

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460



OFFICE OF  
AIR AND RADIATION

November 11, 2014

Dear Audio Video Equipment Brand Owner or Other Interested Stakeholder:

With this letter, the U.S. Environmental Protection Agency (EPA) is clarifying that the calculation of amplifier efficiency in the Version 3.0 Audio Video Equipment specification is intended to capture both the fixed and variable losses of amplifier, even when tested with an embedded compact disc player as audio input source.

This clarification relates to Equation 4 within the current ENERGY STAR Audio Video specification. It does not impact any existing certifications nor does it require any changes to the QPX data exchange. The clarification does, however, avoid misinterpretation of the requirement, which could result in large disparities in reported amplifier efficiency. Further explanation of this clarification follows on page 2 of this document.

In addition, EPA has modified the external power supply (EPS) requirements to clarify that any higher-efficiency EPSs meeting the U.S. Department of Energy's forthcoming 2016 energy conservation standards can be used to qualify. Similar clarifications have been made to other electronics specifications that incorporate EPSs.

An updated copy of the Version 3.0 Audio Video Equipment specification reflecting these clarifications (Rev. Nov-2014) will be posted shortly at [www.energystar.gov/Specifications](http://www.energystar.gov/Specifications). Should you have any questions on them or any other issues related to Audio Video, please contact me at (202) 343-9845 or [radulovic.verena@epa.gov](mailto:radulovic.verena@epa.gov) or Matt Malinowski at (202) 862-2693 or [matt.malinowski@icfi.com](mailto:matt.malinowski@icfi.com). Thank you for your continued support of the ENERGY STAR program.

Sincerely,

A handwritten signature in cursive script that reads "Verena Radulovic".

Verena Radulovic, Product Manager  
ENERGY STAR for Consumer Electronics

Enclosures:

Final Audio Video Equipment ENERGY STAR Program Requirements (Rev. Nov-2014)

## Technical Explanation

Some products with both an amplifier and a disc player cannot be tested with an external audio input and require the use of the embedded disc player during the amplifier test. Equation 4 in the specification then permits the tester to subtract the power needed to play back the disc,  $P_{DISC}$ , so as not to decrease the amplifier efficiency by factoring in the power requirement of the disc player component.

**Equation 4: Calculation of Amplifier Efficiency**

$$\text{Efficiency} = \frac{P_{OUT}}{P_{IN} - P_{DISC}}$$

However because the product is composed of an amplifier and disc player in one, the  $P_{DISC}$  measurement includes the amplifier idle power, so subtracting it actually increases the efficiency.

Component	Losses Measured During Specified Test		
	Idle State ( $P_{IDLE}$ )	Audio Playback Test ( $P_{DISC}$ )	Amplifier Efficiency Test ( $P_{IN}$ )
Disc Player	Fixed	Fixed+Variable	Fixed+Variable
Amplifier	Fixed	Fixed	Fixed+Variable

In other words, this calculation results in a higher efficiency by excluding the fixed amplifier losses and including only the variable amplifier losses. A complete measure of efficiency, as EPA intends to assess with this specification, includes both fixed and variable losses:

$$\begin{aligned} \text{Efficiency} &= \frac{P_{OUT}}{P_{IN} - P_{DISC}} \\ &= \frac{P_{OUT}}{(P_{FIXED_{DISC}} + P_{VAR_{DISC}} + P_{FIXED_{AMP}} + P_{VAR_{AMP}}) - (P_{FIXED_{DISC}} + P_{VAR_{DISC}} + P_{FIXED_{AMP}})} \\ &= \frac{P_{OUT}}{(P_{VAR_{DISC}} + P_{VAR_{AMP}}) - (P_{VAR_{DISC}} + P_{VAR_{AMP}})} \\ &= \frac{P_{OUT}}{P_{VARIABLE_{AMP}}} \end{aligned}$$

To ensure this calculation is made in alignment with the intention of the specification, EPA has clarified the equation to explicitly include Idle State Power,  $P_{IDLE}$ . The resulting calculated efficiency of the product with the amended formula is much closer to the actual amplifier efficiency:

$$\begin{aligned} \text{Efficiency} &= \frac{P_{OUT}}{P_{IN} - P_{DISC} + P_{IDLE}} \\ &= \frac{P_{OUT}}{P_{VARIABLE_{AMP}} + P_{IDLE}} \\ &= \frac{P_{OUT}}{P_{VARIABLE_{AMP}} + (P_{FIXED_{DISC}} + P_{FIXED_{AMP}})} \end{aligned}$$