

**DEPARTMENT OF COMMERCE****Bureau of Export Administration****15 CFR Part 774**

RIN: 0694-AB77

**[Docket No. 981229330-8330-01]****Revisions and Clarifications to the Export Administration Regulations; Commerce Control List**

AGENCY: Bureau of Export Administration, Commerce.

ACTION: Final rule.

**SUMMARY:** On January 15, 1998, the Bureau of Export Administration (BXA) published an interim rule (63 FR 2452) that implemented the Wassenaar Arrangement list of dual-use items and reporting requirements under the Wassenaar Arrangement. The interim rule revised the Commerce Control List by making revisions to implement the Wassenaar Arrangement. This rule amends Commerce Control List by making certain revisions and clarifications and, in some cases, inserts material inadvertently omitted from the January 15 interim rule.

**DATES:** This rule is effective March 5, 1999.

**FOR FURTHER INFORMATION CONTACT:** Patricia Muldonian, Office of Exporter Services, Bureau of Export Administration, Telephone: (202) 482-2440.

**SUPPLEMENTARY INFORMATION:****Background**

Specifically this rule makes the following revisions to part 774 of the Export Administration Regulations:

(1) ECCN 0A982 is amended by revising the entry heading and the License Requirements section by removing the references to "conventional steel military helmets". Conventional steel helmets are controlled under ECCN 0A018 or 0A988. In addition, this entry is also revised by removing the UN controls. The UN controls apply only to machetes and certain conventional steel helmets as described in ECCN 0A988.

(2) ECCN 0D001 is amended by revising the Related Controls section by removing the first reference to ECCN 0A002. Items controlled by ECCN 0A002 are subject to the export licensing authority of the U.S. Department of State, Office of Defense Trade Controls, not the Nuclear Regulatory Commission.

(3) ECCN 0E001 is amended by revising the Related Controls section by adding the phrase "Technology for

items controlled by 0A002 are subject to the export licensing authority of the U.S. Department of State, Office of Defense Trade Controls (see 22 CFR part 121)."

(4) ECCN 1A002 is amended by revising the Related Controls section by adding the phrase "Composite structures that are specially designed for missile application (including specially designed subsystems and components) are controlled by ECCN 9A110".

(5) ECCN 1A005 is amended by revising the Controls and Country Chart sections by revising the item for UN to read "UN applies to entire entry—Rwanda and the Federal Republic of Yugoslavia (Serbia and Montenegro)". In addition, License Exception GBS is revised to read "Yes, except UN".

(6) ECCN 1C001 is amended by revising the List of Items Controlled section by revising note 2 to 1C001.a, as follows: "N.B.: Nothing in this note releases magnetic materials to provide absorption when contained in paint.". This revision is consistent with revisions agreed to and implemented by the Wassenaar Arrangement in December 1997.

(7) ECCN 1C006 is amended by revising License Exceptions GBS and CIV as follows: "GBS: Yes for 1C006.d; CIV: Yes for 1C006.d"

(8) [Reserved]

(9) ECCN 1D390 is amended by revising the Controls section by revising the phrase "CB applies to entire entry NP Column 2" to read "CB applies to entire entry CB Column 2".

(10) ECCNs 1D993, 1E001, and 1E994 are amended by revising the entry heading to remove the reference to ECCN 1C994. The January 15 rule moved fluorocarbon electronic cooling fluids from ECCN 1C994 to ECCN 1C006.d.

(11) ECCNs 1E001, 4D001, 4E001, 5D001, 5E001, 6D001, 6D003, 6E001, 6E002, 8D001 and 8E001 are amended by revising License Exception TSR for clarity purposes. In addition, the January 15 rule omitted Japan from the countries eligible for License Exception TSR. This rule corrects that omission.

(12) ECCN 2B001 is amended by revising the List of Items Controlled section by removing the reference to "(overall positioning)" from 2B001.a.1. This revision is consistent with revisions agreed to and implemented by the Wassenaar Arrangement in December 1997.

(13) ECCN 2B003 is amended by revising the entry heading. The reference to "controls" is revised to read "controllers". This revision is consistent with revisions agreed to and

implemented by the Wassenaar Arrangement in December 1997.

(14) ECCN 2B004 is amended by revising the entry heading by revising the phrase "components, accessories," to read "components, controllers, accessories,".

(15) ECCN 2B005 is amended, as follows:

a. By revising the entry heading by adding the phrase "as follows," after the phrase "surface modifications,";

b. By revising the related controls section by adding two notes as follows: "(1) Vapor deposition equipment designed or modified for the production of filamentary materials are controlled by ECCN 1B101; (2) Chemical Vapor Deposition furnaces designed or modified for densification of carbon-carbon composites are controlled by ECCN 2B104."; and

c. By revising the List of Items Controlled section by revising the reference to "decomposition" to read "deposition", as it appears in paragraph a.1.b;

The revisions described in item (15)a and c are consistent with revisions agreed to and implemented by the Wassenaar Arrangement in December 1997. The revision to item (15) b are consistent with revisions agreed to and implemented by the Missile Technology Control Regime.

(16) ECCN 2B104 is amended by revising the License Requirements section by removing the Nuclear Proliferation controls from this entry. Nuclear proliferation controls for isostatic presses are controlled under ECCNs 2B004 or 2B204. This revision is consistent with revisions agreed to and implemented by the Wassenaar Arrangement in December 1997.

(17) ECCN 2B996 is amended by revising the List of Items Controlled section by removing and reserving paragraph b (systems for simultaneous linear-angular inspection of hemishells). These systems are currently controlled under ECCN 2B206.b.

(18) ECCN 2E003 is amended:

a. By revising the related controls section by adding the following note: "Technology", not controlled by ECCNs 2E001 and 2E002, for spin forming machines combining the functions of spin forming and flow forming, and flow forming machines controlled by ECCNs 2B009 and 2B109, are controlled by ECCN 2E101. This revision is consistent with revisions agreed to and implemented by the Missile Technology Control Regime.

b. By revising the List of Items Controlled section by revising the quotation marks in 2E003.e, as follows: 'Technology' \* \* \*. This revision is consistent with revisions agreed to and implemented by the Wassenaar Arrangement in December 1997.

(19) ECCN 3A001 is amended by revising the List of Items Controlled section as follows:

(a) By revising the Related Definitions section, as follows: "For the purposes of integrated circuits in 3A001.a.1,  $5 \times 10^3$  Gy(Si) =  $5 \times 10^5$  Rads (Si);  $5 \times 10^6$  Gy (Si)/s =  $5 \times 10^8$  Rads (Si)/s."; and

(b) By revising 3A001.a.12.b to correct a typographic error.

(20) ECCN 3A002 is amended by revising the List of Items Controlled section by revising the reference to "CCIR" to read "ITU", in the note to 3A002.a.2.

(21) ECCN 3B001 is amended by revising License Exception GBS to read as follows: "Yes, except 3B001.a.2 (metal organic chemical vapor deposition reactors), a.3 (molecular beam epitaxial growth equipment using gas sources), e (automatic loading multi-chamber central wafer handling systems *only* if connected to equipment controlled by 3B001.a.2, a.3, and f), and f (lithography equipment)."

(22) ECCN 3C002 is amended by revising License Exceptions GBS and CIV to read as follows: "GBS: Yes for positive resists not optimized for photolithography at a wavelength of less than 365 nm, provided that they are not controlled by 3C002.b through .d.

CIV: Yes for positive resists not optimized for photolithography at a wavelength of less than 365 nm, provided that they are not controlled by 3C002.b through .d."

(23) ECCN 4A003 is amended as follows:

(a) By revising the entry heading by adding the phrase "(see List of Items Controlled)" after the phrase "equipment therefor,";

(b) By revising the "License Exception Notes" by adding citation references for reporting obligations for computer exports under NDAA;

(c) By revising License Exception CIV by revising "that" to read "than"; and

(d) By revising the List of Items Controlled section, as follows:

(1) By revising the reference to "4E" to read "4E001", in Note 2.c;

(2) By revising the phrase "use of" to read "using", in note 3 to 4A003.a; and

(3) By revising the phrase "to be capable of" to read "for", in 4A003.c.

The revisions to the List of Items Controlled section are consistent with revisions agreed to and implemented by

the Wassenaar Arrangement in December 1997.

(24) ECCN 5A991 is amended by revising the List of Items Controlled section by removing 5A991.b.6.a (voice coding rates at less than 2,400 bits/s). This item is currently controlled under ECCN 5A001.b.10.

(25) ECCN 5A992 is amended by revising the entry heading, License Requirements and List of Items Controlled section. Specifically, this revision provides clarification that telecommunications equipment that contain encryption is controlled by this entry and that such equipment requires a license to countries identified by AT Column 1. In addition, this entry corrects an inadvertent error of the January 15 rule. "Information security" equipment, n.e.s., (e.g., cryptographic, cryptanalytic, and cryptologic equipment, n.e.s.) and components therefor has been revised to require a license to countries identified by AT Column 2.

(26) ECCN 5D002 is amended by revising the Related Definitions section by adding the following definition, "5D002.a controls "software" designed or modified to use "cryptography" employing digital or analog techniques to ensure "information security"." This definition was erroneously omitted in the January 15 rule.

(27) ECCN 5D992 is amended by revising the License Requirements and List of Items Controlled sections. Specifically this rule clarifies that "software" specially designed or modified for the "development", "production", or "use" of telecommunications equipment containing encryption (e.g., equipment controlled by 5A992.a) or "software" having the characteristics, or performing or simulating the functions of equipment controlled by 5A992.a require a license to countries identified by AT Column 1. In addition, this entry corrects an inadvertent error of the January 15 rule. "Software" specially designed or modified for the "development", "production", or "use" of information security or cryptologic equipment (e.g., equipment controlled by 5A992.b); "software" having the characteristics, or performing or simulating the functions of the equipment controlled by 5A992.b; or "software" designed or modified to protect against malicious computer damage, e.g., viruses has been revised to require a license to countries identified by AT Column 2.

(28) ECCN 5E992 is amended by revising the entry heading, the License Requirements and List of Items Controlled sections. Specifically, this

rule clarifies that "technology" n.e.s., for the "development", "production" or "use" of telecommunications equipment containing encryption (e.g., equipment controlled by 5A992.a) or "software" controlled by 5D992.a.1 or b.1 requires a license to countries identified by AT Column 1. In addition, this entry corrects an inadvertent error of the January 15 rule. "Technology", n.e.s., for the "development", "production", or "use" of "information security" or cryptologic equipment (e.g. equipment controlled by 5A992.b), or "software" controlled by 5D992.a.2, b.2, or c has been revised to require a license to countries identified AT Column 2.

(29) ECCN 6A003 is amended by revising the List of Items Controlled section by revising the phrase "cameras for normal civil purposes" to read "cameras designed for civil purposes", in the note to 6A003.a.1. This revision is consistent with revisions agreed to and implemented by the Wassenaar Arrangement in December 1997.

(30) ECCN 6A005 is amended:

(a) By revising the reference to "c.2.d.2.b" under the Controls section for NP to read "c.2.b.2.b";

(b) By revising the List of Items Controlled section, as follows:

(1) By revising 6A005.a.6 as follows "Krypton ion or argon ion "lasers" having any of the following." This revision is consistent with revisions agreed to and implemented by the Wassenaar Arrangement in December 1997.

(1) By revising the reference to "6A005.c.2.d" to read "6A005.c.2.c" in the note immediately following paragraph c.2.b.

(31) ECCN 6A007 is amended by revising the List of Items Controlled section, as follows:

(a) By revising the phrase "Gravity meters for ground use" to read "Gravity meters designed or modified for ground use" in 6A007.a; and

(b) By revising the phrase "Gravity meters for mobile platforms" to read "Gravity meters designed for mobile platforms" in 6A007.b.

These revisions are consistent with revisions agreed to and implemented by the Wassenaar Arrangement in December 1997.

(32) ECCN 6A008 is amended by revising the List of Items Controlled section by revising the reference to "used" to read "designed" in the note to 6A008.l.4. This revision is consistent with revisions agreed to and implemented by the Wassenaar Arrangement in December 1997.

(33) ECCN 7D003 is amended by adding a License Exceptions section, as follows: "CIV: N/A; TSR: N/A".

(34) ECCN 8A002 is amended by revising the List of Items Controlled section by removing the reference "equipment for" from 8A002.b. This revision is consistent with revisions agreed to and implemented by the Wassenaar Arrangement in December 1997.

(35) ECCN 8A992 is amended by revising the List of Items Controlled section by removing paragraph i and by redesignating paragraphs j, k, and l as paragraphs i, j, and k.

(36) ECCN 9A018 is amended by removing the second reference to that entry.

### Rulemaking Requirements

1. This final rule has been determined to be not significant for the purposes of Executive Order 12866.

2. Notwithstanding any other provision of law, no person is required to respond to nor be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork Reduction Act unless that collection of information displays a current valid OMB Control Number. This rule involves collections of information subject to the Paperwork Reduction Act of 1980 (44 U.S.C. 3501 *et seq.*). These collections have been approved by the Office of Management and Budget under control numbers 0694-0086 and 0694-0088.

3. This rule does not contain policies with Federalism implications sufficient to warrant preparation of a Federalism assessment under Executive Order 12612.

4. Because a notice of proposed rulemaking and an opportunity for public comment are not required to be given for this rule by the Administrative Procedure Act (5 U.S.C. 553) or by any other law, under section 3(a) of the Regulatory Flexibility Act (5 U.S.C. 603(a) and 604(a)) no initial or final Regulatory Flexibility Analysis has to be or will be prepared.

5. The provisions of the Administrative Procedure Act, (5 U.S.C. 553), requiring notice of proposed rulemaking, the opportunity for public participation, and a delay in effective date, are inapplicable because this regulation involves a military or foreign affairs function of the United States. No other law requires that a notice of proposed rulemaking and an opportunity for public comment be given for this rule.

Accordingly, it is issued in final form. However, comments from the public are always welcome. Comments should be submitted to Patricia Muldonian, Office of Exporter Services, Bureau of Export

Administration, Department of Commerce, P.O. Box 273, Washington, DC 20044.

### List of Subjects in 15 CFR Part 774

Exports, Foreign trade.

Accordingly, Part 774 of the Export Administration Regulations (15 CFR Parts 730 through 799) is amended as follows:

1. The authority citation for 15 CFR Part 774 continues to read as follows:

**Authority:** 50 U.S.C. app. 2401 *et seq.*; 50 U.S.C. 1701 *et seq.*; 10 U.S.C. 7420; 10 U.S.C. 7430(e); 18 U.S.C. 2510 *et seq.*; 22 U.S.C. 287c; 22 U.S.C. 3201 *et seq.*; 22 U.S.C. 6004; Sec. 201, Pub. L. 104-58, 109 Stat. 557 (30 U.S.C. 185(s)); 30 U.S.C. 185(u); 42 U.S.C. 2139a; 42 U.S.C. 6212; 43 U.S.C. 1354; 46 U.S.C. app. 466c; 50 U.S.C. app. 5; E.O. 12924, 3 CFR, 1994 Comp., p. 917; E.O. 13020, 3 CFR, 1996 Comp. p. 219; E.O. 13026, 3 CFR, 1996 Comp., p. 228; Notice of August 13, 1997 (62 FR 43629, August 15, 1997); Notice of August 17, 1998 (63 FR 55121, August 17, 1998).

### PART 774—[AMENDED]

#### Supplement No. 1 to Part 774—The Commerce Control List

2. In Supplement No. 1 to part 774 (the Commerce Control List), Category 0—Nuclear Materials, Facilities, and Equipment [and Miscellaneous Items], the following Export Control Classification Numbers (ECCNs) are amended:

- a. By revising the entry heading and License Requirements section for ECCN 0A982;
- b. By revising the List of Items Controlled section for ECCN 0D001; and
- c. By revising the List of Items Controlled section for 0E001, as follows:

**0A982 Saps; thumbcuffs, leg irons, shackles, and handcuffs; straight jackets, plastic handcuffs, police helmets and shields; and parts and accessories, n.e.s.**

#### License Requirements

Reason for Control: CC

Control(s)	Country Chart
CC applies to entire entry ..	CC Column 1
* * * * *	

**0D001 "Software" specially designed or modified for the "development", "production" or "use" of goods controlled by this Category.**

\* \* \* \* \*

#### List of Items Controlled

Unit: \$ value

**Related Controls:** (1) "Software" for items controlled by 0A001, 0B001, 0B002, 0B004, 0B005, 0B006, 0B009, 0C001, 0C002, 0C004, 0C005, 0C006, and 0C201 are subject to the export licensing authority of

the Nuclear Regulatory Commission (see 10 CFR part 110). (2) "Software" for items controlled by 0A002 are subject to the export licensing authority of the U.S. Department of State, Office of Defense Trade Controls (see 22 CFR part 121).

**Related Definitions:** N/A

**Items:** The List of Items Controlled is contained in the ECCN heading.

**0E001 "Technology" according to the Nuclear Technology Note for the "development", "production" or "use" of items controlled by this Category.**

\* \* \* \* \*

#### List of Items Controlled

Unit: N/A

**Related Controls:** (1) "Technology" for items controlled by 0A001, 0B001, 0B002, 0B004, 0B005, 0B006, 0B009, 0C001, 0C002, 0C004, 0C005, 0C006, and 0C201 are subject to the export licensing authority of the Department of Energy (see 10 CFR part 810). (2) "Technology" for items controlled by 0A002 are subject to the export licensing authority of the U.S. Department of State, Office of Defense Trade Controls (see 22 CFR part 121).

**Related Definitions:** N/A

**Items:** The list of items controlled is contained in the ECCN heading.

3. In Supplement No. 1 to part 774 (the Commerce Control List), Category 1—Materials, Chemicals, "Microorganisms", and Toxins, the following Export Control Classification Numbers (ECCNs) are amended:

- a. By revising the List of Items Controlled section for ECCN 1A002;
- b. By revising the License Requirements section and the License Exceptions section for ECCN 1A005;
- c. By revising the List of Items Controlled section for ECCN 1C001;
- d. By revising the License Exceptions section for ECCN 1C006;
- e. [Reserved]
- f. By revising the License Requirements section for ECCN 1D390; and
- g. By revising the entry heading for ECCNs 1D993 and 1E994; and
- h. By revising the entry heading and the License Exceptions section for 1E001, as follows:

**1A002 "Composite" structures or laminates, having any of the following (see List of Items Controlled).**

\* \* \* \* \*

#### List of Items Controlled

Unit: Kilograms

**Related Controls:** (1) See also 1A202, 9A010, and 9A110. (2) Composite structures that are specially designed for missile application (including specially designed subsystems and components) are controlled by 9A1102. (3) This entry does not control "composite" structures or laminates made from epoxy resin

impregnated carbon "fibrous or filamentary materials" for the repair of aircraft structures of laminates, provided that the size does not exceed one square meter (1 m<sup>2</sup>).

**Related Definitions:** N/A

**Items:** a. An organic "matrix" and made from materials controlled by 1C010.c, 1C010.d or 1C010.e; *or*

b. A metal or carbon "matrix" and made from:

b.1. Carbon "fibrous or filamentary materials" with:

b.1.a. A "specific modulus" exceeding 10.15 x 10<sup>6</sup> m; *and*

b.1.b. A "specific tensile strength" exceeding 17.7 x 10<sup>4</sup> m; *or*

b.2. Materials controlled by 1C010.c.

**Technical Notes:** (1) Specific modulus: Young's modulus in pascals, equivalent to N/m<sup>2</sup> divided by specific weight in N/m<sup>3</sup>, measured at a temperature of (296±2) K (23±2) °C and a relative humidity of (50±5)%. (2) Specific tensile strength: ultimate tensile strength in pascals, equivalent to N/m<sup>2</sup> divided by specific weight in N/m<sup>3</sup>, measured at a temperature of (296±2) K (23±2) °C and a relative humidity of (50±5)%.

**1A005 Body armor, and specially designed components therefor, not manufactured to military standards or specifications, nor to their equivalents in performance.**

#### License Requirements

**Reason for Control:** NS, UN, AT

Control(s)	Country Chart
NS applies to entire entry ..	NS Column 2
UN applies to entire entry	Rwanda, Federal Republic of Yugoslavia (Serbia and Montenegro)
AT applies to entire entry	AT Column 1

#### License Exceptions

LVS: N/A

GBS: Yes, except UN

CIV: N/A

\* \* \* \* \*

**1C001 Materials specially designed for use as absorbers of electromagnetic waves, or intrinsically conductive polymers, as follows (see List of Items Controlled).**

\* \* \* \* \*

#### List of Items Controlled

**Unit:** Kilograms

**Related Controls:** See also 1C101

**Related Definitions:** N/A

**Items:** a. Materials for absorbing frequencies exceeding 2 x 10<sup>8</sup> Hz but less than 3 x 10<sup>12</sup> Hz.

**Note:** 1C001.a does not control:

a. Hair type absorbers, constructed of natural or synthetic fibers, with non-magnetic loading to provide absorption;

b. Absorbers having no magnetic loss and whose incident surface is non-planar in shape, including pyramids, cones, wedges and convoluted surfaces;

c. Planar absorbers, having all of the following characteristics:

1. Made from any of the following:

a. Plastic foam materials (flexible or non-flexible) with carbon-loading, or organic materials, including binders, providing more than 5% echo compared with metal over a bandwidth exceeding ±15% of the center frequency of the incident energy, and not capable of withstanding temperatures exceeding 450 K (177° C); *or*

b. Ceramic materials providing more than 20% echo compared with metal over a bandwidth exceeding ±15% of the center frequency of the incident energy, and not capable of withstanding temperatures exceeding 800 K (527° C);

**Technical Note:** Absorption test samples for 1C001.a. Note 1.c.1 should be a square at least 5 wavelengths of the center frequency on a side and positioned in the far field of the radiating element.

2. Tensile strength less than 7 x 10<sup>6</sup> N/m<sup>2</sup>; *and*

3. Compressive strength less than 14 x 10<sup>6</sup> N/m<sup>2</sup>;

d. Planar absorbers made of sintered ferrite, having:

1. A specific gravity exceeding 4.4; *and*

2. A maximum operating temperature of 548 K (275° C).

**N.B.:** Nothing in this note releases magnetic materials to provide absorption when contained in paint.

b. Materials for absorbing frequencies exceeding 1.5 x 10<sup>14</sup> Hz but less than 3.7 x 10<sup>14</sup> Hz and not transparent to visible light;

c. Intrinsically conductive polymeric materials with a bulk electrical conductivity exceeding 10,000 S/m (Siemens per meter) or a sheet (surface) resistivity of less than 100 ohms/square, based on any of the following polymers:

c.1. Polyaniline;

c.2. Polypyrrole;

c.3. Polythiophene;

c.4. Poly phenylene-vinylene; *or*

c.5. Poly thienylene-vinylene.

**Technical Note:** Bulk electrical conductivity and sheet (surface) resistivity should be determined using ASTM D-257 or national equivalents.

**1C006 Fluids and lubricating materials, as follows (see List of Items Controlled).**

\* \* \* \* \*

#### License Exceptions

LVS: \$3000

GBS: Yes for 1C006.d

CIV: Yes for 1C006.d

\* \* \* \* \*

**1D390 "Software" for process control that is specifically configured to control or initiate "production" of chemicals controlled by 1C350.**

#### License Requirements

**Reason for Control:** CB, AT

Control(s)	Country Chart
CB applies to entire entry ..	CB Column 2
AT applies to entire entry	AT Column 1
* * * * *	

**1D993 "Software" specially designed for the "development", "production", or "use" of equipment or materials controlled by 1C210.b or 1C990.**

\* \* \* \* \*

**1E001 "Technology" according to the General Technology Note for the "development" or "production" of items controlled by 1A001.b, 1A001.c, 1A002, 1A003, 1A102, 1B or 1C (except 1C980 to 1C984, 1C988, 1C990, 1C991, 1C992, and 1C995).**

\* \* \* \* \*

#### License Exceptions

CIV: N/A

TSR: Yes, except for the following:

(1) Items controlled for MT reasons; *or*  
(2) Exports and reexports to destinations outside of Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, Portugal, Spain, Sweden, or the United Kingdom of "technology" for the "development" or "production" of the following:

(a) Items controlled by 1C001; *or*

(b) Items controlled by 1A002.a which are composite structures or laminates having an organic "matrix" and being made from materials listed under 1C010.c or 1C010.d.

\* \* \* \* \*

**1E994 "Technology" for the "development", "production", or "use" of fibrous and filamentary materials controlled by 1C990.**

\* \* \* \* \*

4. In Supplement No. 1 to part 774 (the Commerce Control List), Category 2—Material Processing, Export Control Classification Numbers (ECCNs) are amended:

a. By revising the List of items controlled section for 2B001;

- b. By revising the entry heading for ECCNs 2B003 and 2B004;
- c. By revising the entry heading and the List of Items Controlled section for ECCN 2B005;
- d. By revising the License Requirements section for ECCN 2B104; and
- e. By revising the List of Items Controlled section for ECCN 2B996; and
- f. By revising the List of Items Controlled section for ECCN 2E003 (the table remains unchanged), as follows:

**2B001 Machine tools and any combination thereof, for removing (or cutting) metals, ceramics or "composites", which, according to the manufacturer's technical specification, can be equipped with electronic devices for "numerical control".**

\* \* \* \* \*

#### List of Items Controlled

*Unit:* Equipment in number; parts and accessories in \$ value

*Related Controls:* See also 2B201, 2B290 and 2B991

*Related Definitions:* N/A

*Items:* a. Machine tools for turning, having all of the following characteristics:

- a.1. Positioning accuracy with all compensations available of less (better) than 6  $\mu$ m along any linear axis; and
- a.2. Two or more axes which can be coordinated simultaneously for "contouring control";

**Note:** 2B001.a does not control turning machines specially designed for the production of contact lenses.

b. Machine tools for milling, having any of the following characteristics:

b.1.a. Positioning accuracy with all compensations available of less (better) than 6  $\mu$ m along any linear axis (overall positioning); and

b.1.b. Three linear axes plus one rotary axis which can coordinated simultaneously for "contouring control";

b.2. Five or more axes which can be coordinated simultaneously for "contouring control"; or

b.3. A positioning accuracy for jig boring machines, with all compensations available, of less (better) than 4  $\mu$ m along any linear axis (overall positioning);

c. Machine tools for grinding, having any of the following characteristics:

c.1.a. Positioning accuracy with all compensations available of less (better) than 4  $\mu$ m along any linear axis (overall positioning); and

c.1.b. Three or more axes which can be coordinated simultaneously for "contouring control"; or

c.2. Five or more axes which can be coordinated simultaneously for "contouring control";

**Notes:** 2B001.c does not control grinding machines, as follows:

1. Cylindrical external, internal, and external-internal grinding machines having all the following characteristics:

- a. Limited to cylindrical grinding; and
- b. Limited to a maximum workpiece capacity of 150 mm outside diameter or length.

2. Machines designed specifically as jig grinders having any of following characteristics:

a. The c-axis is used to maintain the grinding wheel normal to the work surface; or

b. The a-axis is configured to grind barrel cams.

3. Tool or cutter grinding machines shipped as complete systems with "software" specially designed for the production of tools or cutters.

4. Crank shaft or cam shaft grinding machines.

5. Surface grinders.

d. Electrical discharge machines (EDM) of the non-wire type which have two or more rotary axes which can be coordinated simultaneously for "contouring control";

e. Machine tools for removing metals, ceramics or "composites":

e.1. By means of:

e.1.a. Water or other liquid jets, including those employing abrasive additives;

e.1.b. Electron beam; or

e.1.c. "Laser" beam; and

e.2. Having two or more rotary axes which: e.2.a. Can be coordinated simultaneously for "contouring control"; and

e.2.b. Have a positioning accuracy of less (better) than 0.003°;

f. Deep-hole-drilling machines and turning machines modified for deep-hole-drilling, having a maximum depth-of-bore capability exceeding 5,000 mm and specially designed components therefor.

**2B003 "Numerically controlled" or manual machine tools, and specially designed components, controllers and accessories therefor, specially designed for the shaving, finishing, grinding or honing of hardened ( $R_c = 40$  or more) spur, helical and double-helical gears with a pitch diameter exceeding 1,250 mm and a face width of 15% of pitch diameter or larger finished to a quality of AGMA 14 or better (equivalent to ISO 1328 class 3).**

\* \* \* \* \*

**2B004 Hot "isostatic presses", having all of the following characteristics described in the List of Items Controlled, and specially designed dies, molds, components, controllers, accessories and controls therefor.**

\* \* \* \* \*

**2B005 Equipment specially designed for the deposition, processing and in-process control of inorganic overlays, coatings and surface modifications, as follows, for non-electronic substrates, by processes shown in the Table and associated Notes following 2E003.f, and specially designed automated handling, positioning, manipulation and control components therefor.**

\* \* \* \* \*

#### List of Items Controlled

*Unit:* \$ value

*Related Controls:* (1) This entry does not control chemical vapor deposition, cathodic arc, sputter deposition, ion plating or ion implantation equipment specially designed for cutting or machining tools. (2) Vapor deposition equipment designed or modified for the production of filamentary materials are controlled by 1B101. (3) Chemical Vapor Deposition furnaces designed or modified for densification of carbon-carbon composites are controlled by 2B104.

*Related Definitions:* N/A

*Items:* a. "Stored program controlled" chemical vapor deposition (CVD) production equipment having all of the following:

a.1. Process modified for one of the following:

a.1.a. Pulsating CVD;

a.1.b. Controlled nucleation thermal deposition (CNTD); or

a.1.c. Plasma enhanced or plasma assisted CVD; and

a.2. Any of the following:

a.2.a. Incorporating high vacuum (equal to or less than 0.01 Pa) rotating seals; or

a.2.b. Incorporating *in situ* coating thickness control;

b. "Stored program controlled" ion implantation production equipment having beam currents of 5 mA or more;

c. "Stored program controlled" electron beam physical vapor (EB-PVD) production equipment incorporating all of the following:

c.1. Power systems rated for over 80 kW;

c.2. A liquid pool level "laser" control system which regulates precisely the ingots feed rate; and

c.3. A computer controlled rate monitor operating on the principle of photoluminescence of the ionized atoms in the evaporant stream to control the deposition rate of a coating containing two or more elements;

d. "Stored program controlled" plasma spraying production equipment having any of the following characteristics:

d.1. Operating at reduced pressure controlled atmosphere (equal or less than 10 kPa measured above and within 300 mm of the gun nozzle exit) in a vacuum chamber capable of evacuation down to 0.01 Pa prior to the spraying process; or

d.2. Incorporating *in situ* coating thickness control;

e. "Stored program controlled" sputter deposition production equipment capable of current densities of 0.1 mA/mm<sup>2</sup> or higher at a deposition rate 15 µm/h or more;

f. "Stored program controlled" cathodic arc deposition equipment incorporating a grid of electromagnets for steering control of the arc spot on the cathode;

g. "Stored program controlled" ion plating production equipment allowing for the *in situ* measurement of any of the following:

g.1. Coating thickness on the substrate and rate control; or

g.2. Optical characteristics.

**2B104 Equipment and process controls designed or modified for densification and pyrolysis of structural composite rocket nozzles and reentry vehicle nose tips.**

**License Requirements**

*Reason for Control:* MT, AT

<i>Control(s)</i>	<i>Country Chart</i>
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1
* * * * *	

**2B996 Dimensional inspection or measuring systems or equipment not controlled by 2B006.**

\* \* \* \* \*

**List of Items Controlled**

*Unit:* Equipment in number

*Related Controls:* N/A

*Related Definitions:* N/A

*Items:* a. Manual dimensional inspection machines, having both of the following characteristics:

a.1. Two or more axes; and

a.2. A measurement uncertainty equal to or less (better) than (3 + L/300) micrometer in any axes (L measured length in mm).

**2E003 Other "technology", as follows (see List of Items Controlled).**

\* \* \* \* \*

**List of Items Controlled**

*Unit:* N/A

*Related Controls:* "Technology", not controlled by 2E001 and 2E002, for spin forming machines combining the functions of spin forming and flow forming, and for flow forming machines controlled by 2B009 and 2B109, are controlled by 2E101.

*Related Definitions:* N/A

*Items:* a. "Technology" for the "development" of interactive graphics as an integrated part in "numerical control" units for preparation or modification of part programs;

b. "Technology" for metal-working manufacturing processes, as follows:

b.1. "Technology" for the design of tools, dies or fixtures specially designed for any of the following processes:

b.1.a. "Superplastic forming";

b.1.b. "Diffusion bonding"; or

b.1.c. "Direct-acting hydraulic pressing";

b.2. Technical data consisting of process methods or parameters as listed below used to control:

b.2.a. "Superplastic forming" of aluminum alloys, titanium alloys or "superalloys":

b.2.a.1. Surface preparation;

b.2.a.2. Strain rate;

b.2.a.3. Temperature;

b.2.a.4. Pressure;

b.2.b. "Diffusion bonding" of "superalloys" or titanium alloys:

b.2.b.1. Surface preparation;

b.2.b.2. Temperature;

b.2.b.3. Pressure;

b.2.c. "Direct-acting hydraulic pressing" of aluminum alloys or titanium alloys:

b.2.c.1. Pressure;

b.2.c.2. Cycle time;

b.2.d. "Hot isostatic densification" of titanium alloys, aluminum alloys or "superalloys":

b.2.d.1. Temperature;

b.2.d.2. Pressure;

b.2.d.3. Cycle time;

c. "Technology" for the "development" or "production" of hydraulic stretch-forming machines and dies therefor, for the manufacture of airframe structures;

d. "Technology" for the "development" of generators of machine tool instructions (e.g., part programs) from design data residing inside "numerical control" units;

e. "Technology" for the "development" of integration "software" for incorporation of expert systems for advanced decision support of shop floor operations into "numerical control" units;

f. "Technology" for the application of inorganic overlay coatings or inorganic surface modification coatings (specified in column 3 of the following table) to non-electronic substrates (specified in column 2 of the following table), by processes specified in column 1 of the following table and defined in the Technical Note.

\* \* \* \* \*

5. In Supplement No. 1 to part 774 (the Commerce Control List), Category 3—Electronics, Export Control Classification Number (ECCNs) are amended:

a. By revising the List of Items Controlled section for ECCNs 3A001 and 3A002;

b. By revising the License Exceptions section for ECCN 3B001; and

c. By revising the License Exceptions section for ECCN 3C002, as follows:

**3A001 Electronic components, as follows (see List of Items Controlled).**

\* \* \* \* \*

**List of Items Controlled**

*Unit:* Number

*Related Controls:* See also 3A101, 3A201, and 3A991

*Related Definitions:* For the purposes of integrated circuits in 3A001.a.1,  $5 \times 10^3$

Gy(Si) =  $5 \times 10^5$  Rads (Si);  $5 \times 10^6$  Gy (Si)/s =  $5 \times 10^8$  Rads (Si)/s.

*Items:* a. General purpose integrated circuits, as follows:

**Note 1:** The control status of wafers (finished or unfinished), in which the function has been determined, is to be evaluated against the parameters of 3A001.a.

**Note 2:** Integrated circuits include the following types:

"Monolithic integrated circuits";

"Hybrid integrated circuits";

"Multichip integrated circuits";

"Film type integrated circuits", including silicon-on-sapphire integrated circuits; "Optical integrated circuits".

a.1. Integrated circuits, designed or rated as radiation hardened to withstand any of the following:

a.1.a. A total dose of  $5 \times 10^3$  Gy (Si), or higher; or

a.1.b. A dose rate upset of  $5 \times 10^6$  Gy (Si)/s, or higher;

a.2. Integrated circuits described in 3A001.a.3 to 3A001.a.10 or 3A001.a.12, electrical erasable programmable read-only memories (EEPROMs), flash memories and static random-access memories (SRAMs), having any of the following:

a.2.a. Rated for operation at an ambient temperature above 398 K (125° C);

a.2.b. Rated for operation at an ambient temperature below 218 K (−55° C); or

a.2.c. Rated for operation over the entire ambient temperature range from 218 K (−55° C) to 398 K (125° C);

**Note:** 3A001.a.2 does not apply to integrated circuits for civil automobiles or railway train applications.

a.3. "Microprocessor microcircuits", "micro-computer microcircuits" and microcontroller microcircuits, having any of the following characteristics:

**Note:** 3A001.a.3 includes digital signal processors, digital array processors and digital coprocessors.

a.3.a. A "composite theoretical performance" ("CTP") of 260 million theoretical operations per second (Mtops) or more and an arithmetic logic unit with an access width of 32 bit or more;

a.3.b. Manufactured from a compound semiconductor and operating at a clock frequency exceeding 40 MHz; or

a.3.c. More than one data or instruction bus or serial communication port for external interconnection in a parallel processor with a transfer rate exceeding 2.5 Mbyte/s;

a.4. Storage integrated circuits manufactured from a compound semiconductor;

a.5. Analog-to-digital and digital-to-analog converter integrated circuits, as follows:

a.5.a. Analog-to-digital converters having any of the following:

a.5.a.1. A resolution of 8 bit or more, but less than 12 bit, with a total conversion time to maximum resolution of less than 10 ns;

a.5.a.2. A resolution of 12 bit with a total conversion time to maximum resolution of less than 200 ns; *or*

a.5.a.3. A resolution of more than 12 bit with a total conversion time to maximum resolution of less than 2  $\mu$ s;

a.5.b. Digital-to-analog converters with a resolution of 12 bit or more, and a "settling time" of less than 10 ns;

a.6. Electro-optical and "optical integrated circuits" designed for "signal processing" having all of the following:

a.6.a. One or more than one internal "laser" diode;

a.6.b. One or more than one internal light detecting element; *and*

a.6.c. Optical waveguides;

a.7. Field programmable gate arrays having any of the following:

a.7.a. An equivalent usable gate count of more than 30,000 (2 input gates); *or*

a.7.b. A typical "basic gate propagation delay time" of less than 0.4 ns;

a.8. Field programmable logic arrays having any of the following:

a.8.a. An equivalent usable gate count of more than 30,000 (2 input gates); *or*

a.8.b. A toggle frequency exceeding 133 MHz;

a.9. Neural network integrated circuits;

a.10. Custom integrated circuits for which the function is unknown, or the control status of the equipment in which the integrated circuits will be used is unknown to the manufacturer, having any of the following:

a.10.a. More than 208 terminals;

a.10.b. A typical "basic gate propagation delay time" of less than 0.35 ns; *or*

a.10.c. An operating frequency exceeding 3 GHz;

a.11. Digital integrated circuits, other than those described in 3A001.a.3 to 3A001.a.10 and 3A001.a.12, based upon any compound semiconductor and having any of the following:

a.11.a. An equivalent gate count of more than 300 (2 input gates); *or*

a.11.b. A toggle frequency exceeding 1.2 GHz;

a.12. Fast Fourier Transform (FFT) processors having any of the following:

a.12.a. A rated execution time for a 1,024 point complex FFT of less than 1 ms;

a.12.b. A rated execution time for an N-point complex FFT of other than 1,024 points of less than  $N \log_2 N / 10,240$  ms, where N is the number of points; *or*

a.12.c. A butterfly throughput of more than 5.12 MHz; b. Microwave or millimeter wave components, as follows:

b.1. Electronic vacuum tubes and cathodes, as follows:

**Note:** 3A001.b.1 does not control tubes designed or rated to operate in the ITU allocated bands at frequencies not exceeding 31 GHz.

b.1.a. Travelling wave tubes, pulsed or continuous wave, as follows:

b.1.a.1. Operating at frequencies higher than 31 GHz;

b.1.a.2. Having a cathode heater element with a turn on time to rated RF power of less than 3 seconds;

b.1.a.3. Coupled cavity tubes, or derivatives thereof, with an "instantaneous bandwidth" of more than 7% or a peak power exceeding 2.5 kW;

b.1.a.4. Helix tubes, or derivatives thereof, with any of the following characteristics:

b.1.a.4.a. An "instantaneous bandwidth" of more than one octave, and average power (expressed in kW) times frequency (expressed in GHz) of more than 0.5;

b.1.a.4.b. An "instantaneous bandwidth" of one octave or less, and average power (expressed in kW) times frequency (expressed in GHz) of more than 1; *or*

b.1.a.4.c. Being "space qualified";

b.1.b. Crossed-field amplifier tubes with a gain of more than 17 dB;

b.1.c. Impregnated cathodes designed for electronic tubes, with any of the following:

b.1.c.1. A turn on time to rated emission of less than 3 seconds; *or*

b.1.c.2. Producing a continuous emission current density at rated operating conditions exceeding 5 A/cm<sup>2</sup>;

b.2. Microwave integrated circuits or modules containing "monolithic integrated circuits" operating at frequencies exceeding 3 GHz;

**Note:** 3A001.b.2 does not control circuits or modules for equipment designed or rated to operate in the ITU allocated bands at frequencies not exceeding 31 GHz.

b.3. Microwave transistors rated for operation at frequencies exceeding 31 GHz;

b.4. Microwave solid state amplifiers, having any of the following:

b.4.a. Operating frequencies exceeding 10.5 GHz and an "instantaneous bandwidth" of more than half an octave; *or*

b.4.b. Operating frequencies exceeding 31 GHz;

b.5. Electronically or magnetically tunable band-pass or band-stop filters having more than 5 tunable resonators capable of tuning across a 1.5:1 frequency band ( $F_{\max}/F_{\min}$ ) in less than 10  $\mu$ s having any of the following:

b.5.a. A band-pass bandwidth of more than 0.5% of center frequency; *or*

b.5.b. A band-stop bandwidth of less than 0.5% of center frequency;

b.6. Microwave "assemblies" capable of operating at frequencies exceeding 31 GHz;

b.7. Mixers and converters designed to extend the frequency range of equipment described in 3A002.c, 3A002.e or 3A002.f beyond the limits stated therein;

b.8. Microwave power amplifiers containing tubes controlled by 3A001.b and having all of the following:

b.8.a. Operating frequencies above 3 GHz;

b.8.b. An average output power density exceeding 80 W/kg; *and*

b.8.c. A volume of less than 400 cm<sup>3</sup>;

**Note:** 3A001.b.8 does not control equipment designed or rated for operation in an ITU allocated band.

c. Acoustic wave devices, as follows, and specially designed components therefor:

c.1. Surface acoustic wave and surface skimming (shallow bulk) acoustic wave devices (i.e., "signal processing" devices employing elastic waves in materials), having any of the following:

c.1.a. A carrier frequency exceeding 2.5 GHz;

c.1.b. A carrier frequency exceeding 1 GHz, but not exceeding 2.5 GHz, and having any of the following:

c.1.b.1. A frequency side-lobe rejection exceeding 55 dB;

c.1.b.2. A product of the maximum delay time and the bandwidth (time in  $\mu$ s and bandwidth in MHz) of more than 100;

c.1.b.3. A bandwidth greater than 250 MHz; *or*

c.1.b.4. A dispersive delay of more than 10  $\mu$ s; *or*

c.1.c. A carrier frequency of 1 GHz or less, having any of the following:

c.1.c.1. A product of the maximum delay time and the bandwidth (time in  $\mu$ s and bandwidth in MHz) of more than 100;

c.1.c.2. A dispersive delay of more than 10  $\mu$ s; *or*

c.1.c.3. A frequency side-lobe rejection exceeding 55 dB and a bandwidth greater than 50 MHz;

c.2. Bulk (volume) acoustic wave devices (i.e., "signal processing" devices employing elastic waves) that permit the direct processing of signals at frequencies exceeding 1 GHz;

c.3. Acoustic-optic "signal processing" devices employing interaction between acoustic waves (bulk wave or surface wave) and light waves that permit the direct processing of signals or images, including spectral analysis, correlation or convolution;

d. Electronic devices and circuits containing components, manufactured from "superconductive" materials specially designed for operation at temperatures below the "critical temperature" of at least one of the "superconductive" constituents, with any of the following:

d.1. Electromagnetic amplification:

d.1.a. At frequencies equal to or less than 31 GHz with a noise figure of less than 0.5 dB; *or*

d.1.b. At frequencies exceeding 31 GHz;

d.2. Current switching for digital circuits using "superconductive" gates with a product of delay time per gate (in seconds) and power dissipation per gate (in watts) of less than  $-14$  J; *or*

d.3. Frequency selection at all frequencies using resonant circuits with Q-values exceeding 10,000;

e. High energy devices, as follows:

e.1. Batteries and photovoltaic arrays, as follows:

**Note:** 3A001.e.1 does not control batteries with volumes equal to or less than 27 cm<sup>3</sup> (e.g., standard C-cells or R14 batteries).

e.1.a. Primary cells and batteries having an energy density exceeding 480 Wh/kg and rated for operation in the temperature range from below 243 K (−30° C) to above 343 K (70° C);

e.1.b. Rechargeable cells and batteries having an energy density exceeding 150 Wh/kg after 75 charge/discharge cycles at a discharge current equal to C/5 hours (C being the nominal capacity in ampere hours) when operating in the temperature range from below 253 K (−20° C) to above 333 K (60° C);

**Technical Note:** Energy density is obtained by multiplying the average power in watts (average voltage in volts times average current in amperes) by the duration of the discharge in hours to 75% of the open circuit voltage divided by the total mass of the cell (or battery) in kg.

e.1.c. "Space qualified" and radiation hardened photovoltaic arrays with a specific power exceeding 160 W/m<sup>2</sup> at an operating temperature of 301 K (28° C) under a tungsten illumination of 1 kW/m<sup>2</sup> at 2,800 K (2,527° C);

e.2. High energy storage capacitors, as follows:

**N.B.:** See also 3A201.a.

e.2.a. Capacitors with a repetition rate of less than 10 Hz (single shot capacitors) having all of the following:

e.2.a.1. A voltage rating equal to or more than 5 kV;

e.2.a.2. An energy density equal to or more than 250 J/kg; and

e.2.a.3. A total energy equal to or more than 25 kJ;

e.2.b. Capacitors with a repetition rate of 10 Hz or more (repetition rated capacitors) having all of the following:

e.2.b.1. A voltage rating equal to or more than 5 kV;

e.2.b.2. An energy density equal to or more than 50 J/kg;

e.2.b.3. A total energy equal to or more than 100 J; and

e.2.b.4. A charge/discharge cycle life equal to or more than 10,000;

e.3. "Superconductive" electromagnets and solenoids specially designed to be fully charged or discharged in less than one second, having all of the following:

**N.B.:** See also 3A201.b.

e.3.a. Energy delivered during the discharge exceeding 10 kJ in the first second;

e.3.b. Inner diameter of the current carrying windings of more than 250 mm; and

e.3.c. Rated for a magnetic induction of more than 8 T or "overall current density" in the winding of more than 300 A/mm<sup>2</sup>;

**Note:** 3A001.e.3 does not control "superconductive" electromagnets or solenoids specially designed for Magnetic Resonance Imaging (MRI) medical equipment.

f. Rotary input type shaft absolute position encoders having any of the following:

f.1. A resolution of better than 1 part in 265,000 (18 bit resolution) of full scale; or

f.2. An accuracy better than 2.5 seconds of arc.

### 3A002 General purpose electronic equipment, as follows (see List of Items Controlled).

\* \* \* \* \*

#### List of Items Controlled

*Unit:* Number

*Related Controls:* See also 3A202 and 3A992

*Related Definitions:* N/A

*Items:* a. Recording equipment, as follows, and specially designed test tape therefor:

a.1. Analog instrumentation magnetic tape recorders, including those permitting the recording of digital signals (e.g., using a high density digital recording (HDDR) module), having any of the following:

a.1.a. A bandwidth exceeding 4 MHz per electronic channel or track;

a.1.b. A bandwidth exceeding 2 MHz per electronic channel or track and having more than 42 tracks; or

a.1.c. A time displacement (base) error, measured in accordance with applicable IRIG or EIA documents, of less than  $\pm 0.1$  s;

**Note:** Analog magnetic tape recorders specially designed for civilian video purposes are not considered to be instrumentation tape recorders.

a.2. Digital video magnetic tape recorders having a maximum digital interface transfer rate exceeding 180 Mbit/s;

**Note:** 3A002.a.2 does not control digital video magnetic tape recorders specially designed for television recording using a signal format standardized or recommended by the ITU or the IEC for civil television applications.

a.3. Digital instrumentation magnetic tape data recorders employing helical scan techniques or fixed head techniques, having any of the following:

a.3.a. A maximum digital interface transfer rate exceeding 175 Mbit/s; or

a.3.b. Being "space qualified";

**Note:** 3A002.a.3 does not control analog magnetic tape recorders equipped with HDDR conversion electronics and configured to record only digital data.

a.4. Equipment, having a maximum digital interface transfer rate exceeding 175 Mbit/s, designed to convert digital video magnetic tape recorders for use as digital instrumentation data recorders;

a.5. Waveform digitizers and transient recorders having all of the following:

**N.B.:** See also 3A202.

a.5.a. Digitizing rates equal to or more than 200 million samples per second and a resolution of 10 bits or more; and

a.5.b. A continuous throughput of 2 Gbit/s or more;

**Technical Note:** For those instruments with a parallel bus architecture, the continuous throughput rate is the highest word rate multiplied by the number of bits in a word. Continuous throughput is the fastest data rate the instrument can output to mass storage without the loss of any information while sustaining the sampling rate and analog-to-digital conversion.

b. "Frequency synthesizer", "assemblies" having a "frequency switching time" from one selected frequency to another of less than 1 ms;

c. "Signal analyzers", as follows:

c.1. "Signal analyzers" capable of analyzing frequencies exceeding 31 GHz;

c.2. "Dynamic signal analyzers" having a "real-time bandwidth" exceeding 25.6 kHz;

**Note:** 3A002.c.2 does not control those "dynamic signal analyzers" using only constant percentage bandwidth filters.

**Technical Note:** Constant percentage bandwidth filters are also known as octave or fractional octave filters.

d. Frequency synthesized signal generators producing output frequencies, the accuracy and short term and long term stability of which are controlled, derived from or disciplined by the internal master frequency, and having any of the following:

d.1. A maximum synthesized frequency exceeding 31 GHz;

d.2. A "frequency switching time" from one selected frequency to another of less than 1 ms; or

d.3. A single sideband (SSB) phase noise better than  $-(126 + 20 \log_{10} F - 20 \log_{10} f)$  in dBc/Hz, where F is the off-set from the operating frequency in Hz and f is the operating frequency in MHz;

**Note:** 3A002.d does not control equipment in which the output frequency is either produced by the addition or subtraction of two or more crystal oscillator frequencies, or by an addition or subtraction followed by a multiplication of the result.

e. Network analyzers with a maximum operating frequency exceeding 40 GHz;

f. Microwave test receivers having all of the following:

f.1. A maximum operating frequency exceeding 40 GHz; and

f.2. Being capable of measuring amplitude and phase simultaneously;

g. Atomic frequency standards having any of the following:

g.1. Long-term stability (aging) less (better) than  $1 \times 10^{-11}$ /month; or

g.2. Being "space qualified".

**Note:** 3A002.g.1 does not control non-"space qualified" rubidium standards.

### 3B001 Equipment for the manufacturing of semiconductor devices or materials and specially designed components and accessories therefor.

\* \* \* \* \*

#### License Exceptions

LVS: \$500

GBS: "Yes, except 3B001. a.2 (metal organic chemical vapor deposition reactors), a.3 (molecular beam epitaxial growth equipment using gas sources), e (automatic loading multi-chamber central wafer handling systems *only* if connected to equipment controlled by 3B001.a.2 and a.3, and f), or f (lithography equipment).

CIV: Yes for equipment controlled by 3B001.a.1

\* \* \* \* \*

### 3C002 Resist material and "substrates" coated with controlled resists.

\* \* \* \* \*

#### License Exceptions

LVS: \$3000



GBS: Yes for positive resists not optimized for photolithography at a wavelength of less than 365 nm, provided that they are not controlled by 3C002.b through .d.

CIV: Yes for positive resists not optimized for photolithography at a wavelength of less than 365 nm, provided that they are not controlled by 3C002.b through .d.

\* \* \* \* \*

6. In Supplement No. 1 to part 774 (the Commerce Control List), Category 4—Computers, the following Export Control Classification Numbers (ECCNs) are amended:

a. By revising ECCN 4A003; and  
b. By revising the entry heading, License Requirements and License Exceptions sections for ECCNs 4D001 and 4E001, as follows:

**4A003 “Digital computers”, “electronic assemblies”, and related equipment therefor, and specially designed components therefor.**

**License Requirements**

*Reason for Control:* NS, MT, CC, AT, NP, XP

<i>Control(s)</i>	<i>Country Chart</i>
NS applies to 4A003.b and .c.	NS Column 1
NS applies to 4A003.a, d, .e, .f, and .g.	NS Column 2
MT applies to digital computers used as ancillary equipment for test facilities and equipment that are controlled by 9B005 or 9B006.	MT Column 1
CC applies to digital computers for computerized finger-print equipment.	CC Column 1
AT applies to entire entry (refer to 4A994 for controls on digital computers with a CTP $\geq 6$ but $\leq$ to 2,000 Mtops).	AT Column 1

NP applies to digital computers with a CTP greater than 2,000 Mtops, unless a License Exception is available. See § 742.3(b) of the EAR for information on applicable licensing review policies.

XP applies to digital computers with a CTP greater than 2,000 Mtops, unless a License Exception is available. XP controls vary according to destination and end-user and end-use. See § 742.12 of the EAR for additional information.

**Note:** For all destinations, except Cuba, Iran, Iraq, Libya, North Korea, Sudan, and Syria, no license is required (NLR) for computers with a CTP of 2,000 Mtops, and for assemblies described in 4A003.c that are not capable of exceeding a CTP of 2,000 Mtops in aggregation. Computers controlled in this entry for MT reasons are not eligible for NLR.

*License Requirement Notes:* See §§ 740.7(d)(4), 742.12(b)(3)(iv), and 743.1 of the EAR for reporting requirements for exports under License Exceptions.

**License Exceptions**

LVS: \$5000; N/A for MT and “digital” computers controlled by 4A003.b and

having a CTP exceeding 10,000 MTOPS; or “electronic assemblies” controlled by 4A003.c and capable of enhancing performance by aggregation of “computing elements” so that the CTP of the aggregation exceeds 10,000 MTOPS.

GBS: Yes, for 4A003.d, .e, .f, and .g and specially designed components therefor, exported separately or as part of a system.

CTP: Yes, for computers controlled by 4A003.a, .b and .c, to the exclusion of other technical parameters, with the exception of parameters specified as controlled for Missile Technology (MT) concerns and 4A003.e (equipment performing analog-to-digital or digital-to-analog conversions exceeding the limits of 3A001.a.5.a). See § 740.7 of the EAR.

CIV: Yes, for 4A003.d (having a 3-D vector rate less than 10 M vectors/sec), .e, .f and .g.

**List of Items Controlled**

*Unit:* Equipment in number; parts and accessories in \$ value

*Related Controls:* See also 4A994

*Related Definitions:* N/A

*Items:*

**Note 1:** 4A003 includes the following:

- Vector processors;
- Array processors;
- Digital signal processors;
- Logic processors;
- Equipment designed for “image enhancement”;
- Equipment designed for “signal processing”.

**Note 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:

- The “digital computers” or related equipment are essential for the operation of the other equipment or systems;
- 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.

**N.B. 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 (except 4E980, 4E992, and 4E993).

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:

- Error detection or correction algorithms in “main storage”;
- 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

4. The synchronization of two central processing units by “software” so that one central processing unit recognizes when the other central processing unit fails and recovers tasks from the failing unit.

b. “Digital computers” having a “composite theoretical performance” (“CTP”) exceeding 2,000 million theoretical operations per second (Mtops);

c. “Electronic assemblies” specially designed or modified for enhancing performance by aggregation of “computing elements” (“CEs”) so that the “CTP” of the aggregation exceeds the limit in 4A003.b.;

**Note 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.d, 4A003.e or 4A003.f.

**Note 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. Graphics accelerators and graphics coprocessors exceeding a “three dimensional Vector Rate” of 3,000,000;

e. Equipment performing analog-to-digital conversions exceeding the limits in 3A001.a.5;

f. Equipment containing “terminal interface equipment” exceeding the limits in 5A001.b.3;

**Note:** For the purposes of 4A003.f, “terminal interface equipment” includes “local area network” interfaces and other communications interfaces. “Local area network” interfaces are evaluated as “network access controllers”.

g. Equipment specially designed to provide external interconnection of “digital computers” or associated equipment that allows communications at data rates exceeding 80 Mbyte/s.

**Note:** 4A003.g does not control internal interconnection equipment (e.g., backplanes, buses) or passive interconnection equipment.

**4D001 “Software” specially designed or modified for the “development”, “production” or “use” of equipment or “software” controlled by 4A001 to 4A004, or 4D (except 4D980, 4D993 or 4D994).**

**License Requirements**

*Reason for Control:* NS, MT, CC, AT, NP, XP

Control(s)	Country Chart	Control(s)	Country Chart	List of Items Controlled
NS applies to "software" for commodities or software controlled by 4A001 to 4A004, 4D001 to 4D003.	NS Column 1	MT applies to "technology" for items controlled by 4A001 to 4A003 4A101, 4D001, 4D102 or 4D002 for MT reasons.	MT Column 1	<i>Unit:</i> \$ value <i>Related Controls:</i> N/A <i>Related Definitions:</i> N/A <i>Items:</i> a. Any type of telecommunications equipment, not controlled by 5A001.a, specially designed to operate outside the temperature range from 219 K (– 54° C) to 397 K (124° C). b. Transmission equipment, as follows: b.1. Modems using the "bandwidth of one voice channel" with a "data signalling rate" exceeding 9,600 bits per second; b.2. "Communication channel controllers" with a digital output having a "data signalling rate" exceeding 64,000 bit/s per channel; or b.3. "Network access controller" and their related common medium having a "digital transfer rate" exceeding 33 Mbit/s. b.4. Being "stored program controlled" digital cross connect equipment with "digital transfer rate" exceeding 8.5 Mbit/s per port. b.5. Radio equipment operating at input or output frequencies exceeding: b.5.1. 31 GHz for satellite-earth station applications; or b.5.2. 26.5 GHz for other applications; <b>Note:</b> 5A991.b.5. does not control equipment for civil use when conforming with an International Telecommunications Union (ITU) allocated band between 26.5 GHz and 31 GHz. b.6. Providing functions of digital "signal processing" employing circuitry that incorporates "user-accessible programmability" of digital "signal processing" circuits exceeding the limits of 4A003.b. c. "Stored program controlled" switching equipment and related signalling systems as follows: c.1. "Data (message) switching" equipment or systems designed for "packet-mode operation" and assemblies and components therefor, n.e.s. c.2. Containing "Integrated Services Digital Network" (ISDN) functions and having any of the following: c.2.a. Switch-terminal (e.g., subscriber line) interfaces with a "digital transfer rate" at the highest multiplex level exceeding 192,000 bit/s, including the associated signalling channel (e.g., 2B+D); or c.2.b. The capability that a signalling message received by a switch on a given channel that is related to a communication on another channel may be passed through to another switch. <b>Note:</b> 5A991.b. does not preclude the evaluation and appropriate actions taken by the receiving switch or unrelated user message traffic on a D channel of ISDN. c.3. Routing or switching of "datagram" packets; c.4. Routing or switching of "fast select" packets; <b>Note:</b> The restrictions in 5A991.c.3 and c.4 do not apply to networks restricted to using only "network access controllers" or to "network access controllers" themselves. c.5. Multi-level priority and pre-emption for circuit switching; <b>Note:</b> 5A991.c.5. does not control single-level call preemption.
MT applies to "software" for equipment controlled by 4A001 to 4A003 for MT reasons.	MT Column 1	CC applies to "technology" for computerized fingerprint equipment controlled by 4A003 for CC reasons.	CC Column 1	
CC applies to "software" for computerized fingerprint equipment controlled by 4A003 for CC reasons.	CC Column 1	AT applies to entire entry	AT Column 1	
AT applies to entire entry	AT Column 1	NP applies to digital computers with a CTP greater than 2,000 Mtops, unless a License Exception is available. See § 742.3(b) of the EAR for information on applicable licensing review policies. XP applies to digital computers with a CTP greater than 2,000 Mtops, unless a License Exception is available. XP controls vary according to destination and end-user and end-use. See § 742.12 of the EAR for additional information. <i>License Requirement Notes:</i> See § 743.1 of the EAR for reporting requirements for exports under License Exceptions.		
<b>License Exceptions</b>		<b>License Exceptions</b>		
CIV: N/A		CIV: N/A		
TSR: Yes, except for the following:		TSR: Yes for "technology" directly related for hardware exported under a License Exception. N/A for the following:		
(1) "Software" controlled for MT reasons;		(1) "Technology" controlled for MT reasons; or		
(2) "Software" for equipment or "software" requiring a license; or		(2) Exports and reexports to destinations outside of Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, Portugal, Spain, Sweden, or the United Kingdom of "technology" for the "development" or "production" of the following items:		
(3) Exports and reexports to destinations outside of Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, Portugal, Spain, Sweden, or the United Kingdom of "software" specially designed for the "development" or "production" of equipment controlled as follows:		(a) "Digital" computers controlled by 4A003.b and having a CTP exceeding 10,000 MTOPS;		
(a) "Digital" computers controlled by 4A003.b and having a CTP exceeding 10,000 MTOPS; or		(b) "Electronic assemblies" controlled by 4A003.c and capable of enhancing performance by aggregation of "computing elements" so that the CTP of the aggregation exceeds 10,000 MTOPS; or		
(b) "Electronic assemblies" controlled by 4A003.c and capable of enhancing performance by aggregation of "computing elements" so that the CTP of the aggregation exceeds 10,000 MTOPS.		(c) "Software" specially designed for the "development" or "production" of equipment listed in paragraphs (a) or (b) above.		
* * * * *		* * * * *		
<b>4E001 "Technology" according to the General Technology Note, for the "development", "production" or "use" of equipment or "software" controlled by 4A (except 4A980, 4A993 or 4A994) or 4D (except 4D980, 4D993, 4D994).</b>		7. In Supplement No. 1 to part 774 (the Commerce Control List, Category 5—Telecommunications and Information Security, Part I—Telecommunications, the following Export Control Numbers (ECCNs) are amended:		
<b>License Requirements</b>		a. By revising the List of Items Controlled section for ECCN 5A991; and		
<i>Reason for Control:</i> NS, MT, CC, AT, NP, XP		b. By revising the License Exceptions section for ECCNs 5D001 and 5E001, as follows:		
Control(s)		<b>I. Telecommunications</b>		
Country Chart		* * * * *		
NS applies to "technology" for commodities or software controlled by 4A001 to 4A004, 4D001 to 4D003.		<b>5A991 Telecommunication equipment, not controlled by 5A001.</b>		
* * * * *		* * * * *		

c.6. Designed for automatic hand-off of cellular radio calls to other cellular switches or automatic connection to a centralized subscriber data base common to more than one switch;

c.7. Containing "stored program controlled" digital crossconnect equipment with "digital transfer rate" exceeding 8.5 Mbit/s per port.

c.8. Being packet switches, circuit switches and routers with ports or lines exceeding any of the following:

c.8.a. A "data signalling rate" of 64,000 bit/s per channel for a "communications channel controller"; or

**Note:** 5A991.c.8.a. does not control multiplex composite links composed only of communication channels not individually controlled by 5A001.b.1.

c.8.b. A "digital transfer rate" of 33 Mbit/s for a "network ccess controller" and related common media;

d. Centralized network control having all of the following characteristics:

d.1. Receives data from the nodes; and

d.2. Process these data in order to provide control of traffic not requiring operator decisions, and thereby performing "dynamic adaptive routing";

**Note:** 5A991.d. does not preclude control of traffic as a function of predictable statistical traffic conditions.

e. Phased array antennae, operating above 10.5 GHz, containing active elements and distributed components, and designed to permit electronic control of beam shaping and pointing, except for landing systems with instruments meeting International Civil Aviation Organization (ICAO) standards (microwave landing systems (MLS)).

f. Mobile communications equipment, n.e.s., and assemblies and components therefor; or

g. Radio relay communications equipment designed for use at frequencies equal to or exceeding 19.7 GHz and assemblies and components therefor, n.e.s.

#### 5D001 "Software" as described in the List of Items Controlled.

\* \* \* \* \*

#### License Exceptions

CIV: Yes, except for "software" controlled by 5D001.a and specially designed for the "development" or "production" of items controlled by 5A001.b.9.

TSR: Yes, except for exports and reexports to destinations outside of Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, Portugal, Spain, Sweden, or the United Kingdom of "software" controlled by 5D001.a and specially designed for the "development" or "production" of items controlled by 5A001.b.9.

\* \* \* \* \*

#### 5E001 "Technology" (see List of Items Controlled).

\* \* \* \* \*

#### License Exceptions

CIV: N/A

TSR: Yes, except for exports or reexports to destinations outside of Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, Portugal, Spain, Sweden, or the United Kingdom of "technology" controlled by 5E001.a for the "development" or "production" of the following:

(1) Items controlled by 5A001.b.9; or

(2) "Software" controlled by 5D001.a that is specially designed for the "development" or "production" of items controlled by 5A001.b.9.

\* \* \* \* \*

8. In Supplement No. 1 to part 774 (the Commerce Control List), Category 5—Telecommunications and Information Security, Part 2, Information Security, the following Export Control Classification Numbers (ECCNs) are amended:

a. By revising the entry heading, the License Requirements section and the List of Items Controlled section for ECCNs 5A992 and 5E992;

b. By revising the List of Items Controlled section for ECCN 5D002; and

c. By revising the entry heading, the License Requirements section and the List of Items Controlled section for ECCN 5D992, as follows:

#### Part 2—Information Security

##### 5A992 Equipment not controlled by 5A002.

#### License Requirements

*Reason for Control:* AT

Control(s)	Country Chart
AT applies to 5A992.a .....	AT Column 1
AT applies to 5A992.b .....	AT Column 2
* * * * *	

#### List of Items Controlled

*Unit:* \$ value

*Related Controls:* N/A

*Related Definitions:* N/A

*Items:* a. Telecommunications equipment containing encryption.

b. "Information security" equipment, n.e.s., (e.g., cryptographic cryptoanalytic, and cryptologic equipment, n.e.s.) and components therefor.

##### 5D002 Information Security—"Software".

\* \* \* \* \*

#### List of Items Controlled

*Unit:* \$ value

*Related Controls:* See also 5D992. This entry does not control "software" "required" for the "use" of equipment excluded from control under 5A002 or "software" providing any of the functions of equipment excluded from control under 5A002.

*Related Definitions:* 5D002.a controls "software" designed or modified to use "cryptography" employing digital or analog techniques to ensure "information security".

*Items:* a. "Software" specially designed or modified for the "development",

"production" or "use" of equipment or "software" controlled by 5A002, 5B002 or 5D002.

b. "Software" specially designed or modified to support "technology" controlled by 5E002.

c. Specific "software" as follows:

c.1. "Software" having the characteristics, or performing or simulating the functions of the equipment controlled by 5A002 or 5B002;

c.2. "Software" to certify "software" controlled by 5D002.c.1.

##### 5D992 "Information Security" "software" not controlled by 5D002.

#### License Requirements

*Reason for Control:* AT

Control(s)	Country Chart
AT applies to 5D992.a.1 and .b.1.	AT Column 1
AT applies to 5D992.a.2, b.2 and c.	AT Column 2
* * * * *	

#### List of Items Controlled

*Unit:* \$ value

*Related Controls:* N/A

*Related Definitions:* N/A

*Items:* a. "Software", as follows:

a.1 "Software" specially designed or modified for the "development", "production", or "use" of telecommunications equipment containing encryption (e.g., equipment controlled by 5A992.a);

a.2. "Software" specially designed or modified for the "development", "production; or "use" of information security or cryptologic equipment (e.g., equipment controlled by 5A992.b);

b. "Software", as follows:

b.1. "Software" having the characteristics, or performing or simulating the functions of the equipment controlled by 5A992.a.

b.2. "Software having the characteristics, or performing or simulating the functions of the equipment controlled by 5A992.b.

c. "Software" designed or modified to protect against malicious computer damage, e.g., viruses.

##### 5E992 "Information Security" "technology", not controlled by 5E002.

#### License Requirements

*Reason for Control:* AT

Control(s)	Country Chart
AT applies to 5E992.a .....	AT Column 1
AT applies to 5E992.b .....	AT Column 2
* * * * *	

#### List of Items Controlled

*Unit:* N/A

*Related Controls:* N/A

*Related Definitions:* N/A

*Items:* a. "Technology" n.e.s. for the "development", "production" or "use" of telecommunications equipment containing encryption (e.g., equipment controlled by 5A992.a) or "software" controlled by 5D992.a.1 or b.1.

b. "Technology", n.e.s, for the "development", "production" or "use" of "information security" or cryptologic equipment (e.g., equipment controlled by 5A992.b), or "software" controlled by 5D992.a.2, b.2, or c.

9. In Supplement No. 1 to part 774 (the Commerce Control List, Category 6—Sensors and Lasers, the following Export Control Classification Number (ECCNs) are amended:

a. By revising the List of Items Controlled section for ECCNs 6A001 and 6A003;

b. By revising the License Requirements section and the List of Items Controlled section for ECCN 6A005;

c. By revising the List of Items Controlled section for ECCNs 6A007 and 6A008;

d. By revising the License Exceptions section for ECCNs 6D001 and 6D003; and

e. By revising the entry heading and License Exceptions section for ECCNs 6E001 and 6E002, to read as follows:

#### 6A001 Acoustics.

\* \* \* \* \*

#### List of Items Controlled

Unit: \$ value

Related Controls: See also 6A991

Related Definitions: N/A

Items: a. Marine acoustic systems, equipment and specially designed components therefor, as follows:

a.1. Active (transmitting or transmitting-and-receiving) systems, equipment and specially designed components therefor, as follows:

**Note:** 6A001.a.1 does not control:

a. Depth sounders operating vertically below the apparatus, not including a scanning function exceeding  $\pm 20^\circ$ , and limited to measuring the depth of water, the distance of submerged or buried objects or fish finding;

b. Acoustic beacons, as follows:

1. Acoustic emergency beacons;
2. Pingers specially designed for relocating or returning to an underwater position.

a.1.a. Wide-swath bathymetric survey systems designed for sea bed topographic mapping, having all of the following:

a.1.a.1. Being designed to take measurements at an angle exceeding  $20^\circ$  from the vertical;

a.1.a.2. Being designed to measure depths exceeding 600 m below the water surface; and

a.1.a.3. Being designed to provide any of the following:

a.1.a.3.a. Incorporation of multiple beams any of which is less than  $1.9^\circ$ ; or

a.1.a.3.b. Data accuracies of better than 0.3% of water depth across the swath averaged over the individual measurements within the swath;

a.1.b. Object detection or location systems having any of the following:

a.1.b.1. A transmitting frequency below 10 KHz;

a.1.b.2. Sound pressure level exceeding 224 Db (reference 1  $\mu$ Pa at 1 m) for equipment with an operating frequency in the band from 10 KHz to 24 KHz inclusive;

a.1.b.3. Sound pressure level exceeding 235 Db (reference 1  $\mu$ Pa at 1 m) for

equipment with an operating frequency in the band between 24 KHz and 30 KHz;

a.1.b.4. Forming beams of less than  $1^\circ$  on any axis and having an operating frequency of less than 100 KHz;

a.1.b.5. Designed to operate with an unambiguous display range exceeding 5,120 m; or

a.1.b.6. Designed to withstand pressure during normal operation at depths exceeding 1,000 m and having transducers with any of the following:

a.1.b.6.a. Dynamic compensation for pressure; or

a.1.b.6.b. Incorporating other than lead zirconate titanate as the transduction element;

a.1.c. Acoustic projectors, including transducers, incorporating piezoelectric, magnetostrictive, electrostrictive, electrodynamic or hydraulic elements operating individually or in a designed combination, having any of the following:

**Notes:** 1. The control status of acoustic projectors, including transducers, specially designed for other equipment is determined by the control status of the other equipment.

2. 6A001.a.1.c does not control electronic sources that direct the sound vertically only, or mechanical (e.g., air gun or vapor-shock gun) or chemical (e.g., explosive) sources.

a.1.c.1. An instantaneous radiated acoustic power density exceeding 0.01 mW/mm<sup>2</sup>/Hz for devices operating at frequencies below 10 KHz;

a.1.c.2. A continuously radiated acoustic power density exceeding 0.001 Mw/mm<sup>2</sup>/Hz for devices operating at frequencies below 10 KHz;

**Technical Note:** Acoustic power density is obtained by dividing the output acoustic power by the product of the area of the radiating surface and the frequency of operation.

a.1.c.3. Designed to withstand pressure during normal operation at depths exceeding 1,000 m; or

a.1.c.4. Side-lobe suppression exceeding 22 Db;

a.1.d. Acoustic systems, equipment and specially designed components for determining the position of surface vessels or underwater vehicles having any of the following:

**Note:** 6A001.a.1.d includes:

a. Equipment using coherent "signal processing" between two or more beacons and the hydrophone unit carried by the surface vessel or underwater vehicle;

b. Equipment capable of automatically correcting speed-of-sound propagation errors for calculation of a point.

a.1.d.1. Designed to operate at a range exceeding 1,000 m with a positioning accuracy of less than 10 m rms (root mean square) when measured at a range of 1,000 m; or

a.1.d.2. Designed to withstand pressure at depths exceeding 1,000 m; a.2. Passive (receiving, whether or not related in normal application to separate active equipment) systems, equipment and specially designed components therefor, as follows:

a.2.a. Hydrophones (transducers) having any of the following characteristics:

a.2.a.1. Incorporating continuous flexible sensors or assemblies of discrete sensor elements with either a diameter or length less than 20 mm and with a separation between elements of less than 20 mm;

a.2.a.2. Having any of the following sensing elements:

a.2.a.2.a. Optical fibers;

a.2.a.2.b. Piezoelectric polymers; or

a.2.a.2.c. Flexible piezoelectric ceramic materials;

a.2.a.3. A hydrophone sensitivity better than -180 Db at any depth with no acceleration compensation;

a.2.a.4. When designed to operate at depths not exceeding 35 m, a hydrophone sensitivity better than -186 Db with acceleration compensation;

a.2.a.5. When designed for normal operation at depths exceeding 35 m, a hydrophone sensitivity better than -192 Db with acceleration compensation;

a.2.a.6. When designed for normal operation at depths exceeding 100 m, a hydrophone sensitivity better than -204 Db; or

a.2.a.7. Designed for operation at depths exceeding 1,000 m;

**Technical Note:** Hydrophone sensitivity is defined as twenty times the logarithm to the base 10 of the ratio of rms output voltage to a 1 V rms reference, when the hydrophone sensor, without a pre-amplifier, is placed in a plane wave acoustic field with an rms pressure of 1  $\mu$ Pa. For example, a hydrophone of -160 Db (reference 1 V per  $\mu$ Pa) would yield an output voltage of  $10^{-8}$  V in such a field, while one of -180 Db sensitivity would yield only  $10^{-9}$  V output. Thus, -160 Db is better than -180 Db.

a.2.b. Towed acoustic hydrophone arrays having any of the following:

a.2.b.1. Hydrophone group spacing of less than 12.5 m;

a.2.b.2. Hydrophone group spacing of 12.5 m to less than 25 m and designed or able to be modified to operate at depths exceeding 35 m;

**Technical Note:** "Able to be modified" in 6A001.a.2.b.2 means having provisions to allow a change of the wiring or interconnections to alter hydrophone group spacing or operating depth limits. These provisions are: spare wiring exceeding 10% of the number of wires, hydrophone group spacing adjustment blocks or internal depth limiting devices that are adjustable or that control more than one hydrophone group.

a.2.b.3. Hydrophone group spacing of 25 m or more and designed to operate at depths exceeding 100 m;

a.2.b.4. Heading sensors controlled by 6A001.a.2.d;

a.2.b.5. Longitudinally reinforced array hoses;

a.2.b.6. An assembled array of less than 40 mm in diameter;

a.2.b.7. Multiplexed hydrophone group signals designed to operate at depths exceeding 35 m or having an adjustable or removable depth sensing device in order to operate at depths exceeding 35 m; or

a.2.b.8. Hydrophone characteristics controlled by 6A001.a.2.a;

a.2.c. Processing equipment, specially designed for towed acoustic hydrophone

arrays, having "user accessible programmability" and time or frequency domain processing and correlation, including spectral analysis, digital filtering and beamforming using Fast Fourier or other transforms or processes;

a.2.d. Heading sensors having all of the following:

a.2.d.1. An accuracy of better than  $\pm 0.5^\circ$ ; and

a.2.d.2. Any of the following:

a.2.d.2.a. Designed to be incorporated within the array housing and to operate at depths exceeding 35 m or having an adjustable or removable depth sensing device in order to operate at depths exceeding 35 m; or

a.2.d.2.b. Designed to be mounted external to the array housing and having a sensor unit capable of operating with 360° roll at depths exceeding 35 m;

a.2.e. Bottom or bay cable systems having any of the following:

a.2.e.1. Incorporating hydrophones controlled by 6A001.a.2.a;

a.2.e.2. Incorporating multiplexed hydrophone group signals designed to operate at depths exceeding 35 m or having an adjustable or removable depth sensing device in order to operate at depths exceeding 35 m; or

a.2.f. Processing equipment, specially designed for bottom or bay cable systems, having "user accessible programmability" and time or frequency domain processing and correlation, including spectral analysis, digital filtering and beamforming using Fast Fourier or other transforms or processes;

b. Correlation-velocity sonar log equipment designed to measure the horizontal speed of the equipment carrier relative to the sea bed at distances between the carrier and the sea bed exceeding 500 m.

#### 6A003 Cameras.

\* \* \* \* \*

#### List of Items Controlled

Unit: Number

Related Controls: See also 6A203. See 8A002.d and .e for cameras specially designed or modified for underwater use.

Related Definitions: N/A

Items: a. Instrumentation cameras, as follows:

a.1. High-speed cinema recording cameras using any film format from 8 mm to 16 mm inclusive, in which the film is continuously advanced throughout the recording period, and that are capable of recording at framing rates exceeding 13,150 frames/s;

**Note:** 6A003.a.1 does not control cinema recording cameras designed for civil purposes.

a.2. Mechanical high speed cameras, in which the film does not move, capable of recording at rates exceeding 1,000,000 frames/s for the full framing height of 35 mm film, or at proportionately higher rates for lesser frame heights, or at proportionately lower rates for greater frame heights;

a.3. Mechanical or electronic streak cameras having writing speeds exceeding 10 mm/ $\mu$ s;

a.4. Electronic framing cameras having a speed exceeding 1,000,000 frames/s;

a.5. Electronic cameras, having all of the following:

a.5.a. An electronic shutter speed (gating capability) of less than 1  $\mu$ s per full frame; and

a.5.b. A read out time allowing a framing rate of more than 125 full frames per second.

b. Imaging cameras, as follows:

**Note:** 6A003.b does not control television or video cameras specially designed for television broadcasting.

b.1. Video cameras incorporating solid state sensors, having any of the following:

b.1.a. More than  $4 \times 10^6$  "active pixels" per solid state array for monochrome (black and white) cameras;

b.1.b. More than  $4 \times 10^6$  "active pixels" per solid state array for color cameras incorporating three solid state arrays; or

b.1.c. More than  $12 \times 10^6$  "active pixels" for solid state array color cameras incorporating one solid state array;

b.2. Scanning cameras and scanning camera systems, having all of the following:

b.2.a. Linear detector arrays with more than 8,192 elements per array; and

b.2.b. Mechanical scanning in one direction;

b.3. Imaging cameras incorporating image intensifiers having the characteristics listed in 6A002.a.2.a;

b.4. Imaging cameras incorporating "focal plane arrays" having the characteristics listed in 6A002.a.3.

#### 6A005 "Lasers", components and optical equipment, as follows (see List of Items Controlled).

#### License Requirements

Reason for Control: NS, NP, AT

Control(s)	Country Chart
NS applies to entire entry ..	NS Column 2
NP applies to 6A005.a.1.c,	NP Column 1
a.2.a (with an output power >40W), a.4.c, a.6, (argon ion lasers only), c.1.b (with an output power >30W), c.2.c.2.a (with an output power >40W), c.2.c.2.b (with an output power >40W), c.2.b.2.b (with an output power >40W), and d.2.c.	
AT applies to entire entry	AT Column 1
* * * * *	

#### List of Items Controlled

Unit: Equipment in number; parts and accessories in \$ value

Related Controls: See also 6A205, 6A995, 0B001.g.5 and 0B001.b.6. Shared aperture optical elements, capable of operating in "super-high power laser" applications are subject to the export licensing authority of the U.S. Department of State, Office of Defense Trade Controls. (See 22 CFR part 121.)

Related Definitions: (1) Pulsed "lasers" include those that run in a continuous wave (CW) mode with pulses superimposed. (2) Pulse-excited "lasers" include those that run in a continuously excited mode with pulse excitation

superimposed. (3) The control status of Raman "lasers" is determined by the parameters of the pumping source "lasers". The pumping source "lasers" can be any of the "lasers" described as follows:

Items: a. Gas "lasers", as follows:

a.1. Excimer "lasers", having any of the following:

a.1.a. An output wavelength not exceeding 150 nm and having any of the following:

a.1.a.1. An output energy exceeding 50 mJ per pulse; or

a.1.a.2. An average or CW output power exceeding 1 W;

a.1.b. An output wavelength exceeding 150 nm but not exceeding 190 nm and having any of the following:

a.1.b.1. An output energy exceeding 1.5 J per pulse; or

a.1.b.2. An average or CW output power exceeding 120 W;

a.1.c. An output wavelength exceeding 190 nm but not exceeding 360 nm and having any of the following:

a.1.c.1. An output energy exceeding 10 J per pulse; or

a.1.c.2. An average or CW output power exceeding 500 W; or

a.1.d. An output wavelength exceeding 360 nm and having any of the following:

a.1.d.1. An output energy exceeding 1.5 J per pulse; or

a.1.d.2. An average or CW output power exceeding 30 W;

a.2. Metal vapor "lasers", as follows:

a.2.a. Copper (Cu) "lasers" having an average or CW output power exceeding 20 W;

a.2.b. Gold (Au) "lasers" having an average or CW output power exceeding 5 W;

a.2.c. Sodium (Na) "lasers" having an output power exceeding 5 W;

a.2.d. Barium (Ba) "lasers" having an average or CW output power exceeding 2 W;

a.3. Carbon monoxide (CO) "lasers" having any of the following:

a.3.a. An output energy exceeding 2 J per pulse and a pulsed "peak power" exceeding 5 Kw; or

a.3.b. An average or CW output power exceeding 5 Kw;

a.4. Carbon dioxide (CO<sub>2</sub>) "lasers" having any of the following:

a.4.a. A CW output power exceeding 15 Kw;

a.4.b. A pulsed output having a "pulse duration" exceeding 10  $\mu$ s and having any of the following:

a.4.b.1. An average output power exceeding 10 Kw; or

a.4.b.2. A pulsed "peak power" exceeding 100 Kw; or

a.4.c. A pulsed output having a "pulse duration" equal to or less than 10  $\mu$ s; and having any of the following:

a.4.c.1. A pulse energy exceeding 5 J per pulse; or

a.4.c.2. An average output power exceeding 2.5 Kw;

a.5. "Chemical lasers", as follows:

a.5.a. Hydrogen Fluoride (HF) "lasers";

a.5.b. Deuterium Fluoride (DF) "lasers";

a.5.c. "Transfer lasers", as follows:

a.5.c.1. Oxygen Iodine (O<sub>2</sub>-I) "lasers";

a.5.c.2. Deuterium Fluoride-Carbon dioxide (DF-CO<sub>2</sub>) "lasers";

a.6. Krypton ion or argon ion "lasers" having any of the following:

a.6.a. An output energy exceeding 1.5 J per pulse and a pulsed "peak power" exceeding 50 W; or

a.6.b. An average or CW output power exceeding 50 W;

a.7. Other gas "lasers", having any of the following:

**Note:** 6A005.a.7 does not control nitrogen "lasers".

a.7.a. An output wavelength not exceeding 150 nm and having any of the following:

a.7.a.1. An output energy exceeding 50 mJ per pulse and a pulsed "peak power" exceeding 1 W; or

a.7.a.2. An average or CW output power exceeding 1 W;

a.7.b. An output wavelength exceeding 150 nm but not exceeding 800 nm and having any of the following:

a.7.b.1. An output energy exceeding 1.5 J per pulse and a pulsed "peak power" exceeding 30 W; or

a.7.b.2. An average or CW output power exceeding 30 W;

a.7.c. An output wavelength exceeding 800 nm but not exceeding 1,400 nm and having any of the following:

a.7.c.1. An output energy exceeding 0.25 J per pulse and a pulsed "peak power" exceeding 10 W; or

a.7.c.2. An average or CW output power exceeding 10 W; or

a.7.d. An output wavelength exceeding 1,400 nm and an average or CW output power exceeding 1 W.

b. Individual, multiple-transverse mode semiconductor "lasers" and arrays of individual semiconductor "lasers", having any of the following:

b.1. An output energy exceeding 500  $\mu$ J per pulse and a pulsed "peak power" exceeding 10 W; or

b.2. An average or CW output power exceeding 10 W.

**Technical Note:** Semiconductor "lasers" are commonly called "laser" diodes.

**Note 1:** 6A005.b includes semiconductor "lasers" having optical output connectors (e.g. fiber optic pigtails).

**Note 2:** The control status of semiconductor "lasers" specially designed for other equipment is determined by the control status of the other equipment.

c. Solid state "lasers", as follows:

c.1. "Tunable" "lasers" having any of the following:

**Note:** 6A005.c.1 includes titanium—sapphire (Ti:  $\text{Al}_2\text{O}_3$ ), thulium—YAG (Tm: YAG), thulium—YSGG (Tm: YSGG), alexandrite (Cr:  $\text{BeAl}_2\text{O}_4$ ) and color center "lasers".

c.1.a. An output wavelength less than 600 nm and having any of the following:

c.1.a.1. An output energy exceeding 50 mJ per pulse and a pulsed "peak power" exceeding 1 W; or

c.1.a.2. An average or CW output power exceeding 1 W;

c.1.b. An output wavelength of 600 nm or more but not exceeding 1,400 nm and having any of the following:

c.1.b.1. An output energy exceeding 1 J per pulse and a pulsed "peak power" exceeding 20 W; or

c.1.b.2. An average or CW output power exceeding 20 W; or

c.1.c. An output wavelength exceeding 1,400 nm and having any of the following:

c.1.c.1. An output energy exceeding 50 mJ per pulse and a pulsed "peak power" exceeding 1 W; or

c.1.c.2. An average or CW output power exceeding 1 W;

c.2. Non-"tunable" "lasers", as follows:

**Note:** 6A005.c.2 includes atomic transition solid state "lasers".

c.2.a. Neodymium glass "lasers", as follows:

c.2.a.1. "Q-switched lasers" having any of the following:

c.2.a.1.a. An output energy exceeding 20 J but not exceeding 50 J per pulse and an average output power exceeding 10 W; or

c.2.a.1.b. An output energy exceeding 50 J per pulse;

c.2.a.2. Non-"Q-switched lasers" having any of the following:

c.2.a.2.a. An output energy exceeding 50 J but not exceeding 100 J per pulse and an average output power exceeding 20 W; or

c.2.a.2.b. An output energy exceeding 100 J per pulse;

c.2.b. Neodymium-doped (other than glass) "lasers", having an output wavelength exceeding 1,000 nm but not exceeding 1,100 nm, as follows:

**N.B.:** For neodymium-doped (other than glass) "lasers" having an output wavelength not exceeding 1,000 nm or exceeding 1,100 nm, see 6A005.c.2.c.

c.2.b.1. Pulse-excited, mode-locked, "Q-switched lasers" having a "pulse duration" of less than 1 ns and having any of the following:

c.2.b.1.a. A "peak power" exceeding 5 GW;

c.2.b.1.b. An average output power exceeding 10 W; or

c.2.b.1.c. A pulsed energy exceeding 0.1 J;

c.2.b.2. Pulse-excited, "Q-switched lasers" having a pulse duration equal to or more than 1 ns, and having any of the following:

c.2.b.2.a. A single-transverse mode output having:

c.2.b.2.a.1. A "peak power" exceeding 100 MW;

c.2.b.2.a.2. An average output power exceeding 20 W; or

c.2.b.2.a.3. A pulsed energy exceeding 2 J; or

c.2.b.2.b. A multiple-transverse mode output having:

c.2.b.2.b.1. A "peak power" exceeding 400 MW;

c.2.b.2.b.2. An average output power exceeding 2 kW; or

c.2.b.2.b.3. A pulsed energy exceeding 2 J;

c.2.b.3. Pulse-excited, non-"Q-switched lasers", having:

c.2.b.3.a. A single-transverse mode output having:

c.2.b.3.a.1. A "peak power" exceeding 500 kW; or

c.2.b.3.a.2. An average output power exceeding 150 W; or

c.2.b.3.b. A multiple-transverse mode output having:

c.2.b.3.b.1. A "peak power" exceeding 1 MW; or

c.2.b.3.b.2. An average power exceeding 2 kW;

c.2.b.4. Continuously excited "lasers" having:

c.2.b.4.a. A single-transverse mode output having:

c.2.b.4.a.1. A "peak power" exceeding 500 kW; or

c.2.b.4.a.2. An average or CW output power exceeding 150 W; or

c.2.b.4.b. A multiple-transverse mode output having:

c.2.b.4.b.1. A "peak power" exceeding 1 MW; or

c.2.b.4.b.2. An average or CW output power exceeding 2 kW;

c.2.c. Other non-"tunable" "lasers", having any of the following:

c.2.c.1. A wavelength less than 150 nm and having any of the following:

c.2.c.1.a. An output energy exceeding 50 mJ per pulse and a pulsed "peak power" exceeding 1 W; or

c.2.c.1.b. An average or CW output power exceeding 1 W;

c.2.c.2. A wavelength of 150 nm or more but not exceeding 800 nm and having any of the following:

c.2.c.2.a. An output energy exceeding 1.5 J per pulse and a pulsed "peak power" exceeding 30 W; or

c.2.c.2.b. An average or CW output power exceeding 30 W;

c.2.c.3. A wavelength exceeding 800 nm but not exceeding 1,400 nm, as follows:

c.2.c.3.a. "Q-switched lasers" having:

c.2.c.3.a.1. An output energy exceeding 0.5 J per pulse and a pulsed "peak power" exceeding 50 W; or

c.2.c.3.a.2. An average output power exceeding:

c.2.c.3.a.2.a. 10 W for single-mode "lasers";

c.2.c.3.a.2.b. 30 W for multimode "lasers";

c.2.c.3.b. Non-"Q-switched lasers" having:

c.2.c.3.b.1. An output energy exceeding 2 J per pulse and a pulsed "peak power" exceeding 50 W; or

c.2.c.3.b.2. An average or CW output power exceeding 50 W; or

c.2.c.4. A wavelength exceeding 1,400 nm and having any of the following:

c.2.c.4.a. An output energy exceeding 100 mJ per pulse and a pulsed "peak power" exceeding 1 W; or

c.2.c.4.b. An average or CW output power exceeding 1 W;

d. Dye and other liquid "lasers", having any of the following:

d.1. A wavelength less than 150 nm and:

d.1.a. An output energy exceeding 50 mJ per pulse and a pulsed "peak power" exceeding 1 W; or

d.1.b. An average or CW output power exceeding 1 W;

d.2. A wavelength of 150 nm or more but not exceeding 800 nm and having any of the following:

d.2.a. An output energy exceeding 1.5 J per pulse and a pulsed "peak power" exceeding 20 W;

d.2.b. An average or CW output power exceeding 20 W; or

d.2.c. A pulsed single longitudinal mode oscillator having an average output power exceeding 1 W and a repetition rate exceeding 1 Khz if the "pulse duration" is less than 100 ns;

d.3. A wavelength exceeding 800 nm but not exceeding 1,400 nm and having any of the following:

d.3.a. An output energy exceeding 0.5 J per pulse and a pulsed "peak power" exceeding 10 W; or

d.3.b. An average or CW output power exceeding 10 W; or

d.4. A wavelength exceeding 1,400 nm and having any of the following:

d.4.a. An output energy exceeding 100 mJ per pulse and a pulsed "peak power" exceeding 1 W; or

d.4.b. An average or CW output power exceeding 1 W;

e. Components, as follows:

e.1. Mirrors cooled either by active cooling or by heat pipe cooling;

**Technical Note:** Active cooling is a cooling technique for optical components using flowing fluids within the subsurface (nominally less than 1 mm below the optical surface) of the optical component to remove heat from the optic.

e.2. Optical mirrors or transmissive or partially transmissive optical or electro-optical components specially designed for use with controlled "lasers";

f. Optical equipment, as follows:

(For shared aperture optical elements, capable of operating in "Super-High Power Laser" ("SHPL") applications, see the U.S. Munitions List.)

f.1. Dynamic wavefront (phase) measuring equipment capable of mapping at least 50 positions on a beam wavefront having any the following:

f.1.a. Frame rates equal to or more than 100 Hz and phase discrimination of at least 5% of the beam's wavelength; or

f.1.b. Frame rates equal to or more than 1,000 Hz and phase discrimination of at least 20% of the beam's wavelength; or

f.2. "Laser" diagnostic equipment capable of measuring "SHPL" system angular beam steering errors of equal to or less than 10  $\mu$ rad;

f.3. Optical equipment and components specially designed for a phased-array "SHPL" system for coherent beam combination to an accuracy of  $\lambda/10$  at the designed wavelength, or 0.1  $\mu$ m, whichever is the smaller;

f.4. Projection telescopes specially designed for use with "SHPL" systems.

#### 6A007 Gravity meters (gravimeters) and gravity gradiometers, as follows (see List of Items Controlled).

\* \* \* \* \*

#### List of Items Controlled

Unit: \$ value

Related Controls: See also 6A107 and 6A997

Related Definitions: N/A

Items: a. Gravity meters designed or modified for ground use having a static accuracy of less (better) than 10  $\mu$ gal;

**Note:** 6A007.a does not control ground gravity meters of the quartz element (Worden) type.

b. Gravity meters designed for mobile platforms for ground, marine, submersible, space or airborne use, having all of the following:

b.1. A static accuracy of less (better) than 0.7 mgal; and

b.2. An in-service (operational) accuracy of less (better) than 0.7 mgal having a time-to-steady-state registration of less than 2 minutes under any combination of attendant corrective compensations and motional influences;

c. Gravity gradiometers.

#### 6A008 Radar systems, equipment and assemblies having any of the characteristics (see List of Items Controlled), and specially designed components therefor.

\* \* \* \* \*

#### List of Items Controlled

Unit: \$ value

Related Controls: See also 6A108 and 6A998.

This entry does not control: (1) Secondary surveillance radar (SSR); (2) Car radar designed for collision prevention; (3) Displays or monitors used for Air Traffic Control (ATC) having no more than 12 resolvable elements per mm; (4) Meteorological (weather) radar.

Related Definitions: N/A

Items: a. Operating at frequencies from 40 GHz to 230 GHz and having an average output power exceeding 100 mW;

b. Having a tunable bandwidth exceeding  $\pm 6.25\%$  of the center operating frequency;

**Technical Note:** The center operating frequency equals one half of the sum of the highest plus the lowest specified operating frequencies.

c. Capable of operating simultaneously on more than two carrier frequencies;

d. Capable of operating in synthetic aperture (SAR), inverse synthetic aperture (ISAR) radar mode, or sidelooking airborne (SLAR) radar mode;

e. Incorporating "electronically steerable phased array antennae";

f. Capable of heightfinding non-cooperative targets;

**Note:** 6A008.f does not control precision approach radar (PAR) equipment conforming to ICAO standards.

g. Specially designed for airborne (balloon or airframe mounted) operation and having Doppler "signal processing" for the detection of moving targets;

h. Employing processing of radar signals using any of the following:

h.1. "Radar spread spectrum" techniques; or

h.2. "Radar frequency agility" techniques;

i. Providing ground-based operation with a maximum "instrumented range" exceeding 185 km;

**Note:** 6A008.i does not control:

a. Fishing ground surveillance radar;

b. Ground radar equipment specially designed for enroute air traffic control, provided that all the following conditions are met:

1. It has a maximum "instrumented range" of 500 km or less;

2. It is configured so that radar target data can be transmitted only one way from the radar site to one or more civil ATC centers;

3. It contains no provisions for remote control of the radar scan rate from the enroute ATC center; and

4. It is to be permanently installed;

c. Weather balloon tracking radars.

j. Being "laser" radar or Light Detection and Ranging (LIDAR) equipment, having any of the following:

j.1. "Space-qualified"; or

j.2. Employing coherent heterodyne or homodyne detection techniques and having an angular resolution of less (better) than 20  $\mu$ r (microradians);

**Note:** 6A008.j does not control LIDAR equipment specially designed for surveying or for meteorological observation.

k. Having "signal processing" sub-systems using "pulse compression", with any of the following:

k.1. A "pulse compression" ratio exceeding 150; or

k.2. A pulse width of less than 200 ns; or

l. Having data processing sub-systems with any of the following:

l.1. "Automatic target tracking" providing, at any antenna rotation, the predicted target position beyond the time of the next antenna beam passage;

**Note:** 6A008.l.1 does not control conflict alert capability in ATC systems, or marine or harbor radar.

l.2. Calculation of target velocity from primary radar having non-periodic (variable) scanning rates;

l.3. Processing for automatic pattern recognition (feature extraction) and comparison with target characteristic data bases (waveforms or imagery) to identify or classify targets; or

l.4. Superposition and correlation, or fusion, of target data from two or more "geographically dispersed" and "interconnected radar sensors" to enhance and discriminate targets.

**Note:** 6A008.l.4 does not control systems, equipment and assemblies designed for marine traffic control.

#### 6D001 "Software" specially designed for the "development" or "production" of equipment controlled by 6A004, 6A005, 6A008 or 6B008.

\* \* \* \* \*

#### License Exceptions

CIV: N/A

TSR: Yes, except for the following:

- (1) Items controlled for MT reasons; or
- (2) Exports or reexports to destinations outside of Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, Portugal, Spain, Sweden, or the United Kingdom of "software" specially designed for the "development" or "production" of equipment controlled by 6A008.l.3 or 6B008.

\* \* \* \* \*

#### 6D003 Other "software", as follows (see List of Items Controlled).

\* \* \* \* \*

#### License Exceptions

CIV: Yes for 6D003.h.1

TSR: Yes, except for the following:

- (1) Items controlled for MT reasons; or



(2) Exports or reexports to destinations outside of Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, Portugal, Spain, Sweden, or the United Kingdom of "software" for items controlled by 6D003.a.

\* \* \* \* \*

**6E001 "Technology" according to the General Technology Note for the "development" of equipment, materials or "software" controlled by 6A (except 6A018, 6A991, 6A992, 6A994, 6A995, 6A996, 6A997, or 6A998), 6B (except 6B995), 6C (except 6C992 or 6C994), or 6D (except 6D991, 6D992, or 6D993).**

\* \* \* \* \*

#### License Exceptions

CIV: N/A

TSR: Yes, except for the following:

- (1) Items controlled for MT reasons; or
- (2) Exports or reexports to destinations outside of Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, Portugal, Spain, Sweden, or the United Kingdom of "technology" for the "development" of the following:
  - (a) Items controlled by 6A001.a.2.a.1, 6A001.a.2.a.2, 6A001.a.2.a.7, 6A001.a.2.b, 6A001.a.2.e.1, 6A001.a.2.e.2, 6A002.a.1.c, 6A008.1.3, 6B008, 6D003.a;
  - (b) Equipment controlled by 6A001.a.2.c or 6A001.a.2.e.3 when specially designed for real time applications; or
  - (c) "Software" controlled by 6D001 and specially designed for the "development" or "production" of equipment controlled by 6A008.1.3 or 6B008.

\* \* \* \* \*

**6E002 "Technology" according to the General Technology Note for the "production" of equipment or materials controlled by 6A (except 6A018, 6A991, 6A992, 6A994, 6A995, 6A996, 6A997 or 6A998), 6B (except 6B995) or 6C (except 6C992 or 6C994).**

\* \* \* \* \*

#### License Exceptions

CIV: N/A

TSR: Yes, except for the following:

- (1) Items controlled for MT reasons; or
- (2) Exports or reexports to destinations outside of Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, Portugal, Spain, Sweden, or the United Kingdom of "technology" for the "development" of the following:
  - (a) Items controlled by 6A001.a.2.a.1, 6A001.a.2.a.2, 6A001.a.2.a.7, 6A001.a.2.b, and 6A001.a.2.c; and
  - (b) Equipment controlled by 6A001.a.2.e when specially designed for real time applications; or
  - (c) "Software" controlled by 6D001 and specially designed for the

"development" or "production" of equipment controlled by 6A002.a.1.c, 6A008.1.3 or 6B008.

\* \* \* \* \*

10. In Supplement No. 1 to part 774 (the Commerce Control List), Category 7- Navigation and Avionics, Export Control Classification Number (ECCN) 7D003 is revised to read as follows:

**7D003 Other "software", as follows (see List of Items Controlled).**

#### License Requirements

Reason for Control: NS, MT, AT

<i>Control(s)</i>	<i>Country Chart</i>
NS applies to entire entry ..	NS Column 1
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

#### License Exceptions

CIV: N/A

TSR: N/A

#### List of Items Controlled

*Unit:* \$ value

*Related Controls:* See also 7D103 and 7D994

*Related Definitions:* N/A

*Items:* a. "Software" specially designed or modified to improve the operational performance or reduce the navigational error of systems to the levels controlled by 7A003 or 7A004;

b. "Source code" for hybrid integrated systems that improves the operational performance or reduces the navigational error of systems to the level controlled by 7A003 by continuously combining inertial data with any of the following navigation data:

- b.1. Doppler radar velocity;
- b.2. Global navigation satellite systems (i.e., GPS or GLONASS) reference data; or
- b.3. Terrain data from data bases;

c. "Source code" for integrated avionics or mission systems that combine sensor data and employ "expert systems";

d. "Source code" for the "development" of any of the following:

- d.1. Digital flight management systems for "total control of flight";
  - d.2. Integrated propulsion and flight control systems;
  - d.3. Fly-by-wire or fly-by-light control systems;
  - d.4. Fault-tolerant or self-reconfiguring "active flight control systems";
  - d.5. Airborne automatic direction finding equipment;
  - d.6. Air data systems based on surface static data; or
  - d.7. Raster-type head-up displays or three dimensional displays;
- e. Computer-aided-design (CAD) "software" specially designed for the "development" of "active flight control systems", helicopter multi-axis fly-by-wire or fly-by-light controllers or helicopter "circulation controlled anti-torque or circulation-controlled direction control systems" whose "technology" is controlled by 7E004.b, 7E004.c.1 or 7E004.c.2.

11. In Supplement No. 1 to part 774 (the Commerce Control List), Category 8—Marine, the following Export Control Classification Numbers (ECCNs) are amended:

a. By revising the List of Items Controlled section for ECCNs 8A002 and 8A992;

b. By revising the License Exceptions section for ECCNs 8D001 and 8E001, as follows:

**8A002 Systems and equipment, as follows (see List of Items Controlled).**

\* \* \* \* \*

#### List of Items Controlled

*Unit:* Equipment in number

*Related Controls:* See also 8A992 and for underwater communications systems, see Category 5, Part I—Telecommunications).

*Related Definitions:* N/A

*Items:* a. Systems and equipment, specially designed or modified for submersible vehicles, designed to operate at depths exceeding 1,000 m, as follows:

- a.1. Pressure housings or pressure hulls with a maximum inside chamber diameter exceeding 1.5 m;
  - a.2. Direct current propulsion motors or thrusters;
  - a.3. Umbilical cables, and connectors therefor, using optical fiber and having synthetic strength members;
  - b. Systems specially designed or modified for the automated control of the motion of submersible vehicles controlled by 8A001 using navigation data and having closed loop servo-controls:
    - b.1. Enabling a vehicle to move within 10 m of a predetermined point in the water column;
    - b.2. Maintaining the position of the vehicle within 10 m of a predetermined point in the water column; or
    - b.3. Maintaining the position of the vehicle within 10 m while following a cable on or under the seabed;
  - c. Fiber optic hull penetrators or connectors;
  - d. Underwater vision systems, as follows:
    - d.1. Television systems and television cameras, as follows:
      - d.1.a. Television systems (comprising camera, monitoring and signal transmission equipment) having a limiting resolution when measured in air of more than 800 lines and specially designed or modified for remote operation with a submersible vehicle;
      - d.1.b. Underwater television cameras having a limiting resolution when measured in air of more than 1,100 lines;
      - d.1.c. Low light level television cameras specially designed or modified for underwater use containing all of the following:
        - d.1.c.1. Image intensifier tubes controlled by 6A002.a.2.a; and
        - d.1.c.2. More than 150,000 "active pixels" per solid state area array;
- Technical Note:** Limiting resolution in television is a measure of horizontal resolution usually expressed in terms of the maximum number of lines per picture height discriminated on a test chart, using IEEE Standard 208/1960 or any equivalent standard.
- d.2. Systems, specially designed or modified for remote operation with an underwater vehicle, employing techniques to minimize the effects of back scatter,



including range-gated illuminators or "laser" systems;

e. Photographic still cameras specially designed or modified for underwater use below 150 m having a film format of 35 mm or larger, and having any of the following:

e.1. Annotation of the film with data provided by a source external to the camera;

e.2. Automatic back focal distance correction; or

e.3. Automatic compensation control specially designed to permit an underwater camera housing to be usable at depths exceeding 1,000 m;

f. Electronic imaging systems, specially designed or modified for underwater use, capable of storing digitally more than 50 exposed images;

g. Light systems, as follows, specially designed or modified for underwater use:

g.1. Stroboscopic light systems capable of a light output energy of more than 300 J per flash and a flash rate of more than 5 flashes per second;

g.2. Argon arc light systems specially designed for use below 1,000 m;

h. "Robots" specially designed for underwater use, controlled by using a dedicated "stored program controlled" computer, having any of the following:

h.1. Systems that control the "robot" using information from sensors which measure force or torque applied to an external object, distance to an external object, or tactile sense between the "robot" and an external object; or

h.2. The ability to exert a force of 250 N or more or a torque of 250 Nm or more and using titanium based alloys or "fibrous or filamentary" "composite" materials in their structural members;

i. Remotely controlled articulated manipulators specially designed or modified for use with submersible vehicles, having any of the following:

i.1. Systems which control the manipulator using the information from sensors which measure the torque or force applied to an external object, or tactile sense between the manipulator and an external object; or

i.2. Controlled by proportional master-slave techniques or by using a dedicated "stored program controlled" computer, and having 5 degrees of freedom of movement or more;

**Note:** Only functions having proportional control using positional feedback or by using a dedicated "stored program controlled" computer are counted when determining the number of degrees of freedom of movement.

j. Air independent power systems, specially designed for underwater use, as follows:

j.1. Brayton or Rankine cycle engine air independent power systems having any of the following:

j.1.a. Chemical scrubber or absorber systems specially designed to remove carbon dioxide, carbon monoxide and particulates from recirculated engine exhaust;

j.1.b. Systems specially designed to use a monoatomic gas;

j.1.c. Devices or enclosures specially designed for underwater noise reduction in frequencies below 10 kHz, or special mounting devices for shock mitigation; or

j.1.d. Systems specially designed:

j.1.d.1. To pressurize the products of reaction or for fuel reformation;

j.1.d.2. To store the products of the reaction; and

j.1.d.3. To discharge the products of the reaction against a pressure of 100 kPa or more;

j.2. Diesel cycle engine air independent systems, having all of the following:

j.2.a. Chemical scrubber or absorber systems specially designed to remove carbon dioxide, carbon monoxide and particulates from recirculated engine exhaust;

j.2.b. Systems specially designed to use a monoatomic gas;

j.2.c. Devices or enclosures specially designed for underwater noise reduction in frequencies below 10 kHz or special mounting devices for shock mitigation; and

j.2.d. Specially designed exhaust systems that do not exhaust continuously the products of combustion;

j.3. Fuel cell air independent power systems with an output exceeding 2 kW having any of the following:

j.3.a. Devices or enclosures specially designed for underwater noise reduction in frequencies below 10 kHz or special mounting devices for shock mitigation; or

j.3.b. Systems specially designed:

j.3.b.1. To pressurize the products of reaction or for fuel reformation;

j.3.b.2. To store the products of the reaction; and

j.3.b.3. To discharge the products of the reaction against a pressure of 100 kPa or more;

j.4. Stirling cycle engine air independent power systems, having all of the following:

j.4.a. Devices or enclosures specially designed for underwater noise reduction in frequencies below 10 kHz or special mounting devices for shock mitigation; and

j.4.b. Specially designed exhaust systems which discharge the products of combustion against a pressure of 100 kPa or more;

k. Skirts, seals and fingers, having any of the following:

k.1. Designed for cushion pressures of 3,830 Pa or more, operating in a significant wave height of 1.25 m (Sea State 3) or more and specially designed for surface effect vehicles (fully skirted variety) controlled by 8A001.f; or

k.2. Designed for cushion pressures of 6,224 Pa or more, operating in a significant wave height of 3.25 m (Sea State 5) or more and specially designed for surface effect vehicles (rigid sidewalls) controlled by 8A001.g;

l. Lift fans rated at more than 400 kW specially designed for surface effect vehicles controlled by 8A001.f or 8A001.g;

m. Fully submerged subcavitating or supercavitating hydrofoils specially designed for vessels controlled by 8A001.h;

n. Active systems specially designed or modified to control automatically the sea-induced motion of vehicles or vessels controlled by 8A001.f, 8A001.g, 8A001.h or 8A001.i;

o. Propellers, power transmission systems, power generation systems and noise reduction systems, as follows:

o.1. Water-screw propeller or power transmission systems, as follows, specially

designed for surface effect vehicles (fully skirted or rigid sidewall variety), hydrofoils or small waterplane area vessels controlled by 8A001.f, 8A001.g, 8A001.h or 8A001.i:

o.1.a. Supercavitating, super-ventilated, partially-submerged or surface piercing propellers rated at more than 7.5 MW;

o.1.b. Contrarotating propeller systems rated at more than 15 MW;

o.1.c. Systems employing pre-swirl or post-swirl techniques for smoothing the flow into a propeller;

o.1.d. Light-weight, high capacity (K factor exceeding 300) reduction gearing;

o.1.e. Power transmission shaft systems, incorporating "composite" material components, capable of transmitting more than 1 MW;

o.2. Water-screw propeller, power generation systems or transmission systems designed for use on vessels, as follows:

o.2.a. Controllable-pitch propellers and hub assemblies rated at more than 30 MW;

o.2.b. Internally liquid-cooled electric propulsion engines with a power output exceeding 2.5 MW;

o.2.c. "Superconductive" propulsion engines, or permanent magnet electric propulsion engines, with a power output exceeding 0.1 MW;

o.2.d. Power transmission shaft systems, incorporating "composite" material components, capable of transmitting more than 2 MW;

o.2.e. Ventilated or base-ventilated propeller systems rated at more than 2.5 MW;

o.3. Noise reduction systems designed for use on vessels of 1,000 tons displacement or more, as follows:

o.3.a. Systems that attenuate underwater noise at frequencies below 500 Hz and consist of compound acoustic mounts for the acoustic isolation of diesel engines, diesel generator sets, gas turbines, gas turbine generator sets, propulsion motors or propulsion reduction gears, specially designed for sound or vibration isolation, having an intermediate mass exceeding 30% of the equipment to be mounted;

o.3.b. Active noise reduction or cancellation systems, or magnetic bearings, specially designed for power transmission systems, and incorporating electronic control systems capable of actively reducing equipment vibration by the generation of anti-noise or anti-vibration signals directly to the source;

p. Pumpjet propulsion systems having a power output exceeding 2.5 MW using divergent nozzle and flow conditioning vane techniques to improve propulsive efficiency or reduce propulsion-generated underwater-radiated noise;

**8A992 Underwater systems or equipment, not controlled by 8A002, and specially designed parts therefor.**

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#### List of Items Controlled

Unit: \$ value

Related Controls: N/A

Related Definitions: N/A

Items: a. Underwater vision systems, as follows:

a.1. Television systems (comprising camera, lights, monitoring and signal

transmission equipment) having a limiting resolution when measured in air of more than 500 lines and specially designed or modified for remote operation with a submersible vehicle; *or*

a.2. Underwater television cameras having a limiting resolution when measured in air of more than 700 lines;

**Technical Note:** Limiting resolution in television is a measure of horizontal resolution usually expressed in terms of the maximum number of lines per picture height discriminated on a test chart, using IEEE Standard 208/1960 or any equivalent standard.

b. Photographic still cameras specially designed or modified for underwater use, having a film format of 35 mm or larger, and having autofocussing or remote focussing specially designed for underwater use;

c. Stroboscopic light systems, specially designed or modified for underwater use, capable of a light output energy of more than 300 J per flash;

d. Other underwater camera equipment, n.e.s.;

e. Other submersible systems, n.e.s.;

f. Boats, n.e.s., including inflatable boats, and specially designed components therefor, n.e.s.;

g. Marine engines (both inboard and outboard) and submarine engines, n.e.s.; and specially designed parts therefor, n.e.s.;

h. Other self-contained underwater breathing apparatus (scuba gear) and related equipment, n.e.s.;

i. Life jackets, inflation cartridges, compasses, wetsuits, masks, fins, weight belts, and dive computers;

j. Underwater lights and propulsion equipment;

k. Air compressors and filtration systems specially designed for filling air cylinders.

**8D001 "Software" specially designed or modified for the "development", "production" or "use" of equipment or materials controlled by 8A (except 8A018 or 8A992), 8B or 8C.**

\* \* \* \* \*

#### License Exceptions

CIV: N/A

TSR: Yes, except for the following:

- (1) Items controlled for MT reasons; or
- (2) Exports or reexports to destinations outside of Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, Portugal, Spain, Sweden, or the United Kingdom of "software" specially designed for the "development" or "production" of equipment controlled by 8A001.b, 8A001.d, or 8A002.o.3.b.

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**8E001 "Technology" according to the General Technology Note for the "development" or "production" of equipment or materials controlled by 8A (except 8A018 or 8A992), 8B or 8C.**

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#### License Exceptions

CIV: N/A

TSR: Yes, except for the following:

- (1) Items controlled for MT reasons; or
- (2) Exports or reexports to destinations outside of Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, Portugal, Spain, Sweden, or the United Kingdom of "technology" for items controlled by 8A001.b, 8A001.d or 8A002.o.3.b.

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12. In Supplement No. 1 to part 774 (the Commerce Control List), Category 9—Propulsion Systems, Space Vehicles, and Related Equipment, is amended by removing the second entry for Export Control Classification Number (ECCN) 9A018.

Dated: February 24, 1999.

**R. Roger Majak,**

*Assistant Secretary for Export Administration.*

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