BIOGRAPHY

Ted MacVeagh is an associate at Bromberg & Sunstein LLP. His practice includes advising companies on technology transfer issues and representing high-tech start-ups. Mr. MacVeagh graduated from Wesleyan University with a degree in Philosophy. He received his law degree from the University of Michigan where he was *summa cum laude* and a member of the Michigan Law Review. Prior to joining Bromberg & Sunstein, he practiced law for Cleary, Gottlieb, Steen & Hamilton in New York and received a masters degree in Philosophy from the University of Pennsylvania. He is qualified to practice in New York and Massachusetts.

Relation of Export Control Law to Licensing

Export controls are imposed on technology (and raw materials used with the technology)

Export control law is (potentially) relevant to every technology transfer

Patent and software licenses generally contain a clause such as:

- The Licensee shall not export, re-export or use the Materials or any copy thereof in violation of the export control laws of the United States of America

The clause becomes more than boilerplate if the technology is exported or intended for use outside the United States

The items controlled by the Department of Commerce include an array of items which are not obviously military in nature as well as objects that are used broadly in civilian contexts

Every technology company should be aware of controls relating to high performance computers, encryption software and deemed exports

What is Export Control Law

Export control law is the body of law that controls the transfer of goods which may have military uses to certain non-U.S. persons and entities. These controls are based on shifting national security and foreign policy interests

Export control laws also control:

- **Certain activities of U.S. persons and entities outside of the United States (e.g. activities relating to proliferation)**
- **Certain activities of foreign persons within the United States**
- **Certain transfers within the United States to foreign nationals**
- **Certain transfers within the United States to U.S. persons (!)**

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Export Control Law

July 18, 2002

Presentation to
Franklin Pierce Law Center
Eleventh Annual
Advanced Licensing Institute

by
Theodore E. MacVeagh

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Convincing Clients to Care

The cost of compliance with U.S. export laws can by high and clients may not perceive the value

It is very important for your clients to buy-in to any compliance efforts

Consider these points:

- **Important transactions can be held up if export status of technology is not clear**
- **Penalties for failure to comply can be severe, including fines, loss of export rights, blacklisting, and criminal penalties**
- **More aggressive enforcement is likely in the current climate**
- **Headlines regarding a violation of U.S. Export law are a public relations nightmare**
- **Patriotism: certain exports may cause material damage to U.S. interests**

Current Status of Export Control Law

Pre 9/11 Conventional Wisdom: Outdated cold war laws prohibiting efficient global commerce, and desperately in need of reform

Post 9/11 Conventional Wisdom: Vital first line in the protection of our national security interests, and desperately in need of reform

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Some Historical Perspective

1775 - Continental Congress outlaws export of goods to Great Britain, establishing first American export controls

1949 - U.S. and 6 Western European nations create the Coordinating Committee for Multinational Export Controls (CoCOM) to prevent the transfer of militarily useful technology to communist countries - NOTE MULTILATERAL ORIGINS

1949 - U.S. passes the Export Control Act (ECA) giving the Dept of Commerce primary responsibility for enforcing controls on "dual-use" items

1970 - The ECA lapses and the Export Administration Act (EAA) took effect

1994 - The EAA lapses; Dept. of Commerce continues to act under Executive Orders (invoking authority under International Emergency Powers Act)

1995 - U.S. and 27 nations (including former communist block countries) establish the Wassenar Arrangement as a successor to CoCOM to control the spread of dangerous military technology - CURRENT MULTILATERAL FRAMEWORK

1996 - Interim rule published in the Federal register simplifies the Export Administration Regulations (EAR), the first comprehensive rewrite in 40 years

2002 - The EAA is in the process of being rewritten

Some Policy Issues

1. Despite recent efforts to change, policies are still shaped by a cold war that is not relevant to today's foreign policy concerns
2. Distinctions between military and civilian technology have been blurred
   - Recent engagements (Iraq, Kosovo, Afghanistan) show value of technologies for sensors, geo-spatial location, signal processing and telecommunications over conventional military power
3. Value of export controls to national security v. drag on U.S. economic interests
   - If products are available outside U.S., U.S. loses market share with no appreciable gain in security
   - If regulations fail to keep up with technology, U.S. loses market share with no appreciable gain in security
4. Rationalization of controls is necessary. Divided regime make compliance difficult
5. Value of the multilateral structure of controls

Divided Authority of Current Export Control Regime

1. Department of Treasury - Office of Foreign Assets Control (OFAC)
2. Department of State - Office of Defense Trade Controls (ODTC)
3. Department of Commerce - Bureau of Industry and Security (BIS) (previously known as the Bureau of Export Administration (BXA))
4. Other relevant agencies: Defense Department; Intelligence Agencies; Energy Department; NRC; DEA; FDA; PTO; Department of the Interior

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OFAC Responsibilities

There is no single authorizing statute for OFAC. Much of its work is authorized under the International Emergency Economic Powers Act § 1701-1706

There is no single set of OFAC regulations. Rather they are contained in several parts in Title 31 of the C.F.R. (starting with Part 500)

OFAC administers and enforces economic sanctions programs against countries persons and entities subject to U.S. and U.N. embargoes. These include:

- financial sanctions, including investment bans and asset freezes
- export and import embargoes (sometimes including travel and transportation bans and bans on other commercial activity)

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OFAC Responsibilities

Sanctions are administered against the following countries, entities and individuals:

- **Balkans, Burma, Cuba, Iran, Iraq, Liberia, Libya, North Korea, Sierra Leone, Sudan, Yugoslavia**
- **Taliban, UNITA and its nationals (embargo against Syria is administered by BIS)**
- **Specially Designated Nationals (SDNs) which act as fronts for sanctioned governments**
- **Specially Designated Terrorists**
- **Specially Designated Narcotic Traffickers**

OFAC Responsibilities

- OFAC's regulations are complex and ever-changing
- Since September 11, there have been multiple changes to the list of Blocked Persons and a huge increase in the pressure to comply with regulations
- OFAC penalties are high, up to $1,000,000 fines and 12 year jail terms
- Banks in particular are under pressure and have been struggling to comply with OFAC regulations designed to stop the flow of funds from or to Blocked Persons
- It is vital banks have a compliance in place to identify and stop transactions with Blocked Persons or using assets that have been frozen pursuant to OFAC regulations

ODTC Responsibilities

The ODTC has jurisdiction over the export of "Defense Articles" and "Defense Services"

Controls are contained in the International Traffic in Arms Regulations (ITAR) - 22 C.F.R. § 120 - 130

ITAR is promulgated under the Arms Export Control Act § 2778 - 2994

"Defense Articles" are those products included on the U.S. Munitions List (USML) - 22 C.F.R. § 122

"Defense Services" are military training services or services relating to the design, development, production, maintenance, processing of use of defense articles

ODTC Responsibilities

In addition to overseeing exports of items off the USML, the ODTC has responsibility for the following:

- **Maintaining the USML (adding and subtracting items)**
- **The registration of persons engaged in manufacturing or exporting defense articles**
- **Licensing temporary imports of defense articles (permanent imports of such articles are under the jurisdiction of the Treasury Department's Bureau of Alcohol, Tobacco and Firearms)**
- **Regulating the brokering of transactions involving defense articles or services, whatever the location or origin by a U.S. person**
- **Governing "deemed exports" of defense articles and services**

Defense Articles

Unlike the CCL (discussed below), the USML does not include detailed technical parameters

An article may be designated on the USML if the article:

- **(a) is specifically designed, developed, configured, adapted, or modified for a military application (ii) does not have predominant civil applications and (iii) does not have equivalent performance to an item or service used for civil applications; or**
- **(b) is specifically designed, developed, configured, adapted, or modified for a military application, and has a significant military or intelligence applicability such that control by the State Department is necessary. 22 C.F.R. 120.3**

ITAR defines "defense article" to include "technical data" which includes software "directly related to" defense articles (unlike the BIS regulations, which treat technology and software differently)

Commodity Jurisdiction Requests

Because of the broad categorizations used by the USML, it is not always possible to tell whether a particular product would qualify as on the USML or not. One entry reads:

> (a) military training equipment including but not limited to . . . operational flight trainers . . . and simulation devices related to defense articles.
>
> (b) Components, parts, accessories, attachments, and associated equipment specifically designed or modified for the articles in paragraph (a) of this category.
>
> (c) Technical Data . . . directly related to the defense articles enumerated [above].

If you are selling electronics or software to the military for use in military flight schools, your products may fall on the USML

In order to determine whether an item or service is on the USML you can file a Commodity Jurisdiction (CJ) Request with the ODTC. If you file a Classification Request with BIS for an item predominantly sold to the military, the BIS may require that you file a CJ Request before they will rule on its classification

In reviewing CJ Requests, the ODTC pays particular attention to the origin of an item (military or not), its current use (whether it also has civilian applications) and any characteristics specially related to the use of the item by the military

BIS (BXA) Responsibilities

BIS has jurisdiction over the export and reexport of "dual use" items - items that may have both military and non-military uses

Controls are contained in the Export Administration Regulations (EAR) - 15 C.F.R. § 730-774

BIS is authorized to promulgate and administer the EAR under Executive Order; a successor to the EAA is in the process of being drafted

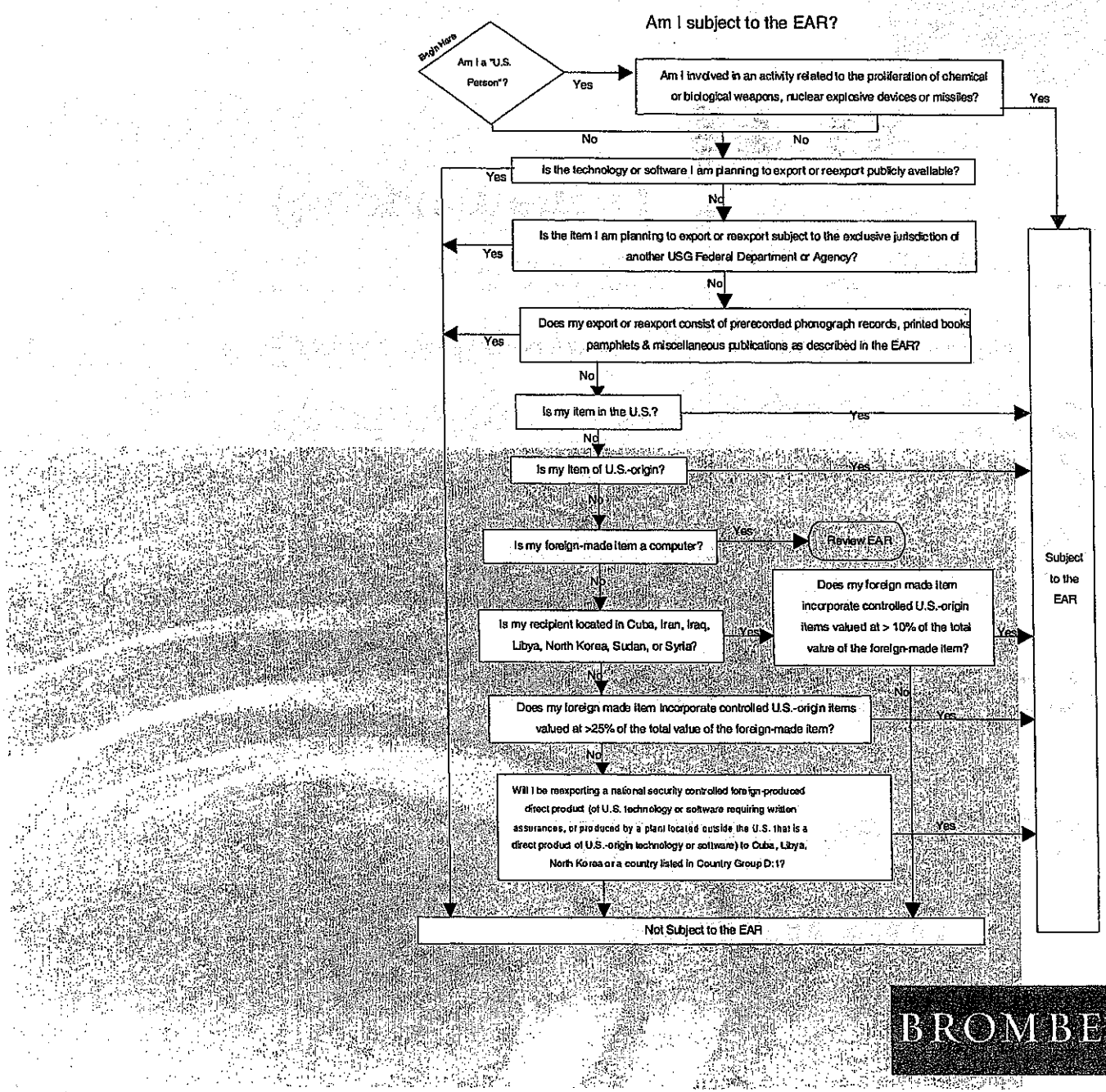
BIS also regulates:

- **activities of U.S. persons relating to spread of ABC weapons or missile technology**
- **release of certain items of technology to foreign nationals within the United States (deemed exports)**
- **sales of certain foreign-made items made with or incorporating U.S. technology**
- **transmission of data and software electronically (e.g., via posting on web site without restrictions on access)**

Using the EAR - "Subject to the EAR"

KEY CONCEPT: Is an export or activity "subject to the EAR"? See chart at 15 C.F.R. § 732 (Supplement 2)

- Is the export or activity related to the proliferation of ABC weapons or missile tech?
- Is the item publicly available?
- Does another agency have jurisdiction?
- Is the item in the U.S.?
- Is the item of U.S. origin?
- Does item have certain U.S. content or is it the direct product of certain U.S. technology?



15 C.F.R. § 732, Supplement 2

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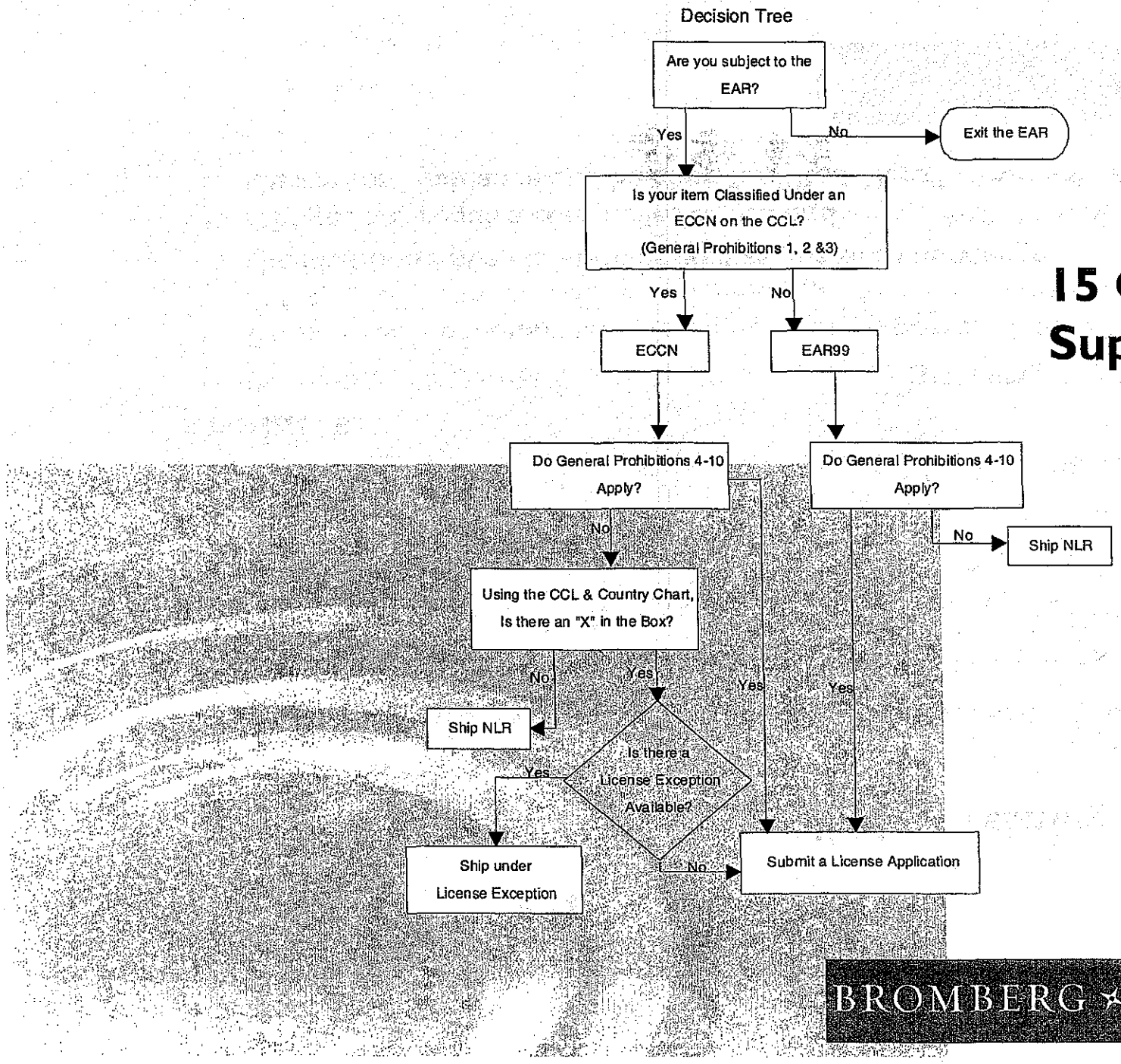
Using the EAR - Is a License Required?

If an export is subject to the EAR, is a license required?

- **Is the item classified under an ECCN on the CCL?**
- **Does a General Prohibition apply?**
- **Is there an "X" across from the proposed destination of the export in the Country Chart?**
- **Does a license exception apply?**
- **Use the EAR Decision Tree at 15 C.F.R. § 732 (Supplement 1)**

15 C.F.R. § 732, Supplement 1



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Using the EAR - General Prohibitions

15 C.F.R. § 736 lists 10 General Prohibitions relating to the export of goods

General Prohibitions 1-3 relate to the Commerce Control List and depend upon the nature of the product being transferred

General Prohibitions 4-10 focus on preventing proliferation of missile technology and nuclear, chemical and biological weapons and apply to the transfer to end-users or end-uses related to proliferation without regard to the nature of the products

- **Prohibition 4 prohibits transfers to persons on BIS's "Denied Person List"**
- **Prohibition 5 prohibits transfers where the exporter "knows" of a specific link to proliferation activity. "Knowledge" includes a conscious disregard of the likelihood of a violation as well as positive knowledge**
- **Obligations require companies to use and follow BIS's "Know Your Customer" guidance and be alert for "Red Flags" (Appendix A)**

Using the EAR - CCL and ECCNs

If an export is subject to EAR, you must determine whether the item to be exported classified on the Commerce Control List (CCL) - 15 C.F.R. § 774

- **If not, a license is required only if one of the General Prohibitions apply**
- **CCL is "parametric" - a millimeter can make a difference**

The Export Control Classification Number (ECCN) of the item will depend on its classification. The CCL will indicate the reasons for controls on a particular ECCN. These reasons include:

- **Chemical/Biological Weapons**
- **Nuclear Nonproliferation 1/2**
- **National Security 1/2**
- **Missile Technology 1**
- **XP (for High Performance Computers)**
- **Regional Stability 1/2**
- **Firearms Convention 1**
- **Crime Control 1/2/3**
- **Anti-terrorism 1/2**

Using the EAR - Commerce Control List

The CCL has ten broad categories:

- 0. Nuclear Materials, Facilities & Equipment
- 1. Materials, Chemicals, Microorganisms & Toxins
- 2 Materials Processing
- 3. Electronics Design, Development and Production
- 4. Computers
- 5. Telecommunications Systems, Equipment and Components
- 6. Sensors and Lasers
- 7. Navigation and Avionics
- 8. Marine
- 9. Propulsion Systems, Space Vehicles and Related Equipment

Each category is divided into 5 subcategories:

- A. Systems, Equipment and Components
- B. Test, Inspection and Production Equipment
- C. Materials
- D. Software
- E. Technology

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Using the EAR - ECCN 4A002

4A002 "Hybrid computers" and "electronic assemblies" and specially designed components therefor.

License Requirements

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

Control(s)	*Country Chart*
NS applies to entire entry	NS Column 2
MT applies to hybrid computers combined with specially designed "software", for modeling, simulation, or design integration of complete rocket systems and unmanned air vehicle systems that are usable in systems controlled for MT reasons	MT Column 1
AT applies to entire entry	AT Column 1

NP applies, unless a License Exception is available. See §742.3(b) of the EAR for information on applicable licensing review policies.

XP applies to hybrid computers with a CTP greater than 28,000 MTOPS, unless a License Exception is available. XP controls vary according to destination and end-user and end-use; however, XP does not apply to Canada. See §742.12 of the EAR for additional information.

Continued on Next Slide

Using the EAR - ECCN 4A002

License Exceptions

LVS: $5000; N/A for MT
GBS: N/A
CIV: N/A

List of Items Controlled

Unit: Equipment in number; parts and accessories in $ value
Related Controls: See also 4A102 and 4A994
Related Definitions: N/A
Items:

a. Containing "digital computers" controlled by 4A003;
b. Containing analog- to- digital converters having all of the following characteristics:
b.1. 32 channels or more; *and*
b.2. A resolution of 14 bits (plus sign bit) or more with a conversion rate of 200,000 conversions/s or more.

Using the EAR - Commodity Classification Requests

If there is any doubt about how a product should be classified, you should submit a Commodity Classification Request to the BIS.

Why is this necessary:

- **CCL may be difficult to interpret; often the standards it uses are not familiar to engineers**
- **BIS may interpret CCL differently than is apparent from the written text based upon policy decisions**
- **Classification Requests are fairly easy to prepare and submit**

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Using the EAR - Country Chart

Is the item's ECCN controlled to the particular country to which you are proposing to export it?

- Review the Country Chart at 15 C.F.R. § 738
- Is there an X across from the country to which you want to export under the reason for control identified under the ECCN under which your product falls?
- If not, no license is required
- If so, a license is required

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Commerce Country Chart

Reason for Control

Countries	Chemical & Biological Weapons			Nuclear Nonproliferation		National Security		Missile Tech	Regional Stability	
	CB 1	CB 2	CB 3	NP 1	NP 2	NS 1	NS 2	MT 1	RS 1	RS 2
Afghanistan	X	X	X	X		X	X	X	X	X
Albania	X	X		X		X	X	X	X	X
Algeria	X	X		X		X	X	X	X	X
Andorra	X	X		X		X	X	X	X	X
Angola[1]	X	X		X		X	X	X	X	X
Antigua & Barbuda	X	X		X		X	X	X	X	X
Argentina	X					X	X	X	X	X
Armenia	X	X	X	X		X	X	X	X	X
Australia	X					X		X	X	
Austria	X					X		X	X	X
Azerbaijan	X	X	X	X		X	X	X	X	X
Bahamas, The	X	X		X		X	X	X	X	X
Bahrain	X	X	X	X		X	X	X	X	X

Continued on Next Slide

Guyana	X	X		X		X	X	X	X	X
Haiti	X	X		X		X	X	X	X	X
Honduras	X	X		X		X	X	X	X	X
●Hong Kong	X	X		X		X		X	X	X
● Hungary	X					X	X	X	X	
Iceland	X			X		X	X	X	X	
India	X	X	X	X	X	X	X	X	X	X
Indonesia	X	X		X		X	X	X	X	X
Iran	See part 746 of the EAR to determine whether a license is required in order to export or reexport to this destination.									
Iraq	See part 746 of the EAR to determine whether a license is required in order to export or reexport to this destination.									
Ireland	X					X		X	X	X
Israel	X	X	X	X	X	X	X	X	X	X
Italy	X					X		X	X	

Using the EAR - License Exceptions

License exceptions are detailed at 15 C.F.R. § 740. In order to qualify for an exception, an export must meet the specific criteria required therefor. Important exceptions include:

- LSV - Shipments of Limited Value
- CIV - Civil End-Users
- TSR - Technology and Software Under Restriction
- CTP - Computers
- TMP - Temporary Imports, Exports, and Reexports
- TSU - Technology and Software - Unrestricted
- ENC - License Exceptions

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Using the EAR - License Exceptions

Consider the TSR License Exception. This exception permits "exports and reexports of technology and software controlled to the ultimate destination for national security reasons and identified by 'TSR - Yes' in entries on the CCL" provided:

- **that the software or technology is destined for countries in Group B;**
- **a written assurance is received from the consignee that neither the technology/software or products of the technology or software will be delivered to certain countries in Group D1 and Group E; and**
- **certain reporting requirements are met**

Exports of Non-Encryption Software

Exports of software are governed like any other product by the CCL

However, there is an important exception for "mass market" software (other than encryption software)

Software qualifies as "mass market" if it is generally available to the public by being:

- sold from stock at retail selling points, without restriction, by means of: (1) over the counter transactions; (2) mail order transactions; or (3) telephone call transactions; AND
- designed for installation by the user without further substantial support by the supplier

Non-Encryption mass market software can be exported without a license under license exception TSU to any destination except the T-7 (Cuba, Iran, Iraq, Libya, North Korea, the Sudan, Syria)

Exports of High Performance Computers (HPCs) - CTP License Exception

For a long time the issue of the export of HPCs was a source of tension between regulators and industry

- Regulations were always outmoded; lagged behind industry
- In 1992, 1/3 of computer industry's overseas sales were subject to license review; in 1993, a computer with a performance of 12.5 million theoretical operations per second (MTOPS), equivalent of an Intel 486 chip, needed a license; manufacturers were preparing to mass produce computers with performance at 200 MTOPS (using Intel Pentium chips and DEC's Alpha AXP chip)
- Mass-produced HPC technology was uncontrollable
- U.S. industry was being harmed; losing market share and encouraging the development of a non-U.S.-based competitors
- U.S. defense requires HPCs and would be harmed if the U.S. HPC industry ceased to be a world leader
- Control of HPCs used to be justified because of use of HPCs in nuclear weapon design. If computer speed is no longer a critical choke point for nuclear weapon design, what is the justification for control?
- Issues resolved by the creation of License Exception CTP and a commitment to revisit the policy on a regular basis

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CTP License Exception Chart from BIS Web Page - http://www.bxa.doc.gov/HPCs/ctpchart.htm

Computer Tier	End-User	CTP greater than	CTP less than or equal to
1[4]	All[2]	28,000[1]	No Limit
2	Reserved		
3[5]	All[2]	28,000[1]	190,000[3]
4[6]	License Exception CTP not available		

1. No license required under 28,000 MTOPS except for AT reasons
2. License Exception CTP not available for nuclear, chemical, biological or missile end users
3. Increased from 85,000 effective March 6, 2002
4. Tier 1 Countries: List of about 136 countries including major industrial nations
5. Tier 3 Countries: List of about 48 countries (including China, India, Pakistan, Russia and the Middle East (including Israel))
6. Tier 4 Countries: Cuba, Iran, Iraq, Libya, North Korea, Sudan, Syria

NOTE: Wassenar reporting required for exports to non-Wassenar members over 65,000 MTOPS

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Exports of Encryption Software

Until 1996 most encryption technology was still listed on the Munitions List, meaning that it could not be exported without a license from the ODTC

Similar story as with HPCs

- Rigorous controls were a source of tension between industry and regulators
- Wide industrial use of encryption and international availability made overbroad export control impracticable (Microsoft Office 2000 could not be exported without a license under 1999 rules)
- Compromise reached through a far-reaching license exception ENC which lifts most controls on technology

Encryption Software is still treated differently than other software (and other technology)

However, new rules issued in January, 2000, substantially loosened the controls

Exports of Encryption Software

Under License Exception TSU:

- Free, publicly available source code can be exported without a license (upon notification of BIS)

Under License Exception ENC:

- Any encryption products may be exported to foreign subsidiaries of U.S. corporations without review and classification by BIS
- Any encryption products of any key length may be exported to any user in the EU+8 or any non-government user in other countries (other than the T7) after review and classification by BIS
- Products designated as "retail" may be exported to any end user (other than in the T7) after review and classification
- Be careful of cryptanalytic products or cryptographic products with open cryptographic interfaces

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Deemed Export Rule

- **EAR § 734.2(b)(2)(ii) defines export to include: "Any release of technology or source code subject to the EAR to a foreign national. Such release is deemed to be an export to the home country or home countries of the foreign national."**
- **EAR § 734.2(b)(3) provides that the "release" of technology includes: "(i) Visual inspection by foreign nationals of U.S.-origin equipment and facilities; (ii) Oral exchanges of information in the U.S. or abroad; and (iii) The application to situations abroad of personal knowledge or technical experience acquired in the U.S."**
- **Foreign national includes anyone in the U.S. on nonimmigrant visa categories (B, E, F, H, J or L), but does not include permanent residents (green card holders) and "protected individuals" as defined in the Immigration and Naturalization Act (e.g. asylees)**
- **BEWARE: ITAR has a similar rule for deemed exports of defense articles and there are almost no applicable license exceptions (see ITAR § 120(17)(a)(4)**

Deemed Export Rule

Encryption "software" (source code and objet code) is not subject to "deemed export" rule (possibly a reaction to Bernstein v. Department of State, 922 F. Supp. 1426 (1996)). See § 734.2(b)(9)

The deemed export rule would apply to encryption "technology" except that license exception ENC permits transfers of encryption technology to foreign nationals within the U.S. for internal company use (exception nationals of the T7)

Result of Deemed Export Rule:

- Companies must classify all technology, not just technology included in exports
- Companies have an obligation to determine the nationality or immigration status of all of its employees who may have access to controlled data

Exporting with Confidence

1. You have checked your licensor/purchaser against the most recent OFAC list of SDNs
2. You have submitted a Commodity Jurisdiction Request and received confirmation that your product is not a "defense article" under the jurisdiction of OTDC
3. You have submitted a Classification Request with respect to your product to the BIS and received an ECCN Number
4. You have checked the controls on the ECCN against the Country Chart and determined that there is no control for the country to which you are exporting
5. You have confirmed that you are not exporting your product in violation of any of the General Prohibitions, paying attention to the BXA "Know Your Customer" Guidelines
6. You have a process in place that will catch any Red Flags

NOW . . . EXPORT AWAY!

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THANK YOU

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125 Summer Street
Boston, MA 02110
tmacveagh@bromsun.com
617-443-9292

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APPENDICES

A. BIS's "Know Your Customer" Guidance and Red Flags – 17 C.F.R. § 732, Supplement No. 3

B. Commerce Country Chart – 17 C.F.R. § 738, Supplement No. 1

C. CCL: Category 4 Computers - 17 C.F.R. § 774, Supplement No. 1, Category 4

D. Useful Web Sites

BXA's "KNOW YOUR CUSTOMER" GUIDANCE AND RED FLAGS

"KNOW YOUR CUSTOMER" GUIDANCE

Various requirements of the EAR are dependent upon a person's knowledge of the end-use, end-user, ultimate destination, or other facts relating to a transaction or activity. These provisions include the nonproliferation-related "catch-all" sections and the prohibition against proceeding with a transaction with knowledge that a violation of the EAR has occurred or is about to occur.

(a) BXA provides the following guidance on how individuals and firms should act under this knowledge standard. This guidance does not change or interpret the EAR.

(1) *Decide whether there are "red flags".* Take into account any abnormal circumstances in a transaction that indicate that the export may be destined for an inappropriate end-use, end-user, or destination. Such circumstances are referred to as "red flags". Included among examples of red flags are orders for items that are inconsistent with the needs of the purchaser, a customer declining installation and testing when included in the sales price or when normally requested, or requests for equipment configurations that are incompatible with the stated destination (e.g., 120 volts in a country with 220 volts). Commerce has developed lists of such red flags that are not all-inclusive but are intended to illustrate the types of circumstances that should cause reasonable suspicion that a transaction will violate the EAR.

(2) *If there are "red flags", inquire.* If there are no "red flags" in the information that comes to your firm, you should be able to proceed with a transaction in reliance on information you have received. That is, absent "red flags" (or an express requirement in the EAR), there is no affirmative duty upon exporters to inquire, verify, or otherwise "go behind" the customer's representations. However, when "red flags" are raised in information that comes to your firm, you have a duty to check out the suspicious circumstances and inquire about the end-use, end-user, or ultimate country of destination. The duty to check out "red flags" is not confined to the use of License Exceptions affected by the "know" or "reason to know" language in the EAR. Applicants for licenses are required by part 748 of the EAR to obtain documentary evidence concerning the transaction, and misrepresentation or concealment of material facts is prohibited, both in the licensing process and in all export control documents. You can rely upon representations from your customer and repeat them in the documents you file unless red flags oblige you to take verification steps.

(3) *Do not self-blind.* Do not cut off the flow of information that comes to your firm in the normal course of business. For example, do not instruct the sales force to tell potential customers to refrain from discussing the actual end-use, end-user, and ultimate country of destination for the product your firm is seeking to sell. Do not put on blinders that prevent the learning of relevant information. An affirmative policy of steps to avoid "bad" information would not insulate a company from liability, and it would usually be considered an aggravating factor in an enforcement proceeding.

(4) *Employees need to know how to handle "red flags".* Knowledge possessed by an employee of a company can be imputed to a firm so as to make it liable for a violation. This makes it important for firms to establish clear policies and effective compliance procedures to ensure that such knowledge about transactions can be evaluated by responsible senior officials. Failure to do so could be regarded as a form of self-blinding.

(5) *Reevaluate all the information after the inquiry.* The purpose of this inquiry and reevaluation is to determine whether the "red

flags" can be explained or justified. If they can, you may proceed with the transaction. If the "red flags" cannot be explained or justified and you proceed, you run the risk of having had "knowledge" that would make your action a violation of the EAR.

(6) *Refrain from the transaction or advise BXA and wait.* If you continue to have reasons for concern after your inquiry, then you should either refrain from the transaction or submit all the relevant information to BXA in the form of an application for a license or in such other form as BXA may specify.

(b) Industry has an important role to play in preventing exports and reexports contrary to the national security and foreign policy interests of the United States. BXA will continue to work in partnership with industry to make this front line of defense effective, while minimizing the regulatory burden on exporters. If you have any question about whether you have encountered a "red flag", you may contact the Office of Export Enforcement at 1-800-424-2980 or the Office of Exporter Services at (202)482-4532.

RED FLAGS

Possible indicators that an unlawful diversion might be planned by your customer include the following:

1. The customer or purchasing agent is reluctant to offer information about the end-use of a product.

2. The product's capabilities do not fit the buy er's line of business; for example, a small bakery places an order for several sophisticated lasers.

3. The product ordered is incompatible with the technical level of the country to which the product is being shipped. For example, semiconductor manufacturing equipment would be of little use in a country without an electronics industry.

4. The customer has little or no business background.

5. The customer is willing to pay cash for a very expensive item when the terms of the sale call for financing.

6. The customer is unfamiliar with the product's performance characteristics but still wants the product.

7. Routine installation, training or maintenance services are declined by the customer.

8. Delivery dates are vague, or deliveries are planned for out-of-the-way destinations.

9. A freight forwarding firm is listed as the product's final destination.

10. The shipping route is abnormal for the product and destination.

11. Packaging is inconsistent with the stated method of shipment or destination.

12. When questioned, the buyer is evasive or unclear about whether the purchased product is for domestic use, export or reexport.

Commerce Country Chart

Reason for Control

Countries	Chemical & Biological Weapons			Nuclear Nonproliferation		National Security		Missile Tech	Regional Stability		Firearms Convention	Crime Control			Anti-Terrorism	
	CB 1	CB 2	CB 3	NP 1	NP 2	NS 1	NS 2	MT 1	RS 1	RS 2	FC 1	CC 1	CC 2	CC 3	AT 1	AT 2
Afghanistan	X	X	X	X		X	X	X	X	X		X		X		
Albania	X	X		X		X	X	X	X	X		X	X			
Algeria	X	X		X		X	X	X	X	X		X		X		
Andorra	X	X		X		X	X	X	X	X		X		X		
Angola[1]	X	X		X		X	X	X	X	X		X		X		
Antigua & Barbuda	X	X		X		X	X	X	X	X	X	X		X		
Argentina	X					X	X	X	X	X	X	X		X		
Armenia	X	X	X	X		X	X	X	X	X		X	X			
Australia	X					X		X	X							
Austria	X					X		X	X	X		X		X		
Azerbaijan	X	X	X	X		X	X	X	X	X		X	X			
Bahamas, The	X	X		X		X	X	X	X	X	X	X		X		
Bahrain	X	X	X	X		X	X	X	X	X		X		X		
Bangladesh	X	X		X		X	X	X	X	X		X		X		

Commerce Country Chart

Reason for Control

Countries	Chemical & Biological Weapons			Nuclear Nonproliferation		National Security		Missile Tech	Regional Stability		Firearms Convention	Crime Control			Anti-Terrorism	
	CB 1	CB 2	CB 3	NP 1	NP 2	NS 1	NS 2	MT 1	RS 1	RS 2	FC 1	CC 1	CC 2	CC 3	AT 1	AT 2
Barbados	X	X		X		X	X	X	X	X	X	X		X		
Belarus	X	X	X	X		X	X	X	X	X		X	X			
Belgium	X					X		X	X							
Belize	X	X		X		X	X	X	X	X	X	X		X		
Benin	X	X		X		X	X	X	X	X		X		X		
Bhutan	X	X		X		X	X	X	X	X		X		X		
Bolivia	X	X		X		X	X	X	X	X	X	X		X		
Bosnia & Herzegovina	X	X		X		X	X	X	X	X		X		X		
Botswana	X	X		X		X	X	X	X	X		X		X		
Brazil	X	X				X	X	X	X	X	X	X		X		
Brunei	X	X		X		X	X	X	X	X		X		X		
Bulgaria	X	X	X			X	X	X	X	X		X	X			
Burkina Faso	X	X		X		X	X	X	X	X		X		X		
Burma	X	X	X	X		X	X	X	X	X		X		X		

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Countries	Chemical & Biological Weapons			Nuclear Nonproliferation		National Security		Missile Tech	Regional Stability		Firearms Convention	Crime Control			Anti-Terrorism	
	CB 1	CB 2	CB 3	NP 1	NP 2	NS 1	NS 2	MT 1	RS 1	RS 2	FC 1	CC 1	CC 2	CC 3	AT 1	AT 2
Burundi	X	X		X		X	X	X	X	X		X		X		
Cambodia	X	X		X		X	X	X	X	X		X	X			
Cameroon	X	X		X		X	X	X	X	X		X		X		
Canada											X					
Cape Verde	X	X		X		X	X	X	X	X		X		X		
Central African Republic	X	X		X		X	X	X	X	X		X		X		
Chad	X	X		X		X	X	X	X	X		X		X		
Chile	X	X		X		X	X	X	X	X	X	X		X		
China	X	X	X	X		X	X	X	X	X		X		X		
Colombia	X	X		X		X	X	X	X	X	X	X		X		
Comoros	X	X		X		X	X	X	X	X		X		X		
Congo	X	X		X		X	X	X	X	X		X		X		
Costa Rica	X	X		X		X	X	X	X	X	X	X		X		
Cote d'Ivoire	X	X		X		X	X	X	X	X		X		X		

Commerce Country Chart

Reason for Control

Countries	Chemical & Biological Weapons			Nuclear Nonproliferation		National Security		Missile Tech	Regional Stability		Firearms Convention	Crime Control			Anti-Terrorism	
	CB 1	CB 2	CB 3	NP 1	NP 2	NS 1	NS 2	MT 1	RS 1	RS 2	FC 1	CC 1	CC 2	CC 3	AT 1	AT 2
Croatia	X	X		X		X	X	X	X	X		X		X		
Cuba	See part 746 of the EAR to determine whether a license is required in order to export or reexport to this destination.															
Cyprus	X			X		X	X	X	X	X		X		X		
Czech Republic	X					X	X	X	X							
Denmark	X					X		X	X							
Djibouti	X	X		X		X	X	X	X	X		X		X		
Dominica	X	X		X		X	X	X	X	X	X	X		X		
Dominican Republic	X	X		X		X	X	X	X	X	X	X		X		
Ecuador	X	X		X		X	X	X	X	X	X	X		X		
Egypt	X	X	X	X		X	X	X	X	X		X		X		
El Salvador	X	X		X		X	X	X	X	X	X	X		X		
Equatorial Guinea	X	X		X		X	X	X	X	X		X		X		
Eritrea	X	X		X		X	X	X	X	X		X		X		
Estonia	X	X		X		X	X	X	X	X		X	X			

Commerce Country Chart

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Countries	Chemical & Biological Weapons			Nuclear Nonproliferation		National Security		Missile Tech	Regional Stability		Firearms Convention	Crime Control			Anti-Terrorism	
	CB 1	CB 2	CB 3	NP 1	NP 2	NS 1	NS 2	MT 1	RS 1	RS 2	FC 1	CC 1	CC 2	CC 3	AT 1	AT 2
Ethiopia	X	X		X		X	X	X	X	X		X		X		
Fiji	X	X		X		X	X	X	X	X		X		X		
Finland	X					X		X	X	X		X		X		
France	X					X		X	X							
Gabon	X	X		X		X	X	X	X	X		X		X		
Gambia, The	X	X		X		X	X	X	X	X		X		X		
Georgia	X	X	X	X		X	X	X	X	X		X	X			
Germany	X					X		X	X							
Ghana	X	X		X		X	X	X	X	X		X		X		
Greece	X					X		X	X							
Grenada	X	X		X		X	X	X	X	X	X	X		X		
Guatemala	X	X		X		X	X	X	X	X	X	X		X		
Guinea	X	X		X		X	X	X	X	X		X		X		
Guinea-Bissau	X	X		X		X	X	X	X	X		X		X		

Commerce Country Chart

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Countries	Chemical & Biological Weapons			Nuclear Nonproliferation		National Security		Missile Tech	Regional Stability		Firearms Convention	Crime Control			Anti-Terrorism	
	CB 1	CB 2	CB 3	NP 1	NP 2	NS 1	NS 2	MT 1	RS 1	RS 2	FC 1	CC 1	CC 2	CC 3	AT 1	AT 2
Guyana	X	X		X		X	X	X	X	X	X	X		X		
Haiti	X	X		X		X	X	X	X	X	X	X		X		
Honduras	X	X		X		X	X	X	X	X	X	X		X		
Hong Kong	X	X		X		X		X	X	X		X		X		
Hungary	X					X	X	X	X							
Iceland	X			X		X	X	X	X							
India	X	X	X	X	X	X	X	X	X	X		X		X		
Indonesia	X	X		X		X	X	X	X	X		X		X		
Iran	See part 746 of the EAR to determine whether a license is required in order to export or reexport to this destination.															
Iraq[1]	See part 746 of the EAR to determine whether a license is required in order to export or reexport to this destination.															
Ireland	X					X		X	X	X		X		X		
Israel	X	X	X	X	X	X	X	X	X	X		X		X		
Italy	X					X		X	X							
Jamaica	X	X		X		X	X	X	X	X	X	X		X		

Commerce Country Chart

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Countries	Chemical & Biological Weapons			Nuclear Nonproliferation		National Security		Missile Tech	Regional Stability		Firearms Convention	Crime Control			Anti-Terrorism	
	CB 1	CB 2	CB 3	NP 1	NP 2	NS 1	NS 2	MT 1	RS 1	RS 2	FC 1	CC 1	CC 2	CC 3	AT 1	AT 2
Japan	X					X		X	X							
Jordan	X	X	X	X		X	X	X	X	X		X		X		
Kazakhstan	X	X	X	X		X	X	X	X	X		X	X			
Kenya	X	X		X		X	X	X	X	X		X		X		
Kiribati	X	X		X		X	X	X	X	X		X		X		
Korea, North	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X
Korea, South	X					X		X	X	X		X		X		
Kuwait	X	X	X	X		X	X	X	X	X		X		X		
Kyrgyzstan	X	X	X	X		X	X	X	X	X		X	X			
Laos	X	X		X		X	X	X	X	X		X	X			
Latvia	X	X				X	X	X	X	X		X	X			
Lebanon	X	X	X	X		X	X	X	X	X		X		X		
Lesotho	X	X		X		X	X	X	X	X		X		X		
Liberia	X	X		X		X	X	X	X	X		X		X		

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Countries	Chemical & Biological Weapons			Nuclear Nonproliferation		National Security		Missile Tech	Regional Stability		Firearms Convention	Crime Control			Anti-Terrorism	
	CB 1	CB 2	CB 3	NP 1	NP 2	NS 1	NS 2	MT 1	RS 1	RS 2	FC 1	CC 1	CC 2	CC 3	AT 1	AT 2
Libya	See part 746 of the EAR to determine whether a license is required in order to export or reexport to this destination.															
Liechtenstein	X	X		X		X	X	X	X	X		X		X		
Lithuania	X	X		X		X	X	X	X	X		X	X			
Luxembourg	X					X		X	X							
Macau	X	X	X	X		X	X	X	X	X		X		X		
FYROM (Macedonia)	X	X		X		X	X	X	X	X		X		X		
Madagascar	X	X		X		X	X	X	X	X		X		X		
Malawi	X	X		X		X	X	X	X	X		X		X		
Malaysia	X	X		X		X	X	X	X	X		X		X		
Maldives	X	X		X		X	X	X	X	X		X		X		
Mali	X	X		X		X	X	X	X	X		X		X		
Malta	X	X		X		X	X	X	X	X		X		X		
Marshall Islands	X	X		X		X	X	X	X	X		X		X		
Mauritania	X	X		X		X	X	X	X	X		X		X		

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	CB 1	CB 2	CB 3	NP 1	NP 2	NS 1	NS 2	MT 1	RS 1	RS 2	FC 1	CC 1	CC 2	CC 3	AT 1	AT 2
Mauritius	X	X		X		X	X	X	X	X		X		X		
Mexico	X	X		X		X	X	X	X	X	X	X		X		
Micronesia	X	X		X		X	X	X	X	X		X		X		
Moldova	X	X	X	X		X	X	X	X	X		X	X			
Monaco	X	X		X		X	X	X	X	X		X		X		
Mongolia	X	X	X	X		X	X	X	X	X		X	X			
Morocco	X	X		X		X	X	X	X	X		X		X		
Mozambique	X	X		X		X	X	X	X	X		X		X		
Namibia	X	X		X		X	X	X	X	X		X		X		
Nauru	X	X		X		X	X	X	X	X		X		X		
Nepal	X	X		X		X	X	X	X	X		X		X		
Netherlands	X					X		X	X							
New Zealand	X					X		X	X							
Nicaragua	X	X		X		X	X	X	X	X	X	X		X		

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Countries	Chemical & Biological Weapons			Nuclear Nonproliferation		National Security		Missile Tech	Regional Stability		Firearms Convention	Crime Control			Anti-Terrorism	
	CB 1	CB 2	CB 3	NP 1	NP 2	NS 1	NS 2	MT 1	RS 1	RS 2	FC 1	CC 1	CC 2	CC 3	AT 1	AT 2
Niger	X	X		X		X	X	X	X	X		X		X		
Nigeria	X	X		X		X	X	X	X	X		X		X		
Norway	X					X		X	X							
Oman	X	X	X	X		X	X	X	X	X		X		X		
Pakistan	X	X	X	X	X	X	X	X	X	X		X		X		
Palau	X	X		X		X	X	X	X	X		X		X		
Panama	X	X		X		X	X	X	X	X	X	X		X		
Papua New Guinea	X	X		X		X	X	X	X	X		X		X		
Paraguay	X	X		X		X	X	X	X	X	X	X		X		
Peru	X	X		X		X	X	X	X	X	X	X		X		
Philippines	X	X		X		X	X	X	X	X		X		X		
Poland	X					X	X	X	X							
Portugal	X					X		X	X							
Qatar	X	X	X	X		X	X	X	X	X		X		X		

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Countries	Chemical & Biological Weapons			Nuclear Nonproliferation		National Security		Missile Tech	Regional Stability		Firearms Convention	Crime Control			Anti-Terrorism	
	CB 1	CB 2	CB 3	NP 1	NP 2	NS 1	NS 2	MT 1	RS 1	RS 2	FC 1	CC 1	CC 2	CC 3	AT 1	AT 2
Romania	X					X	X	X	X	X		X	X			
Russia	X	X	X			X	X	X	X	X		X	X			
Rwanda[1]	X	X		X		X	X	X	X	X		X	X	X		
St. Kitts & Nevis	X	X	X	X		X	X	X	X	X	X	X		X		
St. Lucia	X	X		X		X	X	X	X	X	X	X		X		
St. Vincent & Grenadines	X	X		X		X	X	X	X	X	X	X		X		
San Marino	X	X		X		X	X	X	X	X		X		X		
Sao Tome & Principe	X	X		X		X	X	X	X	X		X		X		
Saudi Arabia	X	X	X	X		X	X	X	X	X		X		X		
Senegal	X	X		X		X	X	X	X	X		X		X		
Seychelles	X	X		X		X	X	X	X	X		X		X		
Sierra Leone	X	X		X		X	X	X	X	X		X		X		
Singapore	X	X		X		X	X	X	X	X		X		X		
Slovakia	X					X	X	X	X	X		X		X		

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Countries	Chemical & Biological Weapons			Nuclear Nonproliferation		National Security		Missile Tech	Regional Stability		Firearms Convention	Crime Control			Anti-Terrorism	
	CB 1	CB 2	CB 3	NP 1	NP 2	NS 1	NS 2	MT 1	RS 1	RS 2	FC 1	CC 1	CC 2	CC 3	AT 1	AT 2
Slovenia	X	X		X		X	X	X	X	X		X		X		
Solomon Islands	X	X		X		X	X	X	X	X		X		X		
Somalia	X	X		X		X	X	X	X	X		X		X		
South Africa	X	X				X	X	X	X	X		X		X		
Spain	X					X		X	X							
Sri Lanka	X	X		X		X	X	X	X	X		X		X		
Sudan	X	X		X		X	X	X	X	X		X		X	X	X
Suriname	X	X		X		X	X	X	X	X	X	X		X		
Swaziland	X	X		X		X	X	X	X	X		X		X		
Sweden	X					X		X	X	X		X		X		
Switzerland	X					X		X	X	X		X		X		
Syria	X	X	X	X		X	X	X	X	X		X		X	X	
Taiwan	X	X	X	X		X	X	X	X	X		X		X		
Tajikistan	X	X	X	X		X	X	X	X	X		X	X			

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Countries	Chemical & Biological Weapons			Nuclear Nonproliferation		National Security		Missile Tech	Regional Stability		Firearms Convention	Crime Control			Anti-Terrorism	
	CB 1	CB 2	CB 3	NP 1	NP 2	NS 1	NS 2	MT 1	RS 1	RS 2	FC 1	CC 1	CC 2	CC 3	AT 1	AT 2
Tanzania	X	X		X		X	X	X	X	X		X		X		
Thailand	X	X		X		X	X	X	X	X		X		X		
Togo	X	X		X		X	X	X	X	X		X		X		
Tonga	X	X		X		X	X	X	X	X		X		X		
Trinidad & Tobago	X	X		X		X	X	X	X	X	X	X		X		
Tunisia	X	X		X		X	X	X	X	X		X		X		
Turkey	X			X		X		X	X							
Turkmenistan	X	X	X	X		X	X	X	X	X		X	X			
Tuvalu	X	X		X		X	X	X	X	X		X		X		
Uganda	X	X		X		X	X	X	X	X		X		X		
Ukraine	X	X	X			X	X	X	X	X		X	X			
United Arab Emirates	X	X	X	X		X	X	X	X	X		X		X		
United Kingdom	X					X		X	X							
Uruguay	X	X		X		X	X	X	X	X	X	X		X		

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Countries	Chemical & Biological Weapons			Nuclear Nonproliferation		National Security		Missile Tech	Regional Stability		Firearms Convention	Crime Control			Anti-Terrorism	
	CB 1	CB 2	CB 3	NP 1	NP 2	NS 1	NS 2	MT 1	RS 1	RS 2	FC 1	CC 1	CC 2	CC 3	AT 1	AT 2
Uzbekistan	X	X	X	X		X	X	X	X	X		X	X			
Vanuatu	X	X		X		X	X	X	X	X		X		X		
Vatican City	X	X		X		X	X	X	X	X		X		X		
Venezuela	X	X		X		X	X	X	X	X	X	X		X		
Vietnam	X	X	X	X		X	X	X	X	X		X	X			
Western Sahara	X	X		X		X	X	X	X	X		X		X		
Western Samoa	X	X		X		X	X	X	X	X		X		X		
Yemen	X	X	X	X		X	X	X	X	X		X		X		
Yugoslavia (Serbia and Montenegro), Federal Republic of [1]	X	X		X		X	X	X	X	X		X	X	X		
Zaire	X	X		X		X	X	X	X	X		X		X		
Zambia	X	X		X		X	X	X	X	X		X		X		
Zimbabwe	X	X		X		X	X	X	X	X		X		X		

[1] This country is subject to United Nations Sanctions. See part 746 of the EAR for additional OFAC licensing requirements that may apply to your proposed transaction.

CATEGORY 4 - COMPUTERS

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

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

N.B: For the control status of "software" specially designed for packet switching, see ECCN 5D001. (Telecommunications).

Note 3: Computers, related equipment and "software" performing cryptographic, cryptoanalytic, certifiable multi-level security or certifiable user isolation functions, or that limit electromagnetic compatibility (EMC), must also be evaluated against the performance characteristics in Category 5, Part 2 ("Information Security").

A. SYSTEMS, EQUIPMENT AND COMPONENTS

4A001 Electronic computers and related equipment, and "electronic assemblies" and specially designed components therefor.

License Requirements

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

Control(s)	*Country Chart*
NS applies to entire entry	NS Column 2
MT applies to items in 4A001.a when the parameters in 4A101 are met or exceeded	MT Column 1
AT applies to entire entry	AT Column 1

●NP applies, unless a License Exception is available. See §742.3(b) of the EAR for information on applicable licensing review policies.

●XP applies to electronic computers with a CTP greater than 28,000 MTOPS, unless a License Exception is available. XP controls vary according to destination and end-user and end-use; however, XP does not apply to Canada. See §742.12 of the EAR for additional information.

License Requirement Notes: See §743.1 of the EAR for reporting requirements for exports under License Exceptions.

License Exceptions

LVS: $5000 for 4A001.a; N/A for MT and 4A001.b
GBS: N/A
CIV: N/A

●List of Items Controlled

Unit: Equipment in number; parts and accessories in $ value
Related Controls: See also 4A101 and 4A994. Equipment designed or rated for transient ionizing radiation is 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: For the purposes of integrated circuits in 4A001.a.2, 5×10^3 Gy(Si) = 5×10^5 Rads (Si); 5×10^6 Gy (Si)/s = 5×10^8 Rads (Si)/s.
Items:

a. Specially designed to have either of the following characteristics:

a.1. Rated for operation at an ambient temperature below 228 K (-45°C) or above 358 K (85°C);

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

a.2. Radiation hardened to exceed any of the following specifications:

a.2.a. A total dose of 5×10^3 Gy (Si);

a.2.b. A dose rate upset of 5×10^6 Gy (Si)/s; *or*

a.2.c. Single Event Upset of 1×10^{-7} Error/bit/day;

b. Having characteristics or performing functions exceeding the limits in Category 5, Part 2 ("Information Security").

4A002 "Hybrid computers" and "electronic assemblies" and specially designed components therefor.

License Requirements

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

Control(s)	*Country Chart*
NS applies to entire entry	NS Column 2
MT applies to hybrid computers combined with specially designed "software", for modeling, simulation, or design integration of complete rocket systems and unmanned air vehicle systems that are usable in systems controlled for MT reasons	MT Column 1
AT applies to entire entry	AT Column 1

●NP applies, unless a License Exception is available. See §742.3(b) of the EAR for information on applicable licensing review policies.

●XP applies to hybrid computers with a CTP greater than 28,000 MTOPS, unless a License Exception is available. XP controls vary according to destination and end-user and end-use; however, XP does not apply to Canada. See §742.12 of the EAR for additional information.

License Exceptions

LVS: $5000; N/A for MT
GBS: N/A
CIV: N/A

List of Items Controlled

Unit: Equipment in number; parts and accessories in $ value
Related Controls: See also 4A102 and 4A994
Related Definitions: N/A
Items:

a. Containing "digital computers" controlled by 4A003;

b. Containing analog-to-digital converters having all of the following characteristics:

b.1. 32 channels or more; *and*

b.2. A resolution of 14 bits (plus sign bit) or more with a conversion rate of 200,000 conversions/s or more.

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

Control(s)	*Country Chart*
NS applies to 4A003.b and .c	NS Column 1
NS applies to 4A003.a, d, .e, 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 ≥ 6 but ≤ to 28,000 MTOPS)	AT Column 1

•NP applies, 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 28,000 MTOPS, unless a License Exception is available. XP controls vary according to destination and end-user and end-use; however, XP does not apply to Canada. See §742.12 of the EAR for additional information.

• **Note:** For all destinations, except Cuba, Iran, Iraq, Libya, North Korea, Sudan, Syria, no license is required (NLR) for computers with a CTP not greater than 28,000 MTOPS and for "electronic assemblies" described in 4A003.c that are not capable of exceeding a CTP greater than 28,000 MTOPS in aggregation. Computers controlled in this entry for MT reasons are not eligible for NLR.

License Requirement Notes: See §743.1 of the EAR for reporting requirements for exports under License Exceptions.

License Exceptions

- LVS: $5000; N/A for MT, b. and .c.
  GBS: Yes, for 4A003.d, .e, and .g and specially designed components therefor, exported separately or as part of a system.
- CTP: Yes, for computers controlled by 4A003.a or .b, and "electronic assemblies" controlled by 4A003.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 .e, and .g.

List of Items Controlled

Unit: Equipment in number; parts and accessories in $ value
Related Controls: See also 4A994 and 4A980
Related Definitions: N/A
Items:

Note 1: 4A003 includes the following:

a. Vector processors;

b. Array processors;

c. Digital signal processors;

d. Logic processors;

e. Equipment designed for "image enhancement";

f. Equipment designed for "signal processing".

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:

a. The "digital computers" or related equipment are essential for the operation of the other equipment or systems;

b. The "digital computers" or related equipment are not a "principal element" of the other equipment or systems; and

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

***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.

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:*

1. Error detection or correction algorithms in "main storage";

2. The interconnection of two "digital computers" so that, if the active central processing unit fails, an idling but mirroring central processing unit can continue the system's functioning;

3. The interconnection of two central processing units by data channels or by use of 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 28,000 million theoretical operations per second (MTOPS);

c. "Electronic assemblies" specially designed or modified to be capable of 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, or 4A003.e*

***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 200,000,000;

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

f. Reserved.

g. Equipment specially designed to provide

external interconnection of "digital computers" or associated equipment that allows communications at data rates exceeding 1.25 Gbyte/s.

Note: 4A003.g does not control internal interconnection equipment (e.g., backplanes, buses) passive interconnection equipment, "network access controllers" or "communication channel controllers".

4A004 Computers, as follows (see List of Items Controlled) and specially designed related equipment, "electronic assemblies" and components therefor.

License Requirements

Reason for Control: NS, AT

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

License Exceptions

LVS: $5000
GBS: N/A
CIV: N/A

List of Items Controlled

Unit: Equipment in number; parts and accessories in $ value
Related Controls: N/A
Related Definitions: N/A
Items:

a. "Systolic array computers";

b. "Neural computers";

c. "Optical computers".

4A101 Analog computers, "digital computers" or digital differential analyzers, other than those controlled by 4A001 designed or modified for use in "missiles", having any of the following (see List of Items Controlled).

License Requirements

Reason for Control: MT, AT

Control(s)	*Country Chart*
MT applies to entire entry	MT Column 1
AT applies to entire entry	AT Column 1

License Exceptions

LVS: N/A
GBS: N/A
CIV: N/A

List of Items Controlled

Unit: Equipment in number
Related Controls: N/A
Related Definitions: N/A
Items:

a. Rated for continuous operation at temperatures from below 228 K (-45° C) to above 328 K (+55°C); *or*

b. Designed as ruggedized or "radiation hardened".

4A102 "Hybrid computers" specially designed for modelling, simulation or design integration of "missiles". (These items are subject to the export licensing authority of the U.S. Department of State, Office of Defense Trade Controls. See 22 CFR part 121.)

4A980 Computers for fingerprint equipment,

n.e.s.

License Requirements

Reason for Control: CC, AT

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

License Exceptions

LVS: N/A
GBS: N/A
CIV: N/A

List of Items Controlled

Unit: Equipment in number
Related Controls: N/A
Related Definitions: N/A
Items:

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

4A994 Computers, "electronic assemblies", and related equipment not controlled by 4A001, 4A002, or 4A003, and specially designed components therefor.

License Requirements

Reason for Control: AT

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

License Exceptions

LVS: N/A
GBS: N/A
CIV: N/A

List of Items Controlled

Unit: Equipment in number; parts and accessories in $ value
Related Controls: N/A
Related Definitions: *"Two dimensional vector rate"* is the number vectors generated per second that have 10 pixel poly line vectors, clip tested, randomly oriented, with either integer or floating point X-Y coordinate values (whichever produces the maximum rate) (see paragraph (g) of this ECCN).
Items:

a. Electronic computers and related equipment, and "electronic assemblies" and specially designed components therefor, rated for operation at an ambient temperature above 343 K (70 °C);

b. "Digital computers" having a "composite theoretical performance" ("CTP") equal to or greater than 6 million theoretical operations per second (MTOPS);

c. "Electronic assemblies" that are specially designed or modified to enhance performance by aggregation of "computing elements" ("CEs"), as follows:

c.1. Designed to be capable of aggregation in configurations of 16 or more "computing elements" ("CEs"); *or*

c.2. Having a sum of maximum data rates on all channels available for connection to associated processors exceeding 40 million Byte/s;

Note 1: 4A994.c applies only to "electronic assemblies" and programmable interconnections with a "CTP" not exceeding the limits in 4A994.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 4A994.

Note 2: 4A994.c does not control any

"electronic assembly" specially designed for a product or family of products whose maximum configuration does not exceed the limits of 4A994.b.

d. Disk drives and solid state storage equipment:

d.1. Magnetic, erasable optical or magneto-optical disk drives with a "maximum bit transfer rate" exceeding 25 million bit/s;

d.2. Solid state storage equipment, other than "main storage" (also known as solid state disks or RAM disks), with a "maximum bit transfer rate" exceeding 36 million bit/s;

e. Input/output control units designed for use with equipment controlled by 4A994.d;

f. Equipment for "signal processing" or "image enhancement" having a "composite theoretical performance" ("CTP") exceeding 8.5 million theoretical operations per second (MTOPS);

g. Graphics accelerators or graphics coprocessors that exceed a "three dimensional vector rate" of 400,000 or, if supported by 2-D vectors only, a "two dimensional vector rate" of 600,000;

Note: The provisions of 4A994.g do not apply to work stations designed for and limited to:

a. Graphic arts (e.g., printing, publishing); and

b. The display of two-dimensional vectors.

h. Color displays or monitors having more than 120 resolvable elements per cm in the direction of the maximum pixel density;

Note 1: 4A994.h does not control displays or monitors not specially designed for electronic computers.

Note 2: Displays specially designed for air traffic control (ATC) systems are treated as specially designed components for ATC systems under Category 6.

i. Equipment containing "terminal interface equipment" exceeding the limits in 5A991.

Note: For the purposes of 4A994.i, "terminal interface equipment" includes "local area network" interfaces, modems and other communications interfaces. "Local area network" interfaces are evaluated as "network access controllers".

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

Note: 4A994.j does not control internal interconnection equipment (e.g., backplanes, buses) passive interconnection equipment, "network access controllers" or "communication channel controllers".

B. TEST, INSPECTION AND PRODUCTION EQUIPMENT

4B994 Equipment for the "development" and "production" of magnetic and optical storage equipment.

License Requirements

Reason for Control: AT

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

License Exceptions

LVS: N/A
GBS: N/A
CIV: N/A

List of Items Controlled

Unit: $ value
Related Controls: This entry does not control general-purpose sputtering equipment.
Related Definition: N/A
Items:

a. Equipment specially designed for the application of magnetic coating to controlled non-flexible (rigid) magnetic or magneto-optical media;

b. "Stored program controlled" equipment specially designed for monitoring, grading, exercising or testing controlled rigid magnetic media;

c. Equipment specially designed for the "production" or alignment of heads or head/disk assemblies for controlled rigid magnetic and magneto-optical storage, and electro-mechanical or optical components therefor.

C. MATERIALS

4C994 Materials specially formulated for and required for the fabrication of head/disk assemblies for controlled magnetic and magneto-optical hard disk drives.

License Requirements

Reason for Control: AT

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

License Exceptions

LVS: N/A
GBS: N/A
CIV: N/A

List of Items Controlled

Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items:

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

D. SOFTWARE

Note: The control status of "software" for the "development", "production", or "use" of equipment described in other Categories is dealt with in the appropriate Category. The control status of "software" for equipment described in this Category is dealt with herein.

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*
NS applies to "software" for commodities or software controlled by 4A001 to 4A004, 4D001 to 4D003	NS Column 1
MT applies to "software" for equipment controlled by 4A001 to 4A003 for MT reasons	MT Column 1
CC applies to "software" for computerized finger-print equipment	CC Column 1

controlled by 4A003 for CC reasons

AT applies to entire entry AT Column 1

●NP applies, unless a License Exception is available. See §742.3(b) of the EAR for information on applicable licensing review policies.

●XP applies to "software" for computers with a CTP greater than 28,000 MTOPS, unless a License Exception is available. XP controls vary according to destination and end-user and end-use; however, XP does not apply to Canada. See §742.12 of the EAR for additional information.

License Requirement Notes: See §743.1 of the EAR for reporting requirements for exports under License Exceptions.

License Exceptions

CIV: N/A

● TSR: (a) N/A for:
(1) "Software" controlled for MT reasons;
(2) "Software" for equipment or "software" requiring a license; *or*
(3) "Software" described by TSR paragraph (b)(1)(ii) of this License Exception section, when exported or reexported to a destination not included in TSR paragraph (b)(1)(i) of this License Exception section.
(b) Yes for:
(1) "Software":
(i) Exported or reexported to Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, or the United Kingdom; and
(ii) Specially designed for the "development" or "production" of any of the following:
(A) "Digital" computers controlled by 4A003.b and having a CTP exceeding than 33,000 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 33,000 MTOPS; *and*
(2) All other "software" not described in TSR paragraphs (a) or (b)(1) of this License Exception section.

List of Items Controlled

Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items:

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

4D002 "Software" specially designed or modified to support "technology" controlled by 4E (except 4E980, 4E992, and 4E993).

License Requirements

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

Control(s)	*Country Chart*
NS applies to entire entry	NS Column 1
MT applies to "software"	MT Column 1

for equipment controlled by 4E for MT reasons

AT applies to entire entry	AT Column 1

●NP applies, unless a License Exception is available. See §742.3(b) of the EAR for information on applicable licensing review policies.

●XP applies to "software" for computers with a CTP greater than 28,000 MTOPS, unless a License Exception is available. XP controls vary according to destination and end-user and end-use; however, XP does not apply to Canada. See §742.12 of the EAR for additional information.

License Exceptions

CIV: N/A
TSR: Yes, except N/A for MT and for "software" specifically designed or modified to support "technology" for computers requiring a license.

List of Items Controlled

Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items:

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

4D003 Specific "software", as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, AT

Control(s)	*Country Chart*
NS applies to entire entry	NS Column 1
AT applies to entire entry	AT Column 1

License Requirement Notes: See §743.1 of the EAR for reporting requirements for exports under License Exception.

License Exceptions

CIV: N/A
TSR: Yes, except 4D003.c

●List of Items Controlled

Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items:

a. Operating system "software", "software" development tools and compilers specially designed for "multi-data-stream processing" equipment, in "source code";

b. [Reserved]

c. "Software" having characteristics or performing functions exceeding the limits in Category 5, Part 2 ("Information Security");

d. Operating systems specially designed for "real time processing" equipment that guarantees a "global interrupt latency time" of less than 20 μs.

4D102 "Software" specially designed or modified for the "development", "production" or "use" of equipment controlled by 4A101.

License Requirements

Reason for Control: MT, AT

Control(s)	*Country Chart*
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: N/A
Related Definitions: N/A
Items:

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

4D980 "Software" specially designed for the "development", "production", or "use" of items controlled by 4A980.

License Requirements

Reason for Control: CC, AT

Control(s)	*Country Chart*
CC applies to entire entry	CC 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: N/A
Related Definitions: N/A
Items:

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

4D993 "Program" proof and validation "software", "software" allowing the automatic generation of "source codes", and operating system "software" not controlled by 4D003 that are specially designed for real time processing equipment.

License Requirements

Reason for Control: AT

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

License Exceptions

CIV: N/A
TSR: N/A

List of Items Controlled

Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items:

a. "Program" proof and validation "software" using mathematical and analytical techniques and designed or modified for "programs" having more than 500,000 "source code" instructions;

b. "Software" allowing the automatic generation of "source codes" from data acquired on line from external sensors described in the Commerce Control List;

c. Operating system "software" not controlled by 4D003 that are specially designed for "real time processing" equipment that guarantees a "global interrupt latency time" of less than 30 microseconds.

4D994 "Software" specially designed or modified for the "development", "production", or "use" of equipment controlled by 4A994,

4B994 and materials controlled by 4C994.

License Requirements

Reason for Control: AT

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

License Exceptions

CIV: N/A
TSR: N/A

List of Items Controlled

Unit: $ value
Related Controls: N/A
Related Definitions: N/A
Items:

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

E. TECHNOLOGY

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).

License Requirements

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

Control(s)	*Country Chart*
NS applies to "technology" 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
CC applies to "technology" for computerized fingerprint equipment controlled by 4A003 for CC reasons	CC Column 1
AT applies to entire entry	AT Column 1

●NP applies, unless a License Exception is available. See §742.3(b) of the EAR for information on applicable licensing review policies.

●XP applies to "technology" for computers with a CTP greater than 28,000 MTOPS, unless a License Exception is available. XP controls vary according to destination and end-user and end-use, however, XP does not apply to Canada. See §742.12 of the EAR for additional information.

License Requirement Notes: See §743.1 of the EAR for reporting requirements for exports under License Exceptions.

License Exceptions

CIV: N/A

● TSR: (a) N/A for:
(1) "Technology" controlled for MT reasons; *or*
(2) "Technology" described by TSR paragraph (b)(2)(ii) of this License Exception, when exported or reexported to a destination not included in TSR paragraph (b)(2)(i) of this License Exception.
(b) Yes for:
(1) " Technology" directly related to hardware eligible for export or reexport under a License Exception;
(2) "Technology":

(i) Exported or reexported to Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, or the United Kingdom; and

(ii) For the "development" or "production" of any of the following:

(A) "Digital" computers controlled by 4A003.b and having a CTP exceeding 33,000 MTOPS;

(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 33,000 MTOPS; *or*

(C) "Software" controlled by 4D001 and specially designed for the "development" or "production" of equipment listed in TSR paragraphs (b)(2)(ii)(A) or (b)(2)(ii)(B) of this License Exception section; *and*

(3) All other "technology" not described in TSR paragraphs (a), (b)(1), or (b)(2) of this License Exception section.

List of Items Controlled

Unit: N/A
Related Controls: N/A
Related Definitions: N/A
Items:

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

4E980 "Technology" for the "development", "production", or "use" of items controlled by 4A980.

License Requirements

Reason for Control: CC, AT

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

License Exceptions

CIV: N/A
TSR: N/A

List of Items Controlled

Unit: N/A
Related Controls: N/A
Related Definitions: N/A
Items:

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

4E992 "Technology" for the "development", "production", or "use" of equipment controlled by 4A994 and 4B994, materials controlled by 4C994, or "software" controlled by 4D993 or 4D994.

License Requirements

Reason for Control: AT

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

License Exceptions

CIV: N/A
TSR: N/A

List of Items Controlled

Unit: N/A
Related Controls: See also 4E994
Related Definitions: N/A
Items:

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

4E993 Other "Technology" for the "development" or "production" of graphics accelerators or equipment designed for "multi-data-stream processing" and "technology" "required" for the "development" or "production" of magnetic hard disk drives.

License Requirements

Reason for Control: AT

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

License Exceptions

CIV: N/A
TSR: N/A

List of Items Controlled

Unit: N/A
Related Controls: N/A
Related Definitions: N/A
Items:

a. "Technology" for the "development" or "production" of graphics accelerators;

b. "Technology", for the "development" or "production" of equipment designed for "multi-data-stream processing";

c. "Technology", "required" for the "development" or "production" of magnetic hard disk drives with a "maximum bit transfer rate" ("MBTR") exceeding 11 Mbit/s.

EAR99 Items subject to the EAR that are *not* elsewhere specified in this CCL Category *or* in any other category in the CCL are designated by the number *EAR99*.

Information on How to Calculate "Composite Theoretical Performance ("CTP")

Technical Note:

"COMPOSITE THEORETICAL PERFORMANCE" ("CTP")

Abbreviations used in this Technical Note

"CE"	"computing element"(typically an arithmetic logical unit)
FP	floating point
XP	fixed point
t	execution time
XOR	exclusive OR
CPU	central processing unit
TP	theoretical performance (of a single "CE")
"CTP"	"composite theoretical performance" (multiple "CEs")
R	effective calculating rate
WL	word length
L	word length adjustment
*	multiply

Execution time t is expressed in microseconds, TP and "CTP" are expressed in millions of theoretical

operations per second (Mtops) and WL is expressed in bits.

Outline of "CTP" calculation method

"CTP" is a measure of computational performance given in Mtops. In calculating the "CTP" of an aggregation of "CEs" the following three steps are required:

1. Calculate the effective calculating rate R for each "CE";

2. Apply the word length adjustment (L) to the effective calculating rate (R), resulting in a Theoretical Performance (TP) for each "CE";

3. If there is more than one "CE", combine the TPs, resulting in a "CTP" for the aggregation.

Details for these steps are given in the following sections.

Note 1: For aggregations of multiple "CEs" that have both shared and unshared memory subsystems, the calculation of "CTP" is completed hierarchically, in two steps: first, aggregate the groups of "CEs" sharing memory; second, calculate the "CTP" of the groups using the calculation method for multiple "CEs" not sharing memory.

Note 2: "CEs" that are limited to input/output and peripheral functions (e.g., disk drive, communication and video display controllers) are not aggregated into the "CTP" calculation.

The following table shows the method of calculating the Effective Calculating Rate R for each "CE":

Step 1: *The effective calculating rate R*

For "CEs" Implementing: **Note:** Every "CE" must be evaluated independently.	Effective calculating Rate, R
XP only (R_{xp})	$\frac{1}{3 * (t_{xp\ add})}$ if no add is implemented use: $\frac{1}{(t_{xp\ mult})}$ If neither add nor multiply is implemented use the fastest available arithmetic operation as follows: $\frac{1}{3 * t_{xp}}$ See Notes X & Z
FP only (R_{fp})	$\max\left(\frac{1}{t_{fp\ add}}, \frac{1}{t_{fp\ mult}}\right)$ See Notes X & Y
Both FP and XP (R)	Calculate both R_{xp}, R_{fp}
For simple logic processors not implementing any of the specified arithmetic operations.	$\frac{1}{3 * t_{log}}$ Where t_{log} is the execute time of the XOR, or for logic hardware not implementing the XOR, the fastest simple logic operation. See Notes X & Z
For special logic processors not using any of the specified arithmetic or logic operations.	R = R' * WL/64 Where R' is the number of results per second, WL is the number of *bits* upon which the logic operation occurs, and 64 is a factor to normalize to a 64 bit operation.

Note W: For a pipelined "CE" capable of executing up to one arithmetic or logic operation every clock cycle after the pipeline is full, a pipelined rate can be established. The effective calculating rate (R) for such a "CE" is the faster of the pipelined rate or non-pipelined execution rate.

Note X: For a "CE" that performs multiple operations of a specific type in a single cycle (e.g., two additions per cycle or two identical logic operations per cycle), the execution time t is given by:

$$t = \frac{\text{cycle time}}{\text{the number of identical operations per machine cycle}}$$

"CEs" that perform different types of arithmetic or logic operations in a single machine cycle are to be treated as multiple separate "CEs" performing simultaneously (e.g., a "CE" performing an addition and a multiplication in one cycle is to be treated as two "CEs", the first performing an addition in one cycle and the second performing a multiplication in one cycle). If a single "CE" has both scalar function and vector function, use the shorter execution time value.

Note Y: For the "CE" that does not implement FP add or FP multiply, but that performs FP divide:

$$R_{fp} = \frac{1}{t_{fpdivide}}$$

If the "CE" implements FP reciprocal but not FP add, FP multiply or FP divide, then

$$R_{fp} = \frac{1}{t_{fpreciprocal}}$$

If none of the specified instructions is implemented, the effective FP rate is 0.

Note Z: In simple logic operations, a single instruction performs a single logic manipulation of no more than two operands of given lengths. In complex logic operations, a single instruction performs multiple logic manipulations to produce one or more results from two or more operands.

Rates should be calculated for all supported operand lengths considering both pipelined operations (if supported), and non-pipelined operations using the fastest executing instruction for each operand length based on:

1. Pipelined or register-to-register operations. Exclude extraordinarily short execution times generated for operations on a predetermined operand or operands (for example, multiplication by 0 or 1). If no register-to-register operations are implemented, continue with (2).

2. The faster of register-to-memory or memory-to-register operations; if these also do not exist, then continue with (3).

3. Memory-to-memory.

In each case above, use the shortest execution time certified by the manufacturer.

Step 2: *TP for each supported operand length WL*

Adjust the effective rate R (or R') by the word length adjustment L as follows:

TP = R * L, where L = (1/3 + WL/96)

Note: The word length WL used in these calculations is the operand length in bits. (If an operation uses operands of different lengths, select the largest word length.) The combination of a mantissa ALU and an exponent ALU of a floating point processor or unit is considered to be one "CE" with a Word Length (WL) equal to the number of bits in the data representation (typically 32 or 64) for purposes of the "CTP" calculation.

This adjustment is not applied to specialized logic processors that do not use XOR instructions. In this case TP = R.

Select the maximum resulting value of TP for:

Each XP-only "CE" (R_{xp});

Each FP-only "CE" (R_{fp});

Each combined FP and XP "CE" (R);

Each simple logic processor not implementing any of the specified arithmetic operations; *and*

Each special logic processor not using any of the specified arithmetic or logic operations.

Step 3: *"CTP" for aggregations of "CEs", including CPUs.*

For a CPU with a single "CE", "CTP" = TP
(for "CEs" performing both fixed and floating point operations
$TP = \max (TP_{fp}, TP_{xp})$)

"CTP" for aggregations of multiple "CEs" operating simultaneously is calculated as follows:

Note 1: For aggregations that do not allow all of the "CEs" to run simultaneously, the possible combination of "CEs" that provides the largest "CTP" should be used. The TP of each contributing "CE" is to be calculated at its maximum value theoretically possible before the "CTP" of the combination is derived.

N.B.: To determine the possible combinations of simultaneously operating "CEs", generate an instruction sequence that initiates operations in multiple "CEs", beginning with the slowest "CE" (the one needing the largest number of cycles to complete its operation) and ending with the fastest "CE". At each cycle of the sequence, the combination of "CEs" that are in operation during that cycle is a possible combination. The instruction sequence must take into account all hardware and/or architectural constraints on overlapping operations.

Note 2: A single integrated circuit chip or board assembly may contain multiple "CEs".

Note 3: Simultaneous operations are assumed to exist when the computer manufacturer claims concurrent, parallel or simultaneous operation or execution in a manual or brochure for the computer.

Note 4: "CTP" values are not to be aggregated for "CE" combinations (inter)connected by "Local Area Networks", Wide Area Networks, I/O shared connections/devices, I/O controllers and any communication interconnection implemented by "software".

Note 5: "CTP" values must be aggregated for multiple "CEs" specially designed to enhance performance by aggregation, operating simultaneously and sharing memory,- or multiple memory/"CE"- combinations operating simultaneously utilizing specially designed hardware.

This aggregation does not apply to "electronic assemblies" described by 4A003.c.

$$\text{"CTP"} = TP_1 + C_2 * TP_2 + \ldots + C_n * TP_n,$$

where the TPs are ordered by value, with TP_1 being the highest, TP_2 being the second highest, ..., and TP_n being the lowest. C_i is a coefficient determined by the strength of the interconnection between "CEs", as follows:

For multiple "CEs" operating simultaneously and sharing memory:

$$C_2 = C_3 = C_4 = \ldots = C_n = 0.75$$

Note 1: When the "CTP" calculated by the above method does not exceed 194 Mtops, the following formula may be used to calculate C_i:

$$C_i = \frac{0.75}{\sqrt{m}} \quad (i = 2, \ldots, n)$$

where m = the number of "CEs" or groups of "CEs" sharing access.

provided:

1. The TP_i of each "CE" or group of "CEs" does not exceed 30 Mtops;

2. The "CEs" or groups of "CEs" share access to main memory (excluding cache memory) over a single channel; *and*

3. Only one "CE" or group of "CEs" can have use of the channel at any given time.

N.B.: This does not apply to items controlled under Category 3.

Note 2: "CEs" share memory if they access a common segment of solid state memory. This memory may include cache memory, main memory or other internal memory. Peripheral memory devices such as disk drives, tape drives or RAM disks are not included.

For Multiple "CEs" or groups of "CEs" not sharing memory, interconnected by one or more data channels:

$C_i = 0.75 * k_i \quad (i = 2, \ldots, 32)$ (see Note below)

$= 0.60 * k_i \quad (i = 33, \ldots, 64)$

$= 0.45 * k_i \quad (i = 65, \ldots, 256)$

$= 0.30 * k_i \quad (i > 256)$

The value of C_i is based on the number of "CE"s, not the number of nodes.

where k_i = min (S_i/K_r, 1), and

K_r = normalizing factor of 20 MByte/s.

S_i = sum of the maximum data rates (in units of MByte/s) for all data channels connected to the i^{th} "CE" or group of "CEs" sharing memory.

When calculating a C_i for a group of "CEs", the number of the first "CE" in a group determines the proper limit for C_i. For example, in an aggregation of groups consisting of 3 "CEs" each, the 22nd group will contain "CE"$_{64}$, "CE"$_{65}$ and "CE"$_{66}$. The proper limit for C_i for this group is 0.60.

Aggregation (of "CEs" or groups of "CEs") should be from the fastest-to-slowest; i.e.:

$TP_1 \geq TP_2 \geq .... \geq TP_n$, and

in the case of $TP_i = TP_{i+1}$, from the largest to smallest; i.e.:

$C_i \geq C_{i+1}$

Note: The k_i factor is not to be applied to "CEs" 2 to 12 if the TP_i of the "CE" or group of "CEs" is more than 50 Mtops; i.e., C_i for "CEs" 2 to 12 is 0.75.

APPENDIX D

Useful Web Sites

1. **BIS Site: http://www.bxa.doc.gov/**
2. **ODTC Site: http://www.pmdtc.org/**
3. **OFAC Site: http://www.treas.gov/offices/enforcement/ofac/**
4. **Microsoft Site: http://www.microsoft.com/exporting**