

Developer information

Imtradex USB Audio Devices

Author: Daniel Schäfer (R&D)
Tobias Bluhm (R&D)
Date: December 2016
Revision: 1.0

Imtradex GmbH
Daimlerstraße 23
D-63303 Dreieich
-Germany-
www.imtradex.com

This document is concerned to the following article series:

HS3-USB design series, AirTalk USB design series, BusinessLine USB design series, AK2 USB design series, AK3 USB design series, Aurelis USB design series, PTT-13 USB design series, PTT-19 USB design series, PTT-Foot USB design series, TM2 USB design series, TM3 USB design series. A short overview about the Imtradex USB design series is pictured under topic *“3.1 Imtradex USB Articles”*

This document and its contents are the property of the Imtradex Hör-/ und Sprechsysteme GmbH (referred to as Imtradex GmbH).

All rights reserved. Complete or partial use, reproduction, copying, use or dissemination in digital or analogue form is prohibited without the written permission of the Imtradex GmbH.

All information shown in this document, without any commitment, is not to be considered as an offer for conclusion of a contract, nor shall be construed as to create any liability.

We reserve the right to change and make improvements to the products; the present and related documents in the sense of technical progress.

Table of content

1.0	Document information	2
1.1	Document history	2
1.2	Related documents	2
2.0	Preamble	2
3.0	General information	3-4
3.1	Imtradex USB devices	3
3.2	Starting your USB device	4
4.0	USB device types	4-6
4.1	USB sound device	4
4.2	USB HID device	4
4.3	HID Input and Output reports	5
4.3.1	Carrying of the HID information	5
4.3.2	HID input reports	5
4.3.3	HID output reports	5
4.3.4	Writing an output report	5
4.3.5	Reading an output report	6
5.0	Testing the device functions	6
5.1	Speaker and microphone	6
5.2	Hook, PTT and volume buttons	6
Appendix A	Product identification	7
Appendix B	HID reports	8
Appendix C	USB-device description	9

1.0 Document information

1.1 Document history

Rev	Changes/ Modification	Author	Date	Checked	Date
0.1	First draft	DS	21.12.2016	TB	21.12.2016

1.2 Related documents

No.	Document name	Rev.	Filename
1	USB User Information GB		

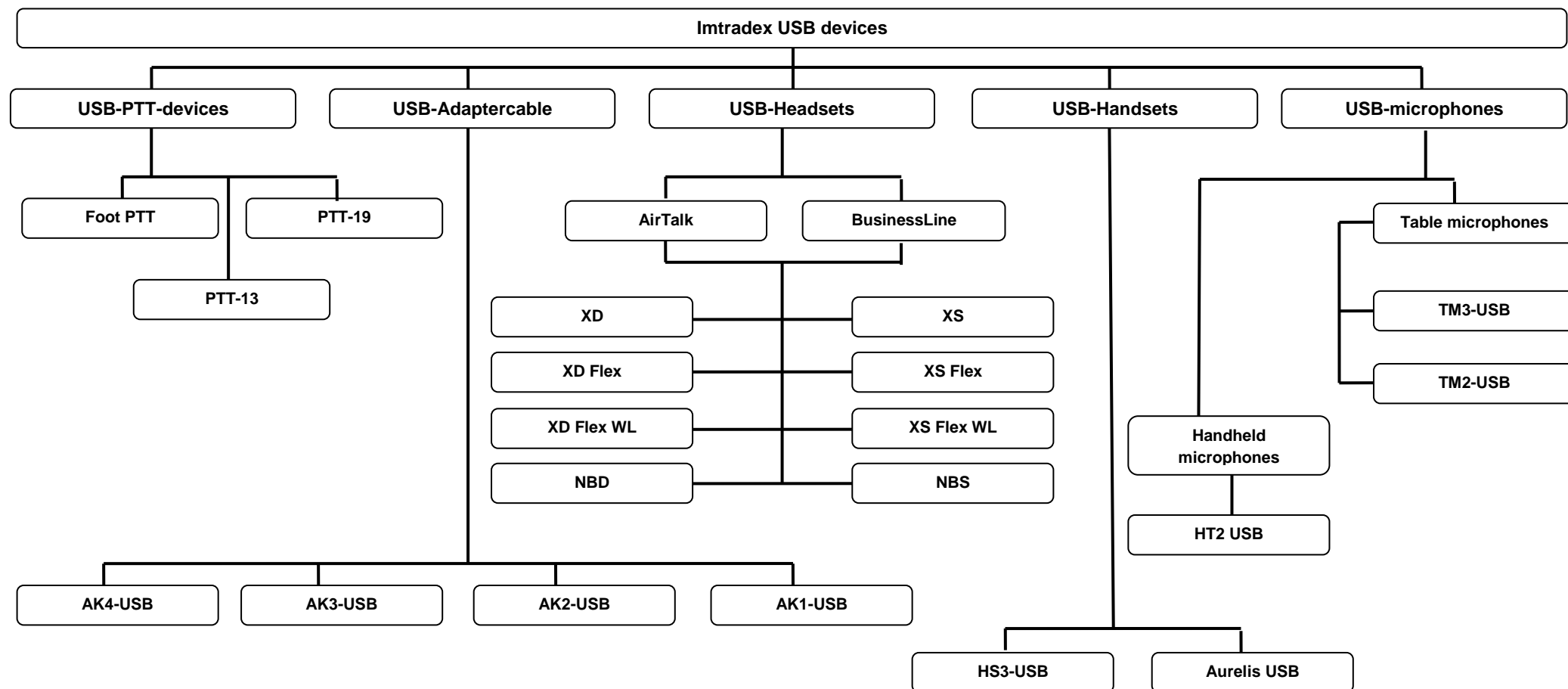
2.0 Preamble

The present document shall give an overview about the available USB-devices and how to interface them by a user's application. You can find an overview about the manufactured USB-devices under Point 3.1 Imtradex USB devices. The content presupposes basic knowledge by the reader of this document about USB technologies and application.

Since Imtradex USB devices are equipped differently, not all parts of this document may be important to you, use the table of contents to navigate through this document.

If you have any further questions, do not hesitate to contact us. You find the contact data on the cover sheet of this document.

3.0 General information
3.1 Imtradex USB devices



* Descriptions of the device types under Appendix C- USB-device description

3.2 Starting your USB-device

The following script refers to the USB software revision 2/3 and higher.

Installing an USB device on your computer is a quite easy process. Plug in the device into an USB port on your system. All required drivers will install automatically after plugging in the USB device for the first time.

The following minimum requirements for your system must be fulfilled:

Operating system:	Windows ® XP, 7, 8, 8.1, 10 Linux Kernel 2.6, or higher*
USB Standard:	USB 2.0, or higher

The computer will notify you a successful installation.

Imtradex USB devices will be identified by Windows ® as a composite device. A USB composite device is a single gadget that has the ability to perform more than one function.

It consists of an *USB sound device* and an *USB HID device*.

Imtradex USB devices use the following ID's:

Point	Value	Remarks
VID (Vendor ID)	0x572	used for all products (except Aurelis USB design series)
PID* (Product ID)	0x1410	used for all products (except Aurelis USB design series)
Product name*	-	according to used device
Serial number**	-	according to the used device

**An overview of the used product names of the Imtradex USB products you can find in the chapter "Appendix A: Product identification"*

***The generated, **unique** serial number is a special feature provided by the Imtradex USB software. The serial number guaranties the explicit identification of the used product and simplifies the traceability of the device.*

4.0 USB device types

4.1. USB sound device

The Windows® Media Mixer is a very complex instrument and can be used for different applications. To describe every single application would bust the frame of this document. Therefore this document only contents the main functions and terms.

The Imtradex USB sound devices appear as an external soundcard and are usually selected automatically by the operating system.

Because of that you can use the following methods to change the volume of the plugged in devices.

- Use the standard Windows® API (Application Programming Interface) functions
- Change the volume by using the Windows® mixer panels

4.2. USB HID device

This chapter contains methods and terms of the USB HID device. The following steps are necessary to use the device.

- Opening the device
- Reading and writing reports
- Closing the device

4.3 HID Input and Output reports

4.3.1 Carrying of the HID information

Depending on the datatype, there are two different methods HID-information is carried.

Either the information is carried over a default interface (endpoint 0) or the HID interrupt interface “*interface 3*” (endpoint 4).

HID interrupt reports are sent using the *HID interrupt interface* unless quarried by the host. If a *HID input report* is quarried by the host, it is sent using *default interface*.

All other reports are sent using the *default interface* which includes *output reports*, *feature reports* and the *report descriptor*.

4.3.2 HID input reports

Input reports send status information to the host using the *HID interrupt interface* (endpoint 4). This endpoint is checked by the host every 1ms.

Input reports contain status regarding buttons, GPIOs (**G**eneral **P**urpose **I**nput **O**utput).

Input reports can also be quarried using the *default interface* with the HID class specific command **GET_Report{}**. If this command is used the report will be returned on the *default interface* instead of the *interrupt interface*. Bits in the *input report* cannot be set by the host.

4.3.3 HID output reports

Output reports send information from the host to the device. This is used to send GPIO (**G**eneral **P**urpose **I**nput **O**utput) output information to the host. These reports are sent by the host using the *default interface*.

4.3.4 Writing an output report

The function **WriteFile()** is used for sending output records. Is it mainly used for setting and switching external output components like LEDs and to prompt the firmware to provide an *Input report* for the following **ReadFile()** operation. The *output report* consists of 37 Bytes.

Byte 1 and 2 are the bytes transporting the *ReportID* and the *OutputByte*, which are the important data. The data which are transported on the bytes 3 to 37 are less important and not necessary in this case. The tablets below show the types of the used bytes and explain the types of sent data.

ReportID	OutputByte	Data not necessary
Byte1	Byte2	Byte3-37

ReportID ReportID is 0x03 or 0x08 to set the device, 0x01, 0x02, 0x08 to perform a GetReport and provide an InputReport

OutputByte The output byte is used for the setting of external output components and request to provide an input report.

4.3.5 Reading an input report

Windows HID Drivers causes the host controller to request *InputReports* periodically. The driver stores received reports in the buffer.

The **ReadFile()** order retrieves one more report from the buffer. If the buffer is empty, **ReadFile()** waits for a report to arrive.

ReadFile() thus does not cause the device to send a report but just reads reports that the driver has requested.

When called without overlapped flag, **ReadFile()** is a blocking the call and the applications thread waits until one of the below cases occurs:

- A new report is available
- The user closes the application via the "Taskmanager"
- The device is removed from the bus.

To avoid this condition there are two main approaches:

Method 1: Use of a separate thread (multitasking) for the **ReadFile()** operation that notifies the main thread when a report is available.

Method 2: Prompt the firmware to provide a report by sending a special output report via **WriteFile()** prior to each **ReadFile ()**.

The input Report consists of **33 Bytes**. Byte 1 and 2 are the bytes which transport the important data. Byte 3 to byte 33 are transporting useless data and can be ignored in this case.

Byte 1, 2 and 3 are the bytes are transporting the *ReportID* and the *InputByte 0*, *InputByte 1* which are the important data. The data which are transported on the bytes 4 to 33 are less important and not necessary in this case.

The tables below show the types of the used bytes and explain the types of sent data.

ReportID	InputByte0	InputByte1	Data not necessary
Byte1	Byte2	Byte3	Byte 4 to Byte33

ReportID The report ID is depending on the function to read from (0x01,0x02,0x08)

InputByte0 The InputByte0 is used to display the states of the device.

InputByte1 The InputByte1 is used to display the jack sense state.

5.0 Testing the device functions

5.1 Speaker and microphone

Plug the used device into the USB connector of your system. The drivers should install automatically (see 3.2 *Starting your USB device*).

After the successful installation the device is ready to use and shown in the volume mixer panels of your operating system. The shown device name is according to your device (see *Appendix A: Product identification*).

The volume mixer panels can be accessed by right-clicking the *speaker icon* in the *task bar*, the *system control*, or the *playback panel* (only Windows® 7, 8, 8.1,10).

For a more accurate description of opening these functions, please use the Windows® Help function.

5.2 Hook, PTT and volume buttons

The handsets volume buttons can take over the control over the speaker volume of the pc*. This can be tested easy during sound/video playback.

In order to check out the functionality of the PTT button a USB sniffer tool required. *SimpleHIDWrite* is a useful tool and available for free on the internet

The tool reports all usage of the PTT-button (press and release), the hook function, the volume buttons together with LED and GPIO information. Additionally it identifies the device by VIP, PID and serial number. For a more accurate description of the tool, please use the related product information.

* *Device firmware based feature*

Appendix A Product identification

USB products developed from November 2015 got the following identification details*:

Vendor ID: 0x572
Product ID: 0x1410

Exceptions are articles of the Aurelis USB design series (Art.-no.: 0710060-XX, red marked). For these products the following ID's are assigned:

Vendor ID: 0x22B6
Product ID: 0x0115

Art.-No.	Product name	Product description for USB
0660005-1	AirTalk 3000 XD Flex-USB, PTT-13, NEU	Airtalk 3000 XD Flex
0660005-2	AirTalk 3000 XD Flex-USB, PTT-13, split.	Airtalk 3000 XD Flex
0660005-3	AirTalk 3000 XD Flex-USB, PTT-19, NEU	Airtalk 3000 XD Flex
0650007-1	AirTalk 3000 XS Flex-USB, PTT-13 NEU	Airtalk 3000 XS Flex
0650008-1	AirTalk 3000 XS Flex-USB, PTT-19 NEU	Airtalk 3000 XS Flex
0260020-22	AirTalk 3000 XS-USB, OT, GN-QD, sonst.	Airtalk 3000 XS Flex
0660002-1	AirTalk NBD-USB, Nackenbügel-Headset, PTT-13 NEU	Airtalk NBD-USB V2
0660004-1	AirTalk NBD-USB, Nackenbügel-Headset, PTT-19 NEU	Airtalk NBD-USB V2
0650002-1	AirTalk NBS-USB, Nackenbügel-Headset, PTT-13 NEU	Airtalk NBS-USB V2
0650005-1	AirTalk NBS-USB, Nackenbügel-Headset, PTT-19 NEU	Airtalk NBS-USB V2
0660001-1	AirTalk XD-USB, Headset, PTT-13 NEU	Airtalk XD-USB V2
0660003-1	AirTalk XD-USB, Headset, PTT-19 NEU	Airtalk XD-USB V2
0290020-21	AirTalk XD-USB, OT, GN-QD, sonst.	Airtalk XD-USB V2
0290019-10	AirTalk XD-USB, OT, split, sonst.	Airtalk XD-USB V2
0650006-1	AirTalk XS-USB, Headset, Fußtaster, NEU	Airtalk XS-USB V2
0650001-1	AirTalk XS-USB, Headset, PTT-13 NEU	Airtalk XS-USB V2
0650004-1	AirTalk XS-USB, Headset, PTT-19, NEU	Airtalk XS-USB V2
0260020-21	AirTalk XS-USB, OT, GN-QD, sonst.	Airtalk XS-USB V2
0640001-1	Handhörer, HS3-USB, PTT, FREQ, Rev.B	Imtradex HS3-USB V2
0640002-1	Handhörer, HS3-USB, PTT, NEU	Imtradex HS3-USB V2
0640004-2	Handhörer, HS3-USB, PTT, Reedkontakt, ausgeführt	Imtradex HS3-USB Reed V2
0640003-1	Handhörer, HS3-USB, PTT, Reedkontakt, FREQ, Rev.B	Imtradex HS3-USB Reed V2
0640004-1	Handhörer, HS3-USB, PTT, Reed Kontakt, NEU, Standard	Imtradex HS3-USB Reed V2
0630002-1	PTT-13-USB, UT Sendetaste, GN-QD, NEU	PTT-13-USB, PLX-QD V2
0630005-1	PTT-13-USB, UT Sendetaste, split, NEU	PTT-13-USB, PLX-QD V2
0630006-1	PTT-13-USB, UT, DEX-QD, für Fußtaster	PTT-13-USB, PLX-QD V2
0630001-1	PTT-13-USB, UT, PLX-QD, NEU	PTT-13-USB, PLX-QD V2
0630003-1	PTT-13-USB, UT, Sendetaste, PLX-QD FREQ,	PTT-13-USB, PLX-QD V2
06FT05-1	PTT-Foot-USB, Fußtaster, mod. Vers., Huawei	USB-Foot-PTT V2
0229109-46	Stielmikrofon HT2-USB, NEU	Imtradex HT2-USB V2
06TM2-25	Tischmikrofon TM2-LS-USB, PTT	TM2-LS-USB V2
06TM2-26	Tischmikrofon TM2-USB, PTT NEU	TM2-USB V2
06TM2-28	Tischmikrofon TM2-USB, PTT, Conet	TM2-USB V2
06TM3-2	Tischmikrofon TM3-USB, PTT, 105dB, NEU, Standard	TM3-LS-USB V2
06TM3-3	Tischmikrofon TM3-USB, PTT, 115dB, NEU	TM3-LS-NT-USB V2
501-258	Anschlußkabel, AK-2-USB, WL-DECT, FREQ, Rev.B	Imtradex AK2-USB V2
501-259	Anschlußkabel, AK-2-USB, WL-DECT, Standard NEU	Imtradex AK2-USB V2
501-270	Anschlußkabel, AK-3-USB, Binder, split FREQ	Imtradex AK3-USB, Binder620 V2
501-272	Anschlußkabel, AK-3-USB, Binder, split, Allegra	Imtradex AK3-USB, Binder620 V2
501-255	Anschlußkabel, AK-3-USB, DEX-QD, NEU	Imtradex AK3-USB, GN-QD V2
501-257	Anschlußkabel, AK-3-USB, PLX, FREQ	Imtradex AK3-USB, PLX-QD V2
501-256	Anschlußkabel, AK-3-USB, PLX-QD, NEU	Imtradex AK3-USB, PLX-QD V2
0710060	Aurelis USB	Imtradex Aurelis-USB

Appendix B HID Reports

Below are the HID reports that can be sent and retrieved on CX2070X.

HID Input Report1 (consumer control)

Byte	7	6	5	4	3	2	1	0
1	Report ID=1							
2		Button 2	Button 1			Spk Mute	Volume down	Volume up

This report is sent to the host when the status of the Volume Up, Volume Down, Speaker mute, Button 1 or Button 2 is pressed.

HID InputReport2 (GPIO Input)

Byte	7	6	5	4	3	2	1	0
1	Report ID=2							
2				Call Status LED/GPIO3			GPIO2	GPIO1
3	HP Jack							

This report is sent to the host when the status of one of the above GPIO is changed.

ATTENTION: HID InputReport2 must be programmed with user customized Firmware

HID Output Report3 (GPIO output)

Byte	7	6	5	4	3	2	1	0
1	Report ID=3							
2				Call Status LED/GPIO3			GPIO2	GPIO1

This report is sent by the host to attempt set the GPIO pins high or low.

The ability to set the GPIO pins high or low depends on if the IO pins are selected as Output and have their secondary functions disabled. **ATTENTION: HID OutputReport3 must be programmed with user customized Firmware**

HID InputReport8 (Telephony)

If the product supports this feature by firmware programming, the device will send up an HID descriptor that supports the following Telephony bits. These bits are used by telephony applications like Microsoft Office Communicator [MSOC].

Byte	7	6	5	4	3	2	1	0
1	Report ID=8							
2							Off Hook	Phone Mute

This report is sent to the host when the status of the Off-Hook button or mute button is changed.

ATTENTION: HID InputReport4 must be programmed with user customized Firmware

HID InputOutputReport8 (Telephony LEDS)

Byte	7	6	5	4	3	2	1	0
1	Report ID=8							
2							Off Hook LED	Phone Mute LED

This report is sent by the host to control the status of the OFF-Hook and Mute LED.

ATTENTION: HID Input/OutputReport8 must be programmed with user customized Firmware

Appendix C USB-device description

USB PTT devices

USB PTT devices are devices for sending messages over your system. The abbreviation PTT stands for “**P**ush-**T**o-**T**alk”. Imtradex offers the following design series:

- PTT-19
- PTT-13
- Foot PTT

USB-Adaptercable

USB adapter cables are used for connecting your used devices to USB connectors. In general, not all used devices are equipped with an USB connector. For such cases Imtradex offers the following design series:

- AK1-USB
- AK2-USB
- AK3-USB
- AK4-USB

USB-Headsets

USB Headsets are Imtradex Headsets with a USB connector. A Headset is equipped with speaker(s) and a microphone. Imtradex offers the following design series:

- | | |
|---|--|
| - AirTalk XD design series | - BusinessLine XD design series |
| - AirTalk XS design series | - BusinessLine XS design series |
| - AirTalk 3000 XS design series | - BusinessLine 3000 XS design series |
| - AirTalk 3000 XD design series | - BusinessLine 3000 XD design series |
| - AirTalk 3000 XS Flex design series | - BusinessLine 3000 XS Flex design series |
| - AirTalk 3000 XD Flex design series | - BusinessLine 3000 XD Flex design series |
| - AirTalk 3000 XS Flex WL design series | - BusinessLine 3000 XS Flex WL design series |
| - AirTalk 3000 XD Flex WL design series | - BusinessLine 3000 XD Flex WL design series |
| - AirTalk NBS design series | - BusinessLine NBS design series |
| - AirTalk NBD design series | - BusinessLine NBD design series |

USB-Handsets

USB handsets are handhelds equipped with a USB connector. These handhelds can be designed like a common telephone handset (for operation in control centers) or in the way of the Aurelis design series. Instead of handheld microphones, a handset is equipped with a speaker and a microphone. Imtradex offers the following design series:

- HS3-USB design series
- Aurelis USB design series

USB-Microphones

USB-microphones are used for imaging and forwarding audio signals. Instead of the handsets, microphones are not equipped with speakers. Imtradex offers two kinds of microphones: Table microphones are positioned on a table or any other flat surface and are used stationary. Handheld microphones are designed for used and carried by you.

Imtradex offers the following design series:

Table microphones

- TM2-USB design series
- TM3-USB design series

Handheld microphones

- HT2-USB design series

Further technical information about all Imtradex products are available on our website “www.imtradex.com”