ENERGY STAR® Program Requirements for Audio/Video

Version 2.0 DRAFT 2

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Partner Commitments

ENERGY STAR® Program Requirements for Audio/Video

Version 2.0 DRAFT 2 Partner Commitments

Commitment

The following are the terms of the ENERGY STAR Partnership Agreement as it pertains to the manufacturing of ENERGY STAR qualified Audio/Video (AV) products. The ENERGY STAR Partner must adhere to the following program requirements:

- comply with current ENERGY STAR Eligibility Criteria, defining the performance criteria that must be met for use of the ENERGY STAR certification mark on Audio/Video products and specifying the testing criteria for AV products. EPA may, at its discretion, conduct tests on products that are referred to as ENERGY STAR qualified. These products may be obtained on the open market, or voluntarily supplied by Partner at EPA's request;
- comply with current ENERGY STAR Identity Guidelines, describing how the ENERGY STAR marks and name may be used. Partner is responsible for adhering to these guidelines and for ensuring that its authorized representatives, such as advertising agencies, dealers, and distributors, are also in compliance;
- qualify at least one ENERGY STAR Audio/Video product within six months of activating a Partnership agreement. When Partner qualifies a product, it must meet the specification in effect at that time;
- provide clear and consistent labeling of ENERGY STAR qualified AV products. Partner must use the ENERGY STAR mark in all of the following ways:
    - Via permanent or temporary label on the product. All temporary labeling must be affixed to the top/front of product with an adhesive or cling-type application. Partner must comply with guidance for certification marks provided in the ENERGY STAR Identity Guidelines, which can be found at www.energystar.gov/marks.
    - Either in product literature (e.g., user manuals, specification sheets, etc.) or in a separate box insert that provides educational language about the product's ENERGY STAR settings; and
    - On product packaging/boxes for products sold at retail.
    - If additional information about the ENERGY STAR program(s) or other products is provided by the Partner on its Web site, Partner must comply with the ENERGY STAR Web Linking Policy, which can be found at www.energystar.gov/partners.
- work with Value Added Resellers (VARs) of Partner's products to help ensure that AV products remain in compliance with ENERGY STAR requirements. Any party within the distribution channel of an ENERGY STAR qualified AV product that alters the power profile of a product after its date of manufacture through hardware or software modifications must ensure that the product continues to meet the ENERGY STAR requirements before delivering this product to the end customer. If the product no longer meets the requirements, it may not bear the ENERGY STAR mark.
- if a VAR makes any modifications to an AV product that was previously qualified under this Version 2.0 specification, re-brands the product, and promotes it as ENERGY STAR, it must become an ENERGY STAR Partner and follow the requirements outlined in this Version 2.0 specification.

- provide to EPA, on an annual basis, an updated list of ENERGY STAR qualifying AV products. Once the Partner submits its first list of ENERGY STAR qualified products, the Partner will be listed as an ENERGY STAR Partner. Partner must provide annual updates in order to remain on the list of participating product manufacturers;
- provide to EPA, on an annual basis, unit shipment data or other market indicators to assist in determining the market penetration of ENERGY STAR. Specifically, Partner must submit the total number of ENERGY STAR qualified AV products shipped (in units, by model) or an equivalent measurement as agreed to in advance by EPA and Partner. Partner is also encouraged to provide ENERGY STAR qualified unit shipment data segmented by meaningful product characteristics (e.g., capacity, size, speed, or other as relevant), total unit shipments for each model in its product line, and percent of total unit shipments that qualify as ENERGY STAR. The data for each calendar year should be submitted to EPA, preferably in electronic format, no later than the following March and may be provided directly from the Partner or through a third party. The data will be used by EPA only for program evaluation purposes and will be closely controlled. If requested under the Freedom of Information Act (FOIA), EPA will argue that the data is exempt. Any information used will be masked by EPA so as to protect the confidentiality of the Partner;
- notify EPA of a change in the designated responsible party or contacts for AV products within 30 days.

Performance for Special Distinction

In order to receive additional recognition and/or support from EPA for its efforts within the Partnership, the ENERGY STAR Partner may consider the following voluntary measures and should keep EPA informed on the progress of these efforts:

- consider energy efficiency improvements in company facilities and pursue the ENERGY STAR mark for buildings;
- purchase ENERGY STAR qualified products. Revise the company purchasing or procurement specifications to include ENERGY STAR. Provide procurement officials' contact information to EPA for periodic updates and coordination. Circulate general ENERGY STAR qualified product information to employees for use when purchasing products for their homes;
- ensure the power management feature is enabled on all ENERGY STAR qualified monitors in use in company facilities, particularly upon installation and after service is performed;
- provide general information about the ENERGY STAR program to employees whose jobs are relevant to the development, marketing, sales, and service of current ENERGY STAR qualified product models;
- feature the ENERGY STAR mark(s) on Partner Web site and in other promotional materials. If information concerning ENERGY STAR is provided on the Partner Web site as specified by the ENERGY STAR Web Linking Policy (this document can be found in the Partner Resources section on the ENERGY STAR Web site at www.energystar.gov), EPA may provide links where appropriate to the Partner Web site;
- provide a simple plan to EPA outlining specific measures Partner plans to undertake beyond the program requirements listed above. By doing so, EPA may be able to coordinate, communicate, and/or promote Partner's activities, provide an EPA representative, or include news about the event in the ENERGY STAR newsletter, on the ENERGY STAR Web pages, etc. The plan may be as simple as providing a list of planned activities or planned milestones of which the Partner would like EPA to be aware. For example, activities may include: (1) increase the availability of ENERGY STAR labeled products by converting the entire product line within two years to meet ENERGY STAR guidelines; (2) demonstrate the economic and environmental benefits of energy efficiency through special in-store displays twice a year; (3) provide information to users (via the Web site and user's manual) about energy-saving features and operating characteristics of

ENERGY STAR qualified products, and (4) build awareness of the ENERGY STAR Partnership and brand identity by collaborating with EPA on one print advertorial and one live press event;

- provide quarterly, written updates to EPA as to the efforts undertaken by Partner to increase availability of ENERGY STAR qualified products, and to promote awareness of ENERGY STAR and its message.
- join EPA's SmartWay Transport Partnership to improve the environmental performance of the company's shipping operations. SmartWay Transport works with freight carriers, shippers, and other stakeholders in the goods movement industry to reduce fuel consumption, greenhouse gases, and air pollution. For more information on SmartWay, visit www.epa.gov/smartway.
- join EPA's Climate Leaders Partnership to inventory and reduce greenhouse gas emissions. Through participation, companies create a credible record of their accomplishments and receive EPA recognition as corporate environmental leaders. For more information on Climate Leaders, visit www.epa.gov/climateleaders.
- join EPA's Green Power partnership. EPA's Green Power Partnership encourages organizations to buy green power as a way to reduce the environmental impacts associated with traditional fossil fuel-based electricity use. The partnership includes a diverse set of organizations including Fortune 500 companies, small and medium businesses, government institutions as well as a growing number of colleges and universities, visit www.epa.gov/grnpower.

1. Definitions

a) APD (Auto-Power Down): The capability to automatically switch a device from On mode to Sleep mode after (1) the device has ceased performance of all primary functions, and (2) a specified period of time has elapsed without user input (e.g. control signal, volume adjustment). For devices that process audio or video signals from external sources, the presence of a signal on any active AV input shall constitute performance of a primary function, and APD shall be initiated (after a specified time delay) by loss of signal (LOS) on all active AV inputs.

   1) For audio signals, LOS is defined as TBD.

   2) For video signals, LOS is defined as TBD.

b) Primary Function: A primary function is any discrete, dynamic device function that is capable of being perceived by an end user. The delivery of active audio/video content to an end user is considered a primary function.

   1) Continuous device functions (e.g. clocks, status displays, indicator lamps) are not primary functions.

   2) Static device functions (e.g. paused playback of content) are not primary functions.

Note: EPA has modified the APD and Primary Function definitions to address several stakeholder concerns. The intent of APD is to encourage systems to turn off when they are not actively being used. A product that is delivering active audio or video content to an end-user is considered to be performing a primary function and would not be expected to APD. In contrast, a DVD player that is paused for an extended period would no longer be performing a primary function and would be expected to APD. EPA is requesting suggestions for how to define LOS for both audio and video input signals generated by external sources.

c) Operational Modes:[1]

   1) On Mode: Where the product is connected to a mains power source, has been activated and is providing one or more primary functions. The common terms “active”, “in-use” and “normal operation” also describe this mode.

      i) Idle: A state within On mode in which a product is not providing a primary function and no content is actively being delivered to the end-user. The common term “ready” also describes this state. An idle product is typically not in a low-power state.

Note: EPA has added a definition for Idle per stakeholder request.

   2) Sleep Mode: The common term “standby” may also describe this mode, where the product is connected to a mains power source, is not providing a primary function, and offers one or more of the following user oriented or protective functions which may persist for an indefinite time:

      i) To facilitate the activation of other modes (including activation or deactivation of On mode) by remote switch (including remote control), internal sensor, timer;

[1] Operational mode definitions are derived from IEC 62301

ii) Continuous function: information or status displays including clocks;

iii) Continuous function: sensor-based functions.

3) Off Mode: Where the product is connected to a mains power source and is not providing any On mode or Sleep mode functions, and where the mode may persist for an indefinite time. An indicator that only shows the user that the product is in the off position is included within the classification of an off mode.

d) EPS (External Power Supply): Also referred to as External Power Adapter. A component contained in a separate physical enclosure external to the AV product, designed to convert line voltage AC input from the mains to lower DC voltage(s) in order to provide power to the AV product. An EPS must connect to the AV product via a removable or hard-wired male/female electrical connection, cable, cord or other wiring.

e) Functional Adder: A functional adder is a product feature that adds functionality to the basic capability of a product. The Operational Mode portion of this specification contains additional power allowances for certain functional adders.

f) HDMI (High-Definition Multimedia Interface): A compact audio/video interface for transmitting uncompressed digital data.

1) CEC (Consumer Electronics Control) Protocol: A single-conductor wire or bus technology that is an optional feature in the HDMI specification. CEC is meant to carry IR/remote and/or control commands between HDMI devices that are interconnected. CEC is not currently required for HDMI compliance.

g) High Definition Resolution: Video output with resolution greater than 480i/p.

h) Multi-component System: A product consisting of several components with separate enclosures that are sold as and intended for use as a single system. A “Home Theater in a Box” is an example of a Multi-component System.

i) Product Classifications:

1) Commercial Product: Any AV product manufactured primarily for use in a public or commercial setting. Typical markets for Commercial AV products include schools and universities, government, military, office, healthcare, legal, retail, museums, churches, sports arenas, entertainment, and transportation.

2) Residential Product: Any AV product manufactured primarily for use in a private residence for personal rather than commercial purposes. For purposes of this specification, any product that does not meet the definition of a commercial product shall be considered a residential product.

j) Product Functions:

1) Audio Amplification: A function by which a device increases the amplitude of an audio signal for purposes of sending the signal to a transducer for playback.

2) Audio Signal Processing: A function by which a device modifies an audio signal for a purpose other than amplification.

3) High Resolution Display: A function by which a device converts a video signal into a visual output (e.g. LCD panel, Plasma display panel). Any displays less than 640x480 pixel resolution or 5 inches diagonal screen size are considered Status Displays and are not provided power allowances under this specification.

4) IP Networking: A function by which a device can connect to an IP-based network for transmission and receipt of data. The connection may be wired or wireless (e.g. WiFi, Ethernet, Bluetooth).

5) Control Interface: A function by which a device can connect in a point-to-point configuration for transmission and receipt of control signals. The connection may be wired or wireless (e.g. RS-232).

6) Optical Disc Drive: A function by which a device can read and/or write data to removable disk media (e.g. CD, DVD, Blu-ray Disc, and derivatives).

Note: Definitions for for “Indicator Light”, “Remote Control”, “Audio Signal Processing”, “Status Display”, “Audio Tuner”, “Data Storage”, “Other Removable Media Drive”, “Video Signal Processing”, and “Video Camera” have been removed from the document, since the features are no longer referenced in the Draft 2 specification.

k) THD (Total Harmonic Distortion): The ratio of the sum of the powers of all harmonic components to the power of the fundamental frequency of a signal.

l) UUT (Unit Under Test): The device being tested.

2. Qualifying Products

2.1. Included Products:

Products covered under this specification include commercial and residential AV products as defined in Section 1 of this document, with the exception of products identified in Section 2.2.

2.2. Excluded Products:

Products that are covered under existing ENERGY STAR product specifications are not eligible for qualification under the Audio/Video specification. The list of specifications currently in effect can be found at www.energystar.gov/products. For example, displays, monitors, lighting, computers, and game consoles cannot qualify as Audio/Video products, since each is subject to qualification criteria under another ENERGY STAR specification.

The following products are excluded from qualification under this specification.

a) Products which meet the definition of a Display, Television, Set-Top Box (STB), Computer, or Game Console per the definitions in ENERGY STAR requirements for those product categories. Also excluded are products that include an IP video tuner and are sold or provided outside of a dedicated service contract, which will be included under the next revision of the Set-top Box specification.

b) Primarily battery-powered products

c) Products for use in automotive applications

d) Video projectors

e) Home automation & control products

f) Whole-house AV systems

g) Videoconferencing systems

h) Wireless microphone systems

Note: Products that include an IP video tuner and are not sold under a service contract have been added to the list of excluded products, as EPA anticipates reviewing these devices for inclusion under the next version of ENERGY STAR program requirements for Set Top Boxes.

Note: Whole-house AV systems have been added to the list of excluded products. EPA believes these products fall into a broad “home systems” or “connected home” product category, and plans to consider them in the context of “home controls” in 2010.

Note: Videoconferencing systems and wireless microphone systems have been added to the list of excluded products. Insufficient test data was received to inform the development of ENERGY STAR power consumption limits for these devices.

3. Energy Efficiency Criteria

3.1. General Qualification Criteria:

a) Mandatory Auto-Power Down: To qualify for ENERGY STAR, products must offer APD functionality that is enabled by default. APD must occur no more than 30 minutes from (1) when the product ceases performance of all primary functions, and (2) the last user input (e.g. control signal, volume adjustment). For devices that process audio or video signals from external sources, the presence of a signal on any active AV input shall constitute performance of a primary function, and APD must occur no more thank 30 minutes from loss of signal (LOS) on all active AV inputs.

Exception to Mandatory APD Requirements: Products which are subject to 3rd party performance standards that prohibit APD, including those used for Mass Notification and Emergency Communications Systems and subject to proposed ANSI/UL 2572, are exempt from ENERGY STAR APD requirements.

Note: Based on stakeholder feedback, EPA has included an exception to Mandatory APD requirements for products that are required to remain on at all times by standards such as proposed ANSI/UL 2572.

b) Products Sold with an External Power Supply: To qualify for ENERGY STAR, AV products that are sold with an External Power Supply must use either; (1) an EPS that is ENERGY STAR qualified, or (2) an EPS that meets the applicable no-load active mode efficiency levels and power factor requirements provided in the latest version of the ENERGY STAR Program Requirements for Single Voltage External AC-AC and AC-DC Power Supplies. The EPS specification and qualified product list can be found at www.energystar.gov/powersupplies.

c) Multi-component Systems: On and Sleep mode power consumption limits for each power-consuming component in a Multi-component System shall be assessed independently. To qualify for ENERGY STAR, each component must meet applicable ENERGY STAR criteria.

Note: Based on stakeholder feedback, EPA has included additional guidance regarding systems comprised of multiple sub-components. In anticipation of setting strict On and Sleep mode power consumption limits, products with several sub-components (and, subsequently, multiple power supplies) would be at a competitive disadvantage against fully-integrated products due to inherent losses in each individual power supply. Thus, EPA intends to assess each sub-component of a system as if it were a stand-alone product, In order for a system to qualify for ENERGY STAR, each powered sub-component must independently satisfy ENERGY STAR requirements.

3.2. Modal Qualification Criteria:

a) Sleep Mode Power Consumption Requirements: To qualify for ENERGY STAR, the calculated Sleep mode power consumption for a product must not exceed the sum of the limits for each applicable product function listed in Table 1.

Table 1: Sleep Mode Power Consumption Limits

Product Function	*Sleep Mode Power Consumption Limit (W)*
Base Limit (All Products)	1.0
IP Networking	1.0
Control Interface (RS-232 Only)	TBD

Note: Table 1 has been revised to include a placeholder for additional Sleep mode power allowances for IP Networking. A substantial data set for IP Networking functions was collected during the development of the ENERGY STAR Version 5.0 Computers specification. EPA referenced this data set to define the On mode power consumption limits for Audio/Video IP Networking.

Note: Table 1 has been revised to include a placeholder for additional Sleep mode power allowances for Control Interface. EPA has received several requests to include power allowances for RS-232 functionality in the Version 2.0 specification to allow commercial AV products to qualify for ENERGY STAR. To date, little to no test data has been provided to allow for the development of a meaningful Sleep mode power allowance. EPA will continue to accept data for Sleep mode power consumption of RS-232 functionality over the next several weeks. If sufficient data is not received, these allowances will be deleted from the Final Draft version of the specification.

b) On Mode Power Consumption Requirements: To qualify for ENERGY STAR, the calculated On mode power consumption for a product must not exceed the sum of the power consumption limits for each applicable product function listed in Table 3. The allowances listed in Table 3 are based on an analysis of test data supplied by stakeholders during the specification development process.

Exception to On Mode Power Consumption Requirements: Stand-alone, dedicated audio digital signal processing (DSP) devices that do not provide audio amplification or any other feature identified in Table 2 are exempt from ENERGY STAR On mode power consumption requirements. In order to qualify for ENERGY STAR, these products must meet the Sleep mode power consumption limits in Table 1, must have APD enabled by default, and must meet all other requirements specified in this document. Furthermore, manufacturers must test and report On mode power consumption for all qualifying products. EPA may consider this On mode power consumption data in future evaluations of Audio/Video ENERGY STAR requirements.

Note: EPA has included unique On mode requirements for stand-alone, dedicated audio digital signal processing devices. Based on stakeholder feedback, there is opportunity for ENERGY STAR to achieve significant energy savings by defining APD requirements and Sleep mode power consumption limits for these products. However, the "audio signal processing" function that is the sole function of a DSP device is a generic function of many products in the Audio/Video market. EPA believes that providing a separate allowance for this generic function would be inappropriate, since power consumption due to basic signal processing in other AV products will be included in the modal power limits for other product functions.

Table 2: On Mode Power Consumption Limits

Product Function	*Tier 1 On Mode Power Consumption Limit (W)*	*Tier 2 On Mode Power Consumption Limit (W)*
Audio Amplification	TBD	TBD
High Resolution Display (> 640x480 resolution and 5 inches diagonal)	*P = 6*(R) + 0.05*(A) + 3* *Where* *R = Display Resolution (x * y)* *A = Screen Area*	
Standard Definition (SD) Optical Disc Drive	5.0 W (Player Only) 15 W (Player/Recorder)	4.0 W (Player Only) 10 W (Player/Recorder)
High Definition (HD) Optical Disc Drive	15 W (Player Only) 25 W (Player/Recorder)	10 W (Player Only) 20 W (Player/Recorder)
IP Networking	1.5 W	1.0 W
Control Interface (RS-232 Only)	TBD	TBD

Note: Power allowances for "Indicator Light", "Remote Control", "Audio Signal Processing", "Status Display", "Audio Tuner", "Data Storage", "Other Removable Media Drive", "Video Signal Processing", and "Video Camera" have been removed from the table, since test data does not support the development of specific On mode power allowances for these features.

Note: EPA is does not currently have enough information to set power consumption limits for audio amplification. Several stakeholders have been contacted for further clarification of their data submissions. EPA intends to provide draft On mode power consumption limits for audio amplifiers as soon as data is received.

Note: The Version 5.0 ENERGY STAR Displays specification On mode power consumption equation is proposed for use as the On mode power allowance for High Resolution Displays. The equation *[P = 6*(R) + 0.05*(A) + 3]* would be used to determine the On mode power consumption limit, where "R" equals screen resolution in megapixels and "A" equals screen area in square inches. EPA is requesting stakeholder feedback on the suitability of this proposal.

Note: The Tier 1 power consumption limits for SD and HD Optical Disc Players and Players/Recorders are based on a combination of submitted test data and the TIAX report "Energy Consumption by Consumer Electronics in US Residences" prepared for the Consumer Electronics Association in 2007. The active mode power consumption data for DVD players found in Table 5-20 of that report suggests that On mode power consumption decreased steadily each year from 1999 through 2006. Based on the test data and the downward trend, EPA expects the top quartile of DVD (SD) players to consume no more than 5W in On mode, and the top quartile of Blu-ray Disc (HD) players to consume no more than 15W in On mode by the proposed specification effective date of June 2010. For players with recorders, EPA is proposing an additional 10W On mode power consumption limit based on data in the TIAX report and also consistent with the very limited data EPA received. EPA's goal is to have approximately 25% of available products in each category meet the Version 2.0 ENERGY STAR Audio/Video requirements on the date the specification takes effect. Based on the test data and market trends, EPA believes the proposed Tier 1 limits are appropriate, and has proposed Tier 2 limits that further reflect the market trend towards increased efficiency.

Note: A substantial data set for IP Networking features was collected during the development of the ENERGY STAR Version 5.0 Computers specification. EPA referenced this data set to define the On mode power consumption limits for Audio/Video IP Networking.

Note: EPA has received several requests to include power allowances for RS-232 functionality in the Version 2.0 specification to allow commercial AV products to qualify for ENERGY STAR. To date, little to no test data has been provided to allow for the development of a meaningful On mode power consumption limit. EPA will continue to accept data for On mode power consumption of RS-232 functionality over the next several weeks. If sufficient data is not received, these allowances will be deleted from the Final Draft version of the specification.

4. Testing

All testing shall be performed per the ENERGY STAR Audio/Video test procedure included as Appendix A of this document.

5. User Interface

Although not mandatory, manufacturers are strongly recommended to design products in accordance with IEEE 1621 "Standard for User Interface Elements in Power Control of Electronic Devices Employed in Office/Consumer Environments." Compliance with IEEE 1621 will make power controls more consistent and intuitive across all electronic devices. For more information on the standard, visit http://eetd.llb.gov/controls.

6. Effective Date

The date that products must meet the requirements specified under the Version 2.0 Audio/Video specification will be defined as the effective date of the agreement. Any previously executed agreement on the subject of ENERGY STAR qualified Audio/DVD products shall be terminated effective June 30, 2010 for products eligible under the Version 1.0 Program Requirements for Audio/DVD Products.

a) Qualifying and Marking products under the Tier 1 Version 2.0 specification: Effective dates for Tier 1 Version 2.0 ENERGY STAR Program Requirements for Audio/Video are listed in Table 3. All products with a date of manufacture on or after the applicable Tier 1 Version 2.0 effective date must meet Tier 1 Version 2.0 requirements in order to qualify for ENERGY STAR (including additional shipments of products originally qualified under Version 1.0). The date of manufacture is specific to each unit and is the date (e.g., month and year) on which a unit is considered to be completely assembled.

b) Qualifying and Marking products under the Tier 2 Version 2.0 specification: Effective dates for Tier 2 Version 2.0 ENERGY STAR Program Requirements for Audio/Video are listed in Table 3. All products with a date of manufacture on or after the applicable Tier 2 Version 2.0 effective date must meet the Tier 2 Version 2.0 requirements in order to qualify for ENERGY STAR. The date of manufacture is specific to each unit and is the date (e.g., month and year) on which a unit is considered to be completely assembled.

Note: EPA is proposing an effective date of June 30, 2010 for products currently eligible for qualification under the Version 1.0 Audio/DVD specification. EPA believes this date provides Partners sufficient time to stop labeling products qualified under Version 1.0 or to re-qualify products under the Version 2.0 specification.

Table 3: Version 2.0 Specification Effective Dates

Audio/Video Product	*Tier 1 Version 2.0 Effective Date*	*Tier 2 Version 2.0 Effective Date*
Products Eligible for Qualification to Version 2.0 Audio/Video and Not Previously Eligible for Qualification to Version 1.0 Audio/DVD	October 31, 2009	March 1, 2012
Products Previously Eligible for Qualification to Version 1.0 Audio/DVD	June 30, 2010	March 1, 2012

c) Elimination of Grandfathering: EPA will not allow grandfathering under this Version 2.0 ENERGY STAR specification. ENERGY STAR qualification under Version 1.0 is not automatically granted for the life of the product model. Therefore, any product sold, marketed, or identified by the manufacturing Partner as ENERGY STAR must meet the current specification in effect at the time of manufacture of the product.

7. Future Specification Revisions

EPA reserves the right to revise the specification should technological and/or market changes affect its usefulness to consumers or industry or its impact on the environment. In keeping with current policy, revisions to the specification will be discussed with stakeholders. In the event of a specification revision, please note that ENERGY STAR qualification is not automatically granted for the life of a product model. Any product sold, marketed, or identified by the manufacturing Partner as ENERGY STAR must meet the program requirements in effect at the time of manufacture of the product.

APPENDIX A:
ENERGY STAR Test Procedure for Audio/Video Products

1. Overview

The following protocol should be followed when measuring power consumption levels of audio/video products for compliance with the levels provided in the ENERGY STAR Version 2.0 Audio/Video Specification.

2. Applicability

Partners must measure a representative sample of the configuration as shipped to the customer. For products that offer a choice of user-configurable options, all options shall be set to their default condition. EPA has prepared the following guidelines for testing of Audio/Video products:

a) Power mode tests described in Section 5 shall be performed on every product,

b) Removable media player device tests (Section 6) shall be performed on any product capable of playback or recording of audio and/or video stored on removable media (e.g. Flash drive, CD, DVD, Blu-ray Disc), and

c) Single-channel and Stereo Amplifier tests (Section 7) shall be performed on any product that offers one- or two-channel audio amplification. Multi-channel Amplifier tests (Section 8) shall be performed on any product that offers surround sound multi-channel audio amplification. Products that offer surround sound processing shall be tested in the default multi-channel surround sound mode.

Under the guidelines, a HTIB system with an integrated DVD player/recorder and audio amplifiers would likely be subject to the power mode tests in Section 5, several of the removable media player tests in Section 6, and the multi-channel amplifier tests in Section 8. In contrast, a stand-alone rack-mount audio amplifier would likely only be subject to the power mode tests in Section 5 and the single-channel and stereo amplifier tests in Section 7.

3. Definitions

Unless otherwise specified, all terms used in this document are consistent with the definitions contained in the Version 2.0 ENERGY STAR Eligibility Criteria for Audio/Video Products.

4. Test Setup

Test setup and instrumentation shall be in accordance with the requirements of IEC 62301, Ed. 1.0, "Measurement of Household Appliance Standby Power", Section 4, "General Conditions for Measurements", unless otherwise noted in this document. In the event of conflicting requirements, this test procedure shall take precedence. The setup and instrumentation requirements from IEC 62301, Ed. 1.0, Section 4 are applicable to both On and Sleep mode testing for ENERGY STAR.

Note: Per stakeholder request, detailed test setup and instrumentation requirements have been removed from this test procedure. Test setup and instrumentation are required to conform to the requirements in the internationally recognized IEC 62301 test standard.

4.1. Calibration

All test equipment shall be annually calibrated by a laboratory accredited to ISO/IEC 17025:2005 by an ILAC recognized accreditation body.

4.2. Power Measurement Test Conditions

a) Measurement Location: All power measurements shall be made at a point between the AC power source and the UUT.

b) Component-level Measurement: For multi-component systems (e.g. a home theater system may include a receiver, powered subwoofer, and wireless speakers); all components shall be connected together in a typical end-use configuration. All components may be tested simultaneously, but each power-consuming device must be metered separately (e.g. power consumption must be measured at each plug connection to mains power).

Note: EPA has deleted the statement regarding summing of power consumption measurements from each sub-component in 4.3.c. Per the guidance in 3.1.c, while it is necessary to test sub-components in a typical end-use configuration, each sub-component with a dedicated power cord will be subject to unique On and Sleep mode power consumption limits. As a result, it is necessary for EPA to retain the requirement for component-level measurements.

4.3. Source Signals

a) Signal Input Location: If the UUT does not have accessible signal input terminals, test signal input shall be through the device antenna or other accessible means typical of customer use.

b) Audio Sources: The following noise profiles shall be used for all audio testing:

1) Pink Noise (A=1/f): Pink noise is a random signal within the audible frequency range, whose amplitude is inversely proportional to frequency, maintaining constant audio power per logarithmic frequency increment. Pink noise signals shall be band-pass filtered per the requirements of IEC-60268-1, Section 6.1 (also cross-referenced in IEC-60065, Annex C). Pink noise signals shall be mono, correlated between channels for testing of stereo amplifiers.

2) Sine Wave: All sine wave input signals used for single-channel and stereo amplifier testing shall have frequency of 1 kHz. For stereo testing, sine wave signals shall be in-phase, with identical frequency.

c) Video Sources: SD and HD video content from IEC-62087 shall be used as the video source for removable media player tests in Section 6.

d) Option to Test with Only HD Video Sources: The video test procedures in Sections 6 and 7 are performed with both SD and HD video sources for devices capable of processing both SD and HD content. The overall average power consumption for the UUT is the average of the power consumption measurements from the SD and HD video source tests. This average is intended to reward devices that can scale back power consumption when processing SD video signals.

If the UUT is found to have negligible differences in power consumption when processing SD versus HD sources, the manufacturer may choose to perform and report results from only HD video source tests (per the definition of Reference Channel B), in order to expedite testing.

4.4. UUT Operation

a) UUT Control: The UUT shall be controlled with the factory-supplied remote control (I/R or RF) to the extent possible. For units that do not ship with a remote control, or for functions that cannot be accessed from the supplied remote control, control interfaces on the face or body of the UUT may be used.

b) Output Volume: The UUT output volume should be set to minimum for the duration of all tests except as noted in the Amplifier test procedures in Section 8.

c) Battery Powered Devices: If the UUT contains rechargeable batteries, or can be integrated with another device that contains rechargeable batteries, all batteries should be in a fully charged state for the duration of testing.

d) Optional Hardware: If the UUT uses Smart card or POD technology for conditional access system control, then insert the applicable card into the UUT prior to applying power.

4.5. UUT Pre-test Configuration

Prior to the start of testing, the UUT must be configured as follows:

1) Set up the UUT per the instructions in the product operating manual. If the product manual contains several example configurations, select the most basic configuration that will allow for completion of the test procedure.

2) If the UUT includes speaker outputs, connect a resistive load across each pair of output terminals equivalent to the nominal rated load impedance or lowest impedance of the rated impedance range. (e.g. 6 ohm if rated 6-8 ohm). The same resistive load must be used for all amplifier tests.

    a. For self-powered or internal speakers with no accessible output terminals, output power shall be measured across the speaker input leads, using the attached speaker as a resistive load.

3) Connect the UUT to the power source.

4) Power on the UUT and perform initial system configuration, as applicable.

    a. Disable any wireless networking functionality (WiFi), unless wireless networking is the UUT's primary means of accessing a network.

    b. Disable any VOIP and Data services that are exposed to the user for external use such as broadband services.

    c. Ensure that all audio tone controls are set to mid-level.

    d. Ensure that UUT components (display brightness, etc.) are in their as-shipped configuration.

5) Connect the UUT to the signal source. The input signal shall comply with the requirements in Section 4.4, above.

6) Let the UUT sit for at least 15 minutes, or until the unit has completed initialization and is ready for use.

7) Measure and record the AC mains input voltage and frequency.

8) Measure and record the test room ambient temperature.

5. Test Procedures for All Products

The following tests shall be performed on all Audio/Video products[2].

5.1. Auto Power-down (APD) Function

1) Configure the UUT in a typical On mode operational state.

2) Stop the UUT from performing any primary functions and turn off all input signals applied to active AV inputs. APD shall initiate within 30 minutes.

3) Measure the average power consumption before APD over a 2-minute period.

4) Allow the UUT to automatically power-down. Record the time elapsed until the APD event.

5) Verify that the device is in the expected APD low-power state.

6) Measure the average power consumption after APD over a 2-minute period.

5.2. Idle Condition

1) Configure the UUT in a typical Sleep or Off mode operational state.

[2] NOTE: The APD test (5.1) is not required for products that do not offer an APD function. The Sleep Mode test (5.3) is not required for products that do not offer a Sleep mode.

2) Press the Power button to bring the unit into an On mode operational state, such that no active content is playing.

3) Measure the average power consumption over a 10-minute period.

5.3. Sleep mode

1) Configure the UUT in a typical On mode operational state.

2) Press the Power button to bring the unit into a Sleep mode low-power operational state.

3) Measure the average power consumption over a 10-minute period.

Note: EPA has deleted the test procedures for Video Devices from the test procedure, per the modifications to the Qualifying Products section of this document. EPA did not receive sufficient test data on video devices before the July 24 data submission deadline. These products will be considered for inclusion under the next revision of the ENERGY STAR Set-top Box specification.

6. Test Procedures for Removable Media Players

The following tests shall be performed on any product capable of playback or recording of audio and/or video stored on removable media (e.g. CD, DVD, Blu-ray Disc).

6.1. Video Playback Test

1) Insert / install the removable media and begin playback of IEC-62087 SD video content.

2) Measure the average power consumption over a 10-minute period.

3) If the UUT is capable of playing HD content, repeat the test with IEC-62087 HD video content and record the average power consumption from each test.

6.2. Video Recording Test

1) Insert / install the removable media and begin recording of IEC-62087 SD video content.

2) Measure the average power consumption over a 10-minute period.

3) If the UUT is capable of recording HD content, repeat the test with IEC-62087 HD video content and record the average power consumption from each test.

6.3. Audio Playback Test

1) Insert / install the optical disc media and begin playback of a pink noise signal per section 4.3.b. The track used for playback shall begin in a region located 24 to 27.5 mm radially from the center of the disc.[3]

2) Measure the average power consumption over a 10-minute period.

6.4. Audio Recording Test

1) Insert / install the optical disc media and begin recording of a pink noise signal per section 4.3.b.

2) Measure the average power consumption over a 10-minute period.

7. Test Procedures for Single-channel and Stereo Amplifiers

The following tests shall be performed on any product that contains a single-channel or stereo audio power amplifier.

7.1. Active Mode Test

1) Connect the UUT to the output of the signal generator.

[3] This disc area corresponds to the beginning of the first track or chapter on a fully written disc.

2) Generate a sine wave input signal per Section 4.3.b. For devices that accept only digital input signals, generate an appropriate representation of a 1 kHz sine wave. [4]

3) Increase the amplifier volume until the THD of the output is 1% or greater. This is considered the maximum undistorted power (MUP). [5]

4) Measure & record the amplifier input and output power.

5) Turn down the amplifier until the output is 1/8 MUP.

6) Measure & record the amplifier input and output power.

Note: EPA removed the requirement to test and record amplifier input and output power using a 1/3 MUP sine wave from the test procedure.

7) Generate and apply a pink noise input signal per Section 4.3.b. Do not alter the amplifier settings from Step 7.1.7, to ensure that the output is still 1/8 MUP.

8) Measure & record the amplifier input and output power, averaged over a 2-minute period.

8. Test Procedures for Multi-channel Amplifiers

The following tests shall be performed on any product that contains a multi-channel audio power amplifier, including surround sound amplifiers.

8.1. Active Mode Test

1) Connect the UUT to the output of the signal generator.

2) Generate a sine wave input signal per Section 4.3.b. If 1 kHz is outside the range of a speaker in the UUT, a sine wave sweep between the upper and lower -3 dB response points of the speaker shall be performed until the maximum input power of the UUT is obtained. Record the frequency when the input power is at its maximum.

3) Using the sine wave frequency determined in 8.1.2, monitor each speaker with a distortion analyzer and power meter. Set the volume of the UUT to 100% and modify the amplitude of the input signal until the THD of the output is 1% or greater. Record the output power measured on each speaker at 1%THD. This shall be considered the maximum undistorted power (MUP).

4) Monitor the speaker with the highest power draw as determined in step 8.1.3. Reduce the sine wave input signal amplitude until the output power of the selected speaker is at 1/8th MUP.

5) Measure & record the input power, averaged over a 2-minute period.

6) Measure & record the output power for all speaker terminals, averaged over a 2-minute period. Record the sum of all the output power measurements.

7) Generate and apply a pink noise input signal per Section 4.3.b. Do not alter the amplifier setting from Step 8.1.4, to ensure that the output is still 1/8th MUP.

8) Measure & record the input power, averaged over a 2-minute period.

9) Measure & record the output power at each speaker terminal, averaged over a 2-minute period. Record the sum of all the output power measurements.

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[4] If 1 kHz is outside of the range of the UUT, the signal frequency shall be the geometric mean of the upper and lower -3 dB response points of the device.

[5] If the UUT performs signal processing such that the amplifier output does not clip at 1% THD, maximum undistorted power shall be obtained by monitoring input signal amplitude and output power simultaneously to identify the point at which input signal amplitude is increased and output power remains constant.