

ENERGY STAR® Computer Monitor Test Methodology
Development Summary
February 2003

As you are aware, EPA has been developing over the course of several months an integrated computer monitor test methodology to measure power consumption in on, sleep, and off modes. Following the industry meeting in April 2002, EPA provided interested stakeholders with several opportunities to comment on the test methodology, which is designed to be comprehensive and produce repeatable results. We feel the test methodology reflects many of the comments we received and is ready for broad distribution.

This document is intended to provide a summary of the key additions or changes that culminate in the latest computer monitor test methodology. It is informational in nature and designed for all interested parties, but particularly those who did not provide comments on the test methodology. For additional details, please visit the Monitors section of the ENERGY STAR Product Development Web site at www.energystar.gov/productdevelopment. Click on "Revisions to Existing Specifications" and then on "Monitor Specification."

The following is a summary of key issues:

Reference to Published Specifications

ENERGY STAR strives to use existing, widely recognized industry practices for measuring product performance and power use under typical or normal operating conditions. As such, Section A: Test Conditions (e.g., supply voltages and ambient temperature) is based entirely on published specifications from the Video Electronics Standards Association (VESA) and the International Electrotechnical Commission (IEC). In addition, references to these specifications can be found in Sections B through G of the test methodology.

Non-Energy Parameters

Refresh Rate and Luminance (Brightness): A few non-energy parameters are included within the test methodology for on-mode power consumption, to ensure all computer monitors are being tested under similar conditions.

- *Refresh Rate:* Many comments were received on whether there should be different refresh rates for LCDs and CRTs, to accommodate differences in technology. LCDs should be measured at a refresh rate of 60 Hz, unless a different refresh rate is specifically recommended by the manufacturer in product literature, in which case that rate should be used. For CRTs, there were several comments received about whether they should be measured at 85 Hz (consistent with TCO '99 requirements and the general practice in Europe) or 75 Hz (the long-time norm in North America). Eventually, 75 Hz was selected by EPA and is reflected in the current computer monitor test methodology. While 85 Hz is better for ergonomic reasons, EPA felt 75 Hz was most appropriate for power measurement purposes.
- *Luminance Test Patterns and Procedures:* Without question, Section F was the most challenging section of the test methodology to write. It is important to EPA that the test methodology supports the implementation of a performance-based specification. As such, the methodology allows for comparisons of power use when all computer monitors were putting out the same level of light. Due to differences in technology, one luminance level for CRTs and LCDs was problematic because the level would be easier for LCDs to attain. While it went through several revisions, Section F now specifies a minimum luminance of at least 100 candelas per square meter for CRTs and 175 candelas per square meter for LCDs. Other comments included:
 - A luminance level of 125 candelas per square meter for LCDs (which was not selected by EPA because it potentially advantaged LCD displays with only a

brightness control and no contrast control over LCD displays with both contrast *and* brightness controls. If a display does not have a contrast control or is in digital mode, adjusting the brightness to get 125 candelas per square meter may lower power consumption significantly by reducing power to the back lights. Thus, models without contrast controls could potentially qualify more easily for ENERGY STAR and advertise lower power consumption levels), and

- Test each LCD model at its maximum brightness (which was not selected by EPA because it was thought that it would punish the better performing models with a higher brightness range to allow for some degradation over time – i.e., make it harder for them to earn the ENERGY STAR).

Comments also were received on the following issues and EPA decided:

- Computer monitors should be located in dark room conditions when performing light measurements. Hence, Section B: Dark Room Conditions was drafted.
- Section F includes language to address any LCD computer monitors unable to reach 175 candelas per square meter.
- The luminance adjustment procedure has separate instructions for CRTs and LCDs in order to reflect differences in these two types of displays.
- All luminance test patterns are borrowed from VESA FPDM Standard 2.0.
- Section F references an industry standard for video signal performance (VESA's Video Signal Standard or VSIS).

Contrast Ratio, Defective Pixels, and Warranty Requirements: Draft 1 of the Revised Computer Monitor Specification included requirements for contrast ratio, defective pixels, and warranty. However, for the following reasons, all three are not included or referenced in the test methodology.

- VESA FPDM Standard 2.0, Section 302-3 does not define parameters to use when measuring contrast ratio, hence it is somewhat meaningless. The Standard refers to the darkroom contrast ratio of the full screen, which is an atypical setting.
- Defective pixels do not affect power consumption levels and thus are not germane to the test methodology.
- Due to the global nature of computer monitors, EPA decided that warranties would be difficult to implement and police within this ENERGY STAR specification.

Color Controls and Peripherals

Adjustments were made to Section C to remove any ambiguity. EPA clarified that computer monitors should be tested with all user-controlled peripherals set to off, or on their lowest setting. Computer monitors cannot be stripped of peripherals (e.g., built-in speakers, TV tuners, etc.) prior to testing, as this would not be representative of how the consumer uses the product.

Multiple Measurements

To the extent it is feasible for manufacturers' evaluations of the ENERGY STAR computer monitor test methodology to include product testing, EPA encourages manufacturers to submit their test results for review. Interested manufacturers should conduct and record measurements in accordance with the ENERGY STAR test methodology, which specifies testing of "five or more randomly chosen units from the production line" at three voltage/frequency combinations. The testing of five units is consistent with VESA Standard: Display Specifications and Measurement Procedures, Version 1.0, Revision 1.0, Section 8.1.3. After evaluating the submitted test data, EPA will make an informed decision about the appropriate sample size and voltage/frequency combinations for the final Version 4.0 specification. It is EPA's intent to reduce the testing requirements wherever justifiable.

Additional Instructions for Digital Computer Monitors

Footnote 1 includes necessary information for digital only interface monitors. The test methodology specifies, however, that computer monitors should be tested with the analog interface, except where unavailable (i.e., analog interface should be used in analog interface monitors and dual interface monitors, but obviously not digital interface monitors).

Continuing Verification

Continuing Verification language, originally included to ensure that manufacturers provide ongoing verification of ENERGY STAR qualification based on their production runs and numbers, was removed from the test methodology based on manufacturer feedback. EPA may further research this topic and based on its findings and industry discussions, reserves the right to re-introduce it at a later date.