Notebooks, Mobile Thin Clients, Two-in-One Notebooks, and Portable All-in-One Computers

Appliance Efficiency Standards and Certification Overview

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October 18, 2018
California Energy Commission, Appliances Office
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TOPICS COVERED

1. Definitions – Title 20 § 1602
2. Test Method – Title 20 § 1604
3. Performance Standards – Title 20 § 1605.3
4. Marking Requirements – Title 20 § 1607
5. Certification Process Demo
DEFINITIONS
DEFINITIONS

- Notebook computer
- Mobile thin client
- Two-in-one notebook
- Portable all-in-one
Notebook computer means a computer designed specifically for portability and to be operated for extended periods both with and without a direct connection to an AC mains power source. A notebook computer is sold with an integrated display and a physical keyboard.
DEFINITIONS

“Mobile thin client” means a notebook computer that relies on a connection to remote computing resources, such as a computer server or a remote workstation, to obtain primary functionality, and does not have integral rotational storage media.

“Two-in-one notebook” means a notebook computer which has a clam shell form factor, but has a detachable keyboard. The keyboard and display portions of the product must be shipped as an integrated unit.
DEFINITIONS

“Portable all-in-one” means a computer designed for limited portability that meets all of the following criteria:

(1) Includes an integrated display with a diagonal size greater than or equal to 17.4 inches;

(2) Does not have a keyboard integrated into the physical housing of the product in its as-shipped configuration;

(3) Includes and primarily relies on touch-screen input, with optional keyboard;

(4) Includes the capacity to connect to a wireless network; and

(5) Includes an internal battery that can power the computer's primary functions.
DEFINITIONS

ADDER or Add-in Card

“Add-in card” means a removable device that can be installed in a computer peripheral component interconnect (PCI) or other slot. Add-in card does not include hard-disks, system memory, removable devices that are intended to operate outside of a computer chassis, or other components that are listed in Table V-8. It also does not include cards, such as riser cards, that split or physically extend a motherboard slot.
“Limited capability operating system” means an operating system that performs basic operations and that meets all of the following criteria:

1. Does not have automatic power management features;
2. Does not support USB devices;
3. Does not have GUI; and
4. Does not support multiple user profiles or distinguish between users.
Manufacturers with total annual gross revenue of $2 million or less who assemble and sell the computers at the same location and has certified themselves as a small volume manufacturer to the Energy Commission under Title 20 Section 1606(k).
Entities seeking to be designated as a “small volume manufacturer” shall certify and retain records to demonstrate the following information:

- Gross revenues from the 12-month period preceding the certification, from all of the entity’s operations, including operations of any other person or business entity that controls, is controlled by, or is under common control of the entity, is $2,000,000 or less; and

- The manufacturer assembles and sells the computers at the same location.

If a small volume manufacturer no longer meets any one of the requirements to be a small volume manufacturer, the entity shall file to remove itself from the database as a small volume manufacturer within 90 calendar days.
A “Basic model” of a computer means a group of computer models that are made by a single manufacturer and that have the same chassis, power supply, motherboard, and expandability score. The chassis shall be considered the same if the energy use characteristics are not modified by variations in the chassis, such as a change in color.
Q. Tablets that are sold with or without keyboard cover: Is a tablet that is packaged with a keyboard considered a notebook for the purpose of complying with the Title-20 Computer regulations? Would it need to be registered?

A. For this computer, if the keyboard is not integrated or physically attached to the tablet when sold, it is considered a tablet and is not in the scope of computer regulations. Tablets are not in the scope of T-20 regulations and don’t need to be registered.
TEST METHOD
The **test method** for computers is the *ENERGY STAR Program Requirements for Computers, Final Test Method (Rev. March-2016)*, with the following modifications:

Settings regarding hard-disk spinning shall not be altered from the default as-shipped settings.
The total annual energy consumption of a computer shall be calculated using Equation 1 in Section 3 of the ENERGY STAR Program Requirements for Computers, Eligibility Criteria Version 6.1 (Rev. March-2016). Equation 1:

\[
E_{TEC} = \frac{8760}{1000} \times (P_{OFF} \times T_{OFF} + P_{SLEEP} \times T_{SLEEP} + P_{LONG\_IDLE} \times T_{LONG\_IDLE} + P_{SHORT\_IDLE} \times T_{SHORT\_IDLE})
\]

Where:
- \( P_{OFF} \) = Measured power consumption in Off Mode (W);
- \( P_{SLEEP} \) = Measured power consumption in Sleep Mode (W);
- \( P_{LONG\_IDLE} \) = Measured power consumption in Long Idle Mode (W);
- \( P_{SHORT\_IDLE} \) = Measured power consumption in Short Idle Mode (W); and
- \( T_{OFF}, T_{SLEEP}, T_{LONG\_IDLE}, \text{ and } T_{SHORT\_IDLE} \) are mode weightings as specified in Table 3 (for Desktops, Integrated Desktops, and Thin Clients) or Table 4 (for Notebooks).
Notebook computers, mobile workstations, portable all-in-one computers manufactured before July 1, 2021 shall use the “conventional” mode weighting of Table 4, contained within Section 3 of the ENERGY STAR Program Requirements for Computers, Final Test Method (Rev. March-2016), unless they meet the criteria to use “full capability” or “remote wake” mode weightings.

### Table 4: Mode Weightings for Notebook Computers

<table>
<thead>
<tr>
<th>Mode Weighting</th>
<th>Conventional</th>
<th>Base Capability</th>
<th>Remote Wake</th>
<th>Service Discovery / Name Services</th>
<th>Full Capability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>T&lt;sub&gt;OFF&lt;/sub&gt;</strong></td>
<td>25%</td>
<td>25%</td>
<td>25%</td>
<td>25%</td>
<td>25%</td>
</tr>
<tr>
<td><strong>T&lt;sub&gt;SLEEP&lt;/sub&gt;</strong></td>
<td>35%</td>
<td>39%</td>
<td>41%</td>
<td>43%</td>
<td>45%</td>
</tr>
<tr>
<td><strong>T&lt;sub&gt;LONG_IDLE&lt;/sub&gt;</strong></td>
<td>10%</td>
<td>8%</td>
<td>7%</td>
<td>6%</td>
<td>5%</td>
</tr>
<tr>
<td><strong>T&lt;sub&gt;SHORT_IDLE&lt;/sub&gt;</strong></td>
<td>30%</td>
<td>28%</td>
<td>27%</td>
<td>26%</td>
<td>25%</td>
</tr>
</tbody>
</table>
In order to use the “full capability” mode weighting a computer shall have the following features enabled as shipped:

a. Maintain Ethernet (IEEE 802.3-2015) or wireless (IEEE 802.11-2012) network addresses and network connection capability while in ACPI System Level S3 Sleep Mode or an alternative to ACPI S3 sleep mode;

b. Resume from ACPI System Level S3 Sleep Mode or an alternative to ACPI S3 sleep mode upon request from outside the local network;

and

c. Support advertising host services and network name while in ACPI System Level S3 Sleep Mode or an alternative to ACPI S3 sleep mode.
In order to use the “remote wake” mode weighting a computer shall have the following features enabled as shipped:

a. Maintain Ethernet (*IEEE 802.3-2015*) or wireless (*IEEE 802.11-2012*) network addresses and network connection capability while in ACPI System Level S3 Sleep Mode or an alternative to ACPI S3 sleep mode; and

b. Resume from ACPI System Level S3 Sleep Mode or an alternative to ACPI S3 sleep mode upon request from outside the local network.

Computers **manufactured on or after July 1, 2021**, shall use the “conventional” mode weighting of Table 4 for a notebook computer, a mobile workstation, or a portable all-in-one computer, contained within Section 3 of the *ENERGY STAR Program Requirements for Computers, Eligibility Criteria Version 6.1 (Rev. March-2016).*
The **power factor** of a computer power supply and compliance with the internal power supply requirements shall both be determined by the following test procedure:

*Generalized Test Protocol for Calculating the Energy Efficiency of Internal Ac-Dc and Dc-Dc Power Supplies Revision 6.7 (March 1, 2014).*

In addition, the median **power factor** during short-idle measurements **shall be recorded** in the test report.
The **computer sleep mode power measurement** shall be tested in a modified manner from the test procedure described in *IEC 62623:2012*.

Instead of measuring power after manually entering sleep mode, the power measurement shall begin **no sooner than 30 minutes and no later than 31 minutes of user inactivity** on the unit under test.

This measurement shall be performed after the long-idle test without altering the unit under test.
A notebook computer shall be tested using the integrated display's native resolution.

For purposes of providing data as required in Title 20 section 1606, notebook computers and portable all-in-ones shall be tested by selecting the configuration that has the greatest allowable energy consumption as provided for in Section 1605.3(v)(5).

If multiple configurations exist that meet this criteria, select the configuration that will yield the greatest annual energy consumption as measured by the test procedure.
Questions?
PERFORMANCE STANDARDS

• Power Management Requirements
• Energy Consumption Limits
• Adders for Special Features
Notebook computers, mobile thin clients, and portable all-in-ones manufactured on or after January 1, 2019, shall:

(A) Comply with Title 20 section 1605.3(v) **Table V-7**; and

(B) Be shipped with power management settings that **do both** of the following:

1. Transition the computer into either the **computer sleep mode** or **computer off mode** measured in Section 1604(v)(5) within 30 minutes of user inactivity. If the transition is to a computer sleep mode, that sleep mode shall either:
   a. Be a computer sleep mode as described in ACPI as S3; or
   b. Consume power less than or equal to the values shown in **Table V-6** (next slide).

2. Transition connected displays into sleep mode within 15 minutes of user inactivity.
## Table V-6

**Alternative Computer Sleep Mode Power Limits**

<table>
<thead>
<tr>
<th>Computer Type</th>
<th>Maximum Power Consumption (watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notebook Computers, Portable</td>
<td>2.5 + 0.03 * C where C is the system memory capacity in gigabytes minus 16 gigabytes. If C is less</td>
</tr>
<tr>
<td>All-In-Ones</td>
<td>than zero, use zero for the value of C. If a discrete GPU is present in the system, the maximum</td>
</tr>
<tr>
<td></td>
<td>power consumption limit shall be increased by an additional 2 watts.</td>
</tr>
</tbody>
</table>
If the model is shipped at the purchaser's request with either a limited capability operating system or without an operating system, or if the model is not capable of having an operating system, the model is not required to comply with the power management standard.
Title 20 section 1605.3(v) Table V-7
Energy Consumption Standards

<table>
<thead>
<tr>
<th>Computer Type</th>
<th>For models manufactured on or after January 1, 2019, the measured value shall be less than or equal to the values below.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notebook computers and portable all-in-ones</td>
<td>30 kWh/yr + applicable adders in Table V-8</td>
</tr>
<tr>
<td>Minimum power factor of a computer power supply that is not a federally-regulated external power supply.</td>
<td>0.9 measured at full load</td>
</tr>
</tbody>
</table>
## ADDERS

### Table V-8
List of Potentially Applicable Adders

<table>
<thead>
<tr>
<th>Function</th>
<th>Notebook Computers and Portable all-in-one Adder (kWh/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Memory</td>
<td>4 + 0.15 * C where C is the capacity in GB.</td>
</tr>
<tr>
<td>Energy-Efficient Ethernet</td>
<td>0.9 per computer</td>
</tr>
<tr>
<td>Storage device other than main storage device</td>
<td>2.6 per storage device</td>
</tr>
</tbody>
</table>
### Table V-8
List of Potentially Applicable Adders cont’d.

<table>
<thead>
<tr>
<th>Function</th>
<th>Notebook Computers and Portable All-In-One Adder (kWh/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrated Display</td>
<td>8.76<em>0.3</em>(1+EP)<em>[(0.43</em>r)+(0.0263*A)]</td>
</tr>
</tbody>
</table>

Where:
- “d” is the diagonal measurement of the display in inches.
- “r” is the megapixel resolution of the display.
- “A” is the viewable screen area in square inches.
- EP = 0 for displays that are not enhanced performance displays.

r=6 for resolutions greater than 6 megapixels.
EP=0.4 for displays with a color gamut support of 38.4% of CIELUV or greater (99% or more of defined Adobe RGB colors).
### ADDERS

#### Table V-8
List of Potentially Applicable Adders cont’d.

<table>
<thead>
<tr>
<th>Function</th>
<th>Notebook Computers and Portable All-In-One Adder (kWh/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Discrete GPU that is not packaged on the same substrate as the CPU (on or after January 1, 2019 and before July 1, 2021) Where “B” is frame buffer bandwidth measured in GB/s</td>
<td>$29.3 \times \text{tanh}(0.0038 \times B - 0.137) + 13.4$</td>
</tr>
<tr>
<td>First Discrete GPU that is not packaged on the same substrate as the CPU (on or after July 1, 2021) Where “B” is frame buffer bandwidth measured in GB/s</td>
<td>$14.7 \times \text{tanh}(0.008 \times B - 0.03) + 5.5 + (0.0055 \times B)$</td>
</tr>
<tr>
<td>First Discrete GPU that is packaged on the same substrate as the CPU (on or after January 1, 2019) Where “B” is frame buffer bandwidth measured in GB/s</td>
<td>$14.7 \times \text{tanh}(0.008 \times B - 0.03) + 5.5 + (0.0055 \times B)$</td>
</tr>
<tr>
<td>Additional Discrete GPU</td>
<td>5.5 per GPU</td>
</tr>
</tbody>
</table>
### Table V-8
List of Potentially Applicable Adders cont’d.

<table>
<thead>
<tr>
<th>Function</th>
<th>Notebook Computers and Portable All-In-One Adder (kWh/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Add-in Cards</strong></td>
<td></td>
</tr>
<tr>
<td>This adder does not apply if either of the following criteria is met:</td>
<td></td>
</tr>
<tr>
<td>1) An adder is claimed for a device connected through this add-in card;</td>
<td></td>
</tr>
<tr>
<td>or</td>
<td></td>
</tr>
<tr>
<td>2) An interface score from Table V-1 applies to a slot or interface</td>
<td></td>
</tr>
<tr>
<td>provided by this add-in card.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 per card</td>
</tr>
<tr>
<td><strong>Video Surveillance Card</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12.5 per card</td>
</tr>
<tr>
<td><strong>Wired Ethernet or Fiber Card with a transmit rate of 10 Gb/s or greater</strong></td>
<td>12.5 per card</td>
</tr>
</tbody>
</table>
### Table V-8
List of Potentially Applicable Adders cont’d.

<table>
<thead>
<tr>
<th>Function</th>
<th>Notebook Computers and Portable All-In-One Adder (kWh/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High bandwidth system memory, where “S” is system memory bandwidth measured in GB/s.</td>
<td>9.11*\text{tanh}[0.006*(S-70)+0.15]-4.45</td>
</tr>
</tbody>
</table>

This adder does not apply to a computer that meets any of the following criteria:

1) Expandability score includes a credit for 4-channel memory.
2) System memory bandwidth is less than 146 GB/s.
3) Less than 4 GB of the system memory has a bandwidth of 146 GB/s or more and either:
   a) Has an integrated display with a resolution of 9 megapixels or less; or
   b) Does not have an integrated display.
4) Uses an adder for a first discrete GPU.
## Effective Dates

<table>
<thead>
<tr>
<th>Small-Scale Servers and Workstations High expandability Computers, Mobile Workstation</th>
<th>Notebooks</th>
<th>Desktops</th>
<th>Desktops</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 1, 2018</td>
<td>January 1, 2019</td>
<td>January 1, 2019</td>
<td>July 1, 2021</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tier 1</td>
<td>Tier 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Questions?
MARKING REQUIREMENTS
MARKING REQUIREMENTS

Name, Model Number, and Date

The following information shall be **permanently, legibly, and conspicuously displayed on an accessible place** on each computer unit;

1. manufacturer's name or brand name or trademark, which shall be either the name, brand, or trademark of the listed manufacturer or, if applicable, the designated manufacturer;

2. model number; and

3. date of manufacture, indicating year and month or smaller (e.g., week) increment. If the date is in a code that is not readily understandable to the layperson, the manufacturer shall immediately, on request, provide the code to the Energy Commission.
Questions?
CERTIFICATION PROCESS
A state or federally regulated new appliance sold or offered for sale in California, including via the internet, must be certified to the Energy Commission as compliant with the Title 20 Regulations. Compliance includes:

- Meeting the applicable efficiency standards
- Testing in a test lab approved by the Commission
- Marking each unit per Title 20 §1607
- Certifying each model to the Commission
- Model appears in the Commission’s database
Products manufactured on or after the effective date must certify their compliance with the standards to the Energy Commission for lawful sale in California, including internet sales. The effective date for Notebooks is January 1, 2019.
The Appliances Office of the California Energy Commission has many original and partner resources available at no cost to the public.

This includes a series of 12 on-demand video tutorials on the certification process, recorded webinars, and detailed instructions with comprehensive graphics that explain how to certify a model to the Commission’s Modernized Appliance Efficiency Database System (MAEDbS).

Our **Title 20 Compliance Assistance Call Center** is also available business weekdays from 9:00 AM – 4:30 PM PT.
CERTIFICATION OVERVIEW

- Submitting Appliance Data
  - Submitting appliance data as a Third-Party Certifier
    - Test Laboratory Application* (Submitted by Test Lab company only)
    - Third Party Certifier Application (Submitted by Third-Party Certifier company only)
    - Delegation of Authority Application (Submitted by Manufacturer company only)
  - Submitting appliance data as a Manufacturer
    - Test Laboratory Application* (Submitted by Test Lab company only)

*If the manufacturer or third-party certifier is only deleting appliance data in their submission no test laboratory is required.
CERTIFICATION REQUIRES SIGNING A BINDING DECLARATION ON BEHALF OF YOUR COMPANY

Declaration

I declare under penalty of perjury of the laws of the State of California that:

1. All the information in this statement is true, complete, accurate, and in compliance with all applicable provisions of Sections 1601 – 1609 of Title 20 of the California Code of Regulations.
2. Units of each basic model of appliance for which certification is requested have been tested in accordance with all applicable requirements of Sections 1603 – 1604 of Title 20 of the California Code of Regulations.
3. Section 1606(g) of Title 20 of the California Code of Regulations have been and are being complied with.
4. All units manufactured, distributed or otherwise intended for sale within the State of California have been and are being marked as required by Section 1607 of Title 20 of the California Code of Regulations.
5. The (i) manufacturer's name or brand name or trademark; (ii) model number; and (iii) date of manufacture are permanently, legibly, and conspicuously displayed on an accessible place on each unit, on the unit's packaging, or, where the unit is contained in a group of several units in a single package, on the packaging of the group.
6. The appliance complies with the applicable energy efficiency, energy consumption, energy design, water efficiency, water consumption, and water design standards in Sections 1605.1, 1605.2, and 1605.3 of Title 20 of the California Code of Regulations.

*Name  *Title  *Date
Desksops, Thin Clients, & Mobile Gaming Systems

Instructions

- Key in appliance data according to associated fields in the import template provided in the instructions for this specific appliance type. If the appliance brand name does not appear in the dropdown, enter it in the free entry field, this will be added to the system after CEC staff processing.
- Model data must first be processed by CEC prior to any submissions to change or delete previously submitted model data.
- Brand codes are not accepted.

*Action
Please Select

*Model Number

Manufacturer
Add Date

Brand
New Brand
Please Select

*Regulatory Status

C - Federally-Regulated Consumer Product
I - Federally-Regulated Commercial & Industrial Equipment
N - Non Federally-Regulated
V - Voluntarily Certified
Z - N/A
- - No Match

Operating System
Motherboard model number

Core Speed (gigahertz)
Number of CPU Cores

CPU Support for 4 or more channels of memory or a 256 bit or greater memory interface
Number of 3.5" hard-disk drives and Others (other than main storage)

None

Number of 2.5" hard-disk drives (other than main storage)
Number of solid-state drives (other than main storage)
**Instructions**

- Key in appliance data according to associated fields in the import template provided in the instructions for this specific appliance type. If the appliance brand name does not appear in the dropdown, enter it in the free entry field, this will be added to the system after CEC staff processing.
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<table>
<thead>
<tr>
<th>Field</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action</td>
<td>Please Select</td>
</tr>
<tr>
<td>Model Number</td>
<td></td>
</tr>
<tr>
<td>Manufacturer</td>
<td></td>
</tr>
<tr>
<td>Add Date</td>
<td></td>
</tr>
<tr>
<td>Brand</td>
<td>Please Select</td>
</tr>
<tr>
<td>New Brand</td>
<td></td>
</tr>
<tr>
<td>Regulatory Status</td>
<td>Please Select</td>
</tr>
<tr>
<td>Computer Type</td>
<td>Please Select</td>
</tr>
<tr>
<td>Expandability Score</td>
<td></td>
</tr>
<tr>
<td>Operating System</td>
<td></td>
</tr>
<tr>
<td>Core Speed (gigahertz)</td>
<td></td>
</tr>
<tr>
<td>Number of CPU Cores</td>
<td></td>
</tr>
<tr>
<td>CPU Support for 4 or more channels of memory or a 256 bit or greater memory interface</td>
<td>None</td>
</tr>
<tr>
<td>Number of 3.5&quot; hard-disk drives and Others (other than main storage)</td>
<td></td>
</tr>
<tr>
<td>Number of 2.5&quot; hard-disk drives (other than main storage)</td>
<td></td>
</tr>
<tr>
<td>Number of solid-state drives (other than main storage)</td>
<td></td>
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RESOURCES

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» Current Appliance Efficiency Rulemakings
» Historical Rulemakings

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» 2018 California Lighting Standards Information
» Residential Pool Pump and Motor Combinations and Replacement Residential Pool Pump Motors, Regulatory Advisory

Upcoming Events

» September 13, 2018 Webinar: Energy Efficiency Regulations for Notebook Computers
» September 19, 2018 Webinar: Energy Efficiency Regulations for Desktop Computers
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