Universal Serial Bus HID Usage Tables

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1 Introduction

Usages are part of the HID **Report** descriptor and supply an application developer with information about what a control is actually measuring or reporting. In addition, a **Usage** tag can be used to indicate the vendor's suggested use for a specific control or group of controls. While most of the items within a **Report** descriptor describe the format of the data—for example, three 8-bit fields—the **Usage** tags define what should be done with the data—for example, *x*, *y*, and *z* input. This feature allows a vendor to ensure that the user sees consistent function assignments to controls across applications. It is also the key feature within HID **Report** descriptors that allows system or application software to know the meaning of data items, or collections of data items, so the data items can be correctly interpreted or routed to the system or application software that consumes them.

1.1 Scope

This document is the most current and complete list of currently defined usages. With the exception of the Keyboard/Keypad Page (0x07), this document is a superset of the usages defined in the *USB Device Class Definition for Human Interface Devices (HID)*, also called the HID Specification. Keyboard/Keypad Page usages are listed in the HID Specification, and are not repeated in this document due to length. Usages for other pages listed in the HID Specification (Generic Desktop, LED, and Button pages) are repeated in this document with additional information. In case of a discrepancy, this document takes precedence over the HID Specification for those usages.

Usage definitions for Monitor, Power, Bar Code Scanner, and Point of Sale devices are in process as of this publication date and are not covered in this document. For details about those usages, see the device class specifications for those devices.

1.2 Purpose

This document defines constants that can be interpreted by an application to identify the purpose and meaning of a data field in a HID report.

Usages are also used to define the meaning of groups of related data items. This is accomplished by the hierarchical assignment of usage information to collections. Usages identify the purpose of a collection and the items it contains. Each **Input**, **Output**, **Feature**, and/or **Collection** data item within a **Collection** item can be assigned a purpose with its own usage item. Usages assigned to a collection apply to the items within the collection.

In some cases a usage applied to a collection can redefine the meaning of the usages it contains. An example of this is the **Usage Selected Indicator** on the LED page.

Usages are also used to specify the meaning of each element within an **Array** data item.

1.3 Related Documents

Universal Serial Bus Specification, 1.0 Version (also referred to as the USB Specification)

USB PC Legacy Compatibility Specification

Universal Serial Bus Device Class Definition for Human Interface Devices (HID) (also referred to as the HID Specification)

USB Device Class Definition for Monitor Devices

USB Device Class Definition for Power Devices

USB Device Class Definition for Bar Code Scanners

USB Device Class Definition for Point of Sale Devices

USB Device Class Definition for Physical Interface Devices

Unicode Standard, version 1.1

International Character Encoding Standard, ISO/IEC10646-1 UCS-2

Open Arcade Architecture Device Data Format Specification

1.4 Terms and Abbreviations

Application — A software program that consumes the data generated by the HID device **Input** reports, or that controls the HID device through **Feature** or **Output** reports. Applications can be games or other programs used by end users or system software components.

Array field — The bit field created by an **Input**, **Output**, or **Feature** main item which is declared as an **Array**. An array field contains the index of a usage, not the usage value.

Control — A control is used to operate or regulate a particular aspect of a device. In this document a control refers broadly to the physical entity on the device that the usage identifies.

Field — The **Input**, **Output**, and **Feature** main items create a bit field in a report. The **Report Size** determines the field's width and the associated usage determines the field's purpose. The offset of a field in a report is determined by the fields that are declared before it.

Pad — If a field is marked as a constant and there is no usage associated with it, the field will be treated as pad bits and ignored by host software.

Note: Fields created by **Main** items that do not have usages attached to them might not be accessible by applications. Whether such access is possible depends on the implementation of the HID device driver.

Usage — Defines the purpose or meaning of an item.

2 Management Overview

This document provides lists of usages and their descriptions that significantly extend the list of usages provided in the HID Specification. A HID usage communicates the intended function or meaning of a particular control. Usages provide a description of the data items in a HID device's **Input**, **Output**, and **Feature** reports. The existence of a defined usage does not guarantee that system or application software will recognize or utilize the data item. Although usages can be very powerful, there is a potential for misuse. The detail provided in this document will help minimize the misuse or misinterpretation of usages when they are applied by a device developer.

Usages have been organized into pages of related controls. Each usage has a usage ID, usage name and a detailed description. The usage names are mnemonics, not definitions. To avoid misleading interpretations based on the usage name, it is very important that a developer review a usage's description in detail to ensure that it properly identifies the purpose of the control or device that the usage is attached to.

In theory, a usage can be attached to any type of HID control, variable, array, collection, and so forth. In reality, usages only make sense when they are attached to particular controls and used in certain ways. A relatively small set of usage types have been defined to help the application software developer better understand what to expect when a particular usage is found. Each usage has a usage type associated with it. The usage type identifies the item types, flag settings and bit fields organizations that are found with a particular usage.

Usages can also identify functional devices as a whole, thus providing an easy method for an application to identify devices that provide functions of interest. Such usages are found attached to application collections that are wrapped around all the items that describe a particular functional device, or a particular function in a complex device. Generally an application will query the HID driver for all application collection usages that it knows pertain to it. For example, a gaming device driver might look for **Joystick** and **Game Pad** usages, while a system mouse driver might look for **Mouse**, **Digitizer Tablet** and **Touch Screen** usages.

As a general rule, the usages selected by a device developer should be specific enough to dissuade inappropriate use by applications while remaining general enough to allow applications to take advantage of device features if they can. If uncertain, favor the more general usage to encourage broader application support for your device. An alternative is to use delimiters to define multiple usages associated with a single control or a device. For details, see Appendix B, "Delimiter Example."

Some usage pages that are in the HID Specification are also found in this document. They are included here because either additional text has been provided to clarify how the usages are to be used , new usages have been added to the page, or both. No changes have been made to the usage values assigned in the HID Specification.

3 Usage Pages

The following table lists the currently defined usage pages and the section in this document or the specification where each page is described.

Table 1: Usage Page Summary

Page ID	Page Name	Section or Document
00	Undefined	
01	Generic Desktop Controls	4
02	Simulation Controls	5
03	VR Controls	6
04	Sport Controls	7
05	Game Controls	8
06	Reserved	
07	Keyboard/Keypad	*USB Device Class Definition for Human Interface Devices (HID).* Note: the usage type for all key codes is Selector (Sel).
08	LEDs	10
09	Button	11
0A	Ordinal	12
0B	Telephony	13
0C	Consumer	14
0D	Digitizer	15
0E	Reserved	
0F	PID Page	*USB Physical Interface Device definitions for force feedback and related devices.*
10	Unicode	16
11-13	Reserved	
14	Alphanumeric Display	17
15-7F	Reserved	
80-83	Monitor pages	*USB Device Class Definition for Monitor Devices*
84-87	Power pages	*USB Device Class Definition for Power Devices*
88	Bar Code Scanner page	*USB Device Class Definition for Bar Code Scanner Devices*
89-8B	Reserved	
8C-8F	Point of Sale pages	*USB Device Class Definition for Point of Sale Devices*
90	Camera Control Page	*USB Device Class Definition for Image Class Devices*

Page ID	Page Name	Section or Document
91	Arcade Page	*OAAF Definitions for arcade and coinop related Devices*
92-FEFF	Reserved	
FF00-FFFF	Vendor-defined	

A **bold** usage definition in the following sections identifies a collection. Non-bold definitions are specific features related to a device that would be applied to individual controls that generate data. In many cases, specific usages can be used by a number of device types.

3.1 HID Usage Table Conventions

Usage ID 0 should always be reserved.

Usage ID 1 through 0x1F are reserved for "top level" collections. These usage IDs are not necessarily application-level but are used to identify general device types.

Usage page values are limited to 16 bits.

Usage ID values are limited to 16 bits.

Usages are 32-bit identifiers, where the high order 16 bits represents the usage page and the low order 16 bits represents the usage ID. To allow more compact **Report** descriptors, **Usage Page** items can be declared to specify the high order bits of the **Usage** item and the **Usage** items can declare only the ID portion of the usage, as follows:

- If the *bSize* field of the **Usage** item equals 1 or 2, the entire 1- or 2-byte data portion of the item is interpreted as a usage ID.
- If the *bSize* field equals 3, bits 16-31 of the 4-byte data portion of the item are interpreted as a usage page, and bits 0-15 of the data portion are interpreted as a usage ID. This interpretation of usages applies to **Usage**, **Usage Minimum**, and **Usage Maximum** items.

The notation for a 32-bit usage (sometimes called an extended usage) in the examples is `Usage(Usage Page: Usage ID)`.

3.2 Handling Unknown Usages

If a usage is unknown to an application then the application should ignore it.

If the usage attached to a collection is unknown to an application, then the application should ignore the collection and all usages contained in the collection. A collection can be used to modify the meaning of the usages that it contains, therefore "known" usages within an unknown collection may not represent their original meaning. An example of this is the **Usage Selected Indicator** on the LED page.

System software provides capabilities for parsing HID **Report** descriptors. In some cases the usage associated with the top level application collection can be used by the system software as a key to load an application-specific driver or a mapping driver for legacy compatibility.

3.3 Usages and Units

For usages that declare data items as a measurement of time, distance, force, and so forth, an application **must** look at the units to properly interpret the value defined by a usage, unless:

1. The usage specifically declares **Units** as optional.

2. The usage description defines the units in which the value will be presented.

If **Units** are set to Optional or set to None (have not been declared) then an application can assume the usage represents a dimensionless value. Any application that ignores **Units** does so at its own risk.

A usage that declares itself to be a measurement of time would specify whether it was seconds or milliseconds by declaring **Units** and **Unit Exponent** prior to the respective **Main** item declaration. An example of this is the **Flash On Time** usage on the LED page, which is described as the duration that the indicator is illuminated in flash mode. The duration would be qualified by the values of **Units** and **Unit Exponent**.

When declaring **Units** for a main item, the **Logical Minimum**, **Logical Maximum**, **Physical Minimum**, **Physical Maximum**, and **Unit Exponent** items must also be declared.

Note In many cases the coordinate system assumes that the values can vary both positively and negatively from zero (0).

3.4 Usage Types

Usages define a wide variety of device features. However, the way an application treats the data that they generate falls into a relatively small set of categories. This section provides descriptions of frequently used types of usages, primarily to save redundant text throughout this document. This list is not an exhaustive list of the possible usage types. Individual usage pages can declare their own usage types.

Each usage type describes how an application should treat the data generated by the **Main** item that the usage is attached to.

Usage type names are followed by an abbreviation that is used in the detailed usage description to identify the default type of a usage. In some cases usage types do not apply and the detailed description will identify how the usage is to be interpreted.

There are three basic types of information that are described by usages: controls, collections, and data. In this context, controls are identified with the state of a device (on/off, enable/disable, and so forth), collections group related controls and data together, and data comprises the remaining information that is passed between a device and the host.

Note Usage types are always considered to be the recommended method of handling a usage. Consult the usage's definition to determine whether alternative usage types may apply.

3.4.1 Usage Types (Controls)

The following table summarizes the control related usage types.

Table 2: Usage Types (Controls)

Control Type	Logical Min	Logical Max	Flags	Signal	Operation
Linear Control (LC)	–1	1	Relative, Preferred State	Edge	1 increments the control's value. –1 decrements the control's value.
	–Min	Max	Relative, Preferred State	Level	*n* increments the control's value. –*n* decrements the control's value.
	Min	Max	Absolute, Preferred State	N/A	The value reported by the control is used directly by the host.
On/Off Control (OOC)	-1	1	Relative, No Preferred	Edge	1 asserts an On condition. –1 asserts an Off condition.
	0	1	Relative, Preferred State	Edge	A 0 to 1 transition toggles the current On/Off state.
	0	1	Absolute, No Preferred	Level	1 asserts an On condition. 0 asserts an Off condition.
Momentary Control (MC)	0	1	Absolute, Preferred State	Level	1 asserts a condition. 0 deasserts the condition.
One Shot Control (OSC)	0	1	Relative, Preferred State	Edge	A 0 to 1 transition triggers an event. A 1 to 0 transition must occur before another event can be triggered.
Re-trigger Control (RTC)	0	1	Absolute, Preferred State	Level	1 triggers an event. When an event completes, if the value is 1 then the event will be triggered again.

3.4.1.1 Linear Control (LC)

In many cases, a control of a linear value is implemented as a pair of increment/decrement buttons, a jog wheel, or a linear control such as a knob or a slide.

When implemented as an increment/decrement control, the two buttons must be translated into a single, 2-bit signed value and declared as a Relative **Main** item with a **Report Size** equal to 2, where –1 decrements the value, +1 increments it, and no change occurs when 0 is asserted.

A jog wheel is normally implemented as a spring-loaded knob that returns to a fixed center position when released. This control reports a single value of two or more bits which are reported as a signed value and declared as a Relative **Main** item where –*n* decrements the value, +*n* increments it, and no change occurs when 0 is asserted. A jog wheel control is implemented with a resolution of +/–*n*, where the offset of the knob from the center position is proportional to the reported value. The **Report Size** must be declared large enough to contain the signed value *n*.

When implemented as a linear knob or slide, the control must be declared as an Absolute Main item. For an example, see Section A.1, "Volume Control," in Appendix A, "Usage Examples."

3.4.1.2 On/Off Control (OOC)

An On/Off Control can be implemented in any of the following ways:

- **Two buttons, On and Off.** The two buttons are encoded into a 2-bit signed value and declared as a Relative, No Preferred **Main** item with **Logical Minimum** and **Logical Maximum** of –1 and 1, respectively. The transition from 0 to –1 generates an Off condition and the transition from 0 to +1 generates an On condition. No change occurs when 0 is asserted.
- **A single button that toggles the On/Off state each time it is pressed.** (single throw momentary switch The single button is encoded into a 1-bit unsigned value and declared as an Relative, Preferred **Main** item with a **Logical Minimum** and **Logical Maximum** of 0 and 1, respectively. The transition from 0 to 1 toggles the current On/Off state. No change occurs on the 1 to 0 transition.
- **A toggle switch that maintains the On/Off state mechanically.** (toggle switch) This control is encoded into a 1-bit unsigned value and declared as an Absolute, No Preferred **Main** item with a **Logical Minimum** and **Logical Maximum** of 0 and 1, respectively. The assertion of 1 generates an On condition and the assertion of 0 generates an Off condition.

3.4.1.3 Momentary Control (MC)

A Momentary Control is a basic push button. A Momentary Control is encoded into a 1-bit value and declared as an Absolute, Preferred **Main** item with a **Logical Minimum** and **Logical Maximum** of 0 and 1, respectively. A value of 1 generates an asserted condition and 0 generates a non-asserted condition. An example is a mouse button.

3.4.1.4 One Shot Control (OSC)

A One Shot Control is a push button that triggers a single event or action. A One Shot Control is encoded into a 1-bit value and declared as a Relative, Preferred **Main** item with a **Logical Minimum** and **Logical Maximum** of 0 and 1, respectively. A 0 to 1 transition initiates an event. Nothing occurs on a 1 to 0 transition but it is required before another event can occur. An example is degauss.

3.4.1.5 Re-Trigger Control (RTC)

A Re-Trigger Control is a push button that triggers a repeating event as long as it is asserted. A Re-Trigger Control is encoded into a 1-bit value and declared as an Absolute, Preferred **Main** item with a **Logical Minimum** and **Logical Maximum** of 0 and 1, respectively. A 0 to 1 transition initiates the first event. When each event terminates, if the control is still asserted (1) then another event will occur. An example is an auto-repeat fire button.

3.4.2 Usage Types (Data)

The following table summarizes the data-related usage types.

Table 3: Usage Types (Data)

Type	Flags	Description
Selector (Sel)	Array	Contained in a Named Array (NAry).
Static Value (SV)	Constant, Variable, Absolute	A read-only multiple-bit value.
Static Flag (SF)	Constant, Variable, Absolute	A read-only single-bit value.
Dynamic Value (DV)	Data, Variable, Absolute	A read/write multiple-bit value.

Type	Flags	Description
Dynamic Flag (DF)	Data, Variable, Absolute	A read/write single-bit value.

3.4.2.1 Selector (Sel)

Selectors come in three forms:

- **One selection of a set.** Radio buttons are a mechanically linked set of buttons where one selection is always valid. This is a perfect example of the "one selection of a set" form. A radio button set is defined by a **Main** item with the Array flag set and the **Report Count** set to 1. The index returned in the array field corresponds to the pressed button (or selection). A usage must be declared for each selection. The array field never returns an index of NULL because one usage is always valid. An example is Stat Not Ready on the Alphanumeric Display page.
- ***N* selections of a set.** More than one selection (button) can be valid at a time. Multiple selections can be returned to the system at one time in a multi-byte array. The "n selections of a set" form is defined by a **Main** item with the Array flag set and the **Report Count** set to *n*, where *n* is the number of selections that can be reported in a single report. An example is a keyboard.
- **Any selection of a set.** The control is implemented as a set of bit fields in which each bit represents a single selection. This control is defined by a **Main** item with the Variable flag set and the **Report Size** equal to 1. The **Report Count** will be equal to the number of selections in the set.

Selectors therefore can be implemented in a number of ways: Array[1] (one selection of a set), Array[*n*] (*n* selections of a set), or bitmap (any selection of a set).

Optionally, the array field or set can be named by wrapping a set of Selectors in a logical collection with a usage attached to it. For details, see Section 3.4.3.1, "Named Array (NAry)."

3.4.2.2 Static Value (SV)

Static values are used to declare a fixed features in a device. They are defined as Constant and treated as read-only information. Therefore, asserting this field in a **Set_Report** command has no defined effect.

3.4.2.3 Static Flag (SF)

Static flags are used to declare the existence of a fixed feature in a device. If a Static Flag usage is found in a **Report** descriptor then the field must be read to determine whether the feature identified by the flag exists. A value of 1 indicates existence and a value of 0 indicates non-existence. The absence of a Static Flag usage implies that the flag is false or the feature defined by the flag is not supported by the device. A Static Flag must be declared as a Constant. To be accessible by applications, a Static Flag must have a usage assigned to it.

Static Flags are typically declared in a **Feature** report as a single-bit field where the value is always read as 1. Attempting to modify this field in a **Set_Report** command has no effect on a Static Flag.

3.4.2.4 Dynamic Flag (DF)

Dynamic Flags are used to declare the existence of a host-controllable feature in a device. The absence of a Dynamic Flag usage implies that the flag is false or the feature defined by the flag is not supported by the device.

Dynamic Flags are typically declared in a report as a single-bit field, where a value of 1 returned by the device indicates that the feature is enabled. The assertion of 1 by the host will cause the feature to be evoked and the assertion of 0 indicates that the feature is to be disabled or ignored if the feature is a one-time event (such as Degauss or Clear Display). A Dynamic Flag **Main** item must be declared as Data.

3.4.2.5 Dynamic Value (DV)

A Dynamic Value is an *n*-bit field that contains a value associated with a control. The associated **Main** item will have the Data and Variable flags set. A Dynamic Value **Main** item must be declared as Data.

Note More advanced devices may allow a usage declared as a Static type to be Dynamic. Always check the Constant/Data flag in an **Input**, **Output** or **Feature Main** item.

3.4.3 Usage Types (Collection)

The following table summarizes the collection-related usage types.

Table 4: Usage Types (Collection)

Type	Collection Type	Definition
Named Array (NAry)	Logical	A collection that encompasses an array definition, naming the array set or the field created by the array.
Application Collection (CA)	Application	Applies a name to a top level collection which the operating system uses to identify a device and possibly remap to a legacy API.
Logical Collection (CL)	Logical	A logical collection of items.
Physical Collection (CP)	Physical	A physical collection of items.
Usage Switch (US)	Logical	Modifies the purpose or function of the usages (controls) that it contains.
Usage Modifier (UM)	Logical	Modifies the purpose or function of the usages (controls) that contains it.

3.4.3.1 Named Array (NAry)

To simplify for an application the process of finding a set of selectors, whether defined as an Array Field or a bitmap, the set of selectors can be named by wrapping them in a logical collection and applying a usage to the collection. Usages applied in this way are called Named Array usages. For an example, see Section A.4, "Named Array Field," in Appendix A, "Usage Examples."

3.4.3.2 Collection Application (CA)

The Collection Application usage type identifies usages that are used only in application-level collections. An application collection identifies a HID device or a functional subset of a complex device. An operating system uses the usage associated with this collection to link the device to its controlling application or driver. Common examples are a keyboard or mouse. A keyboard with an integrated pointing device could contain two different application collections.

Note **Data** reports cannot span application collections.

3.4.3.3 Collection Logical (CL)

The Collection Logical usage type identifies a usage applied to a logical collection. Logical collections can be used to further define the purpose of the items or controls that they contain.

3.4.3.4 Collection Physical (CP)

The Collection Physical usage type identifies a usage applied to a physical collection, usually a collection of axes. A physical collection is used for a set of data items that represent data points collected at one geometric point. This is useful for sensing devices that may need to associate sets of measured or sensed data with a single point. It does not indicate that a set of data values comes from one device, such as a keyboard. In the case of a device that reports the position of multiple sensors, physical collections are used to show which data comes from which sensor.

3.4.3.5 Usage Switch (US)

The Usage Switch usage type identifies a usage applied to a logical collection that modifies the purpose of the usages in that collection. An example is indicators. To avoid having to define a usage for every control that could possibly use an indicator (for example, Play/Play Indicator, etc.) a Usage Switch collection can be wrapped around a usage (Play) to create a indicator for the same function. Usage Switches often modify the type of the contained usage as well.

3.4.3.6 Usage Modifier (UM)

The Usage Modifier usage type identifies a usage applied to a logical collection. This logical collection is always contained in another logical collection. The purpose and possibly the type of the usage attached to the encompassing collection is modified. For instance the usage attached to the encompassing collection may not normally be defined as a collection. For an example, see Section A.6, "Multiple Instances of a Multi-Mode LED," in Appendix A, "Usage Examples."

3.4.4 Alternate Types

Usage types are a guide, not the rule. The flags, **Logical Minimum** and **Logical Maximum** values, and other **Main** item attributes must be evaluated by applications and system software to determine the true purpose, meaning, or interpretation of a control.

In many cases, a usage can take on the attributes of a usage type other than its default type. The alternate type can be declared by a collection in which the usage is found or implied by the way it is declared in a **Report** descriptor. For example, **Usage In Use Indicator** from the LED page is an example of an alternate usage type being applied to a usage. When a usage is wrapped in a **Usage In Use Indicator** collection, it becomes an On/Off Control (OOC).

In other cases, a usage can be declared as either a Static Value (SV) or a Dynamic Value (DV). For example, in a screen saver, the Screen Saver Delay might be fixed on one device and variable on another. The same thing can happen with usages declared as Static Flag (SF) or Dynamic Flag (DF).

Another example is a usage that is declared as either an On/Off Control (OOC) or a Selector (Sel). A device that can support a variety of operational modes will declare individual bits as On/Off Controls to identify which modes are enabled. However, when the device is running, only one mode will be in effect at a time. The device would then declare the same usage as a Selector and report this in a Named Array field to identify the mode associated with the current data. For example, a tape transport could have three states: Stopped, Paused, and Playing. This could be implemented as three individual bits where only one bit is true at a time, or as a 2-bit field in which 0 = Stopped, 1 = Paused, and 3 = Playing.

3.5 System Controls

Applications look at the usage applied to top-level application collections to identify devices. System software that supports keyboards, mice, and joysticks follow the same conventions. If a device vendor wants a device to be recognized by the system software as one of these devices, then the device must follow the conventions described in this section.

3.5.1 Keyboard

Typical system software will search for application collections tagged with either a Keyboard or a Keypad usage. When found, the usages contained in these collections will be treated as standard system keyboard input. All devices that use these declarations will have their output routed to the same destination. That is, typing on any device will affect the active application.

3.5.2 Mice

Typical system software will search for application collections tagged with either a Mouse or a Pointer usage. When found, the usages generated by these collections will be treated as standard system pointer input. All devices that use these declarations will have their output routed to the same destination. That is, moving any mouse will affect the system pointer.

3.5.3 Joysticks

Typical system software will search for application collections tagged with either a Joystick or a Game Pad usage. When found, the usages generated by these collections will be treated as standard system joystick (gaming device) input. Devices that use these declarations will have their output routed to separate destinations, allowing multiple-player applications.

4 Generic Desktop Page (0x01)

Table 5: Generic Desktop Page

Usage ID	Usage Name	Usage Type	Section
00	Undefined		
01	**Pointer**	CP	4.1
02	**Mouse**	CA	4.1
03	Reserved		
04	**Joystick**	CA	4.1
05	**Game Pad**	CA	4.1
06	**Keyboard**	CA	4.1
07	**Keypad**	CA	4.1
08	**Multi-axis Controller**	CA	4.1
09-2F	Reserved		
30	X	DV	4.2
31	Y	DV	4.2
32	Z	DV	4.2
33	Rx	DV	4.2
34	Ry	DV	4.2
35	Rz	DV	4.2
36	Slider	DV	4.3
37	Dial	DV	4.3
38	Wheel	DV	4.3
39	Hat switch	DV	4.3
3A	**Counted Buffer**	CL	4.6
3B	Byte Count	DV	4.6
3C	Motion Wakeup	OSC	4.3
3D	Start	OOC	4.3
3E	Select	OOC	4.3
3F	Reserved		
40	Vx	DV	4.4
41	Vy	DV	4.4
42	Vz	DV	4.4
43	Vbrx	DV	4.4
44	Vbry	DV	4.4
45	Vbrz	DV	4.4
46	Vno	DV	4.4
47-7F	Reserved		

Usage ID	Usage Name	Usage Type	Section
80	**System Control**	CA	4.5
81	System Power Down	OSC	4.5.1
82	System Sleep	OSC	4.5.1
83	System Wake Up	OSC	4.5.1
84	System Context Menu	OSC	4.5
85	System Main Menu	OSC	4.5
86	System App Menu	OSC	4.5
87	System Menu Help	OSC	4.5
88	System Menu Exit	OSC	4.5
89	System Menu Select	OSC	4.5
8A	System Menu Right	RTC	4.5
8B	System Menu Left	RTC	4.5
8C	System Menu Up	RTC	4.5
8D	System Menu Down	RTC	4.5
8E-8F	Reserved		
90	D-pad Up	OOC	4.7
91	D-pad Down	OOC	4.7
92	D-pad Right	OOC	4.7
93	D-pad Left	OOC	4.7
94-FFFF	Reserved		

4.1 Application Usages

Pointer CP – A collection of axes that generates a value to direct, indicate, or point user intentions to an application.

Mouse CA – A hand-held, button-activated input device that when rolled along a flat surface, directs an indicator to move correspondingly about a computer screen, allowing the operator to move the indicator freely in select operations or to manipulate text or graphics. A mouse typically consists of two axes (X and Y) and one, two, or three buttons.

Joystick CA – A manual control or cursor device. A joystick minimally consists of two variable axes (X and Y) and two buttons. A joystick is typically a rotational motion sensor. However, for legacy reasons, it is defined using linear axes.

Traditionally, a joystick driver applies its own scaling to values returned from a joystick. That is, the driver simply linearizes and translates the range of values generated by the stick into normalized values between 0 and 64K, where 32K is centered. The application (game) then interprets the normalized values as necessary. Because of this, joysticks normally do not declare **Units** or **Physical Minimum** and **Physical Maximum** values for their axes. Depending on the driver, these items may be ignored if they are declared.

Game Pad CA – A manual control or cursor device. A game pad minimally consists of a thumb-activated rocker switch that controls two axes (X and Y) and has four

	buttons. The rocker switch consists of four contact closures for up, down, right, and left.
Keyboard	CA – The primary computer input device. A **Keyboard** minimally consists of 103 buttons as defined by the **Boot Keyboard** definition. For details, see Appendix A of the HID Specification.
Keypad	CA – Any keyboard configuration that does not meet the minimum requirements of the **Boot Keyboard**. **Keypad** often refers to a supplementary calculator-style keyboard.
Multi-axis Controller	CA - An input device used to orient eyepoints and or objects in 3 dimensional space. A Multi-axis Controller typically consists of six, variable axes (X, Y, Z, Rx, Ry and Rz) and is used by CAD/digital content creation applications for model manipulation and visualization in 3D space. The device may incorporate zero or more buttons.

4.2 Axis Usages

For X, Y, Z, Rx, Ry, and Rz, the declaration of **Units** is optional. If **Units** is None or not declared, these values should be considered as dimensionless.

X	DV – A linear translation in the X direction. Report values should increase as the control's position is moved from left to right.
Y	DV – A linear translation in the Y direction. Report values should increase as the control's position is moved from far to near.
Z	DV – A linear translation in the Z direction. Report values should increase as the control's position is moved from high to low (Z).
Rx	DV – A rotation about the X axis. Angular position report values follow the righthand rule.
Ry	DV – A rotation about the Y axis. Angular position report values follow the righthand rule.
Rz	DV – A rotation about the Z axis. Angular position report values follow the righthand rule.

4.3 Miscellaneous Controls

Slider	DV – A linear control for generating a variable value, normally in the form of a thumb slide in a slot. Report values should increase as controls are moved from near to far.
Dial	DV – A rotary control for generating a variable value, normally in the form of a knob spun by the index finger and thumb. Report values should increase as controls are spun clockwise. This usage does not follow the HID orientation conventions.
Wheel	DV – A rotary control for generating a variable value, normally rolled, unlike a dial. Report values should increase as controls are rolled forward, away from the user. This usage does not follow the HID orientation conventions.
Hat Switch	DV – A specialized mechanical configuration of switches generating a variable value with a null state. The switches are arranged around a springloaded knob. When the knob is tilted in the direction of a switch, its

	contacts are closed. A typical example is four switches that are capable of generating information about four possible directions in which the knob can be tilted. Intermediate positions can also be decoded if the hardware allows two switches to be reported simultaneously.
Motion Wakeup	DF – Enables the generation of a USB remote wakeup when the device detects motion. Motion Wakeup is always enabled after a USB Reset event is detected by the device. Then host can also assume that the state of the Motion Wakeup flag is maintained while the device is suspended. For example, a mouse may generate a remote wakeup when a button is pressed or when it is moved. For some implementations, a laptop user may want to disable the wakeup on motion because it draws more power.
Start	OOC - Session start button. Initiates a session within an application .
Select	OOC - Application option select button. Selects application configuration options.

4.4 Vector Usages

For the usages Vx, Vy, Vz, Vbrx, Vbry, Vbrz, and Vno, **Units** are always required to determine the meaning of the vector. Rotational vectors are also identified by **Units**. These usages are used when declaring velocity, acceleration, force, electric field, and similar kinds of vectors in the respective direction and frame of reference.

Vx	DV – A vector in the X direction. Report values should increase as the vector increases in the positive X direction (from left to right). Negative values represent vectors in the negative X direction.
Vy	DV – A vector in the Y direction. Report values should increase as the vector increases in the positive Y direction (from far to near). Negative values represent vectors in the negative Y direction.
Vz	DV – A vector in the Z direction. Report values should increase as the vector increases in the positive Z direction (from high to low). Negative values represent vectors in the negative Z direction.
Vbrx	DV – A vector in the X direction relative to the body of an object. Report values should increase as the vector increases in the positive X direction (forward). Negative values represent vectors in the negative X direction. X is the “forward” axis for an object.
Vbry	DV – A vector in the Y direction relative to the body of an object. Report values should increase as the vector increases in the positive Y direction (to the right from an observer facing forward on the object). Negative values represent vectors in the negative Y direction.
Vbrz	DV – A vector in the Z direction relative to the body of an object. Report values should increase as the vector increases in the positive Z direction (down from an observer facing forward on the object). Negative values represent vectors in the negative Z direction.
Vno	DV– A non oriented vector or value. The units define a physical measurement not related to a specific axis or orientation. An example would be pressure or temperature.

4.5 System Controls

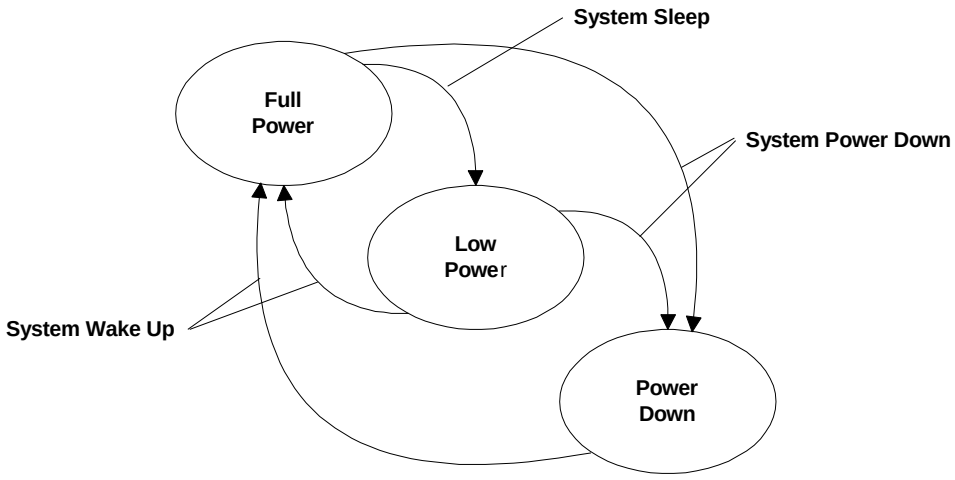
System controls are a special category of usages that affect the system as a whole. They are pulled together in a **System Control** collection to make them easy for system software to identify.

System Control	CA – A application-level collection that contains system-software-specific usages. System software will search specifically for this collection for those controls that affect the system globally.
System Context Menu	OSC – Evokes a context-sensitive menu.
System Main Menu	OSC – Evokes the OS main-level selection menu.
System App Menu	OSC – Displays an application-specific menu.
System Menu Help	OSC – Displays the help menu.
System Menu Exit	OSC – Exits a menu.
System Menu Select	OSC – Selects a menu item.
System Menu Right	RTC – Menu select right.
System Menu Left	RTC – Menu select left.
System Menu Up	RTC – Menu select up.
System Menu Down	RTC – Menu select down.

4.5.1 Power Controls

Power controls can step the system through the following states: Full Power, Low Power, and Power Down. The state diagram is shown in the following figure.

Figure 1: System Power States



Power control usages found in a **System Control** collection affect system level power. Those declared outside of a **System Collection** affect device level power.

System Power Down	OSC – Asserted when the intended action is to initiate system-wide power down now from Full Power or Sleep states.
System Sleep	OSC – Asserted when the intended action is to initiate system-wide low power mode now. If the system is already in the Low Power state, there is no

	effect.
System Wake Up	OSC – Asserted when the intended action is to initiate system-wide Full Power state now. If the system is already in the Full Power, there is no effect.

4.6 Buffered Bytes

The following usages provide a standard way of defining the operation of a buffered-byte field where the number of valid bytes in the field is less than the total number of bytes in the field and the vendor does not define a NoOp value to mark unused bytes.

When declaring a buffered-byte field, the global item **Report Size** should always be set to 8 (for byte cells), and the **Report Count** should be equal to the maximum size of the buffer to be transferred.

Counted Buffer	CL – Used with buffered –byte data to indicate the number of valid bytes in the buffered-byte field. This collection always contains two field declarations: Byte Count and a usage that names the purpose of the buffered-byte field. The **Main** item associated with the purpose usage will always have the Buffered Bytes attribute set.
Byte Count	DV – Defines a report field that indicates the number of meaningful data bytes in an associated buffered-byte field.

4.7 Direction Pads

A Direction Pad or D-Pad control is mechanically identical to a hatswitch, however for legacy reasons their data is interpreted as X and Y axes rather than as an angular direction.

D-pads are typically defined as a pair of X and Y axes that are contained in a logical Pointer collection. There are cases where an application may be interested in the raw D-pad data. The following usages are defined in a report descriptor as single bit fields that identify the current state of the position switches in the D-pad.

Note: A device may declare a Pointer collection with X and Y axes, and D-pad usages for the same control. An application can determine which data format best suits it's needs.

D-pad Up	OOC – Indicates that top of a Direction Pad is pressed
D-pad Down	OOC – Indicates that bottom of a Direction Pad is pressed
D-pad Right	OOC – Indicates that right side of a Direction Pad is pressed
D-pad Left	OOC – Indicates that left side of a Direction Pad is pressed

5 Simulation Controls Page (0x02)

This section provides detailed descriptions of the usages employed by simulation devices.

Table 6: Simulation Controls Page

Usage ID	Usage Name	Usage Type	Section
00	Undefined		
01	**Flight Simulation Device**	CA	5.2
02	**Automobile Simulation Device**	CA	5.3
03	**Tank Simulation Device**	CA	5.4
04	**Spaceship Simulation Device**	CA	5.2
05	**Submarine Simulation Device**	CA	5.5
06	**Sailing Simulation Device**	CA	5.5
07	**Motorcycle Simulation Device**	CA	5.6
08	**Sports Simulation Device**	CA	5.1
09	**Airplane Simulation Device**	CA	5.2
0A	**Helicopter Simulation Device**	CA	5.2
0B	**Magic Carpet Simulation Device**	CA	5.7
0C	**Bicycle Simulation Device**	CA	5.6
0D – 1F	Reserved		
20	**Flight Control Stick**	CA	5.2
21	**Flight Stick**	CA	5.2
22	**Cyclic Control**	CP	5.2
23	**Cyclic Trim**	CP	5.2
24	**Flight Yoke**	CA	5.2
25	**Track Control**	CP	5.4
26 – CF	Reserved		
B0	Aileron	DV	5.2
B1	Aileron Trim	DV	5.2
B2	Anti-Torque Control	DV	5.2
B3	Autopilot Enable	OOC	5.2
B4	Chaff Release	OSC	5.2
B5	Collective Control	DV	5.2
B6	Dive Brake	DV	5.2
B7	Electronic Countermeasures	OOC	5.2
B8	Elevator	DV	5.2
B9	Elevator Trim	DV	5.2
BA	Rudder	DV	5.2
BB	Throttle	DV	5.2

Usage ID	Usage Name	Usage Type	Section
BC	Flight Communications	OOC	5.2
BD	Flare Release	OSC	5.2
BE	Landing Gear	OOC	5.2
BF	Toe Brake	DV	5.2
C0	Trigger	MC	5.2
C1	Weapons Arm	OOC	5.2
C2	Weapons Select	OSC	5.2
C3	Wing Flaps	DV	5.2
C4	Accelerator	DV	5.3
C5	Brake	DV	5.3
C6	Clutch	DV	5.3
C7	Shifter	DV	5.3
C8	Steering	DV	5.3
C9	Turret Direction	DV	5.4
CA	Barrel Elevation	DV	5.4
CB	Dive Plane	DV	5.5
CC	Ballast	DV	5.5
CD	Bicycle Crank	DV	5.6
CE	Handle Bars	DV	5.6
CF	Front Brake	DV	5.6
D0	Rear Brake	DV	5.6
D1-FFFF	Reserved		

5.1 Sports Simulation Device

Usages employed by Stick Devices and Exercise Machines are defined on the Sports Controls page. For details, see Section 7, “Sport Controls Page (0x04).”

Sports Simulation Device CA – This usage definition allows a device to be generally classified as one that uses standard controls found on a sports simulation device.

5.2 Flight Simulation Devices

Flight Simulation Device CA – This usage definition allows a device to be generally classified as one that uses the standard controls found on an airplane.

Spaceship Simulation Device CA – This usage definition allows a device to be generally classified as one that uses standard controls found on a spaceship.

Airplane Simulation Device CA – This usage definition allows a device to be generally classified as one that uses standard controls found on an airplane.

Helicopter Simulation Device CA – This usage definition allows a device to be generally classified as one that uses standard controls found on a helicopter.

Aileron	DV – An aileron is one of two movable flaps on the wings of an airplane that can be used to control the plane's rolling and banking movements. In the zero position the ailerons are centered, positive values will move the right aileron up and the left aileron down, and negative values will have the opposite effect on the ailerons.
Aileron Trim	DV – Allows fine adjustment of the Aileron position. The zero position is the nominal position, positive values will move the right aileron up and the left aileron down, and negative values will have the opposite effect on the ailerons.
Anti-Torque Control	DV – This control mechanically behaves the same as rudder pedals; as one is pushed forward, the other pushes back. In a helicopter, this controls the pitch of the tail blade to spin the helicopter in place. The zero position is centered, positive values rotate right, and negative values rotate left.
Autopilot Enable	OOC – This control enables or disables an airplane's autopilot. This should be a toggle switch, but it is typically implemented as a pushbutton.
Chaff Release	OSC – Chaff is strips of metal, foil, or glass fiber with a metal content, cut into various lengths and having varying frequency responses. It is used to reflect electromagnetic energy as a radar countermeasure. These materials, usually dropped from aircraft, also can be deployed from shells or rockets. Typically this a pushbutton that initiates a release of a fixed amount of material.
Collective Control	DV – This control is specifically for a helicopter. It controls the vertical acceleration or lift of the helicopter. The zero position is centered (level flight), positive values accelerate up, and negative values accelerate down.
Cyclic Control	CP – This control is specifically for a helicopter. A cyclic control is a stick between the pilot's legs that moves in two axes. It controls the swash plate, which in turn controls horizontal acceleration of the helicopter. The zero position is centered, positive Y values accelerate forward, and negative Y values accelerate backward. Positive X values accelerate right, and negative X values accelerate left. This collection will contain X and Y axes.
Cyclic Trim	CP – This control is specifically for a helicopter. **Cyclic Trim** allows fine adjustment of the cyclic position in two dimensions. The zero position is the nominal position, positive values adjust the baseline acceleration right or forward, and negative values adjust the baseline acceleration left or backward, respectively. This collection will contain X and Y axes.
Dive Brake	DV – A flap that can be extended on an aircraft to increase drag and reduce the speed of descent. It is typically implemented as a lever that generates a dimensionless value between no braking (0) and full braking.
Electronic Countermeasures	OOC – A pushbutton that enables electronic countermeasures. This is typically active radar jamming; however Chaff (radar) or Flare (infrared) can be invoked.
Elevator	DV – A movable control surface, usually attached to the horizontal stabilizer of an aircraft, that is used to produce motion up or down. The zero position is centered, positive values raise the elevator, and negative values lower the elevator.

Elevator Trim	DV – Elevator Trim allows fine adjustment of the Elevator position. The zero position is the nominal position, positive values are elevator offset up, and negative values are elevator offset down.
Flight Communications	OOC – In combat aircraft, a communication (comm) button is usually positioned under the index finger. Typically this is a two-position pushbutton where the first position enables communications with the crew and the second position enables the transmitter for communication external to the plane.
Flare Release	OSC – A flare is a device that produces a bright light for signaling, illumination, identification, or heat for infrared missile countermeasures. Typically this is a pushbutton that releases a fixed number of flares.
Flight Control Stick	CA – A Flight Control Stick controls the Pitch and Roll of an airplane. It looks like a joystick. The stick may be pushed forward or pulled back to move the tail elevator down or up, respectively. Pushing forward causes the plane to nose down. Tilting the stick right and left alters the position of the ailerons. In the zero position the ailerons are centered, tilting the stick to the right will move the right aileron up and the left aileron down, and tilting the stick to the left direction will have the opposite effect on the ailerons. Mechanically, a stick presents two degrees of rotational freedom with approximately a +/–45° range. However, these axes are represented as Generic Desktop Page translational axes X (Roll) and Y (Pitch).
Flight Stick	CA – A **Flight Stick** defines a class of device commonly used for flight simulator games. For a device to qualify as a **Flight Stick**, it must support at least two axes (Pitch and Roll), a trigger button, three additional buttons, and a hat switch. A **Flight Stick** is a functional subset of a **Flight Control Stick**.
Landing Gear	OOC – A control for raising or lowering an airplane's landing gear. This should be a toggle switch, but it is typically implemented as pushbutton.
Rudder	DV – The zero position is centered, positive values turn right, and negative values turn left.
Toe Brake	DV – A device for slowing or stopping the motion of an airplane when it is on the ground. Typically, Toe Brakes consist of two foot pedals that affect the left and right brakes, respectively. Control of the Toe Brakes can allow steering of the plane as well as braking when it is on the ground. An analog Toe Brake generates a dimensionless value between 0 and full scale. In some implementations, the Toe Brake can simply be a pushbutton (full on or off).
Throttle	DV – A valve that regulates the flow of a fluid, such as the valve in an internal-combustion engine that controls the amount of vaporized fuel entering the cylinders. A lever or pedal controlling such a valve generates a dimensionless value between 0 and full scale.
Trigger	MC – A lever pressed by the finger to release or activate a mechanism, typically used to discharge a firearm. However, a Trigger can be used for many devices. In combat airplanes the Trigger is usually positioned under the thumb; for a gun it would be positioned under the index finger. Typically this is implemented as a pushbutton.
Weapons Arm	OOC – This device is normally a covered toggle switch that must be selected to enable the weapons system.

Weapons Select	OSC – This device can either be a pushbutton that steps through the available weapons or a radio button that selects them individually.
Wing Flaps	DV – Wing flap controls are usually powered either hydraulically or by electric motors, and are used for low-speed control of an airplane. A flap generates a value between 0 and full extension.
Flight Yoke	CA – A flight yoke (also called a control wheel) controls the pitch and roll of an airplane. It looks like a bow tie grasped by both hands. The yoke at which the pilot sits may be pushed forward or pulled back to move the tail elevator down or up, respectively. In the zero position the elevator is centered for level flight. Pushing forward on the yoke causes the plane to nose down and generates negative values. Pulling back on the yoke causes the plane to nose up and generates positive values. Rotating the yoke alters the position of the ailerons. In the zero position the ailerons are centered. Rotating the yoke in a clockwise direction will move the right aileron up and the left aileron down and generate incrementing values. Rotating the yoke in the counterclockwise direction will have the opposite effect on the ailerons and generate decrementing values.

5.3 Automobile Simulation Devices

Automobile Simulation Device	CA – This usage definition allows a device to be generally classified as one that uses the standard controls found in an automobile or truck.
Accelerator	DV – A device, especially the gas pedal of a motor vehicle, for increasing speed. An Accelerator is a dimensionless single degree-of-freedom dynamic value, where the range of values is from zero to maximum acceleration.
Brake	DV – A device for slowing or stopping motion, as of a vehicle, especially by contact friction. A Brake can be an On/Off Control or a dimensionless single degree-of-freedom dynamic value, where the range of values is from zero to maximum braking.
Clutch	DV – A device for disengaging the transmission of a vehicle to allow shifting of gears. A Clutch can be a generic button or a dimensionless single degree-of-freedom dynamic value, where the range of values is from zero to maximum clutch actuation.
Shifter	DV – A device for shifting gears in a vehicle. A Shifter is a specialized mechanical configuration of a radio button. A zero value is returned when the shifter is in the neutral position. Positive values indicate the forward gear and negative values indicate the reverse gear that the device is in.
Steering	DV – A steering wheel is a single degree-of-freedom device that rotates about an axis. The zero position is always the neutral or “straight ahead” position, with positive values turning clockwise and negative values turning counterclockwise. If the Coordinate Values Wrap attribute is set, the steering wheel can be turned past 360 degrees.

5.4 Tank Simulation Devices

Tank Simulation Device	CA – This usage definition allows a device to be generally classified as one that uses standard controls found in a tank or a treaded vehicle.
Track Control	CP – A device for controlling the direction and velocity of a vehicle that is driven by tracks. There can be either two sticks with one degree of freedom or a single stick with two degrees of freedom: In the two-stick case, the neutral position is when the stick is centered (zero). Pushing the stick forward causes forward acceleration (positive values), and pulling it back causes reverse acceleration (negative values). The righthand and lefthand controls will affect the corresponding side of the vehicle. In the one-stick case, forward/backward acceleration works the same as in the two-stick case. However, right or left movement of the stick determines the amount of power applied to the respective track. When the stick is centered horizontally, equal amounts of power are applied to both tracks, generating a zero output value. Moving the stick to the right will generate positive values, and moving the stick to the left will generate negative values. A **Tank Track Control** is a dimensionless analog entity.
Turret Direction	DV – This control determines the right-to-left positioning of the tank turret. A value of zero maintains the current orientation of the turret. A positive value turns the turret to the right and a negative value turns the turret to the left.
Barrel Elevation	DV – This control determines the elevation of the gun barrel in a turret. A value of zero maintains the current orientation of the barrel. A positive value raises the barrel and a negative value lowers the barrel.

5.5 Maritime Simulation Devices

Submarine Simulation Device	CA – Allows a device to be generally classified as one that uses the standard controls of a submarine.
Dive Plane	DV – Dive planes control the vertical ascent or descent of the submarine under power. A zero value indicates level travel. Positive values indicate ascent, and negative values indicate descent. A Dive Plane is a dimensionless analog entity.
Ballast	DV – Ballast controls the vertical ascent or descent of the submarine. A zero value indicates level travel. Positive values indicate ascent, and negative values indicate descent. A Ballast is a dimensionless analog entity.
Sailing Simulation Device	CA – Allows a device to be generally classified as one that uses the standard controls of a sailboat.

5.6 Two-wheeled Simulation Devices

Motorcycle Simulation Device	CA – Allows a device to be generally classified as one that uses the standard controls of a motorcycle.
Bicycle Simulation Device	CA – Allows a device to be generally classified as one that uses the standard controls of a bicycle.

Bicycle Crank	DV – A foot-operated assembly of pedals attached to a crank that is used for powering a bicycle. The reported value is the rate that the crank turns per minute.
Handle Bars	DV – A steering control, held in both hands, for a motorcycle or bicycle. A zero output value indicates that the direction of travel is straight ahead. Pulling back on the right side turns the vehicle to the right and generates a positive output. Pulling back on the left side turns the vehicle to the left and generates a negative output.
Front Brake	DV – Engages the front brake of the motorcycle to slow the vehicle. A Front Brake can be a generic button or a dimensionless single degree-of-freedom analog entity, where the range of values is from zero to maximum braking.
Rear Brake	DV– Engages the rear brake of the motorcycle to slow the vehicle. A Rear Brake can be a generic button or a dimensionless single degree-of-freedom analog entity, where the range of values is from zero to maximum braking.

5.7 Miscellaneous Simulation Devices

Magic Carpet Simulation Device

CA – Allows a device to be generally classified as one that uses the standard control of a magic carpet. This control is a bar, grasped by both hands, that controls the Yaw, Pitch and Roll of the carpet.

The bar, at which the pilot sits, may be pushed forward or pulled back to cause the carpet to dive or rise, respectively. In the zero position, the carpet is in level flight. Pushing forward on the bar causes the carpet to nose down and generates negative values. Pulling back on the bar causes the carpet to nose up and generates positive values.

Turning the bar turns the carpet. In the zero position, the carpet travels straight ahead. Pulling back on the right side turns the carpet to the right and generates positive values. Pulling back on the left side turns the carpet to the left and generates negative values.

Rotating the bar rolls the carpet. In the zero position, the carpet travels level. Rotating the bar in a clockwise direction rolls the carpet to the right and generates positive values. Rotating the bar in the counterclockwise direction rolls the carpet to the left and generates negative values.

6 VR Controls Page (0x03)

Virtual Reality controls depend on designators to identify the individual controls. Most of the following are usages are applied to the collections of entities that comprise the actual device.

Table 7: VR Controls Page

Usage ID	Usage Name	Usage Type
00	Unidentified	
01	**Belt**	CA
02	**Body Suit**	CA
03	**Flexor**	CP
04	**Glove**	CA
05	**Head Tracker**	CP
06	**Head Mounted Display**	CA
07	**Hand Tracker**	CA
08	**Oculometer**	CA
09	**Vest**	CA
0A	**Animatronic Device**	CA
0B-1F	Reserved	
20	Stereo Enable	OOC
21	Display Enable	OOC
22-FFFF	Reserved	

Belt CA – A Belt wraps around the user's waist. A tracker would be centered in the small of the user's back to identify the orientation of the user's hips.

Body Suit CA – Generally classifies a device as one that uses the standard controls found in a Body Suit. A Body Suit typically has a large number of position sensors typically fixed to the major joints of the body, such as the ankles, knees, hips, shoulders, elbows, wrists and head, for measuring the angle and movement of the wearer's joints and limbs.

Flexor CP – A Flexor describes the angle of bend of a joint or limb in the body. The designator is used to determine which joint a specific Flexor entity represents.

Glove CA – A Glove reports the positions of the fingers. Up to 20 angular values can be reported. Designators are used to determine the degrees of freedom that the Glove device is capable of reporting.

Head Tracker CP – A Head Tracker represents the position and/or orientation of the head in space. The axes are oriented such that, in the zero position, the user is looking from the positive Z axis to the negative Z axis. The positive Y axis is extends vertically from the top of the user's head.

Head Mounted Display CA – A Head Mounted Display (HMD) presents the following parameters to the user: Vbrx, Vbry, and Vbrz. Stereo Enable and Display Enable are optional usages that can be included in an HMD collection.

Stereo Enable	OOC – Selects the display mode of the HMD. A value of 0 selects monoscopic mode and 1 selects stereoscopic mode.
Display Enable	OOC – Enables the HMD video output. A value of 0 turns off the display and 1 turns it on.
Hand Tracker	CA – A Hand Tracker represents the position of the hand in space. A Hand Tracker attaches to the back of the hand. In the zero position, it is assumed that the hand is held upright with the extended thumb parallel to the Y axis and the fingers pointing in the negative Z direction
Oculometer	CA – An Oculometer identifies the direction in which the eye is looking in rotation about the X and Y axes. The designator for an Oculometer is always Eye.
Vest	CA – A Vest wraps around the user's chest and abdomen. A tracker would be placed on the user's back between the shoulder blades.
Animatronic Device	CA – An input device for the animation of mechanical or Computer Graphic Image "electronic" puppets. An animatronic device is engineered to fit a puppeteer's or performer's body (and/or head and/or face) and comfortably allow a wide range of physical freedom. An Animatronic Device measures the angle and movement of the wearer's joints and limbs, which are then translated into the motion of a puppet, allowing the puppet to mimic the wearer's movements. There is not necessarily a 1:1 mapping of human to puppet controls. A puppeteer's arm may be used to control the movement of an elephant's trunk, or hand controls may be used to control facial expressions. Designators are used to determine which puppeteer joint is being tracked. The controlling application will map these inputs to the electronic or mechanical device.

7 Sport Controls Page (0x04)

Table 8: Sport Controls Page

Usage ID	Usage Name	Usage Type	Section
00	Unidentified		
01	**Baseball Bat**	CA	7.1
02	**Golf Club**	CA	7.1
03	**Rowing Machine**	CA	7.2
04	**Treadmill**	CA	7.2
05-2F	Reserved		
30	Oar	DV	7.2
31	Slope	DV	7.2
32	Rate	DV	7.2
33	Stick Speed	DV	7.1
34	Stick Face Angle	DV	7.1
35	Stick Heel/Toe	DV	7.1
36	Stick Follow Through	DV	7.1
37	Stick Tempo	DV	7.1
38	**Stick Type**	NAry	7.1
39	Stick Height	DV	7.1
3A-4F	Reserved		
50	Putter	Sel	7.1
51	1 Iron	Sel	7.1
52	2 Iron	Sel	7.1
53	3 Iron	Sel	7.1
54	4 Iron	Sel	7.1
55	5 Iron	Sel	7.1
56	6 Iron	Sel	7.1
57	7 Iron	Sel	7.1
58	8 Iron	Sel	7.1
59	9 Iron	Sel	7.1
5A	10 Iron	Sel	7.1
5B	11 Iron	Sel	7.1
5C	Sand Wedge	Sel	7.1
5D	Loft Wedge	Sel	7.1
5E	Power Wedge	Sel	7.1
5F	1 Wood	Sel	7.1
60	3 Wood	Sel	7.1

Usage ID	Usage Name	Usage Type	Section
61	5 Wood	Sel	7.1
62	7 Wood	Sel	7.1
63	9 Wood	Sel	7.1
64-FFFF	Reserved		

7.1 Stick Devices

Stick devices are used in applications in which the user swings one object to make contact with another. Typical examples are a baseball bat and a golf club. These devices sense various quantities at the point of impact to determine the direction that the target (struck) object will go. The target object is a sphere. The Stick usages Speed, Face Angle, Heel/Toe, Follow Through, Tempo, and Height identify the measurement quantities.

Baseball Bat	CA – Primary input device for baseball simulation applications. Normally consists of a collection of Stick usages.
Golf Club	CA – Primary input device for golf simulation applications. Normally consists of a collection of Stick usages.
Stick Speed	DV – The velocity with which the stick strikes the target object. This can be expressed as collection of velocity values to provide a direction, or as an absolute magnitude where the Stick Face Angle provides the direction.
Stick Face Angle	DV – The direction in which the stick strikes the target object. In a golf simulation, this will be the horizontal angle and the vertical angle will be determined by the **Stick Type**. For Baseball Bats and other stick devices the direction is expressed as a three-dimensional vector.
Stick Heel/Toe	DV – Identifies the contact point relative to the striking surface. This helps to identify the "sweet spot." This is reported as a relative value where zero is the sweet spot, positive values are away from the user, and negative values are towards the user.
Stick Follow Through	DV – In a golf simulation, the user strikes the ball, swings the club forward over the shoulders, then brings the club back to the tee. Stick Follow Through is a measure of the time that this process takes. Other stick devices may provide this parameter as well.
Stick Tempo	DV – In a golf simulation, the user starts the swing at the ball, swings the club back over the shoulders, then strikes the ball. Stick Tempo is a measure of the time that this process takes. Other stick devices may provide this parameter as well.
Stick Type	NAry – An array that identifies the type of golf club used.
Irons 1 – 11, Woods 1, 3, 5, 7, 9, Sand Wedge, Loft Wedge, Power Wedge, and Putter	Sel – Golf club stick types. Stick type determines the stick face angle.
Stick Height	DV – Height of contact point above the ground for stick device.

7.2 Exercise Machines

Bicycles can be found in Section 5.6 , “Two-wheeled Simulation Devices.”

Rowing Machine	CA – An exercise device that simulates rowing a boat. Usages typically found in this collection are Oars and Rate. Rate is typically expressed in strokes per minute.
Oar	DV – Rowing repetition rate in strokes per minute. Left, right and two-handed oars are distinguished with designators.
Treadmill	CA – An exercise device consisting of an endless moving belt on which a person can walk or jog while remaining in one place. Usages typically found in this collection are Slope and Rate. The Rate is typically expressed in strokes per minute.
Rate	DV – Rate in miles per hour.
Slope	DV – Slope is measured in degrees. Positive angles are uphill, negative angles are downhill, and 0° is level.

8 Game Controls Page (0x05)

Table 9: Game Controls Page

Usage ID	Usage Name	Usage Type	Section
00	Undefined		
01	**3D Game Controller**	CA	8.1
02	**Pinball Device**	CA	8.2
03	**Gun Device**	CA	8.3
04-1F	Reserved		
20	**Point of View**	CP	8.1
21	Turn Right/Left	DV	8.1
22	Pitch Right/Left	DV	8.1
23	Roll Forward/Backward	DV	8.1
24	Move Right/Left	DV	8.1
25	Move Forward/Backward	DV	8.1
26	Move Up/Down	DV	8.1
27	Lean Right/Left	DV	8.1
28	Lean Forward/Backward	DV	8.1
29	Height of POV	DV	8.1
2A	Flipper	MC	8.2
2B	Secondary Flipper	MC	8.2
2C	Bump	MC	8.2
2D	New Game	OSC	8.2
2E	Shoot Ball	OSC	8.2
2F	Player	OSC	8.2
30	Gun Bolt	OOC	8.3
31	Gun Clip	OOC	8.3
32	**Gun Selector**	NAry	8.3
33	Gun Single Shot	Sel	8.3
34	Gun Burst	Sel	8.3
35	Gun Automatic	Sel	8.3
36	Gun Safety	OOC	8.3
37	**Gamepad Fire/Jump**	CL	8.4.1
39	**Gamepad Trigger**	CL	8.4.1
3A-FFFF	Reserved		

8.1 3D Game Controller

The following controls support first-person games or those that are played through the eyes of the character that represents the player in the 3D world.

3D Game Controller	CA – A collection of 3D movement usages.
Point of View	CP – A collection of rotational axes (Rx, Ry, and Rz) that represent the orientation of the user's head in 3D space. If applied to a Hat Switch, only the Rz (Yaw) axis will be controlled.
Turn Right/Left	DV – Identifies the horizontal facing direction of the player's hips (Rz = Yaw). Turn Right/Left is a relative value where 0° is straight ahead, positive values turn right, and negative values turn left. The rate of rotation is determined by the application.
Pitch Right/Left	DV – Identifies the vertical facing direction of the player's hips (Rx = Pitch). Pitch Right/Left is a relative value where 0° is straight up, positive values bend back, and negative values bend forward. The rate of rotation is determined by the application.
Roll Forward/Backward	DV – Identifies the vertical facing direction of the player's hips (Ry = Roll). Roll Forward/Backward is a relative value where 0° is straight up, positive values lean left, and negative values lean right. The rate of rotation is determined by the application.
Move Right/Left	DV – This control allows the player to sidestep or move right and left without changing the orientation of the hips. Move Right/Left is a relative value where 0 is no lateral motion, positive values move right, and negative move left. The rate of movement is determined by the application.
Move Forward/Backward	DV – This control allows the player to move forward and backward in the direction (yaw) the hips are facing. Move Forward/Backward is a relative value where 0 is no motion, positive values move backward, and negative move forward. [1] The rate of movement is determined by the application.
Move Up/Down	DV – This control allows the player to move up and down. It is assumed that the player can fly, is swimming, or is at a ladder or a climbable wall. Move Up/Down is a relative value where 0 is no motion, positive values move down, and negative move up.[1] The rate of movement is determined by the application.
Lean Right/Left	DV – This control allows the player to lean right and left from the hips, without changing the orientation of the hips, for example, to look around a corner. Lean Right/Left is a relative value where 0 is no lateral motion, positive values move right, and negative move left. The rate of movement is determined by the application.
Lean Forward/Backward	DV – This control allows the player to lean forward and backward from the hips in the direction (yaw) the hips are facing. Lean Forward/Backward is a relative value where 0 is no motion, positive values move backward, and negative move forward.[1] The rate of movement is determined by the application.

[1] These directions may appear counter-intuitive but they are consistent with the HID orientation conventions.

Height of POV	DV – This control allows the player to stand, squat, and crawl. Height of POV is a relative value where 0 is the normal standing position and positive values lower the player's Point Of View. The maximum value as indicated by Logical Maximum is the crawling position, the median positive value is the squatting position, and negative values indicate the player is standing on tiptoes or flying. [1]

8.2 Pinball Device

Pinball is a game played on a device in which the player operates a plunger to shoot a ball down or along a slanted surface that has obstacles and targets.

Pinball Device	CA – A collection of usages representing the controls of a pinball game.
Flipper	MC – A button that actuates a bar that swings around a pivot to change the direction of the ball. A pair of right and left flippers normally resides at the near end of the table.
Secondary Flipper	MC – A button that actuates a bar that swings around a pivot to change the direction of the ball. Secondary flippers normally reside on the sides halfway up the table.
Bump	MC – A control that indicates that the flipper assembly has been shoved by the player to change the direction of the ball. This can be as simple as a switch or as complex as a 3D force vector.
New Game	OSC – A button that terminates any current game and reinitializes for a new game.
Shoot Ball	OSC – A control that indicates that the player has placed the ball into play. This can be as a switch or a force vector.
Player	OSC – A button that cycles through the number of players supported by the game.

8.3 Gun Device

A Gun Device is used in battle and war game simulations.

Gun Device	CA – A collection of Gun usages that describes a hand-held projectile weapon.
Gun Bolt	OOC – A control that indicates the state of the gun bolt. A value of 1 indicates that the bolt is locked and ready to fire, and 0 indicates that the bolt is open, ready for the next shell.
Gun Clip	OOC – A control that indicates whether the gun clip is inserted. A value of 1 indicates that the clip is inserted, and 0 indicates that the clip is missing.
Gun Selector	NAry – This control identifies the firing mode of the weapon. Typically it is a mutually exclusive set of usages for single shot, burst, and fully automatic firing that are presented as an array input.
Gun Single Shot	Sel – Selects a single shot each time the trigger is pulled.
Gun Burst	Sel – Selects a short burst (three shots) each time the trigger is pulled.

Gun Automatic	Sel – Places the gun in fully automatic mode where it will fire continuously while the trigger is pulled.
Gun Safety	OOC – A control that indicates whether safety is enabled. A value of 1 indicates that the gun is enabled to fire, and 0 indicates that gun will not fire when the trigger is pulled.

8.4 Gamepads

The following Usages are targeted at gamepads however they can be used for any devices.

Gamepads use Start and Select buttons allow simple menu control. Select allows auser to linearly step through application options. If an option can be varied (i.e. volume, game speed, etc.) then the D-pad is typically used to modify it's value. A user indicates the final acceptance of an option by pressing Start. Seethe Generic Desktop page for the Start and Select button usage definitions.

Gamepad recommendations

1) All gamepad controls should have associated Physical descriptors.

2) If a gamepad control is labeled an associated String descriptor should be declared.

8.4.1 Gamepad Button Collections

Usages in the Gamepad Button Collections are assigned from the Button Page where Button 1 is the easiest for the user to access. Ideally, Button 1 is under the users finger when it is at rest. Button 2 is the next easiest to access and so on. The default gamepad is assumed to have the D-pad under the users left thumb and the Fire/Jump buttons under the right thumb.

The individual Gamepad Button collections can also support "chorded" commands. A Chorded command is invoked by simultaneously pressing multiple buttons with multiple fingers. By separating the buttons into thumb and index finger groups it will be possible for an application to identify whether a gamepad can support chorded commands.

An application should assume that if more than one button is pressed (true) in a collection that only the first button pressed is true. Or the lowest Button (Usage ID) is pressed if two or more buttons in the same collection become true in the same report.

Gamepad Fire/Jump and Trigger buttons are defined with the following conventions: Button 0 is the primary (or easiest to access) button, Button 1 is the secondary button, Button 3 is the tertiary button, and so on. Designators can be applied if more detail is required.

Gamepad Fire/Jump	CL – A collection of gamepad buttons controlled by the user's thumb.
Gamepad Trigger	CL – A collection of gamepad buttons controlled by the user's index fingers.

9 Keyboard/Keypad Page (0x07)

This section is the **Usage Page** for key codes to be used in implementing a USB keyboard. A Boot Keyboard (84-, 101- or 104-key) should at a minimum support all associated usage codes as indicated in the "Boot" column below.

The usage type of all key codes is Selectors (Sel), except for the modifier keys Keyboard Left Control (0x224) to Keyboard Right GUI (0x231) which are Dynamic Flags (DV).

Note A general note on **Usages** and languages: Due to the variation of keyboards from language to language, it is not feasible to specify exact key mappings for every language. Where this list is not specific for a key function in a language, the closest equivalent key position should be used, so that a keyboard may be modified for a different language by simply printing different keycaps. One example is the Y key on a North American keyboard. In Germany this is typically Z. Rather than changing the keyboard firmware to put the Z Usage into that place in the descriptor list, the vendor should use the Y Usage on both the North American and German keyboards. This continues to be the existing practice in the industry, in order to minimize the number of changes to the electronics to accommodate other languages.

Table 10: Keyboard/Keypad Page

Usage ID (Dec)	Usage ID (Hex)	Usage Name	Ref: Typical AT-101 Position	PC-AT	Mac	UNIX	Boot
0	00	Reserved (no event indicated)[9]	N/A	√	√	√	84/101/104
1	01	Keyboard ErrorRollOver[9]	N/A	√	√	√	84/101/104
2	02	Keyboard POSTFail[9]	N/A	√	√	√	84/101/104
3	03	Keyboard ErrorUndefined[9]	N/A	√	√	√	84/101/104
4	04	Keyboard a and A[4]	31	√	√	√	84/101/104
5	05	Keyboard b and B	50	√	√	√	84/101/104
6	06	Keyboard c and C[4]	48	√	√	√	84/101/104
7	07	Keyboard d and D	33	√	√	√	84/101/104
8	08	Keyboard e and E	19	√	√	√	84/101/104
9	09	Keyboard f and F	34	√	√	√	84/101/104
10	0A	Keyboard g and G	35	√	√	√	84/101/104
11	0B	Keyboard h and H	36	√	√	√	84/101/104
12	0C	Keyboard i and I	24	√	√	√	84/101/104
13	0D	Keyboard j and J	37	√	√	√	84/101/104
14	0E	Keyboard k and K	38	√	√	√	84/101/104
15	0F	Keyboard l and L	39	√	√	√	84/101/104
16	10	Keyboard m and M[4]	52	√	√	√	84/101/104
17	11	Keyboard n and N	51	√	√	√	84/101/104
18	12	Keyboard o and O[4]	25	√	√	√	84/101/104
19	13	Keyboard p and P[4]	26	√	√	√	84/101/104
20	14	Keyboard q and Q[4]	17	√	√	√	84/101/104

Usage ID (Dec)	Usage ID (Hex)	Usage Name	Ref: Typical AT-101 Position	PC-AT	Mac	UNIX	Boot
21	15	Keyboard r and R	20	√	√	√	84/101/104
22	16	Keyboard s and S[4]	32	√	√	√	84/101/104
23	17	Keyboard t and T	21	√	√	√	84/101/104
24	18	Keyboard u and U	23	√	√	√	84/101/104
25	19	Keyboard v and V	49	√	√	√	84/101/104
26	1A	Keyboard w and W[4]	18	√	√	√	84/101/104
27	1B	Keyboard x and X[4]	47	√	√	√	84/101/104
28	1C	Keyboard y and Y[4]	22	√	√	√	84/101/104
29	1D	Keyboard z and Z[4]	46	√	√	√	84/101/104
30	1E	Keyboard 1 and !4	2	√	√	√	84/101/104
31	1F	Keyboard 2 and @[4]	3	√	√	√	84/101/104
32	20	Keyboard 3 and #[4]	4	√	√	√	84/101/104
33	21	Keyboard 4 and $[4]	5	√	√	√	84/101/104
34	22	Keyboard 5 and %[4]	6	√	√	√	84/101/104
35	23	Keyboard 6 and ^[4]	7	√	√	√	84/101/104
36	24	Keyboard 7 and &[4]	8	√	√	√	84/101/104
37	25	Keyboard 8 and *[4]	9	√	√	√	84/101/104
38	26	Keyboard 9 and ([4]	10	√	√	√	84/101/104
39	27	Keyboard 0 and)[4]	11	√	√	√	84/101/104
40	28	Keyboard Return (ENTER)[5]	43	√	√	√	84/101/104
41	29	Keyboard ESCAPE	110	√	√	√	84/101/104
42	2A	Keyboard DELETE (Backspace)[13]	15	√	√	√	84/101/104
43	2B	Keyboard Tab	16	√	√	√	84/101/104
44	2C	Keyboard Spacebar	61	√	√	√	84/101/104
45	2D	Keyboard - and (underscore)[4]	12	√	√	√	84/101/104
46	2E	Keyboard = and +[4]	13	√	√	√	84/101/104
47	2F	Keyboard [and {[4]	27	√	√	√	84/101/104
48	30	Keyboard] and }[4]	28	√	√	√	84/101/104
49	31	Keyboard \ and |	29	√	√	√	84/101/104
50	32	Keyboard Non-US # and ~[2]	42	√	√	√	84/101/104
51	33	Keyboard ; and :[4]	40	√	√	√	84/101/104
52	34	Keyboard ‘ and “[4]	41	√	√	√	84/101/104
53	35	Keyboard Grave Accent and Tilde[4]	1	√	√	√	84/101/104
54	36	Keyboard, and <[4]	53	√	√	√	84/101/104
55	37	Keyboard . and >[4]	54	√	√	√	84/101/104
56	38	Keyboard / and ?[4]	55	√	√	√	84/101/104

Usage ID (Dec)	Usage ID (Hex)	Usage Name	Ref: Typical AT-101 Position	PC-AT	Mac	UNIX	Boot
57	39	Keyboard Caps Lock[11]	30	√	√	√	84/101/104
58	3A	Keyboard F1	112	√	√	√	84/101/104
59	3B	Keyboard F2	113	√	√	√	84/101/104
60	3C	Keyboard F3	114	√	√	√	84/101/104
61	3D	Keyboard F4	115	√	√	√	84/101/104
62	3E	Keyboard F5	116	√	√	√	84/101/104
63	3F	Keyboard F6	117	√	√	√	84/101/104
64	40	Keyboard F7	118	√	√	√	84/101/104
65	41	Keyboard F8	119	√	√	√	84/101/104
66	42	Keyboard F9	120	√	√	√	84/101/104
67	43	Keyboard F10	121	√	√	√	84/101/104
68	44	Keyboard F11	122	√	√	√	101/104
69	45	Keyboard F12	123	√	√	√	101/104
70	46	Keyboard PrintScreen[1]	124	√	√	√	101/104
71	47	Keyboard Scroll Lock[11]	125	√	√	√	84/101/104
72	48	Keyboard Pause[1]	126	√	√	√	101/104
73	49	Keyboard Insert[1]	75	√	√	√	101/104
74	4A	Keyboard Home[1]	80	√	√	√	101/104
75	4B	Keyboard PageUp[1]	85	√	√	√	101/104
76	4C	Keyboard Delete Forward[1;14]	76	√	√	√	101/104
77	4D	Keyboard End[1]	81	√	√	√	101/104
78	4E	Keyboard PageDown[1]	86	√	√	√	101/104
79	4F	Keyboard RightArrow[1]	89	√	√	√	101/104
80	50	Keyboard LeftArrow[1]	79	√	√	√	101/104
81	51	Keyboard DownArrow[1]	84	√	√	√	101/104
82	52	Keyboard UpArrow[1]	83	√	√	√	101/104
83	53	Keypad Num Lock and Clear[11]	90	√	√	√	101/104
84	54	Keypad /[1]	95	√	√	√	101/104
85	55	Keypad *	100	√	√	√	84/101/104
86	56	Keypad -	105	√	√	√	84/101/104
87	57	Keypad +	106	√	√	√	84/101/104
88	58	Keypad ENTER[5]	108	√	√	√	101/104
89	59	Keypad 1 and End	93	√	√	√	84/101/104
90	5A	Keypad 2 and Down Arrow	98	√	√	√	84/101/104
91	5B	Keypad 3 and PageDn	103	√	√	√	84/101/104
92	5C	Keypad 4 and Left Arrow	92	√	√	√	84/101/104
93	5D	Keypad 5	97	√	√	√	84/101/104

Usage ID (Dec)	Usage ID (Hex)	Usage Name	Ref: Typical AT-101 Position	PC-AT	Mac	UNIX	Boot
94	5E	Keypad 6 and Right Arrow	102	√	√	√	84/101/104
95	5F	Keypad 7 and Home	91	√	√	√	84/101/104
96	60	Keypad 8 and Up Arrow	96	√	√	√	84/101/104
97	61	Keypad 9 and PageUp	101	√	√	√	84/101/104
98	62	Keypad 0 and Insert	99	√	√	√	84/101/104
99	63	Keypad . and Delete	104	√	√	√	84/101/104
100	64	Keyboard Non-US \ and |[3;6]	45	√	√	√	84/101/104
101	65	Keyboard Application[10]	129	√		√	104
102	66	Keyboard Power[9]			√	√	
103	67	Keypad =			√		
104	68	Keyboard F13			√		
105	69	Keyboard F14			√		
106	6A	Keyboard F15			√		
107	6B	Keyboard F16					
108	6C	Keyboard F17					
109	6D	Keyboard F18					
110	6E	Keyboard F19					
111	6F	Keyboard F20					
112	70	Keyboard F21					
113	71	Keyboard F22					
114	72	Keyboard F23					
115	73	Keyboard F24					
116	74	Keyboard Execute				√	
117	75	Keyboard Help				√	
118	76	Keyboard Menu				√	
119	77	Keyboard Select				√	
120	78	Keyboard Stop				√	
121	79	Keyboard Again				√	
122	7A	Keyboard Undo				√	
123	7B	Keyboard Cut				√	
124	7C	Keyboard Copy				√	
125	7D	Keyboard Paste				√	
126	7E	Keyboard Find				√	
127	7F	Keyboard Mute				√	
128	80	Keyboard Volume Up				√	
129	81	Keyboard Volume Down				√	
130	82	Keyboard Locking Caps Lock[12]				√	

Usage ID (Dec)	Usage ID (Hex)	Usage Name	Ref: Typical AT-101 Position	PC-AT	Mac	UNIX	Boot
131	83	Keyboard Locking Num Lock[12]				√	
132	84	Keyboard Locking Scroll Lock[12]				√	
133	85	Keypad Comma[27]	107				
134	86	Keypad Equal Sign[29]					
135	87	Keyboard International1[15,28]	56				
136	88	Keyboard International2[16]					
137	89	Keyboard International3[17]					
138	8A	Keyboard International4[18]					
139	8B	Keyboard International5[19]					
140	8C	Keyboard International6[20]					
141	8D	Keyboard International7[21]					
142	8E	Keyboard International8[22]					
143	8F	Keyboard International9[22]					
144	90	Keyboard LANG1[25]					
145	91	Keyboard LANG2[26]					
146	92	Keyboard LANG3[30]					
147	93	Keyboard LANG4[31]					
148	94	Keyboard LANG5[32]					
149	95	Keyboard LANG6[8]					
150	96	Keyboard LANG7[8]					
151	97	Keyboard LANG8[8]					
152	98	Keyboard LANG9[8]					
153	99	Keyboard Alternate Erase[7]					
154	9A	Keyboard SysReq/Attention[1]					
155	9B	Keyboard Cancel					
156	9C	Keyboard Clear					
157	9D	Keyboard Prior					
158	9E	Keyboard Return					
159	9F	Keyboard Separator					
160	A0	Keyboard Out					
161	A1	Keyboard Oper					
162	A2	Keyboard Clear/Again					
163	A3	Keyboard CrSel/Props					
164	A4	Keyboard ExSel					
165-223	A5-DF	Reserved					

Usage ID (Dec)	Usage ID (Hex)	Usage Name	Ref: Typical AT-101 Position	PC-AT	Mac	UNIX	Boot
224	E0	Keyboard LeftControl	58	√	√	√	84/101/104
225	E1	Keyboard LeftShift	44	√	√	√	84/101/104
226	E2	Keyboard LeftAlt	60	√	√	√	84/101/104
227	E3	Keyboard Left GUI[10;23]	127	√	√	√	104
228	E4	Keyboard RightControl	64	√	√	√	101/104
229	E5	Keyboard RightShift	57	√	√	√	84/101/104
230	E6	Keyboard RightAlt	62	√	√	√	101/104
231	E7	Keyboard Right GUI[10;24]	128	√	√	√	104
232-255	E8-FF	Reserved					

Footnotes 1-15, 20-29

1 Usage of keys is not modified by the state of the Control, Alt, Shift or Num Lock keys. That is, a key does not send extra codes to compensate for the state of any Control, Alt, Shift or Num Lock keys.

2 Typical language mappings: US: \| Belg: µ`£ FrCa: <}> Dan:'* Dutch: <> Fren:*µ Ger: #' Ital: ù§ LatAm: }`] Nor:,* Span: }Ç Swed: ,* Swiss: $£ UK: #~.

3 Typical language mappings: Belg:<\> FrCa:«°» Dan:<\> Dutch:]|[Fren:<> Ger:<|> Ital:<> LatAm:<> Nor:<> Span:<> Swed:<|> Swiss:<\> UK:\| Brazil: \|.

4 Typically remapped for other languages in the host system.

5 Keyboard Enter and Keypad Enter generate different Usage codes.

6 Typically near the Left-Shift key in AT-102 implementations.

7 Example, Erase-Eaze™ key.

8 Reserved for language-specific functions, such as Front End Processors and Input Method Editors.

9 Reserved for typical keyboard status or keyboard errors. Sent as a member of the keyboard array. Not a physical key.

10 Windows key for Windows 95, and "Compose."

11 Implemented as a non-locking key; sent as member of an array.

12 Implemented as a locking key; sent as a toggle button. Available for legacy support; however, most systems should use the non-locking version of this key.

13 Backs up the cursor one position, deleting a character as it goes.

14 Deletes one character without changing position.

15-20 See additional foot notes below.

21 Toggle Double-Byte/Single-Byte mode.

22 Undefined, available for other Front End Language Processors.

23 Windowing environment key, examples are Microsoft Left Win key, Mac Left Apple key, Sun Left Meta key

24 Windowing environment key, examples are Microsoft® RIGHT WIN key, Macintosh® RIGHT APPLE key, Sun® RIGHT META key.

25 Hangul/English toggle key. This usage is used as an input method editor control key on a Korean language keyboard.

26 Hanja conversion key. This usage is used as an input method editor control key on a Korean language keyboard.

27 Keypad Comma is the appropriate usage for the Brazilian keypad period (.) key. This represents the closest possible match, and system software should do the correct mapping based on the current locale setting.

28 Keyboard International1 should be identified via footnote as the appropriate usage for the Brazilian forward-slash (/) and question-mark (?) key. This usage should also be renamed to either "Keyboard Non-US / and ?" or to "Keyboard International1" now that it's become clear that it does not only apply to Kanji keyboards anymore.

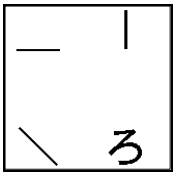
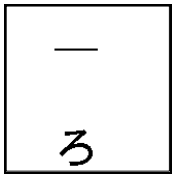
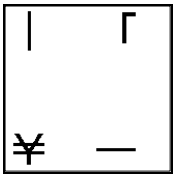
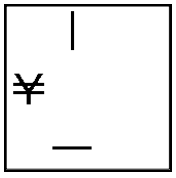
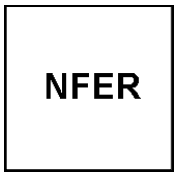
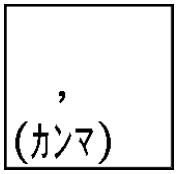
29 Used on AS/400 keyboards.

30 Defines the Katakana key for Japanese USB word-processing keyboards.

31 Defines the Hiragana key for Japanese USB word-processing keyboards.

32 Usage 0x94 (Keyboard LANG5) "Defines the Zenkaku/Hankaku key for Japanese USB word-processing keyboards.

Footnotes 15–20

Note	AT-104	DOS/V-109 (suggested)	PC98 (suggested)
15	No function		
16	No function		
17	No function		
18	No function		
19	No function		
20	No function	No function	

10 LED Page (0x08)

An LED or indicator is implemented as an On/Off Control (OOF) using the “Single button toggle” mode, where a value of 1 will turn on the indicator, and a value of 0 will turn it off. The exceptions are described below.

Table 11: LED Usage Page

Usage ID	Usage Name	Usage Type	Section
00	Undefined		
01	Num Lock	OOC	10.1
02	Caps Lock	OOC	10.1
03	Scroll Lock	OOC	10.1
04	Compose	OOC	10.1
05	Kana	OOC	10.1
06	Power	OOC	10.6
07	Shift	OOC	10.1
08	Do Not Disturb	OOC	10.2
09	Mute	OOC	10.3
0A	Tone Enable	OOC	10.3
0B	High Cut Filter	OOC	10.3
0C	Low Cut Filter	OOC	10.3
0D	Equalizer Enable	OOC	10.3
0E	Sound Field On	OOC	10.3
0F	Surround On	OOC	10.3
10	Repeat	OOC	10.3
11	Stereo	OOC	10.3
12	Sampling Rate Detect	OOC	10.3
13	Spinning	OOC	10.4
14	CAV	OOC	10.3
15	CLV	OOC	10.3
16	Recording Format Detect	OOC	10.4
17	Off-Hook	OOC	10.2
18	Ring	OOC	10.2
19	Message Waiting	OOC	10.2
1A	Data Mode	OOC	10.2
1B	Battery Operation	OOC	10.6
1C	Battery OK	OOC	10.6
1D	Battery Low	OOC	10.6
1E	Speaker	OOC	10.2
1F	Head Set	OOC	10.2
20	Hold	OOC	10.2

Usage ID	Usage Name	Usage Type	Section
21	Microphone	OOC	10.2
22	Coverage	OOC	10.2
23	Night Mode	OOC	10.2
24	Send Calls	OOC	10.2
25	Call Pickup	OOC	10.2
26	Conference	OOC	10.2
27	Stand-by	OOC	10.6
28	Camera On	OOC	10.3
29	Camera Off	OOC	10.3
2A	On-Line	OOC	10.6
2B	Off-Line	OOC	10.6
2C	Busy	OOC	10.6
2D	Ready	OOC	10.6
2E	Paper-Out	OOC	10.5
2F	Paper-Jam	OOC	10.5
30	Remote	OOC	10.6
31	Forward	OOC	10.4
32	Reverse	OOC	10.4
33	Stop	OOC	10.4
34	Rewind	OOC	10.4
35	Fast Forward	OOC	10.4
36	Play	OOC	10.4
37	Pause	OOC	10.4
38	Record	OOC	10.4
39	Error	OOC	10.6
3A	**Usage Selected Indicator**	US	10.6
3B	**Usage In Use Indicator**	US	10.6
3C	**Usage Multi Mode Indicator**	UM	10.6
3D	Indicator On	Sel	10.6
3E	Indicator Flash	Sel	10.6
3F	Indicator Slow Blink	Sel	10.6
40	Indicator Fast Blink	Sel	10.6
41	Indicator Off	Sel	10.6
42	Flash On Time	DV	10.6
43	Slow Blink On Time	DV	10.6
44	Slow Blink Off Time	DV	10.6
45	Fast Blink On Time	DV	10.6
46	Fast Blink Off Time	DV	10.6
47	**Usage Indicator Color**	UM	10.6

Usage ID	Usage Name	Usage Type	Section
48	Indicator Red	Sel	10.6
49	Indicator Green	Sel	10.6
4A	Indicator Amber	Sel	10.6
4B	Generic Indicator	OOC	10.6
4C	System Suspend	OOC	10.6
4D	External Power Connected	OOC	10.6
4E-FFFF	Reserved		

Note The **Usage Selected Indicator**, **Usage In Use Indicator**, and **Usage Multi Mode Indicator** usages can change the usage type of the usage(s) that they contain.

10.1 Keyboard Indicators

Num Lock	OOC – Indicates that Number Lock is enabled.
Caps Lock	OOC – Indicates that Capital Lock is enabled.
Scroll Lock	OOC – Indicates that Scroll Lock is enabled.
Compose	OOC – Indicates that composition mode is enabled.
Kana	OOC – Indicates that Kana mode is enabled.
Shift	OOC – Indicates that the Shift function is enabled.

10.2 Telephony Indicators

Do Not Disturb	OOC – (Phone) Indicates that the phone is not accepting incoming calls.
Off-Hook	OOC – (Phone) Indicates that the handset is off-hook.
Ring	OOC – (Phone) Indicates visually that a phone is ringing.
Message Waiting	OOC – (Phone, answering machine) Indicates that a message has been recorded and has not yet been heard.
Data Mode	OOC – (Phone) Indicates that the phone is in a mode that transfers data (rather than voice).
Speaker	OOC – (Phone) Indicates that the phone is using the speaker/microphone instead of a handset or headset.
Head Set	OOC – (Phone) Indicates that the phone is using the headset instead of a handset or speaker/microphone.
Hold	OOC – (Phone) Indicates that the caller is on hold.
Microphone	OOC – (Phone) Indicates that the microphone has been muted.
Coverage	OOC – (Phone) Indicates that incoming calls are forwarded to a covering station.
Night Mode	OOC – (Phone) Indicates that the phone is in after-hours mode.
Send Calls	OOC – (Phone) Indicates that incoming calls are forwarded to another station.

Call Pickup	OOC – (Phone) Indicates that a call in the user's pickup group has been accepted. Pickup groups associate phones in an area. They allow a ringing phone to be picked up by any other phone in the group.
Conference	OOC – (Phone) Indicates that the phone is in conference call mode.

10.3 Consumer Indicators

Mute	OOC – Indicates that amplifier audio output is shut off.
Tone Enable	OOC – Indicates that tone controls are functional.
High Cut Filter	OOC – Indicates that the high cut filter is enabled.
Low Cut Filter	OOC – Indicates that the low cut filter is enabled.
Equalizer Enable	OOC – Indicates that tone shape processing is active.
Sound Field On	OOC – Indicates that DSP processing is active.
Surround On	OOC – Indicates that surround channel information is being decoded.
Repeat	OOC – Indicates that the playback device is in repeat mode.
Stereo	OOC – Indicates that the signal currently being received by the tuner is in stereo.
Sampling Rate Detect	OOC – Indicates that a digital audio signal has been detected.
CAV	OOC – Indicates that the video disc media is in Constant Angular Velocity format.
CLV	OOC – Indicates that the video disc media is in Constant Linear Velocity format.
Camera On	OOC – Indicates that the camera is recording images.
Camera Off	OOC – Indicates that the camera is powered but not recording images.

10.4 Media Transport Indicators

Spinning	OOC – Indicates that disc media is up to the speed required for playback/read.
Recording Format Detect	OOC – Indicates that a valid recording format has been detected.
Stop	OOC – Indicates that a device's media transport mechanism has been disengaged.
Forward	OOC – Indicates that a device's media transport mechanism or a device is in forward mode.
Reverse	OOC – Indicates that a device's media transport mechanism or a device is in reverse mode.
Rewind	OOC – Indicates that a device's media transport mechanism is in rewind mode.
Fast Forward	OOC – Indicates that a device's media transport mechanism is in fast forward mode.

Play	OOC – Indicates that a device's media transport mechanism is in playback mode. This indicator may also be true when a device is recording.
Pause	OOC – Indicates that a device's media transport mechanism has been paused while playing back or recording.
Record	OOC – Indicates that a device's media transport mechanism is in record mode.

10.5 Printer Indicators

Paper-Out	OOC – Indicates that the device is out of paper.
Paper-Jam	OOC – Indicates that a paper jam has occurred in the device and operator intervention is required.

10.6 General Device Indicators

Power	OOC – Indicates that the device is powered.
Stand-by	OOC – Indicates that the device is in standby mode.
On-Line	OOC – Indicates that the device is online.
Off-Line	OOC – Indicates that the device is offline.
Busy	OOC – Indicates that the device is busy executing operations.
Ready	OOC – Indicates that the device is ready to execute operations.
Remote	OOC – Indicates that the device is being controlled remotely.
Error	OOC – Indicates that an error has occurred on the device.
Battery Operation	OOC – Indicates that the device is currently battery powered.
Battery OK	OOC – Indicates that the battery is in a nominal charge state.
Battery Low	OOC – Indicates that the battery is in a low charge state.
Usage Selected Indicator	US – This collection allows the usages that it contains to be associated with a visual output (an LED) that indicates whether a control identified by the usage is selected. **Usage Selected Indicator** is a 1-bit field where 1 is selected and 0 is not selected. All usages found in this collection will be treated as On/Off Controls (OOC).
Usage In Use Indicator	US – This collection allows the usages that it contains to be associated with a visual output (an LED) that indicates whether a control identified by the usage is in use. **Usage In Use Indicator** is a 1-bit field where 1 is in use and 0 is not in use. All usages found in this collection will be treated as On/Off Controls (OOC).

Usage Multi Mode Indicator[2]	UM – This usage names a logical collection which must be contained in another collection. The usage attached to the encompassing collection is then identified as an indicator that supports multiple illumination modes. In this collection one or more of the following Indicator selectors will be found: On, Flash, Slow Blink, Fast Blink, and Off.
Indicator On	Sel – Light indicator continuously.
Indicator Flash	Sel – Single, momentary illumination of indicator.
Indicator Slow Blink	Sel – Continuous flashing of the indicator at a slow rate.
Indicator Fast Blink	Sel – Continuous flashing of the indicator at a fast rate.
Indicator Off	Sel – Turn indicator illumination off.
Flash On Time	DV – Duration that the indicator is illuminated in flash mode.
Slow Blink On Time	DV – Duration that the indicator is illuminated in slow blink mode.
Slow Blink Off Time	DV – Duration that the indicator is off in slow blink mode.
Fast Blink On Time	DV – Duration that the indicator is illuminated in fast blink mode.
Fast Blink Off Time	DV – Duration that the indicator is off in fast blink mode.
Usage Indicator Color[2]	UM – This collection allows the usage that contains it to be an indicator that supports multiple colors. All usages found in this collection will be treated as a Selectors (Sel) where one or more of the following Indicator selectors will be found: Red, Green, and Amber.
Indicator Red	Sel – Indicator color set to Red.
Indicator Green	Sel – Indicator color set to Green.
Indicator Amber	Sel – Indicator color set to Amber. This is typically implemented by asserting Red and Green simultaneously.
Generic Indicator	OOC – This usage identifies an indicator that has no permanently assigned function.
System Suspend	OOC – Indicates that the system is in a low power state, but is still powered and retaining some context.
External Power Connected	OOC – Indicates that a battery-operated system is connected to external power.

[2] An indicator can support Multi Mode features and multiple colors simultaneously. To tie these functions together, they can be wrapped in a logical collection where the usage that is attached to the collection defines the purpose of the control.

11 Button Page (0x09)

The Button page is the first place an application should look for user selection controls. System graphical user interfaces typically employ a pointer and a set of hierarchical selectors to select, move and otherwise manipulate their environment. For these purposes the following assignment of significance can be applied to the Button usages:

- Button 1, Primary Button. Used for object selecting, dragging, and double click activation. On MacOS, this is the only button. Microsoft operating systems call this a logical left button, because it is not necessarily physically located on the left of the pointing device.
- Button 2, Secondary Button. Used by newer graphical user interfaces to browse object properties. Exposed by systems to applications that typically assign application-specific functionality.
- Button 3, Tertiary Button. Optional control. Exposed to applications, but seldom assigned functionality due to prevalence of two- and one-button devices.
- Buttons 4 – 255. As the button number increases, its significance as a selector decreases.

In many ways the assignment of button numbers is similar to the assignment of **Effort** in **Physical** descriptors. Button 1 would be used to define the button a finger rests on when the hand is in the "at rest" position, that is, virtually no effort is required by the user to activate the button. Button values increment as the finger has to stretch to reach a control. See Section 6.2.3, "Physical Descriptors," in the HID Specification for methods of further qualifying buttons.

Table 12: Button Usage Page

Usage ID	Usage Name	Usage Type
00	No button pressed	See Note
01	Button 1 (primary/trigger)	See Note
02	Button 2 (secondary)	See Note
03	Button 3 (tertiary)	See Note
04	Button 4	See Note
...	...	
FFFF	Button 65535	See Note

Note Buttons can be defined as Selectors (Sel), On/Off Controls (OOC), Momentary Controls (MC) or One-Shot Controls (OSC) depending on the context of their declaration.

When defining buttons as selectors, usage ID 0 is defined to indicate that no buttons are pressed. When declaring an array of buttons one can:

- Declare all buttons of interest, include the usage No Button Pressed, set the No Null Position flag, and declare a **Logical Minimum** of 0.
- Only declare the buttons of interest, set the Null State flag, and declare a **Logical Minimum** of 1. In this case the 0 value is out of range or Null, and is interpreted as No Buttons Pressed.

In either case, by convention, a device that returns a value of 0 for an Array should be indicating that no button is pressed. Radio buttons are an exception to this rule because one button is always valid. For an example, see Section A.3.1, "Mechanically Linked Radio Buttons" in Appendix A, "Usage Examples."

12 Ordinal Page (0x0A)

The Ordinal page allows multiple instances of a control or sets of controls to be declared without requiring individual enumeration in the native usage page. For example, it is not necessary to declare usages of Pointer 1, Pointer 2, and so forth on the Generic Desktop page. When parsed, the ordinal instance number is, in essence, concatenated to the usages attached to the encompassing collection to create Pointer 1, Pointer 2, and so forth.

For an example, see Section A.5, "Multiple Instances of a Control," in Appendix A, "Usage Examples."

By convention, an Ordinal collection is placed inside the collection for which it is declaring multiple instances.

Instances do not have to be identical.

Table 13: Ordinal Usage Page

Usage ID	Usage Name	Usage Type
00	Reserved	
01	Instance 1	UM
02	Instance 2	UM
03	Instance 3	UM
04	Instance 4	UM
...	...	
FFFF	Instance 65535	UM

13 Telephony Device Page (0x0B)

This usage page defines the keytop and control usages for telephony devices.

Indicators on a phone are handled by wrapping them in LED: **Usage In Use Indicator** and LED: **Usage Selected Indicator** usages. For example, a message-indicator LED would be identified by a Telephony: Message usage declared as a **Feature** or **Output** in a LED: **Usage In Use Indicator** collection.

See Section 14, “Consumer Page (0x0C),” for audio volume and tone controls.

Table 14: Telephony Usage Page

Usage ID	Usage Name	Usage Type	Section
00	Unassigned		
01	**Phone**	CA	13.1
02	**Answering Machine**	CA	13.1
03	**Message Controls**	CL	13.1
04	**Handset**	CL	13.1
05	**Headset**	CL	13.1
06	**Telephony Key Pad**	NAry	13.2
07	**Programmable Button**	NAry	13.2
08-1F	Reserved		
20	Hook Switch	OOC	13.3
21	Flash	MC	13.3
22	Feature	OSC	13.3
23	Hold	OOC	13.3
24	Redial	OSC	13.3
25	Transfer	OSC	13.3
26	Drop	OSC	13.3
27	Park	OOC	13.3
28	Forward Calls	OOC	13.3
29	Alternate Function	MC	13.3
2A	Line	OSC	13.3
2B	Speaker Phone	OOC	13.3
2C	Conference	OOC	13.3
2D	Ring Enable	OOC	13.3
2E	Ring Select	OSC	13.3
2F	Phone Mute	OOC	13.3
30	Caller ID	MC	13.3
31-4F	Reserved		
50	Speed Dial	OSC	13.4
51	Store Number	OSC	13.4
52	Recall Number	OSC	13.4

Usage ID	Usage Name	Usage Type	Section
53	Phone Directory	OOC	13.4
54-6F	Reserved		
70	Voice Mail	OOC	13.5
71	Screen Calls	OOC	13.5
72	Do Not Disturb	OOC	13.5
73	Message	OSC	13.5
74	Answer On/Off	OOC	13.5
75-8F	Reserved		
90	Inside Dial Tone	MC	13.6
91	Outside Dial Tone	MC	13.6
92	Inside Ring Tone	MC	13.6
93	Outside Ring Tone	MC	13.6
94	Priority Ring Tone	MC	13.6
95	Inside Ringback	MC	13.6
96	Priority Ringback	MC	13.6
97	Line Busy Tone	MC	13.6
98	Reorder Tone	MC	13.6
99	Call Waiting Tone	MC	13.6
9A	Confirmation Tone 1	MC	13.6
9B	Confirmation Tone 2	MC	13.6
9C	Tones Off	OOC	13.6
9D	Outside Ringback	MC	13.6
9E-AF	Reserved		
B0	Phone Key 0	Sel/OSC	13.7
B1	Phone Key 1	Sel/OSC	13.7
B2	Phone Key 2	Sel/OSC	13.7
B3	Phone Key 3	Sel/OSC	13.7
B4	Phone Key 4	Sel/OSC	13.7
B5	Phone Key 5	Sel/OSC	13.7
B6	Phone Key 6	Sel/OSC	13.7
B7	Phone Key 7	Sel/OSC	13.7
B8	Phone Key 8	Sel/OSC	13.7
B9	Phone Key 9	Sel/OSC	13.7
BA	Phone Key Star	Sel/OSC	13.7
BB	Phone Key Pound	Sel/OSC	13.7
BC	Phone Key A	Sel/OSC	13.7
BD	Phone Key B	Sel/OSC	13.7
BE	Phone Key C	Sel/OSC	13.7
BF	Phone Key D	Sel/OSC	13.7

Usage ID	Usage Name	Usage Type	Section
C0-FFFF	Reserved		

13.1 Telephony Devices

Phone CA – An application-level collection that identifies a device containing telephone controls.

Answering Machine CA – An application level collection that identifies a device containing primarily voice mail or answering machine controls.

Message Controls CL – Usages related to voice mail controls.

Handset CL – Usages related to the handle-shaped part of a telephone, containing the audio receiver and transmitter.

Headset CL – Usages related to the telephone headset (headphones and microphone), containing the audio receiver and transmitter.

13.2 Key Pad

Telephony Key Pad NAry – A collection usage for a standard telephony key pad (dial buttons 1 to 9, *, 0, and #). A **Telephony Key Pad** implies that the keytops are marked with a digit and associated alphabetic characters. This collection can also be used as a general-purpose 1 to 9 and 0 keypad.

There are two options for describing the buttons in a **Telephony Key Pad**:

1. Use the Telephony Keypad usages defined in Section 13.7 , “Phone Keypad.”

2. Define usages for dial digits from the Button page, where dial buttons are assigned to Button page buttons according to the rules shown in Table 15.

Table 15: Dial Button Assignments

Button usage	Dial button	Keytop label
Button 1	0	‘0’ & ‘Oper’
Button 2	1	‘1’
Button 3	2	‘2’ & ‘ABC’
Button 4	3	‘3’ & ‘DEF’
Button 5	4	‘4’ & ‘GHI’
Button 6	5	‘5’ & ‘JKL’
Button 7	6	‘6’ & ‘MNO’
Button 8	7	‘7’ & ‘PQRS’
Button 9	8	‘8’ & ‘TUV’
Button 10	9	‘9’ & ‘WXYZ’
Button 11	Star	‘*’
Button 12	Pound	‘#’
Button 13	A	

Button usage	Dial button	Keytop label
Button 14	B	
Button 15	C	
Button 16	D	

Programmable Button NAry – Programmable telephone button. This collection is enumerated using usages from the Button page.

13.3 Call Control

Hook Switch	OOC – Indicates that the handset is Off Hook. Hook Switch is a single bit where 1 is Off Hook.
Flash	MC – Generates a momentary On Hook condition to signal the application. Often used for alternate line selection.
Feature	OSC – Selects operating feature.
Hold	OOC – Places current call on hold.
Redial	OSC – Redials last number dialed.
Transfer	OSC – Transfers call to another extension.
Drop	OSC – Disconnects the active call.
Park	OOC – Waits for free line.
Forward Calls	OOC – Forwards calls to another number.
Alternate Function	MC – A modifier key, similar to a Shift key, that provides an alternate function to be selected on specific buttons. Pressing this button enables the alternate function mapping. Pressing an alternate function key terminates alternate-function mode.
Line	OSC – Line selection.
Speaker Phone	OOC – Enables speaker phone mode.
Conference	OOC – Initiates conference call.
Ring Enable	OOC – Enables ringer.
Ring Select	OSC – Selects ring tone. Typically, the caller presses Ring Select, then presses a dial digit to select the tone.
Phone Mute	OOC – Disables audio to the called person. The caller can still hear the incoming audio.
Caller ID	MC – Displays ID of caller.

13.4 Speed Dial Controls

Speed Dial	OSC – Initiates speed dial operation.
Store Number	OSC – Saves speed dial number.
Recall Number	OSC – Recalls speed dial number on display.

Phone Directory	OOC – Displays phone directory.

13.5 Voice Mail Controls

Voice Mail	OOC – Enters voice mail application.
Screen Calls	OOC – Disables audio to called person and forwards calls to a voice mail application. The caller can still hear the incoming audio
Do Not Disturb	OOC – Disables ring and speaker phone operation and forwards calls to a voice mail application.
Message	OSC – Listens to voice message.
Answer On/Off	OOC – Toggles answering machine operation.

13.6 Locally Generated Tones

Some telephony devices generate tones locally vs. delivering transmitted tones over the audio input. These tones are played to the user via either the handset speaker or the speaker in a speakerphone telephone.

Inside Dial Tone	MC – The telephone is ready to place an inside call.
Outside Dial Tone	MC – The telephone is ready to place an outside call.
Inside Ring Tone	MC – An in-house destination telephone is ringing.
Outside Ring Tone	MC – An outside destination telephone is ringing.
Priority Ring Tone	MC – A destination telephone which is ringing as a result of a programmable function.
Inside Ringback	MC – A ringback feature has been activated to an inside line.[3]
Outside Ringback	MC – A ringback feature has been activated to an outside line.
Priority Ringback	MC – A priority ringback feature has been activated.
Line Busy Tone	MC – The destination line is currently busy.
Reorder Tone	MC – There are no lines available for the user to place a call.
Call Waiting Tone	MC – The user is currently on a line, and another phone call is coming in.
Confirmation Tone 1	MC – A feature the user has requested has been enabled.
Confirmation Tone 2	MC – A feature the user has requested has been enabled.
Tones Off	OOC – Turn all tones off.

13.7 Phone Keypad

The phone keypad is defined here because of its unique keytop markings. Phone Keys can be used as selectors (Sel) or as one-shot controls (OSC).

Phone Key 0	Sel/OSC – Phone key digit 0 and Oper.

[3] Ringback is a feature that a user could invoke when the destination is busy. Once the destination hangs up its current call, the destination's phone "places a call" to the original user.

Phone Key 1	Sel/OSC – Phone key digit 1.
Phone Key 2	Sel/OSC – Phone key digit 2 and A, B, C.
Phone Key 3	Sel/OSC – Phone key digit 3 and D, E, F.
Phone Key 4	Sel/OSC – Phone key digit 4 and G, H, I.
Phone Key 5	Sel/OSC – Phone key digit 5 and J, K, L.
Phone Key 6	Sel/OSC – Phone key digit 6 and M, N, O.
Phone Key 7	Sel/OSC – Phone key digit 7 and P, Q (optional), R, S.
Phone Key 8	Sel/OSC – Phone key digit 8 and T, U, V.
Phone Key 9	Sel/OSC – Phone key digit 9 and W, X, Y, Z (optional).
Phone Key Star	Sel/OSC – Phone key Star (*).
Phone Key Pound	Sel/OSC – Phone key Pound (#).
Phone Key A	Sel/OSC – Phone key A
Phone Key B	Sel/OSC – Phone key B
Phone Key C	Sel/OSC – Phone key C
Phone Key D	Sel/OSC – Phone key D

14 Consumer Page (0x0C)

All controls on the Consumer page are application-specific. That is, they affect a specific device, not the system as a whole.

Table 16: Consumer Usage Page

Usage ID	Usage Name	Usage Type	Section
00	Unassigned		
01	**Consumer Control**	CA	0
02	**Numeric Key Pad**	NAry	14.2
03-1F	Reserved		
20	+10	OSC	14.2
21	+100	OSC	14.2
22	AM/PM	OSC	14.2
23-3F	Reserved		
30	Power	OOC	14.3
31	Reset	OSC	14.3
32	Sleep	OSC	14.3
33	Sleep After	OSC	14.3
34	Sleep Mode	RTC	14.3
35	Illumination	OOC	14.3
36	**Function Buttons**	NAry	14.3
37-3F	Reserved		
40	Menu	OOC	14.4
41	Menu Pick	OSC	14.4
42	Menu Up	OSC	14.4
43	Menu Down	OSC	14.4
44	Menu Left	OSC	14.4
45	Menu Right	OSC	14.4
46	Menu Escape	OSC	14.4
47	Menu Value Increase	OSC	14.4
48	Menu Value Decrease	OSC	14.4
49-5F	Reserved		
60	Data On Screen	OOC	14.5
61	Closed Caption	OOC	14.5
62	Closed Caption Select	OSC	14.5
63	VCR/TV	OOC	14.5
64	Broadcast Mode	OSC	14.5
65	Snapshot	OSC	14.5
66	Still	OSC	14.5
67-7F	Reserved		

Usage ID	Usage Name	Usage Type	Section
80	**Selection**	NAry	14.6
81	Assign Selection	OSC	14.6
82	Mode Step	OSC	14.6
83	Recall Last	OSC	14.6
84	Enter Channel	OSC	14.6
85	Order Movie	OSC	14.6
86	Channel	LC	14.6
87	**Media Selection**	NAry	14.6
88	Media Select Computer	Sel	14.6
89	Media Select TV	Sel	14.6
8A	Media Select WWW	Sel	14.6
8B	Media Select DVD	Sel	14.6
8C	Media Select Telephone	Sel	14.6
8D	Media Select Program Guide	Sel	14.6
8E	Media Select Video Phone	Sel	14.6
8F	Media Select Games	Sel	14.6
90	Media Select Messages	Sel	14.6
91	Media Select CD	Sel	14.6
92	Media Select VCR	Sel	14.6
93	Media Select Tuner	Sel	14.6
94	Quit	OSC	14.6
95	Help	OOC	14.6
96	Media Select Tape	Sel	14.6
97	Media Select Cable	Sel	14.6
98	Media Select Satellite	Sel	14.6
99	Media Select Security	Sel	14.6
9A	Media Select Home	Sel	14.6
9B	Media Select Call	Sel	14.6
9C	Channel Increment	OSC	14.6
9D	Channel Decrement	OSC	14.6
9E	Media Select SAP	Sel	**Error! Reference source not found.**
9F	Reserved		
A0	VCR Plus	OSC	14.6
A1	Once	OSC	14.6
A2	Daily	OSC	14.6
A3	Weekly	OSC	14.6
A4	Monthly	OSC	14.6

Usage ID	Usage Name	Usage Type	Section
A5-AF	Reserved		
B0	Play	OOC	14.7
B1	Pause	OOC	14.7
B2	Record	OOC	14.7
B3	Fast Forward	OOC	14.7
B4	Rewind	OOC	14.7
B5	Scan Next Track	OSC	14.7
B6	Scan Previous Track	OSC	14.7
B7	Stop	OSC	14.7
B8	Eject	OSC	14.7
B9	Random Play	OOC	14.7
BA	**Select Disc**	NAry	14.7
BB	Enter Disc	MC	14.7
BC	Repeat	OSC	14.7
BD	Tracking	LC	14.7
BE	Track Normal	OSC	14.7
BF	Slow Tracking	LC	14.7
C0	Frame Forward	RTC	14.7
C1	Frame Back	RTC	14.7
C2	Mark	OSC	14.8
C3	Clear Mark	OSC	14.8
C4	Repeat From Mark	OOC	14.8
C5	Return To Mark	OSC	14.8
C6	Search Mark Forward	OSC	14.8
C7	Search Mark Backwards	OSC	14.8
C8	Counter Reset	OSC	14.8
C9	Show Counter	OSC	14.8
CA	Tracking Increment	RTC	14.7
CB	Tracking Decrement	RTC	14.7
CC	Stop/Eject	OSC	14.7
CD	Play/Pause	OSC	14.7
CE	Play/Skip	OSC	14.7
CF-DF	Reserved		
E0	Volume	LC	14.9.1
E1	Balance	LC	14.9.2
E2	Mute	OOC	14.9.1
E3	Bass	LC	14.9.3
E4	Treble	LC	14.9.4
E5	Bass Boost	OOC	14.9.3

Usage ID	Usage Name	Usage Type	Section
E6	Surround Mode	OSC	14.9.5
E7	Loudness	OOC	14.9.5
E8	MPX	OOC	14.9.5
E9	Volume Increment	RTC	14.9.1
EA	Volume Decrement	RTC	14.9.1
EB-EF	Reserved		
F0	Speed Select	OSC	14.10
F1	**Playback Speed**	NAry	14.10
F2	Standard Play	Sel	14.10
F3	Long Play	Sel	14.10
F4	Extended Play	Sel	14.10
F5	Slow	OSC	14.10
F6-FF	Reserved		
100	Fan Enable	OOC	14.11
101	Fan Speed	LC	14.11
102	Light Enable	OOC	14.11
103	Light Illumination Level	LC	14.11
104	Climate Control Enable	OOC	14.11
105	Room Temperature	LC	14.11
106	Security Enable	OOC	14.11
107	Fire Alarm	OSC	14.11
108	Police Alarm	OSC	14.11
109-14F	Reserved		
150	Balance Right	RTC	14.9.2
151	Balance Left	RTC	14.9.2
152	Bass Increment	RTC	14.9.3
153	Bass Decrement	RTC	14.9.3
154	Treble Increment	RTC	14.9.4
155	Treble Decrement	RTC	14.9.4
156-15F	Reserved		
160	**Speaker System**	CL	14.12
161	**Channel Left**	CL	14.12
162	**Channel Right**	CL	14.12
163	**Channel Center**	CL	14.12
164	**Channel Front**	CL	14.12
165	**Channel Center Front**	CL	14.12
166	**Channel Side**	CL	14.12
167	**Channel Surround**	CL	14.12

Usage ID	Usage Name	Usage Type	Section
168	**Channel Low Frequency Enhancement**	CL	14.12
169	**Channel Top**	CL	14.12
16A	**Channel Unknown**	CL	14.12
16B-16F	Reserved		
170	Sub-channel	LC	14.13
171	Sub-channel Increment	OSC	14.13
172	Sub-channel Decrement	OSC	14.13
173	Alternate Audio Increment	OSC	14.13
174	Alternate Audio Decrement	OSC	14.13
175-FFFF	Reserved		

14.1 Generic Consumer Control Device

Consumer Control CA – General consumer control device.

14.2 Numeric Key Pad

Numeric Key Pad NAry – A collection usage for a generic numeric keypad. On a consumer device these are commonly used for channel selection. Usages for digits can be found on the Button page where numeric values starting with 0 are assigned to Button 1, numeric value 1 to Button 2, and so on.

+10 OSC – Increments channel by 10.

+100 OSC – Increments channel by 100.

AM/PM OSC – Toggles between AM and PM for time entry.

14.3 General Controls

Power OOC – Controls the application-specific power state. For global power control, see System Controls on the Generic Desktop Usage page.

Reset OSC – Resets the device. All volatile settings revert to the defaults.

Sleep OSC – Initiates low power state on application-specific device now.

Sleep After OSC – Sets inactivity timeout to a value. The Sleep After button will be followed with the timeout value in minutes entered on a numeric keypad.

Sleep Mode RTC – Cycle through available sleep delays, such as no sleeping, 5 minutes, 10 minutes, 30 minutes, etc. The last selected mode will be enabled.

Illumination OOC – Toggles illumination of consumer control's buttons and controls on/off.

Function Buttons NAry – A collection usage for generic function buttons. On a consumer device, these are commonly used for user-assigned functions. Usages for function buttons can be found on the Button page where Function Button 1 is assigned to Button 1, Function Button 2 to Button 2, and so on.

14.4 Menu Controls

Menu	OOC – Initiates on-device-display main menu. Sets a mode in which the other menu controls are active. In this mode, a subsequent menu press will cancel the mode.
Menu Pick	OSC – Picks an item from an on-screen menu.
Menu Up	OSC – Moves the selection up in a device-displayed menu.
Menu Down	OSC – Moves the selection down in a device-displayed menu.
Menu Left	OSC – Moves the selection left in a device-displayed menu.
Menu Right	OSC – Moves the selection right in a device-displayed menu.
Menu Escape	OSC – Backs up a level in the on-screen menu system.
Menu Value Increase	OSC – Increments the value of the currently selected menu item. For example, after using a menu to select a volume control, the user can modify the volume level using this control.
Menu Value Decrease	OSC – Decrements the value of the currently selected menu item.

14.5 Display Controls

Data On Screen	OOC – Superimposes state data on the monitor video. Typically, channel information is displayed.
Closed Caption	OOC – Enables closed-caption display.
Closed Caption Select	OSC – Cycles through closed-caption viewing options.
VCR/TV	OOC – Selects a recording source for VCR.
Broadcast Mode	OSC – Cycles between available broadcast modes, such as Broadcast, CATV, etc. The last selected mode is enabled.
Snapshot	OSC – Captures the screen or image of the currently selected window.
Still	OSC – Pauses playback in the currently selected window.

14.6 Selection Controls

Selection	NAry – A collection usage for a number of discrete selections. On a consumer device, these are commonly used for “favorite” selections. Usages for the selections can be found on the Button page where the choices are assigned to Button 1 and so on.
Assign Selection	OSC – This button works in conjunction with the **Selection** usage. To assign the current channel or mode to a selection button, the user presses the Assign Selection button followed by a button in the **Selection** named array.
Mode Step	OSC – Steps through devices (TV, VCR, cable) in a multi-mode remote.
Recall Last	OSC – Returns to the last selected channel or mode.
Enter Channel	OSC – Interprets the previous number entry as channel information.
Order Movie	OSC – Requests pay-per-view entertainment.
Channel	LC – Channel selection control where the range of possible values is equal to

	the number of channels supported by the device.
Channel Increment	OSC – Channel control where each activation of the control increments the current channel selection to the next available channel.
Channel Decrement	OSC – Channel control where each activation of the control decrements the current channel selection to the next available channel.
VCR Plus	OSC – Initiates (and optionally terminates) VCR Plus code entry mode.

The controls Once, Daily, Weekly, and Monthly are typically used for programming record operations.

Once	OSC – Performs the operation once.
Daily	OSC – Performs the operation once a day.
Weekly	OSC – Performs the operation once a week.
Monthly	OSC – Performs the operation once a month.
Media Selection	NAry – Identifies the media source to be manipulated or displayed. This collection will contain one of the following Media Select usages.
Media Select Computer	Sel – Selects the computer display.
Media Select TV	Sel – Selects the television display.
Media Select WWW	Sel – Selects World Wide Web access.
Media Select DVD	Sel – Selects the DVD drive.
Media Select Telephone	Sel – Selects telephone mode.
Media Select Program Guide	Sel – Selects the viewing guide.
Media Select Video Phone	Sel – Selects videophone mode.
Media Select Games	Sel – Selects gaming mode.
Media Select Messages	Sel – Selects message mode.
Media Select CD	Sel – Selects the CD drive.
Media Select VCR	Sel – Selects the VCR.
Media Select Tuner	Sel – Selects the tuner.
Media Select Tape	Sel – Select the audio tape.
Media Select Cable	Sel – Selects the cable receiver.
Media Select Satellite	Sel – Selects the satellite receiver.
Media Select Security	Sel – Selects the security status display.
Media Select Home	Sel – Selects the home system status display.
Media Select Call	Sel – Selects the telephone call status display.
Quit	OSC – Exits the current mode.
Help	OOC – Displays the help screen.

14.7 Transport Controls

Play	OOC – Begins streaming linear media.
Pause	OOC – Stops streaming linear media.
Record	OOC – Initiates transferring input data to media.
Fast Forward	OOC – Initiates fast forward scan of linear media.
Rewind	OOC – Initiates fast reverse scan of linear media.
Scan Next Track	OSC – Moves to the next chapter or track boundary.
Scan Previous Track	OSC – Moves to the previous chapter or track boundary.
Stop	OSC – Halts scanning, streaming, or recording linear media.
Eject	OSC – Removes media from the player.
Stop/Eject	OSC – If linear media is scanning, streaming, or recording, stops the media stream. If linear media is halted, removes the media from the player.
Play/Pause	OSC – If linear media is scanning, streaming, or recording, momentarily stops the media stream. If linear media is paused, resumes streaming.
Play/Skip	OSC – If linear media is halted, begins streaming. If linear media is already streaming, advances to the next channel.
Random Play	OOC – Random selection of tracks.
Repeat	OSC – Repeat selection of tracks.
Select Disc	NAry – Attached to a collection that defines the selection of one of many disks. The allowed disk numbers are enumerated with the declaration of ordinals in the **Select Disc** named array.
Enter Disc	MC – This button works in conjunction with the **Numeric Key Pad** usage. To select a disk, the user presses the Enter Disc button followed by the entry of the desired disc number on the numeric key pad.
Tracking	LC – Adjusts media tracking.
Tracking Increment	RTC – Asserting this control increments the current value of media tracking until the maximum value is reached. Typically implemented as a single button.
Tracking Decrement	RTC – Asserting this control decrements the current value of media tracking until the minimum value is reached. Typically implemented as a single button.
Track Normal	OSC – Sets media tracking to default or automatic value.
Slow Tracking	LC – Adjusts media slow tracking.
Frame Forward	RTC – Moves forward one video frame.
Frame Back	RTC – Moves back one video frame.

14.8 Search Controls

Search controls either place a physical flag, index or mark on the magnetic media, or use the position or frame counter to flag points of interest. The search controls allow identifying and moving between these points of interest.

Mark	OSC – Marks a reference point on the media. Synonymous with the “counter memory” function found on some transport devices.
Clear Mark	OSC – Removes a marked reference point from the media.
Repeat From Mark	OOC – Marks the current position as the end of the block and repeat-plays the block starting from the marked beginning of the block.
Return To Mark	OSC – Positions at the last detected mark and plays.
Search Mark Forward	OSC – Searches forward for a mark.
Search Mark Backwards	OSC – Searches backward for a mark.
Counter Reset	OSC – Resets the time, position, or frame counter.
Show Counter	OSC – Toggles between the position counter and the time display.

14.9 Audio Controls

14.9.1 Volume

An application should check the Volume, Volume Increment and Volume Decrement usages when determining whether a device supports volume controls.

Volume	LC – Audio volume control.
Volume Increment	RTC – Asserting this control increments the current value of audio volume until the maximum value is reached. It is typically implemented as a single button.
Volume Decrement	RTC – Asserting this control decrements the current value of audio volume until the minimum value is reached. It is typically implemented as a single button.
Mute	OOC – Audio mute control. Sets the audio output level to the minimum value without affecting the current volume level. When Mute is disabled, the previous audio level will be restored.

14.9.2 Balance

An application should check the Balance, Balance Right and Balance Left usages when determining whether a device supports balance controls.

Balance	LC – Audio balance control.
Balance Right	RTC – Asserting this control adjusts the audio output towards the right channel until the maximum value is reached. It is typically implemented as a single button.
Balance Left	RTC – Asserting this control adjusts the audio to the left channel until the maximum value is reached. It is typically implemented as a single button.

14.9.3 Bass

An application should check the Bass, Bass Increment and Bass Decrement usages when determining whether a device supports bass controls.

Bass	LC – Audio bass control.
Bass Increment	RTC – Asserting this control increments the current value of the audio bass control until the maximum value is reached. It is typically implemented as a single button.
Bass Decrement	RTC – Asserting this control decrements the current value of the audio bass control until the minimum value is reached. It is typically implemented as a single button.
Bass Boost	OOC – Enables audio bass boost.

14.9.4 Treble

An application should check the Treble, Treble Increment and Treble Decrement usages when determining whether a device supports treble controls.

Treble	LC – Audio treble control.
Treble Increment	RTC – Asserting this control increments the current value of the audio treble control until the maximum value is reached. It is typically implemented as a single button.
Treble Decrement	RTC – Asserting this control decrements the current value of the audio treble control until the minimum value is reached. It is typically implemented as a single button.

14.9.5 Other

Surround Mode	OSC – Steps through surround mode options.
Loudness	OOC – Applies boost to audio bass and treble.
MPX	OOC – Enables stereo multiplexer.

14.10 Speed Controls

Speed Select	OSC – Cycles through media speed options.
Playback Speed	NAry – A collection of controls that allow adjustment of playback speed (in units relative to normal playback speed). Contains the selectors Standard, Long, and Extended Play.
Standard Play	Sel – Selects the VCR's "SP" recording speed.
Long Play	Sel – Selects the VCR's "LP"" recording speed.
Extended Play	Sel – Selects the VCR's "EP" recording speed.
Slow	OSC – Enables slow speed transport motion.

14.11 Home and Security Controls

Fan Enable	OOC – Controls the state of a overhead, furnace, or ventilation fan.
Fan Speed	LC – Adjusts the speed of a overhead, furnace or ventilation fan.
Light Enable	OOC – Controls the state of a light or lamp.
Light Illumination	LC – Adjusts the illumination level of a light or lamp.

Level	
Climate Control Enable	OOC – Enables or disables a climate control system.
Room Temperature	LC – Adjusts room temperature level.
Security Enable	OOC – Enables or disables a security system.
Fire Alarm	OSC – Initiates a fire alarm.
Police Alarm	OSC – Initiates a police alarm.

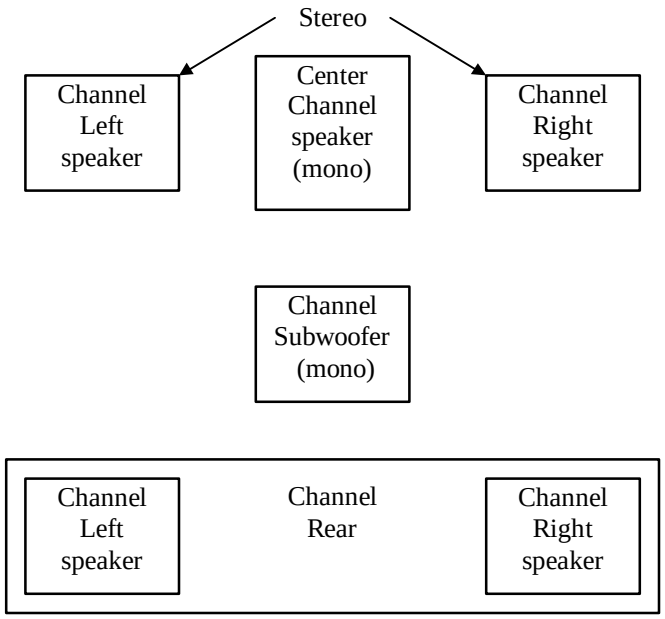
14.12 Speaker Channels

USB speaker system may employ a hierarchy of Channel collections to identify controls that effect individual speakers or subsets of speakers. The selection of collections also allows the speakers associated with USB audio class spatial locations to be identified.

If the only function provided by a device is a speaker system, then it will be defined as a Consumer Control at the application collection level. The volume, balance, mute, and tone control usages found at the top level represent "Master" controls that effect all channels or speaker systems. If more spatial resolution is required then Channel collections can be contained in the top-level collection.

Channel identification assumes the following layout of the speakers.

Figure 2: Audio Channels



14.12.1 Audio Channels

Where:

- A monophonic system is a 1-channel system that would be represented by volume, mute and tone controls in the top-level collection.
- Stereo is a 2-channel system. Normally volume, balance, mute and tone controls in the top-level collection would represent this configuration. However if a device provided individual controls for the right and left channels then these controls would be found in their respective Right Channel and Left Channel collections.
- Dolby Surround is a 3-channel system with Right, Left, and Rear Channels. This configuration is very similar to a stereo configuration however any controls that only effected the rear speakers would be found in a Surround Channel collection.
- Dolby Pro-Logic surround is a 4-channel system with Right, Left, Center, and Rear Channels. Similar to Dolby Surround however any controls that only effected the center speaker would be found in a Center Front Channel collection.
- Dolby Digital is a 6-channel system with 3 front channels (Right, Left and Center), 2 surround channels (Rear Right and Rear Right), and a Subwoofer (LFE) Channel. Similar to Dolby Pro-Logic however any controls that only effected the subwoofer speaker would be found in a Low Frequency Enhancement Channel collection.

In both implementations of Dolby Surround and Dolby Pro-Logic the Rear channel is actually a monophonic bandwidth-limited (7 kHz) channel that is often implemented as two separate speakers, right and left. Both speakers receive the same source.

Master or system-wide controls associated with all channel positions will be found in the top-level collection of the consumer control.

Speaker System	CL – This collection is used to define controls that effect all channels of an individual speaker system if the device contains controls for more than one speaker system. Note that the controls defined in the top-level collection will be the true master controls, effecting all speaker systems. This collection can contain any of the following Channel collections.
Channel Left	CL – A collection of controls associated with the Left channel.
Channel Right	CL – A collection of controls associated with the Right channel.
Channel Center	CL – A collection of controls associated with the Center channel.
Channel Front	CL – A collection of controls associated with the Front channels. To provide more detail on controls, this collection may optionally contain Channel Left, Channel Right, and Channel Center collections The Audio class notation for this Channel Front(Channel Left) is L. The Audio class notation for this Channel Front(Channel Right) is R. The Audio class notation for this Channel Front(Channel Center) is C.
Channel Center Front	CL – A collection of controls associated with the Center Front channels. To provide more detail on controls, this collection may optionally contain Channel Left and Channel Right collections The Audio class notation for this Channel Center Front(Channel Left) is LC (left of center in front). The Audio class notation for this Channel Center Front(Channel Right) is RC (right of center in front).

Channel Side	CL – A collection of controls associated with the Side or wall channels. To provide more detail on controls, this collection may optionally contain Channel Left and Channel Right collections The Audio class notation for this Channel Side(Channel Le
Channel Surround	CL – A collection of controls associated with the Surround channels. The Audio class notation for this Channel Surround is S. To provide more detail on controls, this collection may optionally contain Channel Left and Channel Right collections The Audio class notation for this Channel Surround(Channel Left) is LS. The Audio class notation for this Channel Surround(Channel Right) is RS.
Channel Low Frequency Enhancement	CL – A collection of controls associated with the Low Frequency Enhancement or Subwoofer channel. The Audio class notation for this channel is LFE.
Channel Top	CL – A collection of controls associated with the Top or overhead channel. The Audio class notation for this channel is T.
Channel Unknown	CL – A collection of controls associated with an unknown channel position.

14.13 PC Theatre

Media Select SAP	Sel - Select Tuner using Secondary Audio Program (SAP) information.
Sub-channel	LC - Digital TV sub-channel selection control where the range of possible values is equal to the number of sub-channels supported by the device.
Sub-channel Increment	OSC - Digital TV sub-channel control where each activation of the control increments the current sub-channel selection to the next available sub-channel.
Sub-channel Decrement	OSC - Digital TV sub-channel control where each activation of the control decrements the current sub-channel selection to the next available sub-channel.
Alternate-audio Increment	OSC - Digital TV alternate-audio control where each activation of the control increments the current alternate-audio selection to the next available alternate-audio.
Alternate-audio Decrement	OSC - Digital TV alternate-audio control where each activation of the control decrements the current alternate-audio selection to the next available alternate-audio.

15 Digitizers (0x0D)

This section provides detailed descriptions of the usages employed by Digitizer Devices.

Table 17: Digitizer Page

Usage ID	Usage Name	Usage Types	Section
00	Undefined		
01	**Digitizer**	CA	15.1
02	**Pen**	CA	15.1
03	**Light Pen**	CA	15.1
04	**Touch Screen**	CA	15.1
05	**Touch Pad**	CA	15.1
06	**White Board**	CA	15.1
07	**Coordinate Measuring Machine**	CA	15.1
08	**3D Digitizer**	CA	15.1
09	**Stereo Plotter**	CA	15.1
0A	**Articulated Arm**	CA	15.1
0B	**Armature**	CA	15.1
0C	**Multiple Point Digitizer**	CA	15.1
0D	**Free Space Wand**	CA	15.1
0E-1F	Reserved		
20	**Stylus**	CL	15.2
21	**Puck**	CL	15.2
22	**Finger**	CL	15.2
23-2F	Reserved		
30	Tip Pressure	DV	15.3.1
31	Barrel Pressure	DV	15.3.1
32	In Range	MC	15.3.1
33	Touch	MC	15.3.1
34	Untouch	OSC	15.3.1
35	Tap	OSC	15.3.1
36	Quality	DV	15.3.1
37	Data Valid	MC	15.3.1
38	Transducer Index	DV	15.3.1
39	**Tablet Function Keys**	CL	15.3.1
3A	**Program Change Keys**	CL	15.3.1
3B	Battery Strength	DV	15.3.1
3C	Invert	MC	15.3.1
3D	X Tilt	DV	15.3.2

Usage ID	Usage Name	Usage Types	Section
3E	Y Tilt	DV	15.3.2
3F	Azimuth	DV	15.3.3
40	Altitude	DV	15.3.3
41	Twist	DV	15.3.3
42	Tip Switch	MC	15.4
43	Secondary Tip Switch	MC	15.4
44	Barrel Switch	MC	15.4
45	Eraser	MC	15.4
46	Tablet Pick	MC	15.4
47-FFFF	Reserved		

15.1 Digitizer Devices

Digitizer CA – A device that measures absolute spatial position, typically in two or more dimensions. This is a generic usage; several specialized types of digitizers are distinguished by their attributes.

Pen CA – A digitizer with an integrated display that allows use of a stylus. The system must ensure that the sensed stylus position and the display representations of that position are the same. A pen digitizer has enough time and space resolution for handwriting input. A digitizer that may or may not be in an integrated display application should use the more generic **Digitizer** collection usage.

Light Pen CA – A display-integrated digitizer that relies on the underlying video raster to determine position. The interpretation of light pen coordinates is sensitive to changes of display mode.

Touch Screen CA – A digitizer with an integrated display that allows the use of a finger or stylus for pointing. Some touch-screen technologies can differentiate between the touch of a finger and the touch of a stylus.

Touch Pad CA – A digitizer that is not integrated with a display, but allows the use of a finger for pointing.

White Board CA – A digitizer that is mounted vertically and can optionally be synchronized with a projected video display.

Coordinate Measuring Machine CA – A specialized digitizing instrument that is used to make spatial measurements of maps or photographic images. It is not suitable for screen pointing.

3D Digitizer CA – General usage for a digitizer that measures position(s) in three-dimensional space.

Stereo Plotter CA – A 3D digitizer that relies on the operator's binocular vision to determine the position of points on a stereoscopically rendered image.

Articulated Arm CA – A 3D digitizer that uses a series of instrumented mechanical linkages to determine the position of its tip in space.

Armature CA – A 3D digitizer that determines the position of several mechanical linkages in space. An armature typically represents the position of a human

	body for animation or modeling.
Multiple Point Digitizer	CA – A 3D digitizer that detects the position of multiple points in space, typically through some non-mechanical means such as electromagnetic sensors.
Free Space Wand	CA – A 3D digitizer that detects the position of a point at the end of a hand-held wand.

15.2 Digitizer Transducer Collection Usages

Stylus	CL – A stylus is a hand-held transducer that looks and is used like a pen. A digitizer typically reports the coordinates of the tip of a stylus. The **Stylus** collection is a physical collection containing all the controls physically located on the stylus. In the **Stylus** collection a **Pointer** physical collection will contain the axes reported by the stylus.
Puck	CL – A puck, sometimes called a cursor, is a mouse-like transducer that rests on a low friction surface. A digitizer typically reports the coordinates of crosshairs marked on the puck. The **Puck** collection is a logical collection containing all the controls located on the puck. In the **Puck** collection a **Pointer** physical collection will contain the axes reported by the puck.
Finger	CL – Any human appendage used as a transducer, such as a finger touching a touch screen to set the location of the screen cursor. A digitizer typically reports the coordinates of center of the finger. In the **Finger** collection a **Pointer** physical collection will contain the axes reported by the finger.

15.3 Digitizer Report Field Usages

Not all digitizer field usages are from the Digitizer usage page. In particular, the usages for X and Y displacement come from the Generic Desktop page.

15.3.1 Digitizer-Specific Fields

Tip Pressure	DV – Force exerted against the tablet surface by the transducer, typically a stylus.
Barrel Pressure	DV – Force exerted directly by the user on a transducer sensor, such as a pressure-sensitive button on the barrel of a stylus.
In Range	MC – Indicates that a transducer is located within the region where digitizing is possible. In Range is a bit quantity.
Touch	MC – A bit quantity for touch pads analogous to In Range that indicates that a finger is touching the pad. A system will typically map a Touch usage to a primary button.
Untouch	OSC – Indicates the release of a finger from the surface of the touch screen. A system typically maps an Untouch usage to the release of a primary button.
Tap	OSC – On a touch pad, indicates that the finger has been quickly lifted and replaced on the tablet surface. This is typically mapped to a button event, but is distinct as no physical button is involved.
Quality	DV – If set, indicates that the transducer is sensed to be in a relatively noise-free region of digitizing.

Data Valid	MC – Indicates that the current data set is valid.
Transducer Index	DV – Indicates which transducer generated the current report. Transducer Index is useful if multiple transducers generate identical reports. Otherwise, report IDs should be used to distinguish different transducer types.
Tablet Function Keys	CL – These controls are located on the surface of a digitizing tablet, and may be implemented as actual switches, or as soft keys actuated by the digitizing transducer. These are often used to trigger location-independent macros or other events.
Program Change Keys	CL – Specialized function key targets that change some internal aspect of the digitizer's behavior.
Battery Strength	DV – Indicates the amount of power remaining in a digitizer component that is outside the scope of device power management. Typically this is the battery for a cordless transducer.
Invert	MC – A bit that indicates that the currently sensed position originates from the end of a stylus opposite the tip.

15.3.2 Tilt Orientation

X Tilt and Y Tilt are used together to specify the tilt away from normal of a digitizer transducer. In its normal position, the values of X Tilt and Y Tilt for a transducer are both zero. The X Tilt/Y Tilt orientation of a system does not specify the rotation of the transducer around its own normal axis.

X Tilt	DV – This quantity is used in conjunction with Y Tilt to represent the tilt away from normal of a transducer, such as a stylus. The X Tilt value represents the plane angle between the Y-Z plane and the plane containing the transducer axis and the Y axis. A positive X Tilt is to the right.
Y Tilt	DV – This value represents the angle between the X-Z and transducer-X planes. A positive Y Tilt is toward the user.

15.3.3 Azimuth-Altitude Orientation

Azimuth-altitude is an alternative to the tilt system of specifying a digitizer transducer's orientation. This system includes rotation of the transducer around its own axis.

Azimuth	DV – Specifies the counter-clockwise rotation of the cursor around the Z axis through a full circular range.
Altitude	DV – Specifies the angle with the X-Y plane through a signed, semicircular range. Positive values specify an angle downward and toward the positive Z axis.
Twist	DV – Specifies the clockwise rotation of the cursor around its own major axis.

15.4 Digitizer Switch Usages

Tip Switch	MC – A switch located at the tip of a stylus, indicating contact of the stylus with a surface. A pen-based system or system extension would use this switch to enable the input of handwriting or gesture data. The system typically maps Tip Switch to a primary button in a non-pen context.
Secondary Tip Switch	MC – A secondary switch used in conjunction with Tip Switch to indicate pressure above a certain threshold applied with the stylus. The threshold switch is not closed unless the tip switch already is.
Barrel Switch	MC – A non-tip button located on the barrel of a stylus. Its function is typically mapped to a system secondary button or to a Shift key modifier that changes the Tip Switch function from primary button to secondary button.
Eraser	MC – This control is used for erasing objects. Following the metaphor of a pencil, it is typically located opposite the writing end of a stylus. It may be a bit switch or a pressure quantity.
Tablet Pick	MC – The primary button used by CAD systems, typically to select an object. Sometimes called Button Zero.

16 Unicode Page (0x10)

The Unicode Page directly maps to the two-octet form defined in the Unicode Standard.

The Unicode Standard, Version 1.1, is the newest version of the Unicode™ Standard. Unicode 1.1 includes the changes and additions that were made to Unicode 1.0 in the process of alignment with the international character encoding standard, ISO/IEC 10646-1, which was approved by ISO/IEC as an International Standard in June 1992, and published in May 1993. The character content and encoding of Unicode 1.1 is thus identical to that of the ISO/IEC 10646-1 UCS-2 (the two-octet form).

See Section 17, “Alphanumeric Display Page (0x14),” for an example.

17 Alphanumeric Display Page (0x14)

The Alphanumeric Display page is intended for use by simple alphanumeric displays that are used on consumer devices.

Table 18: Alphanumeric Display Usage Page

Usage ID	Usage Name	Usage Type	Section
00	Undefined		
01	**Alphanumeric Display**	CA	17.1
02-1F	Reserved		
20	**Display Attributes Report**	CL	17.2
21	ASCII Character Set	SF	17.2
22	Data Read Back	SF	17.2
23	Font Read Back	SF	17.2
24	**Display Control Report**	CL	17.3
25	Clear Display	DF	17.3
26	Display Enable	DF	17.3
27	Screen Saver Delay	SV or DV	17.3
28	Screen Saver Enable	DF	17.3
29	Vertical Scroll	SF or DF	17.4
2A	Horizontal Scroll	SF or DF	17.4
2B	**Character Report**	CL	17.5
2C	Display Data	DV	17.5
2D	**Display Status**	CL	17.6
2E	Stat Not Ready	Sel	17.6
2F	Stat Ready	Sel	17.6
30	Err Not a loadable character	Sel	17.6
31	Err Font data cannot be read	Sel	17.6
32	Cursor Position Report	CL	17.7
33	Row	DV	17.7
34	Column	DV	17.7
35	Rows	SV	17.7
36	Columns	SV	17.7
37	Cursor Pixel Positioning	SF	17.7
38	Cursor Mode	DF	17.7
39	Cursor Enable	DF	17.7
3A	Cursor Blink	DF	17.7
3B	**Font Report**	CL	17.8
3C	Font Data	Buffered Byte	17.8
3D	Character Width	SV	17.8

Usage ID	Usage Name	Usage Type	Section
3E	Character Height	SV	17.8
3F	Character Spacing Horizontal	SV	17.8
40	Character Spacing Vertical	SV	17.8
41	Unicode Character Set	SF	17.2
42-FFFF	Reserved		

17.1 Alphanumeric Display

AlphaNumeric Display CA – A collection of alphanumeric-related display usages.

17.2 Flags

If a flag is defined as a single-bit constant **Input** item, it is simply a read-only bit for the host. If a flag is defined as an **Output** item, it can be used to enable or disable the flag's feature.

The Display ASCII Character Set defines a minimum character set that will be supported by a display. The blank character locations in the table may be optionally defined by a vendor. All characters will be passed to the display, so to take advantage of the other characters the controlling application must know vendor-specific information. The total number of character codes supported is vendor-specific.

Display Attributes Report CL –Identifies the report associated with features of the display device.

ASCII Character Set SF – Finding this usage in a display application descriptor indicates that the device supports an 8-bit ASCII-compatible character set as shown in Table 19. In the table, the high nibble of the character code is labeled across the top and the low nibble is labeled down the left side. NoOp means that no operation is performed if this character is received. Space clears the character position.

Table 19: ASCII Display Character Set

Low Nibble	High Nibble 0	1	2	3	4	5	6	7
0	NoOp		Space	0	@	P	`	p
1			!	1	A	Q	a	q
2			“	2	B	R	b	r
3			#	3	C	S	c	s
4			$	4	D	T	d	t
5			%	5	E	U	e	u
6			&	6	F	V	f	v
7			‘	7	G	W	g	w
8			(	8	H	X	h	x
9			)	9	I	Y	i	y
A			*	:	J	Z	j	z

Low Nibble	High Nibble 0	1	2	3	4	5	6	7
B			+	;	K	[	k	{
C			,	<	L	\	l	|
D			-	=	M	]	m	}
E			.	>	N	^	n	
F			/	?	O	_	o	

Unicode Character Set	SF – Finding this usage in a display application descriptor indicates that the device displays the Unicode character set. If defined, it implies that 16-bit characters will be transferred in the Display Data field and the Buffered Bytes flag is set.
Data Read Back	SF – Finding this usage in a display application descriptor indicates that the **Character Report** can be read back. Otherwise, the display data is write-only.
Font Read Back	SF – Finding this usage in a display application descriptor indicates that the **Font Report** can be read back. Otherwise, the display font is write-only.

17.3 Display Control

Display Control Report	CL –Identifies the report associated with controlling the features of the display device.
Clear Display	DF – Clears the display to blanks (spaces) and returns the cursor to the home position. This is a write-only control that returns 0 when read. Clear Display is a single-bit data field where 0 is no operation and 1 clears the display.
Display Enable	DF – Turns the display on or off. Display Enable is a single-bit data field where: 0 is display off and 1 is display on. If this usage is absent from the **Report** descriptor, assume that the display is always enabled.
Screen Saver Delay	SV or DV – The delay in milliseconds between setting Screen Saver Enable and the time that the screen save operation actually takes place.
Screen Saver Enable	DF – When enabled, the display will either put up a vendor-defined screen saver or turn the display off after the Screen Saver Delay. If this usage is absent from the **Report** descriptor, assume that the display does not support this feature.

17.4 Scrolling

If Horizontal Scrolling and Vertical Scrolling are disabled, characters received after the cursor reaches the right-most column (*Column* = *Columns*) will overwrite each other.

There are three scrolling modes: none, horizontal and vertical. Only one mode can be operative at a time. That is, Horizontal Scrolling and Vertical Scrolling are mutually exclusive.

- When Vertical Scrolling is enabled, if the cursor is on the last character of a row (*Column* = *Columns*) other than the last row (*Row* != *Rows*), the next character received will cause the vertical cursor position to be incremented (*Row*++) and the horizontal cursor position to be set to 0 (*Column* = 0). If the cursor is on the last character (*Column* = *Columns*) of the last row (*Row* = *Rows*), the

next character will cause all rows to be scrolled up, the last row to be cleared, and the horizontal cursor position to be set to 0 (*Column* = 0).

- When Horizontal Scrolling is enabled, if the cursor is on the last character of a row (*Column* = *Columns*), the next character received will cause the row to be scrolled horizontally one character position and the character to be placed on the last column of the row.

Any data that scrolls off the display is lost.

Vertical Scroll or Horizontal Scroll are considered to be Static Flags (SF). That is, if they are not declared, it can be assumed that the mode is not supported. However, if they are defined as Dynamic Flags then the modes can be enabled or disabled.

Vertical Scroll	SF – Indicates whether the display will scroll vertically, where 0 means that the display will not scroll vertically and 1 means that the display will scroll vertically.
Horizontal Scroll	SF – Indicates whether the row will scroll horizontally, where 0 means that the display will not scroll horizontally and 1 means that the display will scroll horizontally.

17.5 Character Transfers

An alphanumeric display can be configured to read or write multiple characters in a single message.

Character Report	CL – Identifies the report associated with character data movement. Flow control is handled by the display NAKing Character reports until it is ready for more characters.
Display Data	DV – The report field that is written to pass characters to the display. When read, the character currently indicated by the cursor is returned. If this field is declared with a **Report Count** greater than 1, any characters not defined as NoOp will be written to the display. When the same field is read, all characters from the current cursor position forward will be returned. If the range goes beyond the end of the display memory, NoOp characters will be returned. Buffered Byte – When the Display Data field is declared as Buffered Byte, the data in the array is used as an index in to the character ROM of the device. The **Report Size** will reflect the size of the character set supported by the device. NAry – If a vendor wishes to identify specific characters other than those found in the ASCII character set and does not want to send 16-bit Unicode characters to the display, the vendor can describe the Display Data field as an Named Array (NAry) in which the Selector usages are pulled from the Unicode page.

17.6 Display Status

A display will initially generate a Stat Not Ready status until the display is fully initialized. No commands should be issued to the display until the Stat Ready condition is detected. Any error will be held in Display Status field until it is read, at which point the Display Status field will return to the Stat Ready condition or be set to the next error code.

Display Status	CL – This is a collection of the status codes that the display supports. The status codes are reported in a single location array.
Stat Not Ready	Sel – The display is not ready for use. These displays are typically slow to initialize.
Stat Ready	Sel – The display is ready for use. No commands can be issued until the Display Status indicates Stat Ready.
Err Not a loadable character	Sel – This error will occur after an attempt is made to load a character from a non-loadable character location.
Err Font data cannot be read	Sel – This error will occur after an attempt is made to read the font bitmap of a character location that the display does not support.

17.7 Cursor Control

There are two ways of handling cursor positioning:

- The Row and Column fields may be declared with a Report ID that is different from that used by the Data field. This will allow the cursor to be positioned independently of writing characters to the display.
- The Row, Column, and Data can all be in the same report. If either the Row or Column field contains an out-of-range value, the cursor position will not be updated.

In a Display device, the cursor position is applied first, then any characters are written to the display buffer. Reading the Row and Column will provide the current cursor position.

If Cursor Mode is set to increment (1), nothing will happen if a character is entered when the cursor is on the last column of the last row. If a character is entered when the cursor is on the last column of any other row, the cursor will move to the first column of the next row.

If Cursor Mode is set to decrement (0), nothing will happen if a character is entered when the cursor is on the first column of the first row. If a character is entered when the cursor is on the first column of any other row, the cursor will move to the last column of the next row.

Cursor Position Report	CL –Identifies the report associated with cursor positioning.
Row	DV – Identifies or sets the vertical character position of the cursor. A value of 0 is the topmost row.
Column	DV – Identifies or sets the horizontal character position of the cursor. A value of 0 is the leftmost column.
Rows	SV – Identifies the number of rows supported by the display.
Columns	SV – Identifies the number of columns supported by the display.
Cursor Pixel Positioning	SF – Indicates that the display supports pixel-level cursor positioning. Cursor Pixel Positioning is a single-bit data field where 1 means that cursor pixel positioning is enabled and 0 means that character cursor positioning is enabled. If this usage is absent, assume that the display only supports

	character-level positioning. If pixel positioning is supported but character positioning is enabled, Character Width plus Character Spacing Horizontal indicate the number of pixels the cursor will move horizontally and Character Height plus Character Spacing Vertical indicate the number of pixels the cursor will move vertically. Note: If pixel positioning is supported, the Row and Column fields must be large enough to contain either a character or pixel address.
Cursor Mode	DF – Sets the cursor movement direction. After each character code is sent to the display, the cursor can automatically move either right or left. Cursor Mode is a single-bit data field where 0 decrements the cursor position (moves left) and 1 increments the cursor position (moves right). If this usage is absent from the **Report** descriptor, assume that the cursor position is always incremented.
Cursor Enable	DF – Turns the cursor on or off. Cursor Enable is a single-bit data field where 0 turns the cursor off and 1 turns the cursor on. If this usage is absent from the **Report** descriptor, assume that the cursor is always enabled.
Cursor Blink	DF – Turns the cursor blinking on or off. Cursor Blink is a single-bit data field where 0 turns blinking off and 1 turns blinking on. If this usage is absent from the **Report** descriptor, assume that cursor blinking is off.

17.8 Font Loading

Alphanumeric displays that support loadable fonts will contain the usages described in this section.

To download a font, the report must contain the row and column of the destination and a buffered-bytes data field that contains Character Width times Character Height bits of data.

Font Data is organized as sequential rows of pixels where the least significant bit contains the pixel in the upper right corner of the character.

Not all displays support downloading of all character locations, so the Display Status field should be checked after each download to ensure that the operation completed successfully. An "Err Not a loadable character" value will be returned in the Display Status field if an error occurred.

Not all displays support uploading of all character locations so the Display Status field should be checked after each upload to ensure that the operation completed successfully. An "Err Font data cannot be read" value will be returned in the Display Status field if an error occurred.

Font Report	CL – Finding this usage in a display application descriptor indicates that the display supports downloadable fonts. This usage is applied to a logical collection that defines the font download report.
Font Data	A buffered-bytes data field that contains the font data.

The following usages define display parameters. These are normally static values defined in a **Feature** report.

The Character Spacing Horizontal and Character Spacing Vertical values indicate whether the inter-character spacing must be included in the downloaded font character or whether it is automatically set by the physical pixel layout of the display. A Character Spacing of 0 implies that any inter-character spacing must be included in the downloaded font. If a Character Spacing (Horizontal or Vertical) usage is not declared, it can be assumed that the respective inter-character spacing is forced by the physical pixel layout of the display and Character Spacing can therefore be assumed to be 1.

Character Width	SV – Identifies the width of a character in pixels.
Character Height	SV – Identifies the height of a character in pixels.
Character Spacing Horizontal	SV – Identifies the horizontal distance between characters in pixels.
Character Spacing Vertical	SV – Identifies the vertical distance between characters in pixels.

Appendix A: Usage Examples

This section provides examples of common implementations of controls. Pseudocode is used to describe the **Main**, **Global** and **Local** items.

There are a number of cases where **Usage Minimum** or **Usage Maximum** could have been used in these examples, but they were omitted for clarity.

A.1 Volume Control

Here are two examples of volume controls. The first example defines a pair of buttons that are used to ramp volume up and down, and the second example is a normal volume knob.

A.1.1 Up/Down Buttons

The following example defines a pair of buttons that ramp a variable, such as Volume Up and Volume Down buttons. The Input device must be defined as Relative. A value of –1 will reduce and +1 will increase the volume at a rate determined by the vendor. A value of 0 will have no effect on the volume.

```
UsagePage(Consumer)
Usage(Volume)
Logical Minimum(-1), Logical Maximum(1),
ReportSize(2), ReportCount(1),
Input(Data, Variable, Relative)
```

A.1.2 Knob

The following example defines a volume knob that turns 270°:

```
UsagePage(Consumer)
Usage(Volume)
Logical Minimum(0), Logical Maximum(100),
ReportSize(7), ReportCount(1),
Input(Data, Variable, Absolute, No Wrap, Linear, No Preferred)
```

The **Logical Minimum** and **Logical Maximum** values depend on the resolution provided by the vendor. Because the knob only turns 270 degrees, the No Wrap flag is set. A volume control usually generates an analog output using an audio taper. However, in this example, the volume control simply generates a Linear output as a function of its physical position from 0 to 100 percent. The controlling application would apply the audio taper to the output. The No Preferred flag is set because the control will remain in the last position that the user left it in.

A.2 Tape Jog Wheel

A tape jog wheel is a spring-loaded knob that rotates ±90°, with a small indent for the user's index finger. As the user twists the knob right or left, the tape is advanced or backed up at a rate proportional to the rotation from the spring-loaded center position.

```
UsagePage(Consumer)
Usage(Tape Jog)
Logical Minimum(-127), Logical Maximum(127),
ReportSize(8), ReportCount(2),
Input(Data ,Variable, Relative, No Wrap, Linear, Preferred)
```

The Preferred flag is set because the control will return to the center position when the user releases it.

A.3 Radio Buttons

Radio buttons are a group of mutually exclusive buttons. In this example, an audio receiver uses three radio buttons to select between a computer, a DVD device, or the World Wide Web as a display source.

A.3.1 Mechanically Linked Radio Buttons

Traditionally, radio button implementations have had a mechanical system that releases any buttons not pressed and holds the last pressed button in an active state until another button is pressed. In the example below, one of three values will be returned: Media Select Computer, Media Select DVD, or Media Select WEB.

```
Logical Minimum(1), Logical Maximum(3),
UsagePage(Consumer),
Usage(Media Select Computer),
Usage(Media Select DVD),
Usage(Media Select WWW),
ReportSize(2), ReportCount(1),
Input(Data, Array, Absolute, No Wrap, Linear, No Preferred, No Null Position)
```

The No Preferred flag is set because the report will always present the value of the last button pressed. The No Null Position flag indicates that there is never a state in which the control is not sending meaningful data. The returned values are 1 = Media Select Computer, 2 = Media Select DVD, or 3 = Media Select WWW.

A.3.2 Radio Buttons with No Mechanical Linkage

Many systems today use a separate display to indicate the current selection and there is no mechanical connection between the buttons. In this example, the control will return one of four values: Null (a value outside of the **Logical Minimum** and **Logical Maximum** range), Media Select Computer, Media Select DVD, or Media Select WWW.

```
Logical Minimum(1), Logical Maximum(3),
UsagePage(Consumer),
Usage(Media Select Computer),
Usage(Media Select DVD),
Usage(Media Select WWW),
ReportSize(2), ReportCount(1),
Input(Data, Array, Absolute, No Wrap, Linear, No Preferred, Null Position)
```

The No Preferred flag is set because a valid selection is presented only as long as the user is pressing a button. When the user releases a button, the report will present a Null value. The Null Position flag indicates that there is a state in which the control is not sending meaningful data and that an application can expect a Null value which should be ignored. A Report Size of 2 declares a 2-bit field where only four possible values can be returned: 0 = Null, 1 = Media Select Computer, 2 = Media Select DVD, or 3 = Media Select WWW.

A.4 Named Array Field

To simplify an application finding a “one of many” set of controls, the array field associated with it can be named by wrapping the array declaration in a logical collection.

In the following example, the device returns one of three status codes: Not Ready, Ready, or Err Not a loadable character. An application can simply query for the Display Status usage to find the array field that will contain the status codes.

```
ReportSize(2), ReportCount(1),
Logical Maximum(2),
Usage(Display Status),
Collection(Logical),
    Usage(Stat Not Ready),
    Usage(Stat Ready),
    Usage(Err Not a loadable character),
    Input(Data, Array, Absolute, No Null Position),  ; 3-bit status field
End Collection(),
```

The No Null Position flag indicates that there is never a state in which it is not sending meaningful data. The returned values are Null = No event (outside of the **Logical Minimum** / **Logical Maximum** range) 1 = Stat Not Ready, 2 = Stat Ready, or 3 = Err Not a loadable character.

A.5 Multiple Instances of a Control

This example shows how to implement multiple instances of a set of controls by defining a device with two pointers, each with X and Y axes. An application looking for **Pointer** usages would find two of each type enumerated.

```
UsagePage(Generic Desktop),
Usage(Pointer),                         ; Pointer
Collection(Logical),
    UsagePage(Ordinal),
    Usage(Instance 1),                  ; Pointer 1
    Collection(Physical),
        UsagePage(Generic Desktop),
        Usage(X-axis),
        Usage(Y-axis),
    Collection End,
    UsagePage(Ordinal),
    Usage(Instance 2),                  ; Pointer 2
    Collection(Physical),
        UsagePage(Generic Desktop),
        Usage(X-axis),
        Usage(Y-axis),
    Collection End,
Collection End,
```

A.6 Multiple Instances of a Multi-Mode LED

This example shows how to implement an indicator that supports blinking as well as multiple colors. In this example, there are two LEDs (Play and Stop) that can be On, Blinking, or Off, and when they are illuminated they can be Red, Green, or Amber. The LED page provides slow and fast blinking usages, and either could have been chosen here to enable the single blinking mode that this device supports.

Declare the globals that are used by all the **Main** items.

```
    Report Size(2),
    Report Count(1),
    Logical Minimum(1),
```

```
Logical Maximum(3),
```

Declare the Play LED.

```
Usage Page(Consumer),
Usage Minimum(Play),
Collection(Logical),
    Usage Page(LED),
    Usage(Usage Multi Mode Indicator),    ; Declare Mode field
    Collection(Logical),
        Usage(Indicator On),
        Usage(Indicator Slow Blink),
        Usage(Indicator Off),
        Feature(data, Array, Null),       ; 3 modes supported
    End Collection(),
    Usage(Usage Indicator Color),         ; Declare Color field
    Collection(Logical),
        Usage(Red),                       ; of the LED.
        Usage(Green),
        Usage(Amber),
        Feature(data, Array, Null),       ; Three colors supported
    End Collection(),
End Collection(),
```

Declare the controls for the Stop LED.

```
Usage Page(Consumer),
Usage Minimum(Stop),
Collection(Logical),
    Usage Page(LED),
    Usage(Usage Multi Mode Indicator),
    Collection(Logical),
        Usage(Indicator On),
        Usage(Indicator Slow Blink),
        Usage(Indicator Off),
        Feature(data, Array, Null),
    End Collection(),
    Usage(Usage Indicator Color),
    Collection(Logical),
        Usage(Red),
        Usage(Green),
        Usage(Amber),
        Feature(data, Array, Null),
    End Collection(),
End Collection(),
```

Figure 3: LED Report fields

Bit

7	6	5	4	3	2	1	0
Generic LED 2 Color		Generic LED 2 Mode		Generic LED 1 Color		Generic LED 1 Mode	

A.7 Desktop Tablet Example

This is the **Report** descriptor for a typical desktop digitizing tablet. The tablet's digitizing region is 12 inches square, and it reports data in units of .001 inches. It is optionally equipped with any or all of three cordless transducers: a 16-button cursor, a stylus with a tip and a barrel switch, and a stylus with a pressure transducer.

The example digitizer can distinguish between the different cursors, and it sends a report based on the cursor that last changed state. The **ReportID** report data entity indicates which cursor is generating the current report. The X and Y position data and the In Range bit are in the same field for each report type, but the pressure and button data are different for each transducer, with padding in the report where necessary. The vanilla stylus and puck transducers generate 6-byte reports, whereas the pressure stylus generates a 7-byte report.

The **Report** descriptor below is structured as an application collection containing three physical collections, one for each supported cursor. The **ReportID** items precede each cursor collection, which causes a separate, tagged report to be defined for each cursor. The **Push** and **Pop** items are used to save and restore the item state that defines the X and Y fields. The **Report** descriptor takes advantage of the fact that the tablet is square— that is, the physical and logical ranges of X and Y position are identical.

```
;; Example Digitizer Report Descriptor
Usage Page(Digitizers),                         ; Application collection
Usage(Digitizer),
Collection(Application),
    ReportID(1),                                ; 2-Button Stylus
    Usage(Puck),
    Collection(Physical),
        Usage Page(Generic Desktop),            ; X and Y Position
        Usage(X), Usage(Y),
        ReportSize(16), ReportCount(2),
        Logical Minimum(0), Logical Maximum(12000),
        Physical Minimum(0), Physical Maximum(12),
        Units(English Linear: Distance),        ; Inches
        Exponent(0),
        Push,                                   ; Save position item state
        Input(Data, Variable, Absolute),

        Usage Page(Digitizers),
        Usage(In Range),                        ; In Range bit, switches
        Usage(Barrel Switch),
        Usage(Tip Switch),
        Logical Minimum(0), Logical Maximum(1),
        Physical Minimum(0), Physical Maximum(1),
        Units(None),
        Report Size(1), Report Count(3),
        Input(Variable, Absolute),

        Report Count(1), Report Size(5),        ; Padding (5 bits)
        Input(Constant),
    End Collection,
    Report ID(2),                               ; 16-Button Cursor Tag
    Usage(Stylus),
    Collection(Physical),
        Pop,                                    ; Refer to Global items
        Push,                                   ; saved during last Push
                                                ; Report Count (2)
```

```
        Usage(X), Usage(Y),                     ; X and Y position usages
        Input(Data, Variable, Absolute),

        Usage Page(Digitizer),
        Usage(In Range),                        ; In Range bit
        Logical Minimum(0), Logical Maximum(1),
        Physical Minimum(0), Physical Maximum(1),
        Units(None),
        Report Size(1), Report Count(1),
        Input(Data, Variable, Absolute),

        Usage Page(Buttons),                    ; Button index
        Usage Minimum(0), Usage Maximum(16),
        Logical Maximum(16),
        Report Size(5), Report Count(1),
        Input(Data, Array, No Null Position),

        Report Count(1), Report Size(2),        ; Padding (2 bits)
        Input(Constant),
    End Collection,
    Report ID(3),                               ; Pressure Stylus Tag
    Usage Page(Digitizer),
    Usage(Stylus),
    Collection(Physical),
        Pop,                                    ; Refer to Global items
                                                ; saved during initial Push
        Usage(X), Usage(Y),                     ; X and Y position usages
        Input(Date, Variable, Absolute),

        Logical Minimum(0), Logical Maximum(1),
        Physical Minimum(0), Physical Maximum(1),
        Units(None),
        Report Size(1), Report Count(6),        ; Padding (6 bits)
        Input(Constant),

    Usage Page(Digitizer),
        Usage(In Range),                        ; In Range bit, barrel switch
        Usage(Barrel Switch),
        Report Count(2),
        Input(Variable, Absolute),

        Usage(Tip Pressure),                    ; Tip pressure
        Logical Minimum(0), Logical Maximum(127),
        Physical Minimum(0), Physical Maximum(45),
        Units(SI Linear: Force), Exponent(4),
        Report Size(8), Report Count(1),
        Input(Variable, Absolute, Non Linear),
    End Collection,
End Collection
```

Figure 4: Example Digitizer 2-Button Stylus Input Report

	Bit							
Byte	7	6	5	4	3	2	1	0
0	ReportID = 1 (indicating two-button stylus report)							
1	X Coordinate Bits 0-7							
2	X Coordinate Bits 8-15							
3	Y Coordinate Bits 0-7							
4	Y Coordinate Bits 8-15							
5	Pad					In Range	Barrel Switch	Tip Switch

Figure 5: Example Digitizer 16-Button Puck Input Report

	Bit							
Byte	7	6	5	4	3	2	1	0
0	ReportID = 2 (indicating 16-button puck transducer report)							
1	X Coordinate Bits 0-7							
2	X Coordinate Bits 8-15							
3	Y Coordinate Bits 0-7							
4	Y Coordinate Bits 8-15							
5	Pad		Button Index					In Range

Figure 6: Example Digitizer Pressure Stylus Input Report

	Bit							
Byte	7	6	5	4	3	2	1	0
0	ReportID = 3 (indicating pressure stylus report)							
1	X Coordinate Bits 0-7							
2	X Coordinate Bits 8-15							
3	Y Coordinate Bits 0-7							
4	Y Coordinate Bits 8-15							
5	In Range	Barrel Switch	Unused					
6	Pressure Bits 0-7							

A.8 A Device with a Display

The following example is of a 2x16-character display device. The device uses one **Feature**, one **Input**, and two **Output** reports.

A **Feature** report is declared for identifying fixed features of the display and display status. All of the **Feature** report's fields are constants.

The Character Spacing usage is not declared, so it can be assumed that the respective inter-character spacing is forced by the pixel layout of the display, and any downloaded font characters do not have to include it.

In this example, the Character Height and Width are fixed. The fields are declared in the **Report** descriptor and the actual values are reported when the **Feature** report is read. For example, the Character Height and Width fields will always return 7 and 5, respectively.

Uploading of the font is not supported by this display so there is no Font Report **Input** report.

```
UsagePage(Alphanumeric Display),
Usage(Alphanumeric Display),
Logical Minimum(0),
Collection(Application),
```

The first report defined is a Feature report with seven fields. The Rows, Columns, Character Height and Width fields are Static Values (SV) and their report size is set to 5 to demonstrate how the bit packing takes place in a report. Standard Character Set, Data Read Back and Vertical Scroll are Static Flags (SF).

```
    Usage(Display Attributes Report),
    Collection(Logical),
        Usage(Rows),                            ; Constant = 2
        Usage(Columns),                         ; Constant = 16
        Usage(Character Width),                 ; Constant = 5
        Usage(Character Height),                ; Constant = 7
        ReportID(1),
        Logical Maximum(31),
        ReportSize(5), ReportCount(4),
        Feature(Constant, Variable, Absolute),  ; Four 5-bit fields

        ReportSize(1), ReportCount(3),
        Logical Maximum(1),
        Usage(ASCII Character Set),             ; Constant = 1
        Usage(Data Read Back),                  ; Constant = 1
        Usage(Vertical Scroll),                 ; Constant = 1
        Feature(Constant, Variable, Absolute),  ; Three 1-bit fields

        ReportCount(1),
        Feature(Constant, Variable, Absolute),  ; 1-bit pad
    End Collection(),
```

The second report defined is an **Input** report that is generated on the interrupt endpoint each time the status of the display changes. Each of the possible states that can be identified by the display are identified in the **Display Status** collection. This report can also be read over the control pipe to determine the current status.

```
ReportSize(8), ReportCount(1),
Logical Maximum(2),
Usage(Display Status),
Collection(Logical),
    Usage(Stat Not Ready),
    Usage(Stat Ready),
    Usage(Err Not a loadable character),
    Input(Data, Array, Absolute, No Null),    ; 8-bit status field
End Collection(),
```

A second **Feature** report is defined for getting or setting the current cursor position.

```
Usage(Cursor Position Report),
Collection(Logical),
    ReportID(2),
    ReportSize(4), ReportCount(1),

    Logical Maximum(15),
    Usage(Column),
    Feature(Data, Variable, Absolute, No Preferred State), ;Column

    Logical Maximum(1),
    Usage(Row),
    Feature(Data, Variable, Absolute, No Preferred State), ;Row
End Collection(),
```

There are a number of ways that data can be transferred between the host and the display: one byte at a time, multiple bytes, or the whole screen using a 32-byte buffered-byte transfer. The choice may depend on whether the device is implemented as a low-speed or a high-speed device. In this example, a third **Feature** report is defined for writing up to four sequential characters from the display in a single report. Note that the Data Read Back usage is not declared in the **Report** descriptor, which implies that the display character data is write-only.

```
Usage(Character Report),
Collection(Logical),
    ReportID(3),
    ReportSize(8), ReportCount(4),
    Logical Maximum(126),
    Usage(Display Data),
    Feature(Data, Variable, Absolute, Buffered Bytes),   ;4-byte data buffer
End Collection(),
```

A fourth **Feature** report is defined for updating the font. The Display Data field identifies the character to be modified. Because Character Height = 7 and Character Width = 5, 35 bits will be required for a font character. A 40-bit buffered-byte field (5x8) is declared to contain the font data. Note that the Data Read Back usage is not declared in the **Report** descriptor, which implies that the display font data is write-only.

```
    ReportID(4),
    Usage(Font Report),
    Collection(Logical),
        Logical Minimum(0), Logical Maximum(126),
        ReportSize(8), ReportCount(1),
        Usage(Display Data),
        Output(Data, Variable, Absolute),               ; Character to write

        ReportCount(5),                                 ; Assumes a 5x7 font, 35 bits
        Usage(Font Data),
        Output(Data, Variable, Absolute, Buffered Bytes),    ; Font data
    End Collection(),
End Collection()
```

Figure 7: Example Display Attributes Feature Report

	Bit							
Byte	7	6	5	4	3	2	1	0
0	Report ID = 1							
1	Columns (bits 2-0) = 16			Rows = 2				
2	Character Height (bits 1-0)	Character Width = 5					Columns (bits 4-3)	
3	Pad	Vertical Scroll = 1	Data Read Back = 1	ASCII Character Set = 1	Character Height (bits 5-2) = 7			

Figure 8: Example Display Device Input Report

	Bit							
Byte	7	6	5	4	3	2	1	0
0	Report ID = 1							
1	Display Status							

Figure 9: Example Display Device Display Position Feature Report

	Bit							
Byte	7	6	5	4	3	2	1	0
0	Report ID = 2							
1	Row				Column			

Figure 10: Example Display Device Display Data Feature Report

	Bit							
Byte	7	6	5	4	3	2	1	0
0	Report ID = 3							
1	Display Data 0							
2	Display Data 1							
3	Display Data 2							
4	Display Data 3							

Figure 11: Example Display Device Font Load Output Report

	Bit							
Byte	7	6	5	4	3	2	1	0
0	Report ID = 4							
1	Display Data = Character to update							
2	Font Data 0							
3	Font Data 1							
4	Font Data 2							
5	Font Data 3							
6	Font Data 4							

A.9 Remote Control

The remote control in this example has 24 buttons with the following labels:

- A number pad with ten digits, 1 through 9 and 0
- Channel Up and Channel Down
- Volume Up and Volume Down
- Mute
- Power
- Sleep Timer
- On Screen
- Enter Choice, Choice 1, Choice 2, and Choice 3
- Broadcast
- Return

```
UsagePage(Consumer),
Usage(Consumer Control),
Collection(Linked),
    Usage(Numeric Key Pad),
    Collection(Logical),
        UsagePage(Button),
        Usage(Button 1),                        ; ‘0’
        Usage(Button 2),                        ; ‘1’
        Usage(Button 3),                        ; ‘2’
        Usage(Button 4),                        ; ‘3’
        Usage(Button 5),                        ; ‘4’
        Usage(Button 6),                        ; ‘5’
        Usage(Button 7),                        ; ‘6’
        Usage(Button 8),                        ; ‘7’
        Usage(Button 9),                        ; ‘8’
        Usage(Button 10),                     ; ‘9’
        Logical Minimum(1), Logical Maximum(10),
        ReportSize(4), ReportCount(1),
        Input(Data, Array, Absolute, Null State)
    End Collection(),

    UsagePage(Consumer Devices),
    Usage(Channel),                             ; Channel buttons
    Usage(Volume),                              ; Volume buttons
    Logical Minimum(-1), Logical Maximum(1),
    ReportSize(2), ReportCount(2),
    Input(Data, Variable, Relative, Preferred),

    Usage(Mute),                                ; Mute
    Usage(Power),                               ; Power
    Usage(Sleep Mode),                          ; Sleep
    Usage(Data On Screen),                      ; On Screen
    Usage(Broadcast Mode),                      ; Broadcast
    Usage(Selection Back),                      ; Return
    Usage(Assign Selection),                    ; Enter Choice
    Logical Minimum(1), Logical Maximum(7),
    ReportSize(4), ReportCount(1),
    Input(Data, Array, Absolute, Null State),

    Usage(Selection),
    Collection(Logical),                        ; Three choice buttons
        UsagePage(Button),
        Usage(Button 1),                        ; Choice 1
        Usage(Button 2),                        ; Choice 2
        Usage(Button 3),                        ; Choice 3
        Logical Minimum(1), Logical Maximum(3),
        ReportSize(2), ReportCount(1),
        Input(Data, Array, Absolute, Null State),
    End Collection(),

    Logical Minimum(1), Logical Maximum(2),
    ReportSize(2), ReportCount(1),
    Input(Constant, Variable, Absolute),        ; 2-bit pad
End Collection(),
```

The resulting report will look like the following figure.

Figure 12: Example Remote Control Input Report

	Bit							
Byte	7	6	5	4	3	2	1	0
0	Volume		Channel		Numeric Keypad Values			
1	Pad		Choice Buttons		Remaining Buttons			

A.10 Telephone

This is an example of a speaker phone with the following features:

- Six programmable buttons, each with an In Use indicator LED. The first two programmable buttons also have LEDs that can be used to indicate that the function (line) is selected but not necessarily in use.
- A Message Waiting indicator that can blink when the voice mailbox is full.
- A standard telephone keypad.
- Nine permanently marked buttons: Alternate Function, Conference, Transfer, Drop, Hold, Speaker Phone, Volume Up, and Volume Down.
- An In Use indicator for the Alternate Function button.
- An Off-Hook indicator used by the handset.

```
;Declare all the inputs
ReportCount(1),
UsagePage(Telephony Devices),
Usage(Phone),
Collection(Application),
    Usage(Programmable Button),
    Collection(Logical),
        UsagePage(Button),
        Usage Minimum(Button 1), Usage Maximum(Button 6),
        ReportSize(3),
        Logical Minimum(1), Logical Maximum(6),
        Input(Data, Array, Absolute, Null State),    ; 3-bit buffer for prog buttons
    End Collection(),

    UsagePage(Telephony Devices),
    Usage(Telephony Key Pad),
    Collection(Logical),
        Usage Page(Button),
        Usage Minimum(Button 1), Usage Maximum(Button 12),
        Logical Maximum(12),                         ; 12 buttons
        ReportSize(4),
        Input(Data, Array, Absolute, Null State),    ; 4-bit field, keypad buttons
    End Collection(),
```

```
    UsagePage(Telephony Devices),
    Usage(Hook Switch),
    Usage(Alternate Function),
    Usage(Conference),
    Usage(Transfer),
    Usage(Drop),
    Usage(Hold),
    Usage(Speaker Phone),
    Logical Maximum(7),                             ; 7 buttons
    ReportSize(3),
    Input(Data, Array, Absolute, Null State),       ; 3-bit field for misc. buttons

    UsagePage(Consumer Devices),
    Usage(Volume),
    Logical Minimum(-1),
    Logical Maximum(1),
    ReportSize(2),
    Input(Data, Variable, Absolute),                ; 2-bit field for volume

    ;Pad to byte boundary
    ReportSize(4), ReportCount(1),
    Input(Constant),                                ; 4-bit pad

;Declare all the indicator outputs (LEDs)
    ; Define two Usage Selected Indicators and associate them
    ; with programmable buttons 1 and 2
    Logical Minimum(0), Logical Maximum(1),
    UsagePage(LEDs),
    Usage(Usage Selected Indicator),
    Collection(Logical),
        UsagePage(Telephony Devices),
        Usage(Programmable Buttons),
        Collection(Logical),
            UsagePage(Button),
            Usage Minimum(Button 1), Usage Maximum(Button 2),
            ReportCount(2),
            Output(Data, Variable, Absolute),
        End Collection(),
    End Collection(),

    ; Define six Usage In Use Indicators and associate them
    ; with Programmable buttons 1 through 6
    ; Message Waiting, and Alternate Function
    UsagePage(LEDs),
    Usage(Usage In Use Indicator),
    Collection(Logical),
        UsagePage(Telephony Devices),
        Usage(Programmable Key),
        Collection(Logical),
            UsagePage(Button),
            Usage Minimum(Button 1), Usage Maximum(Button 6),
            ReportCount(6),
            Output(Data, Variable, Absolute),
        End Collection(),
        UsagePage(Telephony Devices),
        Usage(Alternate Function),
```

```
        ReportCount(1),
        Output(Data, Variable, Absolute),
    End Collection(),
    UsagePage(LEDs),
    Usage(Usage Multi Mode Indicator),
    Collection(Logical),
        UsagePage(Telephony Devices),
        Usage(Message),
        Collection(Logical),
            Usage(Indicator On),
            Usage(Indicator Fast Blink),
            Usage(Indicator Off),
            ReportSize(2),
            Output(Data, Array),
        End Collection(),
    End Collection(),

;Volume Control
    UsagePage(Consumer),
    Usage(Volume),                                  ; Volume buttons
    Logical Minimum(-1), Logical Maximum(1),
    ReportSize(2), ReportCount(1),
    Output(Data, Variable, Relative, Preferred),    ; 2-bit field for volume

    ;Pad to byte boundary
    ReportSize(3), ReportCount(1),
    Output(Constant),                               ; 3-bit pad
End Collection()
```

In the following Telephony device reports, the Key Usage Value is an input to the system returning any pressed keys. All the Indicator bits are outputs (LEDs).

Figure 13: Example Telephony Device Input Report

<table>
<tr><td></td><td colspan="8">Bit</td></tr>
<tr><td>Byte</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td>0</td><td>Misc. Buttons Bit 0</td><td colspan="4">Telephony Key Pad</td><td colspan="3">Programmable Keys</td></tr>
<tr><td>1</td><td colspan="4">Pad</td><td>Volume</td><td colspan="3">Misc. Buttons Bits 2-1</td></tr>
</table>

Figure 14: Example Telephony Device Output Report

	Bit							
Byte	7	6	5	4	3	2	1	0
0	In Use Indicator Prog. Button 6	In Use Indicator Prog. Button 5	In Use Indicator Prog. Button 4	In Use Indicator Prog. Button 3	In Use Indicator Prog. Button 2	In Use Indicator Prog. Button 1	Selected Indicator Prog. Button 2	Selected Indicator Prog. Button 1
1	Constant pad = 0			Volume		In Use Indicator Alternate Function	Multi-Mode Indicator Message Waiting	

A.11 Joystick

This is an example of a joystick with the following features:

- A two-axis stick that tilts forward/backward and right/left
- A throttle control on the base
- A four-position hat switch on the stick
- Two buttons on the stick
- Two buttons on the base

```
UsagePage(Generic Desktop)
Usage(Joystick),
Collection(Application),
    UsagePage(Simulation Controls),
    Usage (Throttle),
    Logical Minimum (-127),
    Logical Maximum (127),
    Report Size (8),
    Report Count (1),
    Input (Data, Variable, Absolute),

    UsagePage(Generic Desktop)
    Usage (Pointer),
    Collection (Physical),
        Usage (X),
        Usage (Y),
        Report Count (2),
        Input (Data, Variable, Absolute),
    End Collection(),
    Usage (Hat switch),
    Logical Minimum (0), Logical Maximum (3),
    Physical Minimum (0), Physical Maximum (270),
    Unit (English Rotation: Angular Position),       ; Degrees
    Unit Exponent (0),
    Report Size (4), Report Count (1),
```

```
    Input (Data, Variable, Absolute, Null State),

    Usage Page (Buttons),                           ; Buttons on the stick
    Usage Minimum (Button 1),
    Usage Maximum (Button 4),
    Logical Minimum (0), Logical Maximum (1),
    Physical Minimum (0), Physical Maximum (1),
    Report Count (4),
    Report Size (1),
    Unit (None),
    Input (Data, Variable, Absolute),

End Collection()
```

Figure 15: Example Joystick Input Device Report

	Bit							
Byte	7	6	5	4	3	2	1	0
0	Throttle							
1	X-axis							
2	Y-axis							
3	Button 4	Button 3	Button 2	Button 1	Hat Switch			

A.12 Game Pad

This is an example of a game pad with the following features:

- A two-axis rocker that tilts forward/backward and right/left
- Six buttons

```
UsagePage(Generic Desktop),
Usage(Game Pad),
Collection(Application),
    Usage (Pointer),
    Collection (Physical),
        Usage (X),
        Usage (Y),
        Logical Minimum (-1), Logical Maximum (1),
        Report Count (2), Report Size (2),
        Input (Data, Variable, Absolute, No Null),
    End Collection(),

    Report Count (4),
    Report Size (1),
    Input (Constant, Variable, Absolute),           ; 4-bit pad

    Usage Page (Buttons),                           ; Buttons on the stick
    Usage Minimum (Button 1),
    Usage Maximum (Button 6),
```

```
    Logical Minimum (0), Logical Maximum (1),
    Report Count (6),
    Report Size (1),
    Input (Data, Variable, Absolute),

    Report Count (2),
    Input (Constant, Variable, Absolute)            ; 2-bit Pad

End Collection()
```

Figure 16: Example Game Pad Input Device Report

	Bit							
Byte	7	6	5	4	3	2	1	0
0	Pad				Y-axis		X-axis	
1	Pad		Button 6	Button 5	Button 4	Button 3	Button 2	Button 1

Appendix B: Delimiter Example

Delimiters allow a device to declare multiple uses for a control.

Ideally, an application like a flight simulator would look for the controls that are specific to it. It would first search for Flight Simulation Devices attached to the system and then, if one was found, it would look for controls (usages) such as **Flight Control Stick**, Trigger, Rudder, Throttle, Landing Gear, Toe Brake, etc. The problem with a **Flight Stick** declaring these usages is that the same device can also be used as a generic joystick. A device declaring itself as a **Flight Simulation Device** would not be found by an application that searched for a **Joystick** usage.

A problem that occurs with generic buttons on an application-specific device such as a **Flight Stick** is that different applications use the same buttons for different purposes, forcing the user to relearn the buttons for each application.

Delimiters solve this problem by allowing multiple usages to be associated with a device or an individual control. Using delimiters, a hardware vendor can suggest usages for the buttons that will allow a consistent user interface across applications.

Note Delimiters are not allowed on top-level collections or arrays.

The following example is a single device that can also be identified as a **Flight Simulation Device**, a **Flight Stick** or a generic **Joystick**. Most of the controls also have alternate mappings:

- The axes of the stick are either a **Flight Control Stick** or a **Pointer**.
- The hat switch can also be used as a **Point of View** control.
- Each of the four buttons have alternate mappings:
  - Button 1 or Trigger
  - Button 2 or Weapons Select
  - Button 3, Electronic Counter Measures, or Flare Release
  - Button 4, Landing Gear, or Chaff Release

  Buttons 3 and 4 thus have two alternate usages.

Note that the report generated by this **Report** descriptor is identical to that generated by the joystick example in Appendix A.

```
UsagePage(Generic Desktop),
LogicalMin(0),
Usage (Joystick),
Collection(Application)
    UsagePage(Simulation Controls),
    Usage (Throttle),
    Logical Minimum (-127),
    Logical Maximum (127),
    Report Size (8),
    Report Count (1),
    Input (Data, Variable, Absolute),

    Delimiter(Open),
        Usage (Flight Control Stick),
        Usage (Generic Desktop: Pointer),
    Delimiter(Close),
```

```
    Collection (Physical),
        Usage (Generic Desktop: X),
        Usage (Generic Desktop: Y),
        Report Count (2),
        Input (Data, Variable, Absolute),
    End Collection(),
    Delimiter(Open),
        Usage (Game Controls: Point of View),
        Usage (Generic Desktop: Hat switch),
    Delimiter(Close),
    Logical Minimum (0),
    Logical Maximum (3),
    Physical Minimum (0), Physical Maximum (270),
    Unit (English Rotation: Length(1)),              ; Degrees
    Unit Exponent (0),
    Report Size (4),
    Report Count (1),
    Input (Data, Variable, Absolute, Null State),

    ; Declare the buttons on the stick
    Delimiter(Open),
        Usage (Buttons: Button 1),
        Usage (Trigger),
    Delimiter(Close),
    Delimiter(Open),
        Delimiter(Open),
        Usage (Buttons: Button 2),
        Usage (Weapons Select),
    Delimiter(Close),
    Delimiter(Open),
        Delimiter(Open),
        Usage (Buttons: Button 3),
        Usage (Electronic Counter Measures),
        Usage (Flare Release),
    Delimiter(Close),
    Delimiter(Open),
        Delimiter(Open),
        Usage (Buttons: Button 4),
        Usage (Landing Gear),
        Usage (Chaff Release),
    Delimiter(Close),
    Logical Minimum (0), Logical Maximum (1),
    Physical Minimum (0), Physical Maximum (1),
    Report Count (4),
    Report Size (1),
    Unit (None),
    Input (Data, Variable, Absolute),
End Collection()
```

Appendix C: Physical Descriptor Example

Physical descriptors allow a device to identify how the user physically interacts with the device. These are particularly useful for devices such as ergonomically designed flight simulator throttle controls.

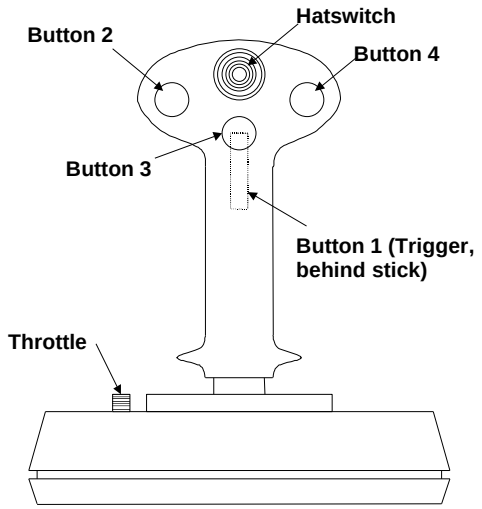
Attaching a designator to a control is as simple as adding a usage. The **Designator Index** is used to access a **Physical** descriptor in a physical descriptor set. In this example, the stick is designed to be held in either hand. However, the way that the user accesses the buttons will change depending on which hand is used.

Consider the joystick below. When the joystick is held by a right-handed person, the thumb falls on the left button (2). It would make sense to assign this button to a function that requires quick access or a fast repeat rate, while the button on the right (4) would be assigned a function that does not. This is because a right-handed user must stretch the thumb from the resting position to touch button 4. If a left-handed person held the device, the reverse would be true because the thumb would naturally rest on the button on the right (4).

These considerations result in the Effort values that are declared for the right-hand bias physical descriptor set (1) below. Buttons 2, 3, 4, and the hat switch are accessed by the user's thumb. The Effort assignments are Button 2 = 0, Hat switch = 1, Button 3 = 2, and Button 4 = 3. In the case of the Hat switch and Button 3, the thumb has to stretch the same amount. The user must, in essence, "heel and toe" the two controls with the thumb. The Hat switch receives the lower Effort value because the tip of the thumb (toe) is considered a more effective manipulator than the first joint of the thumb (heel).

The left hand of a right-handed user normally manipulates the throttle, while a left-handed user must let go of the stick and use the index finger to manipulate it. This is why the **Physical** descriptor for both right-handed and left-handed users indicates the left index finger. However, for the left-handed user, the Effort is higher.

Figure 17: Joystick Button Layout



In the following **Report** descriptor example, **Physical** descriptor 1 is attached to the throttle, **Physical** descriptor 2 to the stick, and so on. Two physical descriptor sets are provided: right and left hand. The physical descriptor set that is actually referenced depends on whether the user is right- or left-handed. It is assumed that the orientation of the user is stored in the user's profile on the system.

```
Usage Page (Generic Desktop),
Logical Minimum (0),
Usage (Joystick),
Collection (Application),
    Usage Page (Simulation Controls),
    Usage (Throttle),
    Designator Index (1),
    Logical Minimum (-127),
    Logical Maximum (127),
    Report Size (8),
    Report Count (1),
    Input (Data, Variable, Absolute),

    Usage Page (Generic Desktop),
    Designator Index(2),
    Usage (Pointer),
    Collection (Physical),
        Usage (X),
        Usage (Y),
        Report Count (2),
        Input (Data, Variable, Absolute),
    End Collection(),
    Usage (Hat switch),
    Designator Index (3),
    Logical Minimum (0), Logical Maximum (3),
    Physical Minimum (0), Physical Maximum (270),
    Unit (English Rotation: Angular Position),       ; Degrees
    Unit Exponent (0),
    Report Size (4), Report Count (1),
    Input (Data, Variable, Absolute, Null State),

    Usage Page (Buttons),                            ; Buttons on the stick
    Usage Minimum (Button 1),
    Usage Maximum (Button 4),
    Physical Minimum (4), Physical Maximum (7),
    Logical Minimum (0), Logical Maximum (1),
    Physical Minimum (0), Physical Maximum (1),
    Report Count (4),
    Report Size (1),
    Unit (None),
    Input (Data, Variable, Absolute),

End Collection()
```

The following notation is used to describe two physical descriptor sets for right-handed and left-handed use.

```
; There are two sets defined. Descriptor set 0 is a special descriptor set
; that specifies the number of additional descriptor sets,
; and also the number of Physical Descriptors in each set.

Physical Descriptor Set [0]
{
    Physical Descriptor Set Count (2)
    Physical Descriptor Set Length (15)              ; In bytes
}
```

```
Physical Descriptor Set [1]
{
    Bias(Right Hand)
    Preference (0)
    Physical Descriptor [1]                          ; Throttle
        Designator (Index Finger)
        Qualifier (Left)
        Effort (0)
    Physical Descriptor [2]                          ; Stick
        Designator (Hand)
        Qualifier (Right)
        Effort (0)
    Physical Descriptor [3]                          ; Hat switch
        Designator (Thumb)
        Qualifier (Right)
        Effort (1)
    Physical Descriptor [4]                          ; Button 1 – Trigger
        Designator (Index Finger)
        Qualifier (Right)
        Effort (0)
    Physical Descriptor [5]                          ; Button 2
        Designator (Thumb)
        Qualifier (Right)
        Effort (0)
    Physical Descriptor [6]                          ; Button 3
        Designator (Thumb)
        Qualifier (Right)
        Effort (2)
    Physical Descriptor [7]                          ; Button 4
        Designator (Thumb)
        Qualifier (Right)
        Effort (3)
}

Physical Descriptor Set Header [2]{
    Bias (Left Hand)
    Preference (0)
    Physical Descriptor [1]                          ; Throttle
        Designator (Index Finger)
        Qualifier (Left)
        Effort (1)
    Physical Descriptor [2]                          ; Stick
        Designator (Hand)
        Qualifier (Left)
        Effort (0)
    Physical Descriptor [3]                          ; Hat switch
        Designator (Thumb)
        Qualifier (Left)
        Effort (1)
    Physical Descriptor [4]                          ; Button 1 – Trigger
        Designator (Index Finger)
        Qualifier (Left)
        Effort (0)
    Physical Descriptor [5]                          ; Button 2
        Designator (Thumb)
        Qualifier (Left)
```

```
        Effort (3)
    Physical Descriptor [6]                             ; Button 3
        Designator (Thumb)
        Qualifier (Left)
        Effort (2)
    Physical Descriptor [7]                             ; Button 4
        Designator (Thumb)
        Qualifier (Left)
        Effort (0)
}
```

Usage Index

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