ATTACHMENT A

# ENERGY STAR OFFICE EQUIPMENT PRODUCT SPECIFICATIONS

## I. COMPUTER SPECIFICATIONS

### A. Definitions

1. Computer: A desktop, tower or mini-tower, or portable unit, including high-end desktop computers, personal computers, workstations, network computer desktops, X terminal controllers, and computer-based point-of-sale retail terminals. To qualify, the unit must be capable of being powered from a wall outlet, but this does not preclude units that are capable of being powered from a wall outlet and also from a battery. This definition is intended primarily to cover computers sold for use in businesses or homes. This definition of a computer does not include computers sold or otherwise marketed as 'File Server' or 'Server'.

2. Monitor: A cathode-ray tube (CRT), flat panel display (e.g. a liquid crystal display) or other display device and its associated electronics. A monitor may be sold separately or integrated into the computer chassis. This definition is intended primarily to cover standard monitors designed for use with computers. For purposes of this specification, however, the following may also be considered a monitor: mainframe terminals, and physically separate display units.

3. Integrated Computer System: Systems in which the computer and visual display monitor are combined into a single unit. Such systems must meet all of the following criteria: it is not possible to measure the power consumption of the two components separately; and the system is connected to the wall outlet through a single power cable.

4. Inactivity: A period of time during which a computer does not encounter any user input (e.g. keyboard input or mouse movement).

5. Low-power or 'sleep' mode: The reduced power state that the computer enters after a period of inactivity.

6. Wake events: A user, programmed, or external event or stimulus that causes the computer to transition from its low-power/'sleep' mode to its active mode of operation. Examples of wake events include, but are not limited to, movement of the mouse, keyboard activity or a button press on the chassis and, in the case of external events, stimulus conveyed via a telephone, remote control, network, cable modem, satellite, etc.

### B. Product Qualification for the ENERGY STAR Logo

1. Technical Specifications

   (a) Computers: An ENERGY STAR-compliant computer shall satisfy the following conditions:

(i) Tier I – Computer models first shipped on or after 1 July 1999 and before 1 July 2000:

(a) The computer shall enter a sleep mode after a period of inactivity.

(b) If the computer is shipped with the capability to be on a network, it shall have the ability to enter a sleep mode while on the network.

(c) If the computer is shipped with the capability to be on a network, it shall retain in sleep mode its ability to respond to wake events directed or targeted to the computer while on a network. If the wake event requires the computer to exit the sleep mode and perform a task, the computer shall re-enter its sleep mode after a period of inactivity after the completion of the task requested. Computers that use alternate means to retain this functionality when sleeping on a network, also qualify. Program Participant may use any means available to achieve the behavior described in this subsection.

(d) A computer whose power supply has a maximum continuous output power rating [1] less than or equal to 200 W (200 W) shall automatically enter a low-power/'sleep' state of 30 W or less after a specified period of inactivity. A computer whose power supply has a maximum continuous output power rating greater than 200 W (> 200 W) shall automatically enter a low-power/'sleep' state of no more than 15 per cent (15%) of its maximum continuous output power rating after a specified period of inactivity.

Computers that always maintain a level of power consumption of 30 W or less comply with the power consumption requirements of Tier I of this Agreement and are not required to incorporate the sleep mode described in Section A.

(ii) Tier II – Computer models first shipped on or after 1 July 2000:

There are two guidelines – A and B – under which a computer can be qualified as ENERGY STAR-compliant. The two guidelines have been developed to provide Program Participants with the freedom to approach power management and energy efficiency in different ways.

The following types of computers must be qualified under Guideline A.

Computers that are shipped with the capability to be on networks such that they can remain in their low-power/sleep mode while their network interface adapter retains the ability to respond to network queries.

Computers that are not shipped with a network interface capability.

[1] The maximum continuous output power rating of a power supply is the value defined by the power supply manufacturer in the operating instructions provided with the product.

Computers shipped to a non-networked environment.

EPA expects computers sold or otherwise marketed as personal computers to be qualified under Guideline A only.

Computers that are shipped with the capability to be on networks that currently require the computer's processor and/or memory to be involved in maintaining its network connection while in sleep mode can be qualified under Guideline B. Computers qualifying under Guideline B are expected to maintain identical network functionality in and out of sleep mode.

(a) Guideline A:

1. The computer shall enter a sleep mode after a period of inactivity.

2. If the computer is shipped with the capability to be on a network, it shall have the ability to enter a sleep mode while on the network.

3. If the computer is shipped with the capability to be on a network, it shall retain in sleep mode its ability to respond to wake events directed or targeted to the computer while on a network. If the wake event requires the computer to exit the sleep mode and perform a task, the computer shall re-enter its sleep mode after a period of inactivity after the completion of the task requested. Program Participant may use any means available to achieve the behavior described in this subsection.

4. The computer shall consume power in the sleep mode according to Table 1.

TABLE 1

| Maximum continuous power rating of power supply [2] (W) | Sleep mode (W) |
|---|---|
| ≤ 200 | ≤ 15 |
| > 200 ≤ 300 | ≤ 20 |
| > 300 ≤ 350 | ≤ 25 |
| > 350 ≤ 400 | ≤ 30 |
| > 400 | 10% of the maximum continuous output rating |

Computers that always maintain a level of power consumption of 15 W or less comply with the power consumption requirements of Tier II of this Specification, and are not required to incorporate the sleep mode described in Section A.

(b) Guideline B:

1. The computer shall enter a sleep mode after a period of inactivity.

[2] The maximum continuous output rating of a power supply is the value defined by the power supply manufacturer in the operating instructions provided with the product.

2. If the computer is shipped with the capability to be on a network, it shall have the ability to enter a sleep mode irrespective of the network technology.

3. The computer shall retain in sleep mode its ability to respond to all types of network requests. There shall be no loss in network functionality available to the user (e.g. the network functionality available to the user during the sleep mode shall be the same as that was available before the computer entered the sleep mode).

4. The computer shall consume in the sleep mode, no more than 15% of the maximum continuous power rating of its power supply.

(b) Integrated Computer Systems: An ENERGY STAR-compliant integrated computer system shall satisfy the following conditions:

(i) The integrated computer system shall enter a sleep mode after a period of inactivity.

(ii) If the integrated computer system is shipped with the capability to be on a network, it shall have the ability to enter a sleep mode while on the network.

(iii) If the integrated computer system is shipped with the capability to be on a network, it shall retain in sleep mode its ability to respond to wake events directed or targeted to the computer while on a network. If the wake event requires the computer to exit the sleep mode and perform a task, the integrated computer system shall re-enter its sleep mode after a period of inactivity after the completion of the task requested.

Program Participant may use any means available to achieve the behavior described in this subsection.

(iv) Tier I: An integrated computer system, first shipped before 1 July 2000, shall consume no more than 45 W in the sleep mode. Integrated computer systems that always maintain a level of power consumption less than or equal to 45 W comply with the power consumption requirements of this Agreement and are not required to incorporate the sleep mode described in Section A.

Tier II: An integrated computer system, first shipped on or after 1 July 2000, shall consume no more than 35 W in the sleep mode. Integrated computer systems that always maintain a level of power consumption less than or equal to 35 W comply with the power consumption requirements of this Agreement and are not required to incorporate the sleep mode described in Section A.

2. Shipment Settings: In order to ensure that the maximum number of users take advantage of the low-power/'sleep' state, Program Participant shall ship its computers and/or integrated computer systems with the power-management feature enabled. The default time for all products shall be pre-set for less than 30 minutes. (EPA recommends that the pre-set time be set between 15 and 30 minutes). The user shall have the ability to change the time settings or disable the sleep/low-power mode.

3. Operating Systems: The proper activation of a computer's low-power/'sleep' mode is typically contingent upon the installation and use of a particular version of an operating system. If a computer is shipped from the Program Participant with one or more operating systems, the computer shall be capable of entering and fully recovering from the low-power/'sleep' mode while running in at least one of those operating systems. If the computer is not shipped with operating system software, the Program Participant shall clearly specify which mechanism will render the computer ENERGY STAR-compliant. In addition, if any special software, hardware drivers, or utilities are necessary for the proper activation and recovery of the sleep mode, they must be installed in the computer. The Program Participant shall include this information in product literature (e.g. user's manual or data sheets) and/or on its Internet web site. Brochures and advertisements shall be worded to avoid misleading statements.

4. Monitor Control: The computer shall include one or more mechanisms through which it can activate the low-power modes of an ENERGY STAR-compliant monitor. Program Participant shall clearly specify in product literature the manner in which its computer can control ENERGY STAR-compliant monitors, and any special circumstances that must exist in order for monitor power management to be accomplished. Program Participant shall set the computer's default to activate the monitor's first low-power or sleep mode within 30 minutes of user inactivity. Program Participant shall also set the default time for the next level of power management such that the monitor enters the second low-power or 'deep sleep' mode within 60 minutes of inactivity. The combined total of the default times for both low-power modes shall not exceed 60 minutes. Program Participant can choose to set the computer to activate the monitor to enter the second low-power or 'deep sleep' mode directly within 30 minutes of inactivity. The user shall have the ability to change the time settings or disable the low-power modes for the monitor control. This monitor control requirement does not apply to integrated computer systems. However, integrated computer systems that are marketed and sold as part of a docking system shall have the capability to automatically control the power of an externally connected monitor.

## II. MONITOR SPECIFICATIONS

### A. Definitions

1. Monitor: A cathode-ray tube (CRT), flat panel display (e.g. a liquid crystal display) or other display device and its associated electronics. This definition is intended primarily to cover standard monitors designed for use with computers. For purposes of this Specification, however, the following may also be considered a monitor: mainframe terminals, and physically separate display units.

2. First low-power or 'sleep' mode: The reduced power state that the monitor model enters after receiving instructions from a computer or via other functions. A blank screen and reduction in power consumption characterise this mode. The monitor returns to full-power mode upon sensing a request from a user.

3. Second low-power or 'deep-sleep' mode: The second reduced power state that the monitor enters after receiving instructions from a computer or via other functions. A significant reduction in power consumption characterizes this mode. The monitor returns to full-power mode upon sensing a request from a user.

B. Product Qualification for the ENERGY STAR Logo

1. Technical Specifications

An ENERGY STAR-compliant monitor shall have the capability to automatically enter two successive low-power modes. In the first low-power 'sleep' mode, the monitor shall consume 15 W or less after receiving instructions from a computer or via other functions. If the monitor continues to be idle, upon instructions from the CPU or via other functions, it shall enter a second low-power 'deep sleep' mode. An ENERGY STAR-compliant monitor in this second low-power mode shall consume 8 W of electricity or less. Monitors that have the capability to proceed automatically from active mode to a low-power mode of 8 W or less comply with the power consumption requirements of this agreement. Upon resumption of user activity, the monitor shall automatically return to full operational capability. It is recommended that for activity not initiated by the user, the monitor will remain in its low-power mode.

If the monitor includes a USB hub/ports, it shall be tested without any devices or an upstream cord connected to the hub/ports.

III. PRINTER, FAX MACHINE, AND MAILING MACHINE SPECIFICATIONS

A. Definitions

1. Printer: Imaging equipment manufactured as a standard model that serves as a hard-copy output device and is capable of receiving information from single-user or networked computers. In addition, the unit must be capable of being powered from a wall outlet. This definition is intended to cover products that are advertised and sold as printers including printers that can be upgraded to a multifunction device (MFD) [3].

2. Fax machine: Imaging equipment, manufactured as a standard model, that serves as a hard-copy output device whose primary function is sending and receiving information. Plain paper fax machines are covered under this Specification (e.g. ink jet/bubble jet, laser/LED, and thermal transfer). The unit must be capable of being powered from a wall outlet. This definition is intended to cover products that are advertised and sold as fax machines.

3. Combination printer/fax machine: Imaging equipment manufactured as a standard model that serves as both a fully-functional printer and fax machine, as defined above. This definition is intended to cover products that are marketed and sold as a combination printer/fax device.

4. Mailing machine: Imaging equipment that serves to print postage onto mail pieces. The unit must be capable of being powered from a wall outlet. This definition is intended to cover products that are advertised and sold as mailing machines.

[3] Note that once a printer based unit is upgraded to an MFD (for example, a photocopier unit is added), then the entire product must qualify according to the ENERGY STAR MFD Specification in order for the product to remain ENERGY STAR compliant.

5. Print speed: Pages per minute (ppm) measures the printing speed of a model. Print speed corresponds to the product's print speed as advertised by Program Participant. For line printers (e.g. dot matrix/impact printers), print speed is based on the method established in ISO 10561.

   For wide format printers designed to handle primarily A2 or 17" x 32" paper or larger, the print speed is specified in terms of monochrome text output at the default resolution. The print speed measured as A2 or A0-sized prints per minute shall be converted into A4-sized print speeds as follows: (a) One A2 print per minute is equivalent to four A4 prints per minute; (b) One A0 print per minute is equivalent to 16 A4 prints per minute. For mailing machines, pages per minute (ppm) are considered equivalent to mail pieces per minute (mppm).

6. Accessory: A piece of additional equipment that is not necessary for the standard operation of the base unit, but may be added before or after shipping in order to enhance or change printer performance. Examples of accessories include finishers, sorters, additional paper supply devices, and duplex units. An accessory may be sold separately under its own model number, or sold with a base unit as part of a printer.

7. Active mode: The condition (or mode) in which the product is producing hard copy output or receiving hard copy input. The power requirement in this mode is typically greater than the power requirement in standby mode.

8. Standby mode: The condition that exists when the product is not producing hard copy output or receiving hard copy input and is consuming less power than when producing such output or receiving such input. The transition from standby mode to active mode should cause no noticeable delay in the production of hard copy output.

9. Sleep mode: The condition that exists when the product is not producing hard copy output or receiving hard copy input and is consuming less power than when in standby mode. In the transition from sleep mode to active mode, there may be some delay in the production of hard copy output, however, there shall be no delay in the acceptance of information from a network or other input sources. The product enters this mode within a specified time period after the last hard copy output was produced.

10. Default time to sleep mode: The time period set by the Program Participant prior to shipping that determines when the product will enter the sleep mode. The default time shall be measured from the time that the last piece of hard copy output was produced.

11. Duplexing: The process of producing text, an image, or a combination of text and image on both sides of a single sheet of paper.

12. Standard model: The term used to describe a product and its bundled features as marketed and sold by the Program Participant and as manufactured for its intended use.

13. Wake Event: As used in this Agreement, a ‘wake event’ is defined as a user, programmed, or external event or stimulus that causes the unit to transition from its standby or sleep mode to its active mode of operation. A ‘wake event’ as defined in this Specification does not include network related polling queries or ‘pings’ that commonly occur in network environments.

B. Product Qualification for the ENERGY STAR Logo

1. Technical Specification

(a) Sleep mode: ENERGY STAR Program Participant agrees that only those products that are capable of entering a sleep mode after a period of inactivity or maintain a level of power consumption at or below the levels of power specified in Tables 2 through 11 (below), may qualify as ENERGY STAR-compliant.

(b) Default time: ENERGY STAR Program Participant agrees to set the product's default time to activate the sleep mode within the time specified in Tables 2 through 11 (below), from the completion of the last job (e.g. from the time that the last piece of hard copy output was produced). Program Participant also shall ship products with the default time for the sleep mode set to the levels specified in Tables 2 through 11 (below).

(c) Network functionality: ENERGY STAR Program Participant agrees to qualify products as they are intended to be used (Section II.A.12 above) by the end-user, particularly products intended to be connected to a network. ENERGY STAR Program Participant agrees that all products marketed, advertised, or sold as network-capable must meet the ENERGY STAR Specifications (below) when configured as network-ready (i.e. with network functionality).

1. If the product is shipped with the capability to be on a network, it shall have the ability to enter a sleep mode while on the network.

2. If the product has the capability to be on a network, is shall retain in sleep mode its ability to respond to wake events directed or targeted to the product while on a network.

(d) Duplexing: For all standard-sized printers above 10 ppm in which a duplexing unit is installed, it is recommended that ENERGY STAR Program Participant educate its customers about using their printers with duplex set as the default printing mode. Education may consist of information about the appropriate printer driver and print menu setup in the product manuals, or by providing specific instructions about the printer driver when a duplexing unit is installed.

(e) Detailed specifications: ENERGY STAR Program Participant agrees to qualify products according to the following Specifications:

TABLE 2: Tier 1

Standard size printers and printer/fax combinations * (1.11.2000 – 31.10.2001)
(designed to accommodate primarily A3, A4 or 8,5" x 11" sized paper)

| Product speed in pages per minute (ppm) | Sleep mode (W) [4] | Default time to sleep mode |
|---|---|---|
| 0 < ppm ≤ 10 | ≤ 10 [5] | ≤ 5 minutes |
| 10 < ppm ≤ 20 | ≤ 20 [5] | ≤ 15 minutes |
| 20 < ppm ≤ 30 | ≤ 30 | ≤ 30 minutes |
| 30 < ppm ≤ 44 | ≤ 40 | ≤ 60 minutes |
| 44 < ppm | ≤ 75 | ≤ 60 minutes |

* Including monochrome electrophotography, monochrome thermal transfer, and monochrome and color ink jet.

TABLE 3: Tier 1

Impact printers designed to accommodate primarily A3 paper (1.11.2000 – 31.10.2001)

| Sleep mode (W) | Default time to sleep mode |
|---|---|
| ≤ 30 | ≤ 30 minutes |

TABLE 4: Tier 1

Large/wide-format printers (1.11.2000 – 31.10.2001)
(designed to accommodate primarily A2 or 17" x 22" or larger paper)

| Product speed in pages per minute (ppm) | Sleep mode (W) [4] | Default time to sleep mode |
|---|---|---|
| 0 < ppm ≤ 10 | ≤ 35 | ≤ 30 minutes |
| 10 < ppm ≤ 40 | ≤ 65 | ≤ 30 minutes |
| 40 < ppm | ≤ 100 | ≤ 90 minutes |

[4] For printers that utilize a functionally integrated computer, whether contained within or outside of the printer cabinet, the power consumption of the computer does not have to be included when determining the sleep mode value of the printer unit. However, the integration of the computer must not interfere with the ability of the printer to enter or exit its sleep mode state. This provision is conditioned upon the manufacturer agreeing to provide potential customers with product literature that clearly states that the power consumed by the integrated computer is in addition to the power consumed by the printer unit, especially when the printer unit is in sleep mode.

[5] For Tier I, a one-time 5 W allowance is permitted for those products that are shipped 'network ready' (i.e. inclusive of network functionality 'out of the box'). For those products shipped as not 'network ready', the additional one-time 5 W allowance does not apply.

TABLE 5: Tier 1

Color Printers * (1.11.2000 – 31.10.2001)
(designed to accommodate primarily A3, A4 or 8,5" x 11", sized paper)

| Product speed in pages per minute (ppm) | Sleep mode (W) [4] | Default time to sleep mode |
|---|---|---|
| 0 < ppm ≤ 10 | ≤ 35 [5] | ≤ 30 minutes |
| 10 < ppm ≤ 20 | ≤ 45 | ≤ 60 minutes |
| 20 < ppm | ≤ 70 | ≤ 60 minutes |

* Including color electrophotography and color thermal transfer

TABLE 6

Stand alone fax machines (1.11.2000 – 31.10.2002)
(designed to accommodate primarily A4, or 8,5" x 11" sized paper)

| Product speed in pages per minute (ppm) | Sleep mode (W) | Default time to sleep mode |
|---|---|---|
| 0 < ppm ≤ 10 | ≤ 10 | ≤ 5 minutes |
| 10 < ppm | ≤ 15 | ≤ 5 minutes |

TABLE 7

Mailing machines (1.11.2000 – 31.10.2002)

| Product speed in mail pieces per minute (mppm) | Sleep mode (W) | Default time to sleep mode |
|---|---|---|
| 0 < mppm ≤ 50 | ≤ 10 | ≤ 20 minutes |
| 50 < mppm ≤ 100 | ≤ 30 | ≤ 30 minutes |
| 100 < mppm ≤ 150 | ≤ 50 | ≤ 40 minutes |
| 150 < | ≤ 85 | ≤ 60 minutes |

TABLE 8: Tier 2

Standard size printers and printer/fax combinations * (1.11.2001 – 31.10.2002)
(designed to accommodate primarily A3, A4 or 8,5" x 11" sized paper)

| Product speed in pages per minute (ppm) | Sleep mode (W) | Default time to sleep mode |
|---|---|---|
| 0 < ppm ≤ 10 | ≤ 10 | ≤ 5 minutes |
| 10 < ppm ≤ 20 | ≤ 20 | ≤ 15 minutes |
| 20 < ppm ≤ 30 | ≤ 30 | ≤ 30 minutes |
| 30 < ppm ≤ 44 | ≤ 40 | ≤ 60 minutes |
| 44 < ppm | ≤ 75 | ≤ 60 minutes |

* Including monochrome electrophotography, monochrome thermal transfer, and monochrome and color ink jet.

TABLE 9: Tier 2

Impact printers designed to accommodate primarily A3 paper (1.11.2001 – 31.10.2002)

| Sleep mode (W) | Default time to sleep mode |
|---|---|
| ≤ 28 | ≤ 30 minutes |

TABLE 10: Tier 2

Large/wide-format printers (1.11.2001 – 31.10.2002)
(designed to accommodate primarily A2 or 17" x 22" or larger paper)

| Product speed in ages per minute (ppm) | Sleep mode (W) | Default time to sleep mode |
|---|---|---|
| 0 < ppm ≤ 10 | ≤ 35 | ≤ 30 minutes |
| 10 < ppm ≤ 40 | ≤ 65 | ≤ 30 minutes |
| 40 < ppm | ≤ 100 | ≤ 90 minutes |

TABLE 11: Tier 2

Color printers* (1.11.2001 – 31.10.2002)
(designed to accommodate primarily A3, A4 or 8,5" x 11" sized paper)

| Product speed in pages per minute (ppm) | Sleep mode (W) | Default time to sleep mode |
|---|---|---|
| 0 < ppm ≤ 10 | ≤ 35 | ≤ 30 minutes |
| 10 < ppm ≤ 20 | ≤ 45 | ≤ 60 minutes |
| 20 < ppm | ≤ 70 | ≤ 60 minutes |

* Including color electrophotography and color thermal transfer.

2. Exceptions and Clarifications: After shipping, the ENERGY STAR Program Participant or its designated service representative shall not alter the models covered by this Specification in any way that will affect the products' ability to meet the Specifications outlined above. Four exceptions follow.

   (a) Integrated computer systems: For a one-year period only, and for those products that incorporate an integrated computer, the power consumption of the integrated computer is not included when a product is qualified as ENERGY STAR-complaint. However, the manufacturer is required to explain to the end-user that the power consumption of the printer does not include the power consumption of the integrated computer (i.e. the power consumption of the computer is in addition to the power consumption of the printer – including when the printer is in the sleep mode). This exception is limited to those situations where the manufacturer integrates a 'stand-alone' computer and does not apply to printer controllers. (See footnote 4).

(b) Network functionality: For a one-year period only, an additional one-time 5 W allowance for network functionality will be permitted for those products in the first two speed bands (0 ppm 10 and 10 < ppm 20) of Table 2 and the first speed band (0 < ppm 10) of Table 5. This exception applies only to those products (in the abovementioned tables and speed segments) that are shipped 'network ready' (i.e. inclusive of network card or functionality 'out of the box'). For those products shipped as not 'network ready', the additional one-time 5 W allowance does not apply. (See footnote 5.)

(c) Default times: After shipping, the ENERGY STAR Program Participant, designated service representative or customer may change the default times for the sleep mode, up to a factory-set maximum of 240 minutes. If a manufacturer chooses to design products with more than one power management mode, then the combined total of the default times shall not exceed 240 minutes.

(d) Disabling the sleep mode: In an individual case where the sleep mode is causing a customer sizeable inconvenience due to his/her particular usage patterns, the Program Participant, designated service representative or customer may disable this sleep mode feature. If the Program Participant chooses to design its product models to allow the customer to disable the sleep mode feature, then the disable option shall be accessed in a manner different from the time settings (e.g. if a software menu provides sleep mode delay times of 15, 30, 60, 90, 120 and 240 minutes, then 'disable' or 'off' shall not be a choice in this menu. It shall be a hidden (or less obvious) choice or included in a different menu).

## IV. COPIER SPECIFICATIONS

### A. Definitions

1. Copier: A commercial reprographic imaging unit whose sole function is the production of duplicates from a graphic hard copy original. A copier must include a marking system, an imaging system and a paper handling module. All black and white plain paper copier technologies are covered under this Specification, though the intent is to focus on widely-used standard copier equipment such as light lens copiers. The Specifications outlined below apply to standard-sized copiers designed to handle A4 or 8,5" x 11" paper and large format copiers designed to handle A2 or 17" x 22" paper or larger.

   Copier speed: Copies per minute (cpm) measures the reproduction speed of the copier. One copy is defined as one 8,5" or 11" or A4-sized page. Double-sided copies are considered as two images and therefore two copies even though they are copied onto one piece of paper. For all copier models sold in the US market, measurement of copier speed shall be based on 8,5" x 11" letter-sized paper. For copiers sold in markets other than the US, copier speed shall be based on either 8,5" x 11" or A4-sized paper, depending on which is standard in a particular market.

   For large format copiers designed to handle primarily A2 or 17" x 22" paper or larger, the copier speed measured as A2 or A0-sized copies per minute shall be converted to A4-sized copier speeds as follows: (a) One A2 copy per minute is equivalent to four A4 copies per minute, and (b) One A0 copy per minute is equivalent to 16 A4 copies per minute.

Copiers qualified as ENERGY STAR shall be divided into five categories: low speed standard-sized copiers, medium speed standard-sized copiers, high speed standard-sized copiers, low speed large format copiers, and medium and high speed large format copiers.

A. Low speed standard-sized copiers: Copiers with an engine speed for producing multiple images of 20 copies per minute or less.

B. Medium speed standard-sized copiers: Copiers with an engine speed for producing multiple images of greater than 20 and less than or equal to 44 copies per minute.

C. High speed standard-sized copiers: Copiers with an engine speed for producing multiple images of greater than 44 copies per minute.

D. Low speed large format copiers: Copiers with an engine speed for producing multiple images of 40 copies per minute or less (expressed as A4-sized copies per minute).

E. Medium and high speed large format copiers: Copiers with an engine speed for producing multiple images of greater than 40 copies per minute (expressed as A4-sized copies per minute).

2. Base unit: For a given engine speed, the base unit is defined as the most basic version of a copier that is actually sold as a fully operational model. The base unit is typically designed and shipped in a single piece and does not include any external power-consuming accessories than may be sold separately.

3. Accessory: A piece of additional equipment that is not necessary for the standard operation of the base unit, but that may be added before or after shipping in order to enhance or change copier performance. An accessory may be sold separately under its own model number or sold with a base unit as part of a copier package or configuration. Examples of accessories include: sorters, large capacity paper feeders, etc. It is assumed that the addition of an accessory, irrespective of its own power consumption, will not substantially increase (more than 10 per cent) the off mode power consumption of the base unit. Any accessories shall not impede the normal operation of the auto-off and low-power features.

4. Copier model: For purposes of this Specification, a copier model is defined as a base unit and one or more specific accessories that are advertised and sold to consumers under a single model number. When advertised and sold to consumers without any additional accessories, a base unit is also considered a copier model.

5. Low-power mode: For purposes of this Specification, the low-power mode is the lowest power state the copier can automatically enter within some period of copier inactivity, without actually turning off. The copier enters this mode within a specified period of time after the last copy was made. For purposes of determining the power consumption in this low-power mode, the company may choose to measure the lowest of either the energy-saver mode or the standby mode.

6. Energy-saver mode: The condition that exists when the machine is not making copies, has previously reached operating conditions but is consuming less power than when the machine is in stand-by mode. When the copier is in this mode, there may be some delay before the copier will be capable of making the next copy.

7. Standby mode: The condition that exists when the machine is not making copies, has reached operating conditions and is ready to make a copy, but has not yet entered into energy-saver mode. When the copier is in this mode, there will be virtually no delay before the copier is capable of making the next copy.

8. Off-mode: For purposes of this Specification, the off-mode is defined as the condition that exists when the copier is connected to an appropriate electrical source, and has been recently shut off via the auto-off feature [6]. When measuring power in this mode, control equipment for remote servicing may be excluded.

9. Auto-off feature: For purposes of this Specification, the auto-off feature is defined as the ability for the copier to automatically shut itself off within a specified period of time after the last copy was made. The copier shall automatically enter its off mode after execution of this feature.

10. Plug-in mode: The condition that exists when the machine is connected to an appropriate electrical source and is not turned on. To turn the copier on, the user typically needs to manually restart the copier via the on/off switch.

11. Default times: The time period set by the Program Participant prior to shipping that determines when the copier will enter its various modes, i.e. the low-power mode, the off mode, etc. Both the off-mode default times and the low-power mode default times shall be measured from the time the last copy was made.

12. Recovery time: The amount of time needed to bring the copier from a low-power mode to the standby mode.

13. Automatic duplex mode: The mode in which the copier automatically places images on both sides of a copy sheet, by automatically sending both the copy sheet and the graphic original through the copier model. Examples of this are one-sided or two-sided copying, or two-sided to two-sided copying. For purposes of this Specification, a copier model is considered to have an automatic duplex mode only if the copier model includes all accessories needed to satisfy the above conditions, i.e. an automatic document feeder and accessories for automatic duplexing capabilities.

14. Weekly timer: An internal device that turns a copier on and off at predetermined times each business day. When programming a timer, the customer shall be able to distinguish between business days and weekends/holidays (i.e. a timer shall not turn on a copier on Saturday and Sunday mornings if employees are not normally in the office on weekends). The customer shall also have the ability to disable the timer. Weekly timers are optional features and therefore are not required on ENERGY STAR-compliant copiers. If included in copier models, weekly timers shall not conflict with the functioning of the low-power and auto-off features.

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[6] Section B.1 of this Specification contains maximum power consumption targets for the off-mode. It is expected that most companies which meet these off-mode power consumption targets by incorporating an auto-off feature in the copier. However, it is possible and allowable under this Specification for a manufacturer to utilize a low-power mode, rather than an auto-off feature if the low-power mode power consumption is equal to or less than the off-mode power consumption targets contained in this Specification. (See the Test Guidelines for more information on this issue).

B. Product Qualification for the ENERGY STAR Logo

1. Technical Specifications

To qualify for the ENERGY STAR logo, a copier shall meet the Specifications outlined below:

TABLE 12: Criteria for ENERGY STAR copiers

| Copier speed (copies per minute) | Low-power mode (W) | Low-power default time | Recover time 30 seconds | Off-mode (W) | Off-mode default time | Automatic duplex mode |
|---|---|---|---|---|---|---|
| 0 < cpm 20 | None | NA | NA | < 5 | 30 min | No |
| 20 < cpm 44 | 3,85 x cpm + 5 | 15 min | Yes | < 15 | 60 min | Optional |
| 44 < cpm | 3,85 x cpm + 5 | 15 min | Recommended | < 20 | 90 min | Optional |
| LARGE FORMAT COPIERS | | | | | | |
| 0 < cpm 40 | NA | NA | NA | < 10 | 30 min | No |
| 40 < cpm | 3,85 x cpm + 5 | 15 min | Recommended | 20 | 90 min | No |

Program Participant shall set the default times for the auto-feature to the levels specified in the table above. The default times for the off-mode and the low-power mode shall be measured from the time the last copy was made.

For all copier speeds where it is optional that the duplex mode be set as the default, if a model is shipped with automatic duplexing capabilities, then it is recommended that duplexing be set as the default mode. Program Participant may provide users with the ability to override this default duplex mode for single-sided copies.

2. Exceptions and Clarifications

After shipping, Program Participant or its designated service representative shall not alter the copier model in any way that will affect the copier's ability to meet the specifications outlined above. Certain exceptions are allowed in changing the default times, the-off mode specifications and the duplex mode. These exceptions are as follows:

(a) Default times: After shipping, the Program Participant, designated service representative or customer may change the default times for either the low-power mode and/or off-mode but only up to a Program Participant set maximum of 240 minutes (i.e. the combined total for off-mode and low-power mode default times shall not exceed 240 minutes).

(b) Off-mode power consumption: In some cases, Program Participant may need to ship a copier model with the anti-humidity device disconnected in order to meet off-mode power requirements. If this situation leads to sizeable inconvenience for a specific customer, Program Participant (or the designated service representative) may connect the anti-humidity device. If Program Participant determines that in a certain geographical area there are chronic reliability problems associated with high humidity levels, Program Participant may contact the EPA program manager

and discuss alternative solutions. Program Participants in the European Community Member States Territory may contact the European Commission. For example, EPA or the European Commission may allow Program Participant to connect the anti-humidity devices in copier models that are shipped to a very humid geographical area.

(c) Disabling the auto-off feature: In an individual case where the auto-off feature is causing a customer sizeable inconvenience due to his/her particular usage patterns, the Program Participant, designated service representative or customer may disable this auto-off feature. If Program Participant chooses to design its copier models to allow the customer to disable the auto-off feature, then the disable option shall be accessed in a manner different from the time settings (e.g. if a software menu provides off-mode delay times of 30, 60, 90, 120 and 240 minutes, then 'disable' or 'off' shall not be a choice in this menu. It shall be a hidden (or less obvious) choice or included in a different menu.

## V. SCANNER SPECIFICATIONS

### A. Definitions

1. Scanner: For purposes of this Specification, a scanner is defined as an electro-optical device for converting color or black-and-white information into electronic images that can be stored, edited, converted or transmitted primarily in a personal computing environment. Scanners defined as such are typically used for digitising hard-copy images. The intent of this Specification is to focus on widely-used desktop scanners (e.g. flatbed, sheet-fed and film scanners); however, high-end office document management scanners that meet the Specifications outlined below may qualify for the ENERGY STAR logo. This Specification is for stand-alone scanners; it does not cover mutifunction products with scanning capabilities, network scanners (i.e. scanners that connect exclusively to a network and are capable of managing the scanned information for transmissions to multiple locations on the network) or scanners that are not powered directly by the building power supply.

2. Base unit: The base unit is defined as the most basic version of a scanner that is actually sold as a fully operational model. The base unit is typically designed and shipped in a single piece, and does not include any external power-consuming accessories that may be sold separately.

3. Scanner model: For purposes of this Specification, a scanner model is defined as a base unit and one or more specific accessories that are advertised and sold to consumers under a single model number. When advertised and sold to consumers without any additional accessories, a base unit is also considered a scanner model.

4. Accessory: Any piece of additional equipment that is not necessary for the standard operation of the scanner, but that may be added in order to enhance or change scanner performance. An accessory may be sold separately under its own model number, or sold with a base unit as part of a scanner package or configuration. Examples of accessories include automatic document feeders (ADFs) and transparency adaptors.

5. Low-power mode: For purposes of this Specification, the low-power mode is the lowest power state the scanner is designed to enter after some period of inactivity, without actually turning off. The scanner enters this mode within a specified period of time after the last image was scanned.

6. Default time: The time period set by the Program Participant prior to shipping that determines when the scanner will enter the low-power mode. The low-power mode default time shall be measured from the time the last image was scanned.

B. Product Qualification for the ENERGY STAR Logo

1. Technical Specifications

Program Participant agrees to introduce one or more specific base units that meet the specifications outlined below.

TABLE 13: Criteria for ENERGY STAR scanners

| Low-power mode | Low-power mode default time |
|---|---|
| 12 W | 15 minutes |

## VI. MULTIFUNCTION DEVICE SPECIFICATIONS

### A. Definitions

1. Multifunction device: A multifunction device (MFD) is a physically integrated device or a combination of functionally integrated components (the 'base unit', see definition below) that produces hard copy duplicates from graphical hard copy originals (distinct from single sheet convenience copying, see next paragraph) as well as performing one or both of the following core functions: printing of documents (from digital information received from direct connect computers, networked computers, file servers and fax transmissions) or faxing (send and receive). An MFD may also include scanning to computer file or any other capabilities not listed in this Specification. The device may be connected to a network and may output black and white, gray scale, or color images. EPA anticipates that a separate Specification may ultimately be required to cover color devices, because of likely technological developments related to color imaging, but for now these devices are included in this Specification.

This Specification covers products that are marketed and sold as multifunction equipment whose primary function is copying but that are able to perform one or both of the additional core functions of printing or faxing. Devices whose primary function is faxing and offer limited sheet copying capabilities (so-called single sheet 'convenience copying') are covered under the printer/fax Specification.

If the MFD is not a single integrated unit but a set of functionally integrated components, then the manufacturer must certify that when installed correctly in the field the sum of all power use for all MFD components comprising the base unit will achieve the mower levels listed below to qualify as an ENERGY STAR-compliant MFD.

Some digital copiers can be upgraded into an MFD in the field with the installation of add-on devices that allow printing or faxing capabilities. Program Participants may consider this system of components to be an MFD, and may qualify it according to the Specifications in Tables 13 and 14. However, when the digital copier is sold independently of the add-on devices, the copier must qualify according to the upgradeable digital copier Specifications in Tables 15 and 16.

Some printers can be upgraded into an MFD in the field with the installation of add-on devices that allow copying (not just single sheet convenience copying) and may also allow faxing capabilities. Program Participants may consider this system of components to be an MFD, and may qualify it according to the MFD Specifications. However, when sold independently, the printer cannot be represented as an ENERGY STAR compliance device unless it meets the ENERGY STAR printer Specifications.

2. Image reproduction speed: Images per minute (ipm) measures the image reproduction speed specified in terms of monochrome text output per minute at the default resolution of the MFD. One image is defined as one 8,5" x 11" or A4-sized printed page of single-spaced monochrome text output, 12-point type, Times font, 1" (2,54 cm) margins on all sides of the page. Double-sided prints or copies count as two images even though they are printed on one piece of paper. If at a later date EPA creates a test procedure specifically designed to measure print speed, then that text procedure shall supersede the output speed specifications listed in this section.

   For all multifunction device models, engine speed shall be based on either 8,5" or 11" or A4-sized paper, depending on which is the standard in a particular market. If copier and print speeds are different, whichever speed is higher shall be used to determine to which speed category the device belongs.

   For large format multifunction device models designed to handle primary A2 or 17" x 22" paper or larger, the reproduction speed measured as A2 or A0-sized images per minute shall be converted into A4-sized image reproduction speeds, as follows:

   (a) one A2 image per minute is equivalent to 4 A4 images per minute;

   (b) one A0 image per minute is equivalent to 16 A4 images per minute.

   Multifunction Devices will be divided into the following categories:

   Personal multifunction devices: Multifunction devices with an engine speed for producing multiple images of 10 images per minute or less.

   Low speed multifunction devices: Multifunction devices with an engine speed for producing multiple images of greater than 10 and less than or equal to 20 images per minute.

   Medium speed multifunction devices: Multifunction devices with an engine speed for producing multiple images of greater than 20 and less than or equal to 44 images per minute.

Medium/high speed multifunction devices: Multifunction devices with an engine speed for producing multiple images of greater than 44 and less than or equal to 100 images per minute.

High speed multifunction devices [7]: Multifunction devices with an engine speed for producing multiple images of greater than 100 images per minute.

3. Base unit: For a given engine speed, the base unit is defined as the most basic version of a multifunction device that is actually sold as a fully operational model. The base unit can be designed and shipped as a single piece or as a combination of functionally integrated components. The base unit must allow copying and one or both of the additional core functions of printing or faxing. The base unit does not include any external power-consuming accessories that may be sold separately.

4. Accessories: A piece of additional equipment that is not necessary for the standard operation of the base unit but that may be added before or after shipping in order to enhance or change multifunction device performance. Examples of accessories include: sorters, large capacity paper feeders, paper finishing equipment, large paper supply devices, output paper organisers and key counters. An accessory may be sold separately under its own model number, or sold with a base unit as part of a multifunction device package or configuration. It is assumed that the addition of any accessories will not substantially increase (more than a total of 10 per cent for all accessories) the low-power or sleep mode power consumption of the base unit (irrespective of the power consumption of the accessories). Any accessories shall not impede the normal operation of the low-power and sleep mode features.

5. Multifunction device model: For purposes of this Specification, a multifunction device model is defined as a base unit and one or more specific accessories that are advertised and sold to consumers under a single model number. When advertised and sold to consumers without any additional accessories, a base unit is also considered a multifunction device model.

6. Standby mode: The condition that exits when the machine is not producing output, has reached operating conditions and is ready to make hard copy output, but has not yet entered into the low-power mode. When the multifunction device is in this mode, there will be virtually no delay before the multifunction device is capable of making the next hard copy output.

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[7] For a multifunction device where the above method would give an inaccurate result (because the device is not completely warmed up after the first warm-up cycle plus 15 minutes standby time), the following procedure (in line with ASTM Standard F757-94) may be used:

Turn on the MFD and allow the machine to warm up and stabilise in the ready mode (= standby mode) for two hours. During the first 105 minutes, prevent the MFD from entering the low power mode (e.g. by making one copy every 14 minutes during this period). Make the last copy at 105 minutes after the MFD was turned on. Then wait exactly 15 minutes. After 15 minutes has passed, read and record the watt-hour meter indication and the time (or start the stopwatch or timer). After 1 hour, read and record the watt-hour indication again. The difference between the two readings of the watt-hour meter is the low-power mode energy use; divide by 1 hour to obtain the average power rating.

7. Low-power mode: For purposes of this Specification, the low-power mode is the condition that exists when the multifunction device is not producing hard copy output and is consuming less power than when in a standby mode. When the multifunction device is in this mode there may be some delay in the production of hard copy output. In this mode there shall be no delay in the acceptance of information from fax or printing or scanning input sources. The multifunction device enters this mode within a specified period of time after the last hard copy output was made no matter what the input source. For products that meet the low-power mode power requirements in standby mode, no further power reductions are required to be compliant.

8. Sleep mode: For purposes of this Specification, the sleep mode is the lowest power state the multifunction device can automatically enter without actually turning off. In this mode both hard copy output and the acceptance of imaging information from some input ports may be delayed. The multifunction device enters the sleep mode within a specified period of time after the last hard copy output was made or after it has entered the low-power mode if a low-power mode is provided.

9. Default times: The time period set by the Program Participant prior to shipping that determines when the multifunction device will enter its various modes (i.e. the low-power mode, the sleep mode, etc. Both the sleep mode default times and the low-power mode default times shall be measured from the time the last hard copy output was made.)

10. Recovery time: The amount of time needed to bring the multifunction device from the low-power mode to the standby mode.

11. Automatic duplex mode: The mode in which the multifunction device automatically places images on both sides of a sheet by automatically sending both the sheet and the graphic original through the multifunction device. Examples of this are one-sided to two-sided copying, two-sided to two-side copying, or double-sided printing. For purposes of this Specification, a multifunction device model is considered to have an automatic duplex mode only if the multifunction device model includes all accessories needed to satisfy the above conditions (i.e. an automatic document feeder and accessories for automatic duplexing capabilities).

12. Weekly timer: An internal device that turns a multifunction device on and off at predetermined times each day. When programming a timer, the customer shall be able to distinguish between business days and weekends/holidays (i.e. a timer shall not turn on a copier on Saturday and Sunday mornings if employees are not normally in the office on weekends). The customer shall also have the ability to disable the timer. Weekly timers are optional features, and therefore are not required on ENERGY STAR-compliant MFDs. If included in multifunction device models, weekly timers shall not conflict with the function of the low-power and sleep mode features.

13. Upgradeable digital copier: A commercial reprographic imaging unit whose sole function is the production of duplicates from a graphic hard copy original using digital imaging technology, but that provides the option of being upgraded to offer multiple functions, such as printing or fax capabilities, through the installation of add-on devices. In order to be classified as an upgradeable digital copier under the MFD Specification, the upgrade options must be available on the market or intended for availability within one year after the base unit is launched. Digital copiers that are not designed for functional upgrades must qualify for the ENERGY STAR logo under the copier Specification.

B. Product qualification for the ENERGY STAR Logo

1. Technical Specifications

ENERGY STAR Program Participant agrees to introduce one or more specific multifunction device models that meet the Specifications outlined in the Tables below.

(a) Standard-sized multifunction devices: To qualify as ENERGY STAR-compliant, multifunction device models designed to handle primarily 8,5" x 11" or A4-sized paper shall meet the Specifications provided in Table 14. All device speeds shall be measured with respect to the number of 8,5" x 11" or A4-sized images that feed through per minute, as described in Section VI.A.2, above.

TABLE 14: Criteria for ENERGY STAR multifunction devices

| Multifunction device speed (images per minute) | Low-power mode (W) | Recovery time 30 seconds | Sleep mode (W) | Sleep mode default time | Automatic duplex mode |
|---|---|---|---|---|---|
| 0 < ipm ≤ 10 | NA | NA | ≤ 25 | ≤ 15 min | No |
| 10 < ipm ≤ 20 | NA | NA | ≤ 70 | ≤ 30 min | No |
| 20 < ipm ≤ 44 | 3,85 x ipm + 50 | Yes | ≤ 80 | ≤ 60 min | Optional |
| 44 < ipm ≤ 100 | 3,85 x ipm + 50 | Recommended | ≤ 95 | ≤ 90 min | Optional |
| 100 < ipm | 3,85 x ipm + 50 | Recommended | ≤ 105 | ≤ 120 min | Optional |

(b) Large format devices: To qualify as ENERGY STAR-compliant, large format multifunction device models designed to handle primarily A2 or 17" x 22" paper or larger shall meet the Specifications provided in Table 15. All large format device speeds shall be measured with respect to the number of A4-sized images that feed through per minute, as described in Section IV.A.2, above.

TABLE 15: Criteria for ENERGY STAR multifunction devices – LARGE FORMAT DEVICES

| Multifunction device speed (images per minute) | Low-power mode (W) | Recovery time 30 seconds | Sleep mode (W) | Sleep mode default time | Automatic duplex mode |
|---|---|---|---|---|---|
| 0 < ipm ≤ 40 | NA | NA | ≤ 70 | ≤ 30 min | No |
| 40 < ipm | 4,85 x ipm + 50 | Recommended | ≤ 105 | ≤ 90 min | No |

(c) Upgradable digital copiers: To qualify as ENERGY STAR-compliant under the multifunction device Specification, upgradeable digital copiers designed to handle primarily 8,5" x 11" or A-4 sized paper shall meet the specifications provided in Table 16. All device speeds shall be measured with respect to the number of 8,5" x 11" or A-4 sized images that feed through per minute, as described in Section IV.A.2, above.

TABLE 16: Criteria for ENERGY STAR multifunction devices — UPGRADEABLE DIGITAL COPIERS

| Upgradeable digital copier speed (images per minute) | Low-power mode (W) | Recovery time 30 seconds | Sleep mode [8] (W) | Sleep mode default time |
|---|---|---|---|---|
| 0 < ipm 10 | NA | NA | 5 | 15 min |
| 10 < ipm 20 | NA | NA | 5 | 30 min |
| 20 < ipm 44 | 3.85 x ipm + 5 | Yes | 15 | 60 min |
| 44 < ipm 100 | 3.85 x ipm + 5 | Recommended | 20 | 90 min |
| 100 < ipm | 3.85 x ipm + 5 | Recommended | 20 | 120 min |

Note that criteria for upgradeable digital copiers are identical to those of the copier Specification, Tier 2.

(d) Large format upgradeable digital copiers: To qualify as ENERGY STAR-compliant under the multifunction device Specification, upgradeable digital copiers designed to handle primarily A2 or 17" x 22" or larger sized paper shall meet the specifications provided in Table 17. All device speeds shall be measured with respect to the number A-4 sized images that feed through per minute, as described in Section VI.A.2 of the Specification.

TABLE 17**:** Criteria for ENERGY STAR multifunction devices — LARGE FORMAT UPGRADEABLE DIGITAL COPIERS

| Upgradeable digital copier speed (images per minute) | Low-power mode (W) | Recovery time 30 seconds | Sleep mode (W) | Sleep mode default time |
|---|---|---|---|---|
| 0 < ipm 40 | NA | NA | 65 | 30 min |
| 40 < ipm | 4,85 x ipm + 45 | NA | 100 | 90 min |

2 Additional requirements

In addition to the requirements shown in Tables 14 through 17, the following additional requirements must also be met.

(a) Default time for low-power mode: For MFDs and upgradeable digital copiers, Program Participant shall ship multifunction device models with the default time for the low-power mode set at 15 minutes. Program Participant shall set the default times for the sleep mode to the levels specified in Tables 14 through 17. The default times for the low-power mode and the sleep mode shall be measured from the time the last copy was made or the last page was printed.

(b) Recovery time from low-power mode: The actual recovery time from low-power mode shall be placed in product literature for those products that have a low-power mode.

[8] For MFDs that consist of functionally integrated, but physically separate units consisting of separate print, scan, and computer components, sleep mode Watts for the total system may be increased by an amount equal to the sleep mode Watts allowed for an ENERGY STAR computer.

(c) Weekly timers: Note that weekly timers may be incorporated, but shall not adversely affect or interfere with the normal operation of the low-power or sleep modes. It is EPA's intention that any added features complement the reduced power modes and not negate their effects.

(d) Auto-duplex features: Duplexing is not required to be the default setting for any multifunction devices. However, it is required to be offered as an option for all standard size multifunction devices faster than 20 ipm. Further, it is recommended that multifunction devices be shipped with automatic duplexing set as the default mode for copying and any other feasible functions and described to customers upon installation.

3. Exceptions and clarifications: After shipping, Program Participant or its designated service representative shall not alter the multifunction device model in any way that will affect the multifunction device's ability to meet the specifications outlined above. Certain exceptions are allowed in changing the default times and the duplex mode. These exceptions are as follows:

(a) Default times: After shipping, the Program Participant, designated service representative or customer may change the default times for either the low-power or sleep mode feature, but only up to a factory-set maximum of 240 minutes (i.e. the combined total of the default times shall not exceed 240 minutes).

(b) Anti-humidity devices: In some cases, Program Participant may need to ship a multifunction device model with the anti-humidity device disconnected in order to meet sleep mode power requirements. If this situation leads to sizeable inconvenience for a specific customer, Program Participant (or the designated service representative) may connect the anti-humidity device. If Program Participant determines that in a certain geographical area there are chronic reliability problems associated with high humidity levels, Program Participant may contact the EPA [9] program manager (as named in Attachment A) and discuss alternative solutions. For example, EPA may allow Program Participant to connect the anti-humidity devices in multifunction device models that are shipped to a very humid geographical area.

(c) Disabling the sleep mode: In an individual case where the sleep mode is causing a customer sizeable inconvenience due to his/her particular usage patterns, the Program Participant, designated service representative or customer may disable this sleep mode feature. If Program Participant chooses to design its multifunction device models to allow the customer to disable the sleep mode feature, then the disable option shall be accessed in a manner different from the time settings (e.g. if a software menu provides sleep mode delay times of 15, 30, 60, 90, 120, and 240 minutes, then 'disable' or 'off' shall not be a choice in this menu. It shall be a hidden (or less obvious) choice or included in a different menu).

[9] For products registered with the European Commission, Program Participants may contact the European Commission.

## VII. TEST GUIDELINES FOR ENERGY STAR OFFICE EQUIPMENT

1. Test conditions: Outlined below are the ambient test conditions which should be established when performing the power measurement. These are necessary in order to ensure that outside factors do not affect the test results, and that test results can be reproduced later.

   (a) Computers, monitors, printers/fax machines and scanners

   | | |
   |---|---|
   | Line impedance: | < 0.25 Ohm |
   | Total harmonic distortion: | < 5% |
   | (Voltage) | |
   | Input AC voltage: [10] | 115 VAC RMS +/- 5 V RMS |
   | Input AC frequency: [10] | 60 Hz +/- 3 Hz |
   | Ambient temperature: | 25 ºC +/- 3 ºC |

   (b) Copiers and multifunction devices

   | | |
   |---|---|
   | Line impedance: | < 0.25 Ohm |
   | Total harmonic distortion: | < 3% |
   | (Voltage) | |
   | Ambient temperature: | 21 ºC +/- 3 ºC |
   | Relative humidity: | 40 - 60% |
   | Distance from wall: | 2 ft. min. |

   Other market-specific criteria:

| Market | Paper size | Voltage/ frequency |
|---|---|---|
| United States | 8,5" x 11" | 115 V RMS +/- 5 V<br>60 Hz +/- 3Hz |
| Europe | A4 | 230 V RMS +/- 10 V<br>50 Hz +/- 3 Hz |
| Japan | A4 | 100 V RMS +/- 5 V<br>50 Hz +/- 3 Hz and 60 Hz +/- 3 Hz<br>200 V RMS +/- 10 V<br>50 Hz +/- 3 Hz and 60 Hz +/- 3 Hz |

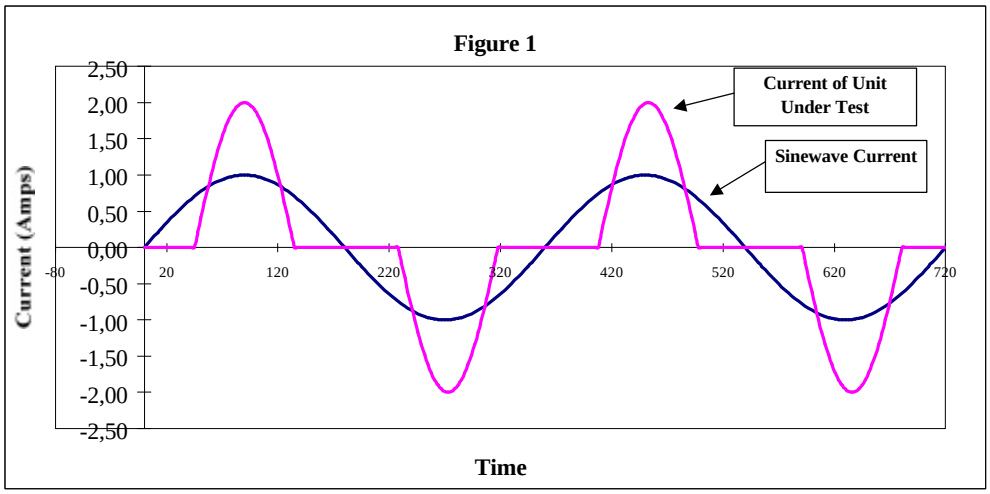
[10] If products will be sold in Europe or Asia, testing should also be performed at the appropriate machine-rated voltage and frequency. For example, products destined for European markets might be tested at 23O V and 50 Hz. The logo should not be displayed on products shipped to Europe or Asia if the equipment does not meet the power requirements of the Program at the local voltage and frequency conditions.

2. Testing equipment: The goal is to accurately measure the true power consumption [11] of the device or monitor. This necessitates the use of a true RMS watt-meter. There are many watt-meters to choose from, but manufacturers will need to exercise care in selecting an appropriate model. The following factors should be considered when purchasing a meter and setting up the actual test.

Crest factor

A previous version of the ENERGY STAR testing procedure included a requirement that manufacturers utilize a watt-meter with a crest factor greater than 8. As many Program Participants pointed out, this is not a useful or relevant requirement. The following paragraphs are meant to discuss the issues relating to crest factor and to clarify the intent of the initial incorrect statement. Unfortunately, in order to remedy the error, the ENERGY STAR program cannot provide a specific equipment requirement. Testing is as much art as it is science, and manufacturers and testers will have to exercise judgement and draw on people well versed in testing issues, to select an appropriate meter.

**Figure 1**




To begin, it is important to understand that devices which contain switching power supplies draw current in a waveform different from typical sinusoidal current [12]. Figure 1 shows the typical current waveform for a typical switched electronic device. While virtually any watt-meter can measure a standard current waveform, it is more difficult to select a watt-meter when irregular current waveforms are involved.

It is critical that the watt-meter selected be capable of reading the current drawn by the device without causing internal peak distortion (i.e. clipping off the top of the current

[11] True power is defined as (Volts)x(Amps)x(power factor) and is typically reported as Watts. Apparent power is defined as (Volts)x(Amps) and is usually expressed in terms of VA or Volt-amps. The power factor for equipment with switching power supplies is always less than 1.0, so true power is always less than apparent power.

[12] The crest factor for a sinusoidal 60 Hz current waveform is always 1,4. The crest factor for a current waveform associated with a PC or monitor containing a switching power supply will always be greater than 1,4 (though typically no higher than 8). The crest factor of a current waveform is defined as the ratio of the peak current (Amps) to the RMS current (Amps).

wave). This requires a review of the meter's crest factor [13], and of the current ranges available on the meter. Better meters will have higher crest factors and more choices of current ranges.

When preparing the test, the first step should be to determine the peak current (Amps) associated with the device being measured. This can be accomplished using an oscilloscope. Then a current range must be selected that will enable the meter to register the peak current. Specifically, the full scale value of the current range selected multiplied by the crest factor of the meter (for current) must be greater than the peak current reading from the oscilloscope. For example, if a watt-meter has a crest factor of 4, and the current range is set on 3 Amps, the meter can register current spikes of up to 12 Amps. If measured peak current is only 6 Amps, the meter would be satisfactory. The other concern to be aware of is that if the current range is set too high in order to register peak current, it may lose accuracy in measuring the non-peak current. Therefore, some delicate balancing is necessary. Again, with more current range choices and higher crest factors you will get better results.

Frequency response

Another issue to consider when selecting a watt-meter is the frequency response rating of the meter. Electronic equipment that contains switching power supplies causes harmonics (odd harmonics typically up to the 21st). These harmonics must be accounted for in power measurement or the wattage consumption will be inaccurate. Accordingly, the ENERGY STAR program recommends that manufacturers purchase watt-meters that have a frequency response of at least 3 kHz. This will account for harmonics up to the 50th and is recommended by IEC 555.

Resolution

Manufacturers will probably want a meter that can provide resolution of 0.1 W.

Accuracy

Another feature to consider is the resulting accuracy you will be able to achieve. Catalogues and specification sheets for watt-meters typically provide information on the accuracy of power readings that can be achieved at different range settings. If you are measuring a product that is very close to the maximum energy consumption for the mode being tested, you will need to set up a test that will provide greater accuracy.

Calibration

Watt-meters should be calibrated every year to maintain their accuracy.

3. Test Method: Manufacturers should measure the Average power consumption of the devices when in the off or low-power modes. This should be done by measuring the Energy consumption over a 1-hour period. The resulting energy consumption can be divided by 1 hour to calculate average Watts.

[13] The crest factor of a watt-meter is often provided for both current and voltage. For current it is the ratio of the peak current to the RMS current in a specific current range. When only one crest factor is given, it is usually for current. An average true RMS watt-meter has a crest factor in the range of 2:1 to 6:1.

Power Measurement for Energy Saving Modes: This test should be conducted for each of the energy saving modes (e.g, low-power, off, standby, sleep) applicable to a particular device for ENERGY STAR qualification. Prior to the start of this test, the machine should have been plugged in to a live power line but turned off and stabilised at room ambient conditions for at least 12 hours. An appropriate watt-hour meter should be in line with the machine, ready to give an accurate indication of machine energy consumption without disruption of the power source. This measurement may be done sequentially with the off-mode power measurement; the two tests together should take no more than 14 hours to perform, including the time required for the machine to be plugged in and turned off.

Turn on the device, and let it go through its warm-up cycle. After the default time to the energy saving mode has passed, read and record the watt-hour meter indication and the time (or start the stopwatch or timer). After 1 hour, read and record the watt-hour indication again. The difference between the two readings of the watt-hour meter is the low-power mode energy use; divide by 1 hour to obtain the average power rating.