

CATEGORY 4-COMPUTERS

Notes:

1. Computers, related equipment and "software" performing telecommunications or "local area network" functions must also be evaluated against the performance characteristics of Category 5, Part 1 (Telecommunications). (L.N. 132 of 2001)

2. Control units which directly interconnect the buses or channels of central processing units, "main storage" or disk controllers are not regarded as telecommunications equipment described in Category 5, Part 1 (Telecommunications).

N.B.:

For the control status of "software" specially designed for packet switching, see Category 5D001 (Telecommunications). (L.N. 132 of 2001)

3. Computers, related equipment and "software" performing cryptographic, cryptanalytic, certifiable multi-level security or certifiable user isolation functions, or which limit electromagnetic compatibility (EMC), must also be evaluated against the performance characteristics in Category 5, Part 2 ("Information Security"). (L.N. 132 of 2001)

4A SYSTEMS, EQUIPMENT AND COMPONENTS

4A001 Electronic computers and related equipment, as follows, and "electronic assemblies" and specially designed components therefor:

N.B.: (L.N. 226 of 2009)

See also 4A101.

(a) Specially designed to have any of the following characteristics:

(1) Rated for operation at an ambient temperature below 228 K (-45⁰C) or above 358 K (85⁰C);

Note:

4A001(a)(1) does not apply to computers specially designed for civil automobile or railway train applications.

(2) Radiation hardened to exceed any of the following specifications:

- (a) Total Dose 5×10^3 Gy (Si);
- (b) Dose Rate Upset 5×10^6 Gy (Si)/s; or (L.N. 65 of 2004)
- (c) Single Event Upset 1×10^{-7} Error/bit/day;

(b) Deleted; (L.N. 45 of 2010)

N.B.:

See Category 5, Part 2 for electronic computers and related equipment performing or incorporating "information security" functions. (L.N. 45 of 2010)

4A002 Deleted; (L.N. 65 of 2004)

4A003 "Digital computers", "electronic assemblies", and related equipment therefor, as follows, and specially designed components therefor:

Notes:

1. 4A003 includes the following:

- (a) Vector processors;
- (b) Array processors;
- (c) Digital signal processors;
- (d) Logic processors;
- (e) Equipment designed for "image enhancement";
- (f) Equipment designed for "signal processing";

2. The control status of the "digital computers" and related equipment described in 4A003 is determined by the control status of other equipment or systems provided:

- (a) The "digital computers" or related equipment are essential for the operation of the other equipment or systems;
- (b) The "digital computers" or related equipment are not a "principal element" of the other equipment or systems; and

N.B.:

1. The control status of "signal processing" or "image enhancement" equipment specially designed for other equipment with functions limited to those required for the other equipment is determined by the control status of the other equipment even if it exceeds the "principal element" criterion.
2. For the control status of "digital computers"

or related equipment for telecommunications equipment, see Category 5, Part 1 (Telecommunications).

(c) The "technology" for the "digital computers" and related equipment is determined by 4E.

(a) Designed or modified for "fault tolerance";

Note:

For the purposes of 4A003(a), "digital computers" and related equipment are not considered to be designed or modified for "fault tolerance" if they utilize any of the following: (L.N. 226 of 2009)

1. Error detection or correction algorithms in "main storage";
2. The interconnection of two "digital computers" so that, if the active central processing unit fails, an idling but mirroring central processing unit can continue the system's functioning;
3. The interconnection of two central processing units by data channels or by using shared storage to permit one central processing unit to perform other work until the second central processing unit fails, at which time the first central processing unit takes over in order to continue the system's functioning; or (L.N. 183 of 1999)
4. The synchronisation of two central processing units by "software" so that one central processing unit recognises when the other central processing unit fails and recovers tasks from the failing unit.

(b) "Digital computers" having an "Adjusted Peak Performance" ("APP") exceeding 1.5 Weighted TeraFLOPS (WT); (L.N. 95 of 2006; L.N. 45 of 2010)

(c) "Electronic assemblies" specially designed or modified for enhancing performance by aggregation of processors so that the "APP" of the aggregation exceeds the limit in 4A003(b); (L.N. 183 of 1999; L.N. 95 of 2006)

Notes:

1. 4A003(c) applies only to "electronic assemblies" and programmable interconnections not exceeding the limit in 4A003(b), when shipped as unintegrated "electronic

assemblies". It does not apply to "electronic assemblies" inherently limited by nature of their design for use as related equipment controlled by 4A003(e). (L.N. 183 of 1999; L.N. 95 of 2006)

2. 4A003(c) does not control "electronic assemblies" specially designed for a product or family of products whose maximum configuration does not exceed the limit of 4A003(b).

(d) Deleted; (L.N. 65 of 2004)

(e) Equipment performing analogue-to-digital conversions exceeding the limits in 3A001(a)(5);

(f) (Repealed L.N. 183 of 1999)

(g) Equipment specially designed for aggregating the performance of "digital computers" by providing external interconnections that allow communications at unidirectional data rates exceeding 2.0 Gbyte/s per link; (L.N. 45 of 2010)

Note:

4A003(g) does not apply to internal interconnection equipment (e.g. backplanes, buses), passive interconnection equipment, "network access controllers" or "communications channel controllers". (L.N. 183 of 1999; L.N. 45 of 2010)

4A004 Computers, as follows, and specially designed related equipment, "electronic assemblies" and components therefor:

(a) "Systolic array computers";

(b) "Neural computers";

(c) "Optical computers";

4A101 Analogue computers, "digital computer" or digital differential analysers, other than those controlled by 4A001(a)(1), which are ruggedized and designed or modified for use in space launch vehicles controlled by 9A004, "unmanned aerial vehicles" controlled by 9A012 or sounding rockets controlled by 9A104;

(L.N. 183 of 1999; L.N. 95 of 2006)

4A102 "Hybrid computers" specially designed for modelling, simulation or design integration of space launch vehicles controlled by 9A004, "unmanned aerial vehicles" controlled by 9A012 or sounding rockets controlled by 9A104; (L.N. 183 of 1999; L.N. 95 of 2006)

Note:

4A102 only applies when the equipment is supplied with software controlled by 7D103 or 9D103.

4B TEST, INSPECTION AND PRODUCTION EQUIPMENT

None

4C MATERIALS

None

4D SOFTWARE

Note:

The status of "software" for the "development", "production", or "use" of equipment described in other Categories is dealt with in the appropriate Category. (L.N. 45 of 2010)

4D001 (a) "Software" specially designed or modified for the "development", "production" or "use" of equipment or "software" controlled by 4A001 to 4A004, or 4D; (L.N. 65 of 2004)

(b) "Software", other than that controlled by 4D001(a), specially designed or modified for the "development" or "production" of:

(1) "Digital computers" having an "Adjusted Peak Performance" ("APP") exceeding 0.25 Weighted TeraFLOPS (WT); or (L.N. 226 of 2009; L.N. 45 of 2010)

(2) "Electronic assemblies" specially designed or modified for enhancing performance by aggregation of processors so that the "APP" of the aggregation exceeds the limit in 4D001(b)(1); (L.N. 65 of 2004; L.N. 95 of 2006)

4D002 "Software" specially designed or modified to support "technology" controlled by 4E;

4D003 Deleted; (L.N. 45 of 2010)

N.B.:

See Category 5, Part 2 for "software" performing or incorporating "information security" functions. (L.N. 45 of 2010)

4E TECHNOLOGY

4E001 (a) "Technology" according to the General Technology Note, for the "development", "production" or "use" of equipment or "software" controlled by 4A or 4D; (L.N. 65 of 2004)

(b) "Technology", other than that controlled by 4E001(a), specially designed or modified for the "development" or "production" of:

(1) "Digital computers" having an "Adjusted Peak Performance" ("APP") exceeding 0.25 Weighted TeraFLOPS (WT); or (L.N. 226 of 2009; L.N. 45 of 2010)

(2) "Electronic assemblies" specially designed or modified for enhancing performance by aggregation of processors so that the "APP" of the aggregation exceeds the limit in 4E001(b)(1); (L.N. 65 of 2004; L.N. 95 of 2006)

TECHNICAL NOTE ON "ADJUSTED PEAK PERFORMANCE" ("APP")

"APP" is an adjusted peak rate at which "digital computers" perform 64-bit or larger floating point additions and multiplications.

Abbreviations used in this Technical Note:

n number of processors in the "digital computer"

i processor number (i, . . . n)

t_i processor cycle time ($t_i = 1/F_i$)

F_i processor frequency

R_i peak floating point calculating rate

W_i architecture adjustment factor

"APP" is expressed in Weighted TeraFLOPS (WT), in units of 10^{12} adjusted floating point operations per second.

Outline of the "APP" calculation method:

1. For each processor i, determine the peak number of 64-bit or larger floating point operations, FPO_i , performed per cycle for each processor in the 'digital computer'.

Note:

In determining FPO , include only 64-bit or larger floating point additions or multiplications or both. All floating point operations must be expressed in operations per processor cycle; operations requiring multiple cycles may be expressed in

fractional results per cycle. For processors not capable of performing calculations on floating point operands of 64-bits or more, the effective calculating rate R is zero.

2. Calculate the floating point rate R for each processor $R_i = FPO_i/t_i$

3. Calculate "APP"

$$\text{"APP"} = W_1 \times R_1 + W_2 \times R_2 + \dots + W_n \times R_n$$

4. For 'vector processors', $W_i = 0.9$. For non-'vector processors', $W_i = 0.3$.

Notes:

1. For processors that perform compound operations in a cycle, such as addition and multiplication, each operation is counted.

2. For a pipelined processor, the effective calculating rate R is the faster of the pipelined rate, once the pipeline is full, or the non-pipelined rate.

3. The calculating rate R of each contributing processor is to be calculated at its maximum value theoretically possible before the "APP" of the combination is derived. Simultaneous operations are assumed to exist when the computer manufacturer claims concurrent, parallel, or simultaneous operation or execution in a manual or brochure for the computer.

4. Do not include processors that are limited to input/output and peripheral functions (e.g., disk drive, communication and video display) when calculating "APP".

5. "APP" values are not to be calculated for processor combinations interconnected by "Local Area Networks", Wide Area Networks, Input/Output shared connections/devices, Input/Output controllers and any communication interconnection implemented by "software".

6. "APP" values must be calculated for 1) processor combinations containing processors specially designed to enhance performance by aggregation, operating simultaneously and sharing memory; or 2) multiple memory/processor combinations operating simultaneously utilizing specially designed hardware.

7. A 'vector processor' is defined as a processor with built-in instructions that perform multiple calculations on floating-point vectors (one-dimensional arrays of 64-bit or larger numbers) simultaneously, and having at least 2 vector functional units and at least 8 vector registers of at least 64 elements each.

(L.N. 95 of 2006)