



ML: Customizing the Realtek ALC AppleHDA

For ML Realtek ALC AppleHDA

Change Log

- v0.1 - 10/8/2012 - Draft
- v0.2 - 10/10/2012 - Procedure 8 correction
- v0.3 - 10/18/12 - 0c4. Item/PathMapID Table and Item/CodecID Table correction
- v0.4 - 10/25/12 - Clarify PathMap and ConfigData edits
- v0.5 - 3/28/13 - encoded digital audio
- 40.6 - 7/28/13 - adding headphone requires deleting 1 audio output device

Guidelines

1. This is not a how to guide. It tells what something looks like before and what it should look like after the edit. The how is left to the reader.

OS X Surround Sound

1. OS X volume control and mute (OSD, System Preferences, keyboard, mouse, Apple Remote, etc.)
 - 1a. Supports volume control/mute for connected analog stereo speakers only
 - 1b. No volume control/mute support for digital audio or aggregate devices
 - 1b1 Use the controls and/or remote for the audio device attached making sound
 - 1b2. There is no known way around this; don't ask. For DD/DTS, Windows is the same
2. Surround Sound in OS X requires
 - 2a. DD/DTS source (movies, iTunes/AC3, etc.)
 - 2b. DD/DTS player (Plex, XBMC, Boxee, VLC - see 5 below)
 - 2c. DD/DTS sound system.
3. Analog 5.1/7.1 Surround Sound - Audi MIDI Setup/Audio Devices/Create Aggregate Device
4. Audi MIDI Setup/Audio Devices/Digital Output/ always shows 2 Channel Stereo.
5. VLC encoded digital audio requires the edited Optical Surround/AppleHDA binary. (See Procedure 8)

Requirements

1. 10.8 or newer - 64 bit kernel
2. Any optimized AppleHDA.kext v2.3.0 or newer
3. Working ML Optimized AppleHDA audio

Tools

1. Property List Editor -
 - 1a. Mac OS X Retail Install Disc v10.6 or v10.6.3 (Optional Installs/Xcode)
 - 1b. http://sveinbjorn.org/install_property_list_editor_app_on_mac_os_x_lion
2. PLE Alternatives
 - 2a. PListEdit Pro Fat Cat Software – PlistEdit Pro
 - 2b. Pref Setter Pref Setter
 - 2c. Applications/TextEdit

3. zlib_terminal

Before You Begin

1. Identify PathMapID
 - 1a. Find Audio ID - System Information/Audio/Intel High Definition Audio/Audio ID
 - 1b. Find PathMapID - Property List Editor/Open layout(Audio ID).xml/Note PathMapID
2. Identify Info.plist/Platforms.xml Item
 - 2a. Find Item number from Item/PathMapID Table

Procedures

0. AppleHDA.kext Assumptions, Structure and Documents
 1. Add SPDIFIn
 2. Manual Mic and Front Mic Selection
 3. Manual Speaker and Headphone Selection
 4. Add Boost to input (Mic/Rear. Mic/Front and/or Line In)
 5. Substitute Gray (Side) for Black (Rear)
 6. Add Line Out (Gray/Rear -Rear Speakers) for analog 7.1 Surround Sound
 7. Substitute SPDIF-2 Wire Output
 8. SPDIF Optical Output/Encoded Digital Audio - Not available for 892 or 898
 9. HDMI audio (AMD/Nvidia/HD3000/HD4000) - Requires dsdt edits, see <https://github.com/toleda>
 10. 2x HD3000/HD4000 HDMI Audio
- Appendix:. ML Optimized AppleHDA.kext/PathMaps

Installation

1. Backup S/L/E/ApplesHDA.kext
2. Copy edited AppleHDA.kext to Desktop
3. Run KextBeast
4. Restart

Editing Tip

1. To ensure successful pasting of printed data into a plist
 - a. paste first to TextEdit and make plain text (Format/Plain Text)
 - b. copy from TextEdit and paste into plist

Credit

THE KING [HOW TO] Patch AppleHDA - Knowledge Base - Project OS X Forums
VHC888 ALC889A, Gigabyte (Intel): now having a working front mic - InsanelyMac Forum
.: ErmaC.: AppleHDA patching in Mountain Lion - Page 4 - Sound - InsanelyMac Forum
RevoGirl Not forgotten

Procedures

0. AppleHDA.kext Assumptions, Structure and Documents

0a. AppleHDA.kext Assumptions

0a1.CodecID= decimal (codec_vendor_device_id)
Ex. 283904137 = 10ec0889 hex

0a2. ML Audio IDs (Audio_ID = layout-id = 1, 2 or 3)

- 1: 5/6 audio port on board with and without AMD/Nvidia HDMI audio
- 2: 3 port on board with and without AMD/Nvidia HDMI audio
- 3: 3/5/6 onboard audio with HD3000 HDMI audio (only)

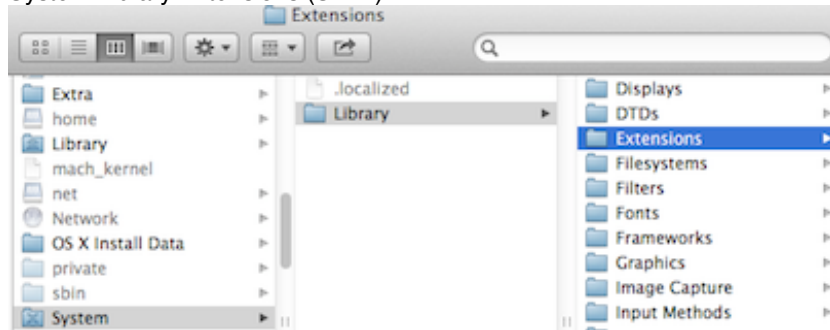
0a3. Realtek AppleHDA.kext supports the following Realtek codecs:

ALC885
ALC887
ALC888
ALC889
ALC892
ALC898

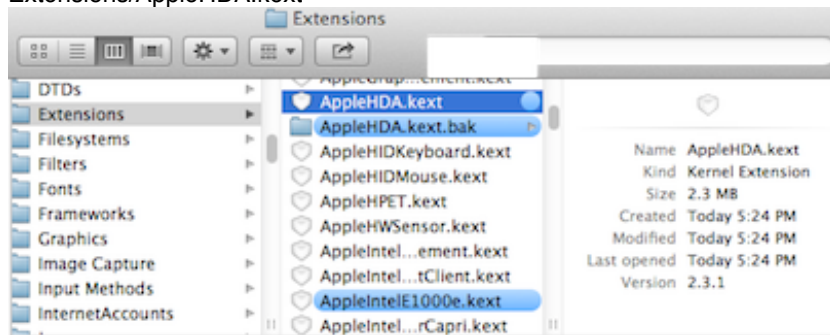
0b. AppleHDA.kext Structure

0b1. AppleHDA.kext>

System/Library/Extensions (S/L/E)

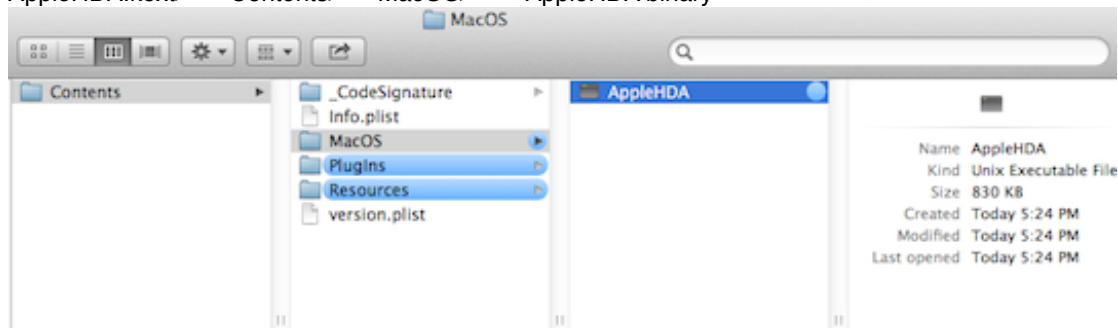


Extensions/AppleHDA.kext



0b2. AppleHDA binary

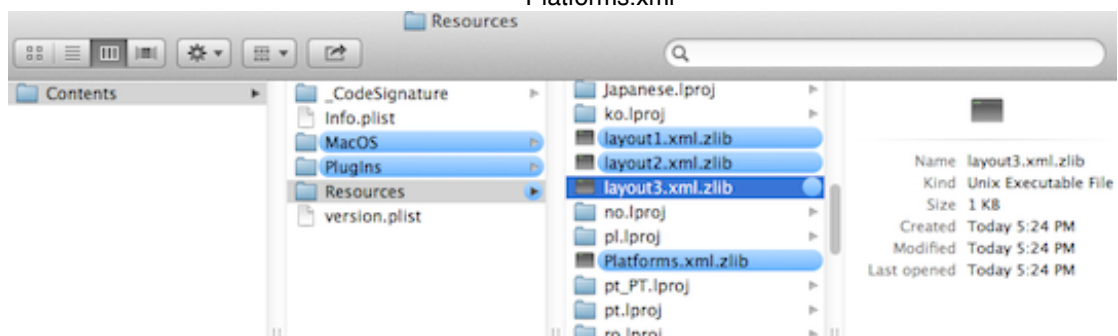
AppleHDA.kext> Contents> MacOS> AppleHDA binary



0b3. layoutx.xml

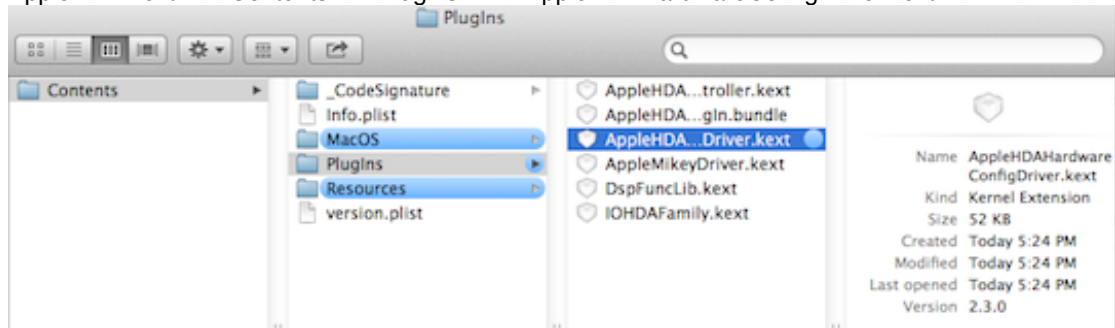
0b4. Platforms.xml

AppleHDA.kext> Contents> Resources> layoutx.xml
Platforms.xml

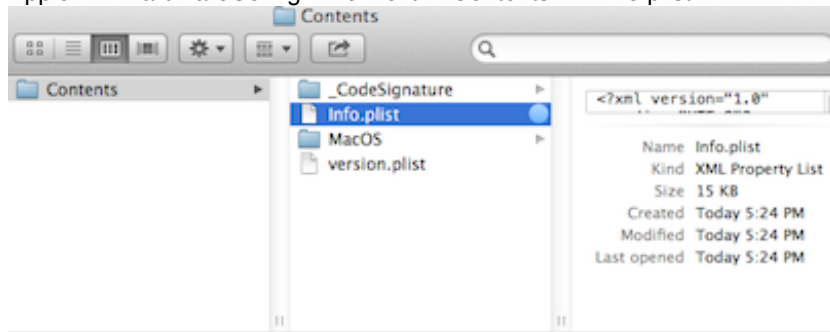


Ob5. Info.plist

AppleHDA.kext> Contents> Plugins> AppleHDAHardwareConfigDriver.kext

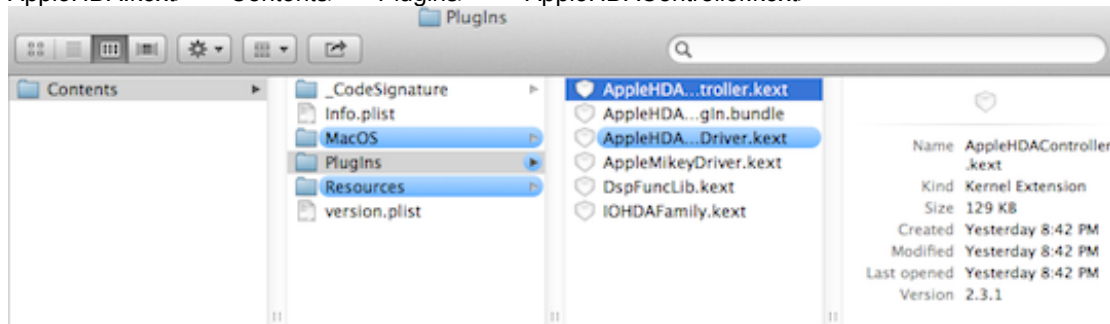


AppleHDAHardwareConfigDriver.kext> Contents> Info.plist

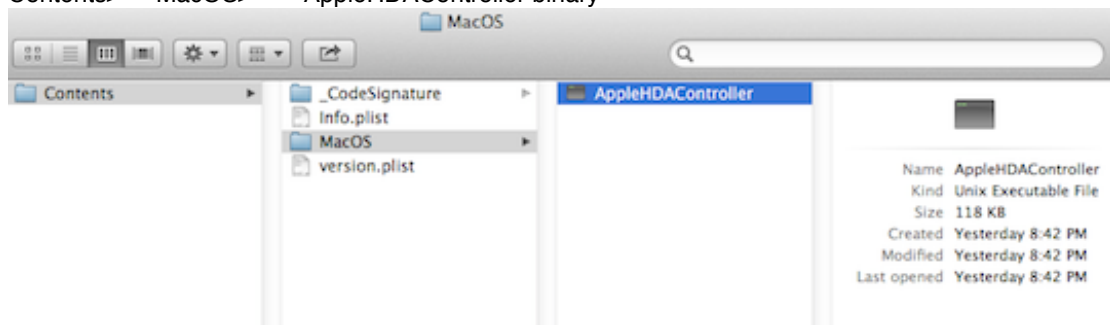


Ob6. AppleHDAController binary

AppleHDA.kext> Contents> Plugins> AppleHDAController.kext>

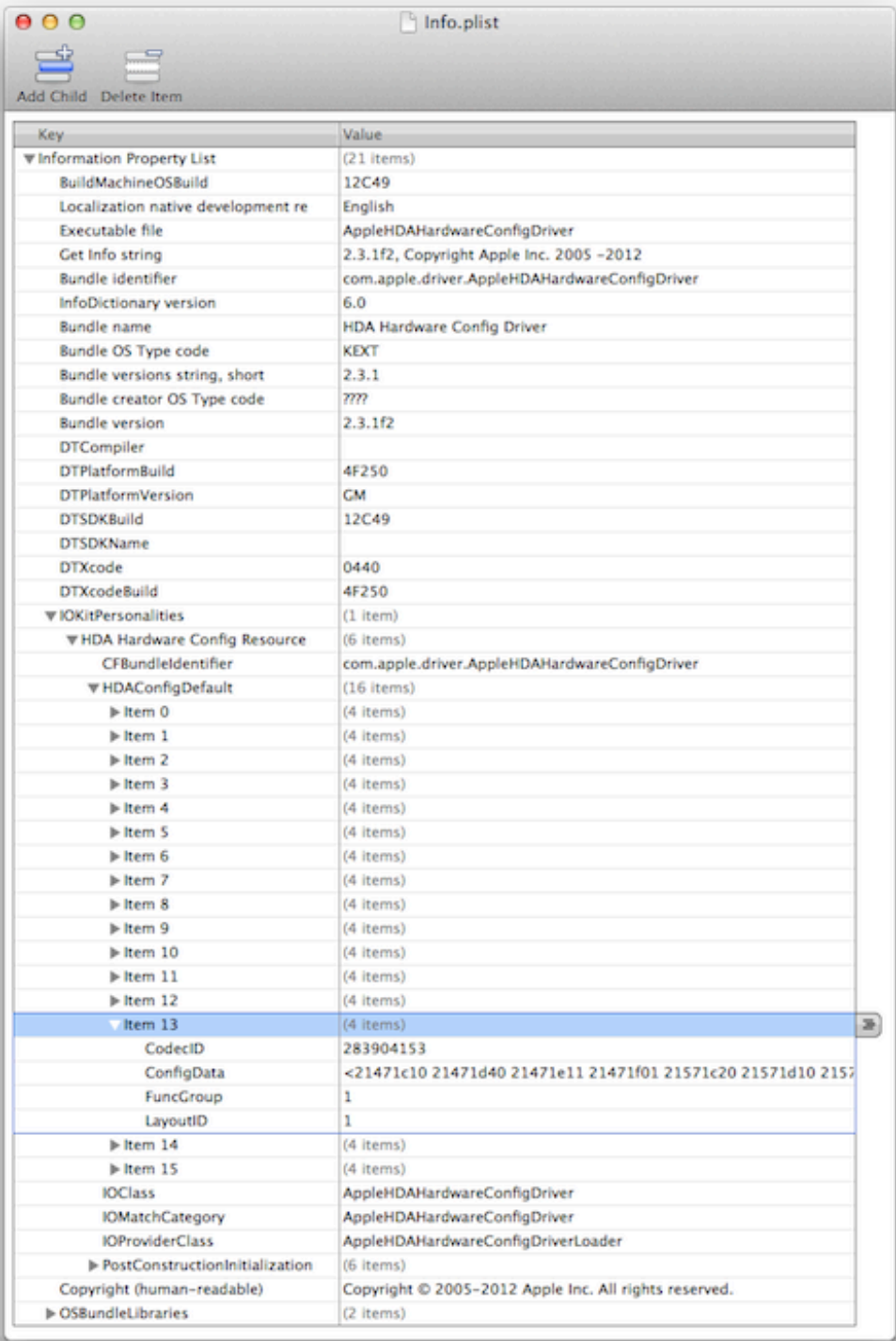


Contents> MacOS> AppleHDAController binary



0c. AppleHDA.kext documents and their location

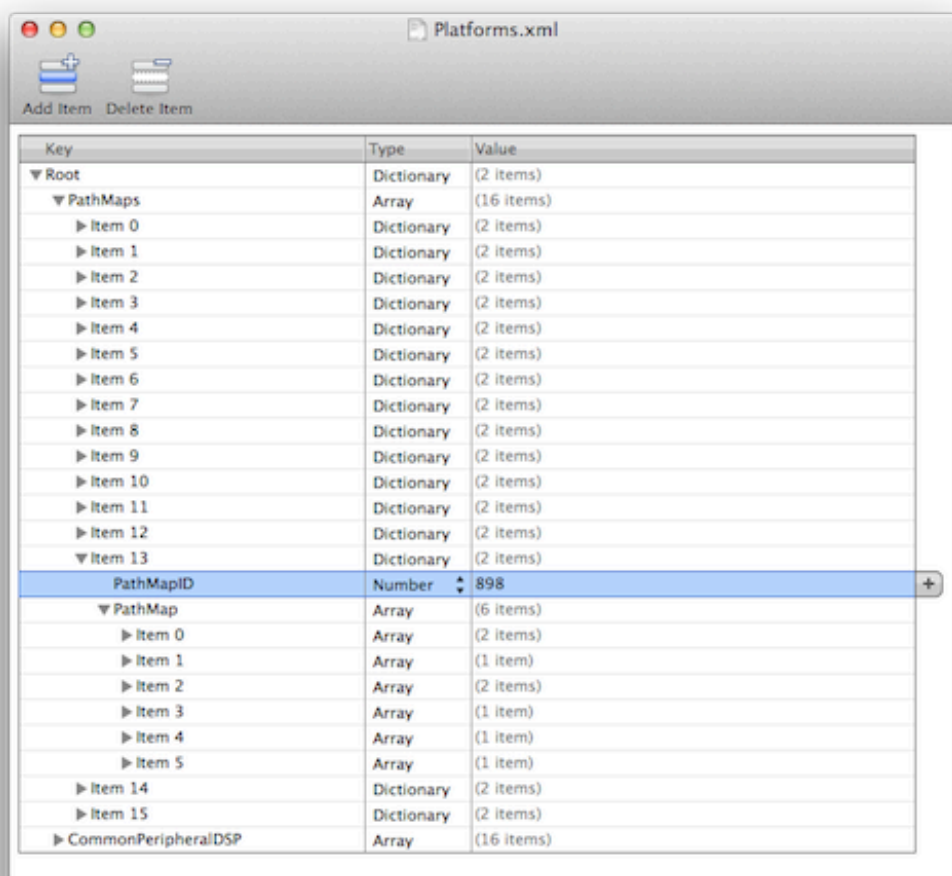
0c1. Info.plist AppleHDA.kext/Contents/Plugins/AppleHDAHardwareConfigDriver.kext/
Contents>info.plist



0c2. layoutx.xml AppleHDA.kext/Contents/Resources/layoutx.xml

Key	Type	Value
▼ Root	Dictionary	(2 items)
LayoutID	Number	1
▼ PathMapRef	Array	(1 item)
▼ Item 0	Dictionary	(10 items)
▼ CodecID	Array	(1 item)
Item 0	Number	283904153
▶ Headphone	Dictionary	(0 items)
▶ Inputs	Array	(2 items)
▶ IntSpeaker	Dictionary	(0 items)
▶ LineIn	Dictionary	(1 item)
▶ LineOut	Dictionary	(0 items)
▶ Mic	Dictionary	(2 items)
▶ Outputs	Array	(4 items)
PathMapID	Number	898
▶ SPDIFOut	Dictionary	(0 items)

0c3. Platforms.xml AppleHDA.kext/Contents/Resources/Platforms.xml



0c4. Item/PathMapID Table and Item/CodecID Table

Item	PathMapID	CodecID	Audio ID
Item 0	885	283904133	1
Item 1	887	283904135	1
Item 2	287	283904135	2
Item 3	387	283904135	3
Item 4	888	283904136	1
Item 5	288	283904136	2
Item 6	388	283904136	3
Item 7	889	283904137	1
Item 8	289	283904137	2
Item 9	389	283904137	3
Item 10	892	283904146	1
Item 11	292	283904146	2
Item 12	392	283904146	3
Item 13	898	283904153	1
Item 14	298	283904153	2
Item 15	398	283904153	3

1 Add SPDIFIn - Not supported

2. Manual Mic/Rear and Mic /Front Selection

Displays both Internal Microphone and Line In (Mic/Front) audio output devices

For 892, see below

885, 887, 888, 889, 892, 898

2a. Edit Platforms.xml

Open Item/PathMapID

Verify PathMapID

Copy and paste the current Rear Mic /Front Mic so there are two of the same (usually Item 0)

Open Item 0 and Item 0 and Item 1 appear; delete Item 1 (front mic).

Open Item 1 and Item 0 and Item 1 appear; delete Item 0 (rear mic).

Edit this path map as follows:

Current:

Item 0/NodeID/Number/9

Item 1/NodeID/Number/34

Item 2/NodeID/Number/25

New:

Item 0/NodeID/Number/7

Item 1/NodeID/Number/36

Item 2/NodeID/Number/25

2b. Save, install and restart

892

2a. Edit Platforms.xml

Open Item/PathMapID

Verify PathMapID

Line In (Blue/Rear) is not available

open Item 0, Item 0 and Item 1 appear; delete Item 1 (front mic)

open Item 1

Current:

Item 0/NodeID/Number/8

Item 1/NodeID/Number/35

Item 2/NodeID/Number/26

New:

Item 0/NodeID/Number/8

Item 1/NodeID/Number/35

Item 2/NodeID/Number/25

2b. Save, install and restart

3. Manual Internal Speaker and Headphone Selection

Displays both Internal Speaker and Headphones audio output devices

Note: An existing audio output device must be deleted to add Headphones as an audio output device.

See Procedure 10.

3a. Edit Platforms.xml

Open Item/PathMapID

Verify PathMapID

Copy and paste the current speaker/headphone so there are two of the same (Item 2)

Note: Paste on top of PathMap

Drag Item 2 up to PathMap - 2 times (moves new item to correct position)

In Item 2, open next level and there are Item 0 and Item 1; delete Item 1 (headphones).

In Item 3, open next level and there are Item 0 and Item 1; delete Item 0 (speakers).

Edit this path map as follows:

Current:

Item 0/NodeID/Number/27

Item 1/NodeID/Number/12

Item 2/NodeID/Number/2

New:

Item 0/NodeID/Number/27

Item 1/NodeID/Number/38

Item 2/NodeID/Number/37

AppleHDA.kext supports 4 audio output devices. Separate Speaker and Headphones results in one more audio device than allowed. Delete one of the following items:

Item 4: Orange Line Out

Item 5: Black Line Out

Item 6: SPDIF Out

3b. Save, install and restart.

4. Add Boost to input (Mic/Rear. Mic/Front and/or Line In)

Increase audio level for audio input devices

4a. Edit Platforms.xml (add to audio input devices as appropriate)

Open Item/PathMapID

Verify PathMapID

i. Mic/Rear

Current:

Item 0/NodeID/Number/9

Item 1/NodeID/Number/34

Item 2/NodeID/Number/24

Select Item1

Select Add Item

Enter Boost

Select Number

Enter 3

New

Item 0/NodeID/Number/9

Item 1

Boost/Number/3

NodeID/Number/34

Item 2/NodeID/Number/24

Save

ii. Mic/Front (displayed as Line In/Built-In)

Note: NodeIDs are different if 2. Manual Mic/Rear and Mic /Front Selection (above) is implemented

Current:

Item 0/NodeID/Number/9

Item 1/NodeID/Number/34

Item 2/NodeID/Number/25

Select Item1

Select Add Item

Enter Boost

Select Number

Enter 3

New

Item 0/NodeID/Number/9

Item 1

Boost/Number/3

NodeID/Number/34

Item 2/NodeID/Number/25

Save

iii. Line In

Current:

Item 0/NodeID/Number/8

Item 1/NodeID/Number/35

Item 2/NodeID/Number/26

Select Item1

Select Add Item

Enter Boost

Select Number

Enter 3

New

Item 0/NodeID/Number/8

Item 1

Boost/Number/3

NodeID/Number/35

Item 2/NodeID/Number/26

4b. Save, install and restart.

5. Substitute Gray (Side Speakers) for Black (Rear Speakers)

Allows configuring Side Speakers in 5.1 analog surround sound.

5a. Edit Platforms.xml

Open Item/PathMapID

Verify PathMapID

Open 2nd to last item

Edit this path map as follows:

Current:

Item 0/NodeID/Number/21

Item 1/NodeID/Number/13

Item 2/NodeID/Number/3

New:

Item 0/NodeID/Number/23

Item 1/NodeID/Number/15

Item 2/NodeID/Number/5

5b. Edit Hardware Config/info.plist

Open Item/PathMapID

Verify PathMapID

PinConfig

Find: 21771cf0 21771d00 21771e00 21771f40

Replace: 21771c80 21771d20 21771e01 21771f01

Find: 21571c80 21571d20 21571e01 21571f01

Replace: 21571cf0 21571d00 21571e00 21571f40

5c. Save, install and restart

6. Add Line Out (Rear Speakers) for analog 7.1 Surround Sound

Adds side speaker for 7.1 analog surround sound

Note: Not available for Audio ID: 2 or Audio ID: 3

6a. Edit Platforms.xml

Open Item/PathMapID

Verify PathMapID

Delete Item 5

Copy and paste the Line Out so there are two of the same. (Item 4)

Note: Paste on top of PathMap

Drag Item 4 up to PathMap - 4 times (moves new item to correct position)

Edit this path map as follows:

Current:

Item 0/NodeID/Number/21

Item 1/NodeID/Number/13

Item 2/NodeID/Number/3

New:

Item 0/NodeID/Number/23

Item 1/NodeID/Number/15

Item 2/NodeID/Number/5

6b. Edit Hardware Config/info.plist

Open Item/PathMapID

Verify PathMapID

PinConfig

Find: 21771cf0 21771d00 21771e00 21771f40

Replace: 21771c80 21771d20 21771e01 21771f01

Find: 21e71c90 21e71d61 21e71e4b 21e71f01

Replace: 21e71ca0 21e71d01 21e71e43 21e71f99

6c. Save, install and restart

7. Substitute SPDIF-2 Wire Output

Replaces SPDIFOut Optical with motherboard SPDIF 2 wire SPDIF audio output device

7a. Edit Platforms.xml

Open Item/PathMapID

Open the current SPDIFOut (last item)

Edit this path map as follows:

Current:

Item 0/NodeID/Number/30

Item 1/NodeID/Number/6

New:

Item 0/NodeID/Number/17

Item 1/NodeID/Number/16

7b. Edit Hardware Config/info.plist

Open Item/PathMapID

Fix PinConfig

Find: 21171cf0 21171d00 21171e00 21171f40

Replace: 21171ca0 21171d01 21171e43 21171f99

Find: 21e71c90 21e71d61 21e71e4b 21e71f01
Replace: 21e71ca0 21e71d01 21e71e43 21e71f99

7c. Save, install and restart

Credit: intamara: Lion HDMI Audio - Part 2a: DSDT Edits/Discrete - AMD/Nvidia - Page 29, Post 289

8. SPDIF OpticalOut/Encoded Digital Audio - Not available for 892 or 898, not needed for 885. Required for VLC Encoded Digital Audio Option

Alternative AppleHDA binary edit

Note: popping may occur with attached analog speakers.

Note: In ML , only the 10.8 AppleHDA.kext supports Encoded Digital Audio, see ML: Optimized Realtek AppleHDA - Preview/Alpha, Download ML_AppleHDA-885-Alpha.zip

Example: 889 patch

8a. Make a backup of your installed MLOptimized AppleHDA

8b. Copy Downloads/ML_AppleHDA-885-Alpha/AppleHDA.kext to Desktop

8c. Open Applications/Utilities/Terminal

```
$ cd Desktop
```

```
$ ls (optional to verify AppleHDA.kext is on the desktop)
```

** The following commands varies for each codec. Copy and paste the correct command below **

```
$ sudo perl -pi -e 's/\x85\x08\xec\x10\x89\x08\xec\x10lg' AppleHDA.kext/Contents/MacOS/AppleHDA
```

Enter Password

```
$ exit
```

8d. Edit layout1.xmll

8e. Edit Hardware Config/info.plist

Open Item/PathMapID

Verify PathMapID

Fix PinConfig

For SPDIFIn

Find: 21e71c90 21e71d61 21e71e4b 21e71f01

Replace: 21e71ca0 21e71d01 21e71e43 21e71f99

8d. Save, install and restart

Use the terminal command appropriate for your codec.

i. 887 SPDIFOut/Encoded Digital Audio (887 Legacy Only)

```
$ sudo perl -pi -e 's/\x85\x08\xec\x10\x87\x08\xec\x10lg' AppleHDA.kext/Contents/MacOS/AppleHDA
```

ii. 888 SPDIFOut/Encoded Digital Audio (888 Legacy Only)

```
$ sudo perl -pi -e 's/\x85\x08\xec\x10\x88\x08\xec\x10lg' AppleHDA.kext/Contents/MacOS/AppleHDA
```

iii. 889 SPDIFOut/Encoded Digital Audio

```
$ sudo perl -pi -e 's/\x85\x08\xec\x10\x89\x08\xec\x10lg' AppleHDA.kext/Contents/MacOS/AppleHDA
```

iv. 892 SPDIFOut/Encoded Digital Audio

Applying this edit for the 892 disables audio. Do not try.

iv. 898 SPDIFOut/Encoded Digital Audio

Applying this edit for the 898 disables audio. Do not try.

9. HDMI audio (AMD/Nvidia/HD3000/HD4000)

See <https://github.com/toleda>

10. 2x HD3000/HD4000 HDMI Audio/Delete Audio Output Device

Deletes an existing audio output device to allow an additional HDMI audio output to be present.

Note: AppleHDA supports a total of 4 audio output devices. For Audio ID: 3, the orange port/line out audio device is removed for HD3000/HD4000 HDMI audio

For Audio ID:3, Select the audio output device to delete:

Item 3: Black port/rear/line out

Item 4: SPDIFOut

For Audio ID:1, Select the audio output device to delete:

Item 3: Orange port/rear/line out/center and sub speakers

Item 4: Black port/rear/line out/rear speakers

Item 5: SPDIFOut

10a. Edit Platforms.xml

Verify PathMapID

Open Item/PathMapID

Delete Item (Selected from Audio ID above)

10b. Edit Hardware Config/info.plist

Open Item/PathMapID

Verify PathMapID

Fix PinConfig

If Orange deleted

Find: 21671c30 21671d60 21671e01 21671f01

Replace: 21671ca0 21671d01 21671e43 21671f99

If Black deleted

Find: 21571c20 21571d10 21571e01 21571f01

Replace: 21571ca0 21571d01 21571e43 21571f99

If SPDIFOut deleted

Find: 21e71c90 21e71d61 21e71e4b 21e71f01

Replace: 21e71ca0 21e71d01 21e71e43 21e71f99

10c. Save, install and restart

Appendix:. ML Optimized AppleHDA.kext/PathMaps

PathMapID 898/All Audio Devices

Item	Sub Item	I/O	Device	Color	Location	NodeID
Item 0	Item 0	Input	Mic	Pink	Rear	24
	Item 1	Input	Mic	Pink	Front	25
Item 1		Input	Line In	Blue	Rear	26
Item 2	Item 0	Output	Speakers	Green	Rear	20
	Item 1	Output	Headphones	Green	Front	27
Item 3		Output	Line Out	Orange	Rear	22
Item 4		Output	Line Out	Black	Rear	21
Item 5		Output	SPDIFOut	N/A	Rear	30

Platforms.xml		
Add Item Delete Item		
Key	Type	Value
▼ Root	Dictionary	(2 items)
▼ PathMaps	Array	(16 items)
▶ Item 0	Dictionary	(2 items)
▶ Item 1	Dictionary	(2 items)
▶ Item 2	Dictionary	(2 items)
▶ Item 3	Dictionary	(2 items)
▶ Item 4	Dictionary	(2 items)
▶ Item 5	Dictionary	(2 items)
▶ Item 6	Dictionary	(2 items)
▶ Item 7	Dictionary	(2 items)
▶ Item 8	Dictionary	(2 items)
▶ Item 9	Dictionary	(2 items)
▶ Item 10	Dictionary	(2 items)
▶ Item 11	Dictionary	(2 items)
▶ Item 12	Dictionary	(2 items)
▶ Item 13	Dictionary	(2 items)
PathMapID	Number	898
▼ PathMap	Array	(6 items)
▼ Item 0	Array	(2 items)
▶ Item 0	Array	(1 item)
▶ Item 1	Array	(1 item)
▶ Item 1	Array	(1 item)
▼ Item 2	Array	(2 items)
▶ Item 0	Array	(1 item)
▶ Item 1	Array	(1 item)
▶ Item 3	Array	(1 item)
▶ Item 4	Array	(1 item)
▶ Item 5	Array	(1 item)
▶ Item 14	Dictionary	(2 items)
▶ Item 15	Dictionary	(2 items)
▶ CommonPeripheralDSP	Array	(16 items)

PathMapID 898/Input Audio Devices

Item	Sub Item	I/O	Device	Color	Location	NodeID
Item 0	Item 0	Input	Mic	Pink	Rear	24
	Item 1	Input	Mic	Pink	Front	25
Item 1		Input	Line In	Blue	Rear	26

Platforms.xml		
Add Item Delete Item		
Key	Type	Value
▼ Root	Dictionary	(2 items)
▼ PathMaps	Array	(16 items)
▶ Item 0	Dictionary	(2 items)
▶ Item 1	Dictionary	(2 items)
▶ Item 2	Dictionary	(2 items)
▶ Item 3	Dictionary	(2 items)
▶ Item 4	Dictionary	(2 items)
▶ Item 5	Dictionary	(2 items)
▶ Item 6	Dictionary	(2 items)
▶ Item 7	Dictionary	(2 items)
▶ Item 8	Dictionary	(2 items)
▶ Item 9	Dictionary	(2 items)
▶ Item 10	Dictionary	(2 items)
▶ Item 11	Dictionary	(2 items)
▶ Item 12	Dictionary	(2 items)
▶ Item 13	Dictionary	(2 items)
PathMapID	Number	898
▼ PathMap	Array	(6 items)
▼ Item 0	Array	(2 items)
▼ Item 0	Array	(1 item)
▼ Item 0	Array	(3 items)
▼ Item 0	Dictionary	(2 items)
▶ Amp	Dictionary	(5 items)
NodeID	Number	9
▼ Item 1	Dictionary	(1 item)
NodeID	Number	34
▼ Item 2	Dictionary	(1 item)
NodeID	Number	24
▼ Item 1	Array	(1 item)
▼ Item 0	Array	(3 items)
▼ Item 0	Dictionary	(2 items)
▶ Amp	Dictionary	(5 items)
NodeID	Number	9
▼ Item 1	Dictionary	(1 item)
NodeID	Number	34
▼ Item 2	Dictionary	(1 item)
NodeID	Number	25
▼ Item 1	Array	(1 item)
▼ Item 0	Array	(1 item)
▼ Item 0	Array	(3 items)
▼ Item 0	Dictionary	(2 items)
▶ Amp	Dictionary	(5 items)
NodeID	Number	8
▼ Item 1	Dictionary	(1 item)
NodeID	Number	35
▼ Item 2	Dictionary	(1 item)
NodeID	Number	26
▶ Item 2	Array	(2 items)
▶ Item 3	Array	(1 item)
▶ Item 4	Array	(1 item)
▶ Item 5	Array	(1 item)
▶ Item 14	Dictionary	(2 items)
▶ Item 15	Dictionary	(2 items)
▶ CommonPeripheralDSP	Array	(16 items)

PathMapID 898/Output Audio Devices

Item	Sub Item	I/O	Device	Color	Location	NodeID
Item 2	Item 0	Output	Speakers	Green	Rear	20
	Item 1	Output	Headphones	Green	Front	27
Item 3		Output	Line Out	Orange	Rear	22
Item 4		Output	Line Out	Black	Rear	21
Item 5		Output	SPDIFOut	N/A	Rear	30

Platforms.xml		
Add Item Delete Item		
Key	Type	Value
▼ Item 13	Dictionary	(2 items)
PathMapID	Number	898
▼ PathMap	Array	(6 items)
▶ Item 0	Array	(2 items)
▶ Item 1	Array	(1 item)
▼ Item 2	Array	(2 items)
▼ Item 0	Array	(1 item)
▼ Item 0	Array	(3 items)
▼ Item 0	Dictionary	(1 item)
NodeID	Number	20
▼ Item 1	Dictionary	(2 items)
▶ Amp	Dictionary	(5 items)
NodeID	Number	12
▼ Item 2	Dictionary	(1 item)
NodeID	Number	2
▼ Item 1	Array	(1 item)
▼ Item 0	Array	(3 items)
▼ Item 0	Dictionary	(1 item)
NodeID	Number	27
▼ Item 1	Dictionary	(2 items)
▶ Amp	Dictionary	(5 items)
NodeID	Number	12
▼ Item 2	Dictionary	(1 item)
NodeID	Number	2
▼ Item 3	Array	(1 item)
▼ Item 0	Array	(1 item)
▼ Item 0	Array	(3 items)
▼ Item 0	Dictionary	(1 item)
NodeID	Number	22
▼ Item 1	Dictionary	(2 items)
▶ Amp	Dictionary	(5 items)
NodeID	Number	14
▼ Item 2	Dictionary	(1 item)
NodeID	Number	4
▼ Item 4	Array	(1 item)
▼ Item 0	Array	(1 item)
▼ Item 0	Array	(3 items)
▼ Item 0	Dictionary	(1 item)
NodeID	Number	21
▼ Item 1	Dictionary	(2 items)
▶ Amp	Dictionary	(5 items)
NodeID	Number	13
▼ Item 2	Dictionary	(1 item)
NodeID	Number	3
▼ Item 5	Array	(1 item)
▼ Item 0	Array	(1 item)
▼ Item 0	Array	(2 items)
▼ Item 0	Dictionary	(1 item)
NodeID	Number	30
▼ Item 1	Dictionary	(1 item)
NodeID	Number	6
▶ Item 14	Dictionary	(2 items)
▶ Item 15	Dictionary	(2 items)
▶ CommonPeripheralDSP	Array	(16 items)