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MIL-R-16131A(SHIPS)
15 August 1951
SUPERSEDING
MIL-R-16131(SHIPS)
1 March 1951

MILITARY SPECIFICATION

RADIAC CALIBRATOR SET AN/UDM-1( )

1. SCOPE

1.1 This is a general performance specification which covers but one type of test equipment for calibration of radiac survey equipment.

2. APPLICABLE SPECIFICATIONS, STANDARDS, DRAWINGS, AND PUBLICATIONS

2.1 The following specifications, standards, drawings, and publications, of the issue in effect on date of invitation for bids, form a part of this specification:

SPECIFICATIONS

FEDERAL
NN-B-621 - Boxes, Wood, Nailed and Lock-Corner.

MILITARY
JAN-P-106 - Packaging and Packing for Overseas Shipment - Boxes; Wood, Nailed.
MIL-E-15090 - Enamel, Equipment, Light-Gray (Formula No. 111).
MIL-S-15395 - Silver-Base-Brazing-Alloy.

NAVY DEPARTMENT
General Specifications for Inspection of Material.
16E1 - Electronic Equipment, Naval Ship and Shore; General Specification.

DRAWINGS

BUREAU OF SHIPS RADIO
RE60-D-125 - AN/UDM-1( ) Radiac Calibrator Set, Lead Safe, Platform, Rolling Platform and Rails.
RE10-D-673 - Shipping Box for Radiation Source Container, AN/UDM-1( ) Radiac Calibrator Set.

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

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Source: NAT. Lab

2.2 Other publications. - The following publications, of the issue in effect on date of invitation for bids, unless otherwise stated, form a part of this specification:

INTERSTATE COMMERCE COMMISSION REGULATION
Regulations for Transportation of Explosives and Other Dangerous Articles, etc.

(Information as to the availability of these Regulations may be obtained from the Interstate Commerce Commission, Washington 25, D. C.)

3. REQUIREMENTS

3.1 General description. - The Radiac Calibrator Set AN/UDM-1( ) is a calibrating apparatus which provides a suitable radioactive source for calibrating radiac survey equipment.

3.1.1 The Radiac Calibrator Set AN/UDM-1( ) shall be constructed and assembled in accordance with this specification and Drawings RE60-D-125 and RE10-D-673. Where the requirements of this specification conflict with the drawings, this specification shall govern.

3.2 Material. - Materials specified herein and in Drawing RE60-D-125 shall be entirely suitable for the purpose intended. Use of other material shall have the approval of the bureau or agency concerned.

3.2.1 Silver solder shall conform to grade III of Specification MIL-S-15395.

3.2.2 Lead shall be at least 95.0 percent pure.

3.3 Equipment composition. - The calibration equipment shall consist of the following:

(a) Radiation source - Cobalt 60.
(b) Source container and filtering plugs.
(c) Platform for source container.
(d) Rolling platform for radiac equipment.
(e) Track or rails for the rolling platform.
(f) Mechanism for activating the radiation source.
(g) Optical system.

3.3.1 Radiation source. - The radiation source shall be a Cobalt 60 source (Government furnished material).

3.3.1.1 Handling of radioactive source. - The contractor shall at no time be required to handle radioactive materials during the performance of this contract.

3.3.1.2 The following steps shall be taken to assure safe and proper insertion of the source:

(a) At the appropriate time, the contractor will ship, with the approval of the bureau or agency concerned, the empty radiation source capsule to the activity of the Atomic Energy Commission concerned with supplying the source.
(b) At the appropriate time, the empty lead source container cap shield, lead plugs, locking bolt and nut shall be forwarded to the National Bureau of Standards with the approval of the bureau or agency concerned.
(c) All equipment, less parts (a) and (b), shall be packaged by the contractor and packed as described in 5.1 and 5.2 and then forwarded to a depot designated by the bureau or agency concerned.

3.3.2 Source container. - The arrangement and construction of the source container shall be as shown on sheet 2 of Drawing RE60-D-125. Individual parts for the container and accessory items shall be fabricated as shown on sheets 3, 4, and 5 of Drawing RE60-D-125. Alternate methods of fabrication and construction may be used provided approval is obtained from the bureau or agency concerned.

3.3.2.1 The intensity of radiation emanating from the radiation cone shall be attenuated by means of two removable plugs. These plugs shall be so constructed that a lead filtration of 12.5 and 9.5 cm. of lead can be obtained. The removal of the lead plugs shall be accomplished by such means that the operator can perform the necessary manipulations easily, quickly and in a region of a safe hourly rate of radiation intensity so that the total accumulated dosage per week does not exceed 0.3 roentgen.

3.3.3 Platform for source container. - Drawing RE60-D-125, sheet 6, shows the construction of the platform. The over-all size of the platform and the size and shape of the individual parts shall conform to Drawing RE60-D-125. However, different methods of fabrication are permissible provided that approval is obtained from the bureau or agency concerned.

3.3.4 Track and rolling platform for radiac equipment. - Drawing RE60-D-125, sheets 7 and 8, show the general construction of the track and the rolling platform. This platform is not only a supporting structure for the radiac equipment but also for parts of the optical system (3.3.6). Details of the construction of these structures shall be determined

by the contractor and shall be subject to approval of the bureau or agency concerned. The following requirements, in addition to the requirements shown on Drawing RE60-D-125, shall govern the design and the construction:

3.3.4.1 The size and shape of the components (major units) and the material used for their fabrication shall be such that the structure is light yet strong enough so that the application of a 50-pound load will not cause buckling, deflections or overstressing of the individual parts or the structure as a whole.

3.3.4.2 The vertical axis of the rolling platform shall remain perpendicular at all points on the track.

3.3.4.3 The rollers and bearings shall have such characteristics that they will carry the load easily and allow the operator to move the platform along the track with a minimum of effort.

3.3.4.4 Means shall be provided to keep the platform on the track at all times.

3.3.4.5 A clamping or holding device shall be incorporated which allows the platform to be locked to the track at any point.

3.3.4.6 The design of the jig and radiac equipment supporting platform shall be such that it can be raised or lowered easily through the distance specified. A lock shall hold the platform securely, and firmly in any position.

3.3.4.7 The rolling platform shall be constructed in such a manner that it can be readily disassembled into several sub-assemblies and thus allow the whole unit to be packed into a minimum of space.

3.3.4.8 Track. - The track or rails shall be built in 5-foot sections. The individual sections shall be designed and constructed for easy assembly and remain in alignment with respect to each other.

3.3.4.9 The entire track shall have a straight, smooth top surface.

3.3.4.10 There shall be no buckling or deflecting of the rails at any point under load.

3.3.4.11 The contractor shall obtain approval of the design of the track and the rolling platform from the bureau or agency concerned prior to construction.

3.3.5 Mechanism for actuating the radiation source capsule. - By remotely controlled mechanical means, the radiation source capsule shall be capable of being raised or lowered. This mechanical device shall be of such construction that it can be operated easily and positively. In addition the mechanism shall hold the source capsule securely in place when it has been raised to either the operating position within the source container or out of the protective source container to a height of at least 18 inches above the top of the container. The design shall be such that there is no possibility of jamming when the source is in the exposed position.

3.3.5.1 Prior to the actual construction of the mechanism the contractor shall submit the necessary detailed drawings and plans for approval by the bureau or agency concerned.

3.3.6 Optical system. - An optical system shall be supplied as specified on sheet 7 of Drawing RE60-D-125.

3.4 External finish. - External finish of the equipment shall be as specified in Specification 16E4. The finish coats shall be gray enamel in accordance with type II, class 2 of Specification MIL-E-15090.

3.5 Markings. - All parts or sub-assemblies shall be identified by appropriate markings. A nameplate shall be attached to the source container having the following inscription:

Radioactive
COBALT 60
. . . . . curies as of date . . . . . unit #
Property, Bureau of Ships, U.S. Navy
Washington 25, D. C.

3.5.1 The unit number and the exact strength of the source, and date of calibration of the source, shall be inserted by the bureau or agency calibrating the source.

3.6 Instruction and installation books. - Instruction and installation books shall be supplied as specified (see 6.1) and shall include, subject to approval of the bureau or agency concerned, all information necessary for installation, operation and maintenance of the equipment.

3.7 Workmanship. - Workmanship shall be as specified in Specification 16E4.

4. SAMPLING, INSPECTION, AND TEST PROCEDURES

4.1 General. - Preproduction, production and selected production models of the equipment shall satisfactorily pass the preproduction and production inspections and tests specified herein and any other tests necessary, in the opinion of the cognizant Government inspector or the bureau or agency concerned, to prove compliance with the requirements of this specification.

4.1.1 Performance of tests. - Before presenting equipment for Government inspection, the contractor shall have ascertained to the best of his ability that the equipment is free from defects of material and workmanship and is in satisfactory operation condition. It shall be the option of the Government inspector to participate in, witness, or accept certified data of tests performed by the contractor or his supplier. The contractor shall make arrangements with the cognizant Government inspector for test schedules, and shall provide him with any information regarding materials, processes, or manufacturing data which he may request. The contractor shall permit the cognizant inspector to examine raw materials and processes used in the contractor's or manufacturer's plants. Upon inspection, the cognizant inspector may reject inferior raw materials and require the correction of processes incorrectly performed.

4.1.2 Inspection procedures. - For Naval purchases, the general inspection procedures shall be in accordance with General Specifications for Inspection of Material. 1

4.2 Preproduction tests. - Preproduction tests shall be made at a Government laboratory designated by the bureau or agency concerned on the preproduction model submitted by the contractor to determine suitability for Naval use. Preproduction tests shall consist of any tests necessary to determine performance with the requirements of this specification and shall include the following:

4.2.1 General inspection. - Equipment shall be inspected and tested to determine compliance with the requirements of this specification and shall include the following:

(a) Assembly, size, fit.
(b) Type and character of material, parts, and finish including prevention of corrosion.

4.2.2 Operating test. - The equipment shall be subjected to a practical operating test.

4.2.3 Controls. - Equipment shall be tested to determine the suitability of controls for satisfactory operation.

Notice. - When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

MILITARY SPECIFICATION

CALIBRATOR, SET, RADIO, AN/UDM-1( )

This amendment forms a part of Military Specification MIL-C-22211A(EC), 5 September 1969.

Page 1

Title: Delete "RADIO" and substitute "RADIAC".

Page 5

4.1.1, line 5: Delete "sixty (60) days" and substitute "(see 6.1.2)".

4.1.3, line 3: Delete "sixty (60) days" and substitute "(see 6.1.2)".

4.2, item (c): Delete and substitute:

"(c) Inspection of preparation for delivery."

4.3: Insert the following as the first sentence: "Unless otherwise specified (see 6.1.1), 1 unit shall be required for first article inspection."

Page 6

4.5, title: Delete and substitute: "Inspection of preparation for delivery."

5. After "PREPARATION FOR DELIVERY" insert the following: "(The preparation for delivery requirements specified herein apply only for direct Government procurements. Preparation for delivery requirements of referenced documents listed in Section 2 do not apply unless specifically stated in the contract or order. Preparation for delivery requirements for products procured by contractors shall be specified in the individual order.)"

Page 8

6.1: Delete and substitute:

"6.1 Ordering data.- Procurement documents should specify the following:

FSC 6665

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1 Procurement requirements.

'(a) Title, number and date of this specification.
"(b) Number of first article samples to be submitted if other
ified in 4.3.
"(c) Selection of applicable levels of packaging and packing
(see 5.1, 5.2 and 5.3).

1.2 Contract data requirements. Data generated by this document are not able unless specified on the Contract Data Requirements List (DD Form 1423). a required by this specification includes, but is not restricted to the ng:

"(a) Contractor's quality assurance system (see 4.1.1)
"(b) Test procedures (see 4.1.3)".

Preparing activity:
Navy - EC
(Project 6665-N275)

☆ U. S. GOVERNMENT PRINTING OFFICE: 1970-433-692/2494

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MIL-C-22211A(EC)
5 September 1969
SUPERSEDING
MIL-C-22211(SHIPS)
30 October 1959

MILITARY SPECIFICATION

CALIBRATOR SET, RADIO, AN/UDM-1( )

1. SCOPE

1.1 This is a general performance specification which covers one type of test equipment for calibration of radiac survey equipment.

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

FEDERAL

PPP-B-601-Boxes, Wood, Cleated-Plywood.

MILITARY

MIL-P-116-Preservation, Methods of.
MIL-P-15024-Plates, Identification——Information and Marking for Identification of Electrical, Electronic and Mechanical Equipment.
MIL-E-15090-Enamel, Equipment, Light-Gray(Formula No. 111).
MIL-B-15395-Brazing Alloys, Silver.
MIL-E-16400-Electronic Equipment, Naval Ship and Shore: General Specification.
MIL-M-19590-Marking of Commodities and Containers to Indicate Radioactive Material.
MIL-I-45208-Inspection System Requirements.

STANDARDS

MILITARY

MIL-STD-129-Marking for Shipment and Storage.
MIL-STD-1186-Cushioning, Anchoring, Bracing, Blocking, and Waterproofing; with Appropriate Test Methods.

DRAWINGS

BUREAU OF SHIPS

REF 10085-Shipping Crate for Source Container.
REF 60001-AN/UDM-1( ) Radiac Calibrator Set, Modified.
REF 60001-2-AN/UDM-1( ) Modified Source Container for.
REF 60001-3-Base Assembly.
REF 60001-4-Stand Assembly.
RED 60001-5-Plate Sub-Assembly.
RED 60001-6-Tripod Assembly.

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

2.2 Other publications.-The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

UNIFORM CLASSIFICATION COMMITTEE
Uniform Freight Classification Rules

(Application for copies should be addressed to the Uniform Classification Committee, 202 Union Station, 516 West Jackson Blvd., Chicago, Ill. 60606.)

NATIONAL CLASSIFICATION BOARD
National Motor Freight Classification Rules

(Application for copies should be addressed to the National Motor Freight Traffic Association, Inc., 1616 P Street, N.W., Washington D.C. 20036.)

DEPARTMENT OF TRANSPORTATION
Code of Federal Regulations, Title 49
Department of Transportation Specification DOT-55

(Application for copies should be addressed to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.)

3. REQUIREMENTS

3.1 First article sample.-Prior to beginning production a sample shall be inspected as specified in 4.3 (see 6.2).

3.2 General description.-The Radiac Calibrator Set AN/UDM-1( ) is a calibrating set which provides a suitable radioactive source for calibrating radiac survey equipment.

3.2.1 The Radiac Calibrator Set AN/UDM-1( ) shall be constructed and assembled in accordance with this specification and Drawings REF 60001 and REF 60001-2. Where the requirements of this specification conflict with the drawings, this specification shall govern. Units are to be constructed to comply with with Department of Transportation (DOT) Specification 55 and all Radiac Transportation Permits.

3.3 Material.-Materials specified herein and in Drawings REF 60001 and REF 60001-2 shall be entirely suitable for the purpose intended. Use of other material shall have the approval of the command or agency concerned.

3.3.1 Silver solder shall conform to grade III of MIL-B-15395.

3.3.2 Lead shall be at least 95.0 percent pure.

3.4 Equipment composition. - The calibration equipment shall consist of the following:

(a) Radiation source - Cesium 137.
(b) Source container.
(c) Platform for source container.
(d) Rolling platform for radiac equipment.
(e) Track or rails for the rolling platform.
(f) Optical system.

3.4.1 Radiation source. - The source holder shall be designed and fabricated to meet Department of Transportation "Special Form" requirements and be compatible with the AN/UDM-1( ) Source Container. The source activity shall be 120 curies of Cesium 137 ±5% with no more than 3% Cesium 134 permissible. The true activity, when the source is installed in the AN/UDM-1( ) shall be at least 40 R/hr at one meter.

3.4.1.1 Procurement requirements for sealed sources. - Source holder must be designed and tested so as to allow U. S. (AEC) Atomic Energy Commission licensing for possession and use of the source and this includes the following information and tests, which shall be supplied to the Naval Electronic Systems Command, Code 05162 16 months after date of contract. In the event of first article sample waiver, the information required shall be delivered 3 months after date of contract.

(a) The source model number.

(b) A drawing or sketch of the source holder describing all materials of construction, dimensions, and methods of sealing the source.

(c) A facsimile of the label to be affixed to the source or source holder and a description of how and where the label will be permanently attached.

(d) A description of tests performed on prototype sources that establish the integrity of the source construction and seal under the most adverse conditions of use to which the source is likely to be subjected.

(e) A description of the quality control procedures to be followed to assure that each finished source meets specifications furnished to the Naval Electronic Systems Command. A description of tests for contamination and leakage of radioactive material should be included.

If tests and other information have already been indexed or furnished to U. S. AEC only source drawing and model number are necessary. The contractor shall certify that the source meets DOT requirements for special form.

3.4.1.2 Permit requirements. - In the event a permit is required, the contractor shall make application for permits through the cognizant Military Traffic Management and Terminal Service Office via the DCAS Transportation office administering contract. Permits when required will be obtained prior to the movement of shipment. Permit number (when applicable) will be shown on DD-250's and Shipping Documents. The date of issue, date of expiration and office issued from will also be shown.

3.4.2 Source container. - The arrangement and construction of the source container shall be as shown on Drawing REF60001-2.

3.4.2.1 Radiographic requirement. - Prior to shipment, each source container shall be radiographed, and certified by the contractor to be free of holes or other defects in the lead.

3.4.3 Platform for source container. - The overall size of the platform and the size and shape of the individual parts shall conform to Drawing REF 60001-3.

3.4.3.1 The components and materials used in the fabrication shall be such that an applied force of 1000 pounds will not cause buckling or overstressing of individual parts or the complete assembly.

3.4.4 Rolling platform for radiac equipment. - Construction of the rolling platform shall conform to Drawing REF 60001-4. This platform is not only a supporting structure for radiac equipment but also for parts of the optical system (RED 60001-5). The following requirements, in addition to the requirements as given in Drawings REF 60001-4 and RED 60001-5, shall govern the design and construction.

3.4.4.1 The size and shape of the components (major units) and the material used for fabrication shall be such that the structure is light yet strong enough so that the application of a 50-pound load will not cause buckling, deflections or overstressing of the individual parts or the structure as a whole.

4.4.2 The vertical axis of the rolling platform shall remain perpendicular at all points on the track.

4.4.3 The rollers and bearings shall have such characteristics that they will carry the load easily and the operator to move the platform along the track with a minimum of effort.

4.4.4 Means shall be provided to keep the rolling platform on the track at all times.

3.4.4.5 A clamping or holding device shall be incorporated which permits the rolling platform to be ed to the track at any point.

3.4.4.6 The design of the jig and radiac equipment supporting platform shall be such that it can be sed or lowered easily through the distance specified. A lock shall hold the platform securely and firmly ny position.

3.4.4.7 The rolling platform shall be constructed in such a manner that it can be readily disassembled o several subassemblies and thus allow the whole unit to be packed into a minimum of space.

3.4.5 Track. - The track or rails shall be built in 5-foot sections. The individual sections shall be esigned and constructed for easy assembly and remain in alignment with respect to each other. Construction design shall be in accordance with Drawing REF 60001-3.

.1 The track length shall be 30 feet.

3.4.5.2 The entire track shall have a straight, smooth top surface.

3.4.5.3 There shall be no buckling or deflecting of the rails at any point under load.

3.4.6 Optical system (tripod assembly). - Construction of the tripod assembly shall be in accordance with Drawing RED 60001-6.

3.5 External finish. - External finish of the equipment shall be as specified in MIL-E-16400. The finish coats shall be grey enamel in accordance with type II, class 2, of MIL-E-15090.

3.6 Markings. - A calibration plate shall be attached to the source container having the following inscription:

Calibrated by_____
Date of calibration _____
Unit No. _____

3.6.1 The unit number and calibrated by, and date of calibration of the source will be inserted by the National Bureau of Standards, upon calibration of the source.

3.6.2 In addition, an identification plate in accordance with type A or B of MIL-P-15024 shall be attached to the source container.

3.7 Workmanship. - Workmanship shall be as specified in MIL-E-16400.

3.8 Safety. - The design, development and production shall promote maximum safety of both operational and maintenance personnel and equipments during all phases of operational life in accordance with MIL-E-16400.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. - Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except

as otherwise specified in the contract or order, the supplier 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 prescribed requirements.

4.1.1 Contractor's quality assurance system. - The contractor shall provide and maintain an effective inspection and quality assurance system, acceptable to the Government, covering the supplies under the contract. The quality assurance system shall be in accordance with the requirements of MIL-I-45208. A current written description of the system shall be submitted to the cognizant Government inspector, for approval, sixty (60) days prior to first article inspection. Any changes to the approved plan which might affect the degree of assurance required by this specification or other applicable documents shall be submitted to the cognizant inspector and approved in writing prior to use.

4.1.2 Government verification. - All quality assurance operations performed by the contractor will be subject to Government verification at any time. Verification will consist of (a) surveillance of the operations to determine that practices, methods, and procedures of the written system description are being properly applied, (b) Government product inspection to measure quality of product to be offered for acceptance, and (c) Government product inspection of delivered products to assure compliance with all requirements of this specification. Failure of the contractor to promptly correct deficiencies discovered by him or of which he is notified shall be cause for suspension of acceptance until corrective action has been made or until conformance of product to prescribed criteria has been demonstrated.

4.1.3 Test procedures. - The contractor shall submit written test procedures including test equipment and tolerance limits to be used for first article inspection and production inspection to the command or agency concerned, via the Government inspector for review and approval sixty (60) days prior to beginning tests. Each test shall be identified in accordance with paragraph 4.2 as to classification.

4.1.3.1 Procedures for inspections, tests, demonstrations, etc. shall contain step by step information which will enable the operator to properly perform the requirements of this specification. The method of examination shall be clearly defined.

4.1.3.2 The procedures shall contain a list of test equipment identified by name and model. Special test equipment shall also be listed and identified.

4.1.3.3 Data sheets shall be included in the procedures. Conformance parameters shall be clearly indicated with tolerance limits. Whenever quantitative measurements are made, the result shall be shown by quantitative data.

4.2 Classification of inspection. - The method of examination and testing of the equipment fall within the following classifications:

(a) First article inspection
(b) Production inspection
(c) Shipping inspection

4.3 First article inspection. - First article inspection shall be made at a Government laboratory designated by the command or agency concerned on the prototype model submitted by the contractor to determine suitability for Naval use and shall consist of all examination and testing necessary to determine compliance with the requirements of this specification. First article inspection shall include the tests specified in table I.

TABLE I. First article inspection

Requirement	Reference
Surface examination	4.6.1
Operating test	4.6.2
Structural integrity	4.6.3

4.4 Production inspection. - Production inspection shall be made on every equipment offered for delivery. The inspection shall comprise such examination and testing as will prove the workmanship and reveal the omissions and errors of the production process such as functional and performance tests at a limited number of points, tests which detect deviations from design, tests of adjustment, and tests which detect hidden defects of material. Production inspection shall consist of the tests approved in accordance with paragraph 4.1.3 and shall include the requirements of table II.

TABLE II. Production inspection

Requirement	Reference
Surface examination	4.6.1
Operating test	4.6.2

4.5 Shipping inspection. - Inspections shall be conducted to insure conformance with the requirements of Section 5 of this specification.

4.6 Inspection procedures. -

4.6.1 Surface examination. - Equipment shall be examined for the following:

(a) Workmanship, assembly and fit, mechanical safety, and marking.
(b) Materials, parts and finish.

For conformance to 3.2, 3.3, 3.4.1, 3.4.2, 3.4.3, 3.4.4, 3.4.5, 3.4.6, 3.5, 3.6, 3.7 and 3.8.

4.6.2 Operating test. - The equipment, with the source in place, shall be subjected to an operating test to insure qualitatively the proper functioning of the equipment including:

(a) All operating controls and adjustments
(b) True activity (using a Victoreen R meter or equivalent)
(c) Radiographic integrity
(d) Safety requirements

For conformance to 3.4.1, 3.4.2.1, 3.4.4.2 through 3.4.4.7 and 3.8.

4.6.3 Structural integrity. - The equipment shall be tested to determine conformance with 3.4.3.1, 3.4.4.1 and 3.4.5.3.

5. PREPARATION FOR DELIVERY

5.1 Packaging. - Packaging shall be level A or C as specified (see 6.1).

5.1.1 Level A. -

5.1.1.1 Source containers. - Each source container shall be individually packaged in accordance with Method II of MIL-P-116. The aperture plug control arm system shall be lubricated for normal operation.

5.1.1.2 Optical system. - Each optical system shall be individually packaged in accordance with submethod IA-8 of MIL-P-116 without preservative compounds.

5.1.1.3 Other equipment. - Other equipment such as platforms and tracks or rails shall be individually packaged in accordance with method III of MIL-P-116.

5.1.1.4 Technical literature. - Technical Literature shall be packaged in transparent, waterproof, heat sealed, plastic bags, minimum 4 mil thick and shall not be placed within the barrier used to package any other item.

5.1.2 Level C. - Each complete set shall be packaged in a manner that will afford adequate protection against corrosion, deterioration and damage during shipment from the supply source to the first receiving activity.

5.2 Packing. - Packing shall be level A, B or C as specified (see 6.1).

5.2.1 Level A. -

5.2.1.1 Source container. - Each source container shall be packed in a container conforming to Drawing REF 10085 and Department of Transportation Regulations. Cushioning, anchoring, bracing and blocking shall be in accordance with MIL-STD-1186 to prevent movement and damage during shipment and handling. The top of the source container shall be blocked so that it can not become separated from the source container. The plug control arm shall be blocked so that it can not move during shipment and handling.

5.2.1.2 Accessory equipment. - Accessory equipment comprising a complete set, packaged as specified in 5.1 shall be packed in containers conforming to PPP-B-601, overseas type without cleats on the top panel. Cushioning, anchoring, bracing, blocking and waterproofing shall be in accordance with MIL-STD-1186. The gross weight of shipping containers shall not exceed 200 pounds.

5.2.2 Level B. - Each source container and accessory equipment packaged as specified in 5.1 shall be packed as specified in 5.2.1, except that PPP-B-601 boxes may be domestic type and weight limitations for accessory equipment packs shall be as permitted by PPP-B-601. Domestic type PPP-B-601 boxes shall be strapped as specified in the appendix.

5.2.3 Level C. - Items comprising a complete set, except for the source container which shall be packed in accordance with 5.2.1.1, shall be packed in containers acceptable to the common carrier and which will insure safe delivery at destination in a satisfactory condition at the lowest applicable rate. Containers, packing or method of shipment shall comply with Uniform Freight and National Motor Freight Classification Rules or regulations of other carrier rules as applicable to the mode of transportation.

5.3 Marking. - In addition to any marking required by the contract or order, unit packages, intermediate packages and shipping containers shall be marked in accordance with MIL-STD-129.

5.3.1 Radioactive equipment. - Each item, package and shipping container containing radioactive material shall be marked in accordance with MIL-M-19590 and specifically Code of Federal Regulations, Title 49, Section 73.391 through 73.394, as applicable. Each shipping container shall be marked with "fragile" and "arrow" markings.

5.3.1.1 Unpacking instructions. - Radioactive source, shipping containers shall be provided with unpacking instructions as follows:

> "Reusable container for Radioactive Source. Retain for reuse. To open, remove screws with screwdriver and topcover. Remove screws and shipping brackets holding down housing base inside container. Leave housing on base until metal stand is assembled."

Unpacking instructions shall be placed in a sealed waterproof envelope marked "UNPACKING INSTRUCTIONS" and affixed to the outside of the shipping container in a protected location, preferably between the cleats on the end of the container adjacent to the identification marking.

6. NOTES

6.1 Ordering data. - Procurement documents should specify the following:

(a) Title, number, and date of this specification.
(b) Levels of preservation, packaging, packing, and marking (see section 5).

6.2 First article. - Invitations for bids should provide that the Government reserves the right to waive the requirement for first article samples as to those bidders offering a product which has been previously procured or tested by the Government, and that bidders offering such products, who wish to rely on such production or tests must furnish evidence with the bid that prior Government approval is presently appropriate for the pending procurement.

Preparing activity:
Navy - EC

(Project 6665-N254)

☆U.S. GOVERNMENT PRINTING OFFICE: 1969-393-065/81960

FOLD

DEPARTMENT OF THE NAVY
NAVAL ELECTRONIC SYSTEMS COMMAND
WASHINGTON, D. C. 20360

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DEFENSE STANDARDIZATION PROGRAM BRANCH
DEPARTMENT OF THE NAVY
WASHINGTON, D. C. 20360

FOLD

SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 119-R004

INSTRUCTIONS

This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity *(as indicated on reverse hereof)*.

SPECIFICATION

ORGANIZATION *(Of submitter)*	CITY AND STATE

CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT
		$

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

☐ YES ☐ NO IF "YES", IN WHAT WAY?

4. REMARKS *(Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)*

SUBMITTED BY *(Printed or typed name and activity)*	DATE

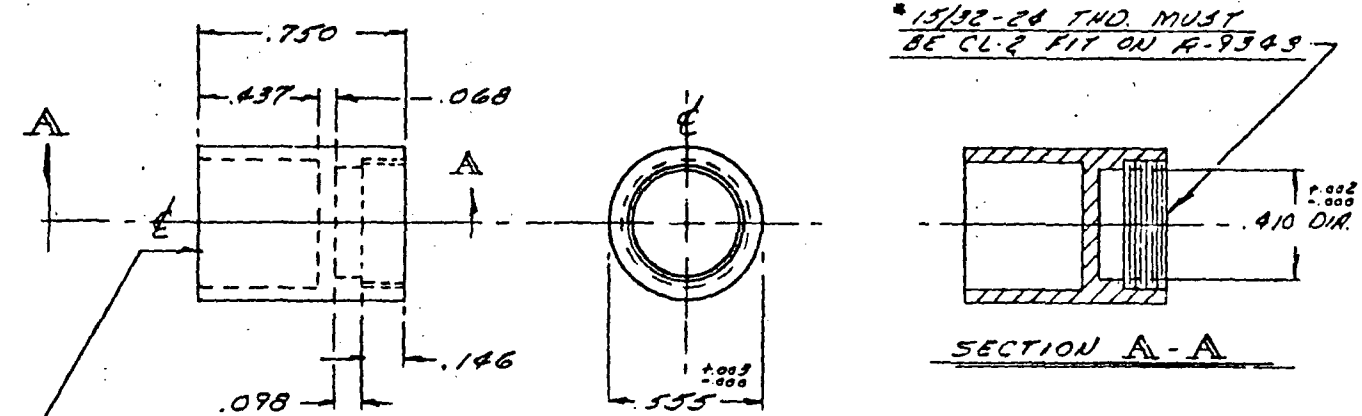
DD FORM 1 APR 63 1426 REPLACES NAVSHIPS FORM 4863, WHICH IS OBSOLETE

9

A 9339

Encl 7

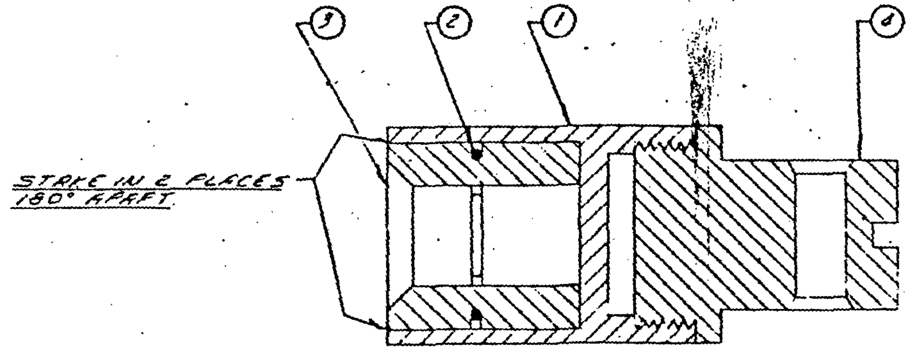
DO NOT SCALE DRAWING. TOLERANCES, FRACTIONS ± .015 ; DECIMALS ± .005 UNLESS OTHERWISE SPECIFIED



ISSUE	DESCRIPTION	REQ.	REQ.	DRAWING USED ON	DRAWING ASSY. DWG.	ITEM	NAME	FINISH
PREPARED TO SCALE: Gouget 2-4-53 JEG 2-4-53		9	1	2407	A9-9342		NATIONAL ELECTRICAL MACHINE SHOPS, INC. SILVER SPRING, MD.	
							CAPSULE	
							MATERIAL ALUM. ROD 6151-T6	
							FINISH NONE.	
				APPR. FOR SAMPLES			02-4-53 Gouget C	SCALE 2-1
		M	M	APPR. FOR PRODUCTION		1	A 5154	A-9339-F

DO NOT SCALE DRAWING. TOLERANCES: FRACTIONS ± .010, DECIMALS ± .005 UNLESS OTHERWISE SPECIFIED

Encl 8



Req.	Drawing	Item	Name	Finish
1	A-9363	4	PLUG	
1	A-9362	3	[illegible] RING SLEEVE	
1	A-9340	2	SPRING	
1	A-9339	1	CAPSULE	

Used On	Assy. Drwg
2635	AD-7532

NATIONAL ELECTRICAL MACHINE SHOPS, INC.
SILVER SPRING, MD.

ASSY. CAPSULE

MATERIAL

FINISH NONE

APPR. FOR SAMPLES

APPR. FOR PRODUCTION

SCALE 4 x 1

AB-9591 -E

U.S. Department
of Transportation

Research and
Special Programs
Administration

400 Seventh Street, S.W.
Washington, D.C. 20590

IAEA CERTIFICATE OF COMPETENT AUTHORITY

Special Form Radioactive Material Encapsulation

Certificate Number USA/0166/S
(Revision 3)

This certifies that the encapsulated sources, as described, when loaded with the authorized radioactive contents, have been demonstrated to meet the regulatory requirements for special form radioactive material as prescribed in IAEA 1/ and USA 2/ Regulations for the transport of radioactive materials.

I. Source Description - The sources described by this certificate are identified as the following Gamma Industries models which are constructed according to the listed drawing numbers:

Model No.	Drawing No.
✓VD and VD(HP)	602-7001-004 ✓
NB, NBG and NB(HP)	602-7001-005
Single Encapsulation Universal Source	602-7001-006
Double Encapsulation Universal Source	602-7001-007
Single Encapsulation Side Weld	602-7001-008

All models are welded encapsulations constructed of 300 series of ARMCO Type 17-4PH stainless steel.

II. Radioactive Contents - The authorized radioactive contents of these sources consist of not more than:

Model No.	Contents
✓VD and VD(HP)	300 curies of:

Barium-131	Manganese-54
Cadmium-109	Phosphorus-32
Calcium-45	Rubidium-86
Calcium-47	Selenium-75
Cesium-137	Strontium-85
Chlorine-36	Thallium-204
Chromium-51	Thulium-170
Iridium-192	Tin-113
✓Cobalt-60	Ytterbium-169
Iron-59	Zinc-65

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II. Radioactive Contents (continued)

Model No. (con'd)	Contents (cont'd)
NB, NBG and NB(HP)	25 Curies Americium-241 30 millicuires Ra-226 500 millicuries Americum-241 and Cesium-137 mixture
Single Encapsulation Universal Source	500 curies Iridium-192 20 curies Cobalt-60
Double Encapsulation Universal Source	5000 curies Iridium-192 2000 curies Cobalt-60
Single Encapsulation Side Weld	500 curies Iridium-192 20 curies Cobalt-60

III. This certificate, unless renewed, expires July 30, 1987.

This certificate is issued in accordance with paragraph 803 of the IAEA Regulations and in response to the June 7, 1982 petition by Gamma Industries, Baton Rouge, Louisiana, and in consideration of the associated information therein.

Certified by:

R. R. RAWL
Chief, Radioactive Materials Branch
Office of Hazardous Materials Regulations
Materials Transportation Bureau

August 10, 1982
(DATE)

1/ "Safety Series No. 6, Regulations for the Safe Transport of Radioactive Materials, 1973 Revised Edition," published by the International Atomic Energy Agency (IAEA), Vienna, Austria.

2/ Title 49, Code of Federal Regulations, Part 170-178, USA

Revision 0 issued in response to the September 7, 1979, petition by Gamma Industries, Baton Rouge, Louisiana.
Revision 1 issued to add Cesium-137 to Models VD and VD(HP)
Revision 2 issued to list alternate stainless steel type.
Revision 3 issued to extend expiration date.

JL SHEPHERD and Associates

740 Salem Street, Glendale, California 91203 • 213/245-0187

Irradiation & Calibration Equipment • Lead Shielding • Nuclear Applications

DATA SHEET - SPECIAL FORM CAPSULE TESTING

Capsule Type: A-0096
Drawing Number: A-0096-C

Capsule was loaded with 5.2 grams of inert CsCl
Inner and outer capsules were heliarc welded in accordance with drawings and tests performed as below.

Date: February 2, 1980

49CFR 173.398 Special Tests

1.Free Drop - 30' to 1/4" thick steel plate on concrete surface.

Results: No visible damage to capsule or welds.

2.Percussion - 1" diameter steel rod, wt. 3 lbs. dropped and on 4 times through 40" distance on capsule laying on 1/4" lead sheet on concrete surface.
Results: Sides and end of capsule were dented. No fracture of outer capsules or welds.

3.Heating - Capsule heated in air to 1475°F in electric furnace and held at this temperature 15 minutes - then allowed to cool.
Results: Capsule discolored - no fracture of capsule ends, welds or walls.

4.Immersion - 24 hours in distilled water pH 7, maximum conductivity of 10 micro-mhos/cm.
Results: No visible effect on capsule - no leaking of CsCl from inside capsule.

Leak Test:
1. Method: Bubble Test. Capsule heated to 240° in glycol.
2. Results: No bubbles emerged from capsule.

J. L. Shepherd

Encl 10

J.L. SHEPHERD and Associates

740 Salem Street, Glendale, California 91203 • 213/245-0187

Irradiation & Calibration Equipment • Lead Shielding • Nuclear Applications

CERTIFICATION

SUBJECT: 130Ci Cesium-137 source capsule per J.L. Shepherd & Associates drawing #A-0096-C

This is to certify that a prototype of the source capsule per drawing A-0096-C has been subjected to and successfully passed free drop, percussion, heating and immersion tests as called out in 10 CFR 173.398.

J.L. Shepherd

Date: February 2, 1980

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MILITARY SPECIFICATION

RADIAC CALIBRATOR AN/UDM-2( )

1. SCOPE

1.1 Scope. - This specification covers the Radiac Calibrator AN/UDM-2( ) which provides the facilities for checking the operational reliability and calibration accuracy of various radiacmeters and radiac set. The calibrator consists of a dosimeter jig assembly and a doserate jig assembly; each assembly can be utilized independently of the other (see 6.1).

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

FEDERAL

PPP-B-585	Box, Wood, Wirebound
PPP-B-601	Box, Wood, Cleated-Plywood
PPP-B-621	Box, Wood, Nailed and Lock-Corner
PPP-B-636	Box, Fiberboard
PPP-B-640	Box, Fiberboard, Corrugated, Triple-Wall
PPP-F-320	Fiberboard, Corrugated and Solid, Sheet Stock Container Grade and Cut Shapes
PPP-S-760	Strapping, Nonmetallic and Connectors
PPP-T-76	Tape, Pressure-Sensitive Adhesive Paper, Water Resistant, for Carton Sealing
PPP-T-97	Tape, Pressure-Sensitive Adhesive, Filament Reinforced
NN-P-71	Pallets, Material Handling
QQ-S-781	Steel Strapping, Flat

ENCL 12

MILITARY

MIL-P-116	Preservation, Methods of
MIL-P-11268	Parts, Materials and Processes Used in Electronic Communication Equipment
MIL-M-13231	Marking of Electronic Items
MIL-M-19590	Marking of Commodities and Containers to Indicate Radioactive Material

STANDARDS

MILITARY

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-109	Quality Assurance Terms and Definitions
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-147	Palletized Unit Loads
MIL-STD-252	Wired Equipment, Classification of Visual and Mechanical Defects
MIL-STD-810	Environmental Test Methods

DRAWINGS

ELECTRONICS COMMAND

DL-SM-B-508965	Radiac Calibrator AN/UDM-2( )

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

3. REQUIREMENTS

3.1 Construction.- The equipment shall be constructed in accordance with the requirements of this specification, and of Drawing DL-SM-B-508965.

3.2 First Article Samples.- The contractor shall furnish first article samples of the calibrator in accordance with the requirements contained in the bid request and contract (see para. 4.3).

3.3 Parts, Materials and Processes.- In addition to any requirements of this specification covering parts, materials and processes, such items shall conform to MIL-P-11268, including the selection requirements therein.

3.4 Performance Characteristics.-

3.4.1 Calibration Accuracy.-

3.4.1.1 Dosimeter Jig Assembly (lower source).- The dose rate produced by the lower sources shall be within ±5R/min when related to a secondary calibration standard. When measured in accordance with paragraph 4.8.1, using a Government Furnished Victoreen Model 555 Radacon II, the dose rate produced by the lower sources shall be 205 R/min ±5R/min (see para. 4.8.1.2).

3.4.1.2 Dosimeter Jig Assembly (upper source).- The dose rate produced by the upper source shall be within ±0.05 mR/min when related to a secondary calibration standard. When measured in accordance with paragraph 4.8.2 using a Government Furnished Victoreen Model 555 Radacon II the dose rate produced by the upper source shall be 0.95 mR ± 0.05 mR (see paragraph 4.8.2.2).

3.4.1.3 Doserate Jig Assembly.- All measured test position dose rates shall be within ± .5R/min when related to a secondary calibration standard. When measured in accordance with paragraph 4.8.2, using a Government Furnished Victoreen Model 555 Radacon II, the dose rate produced with the shutter in the 100 R/hr position shall be 44.5 R/min ± 0.5 R/min (see paragraph 4.8.3).

3.4.2 Compatibility.-

3.4.2.1 Radiacmeters IM-9( )/PD, IM-93( )/UD and IM-147( )/PD, when exposed in the dosimeter jig assembly for the time specified on drawing SM-C-509026, shall respond in accordance with the appropriate reading and tolerance specified on drawing SM-C-509026. The discharge times should be adjusted for source decay in accordance with the instructions and data furnished on drawing SM-B-509027 and specified in paragraph 3.10 (see 4.9.1).

3.4.2.2 Radiacmeters IM-174/PD and IM-174A/PD and Radiac Set AN/PDR-27( ), when calibrated in the dcserate jig assembly in accordance with the instructions contained on drawing SM-C-509024, shall respond in accordance with the appropriate reading and tolerance specified on drawing SM-C-509024. The readings obtained should be adjusted for source decay in accordance with the instructions and data furnished on drawing SM-B-509023 and specified in paragraph 3.10 (see 4.9.2).

3.4.3 Surface Dose Rate.- The maximum allowable dose rate at any point on the external surface of the calibrator set shall not exceed 2 mr/hr. This requirement applies under all conditions of storage (see 4.10).

3.5 Weight.- The weight of the equipment, less manual, shall be held to a practical minimum consistent with good engineering practice for the intended use, but shall not exceed 40 lbs. (See 4.6.1.3)

3.6 Service Conditions.-

3.6.1 General.- The equipment shall perform as required by this specification when exposed to any operating condition listed in 3.6.2, or after exposure to any storage or transportation condition listed in 3.6.3, or to any possible combination of these service conditions.

3.6.2 Operating Conditions.- The conditions to which the equipment may be exposed during operation are as follows:

3.6.2.1 Temperature.- The equipment shall be capable of continuous operation at any ambient temperature from -25°F to+125°F (see 4.11).

3.6.2.2 Altitude.- Altitudes up to and including 10,000 feet above sea level (see 4.14.1).

3.6.2.3 Humidity.- Up to 100% relative humidity at varying temperatures including conditions wherein condensation takes place on the equipment (see 4.15).

3.6.2.4 Salt Fog.- Salt fog such as is encountered in coastal regions or on board ship (see 4.18).

3.6.2.5 Sand and Dust.- Dust and sand exposure shall be per Method 510 of Specification MIL-STD-810 (see 4.19).

3.6.3 Storage and Transportation Conditions.-

3.6.3.1 Temperature.- The equipment shall be capable of withstanding, without deterioration damage or degradation of performance, long periods of storage at temperature of -65°F to +155°F (see 4.11).

3.6.3.2 Altitude.- Altitudes up to and including 50,000 feet above sea level (see 4.14.2).

3.6.3.3 Immersion.- Immersion in water for 2 hours at a covering depth of 3 feet. There shall be no evidence of water inside the equipment (see 4.12).

3.6.3.4 Bench Handling.- The equipment shall meet the test of 4.13 without degradation of performance.

3.6.3.5 Bounce.- The equipment shall meet the test of 4.17 without degradation of performance.

3.6.3.6 Vibration.- The amplitude of any part , subassembly or structural member of the equipment shall not exceed twice the amplitude of the vibration applied to the equipment at any frequency between 10 and 55 Hertz (see 4.16).

3.6.3.7 Rain.- After testing as specified in 4.23 the equipment shall meet paragraph 4.7 without degradation of performance (see 4.23).

3.6.3.8 Shock.- Shock such as is encountered in transportation via aircraft, or dropping by parachute (see 4.21).

3.7 Special Capability Requirements.-

3.7.1 Facilities.- The contractor shall be required to provide in his plant, or have direct access to a cobalt 60 source capable of providing a minimum field intensity of 125 rads/hr at a distance of 1 meter from its geometrical center.

3.7.2 Equipment.- The contractor shall be required to provide in his plant a Victoreen Condenser "R" meter, or equivalent, calibrated by the National Bureau of Standards or other agency approved by the Government for measuring radiation flux.

3.7.3 License. - The contractor shall be required to possess or obtain a byproduct material license for the AN/UDM-2( ) and its sources from the Atomic Energy Commission as per Title 10, Chapter I, Code of Federal Regulations, Part 30.3, or from an agreement-state in which located as per the Agreement-state Regulations.

3.8 Interchangeability.- Like units, assemblies, subassemblies and replaceable parts shall be physically and functionally interchangeable, without modification of such items or of the instrument. Individual items shall not be handpicked for fit or performance however, matched pairs or sets, when permitted, may be interchangeable as such. Reliance shall not be placed on any unspecified dimension, rating,

characteristic, etc. (see 4.6.1.2).

3.9 Marking.-

3.9.1 General.- Marking shall conform to Specification MIL-M-13231.

3.9.2 Radioactive Warnings.- In addition to the general markings required by 3.9.1, the contractor shall comply with the requirements of MIL-M-19590. Each source shall be etched or stamped with a unique serial number and some symbol identifying the manufacturer and model number of the source. The contractor shall provide the Government with a list specifying the serial number of each calibrator and the serial number, symbol and nomenclature of each source contained therein.

3.9.3 Serial Numbers.- Each equipment shall bear a serial number in accordance with the requirements of Specification MIL-M-13231 and drawings SM-B-509016 and SM-B-509022.

3.10 Charts.- The contractor shall update the correction charts, drawings SM-B-509023 and SM-B-509027, which are required to be installed in the doserate jig assembly and dosimeter jig assembly per drawings SM-D-508967 and SM-D-508993. The year of source assay shall be assigned a correction factor of 1.0 for each chart and the remaining correction factors shall be derived accordingly. The chart shall cover a period of 20 years.

3.11 Radiological Tests.- The equipment shall be subject to the tests of paragraph 4.20 in the order given. Sources or calibrators that do not meet the limits specified in the source and contamination tests of 3.11.1 and 3.11.2 shall not be accepted.

3.11.1 Source Tests.- Each sealed source shall be subjected to the tests of paragraphs 4.20.1.1, 4.20.1.2, 4.20.1.3, 4.20.1.4 and 4.20.1.5 in that order.

3.11.1.1 Source Leak Tests.- This test is to be performed after the first encapsulation and again after the second encapsulation. During tests outlined in paragraph 4.20.1.1 and paragraph 4.20.1.3 any indication of bubbles from the source or on the source indicates the source may be leaking and is not acceptable for use in a calibrator.

3.11.1.2 Source Bloat Tests.- Any indication of bloating (bulging) of the thin window from internal pressure at the end of tests 4.20.1.2 and 4.20.1.4 shall be considered failure of the test.

3.11.1.3 Source Contamination Test.- Each sealed source to be used in a radiac calibrator must be subjected to the tests of paragraph 4.20.1.5 before it

is installed in the calibrator. The net counting rate in counts/minute (c/min) of the smear paper, used to smear the source, must not exceed 100 times the counting efficiency (E) of the smear counting system for strontium -90. A higher counting rate indicates that the source is contaminated above acceptable limits and must be decontaminated and tested again until it meets the acceptable limits or is rejected for use in a radiac calibrator.

3.11.2 Calibrator Contamination Tests. Each calibrator shall be subjected to the tests of paragraph 4.20.2. The net counting rate (c/min) of each of the cotton swabs used when following the procedures of paragraphs 4.20.2.2 and 4.20.2.3 must not exceed 25 times the counting efficiency (E) of the smear counting system for strontium -90. A higher counting rate indicates that the source is contaminated above acceptable limits.

3.12 Fungus.- The equipment (including accessories) shall show no evidence of viable fungus or corrosion when subjected to the test specified in 4.22. Corrosion is any visible degradation that can be attributed to flaky, pitted, blistered, or otherwise loosened finished or metal surface.

3.13 Workmanship.- The calibrator shall be manufactured and assembled in accordance with the applicable portions of MIL-P-11268.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection.- Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the contractor may utilize his own facilities, facilities of a subcontractor or any commercial laboratory acceptable to 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 that the supplies and services conform to prescribed requirements.

4.1.1 Contractor Quality Assurance.- The contractor shall provide and maintain a means of determining product conformance in accordance with the requirements specified herein or elsewhere in the contract. The Government, at its option, may perform any evaluation deemed necessary to assure the adequacy of the means employed and the effectiveness of the contractor's quality assurance methods and systems.

4.1.2 Government Verification.- All quality assurance operations required of the contractor shall be subject to Government verification at scheduled or unscheduled intervals. Verification will consist of the following:

(a) Surveillance of the contractor's operations to determine that practices, methods, and procedures of the contractor's quality assurance system are being applied and are, in fact, accomplishing the objectives of total compliance of the product with the requirements of this specification and the contract.

(b) Government product inspections to determine compliance of the product with the specification and contract requirements.

4.1.3 Accomodation and Assistance.- The Government quality assurance representative shall have the right to access to any area of the contractor's or his subcontractor's premises where any part of the work is being performed. The Government quality assurance representative shall be afforded unrestricted opportunity to verify conformance of the product with specification requirements. The contractor shall make his inspection equipment and records available for use by the Government quality assurance representative for verification purposes. The contractor's personnel shall be made available for operation of such inspection equipment as required.

4.1.4 Definitions.- Specification MIL-STD-109 applies for definitions of inspection terms used herein.

4.2 Classification of Inspections.- Inspections shall be classified as follows:

(a) First article inspection. (Does not include preparation for delivery.) (See 4.3.)

(b) Inspections covered by subsidiary documents. (See 4.4.)

(c) Quality conformance inspections.

(1) Quality conformance inspection of equipment before preparation for delivery. (See 4.6.)

(2) Quality conformance inspection of preparation for delivery. (See 4.24.)

4.3 First Article Inspection.- This inspection shall consist of the inspections specified in subsidiary documents covering the items listed in 4.4, and the inspections specified for group A, group B, and group C (see tables III, IV and V respectively). Environmental and stress inspections shall be performed in the order shown in table I according to the number of samples specified in the contract, ie, 5 or 10 each. The

numbers in each column indicate the particular tests to which a particular unit will be submitted and the sequence in which it will be conducted. After completing tests of Table I, each unit shall have their sources removed and the sources shall be tested in accordance with paragraph 4.20 (less paragraph 4.20.1.3 and 4.20.1.4).

Table I. - Order of Environmental and Stress Inspection

Inspection (Note 1)	Number of First Article Samples (Units)									
	5 Samples					10 Samples				
	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10
Non-damaging(Note2)										
Temperature										
Low----------	1					1				
High----------	2					2				
Altitude(elevation)-	-	1								
Leakage(immersion)-			1					1		
Dust----------			2					2		
Vibration----------				1					1	
Rain----------			3					3		
Potentially damaging										
Humidity(moisture resistance)-------	3					3				
Fungus (Note 3)----					1					
Salt Fog(Note 3)---		2								1
Bounce----------				2					2	
Bench handling-----					2					2
Shock----------				3					3	

Note 1: Other inspections may precede, follow, or be interspersed between the non-damaging tests.

Note 2: The order on non-damaging tests and the choice of which units are subjected to the non-damaging tests may be varied if convenient, except that the vibration test shall be performed on the same unit used for the bounce and shock tests.

Note 3: The equipment shall be thoroughly washed, cleaned, dried, and refurbished, if necessary, before preceding with subsequent tests.

4.4 Inspection Covered by Subsidiary Documents.- The following shall be inspected under the applicable subsidiary documents as part of the inspection of equipment before preparation of delivery.

Item	Where Required
Finish	3.3
Marking	3.9

4.5 Equipment Verification Review.- The contractor shall perform an Equipment Verification Review (EVR), consisting of a complete technical audit of the equipment on order against the drawings cited for construction (see 3.1). The EVR shall consist of the following:

4.5.1 An audit to establish that "as built" equipment (unit, assembly, module, or part) is fabricated in accordance with the cited end product drawings.

4.5.2 An audit to establish that "as built" configuration of unit, assembly, module or part meets the test requirements (other than equipment specification performance) specified on the applicable drawings for each unit, assembly, module, or part. The audit shall record all test methods used together with resulting verification test data.

4.5.3 The contractor shall compile an EVR report(s) containing the following information:

(a) Identification of unit, assembly, module, or part and details proving compliance with 4.5.1 and 4.5.2 above.

(b) Discrepancies noted.

(c) Corrective action taken.

4.5.4 The contractor shall make available to the Government copies of his EVR report(s) no later than 15 days prior to the submission of the first production unit or lot. The results of the EVR shall be subjected to inspection by authorized Government personnel at the time the first production unit or production lot is offered for acceptance. Government inspection will be to the depth and extent necessary to demonstrate that the "as built" hardware is in accordance with the cited drawings. Copies of the EVR reports shall be made available to the Government personnel during the inspection. The contractor shall provide the following:

(a) Segregation of units, assemblies, modules and parts to permit reviewing personnel access for detailed inspection.

(b) As required, responsible personnel from each functional department available for discussions in their respective areas.

(c) Adequate administrative support for the EVR.

4.6 Quality Conformance Inspection of Equipment Before Preparation for Delivery.- The contractor shall perform the inspection specified in 4.4. and 4.6.1 through 4.6.3. 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. The Government will review and evaluate the contractor's inspection procedures and examine the contractor's inspection records as an element of Government verification (see 4.1.2).

4.6.1 Group A Inspection.- Equipment shall be assembled into discrete lots for quality conformance inspection, utilizing the criteria of MIL-STD-105 for determination of lot composition. Unless otherwise specified, the lot size shall be determined from table II, as related to production rates necessary to meet delivery schedules of the contract. The lot size shall be adjusted throughout the life of the contract as necessary to provide for changes in contract delivery schedules and production rates. Each unit of each lot of equipment shall be inspected for conformance to all the examinations and tests required in table III. The quality conformance of each lot shall then be subjected to an audit, utilizing the procedures of MIL-STD-105, under the general inspection level II and the Acceptable Quality Level (AQL) indicated in table III. Group A functional inspection shall be performed in the order specified in table III.

Table II. - Lot Formation

Production Rate	Size of Lot
500 or more per month	One week's production
51 to 499 per month	Two week's production
0 to 50 per month	One month's production

4.6.1.1 Visual and Mechanical Inspection.- These inspections shall be performed in any order which is satisfactory to the Government. The units shall be examined for the applicable defects listed in MIL-STD-252.

4.6.1.2 Inspection for Interchangeability.- The mechanical dimensions shall be measured to determine conformance to the physical and functional interchangeability requirements (see 3.8). This inspection shall be conducted on piece parts and subassemblies prior to final assembly.

4.6.1.3 Weight.- The equipment shall be weighed (less manuals) to determine conformance to paragraph 3.5.

Table III. - Group A Inspection

Inspection	Req Para	Insp Para	AQL% Major	AQL% Minor
Visual and Mechanical	3.1	4.6.1.1	1.0	4.0
Functional				*
Surface dose rate	3.4.3	4.10	1.0	
Accuracy	3.4.1	4.8	1.0	
Compatibility				
IM-9( )/PD	3.4.2.1	4.9.1	1.5	
IM-93A/UD IM-147( )/PD	3.4.2.1	4.9.1	1.5	
IM-174/PD IM-174A/PD AN/PDR-27( )	3.4.2.2	4.9.2	1.5	
Radiological				
Source Tests (Note 1)	3.11.1	4.20.1	0.65	
Calibrator Contamination (Note 2)	3.11.2	4.20.2	0.65	

*No minor functional or radiological defects permitted.

Note 1: If the prime contractor does not manufacture the sources, this inspection shall be a requirement placed by the prime contractor on his subcontractor.

Note 2: This inspection shall be performed as a requirement under group A inspection (para. 4.6.1) and also prior to packaging and packing (para. 4.24).

4.6.2 Group B Inspection.- This inspection, including sampling, shall conform to table IV and to procedures for special inspection levels of MIL-STD-105. Group B inspection shall be performed on production lots of product that have passed group A inspection. (See 4.6.1 for lot formation)

4.6.2.1 Order of inspection within Group B.- Group B inspection shall be performed in the following order:

Table IV. - Group B Inspection

Inspection	Req Para	Test Para	AQL
Interchangeability	3.8	4.6.1.2	4.0% Level S-3
Temperature	3.6.2.1	4.11	2.5% Level S-4
Immersion	3.6.3.3	4.12	4.0% Level S-3
Bench Handling	3.6.3.4	4.13	4.0% Level S-3
Weight	3.5	4.6.1.3	4.0% Level S-3

4.6.3 Group C Inspection.- This inspection shall consist of the tests specified in table V and shall be performed on units of product that have been subjected to and passed group A and group B inspection requirements. Sample units shall be selected in accordance with 4.6.3.1.

4.6.3.1 Group C inspections shall be performed on the first production lot and at the 25%, 50%, 75% and 100% points in production. It is not the intention of the Government to require that all the group C tests be performed on the same radiac calibrators. Simultaneous testing, using several groups of radiac calibrators, may be performed. The order of tests and the choice of which units are subjected to each test may be varied to suit the availability of test facilities and decrease total testing time.

Table V.- Group C Inspection

Inspection	Req Para	Test Para	Number of instruments to be submitted to each test
Altitude (storage)	3.6.3.2	4.14.2	2
Humidity	3.6.2.3	4.15	2
Salt Fog	3.6.2.4	4.18	1
Sand and Dust	3.6.2.5	4.19	1
Bounce	3.6.3.5	4.17	2
Vibration	3.6.3.6	4.16	2
Fungus (Note 1)	3.12	4.22	1
Altitude(operating) Note 1	3.6.2.2	4.14.1	2
Rain	3.6.3.7	4.23	2
Shock (Note 1)	3.6.3.8	4.21	1
EVR	3.1	4.5	*

Note 1: These tests shall be performed only on the first production lot and on a sample selected from the lot representing approximately the 50% point in production.

* Shall be performed once on the initial production lot.

4.6.3.2 Noncompliance.- All quality conformance inspection shall be halted, including group A and group B inspections, upon the occurence of any group C failure. The contractor shall immediately report in writing each group C failure occurence, including details of the failure and characteristics affected. The contractor shall immediately investigate the cause of failure and further report the results of investigation and details of the proposed corrective action on the processes and materials, as applicable, and on all units of product which are manufactured under the same conditions and which the Government considers subject to the same failure. Reports shall be forwarded through the Government procurement quality assurance representative to the

responsible technical activity designated in the contract. After corrective action has been taken, additional sample units shall be subjected to group C inspection (all inspections, or the inspections which the sample failed, at the option of the technical activity) and group A and group B inspections may be reinstituted. However, final acceptance and shipment will be withheld until group C reinspection results have shown that the corrective action was effective and approved by the technical activity.

4.6.4 Reinspection of Conforming Group B and Group C Sample Units.- Unless otherwise specified, sample units which have been subject to and passed both group B and group C inspections may be accepted on the contract provided all damage is repaired and the sample units are resubjected to and pass group A inspection.

4.7 Performance Checks.-

4.7.1 Dosimeter Jig Assembly.- Insert a charged and calibrated Radiacmeter IM-93A/UD (see 4.9.1) into the central well of the assembly and discharge it in accordance with the instructions on drawing SM-C-509026. Repeat the above procedure for a total of 3 readings and calculate the average reading. The average reading shall be within the allowable tolerances specified on drawing SM-C-509026; readings shall be adjusted for source decay. Repeat the above using a Radiacmeter IM-147( )/PD and a Radiacmeter IM-9( )/PD.

4.7.2 Doserate Jig Assembly.- Insert the detector unit of a calibrated Radiacmeter IM-174A/PD into the assembly and expose it to fields of 100 Rads and 10 Rads from the source; readings shall be in accordance with the allowable tolerances specified on drawing SM-C-509024. Readings shall be adjusted for source decay. Repeat the above using a calibrated IM-174/PD; readings shall be in accordance with the allowable tolerances specified on drawing SM-C-509024. Readings shall be adjusted for source decay. Separate the probe unit of a calibrated AN/PDR-27( ) into the two tubular sections. Insert the small probe into the assembly and with the radiac set switched to the 500mR/hr range, rotate the calibrator shutter to the 100R position. The reading shall be within the allowable tolerances specified on drawing SM-C-509024; readings shall be adjusted for source decay.

4.8 Accuracy.- Each calibrator, when checked with the Government furnished Victoreen Model 555 Radacon II in accordance with the procedures specified herein, shall meet the requirements of paragraph 3.4.1.

4.8.1 Dosimeter Jig Assembly Measurements (lower source).-

4.8.1.1 Interconnect the Radacon II and its accompanying remote head in accordance with the manufacturer's Instruction Manual supplied with the instrument; attach the probe (Victoreen Part No. 555-100-MB) to the appropriate terminals on the remote head and allow a 30 minute warmup.

4.8.1.2 The lower source of the Dosimeter Jig Assembly tested in accordance with drawing SM-A-509093 paragraph 3.1 shall meet the requirements of paragraph 3.4.1.1.

4.8.2 Dosimeter Jig Assembly Measurements (upper source).-

4.8.2.1 Same as paragraph 4.8.1.1 except probe Victoreen Part No. 555-100-1C shall be used.

4.8.2.2 The upper source of the Dosimeter Jig Assembly shall be tested in accordance with drawing SM-A-509093 paragraph 3.2 and shall meet the requirements of paragraph 3.4.1.2.

4.8.3 Doserate Jig Assembly Measurements.-

4.8.3.1 Same as paragraph 4.8.1.1.

4.8.3.2 Doserate Jig Assembly shall be tested in accordance with drawing SM-A-509093 paragraph 4.0 and shall meet the requirements of para. 3.4.1.3.

4.9 Compatibility.-

4.9.1 Dosimeter Jig Assembly.- Calibrate all Radiacmeters IM-9, IM-93 and IM-147 supplied as Government-furnished equipment (GFE) at mid-scale using a cobalt 60 source, the calibration of which is traceable to the National Bureau of Standards. The radiacmeters shall read as follows:

IM-9( )/PD	100 mR	± 10%
IM-93A/UD	300 R	± 10%
IM-147( )/PD	25 R	± 10%

Any Government furnished radiacmeter, whose reading exceeds the specified tolerance, shall not be used. Select 10 units of each type of radiacmeter and charge to zero. Discharge each radiacmeter in its appropriate position in the dosimeter jig assembly for the period specified on drawing SM-C-509026 for the particular radiacmeter under test. Repeat the above procedure for a total of 3 readings for each radiacmeter and calculate the average reading. The average reading shall be within the allowable tolerances specified on drawing SM-C-509026; readings shall be adjusted for source decay (see 3.4.2.1).

4.9.2 Doserate Jig Assembly.- Calibrate all Radiacmeters IM-174 and IM-174A and Radiac Sets AN/PDR-27( ) supplied as GFE using a cobalt 60 source, the calibration of which is traceable to the National Bureau of Standards. The instruments shall be calibrated at the following points:

Instrument	Calibration Point	Tolerance
IM-174A/PD	100R/hr	±15%
IM-174/PD	100R/hr	±10%
AN/PDR-27( )	250 mR 25 mR 2.5 mR 0.25 mR	±20%

Any Government furnished equipment which can not be calibrated shall not be used. Select 2 units each of Radiacmeters IM-174 and IM-174A and 2 units of Radiac Set AN/PDR-27( ) and check the calibration of each unit in the calibrator in accordance with the procedures specified on drawing SM-C-509024. Repeat each check for a total of 3 readings per unit and the average reading per unit shall be within the allowable tolerances specified on drawing SM-C-509024; readings shall be adjusted for source decay (see 3.4.2.2).

4.10 Surface Dose Rate.- Using a Government furnished Radiac Set AN/PDR-27 (with beta shield removed), calibrated as specified in paragraph 4.9.2, the surfaces of the Radiac Calibrator AN/UDM-2 shall be monitored for conformance to the requirement of paragraph 3.4.3.

4.11 Temperature Tests.-

4.11.1 High Temperature.- The dosimeter jig assembly as defined by drawing SM-D-508967 and the doserate jig assembly as defined by drawing SM-D-508993 shall be subjected to Procedure I, Method 501 of MIL-STD-810 with the following exceptions:

(a) Temperature of step 2 shall be +155°F.

(b) Step 3 shall be for 24 hours.

(c) Step 4 shall be +125°F.

(d) At steps 5 and 7, equipment shall meet the performance checks of paragraphs 4.7.1 and 4.7.2.

4.11.2 Low Temperature.- The dosimeter jig assembly and doserate jig assembly, as defined in paragraph 4.11.1, shall be subjected to Procedure I, Method 502 of MIL-STD-810 with the following exceptions:

(a) Temperature of step 2 shall be -65°F and maintained for 24 hours.

(b) Temperature for step 4 shall be -25°F.

(c) At steps 5 and 7, equipment shall meet the performance checks of paragraphs 4.7.1 and 4.7.2.

4.12 Immersion.- Immerse the equipment, closed as for storage or transportation, in a tank of fresh water so that the surface of the water is not less than 3 feet above the uppermost point of the equipment when submerged; the water shall be at room temperature ±10°F. The equipment shall be immersed for 2 hours and then removed and visually inspected for evidence of leakage into the case (see 3.6.3.3).

4.13 Bench Handling.- The equipment, locked as for storage or transportation, shall be placed on a solid, 2 inch fir bench top. Tilt the equipment through an angle of 30° using one edge as an axis; allow to drop freely back to the horizontal. Repeat, using the remaining three edges of the same horizontal face as axes, for a total of 4 drops. Repeat the above with the equipment resting on the remaining five faces for an overall total of 24 drops. Upon completion of the test, the equipment shall meet the performance checks of paragraphs 4.7.1 and 4.7.2 (see 3.6.3.4).

4.14 Altitude.-

4.14.1 Operating.- Place the equipment in the test chamber in accordance with section 3, paragraph 3.2.2 of MIL-STD-810; maintain standard ambient temperature during the entire test. Reduce the chamber internal pressure to 20.6 inches of Hg (10,000 ft above sea level) and operate the equipment in accordance with paragraphs 4.7.1 and 4.7.2. Upon completion of the performance checks, return the chamber to standard ambient pressure and repeat the performance checks of paragraphs 4.7.1 and 4.7.2 (see 3.6.2.2).

4.14.2 Non-operating.- The equipment, closed for storage or transportation, shall be placed in the test chamber; maintain standard ambient temperature during the entire test. The equipment shall be subjected to steps 2 and 4 of Procedure I, Method 500 of MIL-STD-810. Upon completion of step 4, the equipment shall be tested per paragraph 4.7.1 and 4.7.2 (see 3.6.3.2).

4.15 Humidity.- The equipment shall be subjected to Procedure II, Method 507 of MIL-STD-810 except that:

(a) The equipment shall be opened into its 2 halves during step 1.

(b) Step 2 shall be deleted.

(c) Performance check, per paragraphs 4.7.1 and 4.7.2 shall be accomplished during step 4.

(d) Equipment shall be closed as for storage or transportation during the first 3 cycles of step 6. During cycles 4 and 5, the equipment shall be opened as in step 5.

(e) Performance check, per paragraphs 4.7.1 and 4.7.2 shall be accomplished during step 8 (see 3.6.2.3).

4.16 Vibration (Resonance Search).- The equipment shall be subjected to Procedure XI, paragraph 4.16.1, Method 514.1 of MIL-STD-810. Bolt each half of the equipment on to the table in turn so that the equipment may be observed during the testing. Upon completion of the test, the equipment shall meet the performance checks of 4.7.1 and 4.7.2 (see 3.6.3.6).

4.17 Bounce.- The equipment shall be subjected to Procedure XI, paragraph 4.16.2, Method 514.1 of MIL-STD-810. Upon completion of the test, the equipment shall meet the performance checks of 4.7.1 and 4.7.2 (see 3.6.3.5).

4.18 Salt Fog.- The equipment, opened as in operational use, shall be subjected to Method 508, procedure 1, of MIL-STD-810. Salt concentration shall be 20%. Upon completion of the test the equipment shall meet the requirements of 4.7.1 and 4.7.2 (see 3.6.2.4).

4.19 Sand and Dust.- The equipment, opened as in operational use, shall be subjected to Method 510 Procedure I of MIL-STD-810. Upon completion of the test the equipment shall meet the requirements of 4.7.1 and 4.7.2 (see 3.6.2.5).

4.20 Radiological Tests.- These tests shall be performed by or under the direct supervision of the Radiological Protection or Radiological Safety Officer employed by the contractor in accordance with current Atomic Energy Commission Regulations.

4.20.1 Source Tests.-

4.20.1.1 Source Leak Tests.- Fill a 200-500 ml beaker about 2/3 full

of water. Boil water for several minutes to drive off any dissolved air. (Note: the sensitivity of the test will be increased by addition of ethylene glycol to increase the boiling point). The temperature of the water should be kept above 95°C during the remainder of the tests. A transparent beta shield (preferably plastic), having a minimum area density of 1g/cm^2, should be placed between the individuals performing or observing the tests and the beaker, its heat sources and the shielding type source container, to protect them from the radiation. A light should be directed on the beaker at right angles to the line of view of the operator. Care should be taken to insure that the light does not shine in the operator's eyes. Using remote handling tool(s), remove a source (at or below 30°C) from the shielded container and drop it into the hot water. Closely observe the source and the water above it for one minute. (Note: A large hand lens mounted near the beaker or the use of binoculars or a telescope that will focus on objects as close as two or three feet will aid in this test). Bubbles from the source or on the source indicate a leak.

4.20.1.2 Source Bloat Test.- After a source has passed a leak test, place it in storage for at least ten days. Remove source from storage with remote handling equipment and examine the thin window for bloating or bulging.

4.20.1.3 Second Encapsulation Leak Test.- After the second encapsulation of the source repeat the test described in4.20.1.1.

4.20.1.4 Second Encapsulation Bloat Test.- After a source has passed the test outlined in 4.20.1.3, repeat the test of 4.20.1.2.

4.20.1.5 Source Contamination Test.-

1. Use for counting any standard beta counting system which includes a scaler and timer and has a detector window at least one inch in diameter and not exceeding 2.0 mg/cm^2. Use for wiping any commercially available cloth-type smear paper with adhesive backing or commercially available smooth surface filter paper whose diameter does not exceed the diameter of the detector window or counting planchet. Use for handling the smear paper any handle with a flat end slightly smaller than the smear paper. The end will be covered with about 1/8 inch sponge rubber or compressible foam plastic.

2. Calibrate the beta counting system by placing 0.1 ml standard Sr^{90} counting solution (0.005-0.015 microcuries per milliliter)onto a piece of smear paper and air dry. Center the standard solution smear paper on a planchet and count for a minimum of ten minutes. Calculate Sr^{90} disintegrations per minute (A) by multiplying standard solution concentration (uCi/ml) by 0.1 ml and by 2.22 x 10^6 disintegrations per minute (d/min.) per microcurie. Calculate overall counting

efficiency (E) in counts per disintegration of Sr^{90} by subtracting background number of counts (gotten by counting clean piece of smear paper for same time as standard solution smear paper) from the number of counts from the standard solution smear paper, dividing by the counting time, then dividing by A. Calculate the standard counting time (T) in minutes by using the following formula:

$$T = \frac{8 \times 10^{-4} (50E + B)}{E^2 \quad i}$$

where B is background counting rate in counts per minute.

3. To test each source attach a clean piece of smear paper to the rubber or plastic-tipped handles (use rubber cement if necessary). Protect testing personnel by placing a transparent shield (at least 1 g/cm^2, preferably plastic) between the personnel and source handling area. Handling the source with one pair of tongs and the smear paper handle with another pair of tongs wipe all surfaces of the source applying moderate pressure. Count the test smear paper in the same manner as the background and standard solution smear paper were counted. The counting time will be the next largest whole number of minutes greater than T.

4.20.2 Calibrator Contamination Test.-

4.20.2.1 Equipment and Counting Procedure.- Use the identical procedure outlined in 4.20.1.5 with the following exceptions:

1. Use commercially available cotton swabs in place of smear paper and handle. To count the cotton swab, cut off all but a short stub of the handle and tape the stub to the planchet, centering the cotton in the planchet.

2. Use the following formula to calculate T:

$$T = \frac{6.4 \times 10^{-3} (12.5E + B)}{E^2}$$

4.20.2.2 Dosimeter Jig Assembly Wipe Test.-

WARNING

Do not under any circumstances expose the eyes to the radiation field by peering into the access hole while the swivel cover is swung aside.

Swing aside the swivel cover and using a cotton swab, wipe around the inner surface of the access hole. Using the procedure of 4.20.2.1, check the cotton swab for contamination. WARNING: Prior to checking the swab for contamination do not leave the swab unattended or allow it to touch any object.

4.20.2.3 Doserate Jig Assembly Wipe Test.- Open the drawer and using a cotton swab, wipe the inside and outside surfaces of the drawer. Using the procedure of 4.18.2.1, check the cotton swab for contamination. WARNING: Prior to checking the swab for contamination do not leave the swab unattended or allow it to touch any object.

4.21 Shock Test.- The equipment shall be subjected to Procedure II, Method 516 of MIL-STD-810 except that the height of drop shall be 2 feet. Upon completion of the test, the equipment shall meet the performance checks of paragraphs 4.7.1 and 4.7.2 (see 3.6.3.8).

4.22 Fungus Test.- The equipment in its opened position shall be subjected to Method 508 of MIL-STD-810 (see 3.12). Performance check, per paragraphs 4.7.1 and 4.7.2, shall be accomplished upon completion of the test.

4.23 Rain test.- The equipment, closed as for storage or transportation, shall be tested as follows:

4.23.1 Dry at 150°±5°F for 48 hours.

4.23.2 Condition for 4 hours at 77°±5°F and 50 to 60 percent relative humidity.

4.23.3 Take pretest data. The equipment shall meet the test of 4.7.

4.23.4 Test equipment in accordance with Method 506, Procedure I, of MIL-STD-810. There shall be no wind source and the rain fall throughout the test shall be 4±1 inch. Complete final measurements within 1 hour after the rain has been discontinued (see 3.6.3.7).

4.24 Quality Conformance Inspection of Preparation for Delivery.- Preparation for delivery shall be inspected in accordance with Specification MIL-P-116 to determine conformance to the requirements of section 5. The test of paragraph 4.20.2 shall be performanced on each unit prior to packaging and packing.

5. PREPARATION FOR DELIVERY

5.1 Preservation and Packaging.- Preservation and Packaging shall be level A or C as specified (see 6.1).

5.1.1 Level A.-

5.1.1.1 Cleaning.- Radiac Calibrator AN/UDM-2 shall be cleaned in accordance with process C-1 of MIL-P-116.

5.1.1.2 Drying.- Radiac Calibrator AN/UDM-2 shall be dried in accordance with the applicable procedures of MIL-P-116.

5.1.1.3 Preservation Application.- None required.

5.1.1.4 Unit Packaging.- Unit packaging shall be in accordance with the methods prescribed in MIL-P-116 as specified herein.

5.1.1.4.1 Technical Literature.- Each technical literature shall be packaged Method 1C-1.

5.1.1.4.2 Radiac Calibrator AN/UDM-2.- Each calibrator shall be individually packaged Method III as follows: Secure the shipping locks of both assemblies of the calibrator. Place the 2 halves of the calibrator together and secure the fastenings. Cushion the calibrator on all surfaces with cells or pads or both fabricated of fiberboard conforming to PPP-F-320, type CF, class weather-resistant, variety SW, grade W5c, designed to protect all projections and absorb the shock of impact in handling and transit. Place the cushioned calibrator within a close-fitting fiberboard box conforming to PPP-B-636, W5c. Place the technical literature, packaged as specified in 5.1.1.4.1, on top of the cushioned calibrator, directly under the lid of the box. Close the box as specified in the appendix of the box specification.

5.1.2 Level C.- Radiac Calibrator AN/UDM-2 shall be preserved and packaged in a manner that will afford adequate protection against physical and environmental damage during shipment, handling and limited intransit storage.

5.2 Packing.- Packing shall be level A, B or C as specified. Shipping containers for all levels shall be capable of stacking and supporting superimposed loads, during shipment and storage without damaging the container(s) or its contents (see 6.1(b)).

5.2.1 Level A.-

5.2.1.1 Palletized Loads.- A quantity of Calibrator Set, Radiac AN/UDM-2 not to exceed twenty (20) and packaged as specified in 5.1, shall be placed on a pallet, load type 1, conforming to MIL-STD-147 except that the pallet shall be softwood conforming to NN-P-71, type IV, size 2. A fiberboard cap shall be employed over the load having two sides extending down the stacked load at least 12 inches to accommodate marking requirements. The cap shall be fabricated of fiberboard conforming to PPP-F-320, class weather-resistant, W5s or V3c. The load shall be "bonded" to the pallet by strapping.

5.2.1.2 Less Than Palletized Load.- When quantities per destination are less than a paller load, the item packaged as specified in 5.1, shall be waterproofed, with tape conforming to PPP-T-76, in accordance with the taping requirements of the appendix of the box specification. A quantity of the water-proofed containers not to exceed twenty (20) shall be packed within a close-fitting box conforming to PPP-B-601, overseas type; PPP-B-621, style 4, class 2; or PPP-B-585, style 2 or 3, class 3. When the gross weight exceeds 200 pounds, or the container length and width is 48 x 24 inches or more and the weight exceeds 100 pounds, 3 x 4 inche skids, laid flat, shall be applied in accordance with the requirements of the container specification, or if not specified in the specification, in a manner which will adequately support the item and facilitate the use of material handling equipment. Closure and strapping shall be in accordance with the applicable container specification or appendix thereto except that metal strapping shall conform to QQ-S-781, type I, class B.

5.2.2 Level B.-

5.2.2.1 Palletized Load.- A quantity of Radiac Calibrators, AN/UDM-2, packaged as specified in 5.1, shall be palletized as specified in 5.2.1.1.

5.2.2.2 Less Than Palletized Load.- When quantities per destination are less than a pallet load, a quantity of Calibrator Set, Radiac AN/UDM-2 not to exceed twenty (20) and packaged as specified in 5.1, shall be packed within a close-fitting fiberboard box conforming to PPP-B-640, class 2, style E, or PPP-B-636, type CF, class weather-resistant, variety DW. The gross weight of boxes conforming to PPP-B-640 shall not exceed 250 pounds. When the gross weight exceeds 200 pounds or the container length and width is 48 x 24 inches or more and the weight exceeds 100 pounds, containers will be pallet-mounted on pallets conforming to NN-P-71, type IV. Closure shall be in accordance with the appendix of the applicable box specification. Reinforcing shall be by pressure-sensitive filament tape bonding or non-metallic strapping conforming to PPP-T-97, type IV and PPP-S-760, type II, respectively; selection of the material and application shall be in accordance with

the appendix of the applicable box specification.

5.2.3 Level C.-

5.2.3.1 Palletized Load.- A quantity of Radiac Calibrators AN/UDM-2, packaged as specified in 5.1, shall be palletized as specified in 5.2.1.1 except that the fiberboard caps shall be class domestic.

5.2.3.2 Less Than Palletized Load.- When quantities per destination are less than a pallet load, a quantity of Radiac Calibrator AN/UDM-2, packaged as specified in 5.1, shall be packed as specified in 5.2.2.2 except that the fiberboard boxes shall conform to PPP-B-640 and PPP-B-636, class 1 and class domestic, respectively, and reinforcing shall not be required for boxes conforming to PPP-B-636.

5.3 Marking.- In addition to any special marking required by the contract or order, interior packages and exterior shipping containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use.-

6.1.1 The dosimeter jig assembly is used to check Radiacmeters IM-9( )/PD, IM-93( )/UD and IM-147( )/PD (dosimeters). The assembly containes four SR-90 sources (one 20 microcurie source and three 25 millicurie sources) arranged to radiate into a central cavity. The upper field is utilized in checking the operational reliability of Radiacmeter IM-9( )/PD while the lower field performs a similar function for Radiacmeters IM-93( ) and IM-147( )/PD.

6.1.2 The doserate jig assembly consists of a drawer unit and a spacer block. The drawer unit contains an encapsulated 25 millicurie SR-90 source. The spacing block provides varying field intensities used to calibrate radiacmeter probes. This assembly is utilized to calibrate Radiacmeters IM-174 and IM-174( ) and Radiac Set AN/PDR-27( ).

6.2 Ordering Data.- Procurement documents should specify the following:

(a) Title, number and date of this specification and any amendment thereto.

(b) Levels of preservation, packaging and packing (see Section 5).

Notification to the contractor that he must comply with Title 49 CFR.

(c) Number of First Article samples to be submitted for approval (see 4.2).

(d) Technical literature and running spares (see 3.9).

(e) When the rough handling and functional tests are required.

6.3 Nomenclature.- The contractor should apply for nomenclature in accordance with the applicable clause in the contract.

Notice: When Government drawings, specifications or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility or any obligation whatsoever; and the fact that the Government may have formulated, furnished or in any way supplied the said drawings, specifications or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell patented invention that may in any way be related thereto.

6.4 Government Furnished Property (Loaned).- The following government property, in the quantities specified, shall be loaned to the successful bidder for the purpose of performing acceptance tests on the equipment being procured:

Radiacmeter IM-9( )/PD	25 each
Radiacmeter IM-93A/UD	25 each
Radiacmeter IM-147( )/PD	25 each
Radiacmeter IM-174( )/PD	4 each
Radiacmeter IM-174A/PD	6 each
Radiac Set AN/PDR-27( )	4 each
Radiac Charger PP-1578( )	6 each

Victoreen Model 555 Radacon II with instruction manual, Victoreen Model 555-100-MB probe, Victoreen Model 555-100-1C probe, and accessories 1-5 per drawing SM-A-509093, Timer 555-50	1 each

Custodian
Army-EL

Preparing Activity
Army-EL
Project Number 6665-A285

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C	REDRAWN ALSO ECP NIBFD22010 NOR010 INCORPORATED	12 AUG 81	ES HJW

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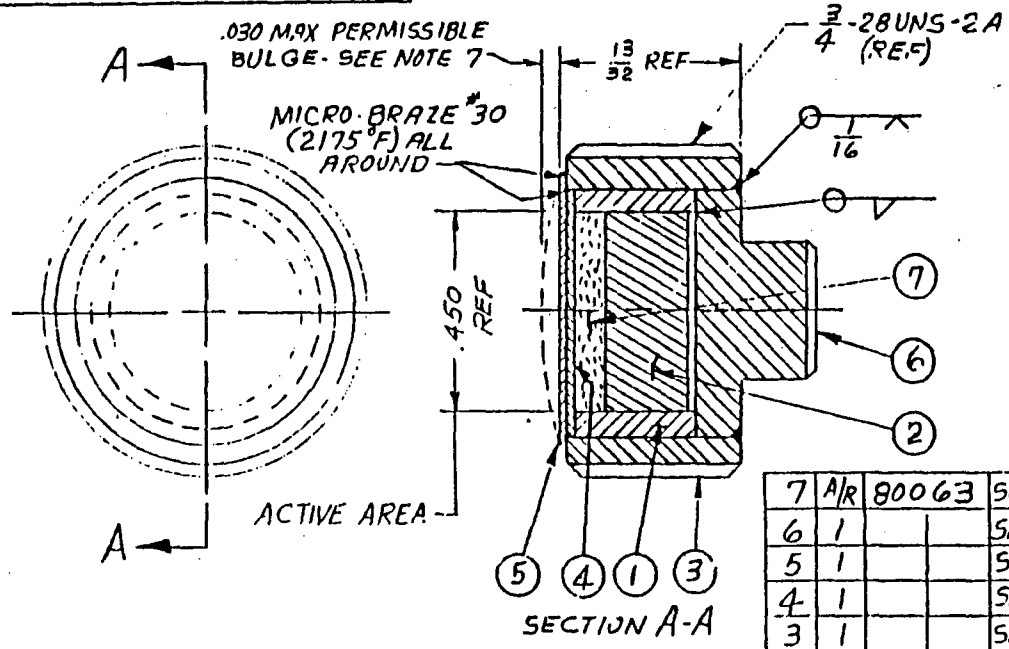

SOURCE CONTROL DRAWING

FIND NO.	QTY REQD	CODE IDENT.	PART NO. OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPECIFICATION	NOTE
7	A/R	80063	SM-B-509048-1	MATERIAL, RADIOACTIVE		8 9 1
6	1		SM-B-509054	PLUG		
5	1		SM-B-509053	WINDOW, OUTER		
4	1		SM-B-509052	WINDOW, INNER		
3	1		SM-B-509051	CAPSULE, OUTER		
2	1		SM-B-509050	PLUG		
1	1		SM-B-509049	CAPSULE, INNER		

PARTS LIST

APPROVED SOURCE

	MFG PART NO	SOURCE
1	3 FIG	3M CO. ST. PAUL MINN. 55105

NEXT ASSY	USED ON
SM-D-508975	DL-508965
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
FRACTIONS — DECIMALS — ANGLES —

MATERIAL: —

DA-28-043-AMC-02402E

ELECTRONICS COMMAND

REVIEWED ER-1 SM'F
APPROVED ER-1 SM'F
DATE 24 FEB 69

DEPARTMENT OF DEFENSE
U. S. ARMY ELECTRONICS COMMAND
FORT MONMOUTH NEW JERSEY 07703

SOURCE ASSEMBLY

SIZE	CODE IDENT NO.	
B	80063	SM-B-509048

SCALE 4/1 SHEET 1 OF 3

WHEN REFERRING TO THIS DRAWING STATE DRAWING NO., APPLICABLE ISSUE LETTER IF ANY, AND DATE

NOTE: DATA MARKED WITH AN ASTERISK (*) IS PECU... TO A PRIOR MANUFACTURER. IT DOES NOT TAKE PRECEDENCE OVER ANY OTHER DATA ON THIS DRAWING, AND IS NOT CONTRACTUALLY BINDING ON EITHER THE CONTRACTOR OR THE GOVERNMENT.

REVISIONS			
LTR	DESCRIPTION	DATE	...ED
C	SEE SHEET 1	12 MAY 81	...

NOTES

1. THIS ASSEMBLY SHALL MEET SPECIAL FORM MATERIAL TEST REQUIREMENTS OF TITLES 49, CODE OF FEDERAL REGULATIONS.
2. THE STRONTIUM -90 (SR90) SOURCES MUST MEET THE ANSI CLASSIFICATION OF 43343 (REFERENCE ANSI N542-1977).
3. THE RADIOACTIVE SOURCE ASSEMBLY MUST BE EVALUATED AND APPROVED FOR USE BY THE NUCLEAR REGULATORY COMMISSION OR AGREEMENT STATE. CONTRACTOR TO SUBMIT DOCUMENTATION OF THE ABOVE TO HEADQUARTERS, CECOM, DRSEL-SF-H, FORT MONMOUTH, NJ 07703.
4. WHEN THE SOURCE ASSEMBLIES ARE INSTALLED IN THE AN/UDM-2 ( ) RADIAC CALIBRATOR, EACH ASSEMBLY SHALL MEET THE FOLLOWING REQUIREMENT AND TEST PARAGRAPHS OF SPEC MIL-R-55350:

REQT PARA	TEST PARA
3.4.1.2	4.6.1.2

5. IN ADDITION, EACH SOURCE ASSEMBLY SHALL MEET THE FOLLOWING REQUIREMENT AND TEST PARAGRAPHS OF SPEC MIL-R-55350:

REQT PARA	TEST PARA
3.11	4.10
3.11.1	4.10.1.1
3.11.1.1	4.10.1.3
3.11.1.2	4.10.1.2 & 4.1.10.1.4
3.11.1.3	4.10.1.5

6. BACK SURFACE TO BE PAINTED YELLOW (COMMERCIAL) FOR IDENTIFICATION AND EACH SOURCE ASSEMBLY SHALL CONTAIN A SERIAL NUMBER IN ACCORDANCE WITH PARAGRAPH 3.9.2 OF MIL-R-55350.
7. AIR PRESSURE BUILD UP DURING ASSEMBLY PROCEDURES MAY PRODUCE BULGING OF EITHER OR BOTH ITEMS 4 OR 5. ACCEPTABLE BULGING IS AS NOTED.
8. THE SR-90 RADIOISOTOPE SHALL BE CONTAINED IN A CERAMIC CARRIER MATERIAL. THIS CARRIER SHALL BE SPHERICAL, DRY, FREE FLOWING MATERIAL WITH AT LEAST 95% HAVING A DIAMETER IN THE RANGE OF 35 MICRONS MINIMUM TO 65 MICRONS MAXIMUM.
9. THE SR-90 RADIOISOTOPE WHEN CONTAINED IN THE CARRIER SHALL BE IDENTIFIED AS THE ACTIVATOR.
9.1. THE ACTIVATOR SHALL HAVE A MINIMUM SPECIFIC ACTIVITY OF 100 MILLICURIES PER GRAM OF ACTIVATOR.
9.2. THE ACTIVATOR SHALL EXHIBIT A SOLUBILITY NOT IN EXCESS OF 0.1 PERCENT WHEN A SAMPLE IS SOAKED AT 25°C FOR 24 HOURS IN 100 MILLILITERS OF 0.1 NORMAL HYDROCHLORIC ACID.
10. THE VENDOR OF THE SOURCE ASSEMBLY SHALL UTILIZE A QUALITY ASSURANCE SYSTEM THAT MEETS THE REQUIREMENTS OF MIL-Q-9858.
11. PRIOR TO THE AWARD OF A CONTRACT FOR SOURCE ASSEMBLIES, THE VENDOR SHALL SUBMIT FOR APPROVAL WRITTEN PROCEDURE FOR:
    A. MEASURING THE RADIATION OUTPUT OF THE SR-90 SOURCES.

FIND NO.	QTY REQD	CODE IDENT.	PART NO. OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPECIFICATION	NOTE

PARTS LIST

SM-D-508975	DL-508965
NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
FRACTIONS DECIMALS ANGLES

MATERIAL:

ELECTRONICS COMMAND
REVIEWED
APPROVED
DATE

DEPARTMENT OF DEFENSE
U.S. ARMY ELECTRONICS COMMAND
FORT MONMOUTH NEW JERSEY 07703

SOURCE ASSEMBLY

SIZE	CODE IDENT NO.	
B	80063	SM-B-509048

SCALE

SHEET 2 OF 3

ANSEL FORM 10490 1 APR 73 NISA-FM 500-73

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REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
C	SEE SHEET 1	12 AUG 81	ES-HJW

B. DETERMINE THE QUANTITY OF SR-90 CONTAINED IN EACH SOURCE ASSEMBLIES.

12. ONLY THE ITEM DESCRIBED ON THIS DRAWING WHEN PROCURED FROM THE VENDORS LISTED HEREON IS APPROVED BY HDQTRS, CS&TA LABS (ERADCOM), FT. MONMOUTH, NJ 07703 FOR USE IN THE APPLICATION SPECIFIED HEREON. A SUBSTITUTE ITEM SHALL NOT BE USED WITHOUT PRIOR TESTING AND APPROVAL BY HDQTRS, CS & TA LABS. PRIOR TO SUBMISSION FOR HDQTRS, CS&TA LABS APPROVAL, THE SUBSTITUTE ITEM SHALL MEET NOTES 1-11 REQUIREMENTS.

FIND NO.	QTY REQD	CODE IDENT.	PART NO. OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPECIFICATION	NOTE

PARTS LIST

SM-D-508975	OL-508965
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
FRACTIONS DECIMALS ANGLES

MATERIAL:

ELECTRONICS COMMAND
REVIEWED
APPROVED
DATE

DEPARTMENT OF DEFENSE
U. S. ARMY ELECTRONICS COMMAND
FORT MONMOUTH NEW JERSEY 07703

SOURCE ASSEMBLY

SIZE	CODE IDENT NO.	
B	80063	SM-B-509048

SCALE | SHEET 3 OF 3

ANSEL FORM 10498 1 APR 73 MIL-STD 100-73

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REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
C	REDRAWN WITH ECP W1BFB22010, NOR 020	13 AUG 81	ES-HJW

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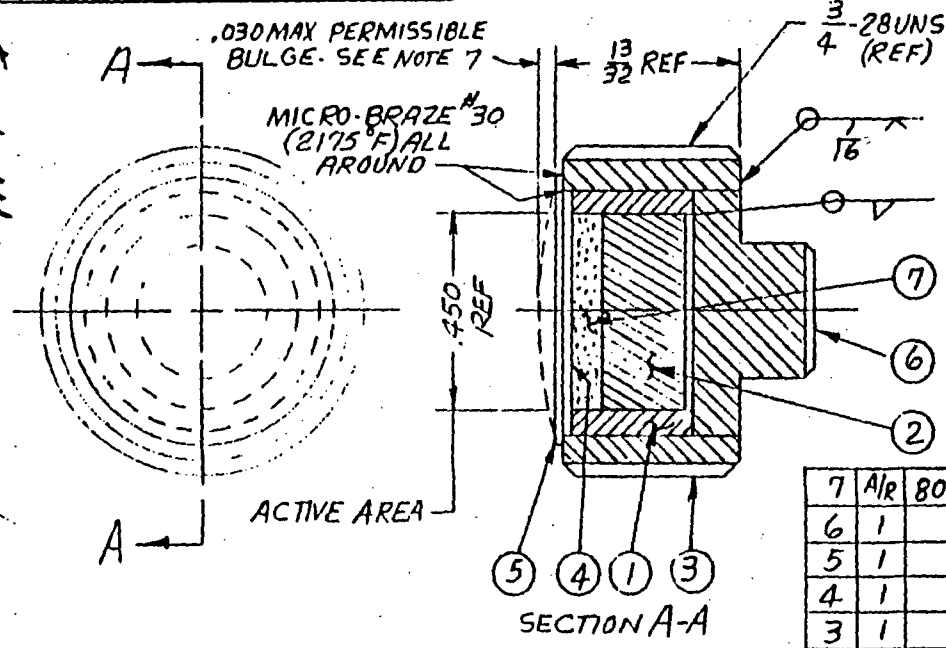

SECTION A-A

SOURCE CONTROL DRAWING

FIND NO.	QTY REQD	CODE IDENT.	PART NO. OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPECIFICATION	NOTE
7	A/R	80063	SM-B-509057-1	MATERIAL, RADIOACTIVE		8&9
6	1		SM-B-509054	PLUG		
5	1		SM-B-509053	WINDOW, OUTER		
4	1		SM-B-509052	WINDOW, INNER		
3	1		SM-B-509051	CAPSULE, OUTER		
2	1		SM-B-509050	PLUG		
1	1		SM-B-509049	CAPSULE, INNER		

PARTS LIST

APPROVED SOURCE

MFG PART NO	SOURCE
3 FIG	3M CO ST PAUL MINN. 55105

SM-D-508994	
SM-D-508981	DL-508965
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
FRACTIONS DECIMALS ANGLES

MATERIAL:

DA-28-043-AMC-02402E

ELECTRONICS COMMAND

REVIEWED ER-1 SM'F

APPROVED ER-1 SM'F

DATE 24 FEB 69

DEPARTMENT OF DEFENSE
U. S. ARMY ELECTRONICS COMMAND
FORT MONMOUTH NEW JERSEY 07703

SOURCE ASSEMBLY

SIZE	CODE IDENT NO.	
B	80063	SM-B-509057

SCALE | SHEET 1 OF 3

ANSCL FORM 10490 M194-FM 558-73
1 APR 73

WHEN REFERRING TO THIS DRAWING STATE DRAWING NO., APPLICABLE ISSUE LETTER IF ANY, AND DATE

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REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
C	SEE SHEET 1	13 JUL 81	ES-NJW

NOTES

1. THIS ASSEMBLY SHALL MEET SPECIAL FORM MATERIAL TEST REQUIREMENTS OF TITLE 49, CODE OF FEDERAL REGULATIONS.
2. THE STRONTIUM -90 (SR90) SOURCES MUST MEET THE ANSI CLASSIFICATION OF 43343 (REFERENCE ANSI N542-1977).
3. THE RADIOACTIVE SOURCE ASSEMBLY MUST BE EVALUATED AND APPROVED FOR USE BY THE NUCLEAR REGULATORY COMMISSION OR AGREEMENT STATE. CONTRACTOR TO SUBMIT DOCUMENTATION OF THE ABOVE TO HEADQUARTERS, CECOM, DRSEL-SF-H, FORT MONMOUTH, NJ 07703.
4. WHEN THE SOURCE ASSEMBLIES ARE INSTALLED IN THE AN/UDM-2 ( ) RADIAC CALIBRATOR, EACH ASSEMBLY SHALL MEET THE FOLLOWING REQUIREMENT AND TEST PARAGRAPHS OF SPEC MIL-R-55350:

REQT PARA	TEST PARA
3.4.1.1	4.6.1.1
3.4.1.3	4.6.1.3

5. IN ADDITION, EACH SOURCE ASSEMBLY SHALL MEET THE FOLLOWING REQUIREMENT AND TEST PARAGRAPHS OF SPEC MIL-R-55350:

REQT PARA	TEST PARA
3.11	4.10
3.11.1	4.10.1.1
3.11.1.1	4.10.1.3
3.11.1.2	4.10.1.2 & 4.10.1.4
3.11.1.3	4.10.1.5

6. BACK SURFACE TO BE PAINTED RED (COMMERCIAL) FOR IDENTIFICATION AND EACH SOURCE ASSEMBLY SHALL CONTIAN A SERIAL NUMBER IN ACCORDANCE WITH PARAGRAPH 3.9.2 OF MIL-R-55350.
7. AIR PRESSURE BUILD UP DURING ASSEMBLY PROCEDURES MAY PRODUCE BULGING OF EITHER OR BOTH ITEMS 4 OR 5. ACCEPTABLE BULGING IS AS NOTED.
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10. THE VENDOR OF THE SOURCE ASSEMBLY SHALL UTILIZE A QUALITY ASSURANCE SYSTEM THAT MEETS THE REQUIREMENTS OF MIL-Q-9858.
11. PRIOR TO THE AWARD OF A CONTRACT FOR SOURCE ASSEMBLIES, THE VENDOR SHALL SUBMIT FOR APPROVAL WRITTEN PROCEDURE FOR:
A. MEASURING THE RADIATION OUTPUT OF THE SR-90 SOURCES.

FIND NO.	QTY REQD	CODE IDENT.	PART NO. OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPECIFICATION	NOTE

PARTS LIST

SM-D-508994	
SM-D-508981	DL-508965
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
FRACTIONS DECIMALS ANGLES

MATERIAL:

ELECTRONICS COMMAND
REVIEWED
APPROVED
DATE

DEPARTMENT OF DEFENSE
U.S. ARMY ELECTRONICS COMMAND
FORT MONMOUTH NEW JERSEY 07703

SOURCE ASSEMBLY

SIZE	CODE IDENT NO.	
B	80063	SM-B-509057

SCALE | SHEET 2 OF 3

FORM 10498 MIRA-FM 556-73

WHEN REFERRING TO THIS DRAWING STATE DRAWING NO., APPLICABLE ISSUE LETTER IF ANY, AND DATE

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REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
C	SEE SHEET 1	13 Aug 81	ES HJW

B. DETERMINE THE QUANTITY OF SR-90 CONTAINED IN EACH SOURCE ASSEMBLIES.

12. ONLY THE ITEM DESCRIBED ON THIS DRAWING WHEN PROCURED FROM THE VENDORS LISTED HEREON IS APPROVED BY HDQTRS, CS&TA LABS (ERADCOM), FT. MONMOUTH, NJ 07703 FOR USE IN THE APPLICATION SPECIFIED HEREON. A SUBSTITUTE ITEM SHALL NOT BE USED WITHOUT PRIOR TESTING AND APPROVAL BY HDQTRS, CS&TA LABS. PRIOR TO SUBMISSION FOR HDQTRS, CS&TA LABS APPROVAL, THE SUBSTITUTE ITEM SHALL MEET NOTES 1-11 REQUIREMENTS.

FIND NO.	QTY REQD	CODE IDENT.	PART NO. OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SPECIFICATION	NOT

PARTS LIST

SM-D-508994	
SM-D-508981	DL-508965
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
FRACTIONS DECIMALS ANGLES

MATERIAL:

ELECTRONICS COMMAND
REVIEWED
APPROVED
DATE

DEPARTMENT OF DEFENSE
U. S. ARMY ELECTRONICS COMMAND
FORT MONMOUTH NEW JERSEY 0770

SOURCE ASSEMBLY

SIZE	CODE IDENT NO.	
B	80063	SM-B-50905

SCALE | SHEET 30

MISA-PM 880-73

WHEN REFERRING TO THIS DRAWING STATE DRAWING NO., APPLICABLE ISSUE LETTER IF ANY, AND

U.S. Department of Transportation
Research and Special Programs Administration

400 Seventh Street, S.W.
Washington, D.C. 20590

IAEA CERTIFICATE OF COMPETENT AUTHORITY

Special Form Radioactive Material Encapsulation

Certificate Number USA/0283/S
Revision 0

This certifies that the encapsulated source, as described, when loaded with the authorized radioactive contents, has been demonstrated to meet the regulatory requirements for special form radioactive material as prescribed in IAEA 1/ and USA 2/ regulations for the transport of radioactive materials.

I. Source Description - The source described by this certificate is identified as 3M Model No. 3F1G which is a tungsten - inert - gas welded double encapsulation constructed of stainless steel and which measures approximately 0.4 inches (10 mm) in length by 0.75 inches (19 mm) in diameter.

II. Radioactive Contents - The authorized radioactive contents of this source consist of not more than 500 millicuries of strontium -90 as 3M Brand Radiating Microspheres.

III. This certificate, unless renewed, expires June 30, 1988.

This certificate is issued in accordance with paragraph 803 of the IAEA Regulations 1/, and in response to the petition by 3M Static Control Systems, New Brighton, MN and in consideration of the associated information therein.

Certified by:

R R Rawl

June 23, 1983
(Date)

Richard R. Rawl
Chief, Radioactive Branch
Office of Hazardous Materials Regulation
Materials Transportation Bureau

1/ "Safety Series No. 6, Regulations for the Safe Transport of Radioactive Materials, 1973 Revised Edition", published by the International Atomic Energy Agency (IAEA), Vienna, Austria.

2/ Title 49, Code of Federal Regulations, Part 170-178, USA.

Encl 15

MIL-R-55350A(ER)
9 June 1981
SUPERSEDING
MIL-R-55350(EL)
16 December 1971

MILITARY SPECIFICATION

RADIAC CALIBRATOR AN/UDM-2( )

This specification is approved for use by Electronics 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 Scope. This specification covers the requirements for Radiac Calibrator which provides the facilities for checking the operational reliability and calibration accuracy of various radiacmeters and radiac set. The calibrator consists of a dosimeter jig assembly and a dose rate jig assembly; each assembly can be utilized independently of the other (see 6.1).

2. APPLICABLE DOCUMENTS

2.1 Issues of documents. The effective issue or revision of the following documents shall be that listed in the Department of Defense Index of Specifications and Standards (DODISS) and supplements thereto, unless (i) specific issues are set forth therefor in the cited specifications, or (ii) issues different than those specified in the cited specifications are set forth in the solicitation. The date of the applicable DODISS and supplements thereto shall be as specified in the solicitation or contract.

SPECIFICATIONS

MILITARY

MIL-P-116	- Preservation Packing, Methods of
MIL-P-11268	- Parts, Materials, and Processes Used in Electronic Equipment
MIL-M-13231	- Marking of Electronic Items
MIL-F-14072	- Finishes for Ground Electronic Equipment

Beneficial comments (recommendations, additions, deletions and any pertinent data which may be of use in improving this document should be addresssed to: Commander, US Army Electronics Research and Development Command, Combat Surveillance and Target Acquisition Laboratory, ATTN: DELCS-PE, Fort Monmouth, NJ 07703, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.)

FSC 6665

Encl 16

STANDARDS

MILITARY

MIL-STD-105	- Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-252	- Classification of Visual and Mechanical Defects for Equipment, Electronic, Wired and Other Devices
MIL-STD-454	- Standard General Requirements for Electronic Equipment
MIL-STD-810	- Environmental Test Methods

DRAWINGS

DL-SM-B-508965	- Radiac Calibrator AN/UDM-2( )
SPI 1G00152	- Special Packaging Instruction

OTHER PUBLICATIONS

US Nuclear Regulatory Commission Regulations - Title 10, Chapter I, Code of Federal Regulations, Parts 19, 20, 21, 30, 51, 71 and 110.

US Department of Transportation Regulations - Title 49, Code of Federal Regulations

(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 Construction. The equipment shall be constructed in accordance with the requirements of this specification, and of DL-SM-B-508965.

3.2 First article. When specified in the contract or purchase order, the contractor shall furnish first article units as required and in the quantities specified therein (see 4.3).

3.3 Parts, materials, and processes; general. In addition to the requirements of this specification, the requirements of MIL-P-11268, including the selection requirement therein, shall apply (see 4.4).

3.3.1 Finish. All surfaces of the AN/UDM-2( ) requiring a protective coating shall be finished in accordance with MIL-F-14072 (see 4.4).

3.4 Performance.

3.4.1 Calibration accuracy.

3.4.1.1 Dosimeter jig assembly (lower source). The dose rate produced by the lower sources shall be within ± 5R/min when related to a secondary calibration standard. When measured in accordance with 4.6.1.1, using a government furnished Victoreen Model 555 Radacon II, the dose rate produced by the lower sources shall be 205 R/min ± 5R/min.

3.4.1.2 Dosimeter jig assembly (upper source). The dose rate produced by the upper source shall be within ± 0.05 mR/min when related to a secondary calibration standard. When measured in accordance with 4.6.1.2, using a government furnished Victoreen Model 555 Radacon II, the dose rate produced by the upper source shall be 0.95 mR/min ± 0.05 mR/min.

3.4.1.3 Dose rate jig assembly. All measured test position dose rate shall be within ± .5R/min when related to a secondary calibration standard. When measured in accordance with 4.6.1.3, using a government furnished Victoreen Model 555 Radacon II, the dose rate produced with the shutter in the 100 R/hr position shall be 44.5 R/min ± 0.5 R/min.

3.4.1.4 Radioactivity. The government shall be provided with the maximum quantity of radioactive material contained in each sealed source needed to produce the required radiation output for compliance with 3.4.1.1, 3.4.1.2 and 3.4.1.3. Each sealed source shall not exceed the maximum quantity of radioactive material specified and shall in accordance with:

a. Special form material test requirements of Title 49, Code of Federal Regulations of US Department of Transportation regulations.

b. American National Standards Institute N542-1977 classification of at least 43343.

c. Approval by the US Nuclear Regulatory Commisinn or Agreement State for its integrity of construction.

The government shall be provided with supporting documentation indicating compliance with a, b, and c above.

3.4.2 Compatibility. Radiacmeters IM-9( )/PD, IM-93( )/UD and IM-147( )/PD, when exposed in the dosimeter jig assembly for the time specified shall respond in accordance with the appropriate reading and tolerance specified in figure 3-1 (see 4.7.1). Radiacmeters IM-174A/PD and IM-174B/PD and Radiac Set AN/PDR-27( ), when calibrated in the dose rate jig assembly in accordance with the instructions shall respond in accordance with the appropriate reading and tolerance specified in figure 3-2 (see 4.7.2).

FIGURE 3-1. Dosime[illegible]ischarge data.

I Dosimeter	II Discharge position	III Manufacturer	IV Procurement order RR	V Year	VI Time	VII Discharge reading ± 20%	VIII Discharge reading limit ±20 %
IM-93	lower	Landsverk	21505-P	56	5 min	300	240-360
0-600 R	lower	Bendix	30884-PP	57	5 min	405	324-486
	lower	Bendix	4371-PP	60	5 min	70	56-84
	lower	Bendix	15916-PP	63	5 min	.60	48-72
	lower	Landsverk	4596-PP	61	5 min	40	32-48
	lower	Landsverk	15631-PP	62	5 min	40	32-48
	lower	Landsverk	DAAB05-68-C-0911	68	5 min	300	240-360
IM-147	lower	Bendix	3439-PP	59	1 min-45 sec	25	20-30
0-50	lower	Landsverk	DAAB05-68-C-0911	68	40 sec	40	32-48
IM-9E	upper	Bendix	15895-PP	63	2 min	100	80-120
0-200 mR	upper	Landsverk	15580-PP	62	3 min	100	80-120
	upper	Landsverk	DAAB05-68-C-1678	67	2 min	80	64-96
IM-9F	upper	Landsverk	C2537MFR-00910	68	5 min	80	64-96
CDV-138	upper	Bendix	No indication		2 min	100	80-120
0200 mR							
CDV-742	lower	Bendix	No indication		2 min	120	96-144
0200 R	lower	Landsverk	No indication		5 min	120	96-144

FIGURE 3 - 2. Dose rate jig assembly.

1. IM-174( )/PD; IM-174A/PD; IM-174B/PD

   a. Release shipping lock
   b. Remove detector assembly from IM-174( )/PD. Position it securely in drawer. Switch on IM-174( )/PD. Set it up per its instruction plate.
   c. Close drawer
   d. Rotate shutter to 100 R/hr position. Note meter reading.
   e. Rotate shutter to 10 R/hr position. Note meter reading.
   f. Meter should read:
      (1) IM-174 between 177 and 117 at 100 R/hr and between 18 and 11 at 10 R/hr.
      (2) IM-174(A) and IM-174(B) between 120 and 80 at 100 R/hr and between 12 and 8 at 10 R/hr.

      If not, remove calibration control cover. Adjust IM-174( )/PD until it reads in tolerance at both positions.
   g. Close shutter. Open drawer. Remove detector assembly. Replace it in the IM-174( )/PD.
   h. Close drawer locate and close shipping lock. Lock source shutter with the key.

2. AN/PDR-27 J, L, R and S

   a. Release shipping lock.
   b. By removing bolts from probe clips, separate both probe units.
   c. Check that spacer block is completely inside drawer.
   d. Close the drawer. Insert smaller probe into hole in handle end of drawer. Switch to 500 mR/hr range and rotate shutter to 100 R/hr position. Rotate small probe to achieve minimum and maximum readings. Note readings.
   e. The average reading shall be 200 mR/hr $\pm$ 30% or 140 to 260 mR/hr.
   f. Rotate shutter to off position. Remove probe unit and open drawer. Remove spacer block and turn over to fit on handle close drawer.
   g. Insert smaller probe in new position. Switch to 50 mR/hr range. Rotate shutter to 100 R/hr position. Rotate smaller probe to achieve minimum and maximum readings. Note readings.
   h. The average reading shall be 30 mR/hr $\pm$ 30% or 21 to 39 mR/hr.
   i. Rotate shutter to off position. Remove probe from drawer.
   j. Switch to 5 mR/hr position and place large probe on the top rear edge of drawer unit, opened to its fullest extremity. Leave shutter in off position, and observe readings.
   k. Average reading should be 3.2 mR/hr $\pm$ 30% or 2.2 to 4.2 mR/hr.
   l. Place large probe on uper edge of handle side of box. Switch to 0.5 mR/hr position and observe readings.
   m. Average reading should be 0.30 mR/hr $\pm$ 30% or 0.21 to 0.39 mR/hr.
   n. If readings obtained are outside quoted tolerances, remove cover over calibration controls and adjust appropriate control to correct reading.
   o. Screw down shipping lock. Lock source shutter with key.
   p. Reassemble AN/PDR-27 probe assembly.

3.4.3 Surface dose rate. The maximum allowable dose rate at any point on the external surface of the calibrator set shall not exceed 5 mR/hr. This requirement applies under all conditions of storage (see 4.8).

3.5 Weight. The weight of the equipment, less manual, shall not exceed 40 lbs (18.14 Kg) (see 4.13).

3.6 Service conditions.

3.6.1 General. The equipment shall perform as required by this specification when exposed to any operating condition listed in 3.6.2, or after exposure to any storage or transportation condition listed in 3.6.3, or to any possible combination of these service conditions and shall have no corrosion deterioration, physical degradation, or change in tolerance limits which could affect operational service or maintenance requirements. (see 4.9)

3.6.2 Operating conditions. The equipment shall meet the following requirements:

3.6.2.1 Temperature. The equipment shall operate continuously at any ambient temperature from -25°F to +125°F (-31.67°C to 51.67°C) (see 4.9.1 and 4.9.2).

3.6.2.2 Altitude. The equipment shall meet specification performance of altitudes up to and including 10,000 feet (3048m) above sea level (see 4.9.5.1).

3.6.2.3 Humidity. The equipment shall meet specification performance with up to 100 per cent relative humidity at varying temperatures including conditions wherein condensation takes place on the equipment (see 4.9.6).

3.6.2.4 Salt fog. The equipment shall meet 3.4.2 after being subjected to salt fog such as is encountered in coastal regions or on board ship (see 4.9.9).

3.6.3 Storage and transportation conditions.

3.6.3.1 Temperature. The equipment shall be capable of withstanding, without deterioration damage or degradation of performance, long periods of storage at temperature of -65°F to +155°F (-53.89°C to +68.33°C) (see 4.9.1 and 4.9.2).

3.6.3.2 Altitude. The equipment shall meet 3.4.1 after being subjected to altitudes up to and including 50,000 feet (15,240m) above sea level (see 4.9.5.2).

3.6.3.3 Immersion. The equipment shall show no evidence of leakage after it is tested as specified in 4.9.3.

4 Bench handling. The equipment shall meet the requirement of 3.4.2 degradation of performance after being subjected to the test of 4.9.4.

3.5 Bounce. The equipment shall meet the requirement of 3.4.2 without dation of performance after being subjected to the test of 4.9.8.

.3.6 Vibration. The equipment shall meet the requirement of 3.4.2 after being cted to vibration such as encountered in a field service environment (see 4.9.7).

.6.3.7 Rain. The equipment shall meet the requirement of 3.4.2 without radation of performance after being subjected to the test of 4.9.12.

3.6.3.8 Shock. The equipment shall meet the requirement of 3.4.2 after being bjected to shock such as is encountered in transportation via aircraft, or dropping by arachute (see 4.9.10).

3.6.3.9 Fungus. The equipment (including accessories) shall show no evidence of viable fungus or corrosion when subjected to the test specified in 4.9.11. Corrosion is any visible degradation that can be attributed to flaky, pitted, blistered, or otherwise loosened finished or metal surface.

Special capability requirements.

3.7.1 Facilities. The contractor is required to possess in his plant, or have direct access to a cobalt 60 source capable of providing a minimum field intensity of 125 R/hr at a distance of 1 meter from its geometrical center.

3.7.2 Equipment. The contractor is required to possess in his plant a Victoreen Condenser "R" meter, or equivalent, calibrated by the National Bureau of Standards or other agency approved by the government for measuring radiation flux.

3.7.3 License. The contractor is required to possess or obtain a byproduct material license for the AN/UDM-2( ) and its sources from the US Nuclear Regulatory Commission as per Title 10, Chapter I, Code of Federal Regulations, Part 30.3, or from an agreement-state in which located as per the agreement-state requlations.

3.8 Interchangeability. Like units, assemblies, subassemblies and replaceable parts shall conform to requirement 7 of MIL-STD-454 (see 4.12).

3.9 Marking.

3.9.1 General. Marking shall conform to MIL-M-13231.

3.9.2 Radioactive warnings. In addition to the general markings required by 3.9.1, the contractor shall comply with the requirements of Title 10, Code of Federal Regulations, Part 20. Each source shall be etched or stamped with a unique serial number and some symbol identifying the manufacturer and model

number of the source. The contractor shall provide the government with a list specifying the serial number of each calibrator and the serial number, symbol and nomenclature of each source contained therein.

3.9.3 Serial numbers. Each equipment shall have a serial number in accordance with the requirements of MIL-M-13231, SM-B-509016 and SM-B-509028.

3.10 Systems safety engineering.

3.10.1 Personnel hazards. Personnel hazards shall be kept to a minimum through compliance with configuration changes and parts selection with requirement 1 of MIL-STD-454. Compliance with these requirements will be verified through a visual inspection (see 4.11).

3.10.2 Corner and edge rounding. All exposed corners and edges shall be rounded to eliminate possible injury to personnel due to lacerations and cuts.

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

3.11 Radiological tests. The equipment shall be subject to the tests of 4.10 in the order given. Sources or calibrators that do not meet the limits specified in the source and contamination tests of 3.11.1 and 3.11.2 are not acceptable.

3.11.1 Source tests. Each sealed source shall be subjected to the tests of 4.10.1.1, 4.10.1.2, 4.10.1.3, 4.10.1.4 and 4.10.1.5 in that order.

3.11.1.1 Source leak tests. This test is to be performed after the first encapsulation and again after the second encapsulation. During tests outlined in 4.10.1.1 and 4.10.1.3, any indication of bubbles from the source or on the source indicates the source may be leaking and is not acceptable for use in a calibrator.

3.11.1.2 Source bloat tests. Any indication of bloating (bulging) of the thin window in excess of 0.030 inch from internal pressure at the end of tests 4.10.1.2 and 4.10.1.4 will be considered failure of the test.

3.11.1.3 Source contamination test. Each sealed source to be used in a radiac calibrator shall be subjected to the tests of 4.10.1.5 before it is installed in the calibrator. The results of these tests shall not exceed 0.001 microcuries of removable radioactive material. Sealed sources exceeding 0.001 microcuries of removable radioactive material shall be rejected.

3.11.1.4 Source radioactivity test. Each sealed source to be utilized in the AN/UDM-2 Radiac Calibrator Set must be subjected to the tests in 4.10.1.6 before it is installed in the calibrator to assure that the maximum quantity limitations for radioactive material is not exceeded.

3.11.2 Calibrator contamination tests. Each calibrator shall be subjected to the tests of 4.10.2. The results of these tests shall not exceed 0.001 microcuries of removable radioactive material. Calibrators exceeding 0.001 microcuries of removable radioactive material shall be rejected.

3.12 Recycled, virgin and reclaimed materials. It is required that, to the maximum extent possible, recovered or reclaimed materials, in lieu of the virgin materials, shall be used without jeopardizing the intended use of the manufactured item.

3.13 Workmanship. The calibrator shall be manufactured and assembled in accordance with requirement 9 of MIL-STD-454 and the applicable portions of MIL-P-11268.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may utilize his own facilities, facilities of a subcontractor or any commercial laboratory acceptable to 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 that the supplies and services conform to prescribed requirements.

4.2 Classification of inspections. Inspections shall be classified as follows:

a. First article inspection (does not include packaging) (see 4.3).

b. Inspections covered by subsidiary documents (see 4.4).

c. Quality conformance inspections.

(1) Quality conformance inspection of equipment before packaging (see 4.5).

(2) Quality conformance inspection of packaging (see 4.14).

4.3 First article. Unless otherwise specified in the contract or purchase order, the first article inspection shall be performed by the contractor.

4.3.1 First article units. The contractor shall furnish nine (9) first article units of the AN/UDM-2( ) for group A, B and C testing.

4.3.2 First article inspection. The first article inspection shall consist of the inspections specified in table I, and shall be performed in the order specified in table I. After completing tests of table I, each unit shall have their sources removed and the sources shall be tested in accordance with 4.10 (less 4.10.1.3 and 4.10.1.4).

TABLE I. First article inspection.

Inspections	Requirement paragraph	Test paragraph	Order of tests		
			Units 1 - 3	Units 4 - 6	Units 7 - 9
1. Inspections covered by subsidiary documents. 2/	3.3 3.9 3.3.1 3.13	4.4	Tests to be performed on all units.		
2. Group A inspection 2/	See Table II		Tests to be performed on all units.		
3. Group B inspection 2/	See Table III		Tests to be performed on all units.		
4. Group C inspection 3/					
Non-damaging 4/					
Altitude	3.6.2.2	4.9.5.1	3		
	3.6.3.2	4.9.5.2			
High temperature	3.6.3.1	4.9.1	2		
Low temperature	3.6.2.1	4.9.2	1		
Humidity	3.6.2.3	4.9.6	4		
Immersion	3.6.3.3	4.9.3		4	
Rain	3.6.3.7	4.9.12			2
Potentially damaging					
Vibration	3.6.3.6	4.9.7		1	
Shock	3.6.3.8	4.9.10		2	
Bench handling	3.6.3.4	4.9.4			1
Salt fog 1/	3.6.2.4	4.9.9	5		
Fungus 1/	3.6.3.9	4.9.11			3
Bounce	3.6.3.5	4.9.8		3	

1/ The equipment shall be thoroughly washed, cleaned, dried and refurbished, as specified in contract, before proceeding with subsequent tests. Only one equipment shall be submitted to fungus test.

2/ Inspections 1 to 3 shall be performed in the order shown before subjecting the equipments under test to any other inspection requirements.

3/ Other inspections may precede, follow, or be interspersed between the non-damaging tets.

4/ The order on non-damaging tests and the choice of which units are subjected to the non-damaging tests may be varied if convenient, except that the vibration test shall be performed on the same unit used for the bounce and shock tests.

4.4 Inspections covered by subsidiary documents. The following shall be inspected under the applicable documents as part of the inspection required by this specification, and the inspection requirement specified in the contract or purchase order.

Item	Where required
Parts, materials, and processes; general	3.3
Finish	3.3.1
Marking	3.9
Workmanship	3.13

4.5 Quality conformance inspection of equipment before packaging. The contractor shall perform the inspections specified in 4.4, 4.5.1 through 4.5.3. 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.

4.5.1 Group A inspection. Each unit on contract or purchase order shall be inspected for conformance to the inspection in table II. Discrete lots shall be formed from units that pass this inspection. Factors of lot composition not defined herein, or in the contract or purchase order, shall be in accordance with MIL-STD-105. Each lot shall be subject to sampling inspection, utilizing the procedures of MIL-STD-105, using the general inspection levels and AQLs indicated in table II.

4.5.1.1 Order of inspection within Group A. Group A inspection shall be performed in an order satisfactory to the government.

4.5.1.2 Visual and mechanical inspection. These inspections shall be performed in any order which is satisfactory to the government. The units shall be examined for the applicable defects listed in MIL-STD-252 (see 3.1).

TABLE II. Group A inspection.

Inspection	Requirement paragraph	Inspection paragraph	AQL%	
			Major	Minor
Visual and mechanical	3.1 3.10	4.5.1.2	1.0	4.0
Functional				1/
Surface dose rate	3.4.3	4.8	1.0	
Calibration accuracy	3.4.1	4.6.1	1.0	
Compatibility	3.4.2	4.7	1.5	
Radiological				1/
Source test 2/	3.11.1	4.10.1		
Calibrator contamination 3/	3.11.2	4.10.2		

1/ No minor functional or radiological defects permitted.

2/ If the prime contractor does not manufacture the sources, this inspection shall be a requirement placed by the prime contractor on his subcontractor.

3/ This inspection shall be performed as a requirement under group A inspection (4.5.1) and also prior to packaging and packing (4.14).

4.5.2 Group B inspection. This inspection, including sampling, shall conform to table III and to procedures for special inspection levels of table I of MIL-STD-105. Group B inspection shall be performed on production lots of products that have passed group A inspection (see 4.5.2.1).

4.5.2.1 Group B sampling plans. The group B AQL shall be 4.0 percent defective and the inspection level shall be S-3.

4.5.2.2 Order of inspection within group B. Group B inspection shall be performed in an order satisfactory to the government.

TABLE III. Group B inspection.

Inspection	Requirement paragraph	Test paragraph	AQL
Interchangeability	3.8	4.12	4.0%
Weight	3.5	4.13	4.0%

4.5.3 Group C inspection. This inspection shall consist of the tests specified in table IV and shall be performed on units of product that have been subjected to and passed group A and group B inspection requirements. Sample units shall be selected in accordance with 4.5.3.1.

4.5.3.1 Sampling for group C inspection. Group C inspections shall be performed on the first production lot and at the 25 percent, 50 percent, 75 percent and 100 percent points in production. Three (3) samples of AN/UDM-2 shall be selected at random for each group of inspections and shall be performed in an order shown in table IV.

TABLE IV. Group C inspection.

Inspection	Requirement paragraph	Test paragraph
Subgroup 1		
Low temperature	3.6.2.1	4.9.2
High temperature	3.6.3.1	4.9.1
Altitude 1/	3.6.3.2	4.9.5
Humidity	3.6.2.3	4.9.6
Salt fog	3.6.2.4	4.9.9
Subgroup 2		
Vibration	3.6.3.6	4.9.7
Shock 1/	3.6.3.8	4.9.10
Bounce	3.6.3.5	4.9.8
Immersion	3.6.3.3	4.9.3
Subgroup 3		
Bench handling	3.6.3.4	4.9.4
Rain	3.6.3.7	4.9.12
Fungus 1/	3.6.3.9	4.9.11

1/ These tests shall be performed only on the first production lot and on a sample selected from the lot representing approximately the 50 percent point in production. Only one equipment shall be submitted to fungus test.

4.5.3.2 Group C failures. Action required relative to group C failures shall be as specified in the contract or purchase order.

4.5.4 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 contract provided all damage is repaired and the sample units are resubjected to and pass group A inspection only.

4.6 Performance.

4.6.1 Calibration accuracy. Each calibrator, when checked with the government furnished Victoreen Model 555 Radacon II in accordance with the procedures specified herein, shall meet the requirements of 3.4.1.

4.6.1.1 Dosimeter jig assembly measurements (lower source). Interconnect the Radacon II and its accompanying remote head in accordance with the manufacturer's instruction manual supplied with the instrument; attach the probe (Victoreen Part No. 555-100-MB) to the appropriate terminals on the remote head and allow a 30 minute warmup. The lower source of the dosimeter jig assembly shall be tested in accordance with SM-A-509093 (see 3.1) and shall meet the requirements of 3.4.1.1.

4.6.1.2 Dosimeter jig assembly measurements (upper source). Same as 4.6.1.1 except probe Victoreen Part No. 555-100-1C shall be used. The upper source of the dosimeter jig assembly shall be tested in accordance with SM-A-509093, paragraph 3.2 and shall meet the requirements of 3.4.1.2.

4.6.1.3 Dose rate jig assembly measurements. Same as 4.6.1.1. Dose rate jig assembly shall be tested in accordance with SM-A-509093 paragraph 4.0 and shall meet the requirements of 3.4.1.3.

4.7 Compatibility.

4.7.1 Dosimeter jig assembly. Calibrate all Radiacmeters IM-9, IM-93 and IM-147 supplied as Government Furnished Equipment (GFE) at mid scale using a cobalt 60 source, the calibration of which is traceable to the National Bureau of Standards. The radiacmeters shall read as follows:

IM-9( )/PD	100 mR ± 10 percent
IM-93A/UD	300 R ± 10 percent
IM-147( )/PD	25 R ± 10 percent

Any government furnished radiacmeter, whose reading exceeds the specified tolerance, shall not be used. Select 10 units of each type of radiacmeter and charge to zero. Discharge each radiacmeter in its appropriate position in the dosimeter jig assembly for the period specified for the particular radiacmeter under test. Repeat the above procedure for a total of 3 readings for each radiacmeter and calculate the average reading. The average reading shall be within the allowable tolerances specified in 3.4.2.

4.7.2 Dose rate jig assembly. Calibrate all Radiacmeters IM-174A/PD, IM-174B/PD and Radiac Sets AN/PDR-27( ) supplied as GFE using a cobalt 60 source, the calibration of which is traceable to the National Bureau of Standards. The instruments shall be calibrated at the following points:

Instrument	Calibration point	Tolerance
IM-174A/PD	100R/hr	± 10 percent
IM-174B/PD	100R/hr	± 10 percent
AN/PDR-27( )	250 mR 25 mR 2.5 mR 0.25 mR	± 20 percent

Any government furnished equipment which can not be calibrated shall not be used. Select 2 units each of Radiacmeters IM-174A, IM-174B and 2 units of Radiac Set AN/PDR-27( ) and check the calibration of each unit in the calibrator in accordance with the procedures specified. Repeat each check for a total of 3 readings per unit and the average reading per unit shall be within the allowable tolerances specified on 3.4.2.

4.8 Surface dose rate. Using a government furnished Radiac Set AN/PDR-27 calibrated as specified in 4.7.2, the surfaces of the Radiac Calibrator AN/UDM-2 shall be monitored for conformance to the requirement of 3.4.3.

4.9 Service condition tests. Service condition tests shall be performed as detailed below. Each unit subjected to these tests shall have passed group A and group B tests and shall be resubmitted to, and pass these group A tests after completion of all service condition testing (see 3.6.1).

4.9.1 High temperature. The dosimeter jig assembly as defined by SM-D-508967 and the dose rate jig assembly as defined by SM-D-508993 shall be subjected to Procedure I, Method 501 of MIL-STD-810 with the following exceptions:

a. Temperature of step 2 shall be +155°F (68.33°C).

b. Step 3 shall be for 24 hours.

c. Step 4 shall be +125°F (51.67°C).

d. At steps 5 and 7, equipment shall meet the requirement of 3.4.2.

4.9.2 Low temperature. The dosimeter jig assembly and dose rate jig assembly, as defined in 4.9.1, shall be subjected to Procedure I, Method 502.1 of MIL-STD-810 with the following exceptions:

a. Temperature of step 2 shall be -65°F (-53.89°C) and maintained for 24 hours.

b. Temperature for step 4 shall be -25°F (-31.67°C).

c. At steps 5 and 7, equipment shall meet the requirement 3.4.2.

4.9.3 Immersion. The equipment, closed as for storage or transportation, shall be subjected to Procedure I, Method 512.1 of MIL-STD-810 (see 3.6.3.3).

4.9.4. Bench handling. The equipment, locked as for storage or transportation, shall be placed on a solid, 2 inch fir bench top. Tilt the equipment through an angle of 30° using one edge as an axis; allow to drop freely back to the horizontal. Repeat, using the remaining three edges of the same horizontal face as axes, for a total of 4 drops. Repeat the above with the equipment resting on the remaining five faces for an overall total of 24 drops. Upon completion of the test, the equipment shall meet the requirement 3.4.2 (see 3.6.3.4).

4.9.5 Altitude.

4.9.5.1 Operating. The equipment shall be subjected to procedure I, Method 500.1 of MIL-STD-810. In step 2 test for conformance to 3.4.2 a chamber pressure of 20.6 inches of hg (10,000 ft (3048m) above sea level). Upon completion of the performance test, return the chamber to standard ambient pressure and repeat the performance test for conformance to 3.4.2 (see 3.6.2.2).

4.9.5.2 Non-operating. The equipment, closed for storage or transportation, shall be subjected to steps 2 and 4 of Procedure I, Method 500.1 of MIL-STD-810. Upon completion of step 4, the equipment shall be tested for conformance to 3.4.2 (see 3.6.3.2).

4.9.6 Humidity. The equipment shall be subjected to Procedure II, Method 507.1 of MIL-STD-810 except that:

a. The equipment shall be opened into its 2 halves during step 1.

b. Step 2 shall be deleted.

c. Conformance to 3.4.2 shall be testing during step 4.

d. Equipment shall be closed as for storage or transportation during the first 3 cycles of step 6. During cycles 4 and 5, the equipment shall be opened as in step 3.

e. Conformance to 3.4.2 shall be tested during step 8 (see 3.6.2.3).

4.9.7 Vibration. The equipment shall be subjected to Procedure X, curve AW of MIL-STD-810, Method 514.1. Upon completion of the test, the equipment shall meet the performance requirement of 3.4.2 (see 3.6.3.6).

4.9.8 Bounce. The equipment shall be subjected to Procedure X, paragraph 4.16.2, Method 514.2 of MIL-STD-810. Upon completion of the test, the equipment shall meet the performance requirement of 3.4.2 (see 3.6.3.5).

4.9.9 Salt fog. The equipment, opened as in operational use, shall be subjected to Method 509.1, Procedure 1 of MIL-STD-810. Salt concentration shall be 20 percent. Upon completion of the test the equipment shall meet the performance requirements of 3.4.2 (see 3.6.2.4).

4.9.10 Shock. The equipment when packed for shipment shall be subjected to Procedure II, Method 516.2 of MIL-STD-810 except that the height of drop shall be 2 feet. Upon completion of the test, the equipment shall meet the performance of 3.4.2 (see 3.6.3.8).

4.9.11 Fungus. The equipment in its opened position shall be subjected to Procedure I, Method 508.1 of MIL-STD-810 (see 3.6.3.9). Upon completion of the test, the equipment shall meet the requirement of 3.4.2.

4.9.12 Rain. The equipment, closed as for storage or transportation, shall be tested as follows:

a. Dry at 150°F ±5°F (from 62.78°C min to 67.33°C max) for 48 hours.

b. Condition for 4 hours at 77°F (25°C) and 50 to 60 percent relative humidity.

c. Take pretest data. The equipment shall meet the requirement of 3.4.2.

Test equipment in accordance with Method 506.1, Procedure I of MIL-STD-810. There shall be no wind source and the rain fall throughout the test shall be 4 ± 1 inch/hr. Complete final measurements within 1 hour after the rain has been discontinued (see 3.6.3.7).

4.10 Radiological tests. These tests shall be performed by or under the direct supervision of the Radiological Protection or Radiological Safety Officer employed by the contractor in accordance with current US Nuclear Regulatory Commission regulations (see 3.11). The government reserves the right to observe and/or participate in the radiological quality assurance tests performed on each sealed source utilized in the AN/UDM-2 Radiac Calibrator Set.

4.10.1 Source tests. (see 3.11.1)

4.10.1.1 First encapsulation leak test. Fill a 200-500 ml beaker about 2/3 full of glycerine. Boil the glycerine for several minutes to drive off any dissolved air. The temperature of the glycerine shall be kept about 150°C during the remainder of the tests. A transparent beta shield (preferably plastic), having a minimum area density of 1gm/cm^2 should be placed between the individuals performing or observing the tests and the beaker, its heat sources and the shielding type source container, to protect them from the radiation. A light should be directed on the beaker at right angles to the line of view of the operator. Care shall be taken to insure that the light does not shine in the operator's eyes. Using remote handling tool(s), remove a source (at or below 30°C) from the shielded container and drop it into the hot glycerine. Closely observe the source and the glycerine above it for one minute. A large hand lens mounted near the beaker or the use of binoculars or a telescope that will focus on objects as close as two or three feet will aid in this test. Bubbles from the source or on the source indicate a leak.

4.10.1.2 Source bloat test. After a source has passed a leak test, the source shall be tested for bloating (bulging) of the thin window. Thin window bloating (bulging) in excess of 0.030 inch shall be considered failure of the test.

4.10.1.3 Second encapsulation leak test. After the second encapsulation of the source repeat the test described in 4.10.1.1.

4.10.1.4 Second encapsulation bloat test. After a source has passed the test outlined in 4.10.1.3, repeat the test of 4.10.1.2 (see 3.11.1.2).

4.10.1.5 Source contamination test. (see 3.11.1.3)

a. Use any standard beta counting system which includes a scaler and timer and has a detector window at least one inch in diameter and not exceeding 2.0 mg/cm^2. Commercially available sponge or smooth surface filter paper wipes shall be utilized whose diameter shall not exceed the diameter of the detector window or counting planchet.

b. The beta counting system utilized in a above shall be calibrated using calibration reference standards certified by, or traceable to the National Bureau of Standards. The radioactive material incorporated into the calibration reference standards shall be of the same type as contained in the sealed sources utilized in the AN/UDM-2 Radiac Calibrator Sets (i.e., Strontium-90). A detailed procedure for the analysis of wipe test samples, including the determination of the quantity of contamination in microcuries, shall be provided the government for evaluation and approval for use.

4.10.1.6 Source radioactivity test. Each sealed source shall be tested to determine its radioactive material content by utilizing appropriate radiation measurement instrumentation to assure that the maximum quantity limitations for radioactive material contained in each sealed source type are not exceeded. The radiation measurement instrumentation shall be calibrated utilizing calibration standard sources certified by, or traceable to, the National Bureau of Standards. The radioactive material incorporated into the calibration standard sources shall be of the same type as contained in the sealed sources utilized in the AN/UDM-2 Radiac Calibrator Sets. A detailed procedure for the determination of the quantity of radioactive material contained in the sealed sources shall be provided the government for evaluation and approval for use.

4.10.2 Calibrator contamination test.

4.10.2.1 Equipment and counting procedure. The equipment and counting procedure stipulated in 4.10.1.5 above shall be followed with regards to the analysis of the wipe test samples as acquired below. Wipe test sampling shall be performed with commercially available cotton swabs in place of sponge or smooth surface filter paper wipes. To count cotton swabs, cut off all but a short stub of the handle and tape the stub to the planchet, centering the cotton on the planchet.

4.10.2.2 Dosimeter jig assembly wipe test.

WARNING

Do not under any circumstances expose the eyes to the radiation field by peering into the access hole while the swivel cover is swung aside.

Swing aside the swivel cover and using a cotton swab, wipe around the inner surface of the access hole. Using the procedure of 4.10.2.1, check the cotton swab for contamination.

4.10.2.3 Dose rate jig assembly wipe test. Open the drawer and using a cotton swab, wipe the inside and outside surfaces of the drawer. Using the procedure of 4.10.2.1, check the cotton swab for contamination.

4.11 System safety inspection. An inspection shall be performed to verify compliance with those portions of 3.10 which can be determined visually.

4.12 Interchangeability. The mechanical dimensions shall be measured to determine conformance to the physical and functional interchangeability requirements (see 3.8). This inspection shall be conducted on piece parts and subassemblies prior to final assembly.

4.13 Weight. The equipment shall be weighed (less manuals) to determine conformance to 3.5.

4.14 Quality conformance inspection of packaging. Quality conformance inspection for packaging shall be in accordance with group A, group B and, when required (see 6.1(d)), the group C (rough handling) requirements of MIL-P-116. Inspection lots shall be in accordance with MIL-P-116.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with SPI 1G00152.

6. NOTES

6.1 Intended use. The dosimeter discharge well assembly is used to check the calibration of Radiacmeters IM-9( )/PD, IM-93( )/UD and IM-147( )/PD (dosimeters). The assembly contains four each sealed sources arranged to radiate into a central cavity. The upper field is utilized in checking the operational

reliability of Radiacmeter IM-9( )/PD while the lower field performs a similar function for Radiacmeters IM-93( ) and IM-147( )/PD. The dose rate jig assembly consists of a drawer unit and a spacer block. The drawer unit contains one each sealed source. The spacing block provides varying field intensities used to calibrate radiacmeter probes. This assembly is utilized to calibrate Radiacmeters IM-174A/PD, IM-174B/PD and Radiac Set AN/PDR-27( ).

6.2 Ordering data. Procurement documents should specify the following:

a. Title, number and date of this specification and any amendment thereto.

b. Complete equipment or individual units to be procured.

c. Level A or B preservation and packing (see section 5).

d. When rough handling test is required.

e. Number of first articles to be submitted for approval (see 3.2).

f. Marking and shipping of samples.

g. Place of final inspection.

h. Technical literature required.

6.3 Environmental. Environmental pollution prevention measures are contained in the packaging material specifications referenced herein. Refer to material specifications or preparing activity for recommended disposability methods.

6.4 Nomenclature. The contractor should apply for nomenclature in accordance with the applicable clause in the contract.

6.5 Government furnished property (loaned). Unless otherwise stated in the contract, the following government property, in the quantities specified, shall be loaned to the contractor for the purpose of performing acceptance tests on the equipment being procured:

Radiacmeter IM-9( )/PD	25 each
Radiacmeter IM-93A/UD	25 each
Radiacmeter IM-147( )/PD	25 each
Radiacmeter IM-174A/PD	6 each
Radiacmeter IM-174B/PD	4 each
Radiac Set AN/PDR-27( )	4 each
Radiac Charger PP-1578( )	6 each
Radiac Set AN/PDR-60	4 each
Victoreen Model 555 Radacon II with instruction manual, Victoreen Model 555-100-MB, probe, Victoreen Model 555-100-1C probe, and accessories 1-5 per SM-A-509093, Timer 555-50	1 each

Custodian:
Army-ER

Preparing Activity:
Army-ER
Project 6665-A424

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS: This form is provided to solicit beneficial comments which may improve this document and enhance its use. DoD contractors, government activities, manufacturers, vendors, or other prospective users of the document are invited to submit comments to the government. Fold on lines on reverse side, staple in corner, and send to preparing activity. Attach any pertinent data which may be of use in improving this document. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity. A response will be provided to the submitter, when name and address is provided, within 30 days indicating that the 1426 was received and when any appropriate action on it will be completed.

NOTE: This form shall not be used to submit requests for waivers, deviations or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

DOCUMENT IDENTIFIER *(Number)* AND TITLE

MIL-R-55350A(ER) RADIAC CALIBRATOR AN/UDM-2( )

NAME OF ORGANIZATION AND ADDRESS OF SUBMITTER

☐ VENDOR ☐ USER ☐ MANUFACTURER

1. ☐ HAS ANY PART OF THE DOCUMENT CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE? ☐ IS ANY PART OF IT TOO RIGID, RESTRICTIVE, LOOSE OR AMBIGUOUS? PLEASE EXPLAIN BELOW.

A. GIVE PARAGRAPH NUMBER AND WORDING

B. RECOMMENDED WORDING CHANGE

C. REASON FOR RECOMMENDED CHANGE(S)

2. REMARKS

SUBMITTED BY *(Printed or typed name and address — Optional)*

TELEPHONE NO.

DATE

DD FORM 1 OCT 76 1426

EDITION OF 1 JAN 72 WILL BE USED UNTIL EXHAUSTED.

FOLD

DEPARTMENT OF THE AIR FORCE

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 73236 WASHINGTON D. C.

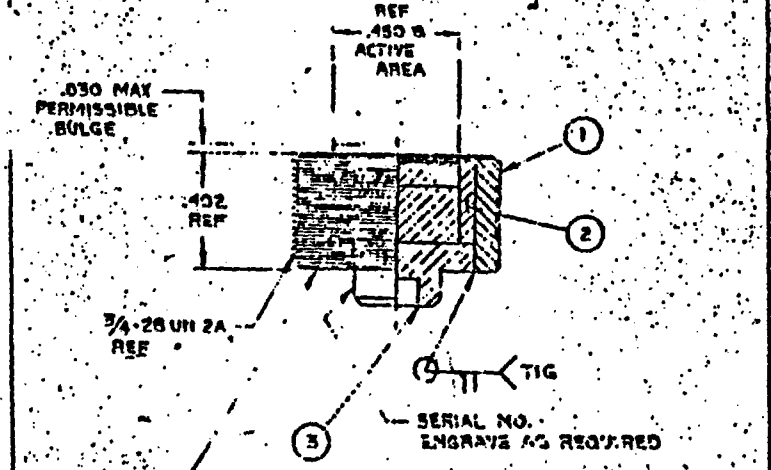
POSTAGE WILL BE PAID BY THE DEPARTMENT OF THE AIR FORCE

Commander
US Army Combat Surveillance and
Target Acquisition Laboratory
Attn: DELCS-PE
Fort Monmouth, NJ 07702

FOLD

★ U.S.GOVERNMENT PRINTING OFFICE: 1981—703-023/4289 3-1

Encl 17



ITEM	QTY	PART NO.	DESCRIPTION
1	1	8-12-1921-3464-5	ASSY WINDOW-OUTER CAPSULE
2	1	8-12-1921-3493-5	ASSY INNER CAPSULE
3	1	8-12-1921-3455-1	OUTER PLUG

COLOR CHART	
LOADING	COLOR
20 MICROCURIES	YELLOW
25 MILLICURIES	RED
OTHER REQ.	NONE

NOTE:
1. CONSTRUCTION TO MEET OR EXCEED ANSI CLASSIFICATION 77C-43343 AND SPECIAL FORM TITLE 49 CFR

USED ON

REVISION	ISSUE DATE AND CHANGE RECORD	APP.	CHK.
F	OCT 4, 82 ECO 82-0080 RECRAWN FROM A-0474-8,5	CRZ	RC

3M

Engineering Division

St. Paul, Minnesota

DRN. CHUCK ZENCER

CHK. RTC

APPR.

SCALE .5:1

TITLE: ASSEMBLY, SR-90 BETA SOURCE 3PIG

PART NO. 12-1921-0474-8

B

MILITARY SPECIFICATION

RADIAC CALIBRATOR SET AN/UDM-7( )

1. SCOPE

1.1 This specification covers a radiac calibrator set AN/UDM-7( ) for calibrating alpha radiac instruments.

2. APPLICABLE DOCUMENTS

2.1 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

MILITARY

MIL-F-1/1388 - Electron Tube, Type 7840.
MIL-S-901 - Shock Tests, H.I. (High Impact); Shipboard Machinery, Equipment and Systems, Requirements for.
MIL-Q-9858 - Quality Program Requirements.
MIL-P-15328 - Primer Pretreatment (Formula No. 117 for Metals).
MIL-E-17555 - Electronic and Electrical Equipment and Associated Repair Parts, Preparation for Delivery of.
MIL-M-19590 - Marking of Commodities and Containers to Indicate Radioactive Material.

STANDARDS

MILITARY

MIL-STD-108 - Definitions of and Basic Requirements for Enclosures for Electric and Electronic Equipment.
MIL-STD-167 - Mechanical Vibration of Shipboard Equipment.

DRAWINGS

MILITARY

RE101F2002 - Alpha Radiac Calibrator AN/UDM-7A

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

2.2 Other publications.- The following document forms a part of this specification. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

CODE OF FEDERAL REGULATIONS

INTERSTATE COMMERCE COMMISSION

Tariff No. 10 - Interstate Commerce Commission Regulations for Transportation of Explosives and Other Dangerous Articles by Land and Water in Rail Freight Service and by Motor Vehicles (Highway and Water) including Specifications for Shipping Containers.

FSC 6665

Encl 18

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, D.C. 20360.)

3. REQUIREMENTS

3.1 Preproduction sample.- Prior to beginning production a sample shall be tested as specified in 4.2.1 (see 6.2).

3.2 General description.- The radiac calibrator set AN/UDM-7( ) is a calibrating set which provides suitable radioactive sources for calibrating alpha radiac survey equipment.

3.2.1 The calibration set shall be constructed and assembled in accordance with the requirements of this specification and Drawing RE101F2002. Where the requirements of this specification conflict with the drawing, the requirements of this specification shall govern.

3.3 Material.- Materials specified herein and in Drawing RE101F2002 shall be entirely suitable for the purpose intended. Use of other material shall have the approval of the procuring activity.

3.4 Equipment composition.- The calibration set shall consist of the following:

(a) Two radioactive sources "A" and "C".
(b) Two radioactive source holders.
(c) Adjustable positioner.
(d) Two attenuators.
(e) Aluminum housing.
(f) Calibrator carrying case.
(g) One pair of tweezers.
(h) Instruction book.

3.4.1 Two radioactive sources.- The two radioactive sources shall contain Plutonium-239 deposited in a resin component. The resin component shall be of the composition specified in MIL-P-15328.

3.4.1.1 Source configuration and description.- The sources shall be about 12-1/2 inches in diameter, 1.0 mg/cm^2 thick and emit alpha energies, 90 percent of which are 4MEV or greater. A set of two sources (labeled A and C, and of activities of 10^7 DPM and 10^5 DPM respectively) are contained in each unit. When a source is positioned in the unit, only a 4 inch x 10 inch area is exposed for calibration. The sources shall be prepared in accordance with the Appendix to this specification.

3.4.1.2 Uniformity of radioactive sources.- The sources shall have no area count rate which exceeds plus or minus 5 percent from the average count rate when tested as specified in 4.4.1.

3.4.1.3 Accuracy.- The activity of each source shall be determined by comparison with a standard source to be approved by the procuring activity. This information shall be recorded and included with each calibrator delivered under the contract. Information shall be on a printed card or similar method of presentation.

3.4.2 Source mounting.- The two radioactive sources shall be mounted in accordance with Drawing RE101F2002.

3.4.3 Adjustable probe positioner.- Construction of the probe positioner shall be in accordance with Drawing RE101F2002.

3.4.4 Aluminum housing.- Each calibration set shall be provided with a lightweight housing, made of aluminum in accordance with Drawing RE101F2002, designed to house the following:

(a) Two radioactive source holders.
(b) Accessory drawer.
(c) The top of the unit shall be designed as a source-positioning well.

The housing shall be labeled in accordance with MIL-M-19590.

3.4.4.1 The two radioactive source holders shall be contained in removable drawers, numbered for source identification, and labeled in accordance with MIL-M-19590.

3.4.4.1.1 Each drawer with source shall be removable as a unit for replacement in the proper position under the probe positioner.

3.4.5 Calibrator carrying case.- The calibrator carrying case shall be constructed to contain the aluminum housing. The carrying case shall be constructed in accordance with Drawing RE101F2002.

3.4.5.1 Size and weight of calibrator.- The overall size and weight of the calibrator shall be as follows:

Height - 1-27/32 inches.
Width - 13-29/32 inches.
Depth - 13-17/32 inches.
Weight - Not to exceed 17 pounds.

3.4.5.2 Size and weight of carrying case.- The overall size and weight of the carrying case shall be as follows:

Height - 3-15/16 inches
Width - 14-7/8 inches
Depth - 15-1/16 inches
Weight - Not to exceed 7-1/2 pounds.

3.5 Shock and vibration.-

3.5.1 Shock.- Shock requirements shall be for grade A, class I, type A in accordance with MIL-S-901, except that the drop shall be 1, 2 and 3 feet in lieu of 1, 3 and 5 feet.

3.5.2 Vibration.- Vibration requirements shall be in accordance with type I of MIL-STD-167.

3.6 Degree of enclosure.- Degree of enclosure for the calibrator shall be splashproof in accordance with MIL-STD-108.

3.7 Temperature.- The sources shall be capable of withstanding a temperature of 120°F in an inverted position, and meet the requirements of 3.9.

3.8 Humidity.- The sources shall be capable of withstanding 95 percent relative humidity at 100°F for 4 hours, and meet the requirements of 3.9.

3.9 Leakage.- When tested in accordance with 4.4.5, the removable radioactive material shall not exceed 0.005 microcuries of Plutonium-239. Leakage test shall be performed immediately after the temperature, humidity, shock and vibration tests.

3.10 Workmanship.- The calibration set shall be manufactured and finished in a thoroughly workmanlike manner and shall be free from all burrs, rough edges, smudges and scratches.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection.- Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to 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 prescribed requirements.

4.1.1 Quality control system.- The contractor shall provide and maintain a quality system acceptable to the government for the supplies covered by the contract. The system of quality control shall be in accordance with MIL-Q-9858. The procedures outlined in MIL-Q-9858 shall serve to supplement and implement the design, performance and test requirements of this specification.

4.2 General inspection.- The methods of examination and testing of the calibration sets shall fall within the following classifications:

(a) Preproduction inspection (see 4.2.1).
(b) Quality conformance inspection (see 4.2.2).

4.2.1 Preproduction inspection.- Preproduction inspection shall be made on the preproduction model and shall consist of the examination of 4.3 and the tests of 4.4.

4.2.2 Quality conformance inspection.- Quality conformance inspection shall consist of the production inspection of 4.2.2.1 and production control inspection of 4.2.2.2.

4.2.2.1 Production inspection.- Production inspection shall be made on each equipment offered for delivery to determine compliance with this specification. Production inspection shall consist of the examination of 4.3 and the uniformity, accuracy and leakage tests of 4.4.1, 4.4.2 and 4.4.5.

4.2.2.2 Production control inspection.- Production control inspection shall be made on one out of each 10 calibration sets produced, to be selected at random by the Government representative. Production control inspection shall consist of the examination of 4.3 and the tests specified in 4.4.

4.3 General examination.- The calibration set shall be examined to determine compliance with the requirements of this specification and shall include the following:

(a) Workmanship, assembly, size and fit.
(b) Materials, parts and finish.

4.4. Test procedures.-

4.4.1 Uniformity.- The uniformity check to determine conformance with 3.4.1.2 shall be made with a type 7840 tube conforming to MIL-E-1/1388, used with a conventional type scaler (1 megohm, 0.5 microsecond resolving time).

4.4.2 Accuracy.- The calibration set shall be tested to determine conformance with 3.4.1.3.

4.4.3 Enclosure.- The housing and the carrying case shall be tested to determine conformance with 3.6.

4.4.4 Shock and vibration.- The calibration set shall be tested to determine conformance with 3.5.1 and 3.5.2.

4.4.5 Leakage test.- The leakage test shall be capable of detecting the presence of 0.005 microcuries of Plutonium-230. The method of the test shall be submitted to the command or agency concerned for approval prior to performing the test.

5. PREPARATION FOR DELIVERY

5.1 Preservation, packaging and packing.- The equipment shall be packaged by level A or C and packed by level A, B or C as specified in the contract or order in accordance with MIL-E-17555. Method III preservation shall apply for level A packaging. As a minimum, the requirements shall conform to the Interstate Commerce Commission Tariff No. 10.

5.2 Marking.- The equipment and containers shall be marked in accordance with MIL-M-19590.

6. NOTES

6.1 Ordering data.- Procurement documents should specify the title, number and date of this specification.

6.2 Preproduction.- Invitations for bids should provide that the Government reserves the right to waive the requirement for preproduction samples as to those bidders offering a product which has been previously procured or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending procurement.

Preparing activity:
Navy-SH
(Project 6665-N228Sh)

APPENDIX

PROCEDURE FOR PREPARING "THIN" ALPHA SOURCES

10. Technique.- The technique is relatively simple. The alpha emitter is dissolved in an alcohol-resin component mixture and stirred to uniformity. The final mixture is then poured through a funnel onto a plastic disk located on a leveling table directly below the funnel spout. The resulting radioactive sources have excellent uniformities - with any source the source area count rate varies ±5 percent or less from the average count rate.

10.1 Procedure.- The procedure shall be as follows:

(a) One cubic centimeter (cc) of radioactive solution (isotope in chloride form) is added to a mixture of 9 - 10 cc of resin component (MIL-C-15328) and 29 cc of ethyl alcohol (99 percent). The total mixture is carefully stirred for a minimum of 15 minutes to assure a uniform dispersion of the radioisotope in the solution.

(b) The radioactive solution is then poured through a funnel onto a 12-1/2 ($\frac{50}{64}$) inch diameter disk on a leveled table. The funnel (spout inner diameter - 11 millimeter (mm) is positioned rigidly with the spout perpendicular to the center of the plastic disk (CR-39 transparent plastic; cast acrylic). The distance between spout and disk is 47 mm. The spout inner diameter and the 47 mm distance eliminate areas of reduced activity in the center of the disk. Prior to pouring, the disk is leveled by means of a leveling table with adjustable legs (NASL uses a 12 inches x 12 inches stainless steel table). A wetting agent applied to the surface of the disk before pouring facilitates spreading of the radioactive mixture. Ten cc of alcohol, carefully hand spread over the disk has bee been used with good results.

(c) After spreading freely on the disk, the radioactive mixture is allowed to air dry. During this phase two factors of control are necessary. First, safety precautions are needed to protect personnel and equipment from possible contamination. A hood is recommended, with conditions to keep air currents from passing over the drying radioactive liquid. Secondly, humidity control is important and a dust free atmosphere is desirable. A relative humidity of 40 percent or less at 70°F. or less will prevent spotty, nonuniform distributions. The water content of the mixture is critical and should never be allowed to exceed 0.3 cc in 5 cc of mixture.

10.2 Source.- The resulting source, if the conditions above are employed, will have a high degree of uniformity. Any area count rate will be ±5 percent or less from the average count rate. A uniformity check can be made with 7840 GM tube (mica window thickness of 2.5 mg/cm^2 or less) used with a conventional type scaler (1 megohm, 0.5 μsec resolving time). The alpha source is a "thin" source, meaning all alpha energies at the surface are 4 Mev or greater. Care should be taken not to gouge or severely rub the source material.

10.3 Summary of material and conditions.- Summary of material and conditions shall be as follows:

(a) Radioactive mixture.-

Radioisotope - Plutonium 239 as $PuCl_3$ in HCl (≤ 0.5 N)
810 μg/cc for source 1 - equivalent to approximately 10^4 μg/m^2
8.1 μg/cc for source 2 - equivalent to approximately 10^2 μg/m^2
Resin component - 9 - 10 cc of MIL-C-15328
Solvent - 29 cc of ethyl alcohol (99 percent)
Total volume
of mixture - 40 cc - bring up with alcohol if necessary

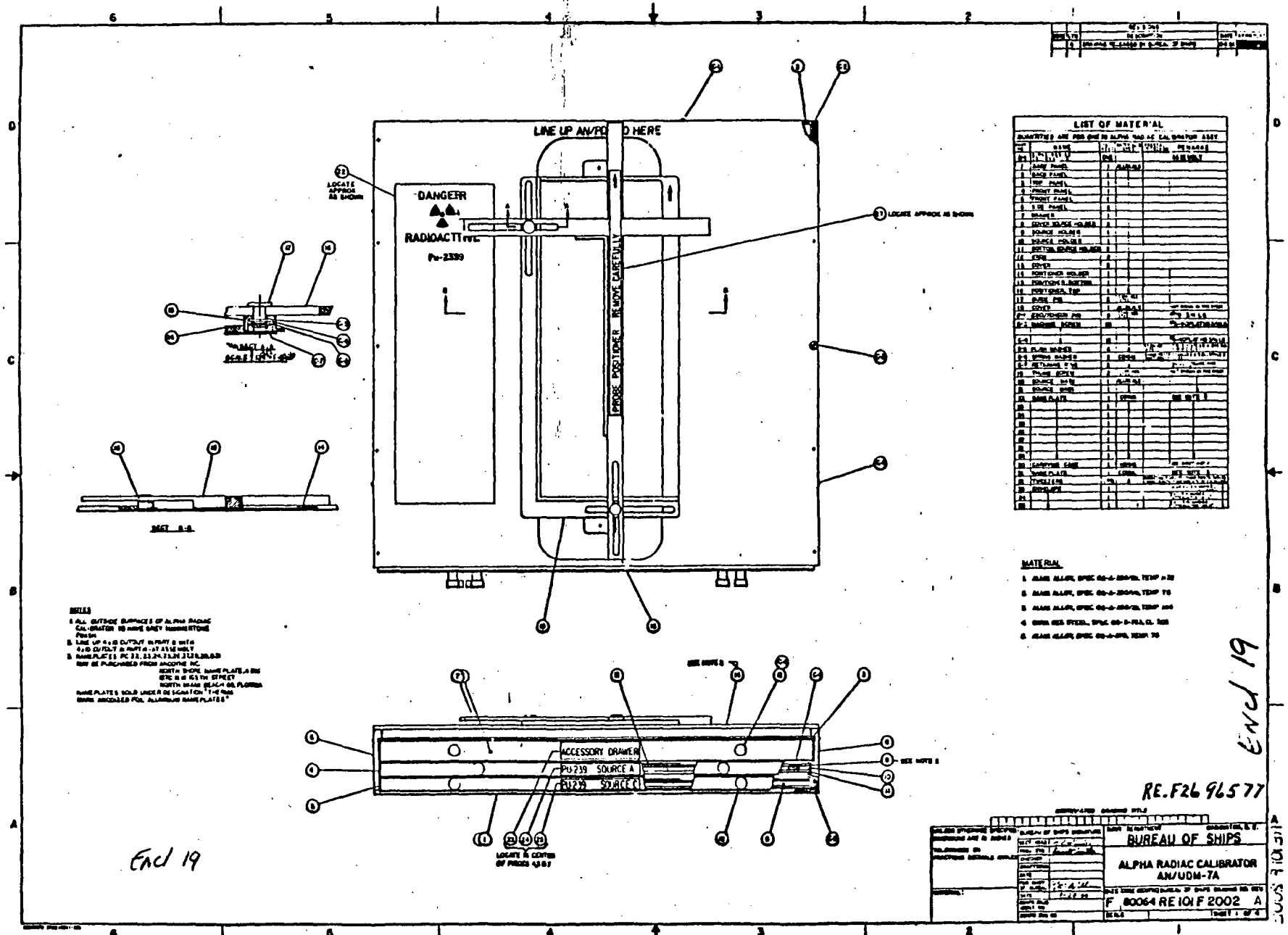
(b) Plastic disk - 12-1/2 inch diameter, 1/8 inch thick, CR-39 transparent, cast acrylic

(c) Leveling table - At least 12 inches x 12 inches for relatively uniform evaporation

(d) Funnel - Spout (inner diameter - 11mm, length - 25mm)
Mouth diameter ≈ 65mm

(e) Mixture beaker - 125 cc (graduated) with pouring spout

(f) Stirring rod - Glass, durable, approximately 8 inches long
(g) Conditions - R. H. - 40 percent or less, temperature 70° F or less
Dust-free atmosphere
Hood for safety precautions
No wind currents over drying mixture


LINE UP ANT/POINTER HERE
DANGER
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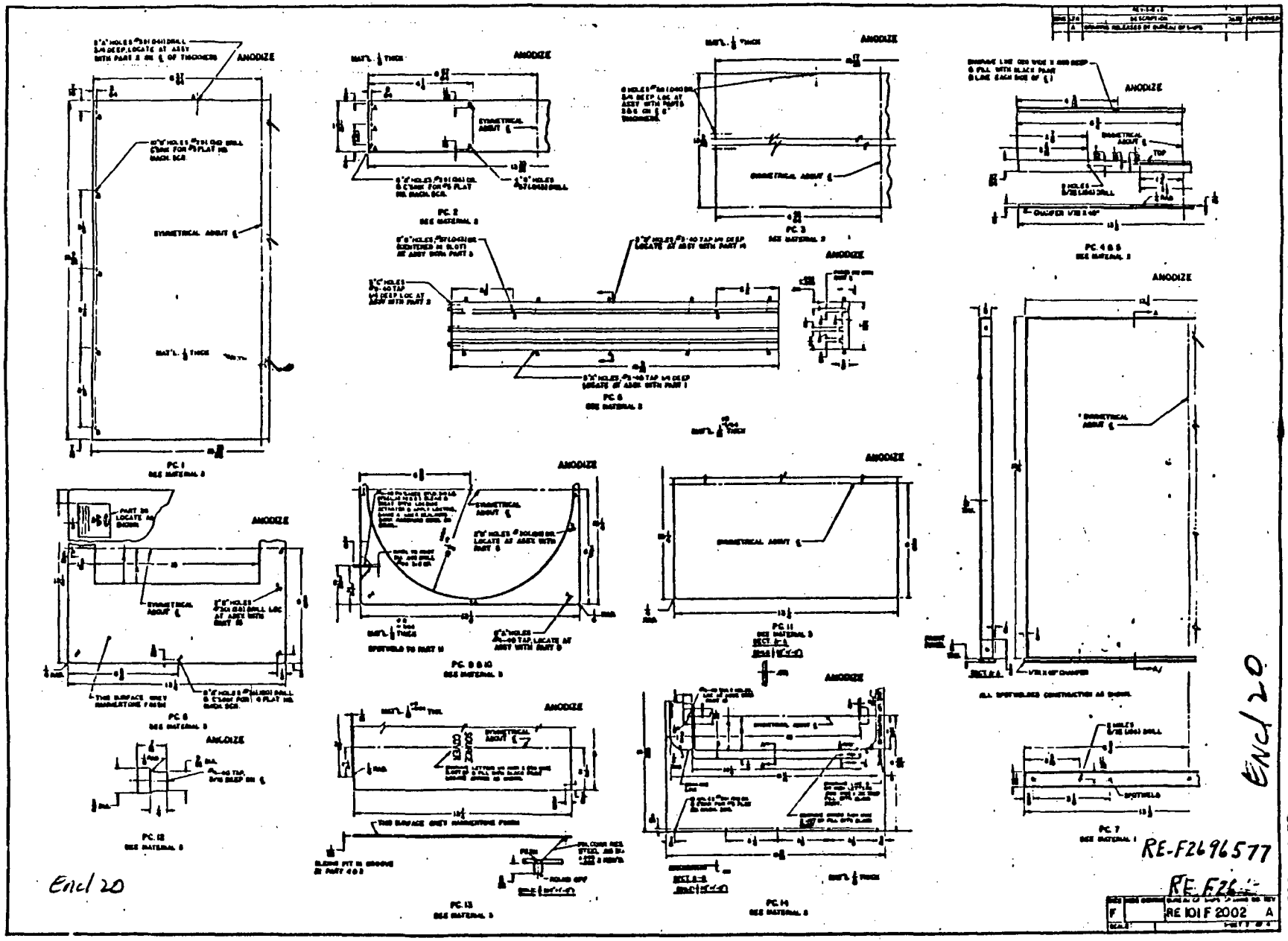
Pu-239
PROBE POSITIONER REMOVE CAREFULLY
LOCATE APPROX AS SHOWN
ACCESSORY DRAWER
Pu-239 SOURCE A
Pu-239 SOURCE B
SEE NOTE 8
SECT A-A
SECT B-B
LIST OF MATERIAL
MATERIAL
BUREAU OF SHIPS
ALPHA RADIAC CALIBRATOR
AN/UDM-7A
F 80064 RE 101 F 2002 A
RE.F26 96577
End 19

End 19


ANODIZE
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PC. 7
PC. 8 & 10
PC. 11
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PC. 13
PC. 14
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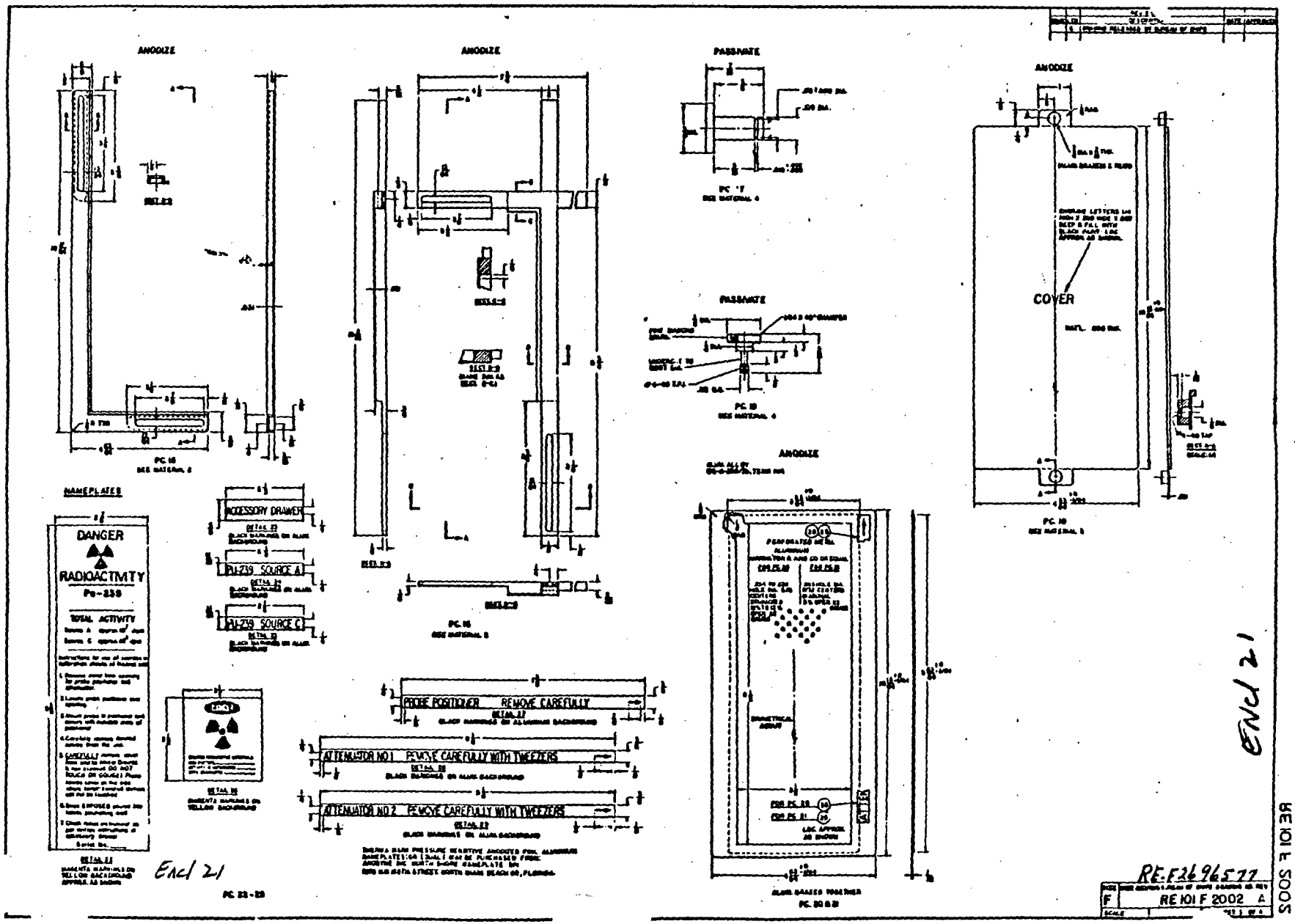
Encl 20
RE-F2696577
RE F26
RE 101 F 2002 A
RE 101 F 5005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PU-239 SOURCE A
PU-239 SOURCE C
PROBE POSITIONER REMOVE CAREFULLY
ATTENUATOR NO.1 REMOVE CAREFULLY WITH TWEEZERS
ATTENUATOR NO.2 REMOVE CAREFULLY WITH TWEEZERS
Encl 21
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RE 101 F 2002 A
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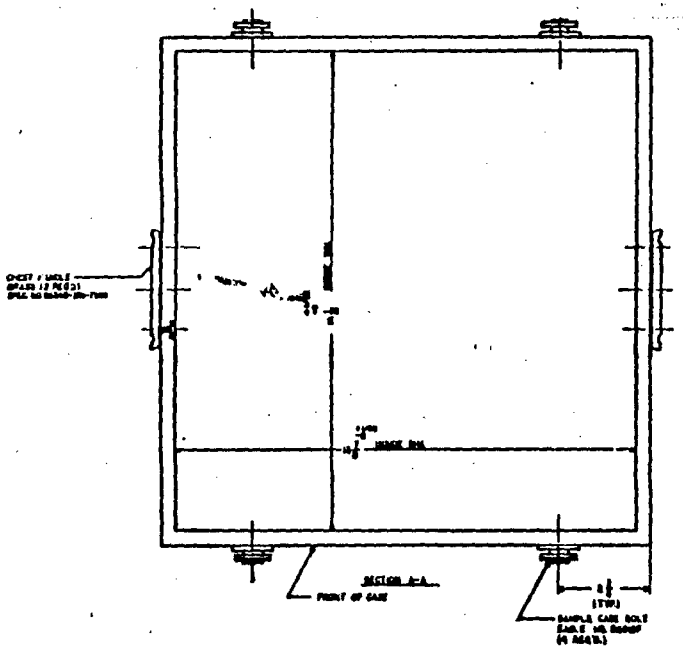
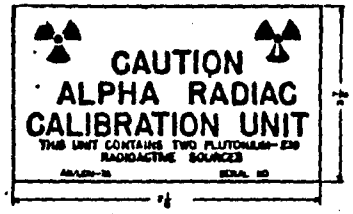
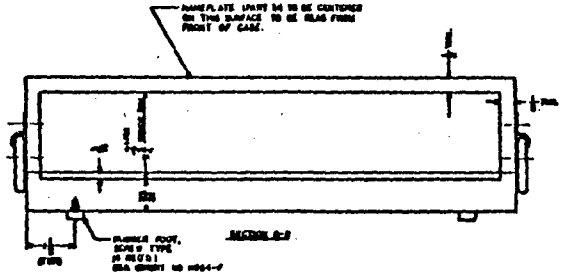
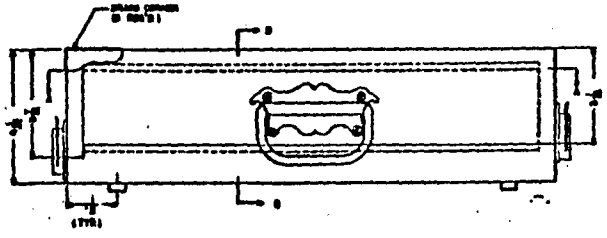
SCALE
SHEET 1 OF 1









ITEM 30, CARRYING CASE

Encl 22

Encl 22

RE: F2696577

FRE 101F 2002 A

SOOS E 101E

MIL-R-51081A(MU)
20 January 1971
SUPERSEDING
MIL-R-51081(CmlC)
29 March 1962

MILITARY SPECIFICATION

RADIOACTIVE SOURCE, COBALT 60, GAMMA, M1A1

1. SCOPE

1.1 This specification covers a capsulated cobalt 60 source.

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

MILITARY

MIL-I-6866 - Inspection, Penetrant Method of.
MIL-M-19590 - Marking of Commodities and Containers to Indicate Radioactive Material.

STANDARDS

MILITARY

MIL-STD-129 - Marking for Shipment and Storage.

DRAWINGS

US ARMY MUNITIONS COMMAND

EDGEWOOD ARSENAL

LM 124-10-10 - Radioactive Source, Cobalt 60, Gamma, M1A1.
D150-2-1 - Marking Diagram for Shipping Containers.

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

FSC 6665

End 23

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

UNIFORM CLASSIFICATION COMMITTEE

Uniform Freight Classification

(Application for copies of these ratings, rules and regulations should be addressed to Uniform Classification Committee, 202 Union Station, 516 West Jackson Boulevard, Chicago, IL 60606.)

CODE OF FEDERAL REGULATIONS

49 CFR 171-179 - Department of Transportation Rules and Regulations for the Transportation of Explosives and Other Dangerous Articles.

(The Department of Transportation regulations are a part of the Code of Federal Regulations available from the Superintendent of Documents, Government Printing Officer, Washington, D.C. 20402. Orders for the above publication should cite "49 CFR 171-179.")

AMERICAN SOCIETY FOR TESTING AND MATERIALS

ASTM STANDARD

D999-68 - Vibration Test for Shipping Containers.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

3. REQUIREMENTS

3.1 Materials and components.

3.1.1 Materials. All materials cited on Drawing LM 124-10-10 or on the subsidiary drawings shall conform to the specification thereon, or to the specific characteristics set forth on the drawings.

3.1.2 Components. All components of the source shall conform to the specifications and drawings listed on Drawing LM 124-10-10 and subsidiary drawings.

3.2 Manufacture and assembly. The radioactive source shall be manufactured and assembled in accordance with C124-10-10.

3.3 Performance.

3.3.1 Activity. The cobalt 60 radioactive source shall have an activity between 103.5 millicuries and 126.5 millicuries (see 3.3.1.1) when tested in accordance with 4.4.4.1.

3.3.1.1 Calibration. The strength (milliroentgens per hour at 1 meter) and the activity (3.3.1) on date of calibration shall have an accuracy of plus or minus 3 percent when tested in accordance with 4.4.4.1. Compliance with this requirement shall be determined while testing for activity (3.3.1).

3.3.1.2 Calibration curve. A calibration curve conforming to figure I shall be furnished with each source. The curve shall be constructed using semi-log graph paper 1 cycle x 12 divisions per inch. The curve and the printing shall be produced using black indelible ink.

3.3.2 Radioactive leakage. The radioactive source shall show no leakage or transfer of radioactive material greater than 5×10^{-4} microcuries after rough handling for 2 hours at a force of at least one times gravity as specified in 4.4.4.2. The source shall be set aside for seven days and retested only for removable activity.

3.3.3 Special form material requirements. The radioactive source shall show no evidence of radioactive leakage (3.3.2), cracks or fissures, and shall not melt or ignite, or undergo a weight change greater than 0.005 percent when subjected to the conditions and tested in accordance with table I (see 4.3.2.1) and 4.3.3.

3.4 Preproduction. Prior to the start of regular production, preproduction samples of radioactive sources and inert sources shall be produced in accordance with this specification for examination and tests (see 4.3).

3.5 Workmanship. The radioactive sources shall be free from cracks, dents, broken chain links or ring, and foreign matter such as grease, oil, or viscous material.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection.

4.1.1 Supplier's responsibility. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier 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 Government's responsibility. The Government will be responsible for performance of the tests in 4.3.3. Samples shall be forwarded to the laboratory designated by the contracting officer.

4.1.3 Objective evidence. The supplier 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 inspection. 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 five cobalt 60 radioactive sources and five inert capsules (Dwg C124-10-34) shall be manufactured using the same methods, materials, equipment, and processes as will be used during regular production.

4.3.2 Inspection procedure.

4.3.2.1 For examination and nondestructive tests. Each radioactive source in the preproduction sample shall be examined for the defects listed in the list of defects (4.4.3.2) and tested in accordance with 4.4.4; if any source is found defective the preproduction lot shall be rejected. The five inert capsules and five radioactive sources shall be tested in accordance with table I (see 4.1.2); any radioactive source or inert capsule found defective shall reject the preproduction sample.

Table I - Special form material requirements*

Condition	5 Inert	5 Radioactive	Requirement	Test
Free drop	X	X	3.3.3	4.3.3.1
Leakage		X	3.3.2	4.4.4.2
Dye penetrant	X		3.3.3	4.3.3.6
Percussion	X	X	3.3.3	4.3.3.2
Leakage		X	3.3.2	4.4.4.2
Dye penetrant	X		3.3.3	4.3.3.6
Heating	X	X	3.3.3	4.3.3.3
Leakage		X	3.3.2	4.4.4.2
Dye penetrant	X		3.3.3	4.3.3.6
Immersion	X	X	3.3.3	4.3.3.4
Leakage		X	3.3.2	4.4.4.2
Dye penetrant	X		3.3.3	4.3.3.6
Vibration	X	X	3.3.3	4.3.3.4
Leakage		X	3.3.2	4.4.4.2
Dye penetrant	X		3.3.3	4.3.3.6
Thermal shock	X	X	3.3.3	4.3.3.5
Leakage		X	3.3.2	4.4.4.2
Dye penetrant	X		3.3.3	4.3.3.6

*Note: The samples shall be tested and examined for compliance with 3.3.2 and the applicable part of 3.3.3 in the sequence shown in the table.

4.3.3 Tests. Chains shall be removed from the sources prior to performing these tests. Tests shall be performed as follows:

4.3.3.1 Free drop. Drop the sources through a distance of 30 feet onto a flat unyielding horizontal surface so that the source strikes the surface in such a position as to suffer maximum damage.

4.3.3.2 Percussion. Place the source on a sheet of lead which is not more than 1 inch thick, has a hardness number between 3.5 to 4.5 on the VICKERS scale, and is supported by a smooth unyielding surface. Drop a flat circular end of a 1 inch in diameter steel rod weighing 3 pounds through a distance of 40 inches so that the face of the flat circular end impacts on the source.

4.3.3.3 Heating. Equilibrate the source to a temperature of 1475°F in a muffle furnace and maintain this temperature for a period of 10 minutes.

4.3.3.4 Immersion. Immerse the source for 24 hours in water at room temperature. The water shall be PH6 to PH8 with a maximum conductivity of 10 micromhos per centimeter. Weight before and after test on a balance accurate to 0.001 gram. Record weight change.

4.3.3.5 Thermal shock. Subject the source to a temperature of -40°C for 2 hours. Remove source from the cold environment and immediately subject it to a temperature of +50°C ± 2°C for 2 hours. This procedure shall constitute one complete cycle of the thermal test. Test duration shall be three cycles.

4.3.3.6 Dye penetrant. Apply dye to inert capsules in accordance with MIL-I-6866. Examine the capsules for evidence of any cracks or fissures.

4.4 Quality conformance inspection.

4.4.1 Lotting. A lot shall consist of the radioactive sources produced by one manufacturer, at one plant, from the same materials, and under the same manufacturing conditions.

4.4.2 Sampling.

4.4.2.1 For examination and nondestructive tests. Each source shall be examined and tested in accordance with 4.4.3.

4.4.3 Inspection procedures.

4.4.3.1 For examination and nondestructive tests. Each source shall be examined in accordance with the list of defects (4.4.3.2) and tested in accordance with 4.4.4.

4.4.3.2 List of defects.

(a) Radioactive source, cobalt 60, gamma, M1A1 (Drawing C124-10-10).

1. Marking missing, incorrect, or illegible.
2. Components missing, incorrect, or incorrectly assembled.
3. Calibration curve missing, incorrect, or incomplete (see figure 1).
4. Workmanship (see 3.5).

4.4.4 Tests. Tests shall be conducted as follows:

4.4.4.1 Activity. Determine the calibrated activity and strength of the source with a standard radiation measuring instrument which has been previously calibrated with a cobalt 60 source certified by National Bureau of Standards (see 6.3 and 6.4).

4.4.4.2 Radioactive leakage. Subject the source to a vibration test in accordance with ASTM Method D999-68. However, for this test replace the shipping container by a metal screw-cap container of appropriate size. Place the source within the container and place the container on the specified table. Vibrate the table for 2 hours at a speed that will yield output forces acting on the container equal to at least one times gravity. Remove the source from the container after vibration is complete and wipe all external surfaces with high wet-strength filter paper moistened with distilled water. Allow the filter paper to dry and then determine any contamination present by using a scaler equipped with a scintillation or Geiger-Mueller tubes for counting. Counting equipment shall be capable of detecting 1×10^{-4} microcuries of radioactive material on the filter paper. Repeat the wipe test on the source after seven days elasped time.

4.4.5 Acceptance/rejection criteria. If any source fails when examined in accordance with 4.4.3 and tested in accordance with 4.4.4 it shall be rejected.

5. PREPARATION FOR DELIVERY

5.1 Packaging, level C. The radioactive source shall be packaged to afford adequate protection against deterioration and damage in shipment from the supply source to the first receiving activity for immediate use. Packaging shall be in compliance with applicable rules and regulations of Department of Transportation (DOT) and Atomic Energy Commission (AEC).

5.2 Packing, level C. The radioactive sources, packaged as specified in 5.1 shall be packed in accordance with applicable requirements specified in DOT regulation 49 CFR 171-179 to insure carrier acceptance and safe delivery to the first domestic destination. Containers shall comply with Uniform Freight Classification rules or regulations of other carriers applicable to the mode of transportation.

5.3 Marking. In addition to any special marking required by the contract or order, unit packages shall be marked in compliance with DOT regulation 49 CFR 171-179, AEC, MIL-M-19590 and applicable requirements of Drawing D150-2-1.

6. NOTES

6.1 Intended use. The source covered by this specification is intended to provide a source of gamma radiation for use in the M3A1.

6.2 Ordering data. Procurement documents should specify the following:

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

(1) Time allowed for supplier 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 supplier whether or no to proceed with production.

6.3 Instruments. The following instruments have been found to be satisfactory for determining the activity:

Victoreen R Chamber
Landeverik R Meter

6.4 Caution. Care should be exercised to prevent injury to personnel engaged in handling and testing radioactive sources. The National Bureau of Standards handbook (NSB No. 73) and Atomic Energy Commission Regulation 10 CFR 20-40 contain information pertaining to protection of personnel from radioactive emanations.

Custodian:

Army - MU

Preparing activity:

Army - MU(EA)

Project No. 6665-A282

☆ U. S. GOVERNMENT PRINTING OFFICE: 1971 -433-695/4276

MIL-R-51080A(MU)
20 January 1971
SUPERSEDING
MIL-R-51080(CmlC)
29 March 1962

MILITARY SPECIFICATION

RADIOACTIVE SOURCE SET, M3A1

1. SCOPE

1.1 This specification covers a portable source of gamma radiation with a remote handling device.

2. APPLICABLE DOCUMENTS

2.1 Government documents. The following documents of the issue in effect on the 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, Flat and Seals.

STANDARDS

MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.

DRAWINGS

US ARMY MUNITIONS COMMAND

EDGEWOOD ARSENAL

DL124-12-3 - Radioactive Source Set, M3A1.

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

Encl 24

FSC 6665

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

CODE OF FEDERAL REGULATIONS

10 CFR 20-40 - Atomic Energy Commission.
49 CFR 171-179 - Department of Transportation Rules and Regulations for the Transportation of Explosives and Other Dangerous Articles.

(The Department of Transportation regulations are a part of the Code of Federal Regulations available from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. Orders for the above publication should cite "10 CFR 20-40" or "49 CFR 171-179.")

3. REQUIREMENTS

3.1 Materials and components.

3.1.1 Materials. All materials cited on Drawing DL124-12-3 or on the subsidiary drawings shall conform to the specifications listed thereon, or to the specific characteristics set forth on the drawings.

3.1.2 Components. All components of the source set shall conform to the specifications and drawings listed on Drawing DL124-12-3 and subsidiary drawings.

3.1.2.1 Magnetic handler operation. The magnetic handler shall telescope to under 20 inches and extend at least 72-1/2 inches. The magnet in the handler shall be capable of picking up a steel washer 1-1/2 inches in diameter by 1/16 inch thick to a height of 3 feet and releasing the washer when tested in accordance with 4.4.4.1.

3.2 Manufacture and assembly. The source set shall be manufactured and assembled to conform to Drawing DL24-12-3.

3.3 External radiation. The gamma radiation shall not exceed 100 milliroentgens per hour (mr/hr) at any point on any surface of the case of the assembled source set when tested as specified in 4.4.4.2.

3.4 Radioactive contamination. The radioactive source set shall show radioactive contamination no greater than 5×10^{-4} microcuries when tested as specified in 4.4.4.3.

3.5 Preproduction. Prior to the start of regular production, preproduction sample of radioactive source sets shall be produced in accordance with this specification for examination and test (see 4.3).

3.6 Workmanship. The source set shall be free from damage such as broken hardware, or marred or splintered wooden panels; and foreign matter such as grease, oil, or viscous material.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection.

4.1.1 Supplier's responsibility. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier 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 supplier 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 three radioactive source sets shall be manufactured using the same methods, materials, equipment, and processes as will be used during regular production.

4.3.2 For examination and nondestructive tests. Sample radioactive source sets shall be examined for all requirements of the drawings and this specification.

4.3.3 Tests. Each set shall be tested in accordance with 4.4.4.

4.3.4 Acceptance/rejection criteria. The radioactive sets shall meet the examinations and tests specified in 4.3.2 and 4.3.3 to be acceptable.

4.4 Quality conformance inspection.

4.4.1 Lotting. A lot shall consist of the source sets produced by one manufacturer, at one plant, from the same materials and under the same manufacturing conditions.

4.4.2 Sampling for examination and nondestructive tests. Sampling shall be conducted in accordance with MIL-STD-105.

4.4.3 Inspection procedures.

4.4.3.1 For examination and nondestructive tests. The source set samples shall be examined and tested in accordance with the classification of defects (4.4.3.3) and MIL-STD-105.

4.4.3.2 Examination for critical defects. Each item in the lot shall be inspected for critical characteristics listed in the classification of defects.

4.4.3.3 Classification of defects.

(a) Radioactive source set, M3A1 (Dwg D124-12-3).

Categories	Defects	Acceptance standards
Critical:		
1	External radiation	4.4.4.2
2	Radioactive contamination	4.4.4.3
3	Source missing	
4	Marking missing, incorrect or incomplete	
Major:	AQL 1.0 percent defective	
101	Component (other than source) missing, incorrect or incorrectly located, or assembled	
102	Hardware nonfunctioning	
103	Calibration curve missing or not coated	
104	Wipe test card missing	
105	Workmanship (see 3.6)	

(b) Magnetic handler, radioactive source, telescoping, M4 (Dwg D124-2-62).

Categories	Defects	Acceptance standards
Critical:		
1	Handler operation	4.4.4.1
Major: AQL 1.0 percent defective		
101	Protective finish missing or incomplete	
102	Knurl missing or incorrect	
Minor: AQL 2.5 percent defective		
201	Foreign matter (grease, oil, or viscous material)	

4.4.4 Tests. The tests shall be conducted as follows:

4.4.4.1 Magnetic handler operation. Extend the handler to its maximum position and record the dimension. Pick up a steel washer and release it by turning the control knob. Retract the handler and repeat the preceeding operation twice. The handler shall perform the three operations to be acceptable. Do not turn the knob when in the retracted position.

4.4.4.2 External radiation. Check the external radiation at the surface of the case of the assembled source set using a radiac survey meter previously calibrated with standard cobalt 60 source.

4.4.4.3 Radioactive contamination. Wipe thoroughly all accessible surfaces of the case, magnetic handler and source, with a piece of high wet-strength filter paper moistened with distilled water. Allow the paper to dry and determine the radioactivity present using a scaler equipped with scintillation or Geiger-Muller tubes for counting. Counting equipment shall be capable of detecting 1×10^{-4} microcuries of radioactive material on the filter paper.

5. PREPARATION FOR DELIVERY

5.1 Packing, level A. No overpacking of the source set is required, however, the source set (Dwg D124-12-3) shall be secured with two flat steel straps 1/2 inch by 0.020 inch conforming to type I, class B, grade 2 of QQ-S-781 placed one at each end running girthwise around the case. The straps shall be placed at least one inch in from each edge of the case encompassing the ends (with handles), top and bottom.

5.2 Marking. In addition to any marking required by the contract or order, each item shall be marked in compliance with Department of Transportation and Atomic Energy Commission regulations and Drawing D124-10-14.

6. NOTES

6.1 Intended use. The source set covered by this specification is intended for use as a portable source of gamma radiation for training in radiation measuring and monitoring techniques, and for calibrating radiac instruments in the field.

6.2 Ordering data. Procurement documents should specify the following:

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

(1) Time allowed for supplier 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 supplier whether or not to proceed with production.

Custodian:

Army - MU

Preparing activity:

Army - MU(EA)

Project No. 6665-A281

4.4.3.4 Classification of defects (continued)

(c) Preparation for delivery (section 5).

Categories	Defects
Critical:	
1	Marking of unit or shipping container illegible, incorrect, incomplete or not durable
Major:	AQL 1.0 percent defective
101	Unit or shipping container not as specified
102	Quantity of samples per unit or shipping container not as specified or indicated
103	Closure of unit or shipping container not as specified
104	Unit or shipping container damaged
105	Cushioning of shipping container not as specified

4.4.4 Tests.

4.4.4.1 Hermetic seal. Submerge each capsule (Drawing B124-12-8) for a minimum of 60 seconds in a suitable constant temperature bath such as glycerine heated to 150 ± 5°F. A steady stream or recurrent sucession of bubbles from the end of the capsule shall indicate leakage.

4.4.4.2 Activity. The radioactive test sample (Drawing C124-12-6) shall be tested for activity using a calibrated scintillation or Geiger-Mueller probe connected to a scaler or spectrometer. Each radioactive test sample shall be numbered and the activity level recorded (initial reading).

4.4.4.3 Mechanical shock. The radioactive test sample (Drawing C124-12-6) shall be tested by dropping from a height of 4 feet and impacting on a steel surface. Each radioactive test sample shall be dropped six times then subjected to the activity test 4.4.4.2 and the results recorded.

5. PREPARATION FOR DELIVERY

5.1 Packaging.

5.1.1 Level A. Radioactive test samples shall be individually packaged, method IC-3 of MIL-P-116, in a paperboard box, of optional type and class, conforming to PPP-B-676. The test sample shall be sufficiently cushioned to fill all voids with material conforming to PPP-C-843.

5.1.2 Level C. The radioactive test samples shall be packaged to afford adequate protection against deterioration and damage from the supply source to the first receiving activity for immediate use.

5.2 Packing.

5.2.1 Level A. Radioactive test samples, packaged as specified in 5.1.1, shall be packed in a quantity not to exceed the applicable requirement specified in Department of Transportation (DOT) regulations 49CFR 171-179 in a cleated plywood box conforming to overseas type, style J of PPP-B-601, for a type 2 average load. Unless otherwise specified, the plywood shall be provided with water repellent preservative treatment as specified in PPP-B-601, in addition, wood cleats shall be immersed for a minimum of three minutes in the same preservative as that specified for the plywood (see 6.2). Each inside face of the wood box shall be lined with fiberboard sheets conforming to grade W5c of PPP-F-320. Additional sheets shall be added as required to assure a tight pack. Boxes shall be closed and strapped using galvanized strapping as specified in the appendix to PPP-B-601.

5.2.2 Level C. Radioactive test samples, packaged as specified in 5.1.2, shall be packed in accordance with applicable requirements specified in DOT regulation 49 CFR 171-179 to insure carrier acceptance and safe delivery to the first domestic destination. Containers shall comply with Uniform Freight Classification rules or regulations of other carriers applicable to the mode of transportation.

5.3 Marking. In addition to any special marking required by the contract or order, unit packages shall be marked in accordance with MIL-STD-129, DOT regulation 49 CFR 171-179 and MIL-M-19590. Shipping containers shall be marked as shown on Drawing D150-2-1.

6. NOTES

6.1 Intended use. The radioactive test samples covered by this specification are intended to provide a radiation source that permits the operator to ascertain the operating condition of AN/PDR 27 radiac set when no known radiation field is available.

6.2 Ordering data. Procurement documents should specify the following:

(a) The title, number, and date of this specification.
(b) Level of packaging and packing required.
(c) Quantity required in each shipping container.
(d) When wood preservative is not required on shipping container.

6.3 Caution. Care should be exercised to prevent injury to personnel engaged in handling and testing radioactive sources. The National Bureau of Standards handbook (NBS No. 73) and Atomic Energy Commission Regulation 10 CFR 20-40 contain information pertaining to protection of personnel from radioactive emanations.

Custodian:

Army - MU

Preparing activity:

Army - MU (EA)

Project No. 6665-A217

☆ U. S. GOVERNMENT PRINTING OFFICE: 1988-141-320/A-70081

ENGINEERING CHANGE PROPOSAL (SHORT FORM)
(SEE MIL-STD-481 FOR INSTRUCTIONS)

DATE PREPARED	ECP NO.	PROCURING ACTIVITY NO.
27 MAR 1970	212-006	

1. ORIGINATOR NAME AND ADDRESS	2. MFR. CODE	3. CLASS OF ECP	4. JUST. CODE	5. PRIORITY
Def Dev & Engr Lab Pdn & Maint Engr Lab				

6. SPECIFICATIONS AFFECTED		7. DRAWINGS AFFECTED		
MFR. CODE	SPECIFICATION/DOCUMENT NO.	MFR. CODE	NUMBER	REV.
	MIL-R-51305			

8. TITLE OF CHANGE
Revision to Specification

9. CONTRACT NO. & LINE ITEM
DAAA15-70-C-0062

10. CONFIGURATION ITEM NOMENCLATURE
Radioactive Test Sample, Kr 85, MX-7338

11. IN PRODUCTION
[Y] YES [ ] NO

12. NAME OF PART OR LOWEST ASSEMBLY AFFECTED
Military Specification

13. PART NO. OR TYPE DESIGNATION
MIL-R-51305

14. DESCRIPTION OF CHANGE
For details to changes see attached DD Form 1695, Notice of Revision.
Changes occurr in the following paragraphs: 3.1.2.2
3.3
4.4.3.4
4.4.4.1
4.4.4.2

15. NEED FOR CHANGE
To improve the radioactive leakage test procedure, to assure a better quality end item and to clarify method of determining end item effective activity.

CONCURRENCE: Joseph Valcarenghi
for LOUIS VALCARENGHI, QA Engr

16. EFFECT ON ASSOCIATED EQUIPMENT
None

17. PRODUCTION EFFECTIVITY BY SERIAL NO.	18. EFFECT ON PRODUCTION DELIVERY SCHEDULE
All items	None
19. RECOMMENDED RETROFIT EFFECTIVITY	**20. ESTIMATED KIT DELIVERY SCHEDULE**
N/A	N/A

21. ESTIMATED COSTS/SAVINGS
None

22. SUBMITTING ACTIVITY AUTHORIZING SIGNATURE	TITLE	
MICHAEL J. SCHUMCHYK M J Schumchyk	Production Engineer	27 Mar 70

23. APPROVAL/DISAPPROVAL

GOVERNMENT ACTIVITY	SIGNATURE	DATE

DD FORM 1693

NOTICE OF REVISION (NOR)
(SEE MIL-STD-480 FOR INSTRUCTIONS)

This revision described below has been authorized for the document listed.

1. ORIGINATOR NAME AND ADDRESS	DATE	MFR. CODE	NOR. NO.
Def Dev & Engr Lab Pdn & Maint Engr Lab	27 MAR 1970		212-006-001

2. TITLE OF DOCUMENT	3. MFR. CODE	4. DOCUMENT NUMBER
Military Specification		MIL-R-51305
	5. REVISION LETTER (CURRENT) / (NEW)	6. ECP NO. 212-006

7. CONFIGURATION ITEM (OR SYSTEM) TO WHICH ECP APPLIES

Radioactive Test Sample, Kr 85, MX-7338

8. DESCRIPTION OF REVISION

a. Change Para 3.1.2.2 to read as follows: Radioactive Leakage. The capsule shall show no evidence of radioactive leakage when tested as specified in 4.4.4.1.

b. Change Para 3.3 to read as follows: Activity. The radioactive test sample shall have an effective activity of 5 millicuries ± 10 percent, corrected for copper and aluminum radiation attenuation, when tested as specified in 4.4.4.2.

c. Para4.4.3.4(b) Critical defect No. 1 - Delete "Hermetic seal" and add "Radioactive leakage".

d. Change Para 4.4.4.1 to read as follows: Radioactive Leakage. Each capsule (Drawing B124-12-8) shall be placed in a small volume container and tightly sealed. Subject the container to a 2 hour vibration test in accordance with ASTM Method D999 in such a manner that the speed of vibration will yield output forces acting on the container equal to one times gravity. Set the container aside for a 6 day period. At the end of the 6 day period, break the containment seal and sample the entrapped air for the presence of radioactive leakage using a suitable calibrated survey meter.

e. Change Para 4.4.4.2 to read as follows: Activity. The radioactive test sample (Drawing C124-12-6) shall be tested for effective activity using a calibrated scintillation probe connected to a scaler or spectrometer. Correct the activity readings for copper and aluminum radiation attenuation. Each radioactive test sample shall be numbered and the activity level recorded (initial reading).

9. THIS SECTION FOR GOVERNMENT USE ONLY

A. CHECK ONE

[X] EXISTING DOCUMENT SUPPLEMENTED BY THIS NOR MAY BE USED IN MANUFACTURE.

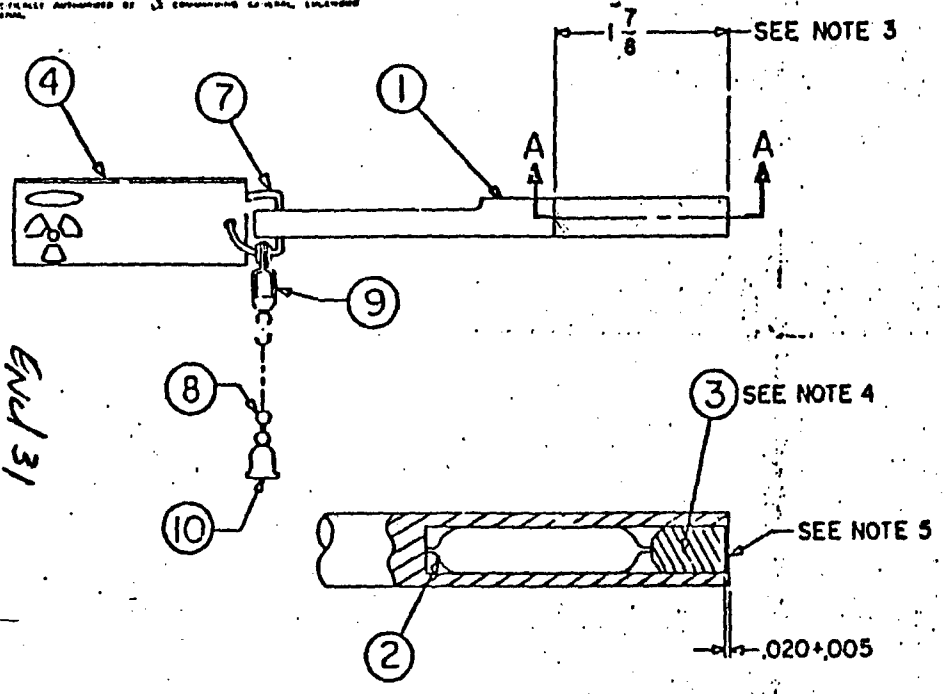
[ ] REVISED DOCUMENT MUST BE RECEIVED BEFORE MANUFACTURER MAY INCORPORATE THIS CHANGE.

[ ] CUSTODIAN OF MASTER DOCUMENT SHALL MAKE ABOVE REVISION AND FURNISH REVISED DOCUMENT TO:

B. ACTIVITY AUTHORIZED TO APPROVE CHANGE FOR GOVERNMENT	SIGNATURE AND TITLE	DATE
Def Dev & Engr Lab, Pdn & Maint Engr Lab	MICHAEL J. SCHUMCHYK, Pdn Engr	26 Mar 70
10. ACTIVITY ACCOMPLISHING REVISION	**REVISION COMPLETED (SIGNATURE)**	**DATE**

DD FORM 1 DEC 68 1695

REVISIONS			
LTR	DESCRIPTION		APPROVED
A	ECO 212-1 INC.	5 B	
B	N.O.R. 212-00[illegible] INC.	17JAN69	
C	INC NOR 212-0[illegible]	27AUG69	



SECTION A-A
SCALE 2/1

QTY REQD	DRAWING OR PART NO.	NOMENCLATURE	MATERIAL	SPECIFICATION
1		RETAINING SLEEVE-PART NO. 10SL (HOLE SIZE FOR SLEEVE .221) MS LBS MINIMUM PULL		SEE NOTE 7
1		COUPLING-PART NO. 1CA (.188+.015 HOLE DIA)		SEE NOTE 7
1		CHAIN PART NO. 10 (CARBON STEEL, NICKEL PLATED) LENGTH 24 INCHES ± 1/2		SEE NOTE 7
1		RING, DEE, CLASS 2, SIZE 9/16 X 7/16 T .0625 NOM THK, CAD OR ZINC PLATED		MIL-R-3990
- -		ANODIC COATING		MIL-A-8625
- -		ADHESIVE, EPOXY RESIN, TYPE I		MIL-A-8623
- -		LACQUER, ACRYLIC, COLOR PURPLE		MIL-L-81352
1	DL124-12-10	IDENTIFICATION TAG		
1	DL124-12-9	PLUG		
1	DL124-12-8	CAPSULE		
1	DL124-12-7	BODY		

LIST OF MATERIALS

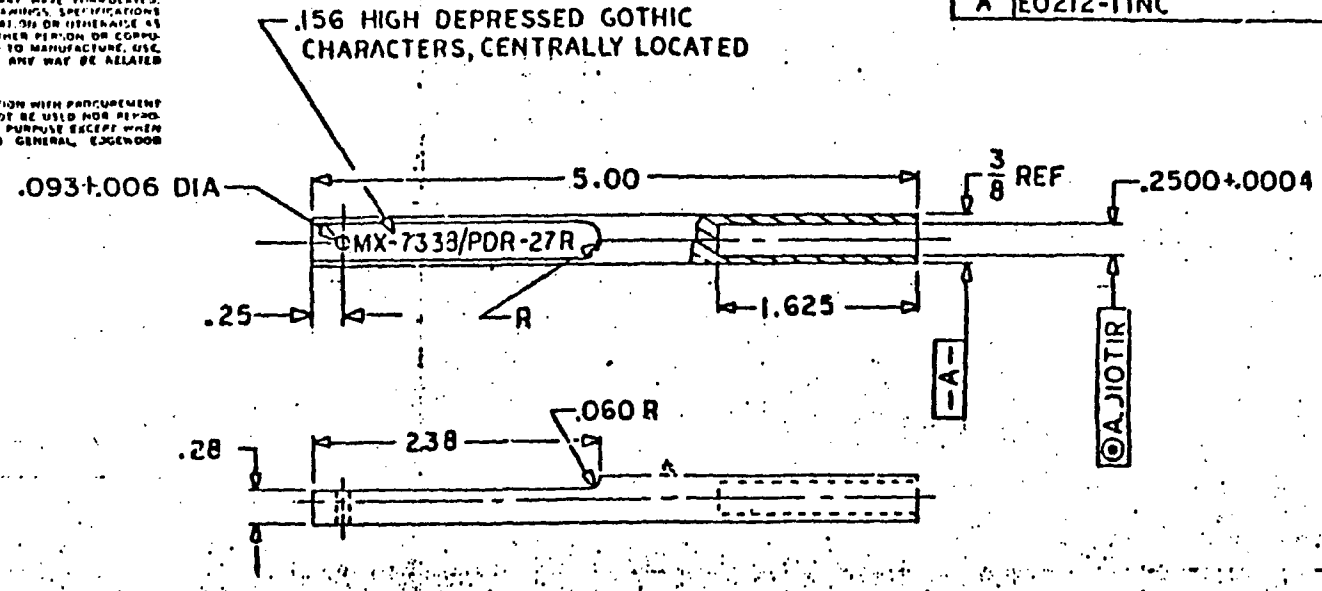
NOTES:

1. THIS DRAWING SHALL BE INTERPRETED IN ACCORDANCE WITH APPLICABLE STANDARDS LISTED IN DRL SPEC DRL-D4000
2. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ⊓
   - ☐ REMOVE BURRS ☐ BREAK SHARP EDGES .010 MAX
   - ☐ FILLETS .010 MAX R.
   - ☐ [illegible] ALL OVER, EXCEPT AS NOTED
   - ☐ DIMENSIONS APPLY AFTER PLATING
   - ☐ TOLERANCES ON STOCK MATERIAL SIZES, SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.
3. APPLY ITEM 6 FOR DISTANCE INDICATED
4. APPLY ITEM 6 AROUND ITEM 3 AND PRESS FIT ITEM 3 INTO ITEM 1.
5. SEAL ASSEMBLY WITH ITEM 6. SEALED END OF ASSEMBLY SHALL BE FREE OF EXCESS EPOXY RESIN AND SMOOTH.
6. FOR LEAKAGE TEST AND ADDITIONAL REQUIREMENTS SEE END ITEM SPEC MIL-R-[illegible].
7. BALL CHAIN MFG CO. INC
   7[illegible] S. FULTON AVE.
   MOUNT VERNON, NEW YORK, 10550

APPLICATION	UNLESS OTHERWISE SPECIFIED	ORIGINAL DATE OF DRAWING 20 APR 1968	DEPT OF THE ARMY
NEXT ASSY	DIMENSIONS ARE IN INCHES	DRAFTSMAN R.L.B.	U. S. ARMY EDGEWOOD ARSENAL
	TOLERANCES ON	CHECKED	EDGEWOOD ARSENAL, MARYLAND
	3 PLACE DECIMALS ± .00	LINEARD	RADIOACTIVE TEST SAMPLE
	2 PLACE DECIMALS ± .01	SUBMITTED	MX7338 / PDR-27R
	FRACTIONS ± 1/16	APPROVED	
	ANGLES ± 0°30'	APPROVED BY BRANCH OR CO	
DL124-12-6	MATERIAL		CODE IDENT NO. 81361 / SIZE C / DL124-12-6
END ITEM CODE NO. 212			SCALE 1/1 / SHEET

End 32

REVISIONS			
LTR	DESCRIPTION	DATE	APPR
A	EO212-1 INC	2AU668	[illegible]



ALUMINUM ALLOY BAR, COLD FINISHED, 6061, T6, 3/8 DIA STOCK SIZE, SPEC QQ-A-225/8

NOTES:

1. THIS DRAWING SHALL BE INTERPRETED IN ACCORDANCE WITH APPLICABLE STANDARDS LISTED IN MIL SPEC MIL-D-1000
2. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ■
   - ■ REMOVE BURRS ■ BREAK SHARP EDGES .010 MAX
   - □ FILLETS .010 MAX R.
   - ■ [illegible] ALL OVER EXCEPT AS NOTED
   - □ DIMENSIONS APPLY AFTER PLATING
   - ■ INTERPRETATION OF STOCK MATERIAL SIZE SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.
3. SURFACE TREATMENT FINISH NO. 7.1.1 OR 7.2.1, MIL-STD-171 TO OUTSIDE SURFACES

C124-12-6	212
NEXT ASSY	CODE NO.
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
2 PLACE DECIMALS ± .01
3 PLACE DECIMALS ± .010
FRACTIONS ± 1/16
ANGLES ± 0°30'

MATERIAL
SEE ABOVE

ORIGINAL DATE OF DRAWING 29 APR 1968

DRAFTSMAN	CHECKER	GR LEADER
RLE	WG	

SUBMITTED [signature]

APPROVED [signature]

APPROVED BY ORDER OF CG [signature]

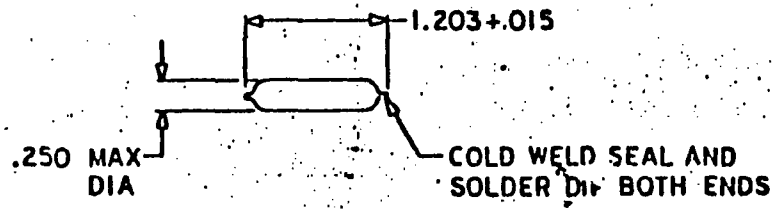
DEPT OF THE ARMY
U.S. ARMY EDGEWOOD ARSENAL
EDGEWOOD ARSENAL, MARYLAND

BODY

CODE IDENT NO.	SIZE	
81361	B	B124-12-7
SCALE 1/1		SHEET

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVAL

End 33



Kr^{85} SAMPLE (5 MILLICURIES)
IN 3/16 OD × .030 WALL COPPER TUBE

PART MAY BE PROCURED FROM:
U.S. NUCLEAR CORP.
POST OFFICE BOX 208, 801 NORTH LAKE ST., BURBANK CALIFORNIA, 91503
PART NO. 3113

NOTES:

1. THIS DRAWING SHALL BE INTERPRETED IN ACCORDANCE WITH APPLICABLE STANDARDS LISTED IN MIL SPEC MIL-D-1000.
2. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ■
   - ☐ REMOVE BURRS ☐ BREAK SHARP EDGES .010 MAX
   - ☐ FILLETS .010 MAX R.
   - ☐ [illegible] ALL OVER, EXCEPT AS NOTED
   - ☐ DIMENSIONS APPLY AFTER PLATING
   - ☐ TOLERANCES ON STOCK MATERIAL SIZES SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.
3. FOR LEAKAGE TEST AND ADDITIONAL REQUIREMENTS SEE END ITEM SPEC MIL-R-51305.

SPECIFICATION CONTROL DRAWING

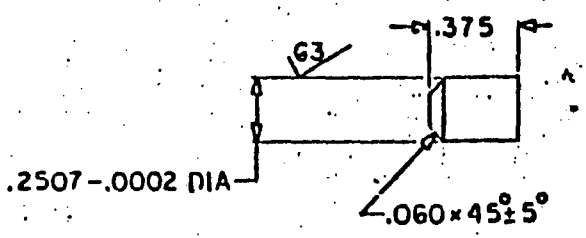
		UNLESS OTHERWISE SPECIFIED	ORIGINAL DATE OF DRAWING 29 APR 1968	DEPT OF THE ARMY	
		DIMENSIONS ARE IN INCHES	DRAFTSMAN RLE / CHECKER WO / GR LEADER	U.S. ARMY EDGEWOOD ARSENAL	
		TOLERANCES ON: 2 PLACE DECIMALS ± .04; 3 PLACE DECIMALS ± .010; FRACTIONS ± 1/16; ANGLES ± 0°30'	SUBMITTED [signature]	EDGEWOOD ARSENAL, MARYLAND	
		MATERIAL	APPROVED [signature]	CAPSULE	
C124-12-6	212	SEE ABOVE	APPROVED BY ORDER OF CO [signature]	CODE IDENT NO. 81361	SIZE B — B124-12-8
NEXT ASSY	CODE NO.			SCALE 1/1	SHEET
APPLICATION					

NOTICE: WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER, AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

NOTICE: THIS DRAWING IS FOR USE ONLY IN CONNECTION WITH PROCUREMENT OF THE UNITED STATES GOVERNMENT AND SHALL NOT BE USED NOR REPRODUCED EITHER WHOLLY OR IN PART FOR ANY OTHER PURPOSE EXCEPT WHEN SPECIFICALLY AUTHORIZED BY THE COMMANDING GENERAL, EDGEWOOD ARSENAL.

REVISIONS		
LTR	DESCRIPTION	DATE

Dwg 34



NOTES:

1. THIS DRAWING SHALL BE INTERPRETED IN ACCORDANCE WITH APPLICABLE STANDARDS LISTED IN MIL SPEC MIL-D-1000.
2. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ■
   - ■ REMOVE BURRS ■ BREAK SHARP EDGES .010 MAX
   - □ FILLETS .010 MAX R.
   - ■ "V" ALL OVER, EXCEPT AS NOTED
   - □ DIMENSIONS APPLY AFTER PLATING
   - □ TOLERANCES ON STOCK MATERIAL SIZES, SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.

ALUMINUM ALLOY BAR, COLD FINISHED, 6061, T6, SPEC QQ-A-225/8

C124-12-6	212
NEXT ASSY	COUE NO.
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
2 PLACE DECIMALS ± .04
3 PLACE DECIMALS ± .010
FRACTIONS ± 1/16
ANGLES ± 0°30'

MATERIAL
SEE ABOVE

ORIGINAL DATE OF DRAWING DEC 17 1968
DRAFTSMAN RLE | CHECKER | GR LEADER
SUBMITTED
APPROVED
APPROVED BY ORDER OF CO

DEPT OF THE ARMY
U.S. ARMY EDGEWOOD ARS
EDGEWOOD ARSENAL, MARYLAND

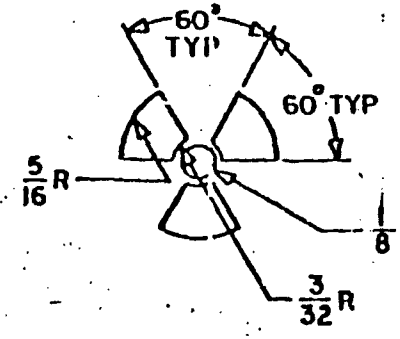
PLUG

CODE IDENT NO.	SIZE	
81361	B	B124-12-

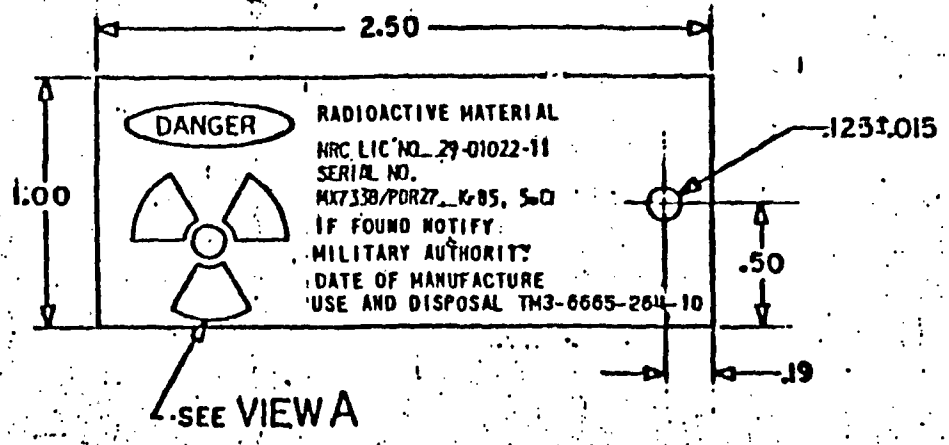
SCALE 2/1 SHEET

REVISIONS			
LTR	DESCRIPTION	DATE	APPD
A	REPLACES B124-12-10 DATED 26 APR 1968 AND EO 212-1 INC	28 MAY 69	[illegible]
B	N.O.R. 212-003-002 INC	17 JUL 69	[illegible]
C	NOR212-007-C01 INC.	24 JUL 69	[illegible]

EVEL 35



VIEW A



NOTES:

1. THIS DRAWING SHALL BE INTERPRETED IN ACCORDANCE WITH APPLICABLE STANDARDS LISTED IN MIL SPEC DoDD-1000.
2. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ■
   - ☐ REMOVE BURRS ☐ BREAK SHARP EDGES .010 MAX
   - ☐ FILLETS .010 MAX R.
   - ☐ ═V ALL OVER, EXCEPT AS NOTED
   - ☐ DIMENSIONS APPLY AFTER PLATING
   - ☐ TOLERANCES ON STOCK MATERIAL SIZES, SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.
3. COLORS SHALL BE IN ACCORDANCE WITH FED STD NO. 595, AS FOLLOWS:
   a. BACKGROUND, COLOR YELLOW NO. 23655
   b. LETTERING, COLOR BLACK NO. 27038
   c. SYMBOLS, COLOR MAGENTA NO. 27142
4. ALL LETTERING SHALL BE ENGRAVED OR HOT STAMPED.
5. ALL MARKING SHALL BE LOCATED APPROXIMATELY AS SHOWN.

ALUMINUM ALLOY 3003, SHEET, TEMPER O, .025 NOM THK, SPEC QQ-A-250/2

NOTES CONTINUED:

6. IDENTIFICATION TAG SHALL CONFORM TO SPEC MIL-M-19590.

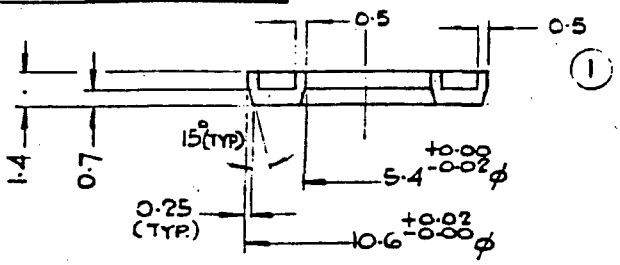
		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: 2 PLACE DECIMALS ± .06 3 PLACE DECIMALS ± .010 FRACTIONS ± 1/16 ANGLES ± 0°30'	ORIGINAL DATE OF DRAWING 26APR1968	U.S. ARMY EDGEWOOD ARSENAL	
			DRAFTSMAN VJB / CHECKER PWB / SEC LEADER		
			SUBMITTED [signature]	IDENTIFICATION TA	
			APPROVED [signature]	CAGE IDENT NO. 81331	SIZE B / B124-12-1
C124-12-6	212	MATERIAL SEE ABOVE	FOR A.D. HAACK	SCALE 2/1	
NEXT ASSY	CODE NO.				
APPLICATION					

USED ON

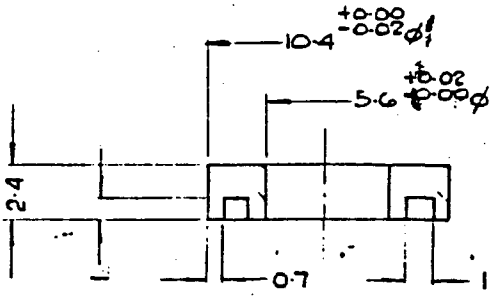
ARC 10045

DRG. No. ARC 10040/S

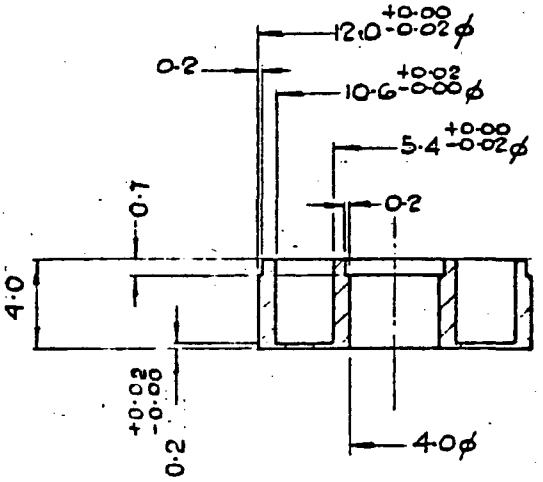
THIRD ANGLE PROJECTION



① LID
MAT'L ST STL
EN 58 J



② INSERT
MAT'L HEAVY ALLOY



③ BODY
MAT'L ST STL
EN 58 J.

NOT FOR PUBLICATION
THE INFORMATION ON THIS DRAWING IS NOT TO BE COMMUNICATED EITHER DIRECTLY OR INDIRECTLY TO THE PRESS OR TO ANY PERSON NOT AUTHORISED TO RECEIVE IT.

JOB No.

PROJECT No.

DRAWN RADAK

TCD.

CHKD.

APPD.

U.D.O.

MATERIAL & SPEC
SEE DRG

FINISH
CLEAN

SURFACE TEXTURE
√ UNLESS STATED

REMOVE ALL BURRS

DIMS. IN MILLIMETRES

TOLERANCES — UNLESS STATED
± 0·05

SCALE 4:1

ISSUE	DATE	D.O.I. / MOD
B	6-6-72	
A	27-4-72	

THE RADIOCHEMICAL CENTRE
AMERSHAM BUCKS

CONTRACTOR

TITLE ANNULAR PRIMARY SOURCE FOR VARIABLE ENERGY X-RAY DEVICE

DRG. No. ARC 10040/S

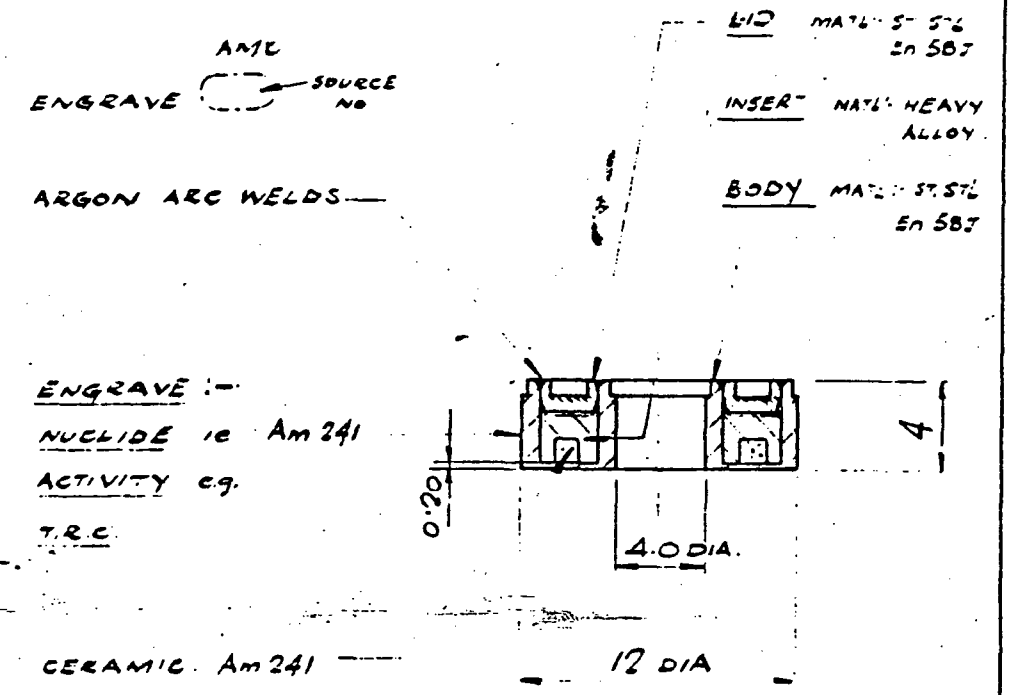
Encl 36

USED ON

USED WITH RC 1040

DRG. No. ARC 10043

THIRD ANGLE PROJECTION



ACTUAL SIZE

FOR DETAIL DRG'S SEE ARC10040

JOB No.

PROJECT No.

MATERIAL & SPEC: SEE DRG

FINISH: CLEAN

SURFACE TEXTURE: √ UNLESS STATED

DRAWN: HEL

REMOVE ALL BURRS

TCD.

DIMS. IN MILLIMETRES

TOLERANCES — UNLESS STATED

CHKD.

SCALE 4/1

APPD.

ISSUE	DATE	D.O.I. / MOD
B	6-6-72	
A		

THE RADIOCHEMICAL CENTRE AMERSHAM BUCKS

CONTRACTOR

TITLE ANNULAR PRIMARY SOURCE FOR VARIABLE ENERGY X RAY DEVICE

DRG. No. ARC 10048/S

U.D.O.

Encl 37.

Product specification

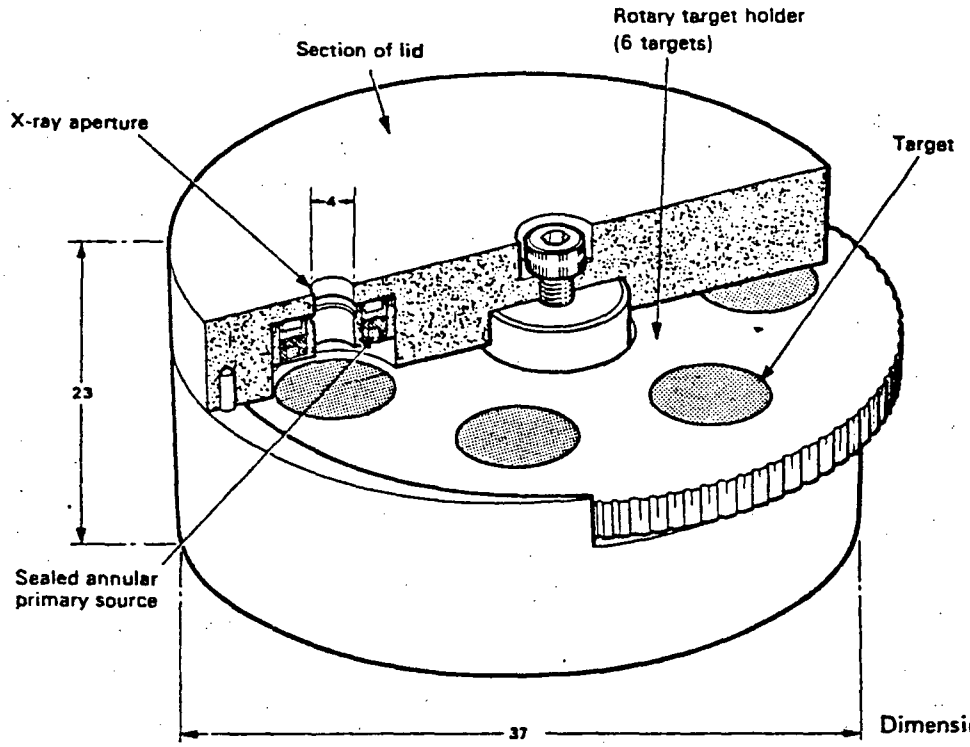
Variable energy X-ray source
code AMC.2084

Data sheet 11196

SPECIFICATION

Construction:

A compact assembly containing a sealed ceramic primary source which excites characteristic X-rays from six different targets in turn. The annular primary source surrounds the X-ray emission aperture in the fixed part of the stainless steel assembly and the targets are mounted on a rotary holder. Each target can be presented to the primary source in turn and the characteristic X-rays from the target are emitted through the 4mm diameter aperture.



Dimensions in mm

Primary source:

A 10mCi americium-241 source, consisting of a ceramic active component in a welded stainless steel capsule, with integral tungsten alloy rear shielding.

X-ray emission:

Target selected	Energy (keV) (1) K_α	K_β	Photon yield (2) (photons/sec per steradian)
Cu	8.04	8.91	2,500
Rb	13.37	14.97	8,800
Mo	17.44	19.63	24,000
Ag	22.10	24.99	38,000
Ba	32.06	36.55	46,000
Tb	44.23	50.65	76,000

Notes: (1) weighted mean energies.

(2) the photon yield has been determined using a high resolution Si (Li) X-ray spectrometer (the values listed amending those shown in the 1974/5 catalogue); the photon output is highly collimated limiting emission to ~0.5 steradians.

Maximum surface dose rate: (excluding emission aperture where the dose rate will vary with the target in use) <0.1mR/h (as measured with type NIS295 gamma dose rate meter which has a flat energy response from 45keV to 2.5MeV.)

Encl 38

Amersham

00-05-00 03:43 T- #131 -06

Amersham International plc
White Lion Road Amersham
Buckinghamshire England HP7 9LL

Telephone Little Chalfont (02404) 4444
cables Activity Amersham telex
telex 83141 ACTIVA G

(4)

58879

Certificate of radioactive source integrity QCS 592 Issue 1

Title : Variable Energy X-Ray Source (V.E.X.)

Assembly code : X208

Assembly drawing : ARC 10469/S

Nuclide : Americium 241 (Am-241)

Radiotoxicity group : A

Maximum activity : 30mCi (1.11 GBq)

CLASSIFICATION : BS/ISO/ANSI77 C64344 (Assessed)

RECOMMENDED WORKING LIFE : 15 Years (see overleaf)

Test sources : No tests were performed. This assessed classification is based on experimental data obtained from tests performed on the V.E.X. primary capsule assembly Code X1146. Drawing number ARC 10048/S. See QCS144 for BS/ISO classification and QCS402 for IAEA special form testing.

Tests carried out in accordance with Recommendation of:

~~BS 5288~~ : ~~ISO 2919~~ : ~~ANSI N542~~ : ~~IAEA Safety Series No 6~~ :

Leak test method	TEMPERATURE	PRESSURE	IMPACT	VIBRATION	PUNCTURE	Units

[signature] Encl 39 D G Hunt

...y Controller - Sources

Buckinghamshire England HP7 9LL Telex 83141 ACTIVA G

58879

Certificate of radioactive source integrity QCS 144 Issue 3

Title : Low Energy Photon Annular Source (V.E.X. Primary Capsule)

Assembly code : X1146

Assembly drawing : ARC 10048/S

Nuclide : Americium-241 (Am-241)

Radiotoxicity group : A

Maximum activity : 30mCi (1.11 GBq)

CLASSIFICATION : BS/ISO C64344

RECOMMENDED WORKING LIFE : 15 Years (see overleaf)

Test sources : Two active sources serial numbered AMC1847 and AMC1848. Each containing 10 millicuries of Americium-241 as ceramic. Assembled as per drawing number ARC 10048/S Issue B.

Tests carried out in accordance with Recommendation of:

BS.5288: 1976 ISO.2919: 1980(E) ~~ANSI N542~~: ~~IAEA Safety Series No.6~~:

Leak test method	TEMPERATURE	PRESSURE	IMPACT	VIBRATION	PUNCTURE	Units
	6	4	3	4	4	
Immersion (QCR31)	PASS 0.02 0.02	PASS 0.03 0.02	PASS 0.06 0.04	PASS 0.03 0.40	PASS 0.06 0.04	Nanocuries

NOTE: This capsule has also been tested for IAEA special form material approval. See QCS402.

Quality Controller - Sources

Production Manager - Sources

ISSUED 21 May 1985 Encl 40

EXPIRES 30 April 1988

White Lion...
Buckinghamshire England HP7 9LL

Cables Activity Amersham telex
telex 83141 ACTIVA G

58879

Certificate of radioactive source integrity QCS 402 Issue 3

Title	:	Low Energy Photon Annular Source (V.E.X. Primary Capsule)
Assembly code	:	X1146
Assembly drawing	:	ARC 10048/S
Nuclide	:	Americium-241 (Am-241)
Radiotoxicity group	:	A
Maximum activity	:	30mCi (1.11 GBq)

CLASSIFICATION : Special Form

RECOMMENDED WORKING LIFE : 15 Years (see overleaf)

Test sources : One simulated source serial number 1. Containing 5μCi of soluble Caesium-137 chloride. Assembled as per drawing number ARC 10048/S Issue B.

Tests carried out in accordance with Recommendation of:

~~BS 5288~~: ~~ISO 2919~~: ~~ANSI N542~~: IAEA Safety Series No.6: 1973

Leak test method	TEMPERATURE		IMPACT		PERCUSSION	Units
	ISO 6					
Immersion (QCR31)	PASS <0.02		PASS 0.03		PASS 0.08	Nanocuries
Immersion (Para 737)	PASS 0.03		PASS 0.03		PASS 0.03	Nanocuries
Helium Pressurisation (QCR 13)	PASS 3.06×10^{-9}		PASS 2.53×10^{-9}		PASS 4.79×10^{-8}	mbar L sec^{-1}

NOTE: This capsule also has a BS/ISO integrity classification of C64344. See QCS 144.

Quality Controller - Sources

Enc/41

Production Manager - Sources

ISSUED 21 May 1985

Reference GB/110/S

Certificate Issue 2

Certificate of Approval of Design for Special Form Radioactive Material

Title
Low Energy Photon Annular Source - Capsule X.208
Drawing Nos and Specification Reference
ARC 10048/S Issue C ARC 10040/S Issue B RSD/CTR/133 Dated 23 July 1981

Radioactive Material	Maximum Activity
Americium 241	30 mCi

THIS IS TO CERTIFY that the Secretary of State for Transport being, for the purposes of the Regulations of the International Atomic Energy Agency, the Competent Authority of Great Britain in respect of inland surface transport and of the United Kingdom of Great Britain and Northern Ireland in respect of sea and air transport and the Department of the Environment for Northern Ireland being the Competent Authority of Northern Ireland in respect of inland surface transport, have approved the above-mentioned Special Form Design. Radioactive material manufactured to the above-mentioned design qualifies as special form radioactive material and as such will meet the requirements of the regulations overleaf.

This Certificate of Approval applies only to the design as set out in the above named drawings and specifications submitted by Amersham International plc

In the event of any alteration to the above mentioned drawings and specifications or in any of the facts stated in the application for approval, this certificate will cease to have effect unless the Competent Authority is notified of the alteration and the Competent Authority confirms the certificate notwithstanding the alteration.

This Certificate Cancels all Previous Issues and is valid until 31 October 1987

Competent Authority Identification Mark:

GB/110/S

UNITED KINGDOM COMPETENT AUTHORITY FOR THE TRANSPORT
- 8 OCT 1984
OF RADIOACTIVE MATERIALS

Encl 42

D. J. Blackman

pp Transport Radiological Adviser
Department of Transport
2 Marsham Street
London SW1P 3EB

On behalf of the Secretary of State for Transport and the Department of

Technical information

Quality control

Quality control of radiation sources can be divided into two main parts:

1: checks made routinely during production;
2: special tests on prototypes.

Routine checks during production include:

1: tests for leakage and contamination, normally carried out just prior to shipment;
2: checks for activity content or radiation output against production reference standards.

The results of tests for leakage and contamination are given in a TEST REPORT which also includes the result of any routine content or output measurements.

Source dimensions, where these are critical, are also checked.

Special testing of prototypes, see page 98.

Standards for the testing of sealed radioactive sources have been specified by the International Standards Organization, as follows

ANSI.1677 'Sealed radioactive sources—General'
ANSI.2919 'Sealed radioactive sources—Classification'

and
ANSI Technical Report 'Sealed radioactive sources—leak test methods'

Testing for leakage and contamination

Stringent tests for leakage are an essential feature of radioactive sources production. The methods adopted depend on the design and intended application of the source and also on regulatory requirements. Where necessary, tests can be specially modified to meet particular requirements.

The standard methods used for testing radiation sources are listed below. The particular tests used for each type of source are given under the appropriate product entry.

Wipe test A
The source is wiped with a swab or tissue, moistened with ethanol or water; the activity removed is measured. Limit: 0.005μCi.

Wipe test B
The source is wiped with a swab or tissue, moistened with ethanol or water; the activity removed is measured. Limit: 0.05μCi.

Bubble test D
The source is immersed in a suitable liquid (ethanediol) and the pressure in the vessel reduced to 100mm of mercury. No bubbles must be observed.

Immersion test F
The source is immersed in water at 50°C for 8 hours and the activity in the water measured. Limit: 0.05μCi.

Immersion test L
The source is immersed in water at 50°C for 4 hours and the activity in the water measured. Limit: 0.005μCi.

Immersion test M
The source is immersed in water which is raised to 100°C and held at that temperature for 10 min. The water is then removed, the source cooled and rinsed using fresh water. These operations are repeated twice, boiling in the water from the preceding rinsing operation. If the activity detected in all the liquid collected is less than 0.005μCi the source is considered to be leak-free.

Helium mass spectrograph test H
Limit: leak rate of 10^{-8} standard cm^3/sec.

Emanation test K
(scintillation counting test for radon)
The appliance is immersed in a solution of a phosphor in an organic liquid under vacuum; the leakage of radon is measured by liquid scintillation counting.

The limit corresponds to about 5×10^{-11}Ci per 24 hours.

End 43

U. S. ARMY ELECTRONICS RESEARCH & DEVELOPMENT COMMAND

Fort Monmouth, New Jersey

ENGINEERING DIVISION
TECHNICAL SUPPORT ACTIVITY

ENVIRONMENTAL TEST REPORT

AMERSHAM CORPORATION, AMERICIUM-241 (AM-241),
VARIABLE ENERGY X-RAY SOURCE

Prepared By

JOHN M. LYNCH

DELSD-E REPORT NO. 86 6 SEPTEMBER 1985

End 44

NOTICES

The citation of trade names and names of manufacturers in this report is not to be construed as official Government indorsement or approval of commercial products or services referenced herein.

Disposition

Destroy this report when it is no longer needed. Do not return it to the originator.

DELSD-E REPORT NO. 86 6 September 1985

ENVIRONMENTAL TEST REPORT

AMERSHAM CORPORATION, AMERICIUM-241 (AM-241), VARIABLE ENERGY X-RAY SOURCE

Prepared By
John M. Lynch

Environmental Test Branch
Engineering Division
Technical Support Activity

CONCURRED BY: Howard D. Camp
HOWARD D. CAMP, JR.
Chief, Environmental Test Branch

APPROVED BY: Edward R. Nolan
EDWARD R. NOLAN
Chief, Engineering Division, TSA

U.S. ARMY ELECTRONICS
RESEARCH & DEVELOPMENT COMMAND
FORT MONMOUTH, NEW JERSEY 07703-5301

ENVIRONMENTAL TEST REPORT

AMERSHAM CORPORATION, AMERICIUM-241 (AM-241),
VARIABLE ENERGY X-RAY SOURCE

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2. DISCUSSION	1
3. IMMERSION TEST	1
4. ALTITUDE TEST	2
5. HIGH TEMPERATURE TEST	2
6. LOW TEMPERATURE TEST	2
7. VIBRATION TEST	3
8. DROP TEST	3
9. SUMMARY	4
10. CONCLUSION	4

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2. X-RAY SOURCE MOUNTED ON VIBRATION EXCITER	6
3. DROP TEST OF SOURCE IN CASE	7
4. X-RAY SOURCE CASE AFTER DROP TEST	8

APPENDICES

A.	IMMERSION TEST DATA SHEET	A-1
B.	ALTITUDE TEST DATA SHEET	B-1
C.	HIGH TEMPERATURE TEST DATA SHEET	C-1
D.	LOW TEMPERATURE TEST DATA SHEET	D-1
E.	VIBRATION TEST DATA SHEET	E-1
F.	DROP TEST DATA SHEET	F-1

ENVIRONMENTAL TEST BRANCH
ENGINEERING DIVISION
TECHNICAL SUPPORT ACTIVITY
FORT MONMOUTH, NEW JERSEY 07703-5301

DELSD-EE

DELSD-E REPORT NO. 86 6 September 1985

SUBJECT: Amersham Corporation, Americium-241 (Am-241), Variable Energy X-Ray Source

1. BACKGROUND:

a. The Amersham Corporation Variable Energy X-Ray Source is to be used for the calibration of the PDR-56()/DT-590 X-ray probe. The primary radioactive emissions from this source are Alpha and Gamma radiations. Alpha radiation is considered non-penetrating radiation and therefore, does not present an external radiation hazard to personnel. In contrast, Gamma radiation is considered penetrating radiation and may represent an external radiation hazard if established guidelines are not observed. Safety guidelines were provided by the CECOM Safety Office. These guidelines were followed during handling and testing of the source.

b. These tests were requested by Mr. Joseph Santarsiero of the CECOM Safety Office, Fort Monmouth, New Jersey.

c. An X-ray source was supplied by the CECOM Safety Office for testing.

2. DISCUSSION:

a. These environmental tests were conducted by personnel of the Environmental Test Branch, Technical Support Activity, ERADCOM, Fort Monmouth, New Jersey. The facilities used are located in Bldg. 2704, Charles Wood Area.

b. Contamination testing and testing of the source was conducted by health physics personnel of the CECOM Safety Office.

3. IMMERSION TEST:

a. Test Requirement: The X-ray source shall be immersion proof to a covering depth of 3 feet of water for a period of not less than 2 hours.

b. Test Facility: The X-ray source was tested using the Webber Model WF-27-100+250v Temperature/Altitude Chamber and the Immersion Tank.

c. Test Procedure: The X-ray source was subjected to the test of MIL-STD-810C, Method 512.1, Procedure I. The source was stored at +130°F for 2 hours prior to immersion. After storage at +130°, the source was immediately immersed in water which was at room temperature. Immersion was for 2 hours and was such that the test item was 36" below the surface of the water. The source was then returned to Mr. Santarsiero for performance testing.

d. Test Results: It was reported by Mr. Santarsiero that the immersion test caused no damage or degradation to the X-ray source (see Figure 1, Data Sheet, Appendix A).

4. ALTITUDE TEST:

a. Test Requirement: The X-ray source shall be able to withstand air transportation at altitudes up to 40,000 feet above sea level.

b. Test Facility: The X-ray source was tested using the Webber Model WF-27-100+250v Temperature/Altitude Chamber.

c. Test Procedure: The X-ray source was tested in accordance with MIL-STD-810C, Method 500.1, Procedure I. The X-ray source was installed in the altitude chamber and the pressure in the chamber was decreased at a rate which did not exceed 2,000 feet per minute, until a pressure corresponding to an altitude of 15,000 feet was reached. This pressure was maintained for not less than 1 hour. The pressure was then decreased to that which corresponds to 40,000 feet altitude and maintained for 15 minutes. The chamber was then returned to ambient conditions upon completion of the altitude test.

d. Test Results: It was reported by Mr. Santarsiero that the altitude test caused no damage or degradation to the X-ray source (see Data Sheet, Appendix B).

5. HIGH TEMPERATURE TEST:

a. Test Requirement: The X-ray source shall withstand exposure to ambient air temperatures as high as +160°F.

b. Test Facility: The X-ray source was tested in the Webber Model WF-27-100+250v Temperature/Altitude Chamber.

c. Test Procedure: The X-ray source was tested in accordance with MIL-STD-810C, Method 501.1, Procedure II. The chamber temperature was raised to +120°F and maintained for 6 hours. During the next hour, the chamber was raised to +160°F and maintained for 4 hours. The chamber temperature was then returned to +120°F within a 1 hour time period. The 12 hour cycle described was repeated two additional times for a total of 36 hours. Upon completion, the chamber was returned to ambient conditions.

d. Test Results: It was reported by Mr. Santarsiero that the high temperature test caused no damage or degradation to the X-ray source (see Data Sheet, Appendix C).

6. LOW TEMPERATURE TEST:

a. Test Requirement: The X-ray source shall withstand exposure to ambient air temperatures as low as -60°F.

b. Test Facility: The X-ray source was tested using the Tenney Model TR-16 Temperature Chamber.

c. Test Procedure: The low temperature test was performed in accordance with MIL-STD-810C, Method 502.1, Procedure I. The X-ray source was placed in the temperature chamber and the storage temperature was maintained at -60°F for a period of 24 hours. Upon completion, the chamber was returned to ambient conditions.

d. Test Results: It was reported by Mr. Santarsiero, that the low temperature test caused no damage or degradation to the source (see Data Sheet, Appendix D).

7. VIBRATION TEST:

a. Test Requirement: The equipment shall withstand the vibration environment induced during transportation and handling as a non-military (non-ruggedized) item.

b. Test Facility: The X-ray source was tested on the MB Model C-200 Vibration Exciter (see Figure 2). An L.A.B. horizontal motion slip table was utilized for directions other than vertical. Other equipment used for monitoring the vibration level was an Endevco Model 2735 Charge Amplifier, Hewlett-Packard Model 5451C Fast Fourier Analyzer/Vibration control system, and a Nicolet Model 660B Dual Channel Analyzer.

c. Test Procedure: The vibration test was performed in accordance with MIL-STD-810C, Method 514.2, Procedure I. The vibration level was performed in accordance with Curve M of Figure 514.2-3 of MIL-STD-810C. The level was as follows: 5-14 Hz at 0.2 in. Double Amplitude (D.A.), 14-33 Hz at 2 G's peak acceleration, 33-52 Hz at 0.036 in. D.A., 52-2000 Hz at 5 G's peak acceleration. The vibration was applied along each of three mutually perpendicular axes of the test item. The vibration was swept logarithmically, such that a complete cycle (5-2000-5) consumed 36 minutes. The X-ray source was subjected to the cycling test for 3 hours in each axis for a total test time of 9 hours.

d. Test Results: It was reported by CPT Zarick of the CECOM Safety Office that the vibration test caused no damage or degradation to the X-ray source (see Data Sheet, Appendix E).

8. DROP TEST:

a. Test Requirement: The X-ray source shall be capable of withstanding the shocks normally induced by accidental drop of the X-ray source.

b. Test Facility: The X-ray source was tested using the L.A.B. 100 lb. Capacity Drop Tester.

c. Test Procedure: The drop test was performed in accordance with MIL-STD-810C, Method 516.2, Procedure II. The X-ray source was dropped twice on each flat face and eight times on the round surface, twice at each 90° location about the circumference, from a height of 48± 2 inches, for a total of 12 drops onto 2 inch plywood backed with concrete.

d. Test Results: The source was originally dropped in the wooden case (see Figure 3). However, inspection after the second drop revealed that the case had shattered (see Figure 4). The remaining drops were done without the case. It was reported by CPT Zarick that the drop test caused no damge or degradation to the X-ray source (see Data Sheet, Appendix F).

9. SUMMARY:

TEST	PASSED	FAILED
Immersion (MIL-STD-810C, Method 512.1, Procedure I)	x	
Altitude (MIL-STD-810C, Method 500.1, Procedure I)	x	
High Temperature (MIL-STD-810C, Method 501.1, Procedure II)	x	
Low Temperature (MIL-STD-810C, Method 502.1, Procedure I)	x	
Vibration (MIL-STD-810C, Method 514.2, Procedure I)	x	
Drop (MIL-STD-810C, Method 516.2, Procedure II)	x	

10. CONCLUSION: It is concluded that the X-ray source met the immersion, altitude, low and high temperature, vibration, and shock environments of MIL-STD-810C.

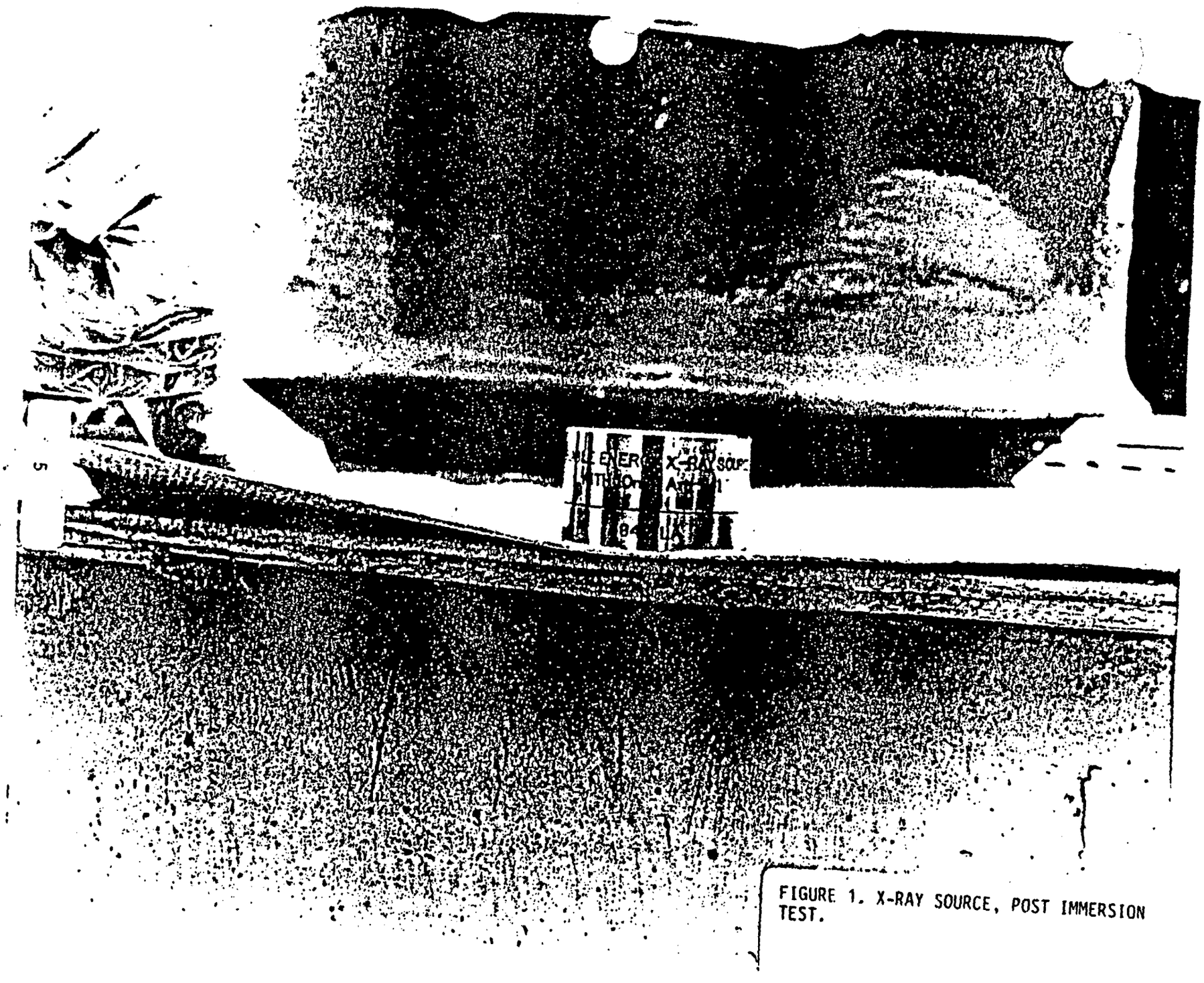


FIGURE 1. X-RAY SOURCE, POST IMMERSION TEST.

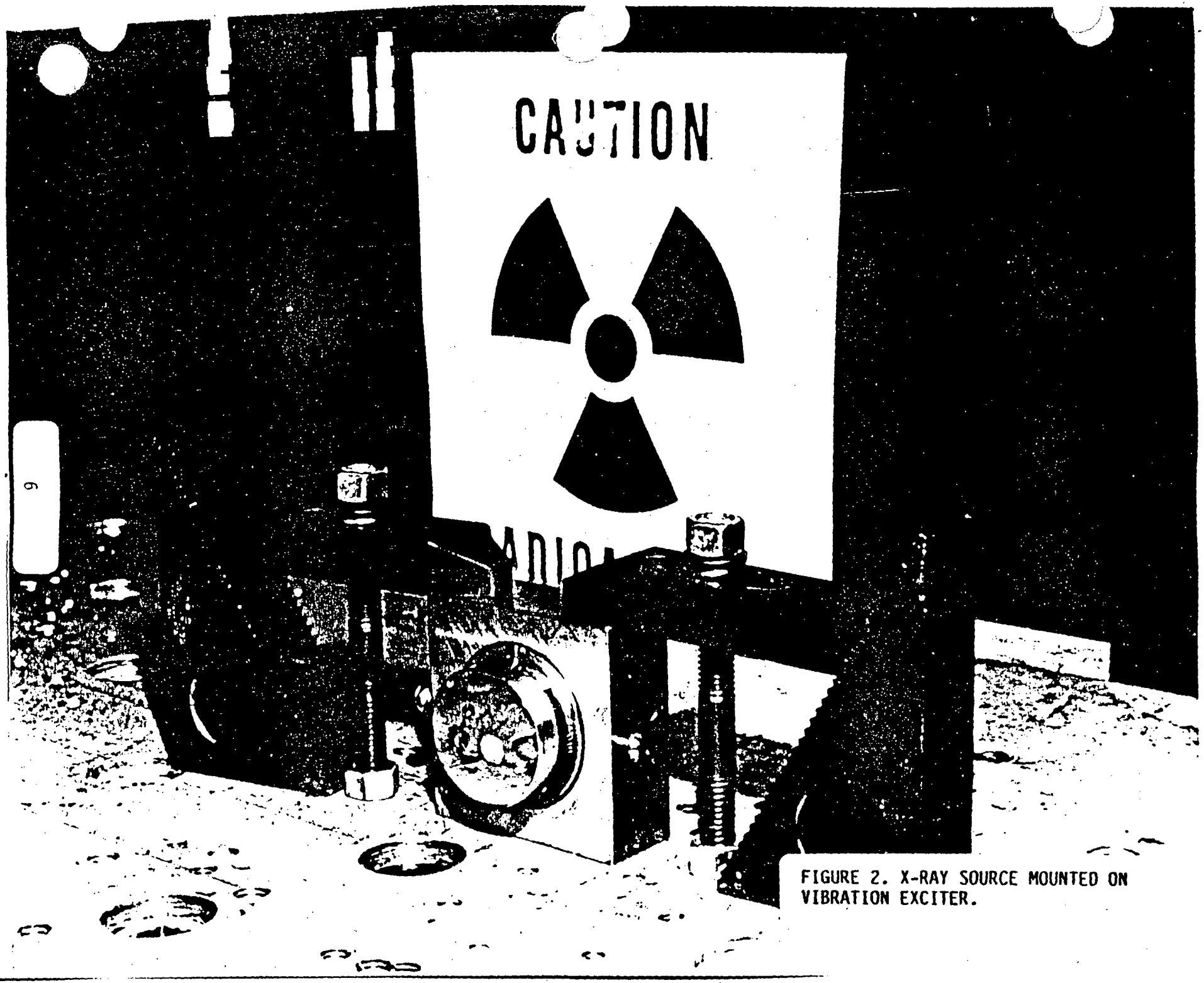


FIGURE 2. X-RAY SOURCE MOUNTED ON VIBRATION EXCITER.

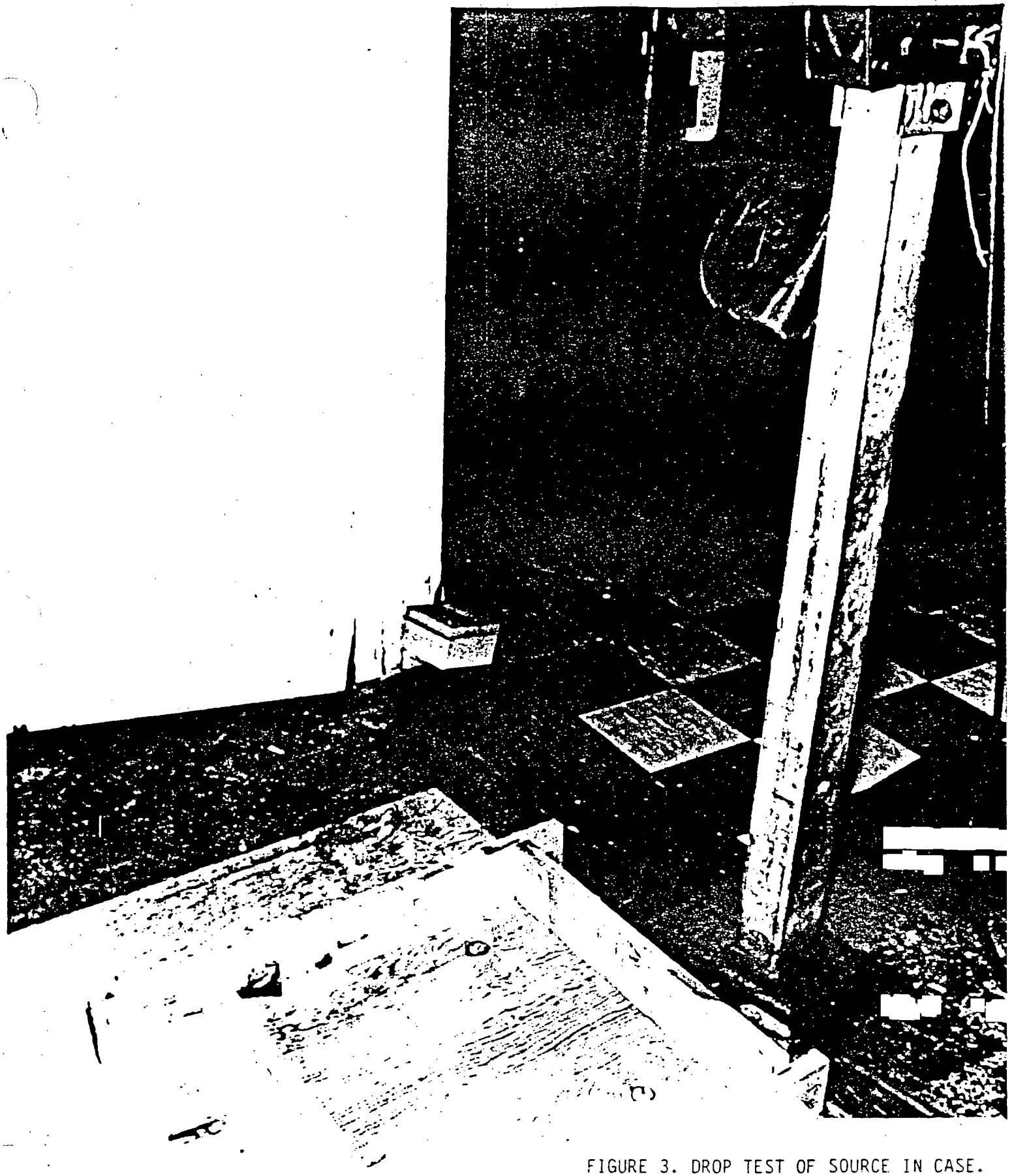


FIGURE 3. DROP TEST OF SOURCE IN CASE.

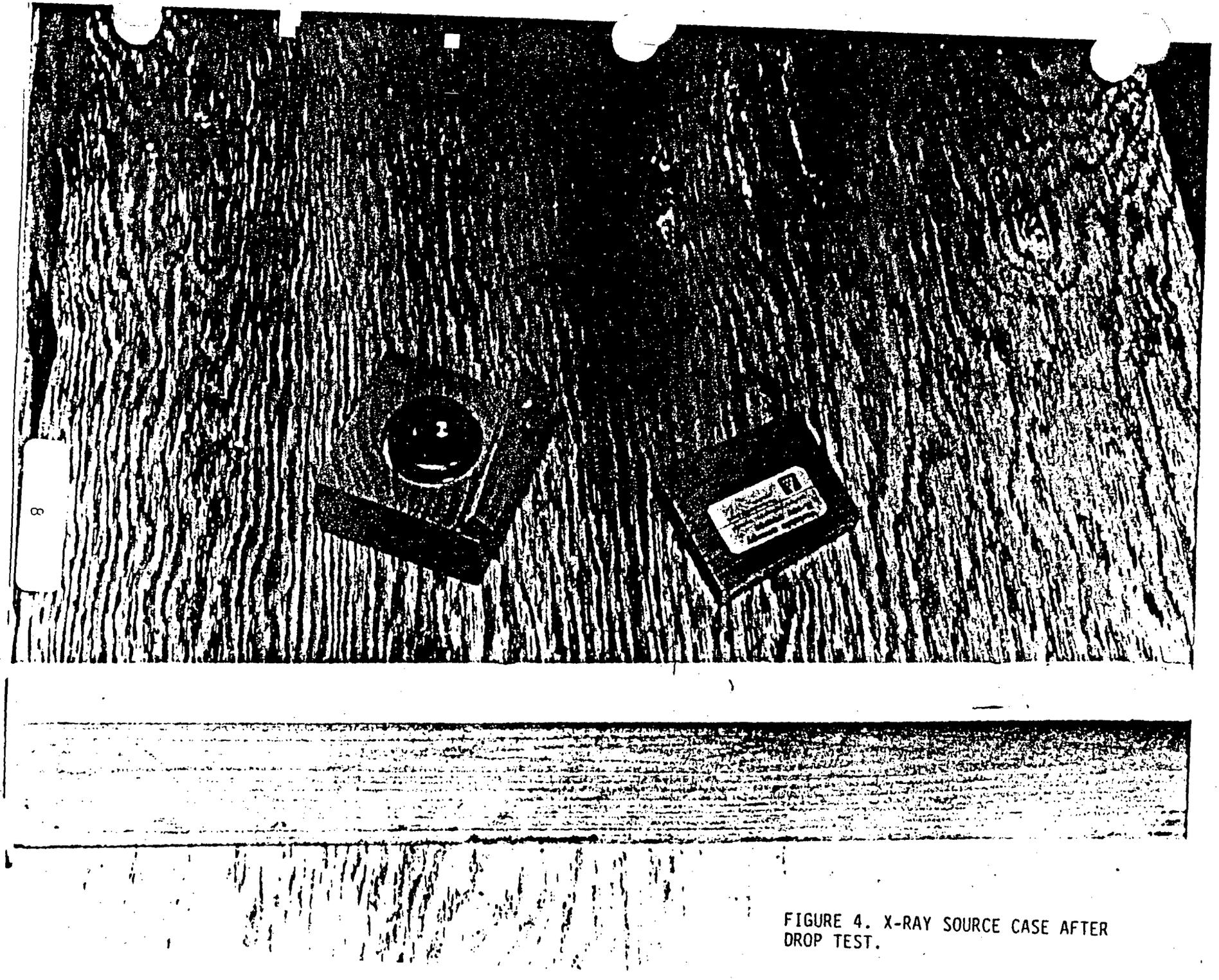


FIGURE 4. X-RAY SOURCE CASE AFTER DROP TEST.

APPENDIX A

IMMERSION TEST DATA SHEET

ENVIRONMENTAL TEST LABORATORY TEST LOG

TEST NO. DATE 4 JUNE 85 /X54427

CUSTOMER ORGAN. AMSEL-SF-MR PROJECT ENGINEER J. SANTARSIERO

TEST ENGINEER JOHN LYNCH TEST TECH. J. CALANDRA, W. FAUST

NOMENCLATURE MODEL VAR. ENERG(XR) SOURCE SERIAL # 3B42LA

TEST CONDITIONS LEAKAGE (BASIC IMMERSION) ~~ROOM TEMP~~ MOD-241-

DESCRIPTION PER 810D, METH 5122 PROCED. I

WATER HEIGHT @36" ABOVE TEST ITEM ±5")

(WATER TEMP 64°F ±9°F) READINGS @30 MIN INTERVALS.-

	DATE	TIME	EVENT	INITIAL
	4 JUNE 85	AM	PRE-TEST DISCUSSION PER HANDLING	PROJ. ENG,
		=	PROCEDURES, PRE & POST TEST	—
	4 JUNE 85	0900	AM-241-5 PLACED IN ENVIR CAB. FOR	WF & JC
		1100	2 HR. PRE TEST SOAK @ +113°F/+45°C	
	4 JUNE 85	1105/1303	AM-241-5 REMOVED FROM E.C. &	WF & JC
			POSITIONED IN IMMER. CONTAINER	
			FOR 60 MINS TOT.	
	(@30 MIN INTER.)		WATER TEMP. - 63°F, 69°F, 70°F, 70°F, 71.5°F	WF & JC
*	4 JUNE 85	1306	REMOVED FROM IMMER CYLINDER	WF & JC
			& PLACED SPEC. STORAGE CONTAINER	PROJ. ENG
	4 JUNE 85	1315	IMMER. TK WATER SAMPLE TAKEN FOR	PROJ. ENG
			ENVIR. TEST @ +212°. TENNEY JR.	-

REMARKS: SEE DATA SHEET NUMBER _____

* Post test materials used, collected for radiation testing by Proj. Eng.- Prior to test continuence Post test radiation scan indicated no apparent leakage.

ENVIR. TEST CAB TENNEY JR MODEL TR-16

AMOUNT OF WATER IN CONTAINER- 2000ML - APPROX 68 OZ.

APPENDIX B

ALTITUDE TEST DATA SHEET

ENVIRONMENTAL TEST LABORATORY TEST LOG

TEST NO. _____ DATE 5 JUNE 1985 X54427

CUSTOMER ORGAN. AMSEL-SF-MR PROJECT ENGINEER J. SANTARSIERO

TEST ENGINEER J. LYNCH TEST TECH. J. CALANDRA & N. FAUST

NOMENCLATURE MODEL VAR. ENERGY (XR) SOURCE SERIAL # 3842 LA

TEST CONDITIONS ALTITUDE (LOW PRESS) ~~ROOM TEMP~~: MOD. 241-

DESCRIPTION MIL STD 810-D, METH 500.3, PROC. I. SECT.
TO +15,000 FT. FOR 1 HR - ± TO 40,000 FT. - LEVEL, TO
SEA LEVEL ON CAM. - (RADIATION CHECK BY PROJ. ENG.)

DATE	TIME	EVENT	INITIAL
* 5 JUNE 85	0840	MOD 241 - PLACED IN ALT. CHAMBER	JC&LF
		± TO +15,000 FT, W/PRE TEST CHECK)	
5 JUNE 85	0845	CHAMBER @ 15,000 FT & HOLD FOR	JC&LF
	0950	1 HR. -	
5 JUNE 85	0950	TO - 40,000 FT, STABILIZE 15 MINS.	JC&LF
	1005	TO SEA LEVEL ON CAM. -	
	1040	@ " " —	
5 JUNE 85	AM	POST CHECK OF CHAMBER INTERIOR	
		CONDUCTED BY PROJ. ENG.,	
		"AREA - CLEAN."	

REMARKS: SEE DATA SHEET NUMBER _____

* - PRE-CHECK OF CHMBR.

WALLACE & TIERNAN BAROM.
MOD - FA 145

ENVIRONMENTAL CHAMBER USED, WEBBER WF27 } ALTITUDE INSTRUMENT BRISTOL, MOD. 153A500 RANGE 0 TO 100,000 FT.

APPENDIX C

HIGH TEMPERATURE TEST DATA SHEET

ENVIRONMENTAL TEST LABORATORY TEST LOG

TEST NO. _____ DATE 6-7 JUNE 1985

CUSTOMER ORGAN. AMSEL-SF-MR PROJECT ENGINEER J. SANTARSIERO

TEST ENGINEER J. LYNCH TEST TECH. J. CALANDRA

NOMENCLATURE MODEL VAR. ENERGY (XR) SOURCE SERIAL # 3842 LA

TEST CONDITIONS HIGH TEMP 120°/160°F ~~ROOM TEMP~~ MOD. -241

DESCRIPTION PER MIL STD 810D. METH 501.2 PROCED II

+120°F/49°C & +160°F/71°C -2- 12 HR CYCLES, TOT. 24 HRS.

DATE	TIME	EVENT	INITIAL
6 JUNE 85	AM	PRE TEST, RADIATION OF CHAMBER	P.E.-
6 JUNE 85	1110	TO +120°F/49°C HOLD 6 HRS	JCE MF
	|	TO +160°F/71°C W/IN 1 HR.	
	|	@ +160°F/71°C HOLD 4 HRS	
	|	TO +120°F/49°C, W/IN 1 HR	
7 JUNE 85	1100	REPEAT ABOVE 1 ADDIT. 12 HR CYCLE	
		TOT 24 HRS.	
7 JUNE 85	11:10	TO ROOM TEMP.	DC
* 7 JUNE 85		POST TEST CHECK OF CHMBR INTERIOR	

REMARKS: SEE DATA SHEET NUMBER _____

* POST TEST RADIATION SCAN OF ENVIR CHAMBER

ENVIRONMENTAL TEST CAB WEBBER, WF27, HONEYWELL RECORDER. MOD 15214216-

APPENDIX D

LOW TEMPERATURE TEST DATA SHEET

ENVIRONMENTAL TEST LABORATORY TEST LOG

TEST NO. _____ DATE 5 & 6 JUNE 1985

CUSTOMER ORGAN. AMSEL-SF-MR PROJECT ENGINEER J. SANTARSIERO

TEST ENGINEER J. LYNCH TEST TECH. J. CALANDRA & W. FAUST

NOMENCLATURE MODEL VAR. ENERGY (XR) SOURCE SERIAL # 3842 LA

TEST CONDITIONS LOW TEMP (STORAGE) ~~ROOM TEMP~~ MOD. - 241

DESCRIPTION PER MIL STD 810D, METH 502.2, PROCED. I

STORAGE @ -60°F/-51°C

DATE	TIME	EVENT	INITIAL
5 JUNE 85	AM	PRE-TEST, RADIATION OF CHAMBER	P. E.
		AREA, ITEM POSITIONED IN CAB.	
5 JUNE 85	1110	START LOW TEMP TO -60°F/-51°C	WF & JC
"	1130	CHAMBER @ -60°F/-51°C	" "
		24 HR. STORAGE	
6 JUNE 85	1025	TO R/T & PHYSICAL EVALUATION	WF
*	1100	FOR RADIATION LEAKAGE	
		"AREA CLEAR"	

REMARKS: SEE DATA SHEET NUMBER _____

* POST TEST RADIATION CHECK OF INTERIOR OF CHAMBER

ENVIRONMENTAL TEST CAB TENNEY JR. MOD TR-16

APPENDIX E

VIBRATION TEST DATA SHEET

ENVIRONMENTAL TEST LABORATORY TEST LOG

TEST NO. [illegible] DATE 10 [illegible]

CUSTOMER ORGAN. [illegible] PROJECT ENGINEER [illegible]

TEST ENGINEER [illegible] TEST TECH. [illegible]

NOMENCLATURE MODEL [illegible] SERIAL #

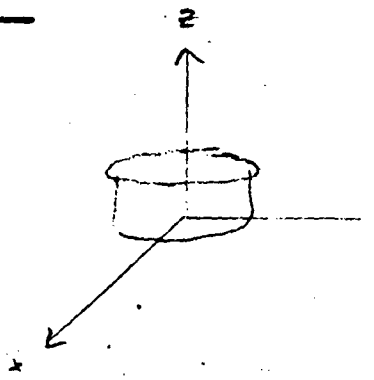
TEST CONDITIONS ROOM TEMP: [illegible]

DESCRIPTION [illegible]

MIL-STD [illegible]

DATE	TIME	EVENT	INITIAL
10 JUNE 85	1100	X AXIS VIBRATION START	
	1300	STOP TEST	
	1430	Y AXIS VIBRATION START TEST	
	1730	STOP	
12 JUNE	0920	Z AXIS VIBRATION START TEST	
	1220	STOP TEST	

REMARKS: SEE DATA SHEET NUMBER _____



APPENDIX F

DROP TEST DATA SHEET

ENVIRONMENTAL TEST LABORATORY TEST LOG

TEST NO. _____ DATE 13 JUNE 1985 (T.THURS)

CUSTOMER ORGAN. AMSEL-SF-MR PROJECT ENGINEER CAPT. ZARICK

TEST ENGINEER JOHN LYNCH TEST TECH. W.FAUST

NOMENCLATURE MODEL VAR. ENERGY (XR) SOURCE SERIAL # 3842 LA

TEST CONDITIONS RM. AMBIENT ~~ROOM TEMP~~ MOD. -241

DESCRIPTION MIL 810C - DROP TEST W/ & W/O CASE

FROM HEIGHT OF (48" ±2")

(ALL POSITIONING & HANDLING BY CAPT ZARICK

DATE	TIME	EVENT		INITIAL
13 JUNE 85	1400	INITIAL START OF DROP TEST		JL & WF
			NOTES	
13 JUNE 85		CASED - TOP ↑	OK -	JL & WF
		" —	LID-CRACKED	"
		NO CASE ⊙ → XRAY PORT		"
		" ⊙ ↓ "		"
		" ← ⊙ "		"
		" ↑ ⊙ "		"
		" → REVERSED	SLIGHT SEAM SEPERATION	"
		" ↓	(NO LEAKAGE)	"
		" ←		"
		" 📖 →		"
		" ← 📖	NO LEAKAGE	"
13 JUNE 85	1500	ALL SURFACES, POST TEST, WIPED FOR		
		EVALUATION		

REMARKS: SEE DATA SHEET NUMBER _____

UNIT DROPPED FROM HEIGHT @ 48" ± 2")
TO PLYWOOD SURFACE ON CONCRETE BASE

PHOTOS TAKEN DURING ENTIRE TESTING—

DEPARTMENT OF THE ARMY
HEADQUARTERS, US ARMY COMMUNICATIONS-ELECTRONICS COMMAND
AND FORT MONMOUTH
FORT MONMOUTH, NEW JERSEY 07703-5000

REPLY TO
ATTENTION OF

AMSEL-SF-MR

6 May 1986

MEMORANDUM FOR RECORD

SUBJECT: Requirements of U.S. Nuclear Regulatory Commission (NRC) License for the AN/UDM-1 Radiac Calibrator Set and Title 10 Chapter 1, Code of Federal Regulations, Parts 19, 20 and 21 (10 CFR Parts 19, 20 and 21)

1. The following information is provided to all users of the AN/UDM-1 Radiac Calibrator Set, thereby satisfying the radiation protection requirements set forth in 10 CFR Parts 19, 20 and 21:

a. Specific instructions on NRC license/regulatory requirements, duties of the Radiation Protection Officer, emergency situations, operating and maintenance instructions, as described in TM 11-1174.

b. Form NRC-3, Notice to Employees, for required posting wherever the calibrator set will be used and/or stored (enclosure 1).

c. Section 206 of the Energy Reorganization Act of 1974 for required posting wherever the calibrator set will be used and/or stored (enclosure 2).

d. As stipulated in 10 CFR Part 21, report of radiac calibrator set defects and noncompliance, as outlined in Section 206 of the Energy Reorganizatin Act of 1974, should be reported through your appropriate radiological command channels to the U.S. Army Communications-Electronics Command (CECOM) Safety Office. Notification shall be made within 24 hours following the identification of defects or noncompliance.

2. In addition, users may request further information relating to the NRC license, license conditions, documents incorporated into the license by reference, and amendments thereto, from Commander, U.S. Army Communications-Electronics Command, ATTN: AMSEL-SF-MR, Fort Monmouth, New Jersey 07703-5024. This is in compliance to paragraph 1911.b of 10 CFR Part 19. The CECOM Safety Office may be contacted by telephone on Autovon 995-4427 for this purpose.

AMSEL-SF-MR 6 May 1986

SUBJECT: Requirements of U.S. Nuclear Regulatory Commission (NRC) License for the AN/UDM-1 Radiac Calibrator Set and Title 10, Chapter 1, Code of Federal Regulations, Parts 29, 20 and 21 (10 CFR Parts 19, 20 and 21)

Prepared by: Joseph M Santarsiero
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Reviewed by: Barry J Silber
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C, Radiological Sfty Engrg Br

Approved by: Steven A Horne
STEVEN A. HORNE
Acting Chief, Safety Office

CF: Users of the AN/UDM-1 Radiac Calibrator Set

TM 11-1176

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

RADIAC CALIBRATOR SET AN/UDM-1

DEPARTMENT OF THE ARMY *APRIL 1955*

Encl 1

TECHNICAL MANUAL
No. 11-1176

DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *21 April 1955*

RADIAC CALIBRATOR SET AN/UDM-1

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REPORT OF FAILURE

Report of failure of any part of this equipment, during its entire service life, shall be made to the Bureau of Ships in accordance with current regulations using form NAVSHIPS NBS 383 (revised). The report shall cover all details of the failure and give the date of installation of the equipment. Should failure occur within the radiation source chamber, UNDER NO CIRCUMSTANCES SHOULD THE SEAL ON THE CHAMBER BE BROKEN AND THE CHAMBER OPENED, EXCEPT BY QUALIFIED PERSONNEL AUTHORIZED BY THE BUREAU OF SHIPS. For procedure in reporting failures see Chapter 67 of the *Bureau of Ships Manual* or superseding instructions.

RADIOLOGICAL SAFETY NOTICE

All personnel working in high intensity levels of radioactivity must exercise caution to prevent bodily injury. While the radiation from radioactive substances cannot usually be seen or felt, prolonged or intensive exposure may result in serious injury. Three-tenths of a roentgen per week (0.3 r/week) is considered to be the maximum dosage of such radiation to which the body can be exposed continuously without serious damage. The radiation intensity of this equipment in the operating area is well below this figure. However, the area in front of this set is dangerous, and should be well marked. No one should be permitted to walk in front of the equipment during operation.

Several caution signs, similar to A.E.C. form W16118, as illustrated below, must be displayed prominently in the area where this equipment is being used. Additional copies of this sign may be obtained from BuShips, Code 592 or the Isotope Div., U. S. Atomic Energy Commission, Oak Ridge, Tenn.

RESUSCITATION

AN APPROVED POSTER ILLUSTRATING THE RULES FOR RESUSCITATION BY THE PRONE PRESSURE METHOD SHALL BE PROMINENTLY DISPLAYED IN EACH RADIO, RADAR, RADIAC, OR SONAR ENCLOSURE. POSTERS MAY BE OBTAINED UPON REQUEST TO THE BUREAU OF MEDICINE AND SURGERY.

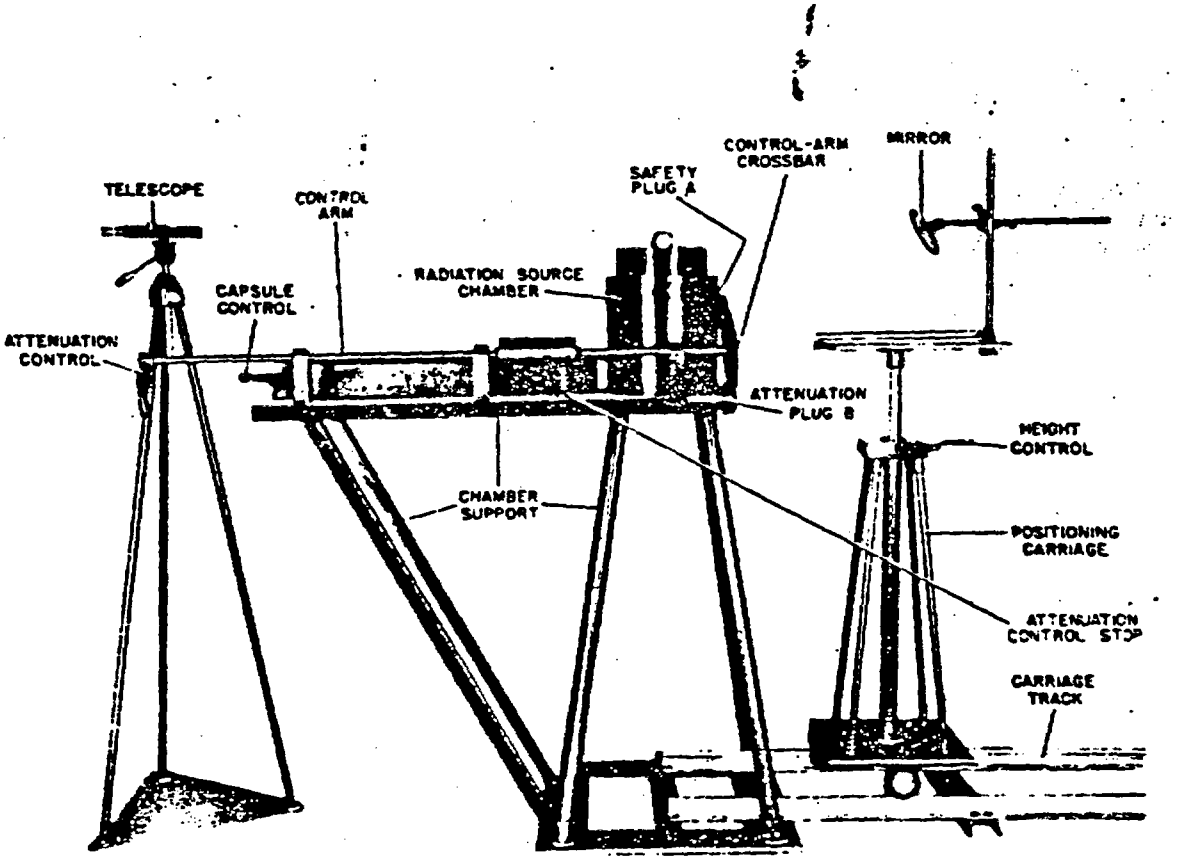

Figure 1-1. Radiac Calibrator Set AN/UDM-1

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SECTION 1
GENERAL DESCRIPTION

1. PURPOSE AND FUNCTION OF EQUIPMENT.

Radiac Calibrator Set AN/UDM-1, shown in figure 1-1, is designed to provide a radioactive source of known intensity for use as a standard in checking and calibrating radiac equipments. A capsule containing a small quantity of Co^{60} (a radioactive isotope of cobalt) encased in a lead-shielded container with a cone-shaped opening in one side, furnishes a beam of radiation. Two controls, located a safe distance behind the container, provide a means of raising and lowering the capsule within the container and regulating the radiation intensity of the beam. An optical system, consisting of a telescope, tripod, and mirror, is also provided so that the meter of the radiac equipment being tested can be read from a safe location while the equipment is being exposed to radiation.

2. DESCRIPTION OF MAJOR UNITS.

a. *Radiation Source Chamber.*—The radiation source chamber, shown in figure 1-2, is a lead-lined, brass container with a removable top, used to house the radioactive cobalt safely. The chamber has a cavity in the center which holds a capsule containing radioactive cobalt. Attached to the capsule is one end of a flexible cable. The cable passes through the chamber wall to a control handle, which makes it possible to raise and lower the capsule from an external position. During operation the cone-shaped opening (radiation outlet) in one side of the chamber permits radiation from the cobalt to emanate from the chamber in a beam when the capsule is in its raised position at the inner end of the radiation outlet. The width of the radiated beam, from the center of the beam to points on either side where the intensity is 20 per cent of that of the center, is 32 degrees.

b. *Chamber Support.*—The chamber support, shown in figure 1-3, is a metal stand on which are mounted the radiation source chamber, the attenuation control, and the capsule control. Two lead-filled, cone-shaped, plugs marked A and B, which are 12.5 and 9.5 centimeters thick, respectively, are attached to opposite

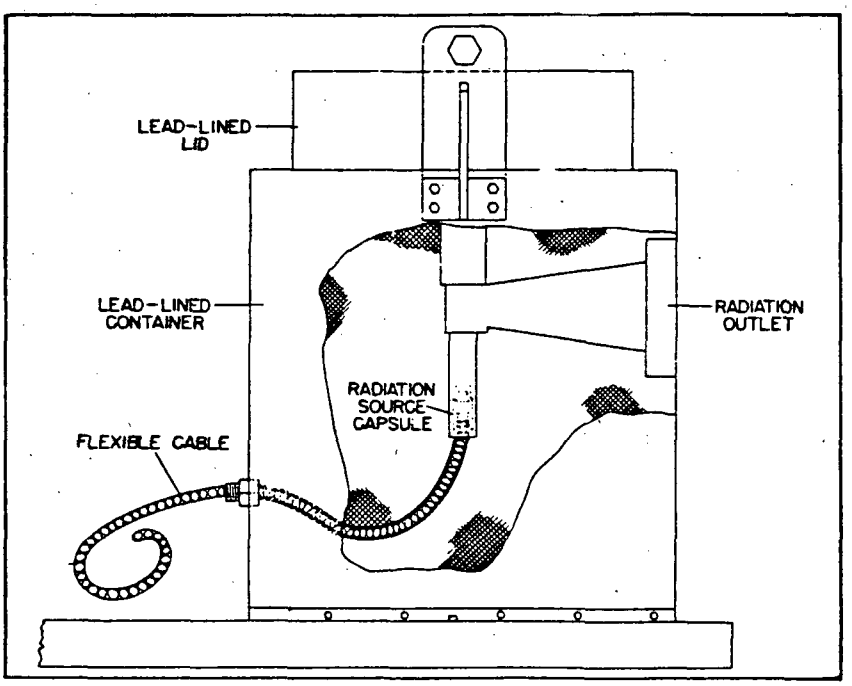

Figure 1-2. Radiation-Source Chamber, Cross-Section View

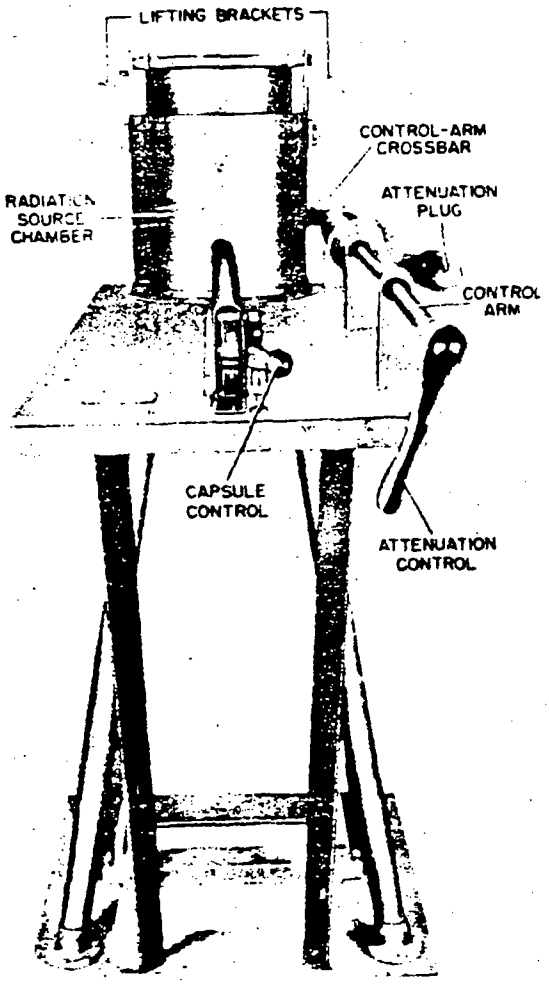

Figure 1-3. Radiation-Source Chamber and Support

ends of the cross-arm of the attenuation control. The attenuation control system has three (3) settings, as follows:

A-position—Safety plug A in source chamber.

B-position—Attenuation plug B in source chamber.

O-position—Both plugs out of source chamber (unattenuated beam obtained).

The 9.5-cm plug (B) is used to attenuate the intensity of the radiation emanating from the radiation outlet during tests, and the other is a safety plug (A) which is used when the set is not in operation. The capsule control is comprised of a handle and worm-gear which drives the flexible cable for positioning the capsule. Also controlled by the cable is a micro-switch. The switch, a part of an alarm circuit, is off when the capsule control lever is in the SAFE, and on when the lever is in the EXPOSED position.

c. *Positioning Carriage.*—The positioning carriage, shown in figure 1-4, provides a means for accurately positioning the equipments in front of the radiation outlet in the radiation source chamber. It consists of a metal platform attached to a track-mounted, metal stand. The stand is provided with a brake, to prevent the carriage from being accidentally moved after it has been positioned. On the platform are adjustable bars, marked X and Y, for setting the position of the radiac equipment being tested. A height control is provided for raising or lowering the platform. The settings for the positioning bars and height control vary, depending upon the size and shape of the radiac equipment.

d. *Carriage Track.*—The carriage track, along which the positioning carriage travels, consists of four 5-foot aluminum, double-rail sections with crossties which can be assembled into a 20-foot, double-rail track. A 4-section, full-length scale, calibrated in centimeters, is mounted on the crossties alongside one rail, as shown in figure 1-4. It is used to accurately position the carriage the proper distance from the radiation source chamber.

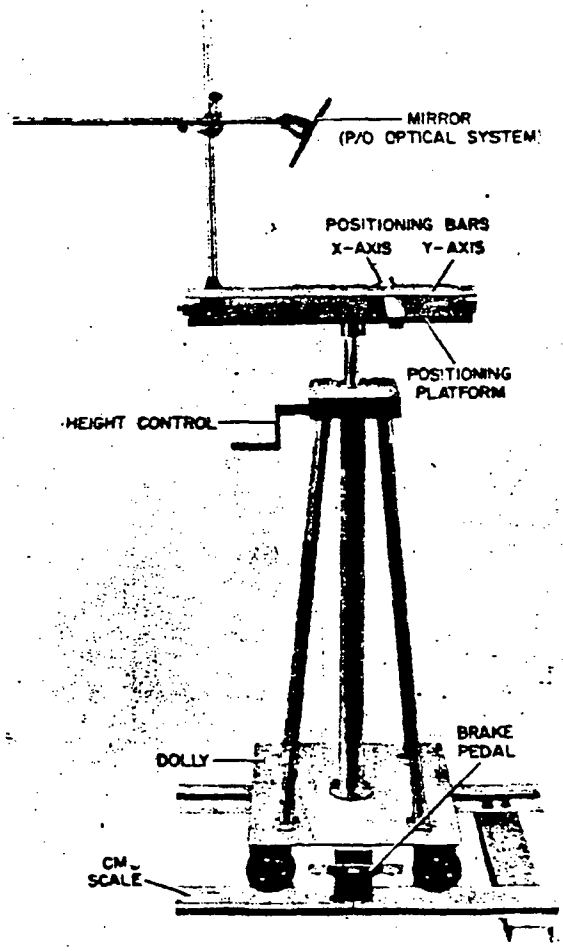

Figure 1-4. Positioning Carriage, Mounted on Track

SUBJECT	FIGURE	TABLE	PAGE
E			
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Adjusting			4-10
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Description of			1-3
P			
Positioning Carriage			
Assembly Drawing	3-3		3-3
Description of			1-2

e. *Optical System.*—An optical system, consisting of a telescope and tripod and two mirrors with supports, is supplied as part of the set to permit observation of the meter on the radiac equipment from an unexposed position during the calibration procedure. The legs of the tripod are bolted to a triangular base plate to provide a safer mounting for the telescope. Ordinarily only one mirror is used, and its support fastens to the positioning platform of the positioning carriage, as shown in figure 1-4. The second mirror is used as a supplement when the position of the meter on the radiac equipment makes it necessary.

3. REFERENCE DATA.

a. *Nomenclature.*—Radiac Calibrator Set AN/UDM-1.

b. *Contract Number and Date.*—NObsr-52466, 25 June 1951

c. *Contractor.*—National Electrical Machine Shops, Inc., 919 Jesup-Blair Drive, Silver Spring, Maryland.

d. *Cognizant Naval Inspector.*—INM, Baltimore, Md.

e. *Number of Packages Per Complete Shipment of Equipment.*—4 boxes, 1 crate.

f. *Total Cubical Contents.*—48.76 cu. ft.

g. *Total Weight.*—1025 lb.

h. *Radiation Source.*—Radioactive isotope of cobalt (Co^{60}).

i. *Type of Radiation.*—Gamma radiation rays.

j. *Initial Rate of Radioactivity.*—9 curies (approx.)

k. *Half Life of Radiation Source.*—5.3 years.

l. *Equipment Lists.*—Table 1-1 lists the equipment supplied.

m. *Shipping Data.*—Table 1-2 gives shipping data for the equipment.

4. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

An alarm system, consisting of a red light, buzzer, or bell and a source of power, should be used to warn operating personnel when the equipment is in operation.

TABLE 1-1. EQUIPMENT SUPPLIED

Quantity Per Equipment	*Name of Unit*	*Navy Type*	*Over-all Dimensions*			*Volume*	*Weight*
		Designation	*Height*	*Width*	*Depth*		
1	RADIAC CALIBRATOR SET	AN/UDM-1					
	Consisting of						
1	Chamber Support		49	16	45	20.43	145
1	Carriage Track		4	17½	20 ft. (length)	.81	120
1	Positioning Carriage		40	16½	14½	5.54	35
1	Optical System		73	19	19	15.25	16
1	Radiation Source Chamber		15½	12½	12½	1.4	436
2	Instruction Books	NavShips 91809					

Unless otherwise stated, dimensions are in inches, volume in cubic feet, weight in pounds.

[AG 413.6 (11 Apr 55)]

BY ORDER OF THE SECRETARY OF THE ARMY:

M. B. RIDGWAY,
General, United States Army,
Chief of Staff.

OFFICIAL:

JOHN A. KLEIN,
Major General, United States Army,
The Adjutant General.

DISTRIBUTION:

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SUBJECT	FIGURE	TABLE	PAGE
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Shipping Data		1-2	1-4
Telescope and Tripod	4-6		4-10
Assembly Drawing	3-4		3-4

TABLE 1-2. SHIPPING DATA

Shipping Container No.	*Contents*		*Over-all Dimensions*			*Volume*	*Weight*
	Name	*Designation*	*Height*	*Width*	*Depth*		
1	Chamber Support		13½	58¾	27	12.96	195
2	Carriage Track		12	66½	20	9.81	175
3	Positioning Carriage		18	39¼	16	6.53	63
4	Optical System		5	56½	23½	3.84	46
5	Radiation Source Chamber, Attenuation Plugs, and NBS Calibration Chart		30	30	30	15.62	546

Unless otherwise stated, dimensions are in inches, volume in cubic feet, weight in pounds.

SECTION 2
THEORY OF OPERATION

1.–RADIOACTIVITY.

Radioactivity is the process of disintegration or breaking up of the atoms of an unstable element. Many chemical elements such as uranium, radium, radon, etc., have natural radioactive properties. These elements emit (radiate) specific types of radiations in various quantities and intensities, depending on the nature of the element from which the emission occurs. These radiations are emitted without the addition of any external energy to the element.

Under certain conditions, radioactivity can be artificially induced in normally stable elements. One such element is Co^{60}, a radioactive isotope of cobalt, the radiation source used in Radiac Calibrator Set AN/UDM-1. Co^{60} is produced by irradiating pure cobalt (Co^{59}) with neutrons in a nuclear reactor (radioactive pile). The amount of radioactivity produced is governed by the length of exposure in the reactor. The cobalt used in this set is exposed until its radiation rate is approximately 9 curies. A curie is a unit of radiation intensity, which may be used to compare strengths of various sources of radioactivity.

2. HALF-LIFE PERIOD.

All radioactive elements are continuously disintegrating. The time required for the radioactivity of a given amount of an element to decay to one-half of its initial value is called the *half life* of the material. The rate at which radioactive elements decay, however, varies with each element. Radium, for example, loses one-half its original value in approximately 1600 years. Hence its half life is said to be 1600 years. The half life of Co^{60}, on the other hand, is only 5.3 years. An important characteristic of radioactive elements is that they disintegrate in an exponential manner, as shown in figure 2-1. Assume, for example, that a particular radioelement has a half life of one year. Starting with 1 gram of the element, 0.5 gram will have disintegrated by the end of 1 year, so that only 0.5 gram will remain. During the next year, one-half of this amount (0.25 gram) will disintegrate, leaving 0.25 gram. In each successive year the amount which disintegrates is less than in the preceding year, although it is always the same fraction (½) of the amount present at the beginning of that particular year. It will be seen, therefore, that the quantity of a radioactive element remaining at any future date can be precisely calculated, if the half life of the element is known.

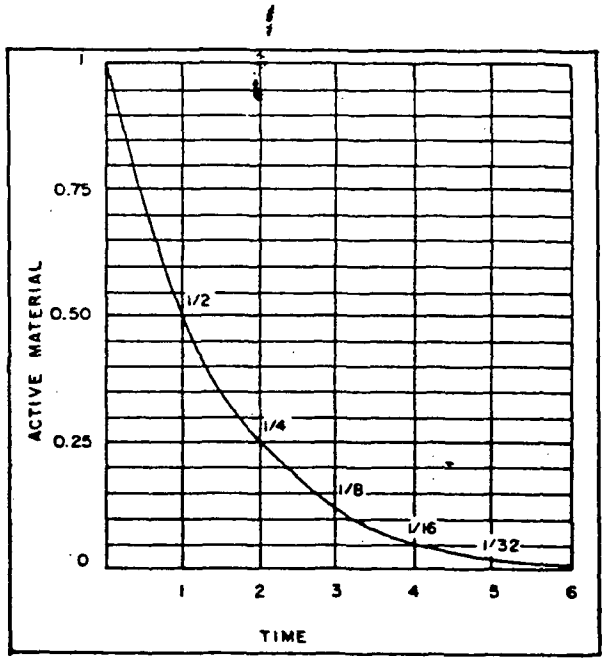


Figure 2-1. Half-Life Chart, Showing Exponential Decay Rate of Radioactive Materials

3. METHOD OF COMPENSATING FOR RADIOACTIVE DECAY.

Since the radiation source in the Radiac Calibrator Set AN/UDM-1 becomes weaker as it ages, some means must be provided to compensate for this characteristic. This is accomplished by moving the radiac equipment under test closer to the source of radiation. The proper distance between the source and the radiac equipment can be determined from a correction-factor table and positioning chart such as the example shown in figure 2-2.

NOTE:

The sample charts shown in figures 2-2, 2-3, and 4-2 are for illustration only. Do *not* use for actual calibration.

The Bureau of Standards has calibrated each radiation source, and has prepared the individual tables and charts accompanying each source. The charts and tables accompanying each source are the *only* correct ones for adjusting the calibration of Radiac Calibrator Set AN/UDM-1.

A similar table and chart is furnished with each radiation source. The chart shows the initial radiation

SAMPLE CHART

TABLE OF CORRECTION FACTORS
FOR
UNATTENUATED BEAM
SOURCE NO. 2
OCT. 8, 1951

Apply correction factors to calibrating position indicated by chart to compensate for the change in source strength with time.

Time (Mo)	Correction Factor	Time (Mo)	Correction Factor	Time (Mo)	Correction Factor	Time (Mo)	Correction Factor
0	1.000	16	.917	32	.840	48	.770
1	.995	17	.912	33	.836	49	.766
2	.989	18	.907	34	.831	50	.762
3	.983	19	.902	35	.826	51	.758
4	.978	20	.897	36	.822	52	.754
5	.973	21	.892	37	.818	53	.750
6	.968	22	.887	38	.814	54	.746
7	.963	23	.883	39	.809	55	.742
8	.958	24	.878	40	.804	56	.738
9	.952	25	.873	41	.800	57	.734
10	.947	26	.868	42	.796	58	.729
11	.942	27	.863	43	.792	59	.725
12	.937	28	.859	44	.787	60	.722
13	.932	29	.854	45	.783	61	.718
14	.927	30	.850	46	.779	62	.713
15	.922	31	.845	47	.775	63	.710

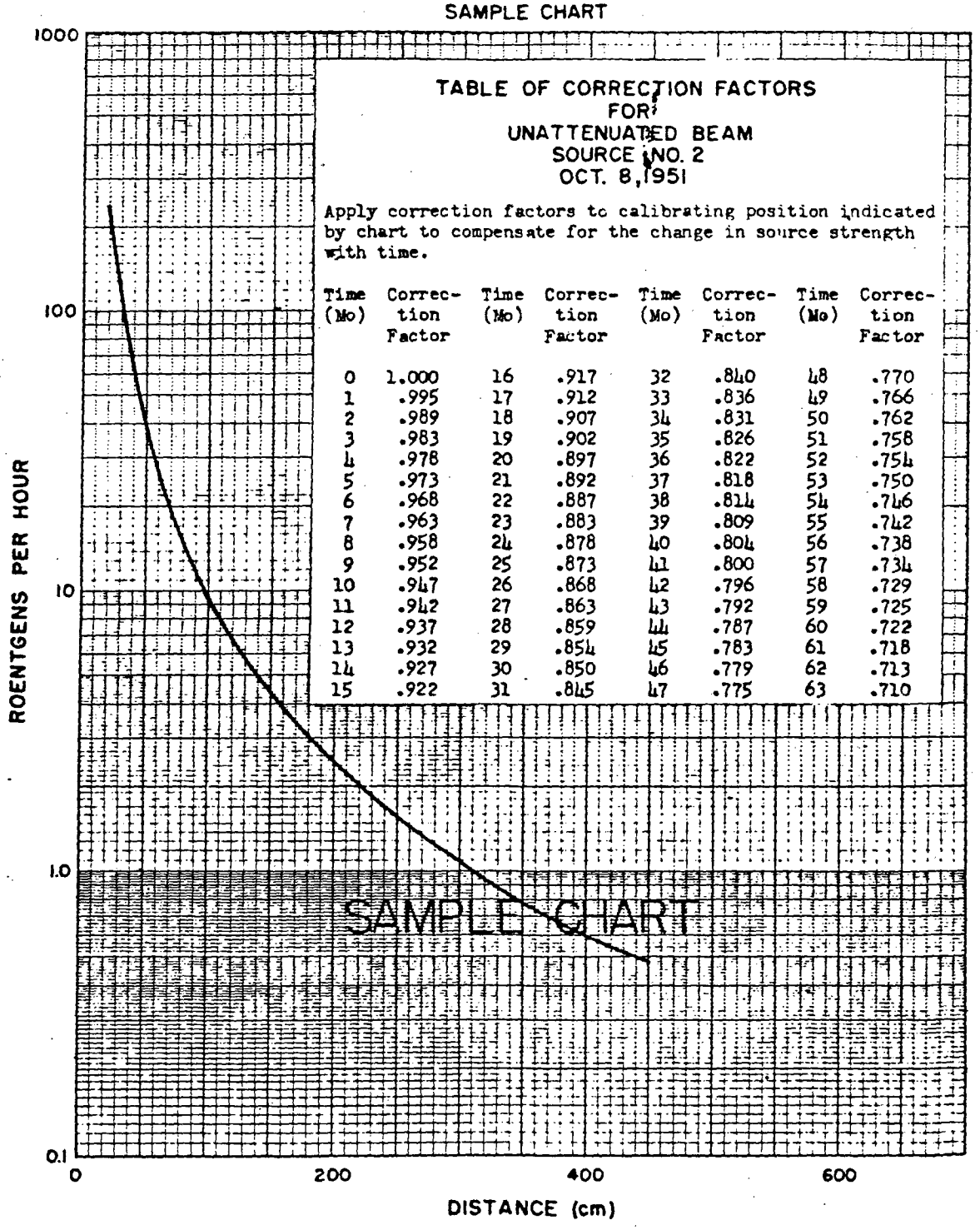


Figure 2-2. Correction Factors and Positioning Chart for Co^{60}, Unattenuated

SAMPLE CHART

TABLE OF CORRECTION FACTORS FOR ATTENUATED BEAM FROM SOURCE NO. 2 USING 9.5 CM ATTENUATION PLUG OCT. 3,1951

Apply correction factors to calibrating position indicated by chart to compensate for the change in source strength with time.

Time (Mo)	Correction Factor	Time (Mo)	Correction Factor	Time (Mo)	Correction Factor	Time (Mo)	Correction Factor
0	1.000	16	.917	32	.840	48	.770
1	.995	17	.912	33	.836	49	.766
2	.989	18	.907	34	.831	50	.762
3	.983	19	.902	35	.826	51	.758
4	.978	20	.897	36	.822	52	.754
5	.973	21	.892	37	.818	53	.750
6	.968	22	.887	38	.814	54	.746
7	.963	23	.883	39	.809	55	.742
8	.958	24	.878	40	.804	56	.738
9	.952	25	.873	41	.800	57	.734
10	.947	26	.868	42	.796	58	.729
11	.942	27	.863	43	.792	59	.725
12	.937	28	.859	44	.787	60	.722
13	.932	29	.854	45	.783	61	.718
14	.927	30	.850	46	.779	62	.713
15	.922	31	.845	47	.775	63	.710

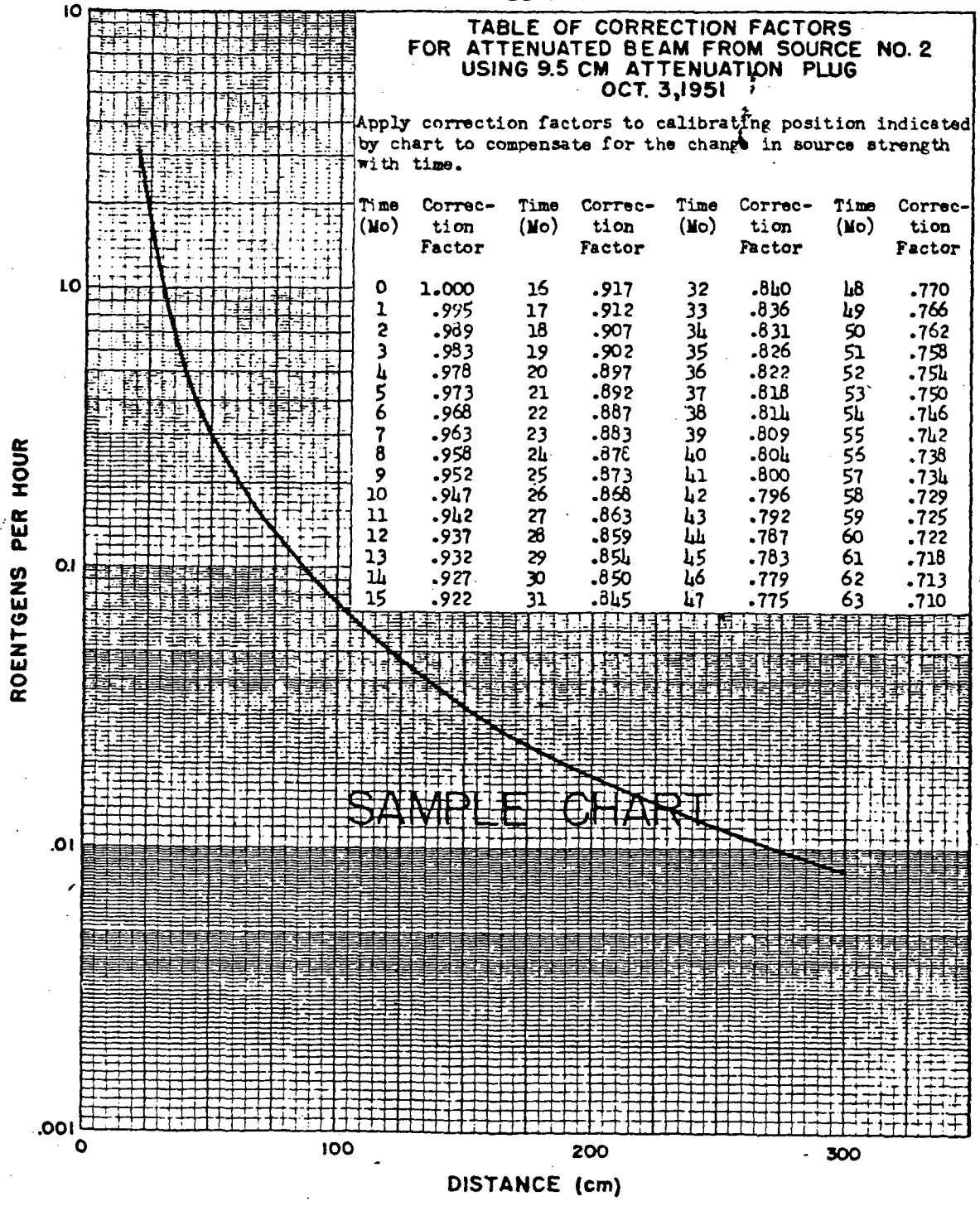


Figure 2-3. Correction Factors and Positioning Chart for Co^{60}, Attenuated

intensity versus distance, and gives the date on which the measurement was made. With this information it is possible to determine, at any time, how far away from the source a radiac equipment under test should be placed to subject it to radiation of known intensity. For example, assume that on October 8, 1952, a radiation value of 500 milliroentgens per hour (500 mr/hr) is desired. The chart in figure 2-2 indicates that the positioning carriage should be placed 400 cm from the radiation source. However, since the source is 12 months old a correction factor of .937 must be applied, as follows:

$$400 \text{ cm} \times .937 = 374.8 \text{ cm}$$

Therefore, to place the radiac equipment in the 500 mr/hr area, the carriage should be moved up to the 374.8-cm position on the track.

The 9.5-cm plug, marked B, is used to attenuate the radiation beam when testing high-sensitivity radiac equipment. The correction factors and correction chart supplied with this attenuator must be used as explained above. A typical chart is shown in figure 2-3.

Since very accurate positioning is required, additional adjustments can be made on the positioning carriage. Because of the size, shape, and internal construction of the radiac equipment which can be checked by this equipment, a calibrated positioning platform, with x- and y-axis positioning bars, is provided as an aid in properly placing the radiac equipment on the positioning carriage. A calibrated height control, built into the carriage, permits raising or lowering the positioning platform, as required

An alarm circuit, consisting of a single-pole, double-throw microswitch connected to a terminal strip, as shown in figure 2-4, is provided to furnish a means of alerting personnel when the set is in operation. The switch is turned on and off by action of the capsule control lever. Figure 2-4 shows the circuit when the lever is in the SAFE position. When the lever is raised to the EXPOSED position, continuity between terminals 1 and 2 is obtained.

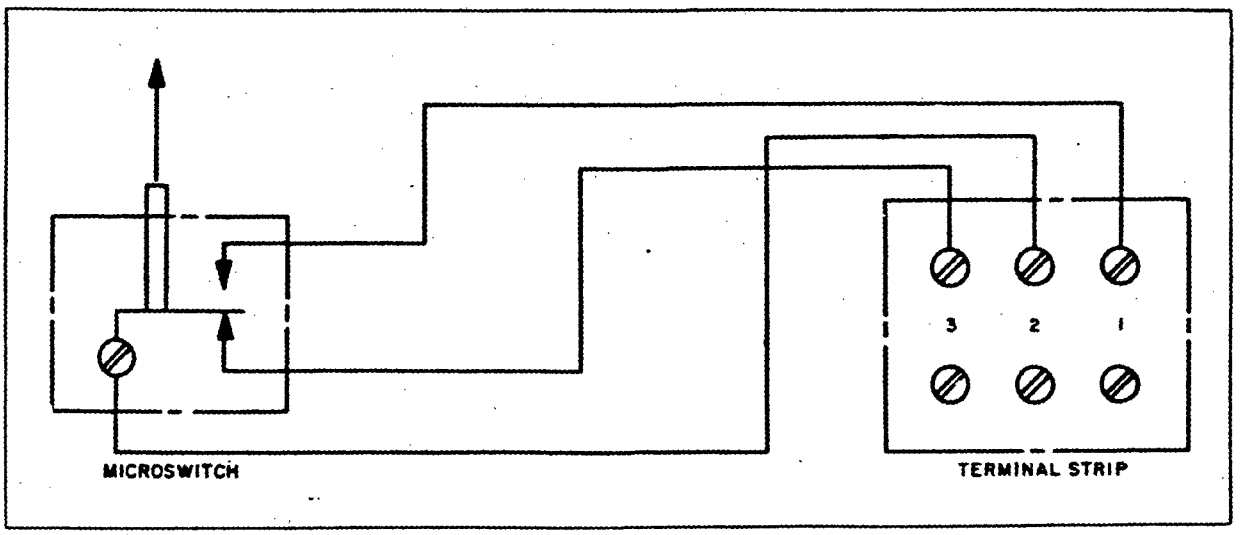


Figure 2-4. Alarm Circuit

SECTION 3
INSTALLATION

1. UNPACKING.

Radiac Calibrator Set AN/UDM-1 is packed in four wooden shipping boxes and one demountable, wooden crate. To open box No. 1, cut the metal bands that bind the box. Using a nail puller, remove all nails from the top of the box. Remove shipping braces. Remove contents of box and check against the packing list enclosed. Boxes No. 2, 3, and 4 can be unpacked in the same manner.

Demountable crate No. 5 is of special construction, having been designed to conform with the requirements of the Interstate Commerce Commission for shipping radioactive material. To unpack the radiation source chamber, first remove the screws holding the cover to the crate base, as shown in figure 3-1. Lift cover off base. Remove screws and lift plywood shipping brackets from crate. The chamber is left on the base until the chamber support is assembled.

NOTE:

Since the radiation-source chamber will have to be returned for reloading within 3 to 5 years, the crate, after unpacking, should be reassembled and stored for future use.

2. SPACE REQUIRED.

Radiac Calibrator Set AN/UDM-1 should be installed indoors, in an area of approximately 25 by 40 feet which is free of dampness. Because of the possibility of radiation injury to personnel if this equipment is improperly installed, all installation sites must be approved by the Bureau of Ships.

3. ASSEMBLY.

a. *Chamber Support.*—All parts required for assembling the chamber support are packed in shipping box No. 1. The support is shipped with the capsule and attenuation controls bolted to the support platform, as shown in figure 3-2. To complete the assembly of the support, proceed as follows:

(1) Lay support platform on side opposite attenuation control.

(2) Bolt the two braces to platform.

(3) Bolt the four legs to underside of platform.

(4) Bolt base plate to legs.

(5) Bolt braces to base plate.

(6) Raise assembly to upright position.

b. *Carriage Track.*—The carriage track is packed, partially assembled in four 5-foot sections, in shipping box No. 2. The four sections are similar in construction, except for the following: the first tie of section one is notched to fit the base plate for the chamber support, and the last tie of section four is equipped with rail stops to prevent the positioning carriage from rolling off the track. To complete the assembly, proceed as follows:

(1) Lay out sections on floor in proper order, as indicated by scale on side of each section.

(2) Bolt sections together, using the three bolt holes in each end tie provided for this purpose.

(3) Bolt notched tie of section one to base plate of chamber support.

(4) Level carriage track, as required.

c. *Positioning Carriage.*—The positioning carriage in shipping box No. 3, is shipped preassembled except for the positioning platform, as shown in figure 3-3. To complete the assembly, proceed as follows:

(1) Bolt positioning platform to flange on height control rod so that slot on plate is on same side as height control.

(2) Remove rail stops from last tie of carriage track and slide carriage on track over brass guide rails.

(3) Replace rail stops.

d. *Optical System.*—The optical system is packed, partially assembled as shown in figure 3-4, in shipping box No. 4. To complete the assembly, proceed as follows:

(1) Bolt legs to base plate.

(2) Slide legs into holes in tripod head, and tighten set screws with Allen wrench to fasten legs to head.

(3) Insert pan head shaft through hole in tripod head and tighten height control.

(4) Fasten telescope to pan head by using thumb screw of pan head.

(5) Fit mirror support into slot in positioning platform; shown in figure 3-3 (refer also to figure 1-4).

e. *Radiation-Source Chamber.*—The radiation-source chamber is packed in shipping crate No. 5. Because of its weight, a lifting fork or block and tackle capable of lifting 1000 lb or more should be used to raise the chamber into position on the chamber support. If neither of these is available, the chamber can be raised by four men using two pieces of solid iron rods about 4 feet long and 1 inch in diameter, passed through the two lifting brackets on the chamber. An additional person will be required to feed the flexible cable from the chamber into the upper cable guide tube, shown in figure 3-5, as the chamber is slowly raised into position on the support platform. To install the radiation-source chamber, proceed as follows:

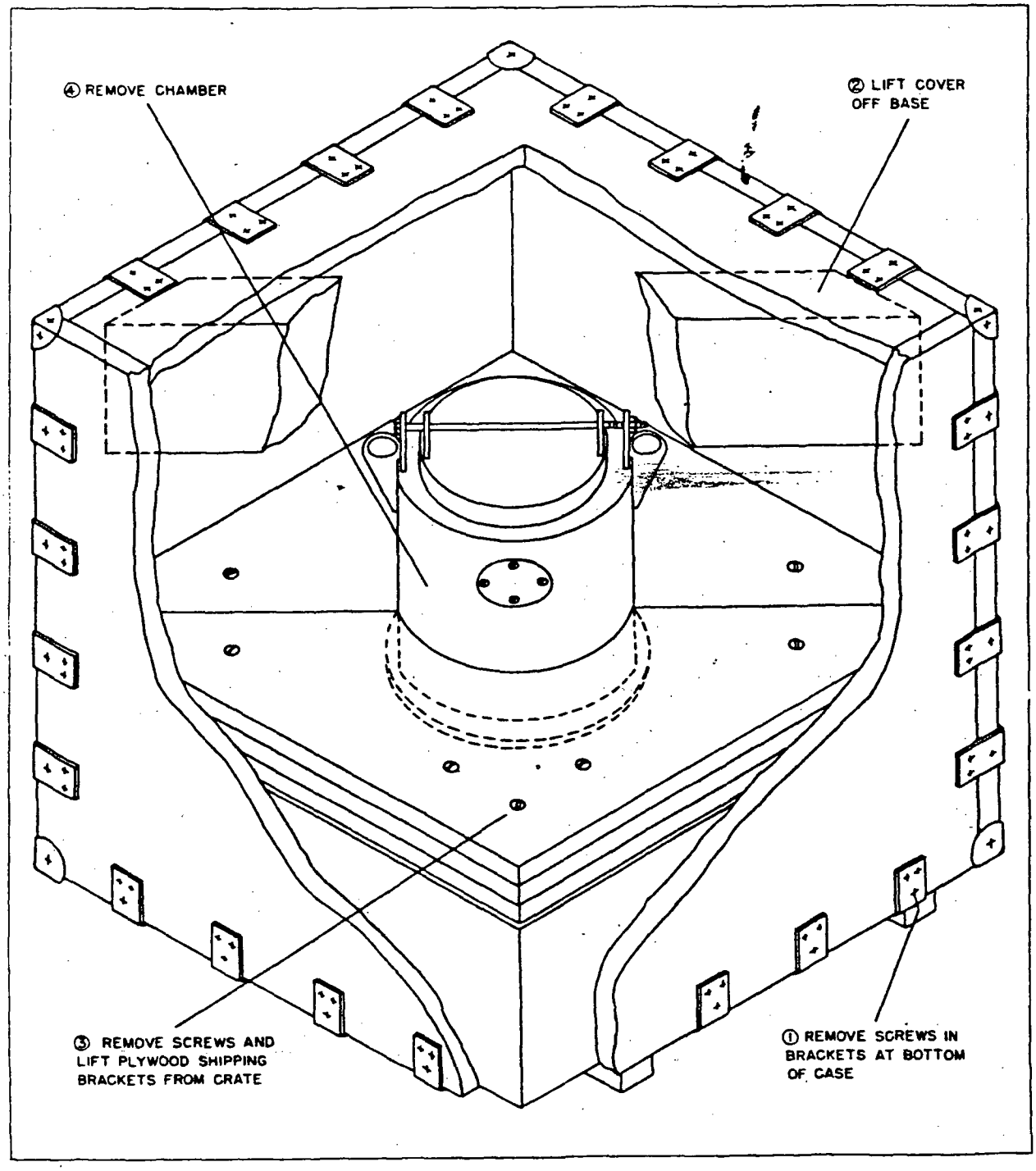


Figure 3-1. Cutaway View of Shipping Crate for Radiation-Source Chamber

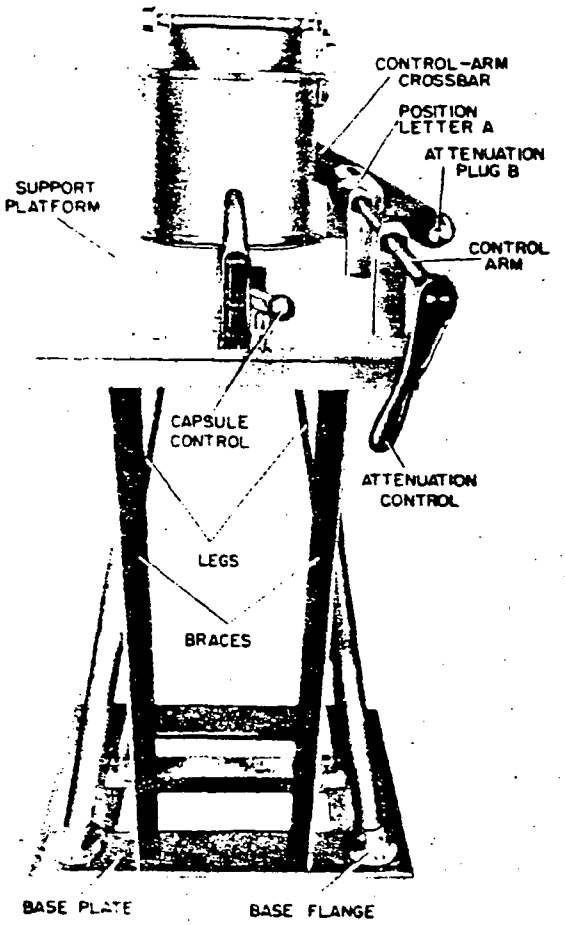


Figure 3-2. Chamber Support, with Radiation-Source Chamber and Controls Mounted

(1) Remove shipping clamp from flexible cable.

(2) Remove cable housing from support platform.

(3) Loosen nut and remove capsule-control lever.

(4) Slowly raise radiation-source chamber into position on support platform; at the same time feed flexible cable into upper cable-guide tube.

(5) Fit chamber over guide pins on support platform, and bolt to platform.

(6) Replace capsule control in low (SAFE) position, and make sure that it remains in SAFE position for steps (7) through (9).

(7) Carefully remove shipping bolts from safety plug located in radiation outlet of chamber.

WARNING

Hold safety plug A tightly in place while removing last bolt, and continue to hold until next step is completed (see figure 3-5).

(8) Set attenuation control in position A (see figure 3-2), and bolt control-arm crossbar to safety plug A.

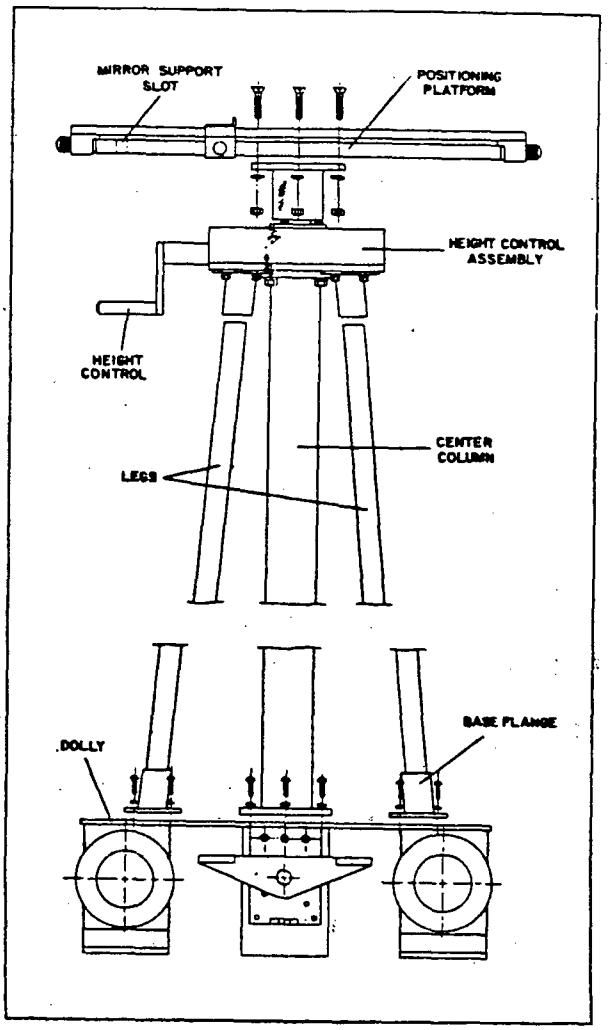


Figure 3-3. Positioning Carriage, Assembly Drawing

(9) Without changing position of control arm, bolt attenuation plug B to the free end of the crossbar. Refer to figure 3-5.

4. INITIAL ADJUSTMENTS.

a. *Capsule Control.*—Two adjustable stops, lower and upper, limit the travel of the capsule control. See figure 3-5. The lower stop is used to prevent the flexible cable from becoming detached from the radiation-source capsule. To adjust lower stop, proceed as follows:

(1) Loosen lock nut, and set stop to its lowest position.

(2) Gently raise and lower control lever a few times until it is determined that the capsule is resting on the bottom of the cavity in the radiation-source chamber.

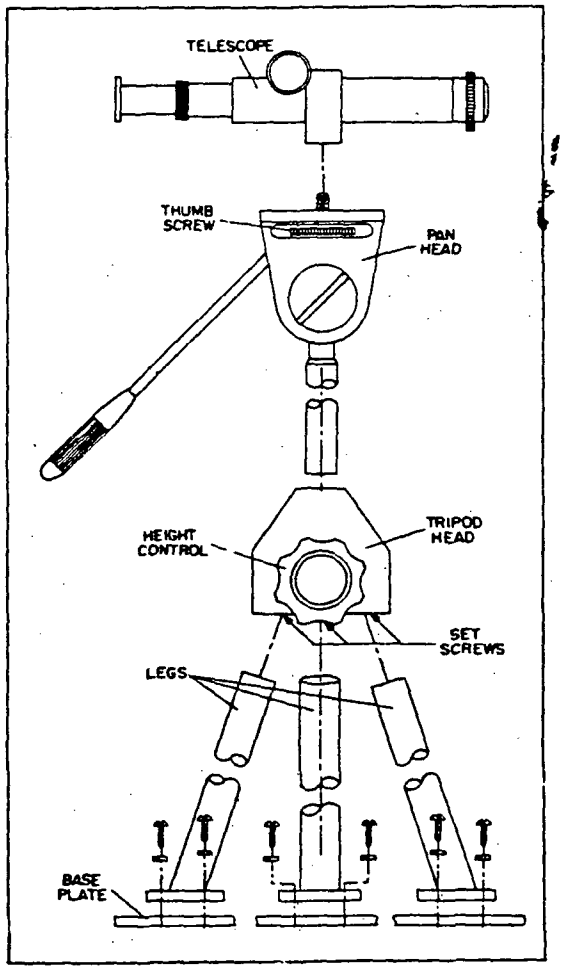


Figure 3-4. Telescope and Stand, Assembly Drawing

(3) Raise control lever slightly, adjust stop until it touches bottom of control lever, and tighten lock nut. The upper stop limits the travel of the capsule control so that when it is in the EXPOSED position the radiation-source capsule is exactly in the center of the radiation outlet of the radiation-source chamber.

WARNING

Before making the following adjustments be sure that the capsule control is in the SAFE position, and that the attenuation control is in position A.

To set upper stop, proceed as follows:

(1) Loosen lock nut, and set stop to its highest position.

(2) Place any available radiac equipment having a horizontal meter face with a range of 0 to 50 mr/hr. (to facilitate meter observation only) on the positioning platform.

(3) Move the positioning platform as close to the radiation-source chamber as possible.

(4) Adjust the height of the positioning platform so that the center of the radiac equipment is level with the center of the aperture of the radiation-source chamber.

(5) Adjust the horizontal position of the radiac equipment so that a vertical plane passing through the longitudinal axis of the chamber support platform and the radiation-source chamber will also pass through the center of the radiac equipment.

(6) Move the positioning platform (by releasing the foot brake on the carriage) until the radiac equipment is approximately 150 cm away from the radiation-source chamber. (This distance is measured by lining up the pointer on the carriage with the proper position on the cm scale mounted on the track.) Set the foot brake to prevent the carriage from being moved.

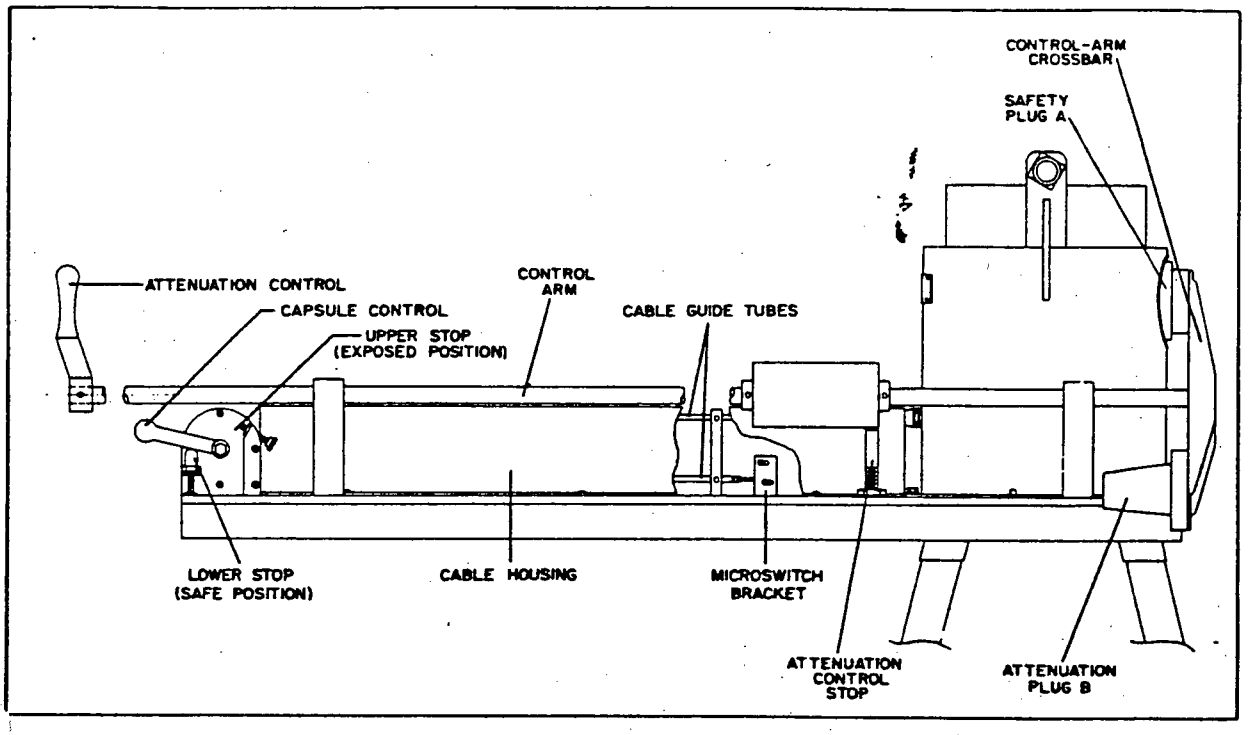


Figure 3-5. Support Platform, with Controls and Mountings

(7) Adjust the position of the mirror on the positioning platform so that it is directly over the meter face of the radiac equipment, facing the telescope, and set at an angle of 45 degrees with respect to the horizontal (see figure 1-4).

(8) Set attenuation control in position B.

(9) Raise capsule control to upper limit.

(10) Slowly lower control lever, and observe in mirror at what point maximum meter deflection occurs.

(11) Hold lever at this point, and set upper stop against control lever. Refer to figure 3-5.

(12) Tighten lock nut.

(13) Return capsule control to SAFE position and attenuation control to position A.

b. *Alarm Circuit.*—After the lower and upper stops have been adjusted, the microswitch of the alarm circuit should be adjusted. The switch is turned on and off by the action of the capsule control. When the control lever is in the SAFE position, the pressure exerted by the flexible cable on the spring switching element should be sufficient to open the contact between A and C, as shown in figure 3-6. When the lever is raised to the EXPOSED position, the pressure should be removed from the spring element, allowing the contact between A and C to close. To adjust pressure on spring, proceed as follows:

(1) Set capsule control ⅛ inch above lower stop.

(2) Loosen set screws on microswitch bracket.

(3) Move switch away from end of flexible cable until pressure on plunger is relieved sufficiently to close contact between A and C. If additional adjustment is needed, loosen screws holding microswitch bracket to support platform and move bracket, as required.

(4) Tighten set screws.

(5) Replace cable housing.

The set is now ready for operation.

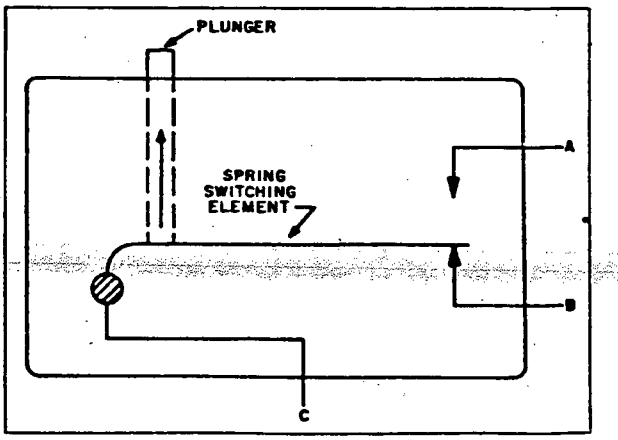


Figure 3-6. Schematic Diagram of Alarm-Circuit Microswitch

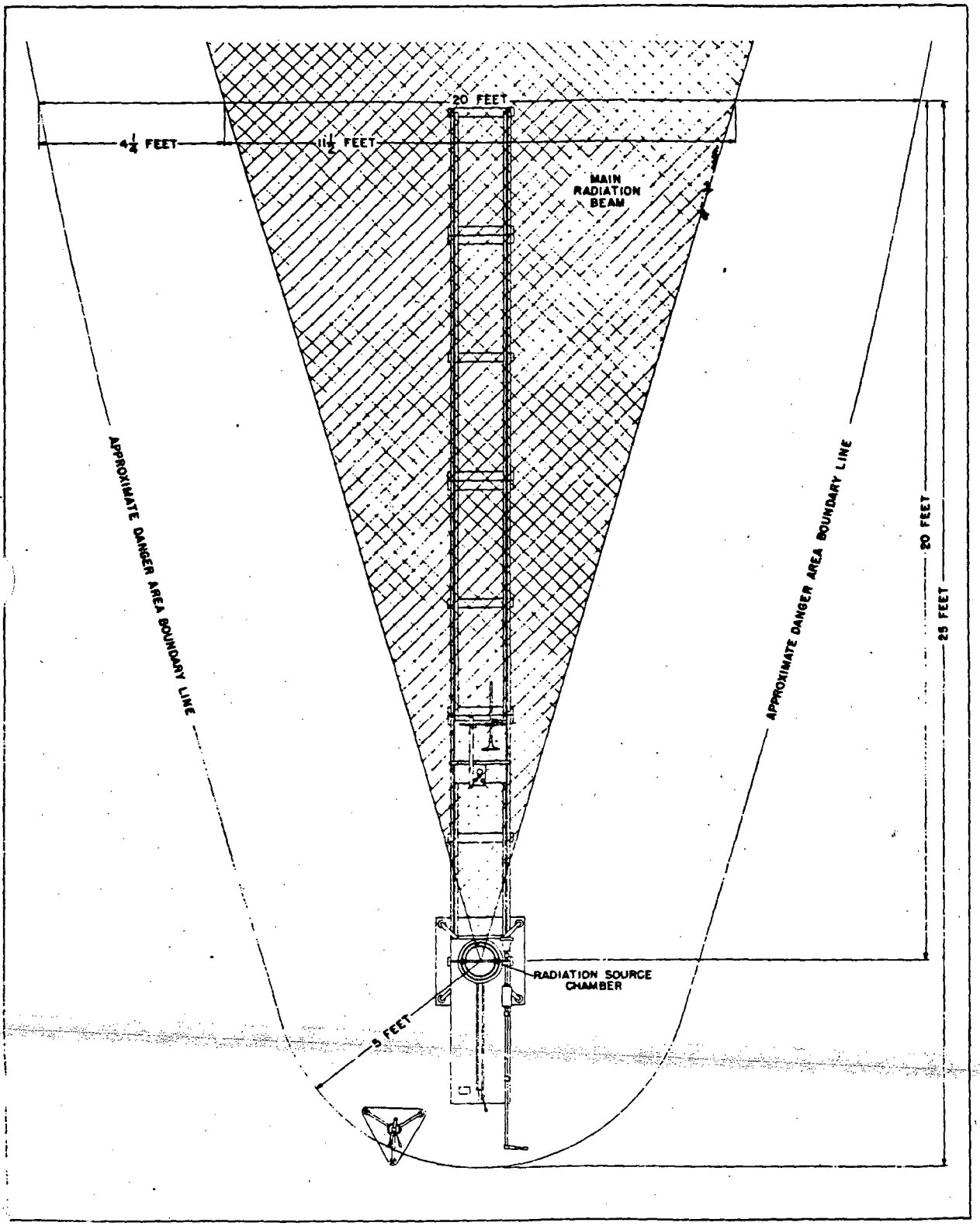


Figure 4-1. Radiation Pattern of Unattenuated Beam, Showing Approximate Danger Area Boundary Line

SECTION 4
OPERATION

1. GENERAL.

When Radiac Calibrator Set AN/UDM-1 is in operation, the main radiation emanates through the cone-shaped outlet of the radiation-source chamber, and is confined to a limited, beam-shaped area, as shown typically in figure 4-1. However, there is also leakage radiation, in all directions, through the walls of the chamber, the level being approximately that shown by the curve in figure 4-2. (This level, however, will vary somewhat with the respective source strength of each installation.) It shows that at 150 cm (approximately 5 feet) the leakage radiation intensity is less than 4 milliroentgens per hour (4 mr/hr); since this is the distance at which the operating controls are located, the equipment can be safely operated for a considerable period of time.

WARNING

After set has been assembled the boundary line of the danger area, shown in figure 4-1, should be prominently marked to deter personnel from entering this area while the set is in operation.

In order to use the Radiac Calibrator Set AN/UDM-1 to check and calibrate radiac equipments, it is necessary for the operator to be thoroughly familiar with the operation and calibrating procedure of the radiac equipment to be tested. For this purpose, the instruction book for each radiac equipment under test must be available to the operator.

Before a calibration test can be performed, the three following adjustments must be made:

(a) The radiac equipment must be properly placed on the positioning platform of the positioning carriage.

(b) The proper position of the carriage on the track must be determined.

(c) The optical system must be adjusted.

2. POSITIONING THE RADIAC EQUIPMENT.

Because of the differences in size and construction of the various radiac equipments in use, different settings of the x- and y-axis positioning bars and height control on the positioning carriage are required for each model. These settings are listed in table 4-1, together with an illustration showing exactly how the radiac equipment must be placed on the platform. In all the illustrations of table 4-1 the y-axis bar is shown horizontally, and the x-axis bar is shown vertically.

The procedure for determining the x-axis bar, y-axis bar, and height control settings for radiac equipments not included in table 4-1 is as follows:

WARNING

Before entering the danger area shown in figure 4-1, make sure that the capsule control is in the SAFE position and that the attenuation control is in position A.

(a) Turn height control of positioning carriage until height indication is zero. (The height scale is etched on the center column of the positioning carriage. Refer to figure 3-3.)

(b) Using the instruction book for the radiac equipment being tested, disassemble equipment until radiation-sensitive device (see figure 4-3) is exposed.

(c) Place radiac equipment on positioning platform.

(d) Measure in inches from vertical center of radiation-sensitive device to top of positioning platform. (This is reference H of figure 4-3.) Record this measurement in height control column in space provided at end of table 4-1.

(e) Place radiac equipment so that radiation-sensitive device is facing toward radiation-source chamber. Refer to figure 4-3.

(f) Measure in inches from center of radiation-sensitive device to right-hand edge of equipment (operator facing radiation-source chamber) and record as a y measurement.

(g) Measure in inches from center of radiation-sensitive device to rear edge of equipment (edge away from radiation-source chamber), and record as an x measurement.

(h) Reassemble radiac equipment.

(i) When base of equipment housing extends beyond the points used to determine x and y measurements obtained in steps (f) and (g) above, measure this distance and add to recorded x and y measurements. When base of equipment housing is within the points used to determine x and y measurements obtained in steps (f) and (g) above, measure this distance and subtract from recorded x and y measurements.

(j) Subtract y measurement, obtained by steps (f) and (i) above, from 6.5 (of y-axis scale; refer to figure 4-4), and record this reading in y-axis bar column at end of table 4-1.

SAMPLE CHART

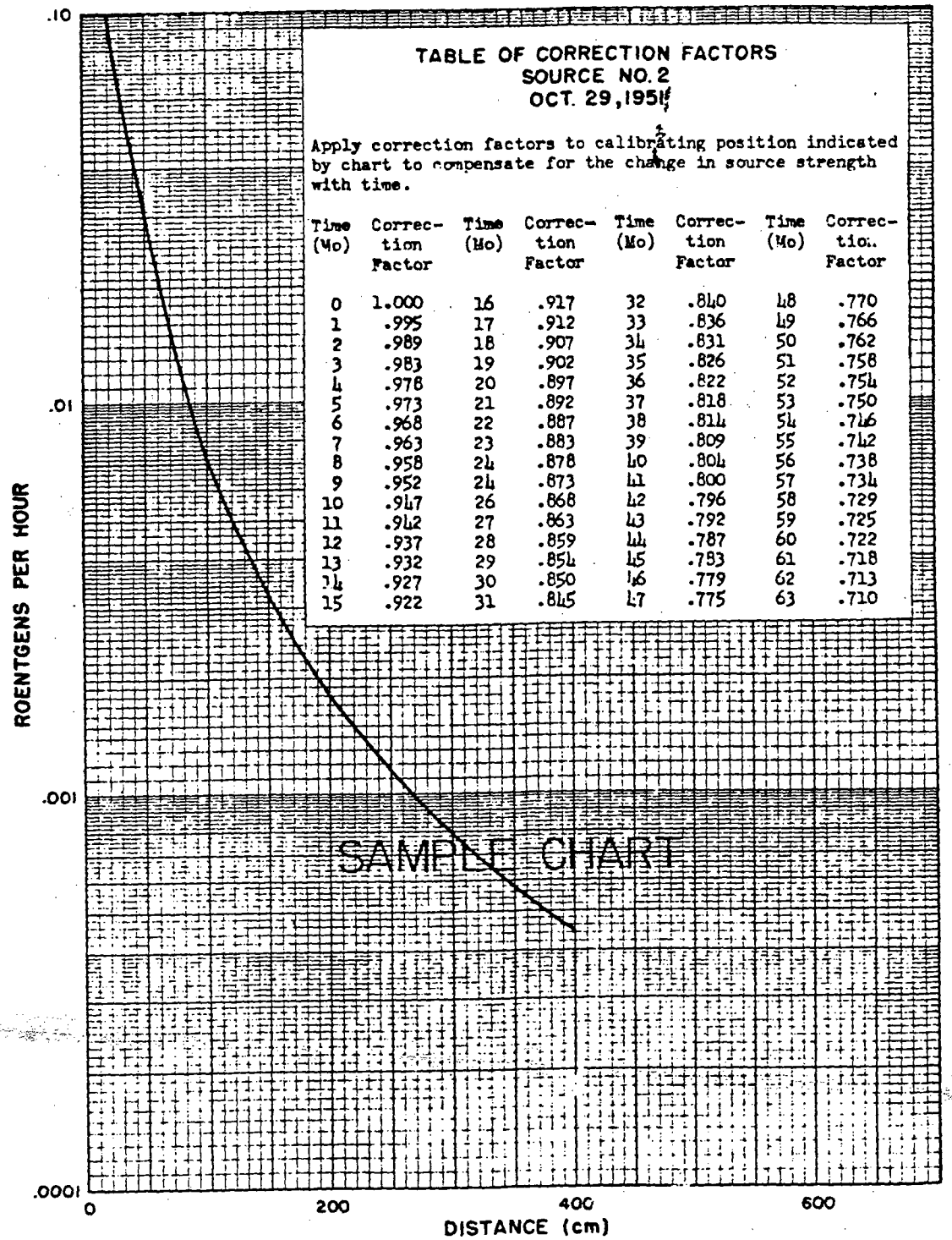


TABLE OF CORRECTION FACTORS
SOURCE NO. 2
OCT. 29, 1951

Apply correction factors to calibrating position indicated by chart to compensate for the change in source strength with time.

Time (Mo)	Correction Factor	Time (Mo)	Correction Factor	Time (Mo)	Correction Factor	Time (Mo)	Correction Factor
0	1.000	16	.917	32	.840	48	.770
1	.995	17	.912	33	.836	49	.766
2	.989	18	.907	34	.831	50	.762
3	.983	19	.902	35	.826	51	.758
4	.978	20	.897	36	.822	52	.754
5	.973	21	.892	37	.818	53	.750
6	.968	22	.887	38	.814	54	.746
7	.963	23	.883	39	.809	55	.742
8	.958	24	.878	40	.804	56	.738
9	.952	24	.873	41	.800	57	.734
10	.947	26	.868	42	.796	58	.729
11	.942	27	.863	43	.792	59	.725
12	.937	28	.859	44	.787	60	.722
13	.932	29	.854	45	.783	61	.718
14	.927	30	.850	46	.779	62	.713
15	.922	31	.845	47	.775	63	.710

Figure 4-2. Correction Factors for Co^{60}

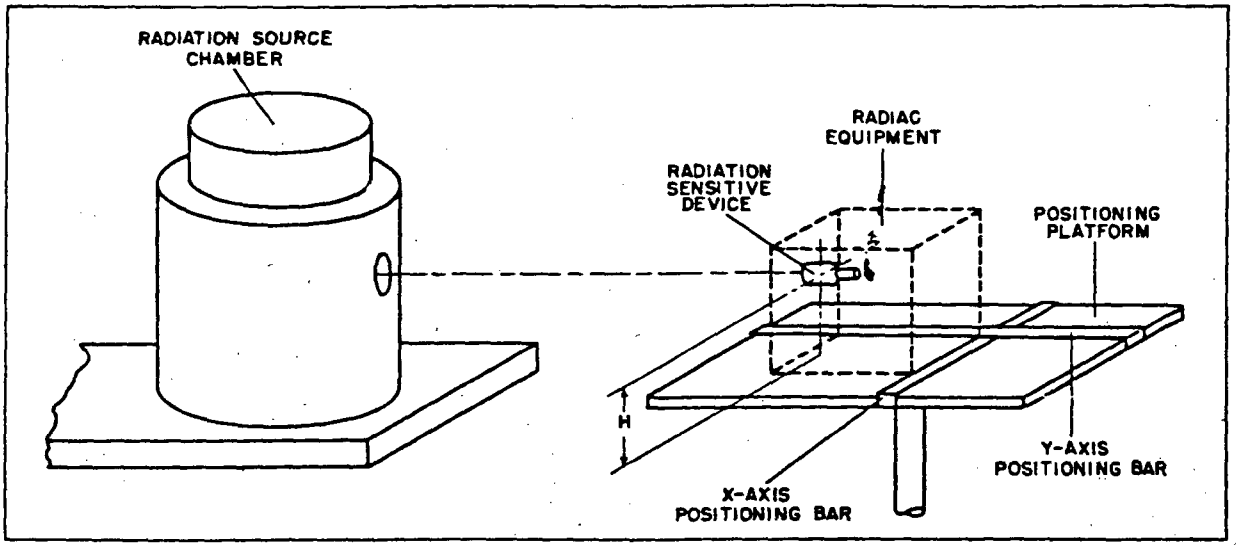


Figure 4-3. Phantom View of Radiac Equipment, Showing Location of Radiation-Sensitive Device Relative to Positioning Platform

(k) Record x measurement, obtained by steps (g) and (i) above, in x-axis bar column at end of table 4-1.

(l) Using setting entered in table 4-1, position radiac equipment on positioning platform. If measurements described in above steps have been done accurately, radiation-sensitive device will be centered in front of radation-source chamber opening, as shown in figure 4-3.

TABLE 4-1. POSITIONS OF X- AND Y-AXIS BARS, HEIGHT CONTROL, AND RADIAC EQUIPMENTS

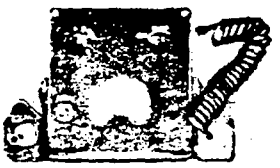
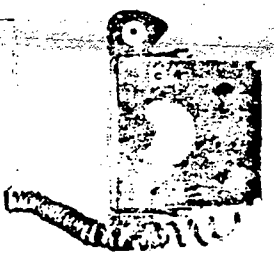
Equipment	*X-Axis Bar*	*Y-Axis Bar*	*Height Control*	*Radiac Equipment or Probe Position*
AN/PDR-8 (High range)	7.3	3.5	5.2	
AN/PDR-8 (Low range)	0.7	3.7	9.6	

TABLE 4-1. POSITIONS OF X- AND Y-AXIS BARS, HEIGHT CONTROL, AND RADIAC EQUIPMENTS (Cont.)

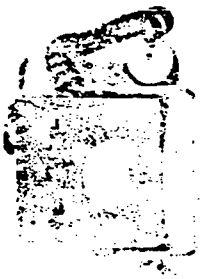
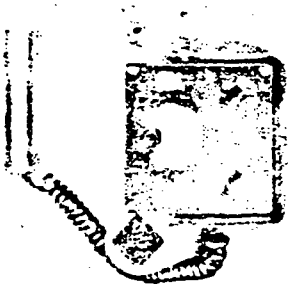
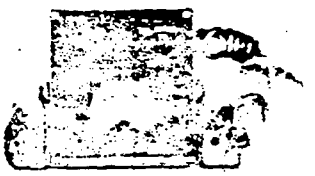
Equipment	*X-Axis Bar*	*Y-Axis Bar*	*Height Control*	*Radiac Equipment or Probe Position*
AN/PDR-8A (High range)	6.3	0.9	5.6	
AN/PDR-8A (Low range)	0.8	4.0	9.6	
AN/PDR-8B (High range)	9.4	2.4	5.0	
AN/PDR-8B (Low range)	0.7	3.7	9.6	

TABLE 4-1. POSITIONS OF X- AND Y-AXIS BARS, HEIGHT CONTROL, AND RADIAC EQUIPMENTS (Cont.)

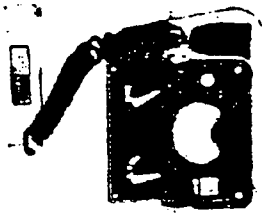
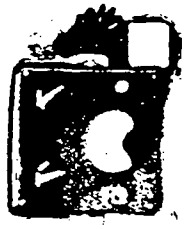
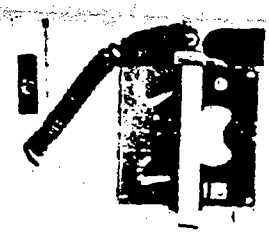
Equipment	*X-Axis Bar*	*Y-Axis Bar*	*Height Control*	*Radiac Equipment or Probe Position*
AN/PDR-8C (High range)	6.2	1.6	7.1	
AN/PDR-8C (Low range)	0.8	4.0	9.6	
AN/PDR-8D (High range)	6.2	1.6	7.2	
AN/PDR-8D (Low range)	0.8	4.0	9.6	

TABLE 4-1. POSITIONS OF X- AND Y-AXIS BARS, HEIGHT CONTROL, AND RADIAC EQUIPMENTS (Cont.)

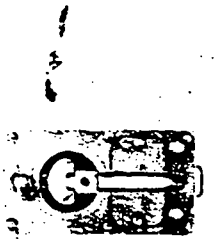
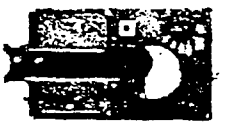
Equipment	*X-Axis Bar*	*Y-Axis Bar*	*Height Control*	*Radiac Equipment or Probe Position*
AN/PDR-18	6.4	4.2	9.1	
AN/PDR-27 (High range)	4.0	4.8	7.0	
AN/PDR-27 (Low range)	9.0	4.0	8.0	
AN/PDR-27A (High range)	4.4	4.0	7.0	

TABLE 4-1. POSITIONS OF X- AND Y-AXIS BARS, HEIGHT CONTROL, AND RADIAC EQUIPMENTS (Cont.)

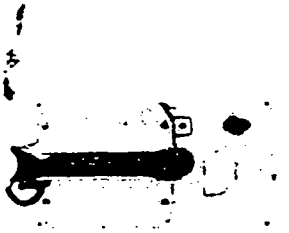
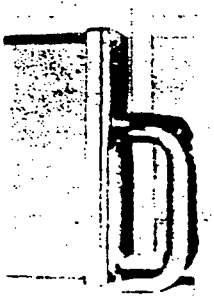
Equipment	*X-Axis Bar*	*Y-Axis Bar*	*Height Control*	*Radiac Equipment or Probe Position*
AN/PDR-27A (Low range)	11.1	4.2	8.0	
AN/PDR-27C (High range)	4.4	4.4	8.0	
AN/PDR-27C (Low range)	11.3	3.5	8.0	
AN/PDR-32	2.5	4.3	4.9	

TABLE 4-1. POSITIONS OF X- AND Y-AXIS BARS, HEIGHT CONTROL, AND RADIAC EQUIPMENTS (Cont.)

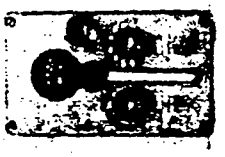
Equipment	*X-Axis Bar*	*Y-Axis Bar*	*Height Control*	*Radiac Equipment or Probe Position*
AN/PDR-T1B	7.1	4.5	8.6	
IM-7/PD	4.4	4.5	8.5	
IM-7A/PD	4.4	4.5	8.5	

TABLE 4-1. POSITIONS OF X- AND Y-AXIS BARS, HEIGHT CONTROL, AND RADIAC EQUIPMENTS (Cont.)

Equipment	*X-Axis Bar*	*Y-Axis Bar*	*Height Control*	*Radiac Equipment or Probe Position*

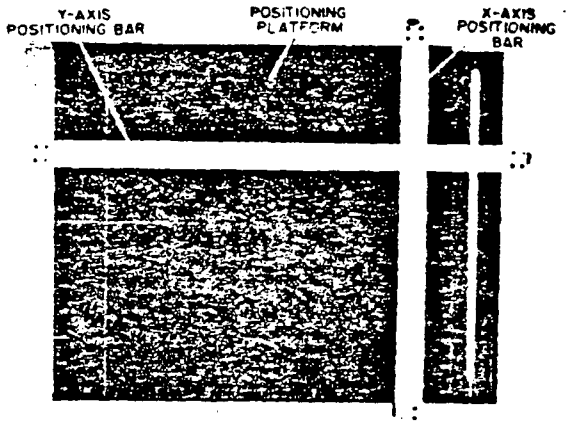


Figure 4-4. Top View of Positioning Platform, Showing X-Axis and Y-Axis Positioning Bars

3. LOCATING THE POSITIONING CARRIAGE.

The distance between the positioning carriage and the radiation source will depend on the radiac equipment and the age of the radiation source at the time the calibrating test is made. For accurate results, the carriage should be located so that the radiation intensity produces a mid-scale meter reading. If, for example, the meter range of the radiac equipment being tested is 0 to 50 mr/hr, a radiation intensity of 25 mr/hr should be used. By referring to the positioning chart supplied with the radiation source, the approximate location of the carriage can be found. However, since the source loses strength as it ages, a correction factor must be applied as explained in Section 2, paragraph 3, to find the exact location.

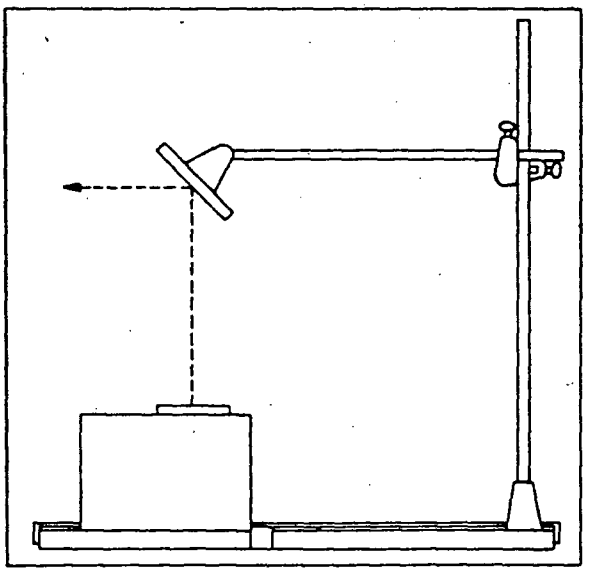


Figure 4-5. Location of Mirror for Radiac Equipment Having a Horizontal Meter Face

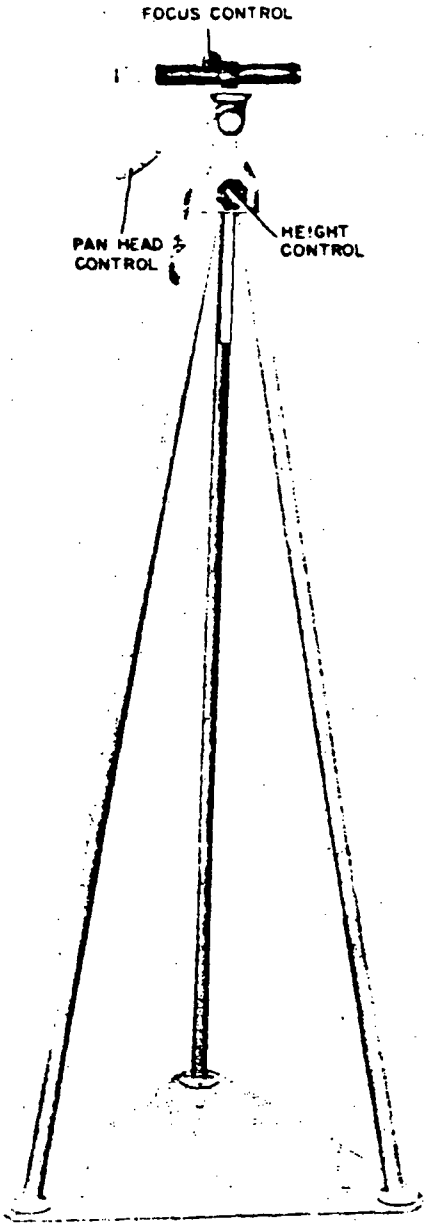


Figure 4-6. Telescope and Tripod, with Adjustable Pan Head

4. ADJUSTING OPTICAL SYSTEM.

After the radiac equipment and positioning carriage have been properly positioned, it is necessary to adjust the optical system so that the operator can read the meter from a safe location. This should be done as follows when the radiac equipment being used has a horizontal meter scale:

(a) Adjust mirror assembly until mirror is centered directly over meter scale of radiac equipment, and locked in place. (See figure 4-5.)

(b) Adjust mirror to a 45° angle with respect to the meter scale.

(c) Adjust telescope height control (figure 4-6) so that telescope is at mirror level.

(d) Sight over telescope, and move telescope, by means of pan head control arm, until it is pointing directly at mirror. (By rotating pan head control arm clockwise, horizontal and vertical motion of pan head can be stopped and position locked. Conversely, counterclockwise rotation will release pan head locking mechanism.)

(e) Have mirror turned horizontally, if necessary, without changing its angle with respect to the horizontal, until meter can be seen in mirror while operator sights over telescope.

(f) Remove lens cap, sight through telescope, and adjust until meter can be seen through telescope.

(g) Focus telescope for sharp image.

When the radiac equipment being used as a vertical meter scale, the following optical system adjustment procedure should be followed:

(a) Adjust lower mirror assembly (see figure 4-7) until mirror is centered directly in front of meter scale of radiac equipment, and lock.

(b) Adjust lower mirror to a 45° angle with respect to meter scale.

(c) Adjust upper mirror assembly until mirror is centered directly over lower mirror, and lock in place.

(d) Adjust upper mirror so that its face is at a 90° angle with respect to the face of the lower mirror (45° with respect to horizontal).

(e) Continue with steps (c) through (g) of the horizontal meter scale adjustment procedure.

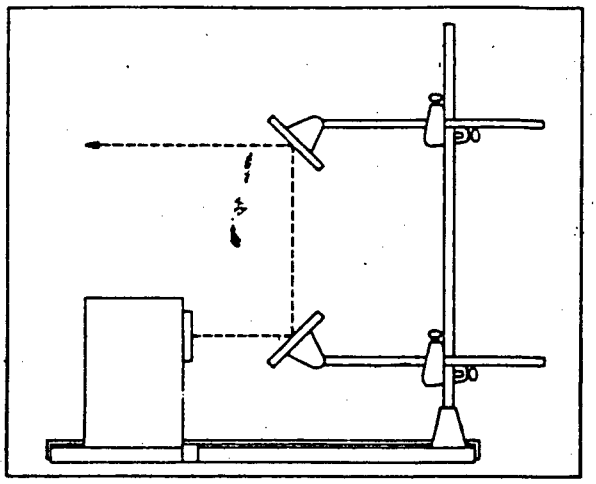


Figure 4-7. Location of Mirrors for Radiac Equipment Having a Vertical Meter Face

5. CHECKING METER ACCURACY.

After the preceding adjustments have been made, proceed as follows:

a. Place radiac equipment on positioning platform as shown in table 4-1.

b. Set attenuation control to position O or B, depending on radiation intensity required.

c. Raise capsule control to EXPOSED position.

d. Read meter through telescope.

e. If meter reading is incorrect, refer to instruction book of equipment for proper adjustment procedure.

SECTION 5
MAINTENANCE

1. ROUTINE CHECK.

a. Check tightness of plug bolts holding attenuation plugs to crossbar of attenuation control; tighten loose screws (see figure 5-1).

b. Check for looseness of stop for attenuation control arm; adjust head of stop for free travel of cylinder, and tighten lock nut. (See figure 5-2.)

c. Check for looseness of lower and upper stops for capsule control, if loose, readjust lever travel as described in Section 3, paragraph 4a.

2. PREVENTIVE MAINTENANCE.

NOTE:

The attention of maintenance personnel is invited to the requirements of Chapter 67 of the Bureau of Ships Manual, of the latest issue.

a. Apply 10 drops of MIL-L-664 light preservative lubricating oil, once a month, to the attenuation control arm, as shown in figure 5-1.

3. CORRECTIVE MAINTENANCE.

Except for the radiation-source chamber and the commercial parts listed in table 2 of Section 6, all other replacement parts for the repair of this equipment should be fabricated in the machine shop of the activity where the set is located.

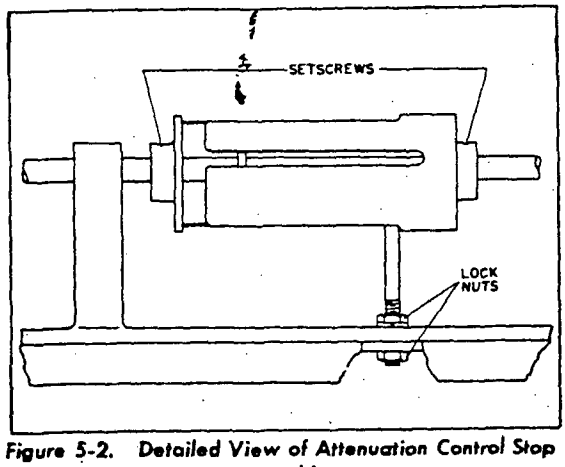
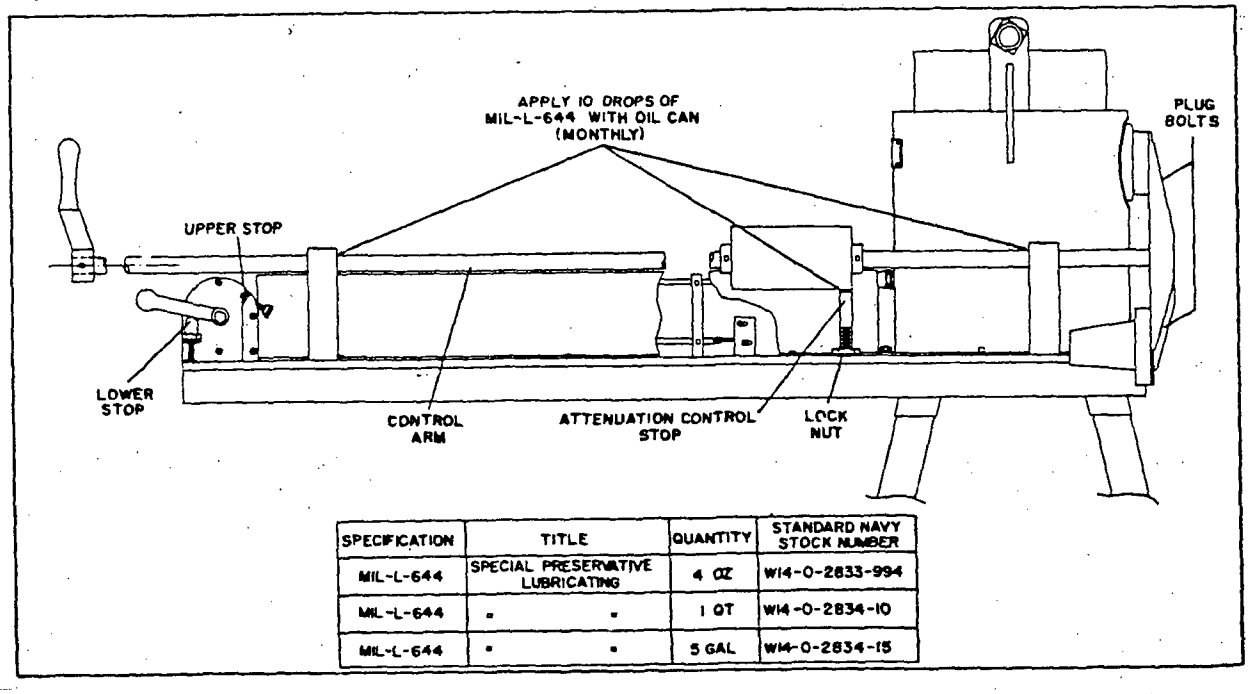


Figure 5-2. Detailed View of Attenuation Control Stop Assembly

WARNING

In the event of failure within the radiation source chamber, do not attempt local repair. Submit a dispatch to the bureau of ships requesting instructions for disposal of unit.



SPECIFICATION	TITLE	QUANTITY	STANDARD NAVY STOCK NUMBER
MIL-L-644	SPECIAL PRESERVATIVE LUBRICATING	4 OZ	W14-0-2833-994
MIL-L-644	" "	1 QT	W14-0-2834-10
MIL-L-644	" "	5 GAL	W14-0-2834-15

Figure 5-1. Maintenance Check Points

FAILURE REPORTS

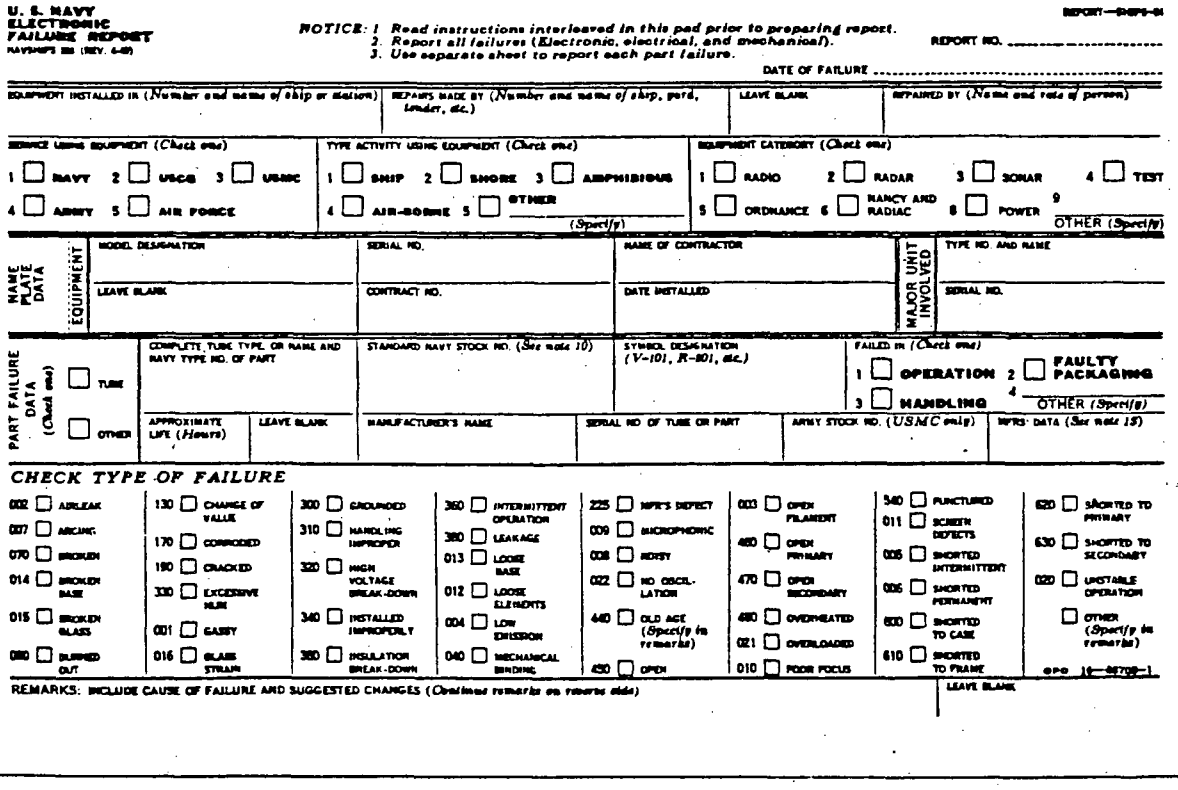
A FAILURE REPORT must be filled out for the failure of any part of the equipment whether caused by defective or worn parts, improper operation, or external influences. It should be made on Failure Report, form NBS-383, which has been designed to simplify this requirement. The card must be filled out and forwarded to BUSHIPS in the franked envelope which is provided. Full instructions are to be found on each card.

Use great care in filling out the card to make certain it carries adequate information. Do not substitute brevity for clarity. Use the back of the card to completely describe the cause of failure, and attach an extra piece of paper if necessary.

The purpose of this report is to inform BUSHIPS of the cause and rate of failures. The information is used by the Bureau in the design of future equipment and in the maintenance of adequate supplies to keep the present equipment going. The cards you send in, together with those from hundreds of other ships and shore activities, furnish a store of information permitting the Bureau to keep in touch with the performance of all electronic equipment of the Naval Establishment.

This report is not a requisition. You must request the replacement of parts through your Officer-in-Charge in the usual manner.

Make certain you have a supply of Failure Report cards and envelopes on board. They may be obtained from the nearest Publications and Printing Office.



U. S. NAVY
ELECTRONIC
FAILURE REPORT
NAVSHIPS 383 (REV. 4-49)

NOTICE: 1. Read instructions interleaved in this pad prior to preparing report.
2. Report all failures (Electronic, electrical, and mechanical).
3. Use separate sheet to report each part failure.

REPORT—BUSHIPS-04

REPORT NO. _____

DATE OF FAILURE _____

EQUIPMENT INSTALLED IN (Number and name of ship or station) | REPAIRS MADE BY (Number and name of ship, yard, tender, etc.) | LEAVE BLANK | REPAIRED BY (Name and rate of person)

SERVICE USING EQUIPMENT (Check one)
1 ☐ NAVY 2 ☐ USCG 3 ☐ USMC
4 ☐ ARMY 5 ☐ AIR FORCE

TYPE ACTIVITY USING EQUIPMENT (Check one)
1 ☐ SHIP 2 ☐ SHORE 3 ☐ AMPHIBIOUS
4 ☐ AIR-BORNE 5 ☐ OTHER (Specify)

EQUIPMENT CATEGORY (Check one)
1 ☐ RADIO 2 ☐ RADAR 3 ☐ SONAR 4 ☐ TEST
5 ☐ ORDNANCE 6 ☐ NAVCY AND RADIAC 8 ☐ POWER 9 ☐ OTHER (Specify)

NAME PLATE DATA — EQUIPMENT
MODEL DESIGNATION | SERIAL NO. | NAME OF CONTRACTOR | TYPE NO. AND NAME
LEAVE BLANK | CONTRACT NO. | DATE INSTALLED | SERIAL NO.
MAJOR UNIT INVOLVED

PART FAILURE DATA (Check one) ☐ TUBE ☐ OTHER
COMPLETE TUBE TYPE OR NAME AND NAVY TYPE NO. OF PART | STANDARD NAVY STOCK NO. (See note 10) | SYMBOL DESIGNATION (V-101, R-801, etc.)
FAILED IN (Check one) 1 ☐ OPERATION 2 ☐ FAULTY PACKAGING 3 ☐ HANDLING 4 ☐ OTHER (Specify)
APPROXIMATE LIFE (Hours) | LEAVE BLANK | MANUFACTURER'S NAME | SERIAL NO OF TUBE OR PART | ARMY STOCK NO. (USMC only) | MFR'S DATA (See note 15)

CHECK TYPE OF FAILURE

002 ☐ AIRLEAK
007 ☐ ARCING
070 ☐ BROKEN
014 ☐ BROKEN BASE
015 ☐ BROKEN GLASS
080 ☐ BURNED OUT
130 ☐ CHANGE OF VALUE
170 ☐ CORRODED
190 ☐ CRACKED
330 ☐ EXCESSIVE NOISE
001 ☐ GASSY
016 ☐ GLASS STRAIN
300 ☐ GROUNDED
310 ☐ HANDLING IMPROPERLY
320 ☐ HIGH VOLTAGE BREAK-DOWN
340 ☐ INSTALLED IMPROPERLY
380 ☐ INSULATION BREAK-DOWN
360 ☐ INTERMITTENT OPERATION
390 ☐ LEAKAGE
013 ☐ LOOSE BASE
012 ☐ LOOSE ELEMENTS
004 ☐ LOW EMISSION
040 ☐ MECHANICAL BINDING
225 ☐ MFR'S DEFECT
009 ☐ MICROPHONIC
008 ☐ NOISY
022 ☐ NO OSCILLATION
440 ☐ OLD AGE (Specify in remarks)
450 ☐ OPEN
003 ☐ OPEN FILAMENT
460 ☐ OPEN PRIMARY
470 ☐ OPEN SECONDARY
480 ☐ OVERHEATED
021 ☐ OVERLOADED
010 ☐ POOR FOCUS
540 ☐ PUNCTURED
011 ☐ SCREEN DEFECTS
005 ☐ SHORTED INTERMITTENT
006 ☐ SHORTED PERMANENT
600 ☐ SHORTED TO CASE
610 ☐ SHORTED TO FRAME
620 ☐ SHORTED TO PRIMARY
630 ☐ SHORTED TO SECONDARY
020 ☐ UNSTABLE OPERATION
☐ OTHER (Specify in remarks)

OPO 16—86709-1

REMARKS: INCLUDE CAUSE OF FAILURE AND SUGGESTED CHANGES (Continue remarks on reverse side)

LEAVE BLANK

SECTION 6
PARTS LISTS

NOTE:

It is not intended that this equipment will be supported through the Electronics supply system. Any parts which require replacement shall be fabricated or procured locally.

TABLE 6-1. LIST OF MAJOR UNITS

Quantity	*Name of Major Unit*	*Type Designation*
1	Radiac Calibrator Set Consisting of:	AN/UDM-1
1	Radiation Source Chamber	[redacted]
1	Chamber Support	
1	Carriage Track	
1	Positioning Carriage	
1	Optical System	
2	Instruction Books	NavShips 91809

TABLE 6-2. REPLACEABLE PARTS LIST

NAME OF PART AND DESCRIPTION	FUNCTION
BAR, x-axis positioning: instrument positioning bar; u/w Natl Elec Mach positioning carriage platform; sub-assembly consisting of bar w/block, pin, spacer, and knurled knob mtd on each end by four #4-40 x 1/2" lg Fil H mach screws; aluminum, lacquer finish; rectangular shape; 17" lg x 1" wd x 13/16" thk o/a; 1/8" thk "L"-shaped bar; Natl Elec Mach dwg #AD-9534-B; Navy contract NObsr-52466.	Positions instrument under test
BAR, y-axis positioning: instrument positioning bar; u/w Natl Elec Mach positioning carriage platform; sub-assembly consisting of bar w/block, pin, spacer, and knurled knob mtd on each end by four #4-40 x 1/2" lg Fil H mach screws; aluminum, lacquer finish; rectangular shape; 20" lg x 1" wd x 1-13/16" thk o/a; 1/8" thk "L"-shaped bar; Natl Elec Mach dwg #AD-9534-B; Navy contract NObsr-52466.	Positions instrument under test
BASE, tripod: u/w Natl Elec Mach optical system; CRS; equilateral triangular shape; 24" lg x 20-3/4" wd x 1/8" thk; three 5/16" diam holes on bisector of angles 8" from intersection of bisectors; nine #6-32 thd holes on 13/16" rad spaced 120 degrees apart 10-49/64" from intersection of bisectors; apex of each angle of base rounded on 1-35/64" rad; Natl Elec Mach dwg #C-9836; Navy contract NObsr 52466.	Supports tripod legs
BRACE, chamber support platform: "L" shape; CRS, Navy gray 52E4 type "C"; 50" lg x 1-1/2" wd x 1-1/2" thk o/a; each end bent 60 degrees 45 minutes, equipped w/1-1/32" lg x 9/32" wd rounded slot 1/4" from end and 3/4" from inside edge to receive two #1/4-20 x 1/2" lg hex bolts w/1/4" ID lock washer; two 1/8" thk braces required, mtd w/angle outside; u/w Natl Elec Mach chamber support platform; Natl Elec Mach dwg #C-9833; Navy contract NObsr-52466.	Supports chamber-support platform

TABLE 6-2. REPLACEABLE PARTS LIST (Continued)

NAME OF PART AND DESCRIPTION	FUNCTION
CHAMBER, radiation source: container of radiation source; u/w Natl Elec Mach chamber support platform; sub-assembly consisting of radioactive cobalt, radiation source capsule, flexible cable, and safety plug; tubular shape; 16" lg x 12-1/2" wd x 13-1/2" h o/a, three 13/32" diam holes and three 5/16" diam holes spaced alternately 60 degrees apart on 11-5/8" diam of bottom plate for mtg on support platform; engraved name plate mtd opposite chamber aperture; Natl Elec Mach dwg #AH-9865; Navy contract NObsr-52466.	Houses source of radiation
CONTROL, attenuation: controls amount of radiation from source chamber; u/w Natl Elec Mach chamber support platform and radiation source chamber; sub-assembly consisting of handle, rod, positioning control stop, attenuation plug arm, attenuation plug, and bearings; 57" lg x 19-3/16" wd x 19-3/16" h o/a; mtd on chamber support platform by twelve #10-32 mach screws; Natl Elec Mach dwg #AH-9865; Navy contract NObsr-52466.	Radiation control
CONTROL, elevation: for raising and lowering positioning carriage platform; u/w Natl Elec Mach chamber support platform and radiation-source chamber; sub-assembly consisting shield, collar flange, and crank; rectangular shape; 35-1/4" h x 12" lg x 8" wd o/a; mtd on dolly by four #8-32 x 5/8" lg Fil H mach screws through flanged base of tube, top plate mtd on tube w/four #8-32 x 1/2" lg Fil H mach screws; Natl Elec Mach dwg #AD-9528-C Navy contract NObsr-52466.	Controls vertical movement of positioning carriage platform
DOLLY: platform; three brass wheels w/solid, grooved bakelite tires and steel shafts; aluminum body; sq shape; 14-1/4" lg x 16-1/4" wd x 4-11/16" h o/a; three grooved aluminum guides prevent tipping, brake w/foot pedal and pointer prevents slipping; u/w Natl Elec Mach track to carry positioning carriage platform; Natl Elec Mach dwg #AD-9528-C; Navy contract NObsr-52466.	Supports positioning carriage platform
HEAD, tripod: positions height and panoramic setting of telescope; u/w Natl Elec Mach tripod and telescope; sub-assembly consisting of pan head and height control head; cylindrical shape; 12" h x 3-1/4" diam o/a; three 29/32" diam x 3/4" deep holes spaced 120 degrees apart in bottom of height control head to receive tripod legs; pan head purchased from Quick Set Inc., Chicago 22, Illinois, catalogue number 1661; Natl Elec Mach dwg #AC-9580-A; Navy contract NObsr-52466.	Controls height and panoramic setting of telescope
LEG, chamber support platform: u/w Natl Elec Mach chamber support platform; consists of leg and two flanges; med carbon steel; cylindrical shape; 3-1/2" diam x 42-1/8" lg o/a; three 9/32" diam holes spaced 120 degrees apart on 1-15/32" rad on flanges for mtg leg w/#1/4-20 x 3/4" lg hex bolt; four legs required, ea leg #11 BWG x 1-3/4" OD seamless tubing; Natl Elec Mach dwg #AB-9885; Navy contract NObsr-52466.	Supports chamber-support platform
LEG, positioning carriage: u/w Natl Elec Mach positioning carriage platform and dolly; consists of rod, two tubes, and two plates; aluminum; cylindrical shape; 2" diam x 28-7/8" lg o/a; three 3/16" diam holes spaced 120 degrees apart on a 3/4" rad on plates for mtg leg w/#8-32 x 5/16" lg RH mach screws; four legs required; 3/4" diam rod; Natl Elec Mach dwg #AA-9488-C; Navy contract NObsr-52466.	Supports positioning carriage platform
LEG, tripod: supports tripod head; u/w Natl Elec Mach tripod head and base; consists of leg and plate; aluminum; cylindrical shape; 2-1/8" diam x 54-1/8" lg o/a; three 5/32" diam holes spaced 120 degrees apart on a 13/16" rad on plate for mtg leg w/#6-32 x 1/4" lg RH mach screws; three legs required; ea leg 7/8" OD x .745" ID tubing; Natl Elec Mach dwg #AA-9578; Navy contract NObsr-52466.	Supports tripod head
MIRROR: glass, 5" diam; non-magnifying; 2" lg back plate; #1/4-20 x 1/4" thk brass hex nut brazed to plate; u/w Natl Elec Mach optical system on positioning platform; Natl Elec Mach dwg #AA-9504-A; Navy contract NObsr-52466.	Provides view of instrument under test
PLATE, base: chamber support base; u/w Natl Elec Mach chamber support platform legs and braces; med carbon steel, Navy gray 52E4 type "C"; sq shape; 25" sq x 3/8" thk o/a; four sets of three holes drilled and tapped for #1/4-28 x 1/4" lg bolts spaced 120 degrees apart on 1-15/32" rad ctr 2-1/2" from each edge for mtg legs, six #1/4-20 x 1/4" d tapped holes for mtg braces and crosstie; welded platform plates; Natl Elec Mach dwg #AC-9832-A; Navy contract NObsr-52466.	Supports chamber-support platform legs and braces
PLATFORM, chamber support: u/w Natl Elec Mach radiation-source chamber; sub-assembly consisting of frame, top plate, flexible-cable housing, control box, and sensitive switch; aluminum; Navy gray 52E4 type "C"; rectangular shape; 45" lg x 16" wd x 5-1/8" h o/a; four sets of three holes tapped through for #1/4-28 x 1/4" lg bolts spaced 120 degrees apart on 1-15/32" rad for mtg legs, four 9/32" diam csk holes for #10-32 x 3/4" lg Fil H mach screws for mtg braces; engraved brass plate mtd on plate for radiation control positions; sensitive switch purchased from Micro Sw catalogue number V3-1, control box purchased from Teleflex, Inc. part number C-6838-3; Natl Elec Mach dwg #AH-9865; Navy contract NObsr-52466.	Supports radiation-source chamber and controls

TABLE 6-2. REPLACEABLE PARTS LIST (Continued)

NAME OF PART AND DESCRIPTION	FUNCTION
PLATFORM, positioning carriage: to position instruments under test; u/w Natl Elec Mach x- and y-positioning bars, mirror support, and dolly legs; aluminum; black anodized finish; rectangular shape; 17" lg x 14" wd x 1/2" thk o/a; four 9/32" diam csk holes on 1-5/8" rad on ctr line 7" from edge for mtg w/#1/4-20 x 1/4" lg Fil H mach screws; inch scale engraved on periphery of platform; 12" lg x 9/32" wd slot 1" from edge for mtg mirror support; Natl Elec Mach dwg #D-9527-C and dwg #D-9548-B; Navy contract NObsr-52466.	Positions instrument under test
SUPPORT, mirror: u w Natl Elec Mach positioning carriage platform; sub-assembly consisting of knob, rods, base, and clamp; 19-3/8" h x 17-1/8" lg x 6-1/4" wd o a; mtd on positioning platform slot by base and knob; clamp purchased from Fisher Scientific, catalogue number 1540; rods 1/2" diam and 9/16" diam; base 1-1/2" h x 1-7/16" diam, drilled 37 64" diam x 5 8" d on top to receive 9/16" diam rod, and tapped 1/4 x 9/16" d on bottom for knob; Natl Elec Mach dwg #AD-9534-B; Navy contract NObsr-52466.	Mirror support
TELESCOPE: terrestrial type; one draw tube; 1-5/16" diam o/a; brass draw tube, black crackle finish; focus control, holder for mtg on pan head, and lens cover purchased from Gaertner Scient number M-522 w/number M-239 eyepiece and number M-239-250 adaptor; Natl Elec Mach dwg #AC-9580-A; Navy contract NObsr-52466.	Observation of instrument under test
TRACK, carriage: to position dolly and platform; u/w Natl Elec Mach dolly; sub-assembly consisting of rails, crossties, guide, stops, and scale; rectangular shape; 21' lg x 17-1/2" wd x 5-1 2" h o a; mtd to chamber support base by #3/8-16 x 7/8" lg hex head bolts; four track sections mtd together at crossties by #3 8-16 x 7/8" lg hex head bolts; stops mtd on end of first and last sections by #8-32 x 1/2" lg Fil H mach screws; 1/2" sq x 60" lg guide mtd inside each rail by #10-32 x 3 4" lg Fil H mach screws; cm scale mdt outside each rail on 3/4" h x 3/4" wd x 60" lg angle by #6-32 x 3/8" lg Fil H mach screws, scale purchased from K & E Co., type Stevens wyteface "A"; Natl Elec Mach dwg #C-9396-C, dwg #AD-9496-D, and dwg #AD-9873; Navy contract NObsr-52466.	Dolly positioning

TABLE 6-3. LIST OF MANUFACTURERS

Abbrev.	*Mfr. Prefix*	*Name*	*Address*
Fisher Scientific		Fisher Scientific Co.	Pittsburgh, Pa.
Gaertner Scient		Gaertner Scientific Corp., The	Chicago 14, Ill.
K&E Co	CBIO	Keuffel & Esser Co.	Hoboken, N. J.
Micro Sw	CMU	Micro Switch Corp.	Freeport, Ill.
Natl Elec Mach	CN	National Electric Machine Shop, Inc.	Silver Spring, Md.
		Quick Set., Inc.	Chicago 22, Ill.
		Teleflex, Inc.	North Wales, Pa.

DEPARTMENT OF THE ARMY
HEADQUARTERS, US ARMY COMMUNICATIONS-ELECTRONICS COMMAND
AND FORT MONMOUTH
FORT MONMOUTH, NEW JERSEY 07703-5000

REPLY TO
ATTENTION OF

AMSEL-SF-MR

6 May 1986

MEMORANDUM FOR RECORD

SUBJECT: Requirements of U.S. Nuclear Regulatory Commission (NRC) License for the AN/UDM-1A Radiac Calibrator Set and Title 10, Chapter 1, Code of Federal Regulations, Parts 19, 20 and 21 (10 CFR Parts 19, 20 and 21)

1. The following information is provided to all users of the AN/UDM-1A Radiac Calibrator Set, thereby satisfying the radiation protection requirements set forth in 10 CFR Parts 19, 20 and 21:

a. Specific instructions on NRC license/regulatory requirements, duties of the Radiation Protection Officer, emergency situations, operating and maintenance instructions, as described in TM 11-6665-217-15.

b. Form NRC-3, Notice to Employees, for required posting wherever the calibrator set will be used and/or stored (enclosure 1).

c. Section 206 of the Energy Reorganization Act of 1974 for required posting wherever the calibrator set will be used and/or stored (enclosure 2).

d. As stipulated in 10 CFR Part 21, report of radiac calibrator set defects and noncompliance, as outlined in Section 206 of the Energy Reorganization Act of 1974, should be reported through your appropriate radiological command channels to the U.S. Army Communications-Electronics Command (CECOM) Safety Office. Notification shall be made within 24 hours following the identification of defects or noncompliance.

2. In addition, users may request further information relating to the NRC license, license conditions, documents incorporated into the license by reference, and amendments thereto, from Commander, U.S. Army Communications-Electronics Command, ATTN: AMSEL-SF-MR, Fort Monmouth, New Jersey 07703-5024. This is in compliance to paragraph 19.11b of 10 CFR Part 19. The CECOM Safety Office may be contacted by telephone on Autovon 995-4427 for this purpose.

AMSEL-SF-MR 6 May 1986

SUBJECT: Requirements of U.S. Nuclear Regulatory Commission (NRC) License for the AN/UDM-1A Radiac Calibrator Set and Title 10, Chapter 1, Code of Federal Regulations, Parts 19, 20 and 21 (10 CFR Parts 19, 20 and 21)

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CF: Users of the AN/UDM-1A Radiac Calibrator Set

TM 11-6665-217-15

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

ORGANIZATIONAL, DS, GS, AND DEPOT MAINTENANCE MANUAL

RADIAC CALIBRATOR SET AN/UDM-1A

HEADQUARTERS, DEPARTMENT OF THE ARMY
AUGUST 1967

Encl 2

*TM 11-6665-217-15

TECHNICAL MANUAL)
)
NO. 11-6665-217-15)

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., 21 July 1967

RADIAC CALIBRATOR SET AN/UDM-1A

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*This technical manual supersedes TB 11-6665-217-12/1, 5 May 1965.

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A-1. SCOPE

a. This manual describes Radiac Calibrator Set AN/UDM-1A and covers its installation, operation, and maintenance. It includes operation under usual conditions and cleaning and inspection of the equipment.

b. Official nomenclature followed by (*) is used to indicate all models of the equipment items covered in this manual. Thus, Radiac Set AN/PDR-27(*) represents Radiac Set AN/PDR-27A, AN/PDR-27C, AN/PDR-27E, AN/PDR-27G, AN/PDR-27J, AN/PDR-27L, AN/PDR-27P, AN/PDR-27Q, and AN/PDR-27R.

A-2. INDEXES OF PUBLICATIONS

a. DA PAM 310-4. Refer to DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment. Department of the Army Pamphlet No. 310-4 is a current index of technical manuals, technical bulletins, supply manuals (types 7, 8, and 9), supply bulletins, and lubrication orders that are available through publications supply channels. The index lists the individual parts (-10, -20, -35P, etc) and the latest changes to and revisions of each equipment publication.

b. DA PAM 310-7. Refer to DA Pam 310-7 to determine whether there are Modification Work Orders (MWO's) pertaining to the equipment. Department of the Army Pamphlet No. 310-7 lists all authorized Department of the Army modification work orders, identifying the type, model, series, and Federal stock number of the item to be modified; number, date, and classification of the MWO; category of maintenance authorized to perform the modification; and the man-hours required to apply the modification to each item.

A-3. FORMS AND RECORDS

a. REPORTS OF MAINTENANCE AND UNSATISFACTORY EQUIPMENT. Use equipment forms and records in accordance with instructions in TM 38-750.

b. REPORT OF DAMAGED OR IMPROPER SHIPMENT. Fill out and forward DD Form 6 (Report of Damaged or Improper Shipment) as prescribed in AR 700-58 (Army), NAVSUP Publication 378 (Navy), and AFR 71-4 (Air Force).

c. REPORTING OF EQUIPMENT MANUAL IMPROVEMENTS. Report of errors, omissions, and recommendations for improving this equipment manual by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to DA Publications) and forwarded direct to Commanding General, U. S. Army Electronics Command, ATTN: AMSEL-MR-NMP-AD, Fort Monmouth, New Jersey 07703.

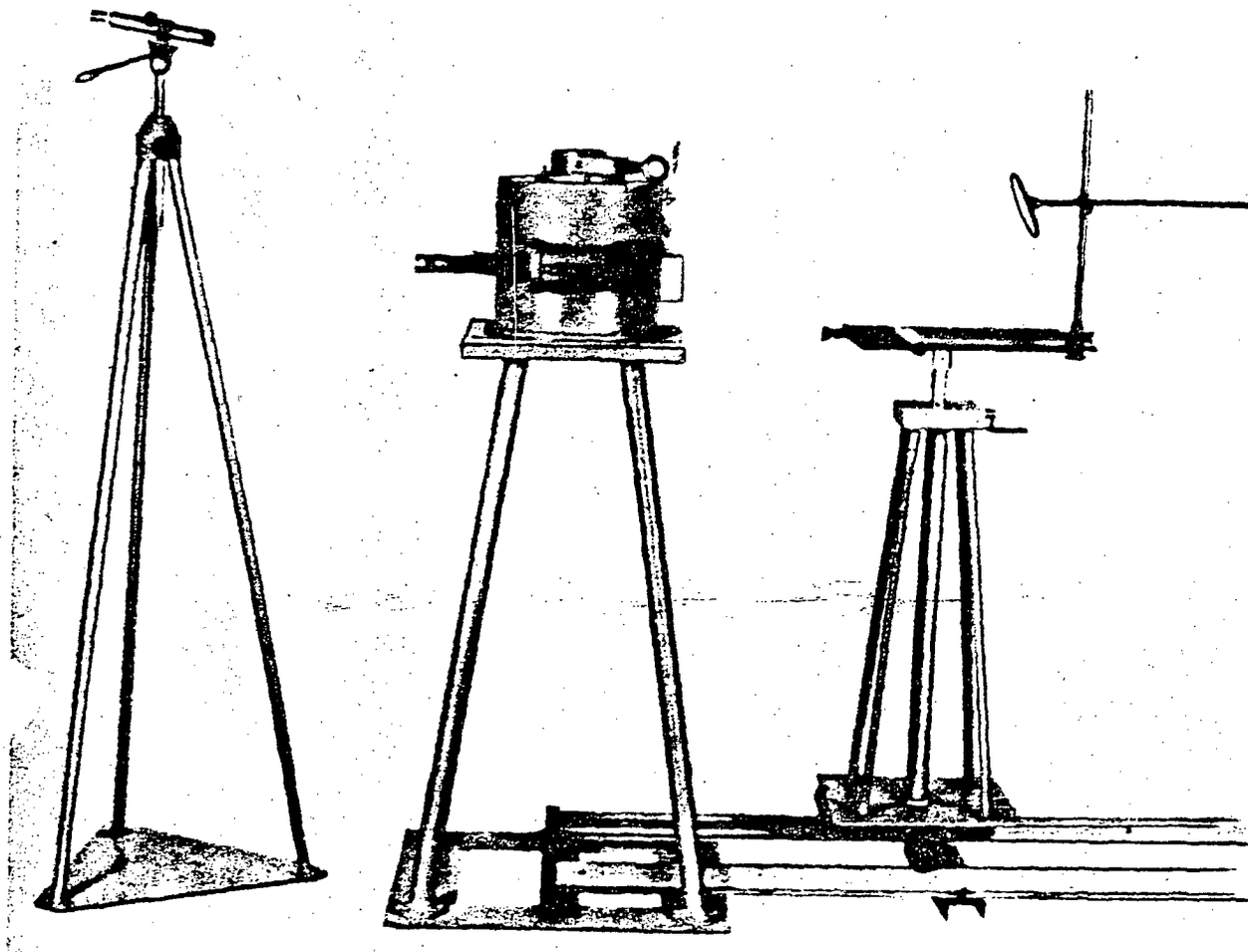


Figure 1-1. Radiac Calibrator Set, AN/UDM-1A

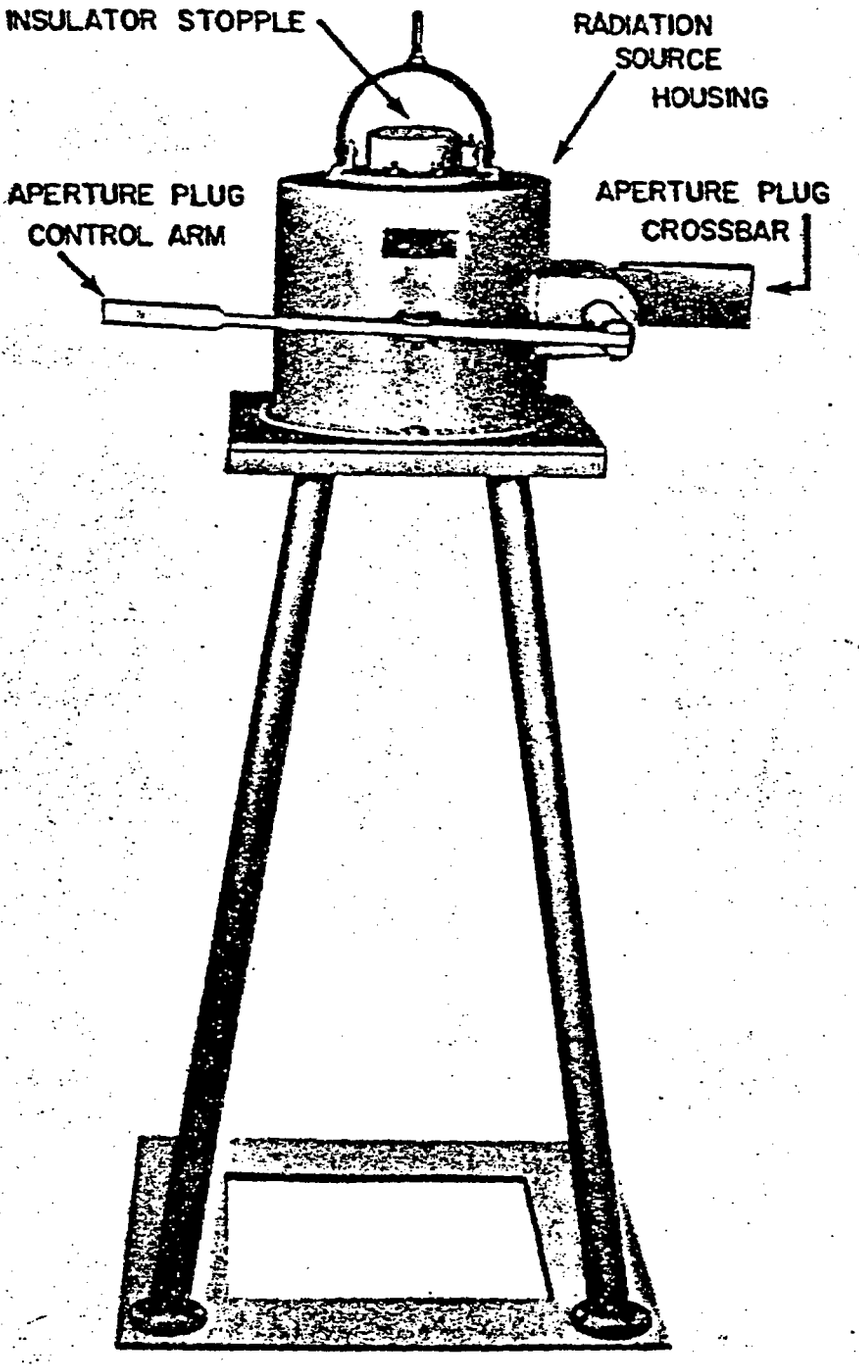


Figure 1-2. Radiation-Source Chamber and Stand

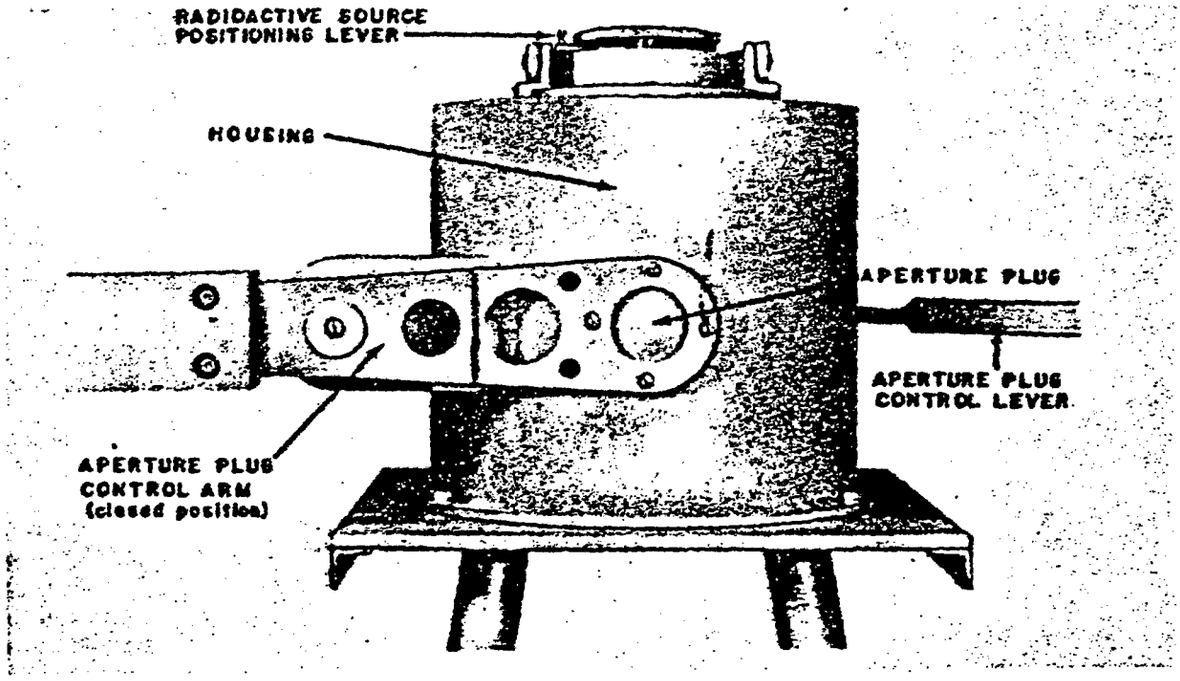


Figure 1-3. Radiation-Source Housing, Aperture Closed

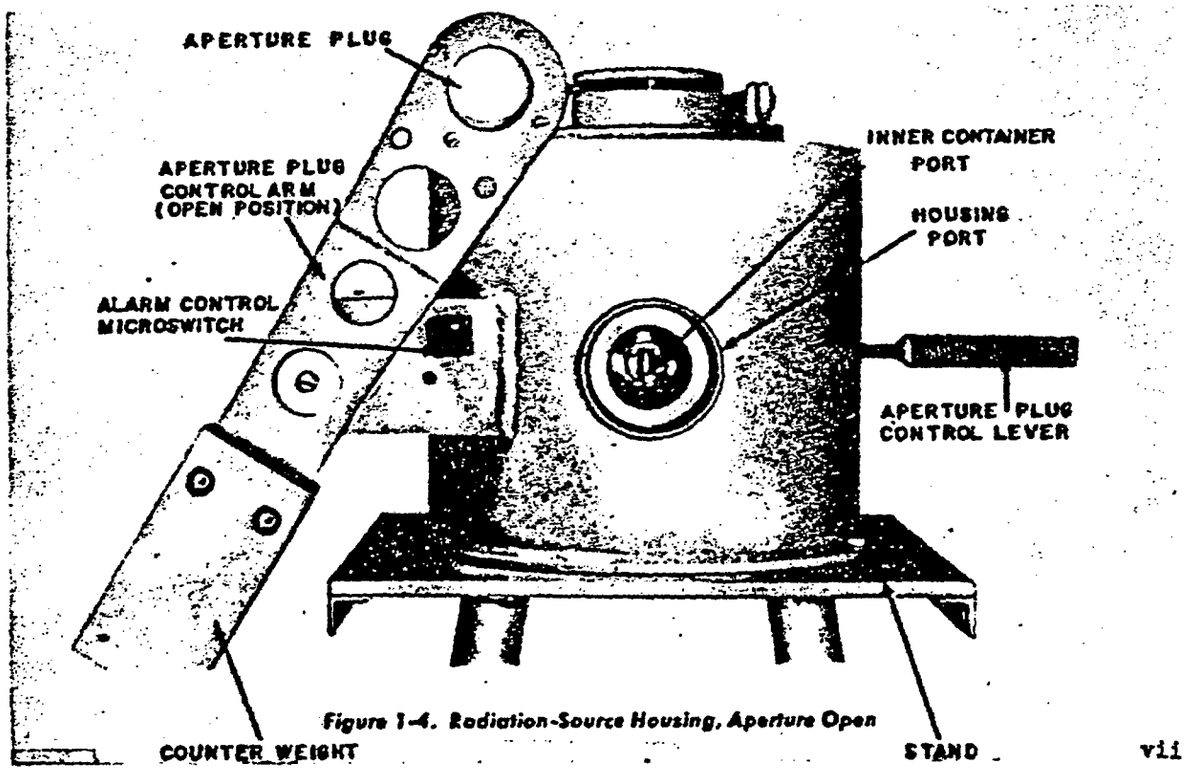


Figure 1-4. Radiation-Source Housing, Aperture Open

SECTION 1
GENERAL DESCRIPTION

1-1. PURPOSE AND FUNCTION OF EQUIPMENT

The Radiac Calibrator AN/UDM-1A, shown in Figure 1-1, consists of three main units: the lead-lined Radiation Source Housing, and the Telescope and Mirror components comprising the Optical System. The three interdependent units, in turn, function as a single instrument.

Generally, the Radiac Calibrator is used to house a specific quantity of radioactive material, its radiation being emitted as a controlled beam of known intensity which is used as a standard in checking and calibrating radiac instruments. The process consists of placing a known mass of a radioactive substance a known distance from the radiac instrument which registers the pre-determined intensity of (mainly) gamma rays emitted in a known time interval.

1-2. DESCRIPTION OF MAJOR UNITS

a. RADIATION SOURCE HOUSING.—This unit, shown in Figure 1-2, is a lead-packed steel container with an Aperture through its side wall for emitting the radioactive beam. A larger cavity is located in the top of the Housing through which is lowered the radioactive material and into which is also set the lead-packed Insulator Stopple containing the Radioactive Source Control Levers Assembly. The Aperture Plug Control Arm is affixed to the side of the Housing; a forward and backward movement of the handle serves to plug and unplug the Aperture at the front of the Housing and also operates a microswitch warning system. See Figures 1-3 and 1-4. The Housing and its controls are firmly mounted on a non-collapsible metal stand, Figure 1-2.

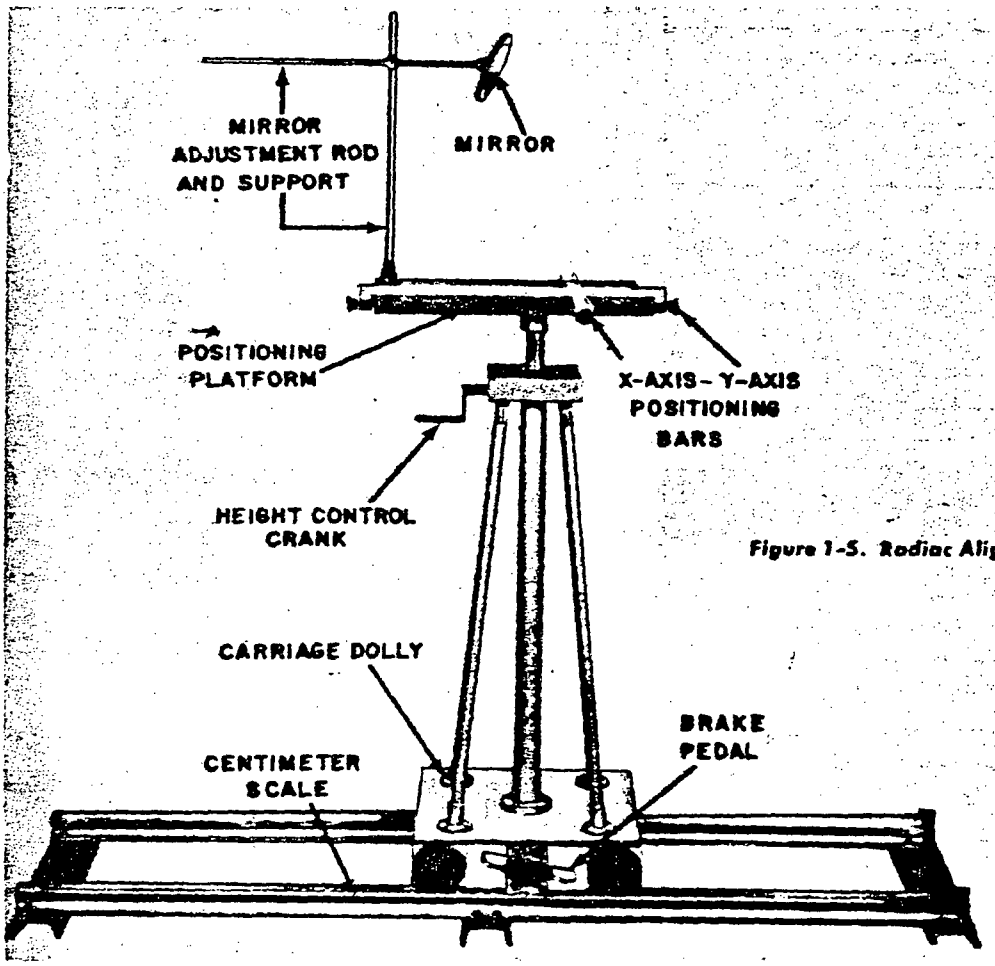


Figure 1-5. Radiac Alignment Stand

b. RADIAC ALIGNMENT STAND.—This component, see Figure 1-5, positions the radiac instrument to be checked and calibrated in front of the Radiation Source Housing and aligns it in the path of the radioactive beam. The Alignment Stand is mounted on a three-wheeled carriage which travels on a double rail and is locked in position by means of the Brake Pedal. A scale, calibrated in centimeters, is attached to one side of the rail on all rail sections and is used in positioning the Alignment Stand Carriage the correct distance from the radioactive source material. One end of the track is attached to the base-plate of the Radiac Source Housing stand so that the zero mark on the scale is directly beneath the radioactive source in the Housing when the source is in the "open" position. The carriage is aligned on the scale by means of the Pointer directly beneath the Brake Pedal, see Figure 1-6. Attached to the top of the stand is a flat metal table which may be raised and lowered by means of the Height Control Crank. The surface of the table is ruled and calibrated so that, with the aid of the Positioning Bars, variously-sized radiac instruments may be aligned accurately. The mirror suspended above the Alignment Table is adjusted to reflect back to the Optical Viewing Stand the image of the meter dial on the radiac instrument. A second mirror is used when the meter is in an awkward position.

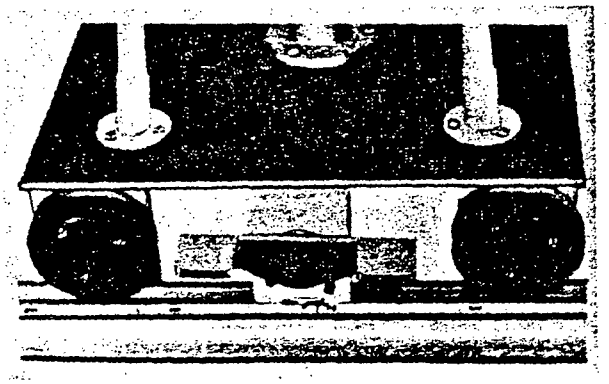


Figure 1-6. Detail of Carriage Locking Device and Calibrating Scale

c. OPTICAL VIEWING STAND.—A telescope and non-collapsible tripod, Figure 1-7, comprise the Optical Viewing System for observation of the meter dial on the radiac instrument from an accepted safe position during the calibration procedure. Manual adjustments such as the height and panhead controls are provided for raising, lowering and directing the telescope toward the mirror. The telescope has an adjustable focusing control knob.

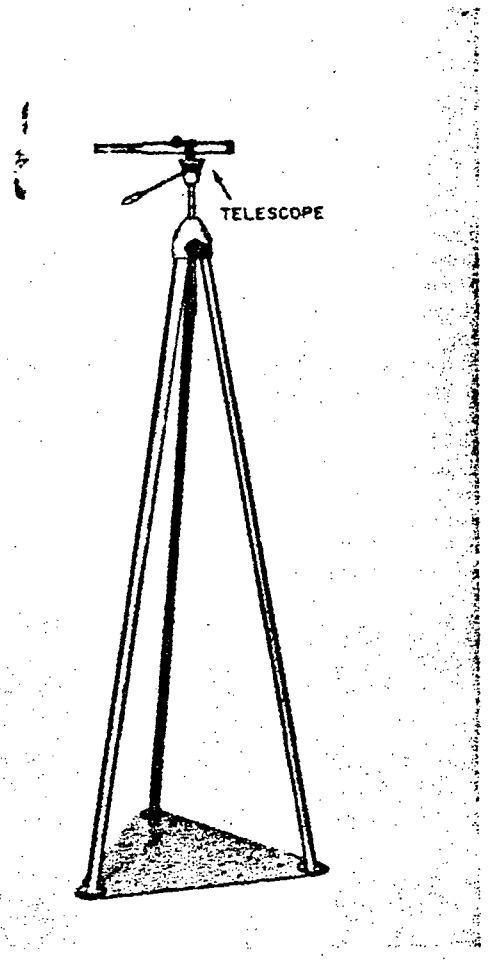


Figure 1-7. Optical Viewing Stand

1-3. REFERENCE DATA

a. *Number of Packages Per Complete Shipment of Equipment.*—4 boxes.

b. *Total Cubical Contents.*—37.4 cu. ft.

c. *Total Weight.*—1,252 lbs.

d. *Radiation Source.*—Radioactive Isotope of Cesium (C_s 137).

1. Type—Mainly gamma rays.

2. Initial Rate of Radioactivity—Approximately 120 curies.

3. Half Life—30.4 years.

e. *Equipment Lists.*—Table 1-1 lists the equipment supplied.

f. *Shipping Data.*—Table 1-2 gives shipping data for equipment.

1-4. EQUIPMENT REQUIRED BUT NOT SUPPLIED

Alarm systems, consisting of lights, buzzers or bells and a source of power, should be used to warn operating personnel when the equipment is in operation.

TABLE 1-1. EQUIPMENT SUPPLIED

Quantity Per Equipment	Name of Unit	Navy Type Designation	Height	Width	Depth	Volume	Weight
1	RADIAC CALIBRATOR Consisting of:	AN/UDM-1A					
4	Radiac Alignment Stand Tracks		4	17½	20 ft. (Total)	.81	120
1	Radiac Alignment Stand		40	16½	14½	5.54	35
1	Optical Viewing Stand		73	19	19	15.25	16
1	Radiation Source Housing & Stand		56	25	25	20.	600
6	Radiac Alignment Stand tracks (U. S. Nuclear)		4	17-1/2	30 ft (Total)	1.2	180
1	Technical Manual TM 11-6665-217-15	NAVSHIPS 93204					
1	Operator Instruction Chart		7-3/4	5-3/4			

Unless otherwise stated, Dimensions are in inches, Volume in cubic feet, Weight in pounds.

TABLE 1-2. SHIPPING DATA

Shipping Container No.	Contents	Designation	Over-all Dimensions			Volume	Weight
			Height	Width	Depth		
1	Radiation Source Housing		31⅝	30	30	16.2	800
2	Radiac Alignment Stand		19	16	41	7.2	100
3	Radiac Alignment Stand Tracks		12½	20	68	9.8	200
4	Optical Viewing Stand, and Radiation-Source Housing Stand		5¾	27	58	5.2	152

Unless otherwise stated, Dimensions are in inches, Volume in cubic feet, Weight in pounds.

SECTION 2
THEORY OF OPERATION

RADIOACTIVITY

Radioactivity is a nuclear process resulting in the emission of a charged particle from the nucleus of an atom. These atoms emit (radiate) specific types of radiations in various quantities and intensities, depending on the nature of the atom and element from which the emission occurs. These radiations are emitted as a natural phenomena.

Some elements are naturally radioactive, while others are made radioactive by artificial means; one such method is the bombardment of uranium by neutrons and this is accomplished in a nuclear reactor. As a result of this bombardment some of the uranium atoms fission or split. Each fission produces two radioactive isotopes of elements ranging in atomic numbers from 34 to 74. These fission products are periodically removed from the nuclear reactor, chemically separated, and made available to qualified users.

One of these fission products, Cesium 137, is utilized by the Radiac Calibrator AN/UDM-1A. Approximately 120 curies of Cesium 137 is used in each instrument. A curie is a unit of radiation intensity, and is numerically equal to 3.7×10^{10} atomic disintegrations per second.

2-2. HALF-LIFE PERIOD

All radioactive elements are continuously disintegrating. The time required for the radioactivity of a given amount of an element to decay to one-half of its initial value is called the half-life of the material. The rate at which radioactive elements decay, however, varies with each element. Radium loses one-half its original value in approximately 1600 years, hence its half-life is said to be 1600 years. The half-life of Cs 137 is only 30.4 years. An important characteristic of radioactive elements is that they disintegrate in an exponential manner, as shown in Figure 2-1.

As an example, a particular radioactive element has a half-life of one year. Starting with 1 gram of the element, 0.5 gram will have disintegrated by the end of 1 year so that only 0.5 gram will remain. During the next year, one-half of this amount (0.25 gram) will disintegrate, leaving 0.25 gram. In each successive year the amount which disintegrates is less than in the preceding year, although it is always the same fraction (½) of the amount present at the beginning of that particular year. If the weight, date of weighing, and half-life of the element is known, the quantity of a radioactive element remaining at any future date can be precisely calculated.

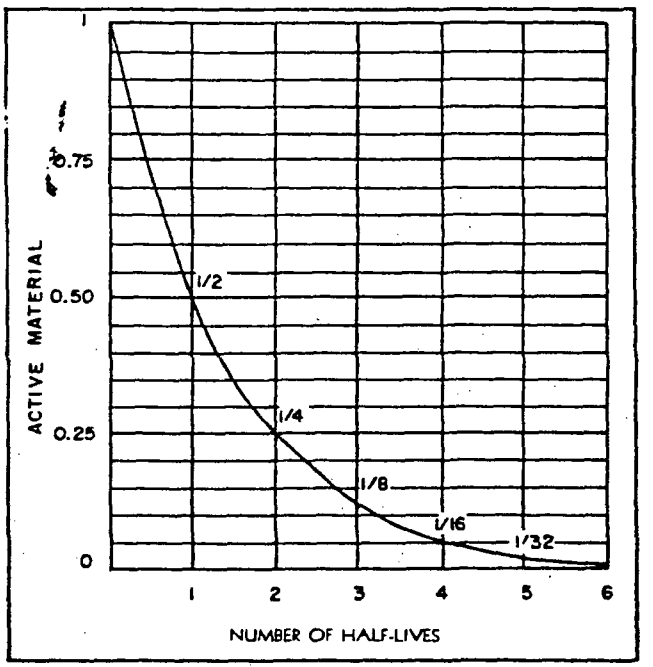


Figure 2-1. Half-Life Chart, Showing Exponential Decay Rate of Radioactive Materials

2-3. METHOD OF COMPENSATING FOR RADIOACTIVE DECAY

Since the radioactive material in the Radiation Source Housing becomes weaker as it ages, some means must be provided to compensate for this characteristic. This is accomplished by moving the radiac instrument under test closer to the source of radiation. The correct distance between the source and the Housing can be determined from a correction-factor table and positioning chart; Figures 2-2 and 2-3 are examples of such charts.

Note

The Bureau of Standards has calibrated the radiation emitting characteristics of each Radiac Calibrator instrument, and has prepared the correct tables and charts which accompany each instrument. The sample charts shown in Figures 2-2 and 2-3 are for illustration only and should not be used for actual calibrations.

The chart furnished with the Radiac Calibrator ›ws the initial radiation intensity versus distance, l gives the date the radiation was measured. With ; information, it is possible to determine at any e how far away the radiac instrument should be ced from the radioactive source in order to subject o radiation of known intensity during the test iod. Assume as an example that, on October 8, :2, a radiation value of 500 milliroentgens per r (500 mr/hr) is desired. The sample chart in ıre 2-2 indicates that the Alignment Stand should ɔlaced a certain number of centimeters from the ·oactive source. However, since the radioactive ·ce is 12 months old a correction factor formula (CF) must be applied as follows:

(Original Distance) XCF = Actual Distance

Therefore, to locate the Alignment Stand and radiac instrument in the 500 mr/hr area, the carriage should be moved to the computed position on the scale on the track. This places the radiac instrument the desired distance from the radioactive source. To face the radiation-sensing element within the radiac directly in the center of the aperture in the Radiation Source Housing, accurate horizontal and vertical positioning is accomplished on the Alignment Stand as explained in Section 4.

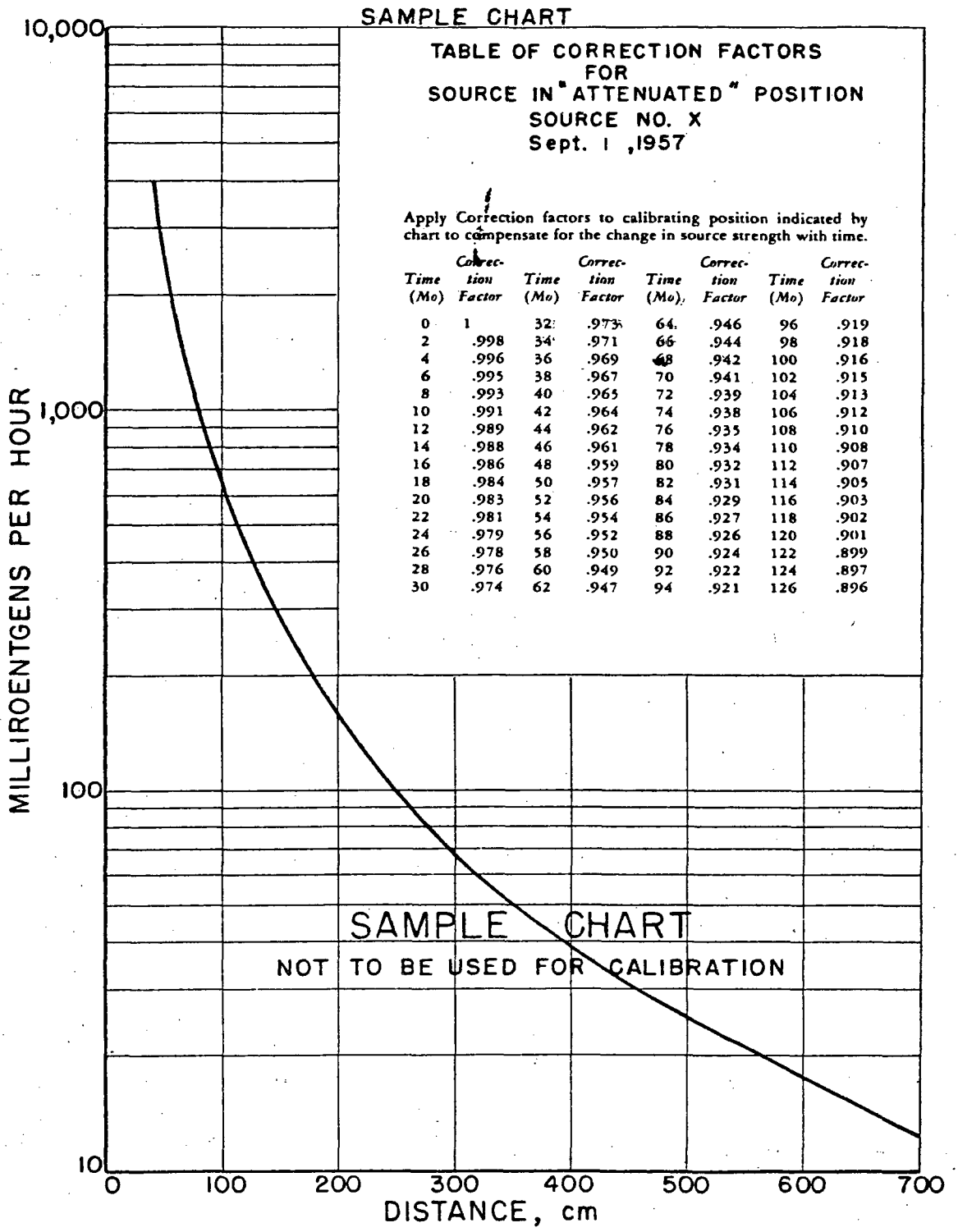


Figure 2-2. Sample Positioning Chart for Radiac Measurements with Radioactive Source in "Attenuated" Position

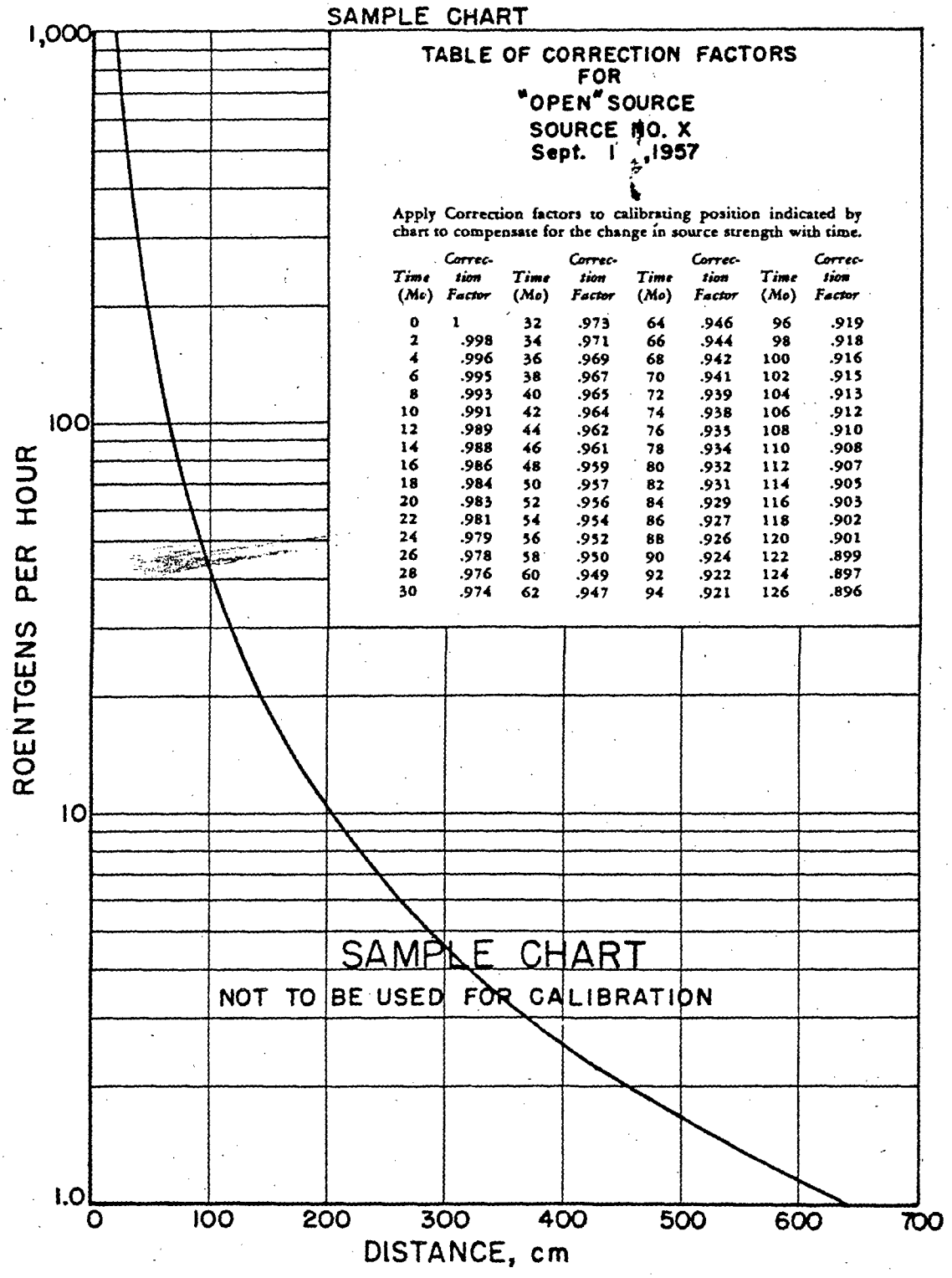


Figure 2-3. Sample Positioning Chart for Radiac Measurements with Radioactive Source in "Open" Position

SECTION 3
INSTALLATION

3-1. UNPACKING

The Radiac Calibrator AN/UDM-1A is packed in four wooden shipping boxes. To open boxes 2, 3 and 4, first cut the metal bands; then, using a nail puller, remove all nails from the top of each box. Remove shipping braces. Remove contents of each box and check against the enclosed packing list.

Box No. 1 has been specially designed to conform with the requirements of the Interstate Commerce Commission for shipping radioactive material. To unpack the Radiation Source Housing, first remove the painted screws along the top-edge of the crate and remove the top cover. Remove the screws and the four shipping brackets holding down the base of the Housing inside the case. The Housing is left on this wooden base until its metal stand is assembled. The parts of the crate should be reassembled and the crate stored for future use.

3-2. SPACE REQUIRED

The Radiac Calibrator AN/UDM-1A should be installed indoors, in an approved area approximately 25 by 40 feet which is free of dampness.

3-3. ASSEMBLY

a. RADIATION SOURCE HOUSING.—The Housing is shipped already mounted on its steel base-plate and should be mounted on its stand only after the four legs have been bolted to the square floor-plate, Figure 1-2.

All parts required for assembling the stand are packed in shipping box No. 4. To complete assembly of this component, proceed as follows:

(1) Bolt legs to floor-plate; toe-in top ends as in Figure 1-2.

(2) Set stand upright on floor-plate.

(3) Prepare to mount Radiation Source Housing.

The Housing is packed in shipping crate No. 1. Because of its weight, a hoisting system as a lifting fork or block-and-tackle capable of lifting 1000 pounds or more should be used to raise the Housing into position on the stand. The Housing should be moved with care so as not to strike the Aperture Plug Crossbar and Control Arm. To mount the Housing, proceed as follows:

(1) Remove attachments holding Housing to shipping crate.

(2) Slowly raise Housing by means of its Hoisting Handle.

(3) Suspend Housing over the stand, line-up holes under Housing with appropriate holes through flanges on top of legs; attach with bolts.

(4) Remove shipping bolt locking Aperture Plug Crossbar before attempting to manipulate Control Arm.

b. RADIAC ALIGNMENT STAND.—This stand, in shipping box No. 2, is shipped preassembled except for the calibrated Alignment Table; the mirror and its supports are packed in box No. 2.

(1) The Alignment Stand Carriage travels before the Radiation Source Housing on six 5-foot lengths of track joined together so that the scale on the side of the track runs in ascending numerical order. The first tie of the first track section is attached to the floor-plate of the Radiation Source Housing Stand; the last tie of the last track section is equipped with rail stops to prevent the Alignment Stand Carriage from rolling off the track. To complete assembly, proceed as follows:

(a) Lay track sections on floor in ascending numerical order as indicated by scale on side of each section.

(b) Bolt sections together, using the bolt holes provided in each end tie.

(c) Bolt notched tie of first section to floor-plate of Housing Stand.

(d) Level carriage track as required.

(2) After the Alignment Stand is set on the track, proceed as follows:

(a) Bolt alignment Table to flange on top of Height Control Column so that long slot in table is on same side as Height Control Crank.

(b) Place short Positioning (x-axis) Bar on table with outer vertical side of flange away from long slot; place long (y-axis) bar over short bar with its outer vertical flange facing same side as single wheel on carriage.

(c) Lock both Positioning Bars onto table by gently tightening knurled knobs on ends.

(d) Unscrew knob from flange-end of vertical Mirror Support Bar; place bolt through slot in top of table, screw on knob from underside of table and lock firmly.

(e) Screw mirror onto threaded end of second rod; attach to vertical rod on table by means of Clamp-Holder.

c. OPTICAL VIEWING STAND.—This component is packed partially assembled in shipping box No. 4. To complete the assembly, proceed as follows:

(1) Bolt legs to triangular floor-plate.

(2) Slide upper ends of legs into holes in tripod head, and tighten set-screws with Allen wrench to fasten legs to head.

(3) Insert pan-head shaft through hole in tripod head and tighten the Height Control Knob.

(4) Slide forward end of Telescope through metal clamp, tighten set-screws in clamp and fasten Telescope to pan-head by using the large thumb-screw in pan-head.

SECTION 4
OPERATION

4-1. GENERAL

When the Radiac Calibrator AN/UDM-1A is in operation, the radiation is emitted as a cone-shaped beam through the unplugged Aperture in the Radiation Source Housing and is mainly confined to a fan-shaped area as shown in Figure 4-1.

WARNING

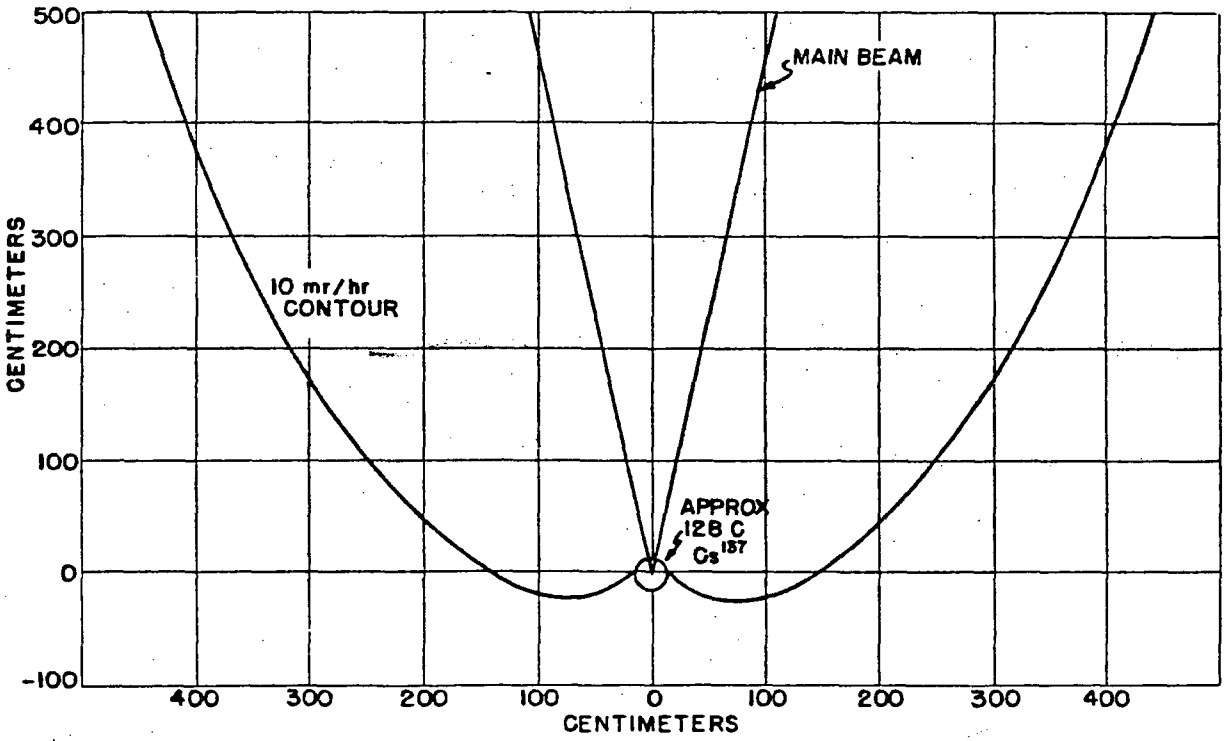
There is leakage radiation in all directions through the walls of the Housing and, therefore, after the components have been assembled the boundary line of the danger area, shown in Figure 4-1, should be prominently marked to deter personnel from entering this area while the unit is in operation.

Before the Radiac Calibrator is used to check and calibrate radiac instruments, the operator should become familiar with the operating and calibrating procedures pertaining to the radiac instrument to be tested. This information is found in the instruction book for each type of radiac device and should be available to the operator at all times.

Before a calibration test can be performed, the following adjustments must be made:

a. The radiac instrument must be correctly located on the calibrated Alignment Table on the Alignment Stand.

b. The Alignment Stand Carriage must be positioned on its track the correct distance from the radioactive source in the Radiation Source Housing.



Graph of main beam and 10 mr/hr contours for UDM-1A Calibrator with the source in the "open" position. The main beam contour was determined by the dimensions of the source and collimator cone. The 10 mr/hr contour was measured by means of an ionization chamber.

Figure 4-1. Radiation Pattern and Danger Area

c. The Optical System must be adjusted so that the radiac meter can be read by the operator from an accepted safe distance from the source of radiation.

WARNING

In order to make the following adjustments, it will be necessary to enter the danger area indicated in Figure 4-1. Before stepping in front of the Radiation Source Housing, the operator should check the alarm warning system and Housing controls to see that the Positioning Lever has been released so that the port in the Radioactive Source Container is positioned away from the Aperture in the Housing wall and locked in the attenuated position, and that the Aperture has been tightly plugged.

4-2. ALIGNING RADIAC INSTRUMENTS

Differences in size of the case, construction and location of inner components of various radiac instruments in use, requires that the x- and y-axis Positioning Bars and Height Control Column be adjusted differently for each individual unit aligned on the Radiac Alignment Stand. Table 4-1 lists the radiac instruments in use, and illustrates how each unit should be located on the calibrated table according to the accompanying numerical settings. The x-axis bar is shown vertically and the y-axis bar horizontally for all settings listed in Table 4-1 at the end of this section.

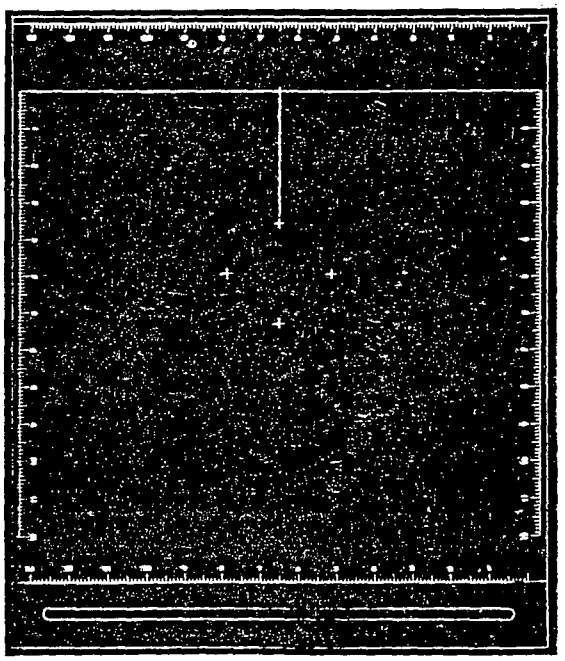


Figure 4-2. Top View of Alignment Table Showing Calibrated Rulings

4-3. POSITIONING ON ALIGNMENT TABLE

a. When checking a radiac unit that is already listed in Table 4-1, the operator should proceed as follows:

(1) Locate the appropriate aligning data for the radiac unit in Table 4-1.

(2) Position and lock the x- and y-axis bars on the Alignment Table (Figure 1-5) so that the vertical edges of the "L" shaped bars are set on the readings as given in Table 4-1.

(3) The radiac case (high range) or its removable probe (low range) is then set on the table inside and against the vertical edges of the Positioning Bars as shown in the related illustration.

(4) With the Height Control Crank, raise or lower the table to the appropriate reading on the calibrated Height Control Column as given in the book.

(5) The center of the aperture in the Radiation Source Housing should now be directly aligned with the center of the radiation sensing element inside the radiac case or probe, the high-range element within the case, or the low-range element in the removable probe as illustrated in Table 4-1.

b. When positioning radiac instruments not listed in Table 4-1, the alignment is determined as follows:

(1) Loosen and move x- and y-axis Positioning Bars to edges of Alignment Table.

(2) Note special marking at midpoint (6½ inches) on 13-inch scale nearest the Housing; see Figure 4-2. The radiation sensing element in the radiac instrument should be centered exactly on this 6½ inch marking and faced directly at the Radiation Source Housing.

(3) If the outside of the radiac case or its probe contain a marking locating the center of the radiation sensing element within, place marked area directly on 6½ inch point facing the Housing.

(4) If radiac case and probe do not contain a marking locating the inner radiation sensing element, obtain its location from the instruction book accompanying the radiac. Mark on case and place on 6½ inch marking on table.

(5) If the radiac instruction book does not locate the sensing element, remove inner assembly from its case, place on table facing Housing with radiation sensing element directly over 6½ inch marking (Figure 4-3). Align x- and y-axis Positioning Bars against the right and rear edges of the radiac, at the positions where the outside of the case would be if the inner assembly were placed back into its case.

(6) Take the inner-edge readings of the x- and y-axis bars and record them under their respective headings on the blank spaces provided for this purpose at the end of Table 4-1.

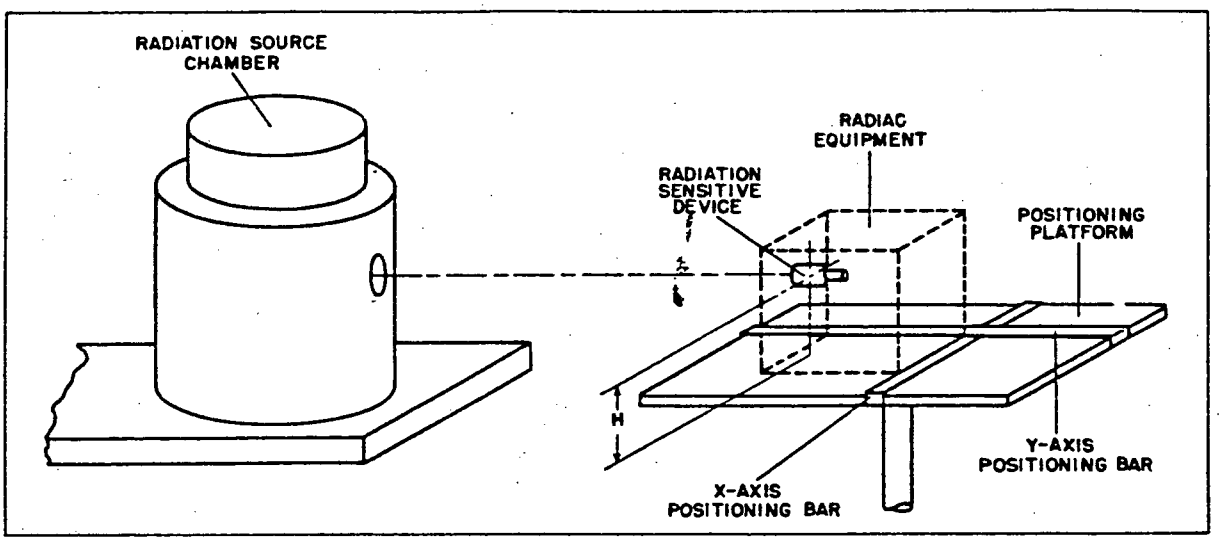


Figure 4-3. Phantom View of Radiac Equipment Showing Location of Radiation-Sensitive Device Relative to Postitioning Platform

4-4. POSITIONING ALIGNMENT STAND

The distance between the Radiac Alignment Stand and the radioactive source in the Housing will depend on the type of radiac instrument and the age of the radioactive material at the time the test and calibration is made. To insure more accurate calibration, the Alignment Stand Carriage should be located on the track at the distance where the radiation intensity produces a meter reading of approximately ⅔ or ¾ of full scale. For example, if the meter range of the radiac instrument under test is 0 to 50 mr/hr, the carriage should be moved to the location where the radiation intensity reads approximately 35 mr/hr on the meter. The approximate location of the carriage can be found on the positioning chart supplied with the Radiac Calibrator; however, since the radioactive material becomes weaker with age, a correction factor must be applied, as explained in Section 3, paragraph 3, when positioning the carriage.

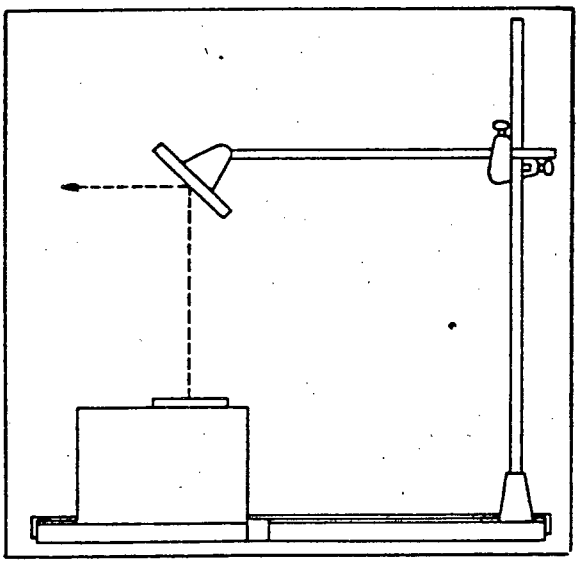
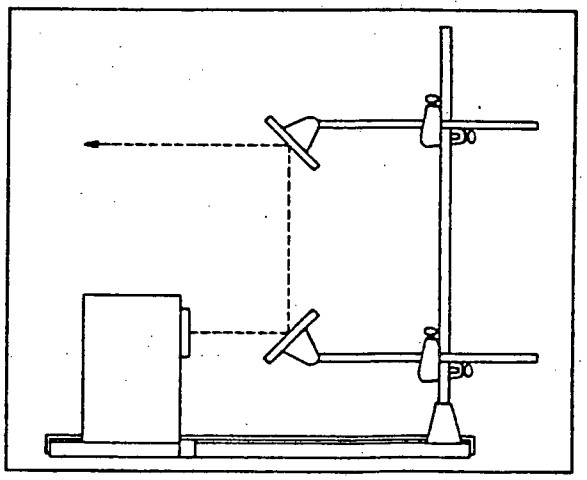


Figure 4-4. Location of Mirror for Radiac Equipment Having a Horizontal Meter Face



Having a Vertical Meter Face
Figure 4-5. Location of Mirrors for Radiac Equipment

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graph 4-5

4-5. ADJUSTING OPTICAL SYSTEMS

After the radiac instrument and Alignment Stand have been correctly positioned, the next step is to adjust the Optical System so that the operator can read the meter at an accepted safe distance behind the Radiation Source Housing.

a. This adjustment is accomplished as follows for radiac equipment having a horizontal meter dial:

(1) The radiac should be placed in an upright position on the Alignment Table with the meter facing upward.

(2) Adjust mirror to a 45° angle above and facing the meter scale, Figure 4-4.

(3) Adjust telescope to same height as mirror.

(4) Sighting over telescope, point it directly at the meter image in the mirror by means of the Pan-Head Control Arm, Figure 1-7. The telescope can be moved vertically and horizontally and locked in position by turning and tightening the Pan-Head Control Arm.

(5) Remove lens cap and sight through telescope, focus for sharpest image of meter.

b. Should the radiac be of the type, or positioned in such a manner that its meter is on the vertical side of the instrument, the Optical System should be adjusted as follows:

(1) Utilizing two mirrors (Figure 4-5), attach and adjust a lower mirror so that it faces the meter at a 45° angle and reflects the meter image to the upper mirror facing it at a 90° angle.

(2) Adjust and focus telescope as explained in steps a. (3) through a. (5) above.

4-6. CHECKING METER ACCURACY

After aligning the radiac on the Alignment Table, locating the Alignment Stand the correct distance from the radioactive source, and adjusting the Optical System, the response and accuracy of the radiac meter is then checked against a known intensity of radiation in the following manner:

a. The radiation danger area is first cleared of all personnel; the warning system should be operative.

b. Pull the left Spindle Release Lever, Figures 4-6 and 4-7, to release the locking pin of the spindle. Swing the Radioactive Source Positioning Lever from the "closed" position clockwise until it locks in the "open" position. This turns the port of the Radiation Source Container within the Housing so that it faces the aperture at the side of the Housing for "full intensity" calibrations. (See Figure 1-4 showing the plug removed and the ports in "open" position). Turning of the spindle from the "closed" position operates a micro-switch to put the warning system into effect.

c. Pull the Aperture Plug Control Arm away from the Housing to operate the mechanism which removes the plug from the Aperture, Figures 1-4 and 1-6. This operates a micro-switch and the warning system is in effect for this position. (The warning system should operate when either port is in the "open" position). For "attenuated source" (low intensity) calibrations, omit step (b) above.

d. Read radiac meter through the telescope.

e. To close the radioactive source, push the Aperture Plug Control Arm toward the Housing to replace the plug in the aperture. Pull the Spindle Release Lever at the right, Figure 4-7, and swing the Positioning Lever at the top of the Housing counterclockwise to the "closed" position until it locks in place. The warning system should stop operating if the radioactive source has been properly sealed.

f. If the radiac meter reading does not agree with the radiation intensity at that distance, refer to the instruments' instruction book for the proper adjustment proceedure. After making the proper adjustments, repeat the above steps, a. through e. for "open source" (full intensity) calibrations, or c. through e. for "attenuated" (low intensity) calibrations.

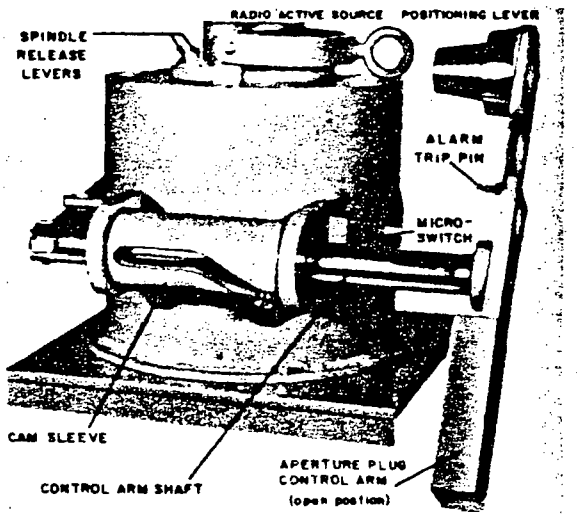


Figure 4-6. Aperture Plug Control Arm System and Cam Sleeve

4-7. ALARM CIRCUIT

Two single-pole, double-throw micro-switches are provided on the Radiation Source Housing, which serve to activate external alarm circuits for alerting personnel when the Radiac Calibrator is in operation. Each microswitch operates as follows:

a. Attached to the front of the Housing, directly behind the Aperture Plug Crossbar (see Figures 1-4 and 4-6), is the switch which activates an alarm when the Crossbar and Aperture Plug are removed beyond a certain distance. The switch operates by pressure from the Switch Trip Pin on the Crossbar.

b. Removal of the Lever Assembly Cover atop the Radiation Source Housing will expose the Lever Assembly and the other switch seated between the two Lock-and-Release Levers, (Figure 4-7). Pressure by the Switch Trip Pin on the Positioning Lever Spindle operates the switch.

WARNING

Before entering the danger area and removing the radiac instrument, be sure that the radioactive source material has been properly sealed off as indicated by the preceding instructions.

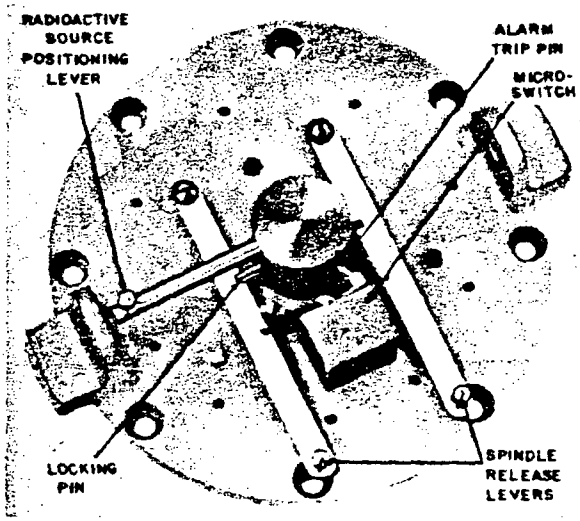


Figure 4-7. Radioactive Source Control Lever Assembly

4-8. MANIPULATING RADIOACTIVE SOURCE

Figure 4-7 illustrates the Lever Assembly (cover removed) mounted atop the Insulator Stopple; its function is to position the port in the Radiation Source Container directly in front or away from the Aperture. The Lever Assembly operates as follows (refer to Figure 4-7, Lever Assembly, and Figure 4-8, exploded view of Housing components):

a. The Radiation Source Container, located beneath the Insulator Stopple, is rotated by means of the Positioning Lever.

b. The Positioning Lever, in turn, is attached to the upper portion of the large Spindle atop the Insulator Stopple. Running from the bottom of the Spindle is the Positioning Rod which runs through the center of the Insulator Stopple, out the bottom and is inserted into the top of the Radiation Source Container. Rotating the Positioning Lever will rotate the Container located below the Stopple.

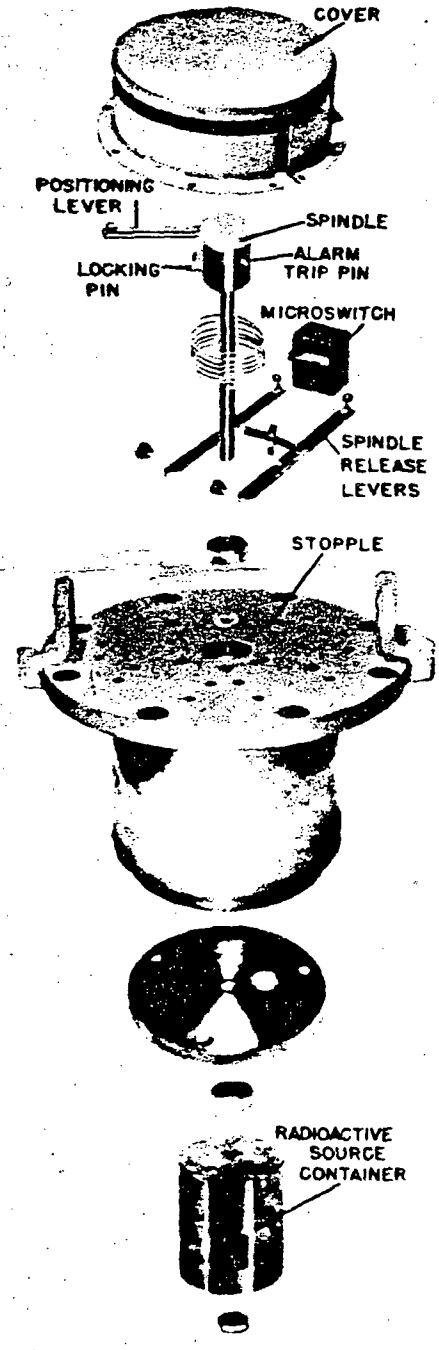


Figure 4-8. Exploded view of Housing Stopple Components

c. Attached to the lower portion of the Spindle is the Locking Pin. As the Spindle is rotated from one side towards the other, the Locking Pin depresses one of the spring-loaded Lock-and-Release Levers, snaps into the slot in the Lever and the Spindle is locked in that position. The Radiation Source Container below is turned towards or away from the Aperture, depending upon the locked positikn of the Spindle.

d. When the Spindle is rotated and locked in the position shown in Figure 4-7, a second and smaller Switch Trip Pin on the Spindle depresses the roller-lever-actuator on the micro-switch, which sets off the alarm system warning that the radiation is concentrated at the plugged Aperture, for calibrations in the "open" position by subsequent opening of the plug.

e. By moving the Lock-Release Lever, the Locking Pin will be released, the spring-loaded Spindle will return to the opposite side where the other Lock-Release Lever will lock the Spindle in that position. The port in the Radiation Source Container will now be facing away from the Aperture in the Housing. By moving the Lock-Release Lever and releasing the Spindle, then rotating the Spindle by means of the Positioning Lever, the port in the Radiation Source Container can be returned to the "open" position.

WARNING

The Lever Assembly Cover should be removed for maintenance purposes only after the radioactive material has first been safely positioned. The Insulator Stopple should never be removed without first advising the Bureau of Ships.

TABLE 4-1. POSITIONS OF X- AND Y-AXIS BARS, HEIGHT CONTROL, AND RADIAC EQUIPMENT

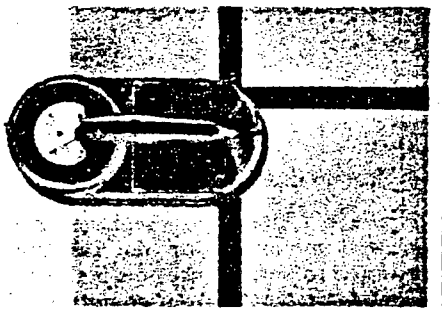
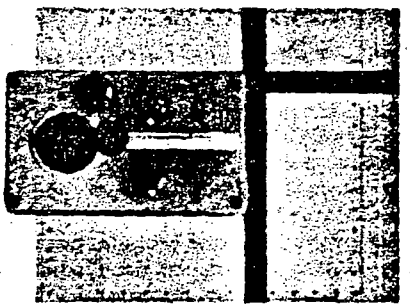
Equipment Type and Range	*X-Axis Bar*	*Y-Axis Bar*	*Height Control*	*Radiac Equipment or Probe Position*
IM-3/PD	7.9	4.3	3.5	
AN/PDR-T1B	7.6	3.6	5.0	

TABLE 4-1, CONT'D. POSITIONS OF X- AND Y-AXIS BARS, HEIGHT CONTROL, AND EQUIPMENT

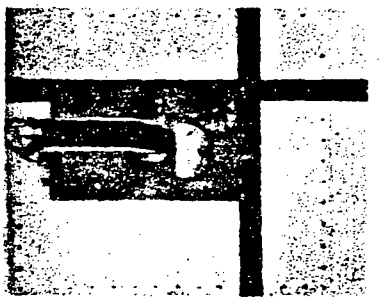
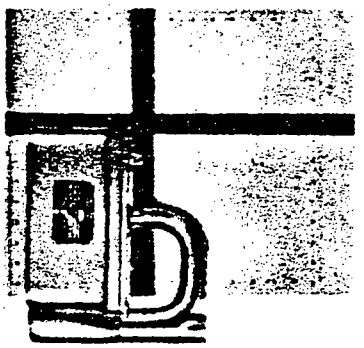
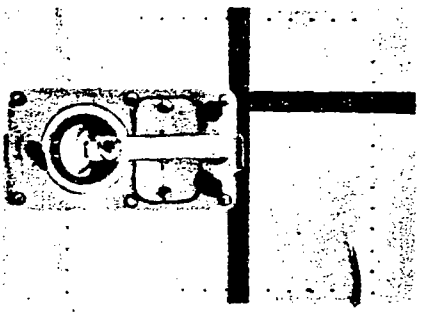
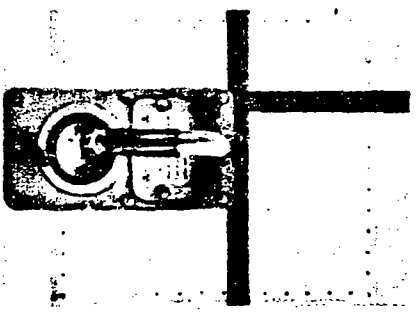
Equipment Type and Range	*X-Axis Bar*	*Y-Axis Bar*	*Height Control*	*Radiac Equipment or Probe Position*
IM-57/PDR-27 Low Range:	Center Probe Over Cross Lines			
IM-57/PDR-27 High Range:	4.5	5.0	4.2	
IM-68/PDR-18	8.6	4.4	6.0	
IM-68A/PDR-18	8.6	4.4	6.0	

TABLE 4-1, CONT'D. POSITIONS OF X- AND Y-AXIS BARS, HEIGHT CONTROL, AND EQUIPMENT

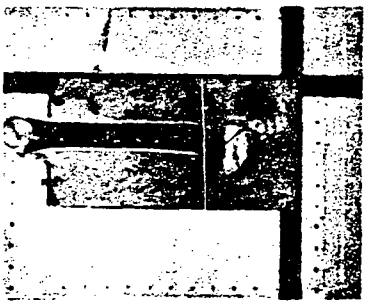
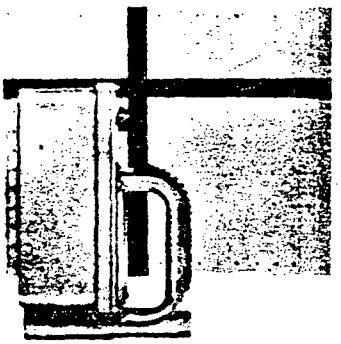
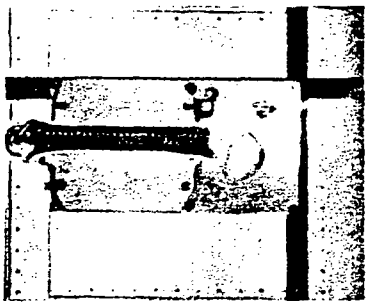
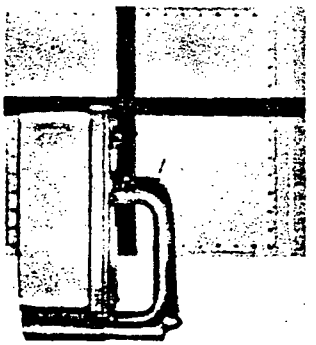
Equipment Type and Range	*X-Axis Bar*	*Y-Axis Bar*	*Height Control*	*Radiac Equipment or Probe Position*
IM-74/PDR-27C Low Range:	Center Probe Over Cross Lines			
High Range:	5.3	5.7	4.1	
IM-74A/PDR-27C Low Range:	Center Probe Over Cross Lines			
High Range:	5.3	5.7	4.1	

TABLE 4-1, CONT'D. POSITIONS OF X- AND Y-AXIS BARS, HEIGHT CONTROL, AND EQUIPMENT

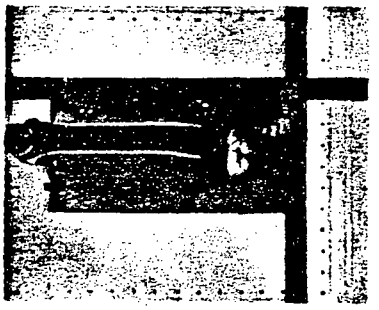
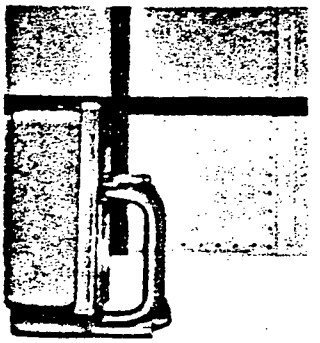
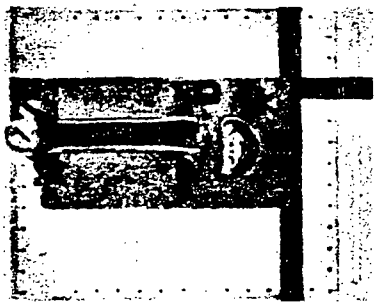
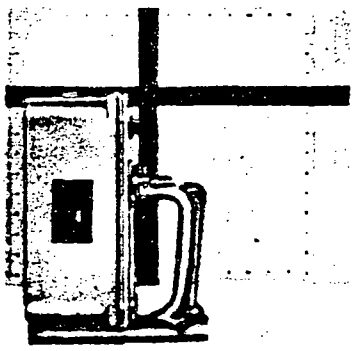
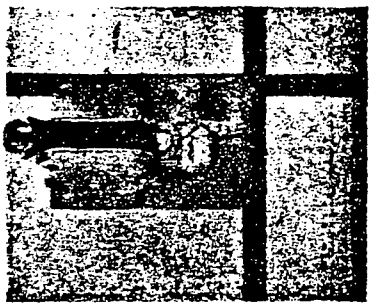
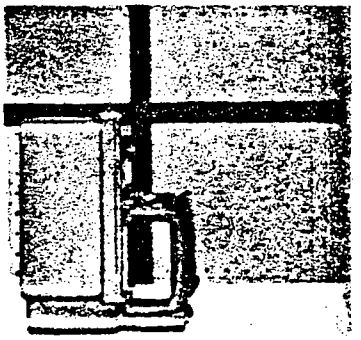
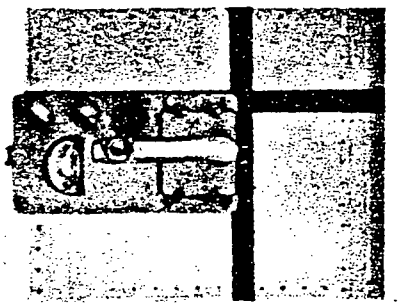
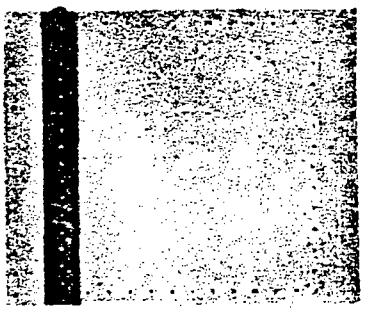
Equipment Type and Range	*X-Axis Bar*	*Y-Axis Bar*	*Height Control*	*Radiac Equipment or Probe Position*
IM-74B/PDR-27C Low Range:	Center Probe Over Cross Lines			
IM-74B/PDR-27C High Range:	5.3	5.7	4.1	
IM-75/PDR-27D Low Range:	Center Probe Over Cross Lines			
IM-75/PDR-27D High Range:	5.3	5.7	4.1	

TABLE 4-1, CONT'D. POSITIONS OF X- AND Y-AXIS BARS, HEIGHT CONTROL, AND EQUIPMENT

Equipment Type and Range	*X-Axis Bar*	*Y-Axis Bar*	*Height Control*	*Radiac Equipment or Probe Position*
Low Range: IM-85/PDR-27F	Center Probe Over Cross Lines			
High Range:	5.3	5.6	5.6	
IM-75/PDR-18A	8.6	4.4	6.0	
IM-9-PD Dosimeters	Center Dosimeters Over Cross Lines Mounted Upright			

Write Settings for Additional Radiac Equipment

Equipment Type and Range	*X-Axis Bar*	*Y-Axis Bar*	*Height Control*	*Radiac Equipment or Probe Position*

Write Settings for Additional Radiac Equipment

Equipment Type and Range	*X-Axis Bar*	*Y-Axis Bar*	*Height Control*	*Radiac Equipment for Probe Position*

Section 5. OPERATOR'S MAINTENANCE

5-1. Scope of Operator's Maintenance

The maintenance duties assigned to the operator of the AN/UDM-1A are listed below together with references to the paragraphs covering the specific maintenance functions.

a. Weekly preventive maintenance checks and services (para 5-5).

b. Cleaning (para 5-6).

5-2. Tools and Materials Required for Operator's Maintenance

The tools and materials required for operator's maintenance are listed below.

a. Lint free cloth (FSN 8305-170-5062).

b. Cleaning Compound (FSN 7930-395-9542).

c. Lens cleaner (FSN 6760-408-5175).

d. Lens tissue (FSN 6640-393-2090).

e. Hand blower (air syringe) (FSN 5120-254-4612).

f. Camel's-hair brush (FSN 8020-246-8806).

5-3. Operator's Preventive Maintenance

Operator's preventive maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble, to reduce downtime, and to assure that the equipment is serviceable.

a. Systematic Care. The procedures given in paragraphs 5-5 and 5-6 cover routine systematic care and cleaning essential to proper upkeep and operation of the equipment.

b. Preventive Maintenance Checks and Services. The preventive maintenance checks and services chart (para 5-5) outlines functions to be performed at specific intervals. These checks and services are to maintain Army equipment in a serviceable condition; that is, in good general (physical) condition and in good operating condition. To assist operators

in maintaining serviceability, the chart indicates what to check, how to check, and the normal conditions. The *References* column lists the location of supplementary data. If a defect is noted that cannot be remedied by the operator, a higher level of maintenance is required. Records and reports of these checks and services must be made in accordance with the requirements of TM 38–750.

5-4. **Operator's Preventive Maintenance Checks and Services Periods.** Preventive maintenance checks and services of the equipment are required weekly while the equipment is in use. A week is defined as approximately 7 calendar days of 8-hour-per-day operation. If the equipment is operated more than 8 hours a day, the weekly maintenance interval should be adjusted. Adjustment of the weekly maintenance interval should also be made to compensate for any unusual operating conditions. Equipment maintained in a *standby* (ready for immediate operation) condition must have weekly maintenance. Equipment in *limited storage* (requires service before operation) does not require weekly maintenance. Paragraph 5-5 specifies the checks and services that must be accomplished weekly and when the equipment is initially placed in service or removed from service for any reason.

5-5 **Weekly Preventive Maintenance Checks and Services Chart.**

Sequence No.	Item to be inspected	Procedures	References
1	Cleanliness	Check to see that equipment is clean. *Warning:* **Do not place the hands or any other part of the body in front of the housing port** (fig. 5-1).	Para 5-6.
2	Aperture plug system	Check movement of aperture plug control arm; aperture plug should move in and out of housing port without binding. *Be sure to replace aperture plug in housing port.*	

5-6. Cleaning.

***Warning:* Before performing any cleaning procedures, check to see that the aperture plug** (fig. 5-1) **is firmly seated in the housing port and that the radioactive source positioning lever is released (in the attenuated position). If the aperture plug is not firmly seated and the radioactive source positioning lever is not released, maintenance personnel will be subjected to high-intensity radiation.**

a. Mechanical Components. Inspect the exterior of the radiation-source housing, housing stand, housing controls, radiac alignment stand, radiac alignment stand controls, track (double rails), and optical viewing stand. The exterior surfaces should be free of dust, dirt, grease, and fungus.

***Warning:* Do not clean the area immediately around the housing port; the cleaning material may become contaminated.**

(1) Remove dust and loose dirt with a clean, soft cloth.

***Warning:* Cleaning compound is flammable and its fumes are toxic. Provide adequate ventilation; *do not* use near a flame.**

***Caution:* Do not allow cleaning compound to come in contact with optical or lubricated surfaces. Use cleaning compound sparingly.**

(2) Remove grease, fungus, and ground-in dirt from the exterior surfaces; use a clean cloth dampened with cleaning compound; dry thoroughly.

b. Optical Components. Inspect the exposed optical surfaces of the telescope and mirrors. The exposed surfaces should be free of dust, dirt, grease, and fungus.

(1) Carefully remove all dust, dirt, and foreign matter from the exposed optical surfaces of the telescope and mirrors; use a camel's-hair brush or and air syringe.

Caution: **Do not use lens tissue that contains silicone to clean optical surfaces. Any residue that would be left on the optical surfaces by lens tissue that contains silicone could affect the performance of the optical parts. Use only the lens tissue specified in paragraph 5-2.**

(2) Slightly dampen a wad of lens tissue with lens cleaner.

(3) Gently wipe the exposed optical surfaces with the moistened lens tissue. Use a circular motion; start from the edge of the glass and work toward the center.

(4) Dry the cleaned optical surface with a fresh lens tissue; use the circular motion described in (3) above.

Note. **Check for radioactive contamination of the used cleaning materials. If any radioactive contamination is detected, refer to paragraph 6-10.**

Section 6. ORGANIZATIONAL MAINTENANCE

6-1. **Scope of Organizational Maintenance.** The maintenance duties assigned to organizational maintenance personnel of the equipment are listed below together with a reference to the paragraphs covering the specific maintenance functions.

a. Monthly preventive maintenance checks and services (para 6-5).

b. Quarterly preventive maintenance checks and services (para 6-7).

c. Lubrication (para 6-8).

d. Wipe test (para 6-9).

e. Instructions for handling, storage, and disposal of radioactive material (para 6-10).

6-2. **Tools, Materials, and Test Equipment Required for Organizationl Maintenance.** In addition to the tools and materials required for operator's maintenance (para 5-2), the following items are required for organizational maintenance.

a. Applicator, wood, cotton tip (cotton swab) (FSN 6515-303-8250).

b. Tongs (FSN 6640-537-9088).

c. Sandpaper (No. 000).

d. Lubricating oil, general purpose, preservative (PL-Special) (FSN 9150-273-2389).

e. Radiac Set AN/PDR-27(*).

6-3. **Organizational Preventive Maintenance.** *a.* Organizational preventive maintenance is the systematic care, inspection, and servicing of equipment to maintain it in a serviceable condition, to prevent breakdowns, and to assure maximum operational capability. Preventive maintenance is the responsibility of all levels of maintenance concerned with the equipment and includes the inspection, testing, and repair or replacement of parts, subassemblies, or units that inspection and tests indicate would probably fail before the next scheduled periodic service. Preventive maintenance checks and services of the equipment at the organizational level are made at monthly and quarterly intervals unless otherwise directed by the commanding officer. The preventive maintenance checks and services (para 6-5 and 6-7) should be scheduled concurrently with the weekly preventive maintenance checks and services (para 5-5).

b. Maintenance forms and records to be used and maintained on this equipment are specified in TM 38-750.

6-4. **Monthly Maintenance.** Perform the maintenance functions indicated in the monthly preventive maintenance checks and services chart (para 6-5) once each month. A month is defined as approximately 30 calendar days of 8-hour-per-day operation. If the equipment is operated 16 hours a day, the monthly preventive maintenance checks and services should be performed at 15-day intervals. Adjustment of the maintenance interval must be made to compensate for any unusual operating conditions. Equipment maintained in a *standby* condition must have monthly preventive maintenance checks and services. *Equipment* in *limited storage* does not require monthly preventive maintenance.

6-5. **Monthly Preventive Maintenance Checks and Services Chart.**

Sequence No.	Item to be inspected	Procedures	References
1	Installation	Check to see that equipment is properly installed.	
2	Mountings	Check to see that all bolts, nuts, washers, and pins are properly positioned and secured.	
3	Lubrication	Lubricate equipment	Para 6-8.

6-6. **Quarterly Maintenance.** Quarterly preventive maintenance checks and services (para 6-7) of the equipment are required. Periodic weekly (para 5-5) and monthly (para 6-5) preventive maintenance checks and services constitute a part of the quarterly preventive maintenance checks and services and must be performed concurrently. All deficiencies or shortcomings will be recorded in accordance with the requirements of TM 38-750.

6-7. **Quarterly Preventive Maintenance Checks and Services Chart.**

Sequence No.	Item to be inspected	Procedures	References
1	Aperture plug	Check for jamming or improper seating of aperture plug in housing port. Check area of aperture plug control arm shaft which slides through cam sleeve; clean aperture plug control arm shaft if necessary (para 5-6a). If aperture plug sticks, unscrew and remove cap, and tighten cam roller; replace and tighten cap.	
2	Lever assembly	Remove positioning lever assembly cover, and check for proper positioning of movable parts and secureness of all connections; clean as necessary, and replace positioning lever assembly cover.	Para 5-6a.
3	Alarm circuits	Check wiring of alarm circuits. Resolder loose connections, and replace damaged wire.	
4	Preservation	Check all surfaces for evidence of fungus. Remove rust and corrosion from metal surfaces by lightly sanding them with fine sandpaper. Brush two thin coats of paint on bare metal to protect it from further corrosion.	SB 11-573; TB SIG 364.
5-S[1]	Wipe test	Perform wipe test (para 6-9).	
6	Completeness	Check to see that equipment is complete.	
7	Modifications	Check DA Pam 310-7 to determine whether new applicable MWO's have been published. All URGENT MWO's must be applied immediately. All NORMAL MWO's must be scheduled.	
8	Publications	Check to see that all publications are complete, serviceable, and current.	DA Pam 310-4 and 310-7.

[1] To be accomplished semiannually instead of quarterly.

6-8. **Lubrication.** Lubricate the equipment monthly as follows:

a. Before lubricating the equipment, clean the parts to be lubricated with a soft, clean cloth or a cloth dampened with cleaning compound. Refer to paragraph 5-6a for cleaning procedures.

b. Apply oil (PL-Special) to the pivot are and sliding areas of the aperture plug contr arm system.

c. Remove any excess oil; wipe dry.

6-9. **Wipe Test.** *a. Safety Precautions.* A minimum of two persons is required to perform the wipe test; one of these persons must be the Radiological Protection Officer. Each person performing the wipe test will wear a film badge and a pocket dosimeter.

b. Performing Wipe Test.

***Warning:* Do not place the hands or any other part of the body in front of the housing port** (fig. 5-1).

(1) Write the date that the wipe test is performed and the radiation source serial number on paper tabs attached to two cotton swabs.

(2) Moisten one cotton swab with distilled water or clean tap water.

Warning: **Be sure the radioactive source positioning lever is in the attenuated position.**

(3) Unplug the housing port by placing the aperture plug control arm in the open position.

(4) Hold the wooden end of the cotton swab with a pair of tongs, and wipe the small end of the aperture plug with the cotton swab. A gentle wiping motion will remove any contamination that is present.

***Warning:* Do not leave the cotton swab unattended, or allow it to touch any other object.**

(5) Plug the housing port by placing the aperture plug control arm in the closed position.

(6) Moisten the second cotton swab with distilled water or clean tap water, and wipe accessible areas of the radiation source housing, including seams and crevices where contamination may appear because of leakage from the radiation source.

c. Checking and Mailing Swabs. Perform the following procedures in an area that is free from all radiation, except for normal background radiation.

(1) Adjust Radiac Set AN/PDR-27(*) to measure 0 to 0.5 mr/hr. Place each cotton swab, in turn, in front of the open probe (radiac detector) of the AN/PDR-27(*) and note the indications. Do not touch the probe with a cotton swab.

(2) Any detectable indication on the AN/PDR-27(*) above twice the background radiation or above 0.1 mr/hr indicates that the AN/UDM-1A is contaminated. Discontinue use of the AN/UDM-1A immediately and wait for instructions from the supporting Nucleonics Primary Standard Laboratory ((4) below).

(3) Place each cotton swab in a plastic bag and follow the procedures in (4) or (5) below.

(4) If the indication on the AN/PDR-27(*) ((1) above) indicates that the AN/UDM-1A is contaminated, place the plastic bags (containing the cotton swabs) in a small cardboard box. Measure the radiation at the surface of the cardboard box. If the radiation level is higher than 0.4 mr/hr, wrap each plastic bag in a thin sheet of lead, aluminum, or other metal; replace the wrapped plastic bags in the cardboard box, and recheck the radiation at the surface of the cardboard box. Mail the cardboard box to the supporting Nucleonics Primary Standards Laboratory.

Note. The supporting Nucleonics Primary Standards Laboratory for the States of Minnesota, Iowa, Missouri, Arkansas, Louisiana, the area east of these States, and USAREUR is at Lexington-Bluegrass Army Depot; the supporting Nucleonics Primary Standards Laboratory for the remainder of CONUS and for USARPAC is Sacramento Army Depot.

(5) If no detectable indication on the AN/PDR-27(*) was obtained ((1) above), place the plastic bags (containing the cotton swabs) in an envelope, and immediately mail the envelope to the supporting Nucleonics Primary Standards Laboratory ((4) above).

(6) When the cotton swabs are received, the supporting Nucleonics Primary

Standards Laboratory personnel will check them and send a report to the activity that submitted the cotton swabs. The report will state the number of microcuries of contamination and instructions for handling contaminated equipment (if necessary). If no specific level appears on the AEC license held by the submitting activity, 0.005 microcurie of removable contamination will be the maximum permissible level.

6-10. **Handling, Storage, and Disposal of Radioactive Material.** *a.* Handle, store, and dispose of radioactive material as directed by the procedures in AR 700–52, AR 755–380, and TB SIG 225.

b. Because of the radiological hazard present, pack radioactive material only under the supervision of a Radiological Protection Officer.

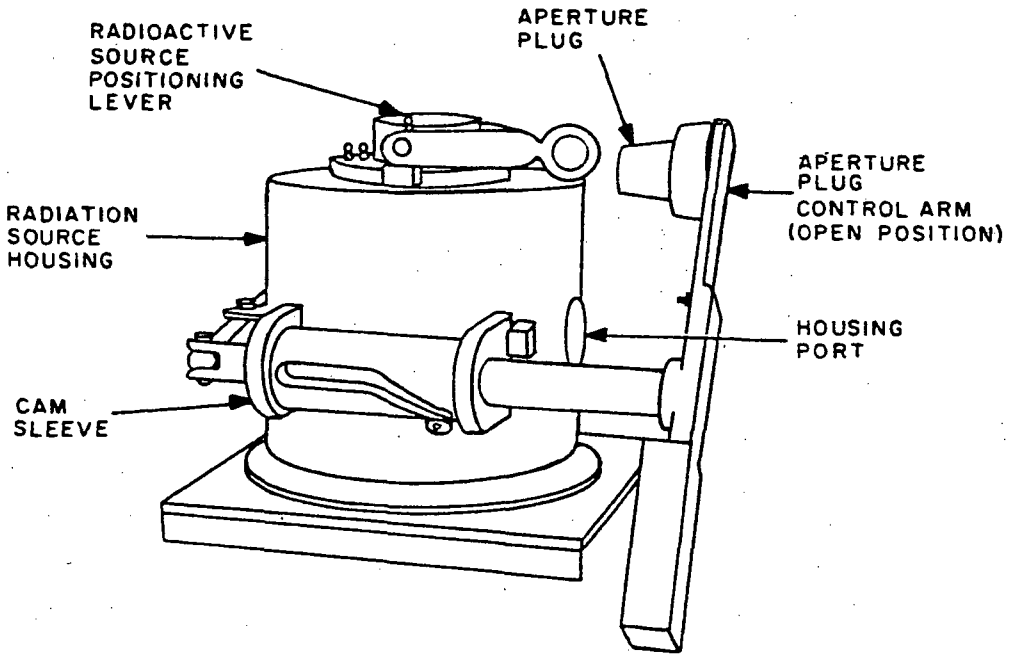


Figure 5-1. Radiation source housing.

APPENDIX A

REFERENCES

The following is a list of applicable references available to the maintenance personnel of Radiac Calibrator Set AN/UDM-1A.

AR 700-52	Logistics, Licensing and Control of Sources of Ionizing Radiation.
AR 755-380	Disposal of Supplies and Equipment, Disposal of Unwanted Radioactive Material.
DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (Types 7, 8, and 9), Supply Bulletins, and Lubrication Orders.
DA Pam 310-7	Index of Modification Work Orders.
SB 11-573	Painting and Preservation Supplies Available for Field Use for Electronics Command Equipment.
TB SIG 225	Identification and Handling of Radioactive Signal Items.
TB SIG 364	Field Instructions for Painting and Preserving Electronics Command Equipment.
TM 11-5543	Radiac Sets AN/PDR-27A, AN/PDR-27C, and AN/PDR-27E.
TM 11-6665-209-15	Organizational, DS, GS, and Depot Maintenance Manual Including Repair Parts and Special Tool Lists: Radiac Sets AN/PDR-27J, AN/PDR-27L, and AN/PDR-27Q.
TM 11-6665-224-15	Organizational, DS, GS, and Depot Maintenance Manual Including Repair Parts and Special Tools List: Radiac Set AN/PDR-27P.
TM 11-6665-228-15	Organizational, DS, GS, and Depot Maintenance Manual Including Repair Parts and Special Tool Lists: Radiac Set AN/PDR-27G.
TM 11-6665-230-15	Organizational, DS, GS, and Depot Maintenance Manual Including Organizational Repair Parts and Special Tools List: Radiac Set AN/PDR-27R.
TM 38-750	Army Equipment Record Procedures.

APPENDIX B

BASIC ISSUE ITEMS

Section I. INTRODUCTION

B-1. General

The equipment described in this appendix is for Radiac Calibrator Set AN/UDM-1A. There are no items required for installation, operation or operator's maintenance.

B-2. Explanation of Columns

An explanation of the columns in section II is given below.

a. Source, Maintenance, and Recoverability Code, Column 1.

(1) Source code, column 1a. The selection status and source for the listed item is noted here. The source code used is:

Code		Explanation
A	-	applies to assemblies that are not procured or stocked as such but are made up of two or more units, each of which carry individual stock numbers and descriptions and are procured and stocked and can be assembled by units at indicated maintenance categories.

(2) Maintenance code, column 1b. The lowest category of maintenance authorized to install the listed item is noted here. The maintenance code used is as follows:

Code		Explanation
D	-	Direct Support Maintenance

(3) Recoverability code, column 1c. The information in this column indicates whether unserviceable items should be returned for recovery or salvage. Recoverability code and its explanations are as follows:

Note: When no code is indicated in the recoverability column, the part will be considered expendable.

Code		Explanation
R	-	applies to repair parts and assemblies that are economically repairable at DSU and GSU activities and are normally furnished by supply on an exchange basis.

b. Federal Stock Number, Column 2. The Federal stock number for the item is indicated in this column.

c. Description, Column 3. The Federal item name, is included in this column.

d. Unit of Issue, Column 4. The unit used as a basis of issue (e.g. ea, pr, ft, yd, etc) is noted in this column.

e. Quantity Incorporated in Unit Pack, Column 5. Not used.

f. Quantity Incorporated in Unit, Column 6. Not used.

g. Quantity Authorized, Column 7. The total quantity of an item required to be on hand and necessary for the operation and maintenance of the equipment is given in this column.

h. Illustration, Column 8. Not used.

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

Distribution:

Active Army:

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USASESS (40)
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USASA (2)
USACDCCEA (1)
USACDCCEA Ft Huachuca (1)
Army Depots (1) except
LBAD (14)
SHAD (30)
TOAD (14)
IEAD (7)
NAAD (3)
SVAD (3)
ATAD (10)
Svc Colleges (1)
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Sig Sec GENDEP (4)
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NG: State AG (3)

USAR: None

For explanation of abbreviations used, see AR 320-50.

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 310-1; the proponent agency is the US Army Adjutant General Center.	Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE 21 Oct 83

(Forward to proponent of publication or form) (Include ZIP Code)	FROM: (Activity and location) (Include ZIP Code)
Commander US Army CECOM ATTN: DRSEL-ME-MQ Fort Monmouth, NJ 07703	Commander US Army CECOM ATTN: DRSEL-SF-MR Fort Monmouth, NJ 07703

PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE
TM-11-6665-227-12	21 May 1982	Operator's & Organizational Maintenance Manual Calibrator Set, Radiac AN/UDM-2 (NSN 6665-00-179-9037)

ITEM NO.	PAGE NO.	PARAGRAPH	LINE NO.*	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON (Exact wording of recommended change must be given)
1	Inside Item	Front 3,	Cover line	15		Change: "... of a Radiological Protection Officer..." To: "...of a Radiation Protection Officer:" Reason: To reflect proper designation of the position listed
2	1-1	1-6.2a	10	-	-	Change: "...parts 19 and 20)." To: "... parts 19,20, and 21)." Reason: To reflect changes in TB 11-6665-227-12 and US Nuclear Regulatory Commission regulations
3	1-1	1-6.2c	3	-	-	Change: "...US Army Electronics Command..." To: "...US Army Communications - Electronics Command..." Reason: To reflect command name change.
	1-2	1-6.2c	5	-	-	Change: "...DRSEL-SF-H..." To: "...DRSEL-SF-MR..." Reason: To reflect attention symbol change.
5	1-3	1-8	5	-	-	Change: "...Three encapsulated sources of 25 millicuries..." To: "Three encapsulated sources of 45 millicuries ..." Reason: AN/UDM-2 has been refurbished with replacement sources of greater activity.
6	1-3	1-8	7	-	-	Change: "... source of 20 microcuries." To: "...source of 30 microcuries." Reason: AN/UDM-2 has been refurbished with replacement sources of greater activity.
7	1-3	1-8	8	-	-	Change: "One encapsulated source of 25 millicuries." To: "One encapsulated source of 45 millicuries." Reason: AN/UDM-2 has been refurbished with replacement sources of greater activity.

*Reference to line numbers within the paragraph or subparagraph.

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
RICHARD TENPENNY Health Physicist	AV 995-4427	Richard Tenpenny

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 310-1; the proponent agency is the US Army Adjutant General Center.	Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE 21 Oct 83

TO: (Forward to proponent of publication or form) (Include ZIP Code)	FROM: (Activity and location) (Include ZIP Code)
Commander Army CECOM ATTN: DRSEL-ME-MQ Fort Monmouth, NJ 07703	Commander US Army CECOM ATTN: DRSEL-SF-MR Fort Monmouth, NJ 07703

PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE
TM-11-6665-227-12	21 May 1982	Operator's & Organization Maintenance Manual Calibrator Set, Radiac AN/UDM-2 (NSN 6665-00-179-9037)

ITEM NO.	PAGE NO.	PARAGRAPH	LINE NO.*	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON (Exact wording of recommended change must be given)
8	1-3	1-8	11	-	-	Delete; "Bremmstrahlung produced...Radiation dose rate from source... "to end of the sentence. Reason: Information supplied is inaccurate and not required in a TM.
9	1-3	1-10a	6	-	-	Change: "...(one 20 microcurie source..." To: "...(one 30 microcurie source..." Reason: AN/UDM-2 has been refurbished with replacement sources of greater activity.
10	1-3	1-10a	10	-	-	Change: "...20-microcurie source..." To: "...30-microcurie source..." Reason: AN/UDM-2 has been refurbished with replacement sources of greater activity.
11	1-3	1-10a	6	-	-	Change: "...three 25..." To: "...three 45..." Reason: AN/UDM-2 has been refurbished with replacement sources of greater activity.
12	1-3	1-10a	11	-	-	Change: "...three 25-millicuries sources..." To: "...three 45-millicuries sources..." Reason: AN/UDM-2 has been refurbished with replacement sources of greater activity.
13	1-6	1-10b	4	-	-	Change: "...encapsulated 25-millicurie..." To: "...encapsulated 45-millicurie..." Reason: AN/UDM-2 has been refurbished with replacement sources of greater activity.
14	2-1	2-2c	-	-	-	Add the following paragraph after para 2,2b as paragraph 2-2c and redesignate paragraphs 2-2c and 2-2d as paragraphs 2-2d and 2-2e, respectively: "Turn the manual valve clockwise to the closed position to avoid damaging the manual valve. It should be noted that a damaged manual valve may void the AN/UDM-2 container from being considered as US

*Reference to line numbers within the paragraph or subparagraph.

NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
[illegible]HARD TENPENNY [illegible]lth Physicist	AV 995-4427	Richard Tenpenny

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS

For use of this form, see AR 310-1; the proponent agency is the US Army Adjutant General Center.

Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).

DATE: 27 Oct 83

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mmander
Army CECOM
N; DRSEL-ME-MQ
Fort Monmouth, NJ 07703

FROM: (Activity and location) (Include ZIP Code)

Commander
US Army CECOM
ATTN: DRSEL-SF-MR
Fort Monmouth, NJ 07703

PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE
M-11-6665-227-12	21 May 1982	Operator's & Organization Maintenance Manual Calibrator Set, Radiac AN/UDM-2 (NSN 6665-00-179-9037)

ITEM NO.	PAGE NO.	PARAGRAPH	LINE NO.*	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON (Exact wording of recommended change must be given)
4 co	nt.					Department of Transportation Specification 7A Type A packaging." Reason: To prevent damage to the manual valve of the AN/UDM-2.
5	3-1	-	4	-	3-1	Change: "TS-3495/IDM-2 (fig. 1-2):" To: "TS-3495/UDM-2 (fig. 1-2):" Reason: To reflect the proper designation.
6	3-9	-	-	3-1.1	-	Delete: "Figure 3-1.1 TS-3495/UMD-2 discharge well assembly, correction factor chart" and table above Reason: A specific correction factor chart is supplied with each AN/UDM-2.
	3-9	-	-	3-1.1	-	Delete: "Figure 3-1.2 TS 3494/UMD rate meter assembly, correction factor chart" and table above Reason: A specific correction factor chart is supplied with each AN/UDM-2.
8	4-2	-	12	-	4-2	Change: "...of the Radiological Protection Officer ..." To: "...of the Radiation Protection Officer..." Reason: To reflect the proper designation of the position listed.
9	A-1	-	-	Appendix A		Delete: "AR 55-55 Transportation of Radiactive and Fissile Materials Other than Weapons." Delete: "AR-700-52 Licensing and Control of Sources of Ionizing Radiation" Delete: "AR 755-15 Disposal of Unwanted Radioactive Material" Replace with: "AR 385-11 Ionizing Radiation Protection (Licensing, Control, Transportation, Disposal, and Radiation Protection)" Reason: Above listed ARs have been recinded and replaced by AR 385-11.

*Reference to line numbers within the paragraph or subparagraph.

NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
ARD TENPENNY ealth Physicist	AV 995-4427	Richard Tenpenny

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 310-1; the proponent agency is the US Army Adjutant General Center.	Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE 21 Oct 83

TO: (Forward to proponent of publication or form) (Include ZIP Code)	FROM: (Activity and location) (Include ZIP Code)
Commander US Army CECOM ATTN: DRSEL-ME-MQ Fort Monmouth, NJ 07703	Commander US Army CECOM ATTN: DRSEL-SF-MR Fort Monmouth, NJ 07703

PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE
TM-11-6665-227-12	21 May 1982	Operator's & Organization Maintenance Manual Calibrator Set, Radiac AN/UDM-2 (NSN 6665-00-179-9037)

ITEM NO.	PAGE NO.	PARAGRAPH	LINE NO.*	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON (Exact wording of recommended change must be given)
20	Glos	sary 1,	7 of	Column 1		Change: "Bremsstrahlung - Secondary electro-magnetic radiation..."to the end of the definition. To: "Bremsstrahlung (braking radiation) - Are those X-rays that are emitted when high-speed charged particles passing close to a nucleus suffer rapid acceleration due to the strong attractive coulombic force of the nucleus." Reason: To have the definition comply with the modern conception of the definition.
21	Glos	sary 1,	10 of	Column 1		Change: "Curie - That quantity of a radioactive..." To: "Curie (Ci) - The activity of that quantity of radioactive material in which the number of disintegrations per second is $3.7X10^{10}$. Reason; To have the definition comply with the modern conception of the definition.
22	Glos	sary 1,	16 of	Column 1		Change and alphabetize definition: "Dose rate - The radiation dose delivered per..." to the end of the definition. To: "Absorbed dose rate ($\dot{D}$) - That quotient of dD by dt, where dD is the increment of absorbed dose in the time dt. A special unit of absorbed dose rate is any quotient of the rad or its dose rate is any quotient of the rad or its multiple or submultiple by a suitable unit of time (rad s^{-1}, mrad h^{-1}, etc.). See absorbed dose." Reason: To have the definition comply with ICRU Report 19 definitions.
23	Glos	sary 1,	20 of	Column 2		Change: "Rad (r) - An exposure does of X- ..."to the end of the definition. To: "Rad (Radiation Absorbed Dose) - Is the special unit of absorbed dose where 1 rad = 10^{-2} J Kg^{-1} and J represents joule and Kg represents kilogram. See absorbed dose." Reason: To modify definition so it complies with ICRU Report 19 Radiation Quantities and Units.

*Reference to line numbers within the paragraph or subparagraph.

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
RICHARD TENPENNY Health Physicist	AV 995-4427	Richard Tenpenny

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS

For use of this form, see AR 310-1; the proponent agency is the US Army Adjutant General Center.

Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).

DATE: 24 Oct 83

TO: (Forward to proponent of publication or form) (Include ZIP Code)
Commander
Army CECOM
ATTN: DRSEL-ME-MQ
Fort Monmouth, NJ 07703

FROM: (Activity and location) (Include ZIP Code)
Commander
US Army CECOM
ATTN: DRSEL-SF-MR
Fort Monmouth, NJ 07703

PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE
M-11-6665-227-12	21 May 1982	Operator's & Organization Maintenance Manual Calibrator Set, Radiac AN/UDM-2 (NSN 6665-00-179-9037)

ITEM NO.	PAGE NO.	PARAGRAPH	LINE NO.*	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON (Exact wording of recommended change must be given)
24	Glos	sary 1	25,	of Col	umn 2	Change: "Strontium-90 (Sr 90) -..." To: "Strontium-90 (Sr 90)-..." Reason: Spelling correction.
25	Glos	sary 1				Add and alphabetize definition: "Absorbed dose (D)- is the quotient of $d\bar{\epsilon}$ by dm, where $d\bar{\epsilon}$ is the mean energy imparted by ionizing radiation to the matter in a volume element and dm is the mass of the matter in that volume element. See rad." Reason: Updating of glossary to comply with ICRU Report 19.
26	Glos	sary 1				Add and alphabetize definition: "Exposure (X) - Is the quotient of dQ by dm where dQ is the absolute value of the total charge of the ions of one sign produced in air when all the electrons (negatrons and positrons) liberated by photons in a volume element of air has mass dm are completely stopped in air. See roentgen." Reason: Updating of glossary to comply with ICRU Report 19.
27	Glos	sary 1				Add and alphabetize definition: "Roentgen (R) - Is the special unit of exposure where 1 R = 2.58×10^{-4} C kg^{-1} and C represents coulomb. See exposure." Reason: Compliance with ICRU Report 19.
28	Glos	sary 1				Add and alphabetize definition: "Dose equivalent (H) - Is the product of D, Q and N, at the point of interest in tissue, where D is the absorbed dose, Q is the Quality factor and N is the product of any other modifying factors. The dose equivalent is a measure of the biological effectiveness of a given absorbed dose. See rem." Reason: Compliance with ICRU Report 19.
29.	Glos	sary 1				Add and alphabetize definition: "Rem - Is the special unit of dose equivalent. When absorbed dose

*Reference to line numbers within the paragraph or subparagraph.

NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
ard Tenpenny ealth Physicist	AV 995-4427	Richard Tenpenny

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 310-1; the proponent agency is the US Army Adjutant General Center.	Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE 24 Oct 83

TO: (Forward to proponent of publication or form) (Include ZIP Code)	FROM: (Activity and location) (Include ZIP Code)
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ITEM NO.	PAGE NO.	PARAGRAPH	LINE NO.*	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON (Exact wording of recommended change must be given)
29	cont.					is expressed in rads, H is in rems. See dose equivalent." Reason: Compliance with ICRU Report 19.
30	NRC Forms 3 after			Glossary		Replace: NRC Forms 3, dated June 1977, with the most recent edition of NRC Form 3, dated June 1982, provided at enclosure 1. Reason: To utilize the most current data in the TM.

*Reference to line numbers within the paragraph or subparagraph.

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
RICHARD TENPENNY Health Physicist	AV 995-4427	Richard Tenpenny

DEPARTMENT OF THE ARMY
HEADQUARTERS, US ARMY COMMUNICATIONS-ELECTRONICS COMMAND
AND FORT MONMOUTH
FORT MONMOUTH, NEW JERSEY 07703-5000

REPLY TO
ATTENTION OF

AMSEL-MF-MR

6 May 1986

MEMORANDUM FOR RECORD

SUBJECT: Recommended Changes to TM 11-6665-227-12, Operator's and Organizational Maintenance Manual, Calibrator Set, Radiac AN/UDM-2

1. Reference:

a. DF, DRSEL-ME-PES, 22 Nov 83, subject: Revision of Technical Manual (TM) 11-6665-227-12.

b. FONECON between Mr. Thomas Brown, Directorate For Maintenance Engineering and Mr. Joseph M. Santarsiero, CECOM Safety Office, 5 May 1986, subject as above.

2. Reference 1a provided this office with a Control Number and projected timeframe for incorporation of subject changes: Control Number Q84/0275 was assigned with an estimated completion date of June 1984.

3. As indicated during reference 1b FONECON, subject changes, due to budgetary constraints and types of changes recommended, have not yet been implemented.

4. Because of this fact, this command has taken the initiative in providing users of the AN/UDM-2 Radiac Calibrator Set with copies of the subject requested changes.

5. This was done to ensure maximum safety and direction to all users of the AN/UDM-2 Radiac Calibrator Set.

Prepared by: Joseph M Santarsiero
JOSEPH M. SANTARSIERO
Health Physicist

Reviewed by: Barry J Silber
BARRY J. SILBER
C, Radiological Sfty Engrg Br

Approved by: Steven A Horne
STEVEN A. HORNE
Acting Chief, Safety Office