

ENERGY STAR® Qualified Imaging Equipment Operational Mode (OM) Test Procedure

*This document presents the test procedure for the **Operational Mode (OM)** approach for the Version 1.0 ENERGY STAR Imaging Equipment (IE) specification. The procedure is to be used to quantify the power consumption of imaging products that do not utilize the Typical Electricity Consumption (TEC) method. Examples of products that will be tested with this OM method include those that use marking technologies such as Ink Jet, Dot Matrix or Impact, as well as scanners and all large-format and small-format devices. The key results of this test procedure are power values for Ready, Sleep, and Off modes.*

This test procedure document includes the following sections:

1. Types of Products Covered;
2. Test Parameters;
3. Power Measurement Method;
4. Measurement Procedure;
5. Reporting; and
6. References.

The full OM test procedure consists of this narrative document and the accompanying test conditions, entitled **Test Conditions and Equipment for ENERGY STAR Imaging Equipment Products**. The Test Conditions document provides the ambient test conditions and equipment requirements that should be established when performing the energy or power measurements to determine a product's ENERGY STAR qualification status.

1. Types of Products Covered

The OM test procedure is for the measurement of products defined in Section 2, Table 2 of the **ENERGY STAR Program Requirements for Imaging Equipment**.

2. Test Parameters

This section describes the test parameters to use when measuring a product's power consumption under the OM test procedure.

Network Connectivity

Products that are capable of being network-connected as-shipped¹ shall be connected to at least one network during the test procedure. The type of network connection that is active is at the discretion of the manufacturer, and the type used shall be reported.

The product shall not receive operating power over the network connection (e.g., via Power over Ethernet, USB, USB PlusPower, or IEEE 1394) unless that is the only source of power for the product (i.e., no ac power source is present).

Product Configuration

The product shall be configured **as shipped and recommended for use**, particularly for key parameters such as power management default-delay times, print quality, and resolution. In addition:

- Paper source and finishing hardware shall be present and configured as shipped; however, use of these features in the test is at the manufacturer's discretion (e.g., any paper source may be

¹ The type of network connection shall be reported. Common network types are Ethernet, WiFi (802.11), and Bluetooth. Common data (non-network) connection types are USB, Serial, and Parallel.

used). Any hardware that is part of the model and intended to be installed or attached by the user (e.g., a paper feature) shall be installed prior to this test.

- Anti-humidity features may be turned off if they are user-controllable.
- For fax machines, a page shall be fed into the unit's document feeder for convenience copying, and may be placed in the document feeder before the test begins. The unit need not be connected to a telephone line unless the telephone line is necessary for performing the test. For example, if the fax machine lacks convenience copying capability, then the job performed in Step 2 shall be sent via phone line. On fax machines without a document feeder, the page should be placed on the platen.
- If a product has an Auto-off mode enabled as shipped, it shall be enabled prior to performing the test.

Speed

When conducting power measurements under this test procedure, the product shall produce images at the speed resultant from its default settings as shipped. However, the manufacturer's reported maximum claimed simplex speed for making monochrome images on standard-sized paper shall be used for reporting purposes, according to the **ENERGY STAR Program Requirements for Imaging Equipment**.

3. Power Measurement Method

All power measurements are to be made in accordance with IEC 62301 with the following exceptions:

- To determine the voltage/frequency combinations to be used during testing, see the **Test Conditions and Equipment for ENERGY STAR Imaging Equipment Products**.
- The harmonics requirement used during testing is that specified in the IE Test Conditions document, which is more stringent than that required by IEC 62301.
- The accuracy requirement for this OM test procedure is 2% for all measurements except for Ready power. The accuracy requirement for measuring Ready power is 5%, as provided in the IE Test Conditions document. The 2% figure is consistent with IEC 62301, although the IEC standard expresses it as a confidence level.
- For products designed to operate using batteries when not connected to the mains, the battery shall be left in place for the test; however, the measurement should not reflect active battery charging beyond maintenance charging (i.e., the battery should be fully charged before beginning the test).
- Products with external power supplies shall be tested with the product connected to the external power supply.
- Products powered by a standard low voltage dc supply (e.g., USB, USB PlusPower, IEEE 1394, and Power Over Ethernet) shall utilize a suitable ac-powered source of the dc power. This ac-powered source's energy consumption shall be measured and reported for the imaging equipment product under test. For imaging equipment powered by USB, a powered hub serving only the imaging equipment being tested shall be used. For imaging equipment powered by Power Over Ethernet or USB PlusPower, it is acceptable to measure the power distribution device with and without the imaging product connected, and use this difference as the imaging product's consumption. The manufacturer should confirm that this reasonably reflects the unit's dc consumption plus some allowance for power supply and distribution inefficiency.

4. Measurement Procedure

To measure time, an ordinary stopwatch and timing to a resolution of one second is sufficient. All power figures are to be recorded in watts (W). Table 1 outlines the steps of the OM test procedure.

Service/maintenance modes (including color calibration) generally should not be included in measurements. Any adaptation of the procedure needed to exclude such modes that occur during the test shall be noted.

As stated above, all power measurements are to be made in accordance with IEC 62301. Depending on the nature of the mode, IEC 62301 provides for instantaneous power measurements, five-minute accumulated energy measurements, or accumulated energy measurements over periods long enough to properly assess cyclical consumption patterns. Regardless of the method, only power values should be reported.

Table 1. The OM Test Procedure

Step	Initial State	Action	Record
1	Off	Plug the unit into meter. Turn on unit. Wait until unit indicates it is in Ready mode.	–
2	Ready	Print, copy, or scan a single image.	–
3	Ready	Measure Ready power.	Ready <i>power</i>
4	Ready	Wait default delay-time to Sleep.	Sleep default-delay <i>time</i>
5	Sleep	Measure Sleep power.	Sleep <i>power</i>
6	Sleep	Wait default delay time to Auto-off.	Auto-off default-delay <i>time</i>
7	Auto-off	Measure Auto-off power.	Auto-off <i>power</i>
8	Off	Manually turn device off. Wait until unit is off.	–
9	Off	Measure Off power.	Off <i>power</i>

Notes:

- Before beginning the test, it is helpful to check the power management default-delay times to ensure they are as shipped.
- Step 1 – If the unit has no Ready indicator, use the time at which the power consumption level stabilizes to the Ready level, and note this detail when reporting the product test data.
- Steps 4 and 5 – For products with more than one Sleep level, repeat these steps as many times as necessary to capture all successive Sleep levels and report this data. Two Sleep levels are typically used in large-format copiers and MFDs that use high-heat marking technologies. For products lacking this mode, disregard Steps 4 and 5.
- Steps 4 and 6 – Default-delay time measurements are to be measured in parallel fashion, cumulative from the start of Step 4. For example, a product set to enter a Sleep level in 15 minutes and enter a second Sleep level 30 minutes after entering the first Sleep level will have a 15-minute default-delay time to the first level and a 45-minute default-delay time to the second level.
- Steps 6 and 7 – Most OM products do not have a distinct Auto-off mode. For products lacking this mode, disregard Steps 6 and 7.
- Step 8 – If the unit has no power switch, wait until it enters its lowest power mode and note this detail when reporting the product test data.

Note: For consistency with the Version 1.0 specification, the separate step for measuring “low-power mode” that appeared in the Final Draft OM test procedure has been removed in this Final version. The note for Steps 4 and 5 provide guidance for measuring multiple Sleep levels where applicable.

4.a. Additional Measurement for Products with a Digital Front End (DFE)

This step applies only to products that have a DFE as defined in Section 1 of the **ENERGY STAR Program Requirements for Imaging Equipment**.

If the DFE has a separate mains power cord, regardless of whether the cord and controller are internal or external to the imaging product, a five-minute energy measurement of the DFE alone shall be made while

the main product is in Ready mode. The unit must be connected to a network if network-capable as shipped.

If the DFE does not have a separate mains power cord, the manufacturer shall document the ac power required for the DFE when the unit as a whole is in a Ready mode. This will most commonly be accomplished by taking an instantaneous power measurement of the dc input to the DFE and increasing this power level to account for losses in the power supply.

5. References

- IEC 62301:2005. Household Electrical Appliances – Measurement of Standby Power