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PERFORMANCE SPECIFICATION
RADIAC SET, AN/PDR-75

This performance specification is approved for use by USACECOM, Department of the Army and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE.

1.1 Scope. This performance specification covers the Radiac Set, AN/PDR-75.

2. APPLICABLE DOCUMENTS.

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents 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 documents cited in sections 3 and 4 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 listed in the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (See 6.2). Handbooks are for guidance only and therefore are not mandatory.

Comments, suggestions, or questions on this document should be addressed to: Communications-Electronics RDEC ATTN: RDER-PRQ-QE Fort Monmouth, NJ 07703-5201or emailed to mike.g.williams@us.army.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at https://assist.daps.dla.mil.

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HANDBOOKS
DEPARTMENT OF DEFENSE

MIL-HDBK-454 Standard General Requirements for Electronic Equipment.

MIL-HDBK-781 Reliability Design Qualification and Production Acceptance Tests.

(Unless otherwise indicated, copies of the above specification, standards and handbooks are available at https://assist.daps.dla.mil.)

2.2.2 Other Government documents, drawings and publications. The following Government documents, drawings, and publications form a part of this specification to the extent specified herein. Unless otherwise specified, the issues should be those in effect on the date of the solicitation.

PUBLICATIONS

EL-CP-5111-0002A	- Nuclear Survivability Requirements for Detector, Radiac DT-236/PD and Computer Indicator, CP-696( )UD, 18 March 1974
TB 9-6665-286-35	- Calibration Procedure for Radiac Set, AN/PDR-75 MK-2512/PDR-75 - Maintenance Kit

(Copies of documents, 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).

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 the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation. (See 6.2).

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C63.14-1994 - Electromagnetic Compatibility (EMC) etc.; Dictionary for Technologies of

(Application for copies should be addressed to http://www.ansi.org/contact_us/contact_us.aspx?menuid=contact).

2.4 Order of Precedence. 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

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document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 AN/PDR-75 System Description. The AN/PDR-75 Radiac Set consists of the Computer Indicator Radiac CP-696/PDR-75 (Reader), the Carrying Case CY-8420/PDR-75 and three power cables. The Dosimeter (DT-236/PDR-75) is used with but not a part of the Radiac Set. It measures neutrons and gammas from nuclear detonations and residual neutrons and gammas from contamination. The dosimeter is contained in a two-part case and is a type that can be worn the same as a wristwatch. The Reader is capable of opening, reading and closing the dosimeter. Two separate reading elements are contained in the Reader, consisting of an ultraviolet light source, filters and a light detector for reading the gamma dose, plus a constant current source and a peak reading voltmeter for reading the neutron dose. A digital meter displays a combined reading of the two separate reading elements. The range of the system is zero to one thousand centigrays (cGy) (threshold) and zero to two thousand cGy (objective). The CP-696/PDR-75 is powered from a 24 volt DC source.

3.1.1 Functional Description. The CP-696/PDR-75 Radiac Computer Indicator is used to measure the accumulated neutron and gamma radiation recorded by the Dosimeter DT-236/PDR-75. The Radiac Detector DT-236/PDR-75 is worn by personnel who may be exposed to radiation from nuclear weapons.

3.1.2 First Article. When specified in the contract (See 6.2), the contractor should furnish first article units for inspection (See 4.3).

3.2 Materials. The contractor should select the materials, but the materials and parts used should be fully capable of meeting all of the operational and environmental requirements specified herein. The materials specified in the applicable drawings are recommended, but are not mandatory. Selection criteria of the class, grade or type part should be that the material will be able to perform its intended function when it is assembled. Verification of the supplier meeting the overall performance requirements should be the governing acceptance standard. Recovered materials should be used to the maximum extent possible.

3.2.1 Bonds and Grounds. Bonding for equipment current path returns, RF potentials and shock hazards should be installed so that expansion, contraction, or movement incident to normal service use and maintenance will not break or loosen the connections. Surface preparation for bonds and grounds should be accomplished by removing all anodic film, grease, paint, lacquer or other high resistance coatings from the immediate areas of contact. The equipment finish should be restored to its original condition. The DC resistance of bonds and grounds should not exceed 25.0 milliohms. (See 4.8.1).

3.2.2 Cables and Connectors. Shielded cables, when required, should have a shield weave providing 90% coverage. For guidance, refer to requirement 11 of MIL-HDBK-454.

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3.3 Design.

3.3.1 Calibration of the AN/PDR-75 reader. The AN/PDR-75 field reader should be calibrated in accordance with the calibration procedure described in Department of the Army Technical Bulletin, TB 9-6665-286-35. The reference locket set in Maintenance Kit, MK-2512/PDR-75 should be calibrated every 6 months by the U.S. Army Test Measurement and Diagnostic Equipment (TMDE) Support Group.

3.3.2 Finish. All surfaces of the CP-696/PDR-75 requiring a protective coating should be finished with a green chemical resistant polyurethane coating.

3.3.3 Interchangeability. Like units, subassemblies and replaceable parts should be electrically and mechanically interchangeable.

3.3.3.1 Electrical and mechanical interchangeability demonstration test (EMIDT). The EMIDT should be conducted to validate that the equipment possesses such functional and physical characteristics as to be equivalent in performance to another item of identical purpose. The interchanged items should be capable of exchange with identical purpose items without selection for fit or performance and without alteration of the item or adjoining items, except for adjustment.

3.4 Dimensions.

3.4.1 Size and Weight. The total weight of the Radiac Set, AN/PDR-75 should not exceed 35 lbs. (15.8 Kg). The external dimensions of the CP-696/PDR-75 should not exceed:

Width: 8.09 in. (205mm)
Height: 7.52 in. (191mm)
Depth: 13.11 in. (333mm)

The external dimensions of the carrying case should not exceed:

Width: 13.16 in. (334mm)
Height: 12.50 in. (315mm)
Depth: 21.75 in. (555mm)

3.5 Performance requirements.

3.5.1 Accuracy. The AN/PDR-75, when reading DT-236/PDR-75 dosimeters, should, as a system, have an accuracy of ±30 percent or ±15 cGy below 50 cGy of the true dose delivered to the dosimeter at the temperature limits of -25ºF (-32ºC) and +125ºF (+52ºC) (See 4.5.1).

3.5.2 Precision. DT-236/PDR-75's dosed to 500 cGy and read on the AN/PDR-75, should exhibit readings of ±5% of its own mean with a 95% confidence level (See 4.5.2).

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3.5.3 Reading Rate. The AN/PDR-75 should be designed to allow reading at least 60 DT-236/PDR-75's per hour (See 4.5.3).

3.5.4 Voltage Range. The AN/PDR-75 should operate at voltages between 21 to 30 volts DC.

3.5.4.1 Power Supply Transient Voltage. The AN/PDR-75 should provide protection from vehicular/charging system transients up to 40 volts for less than 50 milliseconds or 600 volts for less than 10 microseconds.

3.5.5 Orientation. The AN/PDR-75 should operate when inclined ±20 degrees from the normal (0°) orientation (See 4.5.5).

3.5.6 Burn-in. Each AN/PDR-75 should be operated for a minimum of 48 hours under the conditions specified in paragraph 4.5.6. The burn-in should be concluded by a failure free period, the duration of which should be not less than 16 hours. Performance should be monitored as specified in paragraph 4.5.6 and its subparagraphs.

3.5.7 Secure Lighting. The equipment should not emit excessive light that can be readily detected by image intensifier devices (See 4.5.7).

3.6 Environmental Conditions. The AN/PDR-75 should be subjected to and meet the environmental conditions below. For the purpose of environmental conditions, specified performance is defined as meeting the following requirements:

Requirement paragraph	Measurement
3.5.1	Accuracy
3.5.2	Precision

3.6.1 High Temperature: The AN/PDR-75 should not be damaged or experience any degradation of performance after being operated at 125+°F (+52°C) or stored at +160°F (+71°C) (See 4.6.1).

3.6.2 Low Temperature. The AN/PDR-75 should not be damaged or experience any degradation of performance after being operated at -25°F (-32°C) or stored at -70°F (-57°C) (See 4.6.2).

3.6.3 Humidity. The AN/PDR-75 should not be damaged or experience any degradation of performance following exposure to relative humidity of 94, ±4 percent (See 4.6.3).

3.6.4 Altitude. The AN/PDR-75 should not be damaged or experience any degradation of performance following transport by aircraft to 40,000 feet (12,192m) (non-operating) and operation at altitudes up to 10,000 feet (3,048m) (See 4.6.4).

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3.6.5 Immersion. The AN/PDR-75, in its carrying case, should not be damaged or experience any degradation of performance after being immersed in fresh water to a depth of not less than 3.3 feet (1 meter) for a period of 120 minutes (See 4.6.5).

3.6.6 Shock, Transit Drop. The AN/PDR-75, in its carrying case, should not be damaged or experience any degradation of performance after being subjected to a sequence of shocks applied in each direction along each of 3 mutually perpendicular axes (horizontal and vertical). Shocks should be half sine pulses having a time duration of 4 milliseconds, ±5%. Shock pulses should have a peak amplitude of 100 g's ±15 g's (See 4.6.6).

3.6.7 Vibration. The AN/PDR-75 should withstand, without damage, simple harmonic motion having an amplitude of ±0.015 inches (0.030 inch total excursion) with the frequency being varied between 5-55 Hz (See 4.6.7).

3.6.8 Shock, Bench Handling. The AN/PDR-75 should not be damaged or experience any degradation of performance after being subjected to normal bench handling shocks (See 4.6.8).

3.6.9 Dust (Fine Sand). The AN/PDR-75 should withstand, in both operating and non-operating conditions, exposure to fine dust particles with wind speeds of 1750 ft/min (17.3 knots) and exposure to sand particles with wind speeds of 5700 ft/min (56.4 knots) (See 4.6.9).

3.6.10 Salt Fog. After the salt fog test (See 6.3), the AN/PDR-75 should operate without degradation in specified performance and should show no evidence of degradation such as flaking, pitting, blistering or loosening of finish on metal surface or exfoliation. Also, there should be no binding or clogging of mechanical parts. Drawer contacts should be cleaned prior to performance of operational checks to ensure contact with DT-236/PDR-75 dosimeters (See 4.6.10).

3.6.11 Fungus. The AN/PDR-75, as prepared for operation, should be subjected to the fungus test. There should be abundant growth colonization on 50 percent or more of the area of the control item after 14 and 28 days. No cleaning of the reader is permitted for 72 hours prior to the fungus test. Handling, prior to and during testing, should be accomplished without contamination of the reader (See 6.3). After the fungus test, the AN/PDR-75 should be visually examined. The reader should show no more than sparse microbial growth with restricted tubular growth development in an area ten percent or less of the total area and no more than six unrelated minute circuit portions such as terminal spacing, printed circuit boards, etc., with sparse growth due to random contamination or traces of unmixed material ingredients. In addition, the reader should operate without degradation in specified performance after the test of 4.6.11.

3.6.12 Temperature Shock. The equipment should be capable of withstanding temperature shocks between -65°F (-54°C) and +145°F (+63°C) (See 4.6.12).

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3.6.13 Explosive Atmosphere. The equipment should not cause ignition of an ambient-explosive-gaseous mixture with air when operating in such an atmosphere. (See 4.6.13).

3.7 Nuclear Survivability. The AN/PDR-75 should be subjected to the nuclear environmental conditions specified in EL-CP-5111-0002A. The reader should be energized during exposure. The AN/PDR-75 should meet the specified performance after being subjected to the nuclear environment (See 4.7).

3.7.1 Electromagnetic Pulse (EMP). The AN/PDR-75 should be placed within a long wire electromagnetic pulse facility or its equivalent in the following orientations:

a. Power cables extend parallel to the electric field and perpendicular to the magnetic field; all individual units under the long wire, but widely separated.

b. Power cables coiled on the ground; all units centrally located under the long wire. Test data should satisfy the EMP requirements in accordance with EL-CP-5111-0002A (See 4.7.1).

3.7.2 Thermal Radiation. The AN/PDR-75 should be subjected to the thermal radiation levels specified in EL-CP-5111-0002A without damage. Since the available simulation facilities provide these thermal radiation levels only over relatively small areas, many individual exposures will be required so that each of the exposed surfaces (case, meters, knobs cables, and other outboard components) will receive the required thermal exposure. The AN/PDR-75, when so exposed, should show no degradation and should meet specified performance (See 4.7.2).

3.7.3 Nuclear Air Blast. The AN/PDR-75 should be placed in a nuclear air blast simulation facility and exposed to the air blast environment as specified in EL-CP-5111-0002A. The reader should meet the specified performance following this test (See 4.7.3).

3.7.4 Initial Nuclear Radiation. The complete reader should be exposed to a LINAC and a pulsed or fast burst reactor in such a manner that all electronic piece parts and circuits in the set receive the neutron and gamma doses and rates specified in EL-CP-5111-0002A. The reader should meet specified performance of 3.5.1 and 3.5.2 (See 4.7.4).

3.7.5 Nuclear, Biological and Chemical Environment. The equipment should be such as to minimize contamination by chemical or biological agents or radioactive contaminants. The equipment should be readily capable of decontamination with minimum effect on its proper operation.

3.7.6 Nuclear Contamination Survivability. The AN/PDR-75 should be capable of being decontaminated to a negligible risk level for unprotected personnel operating the equipment with a maximum exposure of 12 hours. A decontamination must result in a particle reduction of at least 2.5:1 using zinc sulfide FP simulant. The AN/PDR-75 must be capable of enduring five contamination/decontamination cycles without degradation in performance (see 4.10.1.3).

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3.8 Electromagnetic Interference (EMI). The AN/PDR-75 should meet the following emission and susceptibility requirements and the requirements of this specification. The procedures recommended in 6.5 may be used as guidance (See 4.8).

a. The power supply switching frequency and its harmonics below 267 KHz are allowed to exceed the limit by a maximum of 10 dB.

b. The injected interfering signal should be 1 KHz, 50% AM.

c. The power supply switching frequency and its second and third harmonics are allowed to exceed the limit by a maximum of 20 dB.

d. The frequency range of test should be 10 KHz to 10GHz with the AN/PDR-75 immersed in the following radiated electric fields.

e. All electromagnetic interference (EMI) tests should be performed for both AC power and DC power and DC power operations. For frequencies between 300 and 450 MHz and field intensities of 8 to 10 volts/meter an increase in reading variation of up to ±20 cGy is allowable.

CE101 (1)	CE101 (1) CE102	CS101 CS102 (2) CS115	RE102	RS103(4)

Frequency range	Field intensities	Modulation characteristics
0.01 - 2 MHz	1V/M	AM 50% 1 KHz tone
2 - 30 MHz	5V/M	"
30 - 2000 MHz	10V/M	"
2 - 10 GHz	5V/M	"

3.9 Reliability and Maintainability. The AN/PDR-75 should have a specified (Θ_0) mean-time between failure (MTBF) of 800 hours. The lower test MTBF (Θ_1) should be 400 hours. The reliability requirements should be demonstrated when operating under the following conditions (See 4.9):

a. Operating temperature: -25°F to +125°F, (-32°C to +52°C)

b. Environment: Ground mobile

c. Duty cycle: 100%

NOTE: Use of MIL-HDBK-781 is recommended.

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3.9.1 Maintainability. The Mean Time To Repair (MTTR) should not exceed 10 minutes at organizational and 120 minutes at GS level. The equipment should not require checkout calibration at intervals of less than 1080 days.

3.10 Safety Engineering.

3.10.1 Personnel Hazards. Personnel hazards should be kept to a minimum. Compliance with these requirements will be verified through a visual inspection.

3.10.2 Corner and Edge Rounding. All exposed corners and edges should be rounded to eliminate possible injury to personnel due to laceration and cuts.

3.10.3 Radioactive Materials. Radioactive materials should not be used (e.g., luminous dials/markings, electron tubes, surge arrestors and lenses).

3.11 Nameplate and Marking (See 4.3.3).

3.11.1 Front Panel Markings. See Requirement 67 of MIL-HDBK-454 for guidance.

3.11.2 Nameplates. Each nomenclatured item should have a nameplate. See Requirement 67 of MIL-HDBK-454 for guidance.

3.11.3 Serial Numbers. Each AN/PDR-75 should be serial numbered in accordance with the contract (See 6.2.k).

3.12 Workmanship. All electronic parts, components, assemblies and sub-assemblies should be free of smudges, excess solder, metal chips or the existence of any foreign material on any surface. Bearing assemblies should be free from rust, dirt or tool marks. Wires and integrated circuitry should be protected from contact with rough or irregular surfaces and should be shielded from shorting (See 4.3.3).

4. VERIFICATION.

4.1. Calibration. The contractor should perform calibration as described in TB 9-6665-286-35, as required in paragraph 3.3.2 of this specification, prior to operating the unit before and after conduction of the tests specified in the Section 4 of this specification.

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

a. First Article inspection (See 4.3).

b. Inspections covered by subsidiary documents (See 4.3.3).

c. Conformance inspection (See 4.4).

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4.3 First Article. Unless otherwise specified in the contract, the first article inspection should be performed by the contractor (See 3.1).

4.3.1 First Article Units. The contractor should furnish 12 first article units of the Radiac Set, AN/PDR-75.

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TABLE I - First Article Inspection

Inspection	Reqt. Para.	Test Para.	Order of tests 2/				
			Unit 1	Unit 2	Unit 3	Unit 4-7	Unit 8-12
1. Inspections covered by subsidiary documents 1/	3.3.3, 3.11, 3.12	4.4.3	Inspection to be performed on all units				
2. Burn-In 1/	3.5.6	4.5.6	Inspection to be performed on all units				
3. Group A inspection 1/	See Table II		Inspection to be performed on all units				
4. Group B inspection 1/	See Table III		Inspection to be performed on all units				
5. Group C inspection Ambient temperature 4/							
High temperature	3.6.1	4.6.1	1				
Low temperature	3.6.2	4.6.2	2				
Humidity	3.6.3	4.6.3	4				
Immersion	3.6.5	4.6.5		3			
Dust	3.6.9	4.6.9		2			
Vibration	3.6.7	4.6.7			1		
Shock, Transit drop	3.6.6	4.6.6			2		
Shock, Bench handling	3.6.8	4.6.8			3		
Salt fog	3.6.10	4.6.10		4			
Fungus	3.6.11	4.6.11			4		
Altitude	3.6.4	4.6.4		1			
Temperature shock	3.6.12	4.6.12	3				
Explosive Atmosphere	3.6.13	4.6.13					
6. Unique first article tests							
Transient voltage 4/	3.5.4.1	4.5.4.1					
Reading rate 3/	3.5.3	4.5.3				1	
Orientation	3.5.5	4.5.5				2	
Nuclear Survivability	3.7	4.7					
Nuclear Air Blast	3.7.3	4.7.3				4	
Thermal Radiation	3.7.2	4.7.2				5	
Electromagnetic Pulse	3.7.1	4.7.1				6	
Initial Nuclear Radiation	3.7.4	4.7.4				6	
Electromagnetic Interference	3.8	4.8				7	
7. Group D Reliability	3.9	4.9					1

1/ The inspections 1 to 4, in the order shown, should be performed on all first article units before subjecting these units to any other inspection requirements.

2/ The numbers in the unit columns in the table, covered by inspections 5 and 6, specify the order of inspections for the indicated units. Each of the 4 nuclear survivability tests should be performed on one unit only after tests 1 and 2. The electromagnetic pulse test will be performed on unit 6 before the initial nuclear radiation test.

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3/ This test involves human performance reliability and equipment compatibility.

4/ Test to be performed on all first article test units.

4.3.2 First Article Inspection. The first article inspection should consist of the inspection specified in Table I and should be performed in the order specified.

4.3.3 Inspections Covered by Subsidiary Documents. The following should be inspected under the applicable subsidiary documents as part of the inspection required by this specification and the inspection requirements specified in the contract.

4.4 Conformance Inspection. The contractor should perform the inspections specified in 4.3 and 4.4.1 through 4.4.4. This does not relieve the contractor of his responsibility for performing any additional inspection which is necessary to control the quality of the product and to assure compliance with all specification requirements.

Item	Where required
Finish	3.3.3
Nameplate and marking	3.11
Workmanship	3.12

4.4.1 Group A Inspection. Each unit on contract or purchase order should be inspected for conformance to the inspections in Table II. Lots should be formed from units that pass this inspection. Each lot should be subjected to sampling inspection as specified in the contract or purchase order. Lots in which samples exhibit any failure should be screened for that failure prior to being subjected to Group A inspection.

4.4.1.1 Order of Inspection within Group A. A Group A inspection should be performed in an order satisfactory to the Government.

TABLE II - Group A Inspection

Inspection	Requirement paragraph	Test paragraph
Accuracy 1/ 2/	3.5.1	4.5.1
Precision	3.5.2	4.5.2
Visual and Mechanical	3.1	4.11
Safety Engineering	3.10	4.10
Secure Lighting Electroluminescent Panel	3.5.7	4.5.7

1/ All performance defects are major.
2/ Accuracy tests performed on dosimeters with doses of 50, 200, 400, 500, 700, and 800 cGy and temperatures of 0°F and 32°F required during first article testing should be

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deleted from production testing.

TABLE IIA - Sampling Plan for Accuracy, Precision, Visual and Mechanical, Safety Engineering, and Voltage Range

Lot Size	Sample Size
1 to 8	1/
9 to 15	13
16 to 25	13
26 to 50	13
51 to 90	13
91 to 150	13
151 to 280	13
281 to 500	20
501 to 1200	34
1201 to 3200	42
3201 to 10,000	50
10,001 to 35,000	60
35,001 to 150,000	74
150,001 to 500,000	90
500,001 and over	102

NOTES:

1. 1/ Indicates entire lot must be inspected.
2. Acceptance number in all cases is zero.

4.4.2 Group B Inspection. Group B inspection should be performed on lots that have passed Group A inspection. This inspection should consist of the inspections listed in Table III. Lots in which samples exhibit any failures should be screened for that failure prior to the units within the lot being subject to Group C inspection.

TABLE III - Group B Inspection

Inspection	Requirement paragraph	Test paragraph
Visual and Mechanical	3.4.1	4.11
Interchangeability	3.3.3	4.12
Size and Weight	3.4.1	4.11.1
Voltage Range 1/	3.5.4	4.5.4
Orientation	3.5.5	4.5.5

1/ Sampling Plan for Voltage Range – See Table IIA.

4.4.2.1 Group B Sampling Plans. Group B sampling should be performed in accordance with the contract or purchase order (See 6.2.j).

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4.4.3 Group C Inspection. Group C inspection should be performed on units that have passed Group A and Group B inspection. The inspection should consist of the inspections specified in Table IV. Samples should be selected in accordance with the contract or purchase order (See 6.2.j).

4.4.3.2 Group C Failures. Action required relative to Group C failure should be as specified in the contract (See 6.2.i).

4.4.3.3 Reinspection of Conforming Group C Sample Units. Unless otherwise specified, sample units which have been subjected to and passed Group C inspection may be accepted on the contract provided all damage is repaired and sample units are resubjected to and pass Group A inspection, with the exception of safety engineering.

TABLE IV - Group C Inspection

Inspection	Requirement paragraph	Test paragraph
Subgroup 1		
High temperature	3.6.1	4.6.1
Low temperature	3.6.2	4.6.2
Temperature shock	3.6.12	4.6.12
Humidity	3.6.3	4.6.3
Subgroup 2		
Altitude	3.6.4	4.6.4
Dust	3.6.9	4.6.9
Salt fog 1/ 2/	3.6.10	4.6.10
Explosive Atmosphere	3.6.13	4.6.13
Subgroup 3		
Vibration	3.6.7	4.6.7
Shock, transit drop	3.6.6	4.6.6
Shock, bench handling	3.6.8	4.6.8
Immersion	3.6.5	4.6.5
Fungus 1/ 2/	3.6.11	4.6.11
Subgroup 4		
Electromagnetic interference 2/	3.8	4.8

1/ The Radiac Set should be thoroughly washed, cleaned, dried and refurbished after this inspection before proceeding with subsequent inspection.

2/ Should be performed at mid-point of production contract.

4.4.4 Group D Inspection. This inspection should consist of the tests specified in Table V and should be performed on units from lots which have been subjected to and met

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Group A and Group B inspection.

4.4.4.1 Group D Failures. Actions relative to Group D failures should be as specified in the contract (See 6.3.i).

4.4.4.2 Sampling for Group D Inspection. Sampling for Group D inspection should be as specified in the contract or order (See 6.2.j).

TABLE V. Group D Inspection.

Inspection	Requirement paragraph	Test paragraph
Reliability	3.9	4.9

4.4.4.3 Reinspection of Conforming Group D Sample Units. Unless otherwise specified, sample units which have been subjected to and passed Group D inspection may be accepted on contract provided all visible and known damage is repaired and the sample units are resubjected to and pass Group A inspection.

4.5 Methods of inspection.

4.5.1 Accuracy. The DT-236/PDR-75 dosimeters exposed to 50, 100, 200, 300, 400, 600, 700, 800, and 900 cGy gamma and neutron radiation respectively, should be read at 48 hours ±1 hour after exposure with a calibrated AN/PDR-75 field reader at -25°F (-32°C), 0°F (17.7°C), 32°F (0°C), 68°F, (20°C) and 125°F (+52°C). The AN/PDR-75, as a system, should meet the accuracy requirements given in 3.5.1. The readings should be taken within the 0-999 cGy scale range. Fifteen neutron readings should be taken when reading each separate neutron dosed DT236. The first ten readings should be discarded and the remaining five recorded and averaged. Five readings should be taken when reading each separate gamma dosed DT-236, then recorded and averaged.

NOTE: Both reader and dosimeters should be tested at the listed temperature.

4.5.2 Precision. A DT-236/PDR-75 should be exposed to 500 cGy neutron and after 48 hours ±1 hour stabilization period should be read twenty consecutive times on a AN/PDR-75. Failure of the readings to fall within the limits specified in 3.5.2 should constitute failure of the test. The above should be performed for both neutron and gamma standards.

4.5.3 Reading Rate. Fifteen dosimeters should be opened, read and resealed in 15 minutes or less (See 3.5.3).

4.5.4 Voltage Range. The DT-236/PDR-75 dosimeters exposed to 50, 100, 200, 300, 400, 500, 600, 700, 800, and 900 cGy gamma and neutron radiation respectively should be read at -25°F (-32°C) and 125°F (+52°C). The input voltage to the reader should be set at

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21 volts and 30 volts and readings taken at both temperatures (See 3.5.4). Accuracy should be in accordance with 3.5.1.

NOTE: Both reader and dosimeters should be tested at the listed temperatures.

4.5.4.1 Power Supply Transient Voltage. The contractor should set up and conduct transient voltage tests at room temperature. The AN/PDR-75 operational verification should be conducted before and after test. Data should be recorded of the electrical test environment and readings taken during the operational verification of the unit. The test electrical environment should be voltage transient of 40 volts for less than 50 milliseconds or 600 volts for less than 10 microseconds (See 3.5.4.1).

4.5.5 Orientation. The dosimeters should be read with the reader set at an angle of 20° from the normal operating position tilted back, to the front, and to both sides (See 3.5.5).

4.5.6 Burn-in. (See paragraph 3.5.6).

4.5.6.1 Test Equipment.

a. Temperature Chamber
b. Temperature Controller
c. Temperature Recorder
d. Programmable Power Supply
e. Cable(s) as appropriate

4.5.6.2 Test Facility. The required apparatus consists of a chamber or cabinet and auxiliary instrumentation capable of maintaining and continuously monitoring the specific conditions of temperature.

4.5.6.3 Controls. Burn-in must be a minimum of 48 hours concluded by a failure free period of at least 16 hours. The failure free period of 16 hours is part of the 48 burn-in hours. Each Radiac Set and spare assembly identified should be operated under the following conditions:

Temperature Cycling: Six 8 hour cycles with temperature variation from -51°C to +48.9°C. The temperature change rate should be uniform. Continuous recordings of chamber temperature should be taken.

Operating Time: 3 hours on, 15 minutes off.

Voltage Stress:

Percentage of Operating Time	Voltage
33	100% Nominal Voltage ±0.2 volts
33	110% Nominal Voltage ±0.2 volts
33	90% Nominal Voltage ±0.2 volts

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Failure. Failures will be noted on the data sheet in the “Remarks” column. Failures will be noted by unit serial number. Failed units will be repaired and resubjected to the burn-in test.

4.5.6.4 Test Interruption. To achieve the desired effects, the test item must be subjected to the burn-in environment without interruption.

Undertest Interruptions. Any occurrence that causes the test section temperature to deviate more than 10% of the measured value toward ambient atmospheric conditions should be followed by a repeat of the entire test.

Overtest Interruptions. Any occurrence that results in a temperature decrease of more than 10% of the measured value below that cited by this specification should be followed by a complete physical examination and operational check (where possible). Any evidence of deterioration should result in a retest. Reinitiation of the entire test with a new test item is allowed. If no deterioration is detected, the entire test should be repeated.

4.5.6.5 Preparation for Test.

4.5.6.5.1 Preliminary Steps. Before initiating any testing, determine from section 4.8.13.3 the burn-in requirements.

4.5.6.5.1.1 Set Up.

a. Install the equipment under test in the temperature chamber. The units will have their batteries removed, and be powered by a single programmable power supply external to the chamber. Attached to the probe of each unit will be an appropriate radiation source capable of producing a mid-range reading. Each source will be mechanically secured to preclude movement.

b. Record the standard ambient conditions on the data sheet.

c. Record the operational and visual inspection results for compliance with requirements on the data sheet.

4.5.6.6 Procedures. The following test procedures, alone or in combination, provide the basis for collecting the necessary information concerning the performance of the test item(s) in the specified environment. Specific steps are included in the test procedures to combine the test procedures to get the necessary test data. Unless otherwise specified, the chamber temperature should be maintained at standard ambient conditions.

The equipment under test should be subjected to six 8 hour temperature cycles. The temperature cycle should start at ambient room temperature (~20°C) and automatically increase at a uniform rate to 48.9°C, then decrease at a uniform rate to -51°C, and then increase again to ambient room temperature. The rate of change in the temperature

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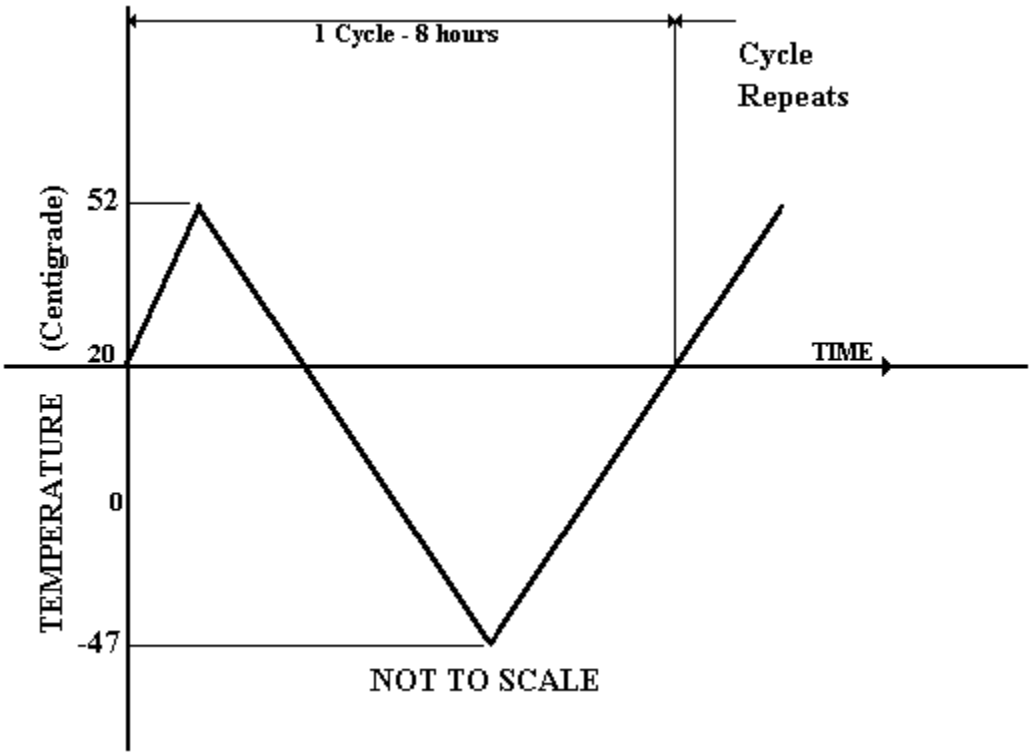
chamber should be controlled using the temperature controller so that one complete cycle takes eight hours. The temperature cycle is shown in figure 4.5.6.1.

The equipment under test should be energized for a period of fifteen minutes every three hours. The operating time cycle is shown in figure 4.5.6.1.



4.5.6.1 - Burn-In Temperature Cycle

When energized, the voltage powering the equipment under test should be automatically adjusted as follows:

Percentage of Operating Time	Voltage
33	100% Nominal Voltage ±0.2 volts
33	110% Nominal Voltage ±0.2 volts
33	90% Nominal Voltage ±0.2 volts

The response of each unit under test will be recorded on the data sheet at the beginning and at the end of each burn-in (48 hours or six cycles), as well as at 16 hours into the test. Operation of the test unit will be considered satisfactory if the performance requirements specified in paragraph 3.5 are met without subsequent processing.

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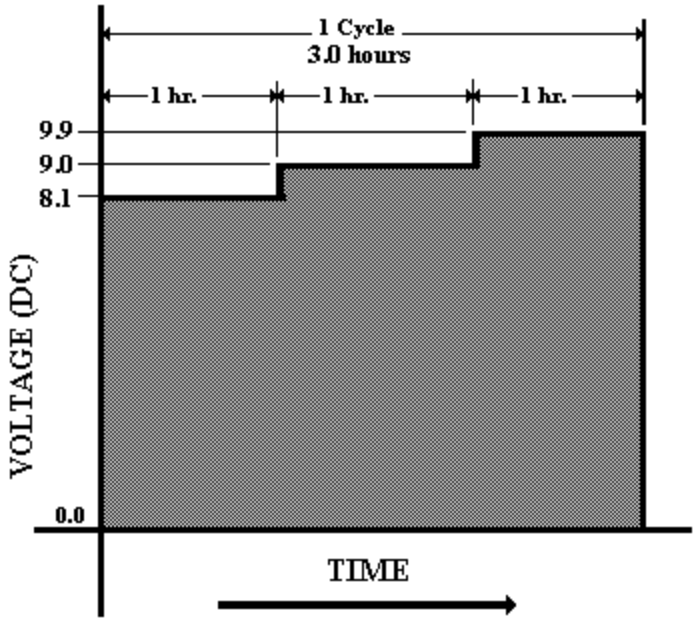

Figure 4.5.6.2 - Burn-In Voltage Cycle

4.5.6.7 Information to be Recorded. Test data should include the following:

a. Test item identification (manufacturer, serial number, etc.).
b. Previous test methods to which the specific test item has been subjected.
c. Time-versus temperature data.
d. Test ambient conditions.
e. Initial failure analysis.

4.5.7 Secure Lighting: Electroluminescent Panel. The light output from the LCD display should be measured with a photometer capable of indicating the range of 0.028 to 0.052 foot lamberts. The equipment should be placed in an environment with a background light of less than 0.0028 foot lamberts. The light source at night should be dimmed down to 0.05 foot lamberts or less and still be visible to the unaided eye. (See 3.5.7)

4.5.7.1 The total energy above 700 nm is to be no more than 0.5 percent of the total energy emitted between 350 and 930 nm. The 0.5 percent cut-off is to be between 600 and 700 nm, and as close to 600 nm as possible and still maintain visibility to the unaided eye.

4.6 Environmental Tests. Environmental testing may be performed in accordance with the methods and procedures identified in 6.3. The contractor may develop and use an alternative, (equivalent) test plan following Government review and approval. When the contractor's test plan deviates from the recommended test procedures, the contractor should be required to show where his own tests and methods for verifying the specified performance are equivalent. Also, measurements taken by the contractor during verification testing of all environmental requirements should be accomplished using

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known testing apparatus such as an environmental test chamber, vibration test table, pendulum shock device or similar equipment for which the technical capabilities to properly simulate extreme climatic or environmental conditions are scientifically documented.

4.6.1 High Temperature (Storage and Operation). Verify compliance with the requirement of 3.6.1. The tests recommended in 6.3, or equivalent test methods may be used. Failure to meet the requirement should constitute failure of the test.

4.6.2 Low Temperature. Verify compliance with the requirement of 3.6.2. The tests recommended in 6.3, or equivalent test methods may be used. Failure to meet the requirement should constitute failure of the test.

4.6.3 Humidity. Verify compliance with the requirement of 3.6.3. The tests recommended in 6.3, or equivalent test methods may be used. Failure to meet the requirement should constitute failure of the test.

4.6.4 Altitude. Verify compliance with the requirement of 3.6.4. The tests recommended in 6.3, or equivalent test methods may be used. Failure to meet the requirement should constitute failure of the test.

4.6.5 Immersion. Verify compliance with the requirement of 3.6.5. The tests recommended in 6.3, or equivalent test methods may be used. Failure to meet the requirement should constitute failure of the test.

4.6.6 Shock, Transit Drop. Verify compliance with the requirement of 3.6.6. The tests recommended in 6.3, or equivalent test methods may be used. Failure to meet the requirement should constitute failure of the test.

4.6.7 Vibration. Verify compliance with the requirement of 3.6.7. The tests recommended in 6.3, or equivalent test methods may be used. Failure to meet the requirement should constitute failure of the test.

4.6.8 Shock, Bench Handling. Verify compliance with the requirement of 3.6.8. The tests recommended in 6.3, or equivalent test methods may be used. Failure to meet the requirement should constitute failure of the test.

4.6.9 Dust (Fine Sand). Verify compliance with the requirement of 3.6.9. The tests recommended in 6.3, or equivalent test methods may be used. Failure to meet the requirement should constitute failure of the test.

4.6.10 Salt Fog. Verify compliance with the requirement of 3.6.10. The tests recommended in 6.3, or equivalent test methods may be used. Failure to meet the requirement should constitute failure of the test.

4.6.11 Fungus. Verify compliance with the requirement of 3.6.11. The tests

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recommended in 6.3, or equivalent test methods may be used. Failure to meet the requirement should constitute failure of the test.

4.6.12 Temperature Shock. Verify compliance with the requirement of 3.6.12. The tests recommended in 6.3, or equivalent test methods may be used. Failure to meet the requirement should constitute failure of the test.

4.6.13 Explosive Atmosphere. Verify compliance with the requirement of 3.6.13. The tests recommended in 6.3, or equivalent test methods may be used. Failure to meet the requirement should constitute failure of the test.

4.7 Nuclear Survivability. The AN/PDR-75 should be subjected to the nuclear environment as specified in EL-CP-5111-0002A. The reader should be energized during exposure.

4.7.1 Electromagnetic Pulse (EMP). The reader should be placed within a long wire electromagnetic pulse facility or its equivalent in the following orientations:

a. Power cables extended parallel to the electric field and perpendicular to the magnetic field; all individual units under the long wire, but widely separated.

b. Power cables coiled on ground; all units centrally located under the long wire. Test data to satisfy the EMP requirements in EL-CP-5111-0002A may be assembled by extrapolation.

4.7.2 Thermal Radiation. One reader should be exposed to the thermal radiation levels specified in EL-CP-5111-0002A. Since the available simulation facilities provide these thermal radiation levels only over relatively small areas, many individual exposures will be required so that each of the exposed surfaces (case, meters, knobs, cables, and other outboard components) will receive the required thermal exposure. The reader, following exposures, should show no degradation and should meet specified performance.

4.7.3 Nuclear Air Blast. The reader should be placed in a nuclear air blast simulation facility and exposed to the air blast environment as specified in EL-CP-5111-0002A. The reader should meet the specified performance following this test.

4.7.4 Initial Nuclear Radiation. The complete reader should be exposed to a LINAC and a pulsed or fast burst reactor in such a manner that all electronic piece parts and circuits in the set receive the neutron and gamma doses and rates specified in EL-CP-5111-0002A. The reader should meet specified performance (See 3.7.4).

4.8 Electromagnetic Interference (EMI). The reader should be tested for compliance with the requirements of 3.8. The recommended test methods of 6.5 may be used to measure compliance.

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4.8.1 Bonding Tests. Prior to initiation of EMI tests, compliance with the bonding requirement of paragraph 3.3.3.3 should be ascertained. The DC bonding impedance should be measured from equipment chassis to ground plane using a Shouldcross model 670A milliohm meter or approved equal. The bonding impedance should be recorded and included in the EMI test report (See 3.2.1).

4.9 Reliability Testing.

4.9.1 First Article and Quality Conformance Group D Inspection. To determine compliance with 3.9 during first article testing and conformance inspection, the equipment should be tested in accordance with a contractor-developed, Government approved test plan and procedure as required in the contract. The sample size should be 5 units. Test Plan IIIC and Test Plan IVC of MIL-HDBK 781 are recommended as guidance.

4.9.2 Reliability Test Conditions. The test environment for the reliability test should be under the following conditions:

a. Electrical Stress. The equipment should be operated at nominal design input voltage for 50 percent of the time and at maximum and minimum input voltage for 25 percent of the time, respectively. The maximum and minimum voltages should be ±10 percent of nominal.

b. Vibration Stress. The equipment should be vibrated 15 minutes each operating hour at 2.2, ±0.22g peak acceleration at any non-resonant frequency between 20 and 60 Hz measured at the mounting point of the unit. Total vibration time in a 24 hour period should be at least 4 hours, 2 hours at low temperature and 2 hours at high temperature.

c. Thermal Stress. The AN/PDR-75 should be continuously operated under the following temperature cycling:

d. Test Cycle. The test cycle should be 24 hours long.

e. Failure Definition. A failure is defined as the inability of the equipment to perform its required function. This includes any events which cause departure from performance as required by this specification and approved test procedures.

Transit	Ambient to -25°F(-32°C)	1 hour
Stabilized	-25°F(-32°C)	9 hours
Transit	-25°F(-32°C to +125°F(+52°C)	2 hours
Stabilized	+125°F(+52°C)	9 hours
Transit	+125°F(+52°C) to ambient	1 hour
Stabilized	Ambient	2 hours

f. Parameters to be Measured. Performance parameters are to be measured and

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recorded at least once per day on each equipment during the reliability test. A complete set of measurements in accordance with paragraphs 3.5.1 and 3.5.2 should be taken daily during both the high and low temperature stabilization.

4.10 Safety Engineering Inspection. A visual inspection should be performed in the presence of a government safety representative to determine that all requirements of 3.10 have been incorporated in the equipment. Inability to meet these requirements should constitute a failure of the test. Results of this inspection should be included in the Safety Assessment Report, if required in the contract.

4.11 Visual and Mechanical Inspection. These inspections should be performed in any order which is satisfactory to the government. The units should be examined for defects.

4.11.1 Physical Characteristics (Weight and Size). The weight and size of the AN/PDR-75 should be measured and determined. Weight and size should conform to the requirements of 3.4.2.

4.12 Interchangeability

4.12.1 Inspection for Dimensional Interchangeability. The dimensions listed below should be gauged or measured to determine conformance to the physical interchangeability requirement. When a listed dimension is not within specified or design limits, it should be considered a major defect.

a. External and internal dimensions of cases, chassis, and insertable assemblies, when such dimensions affect mating of parts.

b. Dimensions of cavities, when such dimensions affect insertion of items.

c. Location of connectors, locating pins, fasteners, sliders and mountings that receive mating part of plug-in assemblies and major units; and location of the mating parts on the plug-in assembly or major unit.

4.12.2 Inspection for Electrical Interchangeability. Electrical interchangeability of all modules, PC boards, components, subassemblies, and chassis should be tested to determine compliance with applicable performance requirements of this specification.

5. PACKAGING.

5.1 Packaging. For acquisition purposes, the packaging requirements should be as specified in the contract or purchase order (See 6.2). When actual packaging of material is to be performed by DoD 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 Department of Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or

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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. Radiac Set, AN/PDR-75 is intended to read gamma and neutron doses from Radiac Detector, DT-236/PDR-75 in the field.

6.2 Ordering Data. Procurement documents should specify the following:

a. Title, number and date of this specification and any amendment thereto.
b. The contractor should apply for nomenclature in accordance with the applicable clause in the contract.
c. Marking and shipping of samples.
d. Place of final inspection.
e. Number of first articles to be submitted for approval (See 3.1).
f. Requirement for first article test plan and test report.
g. Issue of the DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (See 2.2 and 2.3).
h. Levels of preservation and packaging (See Section 5).
i. Handling of groups C and D failures must be specified.
j. Groups B and D sample requirements must be stated.
k. Specific serial numbers to be placed on the produced items.

6.3 Environmental Inspection Procedures. The test methods and procedures of MIL-STD-810C listed below are recommended, but not mandatory for determining compliance with the environmental requirements of this specification. The contractor may use any test method that he can verify as providing comparable stress levels on the material to be tested.

Inspection	Spec. paragraph	MIL-STD-810C method	MIL-STD-810C proc.	Remarks
High temperature (Storage)	3.6.1	501.1	I	Storage temperature (Step 2) should be for 6 hours duration. +160°F(+71°C)

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High temperature (operation)	3.6.1	501.1	I	Operation temp (Step 2) should be +125°F (+52°C) with the sight turned on for 3 hours. "Operate" (Step 5) should be defined as the ability to observe a green glow from the eyepiece from the exterior of the chamber turn a window.
Low Temperature	3.6.2	502	I	Storage temp. of Step 2 should be -70°F (-57°C) -23°F)-32°C) for 9 hours. Step 5 "Operate" should be defined as the ability of all controls to operate as per this spec.
Humidity	3.6.3	507.1	III	Use 2 continued 48 hour cycles.
Altitude	3.6.4	500	I	Operate altitude chamber @40,000 feet above sea level. Operate the sight (Step 2) for 3 hours. Storage article is 10,000 for 6 hours.
Immersion	3.6.5	512.1	I	Use 30 minutes.
Shock, transit drop	3.6.6	516.2	II	
Vibration	3.6.7	514.2	X	-Use Curve AX.
Shock, bench handling	3.6.8	516.2	V	Their should be no mechanical damage following the test.
Dust	3.6.9	510.1	I	
Salt fog	3.6.10	I		
Explosive Atmosphere	3.6.13	511.1	I	
Fungus	3.6.11	508.1	I	No growth colonization on 50% after 14-28 days. No more than sparse microbial growth on 10 % of the area.
Temperature shock	3.6.12	503.1	I	Use shock temperatures of -65°F (-54°C) and +145°F (+63°C).

6.4 Definitions.

6.4.1 Damage. Damage is defined as breakage, loosening, shifting, or evidence of corrosion, or the failure of any component's connection, hardware or surface finish; leakage into the case, the degradation in input or output characteristics and any failure of the control knobs to perform their intended function.

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6.4.2 “g”. “g” represents the acceleration (+) or deceleration (-) caused by the force resulting from the phenomenon of gravity.

6.4.3 Exfoliation. Exfoliation is defined as corrosion occurring along the grain boundaries of metal resulting in peeling or separating of successive layers of base metal. The appearance resembles loose onion skin-like peeling.

6.5 Electromagnetic Interference. Use of MIL-STD-462 is recommended for measuring compliance within 3.8.

6.6 Subject Term (Key Word) Listing.

Computer-Indicator Radiac CP-696/PDR-75
Radiac Detector DT-236/PDR-75
Case, Carrying Y-8420/PDR-75
Nuclear Environments
Measurements of Neutron and Gamma doses

6.7 Changes from previous issues. Marginal notations are not used in this revision to identify changes due to the extent of the changes.

CUSTODIAN:
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PREPARING ACTIVITY:
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(Project 5855-2011-004)