



## ENERGY STAR® Program Requirements for Telephony

### Eligibility Criteria (Version 2.1)

Below is the ENERGY STAR (Version 2.1) telephony product specification. A product must meet all of the identified criteria if it is to be qualified as ENERGY STAR by its manufacturer.

- 1) **Definitions:** Below is a brief description of telephony products and their common operational modes as relevant to ENERGY STAR.
  - A. **Additional Handset:** A commercially available electronic product with a handset, charging base and battery, designed for use with Multi-Handset capable phone systems. To qualify, the charging base of the cordless phone or its power supply must be designed to plug into a wall outlet and there must not be a physical connection between the portable handset and the phone jack.
  - B. **Cordless Telephone:** A commercially available electronic product with a base station and a handset whose purpose is to convert sound into electrical impulses for transmission. Most of these devices require an external power supply for power, are plugged into an ac power outlet for 24 hours a day, and do not have a power switch to turn them off. To qualify, the base station of the cordless phone or its power supply must be designed to plug into a wall outlet and there must not be a physical connection between the portable handset and the phone jack.
  - C. **Answering Machine:** A commercially available electronic product—also known as a telephone answering device (TAD)—whose purpose is to provide analog or digital storage of outgoing and incoming telephone messages by connecting to the telephone line between the phone and the phone jack. Most of these devices require an external power supply for power and are plugged into an ac power outlet for 24 hours a day. To qualify, the answering machine or its power supply must be designed to plug into a wall outlet.
  - D. **Combination Cordless Telephone/Answering Machine:** A commercially available electronic product in which the cordless telephone and answering machine are combined into a single unit and which meets all of the following criteria: the answering machine is included in the base station of the cordless telephone; it is not possible to measure the power requirements of the two components separately without removal of the telephone casing; and the unit is connected to the wall outlet through a single power cable. Most of these devices require an external power supply for power, are plugged into an ac power outlet for 24 hours a day, and do not have a power switch to turn them off. To qualify, the combination unit or its power supply must be designed to plug into a wall outlet.
  - E. **Multi-Handset Model:** This cordless phone system requires only one base and phone jack and, as the name implies, can support multiple cordless handsets. Each handset added to the system comes with a battery and a charging base.
  - F. **Cellular Telephone:** A cellular telephone uses radio waves to connect to the cellular telephone carrier. Cellular telephones are not eligible to carry the ENERGY STAR mark under this specification as they are not considered cordless telephones.
  - G. **Corded Telephone:** Corded telephones provide the same services as cordless telephones except that there is a physical connection between the handset and the jack, which limits the user's mobility while using the telephone. Corded telephones may or may not require an external power supply for power. Corded telephones and combination units are not covered by this cordless telephone specification and may not qualify as ENERGY STAR.
  - H. **Spread Spectrum Technology (SST):** There are two types of spread spectrum technology, direct sequence (e.g., digital spread spectrum or DSS) and frequency hoppers. Both types are available in some digital telephony products to provide enhanced transmission range, extendable portable numbers, and additional security.

- I. **Standby Mode:** Lowest power consumption mode which cannot be switched off (influenced) by the user and that may persist for an indefinite time when an appliance is connected to the main electricity supply and used in accordance with the manufacturer’s instructions. Note: The standby mode is usually a non-operational mode when compared to the intended use of the appliance’s primary function.<sup>1</sup> For the purposes of this specification, standby mode is the condition in which the product is connected to a power source and is inactive (i.e., the unit is not transmitting a conversation or recharging a low battery); in TAD the product is idle. In this mode, conventional units may consume energy to operate circuitry and to overcharge rechargeable batteries.
- J. **Active Mode:** The product is connected to a power source and is transmitting telephone conversation, and/or playing/recording a message, and/or supplying current to a low battery to charge it. The power requirement in this mode is typically greater than the power requirement in Standby Mode.
- K. **Disconnect:** The product is disconnected from all external power sources.
- L. **External Power Supply (EPS):** A component contained in a separate physical enclosure external to the telephony product casing and designed to convert line voltage ac input from the mains to lower dc voltage(s) for the purpose of powering the telephony product. An external power supply must connect to the telephony product via a removable or hard-wired male/female electrical connection, cable, cord or other wiring. For an expanded definition of an External Power Supply, please see the latest ENERGY STAR EPS specification, which can be found at <http://www.energystar.gov/powersupplies>.
- 2) **Qualifying Products:** Telephony product types that are covered by this EPA specification are: analog and digital cordless telephones, multi-handset cordless telephones, answering machines, combination cordless telephones/answering machines, multi-handset combination cordless telephones/answering machines, and additional handsets using a variety of frequency ranges (e.g., 5.8 GHz, 2.4 GHz, 900 MHz, 46/49 MHz). Any cordless telephone, multi-handset cordless telephone, answering machine, combination cordless telephone/answering machine, multi-handset combination cordless telephones/answering machine, or additional handset that is marketed to the consumer in this way and meets the applicable product definition in Section 1 is eligible to earn the ENERGY STAR. Please note that mobile/cellular and corded telephones may not qualify for ENERGY STAR at this time.
- 3) **Energy-Efficiency Specifications for Qualifying Products:** Only those products listed in Section 2 that meet the criteria below, may qualify as ENERGY STAR.

A. **System-Level Efficiency Requirements**

**Table 1: Energy-Efficiency Criteria for ENERGY STAR Qualified Telephony Products**

Product Category*	Standby Mode Requirements
<ul style="list-style-type: none"> <li>• Additional Handset</li> </ul>	≤ 1 watt
<ul style="list-style-type: none"> <li>• Answering Machine</li> <li>• Cordless Telephone</li> <li>• Multi-Handset Cordless Telephone</li> </ul>	≤ 2 watts
<ul style="list-style-type: none"> <li>• Answering Machine with SST</li> <li>• Cordless Telephone with SST</li> <li>• Multi-Handset Cordless Telephone with SST</li> </ul>	≤ 2 watts
<ul style="list-style-type: none"> <li>• Combination Cordless Telephone/Answering Machine</li> <li>• Multi-Handset Combination Cordless Telephone/Answering Machine</li> </ul>	≤ 2.5 watts

<sup>1</sup> This definition is consistent with IEC 62301: Household Electrical Appliances – Measurement of Standby Power.

Product Category*	Standby Mode Requirements
<ul style="list-style-type: none"> <li>Combination Cordless Telephone/ Answering Machine with SST</li> <li>Multi-Handset Combination Cordless Telephone/Answering Machine with SST</li> </ul>	≤ 2.5 watts

**\*Note:** Any power consumed by the external power supply must be included when metering the unit for ENERGY STAR qualification.

- B. External Power Supply Efficiency Requirements: All telephony products designed for use with external power supplies must use external power supplies that meet or exceed the Active efficiency and power factor requirements (where applicable) of the Version 2.0 ENERGY STAR requirements for single voltage external ac-dc and ac-ac power supplies. External power supplies used in conjunction with telephony products do not need to meet the No-load requirement of 0.3 or 0.5 watts, depending on type of external power supply (ac-ac or ac-dc) and nameplate output power (unless otherwise required by federal standard). Please note: EPA is not requesting that telephony manufacturers test and submit data on external power supplies.

A list of ENERGY STAR qualified power supplies is featured on the ENERGY STAR Web site, for your reference. If the external power supply specification is revised over time (e.g., a Version 3.0 specification is developed), then similar modifications will be made to this Version 2.1 telephony specification within a reasonable time period. For more information on the external power supply program, visit the ENERGY STAR Web site at [www.energystar.gov/powersupplies](http://www.energystar.gov/powersupplies).

- 4) **Test Methodology:** The following test procedure should be followed to ensure consistency in measuring the system-level power requirements for electronics products. Outlined in Section A are the ambient test conditions that should be respected when performing power measurements. These conditions ensure that outside factors do not affect the test results and that the test results can be reproduced. Sections B and C describe the specifications for testing equipment and the test method, respectively.

A. Test Conditions:

<b>Supply Voltage:</b>	North America/Taiwan:	115 (± 1%) Volts AC, 60 Hz (± 1%)
	Europe/Australia/New Zealand:	230 (± 1%) Volts AC, 50 Hz (± 1%)
	Japan:	100 (± 1%) Volts AC, 50 Hz (± 1%)/60 Hz (± 1%)
		<i>Note:</i> For products rated for > 1.5 kW maximum power, the voltage range is ± 4%
<b>Total Harmonic Distortion (THD) (Voltage):</b>	< 2% THD (< 5% for products which are rated for > 1.5 kW maximum power)	
<b>Ambient Temperature:</b>	23°C ± 5°C	
<b>Relative Humidity:</b>	10 – 80%	

(Reference IEC 62301 Ed 1.0: Household Electrical Appliances – Measurement of Standby Power, Sections 4.2, 4.3)

*Terminations:* External speaker terminals terminated per 3.6.2.2 (IEC 107-1)

- B. Models Capable of Operating at Multiple Voltage/Frequency Combinations: Manufacturers shall test their products based on the market(s) in which the models will be sold and promoted as ENERGY STAR qualified. For products that are sold as ENERGY STAR in multiple international markets and therefore rated at multiple input voltages, the manufacturer must test at and report the required power consumption, energy performance, or efficiency values at all relevant voltage/frequency combinations. For example, a manufacturer that is shipping the same model to the United States and

Europe must measure, meet the specification, and report test values at both 115 volts, 60 Hz and 230 volts, 50 Hz in order to qualify the model as ENERGY STAR in both markets. If a model qualifies as ENERGY STAR at only one voltage/frequency combination (e.g., 115 volts, 60 Hz), then it may only be qualified and promoted as ENERGY STAR in those regions that support the tested voltage/frequency combination (e.g., North America and Taiwan).

C. Test Equipment: Manufacturers should measure and report the true standby power<sup>2</sup> requirements of the product. Doing so necessitates the use of a true power wattmeter. Because there are many wattmeters from which to choose, manufacturers need to exercise care in selecting an appropriate model. The following items should be considered when procuring equipment and performing the test:

1. Ac Power Source (with sufficient output current for the test unit such that it meets the requirement for ac line voltage, frequency stability, and THD).
2. True Power Meter (with sufficient accuracy, resolution, crest factor rating, and bandwidth).
3. Oscilloscope with Current Probe (to monitor ac line current waveform, amplitude, and frequency. Optional but recommended).
4. True RMS Voltmeter (to verify voltage at the input of test unit. Optional if ac source output is sufficiently accurate).
5. Frequency Counter (to verify frequency at the input of test unit. Optional if ac source output is sufficiently accurate).

*Crest Factor*: Electronics equipment may draw current that is not sinusoidal.<sup>3</sup> While virtually any wattmeter can measure a standard current waveform, it is more difficult to select a wattmeter when irregular current waveforms are involved.

It is critical that the wattmeter selected be capable of reading the current drawn by the product without causing internal peak distortion (i.e., clipping off the top of the current wave). This requires a review of the meter's crest factor rating and the current ranges available on the meter. Better quality meters will have higher crest factor specifications and more choices of current ranges.

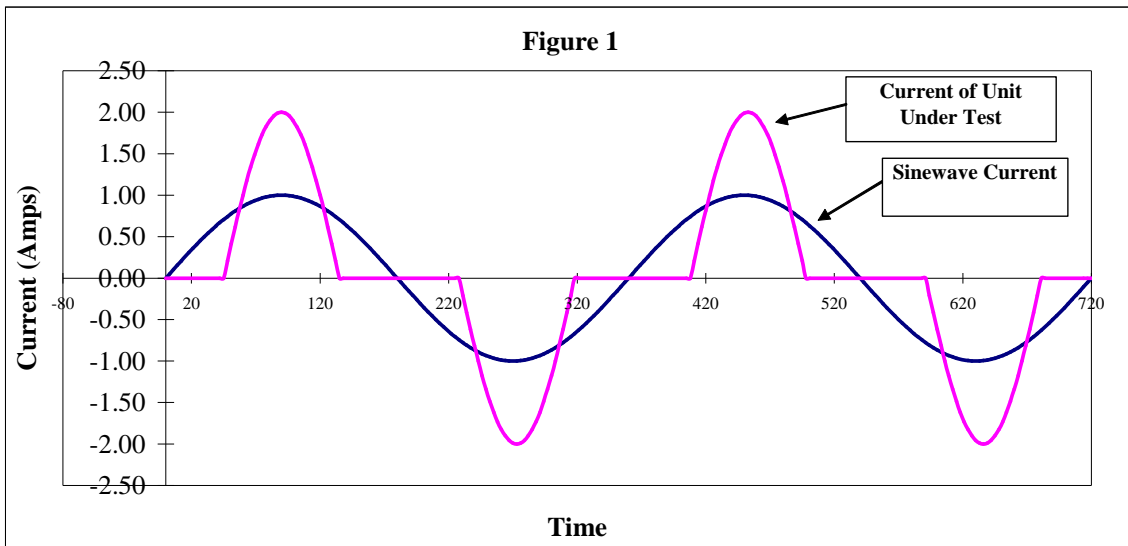
To determine the crest factor rating requirement of the meter and the proper current range settings, the peak current (amperes (A)) draw of the product under test in standby mode must first be measured. This can be accomplished using an oscilloscope with a current probe.

A current range on the meter must be selected that is sufficient to register the peak current. Specifically, the full-scale value of the selected current range multiplied by the crest factor of the meter (for current) must be at least 15 percent greater than the peak current reading from the oscilloscope to compensate for any measurement error. (Note: It is difficult to measure within 5 percent using an analog oscilloscope.) For example, if a wattmeter has a crest factor of 4 and the current range is set on 3 A, the meter can register current spikes of up to 12 A. If measured peak current is only 6 A, the meter would be satisfactory. If, however, the current range is set too high, the meter may lose accuracy in measuring non-peak current. Therefore, some delicate balancing is necessary. When choosing a meter, make sure that the crest factor is given for the current level that you desire.

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<sup>2</sup> True power is defined as (volts)x(amperes)x(power factor) and is typically reported as watts. Apparent power is defined as (volts)x(amperes) and is usually expressed in terms of VA or volt-amperes. The power factor for equipment with switching power supplies is always less than 1.0; therefore, true power is always less than apparent power.

<sup>3</sup> The crest factor of a current waveform is defined as the ratio of the peak current (amperes) to the rms current (amperes). The crest factor for a sinusoidal 60 Hz current waveform is always 1.4. The crest factor for a current waveform associated with a product containing a switching power supply will always be greater than 1.4 (though typically no higher than 8).



**Frequency Response:** Another issue to consider when selecting a wattmeter is the frequency response rating of the meter. Electronics equipment may cause harmonic waveforms that can lead to inaccuracies in the power measurements. For example, electronics equipment powered by switching power supplies typically produces odd harmonics up to the 21st. To ensure that the harmonics are properly addressed, ENERGY STAR recommends the use of a wattmeter with frequency response of at least 3 kHz. This will account for harmonics up to the 50th, which is recommended by IEC 555.

**Resolution:** Manufacturers should choose a wattmeter that can provide resolution of 0.1 watt or better.

**Accuracy:** Catalogues and specification sheets for wattmeters typically provide information on the accuracy of power readings that can be achieved at different range settings. If the power measurement is very close to the energy-efficiency guideline specified in these Program Requirements (Eligibility Criteria), a test procedure with greater accuracy will be necessary. For example, if the ENERGY STAR specification is 1.0 watt or less *and* the resulting accuracy of the wattmeter at the test settings is  $\pm 0.1$  watts, then a power measurement of less than 0.9 watts will ensure that the product qualifies for ENERGY STAR.

**Calibration:** To maintain their accuracy, wattmeters should be calibrated every year with a standard that is traceable to the US National Bureau of Standards (NBS).

- D. **Test Method:** The following are the steps to be used to measure the true power requirements of the product under test (PUT) in standby mode. To view the definition of true power, refer to Footnote 2 on page 6.
1. Power the PUT. When rechargeable batteries are involved, the PUT must be fully charged (allow up to 24 hours).
  2. Power on all test equipment and properly adjust operation range. Connect the test equipment and PUT.
  3. Check that the PUT is connected to an external phone jack before and during testing. This is done to ensure that the product is tested in a manner consistent with the way the consumer will use it.
  4. Check that the PUT has all settings equal to the factory default settings (i.e., unit must be in the condition shipped to the customer).

5. Verify that the PUT is in standby mode (not disconnect mode).
  6. Either verify that the wall outlet power is within specifications or adjust the ac power source output as described in Section A (e.g., 115 Vrms  $\pm$  3 Vrms, 60 Hz  $\pm$  3 Hz).
  7. Set the power meter current range. The selected full scale value multiplied by the crest factor rating ( $I_{\text{peak}}/I_{\text{rms}}$ ) of the meter must be greater than the peak current reading from the oscilloscope.
  8. After the PUT reaches operating temperature and the readings on the power meter stabilize, (times may vary depending on product) take the true power reading in watts from the power meter.
  9. Record the test conditions and test data. The measurement time shall be sufficiently long to measure the correct average value to within a +10% - 0% error, up to 24 hours but no less than 2 hours. If the device has different standby modes that can be manually selected, the measurement should be taken with the device in the most power consumptive mode. If the modes are cycled through automatically, the measurement time should be long enough to obtain a true average that includes all modes.
- 5) **Effective Date:** The date that manufacturers may begin to qualify products as ENERGY STAR, under the Version 2.1 specification, will be defined as the *effective date* of the agreement. The ENERGY STAR telephony (Version 2.1) specification shall go into effect on **November 1, 2008**.
- A. Qualifying and Labeling Products Under the Version 2.1 Specification: All products, including models originally qualified under Version 2.0, with a **date of manufacture** on or after **November 1, 2008** must meet the Version 2.1 requirements in order to bear the ENERGY STAR mark. The **date of manufacture** is specific to each unit and is the date (e.g., month and year) on which a unit is considered to be completely assembled.
- 6) **Future Specification Revisions:** EPA reserves the right to change the specification should technological and/or market changes affect its usefulness to consumers or industry or its impact on the environment. In keeping with current policy, revisions to the specification will be discussed with stakeholders. In the event of a specification revision, please note that ENERGY STAR qualification is not automatically granted for the life of a product model. To qualify as ENERGY STAR, a product model must meet the ENERGY STAR specification in effect on the model's date of manufacture. The date of manufacture is specific to each unit and is the date on which a unit is considered to be completely assembled.