HRP Job Aid

Cooling Equipment

Description	ECCN
Cryogenic units	1B228, 9A620
Refrigeration units	1B231
Freon and water chilled units	1B999

Cryogenic Units

ECCN 1B228

- Cryogenic equipment controlled under ECCN 1B228 will typically be found in specialized laboratories with a known history of research and development in the cryogenic distillation of hydrogen
- Cryogenic units will be in the physical form of columns and will resemble the distillation columns pictured

Hydrogen Isotope Separation Test Assembly in Russia. The cryogenic distillation column shown is 18 ft (5.5 m) in length with an internal diameter of 12 in. (30 cm), and an outer 48 in. (120 cm) diameter vacuum jacket.

Cryogenic distillation column at Fermi National Accelerator Laboratory.

Identifying Features and Inspection Tips

Is the property item a column with an internal diameter of 12 in. (30 cm) or greater **AND** an effective length of 13.1 ft (4 m) or greater? The *effective length* is the active height of the internal packing material or the height of internal contactor plates.

If NO > The item is not controlled under ECCN 1B228 **> STOP**

If YES > Determine the material of construction and the operating temperature and pressure. Consult the manufacturer's nameplate and website and proceed through the following questions:

1. Is the cryogenic column designed to operate with internal temperatures of 35 K (−238 °C) or less? **AND**
2. Is the cryogenic column designed to operate at an internal pressure of 73.5–735 psi (0.5–5 MPa)? **AND**
3. Is it constructed of a fine-grain austenitic stainless steel 300 series with an ASTM grain size number of ≥5?
    a. If **NO** to **any** of the three criteria listed above **>** the item is not controlled under ECCN 1B228
    b. If **YES** to **all** of the three criteria listed **>** the item is controlled under ECCN 1B228

ECCN 9A620

Cryogenic equipment controlled under ECCN 9A620 is **only for**

- equipment especially designed to be installed in a vehicle for military ground, marine, airborne, or space applications, **AND**
- capable of operating while in motion, **AND**
- of producing or maintaining temperatures below 103 K (−170 °C).

Such equipment includes mobile systems incorporating or employing "accessories" or "components" manufactured from nonmetallic or nonelectrical conductive materials such as plastics or epoxy-impregnated materials.

Identifying Features and Inspection Tips

- Very unique and specialized (e.g., especially designed) cryogenic equipment
- Is there history of the equipment or the facility being associated with military or space programs?

Refrigeration Units

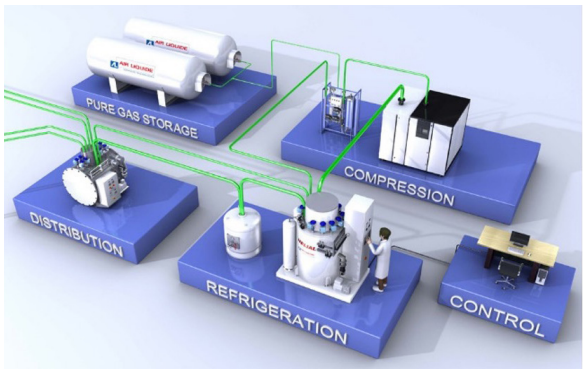
ECCN 1B231

Refrigeration equipment controlled under ECCN 1B231 includes hydrogen or helium refrigeration units for tritium facilities or plants capable of cooling ≤23 K (−250 °C), **AND** with a heat removal capacity >150 watts (W).

Identifying Features and Inspection Tips

- Is there a history of the equipment or the facility being used for tritium production?
- Look for related equipment items: compression station, oil removal unit, liquid storage tanks, pure gas storage, coaxial lines and valve box for distribution, monitoring station or gas analysis system
- Does the refrigeration equipment resemble the following images?

Helium refrigeration unit. Performance ranges: Heat removal capacity is 100 W to 1 kW at 4.5 K. Electrical consumption is 50–250 kW.



Complete helium refrigeration system. Note the individual for scale.

Freon and Water Chilled Units

ECCN 1B999

Freon and chilled water cooling systems are controlled under ECCN 1B999 if they meet the following criteria:

- Destined for export to North Korea for anti-terrorism reasons (AT) or Iraq regional stability (RS) reasons **AND**
- Capable of continuous cooling duties of ≥100,000 BTU/h (29.3 kW)

Useful conversion: 1 refrigeration ton = 12,000 BTU/h or 3.517 kW

Background Information: Heat Exchangers vs. Chillers

Major manufacturers (e.g., NESLAB/Thermo Scientific) produce both chillers and heat exchangers as part of their product lines, and the physical appearance of chillers and heat exchangers can be very similar. The major difference between a heat exchanger and a chiller is the design.

- Chiller systems possess refrigeration units and require a refrigerant (e.g., R-22)
- Chillers are either air-cooled or water-cooled, denoting the method used to cool the condenser coils to remove the heat
  - Air-cooled chillers are located outside a building and have condenser coils cooled by fan-driven air
  - Water-cooled chillers are located inside a building, and water is recycled to a heat sink or external cooling method

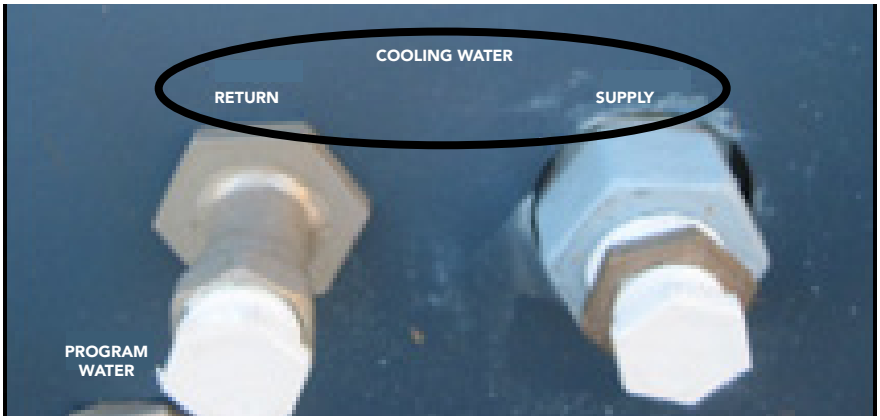
Indoor water-cooled chiller (205 ton).

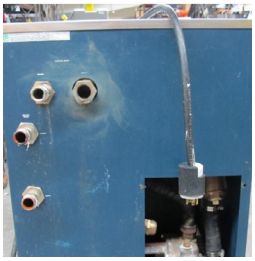
Air-cooled chillers installed outdoors.

In comparison, a heat exchanger lacks a refrigeration unit and achieves temperature regulation by direct fluid heat transfer. Heat exchangers are export controlled under ECCN 2B350 or ECCN 2A290, and the material of construction (i.e., corrosion-resistance) is an important design feature.

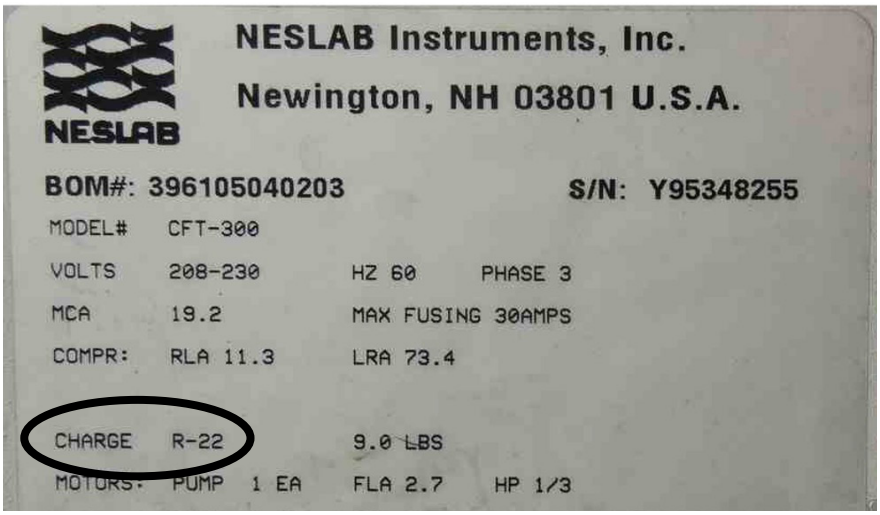
Identifying Features and Inspection Tips

- Manufacturer's nameplate: look for any notation of a refrigerant (e.g., R-22). Chillers will require a refrigerant; heat exchangers will not
- Piping connections: heat exchangers will have four piping connections, often with such markings as *process water*, *cooling water*, *supply*, and *return*





NESLAB System III heat exchanger. Dimensions: 34 in. H × 23 in. W × 27 in. D. Weight: 206 lb. Note the four piping connections and markings.



NESLAB CFT-300 water chiller (3 ton, 36,000 BTU/h). Dimensions: 43 in. H × 25.5 in. W × 27.8 in. D. Weight: 450 lb. Note the R-22 refrigerant on manufacturer's nameplate.

DOE/NNSA High Risk Property

https://hrp.doe.gov

https://ecap.doe.gov

Krystee Ervin
ervinkp@ornl.gov

Dave Snider
sniderjd@ornl.gov

Shane Duffle
dufflesc@ornl.gov