

INCH-POUND

MIL-DTL-82962H (OS)
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 SUPERCEDING
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DETAIL SPECIFICATION

CARTRIDGES, IMPULSE, CCU-136/A, CCU-138/A, and CCU-136A/A

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

1. SCOPE

1.1 Scope. This document gives the requirements for the manufacture, assembly, and packaging of the CCU-136/A, CCU-138/A, and CCU-136A/A impulse cartridges and the methods of inspection and tests upon which product acceptance will be based.

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 SPECIFICATIONS

MIL-DTL-23659 Initiators, Electric, General Design Specification For

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-202	Test Methods for Electronic and Electrical Component Parts
MIL-STD-286	Propellants, Solid: Sampling, Examination, and Testing
MIL-STD-1168	Ammunition Lot Numbering and Ammunition Data Card
DOD-STD-2101	Classification Of Characteristics

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

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

DRAWINGS

Naval Air Systems Command

842AS205	Cartridge, Impulse, CCU-136/A and CCU-138/A
842AS207	Primed Subassembly
842AS110	Output Charge, Smokeless powder
842AS210	Fused Subassembly
842AS213	Low Flash Primer Charge
842AS217	CCU-136A/A Impulse Cartridge Assembly
842AS219	Primed Assembly
842AS220	Filter Assembly
842AS221	Fused Body Assembly
842AS241	CCU-136A/A, CCU-136/A, CCU-138/A Impulse Cartridge Vibration Fixture
841AS684	Functional Test Fixture

(Application for copies 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.)

2.3 Non-Government publications. 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 Standards Institute (ANSI)/American Society For Quality (ASQ)

ANSI/ASQ Z1.4	Sampling Procedures and Tables for Inspection by Attributes (DoD adopted)
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(Copies of this document are available online at <http://www.asq.org/>, or from the American Society for Quality, PO Box 3005, 611 E. Wisconsin Ave., Milwaukee, WI 53201-4606.)

American Society For Testing And Materials (ASTM)

ASTM E 1742	Standard Practice for Radiographic Examination
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(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.)

American National Standards Institute

ANSI Z1.1	Guide for Quality Control Charts
ANSI Z1.2	Control Chart Method of Analyzing Data
ANSI Z1.3	Control Chart Method of Controlling Quality During Production

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(Copies of these documents are available online at <http://webstore.ansi.org/ansidocstore/default.asp> or from the American National Standards Institute, 1430 Broadway, New York, NY 10018.)

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. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.3.2.

3.2 General. The CCU-136/A and CCU-138/A impulse cartridges shall be manufactured in accordance with DL842AS205 and all documents and drawings listed thereon. Drawings listed in this specification are included as part of the data package defined by DL842AS205. The CCU-136A/A impulse cartridges shall be manufactured in accordance with DL842AS217 and all documents and drawings listed thereon. Drawings listed in this specification are included as part of the data package defined by DL842AS217.

3.3 Materials. All materials used in the manufacture of the cartridges shall conform strictly with 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 low flash primer charge (Drawing 842AS213) and output charge (Drawing 842AS110) are defined as primary components (see 4.3.3).

3.4.1 Igniter 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.

3.4.2 Propellant charges.

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

3.4.2.2 Calorimetry. Using a differential scanning calorimeter at a heating rate of 10°C per minute between 100 to 350°C, the exothermic peak shall occur within 10C of baseline material known to be good (approximately 206°C).

3.4.2.3 Moisture and volatiles. Moisture and volatiles content shall be 1.0 percent maximum when tested in accordance with MIL-STD-286, Method 101.1.2.

3.4.2.4 Quality characteristics. Main charge propellant 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.

3.5 Subassembly requirements.

3.5.1 Insulation resistance. The insulation resistance of each fused subassembly, Drawing 842AS210 or 842AS221, shall not be less than 50 megohms at a relative humidity of less than 80 percent when measured in accordance with 4.6.1.

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3.5.2 Glass-to-metal seal. The fused subassembly, Drawing 842AS210 or 842AS221, shall pass a dead load, hydrostatic, and helium leak test when tested as specified in 4.6.2.

3.5.3 Capacitance. The capacitor-body assembly, drawing 842AS220, shall be subjected to capacitance measurement of 10 KHz minimum in accordance with method 305A of MIL-STD-202. The capacitance shall be 88 to 112 nano-farads when measured from pin to pin. Reject any parts not meeting this requirement.

3.6 Thermal transient test. Each primed subassembly, Drawing 842AS207 or 842AS219, shall be subjected to a thermal transient test to verify proper bridgewire and ignition mix interface. A thermal response greater than 200 microvolts shall indicate a defective subassembly (see 4.6.3).

3.7 Cartridge inspection.

3.7.1 Visual inspection. The complete cartridge shall be free of the visible defects noted in 4.6.4.

3.7.2 Bridge circuit resistance. The resistance of the bridge circuit in each completely assembled cartridge, when measured electrically as specified in 4.6.5, shall not be less than 0.85 ohm and not be greater than 1.15 ohm.

3.7.3 Leakage. The cartridges shall not exhibit a leak rate in excess of 10^{-5} cc/sec of air when tested in accordance with 4.6.6.

3.7.4 X-ray. Cartridges shall be free of imperfections when examined in accordance with 4.6.7.

3.7.5 Electrostatic discharge. Cartridges shall not fire, dud, or otherwise be adversely affected when subjected to electrostatic discharge testing in accordance with 4.6.9. After electrostatic discharge testing cartridges shall meet the bridgewire resistance requirements of 3.7.2 and the ballistic requirements of 3.8.

3.7.6 Power current. The cartridge shall not fire when subjected to one watt of power for 5 minutes when tested in accordance with 4.6.8. The power current test is considered a potential 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.

3.7.7 Filter test. The output voltage as measured on the oscilloscope shall be less than 85 millivolts peak to peak when tested in accordance with 4.6.10. Note: Filter test is conducted on first article sample and ballistic sample. Filter test of the production lot will only be required when one or more ballistic samples fail the requirements of this paragraph.

3.7.8 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 4.6.11. Cartridges subjected to the forty-foot drop test are not ballistically tested.

3.7.9 Six-foot drop test. Cartridges shall not initiate or incur any detrimental internal or external damage or degradation when subjected to the six-foot drop test in accordance with 4.6.12. After the six-foot drop test the cartridges shall meet the ballistic test requirements of 3.8.

3.7.10 Temperature, humidity and altitude cycling (TH&A) test. Cartridges shall not initiate or incur any internal or external damage or degradation when subjected to TH&A cycling in accordance with 4.6.13. After exposure to the TH&A environment the cartridges shall meet the ballistic test requirements of 3.8.

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3.7.11 Shock test. Cartridges shall not initiate or incur any internal or external damage or degradation when subjected to the shock test in accordance with 4.6.14. After exposure to the shock environment the cartridges shall meet the ballistic test requirements of 3.8.

3.7.12 Vibration test. Cartridges shall not initiate or incur any internal or external damage or degradation when subjected to the vibration test in accordance with 4.6.15. After exposure to the vibration environment the cartridges shall meet the ballistic test requirements of 3.8.

3.8 Ballistic requirements. Cartridges from each production lot, selected in accordance with 4.6.16.1, shall meet the following requirements when subjected to the test prescribed in 4.6.16.1. Any cartridge failing to meet one or more requirements shall be classified as a defective unit and the lot represented rejected.

3.8.1 Velocity. Each cartridge shall be capable of ejecting a 0.46 ± 0.01 pound slug. When fired in the test device of 4.6.16.1 (see 6.5.1), the velocity for the CCU-136/A and CCU-136A/A shall be not less than 125 feet per second nor greater than 170 feet per second; the velocity for the CCU-138/A cartridge shall be not less than 90 fps nor greater than 140 fps.

3.8.2 Misfire. There shall be no misfires.

3.8.3 Ignition delay. The ignition delay shall not be more than 15 milliseconds when tested in accordance with 4.6.10.3.

3.8.4 Post-fire. The post-fire resistance shall be greater than 500 ohms in accordance with 4.6.16.4.

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

3.8.6 Mechanical failure. The cartridge shall function in accordance with the performance requirements specified in paragraph 3.8 without mechanical failure (see 6.5.2). Failure to meet this requirement shall result in rejection of the lot.

3.8.7 Quality characteristics. Ballistic velocity 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 Z1.1, Z1.2, and Z1.3 shall be required for quality characteristics cited in this specification (main charge, ballistic velocity). In addition to other requirements for this specification, 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 requirements of this specification and associated drawings. Particular attention should be directed to dimensions, finishes, coatings and glass-to-metal seals.

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4. VERIFICATION

4.1 Classification of inspections.

- a. First article inspection (see 4.3.2)
- b. Quality conformance inspection (see 4.5)

4.2 Sampling. Unless otherwise specified, and when applicable, the sampling plans and procedures used in the determination of the acceptability of products submitted by a supplier shall be in accordance with the provisions of ASQ Z1.4. Unless otherwise specified in the contract, order, or requisition, all samples for test purposes shall be provided at the expense of the contractor.

4.3 Lots.

4.3.1 Inspection lots. Inspection lot definition, formation, and size shall be in accordance with ASQ Z1.4.

4.3.2 First article inspection. Before entering into quantity production, an acceptable first article sample of 85 cartridges shall be prepared. This sample, manufactured using the same methods 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. Seventy-five of these cartridges shall be expended in the tests listed below and ten shall be retained for investigative purposes. A first article sample acceptable for environmental and functional testing shall be defined as a sample which has met the requirements of 3.4 through 3.7.5 of this specification. The contractor shall deliver the cartridges to the activity designated by the contracting agency for test. First article sample acceptance shall consist of the tests listed in Table I. No cartridge shall produce results outside the limits set forth in 3.7 when fired in the test fixture of 4.6.16.1. Any quantity production prior to notification by the contracting agency of first article sample acceptability shall be at the contractor's risk. The first article cartridges will not be applied as a part of the quantity specified for delivery by the contract. The units subjected to 40-foot drop shall not explode or lose propellant and shall be safe to handle for disposal. They will not be ballistically tested.

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TABLE I First article tests.

Test/Inspection	Requirement Paragraph	Test Paragraph	A	B	C	D	E	F	G	H	Total
Quantity			6	6	18	9	12	12	12	10	85
Visual Inspection	3.7.1	4.6.4	6	6	18	9	12	12	12	10	85
Radiographic Exam	3.7.4	4.6.7	6	6	18	9	12	12	12	10	85
Leakage	3.7.3	4.6.6	6	6	18	9	12	12	12	10	85
Bridge Circuit Resistance	3.7.2	4.6.5	6	6	18	9	12	12	12	10	85
Power Current	3.7.6	4.6.8	6	6	18	9	12	12	12	10	85
Bridge Circuit Resistance	3.7.2	4.6.5	6	6	18	9	12	12	12	10	85
Electrostatic Discharge	3.7.5	4.6.9	6	6	18	9	12				51
Bridge Circuit Resistance	3.7.2	4.6.5	6	6	18	9	12				51
Filter Test	3.7.7	4.6.10	6	6	18	9	12	12	12	10	85
Bridge Circuit Resistance	3.7.2	4.6.5	6	6	18	9	12	12	12	10	85
Forty Foot Drop	3.7.8	4.6.11	6								6
Six Foot Drop	3.7.9	4.6.12		6							6
Temp./Humidity/ Altitude	3.7.10	4.6.13			18						18
Shock, 20g (Fixture P/N 842AS241)	3.7.11	4.6.14				9					9
Vibration (Fixture P/N 842AS241)	3.7.12	4.6.15				9					9
Visual Inspection	3.7.1	4.6.4	6	6	18	9					39
Radiographic Exam	3.7.4	4.6.7	6	6	18	9					39
Bridge Circuit Resistance	3.7.2	4.6.5	6	6	18	9					39
Leakage	3.7.3	4.6.6	6	6	18	9					39
Filter Test	3.7.7	4.6.10	6	6	18	9					39
Bridge Circuit Resistance	3.7.2	4.6.5	6	6	18	9					39
-65 F, Function	3.8	4.6.16.1		2	6	3	4	4	4		23
+70 , Function	3.8	4.6.16.1		2	6	3	4	4	4		23
+160 , Function	3.8	4.6.16.1		2	6	3	4	4	4		23
Discard			6								6
Retain										10	10

4.3.3 Production lot. The suggested production lot size is 21,600 (45 boxes) cartridges. Lot numbers shall be in accordance with MIL-STD-1168. Cartridges required for all test purposes are randomly selected from the production lot and will not be applied as a part of the quantity specified for delivery by the contract. 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. Cartridges selected for the ballistic test shall be delivered to the activity designated by the contracting agency. The designated test activity shall perform the cartridge tests and examinations listed in table II to determine lot acceptance.

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

4.4 Classification of characteristics. The characteristics verified by the tests and examinations herein are classified as Critical, Major or Minor in accordance with DOD-STD-2101. Tests and examinations that verify critical characteristics are identified by the symbol (C) and major characteristics by the symbol (M). The number following the classification symbol indicates the serial number of test or examination. Tests and examinations which are not annotated with a classification code are classified minor.

4.5 Quality conformance inspection. Quality conformance inspection shall consist of verification of the characteristics classified on the drawings of DL842AS205 or DL842AS217 and the tests and examinations of table II.

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4.5.1 Packing, packaging and marking. The inspector shall ascertain that the packing and packaging of the cartridges and the container markings conform to Section 5 of this specification.

4.6 Tests.

4.6.1 Insulation resistance. Prior to assembly of the bridgewire and filter, the insulation resistance shall be checked with an applied voltage of 500 ± 25 volts dc. Voltage to be applied between pins and between shorted pins and case. Units which fail to meet the requirements of 3.5 shall be rejected.

4.6.2 Glass-to-metal seal. The glass-to-metal seal shall withstand 320 pounds minimum dead load applied over a 0.160 ± 0.005 inch diameter at center without cracking when applied as shown on Drawing 842AS210 or 842AS221. The seal shall also withstand a 5000 ± 500 psi hydrostatic pressure without cracking or leaking. Following both these tests (dead load and hydrostatic), the seal shall not exceed 1×10^{-6} cc/sec air when tested at a pressure differential of 1.0 ± 0.1 atmosphere.

4.6.3 Thermal transient test. Each Primed Subassembly (Drawing 842AS207 or 842AS219) shall be tested using an 80 ± 10 millisecond step input set for 160 milliamps across a 1-ohm resistor. The differential thermal response to the step input shall be captured.

4.6.4 Visual inspection. Examine each cartridge produced and reject for bent connector pins, perforated or improperly crimped closure discs, incorrect or illegible markings or other visible defects which might adversely affect cartridge installation or ballistic properties.

4.6.5 Bridge circuit resistance. Conformance with the bridge circuit resistance of 3.7.2. shall be ascertained by means of test circuit which limits the bridge current to 25 milliamperes, maximum. Any cartridges not meeting the requirement shall be rejected. The test circuit shall be connected to the cartridge through a fully assembled electrical connector or equal. A safety chamber with an interlock switch shall be used to protect the operator during the application of current. A suitable instrument which is known to be accurate within one percent in the range of resistance specified shall be used to determine whether or not the requirement is met. Units which fail to meet the requirements of 3.7.2 or fail to assemble completely, by hand, with the specified connector shall be rejected. The results of bridge circuit resistance measurements shall not be affected by resistance of the test circuit and connector.

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TABLE II. Quality conformance inspections.

Item	Nature of test	Requirement	Test method	Classification (DOD-STD-2101)
Primary component	Single lot verification	3.4	4.3.3	(M101)
Fused subassembly	Insulation resistance	3.5.1	4.6.1	(M102)
Fused subassembly	Glass-to-metal seal	3.5.2	4.6.2	(M103)
Primed subassembly	Thermal transient test	3.6	4.6.3	(C1)
Ignition mix	Compounding and loading	3.4.1	C	(M104)
Propellant charge	Type and weight verification	3.4.2	C	(M105)
Cartridge	Visual inspection	3.7.1	4.6.4	(M106)
Cartridge	Bridge circuit resistance	3.7.2	4.6.5	(M107)
Cartridge	Leakage	3.7.3	4.6.6	(M108)
Cartridge	X-ray	3.7.4	4.6.7	(M109)
Cartridge	Power current	3.7.6	4.6.8	(M110)
Cartridge	Ballistic requirements	3.8	4.6.16	(C2)
Cartridge	Packing, packaging, and marking	Section 5	4.5.1	(M111)

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	3.7.1	4.6.4	All	All	All
X-Ray	3.7.4	4.6.7	All	All	All
Leak Test	3.7.3	4.6.6	All	All	All
Bridgewire Resistance	3.7.2	4.6.5	All	All	All
Filter Test	3.7.7	4.6.10	All	All	All
Power-Current	3.7.6	4.6.8	All	All	All
ESD Test	3.7.5	4.6.9	20 Randomly Selected		
Bridgewire Resistance	3.7.2	4.6.5	All	All	All
Ballistic test (-65° F)	3.8	4.6.16.1	All		
Ballistic test (+70° F)	3.8	4.6.16.1		All	
Ballistic test (+160° F)	3.8	4.6.16.1			All

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4.6.6 Leakage. Leak test each cartridge in the first article sample and ballistic sample in a dry gas leak tester in accordance with paragraph 4.6.6.1. CCU-136/A and CCU-138/A impulse cartridges that exhibit a leak rate in excess of 10^{-5} cc/sec of air at a pressure differential of one atmosphere are considered defective. Retest CCU-136A/A impulse cartridges that exhibit a leak in excess of 10^{-5} cc/sec of air at a pressure differential of one atmosphere in accordance with paragraph 4.6.6.2. If one or more cartridges of the ballistic sample fail the leak test when tested in accordance with paragraph 4.6.6.1 or 4.6.6.2, a leak test of each cartridge within 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. Cartridges exhibiting a leak rate in excess of that specified above shall be rejected.

4.6.6.1 Cartridge leak procedure.

- a. Place cartridges in a pressure vessel. [NOTE: Leak testing of cartridges must take place within 15 + 1 minute from the time you remove the cartridge from the pressure vessel. Therefore, process only as many cartridges as you can leak test within 15 + 1 minutes of helium bombing. Re-pressurize any cartridge not tested within 15 + 1 minutes.]
- b. Purge the pressure vessel or evacuate the pressure vessel to a pressure of less than 4 inches of mercury (2 psia) and close vacuum valve.
- c. Pressurize the vessel with helium to 30 ± 2 psia for 60 +1/-0 minutes.
- d. Remove the test cartridges from the pressure vessel and record the time.
- e. Flush exterior of the test cartridge with low pressure air to remove possible trapped helium,
- f. Perform leak test on cartridges using helium mass spectrometer leak detector.

4.6.6.2 Output closure leak test procedure.

- a. Place cartridges in a pressure vessel. [NOTE: Leak testing of cartridges must take place within 15 + 1 minute from the time you remove the cartridge from the pressure vessel. Therefore, process only as many cartridges as you can leak test within 15 + 1 minutes of helium bombing. Re-pressurize any cartridge not tested within 15 + 1 minutes.]
- b. Purge the pressure vessel or evacuate the vessel to a pressure of less than 4 inches of mercury (2 psia) and close vacuum valve.
- c. Pressurize the vessel with helium to 30 ± 2 psia for 60 +1/-0 minutes.
- d. Remove the test cartridges from the pressure vessel and record the time.
- e. Flush exterior of the test cartridge with low pressure air to remove possible trapped helium,
- f. Perform leak test on cartridges using helium mass spectrometer leak detector and fixture P/N 842AS239.

4.6.7 Radiographic examination. All cartridges in the first article or production lot test samples shall be radiographically examined in accordance with ASTM E 1742; any observable imperfections in assembly shall be cause for cartridge rejection. The cartridge shall be positioned on their sides for the most revealing exposure with the plane of the pins perpendicular to the X-ray source. All cartridges shall be identified with serial numbers prior to examination. The cartridge serial numbers shall be in consecutive order beginning

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with the number 001 in each production lot. The cartridges shall be arranged on tray boards in consecutive numerical order, and each radiograph shall carry a permanent identification of the cartridges displayed thereon. The radiograph identification shall include the complete lot number, as stamped on the cartridges, and the span of serial numbers displayed. If any assembly or loading defects are noted then the contractor must 100 percent X-ray the represented lot per 4.6.6 and submit results to the cartridge design activity for review. Discontinuities in serial numbers shall be identified on the X-ray. Defective cartridges found by the vendor shall be clearly identified on the X-ray and those defectives removed from the production lot. The serial numbers shall be pen or ink stamped on the cartridges with approximately 1/8-inch-high characters. The serial numbers shall be located apart from the other cartridge markings. When screening of the production lot by X-ray review is required, it shall be at the expense of the contractor.

4.6.8 Power-current test. Each cartridge in the first article and production test sample shall have a direct current of not less than one ampere supplying a minimum of one watt applied to the bridge circuit for at least 5 minutes. 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. Test temperature is ambient and the first article sample or production lot is rejected if a cartridge fires within 5 minutes.

4.6.9 Electrostatic discharge test. Subject the test cartridges to a 500 ± 25 picofarad capacitor charged to $25,000 \pm 500$ volts and a $5,000 \pm 250$ ohm resistor connected in a 5 microhenry total inductance series circuit between the two connector pins. Apply a second discharge between the connector pins shorted together and the cartridge case. Maintain the series connection for 60 seconds minimum if ESD voltage dissipation is not monitored. If ESD voltage dissipation is monitored, maintain series connection for 5 seconds minimum, or until ESD voltage reads zero on oscilloscope.

4.6.10 Filter test. Using a signal generator, input a sinusoidal waveform at 1.0 ± 0.1 megahertz for 10 milliseconds maximum through an equivalent 47 ± 4.7 ohm, 0.25 watt resistor to a 1.0 ± 0.15 ohm load resistor (R1). Adjust the signal generator to obtain an output of 100 ± 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. Condition units at $70 \pm 10^\circ\text{F}$ for 12 hours minimum just prior to conducting the test. Reject those units, which do not meet the requirement of 3.7.7. See Figure 1 below for a schematic of the test set where $R = 47$ ohms.

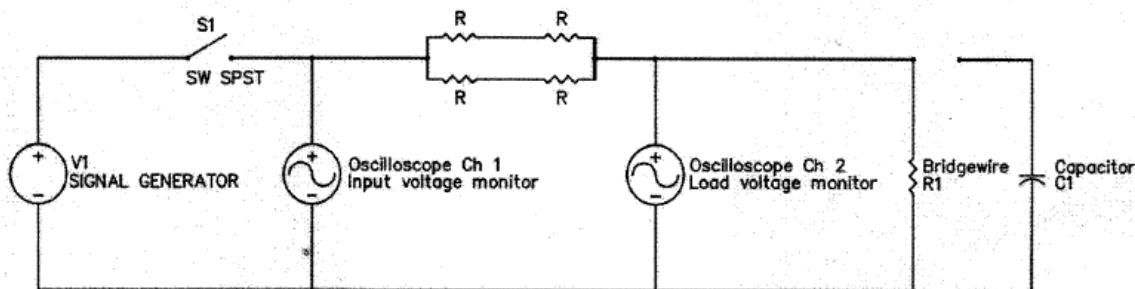


FIGURE 1. Circuit diagram of filter test setup.

4.6.11 Forty-foot drop test. Individually drop the test cartridges once from a height of 40 feet onto a 2-inch minimum thick steel plate embedded in concrete. Test an equal number of cartridges in the sample in the following orientations: output end up, output end down and centerline horizontal. Employ a guidance system to ensure impact in the orientations indicated. Any cartridge failing to meet the requirements of 3.7.8 shall be cause for rejection of the lot represented.

4.6.12 Six-foot drop test. Individually drop the test cartridges once from a height of 6 feet +2 inches/-0 inches onto a 2-inch minimum thick steel plate embedded in concrete. Test an equal number of cartridges in

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the sample in the following orientations: output end up, output end down and centerline horizontal. Employ a guidance system to ensure impact in the orientations indicated. Any cartridge failing to meet the requirements of 3.7.9 shall be cause for rejection of the lot represented.

4.6.13 Temperature, Humidity and Altitude cycling test. Place the cartridges 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 IV. Follow this schedule 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 at a temperature of 160°F. at 95 percent relative humidity. There shall be no interim withdrawals of cartridges. Any cartridge failing to meet the requirements of 3.7.10 shall be cause for rejection of the lot represented.

TABLE IV. 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 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.

4.6.14 Shock test. Mount the test cartridges into the test fixture (Drawing 842AS241) cavity and torque each cap screw to 40 ± 5 in-lbs. Subject the test cartridges to a total of eighteen terminal peak sawtooth

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shock pulses with three shocks applied in each direction along the cartridges three mutually perpendicular axes, see Figure 2. The nominal peak amplitude (P) shall be 20g with a nominal duration (D) of 11 milliseconds. Any cartridge failing to meet the requirements of 3.7.11 shall be cause for rejection of the lot represented.

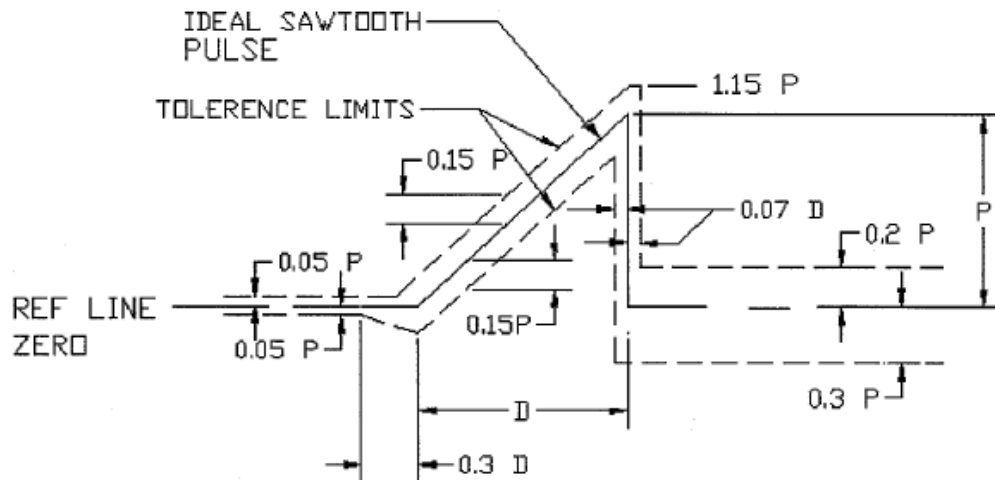


FIGURE 2. Sawtooth shock pulse.

4.6.15 Vibration test. Mount the test cartridges into the test fixture (Drawing 842AS241). Rigidly attach the input control vibration sensor to the test fixture. Subject the cartridges to the random performance and endurance vibration test indicated herein. Failure of any cartridge to meet the requirements of 3.7.12 shall be cause for rejection of the lot .

4.6.15.1 Performance vibration. Subject the cartridges to random performance vibration testing in accordance with the vibration profile of Figure 3 along the cartridges three mutual perpendicular axes. The vibration time per axis is 30 minutes equally divided across the conditioning temperatures of -65°F, 70°F and 160°F.

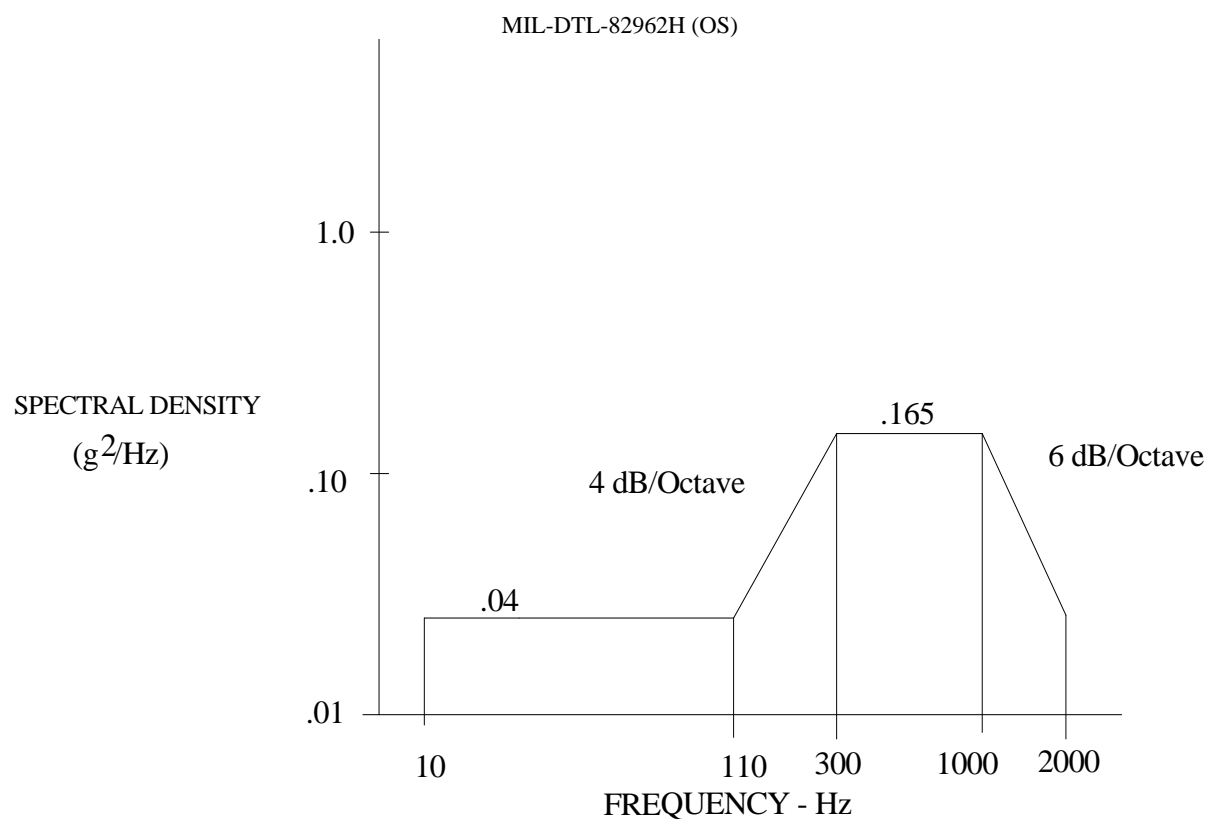


FIGURE 3. Random performance vibration test level.

4.6.15.2 Endurance vibration. Subject the cartridges to random endurance vibration testing in accordance with the vibration profile of Figure 4 along the cartridges three mutually perpendicular axes. The vibration time per axis is 120 minutes equally divided across the conditioning temperatures of -65°F, 70°F and 160°F.

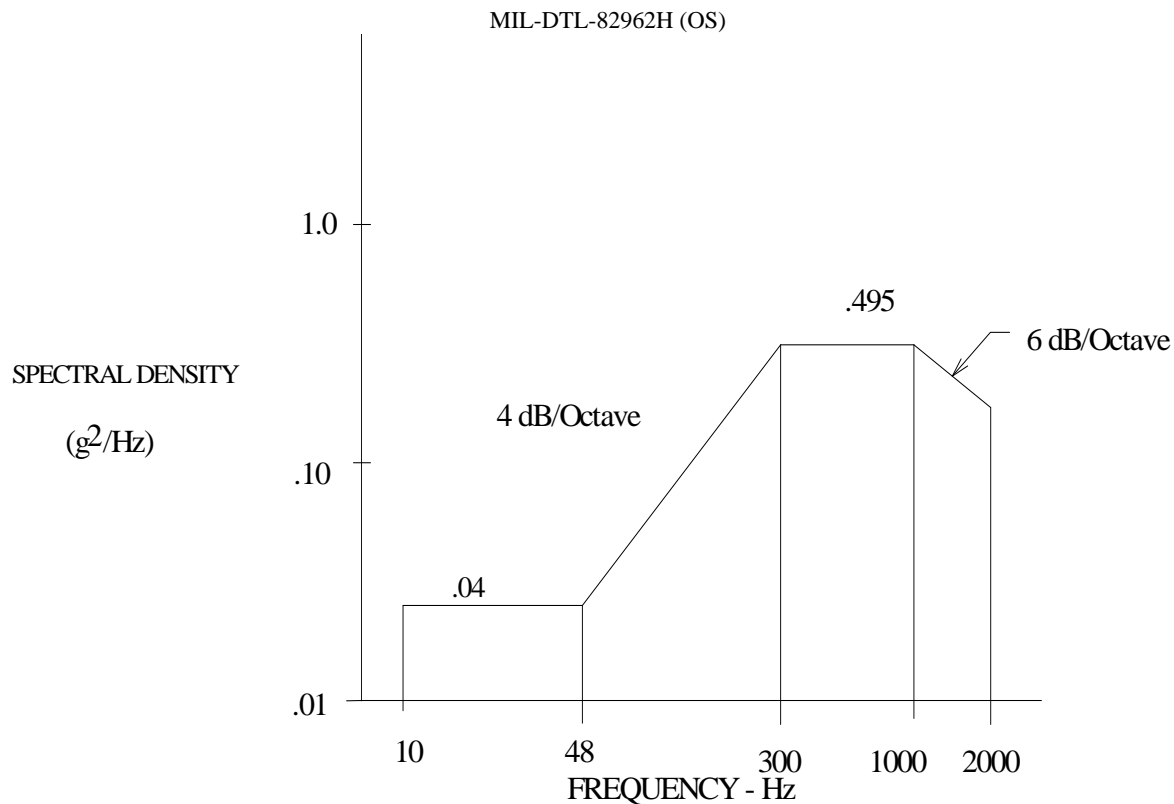


FIGURE 4. Endurance random vibration test levels.

4.6.16 Ballistic test.

4.6.16.1 Test. The number of cartridges selected from each production lot for the ballistic test shall be in accordance with ASQ Z1.4. An additional 6 cartridges are required for investigative purposes. The randomly selected cartridges shall be conditioned at $70^{\circ} \pm 5^{\circ}\text{F}$, $-65^{\circ} \pm 5^{\circ}\text{F}$, or $160^{\circ} \pm 5^{\circ}\text{F}$ for 4 hours minimum and fired in a test fixture, Drawing 841AS684. Firing current shall be 5.0 ± 0.1 ampere. Instrumentation shall be provided to measure the slug velocity and the time interval between the application of firing current and the initial movement of the slug from the tube muzzle. Velocity shall be determined from the flight time to cover the initial 36 ± 0.125 inches of slug travel.

4.6.16.2 Acceptance criteria. The total number of allowed defective units in a first article sample or lot acceptance sample as a result of tests and inspections of 3.7 through 3.9 shall be zero. Any defects will reject the lot represented. Screening of defects as a corrective action is at contractor's expense and the method of screening shall be subject to approval by the contracting officer.

4.6.16.3 Ignition delay. When the cartridges are fired in the test fixture, Drawing 841AS684, the time from application of current to the first indication of slug movement shall not exceed 15 milliseconds at any of the specified conditioning temperatures of -65° to 160°F .

4.6.16.4 Post-fire. The resistance between the pins of the cartridges shall be measured with a multimeter.

4.6.16.5 Retest. There shall be no retests.

4.6.16.6 Test failure. If test failure is attributable to an assignable cause, excluding the test cartridges, original test results should be discarded and the complete test reconducted.

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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 packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. 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 which may be helpful, but is not mandatory.)

6.1 Intended use. The CCU-136/A, CCU-138/A, and CCU-136A/A impulse cartridges are designed to provide the power to eject expendable countermeasures from aircraft. The impulse cartridges are designed for use on military aircraft only, and thus have no commercial application.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of the specification.
- b. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced.
- c. Designation of impulse cartridge (CCU-136/A, CCU-136A/A or CCU-138/A).
- d. Whether first article inspection is required and, if so, specify the test activity.
- e. Production lot size and test activity (see 4.3.3).
- f. Items of data required for each first article and production lot (see 6.3)
- g. 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 part of the description of work to be accomplished by a Government activity, the safety precaution requirements of "Ammunition Ashore," OP 5 are applicable.

6.3 Data. For the information of contractors and contracting officers, any of the data specified in (a) subparagraphs below, (b) applicable documents listed in section 2 of this specification or (c) referenced lower-tier 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

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- 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-136/A and CCU-136A/A provide approximately 614 psi at ambient temperatures in a 43.5 cc Closed bomb. Time to peak pressure is approximately 4.4 milliseconds.

6.4.2 All fire performance. The CCU-136/A impulse cartridge has a minimum all-fire level of 2.63 amps (Bruceton Test Method) with 5-minute current pulse duration. Another test (Langlie) determined the minimum all-fire level to ignite the cartridge within 15 ms to be 2.89 amps. Testing with the CCU-136A/A determined a minimum all-fire current of 2.21 amps with 50 ms pulses (Bruceton).

6.4.3 No-fire performance. The cartridges have a maximum no-fire of 1.40amps (Bruceton) with 5-minute current pulse duration. Testing with the CCU-136A/A determined a maximum no-fire current of 1.88 amps with 50 ms pulses (Bruceton).

6.4.4 Verification data. Indian Head Test Report IHTR 1966 documents the verification testing for the CCU-136/A and the CCU-138/A impulse cartridges. Indian Head Test Report IHTR2204 documents the verification testing of the CCU-136A/A impulse cartridge.

6.4.4.1 Testing and Test Methods. The CCU-136A/A impulse cartridges were shock tested in accordance with method 516, procedure I of MIL-STD-810E during Verification Test.

6.5 Definition.

6.5.1 Velocity. Velocity is defined as the distance from the tube muzzle to a point 36 ± 0.125 inch beyond the tube muzzle divided by the slug transit time between these two points.

6.5.2 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 Differential scanning calorimetry. ASTM E 793 may be used as guidance for conducting tests and interpreting data.

6.7 Subject term (keyword) listing.

chaff
countermeasures
decoy
flare
jammer
stores release

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 following ECP was incorporated in this revision; 10E25LH011.

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Custodian:
Navy - OS

Preparing activity:
Navy - OS
(Project 1377-2010-011)

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/>.