write)

Value	Virtual Control	Description
5Eh	Input Level Select	Changing this value chooses a different video input voltage for the display. Format is *reference white above blank*, *level of sync. below blank*: ENUM_0 None selected ENUM_1 0.700, - 0.300 (1.00 Vpp) ENUM_2 0.714, - 0.286 (1.00 Vpp) ENUM_3 1.000, - 0.400 (1.40 Vpp) ENUM_4 0.700, - 0.000 (0.70 Vpp)
60h	Input Source Select	Changing this value selects a different video input source: ENUM_0 None selected ENUM_1 DB-15HD/VGA1 ENUM_2 DB-15HD/VGA2 ENUM_3 DB-15HD/VGA3 ENUM_4 BNC/RGB1 ENUM_5 BNC/RGB2 ENUM_6 BNC/RGB3 ENUM_7 EVC1 ENUM_8 EVC2 ENUM_9 EVC3 ENUM_10 MAC1 ENUM_11 MAC2 ENUM_12 MAC3 ENUM_13 RCA/ Composite Video1 ENUM_14 RCA/ Composite Video2 ENUM_15 RCA/ Composite Video3 ENUM_16 S-Video1 ENUM_17 S-Video2 ENUM_18 S-Video3 ENUM_19 SCART-Composite1 ENUM_20 SCART-Composite2 ENUM_21 SCART-RGB ENUM_22 SCART-S-video ENUM_23 Tuner1 ENUM_24 Tuner2 ENUM_25 Tuner3 ENUM_26 YUV1 ENUM_27 YUV2 ENUM_28 YUV3
CAh	On Screen Display	ENUM_0 None selected ENUM_1 OSD is disabled to appear ENUM_2 OSD is enabled to appear

Value	Virtual Control	Description
D4h	StereoMode	Changing this value selects the video mode with respect to 2D or 3D: ENUM_0 None selected ENUM_1 Mono Mode ENUM_2 Enable Field-Sequential Right Eye First ENUM_3 Enable Field-Sequential Left Eye First ENUM_4 Enable 2-Way Interleaved Right Eye First ENUM_5 Enable 2-Way Interleaved Left Eye First ENUM_6 Enable 4-Way Interleaved, Display Stereo Buffer 0 (even scan lines) ENUM_7 Enable 4-Way Interleaved, Display Stereo Buffer 1 (odd scan lines) ENUM_8 Enable Side-by-Side Interleaved

Non-contiguous Controls (Read-only)

A2h	Auto Size Center	ENUM_0 None selected ENUM_1 Disabled ENUM_2 Enabled
A4h	Polarity Horizontal Synchronization	ENUM_0 None selected ENUM_1 Negative ENUM_2 Positive
A6h	Polarity Vertical Synchronization	ENUM_0 None selected ENUM_1 Negative ENUM_2 Positive
A8h	Synchronization Type	ENUM_0 None selected ENUM_1 Separate ENUM_2 Digital Composite ENUM_3 Composite on Green
AAh	Screen Orientation	ENUM_0 None selected ENUM_1 Landscape ENUM_2 Portrait
ACh	Horizontal Frequency	Horizontal frequency in Hertz
AEh	Vertical Frequency	Vertical frequency in 0.01 Hertz

Non-contiguous Controls (Write-only)

01h	Degauss	Writing a non-zero value to this control causes the monitor to start a self-timed degauss cycle. The monitor automatically completes the cycle without further action by the host. If a zero value is written to this control, the monitor ignores the write and does not start a degauss cycle. The monitor does not alter any of its other control or status values in response to any write to this control.
B0h	Settings	This control saves or restores the settings of a monitor's virtual controls for the current video mode. The controls that are affected are implementation specific. ENUM_0 None selected (ignored by monitor) ENUM_1 Store current settings ENUM_2 Restore factory default settings ENUM_3 Restore user-saved settings

Note Some controls previously defined by VESA were not included in the previous table because it was unclear whether future VESA specifications would continue to use them (for example, color temperature). Should VESA continue to use such controls or define new controls, that organization has the ability to update the set of defined controls and commands independent of USB by simply including them in the *VESA Monitor Control Command Set Specification*.

6.5 Example Monitor Report Descriptions

This appendix provides examples of how the various Monitor reports might be described. These are examples only. Actual implementation will vary in a number of ways from these examples including (but not limited to) the order in which data items are defined and the legal ranges for various values.

The HID class supports a single report descriptor. All of the reports described below are contained in a single HID Report Descriptor.

Please note, the actual values used for item tags are defined by the *USB Device Class Definition for Human Interface Devices (HID) Specification*. This example only identifies values that are not item tags.

```
USAGE_PAGE (Monitor)                          05 80
USAGE (Monitor Control)                       09 01
COLLECTION (Application)                      A1 01
  REPORT_ID (1)                               85 01
  LOGICAL_MINIMUM (0)                         15 00
  LOGICAL_MAXIMUM (255)                       26 FF 00
  REPORT_SIZE (8)                             75 08
  REPORT_COUNT (128)                          95 80
  USAGE (EDID Information)                    09 02
  FEATURE (Data,Var,Abs,Buf)                  B2 02 01
  REPORT_ID (2)                               85 02
  REPORT_COUNT (243)                          95 F3
  USAGE (VDIF Information)                    09 03
  FEATURE (Data,Var,Abs,Buf)                  B2 02 01
  REPORT_ID (3)                               85 03
  USAGE_PAGE (VESA Virtual Controls)          05 82
  REPORT_SIZE (16)                            75 10
  REPORT_COUNT (1)                            95 01
  LOGICAL_MAXIMUM (200)                       26 C8 00
  USAGE (Brightness)                          09 10
  FEATURE (Data,Var,Abs)                      B1 02
  REPORT_ID (4)                               85 04
  LOGICAL_MAXIMUM (100)                       25 64
  USAGE (Contrast)                            09 12
  FEATURE (Data,Var,Abs)                      B1 02
  REPORT_ID (5)                               85 05
  REPORT_COUNT (6)                            95 06
  LOGICAL_MAXIMUM (255)                       26 FF 00
```

```
  USAGE (Video Gain Red)                      09 16
  USAGE (Video Gain Green)                    09 18
  USAGE (Video Gain Blue)                     09 1A
  USAGE (Video Black Level Red)               09 6C
  USAGE (Video Black Level Green)             09 6E
  USAGE (Video Black Level Blue)              09 70
  FEATURE (Data,Var,Abs)                      B1 02
  REPORT_ID (6)                               85 06
  LOGICAL_MAXIMUM (127)                       25 7F
  USAGE (Horizontal Position )                09 20
  USAGE (Horizontal Size )                    09 22
  USAGE (Vertical Position )                  09 30
  USAGE (Vertical Size )                      09 32
  USAGE (Trapezoidal Distortion)              09 42
  USAGE (Tilt)                                09 44
  FEATURE (Data,Var,Abs)                      B1 02
  REPORT_SIZE (2)                             75 02
  REPORT_COUNT (1)                            95 01
  LOGICAL_MINIMUM (1)                         15 01
  LOGICAL_MAXIMUM (3)                         25 03
  USAGE (Input Source Select)                 09 60
  COLLECTION (Logical)                        A1 02
    USAGE_PAGE (Monitor Enumerated Values)    05 81
    USAGE (ENUM 1)                            09 01
    USAGE (ENUM 4)                            09 04
    USAGE (ENUM 6)                            09 06
    FEATURE (Data,Ary,Abs)                    B1 00
  END_COLLECTION                              C0
  REPORT_SIZE (6)                             75 06
  FEATURE (Cnst,Var,Abs)                      B1 03
END_COLLECTION                                C0
```