



DEPARTMENT OF THE ARMY
 HEADQUARTERS US ARMY MATERIEL DEVELOPMENT AND READINESS COMMAND
 5001 EISENHOWER AVENUE, ALEXANDRIA, VA. 22333

70-2626
Region

RECEIVED

DRCSE-P/81-0139

DEC 31 23 December 1981
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Director
 Nuclear Material Safety and Safeguards
 ATTN: Radioisotopes Licensing Branch
 US Nuclear Regulatory Commission
 Washington, DC 20555

U.S. NUCLEAR REG.
 COMMISSION
 NMSS MAIL SECTION

Gentlemen:

Forwarded is US Army Communications-Electronics Command application for Special Nuclear Material License. This application is for possession and use of plutonium-239 as alpha emitting sources in the AN/UDM-7C Radiac Calibrator. Approval of application will transfer responsibility for management control of AN/UDM-7C Radiac Calibrator from US Army Armament Materiel Readiness Command which currently has management control under Special Nuclear Material License SNM-1745 to US Army Communications-Electronics Command. Included in application is US Army Communications-Electronics Command's environmental assessment for fielding of AN/UDM-7C Radiac Calibrator Set.

Please acknowledge receipt of application on inclosed DA Form 209 Mail Reply Card.

Sincerely,

for Darwin N. Taras
 DARWIN N. TARAS
 Chief, Health Physics
 Safety Office

2 Incl
 as

TELETYPE UNIT

CF:
 HQDA(DASG-PSP-E) WASH DC 20310 2 cys w/incl
 Dir, DARCOM Field Safety Activity, Charlestown, IN 47111 w/incl
 Cdr, US Army Communications-Electronics Command, ATTN: DRSEL-SF-H, Ft. Monmouth, NJ 07703 w/o incl

11/1

20113



DEPARTMENT OF THE ARMY
HEADQUARTERS US ARMY COMMUNICATIONS-ELECTRONICS COMMAND
AND FORT MONMOUTH
FORT MONMOUTH, NEW JERSEY 07703

REPLY TO
ATTENTION OF:

8 SEP 1981

DRSEL-SF-H

SUBJECT: Application for US Nuclear Regulatory Commission (NRC)
Special Nuclear Material License

Commander

US Army Materiel Development and Readiness Command

ATTN: DRCSF-P

5001 Eisenhower Avenue

Alexandria, Virginia 22333

1. The Department of the Army, US Army Communications-Electronics Command (CECOM), ATTN: DRSEL-SF, Fort Monmouth, New Jersey 07703, is hereby making application for an NRC license to receive title to own, acquire, deliver, receive, possess, use and transfer special nuclear material in accordance with paragraph 70.21 of Title 10, Chapter 1, Code of Federal Regulations, Part 70. This application, when approved, will transfer responsibility for management control of the special nuclear material referenced below which is presently authorized under NRC License Number SNM-1745 issued to the Department of the Army, US Army Armament Materiel Readiness Command, Rock Island, Illinois 61201.
2. The special nuclear material, ²³⁹Plutonium, is used as an alpha emitting source of radiation in the AN/UDM-7C Radiac Calibrator Set, each containing approximately 819 micrograms (50.3 microcuries) of ²³⁹Plutonium. The maximum quantity that will be possessed at any one time will be 246 milligrams (15.1 millicuries) of ²³⁹Plutonium. Supplement A contains the manufacturing criteria for this radiac calibrator.
3. The AN/UDM-7C Radiac Calibrator Set will be utilized at Lexington-Blue Grass Depot Activity (LBDA), Lexington, Kentucky; the US Army Ionizing Radiation Dosimetry Center of the US Army Test Measurement Diagnostic Equipment (TMDE) Support Group (formerly the Army Metrology and Calibration Center) at LBDA; and Department of Defense (DOD) installations and activities at worldwide locations. The AN/UDM-7C Radiac Calibrator Sets at DOD installations and activities will be possessed and utilized under the control of Department of the Army military and/or civilian personnel meeting the minimum requirements contained in Supplements B and C.

20113

8 SEP 1981

DRSEL-SF-H

SUBJECT: Application for US Nuclear Regulatory Commission (NRC) Special Nuclear Material License

4. Management of the radiation protection program for these radiaac calibrators are the responsibility of Mr. Bernard M. Savaiko, License Manager, Mr. Steven A. Horne, Radiation Protection Officer (RPO), and Mr. Barry J. Silber, Alternate RPO. Supplement D contains the qualifications of those individuals. Supplement E contains the radiation protection program for the control of this radioactive commodity. Supplements F and G contain information relative to facilities, instrumentation and ultimate disposal requirements.

FOR THE COMMANDER:

7 Incl
as


JAMES V. GANNON
Colonel, GS
Chief of Staff

NOTE

1. Inclosures 1, 2, 3, 4, 5, 6 and 7 are concurrences from the major field commands which are responsible for the use of the AN/UDM-7C Radiac Calibrator Set. Inclosures 8, 9, 10, 11 and 12 are the concurrences from the Army TMDE Support Group and depots with regards to the bulk storage and/or calibration/testing of these calibrator sets.

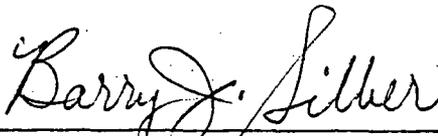
2. This license application was reviewed and concurred in by the Fort Monmouth Ionizing Radiation Control Committee on 30 July 1981.

MEMORANDUM FOR RECORD

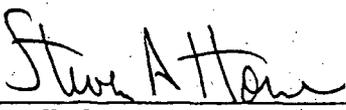
SUBJECT: Application for US Nuclear Regulatory Commission Special Nuclear
Material License

1. Reference is made to letter, AFLG-RES, dated 1 June 1981, subject: Application for US Nuclear Regulatory Commission Source Material License.
2. Reference 1 provided concurrence to subject application for the AN/UDM-7C Radiac Calibrator Set and recommended changes for the technical manual utilized with this calibrator.
3. The technical manual has been revised to include references to current Army regulations in accordance with reference 1 above.

Prepared By:


BARRY J. SILBER
Health Physicist

Reviewed and Approved By:


STEVEN A. HORNE
Chief, Readiness Division
Safety Office



DEPARTMENT OF THE ARMY
HEADQUARTERS, UNITED STATES ARMY FORCES COMMAND
FORT MCPHERSON, GEORGIA 30330

AFLG-RES

1 JUN 1981

SUBJECT: Application for U.S. Nuclear Regulatory Commission Source Material License

Commander
US Army Communications & Electronics Material Readiness Command
ATTN: DRSEL-SF-H
Fort Monmouth, NJ 07703

1. Reference CECOM letter DRSEL-SF-H, 28 April 81, SAB(U).
2. Concur in application for U.S. Nuclear Regulatory Commission Source Material License.
3. Recommend all references to AR's 55-55, 700-52, 755-15, and 725-1 be deleted from Draft Equipment Publication TM 3-6665-313-10. These AR's have been superseded by AR 385-11.

FOR THE COMMANDER:


CAROLYN E. KADLEC
CPT, AGC
Assistant Adjutant General

ATCD-N (26 Apr 81) 1st Ind

SUBJECT: Application for US Nuclear Regulatory Commission Source Material License

HQ, TRADOC, Ft Monroe, VA 23651 18 JUN 1981

TO USACERCOM, ATTN: DRSEL-SF-H, Ft Monmouth, NJ 07703

1. This headquarters concurs with the AN/UDM-7 license application.
2. Point of contact is CPT Taylor, AV 680-4411.

FOR THE COMMANDER:

wd incl



DOREATHA MANGRUM
Assistant Adjutant General



DEPARTMENT OF THE ARMY
THEATER ARMY MATERIEL MANAGEMENT CENTER
APO NEW YORK 09052

AEAGD-MMC-RA-CS

11 June 1981

SUBJECT: Application for US Nuclear Regulatory Commission
Special Nuclear Material License - AN/UDM-7C
Radiac Calibrator Set.

Commander
US Army Communications - Electronics
Command and Fort Monmouth
ATTN: DRSEL-SF-H
Fort Monmouth, NJ 07703

1. References:

a. Letter, DRSEL-SF-H, dated 26 April 1981, subject: Application for US Nuclear Regulatory Commission Source Material License.

b. Letter, DRSEL-SF-H, dated 1 June 1981, SAB.

2. This center has reviewed references 1a and 1b and concurs in the proposed transfer of license holders and in matters pertaining to the implementation of regulatory requirements for control of this commodity.

3. A copy of the DF appointing MAJ Lind as USAREUR Radiation Control Officer is attached as inclosure 1.

FOR THE COMMANDER:

1 Incl
as

ALAN D. LIND
MAJ, CmIC
Acting Chief, Armament Systems Division

DJ-MS-MC (28 Apr 81) 1st Ind
SUBJECT: Application for US Nuclear Regulatory Commission Source Material
License

Headquarters, Eighth United States Army, APO San Francisco 96301 12 JUN 81

TO: Commander, USA Communications and Electronics, Materiel Readiness Command
and Fort Monmouth, ATTN: DRSEL-SF-H, Fort Monmouth, New Jersey 07703

Concur with subject application as drafted.

FOR THE COMMANDER:

wd incl


HAROLD DAVIS, JR
CPT, AGC
Assistant Adjutant General

AJGC-OT (28 Apr 81) 1st Ind MAJ Kluender/kt/3-3976
SUBJECT: Application for US Nuclear Regulatory Commission
Source Material License

Headquarters, US Army Japan/IX Corps, APO SF 96343 26 MAY 1981

TO: Cdr, US Army Communications and Electronics, Materiel
Readiness Command and Fort Monmouth, ATTN: DRSEL-SF-H,
Fort Monmouth, New Jersey 07703

1. Concur with application as written.
2. However, USARJ does not maintain a radiac calibration capability because of the low density of radiac sets in the command. Therefore, we do not have a requirement for the AN/UDM-7() Radiac Calibrator Set.

FOR THE COMMANDER:

wd all incl


COLEMAN P. GIBSON
MSG, USA
Asst AG



DEPARTMENT OF THE ARMY
HEADQUARTERS, UNITED STATES ARMY WESTERN COMMAND
FORT SHAFTER, HAWAII 96858

REPLY TO
ATTENTION OF:

APOP-NC

11 4 MAY 1981

SUBJECT: Application for US Nuclear Regulatory Commission Source Material License

Commander
US Army Communications and Electronics Command
ATTN: DRSEL-SF-H
Fort Monmouth, NJ 07703

1. Reference letter, DRSEL-SF-H, HQ, US Army Communications and Electronics Command, 28 Apr 81, SAB.
2. Concur with license application for the AN/UDM-7 Radiac Calibrator Set.

FOR THE COMMANDER:

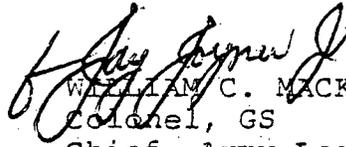
wd all incl

for
NOLAN M. SIGLER
Colonel, GS
Deputy Chief of Staff for
Operations and Plans

NGB-ARL-M (7 August 81) 1st Ind
SUBJECT: Application for US Nuclear Regulatory Commission
Source Material License

Commander, US Army Communications and Electronics Command,
Fort Monmouth, NJ 07703

1. Approved. NGB POC is Mr. R. E. Frigon, AV 225-3220.



WILLIAM C. MACKERT
Colonel, GS

Chief, Army Logistics Division

24 Aug 81

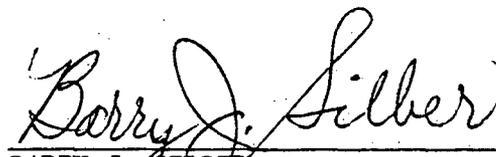
DRSEL-SF-H

MEMORANDUM FOR RECORD

SUBJECT: Application for US Nuclear Regulatory Commission Special Nuclear Material License-AN/UDM-7() Radiac Calibrator Set

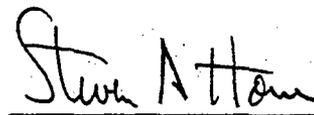
1. Reference is made to 1st Indorsement, DRSMI-M, dated 27 May 1981, subject as above.
2. Reference 1 provided concurrence to subject application and recommended change to Supplement B, paragraph 4, of subject application. The recommended change has been incorporated into subject application.

Prepared By:



BARRY J. SILBER
Health Physicist

Reviewed and Approved By:



STEVEN A. HORNE
Chief, Readiness Division
Safety Office

DRSMI-M (11 May 1981) 1st Ind

SUBJECT: Application for US Nuclear Regulatory Commission Special Nuclear
Material License - AN/UDM-7() Radiac Calibrator Set

HQ, US Army Missile Command, Redstone Arsenal, AL 35898

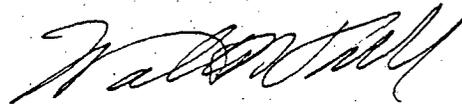
MAY 27 1981

TO: Cdr, US Army Communications-Electronics Command and Fort Monmouth,
Fort Monmouth, New Jersey 07703

1. The subject application, with supplements, has been reviewed and has the concurrence of the US Army Metrology and Calibration Center.

2. The Center recommends that supplement B, paragraph 4 be changed to read as follows: To be qualified as an RCO for the AN/UDM-7(), a person must have a technical, scientific or engineering background and have successfully completed a minimum of 80 hours of formal training in radiation protection including the topics listed in item 2 above. The reason for this change is to preclude the elimination of a person with a technical background from serving as an RCO because he lacks having a scientific or engineering background, yet otherwise is well qualified.

wd incl



WALTER W. TRIBBLE
Technical Director
US Army Metr & Calbr Cen

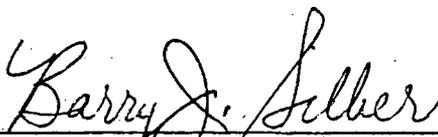
24 August 1981

MEMORANDUM FOR RECORD

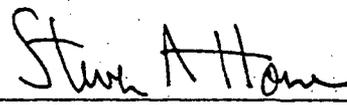
SUBJECT: Application for US Nuclear Regulatory Commission Special Nuclear Material License-AN/UDM-7() Radiac Calibrator Set

1. Reference is made to message, DRSMI-MCI-DC, DTG 311145Z Jul 81, subject as above.
2. Reference 1 provided concurrence to subject application and recommended changes to Supplement F of subject application. These changes have been incorporated into subject application.

Prepared By:


BARRY J. SILBER
Health Physicist

Reviewed and Approved By:


STEVEN A. HORNE
Chief, Readiness Division
Safety Office

DRSMI-MCA-SA (11 May 81) 1st Ind

Mr. Toyama/mka/839-3285

SUBJECT: Application for US Nuclear Regulatory Commission Special Nuclear
Material License - AN/UDM-7() Radiac Calibrator Set

DA, HQ, Sacramento Army Depot, Sacramento, CA 95813 1 June 1981

TO: Commander, US Army Communications-Electronics Command and Ft Monmouth,
ATTN: DRSEL-SF-H, Ft Monmouth, New Jersey 07703

Application submitted with the basic letter was reviewed. Portions of the
license pertaining to our responsibility is concurred.

wd incl 1



FREDERICK T. TOYAMA
Radiological Protection Officer
US Army Calbr & Repair Center -
Sacramento

4 Sep 81

MEMORANDUM FOR RECORD

SUBJECT: Application for US Nuclear Regulatory Commission Special Nuclear Material License

1. Reference is made to the following:

a. Message, DRSMI-ME (RPO), DTG 031420Z SEP 81, subject: US Nuclear Regulatory Commission Source Material License.

b. FONECON, 3 September 1981, between Mr. Barry J. Silber, CECOM Safety Office, and Mr. Delbert Loney, US Army TMDE Support Group, subject as above.

2. Reference 1a provided concurrence to subject application and recommended changes to Supplement C, paragraph 3, Supplement E, paragraph 4g, and Supplement F, paragraph 3. The change required in Supplement C, paragraph 3 is the increase in the calibration team membership from a three-man to a six-man team.

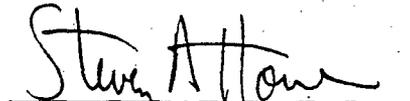
3. Reference 1b verified the increase in calibration team membership and further indicated that team membership may vary from four to seven individuals.

4. The recommended changes have been incorporated into subject application.

Prepared By:


BARRY J. SILBER
Health Physicist

Reviewed and Approved By:


STEVEN A. HORNE
Chief, Readiness Division
Safety Office

DEPARTMENT OF THE ARMY
US ARMY TMDE SUPPORT ACTIVITY PACIFIC
UNITED STATES ARMY MISSILE COMMAND
APO SF 96212

DRSMI-MW-K

6 May 1981

SUBJECT: Application for US Nuclear Regulatory Commission Source Material
License

Commander
Headquarters US Army Communications & Electronics Command
ATTN: DRSEL-SF-H
Fort Monmouth, New Jersey 07703

Mr. George H. Lee, USATSAPAC Radiological Protection Officer (RPO) has reviewed and concurs in the applicable parts of the subject draft document, dated 28 April 1981, pertinent to this command.


KENNETH N. BROWN
LTC, OrdC
Commanding

SUPPLEMENT A

1. Reference: Paragraph 2 of letter/application.
2. Inclosure 1 is Military Specification, MIL-R-24265 (SHIPS) used for the manufacture of the AN/UDM-7C Radiac Calibrator Set.
3. The AN/UDM-7C Radiac Calibrator Set contains two each sources of ²³⁹Plutonium, one source of 810 micrograms and one source of 8.1 micrograms, as ²³⁹Plutonium Chloride. A solution containing a known quantity of ²³⁹Plutonium Chloride is carefully and thoroughly mixed with a polyvinyl-butyril resin and 99 percent ethyl alcohol mixture to assure a uniform dispersion of the radioactive material in the solution. This solution is then poured onto a 12½ inch diameter cast acrylic plastic disk and is allowed to dry under controlled conditions, i.e., 40 percent relative humidity or less and a temperature of 70 degrees Fahrenheit or less, resulting in a very thinly deposited layer of resin having a high degree of uniformity.
4. One hundred percent of the radioactive source disks are tested for uniformity requirements prior to assembly into its shelf casing. One hundred percent of the sources are also tested for accuracy and leakage requirements in their completed configuration. In addition, a random sampling of ten percent of the completed AN/UDM-7C Radiac Calibrator Sets are tested for uniformity, accuracy, enclosure, shock and vibration, and leakage requirements and witnessed by a Government representative. The aforementioned testing requirements are stipulated in Inclosure 1. Inclosures 2, 3, 4 and 5 are the engineering drawings detailing the construction of the AN/UDM-7C Radiac Calibrator Set.
5. Quality audits by a qualified independent testing laboratory (Governmental or Industrial), i.e., the US Army Mobility Equipment Research and Development Command or equivalent organization, will be conducted on a random sampling of ten percent of the completed AN/UDM-7C Radiac Calibrator Sets and tested in accordance with the requirements of MIL-R-24265. Sampling and testing will also conform to the requirements of Military Standard 105, Sampling Procedures and Tables for Inspection by Attributes, or equivalent.

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

(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/cm² 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 10⁷ DPM and 10⁵ 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 - 13-23/32 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 micro-second 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 micro-curies of Plutonium-239. 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 ($\pm 1/64$) 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 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/cm² or less) used with a conventional type scaler (1 megohm, 0.5 μ sec 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 PuCl₃ in HCl (± 0.5 N)

810 μ g/cc for source 1 - equivalent to approximately 10⁴ μ g/m²

8.1 μ g/cc for source 2 - equivalent to approximately 10² μ g/m²

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)

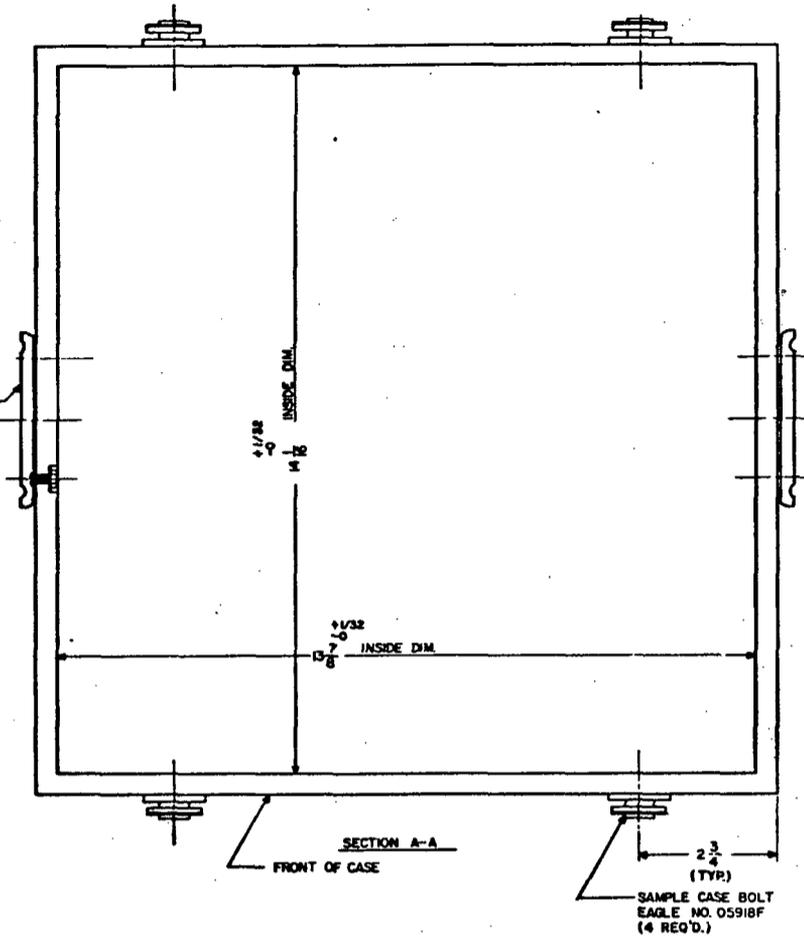
Mouth diameter \approx 65mm

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

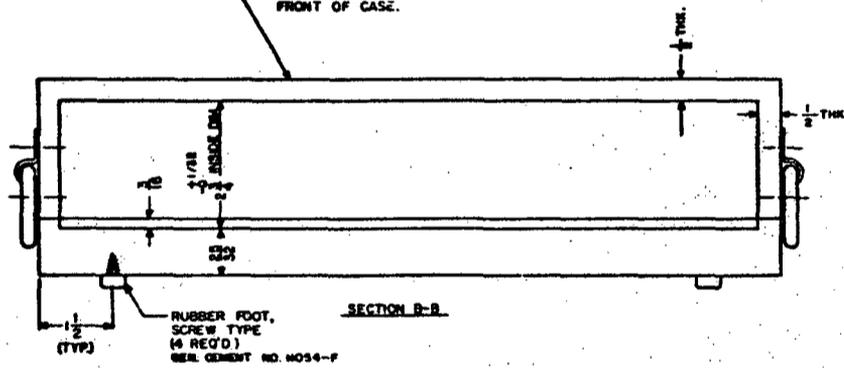
MIL-R-24265(SHIPS)

- (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

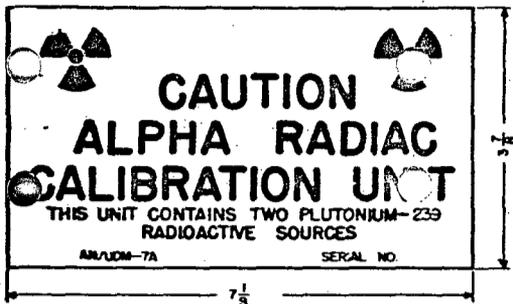
CHEST HANDLE
BRASS (2 REQ'D)
SPEC. NO. 62340-259-7969



NAMEPLATE (PART 31) TO BE CENTERED
ON THIS SURFACE TO BE READ FROM
FRONT OF CASE.

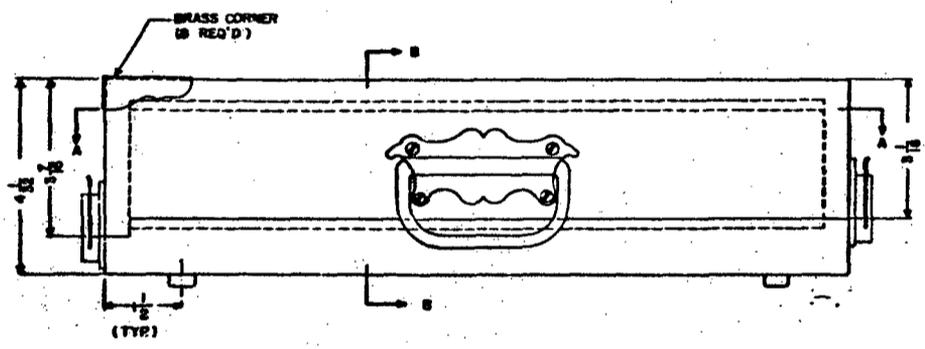


ITEM 30. CARRYING CASE



3 NAMEPLATE
 MAGENTA MARKINGS ON YELLOW BACKGROUND
 THERMAL MARK PRESSURE SENSITIVE ANODIZED FOIL ALUM NAMEPLATE OR EQUAL
 MAY BE PURCHASE FROM:
 ANODYNE INC. NORTH SHORE NAMEPLATE DIV.
 1270 NW 165TH STREET, NORTH MIAMI BEACH 65, FLORIDA

- NOTES:**
1. ALL MATERIAL 1/2 THICK HARDWOOD EXCEPT AS NOTED.
 2. STAIN AND SHELLAC ALL SIDES.
 3. PARTS TO BE FASTENED TOGETHER WITH APPROPRIATE SCREWS AND CEMENT GLUE.

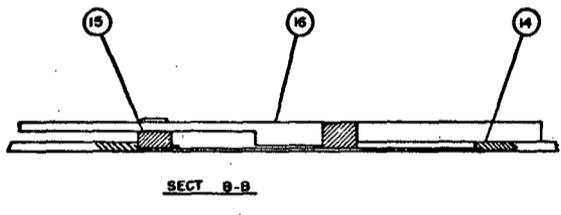
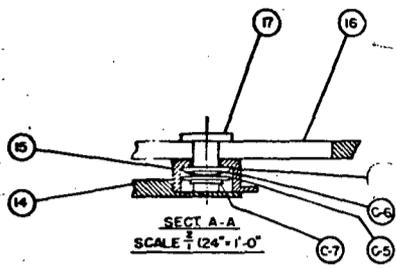
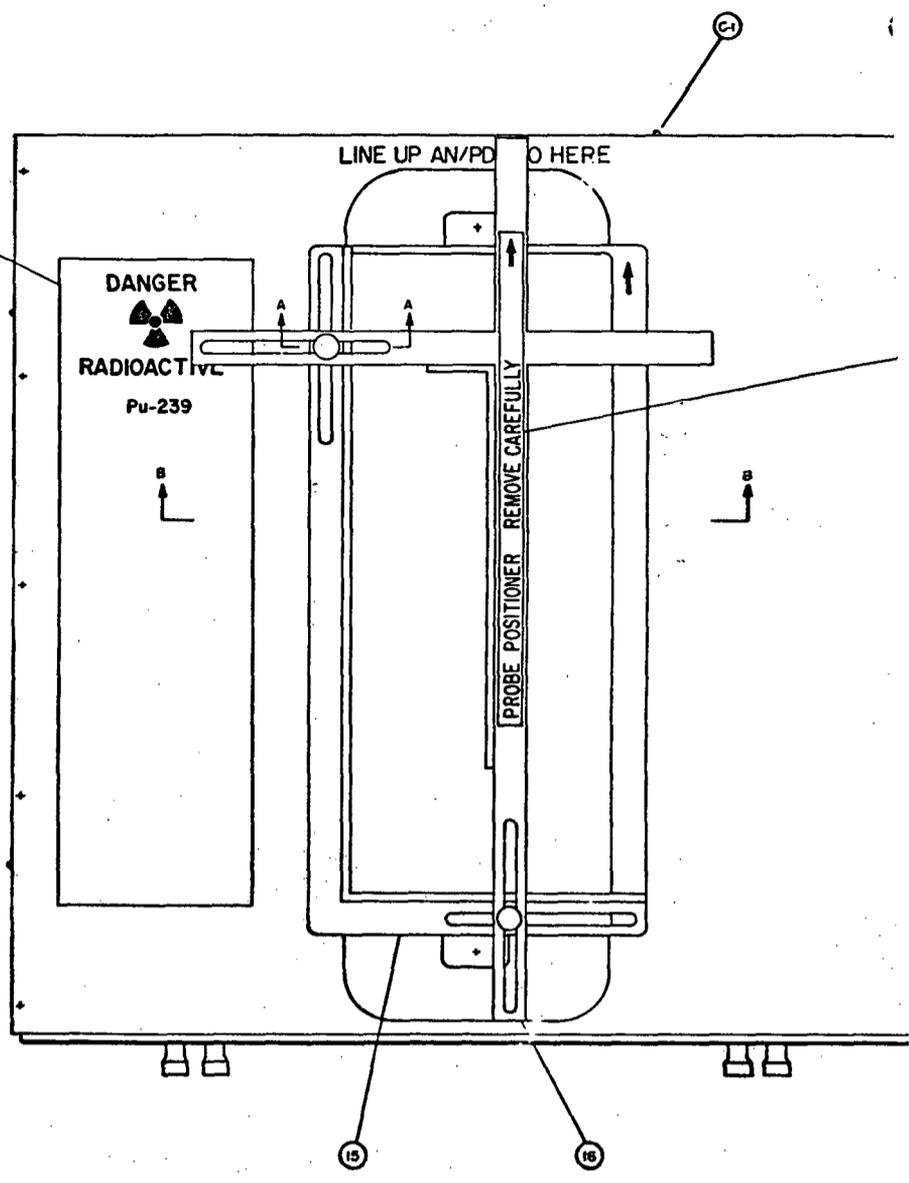


CARRYING CASE

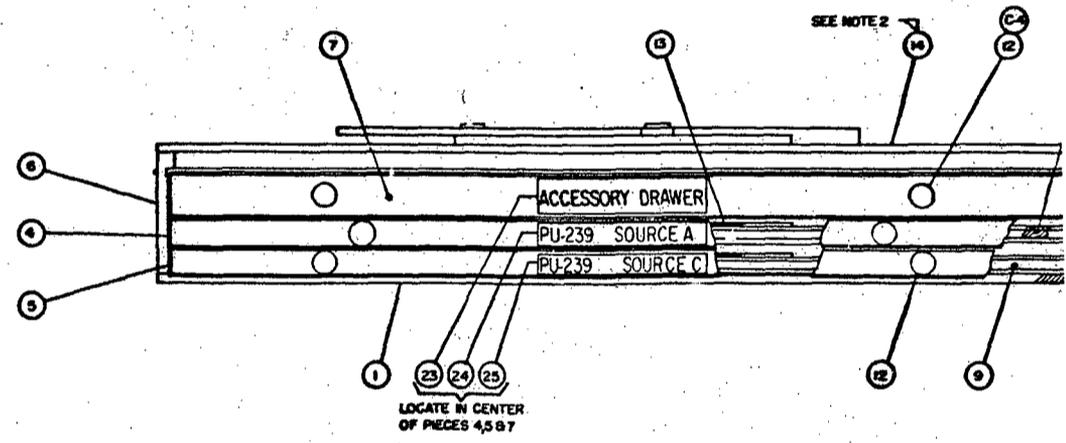
RE-F2696577

CODE IDENT NO.	SIZE	BUREAU OF SHIPS DRAWING NO.	REV.
80066	F	RE 101F 2002	A
SCALE:	SHEET 4 OF 4		

RE 101 F 5005



- NOTES**
1. ALL OUTSIDE SURFACES OF ALPHA RADIAC CALIBRATOR TO HAVE GREY HAMMERTONE FINISH.
 2. LINE UP 4x10 CUTOUT IN PART B WITH 4x10 CUTOUT IN PART M - AT ASSEMBLY
 3. NAMEPLATES: PC.22, 23,24,25,26,27,28,29,B3M MAY BE PURCHASED FROM: ANODYNE INC. NORTH SHORE NAMEPLATE, A DIV. 1270 N.W. 155TH STREET NORTH MIAMI BEACH 69, FLORIDA NAMEPLATES SOLD UNDER DESIGNATION "THERMIA MARK ANODIZED FOIL ALUMINUM NAMEPLATES"



REVISIONS		
ZONE LTR	DESCRIPTION	DATE APPROVED
A	DRAWING RELEASED BY BUREAU OF SHIPS	10-4-66

LIST OF MATERIAL						
QUANTITIES ARE FOR ONE (1) ALPHA RADIAC CALIBRATOR ASSY.						
PART NO.	NAME	QTY	MATERIAL SPEC.	FEDERAL STOCK NO.	REMARKS	
A-1	ASSEMBLY	ONE				ASSEMBLY
1	BASE PANEL	1	ALUMALY			
2	BACK PANEL	1				
3	TOP PANEL	1				
4	FRONT PANEL	1				
5	FRONT PANEL	1				
6	SIDE PANEL	2				
7	DRAWER	1				
8	COVER SOURCE HOLDER	2				
9	SOURCE HOLDER	1				
10	SOURCE HOLDER	1				
11	BOTTOM SOURCE HOLDER	2				
12	KNOB	6				
13	COVER	2				
14	POSITIONER HOLDER	1				
15	POSITIONER, BOTTOM	1				
16	POSITIONER, TOP	1				
17	GUIDE PIN	2	CORR. RES. STEEL			
18	COVER	1	ALUMALY			NOT SHOWN ON THIS SHEET
C-1	ESCUTCHEON PIN	8	CORR. RES. STEEL			#19 3/4 LG.
C-2	MACHINE SCREW	26				#5-40 FLAT HD 3/16 LG.
C-4		16				#40 FLAT HD 3/16 LG.
C-5	PLAIN WASHER	4				250 S 3/16 DIA # 40 FINE
C-6	SPRING WASHER	2	COMM.			5-40 FINE STAINLESS STEEL, STYLE 3
C-7	RETAINING RING	2				250 S 3/16 DIA # 40 FINE
19	THUMB SCREW	2	CORR. RES. STEEL			NOT SHOWN ON THIS SHEET
20	SOURCE MASK	1	ALUMALY			
21	SOURCE MASK	1				
22	NAMEPLATE	1	COMM.			SEE NOTE 3
23		1				
24		1				
25		1				
26		1				
27		1				
28		1				
29		1				
30	CARRYING CASE	1	HDWD.			SEE SHEET 4 OF 4
31	NAMEPLATE	1	COMM.			SEE NOTE 3
32	TWEEZERS	1	PR.			DIRECTING FORCE: SHARP POINTS CURVED 3/16 DIA. LENGTH: 4 1/2 IN. HANDLE: 3-1/4 x 3-1/4 IN. HANDLE: 3/16 DIA. HANDLE: 3/16 DIA. HANDLE: 3/16 DIA.
33	ENVELOPE	1				
34		1				
35		1				

27 LOCATE APPROX. AS SHOWN

MATERIAL

1. ALUM. ALLOY, SPEC. QQ-A-250/86, TEMP. H32
2. ALUM. ALLOY, SPEC. QQ-A-250/116, TEMP. T6
3. ALUM. ALLOY, SPEC. QQ-A-250/26, TEMP. H14
4. CORR. RES. STEEL, SPEC. QQ-9-763, CL. 303
5. ALUM. ALLOY, SPEC. QQ-A-270, TEMP. T6

RE. F26 965 77

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES				BUREAU OF SHIPS SIGNATURE		NAVY DEPARTMENT		WASHINGTON, D. C.	
TOLERANCES ON FRACTIONS DECIMALS ANGLES				SECT. HEAD		BUREAU OF SHIPS			
				PROJ. ENG.		ALPHA RADIAC CALIBRATOR AN/UDM-7A			
				CHECKER					
				DRAFTSMAN					
				DATE					
				FOR CHIEF OF BUREAU					
MATERIAL:				DATE		SIZE		CODE IDENTIFYING BUREAU OF SHIPS DRAWING NO. REV.	
				7-28-66		F		80064 RE 101 F 2002 A	
CONTR. DWS NO.				CONTR. DWS NO.		SCALE:		SHEET 1 OF 4	

A 10101 F 2002

SUPPLEMENT B

1. Reference: Paragraph 3 of letter/application.
2. Local Radiation Protection Officer (RPO). All calibration in which the AN/UDM-7C Radiac Calibrator Set is used will be supervised by a qualified local RPO. To be qualified as such, a person must have received a minimum of 40 hours of formal training in radiation protection including the following topics:
 - a. Principles and practices of radiation protection.
 - b. Biological effects of radiation.
 - c. Radioactivity measurement standardization and monitoring techniques and instruments.
 - d. Mathematics and calculations basic to the use and measurement of radioactivity.
 - e. The operation and use of the AN/UDM-7C.

NOTES

- A. Completion of the Radiological Safety Course at the US Army Chemical School or at the US Army Ordnance Center and School meets these requirements.
 - B. Where circumstances warrant, alternate training may be substituted if this training is approved by Commander, US Army Communications-Electronics Command, ATTN: DRSEL-SF, Fort Monmouth, New Jersey 07703. Such training must be received under the guidance of a qualified local RPO, and must include at least 16 hours of actual experience in the use of the AN/UDM-7C.
3. Operator or User. The operator or user of the AN/UDM-7C shall have a minimum of 8 hours training under the guidance of a qualified local RPO for the AN/UDM-7C in the basic fundamentals of radiological operations, radiac instrumentation theory and application and survey techniques and 16 hours on-the-job training in operation and care of the AN/UDM-7C. Instructions shall include safe working practices and inherent hazards associated with the instrument.
 4. Radiation Control Officer (RCO). To be qualified as an RCO for the AN/UDM-7C, a person must have a technical, scientific or engineering background and have successfully completed a minimum of 80 hours of formal training in radiation protection including the topics listed in item 2 above.
 5. Maintenance Depot for the AN/UDM-7C.
 - a. Depot Radiation Protection Officer and Alternate(s) must have as a minimum:
 - (1) A Bachelor's degree, or specialty, in Science, Engineering, Health Physics or equivalent discipline.

(2) 160 hours of specialized training in radiation protection including:

(a) Principles and practices of radiation protection.

(b) Biological effects of radiation.

(c) Radioactivity measurement standardization and monitoring techniques and instruments.

(d) Mathematics and calculations basic to the use and measurement of radioactivity.

(e) At least one year of satisfactory experience in applied Health Physics.

b. Technicians. The following are the minimum requirements necessary for persons performing leak tests:

(a) Same as in 3 above, and

(b) Sufficient training by the depot RPO or his appointed representative(s) in the use of radiation detection instruments for leak test analysis, which shall include the method of performing the test, e.g., points on equipment to be smeared and method of taking smear; method of calibration of the instruments; and analysis of smears and reporting of smear results.

SUPPLEMENT C

1. Reference: Paragraph 3 of letter/application.

2. AN/UDM-7C Radiac Calibrator Sets will be issued only to authorized calibration activities at the direct support/general support level. Elements authorized to possess alpha radiation measurement/detection instrumentation will not necessarily be authorized to possess the calibrator set. Typically, instrumentation will be sent to authorized calibration activities or will be calibrated by a visiting mobile calibration activity (team). Activities are authorized by US Army TMDE Support Group on the basis of approved facilities, equipment, standards, procedures and qualifications of personnel.

3. Most of the sets will be used by four to seven-man Army TMDE support teams (one set per team) who have received at least forty hours training in the principles and practices of radiation protection which included specific training in the safe use of the calibrator set. The teams will operate at various Army installations/activities which possess alpha detection instrumentation. Other users will be authorized Army depots, installation and activity calibration facilities, and the US Army Chemical School, Fort McClellan, Alabama radiation safety training branch.

SUPPLEMENT D

1. Reference: Paragraph 4 of letter/application.
2. Inclosures 1, 2 and 3 are the qualifications of the Radiation Protection Officer, the Alternate Radiation Protection Officer and the License Manager.

STEVEN A. HORNE, Chief, Readiness Division, Safety Office and Health Physicist,
 US Army Communications-Electronics Command (CECOM), Fort Monmouth, New Jersey

1. Educational Background:

Old Dominion University Norfolk, Virginia	3 Years	1964 - Associate in Applied Science
The Catholic University of America Washington, DC	2 Years	1975 - BSE Nuclear Science and Engineering
The Catholic University of America Washington, DC	-	1975 - Graduate Work in Nuclear Science and Engineering

2. Formal Training and Experience in Radiation Protection Methods,
 Measurements and Effects:

	<u>Duration of Training</u>	<u>On The Job</u>	<u>Formal Course</u>
a. Fifty-six semester hours pertaining to radiation, including college physics, Environmental Aspects of Nuclear Power Plant Management, Environmental Radio- activity, Nucleonic Fundamentals, Nuclear Properties and Interactions, Nuclear Physics, Nuclear Radiation Detection, Nuclear Reactor Physics, Radiation Biology, Radioisotope Techniques and Radiological Physics - Old Dominion University and The Catholic University of America.	1961-1975	No	Yes
b. Radiation Detection Effects and Devices Utilizing various type of high energy accelerators - Virginia Associated Research Center Newport News, Virginia, and NASA Langley Research Center, Langley, Virginia.	1 Year	Yes	No
c. Radiation safety, detection instrumentation and isotopic handling equipment - Flow Corp, Fort Belvoir, Virginia.	2 Months	Yes	No

	<u>Duration of Training</u>	<u>On The Job</u>	<u>Formal Course</u>
d. Radiological Safety Course pertaining to Nuclear Moisture/Density Instrumentation - Seaman Nuclear Corporation, Milwaukee, Wisconsin.	24 Hours	No	Yes
e. Occupational Radiation Protection Course 212 - Public Health Services, Las Vegas, Nevada.	80 Hours	No	Yes
f. Fundamentals of Non-Ionizing Radiation Protection Course 264 - Public Health Service, Rockville, Maryland.	40 Hours	No	Yes
g. Laser Safety Course - University of Cincinnati, Ohio.	40 Hours	No	Yes
h. Radionuclide Analysis by Gamma Spectroscopy Course 208 - Public Health Service, Winchester, Massachusetts.	80 Hours	No	Yes
i. Radiation Guides and Dose Assessment Course 272 - Environmental Protection Agency, Las Vegas, Nevada.	80 Hours	No	Yes

3. Experience with Radioisotopes:

<u>Isotope</u>	<u>Maximum Activities in Curies</u>	<u>Duration of Experience</u>	<u>Type of Experience</u>
^{241}Am	1	3 Years	For all radionuclides listed, experience consisted of laboratory analysis, wipe tests, experiments and evaluations utilizing these sources.
^{252}Cf	.27	3 Years	
^{57}Co	0.1	4 Years	
^{60}Co	1200	8 Years	
^{137}Cs	1	8 Years	
^3H	20	8 Years	
^{192}Ir	100	8 Years	
^{147}Pm	1	8 Years	

<u>Isotope</u>	<u>Maximum Activities in Curies</u>	<u>Duration of Experience</u>
$^{226}\text{RaBe}$	1	5 Years
$^{239}\text{PuBe}$	1	1 Year
^{90}Sr	0.1	2 Years

4. Experience with other Radiation Producing Machines:

<u>Radiation Machine</u>	<u>Duration of Experience</u>	<u>Type of Experience</u>
a. NASA Langley Research Center, and Virginia Associated Research Center's, Space Radiation Effects Laboratory consisting of a 2 MeV Van de Graaff accelerator, 3 MeV Dynamitron accelerator, 10 MeV Linear Electron Accelerator, a 600 MeV Proton Synchrotron Accelerator and a 14 MeV Neutron Generator.	1.5 Year	Radiation damage Shielding Experiments and Related Health Physics Studies.
b. 250 KeV General Electric Corporation X-ray machine	8 Years	Health Physics and Laboratory experiments.
c. Various energy dispersive and wave length X-ray fluorescence spectrometry with X-ray generators up to 50 KeV.	8 Years	Health Physics and Laboratory experiments.

5. Experience with radiation:

- 1964-1965 - Virginia Associated Research Center, NASA, Langley Research Center, Virginia as Health Physics Technologist.
- 1965-1966 - E.R. Squibb, New Brunswick, New Jersey as Radiochemist Isotope Technologist.
- 1966-1968 - Flow Corporation, Nuclear Division, Fort Belvoir, Virginia as Radiation Engineer.
- 1968-1976 - US Army Mobility Equipment Research and Development Command, Fort Belvoir, Virginia as Health Physicist.
- 1976-1978 - US Army Electronics Command, Fort Monmouth, New Jersey as Health Physicist.

1978-1981 - US Army Communications and Electronics Materiel Readiness
Command, Fort Monmouth, New Jersey as Health Physicist.

1981-Present - US Army Communications - Electronics Command , Fort Monmouth,
New Jersey as Chief, Readiness Division, Safety Office and
Supervisory Health Physicist.

BARRY J. SILBER, Health Physicist, US Army Communications-Electronics Command (CECOM), Fort Monmouth, New Jersey

a. Education:

(1) A.A. - Brooklyn College of the City University of New York, Brooklyn, New York - 1965.

(2) B.S. - Brooklyn College of the City University of New York, Brooklyn, New York - 1969. Major: Chemistry.

b. Professional Experience:

(1) October 1966 - May 1967:

Allen Pharmacal Corporation, 175 Pearl Street, Brooklyn, New York.

Laboratory Technician - Analytical Chemistry Laboratory.

Laboratory analyses of pharmaceuticals at various stages of manufacture to insure compliance with Food and Drug Administration Regulations as well as United States Pharmacopeia and National Formulary Monographs.

(2) June 1967 - March 1970:

EON Corporation, 175 Pearl Street, Brooklyn, New York.

Chemist - Responsible for all health physics activities, including radiation surveys, air sampling and wipe tests, leak testing of sealed sources, decontamination of facilities and equipment, disposal of radioactive wastes, calibration of radiation survey and measurement instrumentation, record-keeping, etc., to insure compliance with US Nuclear Regulatory Commission (NRC) and New York State Regulations; liaison between regulatory agencies and corporate management; authorized radiation worker (user) of multiple types of radioactive materials used in the manufacture of radiation sources for commercial, military and highly specialized (custom-made) use; responsible for all chemistry activities including metallurgical applications on products at various stages of manufacture to meet quality control specifications.

(3) March 1970 - June 1977:

State of New York Department of Labor, Division of Safety and Health, 2 World Trade Center, New York, New York.

Senior Radiophysicist - Radiological Health Unit.

Responsible for the review of applications, including the evaluation of facilities, equipment, personnel and products containing radioactive materials, and in the preparation of State licenses authorizing the possession and use of radioactive materials by persons in industry and related activities in this State; assist in the administration of the licensing program; consult with and assist industrial management personnel and others in establishing radiation protection programs; conduct inspections, special precicensing investigations, radiation surveys and tests at the sites of licensees and registrants using radiation sources to enforce state regulations and to insure that radiation workers and the general public are fully protected; assemble environmental research data, analyze and interpret this data, assist in the publication of scientific reports, and training of new staff members.

(4) June 1977 - January 1978:
 US Army Electronics Command (ECOM), Fort Monmouth, New Jersey.
 Health Physicist - Responsible for health physics functions in the establishment and implementation of the ECOM Safety Program aimed at establishing life cycle controls of ECOM commodities utilizing radioactive material and ionizing radiation producing devices; responsible for the evaluation of radiological protection programs and radiation facilities to determine their adequacy and to insure compliance with DA Authorizations and NRC Licenses; perform studies and evaluations necessary to minimize the health risks to personnel; prepare and review applications for DA Authorizations and NRC Licenses; establish and maintain radiation protection records and files.

(5) January 1978 - April 1981:
 US Army Communications and Electronics Materiel Readiness Command (CERCOM), Fort Monmouth, New Jersey.
 Duties are the same as in Item b(4) above. Name change from ECOM to CERCOM.

(6) May 1981 - Present:
 CECOM, Fort Monmouth, New Jersey.
 Duties are the same as in Item b(4) above. Name change from CERCOM to CECOM.

c. Formal Training in Radiation Protection Methods, Measurements and Effects:

	<u>Duration of Training</u>	<u>On-The-Job</u>	<u>Formal Course</u>
(1) X-Ray Technology for Radiological Health Personnel-Memorial Hospital for Cancer and Allied Diseases, 444 East 68th Street, New York, New York - 11 January - 14 January 1971.	3 Days	No	Yes
(2) Orientation Course in Regulatory Practices and Procedures - NRC, Bethesda, Maryland - 1 March - 19 March 1971.	3 Weeks	No	Yes
(3) Health Physics and Radiation Protection - Special Training Division, Oak Ridge Associated Universities, Oak Ridge, Tennessee - 12 February 1973 to 20 April 1973. Sponsored by the NRC for Agreement State regulatory personnel.	10 Weeks	No	Yes
(4) Radiological Safety Course - US Army Ordnance and Chemical Center and School, Aberdeen Proving Ground, Maryland - 25 October - 15 November 1977.	3 Weeks	No	Yes
(5) Internal Dosimetry for Fixed Nuclear Facilities-Oak Ridge Associated Universities, Oak Ridge, Tennessee - 5 November - 9 November 1979.	1 Week	No	Yes
(6) Managers' Environmental Course - US Army Logistics Management Center, Fort Lee, Virginia - 13 July - 17 July 1981.	1 Week	No	Yes

d. Experience with Radiation.

<u>Isotope</u>	<u>Maximum Amount</u>	<u>Duration of Experience</u>	<u>Type of Use</u>
(1) ^{14}C	60 mCi	3 Years	For items 1 through 10-manu- facture of sealed sources, health physics surveys and wipe tests.
(2) ^{32}P	10 mCi	3 Years	
(3) ^{36}Cl	10 mCi	3 Years	
(4) ^{63}Ni	10 mCi	3 Years	
(5) $^{90}\text{Sr}/^{90}\text{Y}$	50 mCi	3 Years	For items 11 and 14-calibration of radiation instrumentation, health physics surveys and wipe tests.
(6) ^{99}Tc	100 mCi	3 Years	
(7) $^{106}\text{Ru}/^{106}\text{Rh}$	50 mCi	3 Years	
(8) $^{144}\text{Ce}/^{144}\text{Pr}$	500 mCi	3 Years	
(9) ^{147}Pm	500 mCi	3 Years	For items 12 and 13-health physics surveys and wipe tests.
(10) ^{204}Tl	50 mCi	3 Years	
(11) ^{60}Co	10 mCi	3 Years	
(12) ^{60}Co	200 Ci	3 Years	
(13) ^{137}Cs	250 Ci	3 Years	
(14) ^{226}Ra	20 mCi	3 Years	

BERNARD M. SAVAICO, Chief, Safety Office, US Army Communications-Electronics Command (CECOM), Fort Monmouth, New Jersey

a. Education: 1957 - B.S. Industrial Engineering, Columbia University, New York, New York.

b. Professional Experience:

(1) 5 years - Safety Officer - US Air Force.

(2) 4 years - Industrial Safety - U.S. Steel Corporation.

(3) 20 years - Industrial Safety and Chief, Safety Office- USACECOM (formerly US Army Communications and Electronics Materiel Readiness Command and US Army Electronics Command) Fort Monmouth, New Jersey, including 3 years experience as a Radiation Protection Officer with responsibilities for the control of various commodities containing radioactive materials.

Mr. Savaiko is designated as the manager of Nuclear Regulatory Commission Licenses and Department of the Army Authorizations.

SUPPLEMENT E

1. Reference: Paragraph 4 of letter/application.

2. The Army program for control of radioactive items of supply is prescribed specifically in two regulations. AR 700-64, Radioactive Commodities in the DOD Supply Systems, is an interservice regulation which prescribes responsibilities for control of radioactive items and components which are introduced in the supply system. AR 385-11, Ionizing Radiation Protection, establishes requirements for obtaining NRC licenses for radioactive materials and authorizations to possess radioactive material not controlled by NRC, and requirements for individually controlled items of supply, the transportation of radioactive materials and the disposal of unwanted radioactive material. Major Army commands are implementing these Department of the Army (DA) regulations.

3. The authority contained in NRC licenses and DA authorizations issued to CECOM permits DOD installations and activities to acquire and use certain radioactive calibration and test items without obtaining their own license or authorization for these items (a DA authorization is required for radioactive material not controlled under an NRC specific license). This is based upon commitments made by CECOM that all Army elements will comply with conditions contained in those licenses and authorizations and with pertinent Federal, DOD and Army regulations. Both NRC and DA require control of all operations involving radioactive items to insure the safety of personnel and property. Army activities possessing licensed radioactive sources and the agencies controlling them are subject to inspection by the NRC in addition to inspection by Army elements.

4. The mission of CECOM includes the management and performance of all material life cycle functions and services and acts as DA licensee for Army-wide distribution of these items. The following is a description of functions of the various CECOM elements providing a coordinated effort:

a. The functions for the manager of the NRC License/DA Authorization are assigned to the Chief, Safety Office of the Command Staff of this headquarters. The responsibilities of the manager are to:

(1) Coordinate, obtain, administer, review, amend and maintain necessary licenses/authorizations for radioactive commodities managed by this command.

(2) Provide information and guidance to all commanders, with respect to limitations, constraints, conditions or procedures which affect the responsibilities of those commanders for the radioactive commodity.

(3) Monitor the various elements of the life cycle program of the radioactive commodities to assure compliance with conditions of the applicable license/authorization.

(4) Assure that licensed/authorized material is not transferred to unauthorized persons or organizations.

b. The health physicists serve as the CECOM staff contact for radiation control and license/authorization matters to the Army Materiel Development and Readiness Command, other major commands and DA elements, other services and federal agencies; provide advice and assistance to other CECOM elements involved in the fielding of radioactive items, the National Inventory Control Point (NICP) (an element of CECOM), depots and other Army elements; prepare applications for NRC Licenses/DA Authorizations for Army-wide distribution of assigned items; prepare radiation safety instructions for incorporation in technical literature and other published guidance pertaining to the items; coordinate with the NICP to assure that requisitioning elements are authorized to and technically capable of receiving the item and the procurements do not exceed the quantity or use limitations imposed by the various licenses; perform pre-award and post award health physics surveys of contractors; provide health physics advice to be included in instructions for disposal of radioactive waste, and serve as staff officers for notification, investigation, and preparation of reports required in the event of an accident or incident in which this command's radioactive items may be involved. In addition to the above, the health physicists maintain a computerized data retrieval system that contains information such as the radioactive commodity type number, set serial number, location, responsible RPO, alternate RPO, where applicable, their qualifications, and all leak test results.

c. The CECOM NICP located at Fort Monmouth, New Jersey has adopted special procedures for individually controlled radioactive items that are in addition to standard Army Supply practices used for all type classified items. The control point maintains records of procurements, receipts, storage locations, shipments, using locations, authorizes, issues, and assures adequate supply. It reviews requisitions submitted and when approved, issues material release orders to the designated depot for shipment of the material to the requisitioner. Requisitions are submitted through various command control channels. The control point bases its approval on previously established authorization of the requisitioner to receive the item from the supply standpoint such as an approved Table of Allowances. Upon approval of the requisition, the control point issues a material release order to the depot storing the item. The depot ships the item directly to the requisitioner, notifies the control point and furnishes other shipping data which is forwarded also through supply property office channels.

d. Reports of excess items are submitted through various command channels to the NICP for review for serviceability, turn-in or disposal as radioactive waste. Requests for disposition instructions of radioactive waste are submitted through radiation control/protection command channels to the NICP.

e. The major Army commands have established regulatory requirements for control of the radioactive items. Each major command has established at the headquarters level a radioactive material control point and appointed a command radiation control officer to administer control of radioactive items within the command. That officer reviews and concurs in the qualifications of local radiation protection officers within the command, maintains records of radioactive items by location and assures periodic inventory and leak tests by using activities, performs periodic inspections/audits of accountable installations/activities to assure that items are properly handled in accordance with Army and NRC regulations, and to assure the submission of inventory and leak test reports and accident/incident reports to the appropriate commodity command as required by Army regulations. The local radiation protection officer is responsible for administering the local radiation protection program. Local programs provide for designated controlled areas, dosimetry, instrumentation, operating procedures to supplement published manuals for the items, receipts, transfers, storage and records.

Requisitions originated by using elements are processed through the local radiation protection officer to the major command radiation control officer. The requisition is reviewed from the radiation protection standpoint and logistics authority for possession. If approved, the requisition is forwarded to the NICP. Upon receipt of notification from the NICP of the transaction the information is forwarded to the local radiation protection officer who assumes radiation protection responsibility for the item. Requests for transfers of items between installations/activities are reviewed by the command radiation control officer and if approved reported to the NICP. Transfers outside the major commands are reviewed and approved by the NICP. Reports of excess items are submitted through radiation control channels for review for serviceability, turn-in or disposal as radioactive waste. Request for disposition instructions of radioactive waste are submitted through radiation control/protection command channels to Commander, USACECOM, ATTN: DRSEL-SF-H, Fort Monmouth, New Jersey 07703.

f. LBDA will provide bulk storage, maintenance, where required, leak test analyses, recalibration, quality surveillance and issue of the AN/UDM-7C Radiac Calibrator Set when approved by the NICP. No maintenance will be performed on the radioactive material/radiation source itself. Cosmetic maintenance may be performed on the calibrator casing. Where radioactive materials are involved, LBDA has established special warehousing facilities and handling procedures. The LBDA formal radiation protection program has been established and administered by a qualified physicist (RPO) from the US Army Ionizing Radiation Dosimetry Center (AIRDC) of the US Army TMDE Support Group located at LBDA through a memorandum of understanding between the two organizations. Mr. Joseph M. King, Chief, AIRDC has been designated to serve in this capacity. As with nonradioactive items, items are inspected when received, at intervals during storage and immediately before shipment. The inspections are conducted according to established surveillance procedures as determined by CECOM for each item. All AN/UDM-7C Radiac Calibrator Sets are tested for leakage of radioactive material prior to shipment to users. The quality surveillance program for the AN/UDM-7C Radiac Calibrator Set will be performed by either the LBDA-AIRDC RPO, his alternates or the CECOM Health Physicists and will involve the annual leak testing of a random sampling of at least one percent of depot assets and/or a minimum of five each of the AN/UDM-7C Radiac Calibrator, whichever is greater. LBDA-AIRDC will provide the results to Commander, USACECOM, ATTN: DRSEL-SF-H, Fort Monmouth, New Jersey 07703. Appropriate action will be taken if results indicate a trend toward leakage. LBDA will provide the NICP with notification of individually controlled item receipts, inspections and shipments. NRC licenses issued to LBDA-AIRDC describe the qualifications of the LBDA-AIRDC RPO, his alternates and the LBDA-AIRDC Radiation Protection Program.

g. The program for control of the AN/UDM-7C Radiac Calibrator Set, as with other radioactive items is, to the extent practical, the same logistics procedures applied to other Army supplies. Regulatory guidance has been established by DA and implemented by the various commands governing the management process, life-cycle management of material, logistics management and support, procurement, maintenance, storage, transportation, including packaging and disposal. For radioactive items the procedures are augmented by specific regulatory controls pertaining to the possession and use of radioactive materials, control of personnel radiation exposure, safe storage, handling maintenance, transportation and disposal of the items. For the AN/UDM-7C Radiac Calibrator Set, more stringent controls have been established as distribution of these devices are limited to authorized calibration activities. These controls include identifying and insuring that the AN/UDM-7C Radiac Calibrator Set is coded in the Commodity Command Standard System Automated Data Processing Program as radioactive in accordance with Appendix A of AR 708-1, Cataloging and Supply Management Data. This calibrator set is coded with a Special Control Item Code of A meaning Regulated and containing a radioactive item. Requisitions are processed initially by computers and then are manually processed by the NICP item manager to verify that the requisitioners are authorized to

receive the calibrator set. To insure that the above requirements are being implemented, the CECOM Health Physicists maintain close coordination with the item manager. Recalibration and recertification of the AN/UDM-7C Radiac Calibrator Set will be performed at LBDA, the US Army TMDE Support Activity Pacific (ATMDESAP), Camp Carroll, Korea, Nucleonics Branch, US Army Area TMDE Calibration and Repair Center - Pirmasens, Germany (ACRC-P), and the Nucleonics Laboratory Branch, US Army Calibration and Repair Center - Sacramento (ACRC-S), Sacramento Army Depot, Sacramento, California. In addition to LBDA, health physics laboratory counting equipment capable of measuring 0.001 microcuries are also available from ATMDESAP, ACRC-P and ACRC-S for evaluation of the three month leak test smears of the calibrator set. Leak test results are forwarded through Army channels to Commander, USACECOM, ATTN: DRSEL-SF-H, Fort Monmouth, New Jersey 07703.

h. Users of the AN/UDM-7C Radiac Calibrator Set are provided with specific instructions on the operation, safe handling, control and maintenance as described in Technical Manual 11-6665-247-10 (Inclosure 1). This information satisfies the radiation protection instructions to users as required by Title 10, Chapter 1, Code of Federal Regulations, Parts 19 and 20. In addition, Form NRC-3, Notice to Employees, is provided with the technical manual. Commander, USACECOM, ATTN: DRSEL-SF-H, Fort Monmouth, New Jersey 07703 will make available to the users the appropriate NRC regulations, the NRC license, license conditions, documents incorporated into the license by reference, and amendments thereto, and any notice of violation involving radiological working conditions for examination.

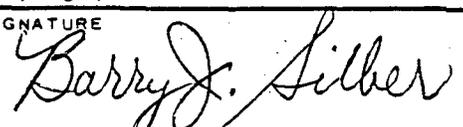
RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 310-1; the proponent agency is the US Army Adjutant General Center.	Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE 24 Aug 81
	TO: (Forward to proponent of publication or form) (Include ZIP Code) Cdr, CECOM ATTN: DRSEL-ME-PES Fort Monmouth, NJ 07703	FROM: (Activity and location) (Include ZIP Code) Cdr, CECOM ATTN: DRSEL-SF-H Fort Monmouth, NJ 07703

PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER TM 11-6665-247-10	DATE Aug 81	TITLE Operator's Manual, Calibrator, Radiac AN/UDM-7C (NSN 6665-01-084-7777)
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ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO.	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON <i>(Exact wording of recommended change must be given)</i>
1	1-2	1-5a(2)	14-16			Delete and replace with the following: "Appointing a Radiation Control Officer (RCO) for each RMCP and forwarding two copies of appointee's orders and qualifications to Commander, US Army Communications Electronics Command, ATTN: DRSEL-SF-H, Fort Monmouth, New Jersey 07703."
2	1-3	1-5b(5)	1			Change "...to Command, US..." to "...to Commander, US..."
3	1-5	1-9b(2)	(c) 1			Change "...to Command, US..." to "...to Commander, US..."
4	1-5	1-10e	47			Change "...49 CFR 173.390(49 CFR 172.202)..." to "...49 CFR 173.390 (49 CFR 172.203)..."
5	1-5	1-10g	50			Change "Specific activity..." to "Activity..."
6	2-6	2-1b	23			Change "...ATTN: DRSMI-MCJ-DC..." to "...ATTN: DRSMI-MCI-DC..."
7	3-1	3-1	13-14			Change "...contact ARRCOM National Maintenance Point..." to "...contact CECOM National Maintenance Point..."
8	A-1					Appendix A, Forms: Add: "Report of Item Discrepancy.....SF 364"

*Reference to line numbers within the paragraph or subparagraph.

TYPED NAME, GRADE OR TITLE BARRY J. SILBER Health Physicist, GS-12	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION 54427	SIGNATURE 
--	--	--

TO: (Forward direct to addressee list, publication)	FROM: (Activity and location), (include ZIP Code)	DATE
---	---	------

PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER			DATE	TITLE				
PAGE NO.	COLM NO.	LINE NO.	FEDERAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

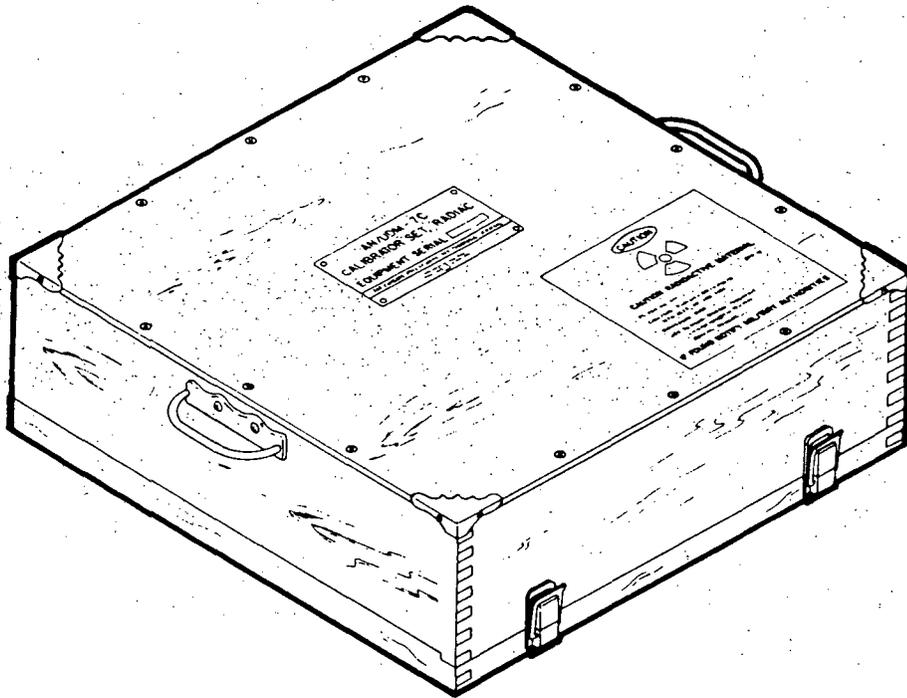
PART III - REMARKS (Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
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TM 11-6665-247-10

OPERATOR'S MANUAL CALIBRATOR, RADIAC AN/UDM-7C

(NSN 6665-01-084-7777)



**US NUCLEAR
REGULATORY
COMMISSION
REQUIREMENTS**

**EQUIPMENT
DESCRIPTION**

**OPERATING
INSTRUCTIONS**

**MAINTENANCE
INSTRUCTIONS**

**FORM NRC-3
NOTICE TO
EMPLOYEES**

**HEADQUARTERS, DEPARTMENT OF THE ARMY
AUGUST 1981**

WARNING

RADIATION HAZARD



Use Radiac Calibrator AN/UDM-7C only under the guidance of an installation/activity (local) Radiation Protection Officer and in accordance with requirements of Chapter 5, Section IV, AR 40-5 and AR 385-11.

Plutonium 239 (Pu239) is dangerous to living tissue. Small amounts of Pu239, when inhaled, ingested, or absorbed in open cuts or wounds, can cause serious illness or death. To avoid accident, observe the following:

- Use and store the calibrator only in designated radiation controlled areas.
- Do not eat, drink, smoke, apply cosmetics, or store food stuffs, drinks, tobacco, or cosmetics where the calibrators are used or stored.
- Do not allow personnel with open skin wounds to handle or work with the calibrators without the approval of the medical officer and the (local) Radiation Protection Officer (RPO).
- Prohibit loitering in the area by unauthorized personnel.
- Handle the calibrator carefully. Do not drop, rough handle, alter or damage it in anyway. Mishandling can cause source leakage.
- Do not touch the source surface with the hands. Wear plastic or surgical type gloves which allow sufficient dexterity during calibration and leak testing. Avoid contact of objects, such as tools, instruments, and components of the set, with the sources.
- Always wash and dry hands thoroughly after handling the calibrator; monitor the hands with a low-range alpha radiac meter; repeat the washing and drying if necessary. Notify the Radiation Protection Officer if washing does not remove contamination.
- DO NOT ATTEMPT TO CLEAN THE SOURCE OR SOURCE HOLDERS.

MATERIALS DATA INPUT MEDICAL

A. TYPE OF ACTION AND IDENTIFICATION CODES

<input type="checkbox"/> NEW LICENSE	<input type="checkbox"/> AMENDMENT TO RENEW LICENSE	<input type="checkbox"/> AMENDMENT TO TERMINATE	<input type="checkbox"/> VOID	DOCKET NUMBER 030-10362	MAIL CONTROL NUMBER 83197	CHANGE NAME/ ADDRESS
<input checked="" type="checkbox"/> NEW LICENSE AND NEW LICENSEE	<input type="checkbox"/> OTHER AMENDMENT	<input type="checkbox"/> CLERICAL CHANGE NO AMENDMENT				

B. INDICATIVE INFORMATION

INDICATIVE INFORMATION LICENSEE'S DETAILS	NAME (LAST, FIRST, MIDDLE)	NAME (LAST, FIRST, MIDDLE)
	NAME (LAST, FIRST, MIDDLE)	NAME (LAST, FIRST, MIDDLE)
	NAME (LAST, FIRST, MIDDLE)	NAME (LAST, FIRST, MIDDLE)

2 ORGANIZATION NAME (ALPHABETIC SEQUENCE)
Army, Department of the

DEPARTMENT OR BUREAU
U. S. Army Electronics Command

3 BUILDING, STREET CITY STATE ZIP
Ft. Monmouth NJ 07705

4 TYPE OF APPLICANT 2	<input checked="" type="checkbox"/> U.S. GOVERNMENT AGENCY <input type="checkbox"/> INDIVIDUAL LICENSEE <input type="checkbox"/> ORGANIZATIONAL LICENSEE	DATE REQUEST RECEIVED 08/13/76	INSTITUTION CODE 01022	PENDING PROG. CODE	ACTUAL PROG. CODE
---------------------------------	--	--	----------------------------------	--------------------	-------------------

5 SECONDARY PROGRAM CODES AS REQUIRED:

#1	#2	#3	#4	#5
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LICENSE NUMBER 29-01022-11	DATE LICENSE ISSUED OR ACTION COMPLETED	EXPIRATION DATE
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BY PRODUCT FORM USE POSS. LIMIT

Amendment 02 per letter dated Aug 13, 1974

Amend card 13 to read (14) copy 13 and add letter, dated Aug 13, 1974

MAIL TO: <i>Walter H. Owen Safely Office</i>	DATE MAILED	REVIEWER <i>J.M. Brown Jr.</i>	DATE COMPLETED
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**OPERATOR'S MANUAL
CALIBRATOR, RADIAC AN/UDM-7C
(NSN 6665-01-084-7777)**

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Communications-Electronics Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, New Jersey 07703. A reply will be furnished to you.

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CHAPTER 1 INTRODUCTION

Section I. GENERAL INFORMATION

1.1. SCOPE

This manual describes Calibrator, Radiac AN/UDM-7C (Calibrator) and covers its installation and operation. It includes instructions for initial service, operation, cleaning, and inspection of the equipment. The calibrator, radiac provides a calibration check for the AN/PDR-54, AN/PDR-56F and AN/PDR-60 Alpha Radiac Sets. Here in referred to as radiac sets. The calibrators contain plutonium which is controlled by the US Nuclear Regulatory Commission (NRC), Title 10 Code of Federal Regulations. AR 385-11 and AR 700-64 implement NRC regulations. Army-wide possession and use of the calibrators are authorized by a Special Nuclear Materials License issued to Department of the Army, US Army Communications-Electronics Command, Fort Monmouth, NJ 07703. The license is issued on the basis of statements concerning procedures established for the life-cycle control of the items. The sets are issued to authorized Army calibration activities, schools, and research and development laboratories through the US Army Communications-Electronics Command, National Inventory Control Point (DRSEL-MME-VC). Established Army supply procedures are augmented by radiological control procedures (AR 385-11).

1.2. MAINTENANCE FORMS AND RECORDS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750, The Army Maintenance Management System (TAMMS).

1.3. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If your AN/UDM-7C needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications-Electronics Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, NJ 07703. We'll send you a reply.

Section II. US NUCLEAR REGULATORY COMMISSION REQUIREMENTS

1.4. GENERAL

The NRC sets standards/conditions and issues licenses for the use of radioactive materials in the United States. The An/UDM-7C comes under the NRC regulations and a license for its use has been issued. Information required by the NRC license and regulations is contained below:

a. Radiation Protection. Users of the AN/UDM-7C should refer to instructions on control, safe handling, storage, emergency situations and operation and maintenance instructions contained in this technical manual. This satisfies the radiation protection requirements of the NRC regulations (Title 10, Code of Federal Regulations, Parts 19 and 20).

b. Notice to Employees. Form NRC-3, Notice to Employees, contained in the back of this manual, must be removed for posting wherever the AN/UDM-7C is used and/or stored. The posting requirements are contained on the form.

c. NRC License. The NRC license for the AN/UDM-7C and documents relating to that license are held by the US Army Communications-Electronics Command Safety Office at Fort Monmouth, New Jersey. AN/UDM-7C users may request further information on these documents by letter addressed to:

Commander
US Army Communications-Electronics Command
ATTN: DRSEL-SF-H
Fort Monmouth, NJ 07703

Requests for further information may also be made by phone by calling on AUTOVON 995-4427 or COMMERCIAL (201) 544-4427.

1-5. RESPONSIBILITY

a. Responsibilities of Major Commands.

- (1) Establishing at least one Radioactive Material Control Point (RMCP) (AR 385-11).
- (2) Appointing a Radiation Control Officer (RCO) for each RMCP and qualifications to Commander, US Army Communications-Electronics Command, ATTN: DRSEL-SF-H, Fort Monmouth, New Jersey 07703.
- (3) Developing implementation procedures to insure periodic leak testing and forwarding two copies of procedures to Commander, US Army Communications-Electronics Command, ATTN: DRSEL-SF-H, Fort Monmouth, New Jersey 07703.
- (4) Forwarding leak test smears to nearest approved smear counting station for evaluation.
- (5) Insuring that each installation or activity using the AN/UDM-7C has an effective radiation protection program.

b. Responsibilities of Radiation Control Officer.

- (1) Review and approve the qualifications of each local Radiation Protection Officer (RPO) for the AN/UDM-7C and forward to Commander, US Army Communications-Electronics Command, ATTN: DRSEL-SF-H, Fort Monmouth, New Jersey 07703 a list of these local RPO's and their qualifications for approval and certification.
- (2) If a qualified local RPO is not available, take one or more of the following actions:
 - (a) Suspend requisition for the AN/UDM-7C.
 - (b) Suspend use of the AN/UDM-7C until someone can be qualified by training.
 - (c) Transfer the AN/UDM-7C to an installation or activity with qualified personnel.
- (3) Maintain the following records for each AN/UDM-7C under his control:
 - (a) National stock number.
 - (b) Description.
 - (c) Serial number.
 - (d) Isotope, source activity, and date activity was determined.
 - (e) Dates and results of leak tests.
 - (f) Shipment number.
 - (g) Shipped from.
 - (h) Shipped to.
 - (i) Date shipped.
 - (j) Date of manufacture.
 - (k) Name of manufacturer.
 - (l) Name of qualifications of local RPO's.
 - (m) Radiation incident reports.
- (4) Insure that the AN/UDM-7C is properly handled in accordance with Army, DOD, and NRC regulations. Periodically inspect and audit records of installations and activities possessing the AN/UDM-7C.

(5) Assure that a Radiation Incident Report is submitted by electrical means to Command, US Army Communications-Electronics Command, ATTN: DRSEL-SF-H, Fort Monmouth, New Jersey 07703, within 24 hours, when an incident occurs.

(6) Consolidate and forward DA Form 3252-R (Radioisotope Inventory and Leak Test Report) (RCS DRC-192) listing all Calibrators, Radiac AN/UDM-7C in area of responsibility to Commander, US Army Communications-Electronics Command, ATTN: DRSEL-SF-H, Fort Monmouth, New Jersey 07703 at least quarterly (31 January, 30 April, 31 July and 31 October). Reports may include information on other CECOM managed calibration and test items of supply listed in AR 385-11.

1-6. SUPERVISION

a. All calibration in which the AN/UDM-7C is used will be supervised by a qualified radiation protection officer. To be a qualified RPO, a person must have received a minimum of 40 hours formal training on radiation including the following topics:

- (1) Principles and practices of radiation protection.
- (2) Biological effects of radiation.
- (3) Radioactivity measurement standardization and monitoring techniques and instruments.
- (4) Mathematics and calculations basic to the use and measurement of radioactivity.
- (5) The operation and use of the AN/UDM-7C.

NOTES

1. Completion of the Radiological Safety Course at the US Army Chemical School or at the US Army Ordnance Center and School meets these requirements.

2. Where circumstances warrant, alternate training may be substituted if this training is approved by Commander, US Army Communications-Electronics Command, ATTN: DRSEL-SF-H, Fort Monmouth, NJ 07703. Such training must be received under the guidance of a qualified RPO, and must include at least 16 hours of actual experience in the use of the AN/UDM-7C.

b. The person appointed as radiation protection officer may be a commissioned officer, a warrant officer, an enlisted man, or civilian, if he meets the minimum qualifications prescribed above. A radiation protection officer designated custodian for the AN/UDM-7C is a specified person designated to control the use of the AN/UDM-7C.

c. The operator or user of the AN/UDM-7C shall have a minimum of 8 hours training under the guidance of a qualified RPO for the AN/UDM-7C in the basic fundamentals of radiation operation, radiac instrumentation theory and application and survey techniques and 16 hours on-the-job training in operation and care of the AN/UDM-7C. Instructions shall include safe working practices and inherent hazards associated with the instrument.

1-7. DUTIES OF RADIATION PROTECTION OFFICER (RPO)

The specific duties of the appointed radiation protection officer will be to:

- a. Insure that the AN/UDM-7C's under his jurisdiction are properly used and stored.
- b. Train local users and operators and maintain list and record of training of users and operators.
- c. Insure records are maintained on each item.
- d. Advise RMCP of any forthcoming change in accountability, local RPO, or installation relocation for the AN/UDM-7C.
- e. Submit Radiation Incident Report according to published directives.

- f. Establish radiation controlled areas for AN/UDM-7C storage and use.
- g. Post Radiation Area warning signs.
- h. Insure items are stored in a fire-resistant structure and no explosives of any kind are stored in the same structure.
- i. Immediately refer actual or suspected overexposure to medical officer.
- j. Insure that periods of time between leak tests do not exceed 3 months and supervise performance of leak tests.
- k. Secure items against unauthorized use and removal.
- l. Insure that all Army, DOD, and Federal Regulations are being followed and that personnel are exposed to a minimum of radiation consistent with practical considerations.
- m. Conduct a physical inventory according to published frequencies.
- n. Submit inventory, leak test, and other reports to RMCP as required.
- o. Prior to relief from duties, place all AN/UDM-7C's under this jurisdiction in locked storage.
- p. Investigate each case of excessive or abnormal exposure to determine the cause, recommend remedial action to prevent recurrence, and submit a complete written report to the Commander, US Army Communications-Electronics Command, ATTN: DRSEL-SF-H, Fort Monmouth, NJ 07703 within 24 hours.

1-8. REQUISITIONING PROCEDURE

Stations in CONUS and Oversea supply agencies will submit requisitions through radioactive material supply channels to Commander, US Army Communications-Electronics Command, ATTN: DRSEL-MME-VC, Fort Monmouth, New Jersey 07703, for issue to certified Radiation Protection Officers. All requisitions will be accompanied by the name of the Radiation Protection/Control Officer who is to be responsible for the equipment. In addition, each request will include the following certification: As required by chapter 3, AR 385-11, sufficient safety equipment, facilities, and trained personnel are available at this installation for the safe handling, use and storage of radioactive material ordered on this requisition. The certification must have the signature and the typed name and grade of the appropriate radiation control officer.

1-9. EMERGENCY SITUATIONS

The procedure outlined below will be followed in an emergency situation.

- a. **Loss of Calibrator.**
 - (1) Attempt to recover the radiac calibrator set.
 - (a) Review records to determine the responsible individual.
 - (b) Make a physical survey.
 - (2) If the radiac calibrator set is recovered, revise procedures as necessary to prevent a recurrence.
 - (3) If the radiac calibrator set is not recovered, report the loss through command channels to the Area Radioactive Material Control Point (AR 385-11) and to the US Army Communications-Electronics Command stating the serial number of the radiac calibrator set, the circumstances involved, and the action taken to prevent recurrence.
- b. **Internal Exposure of Personnel.**
 - (1) Internal exposure is the result of personnel becoming contaminated when radioactive particles are inhaled, swallowed, or absorbed through breaks in the skin.
 - (2) In the event of a known or suspected internal exposure:
 - (a) Obtain immediate medical advice from the Medical Officer.
 - (b) Remove the individual from duties involving occupational exposure to ionizing radiation until subsequent exposure limitations are established by proper medical authority (AR 40-14).
 - (c) Prepare written report of circumstances leading to the internal exposure; include serial number(s) of the AN/UDM-7C involved, action taken to prevent recurrence, and other applicable

information. Forward the report through proper channels to Command, US Army Communications-Electronics Command, ATTN: DRSEL-SF-H, Fort Monmouth, NJ 07703.

c. Damage or Leaking AN/UDM-7C. AN AN/UDM-7C could begin to leak as a result of being dropped, damage to the source, or even as a result of age. Action required in the event of a known or suspected leaking calibrator is:

- (1) Discontinue use of the calibrator. Cover it with plastic, seal it with tape, and label it as contaminated.
- (2) Monitor personnel, equipment, and areas for possible contamination and decontaminate as required.
- (3) Report the item to the Radioactive Material Control Point and to the US Army Communications-Electronics Command.
- (4) Dispose of the AN/UDM-7C as directed by the US Army Communications-Electronics Command, the US Army Ionizing Radiation Dosimetry Center and the Radioactive Material Control Point.
- (5) Report the completed disposal action to the US Army Communications-Electronics Command, ATTN: DRSEL-SF-H, Fort Monmouth, New Jersey 07703 and the Radioactive Material Control Point.

d. Firefighting Emergency Procedures.

(1) **General.** Emergency plans must include procedures for combating fires involving radioactive items. Plans should be commensurate with the quantity and type of items present. Firefighting personnel must know the location(s) of the items and must be familiar with radiation protection procedures. As a general rule, personnel should wear protective respiratory equipment when fighting fires involving radioactive items.

(2) **Emergency procedures.**

- (a) Evacuate personnel in the immediate area who are not directly involved.
- (b) Notify the fire department.
- (c) Extinguish the fire, if possible, and if radioactive materials are involved, with possible release to the environment, clear personnel from downwind area immediately.
- (d) Notify the Radiation Protection Officer.
- (e) Notify medical personnel when appropriate.
- (f) Control access to the immediate area.
- (g) Monitor personnel, equipment, supplies, and environs with appropriate alpha radiation survey instrument.
- (h) Decontaminate personnel, equipment, supplies, and environs.
- (i) The Radiation Protection Officer shall record and report the results of the fire.

1-10. TRANSPORTATION

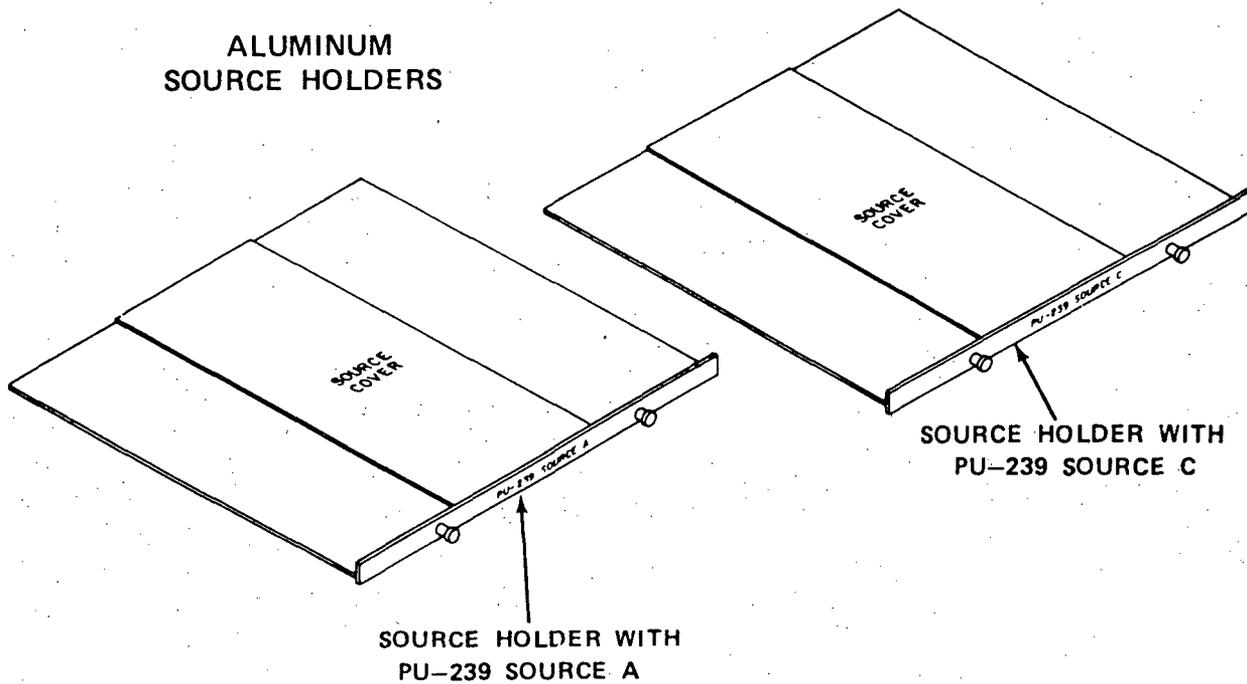
The AN/UDM-7C requires packaging and shipment in accordance with the requirements set forth in Title 49, Code of Federal Regulations (49 CFR) of US Department of Transportation (DOT) regulations and AR 385-11. These regulations require all appropriate information on radioactive shipments to be incorporated onto shipping documentation as follows:

- a. **Proper shipping name (49 CFR 172.101):** Radioactive Material, NOS.
- b. **Hazardous Material Identification Number (49 CFR 172-202):** NA 9181.
- c. **Pieces, weight, cube (49 CFR 172.202):** Hardwood case, 17 inches x 17 inches x 6 inches, with calibrator packed inside; weight approximately 30 pounds. Two alpha sources, Pu239, on plastic disks are housed in aluminum source holders.
- d. **Type of packaging (49 CFR 172.202):** Hardwood case.
- e. **Name of radioactive material as listed in 49 CFR 173.390 (49 CFR 172.202):** Pu239.
- f. **Description of chemical and physical form (49 CFR 172.203):** Plutonium 239 (Plutonium Chloride) solid.
- g. **Specific activity (49 CFR 172.203):** 50.21 microcuries.

- h. Type label (49 CFR 172.203): RADIOACTIVE WHITE I (SF 413).
- i. The words FISSILE EXEMPT shall appear on the shipping documentation as required by 49 CFR 173.396(a).
- j. Shipper's certification (49 CFR 172.204): As applicable.
- k. Shipments of Plutonium 239 must be made in accordance with the applicable provisions of DOT and NRC regulations. At the present time, all shipments of the AN/UDM-7C should only be made by surface transportation.
- l. Any other information as required.

Section III. EQUIPMENT DESCRIPTION

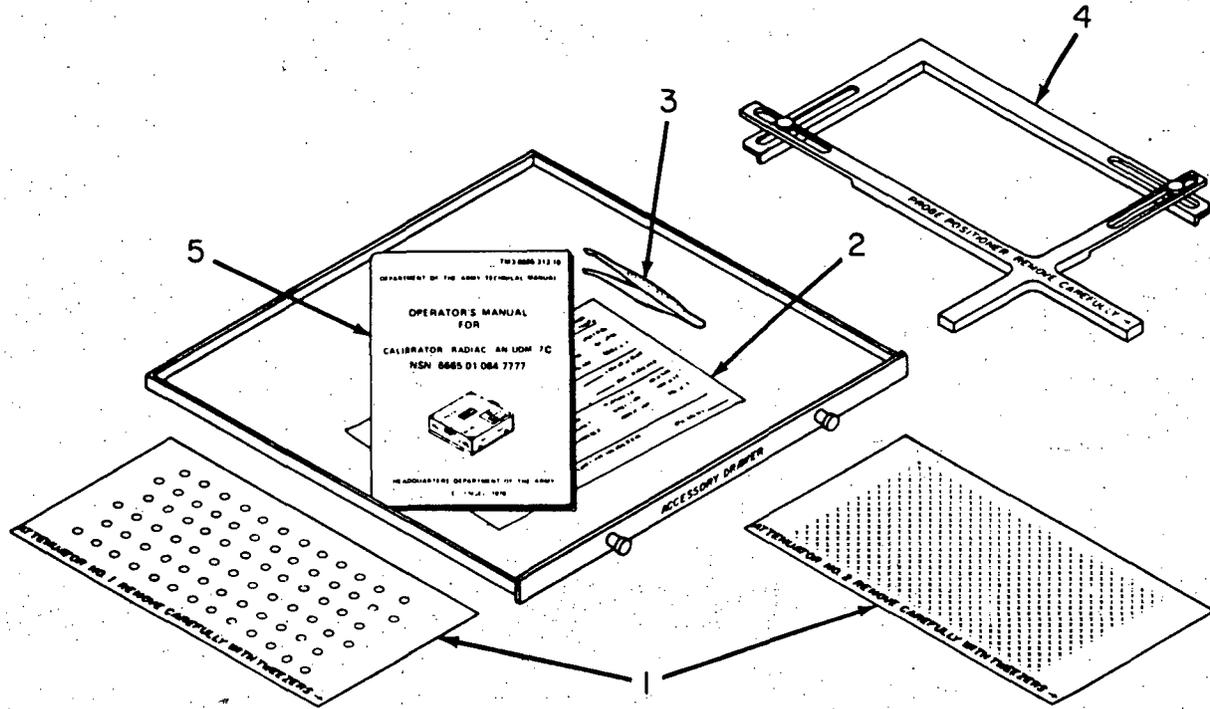
1-11. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS



The aluminum source holders house the Pu239 alpha sources, labeled A and C, which are resin-deposited on plastic discs approximately 12-1/2 inches (32 cm) in diameter. The sources have an approximate accuracy of $\pm 5\%$. Disintegrations per minute (DPM) for source A are on the order of 10^7 . For source C, the DPM are on the order of 10^5 .

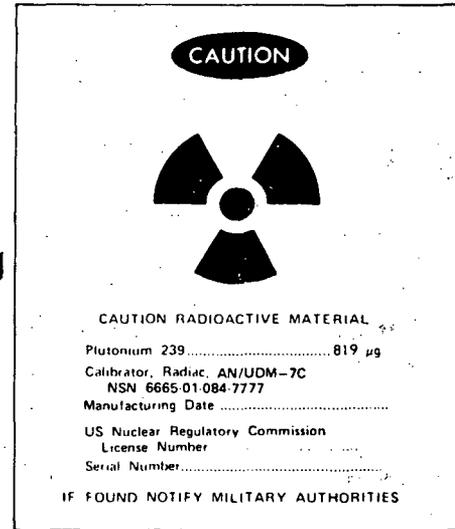
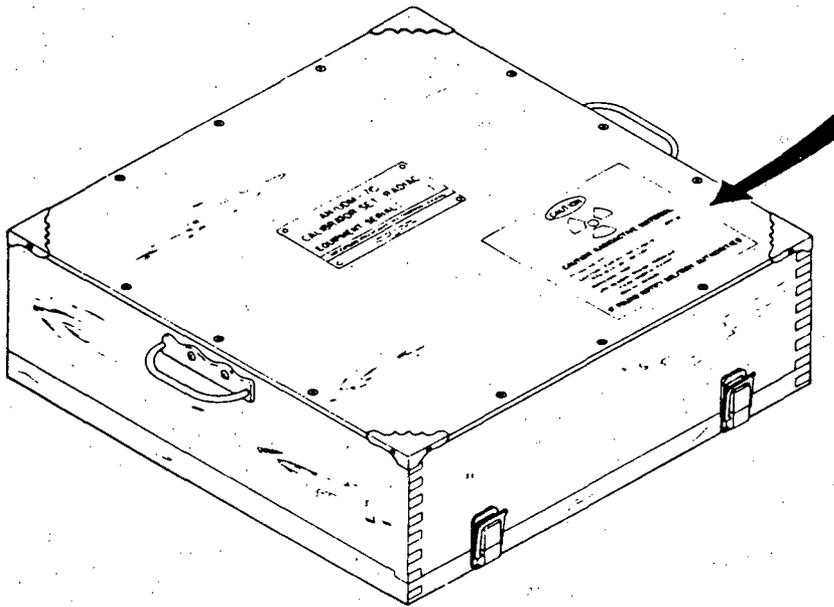
A minimum of 90% of the alpha particles emitted from these sources have energies from 4 to 5.15 MEV (million electron volt).

ACCESSORY DRAWER COMPONENTS



The accessory drawer contains two attenuators (1), a table of meter readings to be used in calibration of radiac sets (2), tweezers (3), and an adjustable probe positioner (4). This technical manual (5) will be stored in the accessory drawer.

HARDWOOD
CARRYING CASE



A **CAUTION** label should always be affixed on top of the hardwood carrying case as required by NRC regulations.

1-12. EQUIPMENT DATA

Weights and Dimensions

● Complete Item

Weight	24.5 lb (11.1 Kg)
Length	15-1/16 in. (38.3 cm)
Width	14-7/8 in. (37.7 cm)
Height	4-1/32 in. (10.2 cm)

● Calibrator

Weight	17 lb (7.7 Kg)
Length	13-17/32 in. (34.4 cm)
Width	13-25/32 in. (35.0 cm)
Height	2-3/32 in. (5.3 cm)

● Source Holders

Length	13-1/4 in. (33.6 cm)
Width	13-1/4 in. (33.6 cm)
Depth	1/4 in. (0.6 cm)

● Exposed Source Area

Length	10.0 in. (25.4 cm)
Width	4.0 in. (10.2 cm)

● Source Positioning Shelf (Interior)

Length	13-1/2 in. (34.3 cm)
Width	13-1/2 in. (34.3 cm)
Depth	5/16 in. (0.8 cm)

● Probe Positioning Well

Length	10-1/4 in. (26.0 cm)
Width	5 in. (12.7 cm)
Depth	3/8 in. (1.0 cm)

Shipping Data

● Pack - Wooden Box	17x17x6 in (43.2x43.2x15.2 cm)
● Contents	Calibrator with carrying case
● Volume	1 cu. ft. (0.03 m ³)
● Weight	30 lb. (13.6 Kg)

Performance

● PU-239 Sources	
Source A	Order of 10 ⁷ DPM
Source C	Order of 10 ⁵ DPM

● Attenuators

No. 1	Approximately 10% of transmission
No. 2	Approximately 2.5% of transmission

CHAPTER 2 OPERATING INSTRUCTIONS

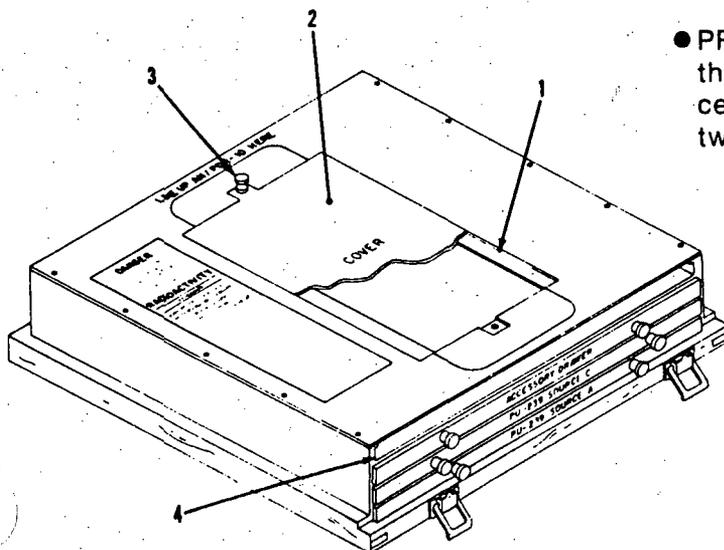
Section I. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS

WARNING

Use the AN/UDM-7C only under the guidance of an installation/activity (local) Radiation Protection Officer and in accordance with requirements of Chapter 5, Section IV, AR 40-5 and AR 385-11.

Plutonium 239 (Pu239) is dangerous to living tissue. Small amounts of Pu239, when inhaled, ingested, or absorbed in open cuts or wounds, can cause serious illness or death. To avoid accident, observe the following:

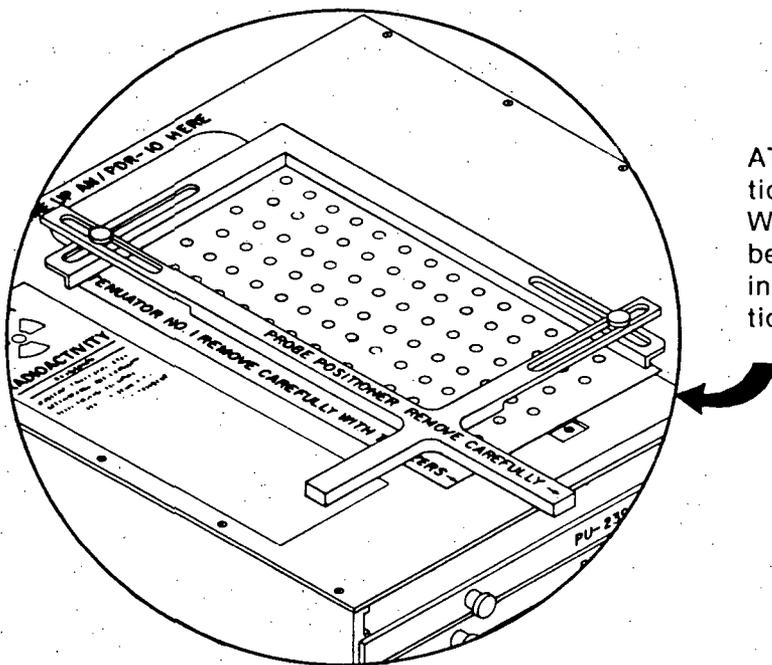
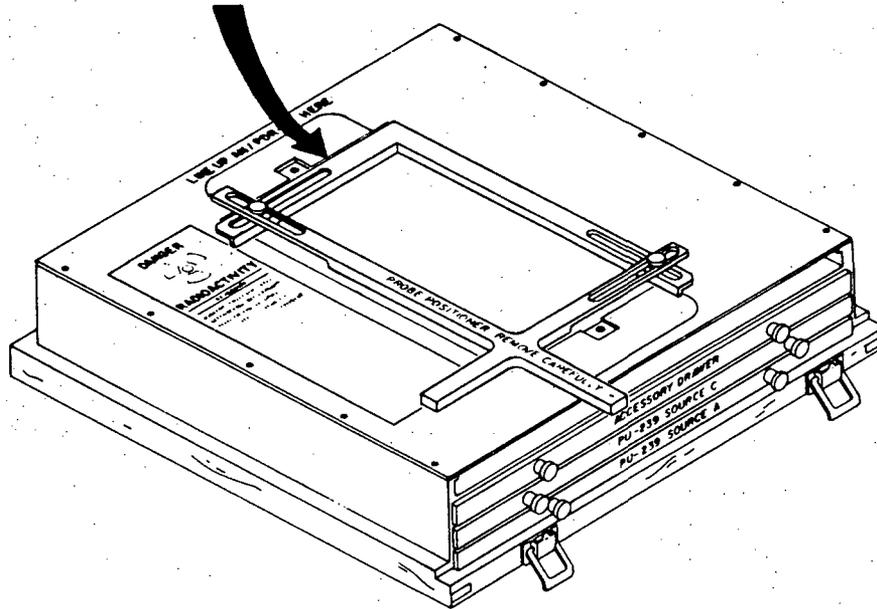
- Use and store the AN/UDM-7C only in designated radiation controlled areas.
- Do not eat, drink, smoke, apply cosmetics, or store food stuffs, drinks, tobacco, or cosmetics where the calibrators are used or stored.
- Do not allow personnel with open skin wounds to handle or work with the AN/UDM-7C without the approval of the medical officer and the (local) Radiation Protection Officer.
- Prohibit loitering in the area by unauthorized personnel.



- **PROBE POSITIONING WELL (1).** Opening over which the radiac probe is positioned for calibration. Access is gained by removing the cover (2) secured by two thumbscrews (3).

- **SOURCE POSITIONING SHELF (4).** Provides for insertion of proper source holder.

ADJUSTABLE PROBE POSITIONER. Aligns radiac probe over exposed source in probe positioning well. The two L-shaped legs of the probe positioner can be adjusted to fit the contour of the probe base by loosening two thumbscrews which engage elongated slots in the legs, sliding the legs along the axis of the slots, and then tightening the thumbscrews. The positioner will then be clamped to the edges of the probe.



ATTENUATORS. Provide reduced radiation transmission levels when required. When an attenuator is used with the probe positioner, the attenuator is placed in the milled groove and the probe positioner is placed on top of the attenuator.

Section II. OPERATION UNDER USUAL CONDITIONS

2-1. INITIAL CHECKS AND SERVICES

a. Leak Test (Wipe Test).

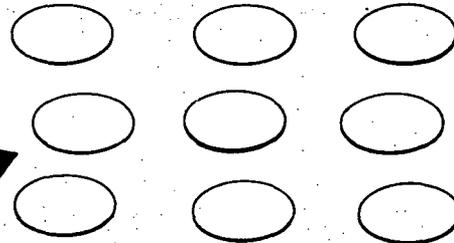
NOTE

A leak test is performed immediately upon receipt of the AN/UDM-7C and at least every 3 months thereafter, while in use.

WARNING

Plutonium 239 is dangerous to living tissue. Handle the AN/UDM-7C and components carefully; **DO NOT TOUCH THE SOURCE SURFACE.** Avoid contact of objects, such as tools, instruments, and calibrator components with the sources. Wear plastic or surgical gloves when performing leak tests and during calibration.

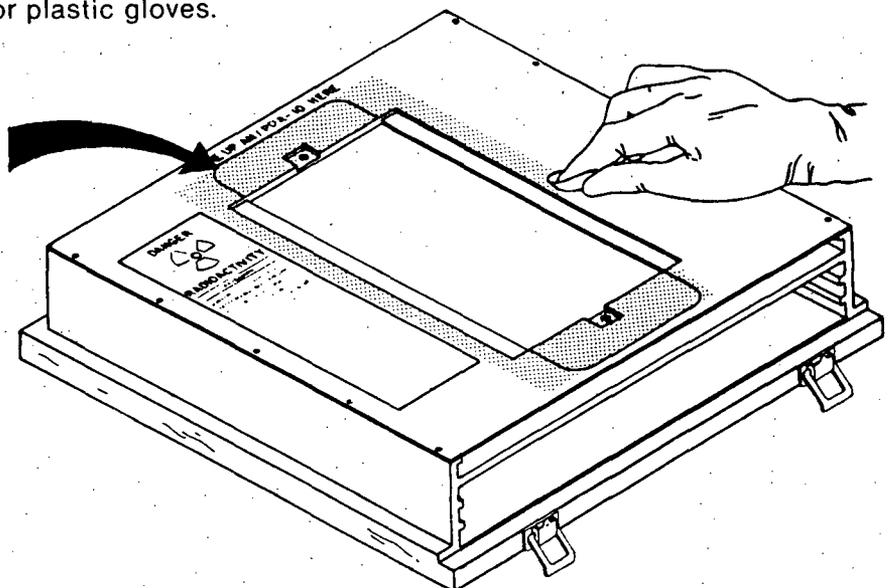
Use commercially available 1 inch smear papers (Whatman filter papers or equivalent). A minimum of nine smear papers will be required.



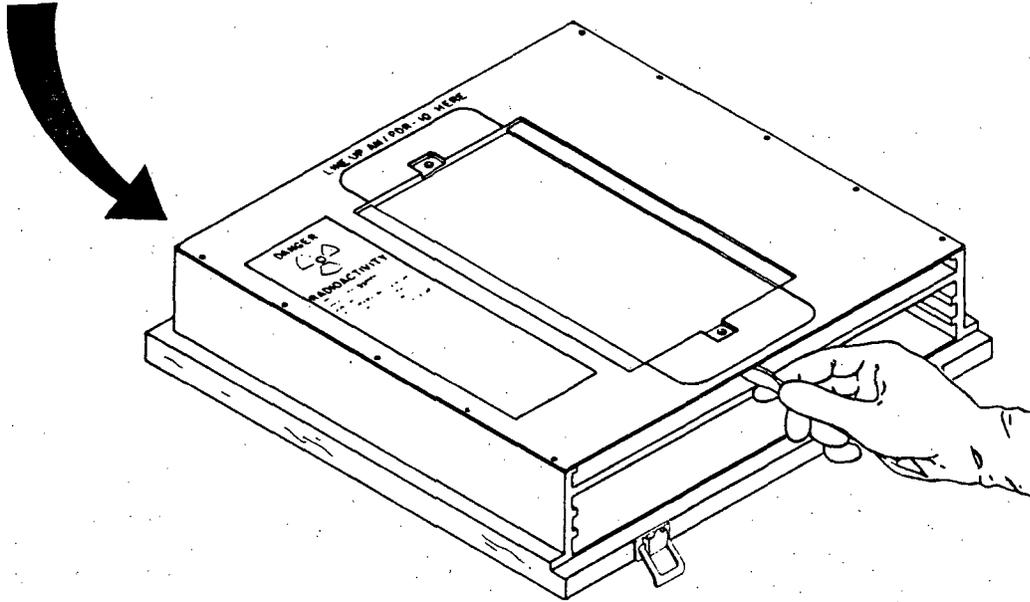
Number consecutively one side of each smear paper and key the numbers to each area, component, or calibrator to be smeared. Use ballpoint or china marking pen to number the papers.

- Dampen the smear papers with water. Do not soak them.
- Put on rubber or plastic gloves.

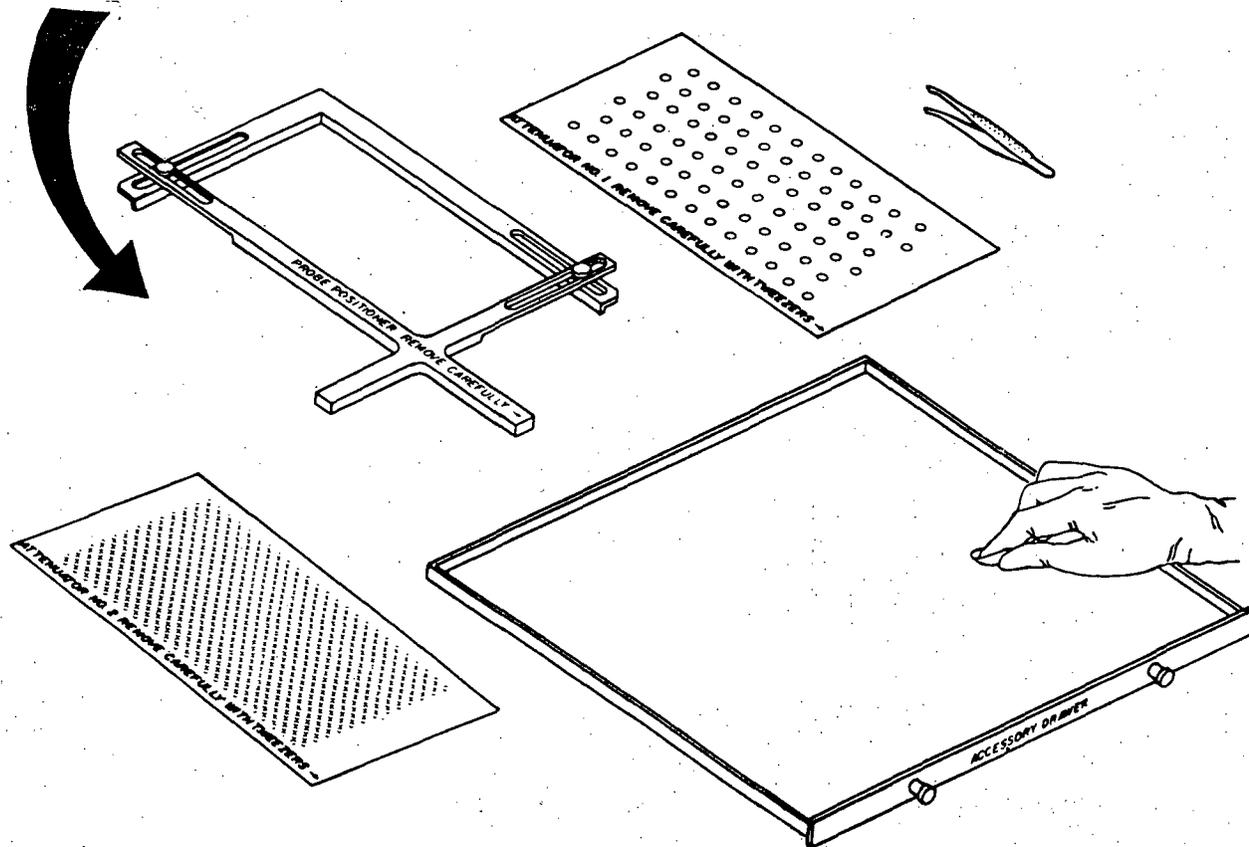
Smear the exterior surfaces surrounding the probe positioning well (shaded area). One smear paper should be enough.



Smear the interior surfaces of the source positioning shelf. Wrap a moistened smear paper around the blunt end of a pencil or dowel and smear those surfaces which are near the radioactive-coated surface of the source when the source is inserted into the shelf.



Smear the probe positioner, both attenuators, the tweezers, the inner surfaces of the accessory drawer, and the inner surfaces of the carrying case cover. Use a separate smear paper for each item.

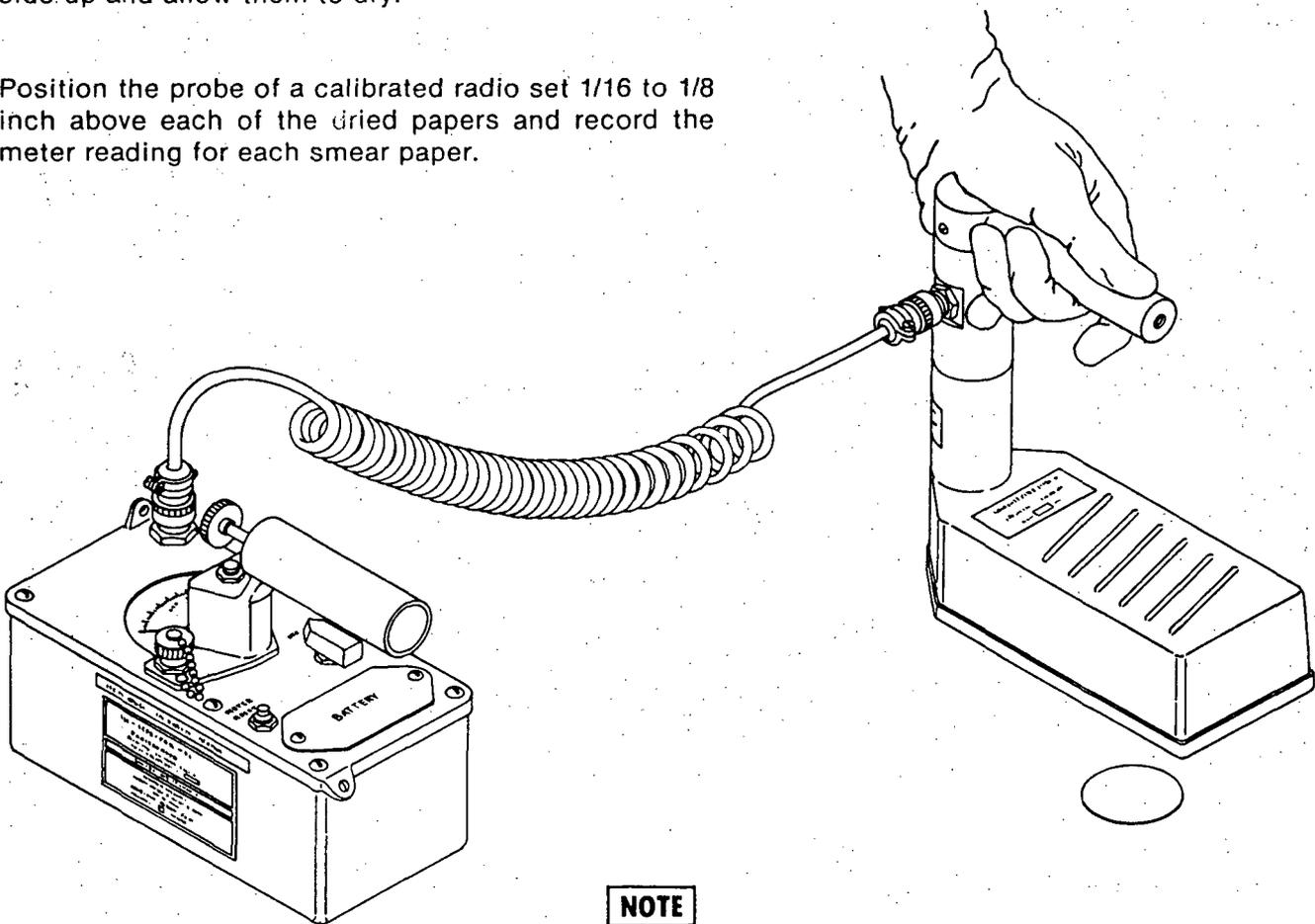
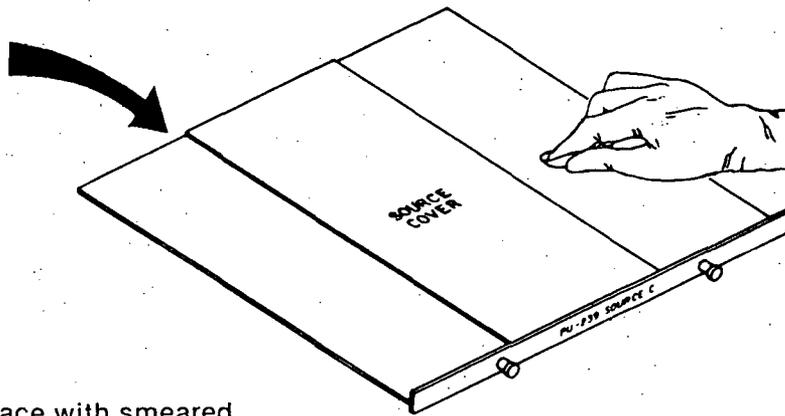


Leave source covers in place and smear the surface of each source holder.

CAUTION

DO NOT SMEAR THE SOURCES

- Place the smear papers on a flat surface with smeared side up and allow them to dry.
- Position the probe of a calibrated radio set 1/16 to 1/8 inch above each of the dried papers and record the meter reading for each smear paper.



NOTE

If the radiacmeter indicates 200 or more counts-per-minute above background for any single smear paper, consider the calibration unserviceable and remove it from operation until the smear paper is evaluated with laboratory equipment. If the meter indicates less than 200 counts-per-minute, use the calibrator pending evaluation of the smear paper.

Remove rubber or plastic gloves. Dispose as radioactive waste. (Refer to AR 385-11.)

b. Smear Paper Evaluation

Evaluate each smear paper using laboratory equipment capable of detecting 0.001 microcurie of alpha contamination on the test sample. Record test results and maintain these records for inspection. If the test reveals the presence of 0.005 microcurie or more of contamination, the user shall immediately withdraw the calibrator from use and report the condition through the Radiation Control Officer, (AR 385-11) to the licensee who will furnish disposition instructions and submit required reports to DA and NRC.

NOTE

No maintenance or repair will be performed by the operator. The US Army Ionizing Radiation Dosimetry Center located at Lexington-Bluegrass Depot Activity is the only authorized facility for maintenance or repair of the calibrator. Requests for maintenance or repair will be submitted to the radioactive material control point for coordination with CECOM and the US Army Ionizing Radiation Dosimetry Center.

If a using installation/activity does not have the proper laboratory equipment, the smear papers will be processed as follows:

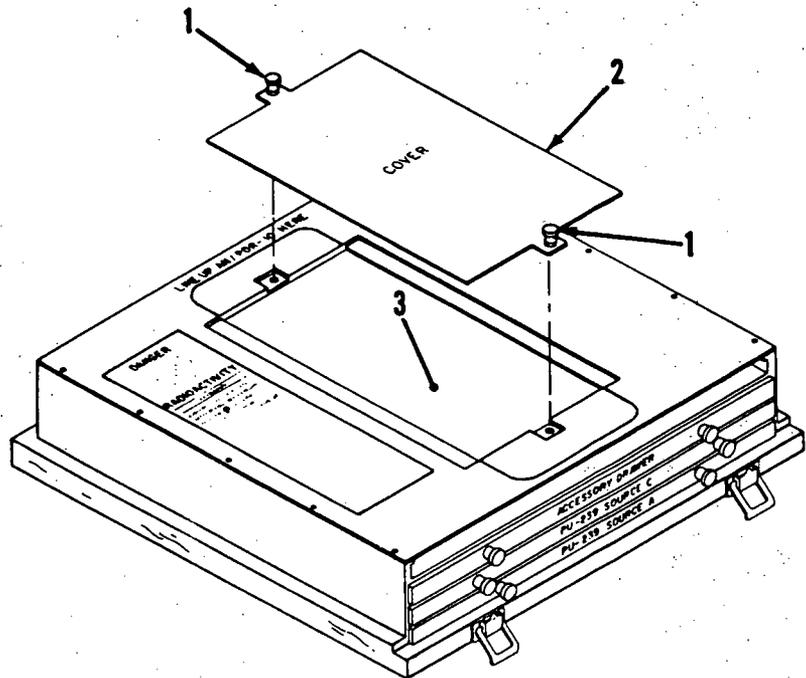
- Place the smear papers, each separated by a sheet of paper in a small envelope marked with the name and location of the user, the serial number(s) of the radioactive test sample(s) and the words: MAILROOM-DO NOT OPEN. Seal the envelope for forwarding.
- In CONUS, forward the smear papers for evaluation using official mail handling channel to, Chief, US Army Ionizing Radiation Dosimetry Center, ATTN: DRSMI-MCJ-DC, Lexington, KY 40511.
- Commanders at overseas installations will comply with procedures established by the responsible commander.

2-2. OPERATING PROCEDURE

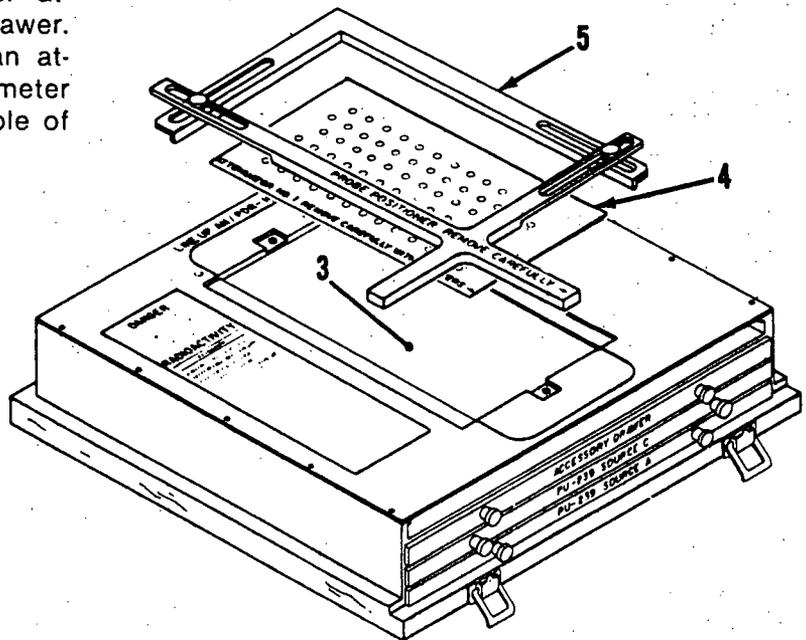
Unlock carrying case and place lid aside. (Calibrator need not be removed from case.)

Put on rubber or plastic gloves (item 1, Appx D).

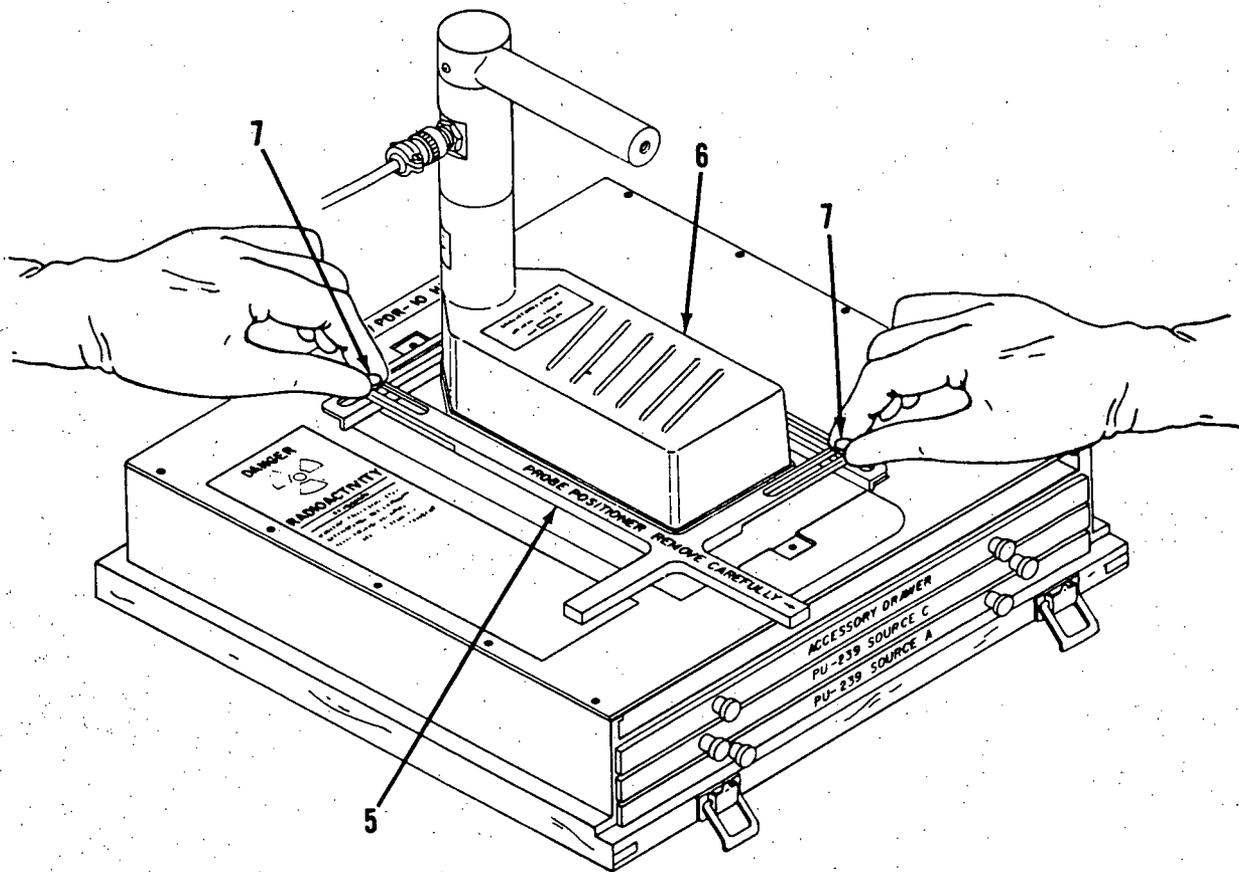
Loosen two thumbscrews (1) and remove cover (2) from probe positioning well (3).



Remove probe positioner and proper attenuator (if required) from necessary drawer. Positioner is used with or without an attenuator depending on which radiacmeter scale is being calibrated. Refer to table of meter readings in accessory drawer.



Place attenuator (4) if used, in probe positioning well (3). Place probe positioner (5) over attenuator in positioning well.



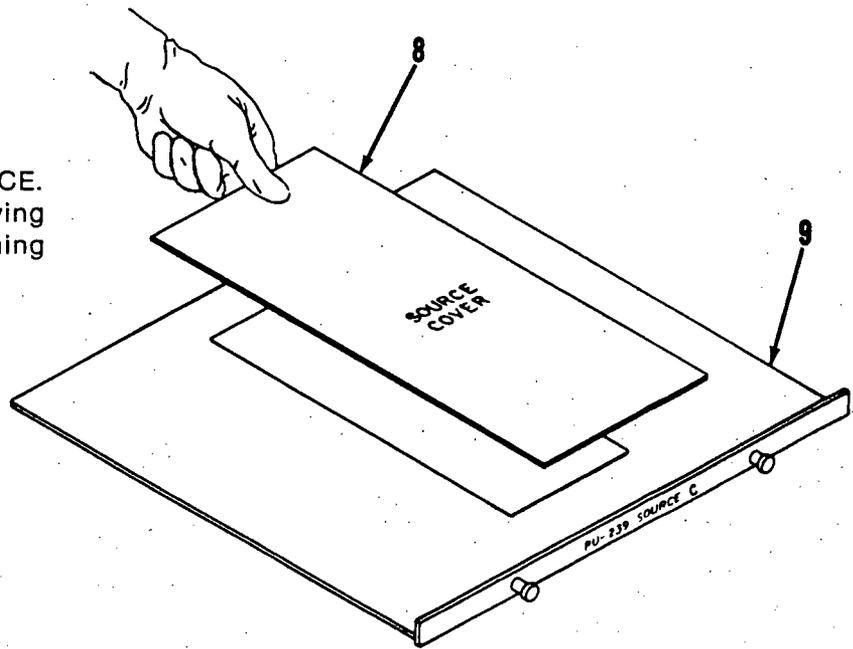
Loosen the two thumbscrews (7) on probe positioner (5).

Place probe (6) of radiac set in positioner (5). Secure the probe by adjusting the two L-shaped legs of the probe positioner to fit the contour of the probe base; clamp the positioner to the edges of the probe by tightening the two thumbscrews (7). The probe sensing area is now aligned with the effective radiation area of the source.

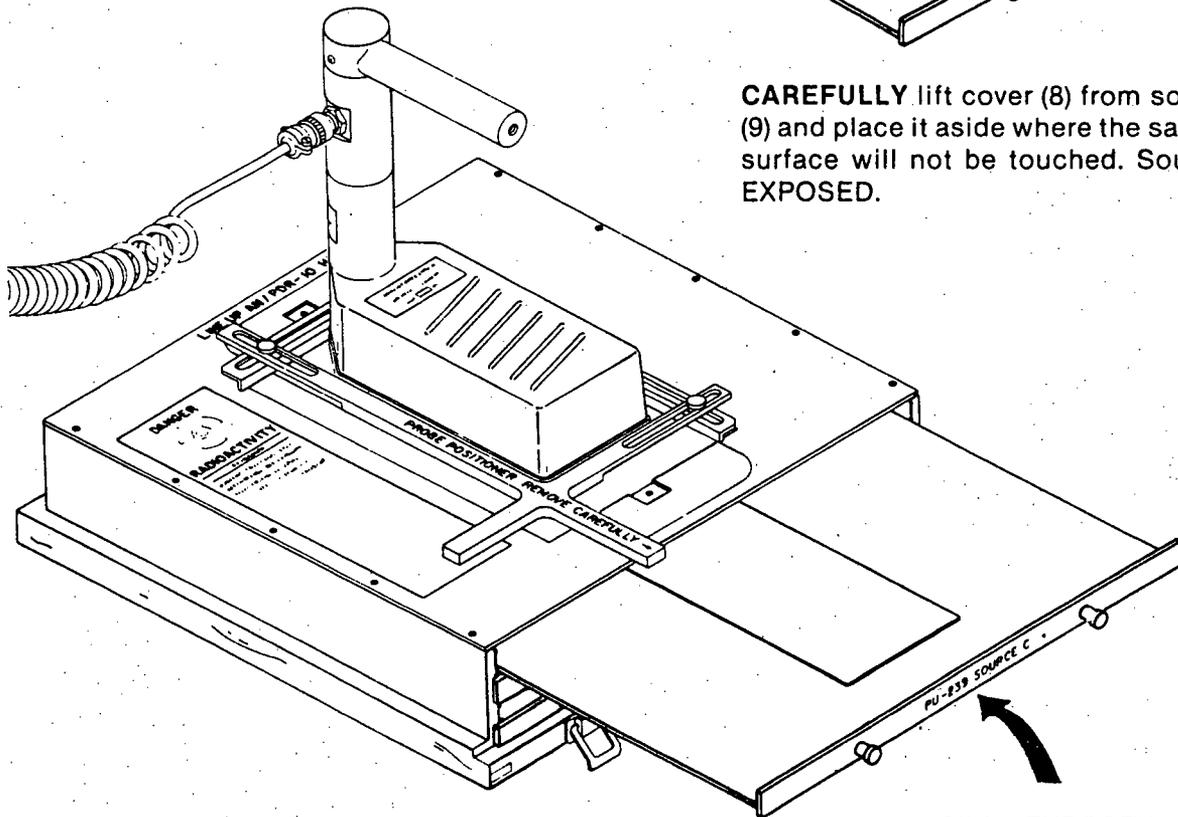
Carefully remove desired Pu239 source (A or C) from cabinet.

WARNING

DO NOT TOUCH OR GOUGE SOURCE. Plutonium 239 is dangerous to living tissue. Heed all warnings at beginning of Chapter 2.



CAREFULLY lift cover (8) from source holder (9) and place it aside where the saran-covered surface will not be touched. Source is now EXPOSED.



Slide EXPOSED source into source positioning shelf.

Select appropriate scale on radiac set and check meter reading. Compare reading with table of meter readings located in the accessory drawer. If the reading is different than the one indicated by the table, use the instructions given in the appropriate radiac set technical manual to adjust set reading to desired value.

2-3: AFTER OPERATING PROCEDURE

Carefully withdraw source from source positioning shelf and place cover on the source.

Replace source in its proper cabinet shelf.

Loosen probe positioner and carefully remove the attenuator using the tweezers from the accessory drawer.

Place probe positioning well cover and carrying case lid.

Remove rubber or plastic gloves. Dispose of gloves as radioactive waste as prescribed in AR 385-11.

WARNING

Always wash and dry hands thoroughly after handling the calibrator; monitor the hands with a low-range alpha radiac meter; repeat the washing and drying if necessary. Notify the Radiation Protection Officer if washing does not remove contamination.

CHAPTER 3 MAINTENANCE INSTRUCTIONS

Section I. TROUBLESHOOTING PROCEDURES

3-1. INTRODUCTION

Table 3-1 lists the common malfunctions which you may find during the operation or maintenance of the calibrator or its components. You should perform the tests/inspections and corrective actions in the order listed.

This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

Table 3-1. Troubleshooting

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. SOURCE DAMAGE.		
Step 1.		Use a similar type radiac calibrator and obtain a set of readings.
Step 2.		Compare the two sets of readings with readings obtained from damaged calibrator before damage occurred. If readings are still erroneous, contact ARRCOM National Maintenance Point (NMP) and request maintenance or repair.
2. CALIBRATION MALFUNCTION.		
Step 1.		Verify that the radiac set is intended to be calibrated with the calibrator.
Step 2.		Verify that the correct accessories (i.e., source and attenuator) are being used for the radiac set being calibrated. If a malfunction still exists, return the radiac set to the using activity for maintenance or repair.

Section II. MAINTENANCE PROCEDURES

3-2. OPERATOR MAINTENANCE.

- a. Operator maintenance is limited to inspection and initial checks and services. No other maintenance or repair will be performed by the operator. The US Army Ionizing Radiation Dosimetry Center is the only authorized facility for maintenance or repair.
- b. Requests for maintenance or repair will be submitted to the radioactive material control point for coordination with the CECOM National Inventory Control Point and the US Army Ionizing Radiation Dosimetry Center. Points of contact are:

CECOM National Inventory Control Point (NICP)
Commander, US Army Communications-Electronics Command
ATTN: DRSEL-MME-VC
Fort Monmouth, New Jersey 07703

CECOM National Maintenance Point (NMP)
Commander, US Army Communications-Electronics Command
ATTN: DRSEL-ME-ES
Fort Monmouth, New Jersey 07703

3-3. STORAGE

- a. Store the calibrators only in fire-resistant buildings (TM 5-812-1) and in rooms/areas/sections designated for storage of radioactive materials which are free from the danger of flooding, outside the danger of radius of flammables or explosives, and secured against unauthorized removal.
- b. Post the area/building with CAUTION - RADIOACTIVE MATERIAL signs as required by AR 385-30.

**APPENDIX A
REFERENCES**

A-1. GENERAL

This appendix lists all forms, technical manuals, and miscellaneous publications referenced in this manual and/or to be utilized in relation to this equipment.

A-2. FORMS

Equipment Inspection and Maintenance Worksheet	DA Form 2404
Recommended Changes to Publications	DA Form 2028
Recommended Changes to Equipment Technical Publications	DA Form 2028-2
Punched Transmission Worksheet-Radioisotope Inventory and Leak Test Report	DA Form 3252-R
Notice to Employees	NRC-3
Radiological Accident Report	RCSDD-SD 1168
Quality Deficiency Report	SF 368
Radioactive I	SF 413

A-3. TECHNICAL MANUALS

Handling and Disposal of Unwanted Radioactive Material	TM 3-261
Fire Protection Manual	TM 5-812-1
List of Applicable Publications (LOAP) for Communications Electronic Equipment	TM 11-5800-213-L
Operator's, Organizational, Direct Support, General Support, and Depot Maintenance Manual: Radiac Set AN/PDR-54 (NSN 6665-00-542-1587)	TM 11-6665-208-15
Operator's, Organizational, Direct Support, General Support, and Depot Maintenance Manual: Radiac Set AN/PDR-60 (NSN 6665-00-965-1516)	TM 11-6665-221-15
Operator's and Organizational Maintenance Manual for Radiac Set AN/PDR-56F (NSN 6665-00-211-6895)	TM 11-6665-245-12
The Army Maintenance Management System (TAMMS)	TM 38-750
Transportation Guidance for Safe Transport of Radioactive Materials	TM 55-315

A-4. MISCELLANEOUS PUBLICATIONS

Health and Environment	AR 40-5
Control and Recording Procedure for Occupational Exposure to Ionizing Radiation	AR 40-14
Reporting of Transportation Discrepancies in Shipment	AR 55-38
Ionizing Radiation Protection (Receiving, Control, Transportation, Disposal, and Radiation Safety)	AR 385-11
Safety Color Code Markings and Signs	AR 385-30
Accident Reporting and Records	AR 385-40
Packaging Improvement Report	AR 700-58
Radioactive Commodities in the DOD Supply System	AR 700-64
Reporting of Item and Packaging Discrepancies	AR 735-11-2

APPENDIX D EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

D-1. SCOPE

This appendix lists expendable supplies and materials you will need to operate and maintain the AN/UDM-7C. These items are authorized to you by CTA 50-970, Expendable Items (Except Medical, Class V, Repair Parts, and Heraldic Items).

D-2. EXPLANATION OF COLUMNS

a. **Column 1 - Item Number.** This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use plastic gloves, item 1, App. D").

b. **Column 2 - Level.** This column identifies the lowest level of maintenance that requires the item.

C — Operator/Crew

c. **Column 3 - National Stock Number.** This is the National stock number assigned to the item; use it to request or requisition the item.

d. **Column 4 - Description.** Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the part number followed by the Federal Supply Code for Manufacturer (FSCM) in parentheses, if applicable.

e. **Column 5 - Unit of Measure (U/M).** Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1)	(2)	(3) NATIONAL STOCK NUMBER	(4)	(5)
ITEM NUMBER	LEVEL		DESCRIPTION	U/M
			PART NO. AND FSCM	
1	C	8415-00-682-6786	GLOVES, DISPOSAL PIMKIES (96717)	Pr
2	C	8540-00-291-0391	TOWEL, PAPER UU-7-591 (81348)	Bx

☆U.S. GOVERNMENT PRINTING OFFICE: 1981-703-029/1283



against radiation hazards
the Nuclear Regulatory

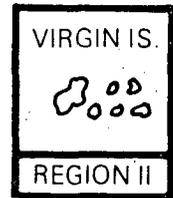
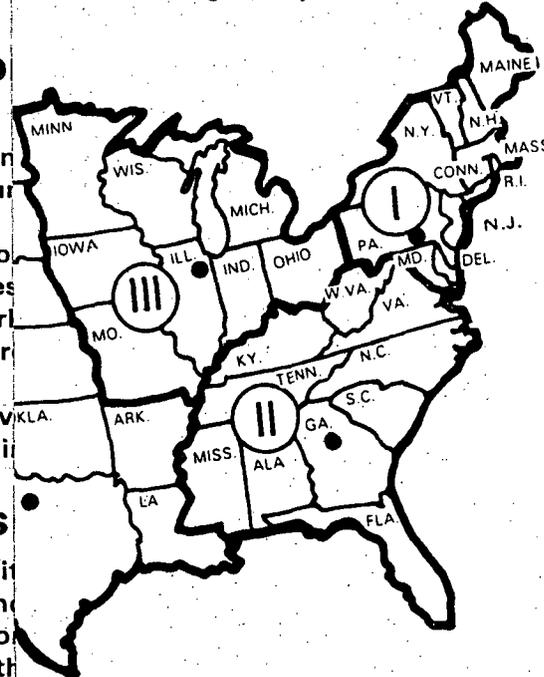
YOUR EMPLOYER'S RESPONSIBILITY

Your employer is required to —

1. Apply these NRC regulations and conditions of his NRC license to all work under the license.
2. Post or otherwise make available to all workers copies of the NRC regulations, licenses and procedures which apply to work they are engaged in, and explain their provisions.
3. Post Notices of Violation involving unsafe working conditions, proposed in writing, and explain the civil penalties and orders.

YOUR RESPONSIBILITY AS AN EMPLOYEE

You should familiarize yourself with the provisions of the NRC regulations, and the procedures which apply to the work you are engaged in. You should observe the rules for your own protection and protection of your co-workers.



WHAT IS COVERED BY THE NRC REGULATIONS

1. Limits on exposure to radiation from radioactive material in restricted and unrestricted areas.
2. Measures to be taken after accidents.
3. Personnel monitoring, surveys and records.
4. Caution signs, labels, and safety equipment.
5. Exposure records and reports.
6. Options for workers regarding radiation exposure and health care.
7. Related matters.

REPORTS ON YOUR RADIATION EXPOSURE HISTORY

1. The NRC regulations require that your employer give you a written report if you are exposed to radiation.

REGULATORY COMMISSION

You can be contacted at the following addresses and telephone numbers. Phone calls from employees who wish to register complaints or other matters regarding compliance with Commission rules and regulations.

Regional Offices

	TELEPHONE	
	DAYTIME	NIGHTS AND HOLIDAYS
Washington, DC, USNRC	215 337-5000	215 337-5000
Atlanta, GA, USNRC	404 221-4503	404 221-4503
Chicago, IL, USNRC	312 932-2500	312 932-2500
Denver, CO, USNRC	817 334-2841	817 334-2841
Washington, DC, USNRC	415 943-3700	415 943-3700

Copies of this notice are available to every establishment licensed, licensed by permit, or operating in a restricted area at the following address: Inland Creek Plaza, Washington, DC.



...nst radiation hazards
...he Nuclear Regulatory

YOUR EMPLOYER'S RESPONSIBILITY

Your employer is required to—

1. Apply these NRC regulations and conditions of his NRC license to all work under the license.
2. Post or otherwise make available to all employees copies of the NRC regulations, licenses, permits, and procedures which apply to work engaged in, and explain their provisions.
3. Post Notices of Violation involving unsafe working conditions, proposed immediate civil penalties and orders.

YOUR RESPONSIBILITY AS AN EMPLOYEE

You should familiarize yourself with the provisions of the NRC regulations, and the procedures which apply to the work engaged in. You should observe the regulations for your own protection and protection of your co-workers.

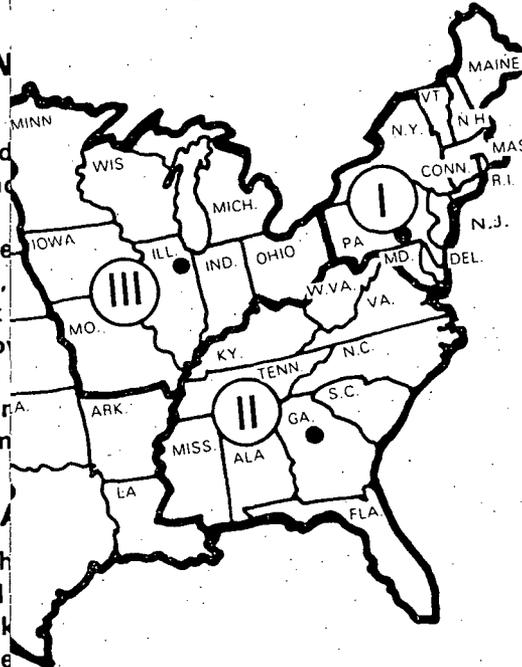
WHAT IS COVERED BY THESE NRC REGULATIONS

1. Limits on exposure to radiation and radioactive material in restricted and unrestricted areas.
2. Measures to be taken after accidents.
3. Personnel monitoring, surveys and records.
4. Caution signs, labels, and safety equipment.
5. Exposure records and reports.
6. Options for workers regarding NRC regulations and
7. Related matters.

REPORTS ON YOUR RADIATION EXPOSURE HISTORY

1. The NRC regulations require that you give your employer a written report if you receive a radiation dose that exceeds the limits.

Copies of this notice must be provided to every establishment conducted, to permit entry into a restricted area without employment.



REGULATORY COMMISSION

...can be contacted at the following addresses and telephone numbers. One calls from employees who wish to register complaints or matters regarding compliance with Commission rules and

Regional Offices

	TELEPHONE	
	DAYTIME	NIGHTS AND HOLIDAYS
...ent, USNRC	215 337-5000	215 337-5000
...ent, USNRC	404 221-4503	404 221-4503
...ent, USNRC	312 932-2500	312 932-2500
...ent, USNRC	817 334-2841	817 334-2841
...ent, USNRC	415 943-3700	415 943-3700



Protect against radiation hazards
the Nuclear Regulatory

YOUR EMPLOYER'S RESPONSIBILITY

Your employer is required to —

1. Apply these NRC regulations and conditions of his NRC license to all work undertaken by him.
2. Post or otherwise make available to his employees copies of the NRC regulations, licenses and procedures which apply to work engaged in, and explain their provisions.
3. Post Notices of Violation involving working conditions, proposed in civil penalties and orders.

YOUR RESPONSIBILITY AS EMPLOYEE

You should familiarize yourself with the provisions of the NRC regulations, and procedures which apply to the work engaged in. You should observe the rules for your own protection and protection of your co-workers.

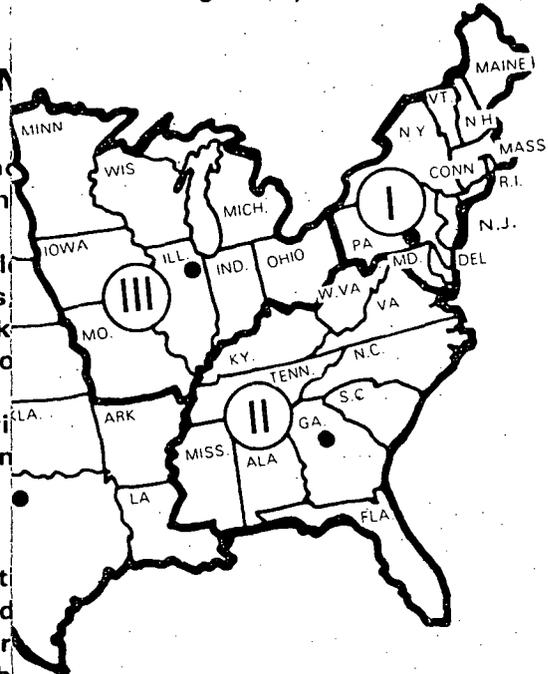
WHAT IS COVERED BY THE NRC REGULATIONS

1. Limits on exposure to radiation and radioactive material in restricted and unrestricted areas.
2. Measures to be taken after accidents.
3. Personnel monitoring, surveys and records.
4. Caution signs, labels, and safety equipment.
5. Exposure records and reports.
6. Options for workers regarding health and safety.
7. Related matters.

REPORTS ON YOUR RADIATION EXPOSURE HISTORY

1. The NRC regulations require that you be given a written report if you are exposed to radiation.

Copies of this notice should be provided to every establishment conducted, to permit access to a restricted area of the employment.



REGIONAL OFFICES

Employees can be contacted at the following addresses and telephone numbers. For more information, please call from employees who wish to register complaints or for matters regarding compliance with Commission rules and regulations.

Regional Offices

	TELEPHONE	
	DAYTIME	NIGHTS AND HOLIDAYS
Washington, DC, USNRC	215 337-5000	215 337-5000
Atlanta, GA, USNRC	404 221-4503	404 221-4503
Chicago, IL, USNRC	312 932-2500	312 932-2500
Denver, CO, USNRC	817 334-2841	817 334-2841
Phoenix, AZ, USNRC	415 943-3700	415 943-3700



THEN... JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT. FOLD IT AND DROP IT IN THE MAIL!

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)
 Commander
 Stateside Army Depot
 ATTN: AMSTA-US
 Stateside, N.J. 07703

DATE SENT 10 July 1975

PUBLICATION NUMBER
 TM 11-5840-340-12

PUBLICATION DATE
 23 Jan 74

PUBLICATION TITLE
 Radar Set AN/PRC-76

BE EXACT... PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO
2-25	2-28		
3-10	3-3		3-1
5-6	5-8		
		FO3	

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

Recommend that the installation antenna alignment procedure be changed throughout to specify a 2° IFF antenna lag rather than 1°.

REASON: Experience has shown that with only a 1° lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2° without degradation of operation.

Item 5, Function column. Change "2 db" to "3db."

REASON: The adjustment procedure the the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.

Add new step f.1 to read, "Replace cover plate removed in step e.1, above."

REASON: To replace the cover plate.

Zone C 3. On J1-2, change "+24 VDC to "+5 VDC."

REASON: This is the output line of the 5 VDC power supply. +24 VDC is the input voltage.

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
 SSG I. M. DeSpirito 999-1776

SIGN HERE

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DOD 314



TEAR ALONG PERFORATED LINE

Commander
US Army Communications-
Electronics Command
ATTN: DRSEL-ME-MQ
Fort Monmouth, New Jersey 07703

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Fort Monmouth, New Jersey 07703

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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS



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SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER

TM 11-6665-247-10

PUBLICATION DATE

13 August 1981

PUBLICATION TITLE

Calibrator, Radiac AN/UDM-7C

BE EXACT PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

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PRINTED NAME GRADE OR TITLE AND TELEPHONE NUMBER

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DA FORM 2028-2 JUL 76

PREVIOUS EDITIONS ARE OBSOLETE

P.S.: IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPE OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

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TEAR ALONG PERFORATED LINE

Commander
US Army Communications-
Electronics Command
ATTN: DRSEL-ME-MQ
Fort Monmouth, New Jersey 07703

By Order of the Secretary of the Army:

Official:

ROBERT M. JOYCE
Brigadier General, United States Army
The Adjutant General

EDWARD C. MEYER
General, United States Army
Chief of Staff

DISTRIBUTION:

To be distributed in accordance with Special List.

NOTE

Inclosed is an abbreviated organizational chart as required by paragraph 3-2.g.(3) of AR 700-64, Radioactive Commodities in the DOD Supply Systems.

RADIATION SAFETY CONTROLS-FUNCTIONAL CHART

ARMY MATERIEL DEVELOPMENT
AND READINESS COMMAND
QUALITY ASSURANCE PROGRAM MANAGEMENT
RADIATION PROTECTION PROGRAM MANAGEMENT

ARMY TEST MEASUREMENT DIAGNOSTIC EQUIPMENT SUPPORT GROUP
TECHNICAL GUIDANCE, ARMY METROLOGY SYSTEM
STANDARDIZATION OF CALIBRATION STANDARDS & PROCEDURES

ARMY COMMUNICATIONS - ELECTRONICS
COMMAND
COMMODITY MANAGEMENT, CALIBRATION SOURCES

DIRECTORATE OF MAINTENANCE
MAINTENANCE PROCEDURES
LOGISTICS SUPPORT
TECHNICAL MANUALS

SAFETY OFFICE
HEALTH PHYSICS
RAD SAFETY PROCEDURES
LICENSING
CONTRACTOR SAFETY
PRE-AWARD, POST AWARD
SURVEYS

DIRECTORATE OF PROCUREMENT
INVITATION FOR BIDS
REQUEST FOR QUOTATION
PROCUREMENT
PROCUREMENT AUTHORIZATION

OTHER INSPECTION AGENCIES

DEPARTMENT OF THE ARMY, OFFICE OF
THE INSPECTOR GENERAL AND
SUBORDINATE COMMAND COUNTERPARTS

US ARMY AUDIT AGENCY

US ARMY HEALTH SERVICES COMMAND,
ENVIRONMENTAL HYGIENE AGENCY

DIRECTORATE OF PRODUCT ASSURANCE
QUALITY ASSURANCE PROCEDURES
PRE-PRODUCTION TESTS
INITIAL PRODUCTION TESTS
PRODUCTION ACCEPTANCE TESTS
DEPOT QA SURVEILLANCE PROCEDURES

DIRECTORATE OF MATERIEL MANAGEMENT
NATIONAL INVENTORY CONTROL POINT
CATALOGING
INVENTORY CONTROL
REQUISITION REVIEW
MATERIAL RELEASE ORDERS

LEXINGTON-BLUEGRASS DEPOT ACTIVITY

INITIAL RECEIPT AND INSPECTION
BULK STORAGE
CALIBRATION
ISSUE
REPAIR
RECALIBRATION
QA SURVEILLANCE
LEAK TEST EVALUATION

SACRAMENTO ARMY DEPOT

RECALIBRATION
LEAK TEST EVALUATION

PIRMASENS, GERMANY

RECALIBRATION
LEAK TEST EVALUATION

CAMP CARROLL, KOREA

RECALIBRATION
LEAK TEST EVALUATION

MAJOR COMMAND RADIOACTIVE MATERIAL CONTROL POINTS

COMMAND RADIATION CONTROL PROGRAM MANAGEMENT
INVENTORY AND LEAK TEST PROCEDURES, RECORD, REPORTS
SURVEYS/INSPECTIONS OF USER ACTIVITIES

SUBORDINATE COMMAND RADIATION CONTROL PERSONNEL

IMPLEMENTATION OF COMMAND RADIATION CONTROL PROGRAM
SURVEYS/INSPECTIONS OF USER LOCATIONS

USERS - AUTHORIZED CALIBRATION ACTIVITIES

MOBILE TEAMS

CALIBRATE INSTRUMENTS
AT USER LOCATIONS

DEPOTS

CALIBRATE INSTRUMENTS
RECEIVED FROM USERS
NOT VISITED BY
MOBILE TEAMS AND
INSTRUMENTS FOR OWN USE
EVALUATION OF USER LEAK
TESTS AS REQUESTED

INSTALLATIONS

CALIBRATE INSTRUMENTS
FOR OWN USE

TRAINING CENTER/SCHOOL

RAD SAFETY TRAINING OF ARMY
PERSONNEL

SUPPLEMENT F

1. Reference: Paragraph 4 of letter/application.
2. Facilities for use and storage of the AN/UDM-7C Radiac Calibrator Set will be designated radiation controlled areas for those purposes as approved by the local RPO.
3. Sets used by the mobile calibration teams (AN/GSM-286/287 Calibration Set/Secondary Transfer Standards) will be used and stored in specially designed vans access to which is limited to team members. The sets will be stored in locked cabinets within the vans. At other locations the sets will be used and stored in fire resistant buildings, in controlled areas and secured against unauthorized removal. Areas/buildings will be posted with Caution-Radioactive Materials signs.
4. LBDA-AIRDC Storage, maintenance and serviceability installation
 - a. Construction: (1) The maintenance and serviceability installation is concrete block and steel with steel and concrete roof. The calibration and storage rooms are constructed of 36 inches of poured concrete with door containing $\frac{1}{2}$ inch of lead shielding.

(2) The storage installation (warehouse) is cinder block and brick construction with asphalt covered wooden roof.
 - b. Fire Protection: The entire installation is protected by fire sprinkler system which is tied to LBDA's self supporting fire department. The fire department has a maximum response time of 2 to 3 minutes to its furthest building.
 - c. Security: The security of the installation is such that all buildings are locked when not inhabited and the perimeters of LBDA are secured by chain-linked fence with roving patrols and sentries at the gate.
 - d. Instrumentation: Adequate health physics instrumentation is immediately available for operations involving ionizing radiation.
5. Calibration activities authorized to receive the AN/UDM-7C Radiac Calibrator Set are required to possess measuring/surveying instruments for which the calibrator is used. They are the AN/PDR-54, AN/PDR-56F and AN/PDR-60 standard Army alpha detection instruments (radiac sets) or commercial equivalent instrumentation such as the Eberline Instrument Corporation PAC series portable alpha survey instruments. In addition, these activities are authorized, as a minimum, the AN/PDR-27() standard Army beta-gamma detection instrument for beta-gamma radiation detection. The sensitivity range of the AN/PDR-54 Radiac Set is zero to 1×10^5 counts per minute (cpm) in three decade scales, the AN/PDR-56F Radiac Set is zero to 1×10^6 cpm in four decade scales, and the AN/PDR-60 Radiac Set is zero to 2×10^6 cpm in four decade scales. The sensitivity range for the AN/PDR-27() Radiac Set is zero to 500mR/hr in four decade scales.

6. The AN/PDR-54, AN/PDR-56F and AN/PDR-60 standard Army alpha detection instruments and the AN/PDR-27() standard Army beta-gamma detection instrument used for health and safety purposes are calibrated in accordance with the frequency specified in Technical Bulletin 43-180, Calibration Requirements for the Maintenance of Army Materiel, and procedures prescribed in the technical manuals issued with the instruments. Presently, the calibration frequency specified is once every 90 days. Calibration standards used for the AN/PDR-54 and AN/PDR-60 are the AN/UDM-6() (²³⁹Plutonium) and AN/UDM-7C Radiac Calibrator Sets. The calibration standard used for the AN/PDR-56F is the AN/UDM-7C Radiac Calibrator Set. Calibration standards used for the AN/PDR-27() are the AN/UDM-1(⁶⁰Cobalt), AN/UDM-1a (¹³⁷Cesium) or equivalent. All calibration standards are certified by, or traceable to, the National Bureau of Standards.

7. The radiation detection/measurement instrumentation, method of calibration, frequency and standards utilized by LBDA-AIRDC are contained in NRC Byproduct Material License 16-05033-01, NRC Source Material License SUB-417 and NRC Special Nuclear Material License SNM-623 issued to LBDA-AIRDC.

8. Bioassays available from the Surgeon General are provided when needed.

SUPPLEMENT G

1. Reference: Paragraph 4 of letter/application.

2. Title 10, Code of Federal Regulations, AR 385-11 and AR 700-64 are followed for disposal of radioactive waste. Presently, the procedure for the disposal of transur-
anium elements, including ²³⁹Plutonium, is to provide a request for disposition
through Army channels to Headquarters, US Department of Energy (DOE), Washington, DC.
DOE, in turn, provides disposition instructions, including compliance requirements to
US Department of Transportation regulations, for shipment to DOE installations for
ultimate disposal as radioactive waste.



DEPARTMENT OF THE ARMY
HEADQUARTERS US ARMY COMMUNICATIONS-ELECTRONICS COMMAND
AND FORT MONMOUTH
FORT MONMOUTH, NEW JERSEY 07703

REPLY TO
ATTENTION OF:

DRSEL-SF-H

7 OCT 1981

SUBJECT: Environmental Assessment and Finding of No Significant Impact for
Fielding of the AN/UDM-7C Radiac Calibrator Set

Commander
U.S. Army Materiel Development and Readiness Command
ATTN: DRCSF-P
5001 Eisenhower Avenue
Alexandria, Virginia 22333

1. Reference is made to the following:
 - a. Letter, DRCIS-A, 11 August 1980, subject: National Environmental Policy Act (NEPA) Compliance for Proposals Involving Nuclear Licensing.
 - b. Title 32, Code of Federal Regulations, Part 651, Environmental Quality; Environmental Effects of Army Actions (AR 200-2).
2. In accordance with references 1a and 1b, the subject environmental documents are provided for your review and evaluation.

FOR THE COMMANDER:

2 Incl
as

Bernard M. Savaiko
BERNARD M. SAVAIKO
Chief, Safety Office

DEPARTMENT OF THE ARMY
COMMUNICATIONS - ELECTRONICS COMMAND

ENVIRONMENTAL ASSESSMENT

AND

FINDING OF NO SIGNIFICANT IMPACT

FIELDING OF THE AN/UDM-7C RADIAC CALIBRATOR SET

FORT MONMOUTH, NEW JERSEY

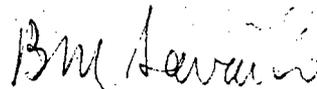
OCTOBER 7, 1981

PREPARED BY:



STEVEN A. HORNE
CHIEF, READINESS DIVISION
SAFETY OFFICE

APPROVED BY:



BERNARD M. SAVAIKO
CHIEF, SAFETY OFFICE
COMMANDER DESIGNEE

FINDING OF NO SIGNIFICANT IMPACT
AND
ENVIRONMENTAL ASSESSMENT

Proposed Action: Fielding of the AN/UDM-7C Radiac Calibrator Set

Lead Agency: Commander
US Army Communications-Electronics Command

Affected Jurisdiction: Lexington-Blue Grass Depot Activity (LBDA), Lexington,
Kentucky, the US Army Ionizing Radiation Dosimetry Center
of the Test Measurement Diagnostic Equipment Support Group
at LBDA, and Department of Defense Installations and Activities
Worldwide

Preparer: Commander
US Army Communications-Electronics Command
ATTN: DRSEL-SF-H
Fort Monmouth, New Jersey 07703

Coordinator: Steven A. Horne
Chief, Readiness Division
Safety Office
(201) 544-4427

and approved
Reviewed By: *SATton*
Bernard M. Savaiko
Chief, Safety Office
(201) 544-4427

A

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- I. Finding of No Significant Impact
- II. Environmental Assessment
 - A. Summary and Conclusion
 - B. Description and Proposed Fielding of the AN/UDM-7C Radiac Calibrator Set
 - C. Environmental Impact of Fielding the AN/UDM-7C Radiac Calibrator Set
 - D. Evaluation of Alternatives
 - E. Status of Compliance
 - F. Listing of Agencies/Persons Contacted
 - G. References
 - H. Inclosures
 - 1. MIL-R-24265 (SHIPS)
 - 2. NAVSHIPS 0967874-9010
 - 3. TM 3-6665-247-10
 - 4. - 7. Technical Drawings RE-F2696577 (RE 101 F2002)

I. Finding of No Significant Impact

1. Fielding of the AN/UDM-7C Radiac Calibrator Set into the US Army Supply System has been proposed for February 1982. These calibrators incorporate Plutonium (Pu)-239 for the calibration of alpha radiation detection instruments. The AN/UDM-7C Radiac Calibrator Set has been selected for use based on its capability of calibrating all existing type classified Army alpha radiation detection instruments and previous successful use by the US Navy for the past twenty years. The Environmental Assessment documents all safety protocol implemented during use, transfer or disposal and demonstrates compliance with all regulatory requirements. The following statements briefly summarize the program developed for safety and control:

a. Maximum safety is designed into the material and equipment with quality assurance testing for source and unit integrity prior to release for use.

b. Authorized users must meet minimum radiation protection training requirements before they are qualified to perform activities involving the AN/UDM-7C Radiac Calibrator Set.

c. Technical Manuals and instructions are supplied concerning proper operating procedures and radiation safety policies with notice given regarding potential hazards and precautions to be implemented.

d. Logistical control and accountability procedures are rigorous, insuring authorized possession and proper distribution.

e. Facilities are specifically designed for storage and use of the calibrator set.

f. Transfer procedures are compliant with packaging and labeling safety criteria.

g. Disposal procedures are specific for the calibrator set.

h. Quarterly leak testing is performed insuring no detectable levels of removable contamination.

2. Based upon its stringent control, all hypothetical incidents involving occupational hazards or release to the environment due to the possession of the AN/UDM-7C are considered highly improbable. Incidents included the evaluation of source leakage, improper disposal, installation fire, and transport accidents leading to contamination of the occupational worker and/or environmental release. The evaluations determined that there were no external or internal dose levels above those permitted by regulatory standards or recommendations. It was further determined that no significant radiological health or environmental hazard was discernable with the implementation of the AN/UDM-7C Radiac Calibrator Set incorporating Pu-239. Alternative radionuclides considered as substitutes for Pu-239 as an alpha calibration source are not identified to possess any significant overall advantage due to similar radiotoxicity, less than optimal energy required, increased external exposure and greater expense. The adoption of the AN/UDM-7C Radiac Calibrator Set provides the ideal immediate calibration source for all existing type classified alpha detection instrumentation eliminating unnecessary redesign of another radiac calibrator assembly.

3. The proposed action is non-substantive, exclusive of environmental quality degradation, and therefore does not require an Environmental Impact Statement. The Environmental Assessment is available for review upon request from Commander, US Army Communications-Electronics Command, ATTN: DRSEL-SF-H, Fort Monmouth, New Jersey 07703.

II. Environmental Assessment

A. Summary and Conclusion

1. The US Army Communications-Electronics Command (CECOM), concurrent with an application for a US Nuclear Regulatory Commission (NRC) license to receive, own, acquire, deliver, possess, use, and transfer special nuclear material, has prepared the following environmental assessment in compliance with Title 32, Code of Federal Regulations (32 CFR), Part 651, Environmental Quality, Environmental Effects of Army Actions. The assessment is required prior to acquisition of radioactive materials into the CECOM material life cycle control which has been proposed for February 1982 with the introduction of the AN/UDM-7C Radiac Calibrator Set incorporating Pu-239.

2. This document includes:

a. The proposed use, need, and description of the AN/UDM-7C Radiac Calibrator Set, inclusive of maximum safety design specifications and Army policies more restrictive than governing regulatory requirements.

b. Alternatives available for substitution based on resources, risk, and benefit analyses.

c. Radiological impacts with resulting dose assessments from hypothetical accidents or misuse.

The comprehensive evaluation is in support of a Finding of No Significant Impact documenting no potential degradation of environmental quality or significant radiological impact to occupational or public health. No

3. The intended use of the AN/UDM-7C Radiac Calibrator Set is solely for calibration of alpha radiation detection instruments employed for tactical (field) and health and safety purposes. All unit design specifications, authorized user qualifications, location and control of calibrator use and accountability, transfer and disposal are outlined in Section B. These meet stringent Army safety policies compliant with governmental agencies having jurisdictional control. For the AN/UDM-7C Radiac Calibrator Set, further control has been established as distribution is limited by approval from the Department of the Army based upon previously established authorization of user organizations to receive the item from a supply standpoint along with specific storage requirements, special handling and maintenance procedures, and exclusive disposal through the US Department of Energy (DOE).

4. Properly implemented safety procedures for actions involving calibrator sets precludes any unnecessary radiation exposure to the occupational worker and excludes consideration of any potential release to the environment. In determining radiological hazards to the occupational worker, assessments for both external and internal doses were performed. The annual external dose received from continuous exposure to the $1.86\text{E}+06$ becquerels (Bq) ($5.03\text{E}+01$ microcuries (uCi)) of Pu-239 is conservatively estimated to be $4.38\text{E}-07$ sieverts (Sv) ($4.38\text{E}-05$ rem) or $8.76\text{E}-04$ percent of the occupational exposure limits set forth in 10 CFR Part 20. This is also consistent with the As Low As Reasonably Achievable (ALARA) concepts adopted by the NRC. For the internal dose, it was assumed that the individual ingested Pu-239 after coming directly into contact with a contaminated source. This evaluation yielded the greatest potential hazard assessable

for all incidents. The maximum committed dose equivalent of $2.44\text{E}-02$ Sv ($2.44\text{E}+00$ rem) was obtained for the bone surface which has a high fractional deposition factor and the longest biological half-life for retention of Pu-239. This is below non-stochastic dose equivalent limits recommended in the International Commission on Radiological Protection (ICRP) Publication 30. The total activity ingested was 5.80 percent of the Annual Limit of Intake (ALI) also specified in ICRP 30. Hypothetical incidents involving improper disposal, installation fire, and transport leading to potential release of radioactive material to the environment or possible intake into the body are described and also result in committed dose equivalents below recommendations. Complete derivation of the evaluations is provided for review in Section C.*

5. The specific need for the AN/UDM-7C Radiac Calibrator Set is evident with its capability to calibrate all type classified alpha radiation detection instruments presently, or which will be incorporated into the Army supply system. Alternatives considered in Section D provide no overall advantage. Department of Defense (DOD) policy precludes development of new items when existing supply items are available and are adequate for functional needs. Minimal radiological risk is associated with the AN/UDM-7C Radiac Calibrator Set which has been used under US Navy control for approximately twenty years with no adverse indication demanding discontinuation of calibrator usage. It is estimated that ten years of research and development would be required for redesign of a calibrator set necessitating tremendous needless financial and manpower resources.

6. This assessment does not consider the worldwide fielding of the AN/UDM-7C Radiac Calibrator Set environmentally controversial, as it is neither capable of significantly affecting the quality of the human environment nor is it demonstrative of radiological impact.

B. Description of the AN/UDM-7C Radiac Calibrator Set

1. The AN/UDM-7C Radiac Calibrator Set incorporates two radioactive sources, one containing $1.84\text{E}+06$ Bq ($4.97\text{E}+01$ uCi) and one of $1.84\text{E}+04$ Bq ($4.97\text{E}-01$ uCi) as Pu-239 Chloride. Military Specification R-24265 (SHIPS) (Incl 1) outlines standards for manufacturing requirements, source/resin composition and integrity, and quality assurance testing for all calibration components. To summarize, one hundred percent of the radioactive source disks are tested for uniformity requirements prior to assembly into casings. One hundred percent of the sources are also tested for accuracy and leakage requirements in their completed configuration. In addition, a random sampling of ten percent of the completed AN/UDM-7C Radiac Calibrator Sets are tested for specific resin properties, uniformity, accuracy, enclosure, shock, vibration, and leakage requirements. Any calibration not meeting test standards will not be incorporated into the Army supply system. Design is suitable to performance requirements and without any portion of the equipment creating hazard to personnel or vital systems.

2. Reference should be made to NAVSHIPS 0967 874-9010 (Incl 2), Technical Manual (TM) 3-6665-247-10 (Incl 3), and Technical Drawings (Incl 4, 5, 6 and 7) for diagrams and complete detail of the structural design of the calibrator set. The radiac calibrator set is composed basically of two aluminum source holders containing the Pu-239 alpha sources, an accessory drawer providing storage of attenuators, instruction manual, tweezers and probe positioner, a surrounding aluminum cabinet and a hardwood carrying case securing all components. Calibrators are marked with adequate radiation labels containing the radiation caution symbol and the appropriate warnings

*The use of exponential (scientific) notation, i.e., $1.86\text{E}+06$ (1.86×10^6) is employed in lieu of standard notation, i.e., 1,860,000.

with instructions for proper handling. Radiation safety policies dictate assurance of qualified users, proper labeling and provision for the technical (operating) manual outlining potential hazards, precautions to be implemented and procedure for calibration of alpha radiation detection instruments for maximum user safety. The aluminum shielding provides complete attenuation of the Pu-239 alpha particle during storage and transport. The very low percent abundance of gamma emission does not present external dose hazard as assessed in Section C. All packaging and labeling of the calibrators meet US Department of Transportation (DOT) Specification 7A Type A packaging.

3. The AN/UDM-7C Radiac Calibrator Set will be utilized at Lexington-Blue Grass Depot Activity (LBDA), Lexington, Kentucky, the US Army Ionizing Radiation Dosimetry Center of the US Army Test Measurement Diagnostic Equipment Support Group located at LBDA, and DOD installations and activities worldwide possessed under the control of the US Army military and/or civilian personnel on the basis of approved facilities, radiation safety standards, procedures, and qualifications of authorized user, i.e., TM 3-6665-247-10 (Incl 3) and Army Regulation (AR) 385-11. Radiac Calibrator Sets issued to authorized activities are for calibration of specific alpha radiation detection instruments, i.e., the AN/PDR-54, AN/PDR-56F, and AN/PDR-60 Radiac Sets. Operations are supervised by a qualified radiation protection officer (RPO) and performed with maximum safety procedures as outlined in TM 3-6665-247-10 insuring lowest achievable occupational exposures. For personnel dosimetry purposes, bioassays are available and provided when needed by the Surgeon General of the Army.

4. Elements authorized to possess alpha radiation detection instrumentation will not necessarily be authorized to possess the calibrator set. Typically, instrumentation will be sent to authorized calibration activities or will be calibrated by a visiting mobile calibration team. Most of the sets will be used by four to seven-man mobile calibration teams. Individuals utilizing these calibrators will have received at least 40 hours training in the principles and practices of radiation protection which includes specific training in the safe use of the calibrator set. Users are provided with specific instructions on the operations, safe handling, control and maintenance of the calibrator as described in inclosure 3.

5. CECOM will individually control the logistics of the AN/UDM-7C, serve as National Inventory Control Point (NICP) for the item, and assure that requesting elements are authorized to, and technically capable of, receiving the item in accordance with the NRC license. The Army program for control of radioactive items of supply is prescribed in two regulations, AR 385-11 and AR 700-64. CECOM has adopted special procedures in addition to standard Army supply practices used for all type classified items. The control point maintains records of procurements, receipts, storage locations, shipments, using locations, authorizes, issues, and assures adequate supply. It reviews requisitions submitted and when approved, issues material release orders to the designated depot for shipment of the material to the requisitioner.

6. Each major command has established at the headquarters level a radioactive material control point (RMCP) and appointed a radiation control officer (RCO) to administer control of radioactive items within the command. The RCO reviews and concurs in the qualifications of local RPOs within the command, maintains records of radioactive items by location and assures periodic inventory and leak tests by using activities, performs periodic inspections/audits of accountable installations/activities to assure that items are properly handled in accordance with Army and NRC regulations, and to assure the submission of inventory and leak test reports and accident/incident reports.

The local RPO is responsible for administering the local radiation protection program. Local programs provide for designated controlled areas, dosimetry, instrumentation, operating procedures supplementing published manuals for the items, receipts, transfers, storage and records. Requisitions originated by using elements are forwarded to NICP where all requisitions are reviewed and approved.

7. Facilities for use and storage of the AN/UDM-7C Radiac Calibrator Set will be designated radiation controlled areas for those purposes as approved by the local RPO. Sets used by the mobile calibration teams will be used and stored in specially designed vans, access to which is limited to team members. The sets will be used and stored in fire resistant buildings, in controlled areas and secured against unauthorized removal. Areas/buildings will be posted with appropriate radiation warning signs. LBDA storage, maintenance and serviceability installations used for bulk storage of the AN/UDM-7C Radiac Calibrator Set are constructed of concrete block and steel. The calibration and storage rooms are constructed of 36 inch poured concrete with a door containing $\frac{1}{4}$ inch of lead shielding. The installation is protected by a fire sprinkler system which is tied to the LBDA self supporting fire department. The fire department has a maximum response time of two to three minutes to its furthest building. The security of the installation is such that all buildings are locked when not inhabited and the perimeter of LBDA is secured by chain-linked fence with roving patrols and sentries at the gate again eliminating any possibility of unauthorized possession.

8. Packaging and shipment of the AN/UDM-7C is in compliance with DOT regulations as outlined in inclosure 3. No more than ten each AN/UDM-7C Radiac Calibrator Sets will be transported per individual shipment following CECOM instructions insuring maximum safeguarding against the worst conceivable transport incident.

9. Ultimate disposal of the AN/UDM-7C Radiac Calibrator Set will be in accordance with AR 385-11, AR 700-64 and 10 CFR. Request for disposition of Pu-239 as contained in the AN/UDM-7C Radiac Calibrator Set must be made through Army channels to headquarters US DOE. This agency provides disposition instructions inclusive of compliance requirements under DOT regulations for shipment to the DOE site located in Oak Ridge, Tennessee. No radioactive waste is anticipated except in cases of damage beyond use of the sources. Unserviceable calibrator sets will be returned to LBDA for repair or replacement of nonradioactive components and examination, leak testing, reorientation of the sources if necessary, recalibration and return to depot stock.

10. The described parameters associated with use of the AN/UDM-7C Radiac Calibrator Set indicates the most stringent governing policies practically applicable for prevention of any radiological hazard to any individual involved occupationally or nonoccupationally during the use or transport of the calibrator set. Army regulations are compliant with NRC and DOT requirements and are implemented in the most restrictive manner for maximum safety.

C. Environmental Impact of Fielding the AN/UDM-7C Radiac Calibrator Set

1. No radiological impact can be associated with the AN/UDM-7C Radiac Calibrator Set under normal operating conditions following proper procedures. The external dose equivalent from gamma emission for an occupational worker revealed a total whole body dose from the $1.84\text{E}+06$ Bq ($4.97\text{E}+01$ uCi) Pu-239 source based on continuous exposure to be $4.38\text{E}-07$ Sv ($4.38\text{E}-05$ rem) per year (yr) derived from the following dosimetric calculations and assumptions:

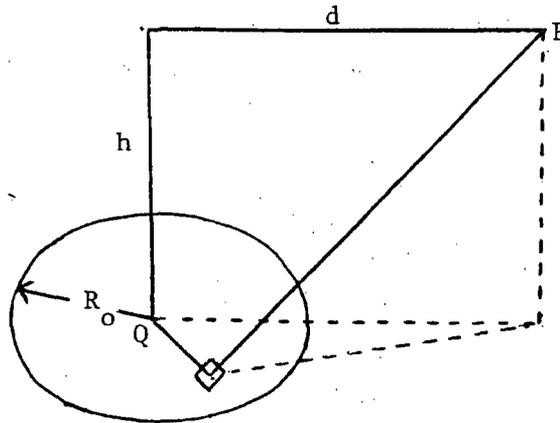


FIGURE C-1

a. Assuming a disk source (Figure C-1) of uniform activity distribution at an operating position (P) of height (h) 30.5 centimeters (cm) above and distance (d) 30.5 cm away from the center (Q) of the source whose radius (R) equals 15.9 cm and whose activity concentration per unit area (C_A) is 2.32E-03 Bq/cm² (6.30E-08 Ci/cm²), I_o (MeV/cm²/sec) at P is calculated by:

$$I_o = 2.96E+09 EC_A \pi \ln \left[\frac{(R_o^2 + h^2 - d^2) + [(R_o^2 + h^2 - d^2)^2 + 4d^2h^2]^{1/2}}{2h^2} \right]$$

Upon substitution of appropriate values, each individual gamma energy of Pu-239 with its associated intensity determined final flux (I_o) calculations as summarized in Table C-1.

b. For the absorbed dose rate (Gy/h) to tissue the following formula was employed:

$$\text{Gy/h} = 5.76E-05 (u_a^{\text{med}} / \rho_{\text{med}}) I_o / 100$$

where u_a^{med} = linear absorption coefficient (cm⁻¹)

ρ_{med} = mass density of the absorbing medium (g/cm³; for tissue the value is assumed equivalent to water, i.e., 1.0 g/cm³)

$u_a^{\text{med}} / \rho_{\text{med}}$ = mass absorption coefficient (cm²/gm) or equivalent to mass energy absorption coefficients at varying energies in a tissue medium,

TABLE C-1

Individual Gamma Flux Values and Final Absorbed Dose Rates

	<u>E(MeV)</u>	<u>Gamma Intensity²</u>	<u>MeV/disintegration</u>	<u>I₀ (MeV/cm²/sec)</u>	<u>u_a tissue</u>	<u>Gy/h (rad/hr)</u>
1.	0.039	7.00E-05	2.73E-06	2.17E-04	7.29E-02	9.10E-12 (9.10E-10)
2.	0.052	2.00E-04	1.04E-05	8.28E-04	3.74E-02	1.78E-11 (1.78E-09)
3.	0.129	5.00E-05	6.45E-06	5.14E-04	2.65E-02	7.86E-12 (7.86E-10)
4.	0.375	1.20E-05	4.50E-06	3.58E-04	3.27E-02	6.74E-12 (6.74E-10)
5.	0.414	1.20E-05	5.00E-06	3.98E-04	3.29E-02	7.54E-12 (7.54E-10)
6.	0.650	8.00E-07	5.20E-07	4.14E-05	3.27E-02	7.80E-13 (7.80E-11)
7.	0.770	2.00E-07	1.54E-07	1.23E-05	3.22E-02	2.28E-13 (2.28E-11)

i.e., (H_2O) since ρ_{med} is equivalent to 1.0 g/cm^3 .

Table C-1 can be used for review of substituted values and final absorbed dose rates determined for each gamma flux which when summed result in $5.00E-11 \text{ Gy/h}$ ($5.00E-09 \text{ rad/hr}$). Assuming a quality factor and dose modifying factor of one (1) for gamma energies, the dose equivalent value can be stated as $5.00E-11 \text{ Sv/h}$ ($5.00E-09 \text{ rem/hr}$) or $4.38E-07 \text{ Sv/yr}$ ($4.38E-05 \text{ rem/yr}$).

c. For occupational exposure, the ICRP recommends the value of 0.05 Sv per year for the stochastic dose-equivalent limit for uniform irradiation of the whole body. The NRC occupational exposure limits, as specified in 10 CFR Part 20 allow for an occupational whole body dose of 5 rem per year. The exposure presented under normal usage demonstrates no excessive occupational radiation level and is, in fact, magnitudes below standards specified for the general public or non-occupational individuals.

d. Estimates given for external dose were not inclusive of the greater operating distance the user maintains and are therefore in excess of the theoretical dose calculated. The radionuclidic purity of the Pu-239 source is greater than 99.0 percent eliminating consideration of any other gamma energies associated with the decay scheme and applicable to dosimetric calculations. Consideration of alpha particle absorption is insignificant since the distance traveled in air for the 5.11 MeV and 5.16 MeV alpha particles is calculated to be approximately 3.78 centimeters and would not penetrate the uppermost layers of epithelial tissue or reach any radiosensitive tissues. Thus, the greatest radiobiological hazard from Pu-239 results from inhalation or ingestion limiting the biological damage to closely surrounding tissues.

2. In the event safety criteria are not properly implemented, internal exposure due to the highly ionizing alpha particles of Pu-239 subsequent to inhalation or ingestion is considered in order to demonstrate levels less than those permissible under ICRP 30 recommendations and regulatory standards. The hypothetical incidents cited assess possible radiological hazards presented to either the occupational worker or the general public. The described incidents are highly improbable but demonstrate unequivocally the final resolution that there would be no significant environmental impact resultant from implementation of the AN/UDM-7C Radiac Calibrator Set.

a. Source Leakage:

(1) The AN/UDM-7C Radiac Calibrator Set is required to be leak tested for removable contamination every three months under safety requirements employing protective handling procedures as outlined in inclosure 3 for every user. In a highly improbable situation of source leakage without detection, the following severe conditions are presented:

(a) Ten percent of the total Pu-239 activity ($1.86E+05 \text{ Bq}$ or $5.02E+00 \text{ uCi}$) is available for contamination evenly distributed over an accessible area.

(b) The accessible area is considered to be the probe positioning well having a total area of 737.8 cm^2 yielding $2.52E+02 \text{ Bq/cm}^2$ ($6.80E-03 \text{ uCi/cm}^2$).

(c) Twenty-five percent of the contaminated area (184.45 cm^2) transfers to the user resulting in a total of $4.60\text{E}+04 \text{ Bq}$ ($1.25\text{E}+00\text{uCi}$) of contamination. Twenty-five percent of the contamination ($1.16\text{E}+04 \text{ Bq}$ or $3.10\text{E}-01\text{uCi}$) is ingested.

(2) The committed dose equivalents to various organs from ICRP 30 data are tabulated in Table C-2. The maximum dose equivalent of $2.44\text{E}-02 \text{ Sv}$ estimated for the bone surface area is below non-stochastic dose equivalent limits. The total ingested activity of $1.16\text{E}+04 \text{ Bq}$ is 5.80 percent of the given ALI ($2.00\text{E}+05 \text{ Bq}$).

(3) The occurrence of this incident is not recognized as having a high probability due to user training, technical manuals indicating potential hazards, protective handling requirements, and routine testing for removable contamination.

b. Source Loss Leading to Improper Disposal to an Incinerator:

(1) The following case has assessed incineration of AN/UDM-7C Radiac Calibrator Sets implementing the analysis provided in NUREG/CR-1156, Environmental Assessment of Ionization Chamber Smoke Detectors Containing Americium-241³. It is inconceivable that a Pu-239 source mounted onto its aluminum shelf or the entire unit itself could be transferred unknowingly to an incinerator. Both the aluminum shelf and calibrator set are marked with radiation symbols and radioactive material identification labels to exclude occurrence. The assumptions used to estimate the amount of Pu-239 in incinerator emissions are as follows:

(a) Five AN/UDM-7C Radiac Calibrator Sets are incinerated giving an initial activity (Q_i) of $9.29\text{E}+06 \text{ Bq}$ ($2.51\text{E}+02 \text{ uCi}$) releasing one hundred percent (f_r) over twenty four hours. The installed air pollution control system efficiency is 90 percent ($f_r = 0.1$).

(b) Fifty percent excess of the theoretical volume of air required for complete combustion of one pound (lb) is $2.00\text{E}+06 \text{ cm}^3/\text{lb}$ (V_a). The weight of refuse incinerated (W_r) is $6.60\text{E}+05$ pounds.

(2) The atmospheric dispersion coefficient (X/Q) is assumed to be $2.00\text{E}-05 \text{ sec}/\text{m}^3$.

(3) The total activity released in a day (Q), given by the formula $Q=Q_i f_r f_s$, is $9.29\text{E}+05 \text{ Bq}$ ($2.51\text{E}+01 \text{ uCi}$).

(4) The continuous release rate (Q') over twenty-four hours is $1.07\text{E}+01 \text{ Bq/s}$ ($2.90\text{E}-04 \text{ uCi/sec}$).

(5) Assuming a constant wind speed of one meter per sec under stable meteorological conditions, the maximum downwind concentration (X) substituting into the general formula $X=Q'$ (X/Q) is estimated to be $2.15\text{E}-04 \text{ Bq}/\text{m}^3$ ($5.80\text{E}-09 \text{ uCi}/\text{m}^3$).

(6) If an average daily breathing rate of 20.0m^3 per day is assumed, the maximum exposed individual would inhale approximately $4.30\text{E}-03 \text{ Bq}$ ($1.16\text{E}-07 \text{ uCi}$).

(7) If the average person is proposed to inhale one-third of this concentration, the total activity is $1.43\text{E}-03 \text{ Bq}$ ($3.86\text{E}-08 \text{ uCi}$). Approximations of committed dose equivalents to various organs using ICRP 30 data are summarized in Table C-3.

(8) Realistic consideration of the above incident is eliminated based on user ability to maintain proper authorized possession and accountability with negligible occasion arising where its control escapes user awareness to the extent a calibrator set

TABLE C-2

Committed Dose Equivalents to Various Organs Following Ingestion

<u>Activity Ingested</u>	<u>Gonads</u>	<u>R. Marrow</u>	<u>Bone Surface</u>	<u>Liver</u>
1.16E+04 Bq (3.10E-01 uCi)	3.02E-04 Sv (3.02E-02 rem)	1.86E-03 Sv (1.86E-01 rem)	2.44E-02 Sv (2.44E+00 rem)	5.10E-03 Sv (5.10E-01 rem)

TABLE C-3

Committed Dose Equivalents to Various Organs Resultant from Inhalation
Following Source Incineration

	<u>Activity Inhaled</u>	<u>Gonads</u>	<u>R. Marrow</u>	<u>Bone Surface</u>	<u>Liver</u>
Average Exposed Person	1.43E-03 Bq (3.86E-08 uCi)	4.57E-08 Sv (4.57E-06 rem)	2.86E-07 Sv (2.86E-05 rem)	3.57E-06 Sv (3.57E-04 rem)	7.57E-07 Sv (7.57E-05 rem)
Maximum Exposed Person	4.30E-03 Bq (1.20E-07 uCi)	1.38E-07 Sv (1.38E-05 rem)	8.60E-07 Sv (8.60E-05 rem)	1.10E-05 Sv (1.10E-03 rem)	2.28E-06 Sv (2.28E-04 rem)

is transferred to an incinerator.

(9) The maximum downwind concentration was estimated to be $2.15E-04 \text{ Bq/m}^3$ ($5.80E-09 \text{ uCi/m}^3$) which is below regulatory standards. The air concentration limit for unrestricted areas as specified in 10 CFR Part 20 is given as $2.22E-03 \text{ Bq/m}^3$ ($6.00E-14 \text{ uCi/ml}$) for soluble forms and $3.70E-02 \text{ Bq/m}^3$ ($1.00E-12 \text{ uCi/ml}$) for insoluble forms. This limit is based on the standard for non-occupational radiation exposure which is $5.00E-03 \text{ Sv/yr}$ ($5.00E-01 \text{ rem/yr}$).

c. Source Loss Resulting in Improper Disposal Directly to a Public Landfill:³

(1) Under the assumption five incinerated calibrator sets are hypothetically disposed in a solid waste landfill. Exposure could result to population groups through ingestion of contaminated ground water or food crops and inhalation of resuspended radioactivity. The environmental health impact resulting from the contamination of ground water by disposal of calibrator sets in a landfill is assessed with the following parameters:

(a) Leaching of source activity from five incinerated AN/UDM-7C Radiac Calibrator Sets is assumed to be 100 percent. The total activity (A_t) in the landfill is $9.30E+06 \text{ Bq}$ ($2.51E+02 \text{ uCi}$).

(b) Fifty percent of the leached activity (f_{L1}) enters the groundwater without further dispersion.

(c) The total volume (V_L) of leachate generated per year from an average 25 acre landfill based on US Environmental Protection Agency (EPA) estimates is $6.76E+06$ gallons ($2.57E+10 \text{ ml}$) accounting only for the average precipitation infiltrate of ten inches per year.

(d) There is no significant dilution (f_{L2}) of the zone of contamination from surrounding groundwater (f_{L2} equals one (1) assuming no significant dilution).

(e) One percent of the contaminated water is withdrawn for domestic water supply (f_{d1}) and five percent is consumed as drinking water (f_{d2}).

(2) The concentration (Bq/m^3) of Pu-239 in the leachate (A_L) as it enters the zone of saturation would be calculated by:

$$A_L = A_t f_{L1} f_{L2} / V_L$$

Substituting the appropriate values, the average Pu-239 concentration in all the leachate generated would be $1.81E+02 \text{ Bq/m}^3$ ($4.90E-09 \text{ uCi/ml}$).

(3) The amount of activity ingested (A_{ing}) as a result of contaminated water in the public drinking water supply is estimated by:

$$A_{\text{ing}} = V_L f_{d1} f_{d2} A_L$$

Substituting values estimated in c(1)(c and e) and c(2), the dietary intake by the entire population (73,000) surrounding the landfill would be $2.30E+03 \text{ Bq}$ ($6.30E-02 \text{ uCi}$). The average individual dietary intake would be $3.20E-02 \text{ Bq}$ ($8.60E-07 \text{ uCi}$).

(4) The dose commitment to the maximally exposed individual is assessed with the assumption that the annual dietary intake of water (I_w) is 370 liters (l) and consists entirely of ground water contaminated with Pu-239 at the same concentration as calculated for leachate ($A_L = 1.81E+02 \text{ Bq/m}^3$) incorporated into the formula:

$$A_{\text{ing}} = I_w A_L$$

The resultant ingestion is $6.70E+01 \text{ Bq}$ ($1.80E-03 \text{ uCi}$). The Pu-239 intake and committed dose equivalents⁵ due to leaching from a landfill to accessible drinking water is summarized in Table C-4.

(5) The maximum permissible water concentration for unrestricted areas is specified in 10 CFR Part 20 and given for Pu-239 to be $1.85E+05 \text{ Bq/m}^3$ ($5.00E-06 \text{ uCi/ml}$) for soluble forms and $1.11E+06 \text{ Bq/m}^3$ ($3.00E-05 \text{ uCi/ml}$) for insoluble forms. The concentration of the radionuclide in the leachate ($1.81E+02 \text{ Bq/m}^3$) is a very small fraction of the permissible limits, i.e., approximately $9.80E-02$ percent of the soluble limit and $1.60E-02$ percent of the insoluble limit.

d. Installation Fire:

(1) The proposed incident involves an installation fire occurring during bulk storage at LBDA in which AN/UDM-7C Radiac Calibrator Sets are incorporated releasing Pu-239. The warehouse facility is equipped with complex sprinkler systems covering 100 percent of the area and an automatic alert to the LBDA firefighting unit which has at maximum a two to three minute response time. The firefighter unit is aware of the radioactive material storage area and has standard operating procedures inclusive of protective clothing, self-contained respiratory devices and procedures limiting water usage and evacuation of personnel from downwind areas immediately if necessary. The hypothetical incident assumes the following for occupationally involved firefighters in the immediate vicinity performing extinguishing operations:

(a) The maximum number possibly stored at any time in the installation is 300 units, each containing $1.86E+06 \text{ Bq}$ ($5.03E+01 \text{ uCi}$).

(b) Prior to extinguishing the fire, 100 units are involved releasing 0.01 percent of the Pu-239 activity as airborne particulates, i.e., $1.86E+04 \text{ Bq}$ ($5.00E-01 \text{ uCi}$) during a one hour time interval.

(c) The volume of air in the warehouse is $1.23E+04 \text{ m}^3$ yielding $1.50E+00 \text{ Bq/m}^3$ ($4.06E-05 \text{ uCi/m}^3$).

(d) The breathing rate of persons involved is $1.2 \text{ m}^3/\text{hr}$.

(e) The total intake for each firefighter is $1.81E+00 \text{ Bq}$ ($4.91E-05 \text{ uCi}$) assuming no implementation of respiratory protective devices during the one hour period.

(2) The committed dose equivalents as calculated using ICRP 30 data are given in Table C-5. No estimates were considered for the general public due to conservative dose estimates derived for occupational individuals in the immediate vicinity and dispersion factors which would further reduce dose commitments. It should be noted that no consideration in the dose estimates for firefighters included ventilation of the

TABLE C-4

Committed Dose Equivalents Due to Leaching from a Landfill to Public Drinking Water

	<u>Activity Ingested</u>	<u>Gonads</u>	<u>R. Marrow</u>	<u>Bone Surface</u>	<u>Liver</u>
Total Public	2.30E+03 Bq (6.30E-02 uCi)	6.00E-05 Sv (6.00E-03 rem)	3.70E-04 Sv (3.70E-02 rem)	4.80E-03 Sv (4.80E-01 rem)	1.10E-03 Sv (1.10E-01 rem)
Average Exposed Person	3.20E-02 Bq (8.60E-07 uCi)	8.30E-10 Sv (8.30E-08 rem)	5.10E-09 Sv (5.10E-07 rem)	6.70E-08 Sv (6.70E-06 rem)	1.40E-08 Sv (1.40E-06 rem)
Minimum Exposed Person	6.70E+01 Bq (1.80E-03 uCi)	1.70E-06 Sv (1.70E-04 rem)	1.10E-05 Sv (1.10E-03 rem)	1.40E-04 Sv (1.40E-02 rem)	2.90E-05 Sv (2.90E-03 rem)

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TABLE C-5

Committed Dose Equivalents to Various Organs Following Inhalation Due to Installation Fire

<u>Activity Inhaled</u>	<u>Gonads</u>	<u>R. Marrow</u>	<u>Bone Surface</u>	<u>Liver</u>
1.80E+00 Bq (4.91E-05 uCi)	5.76E-05 Sv (5.76E-03 rem)	3.60E-04 Sv (3.60E-02 rem)	4.50E-03 Sv (4.50E-01 rem)	9.54E-04 Sv (9.54E-02 rem)

building during extinguishment or the use of respiratory protective devices. The committed dose equivalent limit for bone surface remains below recommended non-stochastic dose equivalent limits and the total inhaled activity is 0.9 percent of the ALI (2.00E+02 Bq) recommendation for inhalation. The air concentration stated in d1(c) is equivalent to 1.50E+00 Bq/m³ (4.06E-11 uCi/ml) or 4.10E-03 Bq/m³ (1.10E-13 uCi/ml) when averaged over one year. The concentration limit as specified in 10 CFR Part 20 is 1.40E-02 Bq/m³ (2.00E-12 uCi/ml) for soluble forms and 1.48E+00 Bq/m³ (4.00E-11 uCi/ml) for insoluble forms. Concentration levels are below one third maximum permissible limits accounting for variation of individual doses.

(3) Operations in the unlikely event of occurrence would be conducted with some awareness of the potential hazard and with measures of protection reducing inhalation risks. The probability of fire at the installation involving the AN/UDM-7C Radiac Calibrator Sets approaches zero due to institution structural composition, fire walls between warehouse sections, complex sprinkler systems, and firefighter units which would respond prior to any conceivable incorporation of units containing radioactive materials.

e. Individual Storage Area Fire:

(1) The AN/UDM-7C Radiac Calibrator Sets fielded will be used by mobile calibration teams in specially designed vans. The calibrator set is stored within a locked fire resistant cabinet. Hypothetically, if the unit were subjected to heat or fire causing breach of the calibrator source integrity, the following assumptions are presented:

(a) Within a fifteen minute time frame, fire surrounds the cabinet causing 10 percent release of activity to the calibrator encasement, i.e., 1.86E+05 Bq (5.03E+00 uCi).

(b) Ten percent of the activity escapes the encasement to the cabinet interior releasing one percent to the van interior (2.14E+01 m³) yielding 8.70E+00 Bq/m³ (2.30E-04 uCi/m³) within the fifteen minute time interval.

(c) Assuming an occupational worker with a breathing rate of 1.2 m³/hr were present for the 5 minutes prior to implementing a respiratory device, the total activity inhaled would be 8.70E-01 Bq (2.30E-05 uCi).

(2) The committed dose equivalents using ICRP 30 data are summarized in Table C-6. The evaluation presented considered the minute plausibility of fire enveloping the specifically designed fire-resistant cabinet and the attempt to arrest the fire without respiratory protective devices or air exchange causing dilution and decrease in inhaled activity. Release of activity prior to extinguishment is realistically improbable with the availability of firefighting devices and user response. The total inhaled activity is 1.3 percent of the recommended ALI for inhalation. The concentration guides for restricted areas as specified in 10 CFR Part 20 are 1.40E-02 Bq/m³ (2.00E-12 uCi/ml) for soluble forms and 1.48E+00 Bq/m³ (4.00E-11 uCi/ml) for insoluble forms. The presented air concentration is equivalent to 8.70E+00 Bq/m³ (2.30E-10 uCi/ml) or averaged over one year equal to 2.40E-02 Bq/m³ (6.30E-13 uCi/ml). The air concentration levels are below one third of permissible limits which are based on standards for occupational exposure levels of 5.00E-02 Sv/yr (5.00E+00 rem/yr).

TABLE C-6

Committed Dose Equivalents from Inhalation Due to Individual Storage Area Fire

<u>Activity Inhaled</u>	<u>Gonads</u>	<u>R. Marrow</u>	<u>Bone Surface</u>	<u>Liver</u>
8.70E-01 Bq (2.30E-05 uCi)	2.66E-06 Sv (2.66E-04 rem)	1.74E-04 Sv (1.74E-02 rem)	2.18E-03 Sv (2.18E-01 rem)	4.61E-04 Sv (4.61E-02 rem)

f. Transportation Accidents:

(1) Transport of the AN/UDM-7C Radiac Calibrator Sets between facilities is rare except upon initial delivery from LBDA to the area of proposed user activity which would lead to a decrease in the probability of incident occurrence. The transport scenario involves vehicular collision resulting in fire, explosion and subsequent release of calibrator source activity to the environ. Inhalation risk is considered the primary immediate mode of exposure to individuals in the vicinity under the assumptions:

(a) The maximum number of AN/UDM-7C Radiac Calibrator Sets transported is ten giving a total activity of $1.86E+07$ Bq ($5.03E+02$ uCi).

(b) Fifty percent of the total activity is instantaneously and uniformly distributed within a hemispherical volume whose radius equals 200 meters yielding a total volume of $1.67E+07$ m³ and whose activity concentration per unit volume is $5.50E-01$ Bq/m³ ($1.50E-05$ uCi/m³).

(c) Individuals within the prescribed area have a breathing rate of 1.2 m³/hr.

(d) Assuming no change in activity per unit volume through dispersion for an hour or evacuation of any individual, the total activity inhaled within the one hour time period would be $5.30E+00$ Bq ($1.40E-04$ uCi).

(2) Approximations of committed dose equivalents to various organs using ICRP 30 evaluation are summarized in Table C-7. The air concentration assumed in f(1)(b) averaged over a one year time interval is $1.50E-03$ Bq/m³ ($4.11E-14$ uCi/ml) and below maximum permissible unrestricted air concentrations specified in 10 CFR Part 20. Further reduction in quantities inhaled and committed dose equivalents would occur through wind dispersion and evacuation of contaminated areas.

(3) The following final statements are offered supporting minimum transport incident probability as assessed:

(a) There has been no documented history of any accident involving transport of the AN/UDM-7C Radiac Calibrator Set over the past twenty years while under US Navy control.

(b) In general, the number of transport incidents involving radioactive materials is insignificant in comparison to the total number of shipments.

(c) Transportation and packaging of the calibrator set is in compliance with all DOT regulations.

(d) Any conceivable damage to the unit in transit would not be of a severe nature but rather from jolting or compression which would not release material to the environ. Upon occurrence, damage would be immediately obvious to the authorized user who would take appropriate action to contain the unit for return or disposal as specified in inclosure 3.

TABLE C-7

Committed Dose Equivalents to Various Organs Resultant from Inhalation Following a Transport Incident

<u>Activity Inhaled</u>	<u>Gonads</u>	<u>R. Marrow</u>	<u>Bone Surface</u>	<u>Liver</u>
5.30E+00 Bq (1.40E-04 uCi)	1.70E-04 Sv (1.70E-02 rem)	1.06E-03 Sv (1.06E-01 rem)	1.33E-02 Sv (1.33E+00 rem)	2.81E-03 Sv (2.81E-01 rem)

3. In summary, the occupational worker under hypothetical assumptions presents himself with the maximum unnecessary internal exposure to Pu-239 through improper use of the AN/UDM-7C Radiac Calibrator Set. Under normal conditions no radiological impact can be associated with the calibrator set. Maximum safety control and strict operating procedures as described in Section B have been determined to be more than adequate to meet the needs of all personnel involved with this device. These controls determine the final conclusion that any incident has a negligible probability of occurrence. Each proposed incident although regarded as highly inconceivable demonstrated levels below those recommended by ICRP or regulatory standards. The total intake of activity for each evaluation is an estimate based on general assumptions and should be considered in excess of the actual intake and calculated committed dose equivalents to various organs.

D. Evaluation of Alternatives

1. All feasible radionuclides listed in Table D-1 were considered as alternatives to the use of Pu-239. These alternative alpha emitters do not offer any significant advantage over Pu-239. Certain of these radionuclides are categorized as having similar radiotoxicity as Pu-239 and/or possess unacceptable characteristics such as short half life, less than optimum energy, increased external exposure and greater expense. The Pu-239 provides an immediate calibration source for all of the alpha radiation detection instruments. The Pu-239 remains an ideal source for special purposes involving quantitative and qualitative assessment since the use of these alpha radiation detection instruments are basically for the detection of Pu-239 contamination.

2. Budgeting and manpower resources expended for the research and development in the design of another calibrator set would be cost ineffective. Based upon previous experience in the research and development of similar equipment, it is estimated that a ten year time frame would be required for the development of a new calibrator set.

3. The AN/UDM-7C Radiac Calibrator Set is type classified as Standard A which was procured by the Navy and has been successfully used for approximately twenty years for the calibration of the AN/PDR-56() Radiac Set. This radiac set is being adopted with modifications for Army use. The AN/UDM-7C will also be used to calibrate existing Army alpha radiation detection instruments, the AN/PDR-54 and AN/PDR-60 Radiac Sets, which will eventually be replaced by the AN/PDR-56F. The AN/UDM-6 Alpha Radiac Calibrator Set, which also utilizes Pu-239, and is presently used for the calibration of the AN/PDR-54 and AN/PDR-60, will eventually be replaced by the AN/UDM-7C Radiac Calibrator Set. Currently, the Army utilizes the AN/UDM-6 Alpha Radiac Calibrator Set which does not have the design capabilities for calibration of the AN/PDR-56F alpha radiation detection instrument. Thus, the adoption by the Army of the AN/UDM-7C Radiac Calibrator Set is most advantageous for immediate implementation and capabilities of operation with all existing type classified alpha detection instruments.

E. Status of Compliance

The AN/UDM-7C Radiac Calibrator Set containing special nuclear material, Pu-239, is subject to regulation by the NRC. The extent of the regulation is stated in 10 CFR. The CECOM NRC license application for this material has identified all areas of compliance to 10 CFR. No specific state or local permits or licenses are required due to Federal control. The proposed action includes transport of calibrator sets between installations for which CECOM has demonstrated compliant measures with regard to shipment and packaging as required by the DOT regulations.

TABLE D-1

Alpha Radionuclides for Instrument Calibration⁴

<u>Radionuclide</u>	<u>Alpha Energy (MeV), Abundance (Percent)</u>	<u>Half-Life (Years)</u>	<u>Advantage/ Disadvantage</u>
¹⁴⁸ Gd	3.18	9.30E+01	Low Energy
²³⁰ Th	4.617, (24) 4.684, (76)	7.70E+04	Radiotoxic
²³⁹ Pu	5.105, (12) 5.143, (15) 5.156, (73)	2.44E+04	Ideal Energy, Radiotoxic
²¹⁰ Po	5.305, (100)	3.79E-01	Short Half-Life
²⁴¹ Am	5.442, (13) 5.484, (86)	4.33E+02	Radiotoxic
²³⁸ Pu	5.456, (28) 5.499, (72)	8.78E+01	Radiotoxic
²⁴⁴ Cm	5.764, (23) 5.806, (77)	1.78E+01	Radiotoxic, Expensive
²⁵² Cf	6.076, (16) 6.119, (84)	2.65E+00	Radiotoxic, Expensive, Short Half-Life, Neutron Hazard

F. Listing of Agencies and Persons Consulted During Preparation of the Assessment

1. Edward Abney: Physicist
US Army Ionizing Radiation Dosemetry Center
Lexington, Kentucky
2. C. Christianson:
Naval Surface Weapons Systems
Silver Spring, Maryland
3. Jack Cooley: President
Nuclear Research Cooperation
Denville, New Jersey
4. Richard Yates:
US Department of Energy
Germantown, Maryland

G. References.

1. Fitzgerald, John J., Applied Radiation Protection and Control, Gordon and Breach Inc., New York, 1970.
2. US Department of Health, Education and Welfare, Radiological Health Handbook. Public Health Service, Rockville, Maryland, 1970.
3. Belanger, R., Buckley, D. W., and Swenson, J. B., Environmental Assessment of Ionization Chamber Smoke Detectors Containing Americium-241, NUREG/CR-1156, Science Applications, Inc., California, 1979.
4. American National Standards Insititue, Radiation Protection Instrumentation Test and Calibration, Institute for Electrical and Electronics Engineers, New York, 1977.
5. International Commission on Radiological Protection, Publication 30, Limits for Intakes of Radionuclides by Workers, Pergamon Press, New York, adopted 1978.

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

(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/cm² 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 10⁷ DPM and 10⁵ 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 - 13-23/32 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, snudges 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-239. 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 ($\frac{1}{8}$) 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 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/cm² or less) used with a conventional type scaler (1 megohm, 0.5 μ sec 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 PuCl₃ in HCl (≤ 0.5 N)

810 μ g/cc for source 1 - equivalent to approximately 10⁴ μ g/m²

8.1 μ g/cc for source 2 - equivalent to approximately 10² μ g/m²

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 \approx 65mm

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

MIL-R-24265(SHIPS)

- (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

★
NAVSHIPS 0967-874-9010

INSTRUCTION MANUAL

for

AN/UDM-7B ALPHA RADIAC
CALIBRATOR SET

DEPARTMENT OF THE NAVY

BUREAU OF SHIPS

★
1 SEPTEMBER 1969

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SECTION I

GENERAL INFORMATION

1-1. SCOPE

1-2. FUNCTIONAL DESCRIPTION

The Alpha Radiac Calibrator Set AN/UDM-7B (Figure 1-1), which is similar to the AN/UDM-7A, is designed to provide a calibration check for the following types of Alpha Radiac Sets:

- a. AN/PDR-54
- b. AN/PDR-56
- c. AN/PDR-60

The AN/UDM-7B consists of five basic components:

- (1) Hardwood carrying case (Figure 1-2).
- (2) Aluminum cabinet used for housing source and accessory drawer.
- (3) Aluminum source holders, housing Pu-239 alpha sources (Figure 1-3).
- (4) Alpha Sources, Pu-239, on plastic discs.
- (5) Accessory drawer for attenuators, card of calibration check meter readings, NAVSHIPS No. 0967-874-9010 Instruction Manual, tweezers, and adjustable probe positioner (Figure 1-4).

1-3. QUICK REFERENCE DATA

a. The AN/UDM-7B contains two Pu-239 radioactive sources, labeled A and C respectively, with an approximate accuracy of $\pm 5\%$.

b.	<u>Source</u>	<u>Order of DPM</u>
	A	10^7
	C	10^5

c. The alpha sources consist of Pu-239 in resin deposited on plastic discs approximately 12-1/2 inches in diameter. A minimum of 90% of the alpha particles are emitted with energies of 4 to 5.15 MEV.

d. Exposed Source Area is 4" x 10".

e.	<u>Attenuator</u>	<u>Approx. % Transmission</u>
	No. 1	10.0
	No. 2	2.5

f. Adjustable positioner will secure all probes over an exposed source.

1-4. EQUIPMENT SUPPLIED

TABLE 1-1. EQUIPMENT SUPPLIED

Quantity Per Equip.	Nomenclature	Overall Dimensions*			Volume*	Weight*
		Height	Width	Depth		
1	AN/UDM-7B, Alpha Radiac Calibrator	2-3/32	13-25/32	13-17/32	0.23	17
1	Carrying Case	4-1/32	14-7/8	15-1/16	0.47	7-1/2

*Dimensions are in inches, volume in cubic feet, weight in pounds.

1-5. PROCUREMENT DATA

TABLE 1-2. SHIPPING DATA

No. of Boxes	Contents	Volume (Cu. Ft.)	Length x Width x Height (Inches)	Weight Packed (Pounds)
1	AN/UDM-7B, Alpha Radiac Calibrator with Carrying Case	.8 - .9	17 x 17 x 6	30

2-2. OPERATING PROCEDURES

a. Sequence of Operation. When calibrating a radiac set with the AN/UDM-7B, perform the following steps.

(1) Unlock carrying case. Place cover aside. The unit need not be removed from the case.

(2) Remove cover from opening for probe positioner and where necessary the proper attenuator from accessory drawer.

(3) Locate probe positioner and attenuator over opening.

(4) Mount probe in positioner and secure with movable arms of positioner.

(5) Carefully remove desired source from the unit.

(6) CAREFULLY remove cover from source holder. (Source is now exposed. DO NOT TOUCH OR GOUGE). Place source cover on the side where saran-covered surface will not be touched.

(7) Slide EXPOSED source into source positioning well. Figure 2-1 illustrates the exposed source in the positioning well.

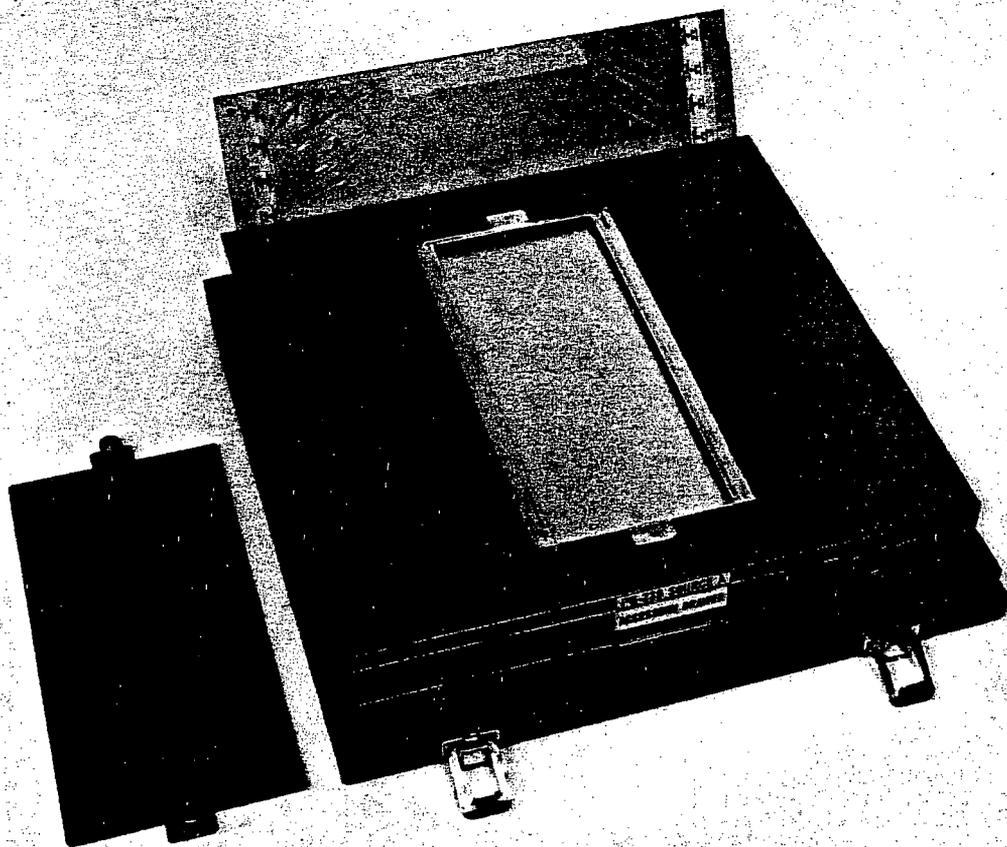


Figure 2-1. AN/UDM-7B, Source A Exposed in Positioning Well

SECTION III

MAINTENANCE

3-1. CONTAMINATION TEST PROCEDURES

a. Surrounding Surfaces

Wipe tests should be performed at least once every three months. Wipe the surrounding surfaces of the source and positioning well, as suggested in Figures 3-1 and 3-2. DO NOT WIPE SOURCE. Count each wipe for one hour in a low-background area, using a GM tube with a mica window thickness of 1.8-2.4 mg/cm² (type 7840 or TGC-1), and a conventional scaler. If the count rate minus background is greater than 32 CPM per 10 sq. inches of wipe, but less than 64 CPM per 10 sq. in., take a second wipe and count. If the count rate minus background still remains within the limits 32-64 CPM per 10 sq. in., completely tape the cover over the source and spray paint* the contaminated surface. If the count rate exceeds 64 CPM per 10 sq. in. follow the "on source" test procedure described below.

Summary

Contamination Limits: 32 to 64 CPM (above background) per 10 sq. inches of wipe
 If greater than 64 CPM (above background) per 10 sq. inches of wipe, see "on source" test.

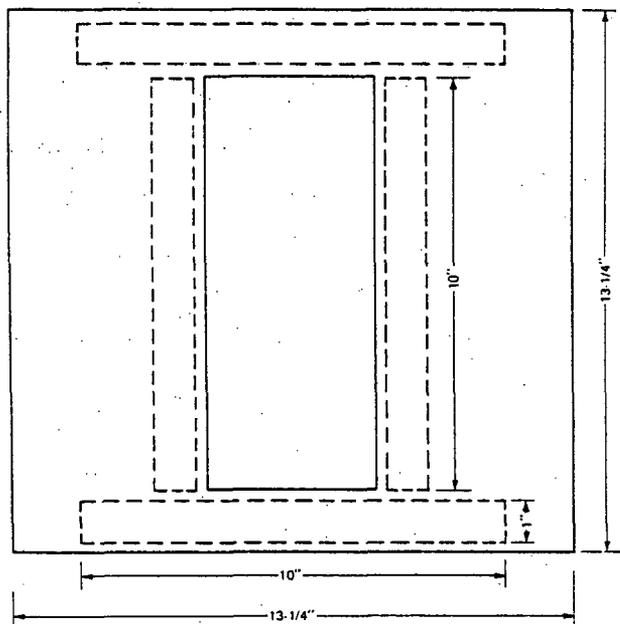


Figure 3-1. Sketch - Source Holder Showing Several Suggested Wipe Paths

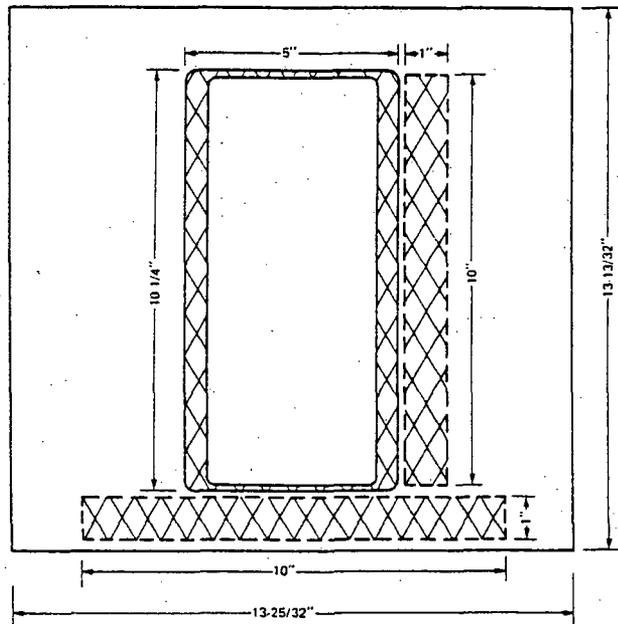


Figure 3-2. Sketch - Top Plate of Source Positioning Well - Wipe Area Should Include Cross Hatched Paths

*such as Crystal Clear Acrylic No. 1301 Krylon, Borden Chemical Company, New York, N.Y. (TT-L-0048).

SECTION IV

TROUBLESHOOTING

4-1. SOURCE DAMAGE

a. The AN/UDM-7B contains two Pu-239 alpha sources with the following approximate total activities:

Source A - - - 800 ug

Source C - - - 8 ug

Caution should be exercised in handling the sources. Since the radioactive source is composed of a thin resin-type carrier which can be gouged, physical contact of objects with the source surface should be avoided. If severe damage at the ends of the long axis of the exposed area does occur, the sources can be rotated in their holders according to instructions given below (see paragraph 4-1b.). If damage is suspected, the effect may be checked by comparing readings of a calibrated radiac set with readings obtained before the damage occurred. The procedure described in paragraph 4-1b. should be carefully followed when handling the sources.

DO NOT TOUCH THE EXPOSED SOURCE SURFACE WITH HANDS.

DO NOT RUB OR GOUGE THE ATTENUATORS, POSITIONER, OR RADIAC PROBE ON THE SOURCE.

b. Instructions for Turning Source in Holder

If there is severe damage to the source at the ends of the long axis of the exposed area (up to two inches from the ends), the source may be rotated in its holder to expose a fresh source area. Remove the cover from the source holder. (The source is now exposed. DO NOT TOUCH OR GOUGE.) Place the source cover on the side where the saran surface will not be touched. Carefully remove the eight screws from the top plate of the source holder. Wearing plastic or rubber gloves, lift the top plate away from the holder and carefully turn it over and lay it aside so that the under surface is facing up, and cannot be accidentally touched. Then turn the source 90° in the source holder. Replace the top plate gently, being careful not to rub the source surface. Remove the gloves and replace the screws in the top plate. The source may now be used as previously described.

4-2. CALIBRATION MALFUNCTION

When it becomes apparent that an Alpha Radiac Set does not meet the expected values as shown on the card of calibration check meter readings the following sequence should be followed before performing Alpha Radiac Set repair:

- a. Verify Alpha Radiac Set type being calibrated.
- b. Verify correct Accessory is used for Alpha Radiac Set being calibrated.
- c. Verify correct Source Holder is being used for Alpha Radiac Set being calibrated.

NAVSHIPS NO. 0967-874-9010

USER ACTIVITY COMMENT SHEET

(Fold on dotted lines on reverse side,
staple in corner, and send to Bureau
of Ships, Code 240, Washington 25, D. C.)

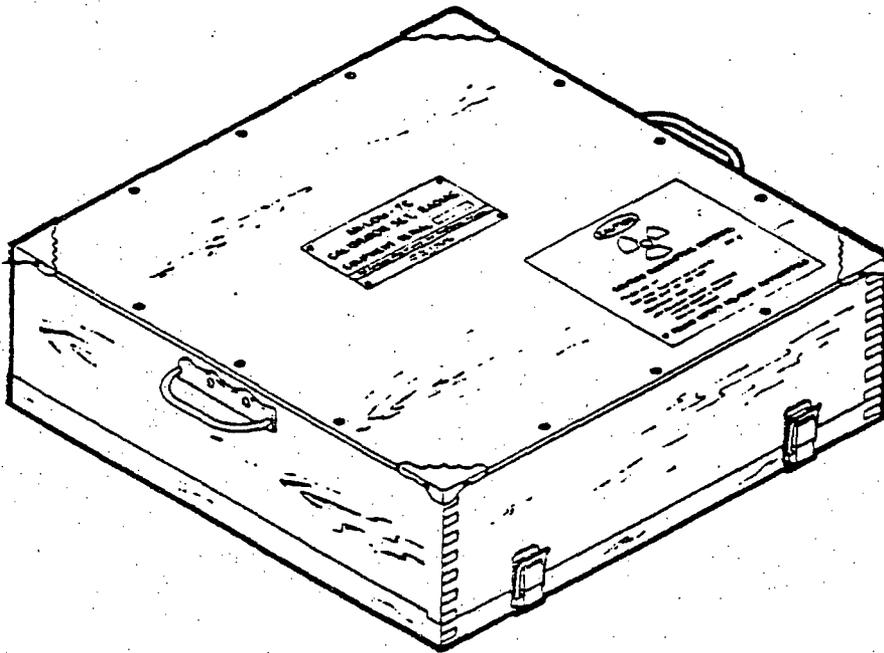
PROBLEM AREA:

Both sides of this form to be reproduced locally as required.

TM 11-6665-247-10

**OPERATOR'S MANUAL
CALIBRATOR, RADIAC AN/UDM-7C**

(NSN 6665-01-084-7777)



**US NUCLEAR
REGULATORY
COMMISSION
REQUIREMENTS**

**EQUIPMENT
DESCRIPTION**

**OPERATING
INSTRUCTIONS**

**MAINTENANCE
INSTRUCTIONS**

**FORM NRC-3
NOTICE TO
EMPLOYEES**

**HEADQUARTERS, DEPARTMENT OF THE ARMY
AUGUST 1981**

WARNING

RADIATION HAZARD



Use Radiac Calibrator AN/UDM-7C only under the guidance of an installation/ activity (local) Radiation Protection Officer and in accordance with requirements of Chapter 5, Section IV, AR 40-5 and AR 385-11.

Plutonium 239 (Pu239) is dangerous to living tissue. Small amounts of Pu239, when inhaled, ingested, or absorbed in open cuts or wounds, can cause serious illness or death. To avoid accident, observe the following:

- Use and store the calibrator only in designated radiation controlled areas.
- Do not eat, drink, smoke, apply cosmetics, or store food stuffs, drinks, tobacco, or cosmetics where the calibrators are used or stored.
- Do not allow personnel with open skin wounds to handle or work with the calibrators without the approval of the medical officer and the (local) Radiation Protection Officer (RPO).
- Prohibit loitering in the area by unauthorized personnel.
- Handle the calibrator carefully. Do not drop, rough handle, alter or damage it in anyway. Mishandling can cause source leakage.
- Do not touch the source surface with the hands. Wear plastic or surgical type gloves which allow sufficient dexterity during calibration and leak testing. Avoid contact of objects, such as tools, instruments, and components of the set, with the sources.
- Always wash and dry hands thoroughly after handling the calibrator; monitor the hands with a low-range alpha radiac meter; repeat the washing and drying if necessary. Notify the Radiation Protection Officer if washing does not remove contamination.
- **DO NOT ATTEMPT TO CLEAN THE SOURCE OR SOURCE HOLDERS.**

**OPERATOR'S MANUAL
CALIBRATOR, RADIAC AN/UDM-7C
(NSN 6665-01-084-7777)**

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

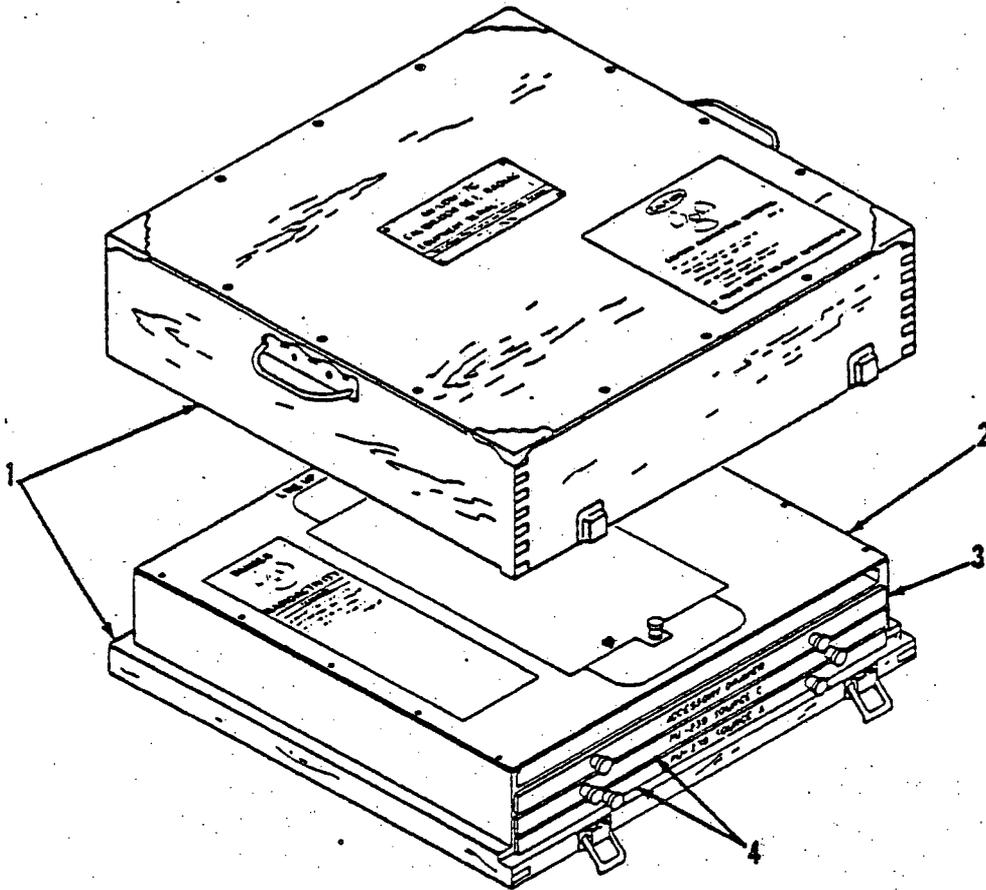
You can help improve this manual. If you find any mistakes or if you know a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Communications-Electronics Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, New Jersey 07703. A reply will be furnished to you.

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AN/UDM-7C-CALIBRATOR, RADIAC



1. Hardwood carrying case

2. Aluminum cabinet

3. Accessory drawer

4. Aluminum source holders

CHAPTER 1 INTRODUCTION

Section I. GENERAL INFORMATION

1-1. SCOPE

This manual describes Calibrator, Radiac AN/UDM-7C (Calibrator) and covers its installation and operation. It includes instructions for initial service, operation, cleaning, and inspection of the equipment. The calibrator, radiac provides a calibration check for the AN/PDR-54, AN/PDR-56F and AN/PDR-60 Alpha Radiac Sets. Here in referred to as radiac sets. The calibrators contain plutonium which is controlled by the US Nuclear Regulatory Commission (NRC), Title 10 Code of Federal Regulations. AR 385-11 and AR 700-64 implement NRC regulations. Army-wide possession and use of the calibrators are authorized by a Special Nuclear Materials License issued to Department of the Army, US Army Communications-Electronics Command, Fort Monmouth, NJ 07703. The license is issued on the basis of statements concerning procedures established for the life-cycle control of the items. The sets are issued to authorized Army calibration activities, schools, and research and development laboratories through the US Army Communications-Electronics Command, National Inventory Control Point (DRSEL-MME-VC). Established Army supply procedures are augmented by radiological control procedures (AR 385-11).

1-2. MAINTENANCE FORMS AND RECORDS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750, The Army Maintenance Management System (TAMMS).

1-3. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If your AN/UDM-7C needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications-Electronics Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, NJ 07703. We'll send you a reply.

Section II. US NUCLEAR REGULATORY COMMISSION REQUIREMENTS

1-4. GENERAL

The NRC sets standards/conditions and issues licenses for the use of radioactive materials in the United States. The AN/UDM-7C comes under the NRC regulations and a license for its use has been issued. Information required by the NRC license and regulations is contained below:

a. **Radiation Protection.** Users of the AN/UDM-7C should refer to instructions on control, safe handling, storage, emergency situations and operation and maintenance instructions contained in this technical manual. This satisfies the radiation protection requirements of the NRC regulations (Title 10, Code of Federal Regulations, Parts 19 and 20).

b. **Notice to Employees.** Form NRC-3, Notice to Employees, contained in the back of this manual, must be removed for posting wherever the AN/UDM-7C is used and/or stored. The posting requirements are contained on the form.

c. **NRC License.** The NRC license for the AN/UDM-7C and documents relating to that license are held by the US Army Communications-Electronics Command Safety Office at Fort Monmouth, New Jersey. AN/UDM-7C users may request further information on these documents by letter addressed to:

Commander
US Army Communications-Electronics Command
ATTN: DRSEL-SF-H
Fort Monmouth, NJ 07703

Requests for further information may also be made by phone by calling on AUTOVON 995-4427 or COMMERCIAL (201) 544-4427.

1-5. RESPONSIBILITY

a. Responsibilities of Major Commands.

- (1) Establishing at least one Radioactive Material Control Point (RMCP) (AR 385-11).
- (2) Appointing a Radiation Control Officer (RCO) for each RMCP and qualifications to Commander, US Army Communications-Electronics Command, ATTN: DRSEL-SF-H, Fort Monmouth, New Jersey 07703.
- (3) Developing implementation procedures to insure periodic leak testing and forwarding two copies of procedures to Commander, US Army Communications-Electronics Command, ATTN: DRSEL-SF-H, Fort Monmouth, New Jersey 07703.
- (4) Forwarding leak test smears to nearest approved smear counting station for evaluation.
- (5) Insuring that each installation or activity using the AN/UDM-7C has an effective radiation protection program.

b. Responsibilities of Radiation Control Officer.

- (1) Review and approve the qualifications of each local Radiation Protection Officer (RPO) for the AN/UDM-7C and forward to Commander, US Army Communications-Electronics Command, ATTN: DRSEL-SF-H, Fort Monmouth, New Jersey 07703 a list of these local RPO's and their qualifications for approval and certification.
- (2) If a qualified local RPO is not available, take one or more of the following actions:
 - (a) Suspend requisition for the AN/UDM-7C.
 - (b) Suspend use of the AN/UDM-7C until someone can be qualified by training.
 - (c) Transfer the AN/UDM-7C to an installation or activity with qualified personnel.
- (3) Maintain the following records for each AN/UDM-7C under his control:
 - (a) National stock number.
 - (b) Description.
 - (c) Serial number.
 - (d) Isotope, source activity, and date activity was determined.
 - (e) Dates and results of leak tests.
 - (f) Shipment number.
 - (g) Shipped from.
 - (h) Shipped to.
 - (i) Date shipped.
 - (j) Date of manufacture.
 - (k) Name of manufacturer.
 - (l) Name of qualifications of local RPO's.
 - (m) Radiation incident reports.
- (4) Insure that the AN/UDM-7C is properly handled in accordance with Army, DOD, and NRC regulations. Periodically inspect and audit records of installations and activities possessing the AN/UDM-7C.

(5) Assure that a Radiation Incident Report is submitted by electrical means to Command, US Army Communications-Electronics Command, ATTN: DRSEL-SF-H, Fort Monmouth, New Jersey 07703, within 24 hours, when an incident occurs.

(6) Consolidate and forward DA Form 3252-R (Radioisotope Inventory and Leak Test Report) (RCS DRC-192) listing all Calibrators, Radiac AN/UDM-7C in area of responsibility to Commander, US Army Communications-Electronics Command, ATTN: DRSEL-SF-H, Fort Monmouth, New Jersey 07703 at least quarterly (31 January, 30 April, 31 July and 31 October). Reports may include information on other CECOM managed calibration and test items of supply listed in AR 385-11.

1-6. SUPERVISION

a. All calibration in which the AN/UDM-7C is used will be supervised by a qualified radiation protection officer. To be a qualified RPO, a person must have received a minimum of 40 hours formal training on radiation including the following topics:

- (1) Principles and practices of radiation protection.
- (2) Biological effects of radiation.
- (3) Radioactivity measurement standardization and monitoring techniques and instruments.
- (4) Mathematics and calculations basic to the use and measurement of radioactivity.
- (5) The operation and use of the AN/UDM-7C.

NOTES

1. Completion of the Radiological Safety Course at the US Army Chemical School or at the US Army Ordnance Center and School meets these requirements.

2. Where circumstances warrant, alternate training may be substituted if this training is approved by Commander, US Army Communications-Electronics Command, ATTN: DRSEL-SF-H, Fort Monmouth, NJ 07703. Such training must be received under the guidance of a qualified RPO, and must include at least 16 hours of actual experience in the use of the AN/UDM-7C.

b. The person appointed as radiation protection officer may be a commissioned officer, a warrant officer, an enlisted man, or civilian, if he meets the minimum qualifications prescribed above. A radiation protection officer designated custodian for the AN/UDM-7C is a specified person designated to control the use of the AN/UDM-7C.

c. The operator or user of the AN/UDM-7C shall have a minimum of 8 hours training under the guidance of a qualified RPO for the AN/UDM-7C in the basic fundamentals of radiation operation, radiac instrumentation theory and application and survey techniques and 16 hours on-the-job training in operation and care of the AN/UDM-7C. Instructions shall include safe working practices and inherent hazards associated with the instrument.

1-7. DUTIES OF RADIATION PROTECTION OFFICER (RPO)

The specific duties of the appointed radiation protection officer will be to:

- a. Insure that the AN/UDM-7C's under his jurisdiction are properly used and stored.
- b. Train local users and operators and maintain list and record of training of users and operators.
- c. Insure records are maintained on each item.
- d. Advise RMCP of any forthcoming change in accountability, local RPO, or installation relocation for the AN/UDM-7C.
- e. Submit Radiation Incident Report according to published directives.

- f. Establish radiation controlled areas for AN/UDM-7C storage and use.
- g. Post Radiation Area warning signs.
- h. Insure items are stored in a fire-resistant structure and no explosives of any kind are stored in the same structure.
- i. Immediately refer actual or suspected overexposure to medical officer.
- j. Insure that periods of time between leak tests do not exceed 3 months and supervise performance of leak tests.
- k. Secure items against unauthorized use and removal.
- l. Insure that all Army, DOD, and Federal Regulations are being followed and that personnel are exposed to a minimum of radiation consistent with practical considerations.
- m. Conduct a physical inventory according to published frequencies.
- n. Submit inventory, leak test, and other reports to RMCP as required.
- o. Prior to relief from duties, place all AN/UDM-7C's under this jurisdiction in locked storage.
- p. Investigate each case of excessive or abnormal exposure to determine the cause, recommend remedial action to prevent recurrence, and submit a complete written report to the Commander, US Army Communications-Electronics Command, ATTN: DRSEL-SF-H, Fort Monmouth, NJ 07703 within 24 hours.

1-8. REQUISITIONING PROCEDURE

Stations in CONUS and Oversea supply agencies will submit requisitions through radioactive material supply channels to Commander, US Army Communications-Electronics Command, ATTN: DRSEL-MME-VC, Fort Monmouth, New Jersey 07703, for issue to certified Radiation Protection Officers. All requisitions will be accompanied by the name of the Radiation Protection/Control Officer who is to be responsible for the equipment. In addition, each request will include the following certification: As required by chapter 3, AR 385-11, sufficient safety equipment, facilities, and trained personnel are available at this installation for the safe handling, use and storage of radioactive material ordered on this requisition. The certification must have the signature and the typed name and grade of the appropriate radiation control officer.

1-9. EMERGENCY SITUATIONS

The procedure outlined below will be followed in an emergency situation.

- a. **Loss of Calibrator.**
 - (1) Attempt to recover the radiac calibrator set.
 - (a) Review records to determine the responsible individual.
 - (b) Make a physical survey.
 - (2) If the radiac calibrator set is recovered, revise procedures as necessary to prevent a recurrence.
 - (3) If the radiac calibrator set is not recovered, report the loss through command channels to the Area Radioactive Material Control Point (AR 385-11) and to the US Army Communications-Electronics Command stating the serial number of the radiac calibrator set, the circumstances involved, and the action taken to prevent recurrence.
- b. **Internal Exposure of Personnel.**
 - (1) Internal exposure is the result of personnel becoming contaminated when radioactive particles are inhaled, swallowed, or absorbed through breaks in the skin.
 - (2) In the event of a known or suspected internal exposure:
 - (a) Obtain immediate medical advice from the Medical Officer.
 - (b) Remove the individual from duties involving occupational exposure to ionizing radiation until subsequent exposure limitations are established by proper medical authority (AR 40-14).
 - (c) Prepare written report of circumstances leading to the internal exposure; include serial number(s) of the AN/UDM-7C involved, action taken to prevent recurrence, and other applicable

information. Forward the report through proper channels to Command, US Army Communications-Electronics Command, ATTN: DRSEL-SF-H, Fort Monmouth, NJ 07703.

c. **Damage or Leaking AN/UDM-7C.** AN AN/UDM-7C could begin to leak as a result of being dropped, damage to the source, or even as a result of age. Action required in the event of a known or suspected leaking calibrator is:

- (1) Discontinue use of the calibrator. Cover it with plastic, seal it with tape, and label it as contaminated.
- (2) Monitor personnel, equipment, and areas for possible contamination and decontaminate as required.
- (3) Report the item to the Radioactive Material Control Point and to the US Army Communications-Electronics Command.
- (4) Dispose of the AN/UDM-7C as directed by the US Army Communications-Electronics Command, the US Army Ionizing Radiation Dosimetry Center and the Radioactive Material Control Point.
- (5) Report the completed disposal action to the US Army Communications-Electronics Command, ATTN: DRSEL-SF-H, Fort Monmouth, New Jersey 07703 and the Radioactive Material Control Point.

d. **Firefighting Emergency Procedures.**

(1) **General.** Emergency plans must include procedures for combating fires involving radioactive items. Plans should be commensurate with the quantity and type of items present. Firefighting personnel must know the location(s) of the items and must be familiar with radiation protection procedures. As a general rule, personnel should wear protective respiratory equipment when fighting fires involving radioactive items.

(2) **Emergency procedures.**

- (a) Evacuate personnel in the immediate area who are not directly involved.
- (b) Notify the fire department.
- (c) Extinguish the fire, if possible, and if radioactive materials are involved, with possible release to the environment, clear personnel from downwind area immediately.
- (d) Notify the Radiation Protection Officer.
- (e) Notify medical personnel when appropriate.
- (f) Control access to the immediate area.
- (g) Monitor personnel, equipment, supplies, and environs with appropriate alpha radiation survey instrument.
- (h) Decontaminate personnel, equipment, supplies, and environs.
- (i) The Radiation Protection Officer shall record and report the results of the fire.

1-10. TRANSPORTATION

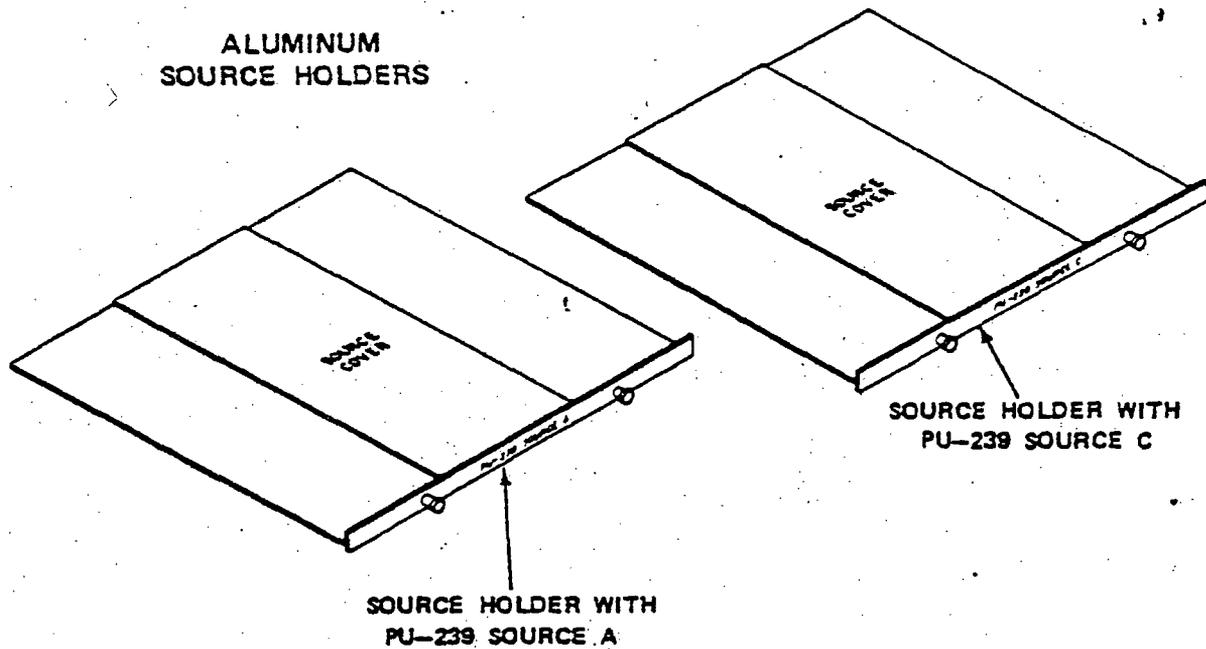
The AN/UDM-7C requires packaging and shipment in accordance with the requirements set forth in Title 49, Code of Federal Regulations (49 CFR) of US Department of Transportation (DOT) regulations and AR 385-11. These regulations require all appropriate information on radioactive shipments to be incorporated onto shipping documentation as follows:

- a. **Proper shipping name (49 CFR 172.101):** Radioactive Material, NOS.
- b. **Hazardous Material Identification Number (49 CFR 172.202):** NA 9181.
- c. **Pieces, weight, cube (49 CFR 172.202):** Hardwood case, 17 inches x 17 inches x 6 inches, with calibrator packed inside; weight approximately 30 pounds. Two alpha sources, Pu239, on plastic disks are housed in aluminum source holders.
- d. **Type of packaging (49 CFR 172.202):** Hardwood case.
- e. **Name of radioactive material as listed in 49 CFR 173.390 (49 CFR 172.202):** Pu239.
- f. **Description of chemical and physical form (49 CFR 172.203):** Plutonium 239 (Plutonium Chloride) solid.
- g. **Specific activity (49 CFR 172.203):** 50.21 microcuries.

- h. Type label (49 CFR 172.203): RADIOACTIVE WHITE I (SF 413).
- i. The words FISSILE EXEMPT shall appear on the shipping documentation as required by 49 CFR 173.396(a).
- j. Shipper's certification (49 CFR 172.204): As applicable.
- k. Shipments of Plutonium 239 must be made in accordance with the applicable provisions of DOT and NRC regulations. At the present time, all shipments of the AN/UDM-7C should only be made by surface transportation.
- l. Any other information as required.

Section III. EQUIPMENT DESCRIPTION

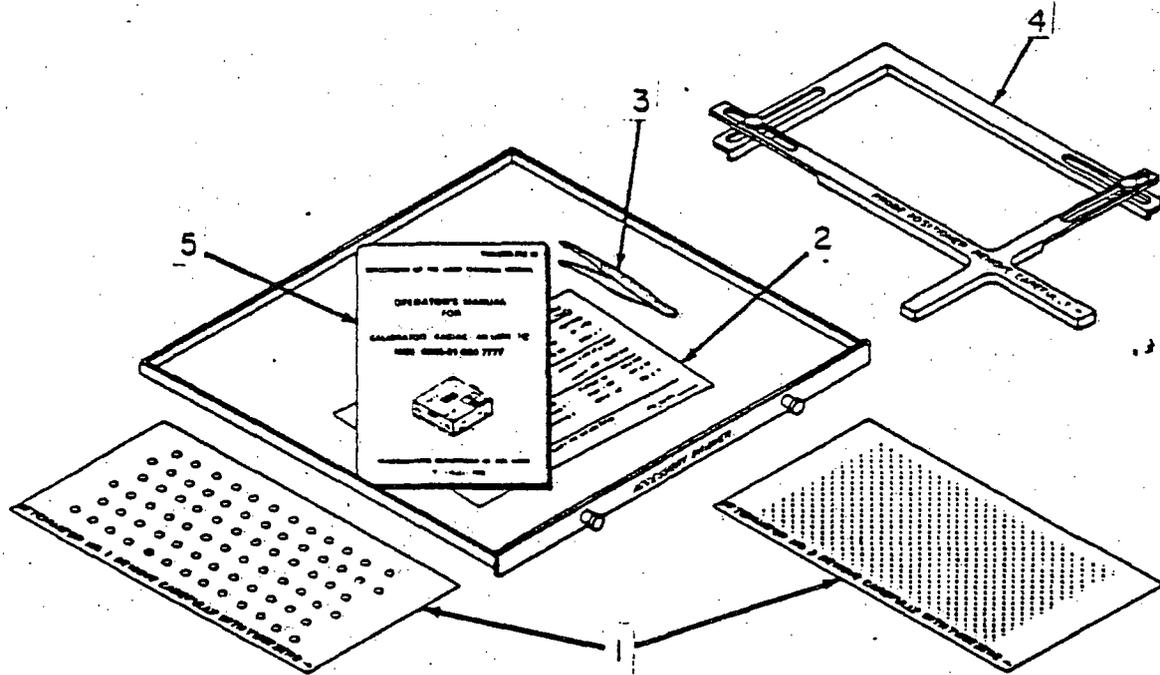
1-11. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS



The aluminum source holders house the Pu239 alpha sources, labeled A and C, which are resin-deposited on plastic discs approximately 12-1/2 inches (32 cm) in diameter. The sources have an approximate accuracy of $\pm 5\%$. Disintegrations per minute (DPM) for source A are on the order of 10^7 . For source C, the DPM are on the order of 10^5 .

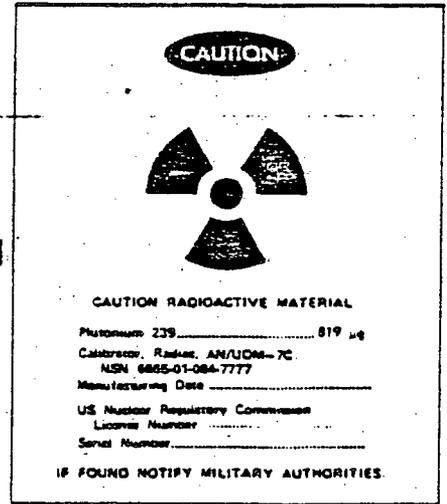
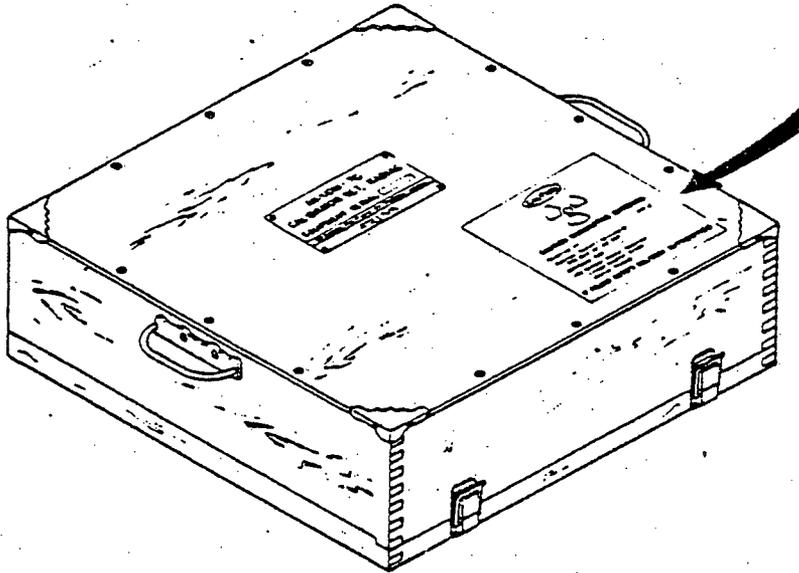
A minimum of 90% of the alpha particles emitted from these sources have energies from 4 to 5.15 MEV (million electron volt).

ACCESSORY DRAWER COMPONENTS



The accessory drawer contains two attenuators (1), a table of meter readings to be used in calibration of radiac sets (2), tweezers (3), and an adjustable probe positioner (4). This technical manual (5) will be stored in the accessory drawer.

HARDWOOD
CARRYING CASE



A CAUTION label should always be affixed on top of the hardwood carrying case as required by NRC regulations.

1-12. EQUIPMENT DATA

Weights and Dimensions

● Complete Item

Weight	24.5 lb (11.1 Kg)
Length	15-1/16 in. (38.3 cm)
Width	14-7/8 in. (37.7 cm)
Height	4-1/32 in. (10.2 cm)

● Calibrator

Weight	17 lb (7.7 Kg)
Length	13-17/32 in. (34.4 cm)
Width	13-25/32 in. (35.0 cm)
Height	2-3/32 in. (5.3 cm)

● Source Holders

Length	13-1/4 in. (33.6 cm)
Width	13-1/4 in. (33.6 cm)
Depth	1/4 in. (0.6 cm)

● Exposed Source Area

Length	10.0 in. (25.4 cm)
Width	4.0 in. (10.2 cm)

● Source Positioning Shelf (Interior)

Length	13-1/2 in. (34.3 cm)
Width	13-1/2 in. (34.3 cm)
Depth	5/16 in. (0.8 cm)

● Probe Positioning Well

Length	10-1/4 in. (26.0 cm)
Width	5 in. (12.7 cm)
Depth	3/8 in. (1.0 cm)

Shipping Data

- | | |
|---------------------|----------------------------------|
| ● Pack - Wooden Box | 17x17x6 in (43.2x43.2x15.2 cm) |
| ● Contents | Calibrator with carrying case |
| ● Volume | 1 cu. ft. (0.03 m ³) |
| ● Weight | 30 lb. (13.6 Kg) |

Performance

- PU-239 Sources
 - Source A
 - Source C

Order of 10⁷ DPM
 Order of 10⁵ DPM

- Attenuators

No. 1
 No. 2

Approximately 10% of transmission
 Approximately 2.5% of transmission

CHAPTER 2 OPERATING INSTRUCTIONS

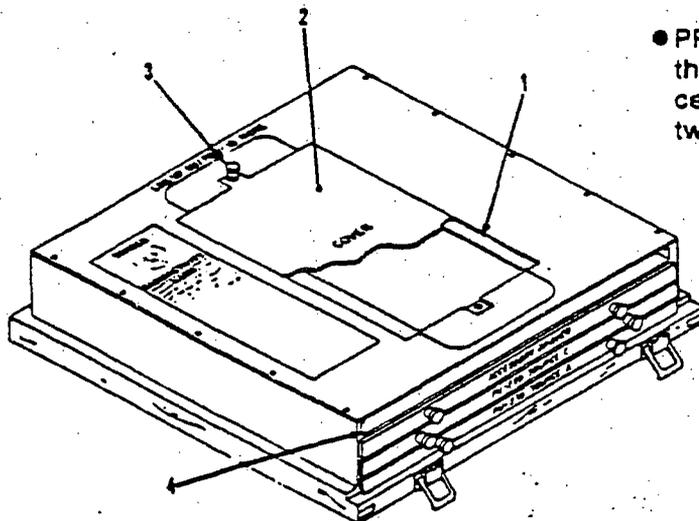
Section I. — DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS

WARNING

Use the AN/UDM-7C only under the guidance of an installation/activity (local) Radiation Protection Officer and in accordance with requirements of Chapter 5, Section IV, AR 40-5 and AR 385-11.

Plutonium 239 (Pu239) is dangerous to living tissue. Small amounts of Pu239, when inhaled, ingested, or absorbed in open cuts or wounds, can cause serious illness or death. To avoid accident, observe the following:

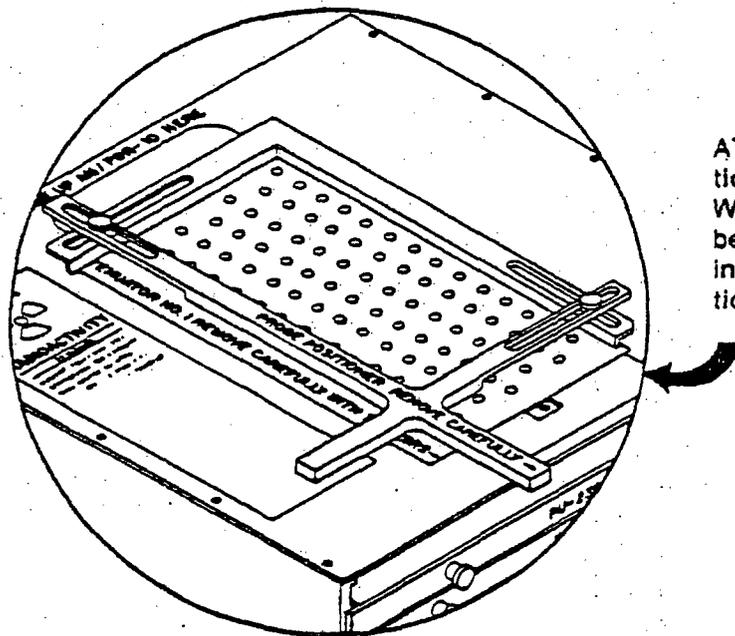
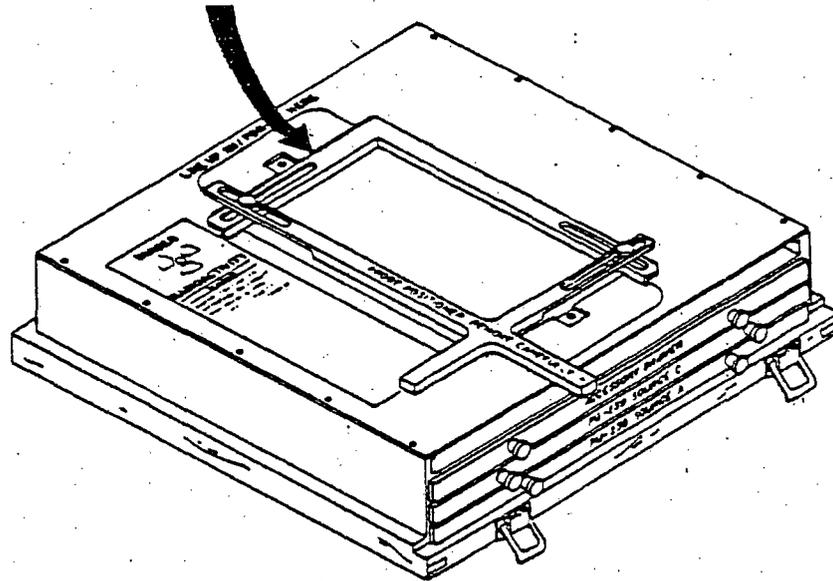
- Use and store the AN/UDM-7C only in designated radiation controlled areas.
- Do not eat, drink, smoke, apply cosmetics, or store food stuffs, drinks, tobacco, or cosmetics where the calibrators are used or stored.
- Do not allow personnel with open skin wounds to handle or work with the AN/UDM-7C without the approval of the medical officer and the (local) Radiation Protection Officer.
- Prohibit loitering in the area by unauthorized personnel.



- PROBE POSITIONING WELL (1). Opening over which the radiac probe is positioned for calibration. Access is gained by removing the cover (2) secured by two thumbscrews (3).

- SOURCE POSITIONING SHELF (4). Provides for insertion of proper source holder.

ADJUSTABLE PROBE POSITIONER. Aligns radiac probe over exposed source in probe positioning well. The two L-shaped legs of the probe positioner can be adjusted to fit the contour of the probe base by loosening two thumbscrews which engage elongated slots in the legs, sliding the legs along the axis of the slots, and then tightening the thumbscrews. The positioner will then be clamped to the edges of the probe.



ATTENUATORS. Provide reduced radiation transmission levels when required. When an attenuator is used with the probe positioner, the attenuator is placed in the milled groove and the probe positioner is placed on top of the attenuator.

Section II. OPERATION UNDER USUAL CONDITIONS

2-1. INITIAL CHECKS AND SERVICES

a. Leak Test (Wipe Test).

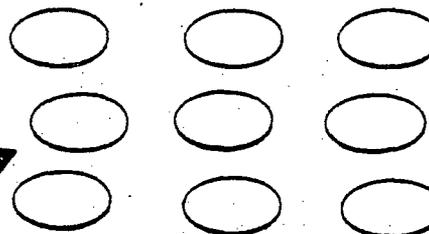
NOTE

A leak test is performed immediately upon receipt of the AN/UDM-7C and at least every 3 months thereafter, while in use.

WARNING

Plutonium 239 is dangerous to living tissue. Handle the AN/UDM-7C and components carefully; **DO NOT TOUCH THE SOURCE SURFACE.** Avoid contact of objects, such as tools, instruments, and calibrator components with the sources. Wear plastic or surgical gloves when performing leak tests and during calibration.

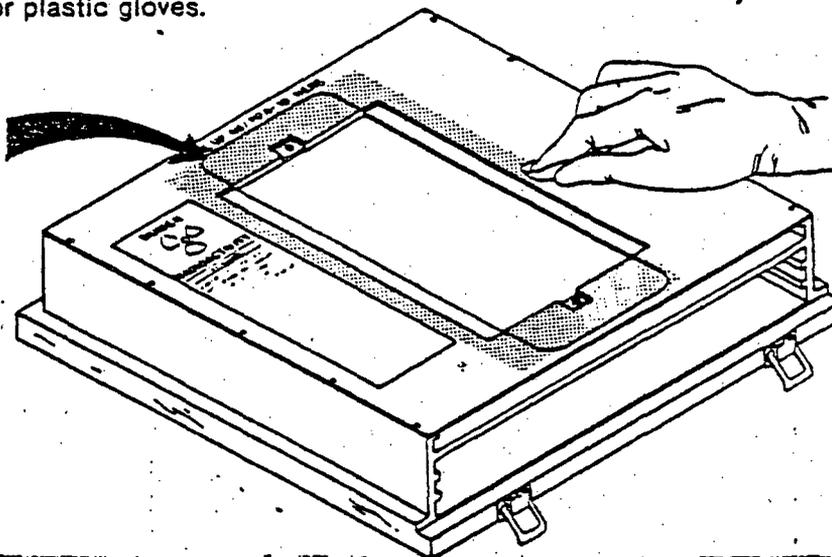
Use commercially available 1 inch smear papers (Whatman filter papers or equivalent). A minimum of nine smear papers will be required.



Number consecutively one side of each smear paper and key the numbers to each area, component, or calibrator to be smeared. Use ballpoint or china marking pen to number the papers.

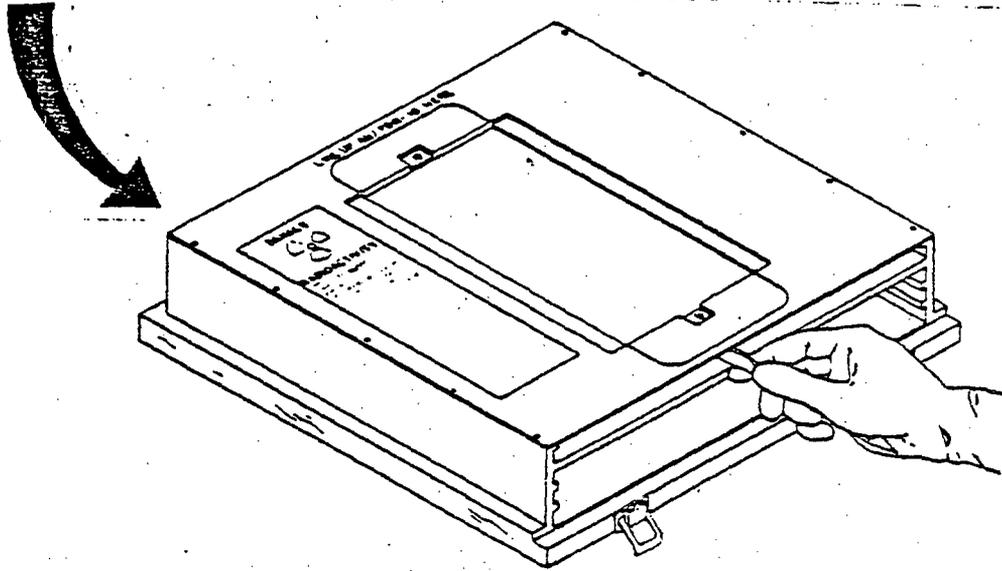
- Dampen the smear papers with water. Do not soak them.
- Put on rubber or plastic gloves.

Smear the exterior surfaces surrounding the probe positioning well (shaded area). One smear paper should be enough.

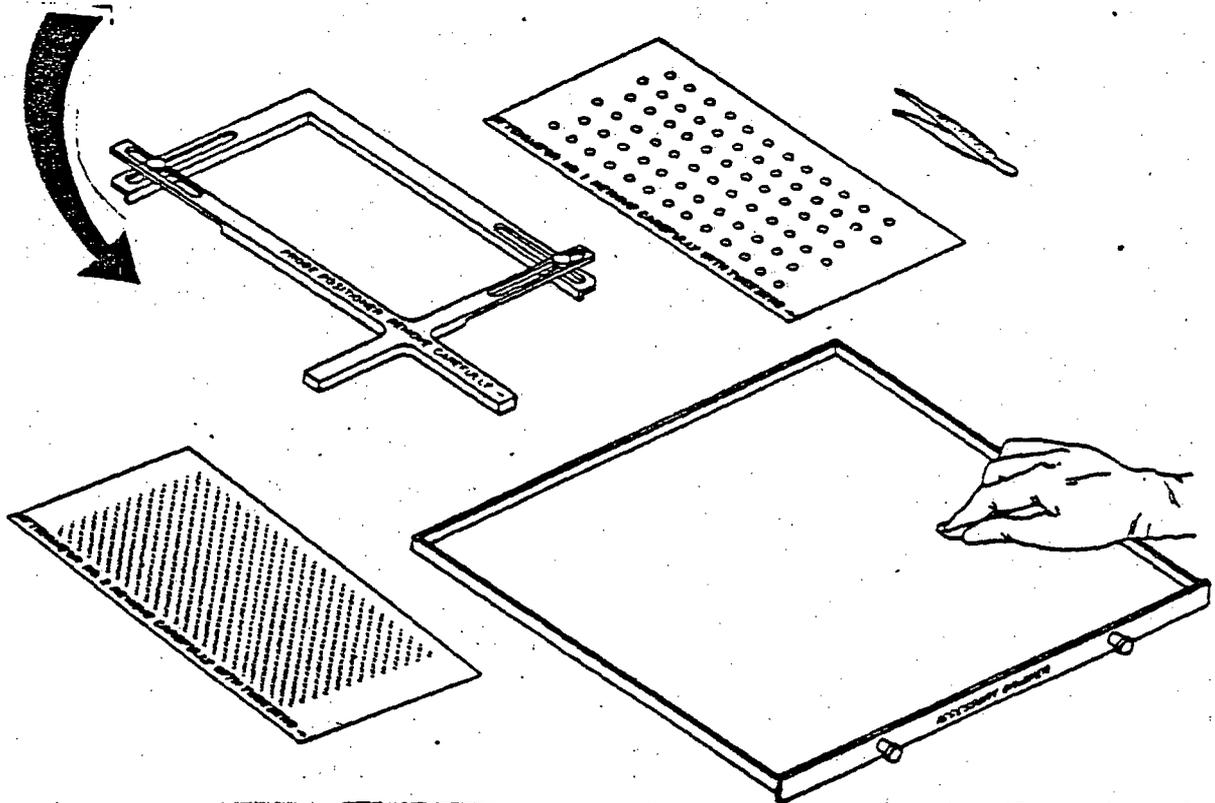


TM 11-6665-247-10

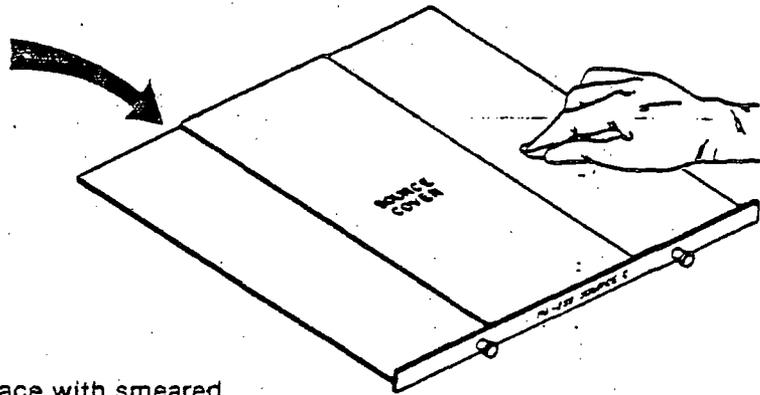
Smear the interior surfaces of the source positioning shelf. Wrap a moistened smear paper around the blunt end of a pencil or dowel and smear those surfaces which are near the radioactive-coated surface of the source when the source is inserted into the shelf.



Smear the probe positioner, both attenuators, the tweezers, the inner surfaces of the accessory drawer, and the inner surfaces of the carrying case cover. Use a separate smear paper for each item.



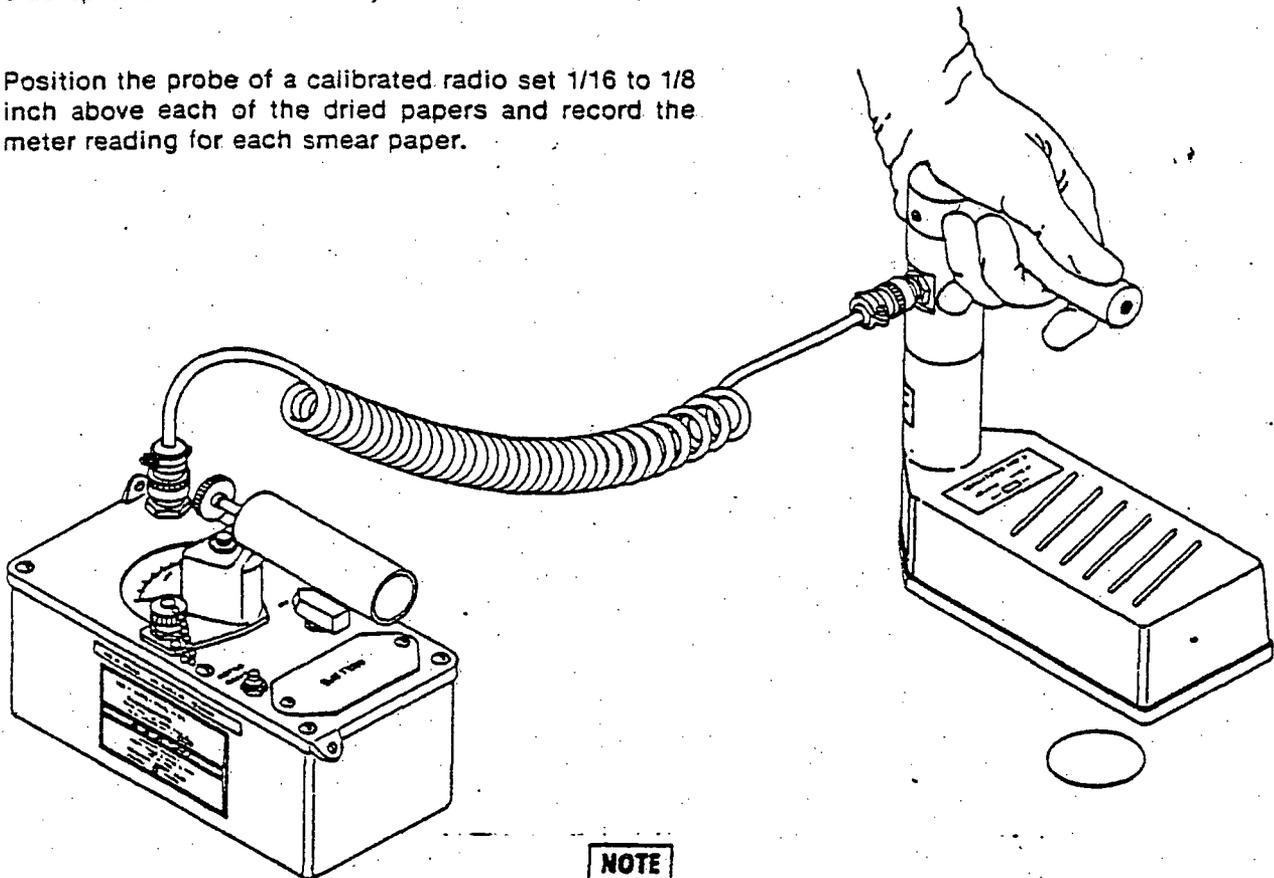
Leave source covers in place and smear the surface of each source holder.



CAUTION

DO NOT SMEAR THE SOURCES

- Place the smear papers on a flat surface with smeared side up and allow them to dry.
- Position the probe of a calibrated radio set 1/16 to 1/8 inch above each of the dried papers and record the meter reading for each smear paper.



NOTE

If the radiacmeter indicates 200 or more counts-per-minute above background for any single smear paper, consider the calibration unserviceable and remove it from operation until the smear paper is evaluated with laboratory equipment. If the meter indicates less than 200 counts-per-minute, use the calibrator pending evaluation of the smear paper.

Remove rubber or plastic gloves. Dispose as radioactive waste. (Refer to AR 385-11.)

b. Smear Paper Evaluation

Evaluate each smear paper using laboratory equipment capable of detecting 0.001 microcurie of alpha contamination on the test sample. Record test results and maintain these records for inspection. If the test reveals the presence of 0.005 microcurie or more of contamination, the user shall immediately withdraw the calibrator from use and report the condition through the Radiation Control Officer, (AR 385-11) to the licensee who will furnish disposition instructions and submit required reports to DA and NRC.

NOTE

No maintenance or repair will be performed by the operator. The US Army Ionizing Radiation Dosimetry Center located at Lexington-Bluegrass Depot Activity is the only authorized facility for maintenance or repair of the calibrator. Requests for maintenance or repair will be submitted to the radioactive material control point for coordination with CECOM and the US Army Ionizing Radiation Dosimetry Center.

If a using installation/activity does not have the proper laboratory equipment, the smear papers will be processed as follows:

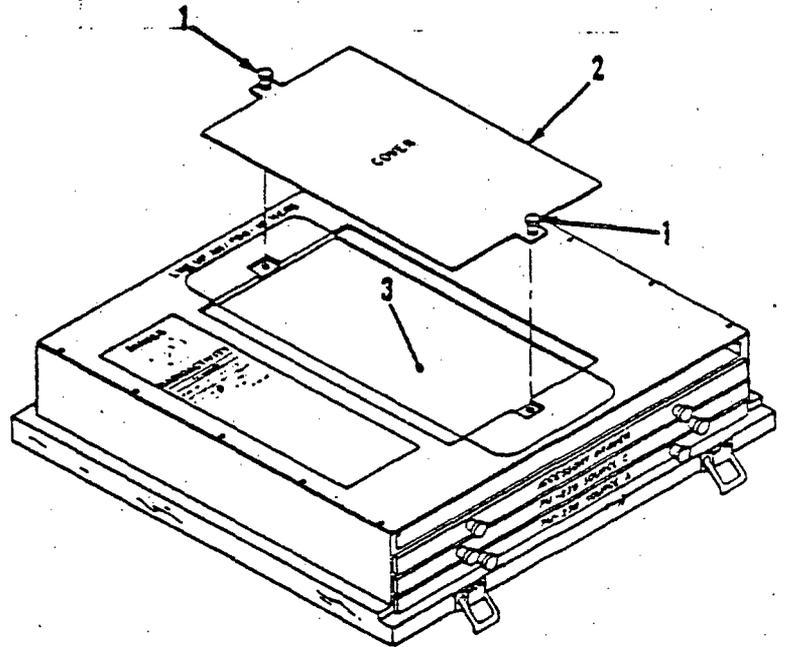
- Place the smear papers, each separated by a sheet of paper in a small envelope marked with the name and location of the user, the serial number(s) of the radioactive test sample(s) and the words: MAILROOM-DO NOT OPEN. Seal the envelope for forwarding.
- In CONUS, forward the smear papers for evaluation using official mail handling channel to, Chief, US Army Ionizing Radiation Dosimetry Center, ATTN: DRSMI-MCJ-DC, Lexington, KY 40511.
- Commanders at overseas installations will comply with procedures established by the responsible commander.

2-2. OPERATING PROCEDURE

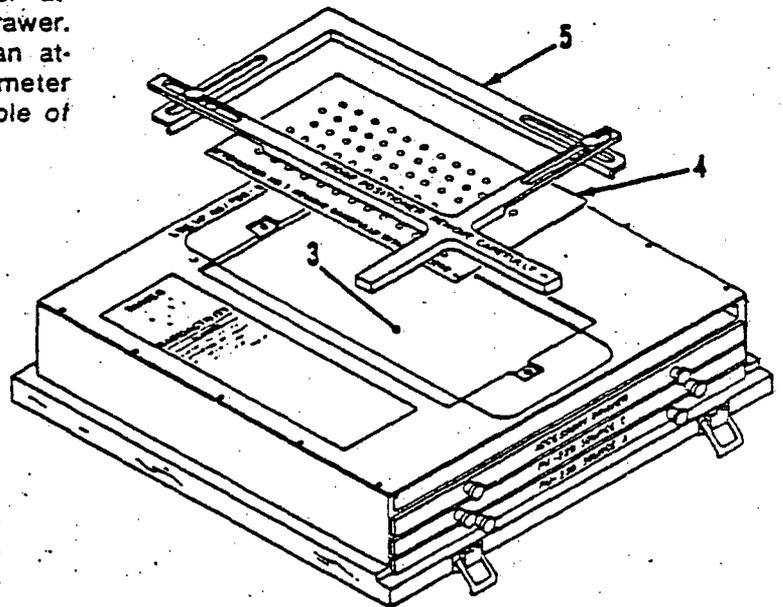
Unlock carrying case and place lid aside. (Calibrator need not be removed from case.)

Put on rubber or plastic gloves (item 1, Appx D).

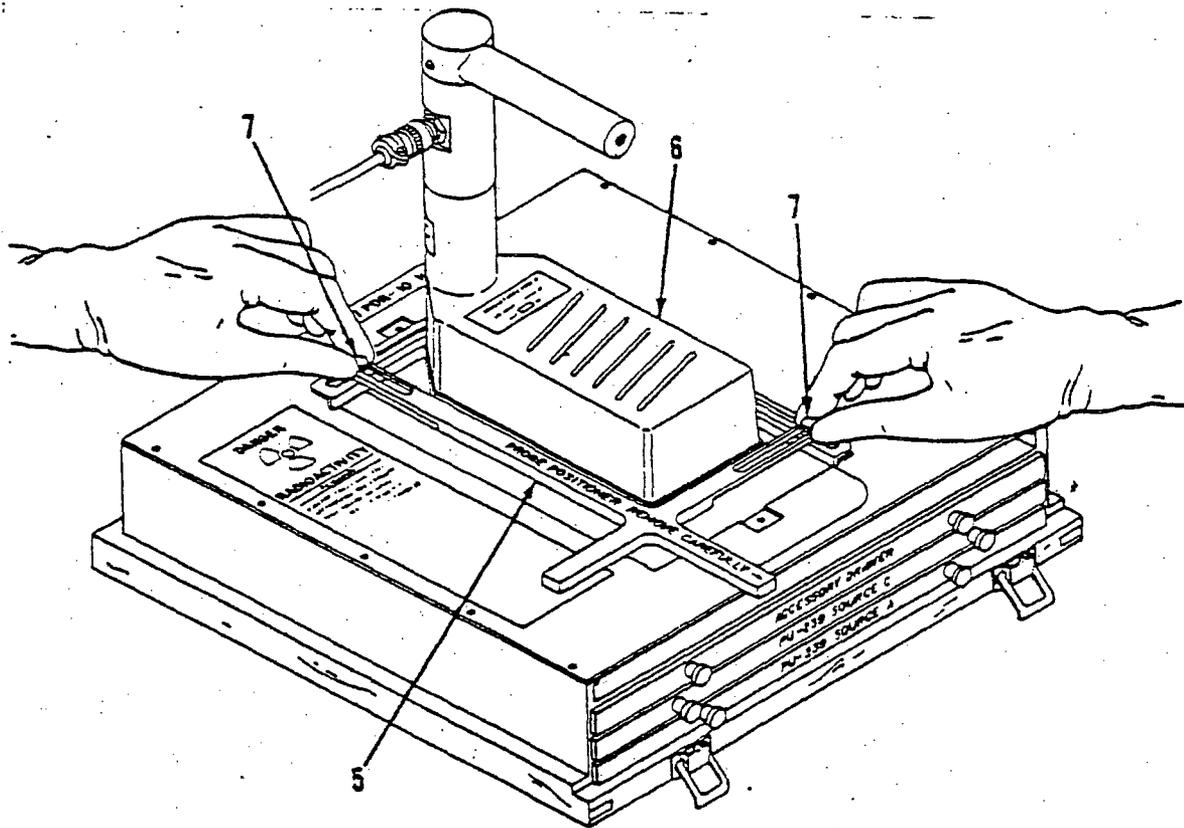
Loosen two thumbscrews (1) and remove cover (2) from probe positioning well (3).



Remove probe positioner and proper attenuator (if required) from necessary drawer. Positioner is used with or without an attenuator depending on which radiacmeter scale is being calibrated. Refer to table of meter readings in accessory drawer.



Place attenuator (4) if used, in probe positioning well (3). Place probe positioner (5) over attenuator in positioning well.



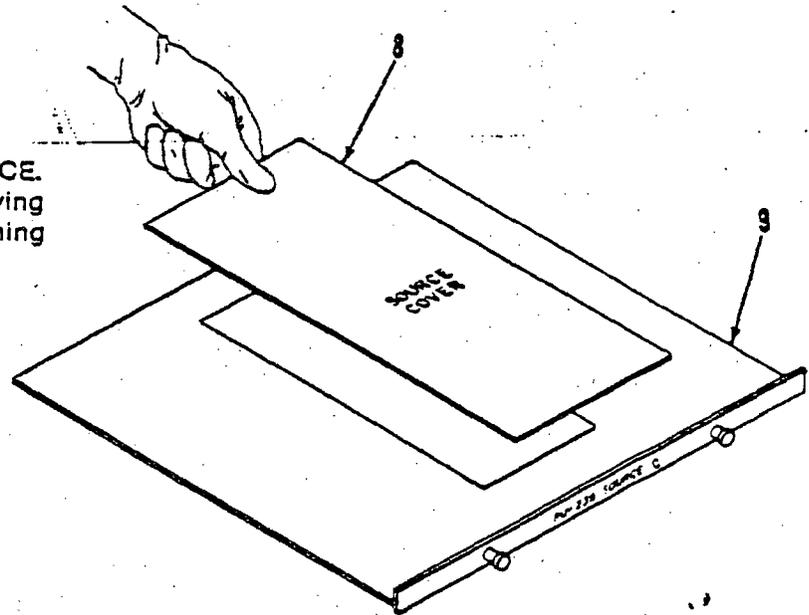
Loosen the two thumbscrews (7) on probe positioner (5).

Place probe (6) of radiac set in positioner (5). Secure the probe by adjusting the two L-shaped legs of the probe positioner to fit the contour of the probe base; clamp the positioner to the edges of the probe by tightening the two thumbscrews (7). The probe sensing area is now aligned with the effective radiation area of the source.

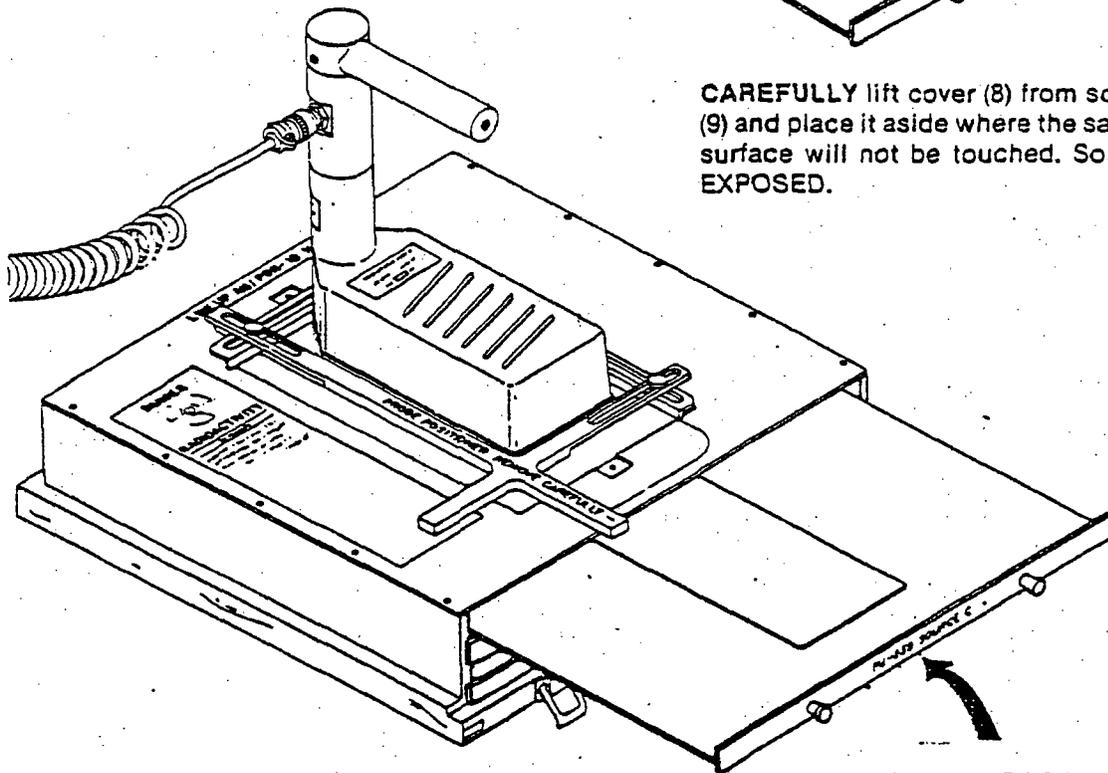
Carefully remove desired Pu239 source (A or C) from cabinet.

WARNING

DO NOT TOUCH OR GOUGE SOURCE. Plutonium 239 is dangerous to living tissue. Heed all warnings at beginning of Chapter 2.



CAREFULLY lift cover (8) from source holder (9) and place it aside where the saran-covered surface will not be touched. Source is now EXPOSED.



Slide EXPOSED source into source positioning shelf.

Select appropriate scale on radiac set and check meter reading. Compare reading with table of meter readings located in the accessory drawer. If the reading is different than the one indicated by the table, use the instructions given in the appropriate radiac set technical manual to adjust set reading to desired value.

2-3. AFTER OPERATING PROCEDURE

Carefully withdraw source from source positioning shelf and place cover on the source.

Replace source in its proper cabinet shelf.

Loosen probe positioner and carefully remove the attenuator using the tweezers from the accessory drawer.

Place probe positioning well cover and carrying case lid.

Remove rubber or plastic gloves. Dispose of gloves as radioactive waste as prescribed in AR 385-11.

WARNING

Always wash and dry hands thoroughly after handling the calibrator; monitor the hands with a low-range alpha radiac meter; repeat the washing and drying if necessary. Notify the Radiation Protection Officer if washing does not remove contamination.

CHAPTER 3 MAINTENANCE INSTRUCTIONS

Section I. TROUBLESHOOTING PROCEDURES

3-1. INTRODUCTION

Table 3-1 lists the common malfunctions which you may find during the operation or maintenance of the calibrator or its components. You should perform the tests/inspections and corrective actions in the order listed.

This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

Table 3-1. Troubleshooting

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. SOURCE DAMAGE.	<p>Step 1.</p> <p>Step 2.</p>	<p>Use a similar type radiac calibrator and obtain a set of readings.</p> <p>Compare the two sets of readings with readings obtained from damaged calibrator before damage occurred.</p> <p>If readings are still erroneous, contact ARRCOM National Maintenance Point (NMP) and request maintenance or repair.</p>
2. CALIBRATION MALFUNCTION.	<p>Step 1.</p> <p>Step 2.</p>	<p>Verify that the radiac set is intended to be calibrated with the calibrator.</p> <p>Verify that the correct accessories (i.e., source and attenuator) are being used for the radiac set being calibrated.</p> <p>If a malfunction still exists, return the radiac set to the using activity for maintenance or repair.</p>

Section II. MAINTENANCE PROCEDURES

3-2. OPERATOR MAINTENANCE

- a. Operator maintenance is limited to inspection and initial checks and services. No other maintenance or repair will be performed by the operator. The US Army Ionizing Radiation Dosimetry Center is the only authorized facility for maintenance or repair.
- b. Requests for maintenance or repair will be submitted to the radioactive material control point for coordination with the CECOM National Inventory Control Point and the US Army Ionizing Radiation Dosimetry Center. Points of contact are:

CECOM National Inventory Control Point (NICP)
Commander, US Army Communications-Electronics Command
ATTN: DRSEL-MME-VC
Fort Monmouth, New Jersey 07703

CECOM National Maintenance Point (NMP)
Commander, US Army Communications-Electronics Command
ATTN: DRSEL-ME-ES
Fort Monmouth, New Jersey 07703

3-3. STORAGE

- a. Store the calibrators only in fire-resistant buildings (TM 5-812-1) and in rooms/areas/sections designated for storage of radioactive materials which are free from the danger of flooding, outside the danger of radius of flammables or explosives, and secured against unauthorized removal.
- b. Post the area/building with CAUTION - RADIOACTIVE MATERIAL signs as required by AR 385-30.

APPENDIX A REFERENCES

A-1. GENERAL

This appendix lists all forms, technical manuals, and miscellaneous publications referenced in this manual and/or to be utilized in relation to this equipment.

A-2. FORMS

Equipment Inspection and Maintenance Worksheet	DA Form 2404
Recommended Changes to Publications	DA Form 2028
Recommended Changes to Equipment Technical Publications	DA Form 2028-2
Punched Transmission Worksheet-Radioisotope Inventory and Leak Test Report	DA Form 3252-R
Notice to Employees	NRC-3
Radiological Accident Report	RCSDD-SD 1168
Quality Deficiency Report	SF 368
Radioactive I	SF 413

A-3. TECHNICAL MANUALS

Handling and Disposal of Unwanted Radioactive Material	TM 3-261
Fire Protection Manual	TM 5-812-1
List of Applicable Publications (LOAP) for Communications Electronic Equipment	TM 11-5800-213-L
Operator's, Organizational, Direct Support, General Support, and Depot Maintenance Manual: Radiac Set AN/PDR-54 (NSN 6665-00-542-1587)	TM 11-6665-208-15
Operator's, Organizational, Direct Support, General Support, and Depot Maintenance Manual: Radiac Set AN/PDR-60 (NSN 6665-00-965-1516)	TM 11-6665-221-15
Operator's and Organizational Maintenance Manual for Radiac Set AN/PDR-56F (NSN 6665-00-211-6895)	TM 11-6665-245-12
The Army Maintenance Management System (TAMMS)	TM 38-750
Transportation Guidance for Safe Transport of Radioactive Materials	TM 55-315

A-4. MISCELLANEOUS PUBLICATIONS

Health and Environment	AR 40-5
Control and Recording Procedure for Occupational Exposure to Ionizing Radiation	AR 40-14
Reporting of Transportation Discrepancies in Shipment	AR 55-38
Ionizing Radiation Protection (Receiving, Control, Transportation, Disposal, and Radiation Safety)	AR 385-11
Safety Color Code Markings and Signs	AR 385-30
Accident Reporting and Records	AR 385-40
Packaging Improvement Report	AR 700-58
Radioactive Commodities in the DOD Supply System	AR 700-64
Reporting of Item and Packaging Discrepancies	AR 735-11-2

APPENDIX D EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

D-1. SCOPE

This appendix lists expendable supplies and materials you will need to operate and maintain the AN/UDM-7C. These items are authorized to you by CTA 50-970, Expendable Items (Except Medical, Class V, Repair Parts, and Heraldic Items).

D-2. EXPLANATION OF COLUMNS

a. **Column 1 - Item Number.** This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use plastic gloves, item 1, App. D").

b. **Column 2 - Level.** This column identifies the lowest level of maintenance that requires the item.

C — Operator/Crew

c. **Column 3 - National Stock Number.** This is the National stock number assigned to the item; use it to request or requisition the item.

d. **Column 4 - Description.** Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the part number followed by the Federal Supply Code for Manufacturer (FSCM) in parentheses, if applicable.

e. **Column 5 - Unit of Measure (U/M).** Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, ln, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION PART NO. AND FSCM	(5) U/M
1	C	8415-00-682-6786	GLOVES, DISPOSAL PIMKIES (96717)	Pr
2	C	8540-00-291-0391	TOWEL, PAPER UU-7-591 (81348)	Bx



UNITED STATES NUCLEAR REGULATORY COMMISSION
Washington, D.C. 20565

NOTICE TO EMPLOYEES

STANDARDS FOR PROTECTION AGAINST RADIATION (PART 20); NOTICES, INSTRUCTIONS AND REPORTS TO WORKERS; INSPECTIONS (PART 19)

In Part 20 of its Rules and Regulations, the Nuclear Regulatory Commission has established standards for your protection against radiation hazards from radioactive material under licenses issued by the Nuclear Regulatory Commission. In Part 19 of its Rules and Regulations, the Nuclear Regulatory Commission has established certain provisions for the options of workers engaged in NRC-licensed activities.

YOUR EMPLOYER'S RESPONSIBILITY

Your employer is required to—

1. Apply these NRC regulations and the conditions of its NRC license to all work under the license.
2. Post or otherwise make available to you a copy of the NRC regulations, license, and operating procedures which apply to work you are engaged in, and explain their provisions to you.
3. Post Notices of Violation involving radiological working conditions, proposed imposition of civil penalties and orders.

YOUR RESPONSIBILITY AS A WORKER

You should familiarize yourself with these provisions of the NRC regulations, and the operating procedures which apply to the work you are engaged in. You should observe their provisions for your own protection and protection of your co-workers.

WHAT IS COVERED BY THESE NRC REGULATIONS

1. Limits on exposure to radiation and radioactive material in restricted and unrestricted areas;
2. Measures to be taken after accidental exposures;
3. Personnel monitoring, surveys and equipment;
4. Caution signs, labels, and safety interlock equipment;
5. Exposure records and reports;
6. Options for workers regarding NRC inspections; and
7. Related matters.

REPORTS ON YOUR RADIATION EXPOSURE HISTORY

1. The NRC regulations require that your employer give you a written report if you receive an

exposure in excess of any applicable limit as set forth in the regulations or in the license. The basic limits for exposure to employees are set forth in Sections 20.101, 20.102, and 20.104 of the Part 20 regulations. These Sections specify limits on exposure to radiation and exposure to concentrations of radioactive material in air.

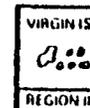
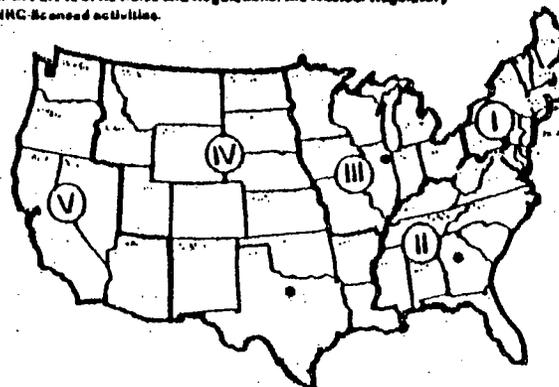
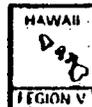
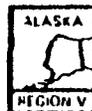
2. If you work where personnel monitoring is required pursuant to Section 20.202;
 - (a) your employer must give you a written report of your radiation exposures upon the termination of your employment, if you request it, and
 - (b) your employer must advise you annually of your exposure to radiation, if you request it.

INSPECTIONS

All activities under the license are subject to inspection by representatives of the NRC. In addition, any worker or representative of workers who believes that there is a violation of the Atomic Energy Act of 1954, the regulations issued thereunder, or the terms of the employer's license with regard to radiological working conditions in which the worker is engaged, may request an inspection by sending a notice of the alleged violation to the appropriate United States Nuclear Regulatory Commission Inspection and Enforcement Regional Office (shown on map at right). The request must set forth the specific grounds for the notice, and must be signed by the worker or the representative of the workers. During inspections, NRC inspectors may confer privately with workers, and any worker may bring to the attention of the inspectors any past or present condition which he believes contributed to or caused any violation as described above.

POSTING REQUIREMENTS

Copies of this notice must be posted in a sufficient number of places in every establishment where activities licensed by the NRC are conducted, to permit employees working in or frequenting any portion of a restricted area to observe a copy on the way to or from their place of employment.



UNITED STATES NUCLEAR REGULATORY COMMISSION

A representative of the Nuclear Regulatory Commission can be contacted at the following addresses and telephone numbers. The Regional Office will accept collect telephone calls from employees who wish to register complaints or concerns about radiological working conditions or other matters regarding compliance with Commission rules and regulations.

Regional Offices

REGION	ADDRESS	TELEPHONE	
		DAYTIME	NIGHTS AND HOLIDAYS
I	Region I, Office of Inspection and Enforcement, USNRC 521 Park Avenue Eling of Prussia, Pennsylvania 19060	215 337-6000	215 337-6000
II	Region II, Office of Inspection and Enforcement, USNRC 101 Marlow St., N.W., Suite 3100 Atlanta, Georgia 30303	404 227-4853	404 227-4858
III	Region III, Office of Inspection and Enforcement, USNRC 706 Roosevelt Road Glen Ellyn, Illinois 60127	312 632-2000	312 632-2600
IV	Region IV, Office of Inspection and Enforcement, USNRC 611 Ryan Plaza Drive, Suite 1000 Arlington, Texas 76013	817 334-2641	817 334-2641
V	Region V, Office of Inspection and Enforcement, USNRC 1928 N. California Boulevard, Suite 202, Walnut Creek Plaza Walnut Creek, California 94596	415 942-2700	415 942-2700

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS



THEN...JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL.

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER

TM 11-6665-247-10

PUBLICATION DATE

13 August 1981

PUBLICATION TITLE

Calibrator, Radiac AN/UDM-7C

BE EXACT PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

TEAR ALONG PERFORATED LINE

PRINTED NAME GRADE OR TITLE AND TELEPHONE NUMBER:

SIGN HERE

By Order of the Secretary of the Army:

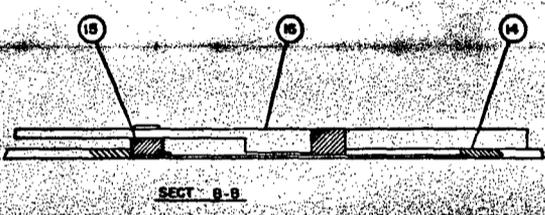
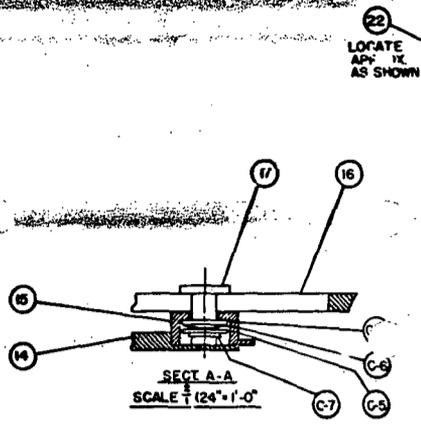
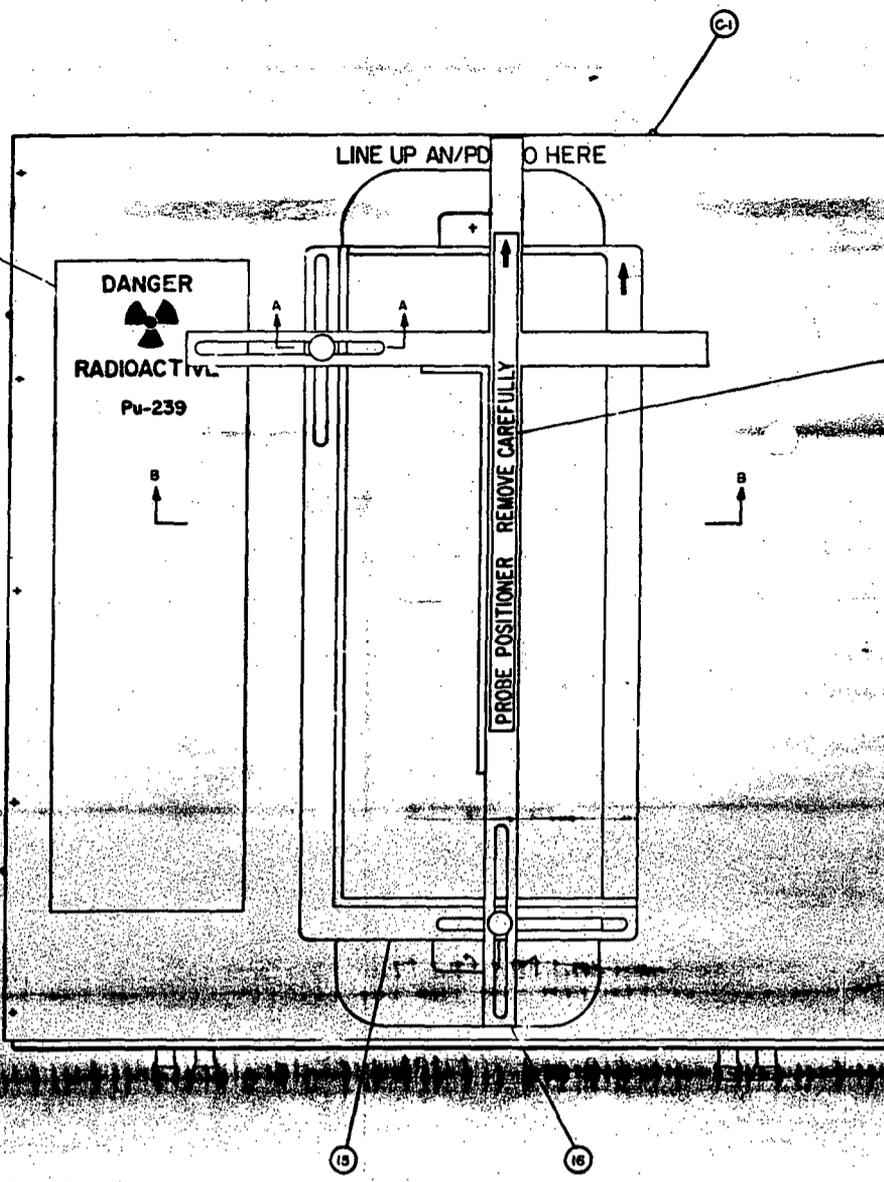
Official:

ROBERT M. JOYCE
Brigadier General, United States Army
The Adjutant General

EDWARD C. MEYER
General, United States Army
Chief of Staff

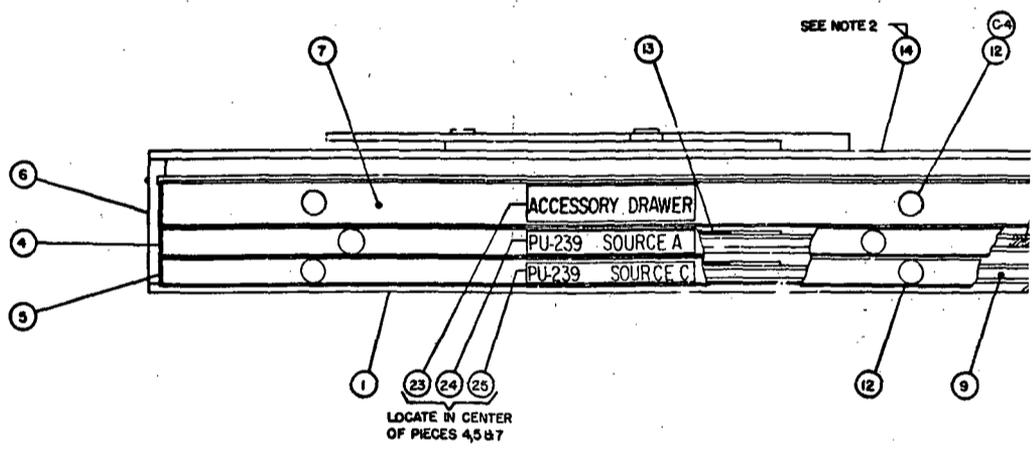
DISTRIBUTION:

To be distributed in accordance with Special List.



NOTES

1. ALL OUTSIDE SURFACES OF ALPHA RADIAC CALIBRATOR TO HAVE GREY HAMMERTONE FINISH.
2. LINE UP 4x10 CUTOUT IN PART B WITH 4x10 CUTOUT IN PART M-AT ASSEMBLY
3. NAMEPLATES PC 22, 23, 24, 25, 26, 27, 28, 29, 30, 31 MAY BE PURCHASED FROM: ANODYNE INC.
NORTH SHORE NAMEPLATE, A DIV
1270 N.W. 165 TH STREET
NORTH MIAMI BEACH 69, FLORIDA
NAMEPLATES SOLD UNDER DESIGNATION "THERMA MARK ANODIZED FOIL ALUMINUM NAMEPLATES"



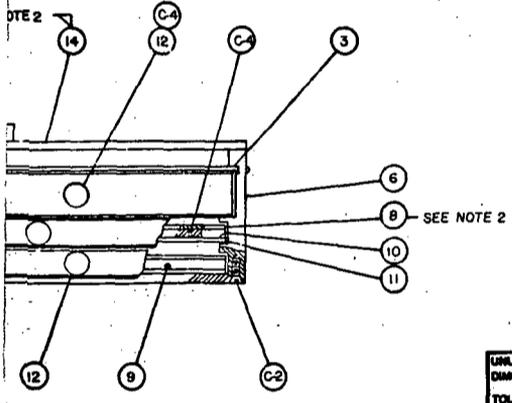
REVISIONS			
ZONE	LTR	DESCRIPTION	DATE APPROVED
A		DRAWING RELEASED BY BUREAU OF SHIPS	04-66

LIST OF MATERIAL					
QUANTITIES ARE FOR ONE (1) ALPHA RADIAC CALIBRATOR ASSY.					
PART NO.	NAME	NO. REQ'D	MATERIAL SPEC.	FEDERAL STOCK NO.	REMARKS
AS-1	ALPHA RADIAC CALIBRATOR ASSY	ONE			ASSEMBLY
1	BASE PANEL	1	ALUM. ALLOY		
2	BACK PANEL	1			
3	TOP PANEL	1			
4	FRONT PANEL	1			
5	FRONT PANEL	1			
6	SIDE PANEL	2			
7	DRAWER	1			
8	COVER SOURCE HOLDER	2			
9	SOURCE HOLDER	1			
10	SOURCE HOLDER	1			
11	BOTTOM SOURCE HOLDER	2			
12	KNOB	6			
13	COVER	2			
14	POSITIONER, DER	1			
15	POSITIONER, BOTTOM	1			
16	POSITIONER, TOP	1			
17	GUIDE PIN	2	CORR. RES. STEEL		
18	COVER	1	ALUM. ALLOY		NOT SHOWN ON THIS SHEET
C-1	ESCUTCHEON PIN	8	CORR. RES. STEEL		#19 3/4 LG.
C-2	MACHINE SCREW	25			#3-40 FLAT HD 3/8 LG.
C-3	PLAIN WASHER	4			#3-40 FLAT HD 3/8 LG.
C-4	SPRING WASHER	2	COMM.		3/16" DIA. 1/2" H. P.P.R. GAY TR. FOR P.O. 212
C-7	RETAINING RING	2			SHARP POINT, STAINLESS STEEL, STYLE 3
19	THUMB SCREW	2	CORR. RES. STEEL		1/4" DIA. 1/2" H. P.P.R. GAY TR. FOR P.O. 212
20	SOURCE MASK	1	ALUM. ALLOY		SHARP POINT, STAINLESS STEEL, STYLE 3
21	SOURCE MASK	1			SHARP POINT, STAINLESS STEEL, STYLE 3
22	NAMEPLATE	1	COMM.		SEE NOTE 3
23		1			
24		1			
25		1			
26		1			
27		1			
28		1			
29		1			
30	CARRYING CASE	1	HDWD.		SEE SHEET 4 OF 4
31	NAME PLATE	1	COMM.		SEE NOTE 3
32	TWEEZERS	1 PR			SHARP POINT, STAINLESS STEEL, STYLE 3
33	ENVELOPE	1			1/4" DIA. 1/2" H. P.P.R. GAY TR. FOR P.O. 212
34		1			SHARP POINT, STAINLESS STEEL, STYLE 3
35		1			SHARP POINT, STAINLESS STEEL, STYLE 3

27 LOCATE APPROX. AS SHOWN

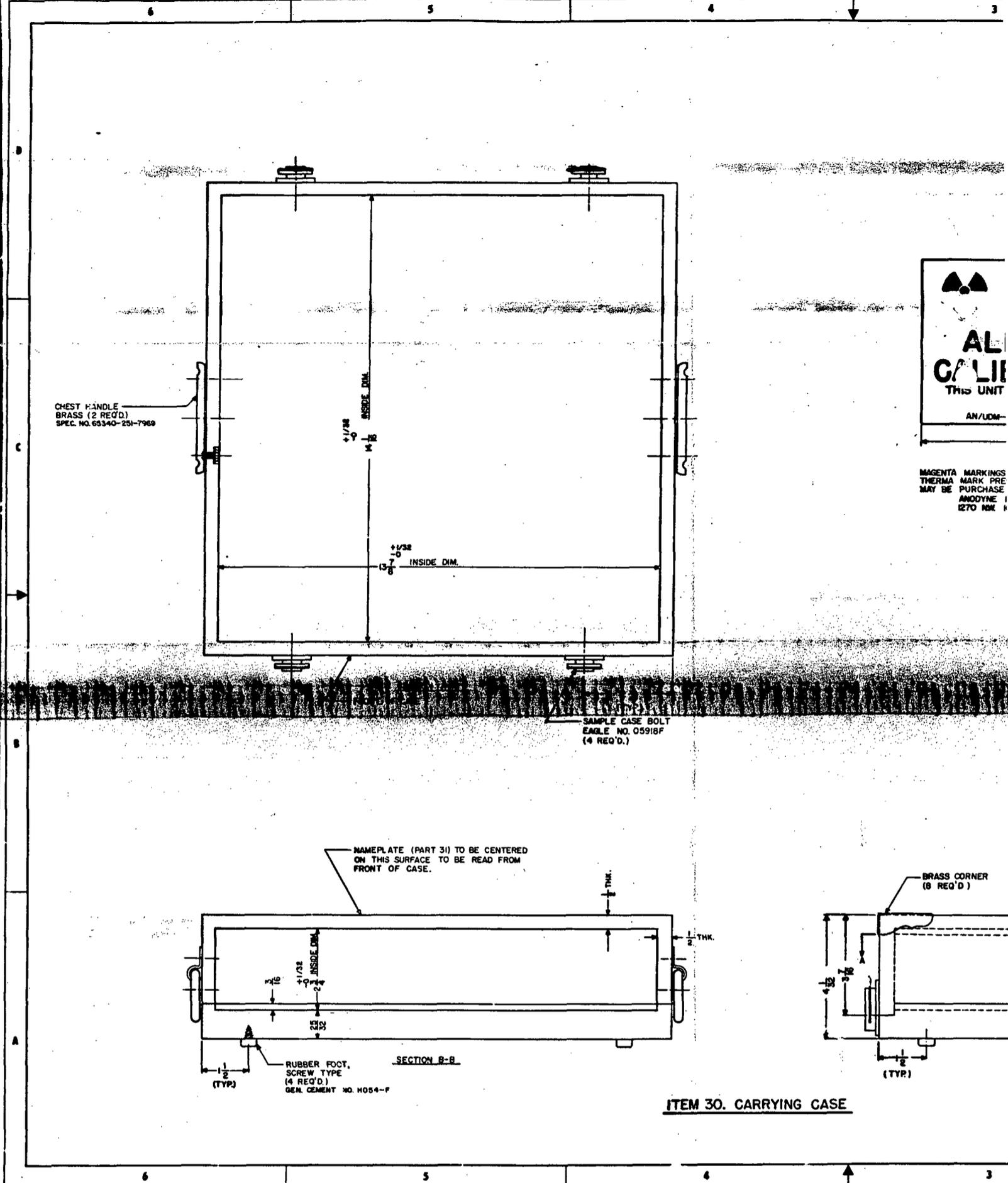
MATERIAL

- 1. ALUM. ALLOY, SPEC. QQ-A-250/95, TEMP. H32
- 2. ALUM. ALLOY, SPEC. QQ-A-250/116, TEMP. T6
- 3. ALUM. ALLOY, SPEC. QQ-A-250/26, TEMP. H14
- 4. CORR. RES. STEEL, SPEC. QQ-S-763, CL. 303
- 5. ALUM. ALLOY, SPEC. QQ-A-270, TEMP. T6



RE. F26 965 77

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES			
BUREAU OF SHIPS SIGNATURE	NAVY DEPARTMENT	WASHINGTON, D. C.	
SECT. HEAD	BUREAU OF SHIPS		
PROJ. ENG.	ALPHA RADIAC CALIBRATOR AN/UDM-7A		
CHECKER			
DRAFTSMAN			
DATE			
FOR CHIEF OF BUREAU			
DATE	7-29-66		
CONTR. CODE IDENT. NO.	SIZE	CODE IDENT. NO.	BUREAU OF SHIPS DRAWING NO. REV.
	F	90064	RE 101 F 2002 A
CONTR. DWG. NO.	SCALE	SHEET 1 OF 4	



CHEST HANDLE
BRASS (2 REQ'D)
SPEC. NO. 69340-251-7969

$\pm 1/32$
 -0
INSIDE DIM.

$\pm 1/32$
 -0
INSIDE DIM.

SAMPLE CASE BOLT
EAGLE NO. 05918F
(4 REQ'D.)

NAMEPLATE (PART 31) TO BE CENTERED
ON THIS SURFACE TO BE READ FROM
FRONT OF CASE.

BRASS CORNER
(8 REQ'D)

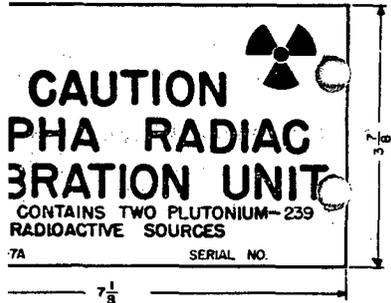
RUBBER FOOT,
SCREW TYPE
(4 REQ'D.)
GEN. CEMENT NO. H054-F

SECTION B-B

ITEM 30. CARRYING CASE

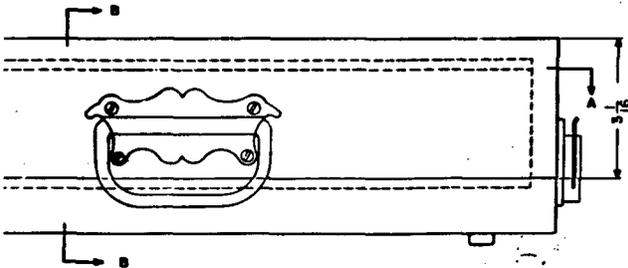


MAGENTA MARKINGS
THERMA MARK PRE
MAY BE PURCHASE
ANDDYNE I
I270 NML



31 NAMEPLATE
 ON YELLOW BACKGROUND
 SURE SENSITIVE ANODIZED FOIL ALUM. NAMEPLATE OR EQUAL
 FROM:
 INC. NORTH SHORE NAMEPLATE DIV.
 65TH STREET, NORTH MIAMI BEACH 69, FLORIDA.

- NOTES:**
1. ALL MATERIAL 1/2 THICK HARDWOOD EXCEPT AS NOTED.
 2. STAIN AND SHELLAC ALL SIDES.
 3. PARTS TO BE FASTENED TOGETHER WITH APPROPRIATE SCREWS AND CEMENT GLUE.



RE-F2696577

COP. IDENT. NO.	SIZE	BUREAU OF SHIPS DRAWING NO.	REV.
88064	F	RE IOIF 2002 A	
SCALE:	SHEET 4 OF 4		

RE IOIF 5005

20113