FORUM NOKIA

Series 40 Platform: USB Audio Device Requirements

Version 1.2; September 9, 2009

Series 40

NOKIA

Disclaimer

The information in this document is provided “as is,” with no warranties whatsoever, including any warranty of merchantability, fitness for any particular purpose, or any warranty otherwise arising out of any proposal, specification, or sample. This document is provided for informational purposes only.

Nokia Corporation disclaims all liability, including liability for infringement of any proprietary rights, relating to implementation of information presented in this document. Nokia Corporation does not warrant or represent that such use will not infringe such rights.

Nokia Corporation retains the right to make changes to this document at any time, without notice.

Licence

A licence is hereby granted to download and print a copy of this document for personal use only. No other licence to any other intellectual property rights is granted herein.

Contents

Change history

March 4, 2008	Version 1.0	Initial document release
March 19, 2009	Version 1.1	Section 3.1, 'Audio topology' updated. Minor updates throughout the document.
September 9, 2009	Version 1.2	Section 3.5, 'HID functionality' updated.

1 Introduction

The Nokia 6500 Classic, Nokia 8800 Arte, and Nokia 6600 Fold mobile devices are based on the Series 40 platform and support USB audio devices. In the future there may be more mobile phones using this platform and supporting USB audio devices. These devices will be referred to throughout the document as the Series 40 USB hosts.

USB audio class specifications describe the capabilities and characteristics that audio devices must support to comply with USB. These classes have been developed to support a wide range of audio devices, some of which may not be suited for connecting to mobile devices. To avoid a mismatch, this document defines the requirements for audio devices to be compatible to connect with a Series 40 USB host.

Currently there are two audio class specifications available. The Series 40 USB host supports USB Audio Class 1.0 only. For more information on USB Audio Class 1.0, see http://www.usb.org.

2 Mandatory features

This section lists the mandatory features for Audio Class 1.0 support. The device must define the Audio Class 1.0 support in the first configuration descriptor. An Audio Class 1.0-compliant device must have a microphone and speaker with the following attributes:

2.1 Microphone path

Required attributes:

- Sampling rate of 48 kHz
- 16-bit resolution
- One channel (mono)
- PCM Type I with synchronous isochronous audio endpoint with 1 ms frame rate

2.2 Speaker path

Required attributes:

- Sampling rate of 48 kHz
- 16-bit resolution
- Two channels (stereo)
- PCM Type I with synchronous isochronous audio endpoint with 1 ms frame rate

2.3 Audio topology

At minimum, an audio device must have the topology defined in Figure 1 to be supported by a Series 40 USB host.

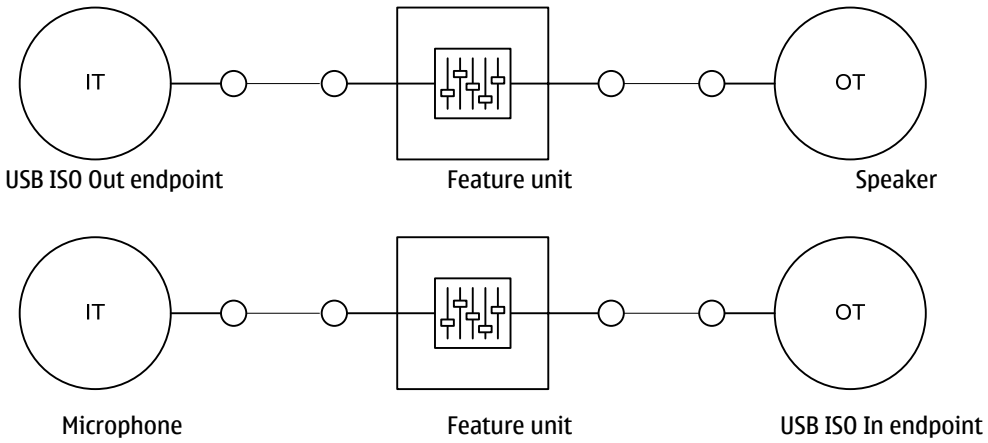

Figure 1: Mandatory audio topology

For default settings, see Chapter 4, ‘Default settings’.

2.4 Unit and terminal type support

2.4.1 Microphone path

- Input terminal for the microphone
- Output terminal for USB isochronous data stream
- Feature unit with gain control for the microphone

2.4.2 Speaker path

- Input terminal for USB isochronous data stream
- Output terminal for the speakers
- Feature unit with volume control for master channel

2.4.3 Audio streaming interface

The audio device must contain an audio streaming interface for the microphone path and an audio streaming interface for the speaker path. A speaker-only or microphone-only audio device is not supported.

2.4.4 Microphone path

The audio device must support a synchronous isochronous data stream endpoint.

It must have at least an alternate setting zero for inactive streaming and an alternate setting one for active streaming, defined as follows:

- Synchronous isochronous endpoint
- A Type I Format Type Descriptor with the following settings as a minimum requirement:

Offset	Field	Size	Value	Description
0	bLength	1	8+3*ns	
1	bDescriptorType	1	Constant	CS_INTERFACE descriptor type.
2	bDescriptorSubtype	1	Constant	FORMAT_TYPE descriptor subtype.
3	bFormatType	1	Constant	FORMAT_TYPE_I. Constantly identifies the Format Type the AudioStreaming interface is using.
4	bNrChannels	1	1	One channel.
5	bSubframeSize	1	2	One audio subframe covers 2 bytes since there is 16-bit resolution for one channel.
6	bBitResolution	1	16	16 bits are used.
7	bSamFreqType	1	Number	A setting that supports 48,000 Hz either as a discrete setting or in a range of a continuous setting.
8	...			48,000 Hz sampling rate only is supported but other sample rates are allowed.

- A maximum packet size of 96 bytes
- 1 ms polling interval

2.4.5 Speaker path

The device must support an isochronous audio data stream endpoint.

It must have at least an alternate setting zero for inactive streaming and an alternate setting one for active streaming defined as follows:

- Synchronous isochronous endpoint
- A Type I Format Type Descriptor with the following settings as a minimum requirement:

Offset	Field	Size	Value	Description
0	bLength	1	8+3*ns	
1	bDescriptorType	1	Constant	CS_INTERFACE descriptor type.
2	bDescriptorSubtype	1	Constant	FORMAT_TYPE descriptor subtype.
3	bFormatType	1	Constant	FORMAT_TYPE_I. Constantly identifies the Format Type the AudioStreaming interface is using.
4	bNrChannels	1	2	Two channels.
5	bSubframeSize	1	2	One audio subframe covers 2 bytes since there is 16-bit resolution for one channel.
6	bBitResolution	1	16	16 bits are used.
7	bSamFreqType	1	Number	A setting that supports 48,000 Hz either as a discrete setting or in a range of a continuous setting.
8	...			48,000 Hz sampling rate only is supported, but other sample rates are allowed.

- A maximum packet size of 192 bytes
- 1 ms polling interval

2.5 Unit controls

2.5.1 Microphone path

The feature unit must have the following controls for mute:

- GET_CUR / SET_CUR

2.5.2 Speaker path

The feature unit must have the following controls for volume:

- GET_MIN
- GET_MAX

- GET_RES
- GET_CUR / SET_CUR

3 Optional features

This chapter lists the optional features for Audio Class 1.0 support. A sidetone path is optionally supported and recommended. There can also be an optional auxiliary input; the audio topology for that is presented as well. All supported Audio Topologies are fully USB audio compliant.

3.1 Audio topology

Figure 2 shows the Audio topology for a headset that has a mono microphone and a stereo headphone (/speaker) part.

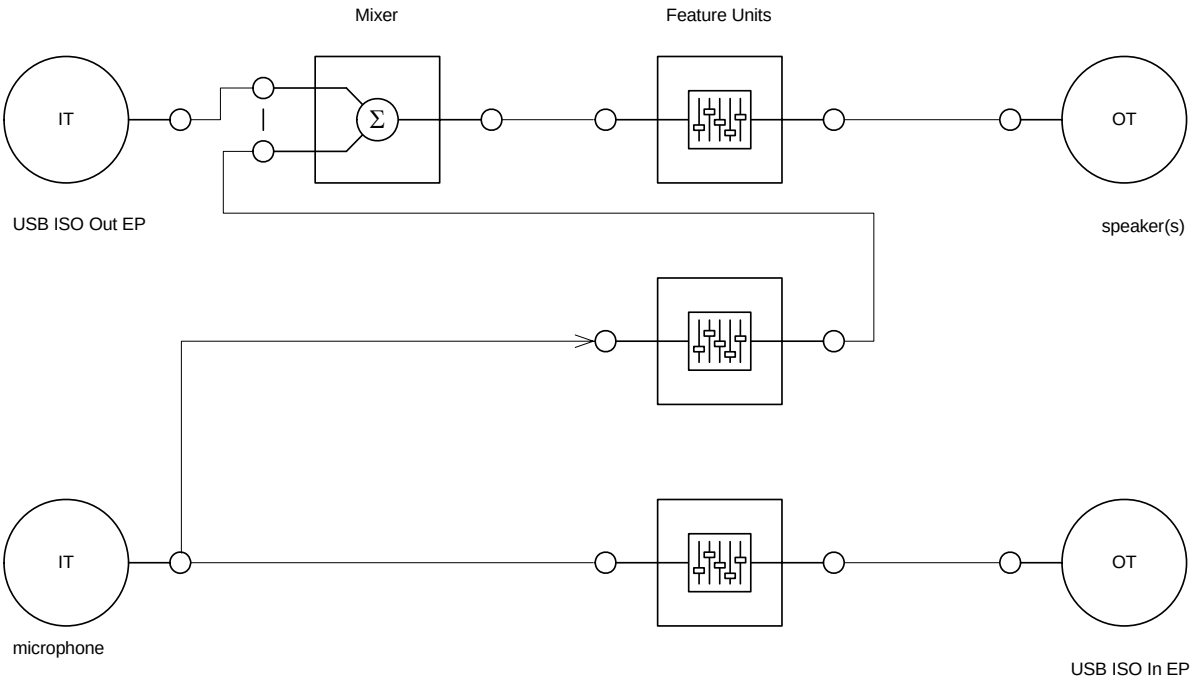

Figure 2: Audio topology with optional sidetone path

Figure 3 shows the Audio topology for a headset with one additional auxiliary input. ID-20 presents the Up/Down Processing Unit that might be used to duplicate the mono microphone signal into the Left Front and Right Front channels of the output.

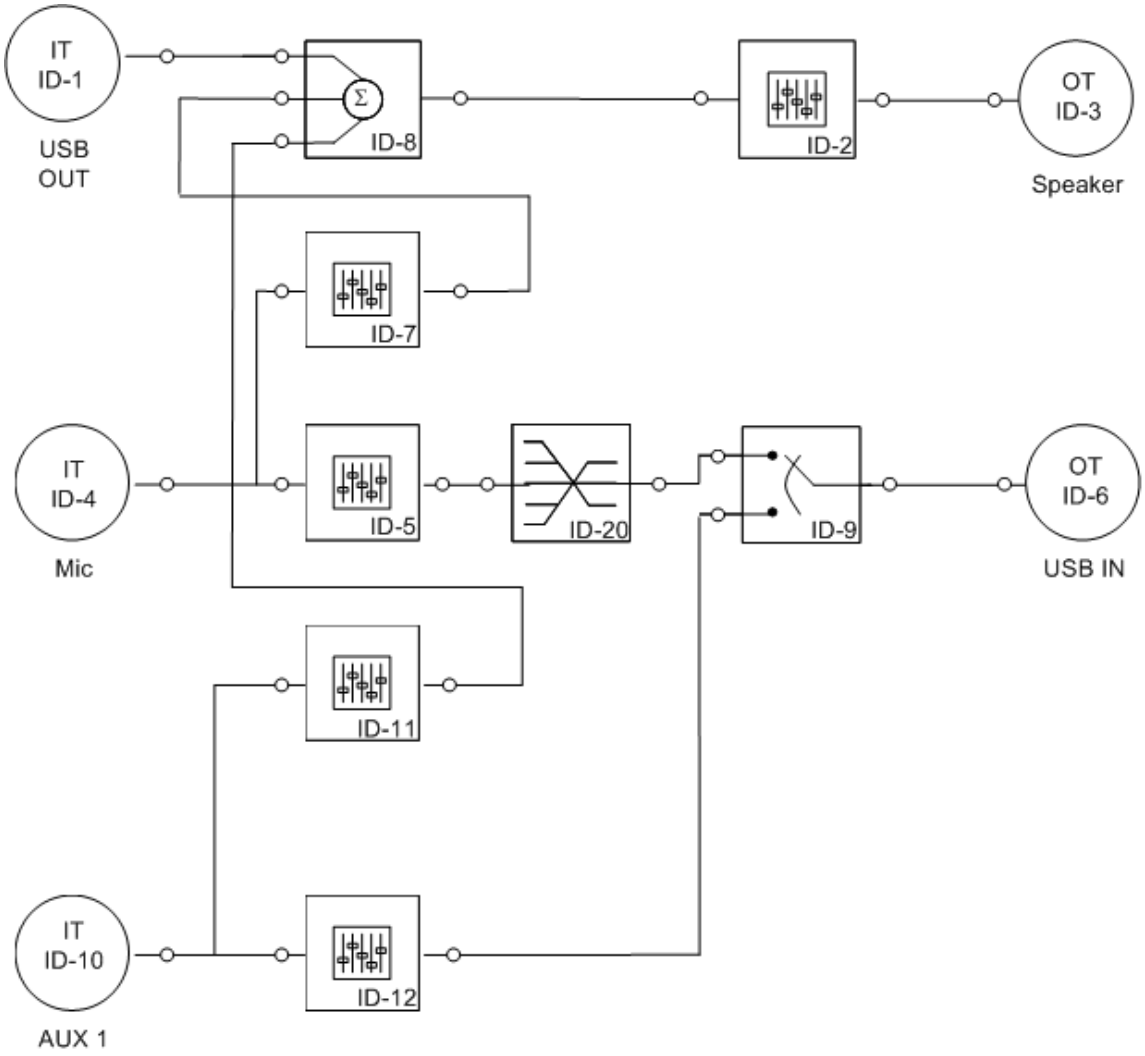

Figure 3: Audio topology with optional auxiliary input

3.2 Unit and terminal type support

3.2.1 Sidetone path

- Mixer unit to mix the USB Out endpoint stream with the microphone signal for sidetone generation
- Feature units with mute and gain setting
- A switch or mixer is ignored by the Series 40 USB host and shall have a default setting that is suitable for telephony call

3.3 Audio streaming interface

With other alternate settings, an audio device may support other sampling frequencies and bit resolutions for the speaker and microphone. However, these will be ignored by the Series 40 USB host.

3.4 Unit controls

3.4.1 Sidetone path

The feature should have the following controls for sidetone volume:

- GET_MIN
- GET_MAX
- GET_RES
- GET_CUR / SET_CUR

3.5 HID functionality

The following buttons will be evaluated by the Series 40 USB host:

- Microphone Mute functionality (relative control, 0x2F from Telephony Usage page)
- Speaker Volume Up/Down functionality (absolute control, 0xE9/0xEA from Consumer Usage page)
- Call control (Hook Switch, absolute control, 0x20 from Telephony Device Usage Page)

Note: Outside of the recommendation, 'Call control' is defined as an absolute control. However, since this control is necessary to detect long and short button presses or double presses, this control does not exclusively show the On/Off state.

The following buttons are supported in some Series 40 USB hosts:

- Play/Pause (absolute control, Play 0xCD from Consumer Usage page)
- Scan Next Track (absolute control, 0xB5 from Consumer Usage page)
  - Long press can perform Fast Forward function while pressed
- Scan Previous Track (absolute control, 0xB6 from Consumer Usage page)
  - Long press can perform Rewind function while pressed
- Stop (absolute control, 0xB7 from Consumer Usage page)

All other buttons will be ignored.

4 Default settings

In order to enable seamless interoperability with Series 40 USB hosts, the device needs to exhibit reasonable default values and audio parameters that provide a good user experience. The default settings will hide headset concept differences from the Series 40 host and ensure that the Series 40 host works with properly designed devices.

Consequently, the Series 40 host will rely on these default values; adjusting them from the host side is an optional feature. For example, the microphone gain shall be on a reasonable level for a phone call. It may be that the Series 40 USB host has no UI to change this value. Also a sidetone shall have a reasonable default value for the same reason that there may be no UI to change the values. Therefore the device should work with reasonable functionality to the end user without changing the settings by the Series 40 USB host. Afterwards, as a result, microphone gain, speaker, and sidetone volume should be reset on a level that is suitable for making a phone call.

It is recommended that the device have the following default values for Uplink (from the device to the phone) and for Downlink (from the phone to the device) parameters:

Uplink:

Microphone sensitivity: -18 dB
(USB microphone signal level when the microphone is located at normal usage position and 0 dB Pa (94 dB SPL) sound pressure is applied at Mouth Reference Point)

Downlink:

Loudspeaker signal: 0 dB
(Maximum signal level in the USB interface, the headset output SPL must stay below EN 50332 limits)

Frequency response: Flat frequency response at full audio range is recommended. All EQ, audio rendering, and similar effects are recommended to be turned off as default.

When limit values are measured, the test signal shall use multi sine and artificial speech signals.

5 Power consumption

The Series 40 USB host can sustain current up to 100 mA. It is recommended to draw as little current as possible to increase playback or speaking times. Based on recommendations by Nokia, an amount of 100 mW should not be exceeded during operation at maximum volume.

6 DRM

DRM is not supported by the Series 40 USB host.

Note: DRM-protected audio is allowed to stream unencrypted in PCM format as long as the attributes do not exceed 48 kHz sampling frequency, a resolution of 16 bits, and stereo and streaming is in real time.