

Introduction to UXV NAV HID

1.0 - What is HID?

The human interface device (HID) standard was adopted to allow devices that interact with humans to transfer data to a computer operating system in a uniform and extensible manner. The protocol runs as a subset of the USB standard ([USB-HID](#)). Most commonly used HID devices are mice, keyboards and joysticks (eg playstation or xbox controllers).

When a device supporting the USB-HID standard is connected to an operating system's downstream USB port, the device sends across a HID report descriptor ([Link](#)), which lays out the following pieces of information:

- Type of HID device (such as a gamepad, joystick, keyboard, mouse)
- Number of data items (termed usages) - such as number of axes, buttons, LEDs, keys. The name of each usage can be any one of those listed in the [USB HID Usage Tables](#), such as X, Y, SLIDER, THROTTLE
- The format of each data item (the data type, range of possible values, whether it is an input or output)

Additionally, two identifiers are used to distinguish the driver from different devices and manufacturers: a Vendor ID (VID) and Product ID (PID).

After connection has been established, a device will usually send out a HID report (containing the information relevant to the system, such as mouse movement, key presses, etc) at regular intervals, or when information has changed. The operating system, in conjunction with the HID report descriptor will interpret this information into its own format/interface, which can then be queried by applications in an operating-system-specific manner (see 4.0). Often, applications which use HID will query the OS for an appropriate HID device that matches a HID type (eg gamepad), or a specific device which matches a VID and PID.

2.0 - What is UXV NAV HID?

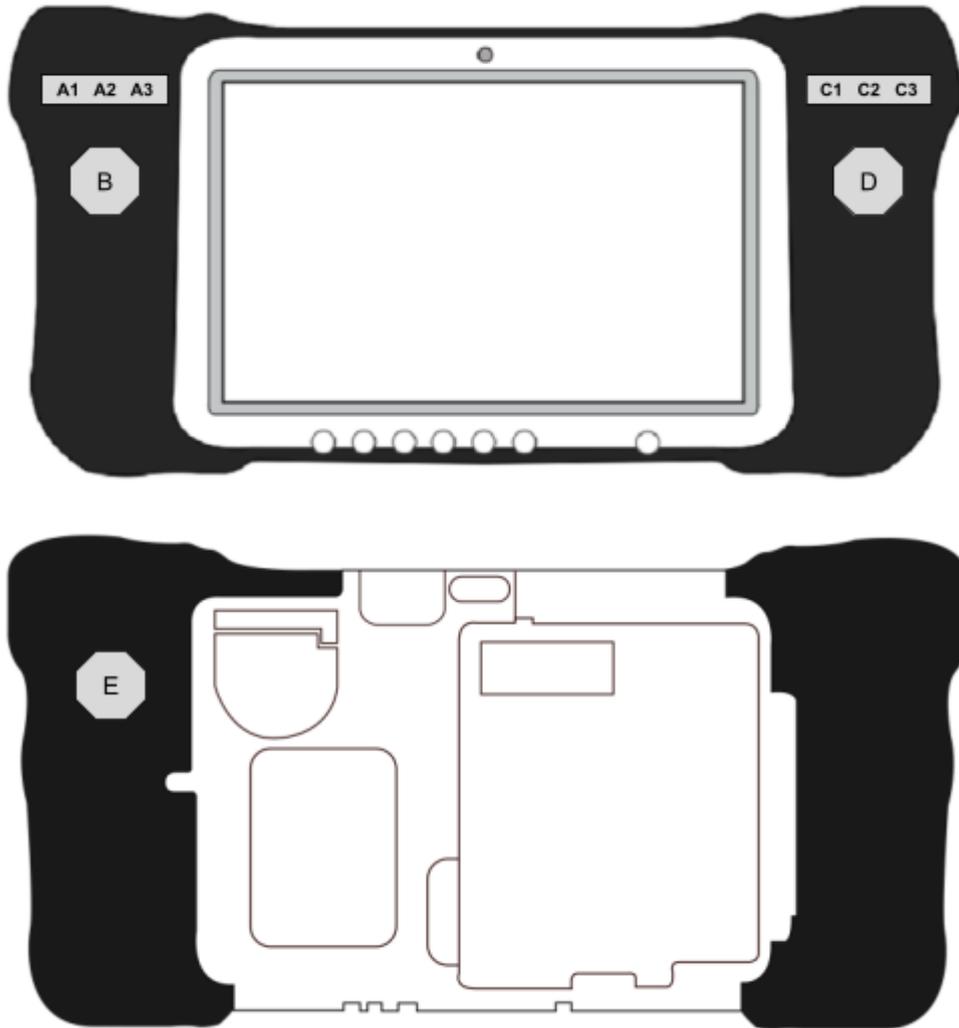
UXV NAV products primarily interface to the tablet attached to them through the USB protocol. Upon power-up they appear as a USB-HID device nominally emulating a gamepad, with a number of gamepad axes and buttons which are dependent on the NAV in question.

For the Aeronav Dev Kit, the following HID configuration is used:

OS Joystick Driver Parameter	Parameter Value
HID Product Description	AERONAV ONE
HID Manufacturer Description	UXV TECHNOLOGIES
HID Driver Vendor ID (VID)	0x0483

HID Driver Product ID (PID)

0xA335



Aeronav Device Front and Back

HID Usage Name - Axes	Joystick Mapping
HID Axis X	B-X
HID Axis Y	B-Y
HID Axis Z	D-X
HID Axis X (Rotation)	D-Y
HID Axis Y (Rotation)	E-X
HID Axis Z (Rotation)	E-Y

HID Usage Name -

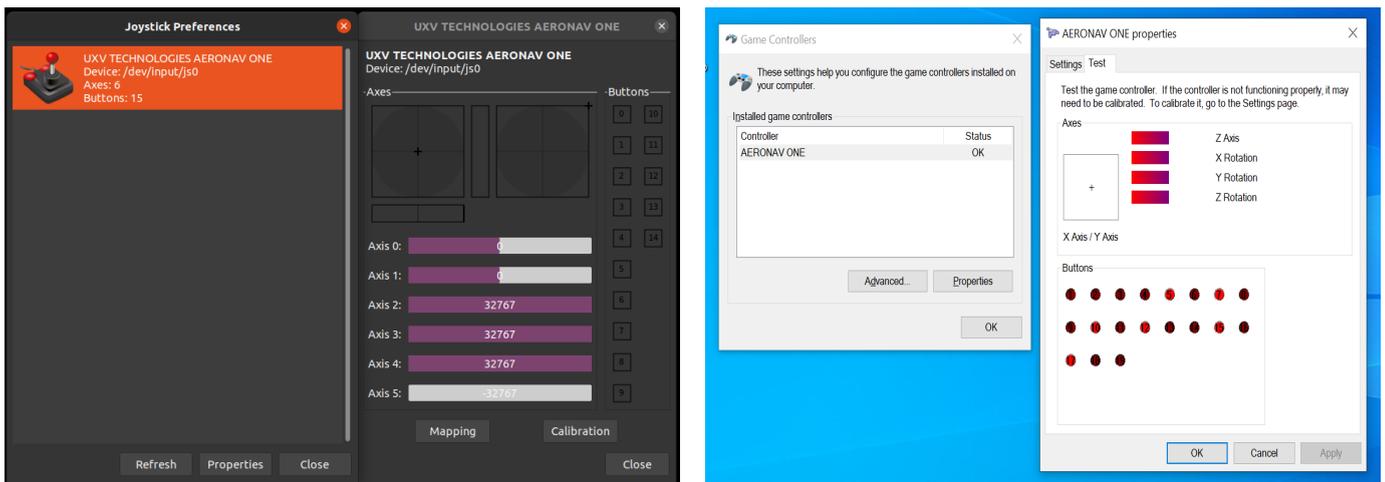
Joystick Mapping

Buttons	
HID Button 1	A1 up
HID Button 2	A1 down
HID Button 3	A2 pressed
HID Button 4	A2 released
HID Button 5	A3 up
HID Button 6	A3 middle
HID Button 7	A3 down
HID Button 8	C1 up
HID Button 9	C1 down
HID Button 10	C2 up
HID Button 11	C2 down
HID Button 12	C3 up
HID Button 13	C3 middle
HID Button 14	C3 down
HID Button 15	E pressed
HID Button 16	None

3.0 - Testing HID Functionality

In order to visualize HID functionality, one of the following applications can be used depending on your OS choice:

- Linux - jstest-gtk (<https://jstest-gtk.gitlab.io/>)
- Windows 10 - Game controllers (installed by default)



4.0 - Interfacing to HID in Application Development

The USB-HID specification is usually abstracted away by the operating system, and the OS provides its own API. Depending on your application programming language choice, you could use cross-platform libraries to aid development:

SDL (C, C++) <https://www.libsdl.org/>

QtGamepad (Qt, C++, qml) (works only for linux, macOS and android)

<https://doc.qt.io/qt-5/qtgamepad-index.html>

QJoysticks (Qt, C++, qml) <https://github.com/alex-spataru/QJoysticks>

Simplehidlibrary (C# and .NET) <https://archive.codeplex.com/?p=simplehidlibrary>

Hid4java (Java) <https://github.com/gary-rowe/hid4java>

Hid 1.0.4 (Python) <https://pypi.org/project/hid/>

HIDAPI <https://github.com/libusb/hidapi>

5.0 - HID Report Changes

For changing of the stock HID report descriptor UXV Technologies can provide companion software, which allows adjustment of axis and button assignments on each tablet.

	INFO	SETTINGS	RAW	HID	DEBUG	
Manufacturer	UXV TECHNOLOGIES					
Description	AERONAV ONE					
Reporting rate	-	33			+	
Axis	-	6			+	
Buttons	-	15			+	
AXIS		BUTTONS		SETTINGS		