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5 November 1979
SUPERSEDING
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MILITARY SPECIFICATION

ALARM UNIT, CHEMICAL AGENT

AUTOMATIC ALARM: ABCA-M42

This specification is approved for use by US Army Armament Research and Development Command, Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 This specification covers one type of remote alarm unit suitable for use with the detector unit of the ABCA-M8 chemical agent alarm.

2. APPLICABLE DOCUMENTS

2.1 Issues of documents. The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

QQ-S-781 - Strapping, Steel, and Seals.
PPP-B-601 - Boxes, Wood, Cleated Plywood.
PPP-B-621 - Box, Wood, Nailed and Lock-Cornered.

FSC 6665

: Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, US Army Armament Research and Development Command, ATTN: DRDAR-TSC-S, Aberdeen Proving Ground, MD 21010 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

STANDARDS

MILITARY

MIL-STD-105	-	Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-129	-	Marking for Shipment and Storage.
MIL-STD-252	-	Classification of Visual and Mechanical Defects For Equipment, Electronic, Wired, and Other Devices.
MIL-STD-810	-	Environmental Test Methods.
MIL-STD-1188	-	Commercial Packaging of Supplies and Equipment.

DRAWINGS AND TECHNICAL DATA PACKAGE LIST (TDPL)

US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND

CHEMICAL SYSTEMS LABORATORY

TDPL 5-15-4826	-	Alarm Unit, Chemical Agent Automatic Alarm: ABCA-M42.
D5-15-6568	-	Packaging of Alarm Unit, ABCA-M42.

(Copies of specifications, standards, drawings and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 Materials and components.

3.1.1 Materials. All materials cited on TDPL 5-15-4826 or on the subsidiary drawings shall conform to the specifications listed thereon, or to the specific characteristics set forth on the drawings and in this specification.

3.1.2 Components. All components of the alarm unit shall conform to the specifications and drawings listed on TDPL 5-15-4826 and subsidiary drawings.

3.2 Manufacture and assembly. The components shall be manufactured and assembled as specified on the subsidiary drawings listed on Drawing D5-15-4826.

3.3 Continuity. The interconnecting wiring of the alarm unit shall have a resistance of less than 1.0 ohm between the points listed in table I when tested as specified in 4.4.4.1.

TABLE I. Continuity between points

From	To
J1-B	DS1-2
	LS1-2
	BT1-1
J1-C	DS1-1
J1-H	BT4-2
	S1-4
J1-M	S1-8
J1-N	S1-1

3.4 Resistance. The alarm unit shall have the resistances specified in table II when tested as specified in 4.4.4.2.

Table II. Resistance between points

From	To	Resistance (ohms)
J1-H	J1-B	Greater than 100,000
J1P	E1	20,000
J1R	E2	20,000
J1-B	J1-M	3.2 ± 0.5 in Switch positions TEST and HORN ON

3.5 Functioning. With the alarm unit energized by 6.0 ± 0.5 volt direct current (vdc) applied at points BT4-2 and BT1-1 and a 12.0 ± 0.5 vdc alarm signal applied at points E1 and E2, the alarm unit shall function as follows when tested as specified in 4.4.4.3:

(a) When switch S1 is in the HORN ON position, the horn shall sound with a cyclic output and the red light shall flash. Reversing the polarity of the voltage applied at points E1 and E2 shall produce no observable change in the sounding of the horn or the flashing of the light.

(b) When switch S1 is in the HORN OFF position, the horn shall not sound but the light shall continue to flash.

(c) When switch S1 is in the TEST position, the horn shall sound with a cyclic output and the red light shall flash.

3.6 Sound level. The sound level of the horn output shall be at least 88 decibels [dB(A)] when measured at a distance of 24.0 ± 2.0 inches (60.96 ± 5.08 cm) from and perpendicular to the horn grill, in a sound test chamber capable of maintaining a reference background noise level of less than 60 decibels (dB(A)] above 2.0×10^{-4} dynes per square centimeter when tested as specified in 4.4.4.4.

3.7 Top panel leakage. There shall be no evidence of air leakage through the top panel of the alarm unit or through or around any of the components mounted thereon when the internal air pressure of the alarm unit is increased to 8.0 ± 0.5 inch (20.32 ± 1.27 cm) of water greater than the ambient pressure and the alarm unit is immersed in a tank of water to a maximum depth of 2.0 inches (5.08 cm) measured from the top surface of the top panel to the surface of the water for at least 45 seconds when tested as specified in 4.4.4.5.

3.8 Gasket leakage. Leakage through the gasketed joint between the alarm unit top panel and the housing (Dwg. D5-15-4824) shall not exceed 46.0 cubic centimeters per minute with the internal air pressure of the alarm unit increased to 8.0 ± 0.5 inch (20.32 ± 1.27 cm) of water greater than the ambient pressure when tested as specified in 4.4.4.6.

3.9 Operation at low temperature. When tested as specified in 4.3.3.1, the alarm unit shall meet the requirements of 3.5 and 3.6 when the alarm unit is at a temperature of -40° ± 5°F (-40° ± 2.8 C). The alarm unit shall be subjected to the low temperature for at least 3 hours prior to testing at that temperature.

3.10 Operation at high temperature. When tested as specified in 4.3.3.2, the alarm unit shall meet the requirements of 3.5 and 3.6 when the alarm unit is at a temperature of 120° ± 5°F (48.9° ± 2.8°C). The alarm unit shall be subjected to the high temperature for at least 3 hours prior to testing at that temperature.

3.11 Operation during rain. When tested as specified in 4.3.3.3, the alarm unit shall meet the requirements of 3.5 after the alarm unit has been exposed to rainfall at the rate of 4.0 ± 0.5 inch (10.16 ± 1.27 cm) per hour for 0.5 ± 0.1 hour with the top panel of the alarm unit up, and then with the alarm unit canted 45° ± 5° and each of the four sides in turn exposed to rainfall at the rate of 4.0 ± 0.5 inch (10.16 ± 1.27 cm) per hour for 0.5 ± 0.1 hour. In addition, the horn of the alarm unit shall not sound and the light shall not light during any of the exposures to rain required above. The accumulation of water within the case of the alarm unit shall not be a cause for rejection.

3.12 Operation after vibration. When tested as specified in 4.3.3.4, the alarm unit shall meet the requirements of 3.5 and 3.6 after exposure to the vibration environment described in MIL-STD-810, method 514, procedure VIII, curve Y (6,000 miles) (9,656 kilometers). The alarm unit battery shall be in place in the alarm unit during exposure to the vibration environment, but the alarm unit need not be producing a sound. There shall be no physical deterioration of the unit after vibration.

3.13 Preproduction. Prior to the start of regular production, a preproduction sample of the alarm units shall be produced in accordance with this specification for examination and test (see 4.3).

3.14 Workmanship. The workmanship of the alarm unit shall be in accordance with MIL-STD-252.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection.

4.1.1 Contractor's responsibility. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to specified requirements.

4.1.2 Objective evidence. The contractor shall provide objective evidence acceptable to the contracting officer that the requirements of 3.1 and section 5 for which specific inspection has not been provided in this specification have been satisfied.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

(a) Preproduction inspection (see 4.3).
(b) Quality conformance inspection (see 4.4).

4.3 Preproduction inspection.

4.3.1 Sample. A preproduction sample of eight alarm units shall be manufactured using the same methods, materials, equipment, and processes as will be used during regular production.

4.3.2 Inspection procedures for examination and nondestructive tests. The preproduction sample of alarm units shall be examined in accordance with 4.4.3.3 and tested in accordance with 4.3.3 and 4.4.4 for conformance to the requirements of this specification.

4.3.3 Tests. Tests shall be conducted as follows:

4.3.3.1 Operation at low temperature. Install 4 cells suitable for low temperature operation into the alarm unit (see 6.3). Connect a source of 12.0 ± 0.5 vdc with an output capability of at least 100 milliamperes to alarm terminals E1 and E2. Include a means of reversing the polarity of the voltage applied at E1 and E2 and opening the circuit while the alarm unit is in a test chamber. Place switch S1 of the alarm in the HORN ON position, and open the circuit to the 12.0 ± 0.5 vdc source. Place the alarm unit into a test chamber already at the temperature required by 3.9 and permit it to remain undisturbed at that temperature for the required period of time. Then, close the circuit to the 12.0 ± 0.5 vdc source and observe the functioning of the alarm unit. Reverse the polarity of the voltage applied at E1 and E2 and again observe functioning. Functioning shall be as required by 3.5(a). Complete the following test sequence, through the measurement of sound level ouput, within 5 minutes after opening the chamber door: Open the chamber door and place switch S1 in the HORN OFF position, disconnect the 12.0 ± 0.5 vdc source from the alarm unit and then place switch S1 in the TEST position. Functioning shall be as required by 3.5(b) and 3.5(c). Remove the alarm unit from the temperature test chamber and place it into a sound level test chamber that conforms with the requirements of 3.6. Measure the sound output of the alarm unit. The sound output shall be as required by 3.6.

4.3.3.2 Operation at high temperature. Install a suitable battery into the alarm unit. Connect a source of 12.0 ± 0.5 vdc with an output capability of at least 100 milliamperes to alarm terminals E1 and E2. Include a means of reversing the polarity of the voltage applied at E1 and E2 and opening the circuit while the alarm unit is in a test chamber. Place switch S1 of the alarm unit in the HORN ON position, and open the circuit to the 12.0 ± 0.5 vdc source. Place the alarm unit into a test chamber already at the temperature required by 3.10 and permit it to remain undisturbed at that temperature for the required period of time. Then, close the circuit to the 12.0 ± 0.5 vdc source and observe the functioning of the alarm unit. Reverse the polarity of the voltage applied at E1 and E2 and again observe functioning. Functioning shall be as required by 3.5(a). Complete the following test sequence, through the measurement of sound level output, within 5 minutes after opening the chamber door: Open the chamber door and place switch S1 in the HORN OFF position, disconnect the 12.0 ± 0.5 vdc source from the alarm unit, and then

place switch S1 in the TEST position. Functioning shall be as required by 3.5(b) and 3.5(c). Remove the alarm unit from the temperature test chamber, and place it into a sound level test chamber that conforms with the requirements of 3.6. Measure the sound output of the alarm unit. The sound output shall be as required by 3.6.

4.3.3.3 Operation during rain. Install a suitable battery into the alarm unit and place switch S1 in the HORN ON position. Place the alarm unit, top panel up, into a test chamber previously adjusted to produce rainfall at the rate required by 3.11. Turn on the rain for the required period of time. Connect a source of 12.0 ± 0.5 vdc with an output capability of at least 100 milliamperes to alarm terminals E1 and E2 and observe functioning. Reverse the polarity of the voltage applied at E1 and E2 and again observe functioning. Functioning shall be as required by 3.5(a). Place switch S1 in the HORN OFF position, disconnect the 12.0 ± 0.5 vdc source, and then place switch S1 in the TEST position. Functioning shall be as required by 3.5(b) and 3.5(c). Return switch S1 to the HORN ON position . Cant the alarm 45° ± 5°, and subject it to another period of the rainfall required by 3.11. Test functioning as was done after exposure to rain with the top panel up. Reposition the alarm unit such that it is still canted 45° ± 5° but another side is exposed to the rain. Subject to rain, and then test functioning. Continue this procedure until all four sides of the alarm unit as well as the top panel have been exposed to the rain. During each period of rainfall, monitor the alarm unit for the sounding of the horn and the lighting of the light; 3.11 requires that the horn shall not sound and the light shall not light during exposure to the rainfall.

4.3.3.4 Operation after vibration. Install a suitable battery into the alarm unit, and place switch S1 in the HORN ON position. Subject the alarm unit to the vibration environment required by 3.12. After vibration, subject the alarm unit to the functioning and sound level tests specified in 4.4.4.3 and 4.4.4.4. Functioning and sound level shall be as required by 3.5 and 3.6. Examine the unit for physical deterioration.

4.3.4 Acceptance/rejection criteria. The alarm unit shall comply with the examinations and tests specified in 4.3.2 to be acceptable. The supplier shall obtain written approval from the contracting officer before proceeding with regular production.

4.4 Quality conformance inspection.

4.4.1 Lotting. A lot shall consist of the alarm units offered for acceptance at one time, which have been produced by one manufacturer, under essentially the same manufacturing conditions.

4.4.2 Sampling for examination and for sound level, top panel leakage, and gasket leakage tests. Sampling shall be conducted in accordance with MIL-STD-105.

4.4.3 Inspection procedures.

4.4.3.1 For examination and for sound level, top panel leakage, and gasket leakage tests. Sample alarm units and the packaging shall be examined and tested in accordance with the classification of defects (4.4.3.3) and MIL-STD-105.

4.4.3.2 For continuity, resistance, and functioning tests. Each alarm unit in the lot shall be tested in accordance with 4.4.4.1, 4.4.4.2, and 4.4.4.3. Any alarm unit found defective shall be rejected.

4.4.3.3 Classification of defects.

(a) Alarm unit, chemical agent automatic alarm: M42, (Dwg. D5-15-4826).

Categories	Defects	Acceptance standards
Critical:	None defined	
Major:	AQL 1.0 percent defective	
101	Workmanship (applicable defects listed as Major in MIL-STD-252, see 3.14)	
102	Sound level	4.4.4.4
103	Top panel leakage	4.4.4.5
104	Gasket leakage	4.4.4.6
Minor:	AQL 4.0 percent defective	
201	Workmanship (applicable defects listed as Minor in MIL-STD-252, see 3.14)	
	AQL 6.5 percent defective	
202	Workmanship (applicable defects listed as Control in MIL-STD-252, see 3.14)	

4.4.3.3 Classification of defects (continued).

(b) Packaging (section 5).

Categories	Defects
Critical:	None defined
Major:	AQL 2.5 percent defective
101	Packaging or packing component missing, incorrect, or incorrectly assembled
102	Packaging or packing component damaged
103	Markings missing, incorrect, or illegible

4.4.4 Tests. Tests shall be conducted as follows:

4.4.4.1 Continuity. Remove the top panel (Drawing E5-15-4819) from the housing (Drawing D5-15-4824). Remove the circuit card (Drawing D5-15-4805) from the top panel. Connect an ohmmeter having an accuracy of at least ± 2° of arc on the R X 1 scale and 1.5° of arc on the R X 100 and R X 10K scales deflection successively to each pair of test points listed in table I and measure the resistance. The resistance measured at each pair of test points shall be as required by 3.3. NOTE: Power sources should be disconnected prior to measurement.

4.4.4.2 Resistance. Remove the top panel (Drawing E5-15-4819) from the housing (Drawing D5-15-4824). Remove the circuit card (Drawing D5-15-4805) from the top panel. Connect an ohmmeter having an accuracy of at least ± 2° of arc on the R X 1 scale and 1.5° of arc on the R X 100 and R X 10K scales deflection successively to each pair of test points listed in table II and measure the resistance. The resistance measured at each pair of test points shall be as required by 3.4.
NOTE: Power sources should be disconnected prior to measurement.

4.4.4.3 Functioning. Remove the top panel (Drawing E5-15-4819) from the housing (Drawing D5-15-4824). Connect a source of 6.0 ± 0.5 vdc with an output capability of at least 1.0 amp to test points BT4-2 and BT1-1. The plus terminal of the power source must be connected to BT4-2. Connect a source of 12.0 ± 0.5 vdc with an output capability of at least 100.0 milliamperes to points E1 and E2. Place switch S1 in the HORN ON position and observe the functioning of the alarm unit. Interchange the power source connections at E1 and E2, and again observe the functioning of the alarm

unit. Functioning shall be as required by 3.5(a). Place switch S1 in the HORN OFF position. Functioning of the alarm unit shall be as required by 3.5(b). Disconnect the 12.0 + 0.5 vdc source, then place switch S1 in the TEST position. Functioning of the alarm unit shall be as required by 3.5(c).

4.4.4.4 Sound level. Place the completely assembled alarm unit, with battery installed, in a test chamber that conforms to the requirements of 3.6. Position the microphone of the sound level measuring device in the relationship to the alarm unit required by 3.6. Place switch S1 of the alarm unit in the TEST position, and measure the sound output of the alarm unit. The level of this sound output shall conform to requirements of 3.6.

4.4.4.5 Top panel leakage. Install the alarm unit top panel onto a test housing conforming to Drawing D5-15-4824. The test housing shall be fitted with a suitable air inlet connection attached to a magnehelic gage, having an accuracy of not less than 2.0 percent full scale deflection in 0.5 inch of water increments, which is then connected to a regulated pneumatic source. Increase the air pressure within the alarm unit until 8.0 $\pm$ 0.5 inch (20.32 $\pm$ 1.27 cm) of water is indicated on the magnehelic gage. Immerse the alarm unit in a tank of water to the specified depth for the required period of time. The water should contain a suitable wetting agent (e.g., 1 gram of Aerosol OT per 500 milliliters of water). Examine the top panel for evidence of leakage as required by 3.7. A leak is defined as a bubble making or breaking from the surface of the alarm unit top panel.

4.4.4.6 Gasket leakage. Install the alarm unit top panel onto a test housing conforming to Drawing D5-15-4824. The test housing shall be fitted with a suitable air inlet connection attached to a flowmeter graduated in 0.5 cubic centimeter increments, and a magnehelic gage graduated in 0.5 inch of water increments, and in turn connected to a regulated pneumatic source. The flowmeter and the magnehelic gage shall have an accuracy of not less than 2.0 percent full scale. Increase the air pressure within the alarm unit until 8.0 $\pm$ 0.5 inch (20.32 $\pm$ 1.27 cm) of water is indicated on the magnehelic gage and maintain the system at this pressure for a period of not less than 1 minute. Observe the flowmeter during this test period. The leakage as indicated by the flowmeter shall not exceed that permitted by 3.8.

5. PACKAGING

5.1 Preservation and unit packing, level A. The alarm unit shall be unit packed in accordance with Drawing C5-15-6568.

5.2 Packing, level A or commercial (see 6.2).

5.2.1 Level A. The alarm unit packed as specified in 5.1 shall be packed in containers conforming to the following:

(1) Box, wood, class 2, style 4, grade B, type 1 load, weight of contents 0-50 pounds, of PPP-B-621.

(2) Box, cleated plywood, overseas type, style optional, grade B, type 1 load, weight of contents 0-100 pounds, of PPP-B-601. The inside dimensions of the boxes shall be 11-1/8 by 8-3/8 by 6-3/4 inches (+ 1/8 inch tolerance on each of the dimensions) length, width, and depth, respectively. The boxes shall be closed and strapped in accordance with the appendix of their respective specifications. Strapping and seals shall conform to QQ-S-781 [Strapping - type I (regular duty), finish B, grade 2, and Seals - type D, style I or IV, finish B, grade 2].

5.2.2 Commercial packing. A uniform quantity of alarm units, unit packed as specified in 5.1, shall be prepared for shipment as specified in MIL-STD-1188.

5.3 Marking. In addition to any special marking required by the contract or order, unit packs (5.1) shall be marked in accordance with MIL-STD-129 (interior unit pack markings). Level A shipping containers (5.2.1) shall be marked in accordance with Drawing D5-15-6564. Commercial shipping containers (5.2.2) shall be marked in accordance with MIL-STD-1188."

6. NOTES

6.1 Intended use. This alarm unit is intended f or use as a portable remote alarm in the ABCA-M8 chemical agent alarm.

6.2 Ordering data. Procurement documents should specify the following:

(a) Title, number, and date of this specification.
(b) Preproduction.

(1) Time allowed for contractor submission of samples for Government test and evaluation after award of contract.
(2) Name and address of test facility and shipping instructions when testing is performed by the Government.
(3) Time required for the Government to notify the contractor whether or not to proceed with production.

(c) Level A or commercial packing required.

6.3 Cells for low temperature operation. Eveready E95 or BA-3030/U cells have been found to be satisfactory for this test.

6.4 International interest. Certain provisions of this specification are the subject of international standardization agreement QSTAG 251. When amendment, revision, or cancellation of this specification is proposed which will affect or violate the international agreement concerned, the preparing activity will take appropriate reconciliation action through international standardization channels including departmental standardization offices, if required.

Custodian:

Army - EA

Preparing activity:

Army - EA

Project No. 6665-A404

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EDITION OF 1 JAN 72 WILL BE USED UNTIL EXHAUSTED.