

INCH-POUND

MIL-DTL-32099B (OS)  
21 June 2010  
SUPERSEDING  
MIL-DTL-32099A (OS)  
24 November 2008

## DETAIL SPECIFICATION

**CARTRIDGE, IMPULSE, CCU-145/A**

*This specification is approved for use by the Naval Sea Systems Command, Department of the Navy, and is available for use by all Department and Agencies of the Department of Defense.*

**1. SCOPE**

**1.1 Scope.** This specification establishes the requirements for the manufacture, assembly, packaging and acceptance of the CCU-145/A Impulse Cartridge (WB24) (see 6.1).

**2. APPLICABLE DOCUMENTS**

**2.1 General.** The documents listed in this section are specified in sections 3, 4 or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4 or 5 of this specification, whether or not they are listed.

**2.2 Government documents.**

**2.2.1 Specifications, standards and handbooks.** The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

## DEPARTMENT OF DEFENSE STANDARDS

MIL-DTL-45444

HMX (CYCLOTETRAMETHYLENETETRANITRAMINE)

Comments, suggestions, or questions on this document should be addressed to DEPARTMENT OF THE NAVY, Indian Head Division, NSWC, Code E12P, Document Control, 4123 Artisans Court, Suite 103, Indian Head, Maryland 20640-5085, OFFICIAL BUSINESS, or emailed to [amanda.penn@navy.mil](mailto:amanda.penn@navy.mil). Since contact information can change, you may want to verify the currency of this information using the ASSIST Online database at <https://assist.daps.dla.mil>.

AMSC N/A

FSC 1377

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## DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-810	Environmental Test Methods and Engineering Guidelines
MIL-STD-1168	Ammunition Lot Numbering and Ammunition Data Card
DOD-STD-2101	Classification Of Characteristics

(Copies of these documents are available online at <https://assist.daps.dla.mil/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

**2.2.2 Other Government documents, drawings, and publications.** The following Government drawings form a part of this specification to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation or contract.

## DRAWINGS

## NAVAL AIR SYSTEMS COMMAND (CAGE Code 30003)

841AS625	Impulse Cartridge, CCU-145/A
841AS627	Ignition Charge
841AS628	Booster Charge
841AS634	Header Assembly
841AS635	Eyelet
841AS636	Contact Pin
841AS660	Functional Test Fixture
841AS868	Vibration Test Fixture

(Application for copies should be addressed to the DEPARTMENT OF THE NAVY, Indian Head Division, NSWC, Code E12P, Document Control, 4123 Artisans Court, Suite 103, Indian Head, Maryland 20640-5085, OFFICIAL BUSINESS.)

**2.3 Non-Government publications and drawings.** The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

## AMERICAN NATIONAL STANDARD INSTITUTE (ANSI)/AMERICAN SOCIETY FOR QUALITY (ASQ)

ANSI/ASQ B1	Guide for Quality Control Charts
ANSI/ASQ B2	Control Chart Method of Analyzing Data
ANSI/ASQ B3	Control Chart Method of Controlling Quality During Production

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ANSI/ASQ Z1.4 Sampling Procedures and Tables for Inspection by Attributes (DoD Adopted)

(Copies of these documents are available online at <http://webstore.ansi.org/ansidocstore/default.asp>, or from the American Society for Quality, PO Box 3005, 600 N. Plankinton Ave., Milwaukee, WI 53203)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E 1742 Standard Practice for Radiographic Examination (DoD Adopted)

(Copies of this document are available online at <http://www.astm.org> or from the American Society for Testing and Materials Customer Service, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

**2.4 Order of precedence.** Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

### 3. REQUIREMENTS

**3.1 First article tests.** When specified in the contract or purchase order (see 6.2), a sample shall be subjected to a first article inspection in accordance with 4.2.1. A first article inspection may be deemed necessary when one or more of the following applies: (a) three years or more since the impulse cartridge or similar item was last produced, (b) there has been a significant turnover in personnel, (c) there have been major changes to the production facility, (d) there has been a transfer of production to a new facility or (e) there has been significant change in the design of the impulse cartridge.

**3.2 Conformance to documents.** The CCU-145/A impulse cartridge and all its components shall be manufactured in accordance with DL841AS625 and all documents and drawings listed thereon.

**3.3 Materials.** All materials used in the manufacture of the cartridges shall conform to the specifications referred to on the respective Naval Air Systems Command drawings unless specific approval in writing covering a departure therefrom has been obtained from the cognizant Navy design activity prior to manufacture. When alternate materials or methods of manufacture are specified on the drawings, the bidders selections shall be clearly stated in the proposal.

**3.4 Primary components.** For the purposes of this specification, the Ignition Charge (Drawing 841AS627), the Booster Charge (Drawing 841AS628) and the Main Charge consisting of HMX ( MIL-DTL-45444, Grade B, Class 1) are defined as primary components. Only primary components from a single lot shall be used in a production lot of cartridges. One primary component production lot may be used in more than one cartridge production lot.

**3.4.1 Ignition and booster composition and loading.** Composition shall be determined by weight rather than by volume measurement. In addition to supplier certification, new lots of material shall be independently certified to ensure accurate composition and consistent performance.

#### 3.4.2 Main charge (HMX).

**3.4.2.1 Quantity.** Charges shall be determined by weight rather than by volume measurements.

**3.4.2.2 Quality characteristics.** The main charge weight shall be a quality characteristic for statistical process control. Sampling for control charting shall be conducted by the contractor in accordance with established procedures.

**MIL-DTL-32099B (OS)****3.5 Subassembly requirements.**

**3.5.1 Insulation resistance.** The insulation resistance of the header assembly ( Drawing 841AS634) shall be greater than 50 megohms at a relative humidity of less than 80 percent when measured in accordance with 4.4.1.

**3.5.2 Hydrostatic test.** The header assembly (Drawing 841AS634) shall not leak, crack or suffer any damage when hydrostatic pressure is applied in accordance with 4.4.2. Samples selected for testing shall be considered rejects and discarded after testing.

**3.6 Cartridge requirements.**

**3.6.1 Visual inspection.** All cartridges shall be free of damaged or missing components when examined visually in accordance with 4.4.3. Cartridges, which fail to meet this requirement, shall be rejected.

**3.6.2 Radiographic inspection.** When radiographically examined in accordance with 4.4.4, any cartridge exhibiting missing, defective or improperly assembled components, foreign matter, cracks, abnormal voids or other abnormalities that could adversely affect the form, fit or function shall be rejected.

**3.6.3 Leak test.** Cartridges which exhibit a leak rate greater than 1.0E-5 standard cc/sec of air when tested in accordance with 4.4.5 shall be rejected.

**3.6.4 Bridge circuit resistance.** The resistance of the bridge circuit in each completely assembled cartridge, when measured electrically as specified in 4.4.6, shall be not less than 0.85 ohm and not be greater than 1.15 ohm.

**3.6.5 Filter test.** The output voltage as measured on the oscilloscope shall be less than 77 millivolts peak to peak, when tested in accordance with 4.4.7.

**3.6.6 Power current.** Cartridges shall not initiate or dud when tested in accordance with 4.4.8. The power current test is considered a destructive test and the test shall only be conducted by the designated test activity on the first article and production lot samples. The test shall not be conducted on units intended for delivery to the fleet.

**3.6.7 Electrostatic discharge.** Cartridges shall not fire, dud, or otherwise be adversely affected when subjected to electrostatic discharge testing in accordance with 4.4.9. After electrostatic discharge testing, cartridges shall meet the bridgewire resistance requirements of 3.6.4 and the ballistic requirements of 3.8.

**3.6.8 Stray voltage.** Cartridges shall not fire, dud, or otherwise be adversely affected when subjected to the stray voltage test in accordance with 4.4.10. After stray voltage testing, cartridges shall meet the bridgewire resistance requirements of 3.6.4 and the ballistic requirements of 3.8.

**3.7 Environmental conditions.**

**3.7.1 Forty-foot drop test.** Cartridges shall not initiate or lose primary components and shall be safe to handle for disposal when tested in accordance with 4.4.11. Cartridges subjected to the forty-foot drop test will not be ballistically tested.

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**3.7.2 Six-foot drop test.** Cartridges shall not fire or incur any detrimental internal/external damage or degradation as a result of the six-foot drop test in accordance with 4.4.12 and shall meet the requirements of 3.8 when ballistically tested.

**3.7.3 Temperature, Humidity and Altitude Cycling (TH&A) test.** Cartridges shall not initiate or incur any internal/external damage or degradation when subjected to TH&A cycling in accordance with 4.4.13. After exposure to the TH&A environment, cartridges shall be ballistically fired and shall meet the requirements of 3.8.

**3.7.4 Shock test.** Cartridges shall not initiate or incur any internal/external damage or degradation when subjected to the shock test in accordance with 4.4.14. After exposure to the shock environment, cartridges shall be ballistically fired and shall meet the requirements of 3.8.

**3.7.5 Vibration test.** Cartridges shall not initiate or incur any internal/external damage or degradation when subjected to the vibration test in accordance with 4.4.15. After exposure to the vibration environment, cartridges shall be ballistically fired and shall meet the requirements of 3.8.

**3.7.6 Salt Fog test.** Cartridges shall not initiate or incur any degradation when subjected to salt fog test in accordance with 4.4.16. After exposure to the fog environment, cartridges shall be ballistically fired and shall meet the requirements of 3.8.

**3.8 Ballistic requirements.** Cartridges shall meet the requirements of 3.8.1 through 3.8.8 when tested in accordance with 4.4.17.

**3.8.1 Projectile velocity.** The velocity of the projectile shall be not less than 44 feet per second or greater than 100 feet per second when tested in accordance with 4.4.17.1.

**3.8.2 Ignition delay.** The time between first application of firing current and first indication of movement of the projectile shall not be more than 50 milliseconds when tested in accordance with 4.4.17.2.

**3.8.3 Post-fire resistance.** The post-fire resistance shall be greater than 500 ohms in accordance with 4.4.17.3.

**3.8.4 Petaling.** After functioning, visual examination of the closure disc shall show evidence of petaling.

**3.8.5 Crimp integrity.** After functioning, the cartridge shall exhibit a secure crimp of 360° between the body and the closure disc. The closure disc shall remain with the cartridge after it is fired.

**3.8.6 Misfire.** There shall be no misfires.

**3.8.7 Mechanical failure.** The cartridge shall function in accordance with the performance requirements specified herein without mechanical failure (see 6.5.1). Failure to meet this requirement shall result in rejection of the lot.

**3.8.8 Quality characteristics.** Ballistic velocity of the projectile shall be a quality characteristic for statistical process control. Sampling for control charting shall be conducted by the contractor in accordance with established procedures.

**3.9 Statistical process control.** Statistical process control in accordance with ANSI/ASQ B1, ANSI/ASQ B2 and ANSI/ASQ B3 shall be required for quality characteristics cited within this specification (main charge, ballistic velocity). In addition to other requirements for this specification,

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only ballistic samples from lots that can demonstrate a state of statistical control shall be submitted for lot acceptance ballistic testing. Samples from lots that cannot demonstrate statistical control shall not be submitted for lot acceptance ballistic tests.

**3.10 Workmanship.** Cartridges shall be constructed and finished in a manner to assure compliance with all the provisions of this specification and the applicable drawings. Special attention shall be directed to dimensions, finishes, coatings and cleanliness.

**4. VERIFICATION****4.1 Classification of inspections.**

- a. First article inspection (see 4.2.1)
- b. Production inspection (see 4.2.2)
- c. Lot acceptance inspection (see 4.2.3)

**4.2 Types of inspections.**

**4.2.1 First article inspection.** Unless otherwise specified (see 6.2), a first article inspection sample of 87 cartridges shall be prepared. This sample, manufactured and packaged in the same methods, materials and procedures proposed for the production lot, is for the purpose of determining that the contractor, prior to starting production, is capable of producing items which comply with the technical requirements of the contract. A first article sample acceptable for environmental and ballistic testing shall be defined as a sample which has met the requirements of 3.2 through 3.6.8 of this specification. The contractor shall deliver the cartridges to the activity designated by the contracting agency for test. Any production prior to notification by the contracting activity of the first article sample acceptability shall be at the contractor's risk. The first article test sample shall be expended in the tests listed in table I. Failure of any cartridge to comply with the requirements of section 3 shall be cause for rejection of the first article represented.

**4.2.2 Production conformance inspection.** Production conformance inspection for production lots shall consist of inspection by the contractor of the characteristics specified on the applicable drawings and the tests and examinations of table II in accordance with the specified requirement.

**4.2.2.1 Lot size.** The lot size shall be as specified in the contract or purchase order (see 6.2). The suggested production lot size is 9600 cartridges. Unless otherwise specified the lot shall include 5 units which will be retained for investigative purposes and the test sample units. Cartridges required for all test purposes are selected from the production lot and will not be applied as a part of the quantity specified for delivery by the contract. Lot numbering shall be in accordance with MIL-STD-1168.

**4.2.3 Lot Acceptance Inspection.** Lot acceptance samples shall be subjected to the inspections and tests specified in table III. Failure of any sample impulse cartridge to comply with the requirements listed shall be cause for rejection of the lot represented.

**4.2.3.1 Sample Size.** The test sample size shall be as specified in table IV. The test sample units shall be randomly selected in accordance with ANSI/ASQ Z1.4. Unless otherwise specified in the contract (see 6.2), all samples for test purposes shall be provided at the contractor's expense.

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TABLE I. First article tests.

Test/Inspection	Requirement paragraph	Test paragraph	A	B	C	D	E	F	G	H
Quantity			6	6	18	9	12	12	12	12
Visual Inspection	3.6.1	4.4.3	6	6	18	9	12	12	12	12
Radiographic Exam.	3.6.2	4.4.4	6	6	18	9	12	12	12	12
Leak Test	3.6.3	4.4.5	6	6	18	9	12	12	12	12
Bridgewire resistance	3.6.4	4.4.6	6	6	18	9	12	12	12	12
Filter Test	3.6.5	4.4.7	6	6	18	9	12	12	12	12
Power Current	3.6.6	4.4.8						12	12	12
Electrostatic discharge	3.6.7	4.4.9	6	6	18	9	12			
Bridgewire resistance	3.6.4	4.4.6	6	6	18	9	12	12	12	12
Stray voltage	3.6.8	4.4.10	6	6	18	9	12			
Bridgewire resistance	3.6.4	4.4.6	6	6	18	9	12			
Forty-foot drop	3.7.1	4.4.11	6							
Six-foot drop	3.7.2	4.4.12		6						
TH&A	3.7.3	4.4.13			18					
Shock	3.7.4	4.4.14				9				
Vibration	3.7.5	4.4.15				9				
Salt Fog	3.7.6	4.4.16					12			
Radiographic Exam.	3.6.2	4.4.4		6	18	9				
Leak	3.6.3	4.4.5		6	18	9				
Bridgewire resistance	3.6.4	4.4.6		6	18	9	12			
Filter test	3.6.5	4.4.7		6	18	9	12			
Ballistic test (-65°F)	3.8	4.4.17		2	6	3	4	12		
Ballistic test (70°F)	3.8	4.4.17		2	6	3	4		12	
Ballistic test (200°F)	3.8	4.4.17		2	6	3	4			12
Discard			6							

**4.3 Packing, packaging and marking.** The contractor shall verify that the packing and packaging of the cartridges and the container markings conform to Section 5 of this specification.

#### 4.4 Tests.

**4.4.1 Insulation resistance.** The insulation resistance of the header assembly, drawing 841AS634, shall be checked on a sample basis with an applied voltage of  $500 \pm 25$  volts dc at  $70 \pm 20$  °F and a relative humidity of less than 80 percent. The sample size shall be 1.0 % minimum of the lot size. Voltage shall be applied between the contact pin (Drawing 841AS636) and the eyelet (Drawing 841AS635). Components that fail to meet the requirements of 3.5.1 shall be rejected.

**MIL-DTL-32099B (OS)****TABLE II. Production conformance tests and examinations.**

Item	Nature of test	Requirement	Test	Classification (DOD-STD-2101)
Primary Component	Single Lot Verification	3.4	-	(M101)
Header Assembly	Insulation resistance	3.5.1	4.4.1	(M102)
Header Assembly	Hydrostatic Testing	3.5.2	4.4.2	(M103)
Ignition and booster mix	Compounding and loading	3.4.1	-	(M104)
Propellant charge	Type and weight verification	3.4.2.1	-	(M105)
Cartridge	Visual Inspection	3.6.1	4.4.3	(M106)
Cartridge	Radiographic inspection	3.6.2	4.4.4	(M107)
Cartridge	Leak	3.6.3	4.4.5	(M108)
Cartridge	Bridge Circuit Resistance	3.6.4	4.4.6	(M109)
Cartridge	Filter	3.6.5	4.4.7	(M110)
Cartridge	Power Current	3.6.6	4.4.8	(M111)
Cartridge	Ballistics	3.8	4.4.17	(C101)
Cartridge	Packing, packaging and marking	Section 5	4.3	(M112)

**TABLE III. Lot acceptance tests.**

Test/Inspection	Requirement paragraph	Test paragraph	A	B	C
Quantity			1/3 sample	1/3 sample	1/3 sample
Visual Inspection	3.6.1	4.4.3	all	all	all
X-ray	3.6.2	4.4.4	all	all	all
Leak Test	3.6.3	4.4.5	all	all	all
Bridgewire Resistance	3.6.4	4.4.6	all	all	all
Filter test	3.6.5	4.4.7	all	all	all
Power Current	3.6.6	4.4.8	all	all	all
ESD Test	3.6.7	4.4.9	20		
Bridgewire Resistance	3.6.4	4.4.6	all	all	all
Ballistic test (-65°F)	3.8	4.4.17	all		
Ballistic test (70°F)	3.8	4.4.17		all	
Ballistic test (200°F)	3.8	4.4.17			all

**TABLE IV. Production lot test sample size.**

Lot size	1-100	101-280	281-500	501-1200	1201-3000	3001-5000	5000-10000
Sample size	12	21	33	54	81	111	180



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**4.4.2 Hydrostatic test.** The header assembly (Drawing 841AS634) shall be tested on a sample basis and shall meet the requirements of 3.5.2 when a  $8,000 \pm 500$  psig hydrostatic pressure is applied to surface A for 10 seconds minimum. The sample size shall be 1.0 % minimum of the lot size. Components that fail to meet the requirements of 3.5.2 shall be rejected.

**4.4.3 Visual inspection.** Visually examine all cartridges produced under contract. Reject all cartridges, which fail to meet the requirements of 3.6.1.

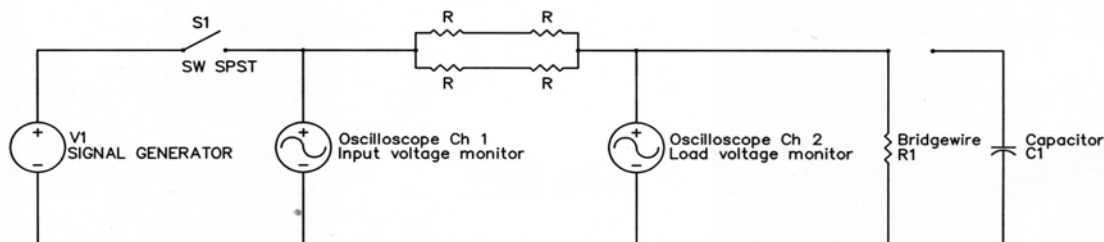
**4.4.4 Radiographic inspection.** Radiographically examine the specified items in accordance with ASTM E 1742 (x-ray). One (1) unit may be used as the penetrometer. Any observable imperfection in components or assembly shall be cause for rejection. All items shall be identified with serial numbers in consecutive numerical order beginning with 0001 in each production lot prior to exposure. The items shall be arranged on boards or trays in consecutive order with any missing serial numbers clearly identified on the radiographic plate. Each radiograph shall carry a permanent identification of the items displayed thereon. The radiographic identification shall include item nomenclature and DODIC, the contract number, the complete lot number assigned to that lot, and the span of serial numbers displayed. Defective items found during radiographic review are to be marked on the radiograph and, prior to shipment, all defective items shall be removed from the production lot. Radiographs of the entire production lot and a detailed description of the defects of removed items shall accompany the ballistic sample to the activity conducting the production lot acceptance tests. Position each cartridge such that the centerline of the cartridge is perpendicular to the radiographic beam. Failure to meet the requirements of 3.6.2 shall result in the rejection of that item.

**4.4.5 Leak test.** Place cartridges in the pressure chamber and evacuate to a pressure less than 2 psia. Process only as many cartridges as can be leak tested within 15 minutes from the time units are removed from the pressure chamber. Slowly pressurize to  $30 \pm 2$  psia of helium and maintain for  $60 \pm 1$  minutes. Following the one-hour period, release the pressure and remove the cartridges from the pressure chamber. Flush exterior of test units thoroughly with low-pressure air to remove possible trapped helium. Test cartridges shall be leak tested in a dry gas leak tester. Any cartridge that is not tested within 15-minute time frame shall be retreated in the helium pressure chamber. If one or more cartridges of the lot acceptance sample leak, then a leak test of each cartridge in the lot shall be required. If a 100 percent leak test of the lot is required, it shall be at the expense of the contractor. Failure of any cartridge to meet the requirements of 3.6.3 shall result in the rejection of that unit.

**4.4.6 Bridge circuit resistance.** The resistance of the bridge circuit shall be measured between the contact pin and the cartridge body by means of a suitable instrument which limits the bridge current to 25 milliamperes maximum. Failure to meet the requirements of 3.6.4 shall result in the rejection of that item.

**4.4.7 Filter test.** Using a signal generator, input a sinusoidal waveform at  $1.0 \pm 0.1$  megahertz for 10 milliseconds maximum through an equivalent  $47 \pm 4.7$  ohm resistor 0.25 watt to a  $1.0 \pm 0.15$  ohm load resistor. Adjust the signal generator to obtain an output of  $100 \pm 5$  millivolts peak to peak as measured across the load resistor using an oscilloscope through a 50 ohm termination. Remove the load resistor and install the cartridge. Reapply the waveform and note the voltage across the bridgewire. Units shall be conditioned at  $70 \pm 10^\circ\text{F}$  for 12 hours minimum just prior to conducting test. Reject those units, which do not meet the requirement of 3.6.5. Figure 1 below is a schematic of the test setup where  $R = 47$  ohms.

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Figure 1. Circuit diagram of filter test setup.

**4.4.8 Power current.** A direct current of not less than one (1) ampere supplying 1-watt minimum shall be applied to the test cartridge bridgewire for 5 minutes minimum. The test current shall be regulated throughout the period of application to within 2 percent. If a rectified current is used, the ripple content shall not exceed 5 percent rms of the test current. Units shall be conditioned at  $70 \pm 10^\circ\text{F}$  for 12 hours minimum just prior to conducting test. Failure of any cartridge to meet the requirements of 3.6.6 shall be cause for rejection of the lot.

**4.4.9 Electrostatic discharge test.** Test cartridges shall be connected in a series circuit to a  $500 \pm 25$  picofarad capacitor charged to  $25,000 \pm 500$  volts and a  $5,000 \pm 250$  ohm resistor. The total circuit inductance shall not exceed 5 microhenrys. After assembling the test circuit, a switch shall be closed allowing the capacitor to discharge through the resistor and test cartridge. Units shall be conditioned at  $70 \pm 10^\circ\text{F}$  for 12 hours minimum just prior to conducting test. Failure of any cartridge to meet the requirements of 3.6.7 shall be cause for rejection of the lot.

**4.4.10 Stray voltage test.** Test cartridges shall be subjected to 2,000 pulses of dc voltage with amplitude of  $100 \pm 5$  milliamperes. Each pulse shall be 300 milliseconds long and shall be followed by a 200 millisecond quiescent period (i.e. the pulse rate shall be 2 pulses per second). Units shall be conditioned at  $70 \pm 10^\circ\text{F}$  for 12 hours minimum just prior to conducting test. Failure of any cartridge to meet the requirements of 3.6.8 shall be cause for rejection of the lot.

**4.4.11 Forty-foot drop test.** Test cartridges shall be individually dropped once each from a height of 40 feet onto a 2-inch minimum thick steel plate embedded in concrete. Equal number of cartridges in sample shall be tested in the following drop orientations: output end up, output end down and centerline horizontal. A guidance system shall be employed to ensure proper impact in the orientations indicated. If any cartridge fails to meet the requirements of 3.7.1 shall be cause for rejection of the lot represented.

**4.4.12 Six-foot drop test.** Test cartridges shall be individually dropped once each from a height of 6 feet + 2 inches – 0 inches onto a 2 inch minimum thick steel plate embedded in concrete. Equal number of cartridges in sample shall be tested in the following drop orientations: output end up, output end down and centerline horizontal. A guidance system shall be employed to ensure proper impact in the orientations indicated. If any cartridge fails to meet the requirements of 3.7.2 shall be cause for rejection of the lot represented.

**4.4.13 Temperature, Humidity and Altitude cycling test.** Place the cartridge on screen trays or in wire baskets to expose all surfaces and allow air to circulate freely. Then subject the cartridges to the 28-day TH&A cycling test of table V. This schedule shall be followed for a total of 4 weeks (28 days) except that on the second and fourth weekends the soak time shall be from 1200 on Friday until 0800 on Monday

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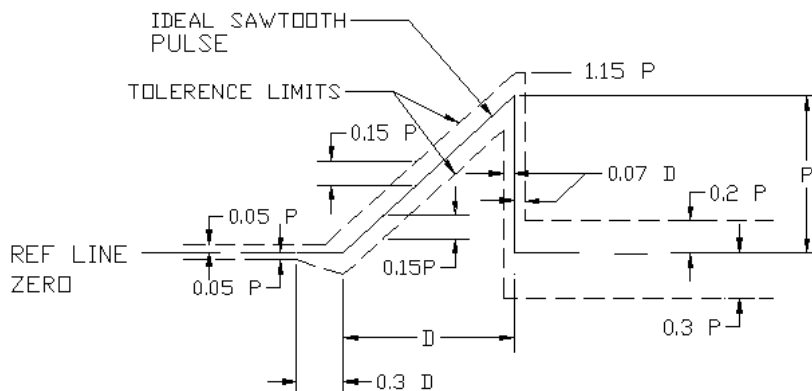
at a temperature of 160°F at 95 percent relative humidity. There shall be no interim withdrawals of cartridges. If any cartridge fails to meet the requirements of 3.7.3 shall be cause for rejection of the lot represented.

Table V. Temperature shock/humidity/altitude cycling schedule.

Monday	800	Place test items in a chamber maintained at 70°F and 50 percent relative humidity (RH).
	1200	Raise chamber temperature to 160°F and the RH to 95 percent. The chamber temperature shall reach 160°F at 95 percent RH no later than 1300.
	1600	Remove test items from the chamber and immediately place in a chamber maintained at -65°F and a pressure altitude of 50,000 feet (1.68 psia).
Tuesday	800	Remove test items from the chamber and immediately place in a chamber maintained at 70°F and 50 percent RH.
	1200	Remove test items from the chamber and immediately place in a chamber maintained at -65°F and a pressure altitude of 50,000 feet (1.68 psia).
	1600	Remove test items from the chamber and immediately place in a chamber maintained at 160°F and 90 percent RH.
Wednesday	800	Reduce chamber temperature to 70°F and RH to 50 percent. The chamber temperature shall reach 70°F and 50 percent RH no later than 0900.
	1200	Raise chamber temperature to 160°F and RH to 95 percent. The chamber temperature shall reach 160°F and 95 percent RH no later than 1300.
	1600	Remove test items from the chamber and immediately place in a chamber maintained at -65°F at a pressure altitude of 50,000 feet (1.68 psia).
Thursday	800	Remove test items from above chamber and immediately place in a chamber maintained at 70°F at 50 percent RH.
	1200	Remove test items from the chamber and immediately place in chamber maintained at -65°F and a pressure altitude of 50,000 feet (1.68 psia).
	1600	Remove test items from the chamber and immediately place in a chamber maintained at 160°F and 95 percent RH.
Friday	800	Reduce chamber temperature to 70°F and RH to 50 percent. The chamber temperature shall reach 70°F and 50 percent RH no later than 0900.
	1200	Raise chamber temperature to 160°F and RH to 95 percent. The chamber temperature shall reach 160°F at 95 percent RH no later than 1300.
	1600	Remove test items from the chamber and immediately place in a chamber maintained at -65°F and standard ambient pressure.

**4.4.14 Shock test.** Mount the test cartridges into the test fixture (Drawing 841AS868) cavity and torque the fixture cap screws to 85 in-lbs. Test cartridges shall be subjected to a shock test in accordance with method 516, procedure I of MIL-STD-810. A total of eighteen terminal peak sawtooth shock pulses, see figure 2, shall be performed with 3 shocks applied in each direction along the cartridges three mutually perpendicular axes. The nominal peak amplitude (P) shall be 20g and the nominal duration (D) shall be 11 milliseconds. If any cartridge fails to meet the requirements of 3.7.4 shall be cause for rejection of the lot represented.

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Figure 2. Sawtooth shock pulse.

**4.4.15 Vibration test.** Mount the test cartridges into the vibration test fixture (Drawing 841AS868) cavity and torque the fixture cap screws to 85 in-lbs. The input control vibration sensor shall be rigidly attached to the test fixture. The test cartridges shall be subjected to the random performance and endurance vibration test as indicated herein. Failure of any cartridge to meet the requirements of 3.7.5 shall be cause for rejection of the lot.

**4.4.15.1 Performance vibration.** The cartridges shall be subjected to random performance vibration testing in accordance with vibration profile of figure 3 along the cartridges three mutually perpendicular axes. The vibration time per axis is 30 minutes and shall be equally divided across conditioning temperatures of  $-65^{\circ}\text{F}$ ,  $70^{\circ}\text{F}$  and  $200^{\circ}\text{F}$ .

**4.4.15.2 Endurance vibration.** The cartridges shall be subjected to random endurance vibration testing in accordance with vibration profile of figure 4 along the cartridges three mutually perpendicular axes. The vibration time per axis is 120 minutes and shall be equally divided across conditioning temperatures of  $-65^{\circ}\text{F}$ ,  $70^{\circ}\text{F}$  and  $200^{\circ}\text{F}$ .

**4.4.16 Salt fog test.** Test cartridges shall be subjected to a salt fog in accordance with MIL-STD-810, Method 509.3 with a 5% salt concentration for 48 hours. Failure of any cartridge to meet the requirements of 3.7.6 shall be cause for rejection of the lot.

**4.4.17 Ballistic tests.** Sample cartridges shall be randomly selected to be representative of the complete lot. One third of samples shall be temperature conditioned at  $-65 \pm 5^{\circ}\text{F}$ , one-third at  $70 \pm 5^{\circ}\text{F}$  and one third at  $200 \pm 5^{\circ}\text{F}$  for 4 hours minimum but not to exceed 24 hours. The 24-hour maximum does not apply to the  $70^{\circ}\text{F}$  conditioning. Each sample shall be fired in the test fixture described in DL 841AS660 within 3 minutes after removal from conditioning. If the 3 minute limit is exceeded the unit shall be returned to a  $70 \pm 5^{\circ}\text{F}$  environment for 4 hours minimum and then reconditioned in the intended environment for the designated time. A  $4.25 \pm 0.1$  ampere firing current shall be applied for a maximum of 15 milliseconds to the cartridge bridge circuit. Failure of any cartridge to meet the requirements of 3.8 shall be cause for rejection of the lot.

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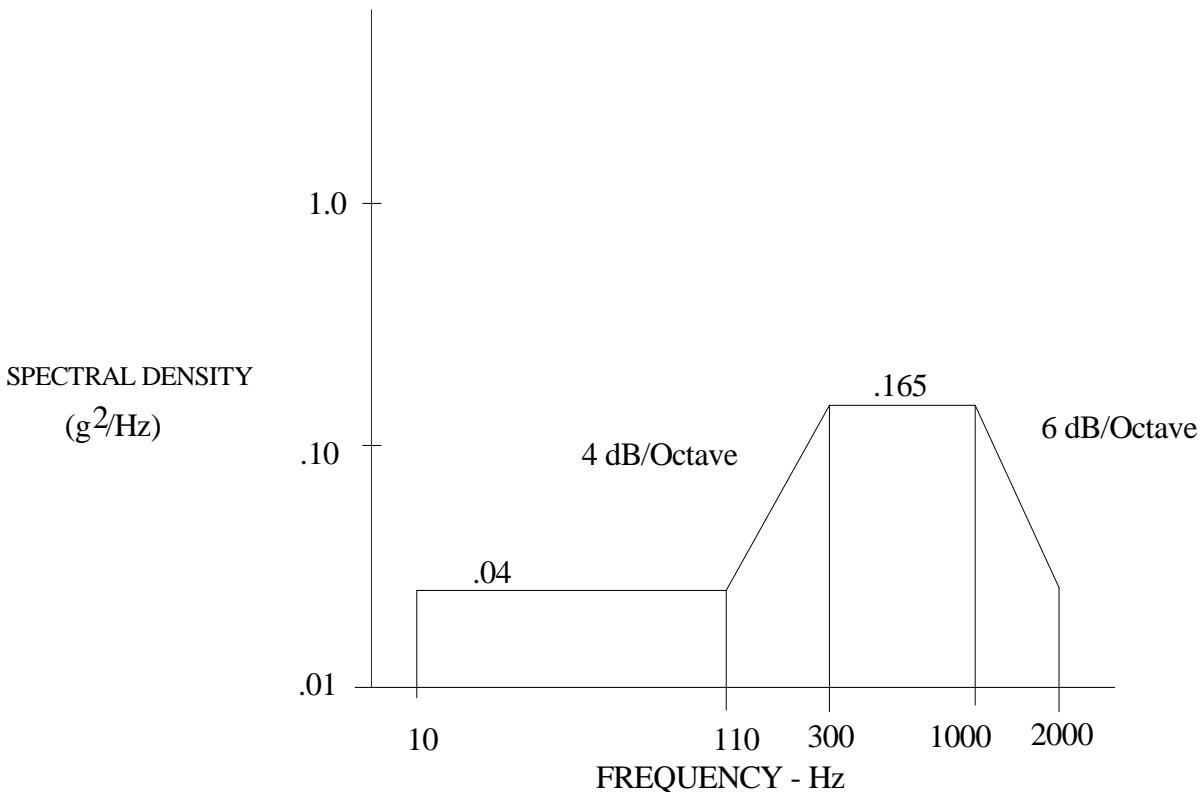


Figure 3. Random performance vibration test level.

**4.4.17.1 Projectile velocity.** Instrumentation shall be provided to measure the velocity of the projectile ejected from the test fixture. Projectile velocity shall be measured over an  $8 \pm 0.1$  inch trajectory beginning when the aft end of the projectile is  $2.75 \pm 0.25$  inches out of the muzzle. The projectile shall weigh  $0.628 \pm 0.005$  pounds and have an outer diameter of  $1.526 \pm 0.010$  inches. The test fixture breech shall have an initial free volume of  $0.897 \pm 0.050$  cubic inches when the projectile is fully inserted. Failure of any cartridge to meet the requirements of 3.8.1 shall result in the rejection of the lot.

**4.4.17.2 Ignition delay.** Instrumentation shall be provided to measure the time between first application of firing current and the initial movement of the projectile from the breech muzzle. Failure of any cartridge to meet the requirements of 3.8.2 shall result in the rejection of the lot.

**4.4.17.3 Post-fire resistance.** After ballistic firing, the resistance between the contact pin and the cartridge body shall be measured using a certified circuit igniter tester. Failure of any cartridge to meet the requirements of 3.8.3 shall be cause for rejection of the lot.

**4.4.17.4 Test failure.** Any failures or defects found during lot acceptance testing may be cause for rejection of the lot represented. If test failure is not attributed to the cartridge, the data may be disregarded for that firing and a retest permitted with a new cartridge.

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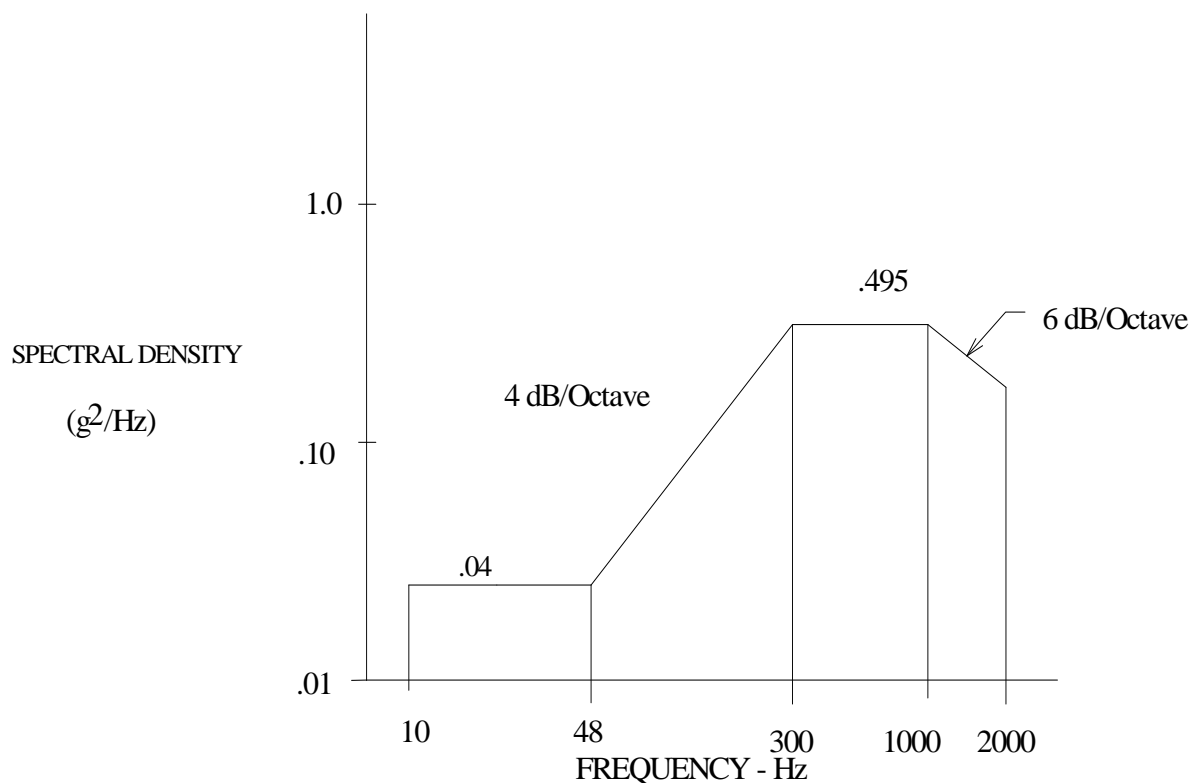


Figure 4. Endurance random vibration test levels.

## 5. PACKAGING

**5.1 Packaging.** For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DOD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Service or Defense Agency, or within the military service's system command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

## 6. NOTES

(This section contains information of a general or explanatory nature that may be helpful but is not mandatory.)

**6.1 Intended use.** The CCU-145/A impulse cartridge is designed to provide the power to eject expendable countermeasures from aircraft. The impulse cartridge is capable of being a one-for-one replacement of the BBU-35/B Impulse Cartridge (Drawing 7729436). The impulse cartridge is designed for use on military aircraft only, and thus has no commercial application.

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**6.2 Acquisition requirements.** Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2.1, 2.2.2 and 2.3).
- c. Whether first article inspection is required and, if so, specify the test activity (see 3.1 and 4.2.1).
- d. Production lot size and test activity (see 4.2.2.1).
- e. Packaging (see 5.1 and 6.6).
- f. That the safety precaution requirements of the “Contractors’ Safety Manual for Ammunition, Explosives and Related Dangerous Material,” DOD 4145.26M are applicable. NOTE: When this specification is used as a part of the description of work to be accomplished by a Government activity the safety precautions requirements of “Ammunition and Explosives,” OP 5, are applicable.

**6.3 Data.** For the information of contractors and contracting officers, any data specified in (a) subparagraphs below, (b) applicable documents listed in section 2 of this specification or (c) referenced lower-tiers documents need not be prepared for the Government unless specified in the contract or order.

**6.3.1 Standard Deliverables.** In addition to the delivery of cartridges, the contract may require delivery of the following:

- a. Radiographic plates.
- b. Radiographic review report.
- c. Radiographic sample plates and techniques.
- d. Requests for waiver/deviation and engineering change proposal (ECP).
- e. Progress and management report.
- f. Test and inspection report if contractor tested.
- g. Ammunition data cards.
- h. Performance oriented packaging (POP) test report.
- i. Process control charts.

**6.4 Additional data.**

**6.4.1 Closed bomb performance.** The CCU-145/A should provide 450 to 750 psig peak pressure at  $-65^{\circ}\text{F}$  to  $200^{\circ}\text{F}$  in a  $43.5 \pm 1.5$  cubic centimeter closed vessel. The slope of the output trace should be 150 psi per millisecond maximum when measured between 10 to 90 percent of the peak pressure.

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**6.4.2 All-fire performance.** The CCU-145/A impulse cartridge has demonstrated a minimum all-fire level of 2.9957 amperes (Franklin Bruceton Test Method) with a 15-millisecond current pulse duration.

**6.4.3 No-fire performance.** The CCU-145/A impulse cartridge has a demonstrated maximum no-fire level of 1.1511 amperes (Franklin Bruceton Test Method) with a 5-minute current pulse duration.

**6.4.4 Qualification test data.** Indian Head Test Report IHTR 2409 documents the qualification testing of the CCU-145/A impulse cartridge.

**6.5 Definitions.** For the purpose of this specification, the following definitions apply.

**6.5.1 Mechanical failure.** Any deformation or breakage of a part or separation of parts that is other than a design function is defined as a mechanical failure.

**6.6 Packaging.** The inner and intermediate packing and packaging should be in accordance with SPI 520-174-0267. Any overpack should be in accordance with SPI 520-174-0269.

**6.7 Subject term (keyword) listing.**

Countermeasures

**6.8 Changes from previous issue.** Marginal notations are not used to identify changes with respect to the previous issue because of the extensiveness of the changes. The changes in this issue were authorized by ECP 10E25LH010.

Custodian:  
Navy - OS

Preparing activity  
Navy- OS  
(Project 1377-2010-010)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <https://assist.daps.dla.mil>.