

Installing new firmware to your Realiser A16

Rev 2.00 June 08, 2021

Updating your A16 with rev 2.00 June 08, 2021, is only necessary if your A16's firmware is older. The current revision of your firmware is found in SETTINGS>UPDATES/ABOUT as described below in step 5. If an update is required, please begin with **STEP 1**.

Issues fixed with this update

(APM110 hardware)

1. When connected to Apple TV and Xbox, MAT formatted Atmos audio was not correctly flagged as an Atmos stream. This problem has been rectified.

(All hardware variants)

2. The pilot tones for HT Assist are now output to all speakers. Previously they were only output to the speaker connected to channel 1.
3. The TCP server now transmits reference level volumes when reference levels are in use.

A16 Firmware update procedure

(All hardware variants)

STEP 1. The new firmware for the Realiser A16 is uploaded through the micro-SD card slot on the front panel. First, obtain a micro-SD card (commonly 16 GB) and ensure it is formatted as FAT32. Second, create a 'realiser' folder in the root directory and copy the firmware file FIRMA001.SVS into the realiser folder. Insert this micro-SD card into the slot on the front of your A16.

STEP 2. Power up the A16 ensuring the power indicator LED is steady green. You can power it up using the remote control or by momentarily depressing either User A or User B volume knobs. Now turn off the A16 by pushing in and holding in the User A volume knob for at least 3 seconds. The LCD screen will switch off and the power indicator LED will turn red. Release the User A volume knob.

STEP 3. Push in and hold in the User B volume knob and, simultaneously, push in and release the User A volume knob. Then release the User B volume knob. The action of holding in B and depressing A

activates the firmware update manager as shown below. The power indicator LED will also be blinking green.



STEP 4. Using the remote control, press the ENTER key twice to begin the firmware update. The A16 will enter a long period (30-45 minutes) of authenticating the software, loading and rebooting. When the unit first reboots it will begin updating the firmware for the individual hardware modules. Once the firmware modules have been reprogrammed the unit will reboot using the normal power-up sequence to the Speaker Map display for User A.

STEP 5. To confirm the firmware update was a success please check the revision numbers displayed in UPDATES/ABOUT accessed via the SETTINGS page.



Confirm the A16 firmware revision is 2.00 Jun 08 2021 and the FPGA firmware revision is 0.65 Oct 15 2020. For APM110 hardware variants the APM firmware will show APM 111 v245, Fe. For APM89L hardware variants the APM firmware will V2.2.6 8901 Oct. This firmware update also includes new head tracker firmware. You should update the HT firmware following completion of this update. See previous updates for instructions on how to undertake this.



Updates/About page APM89L variant



(APM110 variant)

STEP 6. The firmware update is now complete. A full restore must be run to properly initialize new menu and Preset features First press BACK and then navigate to 'Settings' and press ENTER.



Then navigate to 'Restore factory setup' and press ENTER again.



Select 'full restore' and press Enter again.



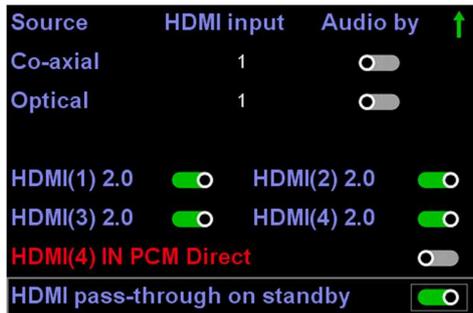
The full restore will take approximately 15 minutes to complete, thereafter the A16 will automatically return to the User A Speaker Map display.

New features

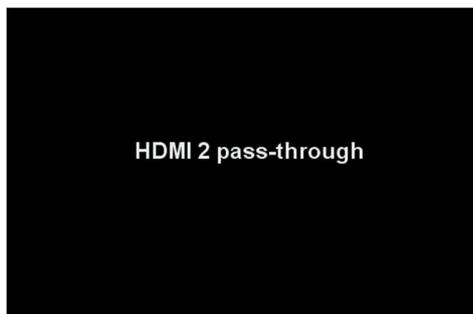
(all hardware variants)

1. HDMI Pass-through during Standby

HDMI pass-through (audio and video) can now operate during standby. Pass-through mode may be activated in the second page of the HDMI Settings menu (HOME>SETTINGS>SYSTEM>HDMI SETTINGS).



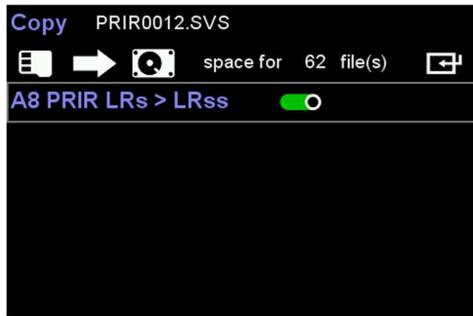
On entering standby (pressing remote control power button) the HDMI output is connected to the currently selected HDMI input and the HDMI source and sink re-establish a new AV connection. At this time the HDMI input currently being passed through to the HDMI output is displayed on the LCD.



In HDMI pass-through mode the A16 must remain powered to keep the HDMI sub-assembly active. However, all unnecessary A16 processing is halted to minimize power consumption. To exit HDMI pass-through the user can either press the remote-control power button or momentarily depress the user A or user B volume knobs.

2. Converting A8 PRIR Surround speakers to Side-Surround speakers

When transferring an A8 PRIR from external SD card into the A16 internal PRIR folder, an option to convert surround speaker labels to side-surround speaker labels has been added to the file copy menu page. This option is only applicable to A8 PRIRs. For example, if an A8 PRIR comprises a 5.1ch speaker layout (L, R, C, SW, Ls, Rs) and the option to convert LRs to LRss is enabled, then the copy written to the A16 will comprise the same speaker data except that surround speaker labels are changed to side-surround labels (L, R, C, SW, Lss, Rss). The original A8 PRIR on the external SD card is left unmodified.



3. Side-Surround Speaker override during Listening Room creation

During the Atmos and dts-X listening room creation process the user populates the listening room by matching virtual speakers (Vspkr) from internal PRIR files against a list of reference speakers (REF) for the listening room layout. Since the reference speaker (REF) list is pre-formatted for each layout and cannot be changed, it can be difficult to populate the listening room due to not having the right combination of surround and/or side surround speakers included the PRIRs off interest.



The listening room menu page (HOME>LISTENING ROOMS) has been modified to include a 'Surrounds' selector that allows surround and side-surround speakers to be inter-changed during the listening room creation process. The 'must match' option describes the normal mode of operation where only PRIR speakers that match reference speakers will be copied to the listening room.



The 'Lss/Rss or Ls/Rs' option describes the new mode of operation. For both 'One Matching Speaker' and 'All Matching Speakers' populate modes this override feature works as follows.

- 1) Where a listening room specifies side-surround speakers (Lss/Rss) and the selected PRIR only includes surround speakers (Ls/Rs), then the Lss/Rss reference labels are changed to Ls/Rs and the speakers from the selected PRIR copied to the listening room.
- 2) Where a listening room specifies surround speakers (Ls/Rs) and the selected PRIR only includes side-surround speakers (Lss/Rss), then the Ls/Rs reference labels are changed to Lss/Rss and the speakers from the selected PRIR copied to the listening room.

4. Preset Listening Room Auto-Load Override

By default, the A16 will automatically load an Atmos listening room when it encounters an HDMI/SPDIF Dolby bitstream (DD, DD+, Atmos, etc) or when the Dolby Surround up-mixer is engaged while receiving an HDMI/SPDIF PCM audio track. Equally a PCM listening room is automatically loaded when an HDMI/SPDIF PCM audio stream is encountered over HDMI (and up-mixing has been disabled) or when LINE/USB/STEREO audio source inputs have been selected. However, there are times, for example running the Reference Level calibration, when it would be more convenient if the automatic listening room loading could be overridden, and a particular room type be loaded in all cases. A 'LOADING' override function is now included in the listening room creation menu (HOME>LISTENING ROOMS).

Selecting 'all' engages the traditional automatic room loading where each room type is loaded depending on the nature of the incoming bitstream or the audio source selection.



Selecting 'only Atmos' forces the A16 to only load the Atmos listening room specified in the current preset for both user A and user B, irrespective of what HDMI/SPDIF bitstream is detected or what audio source input is selected.



Selecting 'only DTS:X' forces the A16 to only load the DTS listening room specified in the current preset for both user A and user B, irrespective of what HDMI/SPDIF bitstream is detected or what audio source input is selected.



Selecting 'only PCM' forces the A16 to only load the PCM listening room specified in the current preset for both user A and user B, irrespective of what HDMI/SPDIF bitstream is detected or what audio source input is selected.



Note that the loading selector is implemented in real time, meaning that as the selector is changed, the system immediately proceeds to reload the user A and user B presets according to the new selection. This means that the menu may become unresponsive for up to 5-10 seconds as the presets are reloaded.

5. Building Composite PRIRs

A composite PRIR builder application has been added to better manage PRIR files in general. The composite application can extract up to 35 virtual speakers from pre-existing PRIRs located in the A16's internal directory and create a new PRIR file comprising these speakers. PRIR speakers that have been created using different look-angle strategies can be loaded to the same composite PRIR without issue. The application also permits the original speaker labels, azimuth, and elevation angles to be altered, the virtual speaker impulse responses to be denoised and/or channel swapped, and for a photograph to be embedded into the PRIR file.



Proceed to the PRIR builder through the APPs menu page. On entering the Composite (CX) PRIR Configuration page, the PRIR filename, location, subject, and layout can be filled out using text entry. These text fields will be associated with the new PRIR. They are optional, but adding pertinent information make other functions, such as building sound rooms, more convenient as they remind the user as to the history of the speaker data. The new PRIR filename is always preceded with text 'CX_' to identify composite PRIRs.



PRIR Photo selection



A bit mapped (.BMP) photograph can be selected at this stage. The photo selector is programmed to look only in the 'realiser' directory of an external SD card. Furthermore, only 24-bit (colour) Bitmap pictures that are formatted 480 pixels (W) by 320 pixels (H) are accepted. Reformatting a photograph to Bitmap is widely supported in photo editing software. For example, the rudimentary Windows 'Paint' application can open any format (for example JPEG), resize the picture to 480x320 pixels and save back as 24-bit Bitmap. Similar applications are available on Mac PCs. Online JPEG to Bitmap converters are also available on the internet.

Once you have installed an SD card with a 'realiser' directory containing 480x320 Bitmap photos, navigate to 'Select PRIR Photo' and press ENTER. The display will show the first photo found in the directory. If present, additional photos can be viewed by pressing either of the ADJ +/- keys. To select a photograph, press the enter key. To abort the photo viewing process, press the BACK key.

PRIR Speaker selection



To select which PRIR speakers you want to include in the new composite PRIR, navigate to 'Select PRIR speaker' and press ENTER. A blank speaker selection for the first seven speakers is initially displayed. Up to a total of 35 speakers can be included in a composite PRIR using additional pages accessed from below.

	Vspkr	Azi	Elev	Denoise	Swap LR	
1		0	0	<input type="checkbox"/>	<input type="checkbox"/>	
2		0	0	<input type="checkbox"/>	<input type="checkbox"/>	
3		0	0	<input type="checkbox"/>	<input type="checkbox"/>	
4		0	0	<input type="checkbox"/>	<input type="checkbox"/>	
5		0	0	<input type="checkbox"/>	<input type="checkbox"/>	
6		0	0	<input type="checkbox"/>	<input type="checkbox"/>	
7		0	0	<input type="checkbox"/>	<input type="checkbox"/>	

Each channel of the new PRIR is numbered on the left-side of the display. The virtual speaker ID (Vspkr), azimuth angle (Azi) and elevation angle (Elev) is displayed for each. 'Denoise' and 'Swap LR' operations can also be enabled or disabled for any channel.



Move the cursor to the desired channel and press ENTER. This will bring up the internal A16 PRIR directory. From the first line you can select the PRIR of interest - from the second line press ENTER to view the range of speakers available for this PRIR.

1	L	AZI	-30.0	ELEV	0.0	
2	R	AZI	30.0	ELEV	0.0	
3	C	AZI	0.0	ELEV	0.0	
4	SW	AZI	0.0	ELEV	0.0	
5	Lss	AZI	-90.0	ELEV	0.0	
6	Rss	AZI	90.0	ELEV	0.0	
7	Lb	AZI	-120.0	ELEV	0.0	
8	Rb	AZI	120.0	ELEV	0.0	

Navigate to the desired speaker and press ENTER. The menu will then jump back to the composite PRIR speaker list. Select the next PRIR channel and repeat the speaker selection. Continue until all the desired channels have been populated.

	Vspkr	Azi	Elev	Denoise	Swap LR	
1	L	-30	0	<input type="checkbox"/>	<input type="checkbox"/>	
2	R	30	0	<input type="checkbox"/>	<input type="checkbox"/>	
3	C	0	0	<input type="checkbox"/>	<input type="checkbox"/>	
4	Ls	-110	0	<input type="checkbox"/>	<input type="checkbox"/>	
5	Rs	110	0	<input type="checkbox"/>	<input type="checkbox"/>	
6		0	0	<input type="checkbox"/>	<input type="checkbox"/>	
7		0	0	<input type="checkbox"/>	<input type="checkbox"/>	

In the example above a new 5.1ch composite PRIR has been created from a collection of pre-existing PRIRs stored in the A16 internal PRIR directory. Note that any composite PRIR channel can hold any speaker. It is not necessary for the first channel to hold a 'L' speaker – any available speaker can occupy that channel. Indeed, composite PRIRs can even include speakers that share the same Vspkr ID. Neither is it necessary to populate channels contiguously – gaps in the populated channel list are permitted.

If no changes to the speaker ID, azimuth, or elevation angles are required then proceed to build the new PRIR by pressing BACK, navigating to 'Build CX PRIR' and pressing ENTER.



The routine will build the new PRIR channel by channel, add any selected Bitmap photograph and finally save the new composite PRIR to the A16 recycle PRIR directory.



Navigate to 'FILES' in the home page and select 'recycle PRIR files' to view the new PRIR. If the composite PRIR has just been built, this will be the first file in the directory.



Composite PRIR files are the same as regular PRIR files in that they can be copied from the recycle directory to both the A16 internal PRIR directory and an external SD card realiser\PRIRs folder.

Denoising PRIR speakers

Any PRIR speaker used to build a composite PRIR can first be denoised before being copied into the new file. A 'Denoise' enable/disable slider is provided for each channel allowing for selective denoising. As discussed previously, denoising is a process that reduces the reverberant effects of background noise present within the virtual speaker impulse response. Where a PRIR has been measured in studio conditions, denoising is rarely necessary.

	Vspkr	Azi	Elev	Denoise	Swap LR	
1	L	-30	0	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2	R	30	0	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Left-Right Channel Swap

'Swap LR' slider controls are also available on a channel-by-channel basis. This functionality is only necessary where a PRIR has been measured with the microphones in the wrong ears, ie the left microphone in the right ear and visa-versa.

	Vspkr	Azi	Elev	Denoise	Swap LR	
1	L	-30	0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
2	R	30	0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

Altering a PRIR speaker ID and/or Azimuth-Elevation angles

As each composite channel is populated with speakers from pre-existing PRIRs, the speaker ID (Vspkr) and angular positions (Azi, Elev) are copied from those PRIRs. However, prior to initiating a build, the user is free to alter these values. Altering the Vspkr IDs has many uses. For example, where speakers were connected to the wrong amplifier channel during a PRIR measurement or the wrong A16 output was connected to the wrong loudspeaker, the PRIR Vspkr IDs needs changed to properly reflect the real position of the virtual speaker. This is particularly important when building listening rooms for Atmos/dtsX soundtracks since decoded audio is routed to virtual speakers according to their Vspkr ID.

In this example a composite PRIR is loaded with PRIR speakers L and R. However, the Left and Right speakers are known to have been swapped during the PRIR measurement, meaning that the L vspkr is the right speaker and visa-versa.

	Vspkr	Azi	Elev	Denoise	Swap LR	
1	L	-30	0	<input type="checkbox"/>	<input type="checkbox"/>	
2	R	30	0	<input type="checkbox"/>	<input type="checkbox"/>	

This can be fixed by swapping the Vspkr IDs before building the new PRIR. Although not shown here, for the purposes of clarity the user may also wish to swap the azimuth angles to reflect the new positions.

	Vspkr	Azi	Elev	Denoise	Swap LR	
1	R	-30	0	<input type="checkbox"/>	<input type="checkbox"/>	
2	L	30	0	<input type="checkbox"/>	<input type="checkbox"/>	

Another use is to give duplicated virtual speaker different IDs. In this example the same virtual speaker Ltf is loaded to two channels.

	Vspkr	Azi	Elev	Denoise	Swap LR	
1	Ltf	-30	40	<input type="checkbox"/>	<input type="checkbox"/>	
2	Ltf	-30	40	<input type="checkbox"/>	<input type="checkbox"/>	

By altering the Vspkr ID of one of the channels to Lh, the subsequent composite PRIR is now compatible for both Atmos and dts-X listening rooms.

	Vspkr	Azi	Elev	Denoise	Swap LR	
1	Lh	-30	40	<input type="checkbox"/>	<input type="checkbox"/>	
2	Ltf	-30	40	<input type="checkbox"/>	<input type="checkbox"/>	

Locked PRIRS

Where a composite PRIR includes speakers from a pre-existing PRIR that has been locked to the users A16, then the entire composite PRIR will be locked to their A16. To warn of this, PRIR speakers that are locked to the users A16 are flagged with a red 'L' against that channel. If the intention is to use the composite PRIR in a different A16, please ensure there are no locked PRIR speakers in the channel list prior to building the new PRIR.

	Vspkr	Azi	Elev	Denoise	Swap LR	
1	L	-30	0	<input type="checkbox"/>	<input type="checkbox"/>	
2	R	L 30	0	<input type="checkbox"/>	<input type="checkbox"/>	
3	C	0	0	<input type="checkbox"/>	<input type="checkbox"/>	
4	Ls	-110	0	<input type="checkbox"/>	<input type="checkbox"/>	
5	Rs	110	0	<input type="checkbox"/>	<input type="checkbox"/>	
6		0	0	<input type="checkbox"/>	<input type="checkbox"/>	
7		0	0	<input type="checkbox"/>	<input type="checkbox"/>	

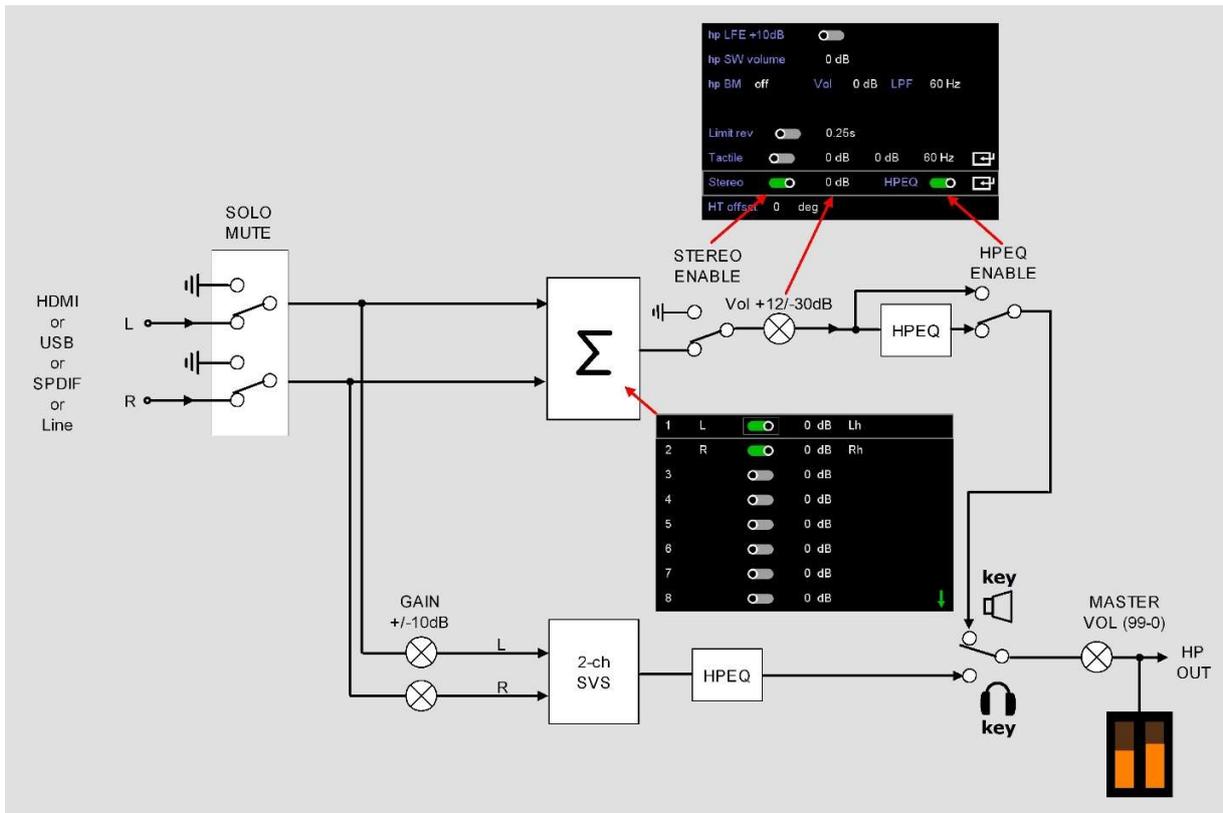
6. Head tracker Offset

Previously a single head tracking offset was specified within the Head tracker settings menu page. From revision 2.00 onwards, separate head tracking offsets can now be specified for each listening room. The HT offset can be found in the listening room 'Configure' menu page. Note that changes made to the offset value do not take effect until the listening room is loaded by a user preset.

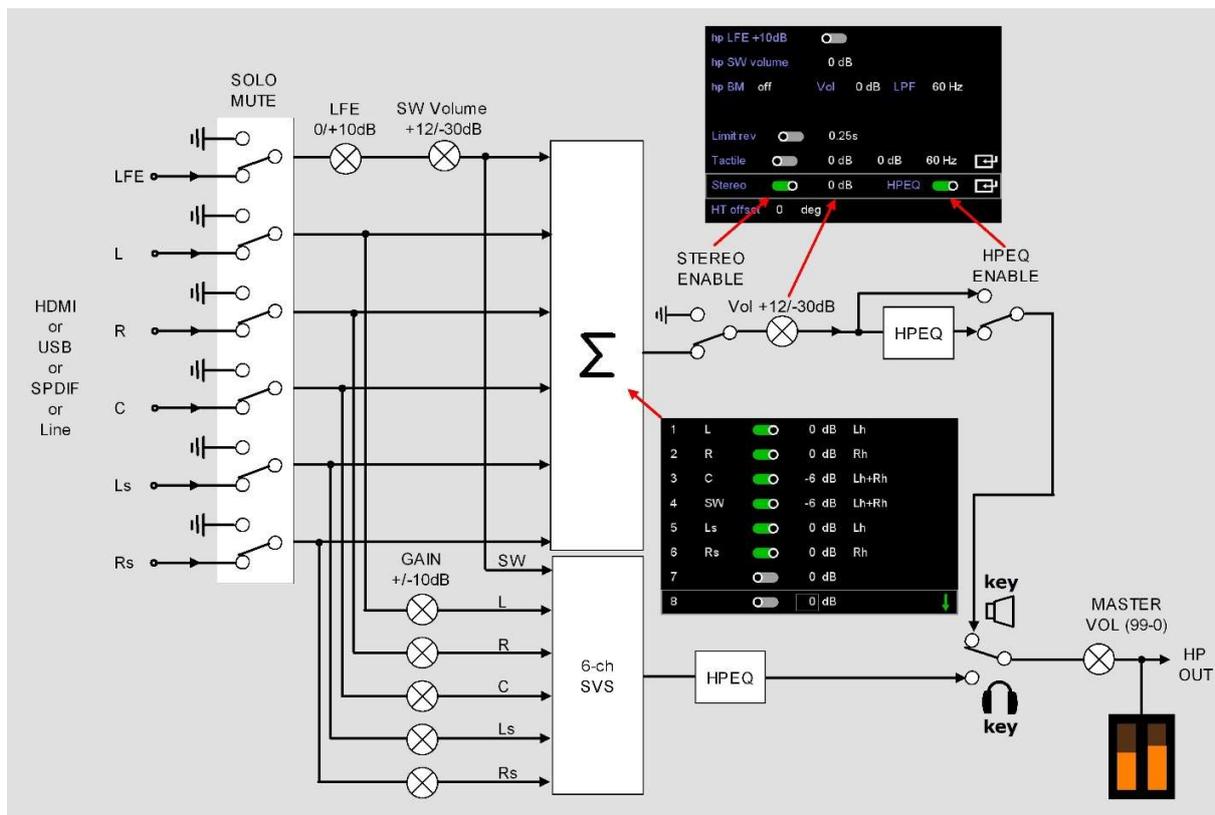


7. Optional use of HPEQ with Stereo Mixdown Operation

Traditionally the stereo mixdown function outputs a stereo mix down of the multi-channel input audio directly to the headphone, bypassing all SVS rendering and headphone equalization processing. From revision 2.00 onwards, an option to filter the stereo audio through the headphone equalizer (HPEQ) has been added to the stereo mixdown configuration under the listening room 'Configure' menu page. The specific HPEQ file used for the equalization is that selected in the user preset configuration menu. Note that changes made to the stereo mixdown settings do not take effect until the listening room is loaded by a user preset.



Example of using the A16 to listen to regular stereo audio without virtualization but retaining the HPEQ



Example of using the A16 to listen to a 5.1ch stereo mix-down without virtualization but retaining the HPEQ

8. Head Tracker Firmware 1.40 May 2021

A16 firmware revision 2.00 June 08 2021 includes a new firmware update for head trackers. Firmware 1.40 May 2021 implements some minor changes.

- 1) For the Optical A8 mode of operation, when the head tracker exceeds the maximum optical azimuth angle or the path between the head tracking and the set-top is blocked, the last valid azimuth angle is held until the head tracker moves back into range, or the obstacle removed, respectively. This brings the operation into line with the A8 legacy operation.
- 2) When the head tracker crosses the +/-180 degree a bug that caused the angle adaption to move in the wrong direction through zero degrees has been removed.

Two revisions of wired head tracker hardware now exist. HW Rev A is the original (2018) design. HW Rev B is the latest design (2020) with 10x lower inertial drift compared to rev A. However, HW Rev B head trackers do not support magnetic stabilization. Consequently, the head tracking confirmation window, triggered by pressing the HT key has been modified to display in real time the firmware and hardware revisions of any head trackers connected to the A16. However, only head tracker firmware 1.4 and

above, transmits the hardware revision number to the A16. Hence all head tracker must be updated in order to know their capability.



In this example the head tracker plugged into the user A side is currently warming up and reports firmware revision 1.4 and hardware revision B. The head tracker plugged into the user B side is up and running and reports firmware revision 1.4 and hardware revision A.



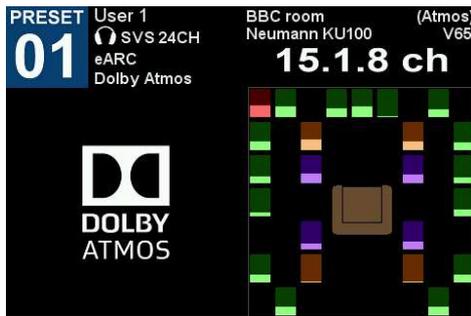
Please follow the head tracker update instructions previously issued. In summary, once the A16 firmware 2.00 installation has completed and you have run the factory restore, plug the head tracker you wish to update into the User A HT socket. Navigate to settings>system>HT settings. Go down to 'Update HT firmware' and press enter to begin. On completion navigate to settings>update/about to confirm the new HT firmware revision has been installed. Alternatively, return to the speaker map page for user A and press the HT key.



9. PA and PB key function

The separate meters function of previous revisions has been dropped and instead integrated into the PA and PB button functionality. If the presets for User A and User B have been successfully loaded and activated, the Speaker Map of the active preset for each user can be displayed using the PA or PB keys on the remote control. Pressing the PA/PB key for a second time brings up the input level meters, while the output levels meters are shown on the third press. Further presses rotate between these three

are continuing to work on various problems and hopefully will have a fully working version soon. The main issue with the beta implementation is that the A16 HDMI board can stop functioning altogether when in the process of negotiating the initial eARC connection, causing the A16 to run very slowly, and requires the A16 power to be cycled to restart it. However, once a connection succeeds, it seems to pass audio without further issue all the way up to Atmos 15.1.8ch. Our advice at this stage is to establish what eARC connection sequence works best with your setup. For example, enable eARC on the TV first and then select eARC as an input on the A16, or the other way round. If at any time you find the A16 has frozen or is very slow, cycle the power and continue.



Imminent A16 Features (all hardware variants)

- 1) DTS-X
- 2) Extend ASYNC PRIR measurements to 24 channels
- 3) Extend OH key group to 10 overhead/height speakers

New A16 Features in Development (all hardware variants)

- 1) Auro3D certification
- 2) Vertical Headtracking mode
- 3) Low delay gaming mode
- 4) Extend optical stabilisation mode to User B head tracking

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