



ENERGY STAR® Program Requirements Product Specification for Telephony

Test Method Rev. Sep-2011

1 OVERVIEW

The following test method shall be used for determining product compliance with requirements in the ENERGY STAR Eligibility Criteria for Telephony.

2 APPLICABILITY

ENERGY STAR test requirements are dependent upon the feature set of the product under evaluation. The following guidelines shall be used to determine the applicability of each section of this document:

- The test procedures in Sections 4 through 6 shall be performed on all products.
- The test procedures in Section 7 shall be performed on VoIP phones.
- The test procedures in Section 8 shall be performed on VoIP phones with computer connectivity.

3 DEFINITIONS

Unless otherwise specified, all terms used in this document are consistent with the definitions in the ENERGY STAR Eligibility Criteria for Telephony.

Note: For the purposes of initial discussion, the acronyms and definitions below have been included in the test method. Some of the definitions are based on those in the current eligibility criteria for telephony, while others are new and have been included to permit testing of VoIP phones. All definitions and acronyms shall eventually be moved to the eligibility criteria upon the start of Draft 1 development.

A) Acronyms:

- 1) Ac: Alternating Current
- 2) C: Celsius
- 3) CAT 5/6: Category 5 or 6 cable, the standard cables used for Ethernet connections
- 4) Dc: Direct Current
- 5) EPS: External Power Supply
- 6) Hz: Hertz
- 7) kHz: Kilohertz
- 8) IEC: International Electrotechnical Commission

- 27 9) IP: Internet Protocol
- 28 10) PoE: Power over Ethernet
- 29 11) PSE: Power Sourcing Equipment
- 30 12) SIP: Session Initiation Protocol
- 31 13) SST: Spread Spectrum Technology
- 32 14) UUT: Unit Under Test
- 33 15) V: Volts
- 34 16) VoIP: Voice over Internet Protocol
- 35 17) W: Watts

36 B) Product Types:

- 37 1) Telephone: A commercially available electronic product whose primary purpose is to transmit and
38 receive sound over a distance using a voice or data network. For the purposes of this
39 specification, Telephones include Voice over Internet Protocol, Analog, and Cellular telephones
40 as well as Answering Machines and Combination Units. Telephones may also be referred to as
41 phones.
- 42 2) Analog Telephone: A Telephone that converts sound into analog waveforms and connects to a
43 voice or data network through an RJ11 phone jack.
- 44 3) Cellular Telephone: A Telephone that uses radio waves to connect to a cellular telephone
45 network. This definition does not include VoIP or Analog Telephones
- 46 4) Internet Protocol (IP): The communications protocol used for the transmission of data packets
47 across multiple networks (e.g., the Internet) as defined by the Internet Engineering Task Force.
- 48 5) Voice over Internet Protocol (VoIP): The transmission of voice and other sound over a network
49 using the Internet Protocol where sound is converted into IP data packets right on the device for
50 transmission over a network that uses IP, whether a local network or the internet as a whole.
51 Devices using VoIP do not plug into a traditional phone jack, but connect to a network through an
52 access point, Ethernet or WiFi.
- 53 6) Voice over Internet Protocol (VoIP) Telephone: A Telephone that implements VoIP on board the
54 device. VoIP Telephones may be Corded or Cordless Telephones.
- 55 7) Cordless Telephone: A Telephone with a base station and a handset. The charging base of a
56 Cordless Telephone or its External Power Supply is designed to plug into a wall outlet, and there
57 is no physical connection between the portable handset and the phone jack.
- 58 8) Corded Telephone: A Telephone with a permanent physical connection between the handset and
59 the phone jack. This definition includes the combination of a corded telephone and answering
60 machine in a single unit.
- 61 9) Additional Handset: A commercially available electronic product with a handset, charging base
62 and battery, designed for use with multi-handset cordless telephones.

63 10) Answering Machine: A commercially available electronic product, also known as a telephone
64 answering device (TAD), whose purpose is to provide analog or digital storage of outgoing and
65 incoming telephone messages by connecting to the telephone line between a phone and phone
66 jack. An answering machine or its power supply is designed to plug into a wall outlet.

67 11) Combination Cordless Telephone/Answering Machine (Combination Unit): A commercially
68 available electronic product in which a cordless telephone and answering machine are combined
69 into a single unit, and which meets all of the following criteria:

- 70 a. The answering machine is included in the base station of the cordless telephone;
- 71 b. It is not possible to measure the power consumption of the two components separately
72 without removal of the telephone casing;
- 73 c. The combination unit is connected to a wall outlet through a single power cable or external
74 power supply; and
- 75 d. There is no physical connection between the portable handset and the phone jack.

76 12) Multi-Handset Technology: A cordless telephone or combination unit that can support multiple
77 additional handsets.

78 C) Operational Modes:

79 1) Partial On (Sleep) Mode: The mode that may persist for an indefinite time when a phone is
80 connected to a power source and is capable of receiving a call. The phone is not receiving or
81 transmitting a conversation or recharging a battery, and the handset is “on the hook”.

82 **Note:** This mode was formerly referred to as Standby Mode.

83 2) On Mode: Comprises the Idle and Operation Modes.

84 **Note:** This set of modes was formerly referred to as Active Mode.

85 a. Idle Mode: The mode in which the phone is connected to a power source and is “off the
86 hook”. Though not necessarily transmitting and receiving data, a dial tone should be
87 present.

88 b. Operation Mode: The mode in which the phone is connected to a power source and is
89 receiving and/or transmitting telephone conversation and/or playing/recording a
90 message.

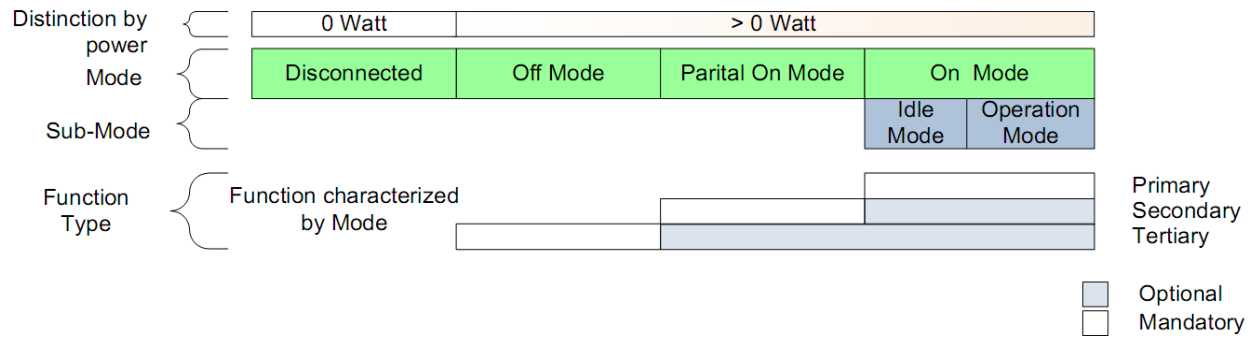
91 c. Charging Mode: The mode in which the phone is connected to a power source and is
92 recharging a battery.

93 3) Off Mode: The mode in which the phone is connected to a power source but is not performing any
94 Partial On or On Mode functions.

95 **Note:** The modes of operation have been re-named in accordance with the proposed IEC 62542:
96 Standardization of environmental aspects - Glossary of terms. This proposed standard seeks to unify
97 mode definitions for the increasing number of electronic products by developing a structure of generic
98 mode categories (On Mode, Partial On Mode, and Off mode) and function types (Primary, Secondary,
99 and Tertiary) that define them. The specific functions considered Primary or Secondary will vary by
100 product, and will have to be listed in a product-specific document, as has been done above.

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More generally, the IEC 62542 structure is illustrated below:



On Mode: Condition during which the equipment provides at least one primary function or can promptly provide a primary function. Sub Modes:

- **Operation Mode:** Form of active mode during which the equipment is performing at least one primary function.
- **Idle Mode:** Form of active mode during which the equipment can promptly provide a primary function but is not doing so.

Partial On Mode: Condition during which the equipment provides at least one secondary function but not a primary function.

Off Mode: Condition during which the equipment only provides tertiary function(s).

Disconnected Condition: Condition of the equipment during which all connections to power sources supplying the equipment are removed or interrupted and no functions depending on those power sources are provided.

Primary Function: Function providing the intended purpose.

Secondary Function: Function that enables, supplements or enhances a primary function.

Tertiary Function: Function other than a primary or a secondary function.

D) VoIP System Equipment:

- 1) Session Initiation Protocol (SIP): A signaling protocol widely used for controlling communications sessions, such as those created by VoIP systems.
- 2) Power over Ethernet (PoE): A system for powering devices over an Ethernet connection. Often the connection will simultaneously transmit data and power.
- 3) Router: An electronic device used to create a network and connect multiple networks together. The router can create a local network with devices connecting either through physical connection or wirelessly. The router can then connect this network to other networks (e.g., the Internet or a larger network).
- 4) Switch: An electronic device used to connect elements of a network. Generally, switches only support wired connections.
- 5) SIP Server: A server running the SIP.
- 6) Power Sourcing Equipment (PSE): An electronic device, such as a switch, that sources (supplies) the power on the Ethernet cable for PoE devices.

- 134 E) Additional Terms:
- 135 1) External Power Supply (EPS): A component contained in a separate physical enclosure external
- 136 to the telephony product casing and designed to convert line voltage ac input from the mains to
- 137 lower dc voltage(s) for the purpose of powering the telephony product. An External Power Supply
- 138 shall connect to the telephony product via a removable or hard-wired male/female electrical
- 139 connection, cable, cord or other wiring.
- 140 2) Spread Spectrum Technology (SST): A communication technique whereby the carrier frequency
- 141 of a signal is automatically and rapidly changed to provide enhanced transmission range,
- 142 extendable portable numbers, and additional security. This definition includes direct sequence
- 143 (e.g., digital spread spectrum or DSS) and frequency hopping.
- 144 3) Product Family: A group of product models that are (1) made by the same manufacturer, (2)
- 145 subject to the same ENERGY STAR qualification criteria, and (3) of a common basic design.
- 146 Product models within a family differ from each other according to one or more characteristics or
- 147 features that either (1) have no impact on product performance with regard to ENERGY STAR
- 148 qualification criteria, or (2) are specified herein as acceptable variations within a product family.
- 149 For Telephony, acceptable variations within a product family include:
- 150 i. Color, or
- 151 ii. Housing.
- 152 4) Unit Under Test (UUT): The specific sample of a representative model undergoing measurement
- 153 which includes the base product (the phone) and any accessories packaged with it.

154 **4 TEST SETUP**

- 155 A) Test Setup and Instrumentation: Test setup and instrumentation for all portions of this procedure shall
- 156 be in accordance with the requirements of IEC 62301, Ed. 2.0, "Household Electrical Appliances –
- 157 Measurement of Standby Power," Section 4, "General Conditions for Measurements", unless
- 158 otherwise noted in this document. In the event of conflicting requirements, the ENERGY STAR Test
- 159 Method shall take precedence.
- 160 B) Ac Input Power:
- 161 1) Products intended to be powered from ac mains shall be connected to a voltage source
- 162 appropriate for the intended market, as specified in Table 1
- 163 2) Products intended to be powered from dc through an EPS or PSE shall first be connected to an
- 164 EPS or PSE and then connected to a voltage source appropriate for the intended market, as
- 165 specified in Table 1.

Table 1 – Input Power Requirements

Market	Voltage	Voltage Tolerance	Maximum Total Harmonic Distortion	Frequency	Frequency Tolerance
North America, Taiwan	115 V ac	+/- 1.0 %	2.0 %	60 Hz	+/- 1.0 %
Europe, Australia, New Zealand	230 V ac	+/- 1.0 %	2.0 %	50 Hz	+/- 1.0 %
Japan	100 V ac	+/- 1.0 %	2.0 %	50 Hz/ 60 Hz	+/- 1.0 %

167 C) Ambient Temperature: Ambient temperature shall remain between 18° C to 28° C, inclusive, for the
168 duration of the test.

169 D) Relative Humidity: Relative humidity shall be from 10% to 80%.

170 E) Alternating Current (Ac) Power Meter: When measuring ac power, power meters shall possess the
171 following attributes:

172 1) Crest Factor:

173 i) An available current crest factor of 3 or more at its rated range value; and

174 ii) Lower bound on the current range of 10mA or less.

175 2) Minimum Frequency Response: 3.0 kHz

176 3) Minimum Resolution:

177 i) 0.01 W for measurement values less than 10 W;

178 ii) 0.1 W for measurement values from 10 W to 100 W; and

179 iii) 1.0 W for measurement values greater than 100 W.

180 F) PoE Power Meter: When measuring PoE power, power meters shall be capable of measuring Power
181 over Ethernet connections directly from the Category 5 or 6 cable (CAT5/6 cable), regardless of the
182 PoE method used (i.e., Mode A, Mode B, or Gigabit PoE). PoE Power Meters may be technician tools
183 and are not required to record data.

184 G) Measurement Accuracy:

185 1) Power measurements with a value greater than or equal to 0.5 W shall be made with an
186 uncertainty of less than or equal to 5% at the 95% confidence level.

187 2) Power measurements with a value of less than 0.5 W shall be made with an uncertainty of less
188 than or equal to 0.1 W at the 95% confidence level.

189 **Note:** Per initial investigation, PoE Power Meters available on the market for measuring PoE tend to have
190 lower resolution and, potentially, lower accuracy than Ac Power Meter counterparts. Stakeholders are
191 encouraged to comment on the use and availability of PoE Power Meters for measuring power directly
192 over an Ethernet cable.

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Additionally, stakeholders are encouraged to comment on the feasibility of using power injectors to measure power consumption given the inherent issues (reduced efficiency, increased test burden, etc.) in measuring the dc line current inline between the UUT and the PoE power source.

196 5 TEST CONDUCT

197 5.1 General Test Conduct

198 A) As-shipped Condition: The UUT shall be in new condition, and shall be tested in its “as-shipped”
199 condition.

200 B) Battery-powered Products: If the UUT contains rechargeable batteries, or can be integrated with
201 another device that contains rechargeable batteries, all batteries shall be fully charged prior to the
202 start of testing and shall remain in place for the duration of testing.

203 C) Measurement Location: All power measurements shall be taken at a point between the ac power
204 source and the UUT.

205 D) VoIP Server: Any standard configuration and/or equipment for creating a VoIP backend system is
206 permitted. The only requirement is that the UUT have a dial tone and be capable of receiving and
207 making a phone call from within the local VoIP server to within the local VoIP server. A valid VoIP
208 route to outside the local VoIP server is not required.

209 E) Allow five (5) minutes for power levels to stabilize after plugging all necessary connections into the
210 UUT, including power and network, before performing the first test.

211 **Note**: Are there any undesired consequences which might arise from allowing such a broad range of
212 VoIP systems? Would more specific requirements limit the ability to test the phone itself or place undue
213 burdens on test houses? Stakeholders are encouraged to comment on the infrastructure requirements
214 laid out in this test procedure.

215 5.2 Power Measurement Method

216 The method used for measuring and recording power will vary depending on the UUT’s capabilities. If the
217 UUT supports PoE functionality, measure according to the *PoE Measurement Method*. If the UUT lacks
218 PoE functionality, measure according to the *Ac Power Measurement Method*.

219 A) PoE Measurement Method: The method given below shall be used for all PoE power measurements.

220 **Note**: The *PoE Measurement Method* is derived from the “direct meter reading method” described in
221 *International Electrotechnical Commission (IEC) 62301 Ed. 2.0* section 5.3.4. While the scope of *IEC*
222 *62301* includes only ac power measurements of certain, standard voltage levels, the direct meter reading
223 method is suitable for this direct current (dc) application.

224 1) For 1 minute following the first reading, take an additional power measurement reading at
225 10 second intervals. This will result in seven readings.

226 2) If the difference in power between any of the seven readings and their average is less than 10%
227 of the average (arithmetic mean) value, report the average.

228 3) If the above criterion is not met, and the difference in power between any of the seven readings
229 and their average is greater than or equal to 10% of the average value, additional measurements

230 shall be taken. Continue to take measurements 10 seconds apart, until seven consecutive
231 measurements meet the criterion. The result is the average of the seven consecutive values that
232 meet the condition.

233 B) Ac Power Measurement Method: The method given below shall be used for all ac power
234 measurements.

235 1) Set the meter to begin accumulating true power values at a frequency greater than or equal to
236 one (1) reading per second. Accumulate power values for 1 minute and record the average value
237 (arithmetic mean) of power observed during that 1 minute period.

238 6 TEST PROCEDURES FOR ALL PRODUCTS

239 6.1 Unit Under Test (UUT) Preparation

240 1) Set up the UUT in accordance with its instructions for use, except where these conflict with the
241 requirements of the ENERGY STAR Product Specification. If no instructions for use are available,
242 then factory or “default” settings shall be used.

243 2) Power Meter Setup:

244 a. If the UUT supports PoE functionality, connect the UUT to the PoE power meter and connect
245 the PoE power meter to a PoE port on a suitable switch. A suitable switch is defined as a
246 switch that:

247 i. Supports all modes of PoE that the phone can support.

248 ii. Supports the maximum network speed of the UUT’s network connection

249 **Note:** What qualifies a “suitable switch” will be further clarified by stakeholder input and further testing
250 and verification.

251 b. If the UUT does not support PoE functionality, set up the UUT in its standard configuration,
252 utilizing any included EPSs, if applicable. Connect an approved power meter to an ac line set
253 to the appropriate voltage and frequency as specified in Section 4.B). Plug the UUT into the
254 measurement outlet on the power meter. No power strips or UPS units shall be connected
255 between the UUT and the meter. Connect the UUT to a suitable switch/router or an external
256 phone jack if it has a phone line connection. In the case that a working phone line is not
257 available, a ringdown simulator may be used as a replacement. If the UUT is a cordless VoIP
258 Telephone, ensure that a wireless connection is established between the UUT and the SIP
259 Server.

260 3) VoIP Telephones:

261 a. Set up the switch according to manufacturer instructions and connect it to the SIP server.

262 b. Configure the SIP server and UUT to prepare the phone for making and receiving calls locally
263 to the SIP server and the VoIP system the SIP server implements.

264 4) Verify that there is a dial tone.

265 5) On a phone with no handset, the speaker shall be used. The volume should be such that the dial
266 tone is barely audible to the tester’s ear to limit the impact of the speaker on testing conditions.

267 6) Measure and record the ac input voltage and frequency.

268 7) Measure and record the test room ambient temperature.

269 **6.2 Measuring Partial On Mode Power**

270 1) Ensure the UUT's handset is in the "on hook" position and that the speakerphone is not activated.

271 2) Measure and record power according to the applicable method in Section 5.2.

272 **7 TEST PROCEDURES FOR VOIP PHONES**

273 **7.1 Measuring Idle Mode Power**

274 1) Ensure the UUT's handset is in the "off hook" position. Unless there is no handset, do not use the
275 speakerphone function for this test. Verify that there is a dial tone.

276 2) Measure and record power according to the applicable method in Section 5.2.

277 **Note:** The dial tone may not last the duration of this test. Would an active mode test (measuring the
278 energy consumption during a representative conversation) be more suitable? Would an active mode test
279 be stable enough for the direct meter reading method?

280 **8 TEST PROCEDURES FOR VOIP PHONES WITH COMPUTER** 281 **CONNECTIVITY**

282 **8.1 Measuring Computer Connectivity**

283 1) Ensure the UUT's handset is in the "on hook" position.

284 2) Connect a personal computer to the switch port of the UUT, if available. Ensure that the computer
285 is on and that this is the computer's only network connection. Ensure that the computer
286 recognizes this connection.

287 3) Measure and record power according to the applicable method in Section 5.2.