THX Spatial Audio for PCs

THX Spatial Audio Processing Object (APO) extension for Realtek HD Audio codecs (THXAPO-HDA), supporting Windows 10 version 19H1 (build 18362) and later

Week 35 / 2020 Release

Component Versions in this Release

NSIS Installer Executable

- `THXAPO_w35_v1.3.32-455.exe` (THX-signed)
  Includes the following components:

  #### THXAPO-HDA

  - `1.0.3.32 (MS-signed, WHQL submitted, passed @ 1.0.3.30)`

  #### Spatial Configuration Utility

  - `2.3.1`

  #### THX Update Service

  - `0.33.9 (THX-signed)`

  #### THX Spatial Audio for PCs (UWP user interface application)

  - `2020.828.1.0`

Known Issues in this Release

- Settings > Apps & features displays both of the following:
  - **THX Spatial Audio** (shows APO version) => use this to uninstall
  - **THX Spatial Audio for PCs** (shows UWP app version)
  - See Uninstallation section below for additional details.

Installation

The NSIS installer executable may be run in Windows Audit Mode or after OOBE (e.g., for QA testing, run as Administrator).

NSIS Installer Flags

Silent Mode /S

The installer can be run without user intervention and with no desktop UI dependencies. No dialogs are presented, and no user responses are required. This is useful for system image integrators who wish to embed the installer into their own, collecting all of the required information on their installer, instead of showing multiple installers.

To run the installer silently (no interactive GUI), use the `/S` flag (forward slash-S).

Debug Mode /DBG

To render the contents of the installer log to a file, use the `/DBG` flag (forward slash-D-B-G). The output file can be found in `C:\Users\ADMINI~1\AppData\Local\Temp\THX`.

Installation Flow

Windows Audit Mode (Sysprep)

All actions are logged to the Windows Event Log > Applications and Services Logs > THX, located on disk at `C:\Windows\System32\Winevt\Logs.THX.evtx`, and viewable from within the Windows Event Viewer (Source: `THXAPOINST`).

1. The installer escalates privileges and de-archives its contents into `C:\Users\ADMINI~1\AppData\Local\Temp\THX`.
2. The installer stops the `audiosrv` service and removes any blocklisted APOs.
3. The driver package is installed via `THXRTExt.inf` and `THXRTAPO.inf`, using the Microsoft PnP Utility.
4. The Spatial Configuration Utility is run, determines the correct chassis / tuning profile, and writes the thx_spatial.conf.json file to the path specified in `HKLM:\SOFTWARE\THX\THXSpatialAudio\ConfigFile`.
5. The installer starts the `audiosrv` service.
6. The installer copies additional required services into `C:\Windows\System32`.
7. The **THX Spatial Audio for PCs** UWP application bundle is installed and provisioned for all users.
8. Required tasks are added to the Windows Task Scheduler under `\THX Ltd\THX Update Service`.

9. The component versions are written to the Windows Registry at `HKLM:\SOFTWARE\THX\THXSpatialAudio\`.
10. The installer cleans up the `C:\Users\ADMINI~1\AppData\Local\Temp\THX` directory.

The default Windows audio output will be renamed to **Realtek(R) Audio Codec with THX Spatial Audio**. The THX Spatial Audio APO has been injected into the Realtek HD Audio codec signal path and is now active.

Uninstallation

The THXAPO-HDA and spatial configuration, along with the THX Spatial Audio for PCs UWP application, may be removed by selecting the **THX Spatial Audio** entry in Settings > Apps & features and clicking `Uninstall`.

On systems where Tuned By THX is installed, the THX Update Service and tasks will remain on the device.

This process will be better refined in a future release.

General Operation Instructions

*See **THX Spatial Audio for PCs Usability Specification for THXAPO-HDA** document for greater detail.*

The THX Spatial Audio for PCs UWP application can be launched from the Start Menu.
● The toggle shown in the upper left hand corner can be used to switch between THX Stereo and THX Spatial Audio (default).
● The THX Spatial Audio APO is configured for Speakers operation (default), unless an analogue headset / headphone is inserted into the 3.5mm combo jack. Listening Mode is automatically selected.
● The UWP application version is shown in the lower left corner.

Basic Instructions for Speakers Operation
● There are five EQ selections in Speakers listening mode:
  ○ Music (default)
  ○ Cinema
  ○ Game
  ○ Voice
  ○ Custom

- The 31Hz + 63Hz + 125Hz EQ sliders are unavailable (and therefore greyed out) when Speakers listening mode is active. A blue illuminated bracket is shown under the remaining, active EQ sliders.
- The Music EQ sliders are shown with their offsets, i.e., not "flat".
- Dialogue Enhancement is switched off (default).
- Volume Levelling (DRC) is switched on with the slider set to 80 (default).

In Speakers listening mode, the THX APO does not perform any audio signal processing on the built-in Microphone Array; echo cancellation and signal conditioning is handled by the Intel Smart Sound Technology (iSST) APO.

Multichannel streams are presently downmixed to stereo, prior to THX Spatial Audio processing (using crosstalk cancellation) for stereo loudspeakers.

Basic Instructions for Headset / Headphone Operation

Insert an analogue headset (mic + speakers) or headphone (speakers only) into the 3.5mm jack on the left side of the device.

The THX APO will now be configured for **headset / headphone** operation.

- There are sixteen EQ selections in **Headphones** listening mode:
    - Music (**Setting**: "Normal")
    - Music (**Setting**: "Flat Live")
    - Music (**Setting**: "Hip Hop Club")
    - Music (**Setting**: "Pop Arena")
    - Music (**Setting**: "EDM Nightclub")
    - Music (**Setting**: "R&B Lounge")
    - Music (**Setting**: "Rock Studio")
    - Music (**Setting**: "Acoustic Coffee Shop")
    - Music (**Setting**: "Jazz Cafe")
    - Music (**Setting**: "Classical Hall")
    - Cinema
    - Game (**Setting**: "Default")
    - Game (**Setting**: "Grand")
    - Game (**Setting**: "Hyperlocator")
    - Voice
    - Custom
- When **Custom** EQ is selected, one of twelve **Rooms** can be selected:
    - Studio (default)
    - Home Theater
    - Pub
    - Cafe

- ○ Small Club
- ○ Movie Theater
- ○ Large Club
- ○ Hall
- ○ Amphitheater
- ○ Arena
- ○ Dry Studio
- ○ Bookstore
- ● A blue illuminated bracket is shown above the EQ sliders. All ten sliders are active in Headphones listening mode.
- ● Dialogue Enhancement is switched off (default).
- ● Bass Boost is switched off (default); this is only available in Headphones listening mode.
- ● Volume Levelling (DRC) is switched on with the slider set to 80 (default).

When using a headset in Headphones listening mode, the THX APO does not perform any audio signal processing on the Microphone connection of the 3.5mm jack. However, the THX APO *does* provide basic routing of Communications output streams to the headset, without spatial processing.

Multichannel streams are binauralized as part of THX Spatial processing for headphones.

Low-Power Audio Playback (LPAP) support

Both stereo as well as multichannel playback streams can be offloaded for low-power playback through the Realtek HD Audio codec driver, using the offload versions of the stream (DCHU-OSFX) and mode (DCHU-OMFX) APOs. All audio signal processing continues to be handled on the host processor*.

At present, up to two separate streams are supported, subject to the capabilities of the Realtek HD Audio codec driver. Multichannel streams are handled in the same manner for low-power playback as for full-power, performance-oriented power configurations.

When low-power playback is engaged, longer playback buffers are present; as a consequence, the transition between listening and/or content present modes will be crossfaded over a period of approximately one second.

* THXAPO does not presently support hardware DSP-offloaded audio signal processing, though this is under active development for the built-in Tensilica HiFi3 cores present on both Intel Ice Lake / Tiger Lake as well as AMD Ryzen CPUs.