Law Concerning the Rational Use of Energy (Energy Saving Law)
Explanation

- Server type computer -

(FY2011 Target Standard)

April 2010

Japan Electronics and Information Technology Industries Association
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Preface

Recently, energy-saving agenda, being in a position of solutions for global warming issue as well as resource issue, has become a question of great concern in and outside Japan. It is recognized that efforts of industry for these issues is very important. As widely known, the energy saving law (Official name: Law Concerning the Rational Use of Energy) was enacted to promote energy-saving activities in all industries, targeting factory, buildings, and equipment.

For energy saving regarding equipment, the energy saving law was revised in June 1998 and new items were added to the target equipment. In addition, regarding conventional target equipment, reinforcement of the standard by the introduction of top runner system was implemented. Also for computer (computer body) and magnetic disk unit, which are also covered by Japan Electronics and Information Technology Industries Association, it is planned to review the concept of conventional energy saving standard from its foundation. The energy saving standard was established as the value with which products to be shipped for domestic use in 2005 must comply and announced as a notification of Ministry of International Trade and Industry as of March 31, 1999.

Regarding the standard value announced as a notification of Ministry of Economy, Trade and Industry as of March 29, 2006, values that all products to be shipped for domestic market in and after FY2007 must satisfy were added.

Regarding the standard value newly announced as a notification of Ministry of Economy, Trade and Industry as of March 31, 2010, values that all products to be shipped for domestic market in and after FY2011 must satisfy were added.

This document is issued for the purpose of promoting the understanding of member corporations about the explanation of the above announcement for server type computers among all kinds of computers.

We appreciate that many concerned parties utilize this document and the industry contribute to the solution of resources issue and global warming issue through observation of the energy saving law.

April 2010

Japan Electronics and Information Technology Industries Association
Server Energy Saving WG
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Computer

1. Scope of Target Computers

Generally, the term “computer” has no clear definition. A computer may include a computer unit and peripheral input and output devices in some cases. The scope of computers designated as target computers is limited to computer units. Actual object computers include digital central processing unit (5211) stipulated by the Standard Commodity Classification for Japan.

The following computers are excluded from the target.

a) Computers with high processing capability
b) Computers with extremely low processing capability

Specific exclusion is as follows:

a) Computers with high processing capability

Computers with high processing capability to be used for specifically limited applications as shown below:

(1) Supercomputer (200,000 MTOPS or more in minimum configuration of central processing unit)

Supercomputers used for research of scientific technologies having a processing capability of 50,000 MTOPS or more used to be excluded by the judgment criteria before revision of the law. In the new judgment criteria, however, supercomputers with composite theory performance of 200,000 MTOPS or more are excluded by raising the criterion. Here, processing capability is measured with central processing unit (“CPU”) in minimum configuration. For minimum configuration of CPU, refer to “4. Method of Measurement, (3) Configuration of Computer”.

(2) Massive Parallel Processor (MPP)

Massive parallel processors that can expand the processor or node connection in a large scale are excluded according as supercomputers. Specifically, computers that can increase the number of CPUs to 256 or more and have a CPU and software for starting or stopping more than 256 CPUs at the time of shipment are excluded under the new standard, like the preceding standard, as massive parallel processor.

(3) Special I/O control tasks (involving many I/O signal bus lines to be controlled)

The new standard, like the existing standard, will exclude backbone computers with their I/O control performance reinforced for the purpose of network, data and other management. More specifically, those computers supporting 512 or more I/O signal bus lines (having a maximum data transfer rate of 100 Mbps per second at least) are excluded.

(4) Fault-tolerant computers

The new standard, like the existing standard, will exclude fault-tolerant computers that dictate extra security and reliability as the socio-economic backbone. Specifically, computers with all of arithmetic processing unit, main memory unit, I/O controller and power equipment in redundant configuration and with their redundant systems logically operated as a single system and processing continued without interruption at the fault occurrence are excluded as fault-tolerant computers.

b) Computers with extremely low processing capability

Computers with composite theoretical performance (CTP) of lower than 100 MTOPS are excluded. For example, computers dedicated for office work such as office computers and adopted mainly in medium and small companies are excluded, because they are specialized to the payroll calculation, office information management, etc. and have extremely low computing capability.
In addition, the following examples are excluded from the target computers.

(1) Control computers used in various kinds of factories and built or embedded in a control panel, monitor panel, operation panel, etc.

(2) Computers embedded as control computers in electric appliance and motorcar

(3) Computers embedded to configure an instrument for specific application. For example, NC (numeric control)-type machine tools

(4) Computer-aided instruments designed for specific applications; for example, electronic calculator, game machine, dedicated POS controller equipment, image processor, artificial intelligence, etc.

(5) Resale of used products (limited to those without manufacturing or importing activities. Here, manufacturing means the works that affect the classification of equipment or energy consumption efficiency. For example, (1) Modification to the capacity exceeding conventional maximum capacity of main memory, (2) Change of mother board, (3) Change of CPU, (4) Change of power unit (AC adapter), (5) Change of model name (change of nameplate of equipment, etc.).

In the light of continuing rapid advances in computer technology and changes in the market trends, allowance need to be made for those products that are not fully energy-conscious due to implementation of their design and development. Like the existing standard, the new standard will not apply to those models whose shipments during the target year have fallen short of 10% of their maximum yearly shipments. This is to screen out the products that have already passed their peak sales.
2. Judgment Criteria

(1) Classification

The fiscal 2007 standard had used certain measures of performance, such as size of main memory and number of I/O signal bus lines, for categorization purposes but such categorization was based on the performance available at the time of the formation of the standard and was not meant to make essential distinction between server and client computers. With subsequent advances in technology, client computers larger than 6GB have already been commercialized, which might add to the ambiguity of product classifications.

The categories of server and client computers, on the other hand, are commonly used in the market. To make for more practical product categorization, the terms will be defined as follows:

○ "Server type computer" is a computer that is designed to work around the clock to offer services and the like on the network and that is exclusively accessed by way of networks.
  ➢ Features
    ◆ Used in extensive fields, from general to specialized.
    ◆ Diversified choice of performance requirements, such as reliability for system management, speed for data communication and parallel processing for multitasks.
  ➢ Applications
    ◆ Large-scale system management, banking and accounting services, backbone services as for telecommunications carriers, network connectivity, academic calculations and more

○ The term "client computer" means any kind of computer that is not a "server type computer."
The fiscal 2007 standard provided for the categorization of server type computers to make for the availability of products that fulfill desired performance requirements. With advances in computer performance, however, computers that do not fit into these categorizations have evolved. The existing scheme of product categorization has been reviewed and set forth as the fiscal 2011 standard as described in the table below.

**Table 1. New categorizations based on product and performance characteristics**

<table>
<thead>
<tr>
<th>CPU type</th>
<th>Number of I/O slots</th>
<th>Number of CPU sockets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dedicated CISC</td>
<td>Less than 32</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>32 or more</td>
<td>-</td>
</tr>
<tr>
<td>RISC</td>
<td>Less than 8</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>8 or more but less than 40</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>40 or more</td>
<td>-</td>
</tr>
<tr>
<td>IA64</td>
<td>Less than 10</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>10 or more</td>
<td>-</td>
</tr>
<tr>
<td>IA32</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Less than 7</td>
<td>Less than 2</td>
</tr>
<tr>
<td></td>
<td>2 or more but less than 4</td>
<td>4 or more</td>
</tr>
<tr>
<td></td>
<td>7 or more</td>
<td>-</td>
</tr>
</tbody>
</table>

(1) **CPU type**

The traditional scheme of product categorization used to classify mainframe servers\(^1\) and open servers\(^2\) according to the size of main memory and the number of I/O signal bus lines (I/O), but with recent technological advances, an intermixture of mainframe and open servers has been made inevitable when categorized by the size of main memory and the number of I/O signal bus lines (I/O). For this reason, a new set of categories based on the CPU type has been set.

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\(^1\): A mainframe server is a large computer used to handle mission-critical or other tasks for a corporate organization. The term is a generic one covering a series of relevant computers or a set of relevant architectures, or covering those computer systems in support of a computer maker-specific architecture and OS that are designed to withstand the working needs of mission-critical tasks carried out by corporate and other large-scale organizations and that have grown to preserve their own cultures. Mainframe servers have these characteristics:

* Massive data processing capacities (not only CPU performance but also I/O performance)
* Workload management allowing a single machine to process multiple tasks in parallel
* Enhanced reliability and availability derived from thorough perfection of redundancies
* Exacting operation management and security facilities required of a large-scale organization
* Computer maker's long-term plans and maintenance support

\(^2\): The term "open server" is a generic term covering those computers that build on newer technologies than those implemented in mainframes, particularly, open standards, and that feature UNIX (Linux)-led OSs and X86- or RISC chip-based CPU hardware to differentiate themselves from customized computers, such as the dominant mainframes, or those computers in support of a standardized programming interface, such as UNIX, that offer enhanced interoperability, affinity with various hardware and software products evolving from third-party vendors and that can be configured for a relatively low cost.
CPUs mounted on server type computers are broken down into four categories: dedicated CISC\(^*3\), RISC\(^*4\), IA64 and IA32\(^*5\). General-purpose CPUs, such as IA64 and IA32, offer high energy efficiency ratios, the highest of which is scored by the IA32 as it dominates the shipments. Dedicated CISC and RISC have relatively low energy efficiency ratios, with dedicated CISC posting the lowest figure as its composite theoretical performance being undervalued as explained above.

(2) Number of I/O slots
The number of I/O slots is the number of I/O expansion slots that are represented by PCI slots supported by the same chassis and differs from the traditional number of I/O lines (number of I/O signal bus lines), or the number of I/O signal bus lines that branch from the signal bus line between the processor and main memory. Categorization by the CPU type has removed the need to categorize servers by the number of I/O lines (number of I/O signal bus lines), but they still need to be categorized by the number of I/O slots due to correlations with their energy efficiency ratio as they increase in chassis size and power capacity according to the expansibility of their I/O slots.

How to count I/O slots
Count the I/O slots in which adapters or cards are mounted to support I/O devices. Take notice of these instructions:
- On-board connectors (such as IDE/SATA) are not counted.
- The number of memory slots is not included in the number of I/O slots.
- Slots dedicated to specific I/O (such as RAID adapter slots) can be counted.
- The connector type of each slot is of no concern.
- HDD slots are not counted.

(3) Number of CPU sockets
Servers supporting less than seven IA32-based I/O slots are many and diverse as they account for nearly 90% of all server shipments. Because server products are designed to allow for the additional number of CPUs that can be mounted later, their power consumption tends to increase with the number of CPU sockets supported. For this reason, only those servers supporting less than seven IA32-based I/O slots will be categorized by the number of CPU sockets supported.

(2) Target Year
Average product cycle of computers is approx. 4 years with personal computers and approx. 5 years with mid-range and general-purpose computers. Accordingly, for the period of 4 years from the setting of the standard, the target fiscal year should properly be set for fiscal 2011.

\(^{*3}\): Dedicated CISC (Complex Instruction Set Computer): A processor complete with advanced and diverse instruction sets, mainly used as mainframe server.

\(^{*4}\): RISC (Reduced Instruction Set Computer): A processor that focuses on speed, with its instruction set being simplified, mainly used as a UNIX server.

\(^{*5}\): IA64, IA32: The microprocessor architecture that originated from the Intel 4004, or the world's first 4-bit microprocessor, and that has since undergone continual functional enhancements to 8, 16, 32 and 64 bits to penetrate an extensive repertoire of computers, from PCs to advanced servers. It is now the de facto architecture for the modern general-purpose CISC microprocessors. IA32 is a 32-bit microprocessor version of the architecture and mainly used in IA servers. IA64 is a 64-bit microprocessor version of the architecture and mainly used in advanced servers. Compatible chips are available from various vendors to work with the IA32, which is also known as "X86" or X64. "X64 is upward compatible with X86. IA64 is Intel's unique 64-bit microprocessor architecture.
(3) Energy Consumption Efficiency

Energy consumption efficiency shall be expressed in two effective digits of “numeral obtained by averaging the power consumption of idling state and that in low power mode measured by the method specified by minister of economy, trade and industry and expressed in wattage, and by dividing composite theoretical performance with giga calculations”. That is, energy consumption efficiency shall be calculated with the following formula.

For the value of composite theoretical performance, value supplied by the CPU manufacturer can be used if the CPU is not in-house product. It is recommended that power consumption and energy consumption efficiency be rounded.

\[ E = \frac{(W_1 + W_2)/2}{Q} \]

- \( E \): Energy consumption efficiency (Unit: watt/giga calculations)
- \( (W_1 + W_2)/2 \): Power consumption (Unit: watt)
- \( Q \): Composite theoretical performance (Unit: giga calculations)
- \( W_1 \): Power consumption in idle state (Unit: watt)
  - Idle-state power consumption is the power consumption in the state where a computer is connected to main power supply and ready for operation without resetting the initial program and before transferring to low power mode such as standby or suspend mode in ACPI specification.
- \( W_2 \): Power consumption in low power mode (Unit: watt)
  - Power consumption in low-power mode is the power consumption in the low power mode such as standby or suspend mode in ACPI specification (limited only to the state where program and data are retained in the main memory).

For server type computers without low power mode, the same value as \( W_1 \) shall be used for \( W_2 \).

Figure 1. Computer in Idle State/Low Power Mode

*6: Composite Theoretical Performance (CTP) is a reference specified as the scale of performance for export management by US Department of State. Conventionally, manufactures submitted that performance value to Coordinating Committee for Export to Communist Area (COCOM) when exporting to communist area. The calculation procedure of CTP is specified by the Ordinance of the Ministry of International, Trade and Industry.

*7: Advanced Configuration and Power Interface (ACPI) Specification related to power management proposed by Microsoft Corporation and others
(4) Target Standard Value

Computer manufacturers are obliged to keep the value of energy consumption efficiency on weighted average by the volume of shipments per category within the standard energy consumption efficiency for the computers for domestic shipment in each year in Target Year 2011 (April 1, 2011 to March 31, 2012). However, as is not practical to apply the same regulation on products which were designed and developed when energy saving design was not sufficiently reflected, the target standard value does “Not apply to the models with volume of shipments in fiscal 2011 below 10 percent of maximum volume of shipments per year in the past” to exclude the products that have passed the peak sales times.

This target value shall apply to each year in and after 2012 unless law revision is implemented. Regarding fiscal 2010 (From April 1, 2010 to March 31, 2011), the target value of fiscal 2007 applies consecutively. For the target value of fiscal 2007, refer to the statements of “Law Concerning the Rational Use of Energy (Energy Saving Law) and Explanation (fiscal 2007 target standard), Computers (Server type computers)."

Table 2. Classification of Computers and Standard Energy Consumption Efficiency

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of I/O slots</th>
<th>Number of CPU sockets</th>
<th>Classification on label</th>
<th>Target standard value (W/GTOPS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dedicated CISC</td>
<td>Less than 32</td>
<td>-</td>
<td>A</td>
<td>1,950</td>
</tr>
<tr>
<td></td>
<td>32 or more</td>
<td>-</td>
<td>B</td>
<td>2,620</td>
</tr>
<tr>
<td>RISC</td>
<td>Less than 8</td>
<td>-</td>
<td>C</td>
<td>13.0</td>
</tr>
<tr>
<td></td>
<td>8 or more but less than 40</td>
<td>-</td>
<td>D</td>
<td>31.0</td>
</tr>
<tr>
<td></td>
<td>40 or more</td>
<td>-</td>
<td>E</td>
<td>140.0</td>
</tr>
<tr>
<td>IA64</td>
<td>Less than 10</td>
<td>-</td>
<td>F</td>
<td>6.2</td>
</tr>
<tr>
<td></td>
<td>10 or more</td>
<td>-</td>
<td>G</td>
<td>22.0</td>
</tr>
<tr>
<td>IA32</td>
<td>0</td>
<td>-</td>
<td>H</td>
<td>1.3</td>
</tr>
<tr>
<td></td>
<td>1 or more but less than 7</td>
<td>Less than 2</td>
<td>I</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td>2 or more but less than 4</td>
<td>J</td>
<td>1.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 or more</td>
<td>-</td>
<td>K</td>
<td>6.7</td>
</tr>
<tr>
<td></td>
<td>7 or more</td>
<td>-</td>
<td>L</td>
<td>7.4</td>
</tr>
</tbody>
</table>

*1: Dedicated CISC (Complex Instruction Set Computer): A CPU that is designed to execute multiple instructions varying in bit length and that is tailored to the specific needs of a computer.
*2: RISC (Reduced Instruction Set Computer): A CPU other than a CPU that is designed to execute multiple instructions varying in bit length.
*3: IA64: A non-dedicated-CISC CPU that is designed to execute multiple instructions varying in bit length and that supports 64-bit architecture.
*4: IA32: A non-dedicated-CISC CPU that is designed to execute multiple instructions varying in bit length and that supports 32-bit architecture.

For the calculation of weighted average, refer to the following example.

[Example]

When the volume of domestic shipment of company X in FY2011 for category c is as shown below:

(i) Volume of category c product shipment

<table>
<thead>
<tr>
<th>Model</th>
<th>Energy consumption efficiency</th>
<th>Number of units</th>
</tr>
</thead>
<tbody>
<tr>
<td>C01</td>
<td>18 W/GTOPS</td>
<td>5,000</td>
</tr>
<tr>
<td>C02</td>
<td>7.5 W/GTOPS</td>
<td>2,000</td>
</tr>
<tr>
<td>C03</td>
<td>2.3 W/GTOPS</td>
<td>13,000</td>
</tr>
</tbody>
</table>

(ii) Weighted average of category c product shipment

\[
\frac{(18 \times 5,000 + 7.5 \times 2,000 + 2.3 \times 13,000)}{(5,000 + 2,000 + 13,000)} = 6.75
\]

As the standard energy consumption efficiency of category c is 6.75 W/GTOPS, the weighted average of shipped products for category c of company X is lower than the standard energy consumption efficiency. Therefore, category c is deemed to meet the standard.
3. Indication

(1) Items Indicated

Indicators for computers are designated as shown below.

a. Name or type
b. Classification on label
c. Energy consumption efficiency
d. Name or title of manufacturer
e. There shall be a notification that energy consumption efficiency is the value of power consumption measured in accordance with the measuring method specified by energy saving law divided by Composite Theoretical Performance specified by energy saving law (including unit denominations).

(2) Requirements

As indication is intended to provide the consumer with the material for judgment in the purchase, catalog indicating the performance and materials indicating the performance to be presented by the manufacturer, etc. for selection of equipment are required for achieving this purpose. For example, among the catalogs printed in large quantities and used by the consumers in selecting a product, those having indication of the performance the relevant product such as memory capacity and materials that the manufacturer presents in the sales of office computer or the like as a reference used by each consumer to select a product are included as the objects. In the case of presenting the latter material attached by a catalog to the customers as a set, however, indication in the catalog is deemed to be the indication in the material. Image catalog without indication of performance, catalog intended for introducing the system, and materials used after product has been selected by the customer are not included in the objects. (Catalogs with indications of performance related to individual computer and HDD unit are included in the objects.) It is also stipulated that the indication be given in an easily viewable place and in the method hard to fade in order to achieve the above purpose.
4. Method of Measurement

Measurement of energy consumption efficiency must be implemented in accordance with the method specified by the notification.

(1) Circuit Configuration

Measurement must be implemented at a rated voltage and rated frequency in reference to the circuit configuration in Figure 2 by the use of appropriate measuring instrument (Note 1) calibrated periodically (Note 2).

Figure 2. Example of Measurement Circuit (1) (Equipment connected to AC Power Source)

![Example of Measurement Circuit (1)](image1)

Example of Measurement Circuit (2) (Equipment connected to DC Power Source) (Note 3)

![Example of Measurement Circuit (2)](image2)

Note 1: For equipment with a measured power consumption of less than 10 W, it is desirable to use a wattmeter capable of measuring 50th harmonic order.

Note 2: Measurement shall be made at any point rated for the equipment.

Note 3: Equipment connected to DC power facility is the instrument operated in the facility where only DC is provided as power supply as in station telephone switching equipment. Instruments operated in a power facility where AC or DC is selectable are treated as the equipment connected to AC power source.

(2) Operating Condition at Measurement

Measurement shall be implemented under the condition specified by the Minister of International Trade and Industry.

Operating conditions at the measurement of power consumption in each state are as shown below.

$W_1$: At the measurement of power consumption in idle state
Measurement is made with power on and under the condition where Initial Program Load (IPL) has been completed. That is, measurement is carried out when the operating system is started and application is ready.

$W_2$: At the measurement of power consumption in low power mode
Measurement is made under the condition where the computer can be restarted immediately without system initialization by the initial program after power on (Note 4).
Specifically, measurement is implemented under the condition where restarting is available (condition where program and data are retained in the main memory) without the start of an embedded microprogram (i.e., microprogram for boot or program called BIOS stored in the read-only memory (ROM)). For computers with low power mode such as standby and suspend excluding hibernation mode, measurement is available in low power mode; however, measurement shall be made in the mode settable by the user (setting other than factory set value may be permitted).

Note 4: System setting by the initial program does not mean the setting at the time of shipment.

(3) Configuration of Computer

The hardware configuration of the computer under test for measuring the energy efficiency ratio shall be as follows:

1. Main memory, cache memory, and I/O buses shall be maximum configuration with the minimum configuration of CPUs.

2. Measurement may be permitted under the condition where internal/external options that are not required for satisfying the operating requirements at the measurement of (2) above and that can be connected or detached easily are excluded.

[Note] The 2011 standard had done away with the categorization by the number of I/O buses, but the I/O bus count condition has been retained for the purpose of energy efficiency measurement.

Power consumption of the product expandable in the number of CPUs is measured with the number of CPUs in minimum configuration. Regarding energy consumption efficiency, as a computer with increased CPU is thought to be derived from the minimum configuration or basic model from technological viewpoint, the value of energy consumption efficiency in the minimum CPU configuration will be adopted. For example, though one-CPU configuration is possible physically, if minimum configuration for sale is actually two CPUs or more, the minimum CPU configuration of the relevant product is "Two CPUs."

(Refer to 4. Method of Measurement, (4) Concept of Minimum CPU Configuration (Supplement).)

Figure 3 and Figure 4 show examples of the measurement range of power consumption with a mid-range computer and general-purpose computer, respectively.

<Supplement for Mid-range Computer>

As shown in the example of Figure 3, SCSI adapter, LAN adapter, magnetic disk unit (not for booting), DAT unit, DVD-ROM unit, display, etc. may be excluded from the measurement range.

For blade servers, one piece of card called server blade mounted in the chassis of the blade server functions as a single server; therefore, measurement is implemented for the power consumption per server blade.

Specifically, power consumption per blade is given by the power consumption with maximum number of server blades mounted on the chassis of the blade server divided by number of server blades mounted. Here, the main memory capacity of each server blade, cache memory, and the number of I/O buses shall be in the minimum configuration with minimum CPU configuration like other mid-range computers.

Components (management module mounted on chassis, network switch module, etc.) not required for satisfying the operating condition at the measurement in (2) above and that can be attached or detached easily may be excluded from the measurement range.

Server blade described here is a blade (card) where CPU, memory, and I/O bus are mounted and one OS can be operated. It is treated as one server. The blade with only CPU or CPU and memory mounted and that cannot function as a server till it is connected to the card equipped with memory or I/O bus or the like through the system bus is not treated as server blade. (Example, processor card, etc., for CPU expansion)

For the number of blade server shipments, the shipment of a server blade is counted as the shipment of a server.

<Supplement for General-purpose Computer>

As shown in the example of Figure 4, magnetic disk control unit and magnetic disk unit (not for booting), SCSI adapter, communication control unit, etc., may be excluded from the measurement range.
Figure 3. Example of Mid-range Computer (UNIX Server, IA Server, etc.)

Note: The dotted line indicates the range of measurement. The portion shows the place where input/output signal paths are counted (four in this figure). The input/output slots are not counted because they are branches of one input/output controller.

Figure 4. Example of General-Purpose Computer

Note: The dotted line indicates the range of measurement. The portion shows the place where input/output signal paths are counted (three in this figure).
<Supplement for the number of I/O buses>


“Number of input/output signal paths” is the number of signal paths with maximum data transmission rate of 100 megabits per second or more among those directly separated from the signal path (including other signal paths having the transmission capacity equivalent to the relevant signal path) connecting CPU and main memory together or those directly separated from the signal path separator connecting to the said signal path (excluding the signal paths connected to the external equipment only through graphic display port or keyboard port).

Number of I/O buses (input/output signal paths) means the number of signal paths shown by double line in Figure 5. High-speed bus (bold line of Figure 5), bus controller, and high-speed switch correspond to “Signal paths (including other signal paths having transmission capacity equivalent to the relevant signal paths) connecting to central processing unit (CPU) and main memory unit (main memory)” expressed in the law. The number of buses of dotted lines (A) primarily separated from here is defined as the number of I/O buses. That is, the number of I/O buses is one in Figure 5 (Example 1), four in (Example 2), and six in (Example 3). Here, the CPU is in minimum configuration (refer to section 4 (3)). Though bus controller in (Example 2) and (Example 3) are separated into multiple portions, a combination of bus controller (or switch) connecting to the CPU and memory and bus controller connected below it is an equivalent of the bus controller in (Example 1).

Note: The number of I/O buses does not include that of I/O slots into which expansion cards are inserted.

Figure 5. Concept of Number of I/O Buses (Input/Output Signal Paths)

(Example 1) One bus
(Example 2) Four buses
(Example 3) Six buses

Note: High-speed bus is a bus having high data transmission rate and usable for connection between CPU and memory and SCSI, LAN, etc. are not included.

May be supplied with PC server in some cases.
(4) Concept of Minimum CPU Configuration (Supplement)

(1) Concept of series, model, etc.
Among general-purpose computers and mid-range computers, those that can accommodate multiple CPUs are prevailing. When a product can be expanded by increasing the number of CPUs with the same computer, the power consumption is measured with the minimum CPU configuration (configuration with least CPU among multi-CPU configuration on sale) that is the basic configuration of the computer. Regarding energy consumption efficiency, as the computer with expanded CPU is thought to be a derivation from the minimum CPU configuration that is technically a basic model, energy consumption efficiency of minimum CPU configuration is adopted. Examples are shown below.

i) When model differs with the number of CPUs
If a computer varies in model with the number of CPUs though the base computer is identical, power consumption is measured with the model of least number of CPUs as the minimum CPU configuration of the computer. This model value is also used for calculating the energy efficiency ratio. With the example of Figure 6, model A of single CPU configuration is the minimum CPU configuration of this computer (models A, B, C, and D). The number of shipments of models B, C, and D is counted as the number of shipments of model A.

Figure 6. When Model Diffs with the Number of CPUs

![Figure 6. When Model Diffs with the Number of CPUs](image)

Model name differs with the number of CPUs though the base computer is identical.

ii) When model is not varied by the number of CPUs
If a computer remains in the same model even with the number of CPUs increased, power consumption of minimum CPU configuration among the computers of the model is measured. Similarly, the value of this configuration is adopted for energy consumption efficiency. With the example of Figure 7, configuration of a single CPU is the minimum CPU configuration. When two-CPU configuration or more are sold instead of one-CPU configuration, the two-CPU configuration is the minimum CPU configuration.

Figure 7. When Model Does Not Change with the Number of CPUs

![Figure 7. When Model Does Not Change with the Number of CPUs](image)

Model name is the same even if the number of CPUs is increased.
(2) When function other than CPU is expandable
In association with the change in the number of CPUs only, if maximum number of I/O buses or maximum main memory capacity is expandable, the following is assumed (in the case of an example with a model name as in Figure 6).

<table>
<thead>
<tr>
<th>Model</th>
<th>Number of CPUs</th>
<th>Max. I/O buses</th>
<th>Max. main memory</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>64</td>
<td>32GB</td>
</tr>
<tr>
<td>B</td>
<td>2</td>
<td>64</td>
<td>32GB</td>
</tr>
<tr>
<td>E</td>
<td>5</td>
<td>128</td>
<td>48GB</td>
</tr>
</tbody>
</table>

Even in any of the above cases, measurement shall be conducted with maximum number of I/O buses (64) and maximum main memory capacity (32 GB) that can be mounted in Model A (one CPU) of minimum CPU configuration.

(3) Equipment excluded from energy saving law
For the equipment excluded from energy saving law shown below, judgment on whether they meet the requirement of being excluded from the object in minimum CPU configuration is required.

[Ordinance 47 of Ministry of International, Trade and Industry]
Equipment excluded from the object
2. Equipment whose operation can be executed by the use of a processing unit consisting of more than 256 processors
   → [Interpretation] Indicates those containing a controller that can drive more than 256 CPUs in minimum CPU configuration (in the configuration on the market).

3. Equipment with more than 512 input/output signal paths (limited to those with more than 100 megabits per second in maximum data transfer rate)
   → [Interpretation] Equipment that can increase the number of input/output signal paths (I/O buses) to more than 512 in minimum CPU configuration (in the configuration on the market)

(5) Counting of Blade Server Shipments
As blade server has cards called server blades each functioning as one server mounted on the chassis, the number of server blades on the chassis is counted as the number of blade servers shipped. For the definition of server blade, refer to “4. Method of Measurement, (3) Configuration of Computer”.
5. Concept of Contracted Manufacturing, Etc. (Locus of Responsibility)

Concept of contract for manufacturing or import-related manufacturing, etc. is as shown in Figure 8.

Figure 8. Counting and Indication of Number of Computers

For the solid arrows, each shipper counts and indicates the number of units.

Companies B1 and B3 have a contract of manufacturing with companies A2 and C2 but they express clearly that they are the manufacturers of their products. In this case, companies B1 and B3 have the primary responsibility on the energy saving law. This includes the case where Company B1 (B3) and Company A2 (C2) are in parent-child relations (the former is the parent company of the latter) and the consigner dominates over the consignee.

Company B2 is not engaged in the manufacture of specific equipment based on this law and sells the product that clearly expresses that Company A3 is the manufacturer only providing own brand. In this case, Company B2 cannot be free from the obligation of indication on the catalog or the like to be used for sales activities of the product. In this figure, Company A1 does not entrust the manufacture. When importing and reselling the used products from overseas market, Company C3 takes the responsibility on the energy saving law. When reselling the used products from domestic market accompanying some manufacturing behavior, Company A4 takes the responsibility on the energy saving law.