ARC-NARC I/O Truth Tab

An audio amplifier "Truth Table" is a logical table that maps different input states or conditions to corresponding output states or settings. In the context of an ARC-NARC this refers to how various inputs (such as volume level, input source selection, tone control settings, etc.) correspond to specific outputs (such as speaker output levels, signal processing states, or LED indicators).

ARC ensures seamless communication between devices, allowing for precise mapping of input states to output settings.

The Truth Tables are structured into sections based on different scenarios involving Default and Secondary Sources, Switchover Behavior, Amp Configuration, Auto-ON settings, and Output Behavior. Each scenario outlines how specific input conditions, such as volume levels, source selection, and tone control settings, correspond to output states like speaker output levels and signal processing states. By breaking down these scenarios systematically, the Truth Tables provide a comprehensive guide for configuring audio amplifiers in various setups, ensuring optimal performance and functionality.

Control Documents

In order to share a single-source of truth for these truth tables with Hansong, these truth tables were exported to word documents, and stored on sharepoint with the following links:

1. Ducking mode truth table: ARC-NARC+I_O+Truth+Table.doc
2. Mute mode truth table: ARC-NARC+I_O+Truth+Table_MUTE.doc

Switching Behaviors

ARC Ducking

- Anytime a TV/CEC/eARC session is active, the HDMI input is treated as if it has active audio.
- “X” means don’t care (could be any configuration and would not change the outcome)
- “Ducking” means to attenuate the default source by the [ducking attenuation setting, typically -20dB], thereby allowing the secondary source to be heard clearly. The secondary source is not attenuated.

Conditions							Output Expected Behavior	
Settings				Initial Power State	Source Conditions		Audio Output	Power State
HDMI	Analog	Auto-ON Mode	Switchover Behavior		HDMI	Analog		
X	X	Always ON	X	ON	X	X	X	System remains ON always
X	X	Auto-Sense	X	Standby	No Audio	No Audio	No Output	System remains in standby mode
Default	Secondary	X	Duck	ON	Audio Present	Audio Present	**Output is a mix of both inputs:** • **HDMI audio attenuated by fixed amount [ducking attenuation setting, typically -20dB]** • **Analog audio at unattenuated level** Both signals can be heard, but HDMI signal is quieter (ducked) so Analog signal can be heard more easily	System remains ON

Default	Secondary	X	Duck	ON	Audio Present → No Audio (No CEC command)	No Audio	**Initial and final Output is only HDMI audio because there is no Analog audio:** • **HDMI audio at unattenuated level** • **No Analog audio contribution** When the HDMI audio drops out, the amplifier output becomes inaudible. It is still outputting the HDMI source because the TV/CEC/eARC session is still active, but the HDMI audio is too quiet to be heard.	System remains ON because the TV is still ON and CEC standby command was not received
Default	Secondary	X	Duck	ON	Audio Present → MUTE CEC command	No Audio	Initial output is only HDMI audio because there is no Analog audio: • HDMI audio at unattenuated level • No Analog audio contribution → **After the Mute CEC command:** • **HDMI audio (but it is muted)** • **No Analog audio contribution** The HDMI source is muted but still active because the TV/CEC/eARC session is still active. The amplifier output is inaudible because there the HDMI source is muted.	System remains ON because the TV is still ON and CEC standby command was not received
Default	Secondary	X	Duck	ON	Audio Present	Audio Present → No Audio	Initial output: • HDMI audio attenuated by fixed amount [ducking attenuation setting, typically -20dB] • Analog audio at unattenuated level → **After Analog audio drops out and [source switchover timeout], output becomes:** • **HDMI audio at unattenuated level** • **No Analog audio contribution**	System remains ON
Default	Secondary	X	Duck	ON	Audio Present → No Audio (No CEC command)	Audio Present	**Output continues to be a mix of both inputs:** • **HDMI audio attenuated by [ducking attenuation setting, typically -20dB]** • **Analog audio at unattenuated level** Only Analog audio is heard on the output because HDMI audio is silent (but the TV/CEC/eARC session is still active)	System remains ON
Default	Secondary	X	Duck	ON	Audio Present → MUTE	Audio Present	Initial output is a mix of both inputs: • HDMI audio attenuated by [ducking attenuation setting,	System remains ON

					CEC command		typically -20dB] • Analog audio at unattenuated level → **After the CEC Mute command:** • **HDMI audio is muted** • **Analog audio at unattenuated level** Only Analog audio is heard on the output because HDMI audio is muted (note: the TV/CEC/eARC session is still active)	
Default	Secondary	X	Duck	ON	Audio Present → CEC standby/off	Audio Present	Initial output is a mix of both inputs: • HDMI audio attenuated by [ducking attenuation setting, typically -20dB] • Analog audio at unattenuated level → **After the CEC Standby/Off command:** • **No contribution from HDMI because TV is off** • **Analog audio at unattenuated level** Only Analog audio is heard on the output because the TV/CEC/eARC session is not active.	System remains ON
Default	Secondary	Always ON	Duck	ON	TV is off/standby	Audio Present → No Audio	Initial output: • No contribution from HDMI because TV is off • Analog audio at unattenuated level → **After Analog audio drops out:** • **No contribution from HDMI audio because TV is off** • **No contribution from Analog audio** After the Analog audio disappears, there is no output.	System remains ON
Default	Secondary	Auto-sense	Duck	ON	TV is off/standby	Audio Present → No Audio	Initial output: • No contribution from HDMI because TV is off • Analog audio at unattenuated level → **After Analog audio drops out:** • **No contribution from HDMI audio because TV is off** • **No contribution from Analog audio**	After the Analog audio drops out, and after the [sleep timeout], system will enter standby state

							After the Analog audio disappears, there is no output.	
Secondary	Default	X	Duck	ON	Audio Present	Audio Present	**Output is a mix of both inputs:** • **Analog audio attenuated by fixed amount [ducking attenuation setting, typically -20dB]** • **HDMI audio at unattenuated level** Both signals can be heard, but Default source audio is quieter (ducked) so the Secondary source audio can be heard more easily	System remains ON
Secondary	Default	X	Duck	ON	Audio Present	Audio Present → No Audio	Output is initially a mix of both inputs: • Analog attenuated by [ducking attenuation setting, typically -20dB] • HDMI output at unattenuated level → **After Analog audio drops out:** • **No contribution from Analog audio** • **HDMI audio at unattenuated level**	System remains ON
Secondary	Default	X	Duck	ON	Audio Present → No Audio (No CEC command)	Audio Present	Output is initially a mix of both inputs: • Analog attenuated by [ducking attenuation setting, typically -20dB] • HDMI output at unattenuated level → **After HDMI audio drops out, output continues to be a mix of both inputs:** • **Analog audio attenuated by [ducking attenuation setting, typically -20dB]** • **HDMI audio at unattenuated level (but no contribution because it is silent)** The Analog audio continues to be attenuated because the TV/CEC/eARC session is still active.	System remains ON
Secondary	Default	X	Duck	ON	Audio Present → Mute CEC command	Audio Present	Output is initially a mix of both inputs: • Analog audio attenuated by [ducking attenuation setting, typically -20dB] • HDMI audio at unattenuated level → **After Mute CEC command, HDMI audio is muted and output becomes:**	System remains ON

							• **Analog attenuated by [ducking attenuation setting, typically -20dB]** • **No contribution from HDMI audio because it is muted** The Analog audio continues to be attenuated because the TV/CEC/eARC session is still active (even though the HDMI audio is muted).	
Secondary	Default	X	Duck	ON	Audio Present → CEC standby/ off	Audio Present	Output is initially a mix of both inputs: • Analog audio attenuated by [ducking attenuation setting, typically -20dB] • HDMI audio at unattenuated level → **After CEC standby/off command, Output immediately becomes:** • **Analog audio at unattenuated level** • **No contribution from HDMI audio because TV is off.**	System remains ON because there is still an Analog audio input signal
Secondary	Default	X	Duck	ON	Audio Present → No Audio (No CEC comman d)	No Audio	**Initial and final output:** • **No contribution from Analog audio** • **HDMI audio at unattenuated level** When the HDMI signal drops out, there is no audible output from the amplifier. It is still outputting the HDMI audio because the TV/CEC/eARC session is still active, but there is no audible contribution from HDMI audio.	System remains ON because the TV is still ON and CEC standby/off command was not received
Secondary	Default	X	Duck	ON	Audio Present → MUTE CEC comman d	No Audio	Initial output: • No contribution from Analog audio • HDMI audio at unattenuated level → **After Mute CEC command:** • **No contribution from Analog audio** • **No contribution from HDMI audio because it is muted** There is no audible output from the amplifier because the HDMI source is muted. But the amplifier remains ON because the TV/CEC/eARC session is still active.	System remains ON because the TV is still ON and CEC standby/off command was not received
Secondary	Default	Always ON	Duck	ON	TV is off/stand by	Audio Present	Initial output: • Analog audio at unattenuated level	System remains ON

						→ No Audio	• No contribution from HDMI audio because TV is off → **After Analog audio drops out and after [switchover timeout]: Amplifier output will turn off because there is no audio and the TV is OFF.**	
Secondary	Default	Auto-Sense	Duck	ON	TV is off/standby	Audio Present → No Audio	Initial output: • Analog audio at unattenuated level • No contribution from HDMI audio because TV is off → **After Analog audio drops out and after [switchover timeout]: Amplifier output will turn off because there is no audio and the TV is OFF.**	After [sleep timeout], system will enter standby state because there is no audio or active TV/CEC/eARC session.

NARC Ducking

- Presence of SPDIF carrier does not mean that audio is present, but presence of SPDIF carrier will prevent system from going into low-power standby.
- “X” means don’t care (could be any configuration and would not change the outcome)
- “Ducking” means to attenuate the default source by the [ducking attenuation setting, typically -20dB], thereby allowing the secondary source to be heard clearly. The secondary source is not attenuated.

Conditions							**Output Expected Behavior**	
Settings				**Initial Power State**	**Input States**		**Audio Output**	**Power State**
Digital	**Analog**	**Auto-ON Mode**	**Switchover Behavior**		**Digital Input State**	**Analog Input State**		
X	X	Always ON	X	ON	X	X	X	System remains ON always
X	X	Auto-Sense	X	Low-power Standby	No SPDIF carrier detected	No Audio	No Output	System remains in low-power standby mode
X	X	Auto-sense	X	Standby - Instant ON	No Audio (SPDIF carrier detected)	No Audio	**No output because there is no audio from either source.**	System remains in Standby - Instant ON mode, because the SPDIF carrier is detected
X	X	Auto-Sense	X	Standby - Instant ON	No Audio (Carrier Detected) → No SPDIF carrier detected	No Audio	Amplifier output is OFF because there is no audio on either input. (no change)	After [sleep timeout], System will enter low-power standby state because there is no input and no SPDIF carrier.

Default	Secondary	X	Duck	ON	Audio Present	Audio Present	**Output is a mix of both sources:** • **Digital audio attenuated by fixed amount [ducking attenuation setting, typically -20dB]** • **Analog audio at unattenuated level** Both signals can be heard, but Digital signal is quieter (ducked) so Analog signal can be heard more easily	System remains ON
Default	Secondary	X	Duck	ON	No Audio (Carrier detected)	Audio Present	**Output is only Analog audio because there is no Digital audio:** • **No Digital audio contribution** • **Analog audio at unattenuated level**	System remains ON
Default	Secondary	X	Duck	ON	No SPDIF carrier detected	Audio Present	**Output is only Analog audio because there is no SPDIF carrier detected:** • **No Digital audio contribution** • **Analog audio at unattenuated level**	System remains ON
Default	Secondary	X	Duck	ON	Audio Present	No Audio	**Output is only Digital audio because there is no Analog audio:** • **Digital audio at unattenuated level** • **No Analog audio contribution**	System remains ON
Default	Secondary	X	Duck	ON	Audio Present	Audio Present → No Audio	Initial output is a mix of both sources: • Digital audio attenuated by fixed amount [ducking attenuation setting, typically -20dB] • Analog audio at unattenuated level → **After Analog audio drops out and [source switchover**	System remains ON

							timeout], output becomes: • **Digital audio at unattenuated level** • **No Analog audio contribution**	
Default	Secondary	X	Duck	ON	Audio Present → No Audio (Carrier detected)	Audio Present	Initial output is a mix of both sources: • Digital audio attenuated by fixed amount [ducking attenuation setting, typically -20dB] • Analog audio at unattenuated level → **After Digital audio drops out and [source switchover timeout], output becomes:** • **No Digital audio contribution** • **Analog audio at unattenuated level**	System remains ON
Default	Secondary	X	Duck	ON	Audio Present → No SPDIF carrier detected	Audio Present	Initial output is a mix of both sources: • Digital audio attenuated by fixed amount [ducking attenuation setting, typically -20dB] • Analog audio at unattenuated level → **After Digital audio drops out and [source switchover timeout], output becomes:** • **No Digital audio contribution** • **Analog audio at unattenuated level**	System remains ON
Default	Secondary	X	Duck	ON	No Audio (Carrier detected)	Audio Present → No Audio	Initial output is: • No Digital audio contribution • Analog audio at unattenuated level →	After the [sleep timeout], system will enter Standby - Instant ON state because there is no audio and SPDIF carrier is still detected.

							After Analog audio drops out and [source switchover timeout], there is no output and amplifier output turns off.	
Default	Secondary	X	Duck	ON	No SPDIF carrier detected	Audio Present → No Audio	Initial output is: • No Digital audio contribution • Analog audio attenuated by fixed amount [ducking attenuation setting, typically -20dB] → **After Analog audio drops out and [source switchover timeout], there is no output and amplifier output turns off.**	After the [sleep timeout], system will enter low-power standby state because there is no audio and no SPDIF carrier.
Default	Secondary	X	Duck	ON	Audio Present → No Audio (Carrier detected)	No Audio	Initial output is : • Digital audio at unattenuated level • No Analog audio contribution → **After Digital audio drops out and [source switchover timeout], there is no output and amplifier output turns off.**	After the [sleep timeout], system will enter Standby - Instant ON state because there is no audio and SPDIF carrier is still detected.
Default	Secondary	X	Duck	ON	Audio Present → No SPDIF carrier detected	No Audio	Initial output is only Digital audio because there is no Analog audio: • Digital audio at unattenuated level • No Analog audio contribution → **After Digital audio drops out and [source switchover timeout], there is no output and amplifier output turns off.**	After the [sleep timeout], system will enter low-power standby state because there is no audio and no SPDIF carrier.

Secondary	Default	X	Duck	ON	Audio Present	Audio Present	**Output is a mix of both sources:** • **Analog audio attenuated by fixed amount [ducking attenuation setting, typically -20dB]** • **Digital audio at unattenuated level** Both signals can be heard, but Analog signal is quieter (ducked) so Digital signal can be heard more easily	System remains ON
Secondary	Default	X	Duck	ON	No Audio (Carrier detected)	Audio Present	**Output is only Analog audio because there is no Digital audio:** • **No Digital audio contribution** • **Analog audio at unattenuated level**	System remains ON
Secondary	Default	X	Duck	ON	No SPDIF carrier detected	Audio Present	**Output is only Analog audio because there is no SPDIF carrier detected:** • **No Digital audio contribution** • **Analog audio at unattenuated level**	System remains ON
Secondary	Default	X	Duck	ON	Audio Present	No Audio	**Output is only Digital audio because there is no Analog audio:** • **Digital audio at unattenuated level** • **No Analog audio contribution**	System remains ON
Secondary	Default	X	Duck	ON	Audio Present	Audio Present → No Audio	Initial output is a mix of both sources: • Analog audio attenuated by fixed amount [ducking attenuation setting, typically -20dB] • Digital audio at unattenuated level → **After Analog audio drops out and [source switchover**	System remains ON

							timeout], output becomes: • **Digital audio at unattenuated level** • **No Analog audio contribution**	
Secondary	Default	X	Duck	ON	Audio Present → No Audio (Carrier detected)	Audio Present	Initial output is a mix of both sources: • Analog audio attenuated by fixed amount [ducking attenuation setting, typically -20dB] • Digital audio at unattenuated level → **After Digital audio drops out and [source switchover timeout], output becomes:** • **No Digital audio contribution** • **Analog audio at attenuated level**	System remains ON
Secondary	Default	X	Duck	ON	Audio Present → No SPDIF carrier detected	Audio Present	Initial output is a mix of both sources: • Analog audio attenuated by fixed amount [ducking attenuation setting, typically -20dB] • Digital audio at unattenuated level → **After Digital audio drops out and [source switchover timeout], output becomes:** • **No Digital audio contribution** • **Analog audio at unattenuated level**	System remains ON
Secondary	Default	X	Duck	ON	No Audio (Carrier detected)	Audio Present → No Audio	Initial output is only Analog audio because there is no Digital audio: • No Digital audio contribution	System will enter Standby - Instant ON state because there is no input and SPDIF carrier is still detected.

							• Analog audio at attenuated level → **After Analog audio drops out and [source switchover timeout], there is no output and amplifier output turns off.**	
Secondary	Default	X	Duck	ON	No SPDIF carrier detected	Audio Present → No Audio	Initial output is only Analog audio because there is no Digital audio: • No Digital audio contribution • Analog audio at unattenuated level → **After Analog audio drops out and [source switchover timeout], there is no output and amplifier output turns off.**	System will enter low-power standby state because there is no input and no SPDIF carrier.
Secondary	Default	X	Duck	ON	Audio Present → No Audio (Carrier detected)	No Audio	Initial output is only Digital audio because there is no Analog audio: • Digital audio at unattenuated level • No Analog audio contribution → **After Digital audio drops out and [source switchover timeout], there is no output and amplifier output turns off.**	System will enter Standby - Instant ON state because there is no input and SPDIF carrier is still detected.
Secondary	Default	X	Duck	ON	Audio Present → No SPDIF carrier detected	No Audio	Initial output is only Digital audio because there is no Analog audio: • Digital audio at unattenuated level • No Analog audio contribution → **After Digital audio drops out and [source switchover**	System will enter low-power standby state because there is no input and no SPDIF carrier.

							timeout], there is no output and amplifier output turns off.	

ARC Mute Mode

- Anytime a TV/CEC/eARC session is active, the HDMI input is treated as if it has active audio.
- “X” means don’t care (could be any configuration and would not change the outcome)
- “Mute” means to attenuate the default source by an infinite amount of dB, thereby allowing the secondary source to be heard clearly. The secondary source is not attenuated.

Line #	Conditions							Output Expected Behavior	
	Settings				Initial Power State	Source Conditions		Audio Output	Power State
	HDMI	Analog	Auto-ON Mode	Switchover Behavior		HDMI	Analog		
1	X	X	Always ON	X	ON	X	X	X	System remains ON always
2	X	X	Auto-Sense	X	Standby	No Audio	No Audio	No Output	System remains in standby mode
3	Default	Secondary	X	Mute	ON	Audio Present	Audio Present	**Output is only Analog input source:** • No contribution from HDMI because it is muted (due to input switchover) • **Analog audio at unattenuated level**	System remains ON
4	Default	Secondary	X	Mute	ON	Audio Present → No Audio (No CEC command)	No Audio	**Initial and final Output is only HDMI audio because there is no Analog audio:** • **HDMI audio at unattenuated level** • **No Analog audio contribution** When the HDMI audio drops out, the amplifier output becomes inaudible. It is still outputting the HDMI source because the TV/CEC/eARC session is still active, but the HDMI	System remains ON because the TV is still ON and CEC standby command was not received

								audio is too quiet to be heard.	
5	Default	Secondary	X	Mute	ON	Audio Present → MUTE CEC command	No Audio	Initial output is only HDMI audio because there is no Analog audio: • HDMI audio at unattenuated level • No Analog audio contribution → **After the Mute CEC command:** • **HDMI audio (but it is muted by CEC command)** • **No Analog audio contribution** The HDMI source is muted but still active because the TV/CEC/eARC session is still active. The amplifier output is inaudible because there the HDMI source is muted.	System remains ON because the TV is still ON and CEC standby command was not received
6	Default	Secondary	X	Mute	ON	Audio Present	Audio Present → No Audio	Initial output: • No contribution from HDMI because it is muted (due to input switchover) • Analog audio at unattenuated level → **After Analog audio drops out and [source switchover timeout], output becomes:** • **HDMI audio at unattenuated level** • **No Analog audio contribution**	System remains ON
7	Default	Secondary	X	Mute	ON	Audio Present → No Audio (No CEC command)	Audio Present	Initial output: • No contribution from HDMI because it is muted (due to input switchover) • Analog audio at unattenuated level → **After HDMI audio drops out, output remains the same:** • **No contribution from HDMI because it is**	System remains ON

								muted (due to input switchover) • **Analog audio at unattenuated level** Only Analog audio is heard on the output because HDMI audio is muted (but the TV/CEC/eARC session is still active)	
8	Default	Secondary	X	Mute	ON	Audio Present → MUTE CEC command	Audio Present	Initial output: • No contribution from HDMI because it is muted (due to input switchover) • Analog audio at unattenuated level → **After the CEC Mute command:** • **No contribution from HDMI because it is muted (due to input switchover and TV CEC command)** • **Analog audio at unattenuated level** Only Analog audio is heard on the output because HDMI audio is muted (note: the TV/CEC/eARC session is still active)	System remains ON
9	Default	Secondary	X	Mute	ON	CEC MUTE State → UNMUTE CEC command	Audio Present	Initial output: • No contribution from HDMI because it is muted (due to input switchover) • Analog audio at unattenuated level → **After the CEC Unmute command:** • **No contribution from HDMI because it is muted (due to input switchover)** • **Analog audio at unattenuated level** NOTE: Only Analog audio is heard on the output because the UNMUTE CEC command will not unmute the HDMI input if it is also	System remains ON

								muted by the input switchover behavior.	
10	Default	Secondary	X	Mute	ON	Audio Present → CEC standby/off	Audio Present	Initial output: • No contribution from HDMI because it is muted (due to input switchover) • Analog audio at unattenuated level → **After the CEC Standby/Off command:** • **No contribution from HDMI because TV is off** • **Analog audio at unattenuated level** Only Analog audio is heard on the output because the TV/CEC/eARC session is not active.	System remains ON
11	Default	Secondary	Always ON	Mute	ON	TV is off/standby	Audio Present → No Audio	Initial output: • No contribution from HDMI because TV is off • Analog audio at unattenuated level → **After Analog audio drops out:** • **No contribution from HDMI audio because TV is off** • **No contribution from Analog audio** After the Analog audio disappears, there is no output.	System remains ON
12	Default	Secondary	Auto-sense	Mute	ON	TV is off/standby	Audio Present → No Audio	Initial output: • No contribution from HDMI because TV is off • Analog audio at unattenuated level → **After Analog audio drops out:** • **No contribution from HDMI audio because TV is off** • **No contribution from Analog audio**	After the Analog audio drops out, and after the [sleep timeout], system will enter standby state

								After the Analog audio disappears, there is no output.	
13	Secondary	Default	X	Mute	ON	Audio Present	Audio Present	**Output is only HDMI input source:** • **No contribution from Analog because it is muted (due to input switchover)** • **HDMI audio at unattenuated level** Only the secondary source analog audio can be heard easily	System remains ON
14	Secondary	Default	X	Mute	ON	Audio Present	Audio Present → No Audio	Initial output: • No contribution from Analog because it is muted (due to input switchover) • HDMI output at unattenuated level → **After Analog audio drops out:** • **No contribution from Analog audio** • **HDMI audio at unattenuated level**	System remains ON
15	Secondary	Default	X	Mute	ON	Audio Present → No Audio (No CEC command)	Audio Present	Initial output: • No contribution from Analog because it is muted (due to input switchover) • HDMI output at unattenuated level → **After HDMI audio drops out:** • **No contribution from Analog because it is muted (due to input switchover)** • **HDMI audio at unattenuated level (but no contribution because it is silent)** The Analog audio continues to be muted because the	System remains ON

								TV/CEC/eARC session is still active.	
16	Secondary	Default	X	Mute	ON	Audio Present → Mute CEC command	Audio Present	Initial output: • No contribution from Analog because it is muted (due to input switchover) • HDMI output at unattenuated level → **After Mute CEC command, HDMI audio is muted and output becomes:** • **No contribution from Analog because it is muted (due to input switchover)** • **HDMI audio at unattenuated level (but no contribution because it is muted)** The Analog audio continues to be muted because the TV/CEC/eARC session is still active (even though the HDMI audio is muted).	System remains ON
17	Secondary	Default	X	Mute	ON	CEC Mute State → Unmute CEC command	Audio Present	Initial output: • No contribution from Analog because it is muted (due to input switchover) • HDMI audio at unattenuated level (but no contribution because it muted) → **After Unmute CEC command, HDMI audio is unmuted and output becomes:** • **No contribution from Analog because it is muted (due to input switchover)** • **HDMI audio at unattenuated level** The Analog audio continues to be muted because the TV/CEC/eARC session is still active (even though the HDMI audio is muted).	System remains ON

18	Secondary	Default	X	Mute	ON	Audio Present → CEC standby/ off	Audio Present	Initial output: • No contribution from Analog because it is muted (due to input switchover) • HDMI output at unattenuated level → **After CEC standby/off command, Output immediately becomes:** • **Analog audio at unattenuated level** • **No contribution from HDMI audio because TV is off.**	System remains ON because there is still an Analog audio input signal
19	Secondary	Default	X	Mute	ON	Audio Present → No Audio (No CEC command)	No Audio	Initial output: • No contribution from Analog because it is muted (due to input switchover) • HDMI output at unattenuated level → **After HDMI audio drops out:** • **No contribution from Analog audio** • **HDMI audio at unattenuated level** When the HDMI signal drops out, there is no audible output from the amplifier. It is still outputting the HDMI audio because the TV/CEC/eARC session is still active, but there is no audible contribution from HDMI audio.	System remains ON because the TV is still ON and CEC standby/ off command was not received

20	Secondary	Default	X	Mute	ON	Audio Present → MUTE CEC command	No Audio	Initial output: • No contribution from Analog audio • HDMI audio at unattenuated level → **After Mute CEC command:** • **No contribution from Analog audio** • **No contribution from HDMI audio because it is muted** There is no audible output from the amplifier because the HDMI source is muted. But the amplifier remains ON because the TV/CEC/eARC session is still active.	System remains ON because the TV is still ON and CEC standby/off command was not received
21	Secondary	Default	Always ON	Mute	ON	TV is off/standby	Audio Present → No Audio	Initial output: • Analog audio at unattenuated level • No contribution from HDMI audio because TV is off → **After Analog audio drops out and after [switchover timeout]: Amplifier output will turn off because there is no audio and the TV is OFF.**	System remains ON
22	Secondary	Default	Auto-Sense	Mute	ON	TV is off/standby	Audio Present → No Audio	Initial output: • Analog audio at unattenuated level • No contribution from HDMI audio because TV is off → **After Analog audio drops out and after [switchover timeout]: Amplifier output will turn off because there is no audio and the TV is OFF.**	After [sleep timeout], system will enter standby state because there is no audio or active TV/CEC/eARC session.

NARC Mute Mode

- Presence of SPDIF carrier does not mean that audio is present, but presence of SPDIF carrier will prevent system from going into low-power standby.
- “X” means don’t care (could be any configuration and would not change the outcome)

- “Mute” means to attenuate the default source by an infinite amount of dB, thereby allowing the secondary source to be heard clearly. The secondary source is not attenuated.

Line #	Conditions							Output Expected Behavior	
	Settings				Initial Power State	Input States		Audio Output	Power State
	Digital	Analog	Auto-ON Mode	Switchover Behavior		Digital Input State	Analog Input State		
1	Default	Secondary	X	Mute	ON	Audio Present	Audio Present	**Output is only Analog input source:** • **No contribution from Digital because it is muted (due to input switchover)** • **Analog audio at unattenuated level**	System remains ON
2	Default	Secondary	X	Mute	ON	No Audio (Carrier detected)	Audio Present	**Output is only Analog audio because there is no Digital audio:** • **No Digital audio contribution** • **Analog audio at unattenuated level**	System remains ON
3	Default	Secondary	X	Mute	ON	No SPDIF carrier detected	Audio Present	**Output is only Analog audio because there is no SPDIF carrier detected:** • **No Digital audio contribution** • **Analog audio at unattenuated level**	System remains ON
4	Default	Secondary	X	Mute	ON	Audio Present	No Audio	**Output is only Digital audio because there is no Analog audio:** • **Digital audio at unattenuated level** • **No Analog audio contribution**	System remains ON
5	Default	Secondary	X	Duck	ON	Audio Present	Audio Present → No Audio	Initial output: • No contribution from Digital because it is muted (due to input switchover) • Analog audio at unattenuated level → **After Analog audio drops out and [source switchover timeout], output becomes:**	System remains ON

								• **Digital audio at unattenuated level** • **No Analog audio contribution**	
6	Default	Secondary	X	Mute	ON	Audio Present → No Audio (Carrier detected)	Audio Present	Initial output: • No contribution from Digital because it is muted (due to input switchover) • Analog audio at unattenuated level → **After Digital audio drops out and [source switchover timeout], output becomes:** • **No Digital audio contribution** • **Analog audio at unattenuated level**	System remains ON
7	Default	Secondary	X	Mute	ON	Audio Present → No SPDIF carrier detected	Audio Present	Initial output: • No contribution from Digital because it is muted (due to input switchover) • Analog audio at unattenuated level → **After Digital audio drops out and [source switchover timeout], output becomes:** • **No Digital audio contribution** • **Analog audio at unattenuated level**	System remains ON
8	Default	Secondary	Auto-Sense	Mute	ON	No Audio (Carrier detected)	Audio Present → No Audio	Initial output: • No Digital audio contribution • Analog audio at unattenuated level → **After Analog audio drops out and [source switchover timeout], there is no output and amplifier output turns off.**	After the [sleep timeout], system will enter Standby - Instant ON state because there is no audio and SPDIF carrier is still detected.
9	Default	Secondary	Always ON	Mute	ON	No Audio (Carrier	Audio Present	Initial output:	System remains ON

						detected)	→ No Audio	• No Digital audio contribution • Analog audio at unattenuated level → **After Analog audio drops out and [source switchover timeout], there is no output and amplifier output turns off.**	
10	Default	Secondary	Auto-Sense	Mute	ON	No SPDIF carrier detected	Audio Present → No Audio	Initial output is: • No Digital audio contribution • Analog audio at unattenuated level → **After Analog audio drops out and [source switchover timeout], there is no output and amplifier output turns off.**	After the [sleep timeout], system will enter low-power standby state because there is no audio and no SPDIF carrier.
11	Default	Secondary	Always ON	Mute	ON	No SPDIF carrier detected	Audio Present → No Audio	Initial output is: • No Digital audio contribution • Analog audio at unattenuated level → **After Analog audio drops out and [source switchover timeout], there is no output and amplifier output turns off.**	System remains ON
12	Default	Secondary	Auto-Sense	Mute	ON	Audio Present → No Audio (Carrier detected)	No Audio	Initial output is : • Digital audio at unattenuated level • No Analog audio contribution → **After Digital audio drops out and [source switchover timeout], there is no output and amplifier output turns off.**	After the [sleep timeout], system will enter Standby - Instant ON state because there is no audio and SPDIF carrier is still detected.
13	Default	Secondary	Always ON	Mute	ON	Audio Present	No Audio	Initial output is : • Digital audio at unattenuated level	System remains ON

						→ No Audio (Carrier detected)		• No Analog audio contribution → **After Digital audio drops out and [source switchover timeout], there is no output and amplifier output turns off.**	
14	Default	Secondary	Auto-Sense	Mute	ON	Audio Present → No SPDIF carrier detected	No Audio	Initial output is only Digital audio because there is no Analog audio: • Digital audio at unattenuated level • No Analog audio contribution → **After Digital audio drops out and [source switchover timeout], there is no output and amplifier output turns off.**	After the [sleep timeout], system will enter low-power standby state because there is no audio and no SPDIF carrier.
15	Default	Secondary	Always ON	Mute	ON	Audio Present → No SPDIF carrier detected	No Audio	Initial output is only Digital audio because there is no Analog audio: • Digital audio at unattenuated level • No Analog audio contribution → **After Digital audio drops out and [source switchover timeout], there is no output and amplifier output turns off.**	System remains ON
16	Secondary	Default	X	Mute	ON	Audio Present	Audio Present	**Output is only Digital input source:** • **No contribution from Analog because it is muted (due to input switchover)** • **Digital audio at unattenuated level**	System remains ON
17	Secondary	Default	X	Mute	ON	No Audio (Carrier detected)	Audio Present	**Output is only Analog audio because there is no Digital audio:**	System remains ON

								• **No Digital audio contribution** • **Analog audio at unattenuated level**	
18	Secondary	Default	X	Mute	ON	No SPDIF carrier detected	Audio Present	**Output is only Analog audio because there is no SPDIF carrier detected:** • **No Digital audio contribution** • **Analog audio at unattenuated level**	System remains ON
19	Secondary	Default	X	Mute	ON	Audio Present	No Audio	**Output is only Digital audio because there is no Analog audio:** • **Digital audio at unattenuated level** • **No Analog audio contribution**	System remains ON
20	Secondary	Default	X	Mute	ON	Audio Present	Audio Present → No Audio	Initial output is : • Digital audio at unattenuated level • No contribution from Analog because it is muted (due to input switchover) → **After Analog audio drops out and [source switchover timeout], output remains consistent:** • **Digital audio at unattenuated level** • **No Analog audio contribution**	System remains ON
21	Secondary	Default	X	Mute	ON	Audio Present → No Audio (Carrier detected)	Audio Present	Initial output is : • Digital audio at unattenuated level • No contribution from Analog because it is muted (due to input switchover) → **After Digital audio drops out and [source switchover timeout], output becomes:** • **No Digital audio contribution**	System remains ON

								• **Analog audio at attenuated level**	
22	Secondary	Default	X	Mute	ON	Audio Present → No SPDIF carrier detected	Audio Present	Initial output is : • Digital audio at unattenuated level • No contribution from Analog because it is muted (due to input switchover) → **After Digital audio drops out and [source switchover timeout], output becomes:** • **No Digital audio contribution** • **Analog audio at unattenuated level**	System remains ON
23	Secondary	Default	Auto-Sense	Mute	ON	No Audio (Carrier detected)	Audio Present → No Audio	Initial output is only Analog audio because there is no Digital audio: • No Digital audio contribution • Analog audio at attenuated level → **After Analog audio drops out and [source switchover timeout], there is no output and amplifier output turns off.**	System will enter Standby - Instant ON state because there is no input and SPDIF carrier is still detected.
24	Secondary	Default	Always ON	Mute	ON	No Audio (Carrier detected)	Audio Present → No Audio	Initial output is only Analog audio because there is no Digital audio: • No Digital audio contribution • Analog audio at attenuated level → **After Analog audio drops out and [source switchover timeout], there is no output and amplifier output turns off.**	System remains ON
25	Secondary	Default	Auto-Sense	Mute	ON	No SPDIF carrier detected	Audio Present → No Audio	Initial output is only Analog audio because there is no Digital audio:	System will enter low-power standby state because there is no input

								• No Digital audio contribution • Analog audio at unattenuated level → **After Analog audio drops out and [source switchover timeout], there is no output and amplifier output turns off.**	and no SPDIF carrier.
26	Secondary	Default	Always ON	Mute	ON	No SPDIF carrier detected	Audio Present → No Audio	Initial output is only Analog audio because there is no Digital audio: • No Digital audio contribution • Analog audio at unattenuated level → **After Analog audio drops out and [source switchover timeout], there is no output and amplifier output turns off.**	System remains ON
27	Secondary	Default	Auto-Sense	Mute	ON	Audio Present → No Audio (Carrier detected)	No Audio	Initial output is only Digital audio because there is no Analog audio: • Digital audio at unattenuated level • No Analog audio contribution → **After Digital audio drops out and [source switchover timeout], there is no output and amplifier output turns off.**	System will enter Standby - Instant ON state because there is no input and SPDIF carrier is still detected.
28	Secondary	Default	Always ON	Mute	ON	Audio Present → No Audio (Carrier detected)	No Audio	Initial output is only Digital audio because there is no Analog audio: • Digital audio at unattenuated level • No Analog audio contribution → **After Digital audio drops out and [source switchover timeout], there is no output and**	System remains ON

								amplifier output turns off.	
29	Secondary	Default	Auto-Sense	Mute	ON	Audio Present → No SPDIF carrier detected	No Audio	Initial output is only Digital audio because there is no Analog audio: • Digital audio at unattenuated level • No Analog audio contribution → **After Digital audio drops out and [source switchover timeout], there is no output and amplifier output turns off.**	System will enter low-power standby state because there is no input and no SPDIF carrier.
30	Secondary	Default	Always ON	Mute	ON	Audio Present → No SPDIF carrier detected	No Audio	Initial output is only Digital audio because there is no Analog audio: • Digital audio at unattenuated level • No Analog audio contribution → **After Digital audio drops out and [source switchover timeout], there is no output and amplifier output turns off.**	System remains ON

LED Matrix

LED Behavior

Item #	Input settings & Conditions						Output Expected Behavior
	Settings			Conditions			LED Color
	Default/Secondary Input Settings		Switchover Behavior	Signal Present?		System State	
	HDMI / Digital	Analog		HDMI* / Digital	Analog		
1	X	X	X	X	X	Standby	Yellow
2	X	X	X	X	X	Protection	Red
3	X	X	X	X	X	Bluetooth Setup	Blue
4	X	X	X	X	X	IR Learning	Blue
5	X	X	X	X	X	Wired FW update	Alternating Red/Blue
6	X	X	Mixed	X	X	ON	Purple

7	Default	Secondary	Mute or Ducking	X	Yes	ON	Green
8	Default	Secondary	Mute or Ducking	Yes	No	ON	White
9	Secondary	Default	Mute or Ducking	Yes	X	ON	White
10	Secondary	Default	Mute or Ducking	No	Yes	ON	Green
11	Default	N/A	None	X	X	ON	White
12	N/A	Default	None	X	X	ON	Green
13	X	X	X	No	No	ON	**Last valid color state (no change)

* Note 1: Any active CEC/eARC session is considered a valid signal present, even if there is no audio or the audio is muted.

** Note 2: if the amp turns on from a power reset, and there is no audio signal from either inputs, whatever the default input is, or purple if mixed. The default is the active input source.

Power states

Wake Up Behavior

ARC

Conditions								**Output Expected Behavior**			
Settings					**Initial Power State**	**Input States**		**Instant ON mode**	**Power State**	**Power Draw**	**Wake Up Time**
HDMI	Analog	**Wake Up Signal**	**Auto-ON Mode**	**Switchover Behavior**		**Digital Input State**	**Analog Input State**				
X	X	NA	Auto Sense	X	Standby	No Audio (CEC standby/ off)	No Audio	OFF	Standby	~0.2W	NA
X	X	NA	Auto Sense	X	Standby	No Audio (No CEC command)	No Audio	OFF	Standby	~0.2W	NA
X	X	NA	Auto-Sense	X	Standby	No Audio (MUTE CEC command)	No Audio	OFF	Standby	~0.2W	NA
Wake up Transitions											
X	X	HDMI	Auto-Sense	X	Standby	No Audio (CEC standby/ off) →	No Audio	OFF	Standby → Awake	~0.2W → ~7W	Less than 1 second

						Audio Present					
X	X	HDMI	Auto-Sense	X	Standby	No Audio (No CEC command) → Audio Present	No Audio	OFF	Standby → Awake	~0.2W → ~7W	Less than 1 second
X	X	HDMI	Auto-Sense	X	Standby	No Audio (MUTE CEC command) → Audio Present	No Audio	OFF	Standby → Awake	~0.2W → ~7W	Less than 1 second
X	X	HDMI	Auto-Sense	X	Awake (amp OFF)	No Audio (No CEC command) → Audio Present	No Audio	OFF	Awake (amp OFF) → Awake	~3W → ~7W	Less than 1 second
X	X	HDMI	Auto-Sense	X	Awake (amp OFF)	No Audio (MUTE CEC command) → Audio Present	No Audio	OFF	Awake (amp OFF) → Awake	~3W → ~7W	Less than 1 second
X	X	Analog	Auto-Sense	X	Standby	No Audio (CEC standby/off)	No Audio → Audio Present	OFF	Standby → Awake	~0.2W → ~7W	Less than 1 second
X	X	Analog	Auto-Sense	X	Standby	No Audio (No CEC command)	No Audio → Audio Present	OFF	Standby → Awake	~0.2W → ~7W	Less than 1 second
X	X	Analog	Auto-Sense	X	Standby	No Audio (MUTE CEC command)	No Audio → Audio Present	OFF	Standby → Awake	~0.2W → ~7W	Less than 1 second
X	X	Analog	Auto-Sense	X	Awake (amp OFF)	No Audio (CEC standby/off)	No Audio → Audio Present	OFF	Awake (amp OFF) → Awake	~3W → ~7W	Less than 1 second
X	X	Analog	Auto-Sense	X	Awake (amp OFF)	No Audio (No CEC command)	No Audio → Audio Present	OFF	Awake (amp OFF) → Awake	~3W → ~7W	Less than 1 second
X	X	Analog	Auto-Sense	X	Awake (amp	No Audio (MUTE	No Audio → Audio	OFF	Awake (amp	~3W → ~7W	Less than 1

					OFF)	CEC command)	Present		OFF) → Awake		second

NARC

Conditions								**Output Expected Behavior**			
Settings					**Initial Power State**	**Input States**		**Instant ON mode**	**Power State**	**Power Draw**	**Wake Up Time**
Digital	Analog	**Wake Up Signal**	**Auto-ON Mode**	**Switchover Behavior**		**Digital Input State**	**Analog Input State**				
X	X	NA	Auto Sense	X	Standby - Low Power	No Audio (No SPDIF carrier detected)	No Audio	OFF	Standby - Low Power	~0.2W	NA
X	X	NA	Auto Sense	X	Standby - Instant ON	No Audio (Carrier Detected)	No Audio	ON	Standby - Instant ON	~2W	NA
Low Power Transitions											
X	X	NA	Auto Sense	X	Standby - Instant ON	No Audio (Carrier Detected) → No Audio (No SPDIF carrier detected)	No Audio	ON → OFF	Standby - Instant ON → Standby - Low Power	~2W → ~0.2W	NA
X	X	NA	Auto-Sense	X	Standby - Low Power	No Audio (No SPDIF carrier detected) → No Audio (Carrier Detected)	No Audio	OFF → ON	Standby - Low Power → Standby - Instant ON	~0.2W → ~2W	NA

Wake up Transitions											
X	X	Digital	Auto-Sense	X	Standby						
X	X	Digital	Auto-Sense	X	Standby						
											X X NA Auto Sense X Standby - Instant ON No Audio (No SPDIF carrier detected) No Audio OFF Standby - Instant ON ~2W → ~0.2W NA

IR Command Truth Table

IR Power Command Behavior

ARC

Line #	Conditions								Output Expected Behavior	
	Settings				Initial Power State	Source Conditions		IR COMMAND	Audio Output	Resulting Power State
	HDMI	Analog	Auto-ON Mode	Switchover Behavior		HDMI	Analog			

1	X	X	Always ON	X	ON	X	X	X	X	System remains ON always
2	X	X	Auto-Sense	X	Standby	No Audio	No Audio	Power ON / Power Toggle	No Output	System turns ON and remains on until Power TOGGLE of Power “OFF” is selected, or IR receiver removed and there is no active CEC session.
	X	X	Auto-Sense	X	Standby	No Audio	No Audio	Power OFF	No Output	System remains in standby mode
3	Default	Secondary	Auto-Sense	Mute	ON	X	Audio Present	X	**Output is only Analog input source:** • Analog audio at unattenuated level • No contribution from HDMI because it is muted (due to input switchover)	System remains ON (no behavior change)
4	Default	Secondary	Auto-Sense	Mute	ON	Audio Present	No Audio	Power ON / No IR COMMAND	**Output is only HDMI input source:** • **HDMI audio at unattenuated level** • **No Analog audio contribution**	System remains ON (no behavior change)
5	Default	Secondary	Auto-Sense	Mute	ON	Audio Present	No Audio	Power OFF / POWER TOGGLE	Initial output: • No contribution	System goes into Standby

									from Analog • HDMI audio at unattenuated level → **After the Power IR command:** • **No contribution from HDMI because it is muted (due to IR command)**	after IR command received
	Default	Secondary	Auto-Sense	Mute	ON	Audio Present → TV powered off/CEC session ends	No Audio	Power ON/ No IR COMMAND	Initial output: • No contribution from Analog • HDMI audio at unattenuated level → **After the Power IR command:** • **No contribution from HDMI because it is muted (due to CEC session ending)** • **Amp still awake and in digital mode due to IR Command not ending digital session**	System remains ON (no behavior change)
6	Default	Secondary	Auto-Sense	Mute	OFF (from IR command)	Audio Present	No Audio	Power ON / POWER TOGGLE	Initial output: • No contribution from Analog • No contribution from HDMI HDMI becuase it is	Standby → System ON

									muted (due to IR command) → **After the Power IR command:** • **HDMI audio at unattenuated level**	
7	Default	Secondary	Auto-Sense	Mute	OFF (from IR command)	Audio Present	No Audio	Power OFF/ No IR COMMAND	No Output • No contribution from HDMI HDMI becuase it is muted (due to IR command)	System remains in standby mode
	Secondary	Default	Auto-Sense	Mute	ON	Audio Present	X	Power ON / No IR COMMAND	Initial output: • No contribution from Analog • HDMI audio output Only	System remains ON (no behavior change)
	Secondary	Default	Auto-Sense	Mute	OFF (from IR command)	X	Audio Present	Power OFF / No IR Command	**Output is only Analog input source:** • **No HDMI audio contribution since IR turned off digital input** • **Analog audio contribution**	System remains ON (no behavior change)
	Secondary	Default	Auto-Sense	Mute	ON	Audio Present → TV powered off/CEC session ends	Audio Present	Power ON / No IR COMMAND	**Output is only HDMI input source:** • **No HDMI audio contribution** • **No Analog audio contribution** • **Output remains HDMI after IR command becuase CEC is disabled.**	System remains ON (no behavior change)

	Secondary	Default	Auto-Sense	Mute	ON	Audio Present	No Audio	Power OFF / Power TOGGLE	Initial output: • HDMI audio at unattenuated level • No contribution from Analog because it is muted (due to input switchover) → **After the Power IR command:** • **No contribution from HDMI nor Analog** • **Amp goes to sleep after timeout**	System ON → Standby
	Secondary	Default	Auto-Sense	Mute	ON	Audio Present	Audio Present	Power OFF / Power TOGGLE	Initial output: • HDMI audio at unattenuated level • No contribution from Analog because it is muted (due to input switchover) → **After the Power IR command:** • **Analog audio at unattenuated level** • **No contribution from HDMI because it is muted (due to IR Command ending digital session)**	System remains ON
	Secondary	Default	Auto-Sense	Mute	ON	Audio Present	Audio Present	Power OFF / Power	Initial output:	System remains

								TOGGLE	• HDMI audio at unattenuated level • No contribution from Analog because it is muted (due to input switchover) → **After the Power IR command:** • **Analog audio at unattenuated level** • **No contribution from HDMI because it is muted (due to IR Command ending digital session**)	ON
13	Secondary	Default	Auto-Sense	Mute	OFF (from IR command)	Audio Present	Audio Present	Power ON / Power TOGGLE	Initial output: • No HDMI audio contribution since IR turned off digital input • Analog audio at unattenuated levels → **After the Power IR command:** • **No contribution from Analog** • **HDMI audio at unattenuated levels due to switchover behavior**	System remains ON
21	Secondary	Default	Auto-Sense	Mute	OFF (from IR	Audio Present	No Audio	Power ON / Power	Initial output:	Standby → System ON

					command)			TOGGLE	• No contribution from Analog • No contribution from HDMI audio because IR disabled digital session → **After the Power IR command:** • No contribution from Analog • HDMI at unattenuated levels	
22	Secondary	Default	Auto-Sense	Mute	OFF (from IR command)	No Audio	No Audio	Power ON / Power TOGGLE	Initial output: • No contribution from Analog • No contribution from HDMI audio because IR disabled digital session → **After the Power IR command:** • No output from both HDMI and Analog, but amp in digital awake mode due to IR enabling digital session, overriding CEC.	Standby → System ON