

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



**OFFICE OF  
AIR AND RADIATION**

August 7, 2012

Dear ENERGY STARS Displays Stakeholder,

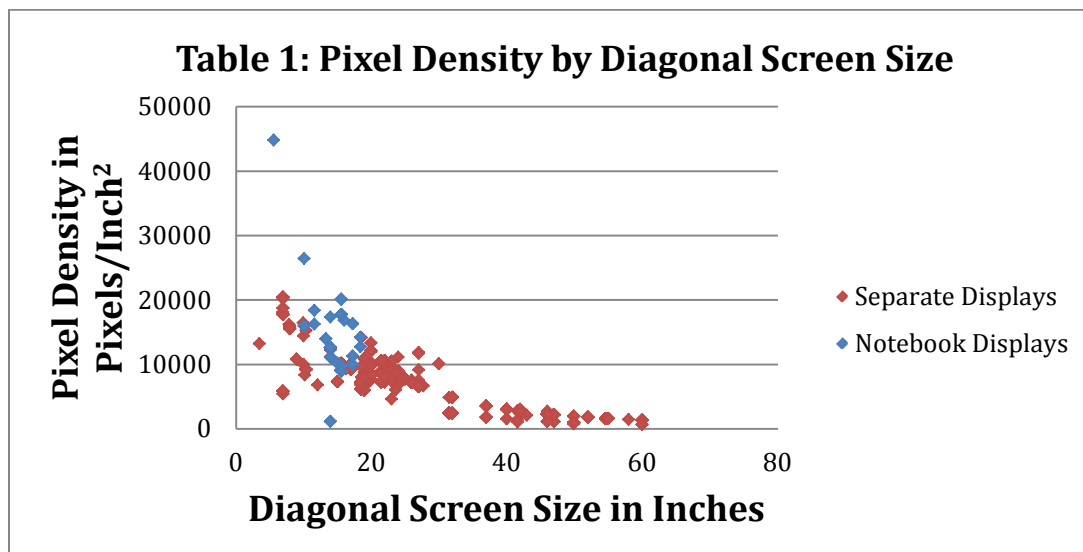
In light of comments received on the Final Draft Version 6.0 ENERGY STAR Displays specification and test method, the U.S. Environmental Protection Agency (EPA) is making a change to the power allowances for models with very high pixel density and for large models that meet the definition of enhanced performance displays. EPA is also removing a testing requirement for models with Automatic Brightness Control (ABC), and the Department of Energy (DOE) is clarifying how products with network connectivity should be tested.

This letter explains these changes, includes the relevant sections of the Version 6.0 specification and test method, and provides opportunity for comment. The Agency intends to finalize Version 6.0 by the end of August.

**Pixel Density Power Allowance**

The 6 watts per megapixel (W/MP) allowance has been extended to products with up to, and including, a pixel density of 20,000 pixels/inch<sup>2</sup>. EPA will add a 3 W/MP allowance for any resolution corresponding to a pixel density greater than 20,000 pixels/inch<sup>2</sup>. The following factors contributed to this decision:

- This allowance reflects the pixel density of many existing products in the marketplace that currently qualify for the ENERGY STAR, when displays in notebook computers are included in the dataset, as seen in Table 1.



- Additional data provided by stakeholders indicate that products with significantly higher resolution will be released in the marketplace in the near future.
- The emergence of higher resolution products, and greater availability of higher resolution products that require more energy than conventional products support EPA's new approach. Based on experience with other products where realized economies of scale occur when powering larger or more highly featured products, EPA recommends a 3 W/MP adder for resolution where pixel density surpasses 20,000 pixels/inch<sup>2</sup>. This balances an interest in encouraging greater energy efficiency for high resolution products with consumer interest in higher resolution products. EPA plans to revisit this approach in its next revision of the Displays specification once new data become available.

### **Enhanced Performance Displays (EPDs)**

EPA has increased the power allowance for EPDs with a diagonal screen size of at least 27 inches to 75% of the maximum On Mode power requirement. New data submitted in response to the final draft indicate a larger power allowance is warranted. The Agency will monitor the market closely and expects to reduce the power allowance for EPDs, especially those with a diagonal screen size of at least 27 inches, in the next specification revision.

### **On Mode Testing for Products with ABC Enabled by Default**

The requirement to test and report On Mode power consumption at 100 lux and 500 lux in Section 7.4 D) of the test method has been removed. The requirement to test and report at 10 lux and 300 lux to qualify products with ABC enabled by default remains. This decision is based on feedback DOE received that testing ABC-enabled displays with a direct light source, as defined by DOE in the Final Draft Displays Test Method (Rev. June-2012), at the illuminance levels stated in the specification, may not represent real world illuminance under different lighting conditions, resulting in uncharacteristically high On Mode power consumption measurements. DOE is further investigating the relationship between lux values seen by the unit's sensor when created by direct and diffuse test setups, as well as methods to minimize variability in testing for the next revision. Going forward, DOE can further investigate the appropriate illuminance levels for environments where displays are used when measured with various light sources. This work will also inform the next revision.

### **Test Method Clarification**

The intent of Section 6.2 C) 1) b) i. of the Final Draft Displays Test Method (Rev. June-2012) is to configure and connect the unit under test to one data source and one network source, if it is capable of being connected to both. DOE will clarify this section in the Final Test Method, and also add language to better define what constitutes a bridge (data) connection and a network connection. The additional language will clarify the test method without changing its substance.

Thank you for reviewing these changes. Please submit any comments to [displays@energystar.gov](mailto:displays@energystar.gov) by August 21, 2012. Contact Verena Radulovic, EPA, at [Radulovic.Verena@epa.gov](mailto:Radulovic.Verena@epa.gov) with questions regarding the specification, or Ashley Armstrong, DOE, at [Ashley.Armstrong@ee.doe.gov](mailto:Ashley.Armstrong@ee.doe.gov) with questions regarding the test method.

Best Regards,

A handwritten signature in black ink, reading "Verena Radulovic". The signature is written in a cursive style with a large, sweeping initial "V".

Verena Radulovic, Product Manager  
ENERGY STAR for Displays

**Revisions to appear in the following sections of the Final Displays specification:**

**3.3 On Mode Requirements**

3.3.1 On Mode power ( $P_{ON}$ ), as measured per the ENERGY STAR test method (referenced in Table 6), shall be less than or equal to the Maximum On Mode Power Requirement ( $P_{ON\_MAX}$ ), as calculated and rounded per Table 1, below.

- i. If the product's pixel density ( $D_P$ ), as calculated per Equation 1, is greater than 20,000 pixels/in<sup>2</sup>, then the screen resolution used to calculate  $P_{ON\_MAX}$  shall be determined per Equation 2.

**Equation 1: Calculation of Pixel Density**

$$D_P = \frac{r \times 10^6}{A}$$

*Where:*

- $D_P$  is the pixel density of the product rounded to the nearest integer, in pixels/in<sup>2</sup>,
- $r$  is the screen resolution, in megapixels, and
- $A$  is the viewable screen area, in in<sup>2</sup>.

**Equation 2: Calculation of Resolution if  $D_P > 20,000$  pixels/in<sup>2</sup>**

$$r_1 = \frac{20,000 \times A}{10^6} \quad r_2 = \frac{(D_P - 20,000) \times A}{10^6}$$

*Where:*

- $r_1$  and  $r_2$  are the screen resolutions, in megapixels, to be used when calculating  $P_{ON\_MAX}$
- $D_P$  is the pixel density of the product rounded to the nearest integer, in pixels/in<sup>2</sup>, and
- $A$  is the viewable screen area, in in<sup>2</sup>.

**Table 1: Calculation of Maximum On Mode Power Requirements ( $P_{ON\_MAX}$ )**

Product Type and Diagonal Screen Size, $d$ (in inches)	$P_{ON\_MAX}$ where $D_p \leq 20,000$ pixels/in <sup>2</sup> (in watts)	$P_{ON\_MAX}$ where $D_p > 20,000$ pixels/in <sup>2</sup> (in watts)
	Where: <ul style="list-style-type: none"> <li>▪ <math>r</math> = Screen resolution in megapixels</li> <li>▪ <math>A</math> = Viewable screen area in in<sup>2</sup></li> <li>▪ The result shall be rounded to the nearest tenth of a watt</li> </ul>	Where: <ul style="list-style-type: none"> <li>▪ <math>r</math> = Screen resolution in megapixels</li> <li>▪ <math>A</math> = Viewable screen area in in<sup>2</sup></li> <li>▪ The result shall be rounded to the nearest tenth of a watt</li> </ul>
$d < 12.0$	$(6.0 \times r) + (0.05 \times A) + 3.0$	$((6.0 \times r_1) + (3.0 \times r_2) + (0.05 \times A) + 3.0)$
$12.0 \leq d < 17.0$	$(6.0 \times r) + (0.01 \times A) + 5.5$	$((6.0 \times r_1) + (3.0 \times r_2) + (0.01 \times A) + 5.5)$
$17.0 \leq d < 23.0$	$(6.0 \times r) + (0.025 \times A) + 3.7$	$((6.0 \times r_1) + (3.0 \times r_2) + (0.025 \times A) + 3.7)$
$23.0 \leq d < 25.0$	$(6.0 \times r) + (0.06 \times A) - 4.0$	$((6.0 \times r_1) + (3.0 \times r_2) + (0.06 \times A) - 4.0)$
$25.0 \leq d \leq 61.0$	$(6.0 \times r) + (0.1 \times A) - 14.5$	$((6.0 \times r_1) + (3.0 \times r_2) + (0.1 \times A) - 14.5)$
$30.0 \leq d \leq 61.0$ (for products meeting the definition of a Signage Display only)	$(0.27 \times A) + 8.0$	$(0.27 \times A) + 8.0$

3.3.2. For products meeting the definition of an Enhanced-Performance Display, a power allowance ( $P_{EP}$ ), as calculated per Equation 3, shall be added to  $P_{ON\_MAX}$ , as calculated per Table 1. In this case,  $P_{ON}$ , as measured per the ENERGY STAR test method (referenced in Table 6), shall be less than or equal to the sum of  $P_{ON\_MAX}$  and  $P_{EP}$ .

**Equation 3: Calculation of On Mode Power Allowance for Enhanced-Performance Displays**

$$P_{EP<27"} = 0.30 \times P_{ON\_MAX}$$

$$P_{EP\geq 27"} = 0.75 \times P_{ON\_MAX}$$

Where:

- $P_{EP<27"}$  is the On Mode power allowance, in watts, for Enhanced-Performance Displays with a diagonal screen size less than 27 inches, and
- $P_{EP\geq 27"}$  is the On Mode power allowance, in watts, for Enhanced-Performance Displays with a diagonal screen size greater than or equal to 27 inches, and
- $P_{ON\_MAX}$  is the maximum On Mode power requirement, in watts.

**Revisions to appear in the following sections of the Final Displays Test Method :**

**6.2 Conditions for Power Measurements**

C) UUT Configuration and Control:

1) Peripherals and Network Connections:

- External peripheral devices shall not be connected to USB ports or other data ports on the UUT.

- 2) Bridging: A physical connection between two hub controllers, typically, but not limited to, USB or FireWire, which allows for expansion of ports typically for the purpose of relocating the ports to a more convenient location, increasing the number of available ports, or connecting two different types of controllers. Examples of bridging for displays include USB and Ethernet network connection to the display for use only by another system via the connection between the display and the system, or allowing a USB keyboard/mouse to be connected to a host device through the display by a USB hub controller.
  - a) If the UUT supports bridging, a bridge connection shall be made between the UUT and the host machine. The connection shall be made in the following order of preference. Only one connection shall be made and the connection shall be maintained for the duration of the test.
    - i. Thunderbolt
    - ii. USB
    - iii. Firewire (IEEE 1394)
    - iv. Other
- 3) Networking: Networking is the capability of a UUT to transmit and receive network data when plugged into a network without needing any other device (e.g., a host machine). The capacity to act as a network bridge is considered bridging capability, not network capability, because the UUT acts only as a bridging device between the network connection and another system connected to the UUT. In this case, the UUT does not transmit or receive data over the network without an additional client connected.
  - a) If the UUT has networking capability, the networking shall be activated and the UUT shall be connected to a live physical network (e.g., WiFi, Ethernet, etc.) and the physical network shall support the highest and lowest data speeds of the UUT's network function. An active connection is defined as a live physical connection over the physical layer of the networking protocol. In the case of Ethernet, the connection shall be via a standard Cat 5e or better Ethernet cable to an Ethernet switch or router. In the case of WiFi, the device shall be connected and tested in proximity to a wireless access point (AP). The tester shall configure the address layer of the protocol, taking note of the following:
    - i. Internet Protocol (IP) v4 and IPv6 have neighbor discovery and will generally configure a limited, non-routable connection automatically.
    - ii. IP can be configured manually or using Dynamic Host Configuration Protocol (DHCP) with an address in the 192.168.1.x Network Address Translation (NAT) address space if the UUT does not behave normally when autoIP is used. The network shall be configured to support the NAT address space and/or autoIP.
  - b) The UUT shall maintain this live connection to the network for the duration of testing, disregarding any brief lapses (e.g., when transitioning between link speeds). If the UUT is equipped with multiple network capabilities, only one connection shall be made in the following order of preference:
    - i. Wi-Fi (Institution of Electrical and Electronics Engineers - IEEE 802.11- 2007<sup>1</sup>)
    - ii. Ethernet (IEEE 802.3). If the UUT supports Energy Efficient Ethernet (IEEE 802.3az-2010<sup>2</sup>), then it shall be connected to a device that also supports IEEE 802.3az

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<sup>1</sup> IEEE 802 – Telecommunications and information exchange between systems—Local and metropolitan area networks – Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications

- iii. Thunderbolt
  - iv. USB
  - v. Firewire (IEEE 1394)
  - vi. Other
- 4) In the case of a UUT that has no data/network capabilities, the UUT shall be tested as-shipped.
  - 5) Built-in speakers and other product features and functions not specifically addressed by the ENERGY STAR eligibility criteria or test method must be configured in the as-shipped power configuration.
  - 6) Availability of other capabilities such as occupancy sensors, flash memory-card/smart-card readers, camera interfaces, or PictBridge shall be recorded.

## **7.4 On Mode Testing for Products with ABC Enabled by Default**

The average On Mode power consumption of the product shall be tested with the dynamic broadcast-content as defined in IEC 62087 Ed. 3.0.

- D) Repeat steps 6.4B) and 6.4C) for the ambient light level of 300 lux to measure  $P_{300}$ .

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<sup>2</sup> Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications - Amendment 5: Media Access Control Parameters, Physical Layers, and Management Parameters for Energy-Efficient Ethernet