Optical Disk Drive（PSC-ID: BB-03）

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2004/03/01 BB-02
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Note: These standards have been prepared for the development of EcoLeaf™ environmental labels. Use for any other purpose without consent of the EcoLeaf™ program office is strictly prohibited.

No.	Major key	Minor key	Class	Requirements
1	Preconditions	Target product	Description	A device for business or consumer use which uses optical disks* to read or to read and write data. This includes both internally and externally connected drives, but excludes products whose main application is viewing DVDs. * Including magneto-optical disks.
2			Scope	Device proper plus its packing material included in smallest retail unit. Intermediate packing material used in distribution is included in the product scope (shipping cases, etc.).
3		Stage	Scope	1. Life cycle stages covered All stages: Material manufacturing, product manufacturing, distribution, use, and discarding/recycling. 2. System boundary Only items specified in number 2 above (target product scope). (In the example of an internal drive, only the drive's power consumption in the usage stage would be included, while the power consumption of the computer itself and the manufacturing impact of the computer power supply that supplies the drive's power are not included.)

No.	Major key	Minor key	Class	Requirements
4	Product data sheet (PDS) Input data for the LCI: Lifecycle inventory analysis	Manufacturing stage information (product information)	Product materials or ingredient makeup	1. Class A parts (parts whose processing and assembly impacts you determine yourself) Assembled circuit boards (only main boards; flexible boards excluded) Only main board mounting processes are checked. This is illustrated in Figure 1. 2. Material category names Materials recorded in the “1. Product Information” section of the product data sheet are as follows. Other materials are listed simply as “others.” Normal steel, stainless steel, aluminum, copper, other metals, thermoplastic resin, thermosetting resin, rubber, glass, paper, wood, assembled circuit boards, batteries (listed only when included in the design), and electromagnetic steel plate 3. Recycling When open recycling and reuse are included Each company can calculate these categories by creating scenarios considered appropriate, and while taking careful note of the following items. The soundness of scenario bases is subject to verification. (1) Processes regarded within the scope of “indirect effects” (2) Deductions and impacts within the scope of “indirect effects” Note PSC-BB-01: No distinction is made between direct and indirect effects with regard to recycling effectiveness.

No.	Major key	Minor key	Class	Requirements
5		Manufacturing stage information (production site information)	Material and energy inputs, consumption, and emissions	1. Materials and energy that are input, consumed, and emitted at the manufacturing site, and inter-process transport impact must be included as standard if they are among the following. (1) Material inputs and energy consumed Electricity, fuel oil A, diesel fuel, kerosene, gasoline, LNG (town gas), LPG, city tap water, industrial water supply, groundwater. (2) Material emissions Not specified. Each company should enter those it deems important. (3) Impact of transport among manufacturing processes The general rule is that the transport impact of material inputs (feedstock and energy) is not factored in. However, the transport impact from manufacturing site to final assembly for class A parts is included. 2. Byproducts and sub-materials Not included. • Byproducts are products which arise secondarily in the manufacturing process and are sold, as distinguished from products whose manufacture is the main purpose. • Sub-materials are materials input and discarded at the manufacturing site, and are not shipped with products.

No.	Major key	Minor key	Class	Requirements
6		Distribution stage information	Product transport conditions	Standard transport conditions for finished products are as follows. 1. Domestic transport Distance is 500 km. Each company decides the means and loading ratio. 2. Product transport from overseas to Japan Each company calculates this by creating a model which covers the means, distance, and loading ratio of domestic and international transport from overseas manufacturing sites to the consumer country (Japan).

No.	Major key	Minor key	Class	Requirements
7		Usage stage information	Product usage conditions	1. Usage conditions A. Assumptions On the premise that the amount of data handled in a certain period of time is constant, usage stage impact is calculated assuming that one whole disk is written and one whole disk is read each day during the usage period using the drive's maximum capability. • Total time per day that drive is on: 4.5 hours Based on the model of personal computers used in ordinary offices, as described in "Energy Conservation for Personal Computers and Peripherals," published by the Japan Electronics and Information Technology Association. Although this document has different definitions for operating, standby, and low-power states, this PSC totals (total for operating and standby states) the time that power is supplied to an optical disk drive in one day, and sets the total at 4.5 hours. • Operating time (reading and writing) in hours per day: In accordance with section B below, "How to measure daily power consumption," daily operating time is the time spent reading and writing data (Tr+Tw in figure below). • Standby time (on but not operating) per day: 4.5 hours per day minus the above "operating time" (Ti in figure below). • Total usage time Drive runs 240 days annually (5 days/week x 4 weeks x 12 months) for 4 years (harmonized with the PSC for notebook computers). • Data capacity Data capacity used for each task is the maximum value for the medium being used.

No.	Major key	Minor key	Class	Requirements
				• Two-sided media Even when a multilayered medium is used, only one side and a single layer are used for the task. [Figure BB-03 (1) 1 Power consumption 2 Writing 3 Reading 4 Standby 5 Total time on per day: 4.5 hours] B. How to measure daily power consumption Determine the power consumption (kWh) required to perform a stipulated task (excluding self-verification). (1) When transfer speed is variable (CD and DVD drives, etc.) Execute the following two tasks. Perform only b for read-only drives. a. Write data at the maximum speed to a medium supported by the drive and allowing the highest write transfer speed. b. Read data at the maximum speed from a medium supported by the drive and allowing the highest read transfer speed. Example: If testing a combination CD-RW/DVD-R drive, write to a CD medium and read from a DVD medium. (2) When there is only one transfer speed (such as MO drives) Execute the following two tasks. Perform only b for read-only drives. a. Write to a medium of the largest capacity supported by the drive. b. Read from a medium of the largest capacity supported by the drive.

No.	Major key	Minor key	Class	Requirements
7		Usage stage information	Product usage conditions	2. Consumables and replacement parts It is assumed there are no consumables or replacement parts used during the usage stage. 3. Maintenance No maintenance is anticipated during the usage stage.

No.	Major key	Minor key	Class	Requirements
8		Waste/ recycling stage information	Product waste/ recycling conditions	Items in common 1. Paper is considered combustible waste. 2. Recycling rate data for corrugated cardboard: Values compiled and released by the Japan Corrugated Case Association are adopted as the industry standard. Because those values are updated every year, this PSC uses the values from the newest version when the EcoLeaf™ standard is published (rate for 2001 was 97.1%). External drives (both business and consumer models) Drives, accessories, batteries, and other such items are considered noncombustible municipal solid waste, and each company develops its own waste management scenario. Internal drives (both business and consumer models) 1. Scenario Use Figure 2, “Discarding and Recycling Scenario for Scrapped Products.” • Product recovery rate Each company should use its own data or those released by the industry, but if these are unavailable, the rate should be set at 20%. • Municipal solid waste (MSW) disposal scenario Each company should develop its own waste management scenario. • Reuse scenario It is assumed that products and parts are not reused. • Recycling scenario, industrial waste disposal scenario - Recovered products are all handled under the recycling scenario. - The recycling scenario covers only metals, and the metal recycling rate (yield) is set at 80%. - Materials other than metals are handled as industrial waste (landfilled).

No.	Major key	Minor key	Class	Requirements
8		Waste/ recycling stage information	Product waste/ recycling conditions	- Transport is set at 500 km by 4-ton truck under the assumption that recovered products are accepted at a domestic location. - Impact of processing, such as crushing, classification, and recycling, is calculated separately within the scenario. - The deduction scenario is Figure 2, “Discarding and Recycling Scenario for Scrapped Products.” 2. Consumables and replacement parts There is no reuse or replacement of consumables during the product lifetime. 3. Open recycling and reuse When open recycling and reuse are included, each company can calculate these categories by creating scenarios considered appropriate, and while taking careful note of the following items. The soundness of scenario bases is subject to verification. (1) Processes regarded within the scope of “indirect effects” (2) Deductions and impacts within the scope of “indirect effects” Note PSC-BB-01: No distinction is made between direct and indirect effects with regard to recycling effectiveness.

No.	Major key	Minor key	Class	Requirements
9	Product Environmental Information Disclosure Sheet (PEIDS)	Inventory analyses	Lifecycle inventory calculation rules	1. How to calculate the main board manufacturing impact The main board comprises semiconductor packages (LSIs and memory), connectors for external wiring, laminated boards, and other components (ICs, capacitors, resistors, connectors for internal wiring, etc.). For impacts of: • LSIs and memory having 30 or more pins, use common-intensity semiconductor packages. • Connectors for external wiring, use common-intensity electroplated steel sheet. • Laminated boards and other parts, use common-intensity laminated board. The printed circuit board mounting process is calculated as being on the manufacturing site, under No. 5, “Manufacturing stage information.” The foregoing is illustrated in Figure 1. Solder used for connections is subject to the cut-off rule because its weight is such a small part of the whole. 2. How to calculate the battery manufacturing impact Calculate impact with the following formula using the EcoLeaf™ manufacturing intensity U (/kg) for alkaline manganese batteries, nominal voltage V of the batteries used, and their nominal discharge capacity A (mAh). See the notes at the end for details. U x V x A x 47/3,900,000 3. When open recycling and reuse are included, calculate direct and indirect effects separately and express the indirect portion as “recycling effectiveness.” On the PEIDS put the indirect effect total in the “Recycling Effectiveness” space. Put the recycling effectiveness breakdown in the PEIDS explanation space. Note PSC-BB-01: No distinction is made between direct and indirect effects with regard to recycling effectiveness.

No.	Major key	Minor key	Class	Requirements
10		Impact analysis	Additional impact category	“Ozone layer depletion” and “eutrophication” items are not included.
11	Breakdown data sheet (PDS-related)	Data processing	Allocation rule	Not unified; each company decides as it sees fit. 1. Resource input amounts In special cases where the mass of some materials cannot be determined, get a breakdown of the masses of the materials making up at least 90% of the product’s total mass, and prorate the rest to come out to 100%. 2. Manufacturing process data Each company decides as it sees fit. Grounds for deciding rules are subject to verification.
12		Data collection	Coverage	When data are unobtainable because products are new or for other reasons, It is permissible to substitute data (including intensities) that include the conditions used in designing or planning.
13			Cut-off rules	Cut-off rules may be applied for assembly impacts and other impacts, but they must be clearly specified as below (subject to verification). 1. Grounds for application 2. Standard values

No.	Major key	Minor key	Class	Requirements
14	Breakdown data sheet (PEIDS-related)	Database	Common intensity selection	Materials anticipated to be used in two or more components, and items using EcoLeaf™ common intensities are as follows. 1. Assembly of parts whose purchase is decided by each company — Parts assembly 2. Main board LSIs and memory with 30 or more pins — Semiconductor package 3. External wiring connectors on main board — Electroplated steel sheet 4. Flexible printed circuit boards, LCDs, and other populated circuit boards — Assembled circuit boards 5. AC adaptors — (Transformer power supply type) Electromagnetic steel plate 50%, copper 20%, applicable resin 30%. (Switching power supply type) Assembled circuit boards 40%, copper 20%, applicable resin 40% 6. Silicon rubber — styrene-butadiene rubber (SBR) 7. Power cords — conductors: copper 40%, covering material: applicable resin 60%. 8. I/F cable — Conductor: copper 30%, covering material: applicable resin 50%, cold-rolled steel sheet 20% 9. Batteries (both primary and secondary) — Use the manufacturing intensity for alkaline manganese batteries, and calculate with the method described in item 9 (LCI calculation method).
15			Intensity addition	No additions.
16			Addition of characterization factor	No additions.

No.	Major key	Minor key	Class	Requirements
17	Product environmental information	Product specification		1. Type: external (bus power or independent power supply) and internal 2. Media and data transfer speed 3. Interface 4. Mass (drive and accessories, in kg), and dimensions of drive unit

No.	Major key	Minor key	Class	Requirements
18		Data disclosure		1. Items to list List the compulsory items specified in section 3.2 of the implementation guidelines: “global warming impact, acidification impact, and energy consumption,” while the 7 optional items (guidelines) may be listed as desired. 2. Items to note Put the following at the bottom of section E of the PEAD sheet. “Items subject to data disclosure include optical disk drives, manuals, accessories, packaging, and shipping cases (when used).” “Usage stage environmental impact is calculated assuming that each day the drive writes one side of a XXX full of data and reads data from a whole side of a YYY.” (XXX is the name of the largest-capacity write medium that can be used with the drive, and YYY is the name of the largest-capacity read medium that can be used.) “The information disclosed above does not include the environmental impact of the data-recording medium itself.” 3. Method of representation Use a bar graph to show the global warming impact (CO_2 equivalent) of each stage in section E of the PEAD sheet. When open recycling and reuse are included: • Show recycling effectiveness with dotted lines independently for each stage, without integrating actual impact; • Enter the recycling effectiveness breakdown in the margin. Note PSC-BB-01: No distinction is made between direct and indirect effects with regard to recycling effectiveness.

No.	Major key	Minor key	Class	Requirements
19	Other environment-related information	Optional items		The following may be entered as information related to the environmental characteristics of the product even though it is not LCA information. 1. Type I and/or Type III environmental label 2. Acquisition of ISO 14001 certification 3. Certificates, approvals, or awards from national or industry organizations 4. Information on hazardous substances Note whether these or other hazardous substances are used: lead, mercury, cadmium, hexavalent chrome, polybrominated biphenyls (PBBs), and polybrominated diphenyl ethers (PBDEs). Note clearly when there are limitations on items subject to entry here. 5. Information on use of eco-friendly materials Note the part and specify its materials.

Note: Explanation on how to calculate manufacturing impact when batteries are used, and into what stage to add the impact

The only EcoLeaf™ common intensities that can be used at this time are alkaline manganese batteries and manganese batteries (primary) and lead-acid batteries (secondary). Therefore, the manufacturing impacts of other battery types cannot be directly calculated.

In accordance with the reasoning that the manufacturing impact of any battery type correlates with the amount of power it can store (voltage × total discharge current), the following procedure is hereby prescribed to calculate the manufacturing impact of a battery.

1. Formula definition

Based on the averages of data brought together by the companies which participated in the working group to discuss the camera PSC, which first prescribed this calculation method, about the same number of photographs could be taken with one CR123A (nominal voltage, 3 V; nominal discharge capacity, 1,300 mAh), which is a representative lithium battery, and two LR6 (AA alkaline manganese dry cell; nominal voltage, 1.5 V) batteries in series. It was therefore decided that the manufacturing burden for a CR123A battery is equivalent to that for two LR6 batteries. In other words,

the manufacturing intensity U (/kg) for alkaline manganese batteries, which is specified as one of the EcoLeaf™ common intensities, is used to calculate the manufacturing impact of a CR123A battery with the following equation.

> CR123A manufacturing impact = manufacturing impact of two LR6 batteries (nominal weight: 23.5 g each) = U x 23.5 x 2 ÷ 1,000 L

Therefore the manufacturing impacts of any battery used with the products covered by this PSC can be calculated with the following equation by using the CR123A manufacturing impact as a reference and correlating with the nominal voltage V and nominal discharge capacity A (mAh) of the battery being investigated.

> manufacturing impact of one battery = L x (V÷3) x (A÷1,300) = U x V x A x 47 ÷ 3,900,000

Reference: Reference data for voltage, discharge capacity, and other properties (get information from battery makers when battery type is not listed below)
CR2: 3 V, 750 mAh
CR123A: 3 V, 1,300 mAh
2CR5: 6 V, 1,300 mAh
CR-V3P: 3 V, 3,000 mAh

2. Stages in which to include impact data

Include the battery-related environmental impact data in stages as follows.

• Manufacturing impact of batteries included with product: Manufacturing stage

• Batteries changed during product usage: Usage stage

• Discarding impact of batteries discarded during usage period: Usage stage

• Batteries discarded with drive: Discarding and recycling stage

Figure 1 Optical Disk Drive

How to determine impacts in the material and manufacturing stage (related to items 4 and 9)

Perform measurements for the hatched portions of the figure and calculate the rest using intensities.

1	Manufacturing of individual parts
2	LSIs and memory with 30 or more pins Calculate using “semiconductor package” intensity.
3	Laminated boards Calculate using “laminated board” intensity
4	External wiring connectors Calculate using “electroplated steel sheet” intensity
5	Others (ICs, capacitors, resistors, internal wiring connectors, etc.) Calculate using “laminated board” intensity
6	Main board manufacturing (mounting)
7	Main board mounting process
8	Final assembly
9	Final assembly process

Figure 2 Optical Disk Drive

Discarding and Recycling Scenario for Scrapped Products (related to item 8)

1 Spent parts
2 Recover?
3 Recovery
4 Crushing
5 Municipal solid waste (MSW) disposal scenario
6 Combustible or noncombustible?
7 Combustible
8 Noncombustible
9 MSW incineration (incineration and landfilling ash)
10 MSW landfilling (landfilling only)
11 Recycling possible?
12 Other than metals
13 Metals
14 Recycling process
Crushing, classification, reconstitution, etc.
15 Recycled materials (can be deducted)
16 Recycling scenario
17 Deduction scenario
18 Industrial waste disposal scenario
19 Industrial waste disposal (industrial waste incineration and landfilling)

Note: Transport impact is calculated on the basis of 500 km transport by 4-ton truck under the assumption that recovered products are accepted at a domestic location.