

ENERGY STAR® Qualified Imaging Equipment
First Draft Test Procedure - Rationale
Operational Mode Approach
May 17, 2005

This document provides details and rationale regarding the contents of the first draft Operational Mode (OM) test procedure, dated May 17, 2005, and provides an account of what has changed in this test procedure from the existing ENERGY STAR imaging equipment test procedures used by the Memoranda of Understanding (MOUs) for these products.

General

Several goals informed the development of this updated Operational Mode (OM) test procedure for imaging equipment. These goals included the following:

- General consistency with the existing MOU test procedures to allow for data collected in the past to be comparable to data collected with this OM test procedure;
- Harmonization where possible with IEC 62301;
- Harmonization of test conditions with the Typical Electricity Consumption (TEC) test procedure where possible;
- Accommodation of potential and foreseeable changes in technology where possible;
- Simplification of measurements where possible; and
- Unification of the existing, separate MOU test procedures into a single common OM test procedure.

1. Test Parameters

Test Pattern

Please refer to Section 4 below regarding the standard test pattern.

Auto-off

EPA expects that most products tested using the OM test procedure will not have an auto-off mode. However, EPA recognizes that some products, e.g. Electrophotographic (EP) large format copiers, may possess this feature. The OM test procedure, therefore, measures power consumed in auto-off for any product that has this capability. It is important to note that EPA has not yet decided whether specification levels will be created for auto-off mode in the ENERGY STAR Imaging Equipment specification.

Network Connectivity

For consistency, all products that are network-capable shall be connected to a network during testing. However, this does not mean that network-capable products must have the job sent via the network (e.g., jobs may be sent via a USB connection from a personal computer).

EPA does not feel it is necessary to specify the type of network connection used during testing; the type of network connection active during testing should be noted, along with other types that are present, should their power consumption be relevant to the specification levels.

“ENERGY STAR” Speed

As in the existing MOUs, the new imaging equipment specifications likely will have dependencies based on product speed for some categories.

Ink Jet print speeds vary widely depending on the content of the image and on quality and resolution settings. The speeds used when marketing products are generally not derived from single standard measurement procedure and for standard-sized products, are commonly much higher than experienced

in typical use. Therefore, these speeds cannot be consulted for ENERGY STAR purposes. For other product types, EPA believes that the speeds used in marketing materials are reasonably reflective of typical performance, that the product class will not have a speed dependency, or both.

2. Power Measurement Method

Harmonization with IEC 62301

Harmonization with IEC 62301 where possible is desirable to allow measurements derived from the ENERGY STAR OM test procedure to be used for additional non-ENERGY STAR purposes, such as for the Federal Energy Management Program (FEMP). Harmonization also reduces the number of different procedures and amount of terminology that manufacturers must manage. While 62301 primarily was developed for measuring standby power, this standard was created with the intention that it could be extended to other power-management modes. 62301 does not specify how to address these other power-management modes, but rather leaves this to specific product test procedures such as ENERGY STAR.

62301 specifies that the measurement for battery-powerable products should be made on the charger only, with the imaging equipment product disconnected. The ENERGY STAR OM test procedure specifies that all measurements must be performed with the imaging equipment product connected to the battery. However, manufacturers are encouraged to perform the charger-only measurement as well, as it may be needed for other purposes.

Battery-powerable Devices

ENERGY STAR expects that most products that can be operated from battery power will be relatively energy-efficient, particularly if they use an ENERGY STAR qualified External Power Supply, which might be required under the new specification. The OM test procedure is not intended to capture battery charging power.

It is assumed that few users will routinely remove the battery so that testing it in that mode will not be a realistic reflection of typical use. In addition, some batteries may not be removable by the user; therefore including such a requirement in the test procedure might result in an inconsistent test procedure across like products.

Products with External Power Supplies

Products that utilize external power supplies must also be connected to an AC power source while performing the OM test procedure.

Low-voltage DC-powered Devices

Some imaging products are powered through low-voltage DC in the form of USB and USB PlusPower. USB provides up to 2.5 W nominal power to each port. USB PlusPower provides up to 30 W, 72 W, or 144 W, depending on the configuration.

EPA is not aware of any imaging products in the market powered through IEEE802.3af (Power Over Ethernet), although that may become common in the future. POE currently provides up to 13 W, although there is ongoing discussion within IEEE 802.3 on whether to increase this and how this might be accomplished.

3. ENERGY STAR OM Measurement Procedure

This OM test procedure does not provide for the long (12 hour) stabilization time of the current copier and MFD test procedures that accompany the existing MOUs for these products. It is assumed that sleep- and off- power levels will not be affected by this change, particularly since the unit is "primed" by

producing the image specified in Step 2 of this test procedure. Note that producing a single copy prior to performing power measurements is an existing part of the current copier and MFD MOU procedures.

The OM test procedure does not have specific requirements for handling of the test media (e.g., 24 hours at ambient temperature), since it is assumed that the manufacturer will not subject the media to adverse temperature or humidity conditions prior to performing the test.

The data source for the standard test image used during the test procedure is not specified, e.g., the type of computer, software, or the method of transmitting the data. It is assumed that manufacturers will choose an appropriate setup that does not disadvantage the product. Note that the data source used is only relevant for the measurement of speed for standard- and smaller-size Ink Jet products as provided in Section 4 of the OM test procedure.

The ready power measurement will not necessarily be used in the ENERGY STAR Imaging Equipment specification. This measurement is included to assist EPA in better understanding the power-consumption profile of these products since the measurement is simple to make.

The off-power measurement is intended to be directly applicable for FEMP standby power reporting. It is important to note, however, that EPA has not yet determined if the OM specification will require products to meet FEMP standby power levels.

4. Speed Measurement Procedure for Standard- and Smaller-size Ink Jet Products

Standard Test Pattern

In May 2004, a workshop was held in Nuernberg, Germany under the auspices of the German standards organization DIN to address the diverse use of “test charts” used in ISO standards, both existing and those under development. Information from that workshop is available at the following Web site: <http://www.ps.bam.de/info04/>

The proposed color test pages available at <http://www.ps.bam.de/info04/JER04.PDF> show preliminary standard test patterns being considered for ISO/IEC 24712, which is currently under development by ISO/IEC JTC1 SC 28 WG2. These test patterns are currently being revised, and will be included in the next version of this OM test procedure. It is expected that the revised images will be similar to the ones shown, and include a “business letter”, “spreadsheet”, “news letter”, and “business slide” (all suitable for use in both A4 and 8.5x11 format). The standard test patterns are only needed for performing measurements of Ink Jet product speed, as directed in Section 4 of the OM test procedure. If it is determined that large format Ink Jet products also need a comparable speed measurement, then the procedure will be adjusted to specify that the test image be tiled across the width of the device to an integral number of pages (that is, there is no need to include partial pages); each “row” would replicate a single image so that the test image set would consist of four different rows.

Resolution Settings

It is assumed that manufacturers ship products with quality and resolution settings representative of the product’s capability, i.e., not extremely high or low. If a manufacturer has default settings that are unusual in this respect, then the speed measurement would be affected. Establishing a requirement for quality and resolution would avoid this, however, would also add complexity to the procedure. EPA believes that using default settings is satisfactory for performing the test.

Media

In the ENERGY STAR Imaging Equipment specification, some product categories may not have energy-efficiency criteria that are dependent on speed. Speed measurement on these products would therefore only be useful as a general indicator of the range of product performance in the market, and would not be used when consulting the specification requirement. As such, close matching of the media and image, e.g., for photo printers, is not critical. The value of a consistent image across all products is more valuable in this case.

Image Sets

The choice of printing the set of test images five times originates from ISO/IEC standard 10561. However, this standard specifies that the timing begin at “the moment the data arrives at the printer interface” or “the moment the ‘start’ key is depressed on the host computer” if not significantly different. EPA considered that determining the data arrival time, as addressed in this standard, is unnecessarily difficult for use in the ENERGY STAR OM test procedure. Instead, the OM procedure begins the timing after an initial job, which is not included in the five job set. This procedure is consistent with 10561 in specifying the end point as “when the fifth sheet has been ejected.”

Finally, in standard 10561, each test image speed is measured separately. For the purposes of the OM test procedure, EPA is only interested in an average speed, therefore the test images are grouped as a set.

Other Test Patterns Considered

Test patterns used in ISO/IEC standard 10561 were also considered for use in measuring Ink Jet product speed for ENERGY STAR. ISO/IEC 10561 is used in the measurement of printer throughput, under the jurisdiction of the ISO/IEC JTC 1 SC 28 Office Equipment technical subcommittee. This standard, approved in 1999, presents several standard monochrome test patterns. 10561 is designed for “Class 1 and Class 2 printers” (as defined by ISO/IEC 11160-1) which is said to include “Dot Matrix, Daisy Wheel, Ink Jet, Thermal Transfer printers”. It is specifically **not** intended for “high-speed page-oriented printers or color printers.”

The ISO/IEC JTC 1 SC 28 Office Equipment technical subcommittee has several other current projects that include test images, besides ISO/IEC WD 24712: Office color test targets for measurement of office equipment consumable yield. None of these are final, and the content is not yet publicly available:

- ISO/IEC CD 24711: Method for determination of ink cartridge yield for color Ink Jet printers and multi-function devices that may contain printer components;
- ISO/IEC NP 24734: Method for measuring digital printer productivity; and
- ISO/IEC NP 24735: Method for measuring digital copying machine productivity.