184

DRAFT

TM 3-6665-214-13&P

TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL, AND DIRECT SUPPORT
MAINTENANCE MANUAL
(INCLUDING REPAIR PARTS LIST)
RADIOACTIVE SOURCE SET, M3A1
(NSN 6665-00-856-8235)

HEADQUARTERS, DEPARTMENT OF THE ARMY

MARCH 1985

Encl 6

LL/4k

WARNINGS

The M3A1 Radioactive Source Set incorporates radioactive Cobalt-60 (Co-60). Use of the source set shall be under the supervision of a qualified individual who has received specific training on the proper use of the set.

Never eat, drink, or smoke in areas where radioactive material are used/stored.

Before removing the radioactive source capsule from the shield, a calibration site must be selected. The calibration site should have a level, unobstructed floor surface, approximately 16 meters (53 feet) square, located in a one-story structure in an area away from the normal stream of traffic. Deviations from the calibration site requirements shall be as approved by the US Army Communications-Electronics Command (CECOM) Safety Office.

Each time the radioactive source is removed from the shield, the Radiation Protection Officer (RPO) must delineate the radiation controlled area and post radiation warning signs.

Never allow personnel without film badges and/or dosimeters inside the restricted area.

Always use the magnetic handler for handling the radioactive source. Never touch the radioactive source capsule.

Never look into the well of the shield or unnecessarily expose parts of the body to the radiation.

Never take the radioactive source from the shield without having a radiacmeter available and in good working order, e.g., an AN/PDR-27( ) Radiac Set.

Never leave an unshielded radioactive source unattended. If necessary to leave the source set, re-shield the radioactive source and lock the container.

If a radioactive source capsule is damaged or broken and radioactive contamination occurs, follow the emergency procedures described in paragraph 2-18 of this manual.

Maintain personnel exposure records.

Wear a film badge, calibrated dosimeter, and disposable protective gloves when performing the leak test. Do not spread contamination by touching other objects with the gloves. Do not leave the unshielded radioactive source or the opened storage case unattended. Do not stay in the radiation area any longer than necessary to perform the leak test.

TECHNICAL MANUAL
No. 3-6665-214-13&P

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, March 1985

OPERATOR'S, ORGANIZATIONAL, AND DIRECT SUPPORT MAINTENANCE MANUAL (INCLUDING REPAIR PARTS LIST) RADIOACTIVE SOURCE SET, M3A1 (NSN 6665-00-856-8235)*

REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS

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

*This manual supersedes TM 3-6665-214-13&P, June 1976, including all changes.

LIST OF ILLUSTRATIONS

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1-1. Scope

This manual is published for personnel who operate the M3A1 Radioactive Source Set, and for personnel who perform organizational and direct support maintenance on the set. The manual contains a description of the source set and information on its use, functioning, and maintenance. Instructions for shipment, storage, and disposal are also provided.

1-2. Authorization For Issue of the M3A1 Radioactive Source Sets

M3A1 Radioactive Source Sets are issued throughout the Army without a special license being required by the individual user. Possession and use of the radioactive source sets are authorized under a US Nuclear Regulatory Commission (NRC) License issued to the Department of the Army (DA), US Army Communications-Electronics Command (CECOM), Fort Monmouth, NJ 07703-5024. The license is issued based upon statements concerning procedures established for the life-cycle control of the item.

1-3. Maintenance Forms, Records, and Reports

a. Reports of Maintenance and Unsatisfactory Equipment. DA forms and procedures used for equipment maintenance will be those prescribed by Technical Bulletin (TB) 750-25-1, Maintenance of Supplies and Equipment: Army Test, Measurement and Diagnostic Equipment (TMDE) Calibration and Repair Support Program.

b. Report of Packaging and Handling Deficiencies. Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in Army Regulation (AR) 735-11-

2/DLAR 4140.55/NAVMATINST 4355.73/AFR 400-54/MCO 4430.3E.

c. Discrepancy in Shipment Report ((DISREP) SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33B/AFR 75-18/MCO 4610.19C/DLAR 4500.15.

1-4. US Nuclear Regulatory Commission Requirements

The NRC sets standards/conditions and issues licenses for the use of specific radioactive materials in the United States. Use of the M3A1 is authorized by the NRC. Information required by the NRC license and regulations is contained below:

a. Radiation Protection. Users of the M3A1 should refer to this Technical Manual (TM) for instructions on control, safe handling, storage, emergency situations, operation and maintenance. This information satisfies the radiation protection requirements established by NRC regulations (Title 10, Code of Federal Regulations (CFR), 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 M3A1 is used and/or stored. The posting requirements are contained on the form.

c. Section 206, "Energy Reorganization Act of 1974", (10 CFR Part 21) contained in the back of this manual should be removed for posting whenever the M3A1 is used and/or stored.

d. Reporting of Defects and Noncompliance Actions. As stipulated in 10 CFR Part 21, reports of radioactive source set defects and noncompliance, as outlined in Section 206 of the Energy Reorganization Act of 1974, should be reported through appropriate radiological command channels to the CECOM Safety

Office. Notification shall be made within 24 hours following the identification of defects or noncompliance.

e. NRC License. The NRC license for the M3A1 and related documents are held by the CECOM Safety Office at Fort Monmouth, New Jersey. M3A1 users may request information on these documents by letter addressed to:

Commander
US Army Communications-Electronics Command
ATTN: AMSEL-SF-MR
Fort Monmouth, NJ 07703-5024

Requests for further information may also be made by calling Autovon 995-4427 or commercial (201) 544-4427.

1-5. Supervision

a. All calibrations utilizing the M3A1 will be supervised by a qualified Radiation Protection Officer (RPO). To be a qualified RPO, a person must have received a minimum of 120 hours formal training on radiation protection including the following topics:

(1) Principles and practices of radiation protection.

(2) Biological effects of radiation.

(3) Radioactivity measurement/monitoring techniques and instrumentation.

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

(5) The operation and use of the M3A1, its equivalent, or other Army radiac calibrator sets.

NOTES

1. Completion of the Radiological Safety Course (7KF3) 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: AMSEL-SF-MR, Fort Monmouth, NJ 07703-5024. 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 M3A1.

b. The operator or user of the M3A1 shall have a minimum of 8 hours training under the guidance of a qualified RPO in the basic fundamentals of radiation protection, radiac instrumentation and survey techniques and 16 hours on-the-job training in operation and care of the M3A1. Instructions shall include safe working practices and knowledge of the hazards associated with the instrument.

1-6. Duties of Radiation Protection Officer

The specific duties of the appointed RPO will be to:

a. Insure that the M3A1 Radioactive Source Sets under his jurisdiction are properly used and stored.

b. Train local users and operators and maintain a record of training for users and operators.

c. Insure appropriate records are maintained on each item.

d. Advise the Radioactive Material Control Point (RMCP) of any change in accountability, local RPO, or installation relocation for the M3A1 Radioactive Source Set.

e. Submit Radiation Incident Report according to published directives.

f. Establish radiation controlled areas for source set storage and use.

g. Post appropriate warning/caution 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 6 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 exposure to radiation is maintained As Low As Reasonably Achievable.

m. Conduct a physical inventory according to published frequencies.

n. Submit inventory, leak test, and other reports to the RMCP as required.

o. Prior to relief from duties, place the M3A1 Radioactive Source Sets 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: AMSEL-SF-MR, Fort Monmouth, NJ 07703-5024 within 24 hours.

1-7. Responsibility

a. Responsibilities of Major Commands.

(1) Establish at least one RMCP.

(2) Appoint a Radiation Control Officer (RCO) for each RMCP and submit qualifications to Commander, US Army Communciations-Electronics Command, ATTN: AMSEL-SF-MR, Fort Monmouth, NJ 07703-5024.

(3) Develop procedures to insure periodic leak testing and forward two copies of procedures to Commander, US Army Communications-Electronics Command, ATTN: AMSEL-SF-MR, Fort Monmouth, NJ 07703-5024.

(4) Forward leak test smears to nearest approved smear evaluation laboratory.

(5) Insure that each installation or activity using the M3A1 Radioactive Source Set has an effective radiation protection program.

b. Responsibilities of Radiation Control Officer.

(1) Review and approve the qualifications of each local RPO for the M3A1 Radioactive Source Set and forward to Commander, US Army Communications-Electronics Command, ATTN: AMSEL-SF-MR, Fort Monmouth, NJ 07703-5024 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 M3A1 Radioactive Source Set.

(b) Suspend use of the M3A1 Radioactive Source Set until someone can be qualified by training.

(c) Transfer the M3A1 Radioactive Source Set to an installation or activity with qualified personnel.

(3) Maintain the following information for each M3A1 Radioactive Source Set 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) Name and qualifications of local RPC's.

(k) Radiation incident reports.

(4) Insure that the M3A1 Radioactive Source Set is properly handled in accordance with Army, DOD, and NRC regulations. Periodically inspect and audit records of installations and activities possessing the M3A1 Radioactive Source Set.

1-8. Control

The M3A1 Radioactive Source Set is classified as an individually controlled item.

a. Stations in CONUS and Oversea supply agencies will submit requisitions through radioactive material supply channels to Commander, US Army Communications-Electronics Command, ATTN: AMSEL-MME-VC, Fort Monmouth, NJ 07703, for issue to certified RPOs. 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 bear the signature and typed name and grade of the local RPO. The CECOM National Inventory Control Point (NICP) reviews requisitions submitted and when approved, issues material release orders to the depot storing the item. The depot then ships the item directly to the requisitioner, notifies the control point and furnishes other appropriate shipping data.

b. Within five days after receiving the radioactive source set, the receiving local RPO will notify the RMCP.

c. Leak testing of the M3A1 Radioactive Source Set will be performed upon receipt, at least every six months thereafter, prior to shipment, or anytime leakage is suspected.

Section II. DESCRIPTION AND DATA

1-9. Use

The M3A1 Radioactive Source Set is used to calibrate radiac survey meters, such as the AN/PDR-27( ) Radiac Set and the IM-9( ) Radiac Dosimeter.

WARNING

The M3A1 Radioactive Source Set will be used only by individuals trained and certified in the proper use of the set. Each time that the radioactive source is removed from the shield, the RPO must delineate the radiation controlled area and post radiation warning signs.

1-10. M3A1 Radioactive Source Set

The M3A1 Radioactive Source Set (fig. 1-1) consists of a storage case, a radioactive source and shield assembly with an M1A1 gamma Co-60 radioactive source, a source calibration chart, an M4 telescoping radioactive source magnetic handler, and a copy of this manual (TM 3-6665-214-13&P).

a. Storage Case, Exterior (fig. 1-2). The wood storage case measures 18 by 18 by 20 inches and is designed to keep the radiation dose rate at the surface of the case below 200 millirads per hour (mR/hr) and less than 10 mR/hr at 3 feet from the external surface of the case. The container meets Department of Transportation (DOT), 49 CFR, Yellow III label shipping requirements. The cover is attached to the case by two hinges (4, fig. 1-2). A chain (7, fig. 1-4) holds the cover in position when the case is open, and two catches (1, fig. 1-2) lock the cover in place when the case is closed. The case is equipped with two handles (6, fig. 1-2), one at each side. The identification plate on the cover of the storage case of each radioactive source set is shown in figure 1-3. The

case is painted yellow and marked in accordance with DOT regulations.

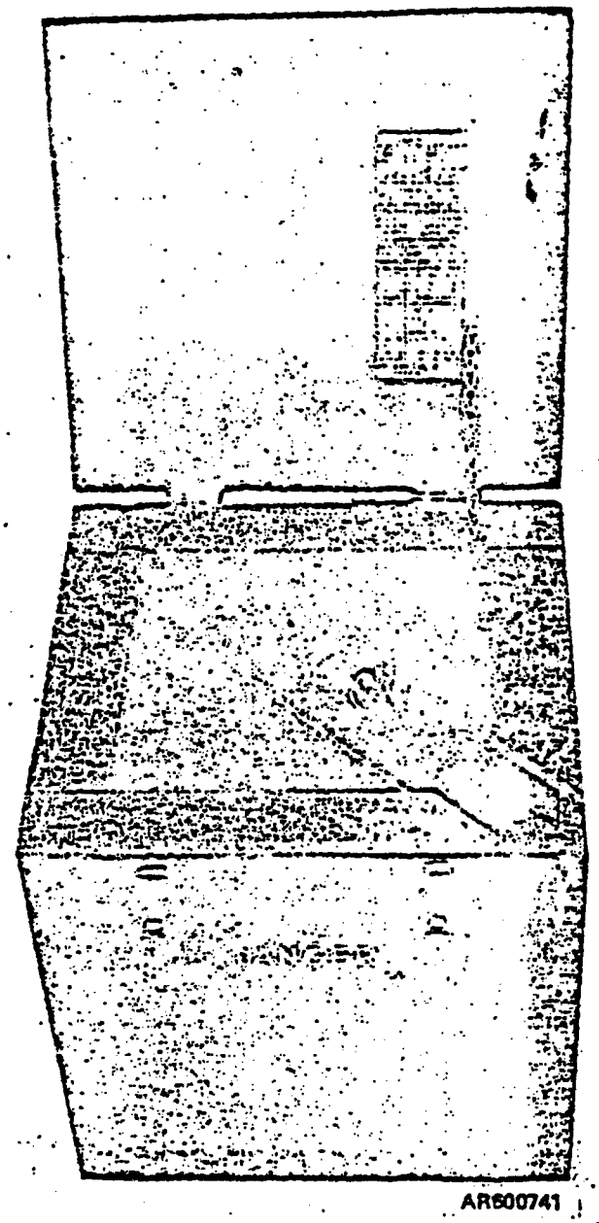
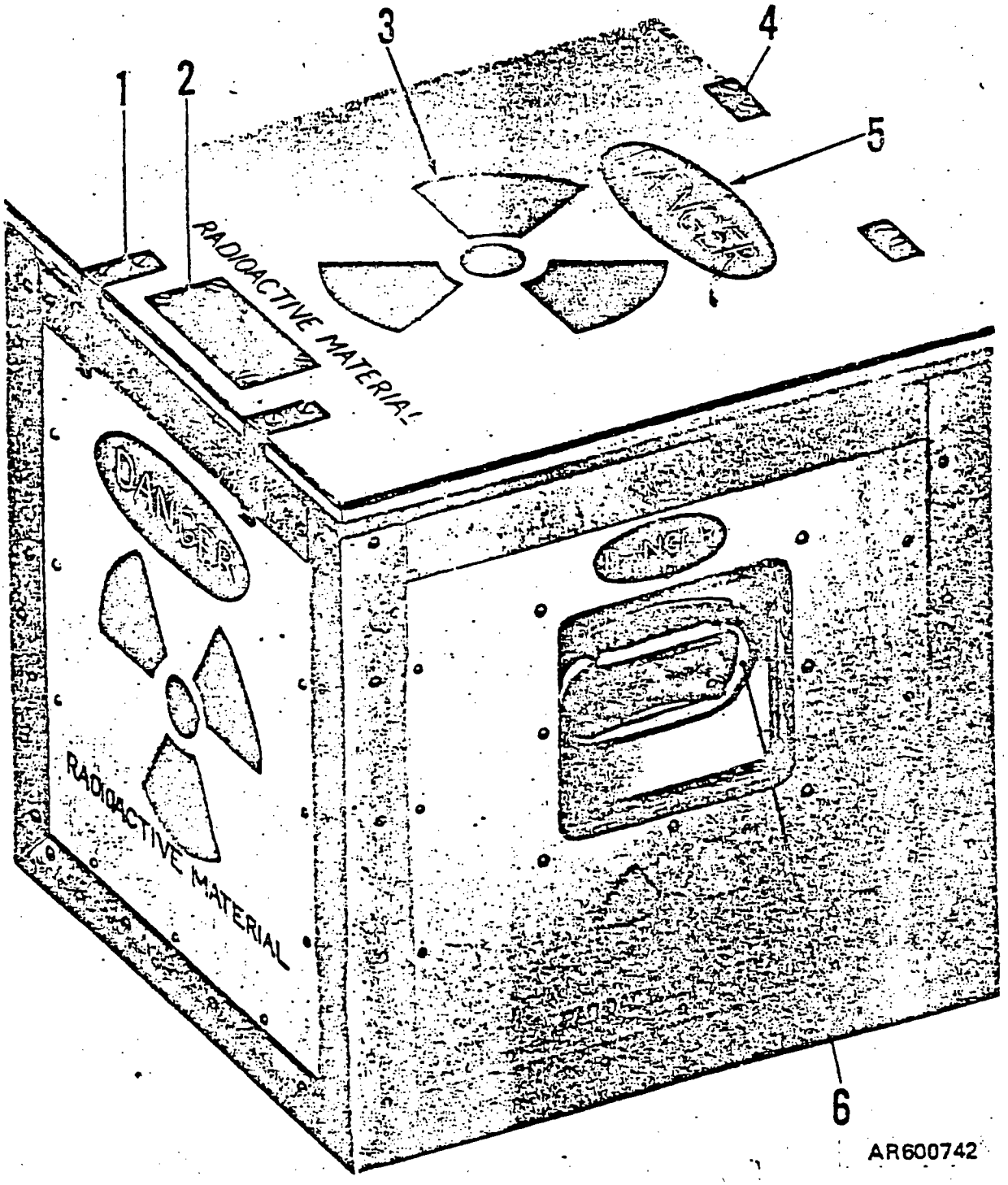


Figure 1-1. M3A1 Radioactive Source Set.



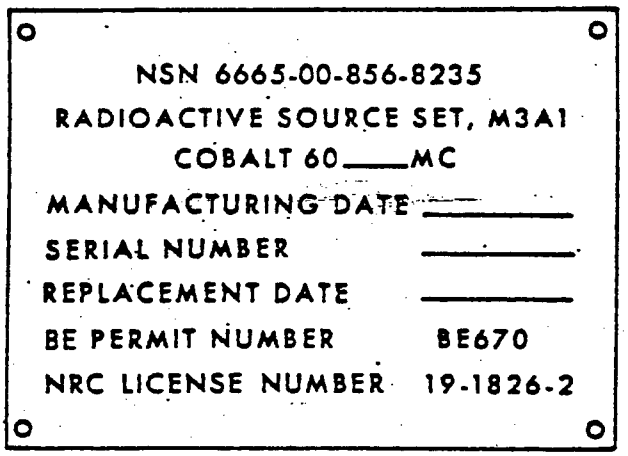
4 Hinge
5 Eliptical DANGER Warning background
6 Handle

1 Catch
2 Identification plate
3 Radiation symbol

Figure 1-2, M3A1 Storage Case (exterior)

b. Storage Case, Interior (fig 1-4). A shield (11, fig. 1-4), described in (1) below, is bolted to a platform (8) in the case, and a spacer (1) is bolted down around the top of the shield. A magnet cap socket (9) in one corner and a cutout diagonally opposite the socket in the storage case provide the means for stowing the magnetic handler, described in d below. A Co-60 decay curve (6, fig. 1-4), described in (2) below, is fastened inside the cover of the case.

(1) Shield. A cylindrical lead shield (11, fig. 1-4), approximately 6 1/2 inches in diameter and 6 1/2 inches high, serves as a container for the radioactive source assembly (13). The shield is encased in a steel jacket and mounted on a square steel base (10). A lead plug (3) with a handle (2) fits into an opening in the top of the shield. When the plug is placed in the shield, it forms the top of an enclosed space in the center of the shield; this space is approximately 1 inch in diameter and 11/16 inch deep. A shoulder near the top of the enclosed space supports the radioactive source assembly within the enclosed space. The shield and plug provide a 2 1/2 inch thick lead barrier against gamma radiation emanating from the radioactive source. A lockbar (4) passes through the handle of the plug and through slots in the lugs (12) on the shield. The shackle of a combination lock (5) passes through round holes in the bent end of the lockbar and through an adjacent lug and secures the radioactive source in the shield. The combination lock is a high security padlock. The combination can be changed by use of a key which is supplied with the lock.



AR600750

1 Spacer
2 Handle
3 Plug
4 Lockbar
5 Combination lock
6 Cobalt 60 decay curve chart
7 Chain
8 Platform
9 Magnet cap socket
10 Base
11 Shield
12 Lug
13 Radioactive source assembly

Figure 1-3. Identification plate.

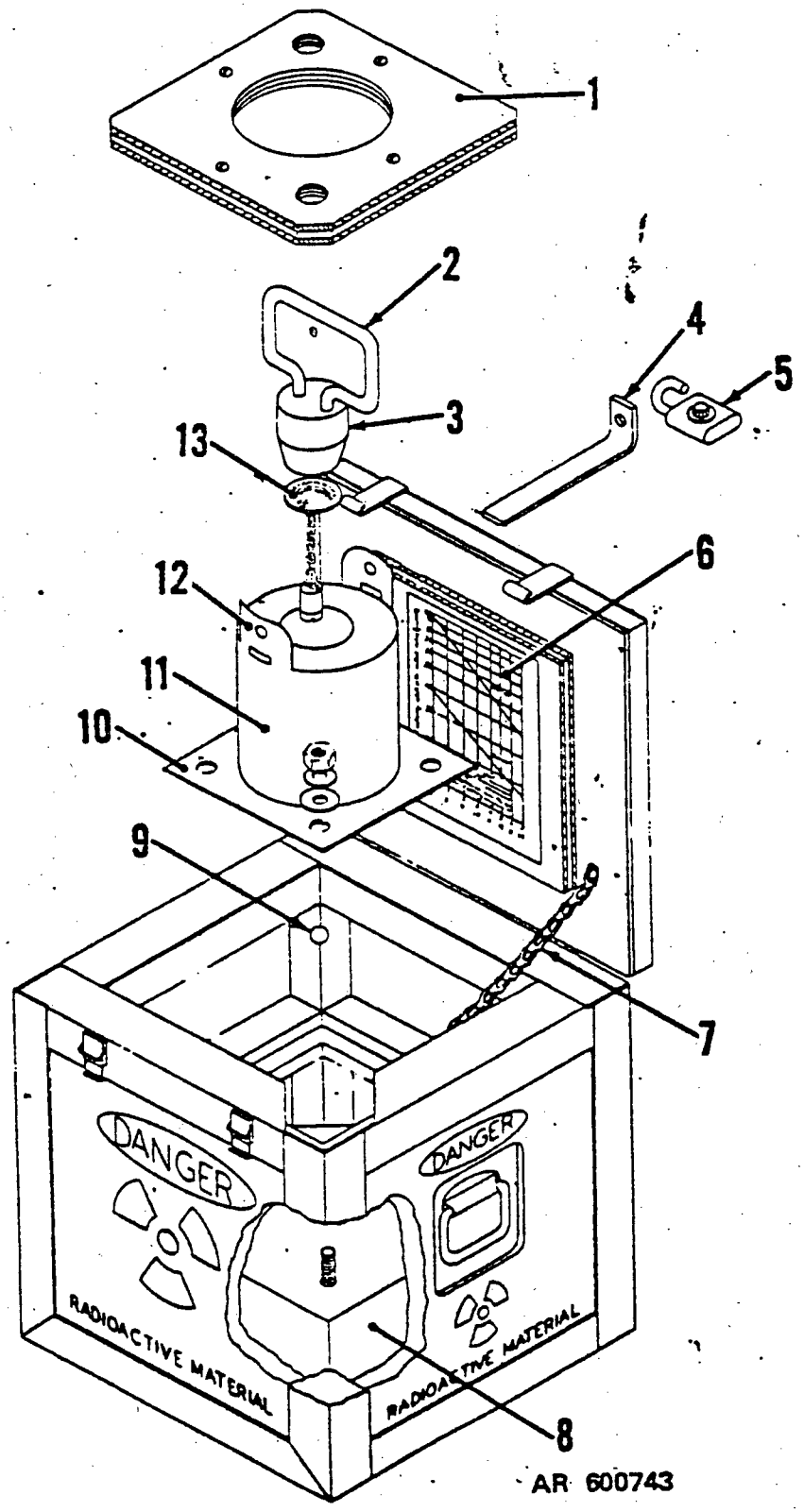


Figure 1-4. Storage case and radioactive source assembly (exploded view).

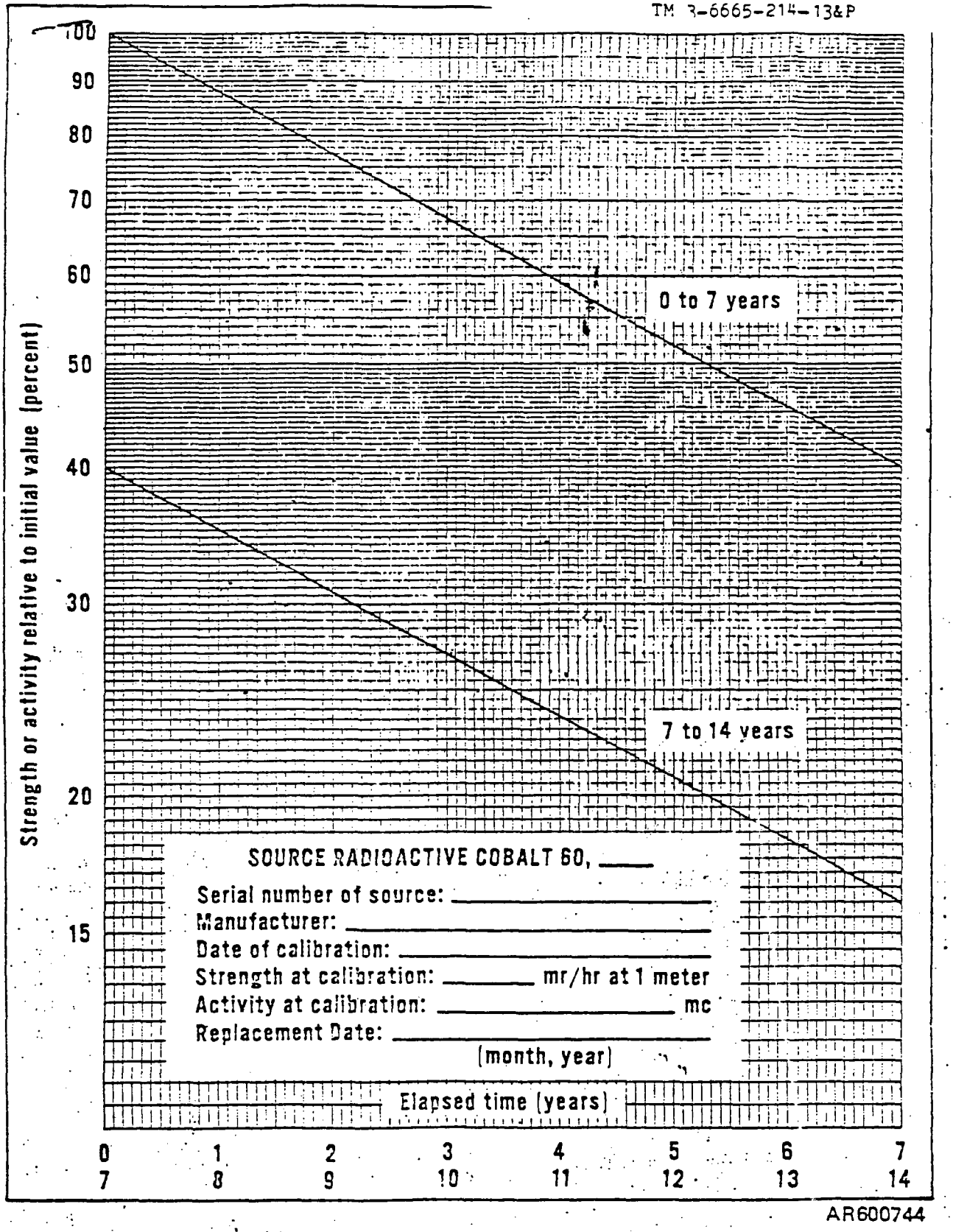
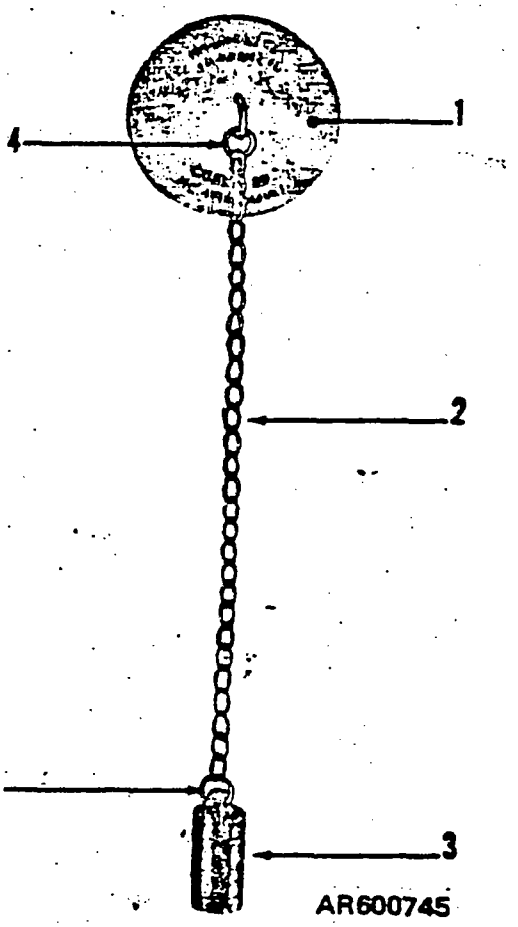


Figure 1-5. Cobalt 60 decay curve.

(2) Co-60 Decay Curve (fig 1-5). The Co-60 decay curve, mounted on the inside cover of the radioactive source case, bears the same serial number as the source. The name and address of the manufacturer; the date of calibration of the radioactive source; the strength at time of calibration in units of exposure rate at a standard distance, i.e., mR/hr at a distance of 1 meter; the activity at the time of calibration in millicuries (mCi); and the replacement date are also indicated on the decay curve chart. The decay curve is used to determine the relative percent strength or activity of the Co-60 at a given time (years and months) after the date of initial calibration.

c. M1A1 Gamma Co-60 Radioactive Source Assembly (fig. 1-6). The M1A1 gamma Co-60 radioactive source assembly consists of a sealed radioactive source capsule (3) containing Co-60, a chain (2), and a lifting disk (1). Connecting rings (4) connect the chain to the radioactive source capsule and the lifting disk.



1 Lifting disk
2 Chain
3 Source capsule
4 Connecting ring

Figure 1-6. M1A1 gamma cobalt 60 radioactive source assembly.

WARNING

The Co-60 source in the M3A1 Radioactive Source Set emits gamma radiation. All use of radioactive source set must be under the supervision of a qualified individual who has received specific training in the proper use of the set.

WARNING

Never eat, drink, or smoke in areas where radioactive material are used/stored.

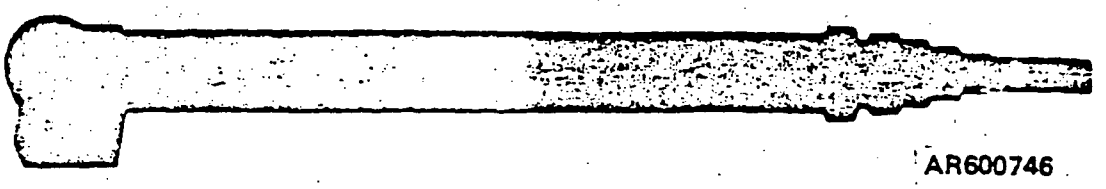
(1) Radioactive Source Capsule. The radioactive source capsule is a sealed steel capsule, 1/4 inch in diameter by 5/8 inch high, containing Co-60. An eye in the stem at the top of the capsule permits the capsule to be suspended from a lifting disk by a chain. The activity of the radioactive source at the time of initial calibration may vary from 80 to 130 mCi. (For an activity level of 100 mCi of Co-60, the exposure dose rate is 132 mR/hr at a distance of 1 meter from the source capsule.) Co-60 has a half-life of 5.3 years and emits one beta particle (energy: 0.32 MeV) and two gamma rays (energy: 1.17 MeV and 1.33 MeV) per disintegration. The steel wall of the capsule stops most of the beta particles but the gamma rays pass through the wall.

(2) Ring and Chain Assembly. The ring and chain assembly consists of a round link brass chain, approximately 5 inches long, with two connecting rings (4) at each end of the chain. One end of the ring and chain assembly is connected to the underside of the lifting disk (1); the other end is connected to the radioactive source capsule.

(3) Lifting Disk. The lifting disk, made of ferromagnetic steel, is approximately 13/16 inch in diameter and 1/16 inch thick. A metal eye on the

underside of the disk provides the means for attaching the ring and chain assembly. The underside of the disk is marked with the serial number of the radioactive source assembly, the activity of the source at the time of initial calibration, the date at which the activity was determined, and the words: COBALT 60. The upper side of the disk is marked with the words: DANGER RADIOACTIVE MATERIAL, NOTIFY ARMY AUTHORITIES IF FOUND, and with the word: DANGER, above a radiation hazard symbol.

d. M4 Telescoping Radioactive Source Magnetic Handler. The M4 telescoping radioactive source magnetic handler (fig.1-7 and 1-8) is designed to manipulate the M1A1 gamma Co-60 Radioactive Source Assembly. When using the fully extended magnetic handler, the operator can remain at a safe distance for the short time required to place or remove the radioactive source. Telescope the handler when not in use (fig. 1-7), and stow it in the storage case. The handler weighs approximately 2 1/2 pounds and is approximately 20 inches long when telescoped and 72 inches inches long when fully extended (See figure 1-8). The magnetic handler consists essentially of a flexible arm assembly (2, fig. 1-8), three extensions of aluminum tubing (3), and a handle and housing assembly (5). Knurled retaining nuts (4), fitted with plastic packing rings, hold the telescoping sections of the handler in the extended position. A small permanent magnet under a stainless steel magnet cap (1) is attached by a length of wire that passes through the telescoping sections of the handler to a spring-loaded motor assembly in the handle and housing assembly (5). A compression spring holds the magnet against the magnet cap; a magnet control knob (6) retracts the magnet. When the magnet is against the cap, the handler picks up and holds the radioactive source assembly. When the magnet is retracted, the radioactive source assembly is released from the handler.



1 Magnet cap
2 Flexible arm assembly
3 Extension
4 Retaining nut
5 Handle and housing assembly
6 Magnet control knob

Figure 1-7. M4 radioactive source magnetic handler (telescoped).

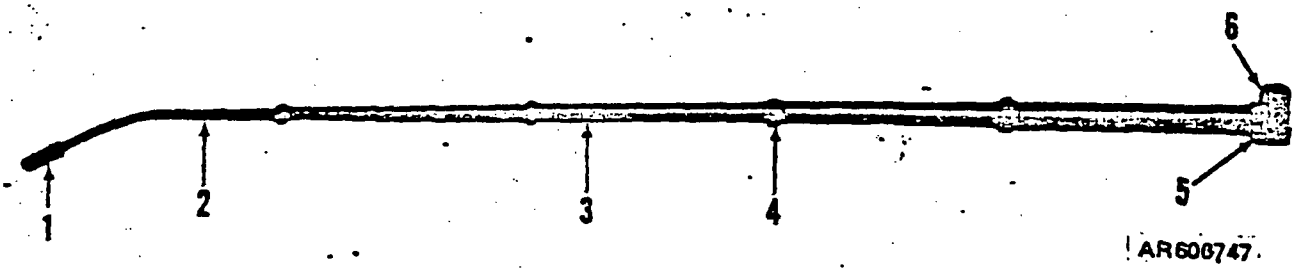


Figure 1-8. M4 radioactive source magnetic handler (extended).

1-11. Tabulated Data

Numerical data are approximate.

Radioactive Material.....Co-60 (0.32 MeV beta particle; 1.17 and 1.33 MeV gamma rays)

Activity at time of initial calibration....80-130 mCi.

Exposure rate for 100 mCi Co-60.....132 mR/hr at 1 meter

Dose rate at surface of capsule.....Greater than 10,000 Rad (R)/hr

Half-Life.....5.3 years

Weight:

M3A1 Radioactive Source Set.....150 lb.

Magnetic handler.....2.5 lb.

Cubage:

M3A1 Radioactive Source Set.....1.75 cu. ft.

NRC License Number.....

BE Permit Number.....BE670

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. Preparation For Use

2-1. Initial Inspection

When the M3A1 Radioactive Source Set is received, the operator, under the supervision of the RPO or his qualified designee, will:

a. Post the radiation area (para 2-3).

b. Inspect the exterior and interior of the storage case for damage. Examine the case and contents for missing parts. If the source set is damaged or parts missing, report an improper shipment (SF 364).

c. Within three hours during normal duty time or within 18 hours of nonduty time from initial receipt, perform a leak test (para 2-5), or at any time a leak is suspected. If the source set is leaking, emergency procedures set forth in paragraph 2-18 will be followed.

d. Inspect the M4 magnetic handler for workability (para 2-9b).

e. Compare the serial number on the underside of the lifting disk with the serial number recorded on the Co-60 decay curve chart (para 2-8).

f. Determine present source strength (para 2-12).

2-2. Calibration of M3A1 Radioactive Source Set

The M3A1 Radioactive Source Set will be sent to depot maintenance personnel once a year for calibration.

2-3. Posting Radiation Controlled Area

a. A radiation controlled area is a delineated area under the supervision of an individual in charge of radiation protection. The perimeter of a radiation controlled area is established where the radiation level is 2 mR/hr or less. Only authorized individuals wearing a film badge or other personnel monitoring devices shall be permitted within the radiation controlled area.

b. Establish the perimeter of the radiation controlled area through estimation and calculation prior to exposing the source. Rope off or otherwise establish, with barriers and signs, the perimeter of the radiation controlled area. After the source is exposed, verify perimeter barriers using an AN/PDR-27( ) or equivalent, and adjust the barriers as necessary. A high radiation area is any area accessible to personnel in which radiation exists such that a major portion of the body could receive a dose in excess of 100 millirem (mrem) in any one hour.

NOTE

If an unshielded Co-60 source having an activity of 100 mCi is being used, the radiation controlled area will be all the area within the radius of approximately 8 meters (26.2 feet) of the source. The radiation controlled area of a more active source will be larger, and the radiation controlled area of a less active source will be smaller.

c. Post radiation warning signs at conspicuous points adjacent to the periphery of the radiation controlled area so that only authorized personnel with film badge dosimeters will be permitted. Self-reading dosimeters are required as a positive means of preventing overexposures. They are also required for

personnel approaching or entering the high radiation area. Figure 2-1 shows suggested dimensions for radiation warning signs. The dimensions of the signs can be varied so long as the proportions of the three-bladed radiation hazard symbol remain as shown and the wording is easy to read.

d. Post NRC Form 3 (contained in the back of this TM), in a conspicuous location near the radioactive source set.

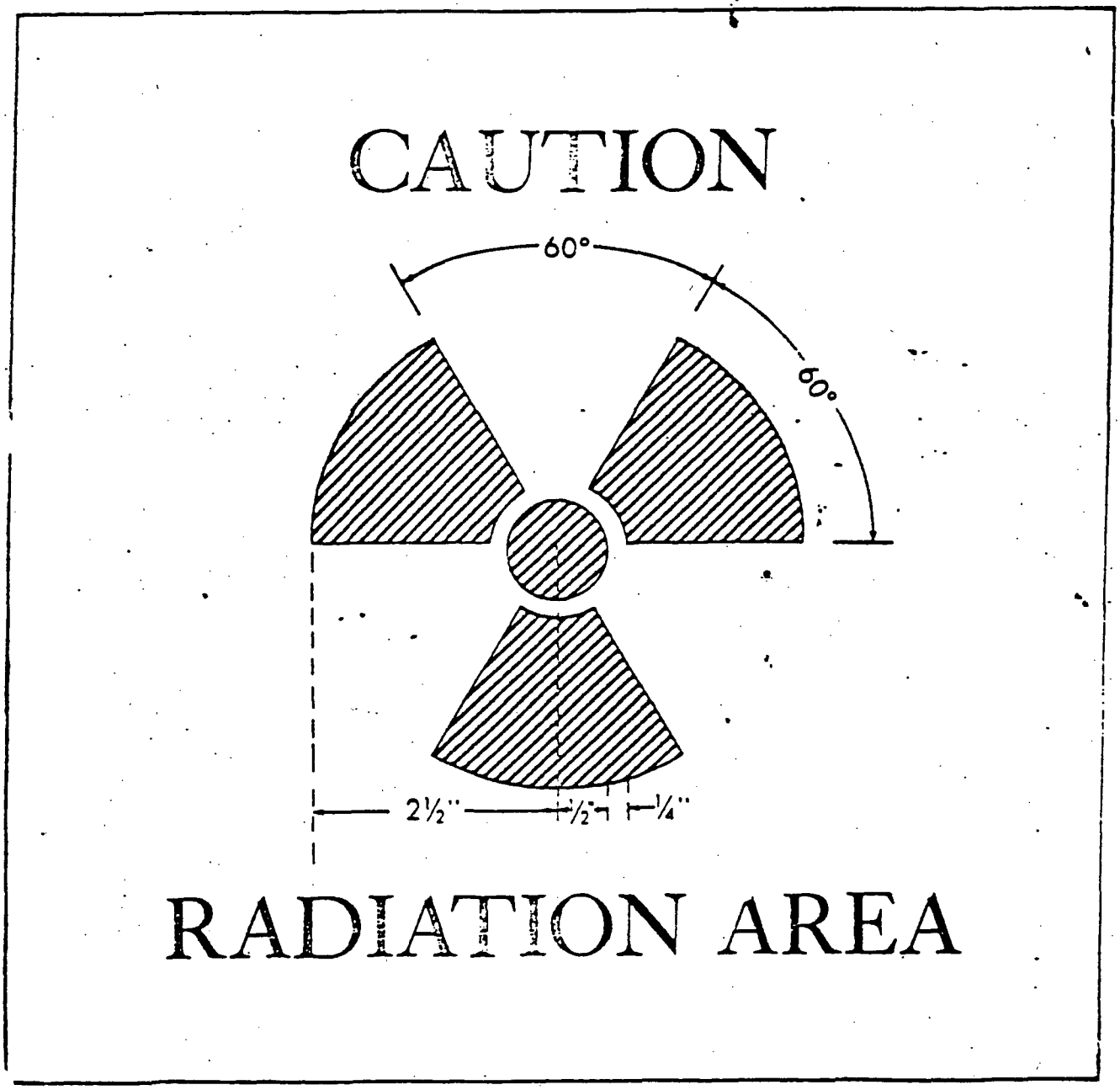


Figure 2-1. Radiation warning sign.

2-4. Dosimetry Records

a. AR 40-14 prescribes procedures and responsibilities for the control and recording of personnel exposures to ionizing radiation. Adherence to these procedures will assure proper monitoring/recording of personnel dosimetry.

Section II. LEAK TEST

2-5. Leak Test

a. Perform a leak test (wipe test) upon receipt of a radioactive source set, at least once every 6 months thereafter, prior to shipment, or at any time it is suspected that the radioactive source may be leaking.

WARNING

Wear a film badge, calibrated dosimeter, and disposable protective gloves when performing the leak test. Do not spread contamination by touching other objects with the gloves. Do not leave the unshielded radioactive source or the opened storage case unattended. Do not stay in the radiation area any longer than necessary to perform the leak test.

a. Assemble the Following Items Before Beginning Leak Testing Procedures.

(1) A calibrated beta-gamma type radiac survey meter such as the AN/PDR-27( ) Radiac Set.

(2) A film badge and calibrated IM-9( )/PD Radiac Dosimeter for each individual taking part in the leak testing procedure.

(3) Disposable protective gloves for the individual performing the wipe.

(4) Cotton swabs furnished by the US Army Ionizing Radiation Dosimetry Center (AIRDC).

(5) Plastic bags provided by AIRDC.

(6) Distilled or clean tap water.

NOTE

Select an area away from the normal stream of traffic. The area of the test site should be unobstructed and have a level floor or ground surface.

b. Perform the Wipe Test.

WARNING

Wear disposable protective gloves.

(1) Record the serial number of the radioactive source set on the paper tab. (The set bears the same serial number as the radioactive source capsule.)

(2) Using the remote magnetic handler, remove the radioactive source from the well and then, gently but thoroughly, wipe the sides and bottom of the well in the shield and the surfaces of the plug that fit into the shield with the moistened cotton swab.

(3) Return the radioactive source to the shield (para 2-10).

WARNING

After removal of the swab from the access well, DO NOT lay the swab down or allow it to touch any other object.

2-6. Test Evaluation

a. Position a calibrated AN/PDR-27( ) Radiac Set over the cotton swab. Place the probe of the radiacmeter (with the beta window open) as close to the filter disk as possible. DO NOT ALLOW THE PROBE TO TOUCH THE COTTON SWAB.

(1) If the dose rate is 0.4 mR/hr or twice the background radiation, discontinue use of the source set and lock the radioactive source in the shield. If necessary, decontaminate the outside of the shield and the storage case. Report results tc the command RCO and request disposition instructions.

(2) The cotton swab should be placed in the provided plastic bag and then placed in a small cardboard box and mailed to AIRDC.

WARNING

The radiation reading at the surface of the box must not exceed 0.4 mR/hr. If the measured radiation is more than 0.4 mR/hr, wrap a thin sheet of lead, aluminum, or other metal around the plastic bag and place in a small cardboard box.

(3) If the meter reading is less than 0.4 mR/hr, place the cotton swab in the provided plastic bag and submit to AIRDC for evaluation. The set may be used while awaiting the report from the laboratory.

NOTE

AIRDC will report its evaluation of the filter disk in microcuries (uCi) of Co-60. If the report indicates 0.005 uCi of Co-60 or greater, turn the radioactive source set in for disposal. If the report indicates less than

0.005 uCi of Co-60, the radioactive source set may be used.

b. If laboratory equipment capable of accurately measuring 0.001 uCi is available, and approval has been granted by CECOM to perform leak test analyses, evaluate the cotton swab, and send a copy of the results of the test to the area RMCP. If the quantity of Co-60 on the disk measures more than 0.005 uCi, the radioactive source set is unserviceable and should be turned in for disposal.

(4) Installation commanders in CONUS will forward smear samples for evaluation to:

Chief
US Army Ionizing Radiation Dosimetry Center
ATTN: AMXTM-CE-DC
Lexington, KY 40511

(3) AIRDC will forward a test evaluation report to the sender.

(4) Commanders at overseas installations will follow the procedures established by the responsible commander.

2-7. Test Records

a. Maintain records of leak tests. Indicate date, results, and name of personnel performing the test.

b. Test records are subject to periodic inspections.

Section III. OPERATING UNDER NORMAL CONDITIONS

WARNING

Once the lead plug is removed from the shield, the source is an exposed radiation hazard. Always use the magnetic handler for handling the radioactive source. Never touch the radioactive source capsule.

2-8. Checking Serial Numbers

a. The serial number on the underside of the lifting disk (ring) of the radioactive source assembly and the serial number on the Co-60 decay curve chart (attached inside the cover of the storage case) must be identical. If the serial numbers are not identical, the radioactive source set cannot be used for calibration purposes, since the source strength value printed on the chart will not correspond to the activity of the radioactive source.

b. Compare the serial numbers on the lifting disk and the chart upon receipt of a radioactive source set. If the serial numbers on the disk and chart differ, report an improper shipment (SF-364).

c. To check the serial number on the underside of the lifting disk, follow the procedures described in paragraph 2-9b(1) through (6). Raise the lifting disk of the radioactive source assembly just high enough to deposit the lifting disk on the rim of the shield. Be sure to keep the radioactive source capsule in the well of the shield. Use a pair of pliers to turn the lifting disk over. Be careful not to overdraw the radioactive capsule from the shield. Make note of the serial number and return the disk to its original position in the shield.

2-9. Removing the Radioactive Source From the Shield

a. General. Each time the radioactive source is removed from the shield, use the probe of an AN/PDR-27( ) Radiac Set to test the well in the shield for radioactive contamination (para 2-5c). If contamination is detected, return the source to the shield using the magnetic handler, and follow emergency procedures (para 2-17 and 2-18).

b. Using the M4 Magnetic Handler.

(1) Remove the M4 magnetic handler (fig. 1-7) from the storage case. Extend the flexible arm assembly (2, fig. 1-8) and each of the three extensions in turn. Tighten each of the four retaining nuts just enough to hold the handler in the extended position. Bend the flexible arm downward.

(2) Make sure that the magnetic handler is fully extended and in proper operating condition. Bring the front end of the magnet cap (1, fig. 1-8) close to a paper clip or small nail. The clip or nail should be attracted and held to the cap by the magnet. Turn the magnet control knob (6) about one-fourth turn counterclockwise to retract the magnet and release the clip or nail from the magnet cap.

CAUTION

Never turn the magnet control knob unless the magnetic handler is fully extended. Never turn the knob in a clockwise direction.

(3) Unlock the combination lock (5, fig. 1-4) and remove the lockbar (4).

NOTE

The RPO will maintain the combination and change the combination as required. The RPO will keep the key that is used to change the combination. When a radioactive source set is transferred from one installation to another, the combination for the lock and the key for changing the combination will be forwarded under separate cover, they will not be sent with the set.

(4) Remove the lead plug (3) from the shield and step back from the shield as quickly as possible.

WARNING

Never look into the well of the shield or unnecessarily expose parts of the body to the radiation.

(5) Bring the magnet cap end of the handler in contact with the lifting disk.

(6) Lift the radioactive source assembly out of the shield with the handler and carry it to the calibration site.

2-10. Returning The Radioactive Source To The Shield

Use the magnetic handler (remote-handling tongs) to return the radioactive source assembly to the shield, and lower the source capsule gently into the well of the shield. Do not look into the well. Release the lifting disk, replace the lead plug in the shield, insert and lock the lockbar. Loosen the nuts on the extension arms of the magnetic handler to telescope the handler, place the handler in the storage case and close the case.

Section IV. CALCULATIONS

2-11. General

The activity of Co-60 decreases with time, therefore the strength of the source must be determined before calibrating an instrument. After determining source strength, the dose rate in mR/hr, at a given distance from the source, and distance from the source required to obtain a given dose rate, can be calculated. Distance from source is measured in meters. One meter is equals to 39.37 inches.

2-12. Determining Present Source Strength and Calculating Dose Rates, Distances, and Dose

a. Determining Present Source Strength.

(1) From the Co-60 decay curve chart (fig 1-5) attached inside the cover of the storage case, note the date of initial calibration (year and month) and the strength of the source in mR/hr at 1 meter on that date. Compute the years and months that have elapsed since that date.

(2) From the decay curve on the chart, determine the percent strength remaining in the source.

(3) Calculate the present source strength using the following formula: Present strength = (strength when initially calibrated) x (percent strength remaining) ÷ 100.

Example:

Present date.....August 1984

Date of initial calibration....February 1982

Elapsed time.....2 years 6 months

Percent strength remaining.....72

Strength of source: 132 mR/hr at 1 meter when initially calibrated

Calculation..... $\frac{132 \times 72}{100} = 95.04$

Present strength.....95.04 mR/hr at 1 meter from the source

b. Calculating Dose Rate at a Given Distance. Use the following formula to calculate the dose rate at a given distance (d): $R = \frac{S}{d^2}$

Where: R = dose rate in mR/hr

S = present source strength (a above)

d = distance from source in meters (1 meter equals 39.37 inches 3.281 feet).

Example:

Present strength.....95.04 mR/hr at 1 meter (a above)

Distance from source (d).....2 meters

Calculation..... $\frac{95.04}{2^2} = \frac{95.04}{4} = 23.76$

Dose rate (R).....23.76 mR/hr at 2 meters

c. Calculating Distance From Source to Obtain a Given Dose Rate. Use the following formula to calculate the distance at which a given dose rate (R) will be obtained:

$$d = \sqrt{\frac{S}{R}}$$

Where: d = distance from source in meters

S = present source strength

R = given dose rate in mR/hr

Example:

Present source strength (S), 95.04 mR/hr at 1 meter (a above).

Given dose rate (R), 23.76 mR/hr at 2 meters (b above).

Calculation..... $\sqrt{\frac{95.04}{23.76}} = \sqrt{4} = 2$

Distance from source (d) equals 2 meters

d. Calculating the Dose. Use the following formula to calculate the dose (D) at a given distance when the dose rate (R) at a given distance and the exposure time (t) are known, D = Rt.

Where: D = the total amount of absorbed radiation (mR)

R = the dose rate at the given distance (mR/hr)

t = time of exposure in hours

Example:

Dose rate (R) at 2 meters equals 23.76 mR/hr (b above).

Let time (t) equal: 1/2 hr

Calculation.....23.76 x 1/2 = $\frac{23.76}{2}$ = 11.88

Dose (D).....11.88 mR

Section V. CALIBRATION OF RADIAC SURVEY METERS AND DOSIMETERS

2-13. General

Calibration of radiac survey meters and dosimeters provides the means for determining to what extent an instrument reading deviates from the true value. Calibration may be performed by checking the instrument against a standard radioactive source, the M3A1 Radioactive Source Set can be used for this purpose.

2-14. Calibration of Radiac Survey Meters

a. General. Radiac survey meters should be calibrated each time electronic components are changed, after long periods of continual use, and after being exposed to extreme temperature changes (FM 21-48).

b. Preliminary Procedure.

WARNING

Never take the radioactive source from the shield without having a radiacmeter available and in good working order; e.g., an AN/PDR-27( ) Radiac Set or equivalent.

(1) Prepare a worksheet for record purposes. Record the name and serial number of the radiac survey meter that is to be calibrated, the serial number of the radioactive source, the date, and the name of the individual performing the calibration. Prepare a table with the following column headings:

(a) Distance from Source (meters).

(b) Calculated Dose Rate (mR/hr).

(c) Survey Meter Scale Reading (mR/hr).

(2) Under the Distance from Source reading, list 1/2; 1; 1 1/2; 1 3/4; 2; 2 1/2; 3; 4; 5; 7; and 9 meters.

(3) From the Co-60 decay curve chart, calculate the present strength of the radioactive source (para 2-12a).

(4) Use the value obtained to calculate the dose rate for each of the distances listed in the table (para 2-12b). Record these dose rates.

(5) Calculate the distance from the radioactive source at which the dose rate is 0.4 mR/hr (para 2-12c). List the distance and the dose rate in the table.

(6) Calculate the distance from the radioactive source at which the dose rate is 2.0 mR/hr (para 2-12c). Use the calculated distance to delineate the radiation area (para 2-3).

c. Prepare a Calibration Site.

WARNING

Before removing the radioactive source capsule from the shield, select a calibration site in an area that is away from the normal stream of traffic. The selected site should be unobstructed and have a level floor or ground surface.

(1) Mark with an "X" the point (center of site) where the radioactive source will be located. Draw a straight line approximately 16 meters long from the point X.

(2) Starting from the point marked X, measure and mark off intervals for each of the distances listed in the table.

(3) Use the point marked X as the center of a circle and calculate the distance for a dose rate of 2 mR/hr as the radius; post the radiation area (para 2-3).

(4) Provide a wood stand with a hook or other means for suspending the radioactive source directly over and approximately 3 inches above the point marked X.

d. Obtain Survey Meter Readings.

WARNING

Never allow personnel without film badges and dosimeters inside the restricted area. Do not linger in the radiation area any longer than is necessary to obtain the meter readings.

(1) To check the survey meter for proper operation, use the procedures described in the appropriate TM. Record the background reading.

(2) Remove the radioactive source from the shield (para 2-9) and suspend the source over the point marked X. Leave the radiation area.

(3) Start with the highest scale on the survey meter and obtain three meter readings on each scale (except the 0 to 0.5 mR/hr scale); one near the top, one near the middle, and one near the lower end of each scale. Obtain one reading ((c) below) on the 0 to 0.5 mR/hr scale.

(a) Select the scale to be calibrated. Start with the marked interval closest to the point X and work away from the source. Before taking a reading, place the survey meter so that the detecting element in the meter is centered on the interval marked.

(b) Record each reading in the proper place on the table.

(c) Turn the selector switch to the 0 to 0.5 mR/hr scale. Place the survey meter at the marker farthest from the source (the point at which the calculated dose rate is 0.4 mR/hr). Observe and record the reading.

(d) Return the radioactive source to the shield (para 2-10).

e. Evaluate the Data. Compare the tabulated readings with the comparable calculated dose rates for each distance from the radiactive source as recorded in the table.

(1) If any tabulated reading differs by more than ±15 percent from the calculated dose rate, do not continue the calibration but turn the survey meter in for adjustment or repair.

(2) If all the tabulated readings are within ±15 percent of the calculated dose rate, prepare a calibration curve as described in f below.

f. Preparing a Calibration Curve.

(1) Use linear graph paper to mark off calculated dose rate intervals on the horizontal axis and survey meter scale intervals on the vertical axis; date the graph with the calibration date.

(2) Plot each survey meter reading in the table against the comparable calculated dose rate.

(3) Complete the calibration graph by drawing a smooth curve through the plotted points.

(4) Attach the calibration graph to the radiac survey meter.

g. Use the Calibration Curve. Each time a survey meter reading is observed, refer to the calibration graph and obtain the true dose rate. Report as survey data the true dose rate obtained from the curve.

2-15. Calibration of Radiac Dosimeters

a. General. IM-9( )/PD Radiac Dosimeters should be calibrated every 6 months (TB 750-242-3). If, after exposure to a radioactive source, a dosimeter scale reading differs from the comparable calculated dose by more than ±10 percent (f(3) below), the dosimeter should be turned in as unserviceable.

b. Preliminary Procedure.

WARNING

Never take the radioactive source from the shield without having a radiacmeter available and in good working order; e.g., an AN/PDR-27( ) Radiac Set or equivalent.

(1) Draw a table with three column headings and date it with the calibration date. Head the three columns as follows:

(a) Dosimeter Serial Numbers.

(b) Scale Reading (SR), mR.

(c) Correction Factor (CF).

(2) In the first column of the table, list the serial number of each dosimeter that is to be calibrated.

(3) Use data from the Co-60 decay curve chart to calculate the present strength (mR/hr at 1 meter) of the radioactive source (para 2-12a). Record this value on the worksheet.

(4) Use the value obtained above to calculate the dose rate (mR/hr) at a distance of 1/2 meter from the radioactive source (para 2-12b). Record this value on the worksheet.

(5) Calculate the dose (mR) resulting from a 15 minute and a 30 minute exposure at a distance of 1/2 meter from the radioactive source (para 2-12d). Record on the worksheet the Calculated Dose (CD) that is closest to 150 mR. Record length of the exposure.

NOTE

The CD resulting from a 15 minute exposure at 1/2 meter will be numerically equal to the present strength of the radioactive source ((3) above). For example, if the present strength of the source is 95.04 mR/hr at 1 meter, the CD resulting from a 15 minute exposure at 1/2 meter will be 95.04 mR. The CD resulting from a 30 minute exposure at 1/2 meter will be numerically equal to twice the present strength of the radioactive source. For example, if the present strength of the source is 95.04 mR/hr at 1 meter, the CD resulting from a 30 minute exposure at 1/2 meter will be twice 95.04 or 190.08 mR.

(6) Calculate the distance from the radioactive source at which the dose rate is 2 mR/hr (para 2-12c). Record this value on the worksheet and use it to delineate the radiation area (para 2-3).

c. Preparing the Calibration Site.

WARNING

Never leave an unshielded radioactive source unattended. If necessary to leave the source set, re-shield the radioactive source and lock the container.

(1) Select a calibration site that is away from the main stream of traffic.

(2) Select a flat unobstructed surface within the calibration area and draw a circle having a radius of 1/2 meter.

(3) Mark the center of the circle; this is where the radioactive source will be suspended.

(4) Prepare a wood stand with a hook or other means for suspending the radioactive source directly over and approximately 3 inches above the center of the circle.

d. Charging Radiac Dosimeters. Radiac dosimeters must be fully charged before they are calibrated. Charge the dosimeters as described in TB SIG 226-9. Be sure that the SR is zero on each dosimeter to be calibrated.

WARNING

Wear film badges and dosimeters. Do not linger in the radiation area any longer than is necessary. Do not leave

the unshielded radioactive source unattended.

e. Exposing Charged Dosimeters to the Radioactive Source.

(1) Stand dosimeters to be calibrated approximately 6 to 8 inches apart on the circumference of the circle (c(2) above). Stand each dosimeter on its viewing end (the end with the clip).

(2) Remove the radioactive source from the shield (para 2-9) and suspend the source over the center of the circle. Note and record the exact time (hours, minutes, and seconds).

(3) Leave the radiation area.

(4) Expose the dosimeters to the radioactive source for either exactly 15 minutes or exactly 30 minutes depending on the strength of the source (b(3) above).

(5) As quickly as possible, remove the source and return it to the shield (para 2-10).

f. Calibrating Radiac Dosimeters.

(1) Collect the exposed dosimeters. Read each dosimeter and enter the SR in the second column opposite the appropriate serial number in the first column.

(2) Calculate a CF for each dosimeter. Divide the CD (b(3) above) by the SR listed in the second column on the worksheet and list the CF in the third column opposite the appropriate serial number.

Example:

$$\frac{CD}{SR} = CF$$

If the CD is 180 mR and the meter reading is 190 mR, the CF is $\frac{180}{190}$ or 0.95.

(3) Scan the list of CF's in the third column of the table. Any dosimeter requiring a CF of less than 0.90 or greater than 1.10 is considered unserviceable and should be turned in.

(4) Record the calibration date, serial number, and CF for each serviceable dosimeter on separate pieces of paper and attach the papers to the appropriate dosimeters.

Section VI. EMERGENCY SITUATIONS AND PROCEDURES

NOTE

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

2-16. Loss of a Radioactive Source Set

a. Try to recover the radioactive source set.

(1) Review records to determine the responsible individual.

(2) Make a physical survey.

b. If the radioactive source set is recovered, revise procedures as necessary to prevent recurrence.

c. If the radioactive source set is not recovered, report the loss through command channels to the RMCP and to the US Army Communications-Electronics Command, ATTN: AMSEL-SF-MR, Fort Monmouth, NJ 07703-5024. State the serial number of the source, the circumstances involved, and the procedures taken to prevent recurrence.

2-17. Internal Exposure of Personnel.

a. Internal exposure results when radioactive material is ingested, inhaled and/or absorbed through breaks in the skin.

b. In the event of known or suspected internal exposure:

(1) Seek immediate advice from the Medical Officer.

(2) Contact the local RPO.

(3) Prepare a written report of the circumstances leading to the internal exposure; include serial number(s) of the M3A1 involved, actions taken to prevent recurrence, and any other applicable information. Forward the report through proper command channels to: Commander, US Army Communications-Electronics Command, ATTN: AMSEL-SF-MR, Fort Monmouth, NJ 07703-5024.

2-18. Damaged or Leaking Radioactive Source Set

a. The M3A1 may leak as a result of age or damage to the source. Action required in the event of a known or suspected leaking source is:

(1) Discontinue use of the M3A1.

(2) Check personnel, equipment, and areas for possible contamination and decontaminate as necessary.

(3) Notify the RMCP and the CECOM Safety Office of the occurrence and follow provided disposition instructions.

2-19. Firefighting Emergency Procedures

a. General. Emergency plans must include procedures for extinguishing fires involving radioactive items. Firefighting personnel must know the location(s) of the radioactive items and be familiar with radiation protection procedures. The M3A1 Radioactive Source Set and M1A1 Source Assembly are designed to withstand high temperatures. Even in temperatures high enough to melt the lead shield, the lead will be contained within the steel jacket and surround the source. No airborne radioactivity is expected from a fire involving only the M3A1 Radioactive Source Set. However, if other radioactive sources are involved, firefighting activities may involve airborne radioactivity. As a general rule, personnel should wear protective respiratory equipment when fighting

fires involving radioactive items.

b. Emergency Procedures.

(1) Evacuate personnel in the immediate area who are not directly involved.

(2) Notify the fire department.

(3) Determine radiation hazard and type of respiratory equipment required. Extinguish the fire with readily available portable extinguishers if a radiation hazard is not present.

(4) Notify the RPO.

(5) Notify medical personnel when appropriate.

(6) Control access to the immediate area.

(7) Monitor personnel, equipment, supplies, and environs and decontaminate as necessary.

(8) Record and report the fire on the appropriate forms.

CHAPTER 3

OPERATOR'S MAINTENANCE INSTRUCTION

3-1. General

a. The operator must perform inspection and preventive maintenance services under the supervision of an RPO who has received specific training in the proper operation of the M3A1 Radioactive Source Set and who has met the minimum qualifications as defined in paragraph 1-5 of this manual.

b. The operator is authorized to clean the exterior of the storage case and to clean the M4 telescoping radioactive source magnetic handler.

3-2. Operator's Preventive Maintenance Checks and Services

a. General. Inspection and maintenance services described in Table 3-1 will be performed each day the equipment is used and at least semiannually when the equipment is in unit storage. Deficiencies beyond the maintenance capability of the operator must be reported to higher level maintenance.

b. Purpose. The preventive maintenance checks and services table provides a step-by-step guide for making inspections and performing required preventive maintenance.

c. Explanation of Columns. The numbers in the first three columns indicate the sequence in which the item listed in the fourth column should be inspected. The procedures for performing the inpsections and the paragraph references are listed in the fifth column. In the sixth column, the estimated mean value of time to perform each individual test is shown in man-hour units.

Table 3-1. Operator's Preventive Maintenance Checks and Services

B-Before Operation Time required: 2.0 | D-During Operation | A-After Operation Time required: 0.1

Interval and sequence No. B	D	A	ITEM TO BE INSPECTED PROCEDURE	Work time (M/H)
			WARNING Follow the instruction in paragraph 2-3 before removing the radioactive source capsule from the shield in the storage case. Use the magnetic handler to handle the radioactive source.	
1			STORAGE CASE Inspect the exterior of the storage case for breakage.	0.1
			Check to see if the paint is chipped or peeled, and if the hardware is loose, damaged, or missing.	0.1
2			IDENTIFICATION PLATE Make sure that an identification plate (2, fig. 1-2) is attached to the outside cover of the case and that markings on the plate are legible. Check the replacement date on the identification plate. (The replacement date also appears on the decay curve chart.)	0.1
3			TECHNICAL MANUAL Make sure that a copy of this manual, TM 3-6665-214-13&P, in usable condition, is packed in the case.	0.1
4			M4 MAGNETIC HANDLER Inspect the magnetic handler to make sure that it is clean and functions properly.	0.3
5			COBALT 60 DECAY CURVE CHART Check the chart (fig. 1-4) on the inside cover of the storage case to make certain that the information printed on the chart is legible.	0.1
6			SHIELD ASSEMBLY Inspect the lead shield (11, Fig. 1-4) to make certain that it is undamaged. See that the plug (3) and the lockbar (4) are in place and that the padlock (5) is locked. If the lock is open or broken, do not remove	

			the plug but check the surface of the storage case with any approved radiac meter capable of measuring a dose rate of 5 mR/hr to 200 mR/hr to determine if the radioactive source capsule is in the shield. A reading in excess of 5 mR/hr but less than 200 mR/hr indicates the presence of the radioactive source in the shield. Perform a leak test (para 2-5).	0.3 0.8
7			RADIOACTIVE SOURCE ASSEMBLY Inspect the radioactive source assembly to make sure that the source capsule is suspended from the lifting disk (or ring).	0.1
		8	STORAGE CASE Clean the exterior of the storage case by wiping it off with a clean, damp cloth.	0.1

CHAPTER 4

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. PREVENTIVE MAINTENANCE SERVICES

4-1. General

Organizational maintenance personnel must perform inspection and preventive maintenance services under the supervision of an RPO.

4-2. Preventive Maintenance Checks and Services (Table 4-1)

Organizational maintenance personnel are authorized to perform the preventive maintenance services listed below. Except for the motor and clutch assembly, these services should be performed weekly when the source set is in use. Motor and clutch assembly should be inspected and serviced monthly after issue to field personnel. Deficiencies beyond their maintenance capability must be reported to higher level maintenance.

a. Make minor repairs of the storage case, such as replacing missing nails and screws and tightening loose screws and nuts.

b. Retouch or repaint the storage case when necessary (para 4-3).

c. Replace or repair lockbar.

d. Inspect, service, and repair magnet, flexible arm, and extension assembly of the M4 telescoping radioactive source magnetic handler. Repair is limited to removal of distorted segment(s) of flexible arm assembly or extensions.

e. Inspect and service motor and clutch assembly.

Table 4-1. Organizational Maintenance Checks and Services

Weekly
Time required: 5.2

Sequence No.	ITEM TO BE INSPECTED PROCEDURE	Work time (M/H)
1	STORAGE CASE	
	Make minor repairs. Tighten loose screws and nuts. Replace missing nails and screws. Retouch or repaint case (para 4-3a).	0.5
2	RADIOACTIVE SOURCE AND SHIELD ASSEMBLY	
	Repair lockbar, if damaged.	0.3
	Replace lockbar, if missing (para 404).	1.0
3	M4 RADIOACTIVE SOURCE MAGNETIC HANDLER	
	Inspect Magnet, flexible arm, and extension assembly.	0.6
	Repair, if damaged (para 4-5c and table 4-2).	0.7
	Inspect motor, clutch assembly, magnet control, and handle housing cover.	1.8
	Service, if needed (para 4-5c).	0.3

Section II. ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

4-3. Storage Case

Organizational Maintenance personnel are authorized to make minor repairs of the storage case, to retouch the paint on the storage case and, when necessary, to thoroughly clean and repaint the case.

a. Paints To Be Used. Use synthetic paint primer and synthetic gloss enamel. (Refer to TM 43-0139 for painting instructions.)

(1) Primer. Paint all exposed exterior surfaces with one coat of primer.

(2) Enamel.

(a) Paint the storage case with yellow gloss enamel color number 13655.

(b) Paint radiation symbols (3, fig. 1-2) and eliptical DANGER Warning backgrounds (5) with magenta (purple) gloss enamel color number 17142.

(c) Paint the word DANGER on the elipitical DANGER Warning backgrounds with white gloss enamel color number 17875.

(d) Paint the words RADIOACTIVE MATERIALS underneath the radiation symbols with black gloss enamel color number 17038.

b. Identification Plate. If the identification plate (fig. 5-1) is bent or twisted, remove the plate from the storage case and straighten it. Secure the repaired plate to the cover of the storage case.

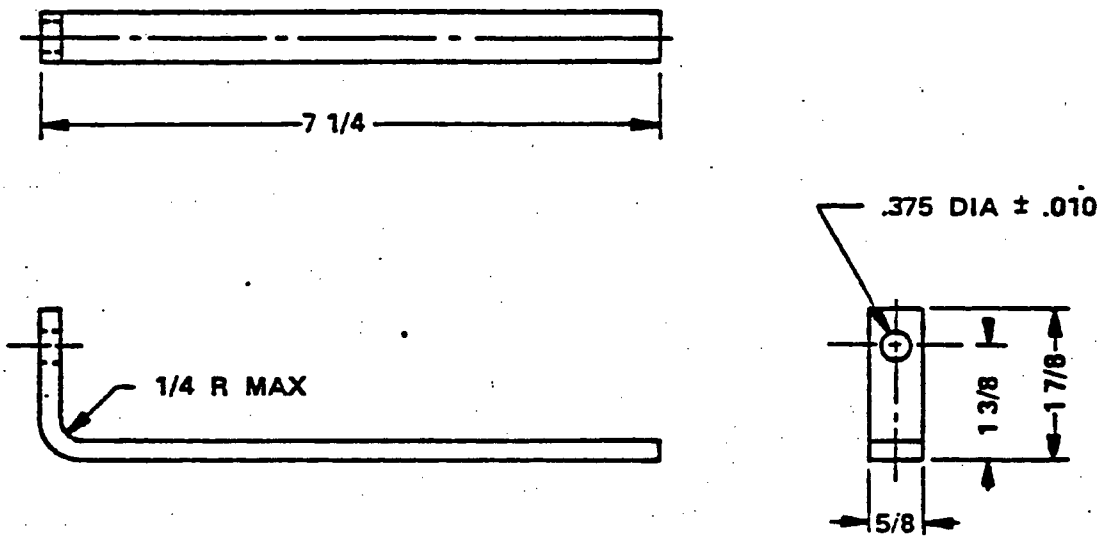
4-4. Radioactive Source and Shield Assembly (Lockbar)

a. General. Organizational support maintenance personnel are authorized to repair, replace, and manufacture a new lockbar, if necessary. If the lockbar is damaged beyond repair, or if it is missing, replace it.

b. Description. The steel lockbar (4, fig 1-4) passes through the handle of the plug and through slots in the lugs (12) on the shield. The shackle of a combination lock (5) passes through round holes in the bent end of the lockbar and through an adjacent lug to secure the radioactive source in the shield.

c. Inspection. Inspect the lockbar for distortion, cracks, or other damage. Replace if damaged or missing.

d. Manufacture. Fabricate the lockbar (fig. 4-1).



STEEL BAR, CARBON, HOT ROLLED, ANNEALED, 1018 OR 1020, 1/4 NOM STK THK, SPEC QQ-S-631, OR

(A) STEEL BAR, CARBON, COLD FINISHED, ANNEALED, 1018 OR 1020, 1/4 NOM STK THK, SPEC QQ-S-634

PROTECTIVE FINISH
FINISH NO. 5.1.1 OR 5.1.2

AR601246

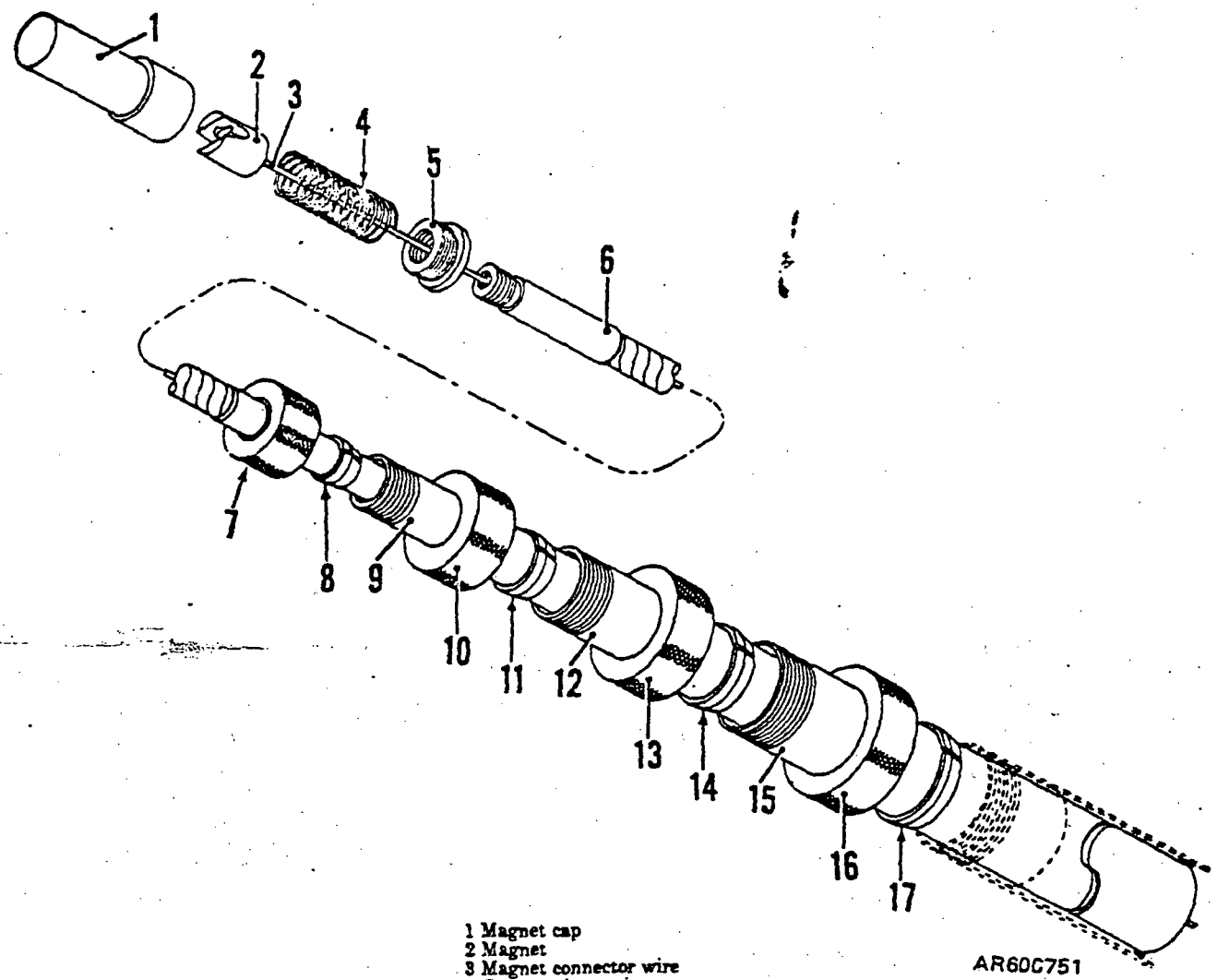
Figure 4-1. Lockbar.

4-5. M4 Telescoping Radioactive Source Magnetic Handler

a. General. The M4 telescoping radioactive source magnetic handler consists of two major groups: the magnet, flexible arm, and extension assembly and the motor and clutch assembly (fig. 4-2) and (fig. 4-3). For purposes of description, the motor and clutch assembly is divided into subgroups and assemblies. Inspection requires at least partial disassembly (para 4-6b). Servicing requires complete disassembly (para 4-6c).

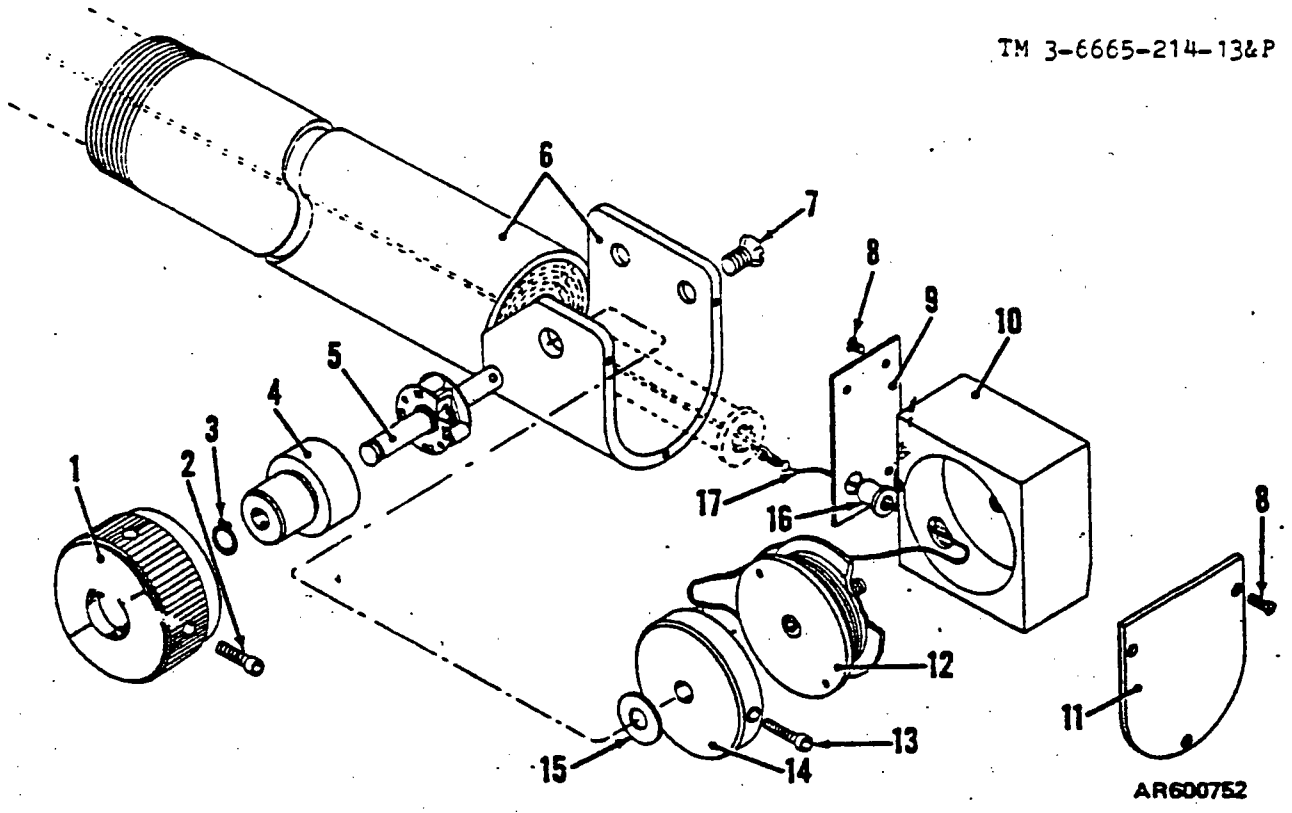
b. Description.

(1) Magnet, flexible arm, and extension assembly. The magnet, flexible arm, and extension assembly, from front to back, consists of a magnet cap (1, fig. 4-2), a magnet (2), a magnet connector wire (3), a compression spring (4), an adapter (5), a flexible arm assembly (6), three extensions (9), (12), and (15), four retaining nuts ((7), (10), (13), and (16)), and four split preformed plastic packing rings ((8), (11), (14), and (17)). The back end of the flexible arm assembly and each of the aluminum extensions are flanged so that each can be fitted inside another, to form the telescoping portion of the handler. The tension exerted by the spring motor assembly (12, fig. 4-3) causes the flexible arm assembly and the three extensions to telescope into the tube end of the handle and housing assembly (6). The magnet connector wire connects the magnet with the spring motor assembly. The magnet cap (1, fig. 4-2) fits over the magnet (2) and compression spring (4) and is screwed onto an adapter (5) on the front end of the flexible arm assembly (6).



1 Magnet cap
2 Magnet
3 Magnet connector wire
4 Compression spring
5 Adapter
6 Flexible arm assembly
7 Retaining nut
8 Packing ring
9 Extension
10 Retaining nut
11 Packing ring
12 Extension
13 Retaining nut
14 Packing ring
15 Extension
16 Retaining nut
17 Packing ring

Figure 4-2. M4 radioactive source magnetic handler, magnet flexible arm, and extension assembly (exploded view).



1 Magnet control knob
2 Setscrew
3 Retaining ring
4 Clutch housing
5 Clutch
6 Handle and housing assembly
7 Screws
8 Screws
9 Bushing retaining plate
10 Spring motor assembly housing
11 Handle housing cover
12 Spring motor assembly
13 Setscrew
14 Clutch adapter
15 Washer
16 Bushing
17 Spring motor cable

Figure 4-3. M4 radioactive source magnetic handler, motor and clutch assembly (exploded view).

(2) Motor and clutch assembly. The motor and clutch assembly consists of a spring motor assembly subgroup which is installed in the housing end of the handle and housing assembly (6, fig. 4-3), a handle housing cover (11) which fits over the housing end of the handle and housing assembly, and a magnet control and clutch subgroup which is installed in the clutch adapter (14).

(a) Spring motor assembly subgroup. The spring motor assembly subgroup consists of a bushing retaining plate (9), a bushing (16), a spring motor assembly housing (10), and a spring motor assembly (12).

(b) Magnet control and clutch subgroup. The magnet control and clutch subgroup contains a clutch assembly consisting of a clutch housing (4) and a clutch (5), a retaining ring (3) which holds the clutch assembly together, a magnet control knob (1) which fits over the clutch housing, a clutch adapter (14), and a washer (15).

c. Disassembly. Disassemble the M4 telescoping radioactive source magnetic handler only to the extent that it is necessary to make the required service, repairs or replacement. With the magentic handler in the telescoped position, follow the sequence of disassembly as given below.

(1) Magnet cap, magnet, compression spring, and adapter.

(a) Unscrew the magnet cap (1, fig. 4-2) from the adapter (5).

(b) Pull the end of the magnet connector wire (3) approximately 6 inches out from the flexible arm assembly (6) and hold it in position with a pair of pliers.

(c) Slide the magnet (2) and compression spring (4) back from the end of the wire.

(d) Use a second pair of pliers to straighten the bend at the end of the magnet connector wire.

(e) Remove the magnet and compression spring.

(f) Unscrew the adapter (5) from the end of the flexible arm assembly (6) and remove the adapter.

(2) Retaining nuts and packing rings.

(a) Unscrew the four retaining nuts ((7), (10), (13), and (16)) and slide the nuts from the end of the flexible arm assembly.

(b) Remove the packing rings ((8), (11), (14), and (17)) from their respective retaining nuts.

(3) Magnet control clutch subgroup.

(a) Loosen two setscrews (2, fig. 4-3) with a 5/64 inch socket-head screw key and pull off the magnet control knob (1).

(b) Loosen setscrew (13) in the clutch adapter (14) with a 1/16 inch socket-head screw key and pull the clutch assembly (para 4-5b) from the clutch adapter. Remove the retaining ring (3) from the clutch housing (4) only if the clutch is damaged and/or in need of replacement.

(4) Handle housing cover. Unscrew and remove three screws (8) and remove the handle housing cover (11) from the back of the handle and housing assembly (6).

(5) Spring motor assembly subgroup and clutch adapter subgroup.

(a) Remove two screws (7) which hold the spring motor assembly housing (10) in position in the housing end of the handle and housing assembly (6).

(b) Withdraw the spring motor assembly subgroup (b(1) above), the clutch adapter (14), and washer (15) from the handle and housing assembly.

(c) Remove the washer (15) and the clutch adapter (14).

(d) Lay the spring motor assembly beside the back end of the handle and housing assembly.

(e) Insert and fully seat a 1/8 inch socket-head screw key in the hexagonal opening in the top of the spring motor assembly (12). Hold the spring motor assembly to prevent it from rotating when the socket-head screw key is turned.

(f) Turn the key counterclockwise to release the threaded end of the spring motor assembly shaft from the threaded hole in the spring motor assembly housing (5 1/2 turns). Do not release the socket-head screw key. Tilt the spring motor assembly so that the shaft does not seat in the threaded opening in the spring motor assembly housing. Slowly release the key to release the spring tension.

(g) Pull the magnet connector wire (3, fig. 4-2) from the back of the flexible arm assembly (6).

(h) Separate the spring motor cable (17, fig. 4-3) from the magnet connector wire by spreading the loop on the end of the magnet connector and removing the soldered loop at the end of the spring motor cable from the magnet connector wire.

(i) Remove the spring motor assembly (12).

(j) Remove the three screws (8) from the bushing retaining plate (9) and remove the plate from the spring motor assembly housing (10).

(k) Remove the bushing (16) from the bushing retaining plate.

(6) Flexible arm assembly and extensions. Withdraw the flexible arm assembly (6, fig. 4-2) and the three extensions ((9), (12), and (15) from the back of the handle and housing assembly (6), fig. 4-3). If any of the above components are distorted to the extent that they cannot be withdrawn from the handle and housing assembly, cut just back of the distortion with a hacksaw and remove that portion from the front of the handle and housing assembly.

d. Maintenance. After disassembling the M4 telescoping radioactive source magnetic handler as directed in c above, inspect the disassembled parts and clean them. Wipe all metal parts with a clean, oily cloth. Replace worn, damaged, or missing parts as authorized in the Maintenance Allocation Chart, Appendix C. Assemble the magnetic handler as directed in e below.

e. Assembly.

(1) Flexible arm assembly and extensions. Insert the extension (15, 12, and 9, fig. 4-2) and the flexible arm assembly (6) in sequence from the back of the handle and housing assembly (6, fig. 4-3). Make certain that the components are inserted so that they can be extended from the front of the handle and housing assembly.

(2) Spring motor assembly subgroup.

(a) Insert the bushing (16, fig. 4-3) through the large opening in the bushing retainer plate (9).

(b) Place the bushing retainer plate against the side of the spring motor assembly housing (10) so that the bushing fits into the recess in the side of the spring motor assembly housing. Align the bushing retainer plate with the side of the housing.

(c) Fasten the bushing retainer plate (9) to the spring motor assembly housing (10) with three screws (8).

(d) Pass the loop end of the spring motor cable (17) from the inside of the spring motor assembly housing through the bushing.

(e) Hook the spring motor cable loop to the hook at the end of the magnet connector wire (3, fig. 4-2) and bend the hook to form a loop.

(f) Insert the magnet connector wire through the back of the flexible arm assembly (6) and pull the wire about 6 inches out from the front of the flexible arm assembly.

(g) Install the retaining nuts and packing rings ((3) below).

(h) Install the adapter, compression spring, magnet, and magnet cap ((4) below).

(i) Telescope the flexible arm assembly and the extensions and seat the spring motor assembly (12, fig. 4-3) in the spring motor assembly housing (10). Place the threaded shaft of the spring motor assembly over the threaded hole in the spring motor assembly housing. Insert and fully seat a 1/8 inch socket-head screw key in the hexagonal opening in the top of the spring motor assembly and turn the key in a clockwise direction until the spring motor assembly is fully seated. Withdraw the key.

(j) With the fingers, rotate the spring motor assembly counterclockwise to take up as much of the spring motor cable slack as possible.

(k) Insert and fully seat the 1/8 inch socket-head screw key in the hexagonal opening in the top of the spring motor assembly. Hold the spring

motor assembly so that it does not rotate in the spring motor assembly housing, and turn the key eight full turns counterclockwise. This action will release the threaded shaft of the spring motor assembly from the threaded opening in the spring motor assembly housing and put sufficient tension in the spring to take up any remaining slack in the spring motor cable when the key is released ((l) below).

(l) Seat the threaded shaft of the spring motor assembly over the threaded opening in the spring motor housing and slowly release the socket-head screw key allowing the spring motor assembly to become fully seated in the housing. After the tension on the key has been released, remove the key from the spring motor assembly.

(m) Fit the two pins on the bottom of the clutch adapter (14, fig. 4-3) into the two round openings in the top of the spring motor assembly and place a washer (15) over the top of the clutch adapter. Insert the assembled spring motor assembly subgroup into the housing end of the handle and housing assembly (6) so that the bushing (16) is adjacent to the back of the flexible arm assembly.

(n) Install the spring motor assembly in the housing end of the handle and housing assembly (6) with two screws (7).

(o) Align the opening in the near side of the handle and housing assembly (6) and the washer and the clutch adapter and install the clutch and magnet control subgroup ((5) below).

(p) Attach the handle housing cover ((6) below).

(3) Retaining nuts and packing rings.

(a) Make sure that each retaining nut is fitted with a packing ring. Packing rings (8,11,14,16, fig. 4-2) are seated in the retaining nuts (7, 10, 13, 16).

(b) Slip the retaining nuts with the threaded end toward the back of the magnetic handler over the front of the flexible arm assembly (6). Start with the largest nut (16) and end with the smallest nut (7).

(c) Screw but do not tighten the nut (16, fig. 4-2) on the threaded end of the handle and housing assembly (6, fig. 4-3). Screw but do not tighten the remaining nuts to the threaded ends of the extensions (15, 12, and 9, fig. 4-2) respectively.

(4) Adapter, compression spring, magnet, and magnet cap.

(a) Slip the adapter (5, fig. 4-2) over the extended magnet connector wire (3) and screw the adapter on the end of the flexible arm assembly (6).

(b) Slip the compression spring (4) over the magnet connector wire.

(c) Thread the magnet connector wire (3) through the magnet (2) so that the slotted end of the magnet is toward the front end of the magnetic handler.

(d) Using a pair of pliers, bend the end of the magnet connector wire just enough to hold the magnet on the wire.

(e) Fit the magnet cap (1) over the magnet and compression spring. Use just enough pressure against the head of the magnet cap to seat the threaded end of the cap on the adapter and screw the cap on the adapter.

(5) Magnet control and clutch subgroup.

(a) See that the clutch housing (4, fig. 4-3) and the clutch (5) are assembled.

(b) Clip a retaining ring (3), if there is none, around the end of the clutch shaft that extends through the top of the clutch housing.

(c) Insert the bottom of the clutch shaft through the aligned holes in the handle and housing assembly, washer, and clutch adapter ((2)(c) above). Rotate the clutch shaft to align the opening in the shaft with the setscrew opening in the clutch adapter. Tighten the setscrew (13) with a 1/16 inch socket-head screw key.

(d) Fit the magnet control knob (1) over the clutch housing (4) and tighten the two setscrews (2) with a 5/64 inch socket-head screw key.

(6) Handle housing cover. Attach the handle housing cover (11) to the back of the handle and housing assembly (6) with three screws (8).

Section III. TROUBLESHOOTING PROCEDURES

4-6. Scope

a. This section contains troubleshooting or malfunction information and tests for locating and correcting most of the troubles which may develop in the M3A1 Radioactive Source Set. Each malfunction or trouble symptom for an individual component, unit, or system is followed by a list of tests or inspections necessary for you to determine probable causes and suggested corrective actions for you to remedy the malfunction.

b. This manual cannot list all possible malfunctions that may occur or all tests or inspections, and corrective actions. If a malfunction is not listed (except when malfunction and cause are obvious), or is not corrected by listed corrective actions, you should notify higher level maintenance. Skills and actions required to perform organizational maintenance of the M3A1 Radioactive Source Set are approximately the same as those required to perform direct support maintenance of the item. The essential difference between the two levels of maintenance is that replacement parts are authorized only to direct support maintenance level.

c. Table 4-2 lists the common malfunctions you may find during the operation or maintenance of the M3A1 Radioactive Source Set or its components. You should perform the tests/inspections and corrective actions in the order listed.

NOTE

Before using this table, be sure you have performed all normal operation checks. If you have a malfunction which is not listed in this table, notify the next higher level of maintenance.

TABLE 4-2. TROUBLESHOOTING PROCEDURES

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
MAGNETIC HANDLER, M4 FLEXIBLE ARM ASSEMBLY AND EXTENSIONS.
Components cannot be withdrawn from the handle and housing assembly (para 4-5c(6)). a. Cut just back of distortion with a hacksaw. b. Remove distorted portion from front of handle and housing assembly. c. Insert (assemble) remaining components so that they can be extended from front of handle and housing assembly.

CHAPTER 5
DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

5-1. GENERAL

Direct support maintenance personnel are authorized to repair and replace the magnet, flexible arm, and extension assembly of the M4 magnetic handler. They are also authorized to repair and replace parts of the motor and clutch assembly. In addition, direct support maintenance personnel are authorized to manufacture a new identification plate, if required, and to perform all maintenance allocated to lower categories of maintenance.

5-2. Identification Plate

a. Description. The brass identification plate (fig. 1-3) is fastened with four screws, one in each corner, to the cover of the storage case. The plate shows the National Stock Number (NSN), replacement date, activity (mCi), manufacturing date, serial number of the radioactive source assembly, Bureau of Explosives Association of American Railroads permit number, and the NRC license number.

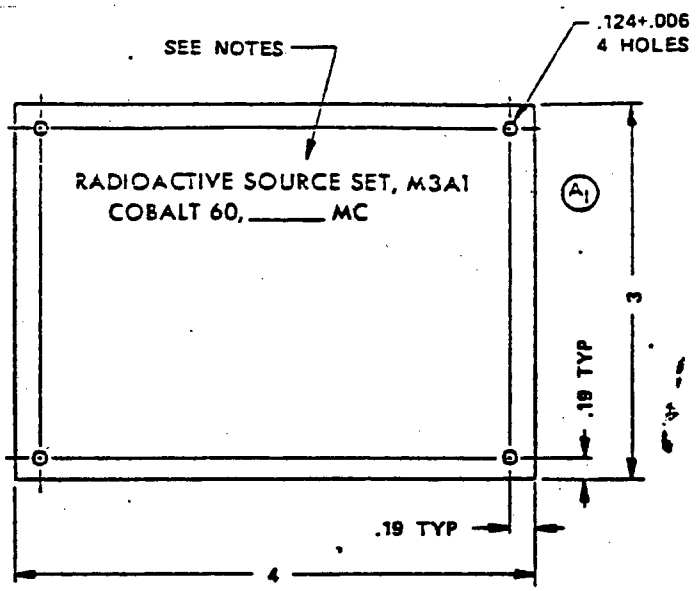
b. Inspection, Manufacture, Removal, and Installation.

(1) Inspection. If the identification plate is illegible, damaged beyond repair, or missing, manufacture a new identification plate.

(2) Manufacture. Fabricate the identification plate (fig. 5-1).

(3) Removal. Remove the four screws, one in each corner, that fasten the identication plate to the cover of the storage case. Lift plate from cover.

(4) Installation. Before securing the plate to cover, stamp or engrave the plate with letters approximately one-eighth inch high. Use the correct NSN and nomenclature. Fill in blank spaces with the appropriate information from the Co-60 decay chart which is fastened to the inside of the cover of the storage case, or from the shipping document that accompanies the M3A1 Radioactive Source Set. Fasten the new identification plate to the cover of the storage case.



BRASS STRIP, ALLOY NO. 268 or 260, ANNEALED TEMPER .032
NOM STOCK THICKNESS, SPEC QQ-B-613

NOTES:

1. Letters shall be engraved or stamped 1/8 high.

2. Marking shall be in accordance with MIL STD-130.

3. The following additional information shall be included

Manufacturing Date_____

Serial No._____

Replacement Date_____

NRC License No.

NSN 6665-00-856-8235 AR601247

Figure 5-1. Identification plate (line drawing).

CHAPTER 6

TRANSPORTATION, STORAGE, AND DISPOSAL

6-1. Transportation of the M3A1. The M3A1 requires shipment in accordance with DOT requirements, 49 CFR, AR 385-11 and the NRC license issued for the item.

a. Upon receipt of the M3A1, contact the CECOM Safety Office on Autovon 995-4427, or commercial (201) 544-4427.

b. Shipment of M3A1 by US Postal Service or by United Parcel Service is prohibited.

c. For shipment of the M3A1 to be in accordance with the above regulations and NRC license, the following requirements must be met:

(1) The motor vehicle, rail car, or freight container containing the calibrator must be placarded on all four sides with a "RADIOACTIVE" placard (49 CFR 172.504, Table 1).

(2) In the event the surface radiation level of the package cannot be decreased to below 200 mR/hr, shipment by exclusive use vehicle is required in accordance with 49 CFR 173.441b. Shipment by aircraft in this case is prohibited (49, CFR 173.441d).

(3) The storage case must be sealed with fiber tape, labelled on opposite sides with Radioactive Yellow III labels (49 CFR 172.403) and marked with 1/2 inch or larger letters with the following: TYPE 'A' DOT-7A, RADIOACTIVE MATERIAL, SPECIAL FORM NOS, UN2974.

(4) A wipe test must be performed within two weeks prior to the desired shipping date to assure that no significant removable radioactive surface contamination exists on the exterior of the package (49 CFR 173.443, 173.475 (i)). The wipe test procedure to be used is contained in Section 6-2. A DOT wipe test kit is provided by AIRDC. Wipe test results must be received from AIRDC prior to shipment.

(5) Report of shipment (RESHIP) must be transmitted to the receiving installation transportation officer (AR 385-11, paragraph 4-1) and RPO with information copy to Commander, US Army Communications-Electronics Command, ATTN: AMSEL-SF-MR, Fort Monmouth, NJ 07703-5024.

(6) The following information must be listed on the shipping documentation as required by 49 CFR 172.202, 172.203(d), 172.204, and AR 385-11, paragraph 4-1a:

(a) Proper shipping name: RADIOACTIVE MATERIAL, SPECIAL FORM, NOS.

(b) Hazardous Material Identification Number: UN 2974.

(c) Pieces, weight and volume: Required.

(d) Type of packaging: Type "A" DOT-7A.

(e) Radioactive material: Co-60.

(f) Description of chemical and physical form: SPECIAL FORM.

(g) Activity: 130.00 millicuries or as indicated on the M3A1.

(h) Type label required: Radioactive Yellow-III.

(i) Shipper's certification: Required.

(k) NRC License Number: As provided by the CECOM Safety Office, AV 995-4427.

(l) Exposure rate at the package surface and at one meter: As determined by RPO.

(m) Results of package wipe test: As determined by AIRDC.

(7) Commerical air shipment of the M3A1 requires, in addition to number 6 above, a "Cargo Aircraft Only" label on opposite sides of the shipping package and the words "Cargo Aircraft Only" listed on the shipping documentation (49 CFR 175.30).

(8) Basic requirements for shipment of radioactive materials by military (USAF Cargo) aircraft are contained in Chapter 12 of AFR 71-4/TM 38-250.

6-2. Wipe Testing Procedure for Shipment

a. The shipping package wipe test is performed for compliance to DOT regulations to assure no significant removable radioactive surface contamination is located on the exterior surface of the shipping package.

WARNING

The NuCon Smear is never to be used for sealed source leak testing of the M3A1 Radioactive Source Set. It is only to be utilized in the wipe testing of the exterior surfaces of the outer shipping package incorporating the M3A1 Radioactive Source Set.

b. Equipment required:

(1) NuCon Smear (1.75 inch diameter circular cloth adhered to an associated paper jacket).

(2) Envelope, pre-addressed to AIRDC.

(3) Radiacmeter, AN/PDR-27( ), or equivalent.

c. Wipe test procedure.

(1) Record date, name of the individual performing the test, and serial number(s) of the M3A1 Radioactive Source Set(s) on the jacket of the NuCon Smear.

(2) With the NuCon Smear retained within its jacket and using moderate finger pressure, wipe all exterior surfaces of the package for a total of at least 300 square centimeters (about 48 square inches).

d. Checking for contamination and mailing the NuCon Smear.

NOTE

Perform the following procedure in an area that is free from all radiation, except for normal background radiation.

(1) Adjust Radiacmeter to measure 0 to 0.5 mR/hr.

(2) Open cover on end of probe.

(3) Place the NuCon Smear approximately 1/4 inch in front of the probe and note the indication: DO NOT TOUCH THE PROBE WITH THE NUCON SMEAR.

WARNING

Any sustained reading on the AN/PDR-27( ) above twice background or 0.1 mR/hr indicates contamination of the shipping

package. Secure shipping package to prevent the spread of contamination.

(4) If no detectable reading is observed on the AN/PDR-27( ), place the NuCon Smear in the self-addressed envelope provided and mail immediately to AIRDC.

(5) If a reading is observed on the AN/PDR-27( ) in excess of 0.1 mR/hr or twice the background, the NuCon Smear should be placed in a small cardboard box and mailed to AIRDC.

WARNING

The radiation reading at the surface of the box must not exceed 0.4 mR/hr. If the measured radiation is more than 0.4 mR/hr, wrap a thin sheet of lead, ~~aluminum, or~~ other metal around the NuCon Smear and place in a small cardboard box and recheck the surface radiation.

(6) Notification of the results of the shipping package wipe test must be received from AIRDC prior to making shipment of the M3A1 Radioactive Source Set(s).

6-3. Storage

a. Areas of M3A1 Radioactive Source Set storage will be considered radioactive material/radiation areas as determined by the RPO and will be posted in accordance with AR 385-30.

b. Access to the storage areas will be restricted to authorized personnel. These areas will be secured to prevent unauthorized use or removal of the source set.

6-4. Disposal

Reports of excess, unwanted or unserviceable M3A1's will be submitted to CECOM NICP for review of serviceability turn-in or disposal as radioactive waste. Requests for disposition instructions are submitted through radiation control command channels to the NICP. The NICP will provide disposition instructions.

APPENDIX A
REFERENCES

AR 40-14	Control and Recording Procedures: Occupational Exposure to Ionizing Radiation.
AR 385-11	Ionizing Radiation Protection (Licensing, Control, Transportation, Disposal, Radiation Safety).
AR 385-30	Safety Color Code Marking and Signs.
DA Pam 310-1	Consolidated Index of Army Publications and Blank Forms.
DA Pam 310-4	Index of Technical Publications.
MIL-STD-129H	Marking for Shipment and Storage.
TB 43-180	Calibration Requirements for the Maintenance of Army Materiel
TM 43-0139	Painting Instructions for Field Use

Title 10, Code of Federal Regulations, Parts 19, 20 and 21.

Title 49, Code of Federal Regulations.

APPENDIX B
ORGANIZATIONAL AND DIRECT SUPPORT MAINTENANCE REPAIR PARTS LIST

SECTION I. INTRODUCTION

B-1. Scope

This appendix lists repair parts required for operation and performance of organizational and direct support maintenance of the M3A1 Radioactive Source Set. It authorizes the requisition and issue of items as indicated by the source and maintenance codes. There are no basic issue items, items troop installed or authorized or special tools applicable to this equipment.

B-2. General

The repair parts list is divided into the following sections:

a. Section II. Repair Parts List. A list of repair parts authorized for use in the performance of maintenance. This list also includes parts which must be removed for replacement of the authorized parts. Parts lists are composed of functional groups in ascending numerical sequence, with the parts in each group listed in figure and item number sequence. Bulk materials are listed in NSN sequence.

b. Section III. NSN and Part Number Index. A list, in ascending numerical sequence, of all NSNs appearing in the listing followed by a list, in alphameric sequence, of all part numbers appearing in the listing. NSNs and part numbers are cross-referenced to each illustration figure and item number appearance.

B-3. Explanation of Columns

The following provides an explanation of columns found in the tabular listings:

a. Illustration. This column is divided as follows:

(1) Figure number. Indicates the figure number of the illustration on which the item is shown.

(2) Item number. The number used to identify each item called out in the illustration.

b. Source, Maintenance, and Recoverability Codes (SMR).

(1) Source code. Source codes are assigned to support items to indicate the manner of acquiring support items for maintenance, repair, or overhaul of end items. Source codes are entered in the first and second positions of the Uniform SMR Code format as follows:

Code	Definition
PA	Item procured and stocked for anticipated or known usage.
PB	Item procured and stocked for insurance purposes because essentiality dictates that a minimum quantity be available in the supply systems.
MF	Item to be manufactured or fabricated at the direct support maintenance level.
XB	Item is not procured or stocked. If not available through salvage, requisition.

NOTE

Cannibalization or salvage may be used as a source of supply for any items source coded above.

(2) Maintenance code. Maintenance codes are assigned to indicate the levels of maintenance authorized to USE and REPAIR support items. The maintenance codes are entered in the third and fourth positions of the Uniform SMR Code format as follows:

(a) The maintenance code entered in the third position will indicate the lowest maintenance level authorized to remove, replace, and use the support item. The maintenance code entered in the third position will indicate one of the following levels of maintenance:

Code	Application/Explanation
O	Support item is removed, replaced, used at the organizational level.
F	Support item is removed, replaced, used at the direct support level.
D	Support items that are removed, replaced, used at depot, mobile depot, specialized repair activity only.

(b) The maintenance code entered in the fourth position indicates whether the item is to be repaired and identifies the lowest maintenance level with the capability to perform complete repair. This position will contain one of the following maintenance codes.

Code	Application/Explanation
O	The lowest maintenance level capable of complete repair of the support item is the organizational level.
F	The lowest maintenance level capable of complete repair of the support item is the direct support level.

Z	Nonreparable. No repair is authorized.

(3) Recoverability code. Recoverability codes are assigned to support items to indicate the disposition action on unserviceable items. The recoverability code is entered in the fifth position of the Uniform SMR Code format as follows:

Recoverability Codes	Definition
A	Item requires special handling or condemnation procedures because of specific reasons (i.e., precious metal content, high dollar value, critical material, or hazardous material). Refer to appropriate manuals/directives for specific instructions.
H	Reparable item. When uneconomically reparable, condemn and dispose at the general support level.
Z	Nonreparable item. When unserviceable, condemn and dispose at the level indicated in position 3.

c. NSN. Indicates the NSN assigned to the item and will be used for requisitioning.

d. Part Number. Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications standards, and inspection requirements, to identify an item or range of items.

NOTE

When a stock number item is requisitioned, the repair part received may have a different part number than the part being replaced.

e. Federal Supply Code for Manufacturer (FSCM). The FSCM is a 5 digit numeric code listed in SB 708-42 which is used to identify the manufacturer, distributor, or Government agency, etc.

f. Description. Indicates the Federal item name and, if required, a minimum description to identify the item.

g. Unit of Measure (U/M). Indicates the standard of the basic quantity of the listed item as used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, ft, etc). When the unit of measure differs from the unit of issue, the lowest unit of issue that will satisfy the required units of measure will be requisitioned.

h. Quantity Incorporated in Unit. Indicates the quantity of the item used in the breakout shown on the illustration figure, which is prepared for a functional group, subfunctional group, or an assembly.

B-4. Special Information

a. Action change codes indicated in the left hand margin of the listing page denote the following:

N - Indicates an added item

C - Indicates a change in data

b. Detailed manufacturing instructions for items source coded to be manufactured are found in this manual. Bulk materials required to manufacture items are listed in the bulk material group of this appendix.

B-5. How to Locate Repair Parts

a. When NSN or Part Number is Unknown:

(1) Determine the functional group within which the repair part belongs since illustrations are prepared for functional groups and listings are divided into the same groups.

(2) Find the illustration covering the functional group to which the repair part belongs.

(3) Identify the repair part on the illustration and note the illustration figure and item number of the repair part.

(4) Using the Repair Parts Listing, find the figure and item number noted on the illustration.

b. When NSN or Part Number is Known:

(1) Using the Index of NSNs and Part Numbers, find the pertinent NSN or part number. This index is in ascending NSN sequence followed by a list of part numbers in ascending alphanumeric sequence, cross-referenced to the illustration figure number and item number.

(2) After finding the figure and item number, locate the figure and item number in the repair parts list.

Section II. REPAIR PARTS LIST

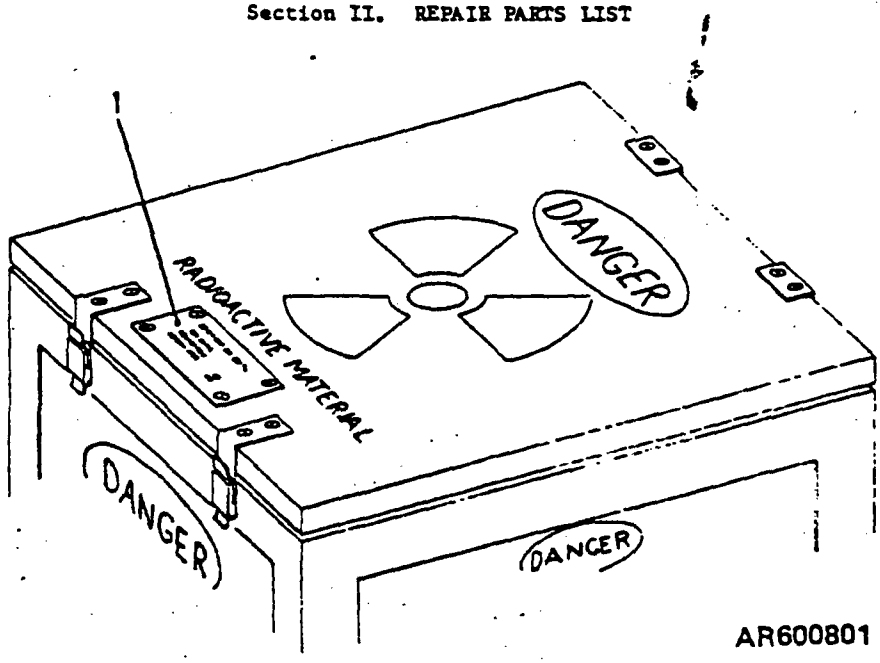


Figure B-1. Storage case.

	(1) ILLUS Fig No.	(1) ILLUS Item No.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER (NSN)	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION Usable On Code	(7) U/M	(8) QTY UNIT
							GROUP 0100 - STORAGE CASE		
C	B-1	1	MFFOZ		B124-10-27	81361	PLATE, IDENTIFICATION: MFD FROM NSN 9535-00-232-6932	EA	1

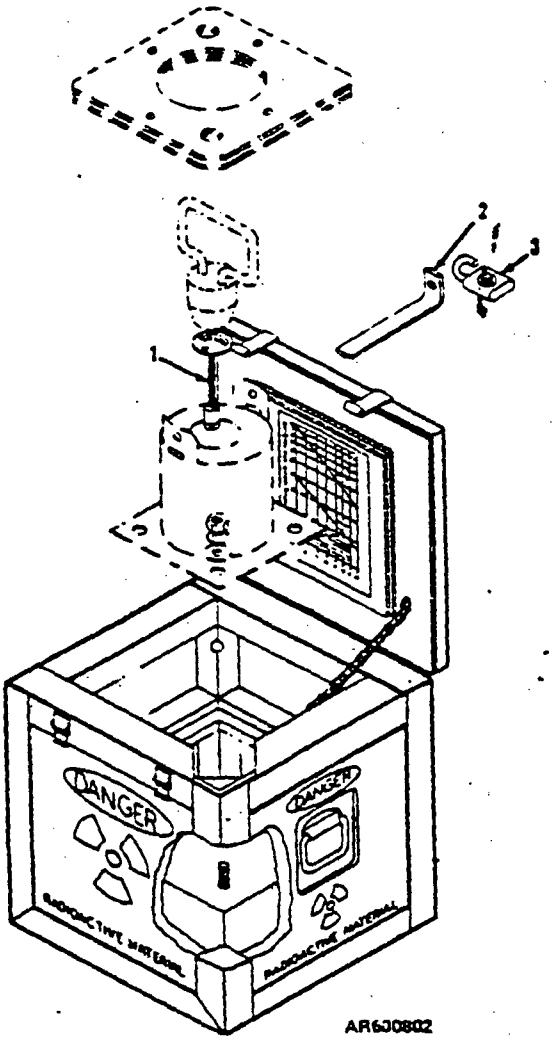


Figure B-2. Source set assembly.

(1) ILLUS Fig No.	(1) ILLUS Item No.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER (NSN)	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION Usable On Code	(7) U/M	(8) QTY/UNC
						GROUP 0200 - RADIOACTIVE SOURCE AND SHIELD ASSEMBLY		
C B-2	1	XBDZA	6665-00-856-8233	C124-10-10	81361	RADIOACTIVE SOURCE ASSEMBLY, COBALT 60: M1A1	EA	1
C B-2	2	MFOOZ		A124-10-9	81361	BAR, LOCK: MFD FROM NSN 9510-00-596-2065	EA	1
N B-2	3	XBDZZ		K439N	72053	PADLOCK COMBINATION	EA	1

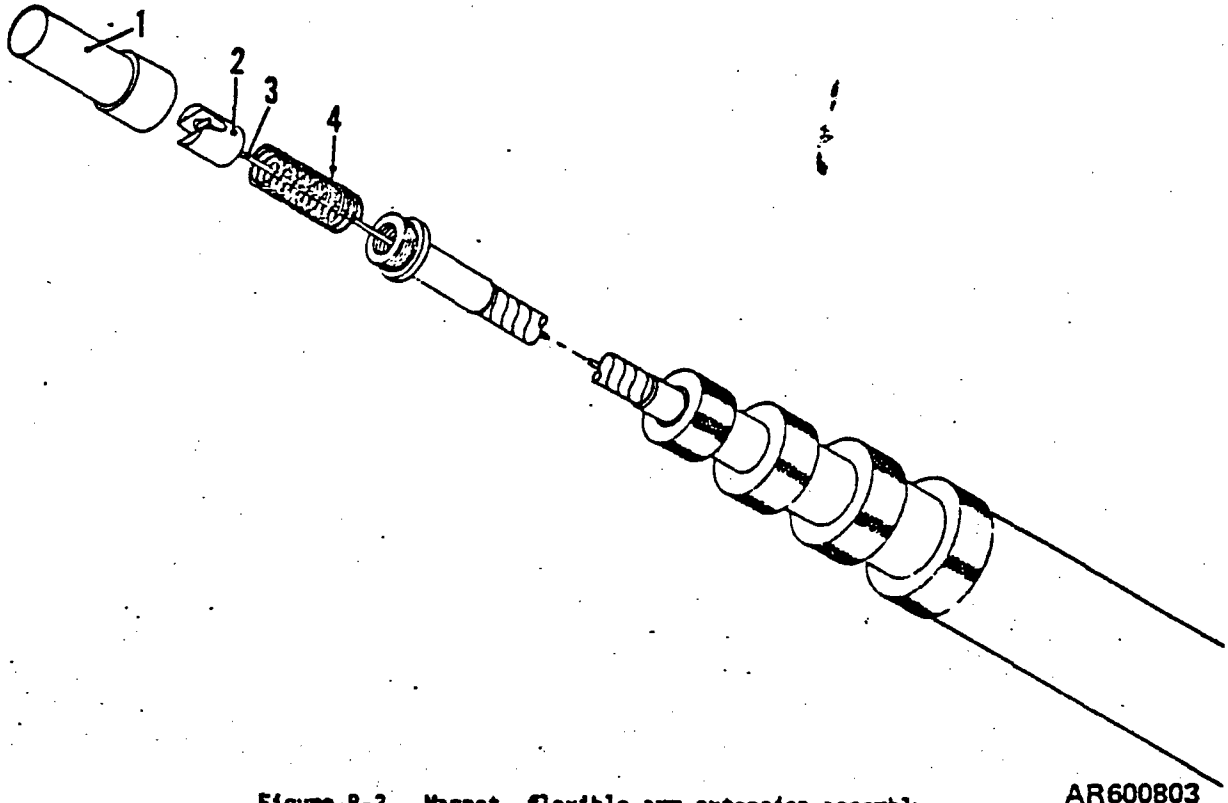


Figure B-3. Magnet, flexible arm extension assembly.

	(1) ILLUS Fig No.	(1) ILLUS Item No.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER (NSN)	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION Usable On Code	(7) U/M	(8) QTY UNIT
							GROUP 0300 - MAGNETIC HANDLER, M4		
C	B-3		PBOPH	6665-00-856-8234	D124-2-62	81361	MAGNETIC HANDLER, RADIOACTIVE SOURCE, TELESCOPING: M4	EA	1
C	B-3	1	XBFZZ		B124-2-75	81361	MAGNETIC CAP	EA	1
C	B-3	2	XBFZZ		B124-2-77	81361	MAGNET	EA	1
	B-3	3	PAFZZ	9505-00-060-0882	00W423	81348	WIRE, STEEL, CORROSION RESISTING: RD, 0.063 IN. DIA	IN	18
	B-3	4	PBFZZ	5360-00-811-9127	B124-2-79	81361	SPRING, HELICAL, COMPRESSION: STL, PLD, 0.046 IN. DIA, 13 COILS, 2 IN. FREE LG, 0.500 IN. FREE OD	EA	1

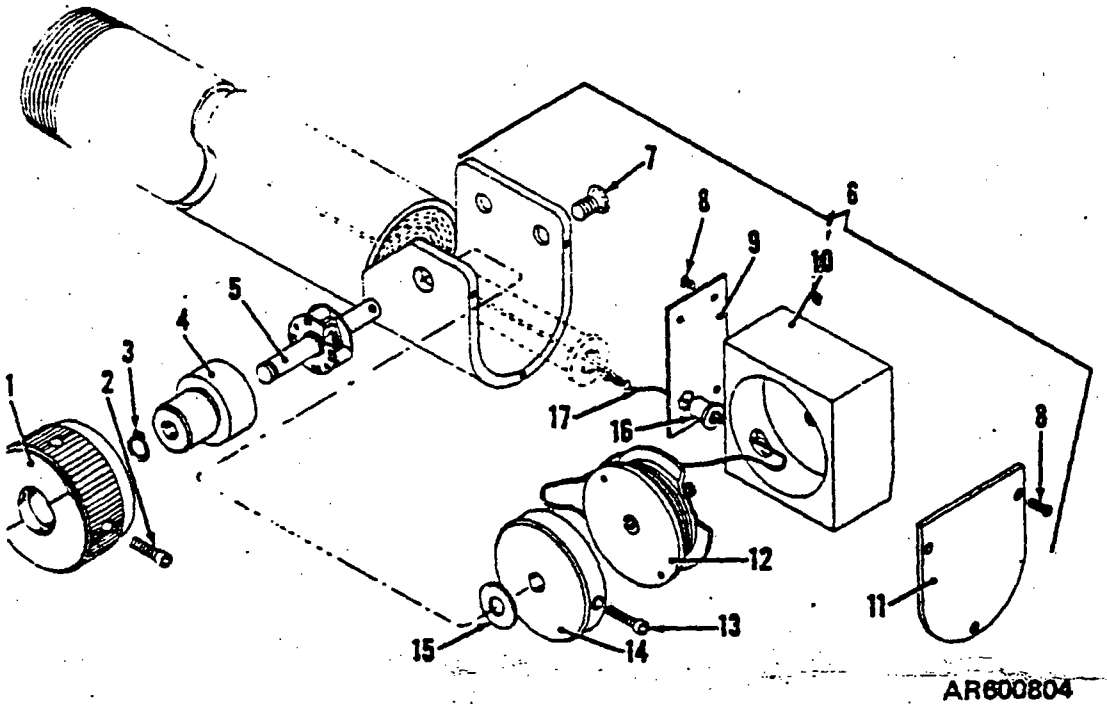


Figure B-4. Motor and clutch assembly.

	(1) ILLUS Fig No.	(1) ILLUS Item No.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER (NSN)	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION Usable On Code	(7) U/M	(8) RPYQNTY
C	B-4	1	XBFZZ		B124-2-78	81361	KNOB, CONTROL	EA	1
C	B-4	2	XBFZZ		MS51030-27	96906	SETSCREW: CRES, HEXAGON SOCKET FLAT PT, #8-32, 1/4 IN. LG	EA	2
C	B-4	3	XBFZZ		MS16624-4025	96906	RING, RETAINING: CRES, EXT APPLICATION, 0.250 IN. SHAFT SIZE	EA	1
C	B-4	4	XBFZZ		B124-2-81HSG	81361	HOUSING, CLUTCH	EA	1
C	B-4	5	XBFZZ		B124-2-81	81361	SHAFT AND ROLLER ASSEMBLY	EA	1
C	B-4	6	XBFZZ		C124-2-63	81361	HANDLE AND HOUSING ASSEMBLY	EA	1
C	B-4	7	XBFZZ		MS35202-51	96906	SCREW, MACHINE: AL ALLOY, FLAT CSK HEAD, #10-24, 1/4 IN. LG	EA	2
C	B-4	8	XBFZZ		MS35218-2	96906	SCREW, MACHINE: AL ALLOY, PAN HEAD, #2-56, 0.187 IN. LG	EA	6
C	B-4	9	XBFZZ		A124-2-67	81361	PLATE, BUSHING RETAINING	EA	1
C	B-4	10	XBFZZ		B124-2-73	81361	HOUSING, SPRING MOTOR ASSEMBLY	EA	1
C	B-4	11	XBFZZ		A124-2-66	81361	COVER		

	(1) ILLUS Fig No.	(1) ILLUS Item No.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER (NSN)	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION Usable On Code	(7) U/M	(8) QTY AUTH
C	B-4	12	PBFZZ	6665-00-474-7226	C124-2-80	81361	MOTOR ASSEMBLY, SPRING LOADED	EA	1
C	B-4	13	XBFZZ		MS51029-20	96906	SETSCREW: CRES, HEXAGON SOCKET, FLAT PT, #6-32, 3/8 IN. LG	EA	1
C	B-4	14	XBFZZ		B124-2-76	81361	PLATE, CLUTCH	EA	1
C	B-4	15	XBFZZ		MS27183-10	96906	WASHER, FLAT: STL PLD, RD, 0.250 IN. ID	EA	1
							GROUP 0400 - BULK MATERIALS		
NB	ULK		PAOZZ	9510-00-596-2065	QQS634	81348	STEEL BAR: CARBON COLD FINISHED FLAT, 1/4 IN. THK, 5/8 IN. W, 10 TO 14 FT LG	FT	14
NB	ULK		PAFZZ	9535-00-232-6932	QQB613	81348	METAL STRIP: 12 IN. W, 48 IN. LG BRASS, 0.032 IN. THK	SH	1

Section III. NATIONAL STOCK NUMBER AND PART NUMBER INDEX

a. National Stock Numbers.

National Stock Number	Fig. No.	Item No.	National Stock Number	Fig. No.	Item No.
9505-00-060-0882	B-3	3	6665-00-856-8234	B-3	
6665-00-474-7226	B-4	12	9510-00-596-2065	BULK	
5360-00-811-9127	B-3	4	9535-00-232-6932	BULK	
6665-00-856-8233	B-4	2			

b. Part Numbers.

Part Number	FSCM	Fig. No.	Item No.	Part Number	FSCM	Fig. No.	Item No.
A124-10-9	81361	B-2	1	C124-2-63	81361	B-4	6
A124-2-66	81361	B-4	11	C124-2-80	81361	B-4	12
A124-2-67	81361	B-4	9	D124-2-62	81361	B-3	
B124-10-27	81361	B-1	1	K439N	72053	B-2	3
B124-2-73	81361	B-4	10	MS16624-4025	96906	B-4	3
B124-2-75	81361	B-3	1	MS27183-10	96906	B-4	15
B124-2-76	81361	B-4	14	MS35202-51	96906	B-4	7
B124-2-77	81361	B-3	2	MS35218-2	96906	B-4	8
B124-2-78	81361	B-4	1	MS51029-20	96906	B-4	13
B124-2-79	81361	B-3	4	MS51030-27	96906	B-4	2
B124-2-81HSG	81361	B-4	4	QQB613	81348	BULK	
B124-2-81LESSHSG	81361	B-4	5	QQS634	81348	BULK	
C124-10-10	81361	B-2	2	QQW423	81348	B-3	3

APPENDIX C

MAINTENANCE ALLOCATION CHART

C-1. General

The maintenance allocation chart (MAC) (Section II) lists the authorized maintenance functions assigned the maintenance categories for maintenance of the M3A1 Radioactive Source Set. This chart is to be used by all levels of maintenance to insure complete support of the equipment.

C-2. Maintenance Functions

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical and/or electrical characteristics with standards through examination.

b. Test. To verify serviceability and detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition; i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which

is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

e. Replace. The act of substituting a serviceable like type part, subassembly or module (component or assembly) for an unserviceable counterpart.

f. Repair. The application of maintenance services or other maintenance actions to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

C-3. Column Entries

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2.

d. Column 4, Maintenance Category. Column 4 specifies, by the listing of a "work time" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number of complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate "work time" figures will be shown for each category. The number of

man-hours specified by the "work time" figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the MAC. This time will be expressed in manhours and carried to one decimal place (tenths of hours).

e. Column 5, Tools and Equipment. Column five (5) specifies by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

f. Tool and Test Equipment Requirements List. This list identifies all tools and test equipment required for maintenance and repair of the M3A1 Radicactive Source Set as specified in the MAC. The list gives tool or test equipment reference codes; user maintenance category code; a short description of items required; and NSN. The tool or test equipment code corresponds to the code in column 5 of the MAC. The maintenance category code indicates the level of availability and authorized use. All remaining columns are self explanatory.

Section II. MAINTENANCE ALLOCATION CHART FOR M3A1 RADIOACTIVE SOURCE SET

(1) Group number	(2) Component/Assembly	(3) Maintenance function	(4) Maintenance category* C	O	F	H	D	(5) Tools and equipment
0100	STORAGE CASE	Inspect	0.5					1,2
		Service	0.1 [b]					
		Repair		0.5 [b]				
		Replace [a]			0.8			
0200	RADIOACTIVE SOURCE AND SHIELD ASSEMBLY							
	Radioactive Source Assembly, M1A1	Inspect	0.1					1,2
	Shield Assembly	Inspect	0.5					1,2,3
		Test	0.5					
		Repair [c]		0.3				
		Replace [c]		1.0				
0300	M4 MAGNETIC HANDLER	Inspect [b]	0.5					
	Magnet, Flexible Arm, and Extension Assembly	Inspect		0.5				
		Repair		0.7 [d]	1.8			
		Replace			1.2			
	Motor and Clutch Assembly	Inspect [b]		1.5				
		Service [b]		0.3				
		Repair			0.5			
		Replace			1.0			

*The subcolumns are as follows:
C—operator/crew
O—organizational
F—direct support
H—general support
D—depot

[a] Manufacture nameplate.
[b] Monthly.
[c] Repair and replacement of lockbar only.
[d] Remove distortion by bending or cutting out segment of arm extension elements.

TOOL AND TEST EQUIPMENT REQUIREMENTS LIST FOR M3A1 RADIOACTIVE SOURCE SET

Tool or test equipment reference code	Maintenance category	Nomenclature	National/NATO stock number	Tool number
1	O	FILM BADGE (Photodosimetry)	See SB 11-206	
2	O	DOSIMETER	6665-00-243-8199	IM-9/PD
3	O	RADIAC SET	6665-00-961-0846	AN/PDR(R)

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SEP 17 1984

TO: NRC Licensees, Permittees, and Applicants

Please find enclosed a revised NRC Form 3, "Notice to Employees", which is required by 10 CFR 19.11(c) and 10 CFR 30.7, 40.7, 50.7 and 70.7 to be posted by each NRC licensee, permittee, and applicant. NRC licensees, permittees, and applicants must have the NRC Form 3 posted in those areas utilized by their employees and contractors and subcontractors.

The revised Form 3 should be promptly posted at locations sufficient to permit employees to observe a copy on the way to or from their place of work. Form 3 must remain posted while the application for a permit or license is pending, during the term of the permit or license, and for 30 days after termination of the license.

Revised Form 3 is written in the form of simple questions and answers which paraphrase relevant statutes and regulations. The purpose of this change in format is to make the form more readable and understandable. The various protections and prohibitions are described in a straightforward, general way. The NRC believes that the revised Form 3 will help employees of its licensees, permittees, applicants, and of their contractors, subcontractors, and vendors, to clearly understand their responsibilities and rights, and those of the NRC and the Department of Labor, on matters related to public health and safety and employee protection from discrimination. Pursuant to 10 CFR 19.11(c), each licensee and applicant shall post the current revision of Form 3. You should take steps to ensure that the current revision of Form 3 is posted by January 1, 1985.

Richard C. DeYoung, Director
Office of Inspection and Enforcement

Enclosure: As stated

UNITED STATES NUCLEAR REGULATORY COMMISSION
Washington, D.C. 20555

NOTICE TO EMPLOYEES

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

WHAT IS THE NUCLEAR REGULATORY COMMISSION?

The Nuclear Regulatory Commission is an independent Federal regulatory agency responsible for licensing and inspecting nuclear power plants and other commercial uses of radioactive materials.

WHAT DOES THE NRC DO?

The NRC's primary responsibility is to ensure that workers and the public are protected from unnecessary or excessive exposure to radiation and that nuclear facilities including power plants are constructed to high quality standards and operated in a safe manner. The NRC does this by establishing requirements in Title 10 of the Code of Federal Regulations (10 CFR) and in licenses issued to nuclear users.

WHAT RESPONSIBILITY DOES MY EMPLOYER HAVE?

Any company that conducts activities licensed by the NRC must comply with the NRC's requirements. If a company violates NRC requirements, it can be fined or have its license modified, suspended or revoked.

Your employer must tell you which NRC radiation requirements apply to your work and must post NRC Notices of Violation involving radiological working conditions.

WHAT IS MY RESPONSIBILITY?

For your own protection and the protection of your co-workers, you should know how NRC requirements relate to your work and should obey them. If you observe violations of the requirements, you should report them.

HOW DO I REPORT VIOLATIONS?

If you believe that violations of NRC rules or of the terms of the license have occurred, you should report them immediately to your supervisor. If you believe that adequate corrective action is not being taken, you may report this to an NRC inspector or the nearest NRC Regional Office.

WHAT IF I WORK IN A RADIATION AREA?

If you work with radioactive materials or in a radiation (controlled) area, the amount of radiation exposure that you may legally receive is limited by the NRC. The limits on your exposure are contained in sections 20.101, 20.103, and 20.104 of Title 10 of the Code of Federal Regulations (10 CFR 20). While these are the maximum allowable limits, your employer should also keep your radiation exposure as far below these limits as is "reasonably achievable."

MAY I GET A RECORD OF MY RADIATION EXPOSURE?

Yes. Your employer is required to tell you, in writing, if you receive any radiation exposure above the limits set in the NRC regulations or your employer's license. In addition, if your job involves radiation, you may request from your employer a record of your annual radiation exposures and a written report of your total exposure when you leave your job.

HOW ARE VIOLATIONS OF NRC REQUIREMENTS IDENTIFIED?

NRC conducts regular inspections of licensed facilities to assure compliance with NRC requirements. In addition, your employer and site contractors conduct their own inspections to assure compliance. All inspectors are protected by Federal law. Interference with them may result in criminal prosecution for a Federal offense.

MAY I TALK WITH AN NRC INSPECTOR?

Yes. Your employer may not prevent you from talking with an NRC inspector and you may talk privately with an inspector and request that your identity remain confidential.

MAY I REQUEST AN INSPECTION?

If you believe that your employer has not corrected violations involving radiological working conditions, you may request an inspection. Your request should be addressed to the nearest NRC Regional Office and must describe the alleged violation in detail. It must be signed by you or your representative.

HOW DO I CONTACT THE NRC?

Notify an NRC inspector on-site or call the nearest NRC Regional office collect. NRC inspectors want to talk to you if you are worried about radiation safety or other aspects of licensed activities, such as the quality of construction or operations at your plant.

CAN I BE FIRED FOR TALKING TO THE NRC?

No. Federal law prohibits an employer from firing or otherwise discriminating against a worker for bringing safety concerns to the attention of the NRC. You may not be fired or discriminated against because you:

- ask the NRC to enforce its rules against your employer;
- testify in an NRC proceeding;
- provide information or are about to provide information to the NRC about violations of requirements;
- are about to ask for or testify, help, or take part in an NRC proceeding.

WHAT FORMS OF DISCRIMINATION ARE PROHIBITED?

No employer may fire you or discriminate against you with respect to pay, benefits, or working conditions because you help the NRC.

HOW AM I PROTECTED FROM DISCRIMINATION?

If you believe that you have been discriminated against for bringing safety concerns to the NRC, you may file a complaint with the U.S. Department of Labor. Your complaint must describe the firing or discrimination and must be filed within 30 days of the occurrence.

Send complaints to:

Office of the Administrator
Wage and Hour Division
Employment Standards Administration
U.S. Department of Labor
Room S3502
200 Constitution Avenue, N.W.
Washington, D.C. 20210

or any local office of the Department of Labor, Wage and Hour Division. Check your telephone directory under U.S. Government listings.

WHAT CAN THE LABOR DEPARTMENT DO?

The Department of Labor will notify the employer that a complaint has been filed and will investigate the case.

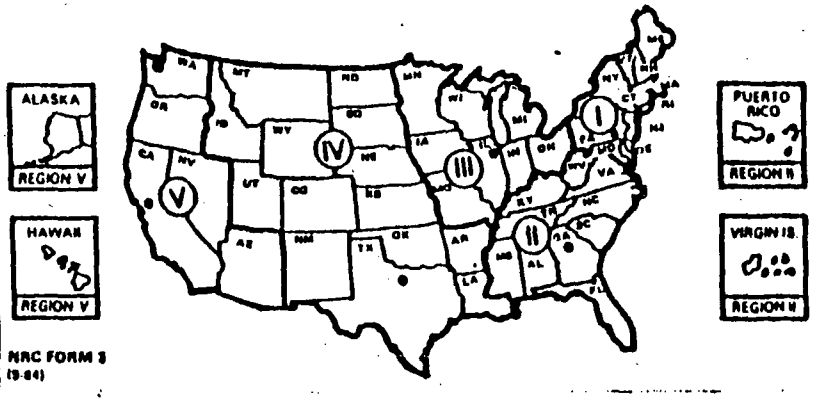
If the Department of Labor finds that your employer has unlawfully discriminated against you, it may order you to be reinstated, receive back pay, or be compensated for any injury suffered as a result of the discrimination.

WHAT WILL THE NRC DO?

The NRC may assist the Department of Labor in its investigation. NRC may conduct its own investigation where necessary to determine whether unlawful discrimination has prevented the free flow of information to the Commission. Also, if the NRC or Department of Labor finds that unlawful discrimination has occurred, the NRC may issue a Notice of Violation to your employer, impose a fine, or suspend, modify, or revoke your employer's NRC license.

UNITED STATES NUCLEAR REGULATORY COMMISSION REGIONAL OFFICE LOCATIONS

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
I	U.S. Nuclear Regulatory Commission Region I 631 Park Avenue King of Prussia, PA 19406	215 337-5000
II	U.S. Nuclear Regulatory Commission Region II 101 Marietta St., N.W., Suite 2900 Atlanta, GA 30323	404 221-4503
III	U.S. Nuclear Regulatory Commission Region III 799 Roosevelt Road Glen Ellyn, IL 60137	312 790-5500
IV	U.S. Nuclear Regulatory Commission Region IV 611 Ryan Plaza Drive, Suite 1000 Arlington, TX 76011	817 860 8100
V	U.S. Nuclear Regulatory Commission Region V 1450 Maria Lane, Suite 210 Walnut Creek, CA 94596	415 943-3700

NRC FORM 3
(9-84)

PUBLIC LAW 93-438
93rd CONGRESS, H. R. 11510
OCTOBER 11, 1974

AN ACT

To reorganize and consolidate certain functions of the Federal Government in a new Energy Research and Development Administration and in a new Nuclear Regulatory Commission in order to promote more efficient management of such functions.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SHORT TITLE

Section 1. This Act may be cited as the "Energy Reorganization Act of 1974".

NONCOMPLIANCE

Section 206. (a) Any individual director, or responsible officer of a firm constructing, owning, operating, or supplying the components of any facility or activity which is licensed or otherwise regulated pursuant to the Atomic Energy Act of 1954 as amended, or pursuant to this Act, who obtains information reasonably indicating that such facility or activity or basic components supplied to such facility or activity--

(1) fails to comply with the Atomic Energy Act of 1954 as amended, or any applicable rule, regulation, order, or license of the Commission relating to substantial safety hazards, or

(2) contains a defect which could create a substantial safety hazard, as defined by regulations which the Commission shall promulgate, shall immediately notify the Commission of such failure to comply, or of such defect, unless such person has actual knowledge that the Commission has been adequately informed of such defect or failure to comply.

(b) Any person who knowingly and consciously fails to provide the notice required by subsection (a) of this section shall be subject to a civil penalty in an amount equal to the amount provided by section 234 of the Atomic Energy Act of 1954, as amended.

(c) The requirements of this section shall be prominently posted on the premises of any facility licensed or otherwise regulated pursuant to the Atomic Energy Act of 1954, as amended.

(d) The Commission is authorized to conduct such reasonable inspections and other enforcement activities as needed to insure compliance with the provisions of this section.

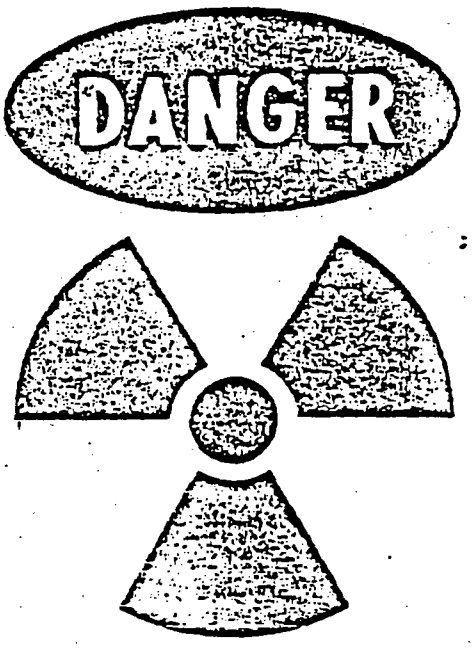
*TM 3-6665-264-10

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR'S MANUAL
RADIOACTIVE TEST SAMPLE, KRYPTON 85, GAMMA
MX-7338/PDR-27R

Headquarters, Department of the Army, Washington, DC
7 February 1975

WARNING
RADIATION HAZARD



STD-RW-1

KRYPTON 85

The MX-7338/PDR-27R contains 5,000 microcuries (uc) of Krypton 85.

Be extremely careful while using this equipment and follow safe procedures in handling, storage, and disposal contained in this manual.

*This manual supersedes TM 3-6665-264-10, 3 February 1969.

Encl 7

SAFETY PRECAUTIONS

When handling Radioactive Test Sample, Krypton 85, Gamma MX-7338/PDR-27R, avoid prolonged exposure to the radiation; do not unchain the test sample from the carrying case except for disposal purposes.

Handle the MX-7338/PDR-27R by the flat (inactive) end only. Protect stored radioactive test sample against unauthorized removal.

BIOLOGICAL SAFETY NOTICE

Personnel working in high radiation dose rate areas must be extremely careful to prevent bodily injury. While the radiation from radioactive substances cannot be felt or seen, prolonged or intensive exposure may result in serious injury. One tenth of a roentgen (100 milliroentgens) per 5-day (40-hour) week is considered to be the maximum dose rate of such radiation to which the body can be exposed continuously without serious damage.

Section I. GENERAL

1. Scope

This manual contains a description of Radioactive Test Sample, Krypton 85, Gamma, MX-7338/PDR-27R (radioactive test sample) and information on its use; instructions for handling, storage, and disposing of damaged or unwanted test samples; and actions to be taken in emergency situations.

2. Indexes of Publications

a. DA Pam 310-4. Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

b. DA Pam 310-7. Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment.

3. Forms and Records

a. Reports of Maintenance and Unsatisfactory Equipment. Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 38-750.

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Packaging Improvement Report) as prescribed in AR 700-58/NAVSUPINST 4030.29/AFR 71-13/MCO P4030.29A, and DSAR 4145.8.

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33/AFM 75-18/MCO P4610.19A, and DSAR 4500.15.

4. Reporting of Errors

Reporting of errors, omissions, and recommendations for improving this manual by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forwarded direct to Commander, US Army Electronics Command, ATTN: AMSEL-MA-PSC, Fort Monmouth, NJ 07703.

5. Use

The radioactive test sample is used as a check source to determine if the electrical circuit of an AN/PDR-27( ) radiac set is functioning properly. Detailed instructions for using the radioactive test sample are given in the technical manuals covering Radiac Set AN/PDR-27( ).

NOTE

The MX-7338/PDR-27R replaces the MX-1083( )/PDR-27 radioactive test samples and is used the same way.

6. Authorization for Issue.

Radioactive Test Sample, Krypton 85, Gamma MX-7338/PDR-27R is issued throughout the Army without a specific license being required by the user. This action is made possible by statements and conditions set forth in an Atomic Energy Commission Byproduct Material License issued to Department of the Army, ATTN: AMSEL-SF-H, US Army Electronics Command, Fort Monmouth, NJ 07703.

7. Supervision and Control

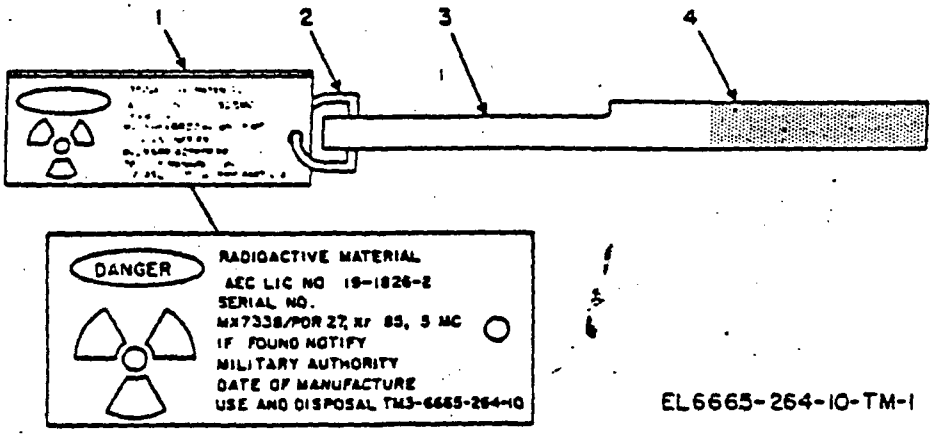
a. The handling, storage, transfer, use and disposal of the radioactive test samples should be under the control of the installation or activity (local) radiological protection officer (RPO), who will assure the radiological safety of all such functions. The items must be handled, used, and stored only by authorized personnel in established, properly placarded radiological controlled areas. Radioactive test samples must be secure against authorized use or removal.

b. Normally each MX-7338/PDR-27R will be chained to the radiac set case and stored in the space provided within the case. The radiac sets will then be stored in a secure, properly placarded radiological control area as determined by the responsible radiological protection officer. To ship the radiac sets off post for calibration, the RPO may authorize temporary removal of the radioactive test samples if they are stored during that period in a suitable, adequately shielded and labeled container within a secure placarded radiological controlled area, then rechained to the radiac set case upon its return from the calibration facility and ready for use. This procedure will permit transportation of the radiac sets as nonradioactive shipments. An exception to this procedure can be made when a number of radiac sets and radioactive test samples are possessed by one organization for training purposes. In this case, the radioactive test samples will be stored in a suitable, adequately shielded and labeled container within a secure, placarded radiological controlled area rather than being chained to the radiac set cases. Use and accountability of the MX-7338/PDR-27R will be controlled by the instructor or similarly positioned person or his specifically designated alternate under the guidance of the local RPO. In all cases, adequate control and personnel radiation protection must be established.

Section II. DESCRIPTION AND DATA

8. Description

The MX-7338/PDR-27R (fig. 1) is an aluminum wand approximately ⅛-inch in diameter and 5 inches in length. A sealed radioactive source containing approximately 5 millicuries of Krypton 85 (Kr85) is sealed in the cylindrical or active end (4) of the wand; the active end is painted purple. an identification tag (1) is attached to the flattened or inactive end (3) of the wand by a D-ring (2); the inactive end is marked MX-7338/PDR-27R. The D-ring also is used to attach the radioactive test sample to a chain in the carrying case of Radiac Set AN/PDR-27( ). While not in use, the MX-7338/PDR-27R is stored in a well in the carrying case.



1 Identification tag
2 D-ring
3 Inactive end
4 Active end

Figure 1. MX-7338/PDR Gamma, Krypton 85, radioactive test sample.

9. Tabulated Data

Type of radiation ..... Gamma.
Quantity (approx)..... 5 millicuries.
Radioactive material .....Kr85.
Half life .....10 years.

Section III. INSPECTION FOR LEAKS

10. General

If the MX-7338/PDR-27R develops a leak because of gross damage or deterioration, Krypton 85 will dissipate into the air without causing surface contamination.

11. Inspection

Inspect the MX-7338/PDR-27R when issued and each time thereafter when the sample is used to make sure that it is not damaged or deteriorated and that the meter reading on the 50 MR/hr scale of the AN/PDR-27( ) is at least 10 MR/hr. If the meter reading is below 10 MR/hr on the 50 MR/hr scale, double check the functioning of the instrument without the radioactive test sample, using the procedure given in TM 11-6665-230-15. If the double check shows the MX-7338/PDR-27R to be defective, open the D-ring (2, fig. 1) and remove the test sample from the chain. Dispose of the MX-7338/PDR-27R and identification tag as directed in paragraphs 14 or 15, whichever is applicable.

Section IV. STORAGE

12. General

The MX-7338/PDR-27R is numbered serially to permit control of supply and issue. They are not individually controlled items as defined in AR 725-1. Accountability for radioactive test samples must be maintained by serial number only. (Loss of a radioactive test sample must be reported as described in paragraph 16c and an unwanted or unserviceable test sample must be disposed of through a radioactive material disposal facility as described in paragraphs 14 and 15.) Protect stored radioactive test samples against unauthorized removal.

13. Bulk Storage

Bulk storage is authorized only at depots designated by the National Inventory Control Point. Designated depots will be equipped with storage and disposal facilities for radioactive materials. The depots will be supported by a health physicist or a qualified radiation protection officer.

Section V. DISPOSITION OF UNWANTED OR UNSERVICEABLE RADIOACTIVE TEST SAMPLES

14. Disposition of Test Samples in CONUS

In CONUS, turn in unwanted or unserviceable MX-7338/PDR-27R to a radioactive material disposal facility in accordance with AR 755-15. Notify Commander, US Army Electronics Command, ATTN: AMSEL-SF-H, Fort Monmouth, NJ 07703 of the completed action. Notification is to include the serial numbers of the MX-7338/PDR-27 disposed.

NOTE

Although the radioactivity is greater than 10 MR/hr when checked with an AN/PDR-27( ), the radioactive test sample is considered unserviceable is the identification tag is damaged, unreadable, or missing, or if the aluminum wand is crushed or corroded.

15. Disposition of Test Samples Overseas

Disposition of radioactive test samples overseas will be in accordance with the procedures established by the responsible theater commander.

Section VI. EMERGENCY SITUATIONS AND ACTIONS TO BE TAKEN

16. Loss of Test Sample

a. Attempt to recover the test sample.

(1) Review records to determine the responsible individual.

(2) Make a physical survey of the area.

b. If the radioactive test sample is recovered, revise procedures as necessary to prevent a recurrence.

c. If the radioactive test sample is not recovered, report the loss within 25 days through command channels to the major command radioactive material control point and state the serial number of the missing MX-7338/PDR-27R, the circumstances involved, and the procedures taken to prevent recurrence. The radioactive material control point will forward this notification to Commander, US Army Electronics Command, ATTN: AMSEL-SF-H, Fort Monmouth, NJ 07703.

17. Internal Exposure of Personnel

Internal exposure of personnel resulting from ingestion, inhalation, or absorption of radioactive material generally associated with damaged or leaking sources does not apply to the MX-7338/PDR-27R because Krypton 85 is an inert gas.

18. External Overexposure of Personnel

a. External overexposure of personnel can occur if the test sample is in direct contact with the skin for prolong periods.

b. The following actions are required if a known or suspected overexposure occurs:

(1) Seek advice from the medical officer.

(2) If the external exposure is suspected, calculate the exposure by multiplying the length of exposure (in hours) by 10 MR/hr and annotate DD Form 1141 (Record of Occupational exposure to Ionizing Radiation).

(3) Correct procedures to prevent a recurrence.

(4) Notify responsible commands and Commander, US Army Electronics Command, ATTN: AMSEL-SF-H, Fort Monmouth, NJ 07703.

APPENDIX
REFERENCES

AR 725-1	Special Authorization and Procedures for Issues, Sales, and Loans.
AR 755-15	Disposal of Unwanted Radioactive Material
DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8 and 9), Supply Bulletins, and Lubrication Orders.
DA Pam 310-7	US Army Index of Modification Work Orders.
TM 11-6665-230-15	Organizational, DS, GS, and Depot Maintenance Manual (Including Organizational Maintenance Repair Parts and Special Tool Lists): Radiac Set, AN/PDR-27R.
TM 38-750	The Army Maintenance Management System (TAMMS).

DRAFT

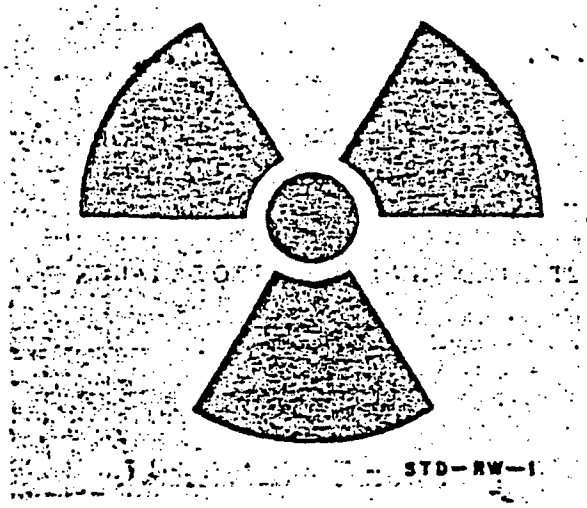
*TM 3-6665-264-10

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR'S MANUAL
MX-7338/PDR-27( )
RADIOACTIVE TEST SAMPLE

Headquarters, Department of the Army, Washington, DC

CAUTION
RADIOACTIVE MATERIAL



KRYPTON 85

The MX-7338/PDR-27( ) contains 5 millicuries (mCi) of Krypton 85 (Kr 85).

Exercise caution in the use of this equipment and follow the safety procedures contained in this manual for handling, storage, and disposal.

*This manual supersedes TM 3-6665-264-10, 7 February 1975

Encl 7

SAFETY PRECAUTIONS

Avoid prolonged, unnecessary contact with the MX-7338/PDR-27( ) Radioactive Test Sample; do not unchain the test sample from the carrying case except for disposal purposes or when shipping the AN/PDR-27( ) Radiac Set for calibration.

Handle the MX-7338/PDR-27( ) by the flat (inactive) end only. Protect stored radioactive test sample against unauthorized removal.

SECTION I. GENERAL

1. Scope. This manual contains a description of the MX-7338/PDR-27( ) Radioactive Test Sample, and information/instructions on the use, handling, storage, transportation and disposal of damaged or unwanted test samples and actions to be taken in emergency situations.

2. Index of Publications. DA Pam 310-1. Refer to the latest issue of DA Pam 310-1 to determine whether there are new editions, changes, modification work orders (MWO's), or additional publications pertaining to the equipment.

3. Forms and Records.

a. Reports of Maintenance and Unsatisfactory Equipment. Maintenance forms, records, and reports to be used by maintenance personnel, at all maintenance levels, are listed in and prescribed by TM 38-750.

b. Report of Discrepancies (ROD) (SF 364). Fill out and forward SF 364 as prescribed in DLAR 4140.55/AR 735-11-2/NAVSUPINST 4440.127E/AFR 400-54/MCO 4430.3F.

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33/AFM 75-18/MCO P4610.19A/DSAR 4500.15.

4. Reporting of Errors. Reporting of errors, omissions, and recommendations for improving this manual by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forwarded directly to: Commander, US Army Communications-Electronics Command (CECOM), ATTN: AMSEL-ME-MT, Fort Monmouth, NJ 07703-5007 with a copy furnished to the CECOM Safety Office, ATTN: AMSEL-SF-MR, Fort Monmouth, NJ 07703-5024.

5. Use. The radioactive test sample is used solely as a check source to determine if an AN/PDR-27( ) Radiac Set is functioning properly. Detailed instructions for using the radioactive test sample are given in the technical manuals (TM) for the Radiac Set AN/PDR-27( ).

-NOTE-

The MX-7338/PDR-27( ) replaces the MX-1083( )/PDR-27 Radioactive Test Sample.

6. Authorization for Issue. The MX-7338/PDR-27( ) Radioactive Test Sample is issued throughout the Department of the Army (DA) and at various Department of Defense (DOD) installations/activities without a specific license being required by the user. This is made possible based upon committments set forth in US Nuclear Regulatory Commission (NRC) Byproduct Material License No. 29-01022-11 issued to CECOM. Information required by the NRC license and regulations is provided as follows:

a. Radiation Protection. Users of the MX-7338/PDR-27( ) should refer to this TM for instructions on control, safe handling, inspection, storage, disposition, emergency situations and transportation. Instructions for the proper use of the MX-7338/PDR-27( ) in conjunction with the AN/PDR-27( ) Radiac Sets are contained in the TM's associated with the radiac sets. These publications satisfy the radiation protection requirements set forth in NRC regulations (Title 10, Chapter 1, Code of Federal Regulations, Parts 19 and 20) (10 CFR Parts 19 and 20).

b. Notice to Employees. The NRC requires that users of licensed material post Form NRC 3, Notice to Employees. Normal use of the AN/PDR-27( ) Radiac Sets for tactical (field) purposes, for reasons of practicality, precludes posting of this form as required by the NRC. Therefore, to fulfill posting

requirements, Form NRC 3, Notice to Employees, will be posted at MX-7338/PDR-27( ) Radioactive Test Sample permanent storage locations. A copy of Form NRC 3 is contained at the back of this manual.

c. Section 206, "Energy Reorganization Act of 1974," (10 CFR 21), also contained in the back of this manual, shall be posted in the same manner as Form NRC 3.

d. Reporting of Defects and Noncompliance Actions. The regulations contained in 10 CFR Part 21, establish procedures and requirements for implementation of Section 206 of the Energy Reorganization Act of 1974. Reporting of defects and noncompliance should be made through appropriate radiological command channels to the CECOM Safety Office. Notification shall be made within 24 hours following the discovery of defects or noncompliance.

e. NRC License. NRC Byproduct Material License No. 29-01022-11 and related documents are held by the CECOM Safety Office at Fort Monmouth, NJ. MX-7338/PDR-27( ) users may request further information on these documents by contacting:

Commander
US Army Communications-Electronics Command
ATTN: AMSEL-SF-MR
Fort Monmouth, NJ 07703-5024

or calling AUTOVON 995-4427.

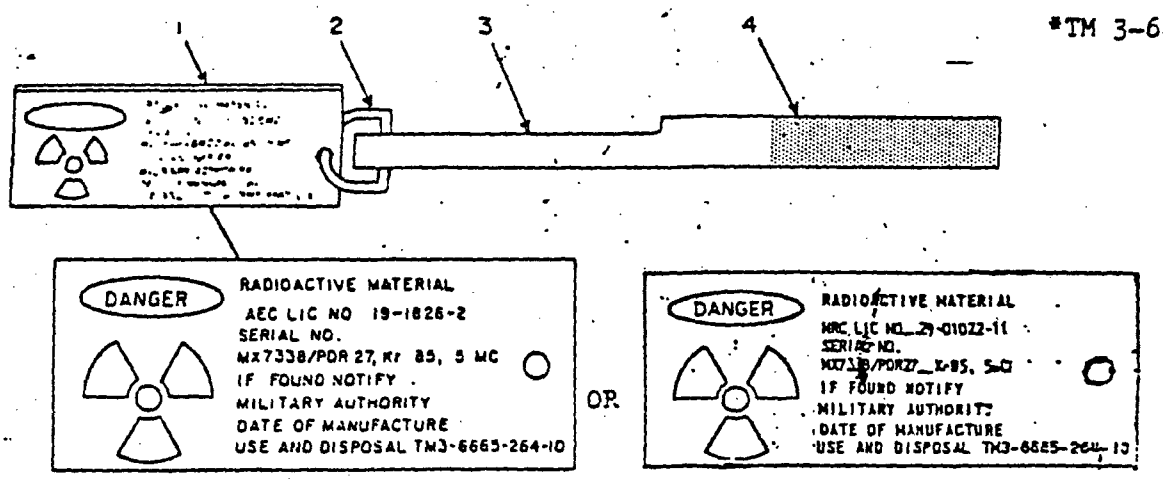
7. Supervision and Control.

a. The accountability, storage and disposal of the radioactive test samples shall be under the guidance of the installation or activity (local) radiation protection officer (RPO), who will assure the radiological safety of all such functions. The items must be stored in established, properly placarded radiation controlled areas and secured against unauthorized use or removal.

b. Each MX-7338/PDR-27( ) will be attached by chain to the radiac set case and stored in the space provided within the case. The radiac sets will then be stored in a secured area. For off post calibration, the RPO may authorize temporary removal of the radioactive test samples. The removed radioactive test samples will stored in a suitable, adequately shielded and labeled container and placed within a designated radiation controlled area. This procedure will permit transportation of the radiac sets as nonradioactive shipments. The radioactive test sample will be rechained to the case upon return of the radiac set from the calibration facility. In all instances, adequate control and personnel radiation protection shall be maintained.

SECTION II. DESCRIPTION AND DATA.

8. Description. The MX-7338/PDR-27( ) (fig. 1) is an aluminum wand approximately 3/8 inch in diameter and 5 inches in length. A sealed radioactive source containing approximately 5 mCi of Kr 85 is sealed in the cylindrical or active end (4) of the wand; the active end is painted purple. An identification tag (1) is attached to the flattened or inactive end (3) of the wand by a D-ring (2); the inactive end is marked MX-7338/PDR-27. The D-ring is also used to attach the radioactive test sample to a chain in the carrying case of Radiac Set AN/PDR-27( ). While not in use, the MX-7338/PDR-27( ) is stored in a well in the carrying case.



1 Identification tag
2 D-ring
3 Inactive end
4 Active end

Figure 1. MX-7338/PDR-27( ) Radioactive Test Sample.

—NOTE—

The logistical and license management responsibilities for the MX-7338/PDR-27( ) Radioactive Test Sample is assigned to CECOM under NRC License Number 29-01022-11. All new procurements made by CECOM will reflect this transition and incorporate NRC License Number 29-01022-11 on the identification tag attached to the test sample. Procurements made prior to the management transition incorporate AEC License Number 19-1826-2 on the identification tag. The NRC has exempted CECOM from exchanging identification tags on those test samples possessed under previous procurements. Therefore, identification tags attached to test samples may bear either of the two license authorization numbers.

9. Radioactive Material Data.

Radioactive material.....Kr-85.

Type of radiation.....Gamma.

Activity (approx).....5 millicuries.

Half-life.....10 years.

SECTION III. INSPECTION FOR LEAKS.

10. General. If the MX-7338/PDR-27( ) develops a leak because of gross damage or deterioration, Krypton 85 will dissipate into the air and will not cause surface contamination.

11. Inspection. Inspect the MX-7338/PDR-27( ) upon issue and use to make sure that it is not damaged or deterioriated and that the meter reading on the 50 mR/hr scale of the AN/PDR-27( ), utilizing the small probe, is at least 10 mR/hr. This procedure is accomplished by placing the active (purple) end of the MX-7338/PDR-27( ) Radioactive Test Sample in direct parallel contact with the center portion of the small probe. If the meter reading is below 10 mR/hr, double check the functioning of the instrument without the radioactive test sample using the procedure given in the TM's for the appropriate AN/PDR-27( ) Radiac Set. If the re-check still indicates that the MX-7338/PDR-27( ) may be defective, open the D-ring, remove and dispose of the MX-7338/PDR-27( ) and identification tag as directed in paragraph 14.

SECTION IV. STORAGE.

12. General. The MX-7338/PDR-27( ) are not individually controlled items as defined in Army Regulation (AR) 385-11. Loss of a radioactive test sample must be reported as described in paragraph 15c. Unwanted or unserviceable radioactive test samples must be disposed of as described in paragraph 14. Stored radioactive test samples must be in properly placarded radiation controlled areas and secured against unauthorized removal.

13. Bulk Storage. Bulk storage is at depots designated by the National Inventory Control Point (NICP). These depots will be equipped with storage and disposal facilities for radioactive materials and supported by a health physicist or a qualified RPO.

SECTION V. DISPOSITION OF UNWANTED OR UNSERVICEABLE RADIOACTIVE TEST SAMPLES.

14. Disposition of Test Samples. The NICP reviews reports of excess, unwanted or unserviceable MX-7338/PDR-27( ) Radioactive Test Samples that are submitted through appropriate command channels for disposition determination. Disposition instructions are provided by the NICP for serviceability, turn-in or disposal of the item as radioactive waste.

-NOTE-

Although the meter reads greater than 10 mR/hr when checked with an AN/PDR-27( ) Radiac Set, the radioactive test sample is considered unserviceable if the identification tag is damaged, unreadable, or missing, or if the aluminum wand is crushed or corroded.

SECTION VI. EMERGENCY SITUATIONS AND ACTIONS TO BE TAKEN.

15. Loss of Test Sample.

a. Attempt to recover the test sample.

(1) Review records to determine the responsible individual.

(2) Make a physical survey of the suspect area.

b. Revise procedures as necessary to prevent recurrence.

c. If the radioactive test sample is not recovered, report the loss immediately through command channels to the major command Radioactive Material Control Point (RMCP) indicating the serial number of the missing MX-7338/PDR-27( ), the circumstances involved, and procedures taken to prevent recurrence. The RMCP will immediately forward this notification to Commander, US Army Communications-Electronics Command, ATTN: AMSEL-SF-MR, Fort Monmouth, NJ 07703-5024.

16. Internal Exposure of Personnel. Internal exposure of personnel due to ingestion, inhalation, or absorption of radioactive material, generally associated with damaged or leaking sources, does not apply to the MX-7338/PDR-27( ) because Krypton 85 is an inert gas.

17. External Exposure of Personnel.

a. External overexposure can occur if the test sample is in direct contact with the individual for periods of time longer than that required for normal use.

b. The following actions are required if a known or suspected overexposure occurs:

(1) Seek advice from the medical officer.

(2) Contact the local RPO.

(3) Correct procedures to prevent recurrence.

(4) Notify responsible commands and Commander, US Army Communications-Electronics Command, ATTN: AMSEL-SF-MR, Fort Monmouth, NJ 07703-5024.

SECTION VII. TRANSPORTATION.

18. Transportation of MX-7338/PDR-27( ) Radioactive Test Sample.

a. The MX-7338/PDR-27( ) requires shipment in accordance with the requirements of the US Department of Transportation (DOT) as set forth in 49 CFR, AR 385-11 and NRC License 29-01022-11.

b. Shipment of the MX-7338/PDR-27( ) can be made as: Radioactive Material, Limited Quantity, N.O.S., UN 2910. The shipment is exempt from specification packaging, shipping papers, certification, marking, and labeling requirements in accordance with 49 CFR 173.421 provided that the following conditions are fulfilled:

(1) The MX-7338/PDR-27( ) must be shipped in a strong tight package (49 CFR 173.421a).

(2) The exposure rate at the package surface must be less than 0.5 mR/hr.

(3) The shipping package must be certified as being acceptable for transportation by having a notice enclosed in, or on the package, included with the packing list, or otherwise forwarded with the package. This notice must include the name of the consignor (sender) or consignee (receiver) and the statement: "This package conforms to the conditions and limitations specified in 49 CFR 173.421 for excepted Radioactive Material, Limited Quantity, N.O.S., UN2910."

(4) The outside of the inner packaging or if there is no inner packaging, the outside of the packaging itself must bear the marking "Radioactive."

(5) The results of the radiation survey and "NRC License Number 29-01022-11" must be annotated on the shipping records (AR 385-11, paragraph 4-1a).

c. Shipment of the MX-7338/PDR-27( ) when incorporated into the AN/PDR-27( ) Radiac Set will qualify as: Radioactive Material, Instruments and Articles, UN 2911; and is exempt from specification packaging, shipping papers, certification, marking, and labeling requirements in accordance with 49 CFR 173.422 provided that the following conditions are fulfilled:

(1) The exposure rate at the package surface must be less than 0.5 mR/hr.

(2) The shipping package must be certified as being acceptable for transportation by having a notice enclosed in, or on the package, included with the packing list, or otherwise forwarded with the package. This notice must include the name of the consignor (sender) or consignee (receiver) and the statement: "This package conforms to the conditions and limitations specified in 49 CFR 173.422 for excepted Radioactive Material, Instruments and Articles, UN2911."

(3) Results of the radiation survey and "NRC License Number 29-01022-11" must be annotated on the shipping records (AR 385-11, paragraph 4-1a).

d. Mailing of the MX-7338/PDR-27( ) by the US Postal Service is permitted for those shipments which may be classified as limited quantities of radioactive materials or excepted instruments, articles and devices as prescribed in 49 CFR 173.421, 173.422 or 173.424, provided that the activity content of any package, instrument or article does not exceed one-tenth the activity limits specified in 49 CFR 173.423. Based on this, shipment of single quantities of MX-7338/-PDR -27( ) Radioactive Test Samples or single quantities of AN/PDR-27( ) Radiac Sets incorporating the MX-7338/PDR-27( ) Radioactive Test Sample is permitted by US Postal Service regulations provided that the requirements stipulated in subparagraph b and c above are complied with.

-NOTE-

Transportation requirements are continually being reviewed and revised with respect to the movement of hazardous materials. If questions regarding the proper transport of radioactive materials should arise, contact your local Radiation Protection Officer or the CECOM Safety Office (AV 995-4427) for assistance.

APPENDIX A

REFERENCES

AR 40-14	Control and Recording Procedures for Exposure to Ionizing Radiation and Radioactive Materials (DLAR 1000.28).
AR 385-11	Ionizing Radiation Protection (Licensing, Control, Transportation, Disposal, Radiation Safety).
AR 385-30	Safety Color Code Marking and Signs.
DA PAM 310-1	Consolidated Index of Army Publications and Blank Forms.
MIL-STD-129H	Marking for Shipment and Storage.
TM 11-6665-209-10	Operator's Manual, Radiac Sets AN/PDR-27J (NSN 6665-00-543-1435), AN/PDR/27L (NSN 6665-00-856-3456) and AN/PDR/27Q (NSN 6665-00-017-8903)
TM 11-6665-224-15	Operator's, Organizational, DS, GS, and Depot Maintenance Manual Radiac Set AN/PDR-27P (NSN 6665-00-975-7222)
TM 11-6665-228-15	Operator's, Organizational, DS, GS, and Depot Maintenance Manual Including Repair Parts and Special Tools List, Radiac Set AN/PDR-27G
TM 11-6665-230-15	Operator's, Organizational, Direct Support, General Support, and Depot Maintenance Manual (Including Repair Parts and Special Tools List), Radiac Set AN/PDR-27R (NSN 6665-00-961-0846)
TM 11-6665-249-14	Operator's, Organizational, Direct Support, and General Support Maintenance Manual for Radiac Set AN/PDR-27S (NSN 6665-01-080-4418)
TM 38-750	The Army Maintenance Management System (TAMMS).

Title 10, Code of Federal Regulations, Parts 19, 20 and 21.

Title 49, Code of Federal Regulations.

UNITED STATES NUCLEAR REGULATORY COMMISSION
Washington, D.C. 20555

NOTICE TO EMPLOYEES

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

AT IS THE NUCLEAR GULATORY COMMISSION?

Nuclear Regulatory Commission is an endent Federal regulatory agency re- ible for licensing and inspecting nuclear r plants and other commercial uses of active materials.

AT DOES THE NRC DO?

NRC's primary responsibility is to re that workers and the public are ected from unnecessary or excessive sure to radiation and that nuclear ities including power plants are con- ted to high quality standards and ated in a safe manner. The NRC does by establishing requirements in Title 10 he Code of Federal Regulations (10 I) and in licenses issued to nuclear users.

IAT RESPONSIBILITY DOES EMPLOYER HAVE?

company that conducts activities ised by the NRC must comply with NRC's requirements. If a company ates NRC requirements, it can be fined ave its license modified, suspended or ked.

ur employer must tell you which NRC ation requirements apply to your work must post NRC Notices of Violation olving radiological working conditions.

WHAT IS MY RESPONSIBILITY?

For your own protection and the protection of your co-workers, you should know how NRC requirements relate to your work and should obey them. If you observe violations of the requirements, you should report them.

HOW DO I REPORT VIOLATIONS?

If you believe that violations of NRC rules or of the terms of the license have occurred, you should report them immediately to your supervisor. If you believe that adequate corrective action is not being taken, you may report this to an NRC inspector or the nearest NRC Regional Office.

WHAT IF I WORK IN A RADIATION AREA?

If you work with radioactive materials or in a radiation (controlled) area, the amount of radiation exposure that you may legally receive is limited by the NRC. The limits on your exposure are contained in sections 20.101, 20.103, and 20.104 of Title 10 of the Code of Federal Regulations (10 CFR 20). While these are the maximum allowable limits, your employer should also keep your radiation exposure as far below these limits as is "reasonably achievable."

MAY I GET A RECORD OF MY RADIATION EXPOSURE?

Yes. Your employer is required to tell you, in writing, if you receive any radiation exposure above the limits set in the NRC regulations or your employer's license. In addition, if your job involves radiation, you may request from your employer a record of your annual radiation exposures and a written report of your total exposure when you leave your job.

HOW ARE VIOLATIONS OF NRC REQUIREMENTS IDENTIFIED?

NRC conducts regular inspections at licensed facilities to assure compliance with NRC requirements. In addition, your employer and site contractors conduct their own inspections to assure compliance. All inspectors are protected by Federal law. Interference with them may result in criminal prosecution for a Federal offense.

MAY I TALK WITH AN NRC INSPECTOR?

Yes. Your employer may not prevent you from talking with an NRC inspector and you may talk privately with an inspector and request that your identity remain confidential.

MAY I REQUEST AN INSPECTION?

If you believe that your employer has not corrected violations involving radiological working conditions, you may request an inspection. Your request should be addressed to the nearest NRC Regional Office and must describe the alleged violation in detail. It must be signed by you or your representative.

HOW DO I CONTACT THE NRC?

Notify an NRC inspector on-site or call the nearest NRC Regional office collect. NRC inspectors want to talk to you if you are worried about radiation safety or other aspects of licensed activities, such as the quality of construction or operations at your plant.

CAN I BE FIRED FOR TALKING TO THE NRC?

No. Federal law prohibits an employer from firing or otherwise discriminating against a worker for bringing safety concerns to the attention of the NRC. You may not be fired or discriminated against because you:

- ask the NRC to enforce its rules against your employer;
- testify in an NRC proceeding;
- provide information or are about to provide information to the NRC about violations of requirements;
- are about to ask for or testify, help, or take part in an NRC proceeding.

WHAT FORMS OF DISCRIMINATION ARE PROHIBITED?

No employer may fire you or discriminate against you with respect to pay, benefits, or working conditions because you help the NRC.

HOW AM I PROTECTED FROM DISCRIMINATION?

If you believe that you have been discriminated against for bringing safety concerns to the NRC, you may file a complaint with the U.S. Department of Labor. Your complaint must describe the firing or discrimination and must be filed within 30 days of the occurrence.

Send complaints to:

Office of the Administrator
Wage and Hour Division
Employment Standards Administration
U.S. Department of Labor
Room S3502
200 Constitution Avenue, N.W.
Washington, D.C. 20210

or any local office of the Department of Labor, Wage and Hour Division. Check your telephone directory under U.S. Government listings.

WHAT CAN THE LABOR DEPARTMENT DO?

The Department of Labor will notify t employer that a complaint has been file and will investigate the case.

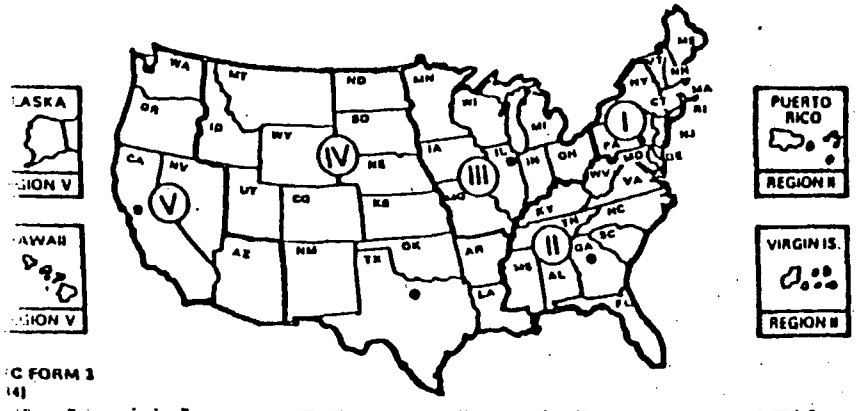
If the Department of Labor finds that yc employer has unlawfully discriminate against you, it may order you to be rei stated, receive back pay, or be compensa for any injury suffered as a result of th discrimination.

WHAT WILL THE NRC DO?

The NRC may assist the Department o Labor in its investigation. NRC may co duct its own investigation where necess to determine whether unlawful discrimi tion has prevented the free flow of info mation to the Commission. Also, if th NRC or Department of Labor finds that unlawful discrimination has occurred, t NRC may issue a Notice of Violation to your employer, impose a fine, or suspe modify, or revoke your employer's NR license.

UNITED STATES NUCLEAR REGULATORY COMMISSION REGIONAL OFFICE LOCATIONS

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
I	U.S. Nuclear Regulatory Commission Region I 631 Park Avenue King of Prussia, PA 19406	215 337-5000
II	U.S. Nuclear Regulatory Commission Region II 101 Marietta St., N.W., Suite 2900 Atlanta, GA 30323	404 221-4503
III	U.S. Nuclear Regulatory Commission Region III 799 Roosevelt Road Glen Ellyn, IL 60137	312 790-5500
IV	U.S. Nuclear Regulatory Commission Region IV 611 Ryan Plaza Drive, Suite 1000 Arlington, TX 76011	817 860-8100
V	U.S. Nuclear Regulatory Commission Region V 1450 Maria Lane, Suite 210 Walnut Creek, CA 94596	415 943-3700

C FORM 3
(4)

PUBLIC LAW 93-438
93rd CONGRESS, H. R. 11510
OCTOBER 11, 1974

AN ACT

To reorganize and consolidate certain functions of the Federal Government in a new Energy Research and Development Administration and in a new Nuclear Regulatory Commission in order to promote more efficient management of such functions.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SHORT TITLE

Section 1. This Act may be cited as the "Energy Reorganization Act of 1974".

NONCOMPLIANCE

Section 206. (a) Any individual director, or responsible officer of a firm constructing, owning, operating, or supplying the components of any facility or activity which is licensed or otherwise regulated pursuant to the Atomic Energy Act of 1954 as amended, or pursuant to this Act, who obtains information reasonably indicating that such facility or activity or basic components supplied to such facility or activity--

(1) fails to comply with the Atomic Energy Act of 1954 as amended, or any applicable rule, regulation, order, or license of the Commission relating to substantial safety hazards, or

(2) contains a defect which could create a substantial safety hazard, as defined by regulations which the Commission shall promulgate, shall immediately notify the Commission of such failure to comply, or of such defect, unless such person has actual knowledge that the Commission has been adequately informed of such defect or failure to comply.

(b) Any person who knowingly and consciously fails to provide the notice required by subsection (a) of this section shall be subject to a civil penalty in an amount equal to the amount provided by section 234 of the Atomic Energy Act of 1954, as amended.

(c) The requirements of this section shall be prominently posted on the premises of any facility licensed or otherwise regulated pursuant to the Atomic Energy Act of 1954, as amended.

(d) The Commission is authorized to conduct such reasonable inspections and other enforcement activities as needed to insure compliance with the provisions of this section.

BARRY J. SILBER, Supervisory 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 prelicensing investigations, radiation surveys and tests at the sites of licensees and registrants using radiation sources to enforce state requlations 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.

Encl 1

(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 CECOM 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 - December 1981:

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

(7) December 1981 - Present:

CECOM, Fort Monmouth, New Jersey.
Supervisory Health Physicist and Chief, Radiological Engineering Branch.
Responsible for directing and administrating Health Physics/Radiological Engineering programs for the life cycle management control of radioactive commodities utilized worldwide which includes but is not limited to the various stages of research, development, test, production, deployment and disposal; directs/administers the Fort Monmouth Radiation Protection Program for multiple type and quantities of radioactive material; develops and provides guidance and assistance to the DOD activities and elements world-wide in the radiological safety aspects of handling, storing and disposal of mission items of supply containing radioactive materials, provides guidance for and technical review of NRC license applications and DA Authorizations for use of radioactive materials in CECOM systems or components thereof; manages comprehensive computerized tracking system to ascertain compliance to stipulated licenses and authorizations; develops technical criteria and provides these data and assistance to all DA Major Commands to assure compliance with the life cycle management controls established by the NRC and/or DA Authorization; assures compliance throughout the Command with the requirements of NRC and DA relative to ionizing radiation within facilities, and mission items containing radioactive materials.

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

	Duration of Training	On-The-Job	Formal Course
(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 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
(7) Health Physics in Radiation Accidents - Radiation Emergency Assistance Center/Training Site, Oak Ridge Associated Universities, Oak Ridge, Tennessee - 11 - 15 January 1982.	1 Week	No	Yes

d. Experience with Radiation.

Isotope	Maximum Amount	Duration of Experience	Type of Use
(1) ^{14}C	60 mCi	3 years	For items 1 through 10-manufacture 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) $^{90}Sr/^{90}Y$	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) $^{106}Ru/^{106}Rh$	50 mCi	3 years	
(8) $^{144}Ce/^{144}Pr$	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	

JOSEPH M. SANTARSIERO, Health Physicist, US Army Communications-Electronics Command, Fort Monmouth, New Jersey 07703

a. Education:

(1) Seton Hall University, East Orange, New Jersey

Biology program 1972-1973.

(2) Brookdale Community College, Lincroft, New Jersey

(3) Rutgers, The State University, New Brunswick, New Jersey

BS degree in Biology, May 1978.

(4) Middlesex General Hospital, New Brunswick, New Jersey

Certification in Nuclear Medicine Technology, May 1978.

(a) American Registry of Radiologic Technologists (ARRT).

(b) Certifying Board of Nuclear Medicine Technology (CBNMT).

(c) State of New Jersey Certification - Nuclear Medicine Technology.

(5) Rutgers, the State University, New Brunswick, New Jersey

Presently completing program of graduate study in Radiation Science (Masters Program).

b. Professional Experience:

(1) May 1978-August 1982:

Monmouth Medical Center, 3rd and Pavillon Avenues, Long Branch, New Jersey.

Senior Nuclear Medicine Technologist-Department of Nuclear Medicine. Licensed to prepare and administer radiopharmaceuticals for diagnostic imaging of disease in or on human beings. Responsible for the quality control of imaging systems and computers, dose calculation and assay prior to administration, patient orientation to procedures and on-call emergency procedures. Performed various 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 Jersey State Regulations.

(2) August 1982-September 1983:

Bio-Med Associates, Inc., 753 Boulevard, Kenilworth, New Jersey.

Provide consultation to hospitals, doctors, administrators, etc., regarding the safe and proper use of radiation and radioactive materials. Determine the requirements of, and design the shielding for X-ray installations and nuclear medicine departments. Prepare applications for the use of radioac-

ENCL 2

tive materials for both USNRC and State regulated radioactive materials. Amend licenses as requested and required. Evaluate radiation safety programs, prepare and give lectures to physicians, nurses, administrators, etc., regarding radiation and radioactivity. Design areas where radioactive materials are stored and/or used. Perform quality control procedures on X-ray machines and nuclear medicine instruments. Instruct X-ray students. Review personnel monitoring records and methods, evaluate personnel performance regarding radiation and its use, perform sealed source leak tests on various radionuclides.

(3) September 1983-February 1984:

State of New Jersey, Department of Environmental Protection, Bureau of Radiation Protection, 380 Scotch Road, Trenton, New Jersey.

Radiation Physicist.

Approved or rejected licenses or amendments for possession and use of radioactive materials, in the State of New Jersey, after assessment of user qualification, radiation safety program, and compliance with State rules and regulations. Reorganized program format and developed inspection procedures, criteria and forms. Evaluated and provided recommendations for quality assurance of radiopharmaceuticals and instruments at user facilities. Performed inspections and violation investigations of facilities utilizing State licensable materials, initiated legal proceedings for areas found to be in non-compliance, and issued letters of compliance. Authorized to impound non-compliant units to prevent usage that may be detrimental to public and/or occupational safety. Conducted special projects evaluating radiation hazards and development of procedures for control and reduction of unnecessary radiation. Investigated violations and incidents post notification of radiation hazard with authority to establish improved radiation safety requirements. Registered NRC licensable materials. Registered accelerators and reviewed radiation hazard with licensable materials. Registered accelerators and reviewed radiation safety surveys. Member of emergency response team with authority to make immediate decisions relative to public health and safety regarding the control of radiation. Responsible for monthly report and statistic preparation involving radioactive material users, inspections, violations, NRC registrations, and accelerators. Responded to all public and private inquiries involving radioactive materials or non-ionizing radiations. Proposed regulations for NJ Administrative Code adoption.

(4) February 1984-present

US Army Communications-Electronics Command (CECOM), Fort Monmouth, New Jersey.

Health Physicist - Responsible for health physics functions in the establishment and implementation of the CECOM Safety Program aimed at establishing life cycle controls of CECOM 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.

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

Topic	Duration of Training	On-The-Job	Formal Course
(1) Internship in Radiation Health Sciences; Rutgers University, New Brunswick, NJ (1977-1978)*	1 year	Yes	Yes
(2) Radiation and Radioactivity; Rutgers Graduate School of Radiation Science, New Brunswick, NJ (Sep - Dec, 1981)	1 semester	No	Yes
(3) Radioactivity and the Environment; Rutgers Graduate School of Radiation Science, New Brunswick, NJ (Jan-Apr, 1982)	1 semester	No	Yes
(4) Special Topics in Radiological Health; Rutgers Graduate School of Radiation Science, New Brunswick, NJ (Jan-Apr, 1982)	1 semester	Yes	Yes
(5) Radiation Dosimetry; Rutgers Graduate School of Radiation Science, New Brunswick, NJ (Sep-Dec, 1982)	1 semester	No	Yes
(6) Radiation Biophysics; Rutgers Graduate School of Radiation Science, New Brunswick, NJ (Jan-Apr, 1983)	1 semester	No	Yes
(7) Radiation Chemistry; Rutgers Graduate School of Radiation Science, New Brunswick, NJ (Sep-Dec, 1983)	1 semester	No	Yes
(8) Nuclear Emergency Response, State of NJ, Department of Environmental Protection (27, 28 Sep, 1983)	16 hours	No	Yes
(9) Instrumentation and Radiation; Rutgers Graduate School of Radiation Science, New Brunswick, NJ (Jan-Apr, 1984)	1 semester	No	Yes
(10) Radioactive Materials Transportation; Department of Energy; Chicago, IL (20-24 Aug, 1984)	40 hours	No	Yes

*Course work included: Radiation Detection and Measurement; Nuclear Instrumentation; Radionuclide Chemistry; Radiation Protection; Radiation Biology;

Radiation Biochemistry; Interactions of Radiation with Matter; Atomic Theory and Structure; Nuclear Physics.

d. Experience with Radioactive Materials:

	Maximum Isotope	Amount	Experience	Type of Use
1.	$^{99}Mo/^{99m}Tc$	2 Ci	5 years	For items 1 through 18, radiopharmaceutical preparation, dose injection, and/or related diagnostic/therapeutic procedures, health physics surveys, wipe test analysis, and instrument calibration.
2.	^{131}I	20 mCi	5 years	
3.	^{75}Se	5 mCi	5 years	
4.	^{67}Ga	50 mCi	5 years	
5.	^{201}Tl	30 mCi	5 years	
6.	^{32}P	40 mCi	5 years	
7.	^{133}Xe	200 mCi	5 years	
8.	$^{81}Rb/^{81m}Kr$	25 mCi	5 years	
9.	^{125}I	50 mCi	5 years	
10.	^{123}I	10 mCi	5 years	
11.	^{137}Cs	5 Ci	5 years	
12.	^{226}Ra	800 mg	5 years	
13.	^{192}Ir	80 Ci	6 months	
14.	^{57}Co	30 mCi	5 years	
15.	^{133}Ba	10 mCi	5 years	
16.	^{51}Cr	25 mCi	5 years	
17.	^{59}Fe	20 mCi	1 year	
18.	^{111}In	3 mCi	5 years	
19.	^{85}Kr	6 mCi	2 years	For items 19 through 21 experience consisted of wipe tests, experiments and evaluations utilizing these sources.
20.	^{90}Sr	200 uCi	2 years	
21.	^{60}Co	100 Ci	2 years	

STEVEN A. HORNE, Supervisory Safety Engineer, 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:

	Duration of Training	On The Job	Formal Course
a. Fifty-six semester hours pertaining to radiation, including college physics, Environmental Aspects of Nuclear Power Plant Management, Environmental Radioactivity, 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

End 3

	Duration of Training	On The Job	Formal Course
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 Spectrocopy Course 208 - Public Health Services, Winchester, Massachusetts.	80 Hours	No	Yes
i. Radiation Guides and Dose Assessment Course 272 - Environmental Protection Agency, Las Vegas, Nevada.	80 Hours	No	Yes
j. Boiling Water Reactor Technology Course - Public Service Gas and Electric Company, Salem, New Jersey.	64 Hours	No	Yes

3. Experience with Radioisotopes:

Isotope	Maximum Activities in Curies	Duration of Experience	Type of Experience
^{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	
^{3}H	20	8 Years	
^{192}Ir	100	8 Years	

Isotope	Maximum Activities in Curies	Duration of Experience	Type of Experience
^{147}Pm	1	8 Years	
$^{226}RaBe$	1	5 Years	
$^{239}PuBe$	1	1 Year	
^{90}Sr	0.1	8 Years	

4. Experience with other Radiation Producing Machines:

Radiation Machine	Duration of Experience	Type of Experience
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 Synchrocyrlotron 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 fluorence 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.

1978-1983 - CECOM, Fort Mormouth, New Jersey as Supervisory Health Physicist.

1983-1985 - CECOM, Fort Monmouth, New Jersey as Supervisory Safety Engineer.

1986-Present - CECOM, Fort Monmouth, New Jersey, as Chief, Safety Office

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

PROGRAM OF INSTRUCTION

NUMBER 4J-F1/493-F3 SEPTEMBER 1983

RADIAC CALIBRATOR CUSTODIAN COURSE

MOS: NONE

THIS IS A PEACETIME POI
LENGTH: 5 DAYS

APPROVED BY
COMMANDING GENERAL
UNITED STATES ARMY TRAINING
AND DOCTRINE COMMAND
19 SEPTEMBER 1983

US ARMY CHEMICAL SCHOOL
FORT MCCLELLAN, ALABAMA

Encl 1

PREFACE PAGE

NUMBER: 4J-F1/493-F3

TITLE: RADIAC Calibrator Custodian

PURPOSE: To train commissioned officers, warrant officers, enlisted personnel, and civilians to serve as calibrator custodians/ Radiation Protection Officer (RPO). SSI/MOS for which trained: None.

PREREQUISITES:

a. Active Army or Reserve Component. Commissioned officers, warrant officers, enlisted personnel, or DA civilian personnel.

b. All: Must be assigned or be under orders for assignment to a duty position requiring training as a calibration custodian or RPO. Security clearance required: None. Obligated service: None.

SCOPE: Instruction for calibration custodians and RPO to include radiological safety, RADIAC Calibration, principles, of nuclear radiation, basics of radiation detection, specific RADIAC instruments, and medical aspects of radiation.

LENGTH:	PEACETIME	MOBILIZATION
	1 Week	None

TRAINING LOCATION: US Army Chemical School
Fort McClellan, AL 36205

COURSE SUMMARY

COURSE TITLE: RADIAC Calibrator Custodian

SPECIALTY TRAINED: None

HOURS:	PEACETIME	MOBILIZATION
	43	NA

SUMMARY:

TASK CLUSTER ANNEXES	HOURS PEACETIME	HOURS MOBILIZATION	ANNEX	PAGE
Radiological Safety and RADIAC Calibration	40	NA	A	A-1
SUBTOTAL	40			
ADMINISTRATIVE TIME				
INPROCESSING	0			
OUTPROCESSING	0			
COMMANDANT'S TIME	0			
OPEN TIME	0			
PHYSICAL READINESS TRAINING	3			
SUBTOTAL	3			
TOTAL	43			

RECAPITULATION	HOURS PEACETIME	HOURS MOBILIZATION
SECURITY CLASSIFICATION		
Unclassified	43	
TOTAL	43	
TYPE OF INSTRUCTION		
Conference	13	
Examination 3	3	
Practical Exercise 1	14	

	HOURS	
	PEACETIME	MOBILIZATION
Practical Exercise 3	9	
Seminar	1	
Nonacademic	3	
TOTAL	43	

TASK CLUSTER ANNEXES

TASK CLUSTER ANNEX: A - Radiological Safety and RADIAC Calibration

PURPOSE: To qualify the custodians/RPOs for RADIAC Calibrators AN/UDM-2, AN/UDM-6 or AN/UDM-7C, and M3A1 Radioactive Source Set, or their replacements, as outlined in TM 3-6665-203-10, TM 3-6665-214-15 w/C3, TM 11-6665-227-12, and TB 11-6665-227-12. Basic nuclear radiations and their hazards, radiation units, medical aspects of ionizing radiation and shielding principles associated with RADIAC calibration. Basics of radiation detection, RADIAC theory, operation and operator's maintenance involved with standard Army radiacmeters. The Army RADIAC calibration system and the role of the RADIAC calibrators AN/UDM-2, AN/UDM-6, or AN/UDM-7C, and M3A1 Radioactive Source Set or their replacements. Use of the RADIAC calibrators in performing calibration. Safety requirements and regulations, to include exposure guidance, area posting, reports and records, storage, film badges required, disposal, monitoring and wipe test, and transportation of RADIAC calibrators. Accident procedures and decontamination.

	PEACETIME	MOBILIZATION
TOTAL HOURS:	40	NA

POI FILE: A-1 Course Orientation (U)

TYPE OF INSTRUCTION: 1C

	PEACETIME	MOBILIZATION
HOURS:	1	NA

SCOPE: Present policies and procedures pertaining to course, introduce course counselor and instructors, complete film badge forms and explain requirement to complete DA Form 1952 for privacy act requirements.

LESSON REFERENCES: AR 40-14 and A-1 Handouts.

POI FILE: A-2 Principles of Nuclear Radiation (U)

TYPE OF INSTRUCTION: 1C, 1PE3

	PEACETIME	MOBILIZATION
HOURS:	2	NA

TRAINING OBJECTIVE:

TASK: Student will outline the basic fundamentals of nuclear radiation to include basic structure of matter; nature and type of radioactivity; dose, dose rate, dose rate versus time relations; concepts of radioactive decay and half-life, and solve single isotope decay problems.

CONDITIONS: Given ST 3-155, in a classroom environment.

STANDARDS: With 70 percent accuracy, in accordance with ST 3-155, para 2.1-2.7, 3.4, 3.6, and 3.7.

LESSON REFERENCES: ST 3-155; Glasstone, Sourcebook on Atomic Energy; Evans, The Atomic Nucleus; A-2 Handouts.

POI FILE: A-3 Radiation Units (U)

TYPE OF INSTRUCTION: 1PE3

	PEACETIME	MOBILIZATION
HOURS:	1	NA

TRAINING OBJECTIVE:

TASK: Student will identify, define, and use the radiation dose units used in radiological safety, to include roentgen, rem (sievert), and rad (gray); define and explain activity units to include curie (becquerel), rad per hr at 1 meter (rhm), and related units; convert rad (gray) to rem (sievert) and determine dose rate at various distances from radioactive sources.

CONDITIONS: In a classroom environment, given ST 3-155.

STANDARDS: Solutions completed with 70 percent accuracy, in accordance with ST 3-155, Chapter 3.

LESSON REFERENCES: National Bureau of Standards Handbooks; National Council on Radiation Protection and Measurements Reports on Radiation Units; A-3 Handouts; ST 3-155.

POI FILE: A-4 Basics of Radiation Detection (U)

TYPE OF INSTRUCTION: 1C

	PEACETIME	MOBILIZATION
HOURS:	1	NA

TRAINING OBJECTIVE:

TASK: Student will explain the principles of radiation detection; the nomenclature system for radiacmeters; theory and purpose of the US Army standard meters calibrated by the RADIAC calibrators AN/UDM-2, AN/UDM-6 or AN/UDM-7C, and M3A1 Radioactive Source Set or their replacements; explain the radiological safety precautions required while using the RADIAC calibrators and apply dose, dose rate and units of measurement.

CONDITIONS: In a classroom/radiation laboratory environment; given ST 3-155.

STANDARDS: In accordance with ST 3-155, para 3.4, 3.5, 4.1, 4.3, 4.5, and Chapter 7-8; with 70 percent accuracy.

LESSON REFERENCES: TM 11-5543, w/C1 and 4-6; TM 11-6665-213-12; TM 11-6665-214-10; TM 3-6665-203-10; TM 11-6665-209-15; ST 3-155; A-4 Handouts.

POI FILE: A-5 RADIAC Instruments (U)

TYPE OF INSTRUCTION: 2C, 2PE1

	PEACETIME	MOBILIZATION
HOURS:	4	NA

TRAINING OBJECTIVE:

TASK: Student will participate in a practical exercise covering operation, maintenance, and use of US Army Standard Field Radiacmeters calibrated by the AN/UDM-2; practical exercise in operation and operator/organizational maintenance, basic radiation detection, and common faults found in these RADIAC instruments.

CONDITIONS: Given required TMs, TBs, ST 3-155, Radiological Safety Handbook (RSH), DF 140, in a classroom/radiation laboratory environment.

STANDARDS: In accordance with ST 3-155, Chapters 6 and 14; with 70 percent accuracy.

LESSON REFERENCES: TM 11-5543 w/C1 and 4-6; TM 11-6665-213-12; TM 11-6665-214-10; TM 38-750; TM 11-6665-209-15; TM 11-5514A; ST 3-155; TB Sig 226-8; Radiological Safety Handbook, DF 140; NBC Div Safety SOP; A-5 Handouts.

POI FILE: A-6 Shielding of Ionizing Radiation (U)

TYPE OF INSTRUCTION: 1C, 2PE3

	PEACETIME	MOBILIZATION
HOURS:	3	NA

TRAINING OBJECTIVE:

TASK: Student will explain the method of absorption of alpha, beta, and other charged particles; the method of absorption of X and gamma radiation; nature and method of production of bremsstrahlung radiation; comparison of gamma and bremsstrahlung radiation; and shielding consideration of RADIAC calibration and solve basic shielding problems.

CONDITIONS: Given ST 3-155, in a classroom environment.

STANDARDS: In accordance with ST 3-155, para 4.1-4.3, 4.5, 4.6, 4.9, 4.10; with 70 percent accuracy.

LESSON REFERENCES: ST 3-155; Evans, The Atomic Nucleus, A-6 Handouts.

POI FILE: A-7 Medical Aspects of Ionizing Radiation (U)

TYPE OF INSTRUCTION: 1C

	PEACETIME	MOBILIZATION
HOURS:	1	NA

TRAINING OBJECTIVE:

TASK: Student will describe the varied effects of nuclear radiation on body tissue to include somatic and genetic damage.

CONDITIONS: In a classroom environment, given A-7 Handouts.

STANDARDS: In accordance with school solution, with 70 percent accuracy.

LESSON REFERENCES: A-7 Handouts and Elizabeth Latorre Travis, Primer of Medical Radiobiology.

POI FILE: A-8 Exposure Guidance and Control (U)

TYPE OF INSTRUCTION: 1C, 2PE3

	PEACETIME	MOBILIZATION
HOURS:	3	NA

TRAINING OBJECTIVE:

TASK: Student will explain and use Federal and military safety regulations to include permissible radiation doses and levels; permissible concentrations of radioactive material, precautionary procedures; reports, records, and notifications; posting of radiation areas; precautionary measures to limit exposures.

CONDITIONS: In a classroom environment; given Title 10, parts 19 and 20; Radiological Safety Handbook Supplement; Code of Federal Regulations (CFR).

STANDARDS: With 70 percent accuracy, in accordance with Title 10, parts 19 and 20; CFR; Radiological Safety Handbook Supplement.

LESSON REFERENCES: AR 40-14; Title 10, parts 19 and 20; Radiological Safety Handbook Supplement; CFR; A-8 Handouts.

POI FILE: A-9 Alpha Instruments (U)

TYPE OF INSTRUCTION: 2PE1

	PEACETIME	MOBILIZATION
HOURS:	2	NA

TRAINING OBJECTIVE:

TASK: Student will use available alpha instruments (AN/PDR-60 and AN/PDR-56A), and conduct alpha monitoring, to include measurement techniques.

CONDITIONS: In a classroom/radiation laboratory environment, given alpha instruments and required training manuals.

STANDARDS: With 70 percent accuracy, in accordance with ST 3-155, Chapter 10.

LESSON REFERENCES: TM 11-6665-208-15; TM 3-6665-203-10; ST 3-155; A-9 Handouts.

POI FILE: A-10 Monitoring, Wipe Test, and Transportation (U)

TYPE OF INSTRUCTION: 1C, 1PE3

	PEACETIME	MOBILIZATION
HOURS:	2	NA

TRAINING OBJECTIVE:

TASK: Student will describe the sealed sources, leakage, and hazards associated with RADIAC calibrators and RADIAC instruments to include methods and requirements for leak testing. Define terms and terminology involved in transport of radioactive materials; explain precautions and requirements involved in preparing shipment, actual movement, and receipt of shipment of RADIAC calibrators; use Federal and military regulations on transportation; and perform leakage test for sealed radiological sources.

CONDITIONS: In a classroom environment, given required TMs, and a mock sealed radiological source.

STANDARDS: With 70 percent accuracy, IAW AR 385-11; TM 11-6665-227-12; TM 55-315; TB 11-6665-227-12.

LESSON REFERENCES: AR 385-11; TM 11-6665-227-12; TM 55-315; TM 11-6665-247-10; TM 3-6665-203-10; TB 11-6665-227-12; current BOE Tariff; A-10 Handouts.

POI FILE: A-11 Storage, Reporting, and Disposal (U)

TYPE OF INSTRUCTION: 1C, 1PE3

	PEACETIME	MOBILIZATION
HOURS:	2	NA

TRAINING OBJECTIVE:

TASK: Student will explain safe practices for handling radioactive material; describe requirements for storage of RADIAC calibrators and considerations in selecting storage sites; explain caution signs and labels; discuss the Department of the Army controls on radioactive materials licensed by other agencies; describe reports required; methods of completing these reports; explain procedures for controlling use of radioactive materials; and describe the Department of the Army disposal program to include regulations covering disposal of RADIAC calibrators.

CONDITIONS: In a classroom environment, given A-11 Handouts; TM 11-6665-227-12; TB 11-6665-227-12.

STANDARDS: With 70 percent accuracy, in accordance with school solution.

LESSON REFERENCES: AR 385-11; AR 725-1, Chapter 3; TM 11-6665-227-12; TB 11-6665-227-12; A-11 Handouts.

POI FILE: A-12 Alpha Instrument Calibration (U)

TYPE OF INSTRUCTION: 2PE1

	PEACETIME	MOBILIZATION
HOURS:	2	NA

TRAINING OBJECTIVE:

TASK: Student will explain methods of calibration of alpha RADIAC instruments using the AN/UDM-6 or its replacement (AN/UDM-7C) and perform the required calibration.

CONDITIONS: Given ST 3-155, A-12 Handouts, in a classroom/radiation laboratory environment.

STANDARDS: With 70 percent accuracy IAW ST 3-155, Chapter 10 and 14.

LESSON REFERENCES: TM 11-6665-247-10; TM 3-6665-203-10; TB 3-6665-203-12; ST 3-155; A-12 Handouts.

POI FILE: A-13 Calibration Techniques and Safety (U)

TYPE OF INSTRUCTION: 8PE1

	PEACETIME	MOBILIZATION
HOURS:	8	NA

TRAINING OBJECTIVE:

TASK: Student will describe the Army system for calibration of RADIAC instruments; perform operations involving equipment used in the calibration of standard Army RADIAC instruments; techniques of calibration; safety requirements and procedures involved in handling of the calibration equipment; calibrate standard RADIAC instruments using the AN/UDM-2 and AN/UDM-6 or AN/UDM-7C RADIAC calibrator.

CONDITIONS: Given A-13 Handouts; required TMs; TBs; in a classroom/radiation laboratory environment.

STANDARDS: With 70 percent accuracy, IAW A-13 Handouts, and school solution.

LESSON REFERENCES: TM 11-6665-247-10; TM 11-6665-227-12; TM 3-6665-214-15, w/C3; TM 3-6665-203-10; TB 11-6665-227-12; TB SIG 226-8; A-13 Handouts.

POI FILE: A-14 Radiation Accidents and Decontamination (U)

TYPE OF INSTRUCTION: 1PE3

HOURS:	PEACETIME	MOBILIZATION
	1	NA

TRAINING OBJECTIVE:

TASK: Student will develop emergency action procedures appropriate to accidents that may involve the RADIAC calibrator; enumerate actions to control and minimize the hazards involved; and outline basic decontamination principles and methods to be used to return the area involved to operational status.

CONDITIONS: In a classroom environment, given TM 3-220.

STANDARDS: With 70 percent accuracy in accordance with TM 3-220, and school solution.

LESSON REFERENCES: TM 3-220; all previous instructions.

POI FILE: A-15 Written Examination - RADIAC Instrument Calibration and Safety (U)

TYPE OF INSTRUCTION: 3E3

HOURS:	PEACETIME	MOBILIZATION
	3	NA

TRAINING OBJECTIVE:

TASK: To evaluate student achievement and ability to apply knowledges and skills learned to solve the problems and to evaluate effectiveness of the instruction.

CONDITIONS: Given examination, 150 minutes, with references during problem-solving portion only.

STANDARDS: With 70 percent accuracy in accordance with school solution.

LESSON REFERENCES: All references in RADIAC Calibrator Custodian Course subannexes.

POI FILE: A-16 Seminar - RADIAC Instrument Calibration and Safety (U)

TYPE OF INSTRUCTION: 1S

HOURS:	PEACETIME	MOBILIZATION
	1	NA

SCOPE: Student will be provided the opportunity to evaluate and discuss problems encountered from the class.

LESSON REFERENCES: All previous instruction.

POI FILE: A-17 Course Critique and Closing (U)

TYPE OF INSTRUCTION: 3C

HOURS:	PEACETIME	MOBILIZATION
	3	NA

SCOPE: Student will critique the course of instruction and resolve any problems concerning material presented in the course.

LESSON REFERENCES: All previous instruction.

TASK/SUBJECT INFORMATION SHEETS

A. TRAINERS GUIDE OR "OFFICER CRITICAL" TASKS LISTED FOR RESIDENT TRAINING FOR: RADIAC Calibrator Custodian Course.

TASK NUMBER	TITLE	POI FILE NUMBER	TRAINED TO JOB PERFORMANCE STANDARD		REMARKS
			PEACETIME	MOBILIZATION	
	Course Orientation	A-1	Yes	NA	
	Principles of Nuclear Radiation	A-2	Yes	NA	
	Radiation Units	A-3	Yes	NA	
	Basics of Radiation Detection	A-4	Yes	NA	
	RADIAC Instruments	A-5	Yes	NA	
	Shielding of Ionizing Radiation	A-6	Yes	NA	
	Medical Aspects of Ionizing Radiation	A-7	Yes	NA	
	Exposure Guidance and Control	A-8	Yes	NA	
	Alpha Instruments	A-9	Yes	NA	
	Monitoring Wipe Test and Transporation	A-10	Yes	NA	
	Storage Reporting and Disposal	A-11	Yes	NA	
	Alpha Instrument Calibration	A-12	Yes	NA	
	Calibration Techniques and Safety	A-13	Yes	NA	

TASK/SUBJECT INFORMATION SHEETS

A. TRAINERS GUIDE OR "OFFICER CRITICAL" TASKS LISTED FOR RESIDENT TRAINING FOR: RADIAC Calibrator Custodian Course.

TASK NUMBER	TITLE	POI FILE NUMBER	TRAINED TO JOB PERFORMANCE STANDARD		REMARKS
			PEACETIME	MOBILIZATION	
	Radiation Accidents and Decontamination	A-14	Yes	NA	
	Written Exam	A-15	Yes	NA	
	Seminar - RADIAC Instrument Calibration and Safety	A-16	Yes	NA	
	Course Critique and Closing	A-17	Yes	NA	

B. OTHER TASKS AND SUBJECTS TAUGHT IN RESIDENT TRAINING: NA

C. ADDITIONAL REMARKS/RATIONALE FOR TRAINING THE TASKS LISTED IN A AND B (IF REQUIRED): NA

PROGRAM OF INSTRUCTION

NUMBER 7K-F3

MAY 1983

RADIOLOGICAL SAFETY COURSE

MOS: NONE

THIS IS A PEACETIME AND MOBILIZATION POI
LENGTH: PEACETIME - 3 WEEKS
MOBILIZATION - 3 WEEKS

APPROVED BY
COMMANDING GENERAL
UNITED STATES ARMY TRAINING
AND DOCTRINE COMMAND
19 MAY 1983

US ARMY CHEMICAL SCHOOL
FORT MCCLELLAN, ALABAMA

Encl 2

PREFACE

A. COURSE NUMBER: 7K-F3
COURSE TITLE: Radiological Safety

B. PURPOSE: To provide commissioned officers, warrant officers, enlisted personnel, and civilians with the skills and knowledge pertaining to radiological safety principles and procedures required to qualify them to perform the duties of a radiological protection or control officer. MOS for which trained: None.

C. PREREQUISITES: Prior to reporting for this course, each student is required to demonstrate a working knowledge of basic mathematics and radiation physics by completing US Army Correspondence Subcourse Cml 9100 Radiological Safety I - Fundamentals.

1. Commissioned officers and warrant officers - a member of the Active Army or of a Reserve component who is assigned or under orders for assignment to a duty involving radiological safety. No security clearance required. Obligated service for Active Army officers - None.

2. Enlisted personnel - selected enlisted personnel may attend this course upon application to Commandant, USACMLS, Fort McClellan, AL 36205. Enlisted personnel will have a minimum GT score of 110 and anticipated assignment as radiological protection officers as specified in TB 11-6665-204-12. No security clearance is required.

3. Civilian personnel - must be assigned or under orders for assignment to a position requiring training in radiological safety. No security clearance required.

4. Special information: Application for enrollment in the Correspondence Course, Cml 9100 Radiological Safety I - Fundamentals, should be sent to the Army Institute for Professional Development, Newport News, VA 23628 on DA Form 145, not less than 60 days prior to anticipated reporting date for this course.

D. SCOPE: Students will receive training in tasks necessary to perform duties in radiological safety.

E. LENGTH:

PEACETIME	MOBILIZATION
3 Weeks	3 Weeks

F. TRAINING LOCATIONS:

PEACETIME	MOBILIZATION
US Army Chemical School Fort McClellan, AL 36205	US Army Chemical School Fort McClellan, AL 36205

COURSE SUMMARY

COURSE TITLE: Radiological Safety

SPECIALTY TRAINED: None

HOURS:	PEACETIME 128	MOBILIZATION 128

SUMMARY:

TASK CLUSTER ANNEXES	HOURS PEACETIME	HOURS MOBILIZATION	ANNEX	PAGE
Technical Aspects of Radiological Safety	117	117	A	4
SUBTOTAL	117	117		
ADMINISTRATIVE TIME				
INPROCESSING				
OUTPROCESSING				
COMMANDANT'S TIME	2	2		
OPEN TIME				
PHYSICAL FITNESS TRAINING	9	9		
SUBTOTAL	11	11		
TOTAL	128	128		

RECAPITULATION	HOURS PEACETIME	HOURS MOBILIZATION
SECURITY CLASSIFICATION		
All material in this POI is Unclassified	128	128
TOTAL	128	128

E S..ARY (Continued)

OF INSTRUCTION		
Conference	32.2	32.2
Case Study	9.5	9.5
Demonstration	1.0	1.0
Examination - 2	10.0	10.0
Seminar	1.0	1.0
Television	2.3	2.3
Practical Exercise 1	32.0	32.0
Practical Exercise 2	29.0	29.0
Nonacademic	11.0	11.0
TOTAL	128.0	128.0

TASK CLUSTER ANNEX: A Technical Aspects of Radiological Safety

PURPOSE: To provide a working knowledge of fundamental radiological safety principles for ionizing and nonionizing radiation, to include storage, handling, transportation, disposal, reporting, control, and general safety for radioisotopes, neutronic sources, microwave, laser and machine-produced radiation; to qualify as radiological protection or control officer.

	PEACETIME	MOBILIZATION
TOTAL HOURS:	117	117

POI FILE: DB 001 Course Orientation (U)

TYPE OF INSTRUCTION: 2C

	PEACETIME	MOBILIZATION
HOURS:	2	2

SCOPE: Outline the purpose and major subject areas of the course; describe the instruction and training procedures; identify the safety hazards of the course; receive texts and references used during the course.

LESSON REFERENCES: AR 220-58; TRADOC and FORSCOM Supplement 1 to AR 220-58; Instructor Notes.

POI FILE: DB 010 Structure of Matter (U)

TYPE OF INSTRUCTION: 1C

	PEACETIME	MOBILIZATION
HOURS:	1	1

TRAINING OBJECTIVE:

TASK: Identify and describe the following:

a. Characteristics and location of the proton, neutron, and electron related to atomic structure and an isotope as related to atomic structure.

b. Unknown isotopes and the number of protons, neutrons, and electrons using A and Z number notations.

c. A and Z number notation for any specific element.

CONDITIONS: Given ST 3-155 and Radiological Safety Handbook.

STANDARDS: IAW Radiological Safety Handbook DB010.

SON REFERENCES: ST 3-155; Radiological Safety Handbook; Chase and Rabinowitz, Principles of Radioisotope Methodology.

I FILE: DB 040 Radioactivity (U)

:PE OF INSTRUCTION: 1C, 1PE2

	PEACETIME	MOBILIZATION
OURS:	2	2

:RAINING OBJECTIVES:

TASK 1: Identify the characteristics of ionizing radiation; define radioactive nuclide and the origin of radiation from the nucleus of an atom; explain the phenomena of induced radiation.

CONDITIONS: Given ST 3-155, Radiological Safety Handbook, and Radiological Safety Handbook Supplement.

STANDARDS: IAW Radiological Safety Handbook DB040.

TASK 2: Execute the following:

a. Write and balance nuclear equations.

b. Apply the proper radiation units.

c. Identify the concepts of radioactive decay and half-life.

d. Apply the mathematical solution in solving half-life problems.

CONDITIONS: Given problems and Radiological Safety Handbook.

STANDARDS: Equations and half-life problems solved with 100 percent accuracy IAW Radiological Safety Handbook DB040.

LESSON REFERENCES: ST 3-155; Radiological Safety Handbook; Radiological Safety Handbook Supplement.

POI FILE: DF 020 Radiation Units (U)

TYPE OF INSTRUCTION: 1C, 1PE2

	PEACETIME	MOBILIZATION
HOURS:	2	2

TRAINING OBJECTIVES:

TASK 1: Identify, define, and use the radiation units roentgen, rad, rem, dose equivalent, absorbed dose, conversion RBE, quality factors, distribution factors, and activity units.

CONDITIONS: Given ST 3-155 and Radiological Safety Handbook.

STANDARDS: IAW Radiological Safety Handbook DF020.

TASK 2: Solve equation $R=S/d^2$ for unknown value and solve problems on SI units.

CONDITIONS: Given problems and Radiological Safety Handbook.

STANDARDS: Solutions completed with 100 percent accuracy IAW Radiological Safety Handbook DF020.

LESSON REFERENCES: ST 3-155; NCRP Reports 13 and 19; Radiological Safety Handbook.

POI FILE: DF 040 Nature of X and Gamma Radiation (U)

TYPE OF INSTRUCTION: 1C

	PEACETIME	MOBILIZATION
HOURS:	1	1

TRAINING OBJECTIVE:

TASK: Describe the following:

a. Nature and different types of electromagnetic energy.

b. Production of X and gamma rays, to include Bremstrahlung, electron, and nuclear de-excitation.

c. Biological hazards with respect to X and gamma rays.

CONDITIONS: Given Radiological Safety Handbook and ST 3-155.

STANDARDS: IAW Radiological Safety Handbook DF040.

LESSON REFERENCES: Radiological Safety Handbook; ST 3-155; Leighton, Principles of Modern Physics; Sproull, Modern Physics; Sproull, X-ray in Practice.

POI FILE: DF 050 Table of Isotopes (U)

TYPE OF INSTRUCTION: 3PE2

HOURS:	PEACETIME	MOBILIZATION
	3	3

TRAINING OBJECTIVE:

TASK: Locate and apply pertinent information contained in the table of isotopes, including, but not limited to:

a. Nuclide under consideration.

b. Half-life.

c. Type of decay.

d. Percent abundance.

e. Energies of both particulate and electromagnetic emissions.

f. Means of production.

g. Use of decay schemes.

CONDITIONS: Given problems, Pam 25, and Radiological Safety Handbook.

STANDARDS: Table of isotopes used with 100 percent accuracy IAW Radiological Safety Handbook DF050 and Pam 25 exercise.

LESSON REFERENCES: Pam 25; Radiological Safety Handbook.

POI FILE: DF 060 Shielding of Charged Particles (U)

TYPE OF INSTRUCTION: 1PE2

HOURS:	PEACETIME	MOBILIZATION
	1	1

TRAINING OBJECTIVES:

TASK 1: Identify the characteristics of alpha and beta radiation, to include hazards and penetration power.

CONDITIONS: Given Pam 25 and Radiological Safety Handbook.

STANDARDS: IAW Pam 25 and Radiological Safety Handbook DF060.

TASK 2: Calculate the penetration power of the beta particle.

CONDITIONS: Given problems, Radiological Safety Handbook, and Pam 25.

STANDARDS: Calculations completed with 100 percent accuracy IAW Radiological Safety Handbook DF060 exercise.

LESSON REFERENCES: Pam 25; Radiological Safety Handbook; ST 3-155.

POI FILE: DF 070 Special Hazards (U)

TYPE OF INSTRUCTION: 2C

	PEACETIME	MOBILIZATION
HOURS:	2	2

TRAINING OBJECTIVE:

TASK: Describe the following:

a. Special hazards associated with commonly used radiation sources and items containing radioactive materials.

b. Methods of protecting radiation workers from hazards.

c. Special procedures for decontamination.

CONDITIONS: Given Radiological Safety Handbook and Pam 25.

STANDARDS: IAW Radiological Safety Handbook DF070.

LESSON REFERENCES: DA Pam 39-3; TM 3-220; Pam 25; Radiological Safety Handbook; S. L. Sawyer, Medical Aspects of Radiation Accidents.

POI FILE: DF 100 Shielding of X and Gamma Radiation (U)

TYPE OF INSTRUCTION: 1C, 2PE2

	PEACETIME	MOBILIZATION
HOURS:	3	3

TRAINING OBJECTIVES:

TASK 1: Define and/or describe the following:

a. Nature and origin of X and gamma radiation and production of these radiations to include Bremstrahlung.

b. Gamma radiation absorption.

c. Factors influencing absorption efficiency.

d. Mass and linear absorption coefficients.

e. Half-thickness.

CONDITIONS: Given Radiological Safety Handbook, Pam 25, and Radiological Safety Handbook Supplement.

STANDARDS: IAW Pam 25, Radiological Safety Handbook DF100, and Radiological Safety Handbook Supplement.

TASK 2: Determine the following:

a. Mass and linear attenuation coefficients for given energies and shielding material.

b. Half-thickness for given energies and shielding material.

CONDITIONS: Given problems, Radiological Safety Handbook, Radiological Safety Handbook Supplement, and Pam 25.

STANDARDS: Problems solved with 100 percent accuracy IAW Radiological Safety Handbook DF100.

LESSON REFERENCES: Pam 25; Radiological Safety Handbook; ST 3-155; Radiological Safety Handbook Supplement; Evans, The Atomic Nucleus; Friedlander and Kennedy, Nuclear and Radiochemistry.

POI FILE: DF 110 Basics of Radiation Detection (U)

TYPE OF INSTRUCTION: 1C

	PEACETIME	MOBILIZATION
HOURS:	1	1

SCOPE: Provide student a safety orientation on procedures to be followed in the radiological laboratory.

TRAINING OBJECTIVE:

TASK: Identify the basics of operations used in radiation detection and absorption, and describe the principles of operation of basic radiac instruments.

CONDITIONS: Given ST 3-155 and Radiological Safety Handbook.

STANDARDS: IAW Radiological Safety Handbook DF110.

LESSON REFERENCES: ST 3-155; Radiological Safety Handbook.

POI FILE: DF 130 Computational Procedures in Physical Sciences (U)

TYPE OF INSTRUCTION: 2PE2

	PEACETIME	MOBILIZATION
HOURS:	2	2

TRAINING OBJECTIVE:

TASK: Solve practical problems related to material covered in subannexes B01-2 through B01-11.

CONDITIONS: Given practical problems, all references and instructor assistance.

STANDARDS: Problems solved with 100 percent accuracy IAW Radiological Safety Handbook DF130.

LESSON REFERENCES: ST 3-155; Radiological Safety Handbook; Radiological Safety Handbook Supplement; Pam 25.

POI FILE: DF 138 Examination Radiological Safety I (U)

TYPE OF INSTRUCTION: 3E2

	PEACETIME	MOBILIZATION
HOURS:	3	3

TRAINING OBJECTIVE:

TASK: Apply radiological safety procedures.

CONDITIONS: Given examination and 150 minutes, with references during problem-solving portion only.

STANDARDS: 70 percent accuracy IAW school solution.

LESSON REFERENCES: All references in Radiological Safety I subannexes.

POI FILE: DF 140 Radiac Instruments (U)

TYPE OF INSTRUCTION: 4PE1

	PEACETIME	MOBILIZATION
HOURS:	4	4

TRAINING OBJECTIVE:

TASK: Operate and perform operator maintenance on selected radiac instruments.

CONDITIONS: In a radiological laboratory, given requirement and IM-9E, IM-147, IM-93(), IM-174 series, AN/PDR-27() radiac instruments, and PP-1578A/PD.

:ANDARDS: IAW procedures outlined in Radiological Safety Handbook DF140 and applicable technical manuals.

REFERENCES: TM 11-6665-209-20; TM 11-6665-213-12; TM 11-6665-214-10; TM 11-6665-224-15; TM 11-6665-232-12; TM 38-750; TB 750-242-3; TB SIG 226-8; TB SIG 226-9; ST 3-155; Radiological Safety Handbook; CD Handbook FGE 519; Handbook for Radiological Monitors; Rad Div Safety SOP.

FILE: DF 170 Standards for Protection (U)

E OF INSTRUCTION: 1C, 2PE2

	PEACETIME	MOBILIZATION
URS:	3	3

RAINING OBJECTIVES:

TASK 1: Describe and use terminology related to exposure guidance and control.

)NDITIONS: Given Pam 25, Radiological Safety Handbook, and Radiological Safety Handbook Supplement.

STANDARDS: IAW AR 40-14, AR 385-11, and Title 10, Part 19 and 20 CFR.

TASK 2: Execute the following:

a. Control allowable doses and record these doses.

b. Restrict areas as necessary to include use of Title 10, Part 20, App B, CFR.

c. Apply procedures required for safety program.

d. Post areas as necessary.

CONDITIONS: Given requirement and use of Pam 25, Radiological Safety Handbook, and Radiological Safety Handbook Supplement.

STANDARDS: Actions completed IAW AR 40-14, AR 385-11, Title 10, Part 19 and 20 CFR, and Radiological Safety Handbook DF170.

LESSON REFERENCES: AR 40-14; AR 385-11; Title 10, Part 19 and 20, CFR; Pam 25; Radiological Safety Handbook; Radiological Safety Handbook Supplement.

POI FILE: DF 180 Safe Handling and Storage of Radioactive Material (U)

TYPE OF INSTRUCTION: 1C, 1PE2

HOURS:	PEACETIME	MOBILIZATION
	2	2

TRAINING OBJECTIVES:

TASK 1: Identify the following:

a. Seven methods of exposure and contamination control.

b. Application of all forms of handling techniques.

c. Storage and maintenance of all forms of radioactive material limiting the exposure dose to operating personnel to as low as practical.

CONDITIONS: Given Radiological Safety Handbook.

STANDARDS: IAW Radiological Safety Handbook DF180.

TASK 2: Calculate source strength for radioactive sources and dose rates at any distance from a source point.

CONDITIONS: Given problems, Pam 25, Radiological Safety Handbook, and Radiological Safety Handbook Supplement.

STANDARDS: Calculations completed with 100 percent accuracy IAW Radiological Safety Handbook DF180.

LESSON REFERENCES: AR 385-11; AR 700-64; TM 3-260; TM 3-261; Radiological Safety Handbook.

POI FILE: DF 200 Introduction to Scaler Counting (U)

TYPE OF INSTRUCTION: 1PE2, 3PE1

HOURS:	PEACETIME	MOBILIZATION
	4	4

TRAINING OBJECTIVES:

TASK 1: Describe the main components of the scaler assembly, the function of each, and calculate data required in the operation of a scaler system.

CONDITIONS: Given problems, pertinent data, and Radiological Safety Handbook.

STANDARDS: Descriptions and calculations completed IAW Radiological Safety Handbook DF200.

TASK 2: Determine resolving time, operating voltage and dead time of a scaler system.

CONDITIONS: In a radiological laboratory, given scaler system, radioactive source, and Radiological Safety Handbook.

STANDARDS: Procedures applied and data derived with 100 percent accuracy IAW Radiological Safety Handbook DF200.

LESSON REFERENCES: ST 3-155; Radiological Safety Handbook; Overman and Clark, Radioisotope Techniques; Chase and Rabinowitz, Principles of Radioisotope Methodology.

POI FILE: DF 212 Characteristics and Detection of Neutrons (U)

TYPE OF INSTRUCTION: 1C, 2PE1

	PEACETIME	MOBILIZATION
HOURS:	3	3

TRAINING OBJECTIVES:

TASK 1: Identify terminology and principles of neutron detection and shielding.

CONDITIONS: Given ST 3-155 and Radiological Safety Handbook.

STANDARDS: IAW Radiological Safety Handbook DF212.

TASK 2: Perform neutron monitoring and calculate neutron production, determine neutron dose, and calculate neutron dose and rem.

CONDITIONS: In a radiological laboratory, given problems, neutron source and neutron monitoring instruments.

STANDARDS: Actions completed with 100 percent accuracy IAW Radiological Safety Handbook DF 212.

LESSON REFERENCES: DA Pam 39-3; ST 3-155; Radiological Safety Handbook; Kaplan, Nuclear Physics; Radiation Safety Course, Part 1, Argonne National Laboratory.

POI FILE: DF 230 Shielding Properties of Material (U)

TYPE OF INSTRUCTION: 1PE2, 2PE1

	PEACETIME	MOBILIZATION
HOURS:	3	3

TRAINING OBJECTIVES:

TASK 1: Calculate the thickness of shielding materials necessary to reduce the dose rate to a given level.

CONDITIONS: Given Pam 25, Radiological Safety Handbook, and Radiological Safety Handbook Supplement.

STANDARDS: Calculations completed with 100 percent accuracy IAW Radiological Safety Handbook DF230.

TASK 2: Perform laboratory measurements to determine the half-thickness of shielding materials and solve shielding problems.

CONDITIONS: In a radiological laboratory, given radioactive source, eight shields, AN/PDR-27(), and Radiological Safety Handbook.

STANDARDS: Requirements completed with 100 percent accuracy IAW Radiological Safety Handbook DF230.

LESSON REFERENCES: ST 3-155; TM 11-6665-209-20; Radiological Safety Handbook; Radiological Safety Handbook Supplement; Rad Div Safety SOP.

POI FILE: DF 241 Introduction to Gamma Analysis (U)

TYPE OF INSTRUCTION: 1C, 3PE1

	PEACETIME	MOBILIZATION
HOURS:	4	4

TRAINING OBJECTIVES:

TASK 1: Describe the scintillation process, its use in radiation detection, and the capabilities and limitations of scintillation instruments.

CONDITIONS: Given ST 3-155 and Radiological Safety Handbook.

STANDARDS: IAW Radiological Safety Handbook DF241.

TASK 2: Use the mechanism for energy transfer in a liquid scintillation system, and operate the pulse height channel analyzer and proportional system.

CONDITIONS: In a radiological laboratory, given requirement and scintillation systems.

STANDARDS: Requirement completed IAW prescribed operational procedures.

LESSON REFERENCES: ST 3-155; Radiological Safety Handbook; W. J. Price, Radiation Detection; FPA Gamma Spectro-Analysis Handbook; E. Schram, Organic Scintillation Detectors; S. C. Curran, Luminesence and the Scintillation Counter.

POI FILE: DF 250 Alpha Instruments (U)

TYPE OF INSTRUCTION: 1C, 1PE1

	PEACETIME	MOBILIZATION
HOURS:	2	2

TRAINING OBJECTIVES:

TASK 1: Describe the nature of alpha particles, their physical components, range in air, velocity, ionization potential, penetration ability, and monitoring requirements.

CONDITIONS: Given Radiological Safety Handbook.

STANDARDS: IAW Radiological Safety Handbook DF250.

TASK 2: Describe theory and demonstrate operation, preoperational checks, maintenance, and decontamination of alpha instruments.

CONDITIONS: Given requirement, AN/PDR-54, AN/PDR-56, and AN/PDR-60.

STANDARDS: IAW prescribed operation and maintenance procedures of applicable technical manuals.

TASK 3: Monitor for alpha radiation and convert meter readings to microgram Pu-239 per square meter.

CONDITIONS: In a radiological laboratory, given requirement, AN/UDM-6, radiac source set and AN/PDR-60.

STANDARDS: Exercise completed with 100 percent accuracy IAW Radiological Safety Handbook DF250.

LESSON REFERENCES: TM 3-6665-203-10; TM 11-6665-208-15; TM 11-6665-221-15; TM 11-6665-245-12; ST 3-155; Radiological Safety Handbook; NAVSHIPS 94433.

POI FILE: DF 290 Beta Particle Considerations (U)

TYPE OF INSTRUCTION: 5PE2

	PEACETIME	MOBILIZATION
HOURS:	5	5

TRAINING OBJECTIVE:

TASK: Calculate source strength and compute shielding requirements for beta and positron emitters, including all associated gamma and X-rays.

CONDITIONS: Given problems, Radiological Safety Handbook, Pam 25, and Radiological Safety Handbook Supplement.

STANDARDS: Calculations completed with 100 percent accuracy IAW Radiological Safety Handbook DF290.

LESSON REFERENCES: Radiological Safety Handbook; Radiological Safety Handbook Supplement; Pam 25; Kaplan, Nuclear Physics; Price, Nuclear Radiation Detection.

POI FILE: DF 310 Radiac Instrument Calibration Techniques and Equipment (U)

TYPE OF INSTRUCTION: 1C, 7PE1

	PEACETIME	MOBILIZATION
HOURS:	8	8

TRAINING OBJECTIVES:

TASK 1: Describe the following:

a. Sources of calibration error.

b. The Army's Radiac Calibration System.

c. Prerequisites for radiological protection officer to qualify as a custodian.

d. Characteristics, unpacking procedures, and safety requirements for radiac calibrators.

CONDITIONS: Given Radiological Safety Handbook.

STANDARDS: IAW Radiological Safety Handbook DF310.

TASK 2: Supervise safety and operate radiac calibrators.

CONDITIONS: In a radiological laboratory, given requirement, IM-9E, IM-174, IM-174A, AN/PDR-27, AN/PDR-60, PP-1578A/PD, AN/UDM-2, AN/UDM-6, M3A1 Source Set, and laboratory accessories.

STANDARDS: Actions completed IAW Radiological Safety Handbook DF310 and applicable technical manuals.

LESSON REFERENCES: AR 750-25; FM 29-27; TM 3-6665-202-10; TM 3-6665-203-10; TM 11-6665-209-20; TM 11-6665-213-12; TM 11-6665-214-10; TM 11-6665-221-15; TM 11-6665-224-15; TM 11-6665-232-12; TB SIG 226-8; TB SIG 226-9; TB 11-6665-215-12/1; TB 11-6665-227-12; TB 750-242-3.

POI FILE: DF 320 Computational Procedures in Physical Sciences (U)

TYPE OF INSTRUCTION: 2PE2

	PEACETIME	MOBILIZATION
HOURS:	2	2

TRAINING OBJECTIVE:

TASK: Solve practical problems related to material covered in subannexes B01-15 through B01-24.

CONDITIONS: Given practical problems, all references and instructor assistance.

STANDARDS: Problems solved with 100 percent accuracy IAW Radiological Safety Handbook DF320.

LESSON REFERENCES: ST 3-155; Radiological Safety Handbook; Radiological Safety Handbook Supplement; Pam 25.

POI FILE: DF 328 Examination Radiological Safety II (U)

TYPE OF INSTRUCTION: 3E2

	PEACETIME	MOBILIZATION
HOURS:	3	3

TRAINING OBJECTIVE:

TASK: Demonstrate proficiency in performing radiological safety procedures.

CONDITIONS: Given examination and 150 minutes, with references during problem-solving portion only.

STANDARDS: 70 percent accuracy IAW school solution.

LESSON REFERENCES: All references in Radiological Safety II subannexes.

POI FILE: DF 340 Leakage Test (U)

TYPE OF INSTRUCTION: 1C

HOURS:	PEACETIME	MOBILIZATION
	1	1

TRAINING OBJECTIVE:

TASK: Describe the following:

a. Purpose, methods, and procedures for performing leakage tests.

b. Determination of acceptable level of contamination.

c. Environmental monitoring.

d. Bio-assay sampling.

CONDITIONS: Given Radiological Safety Handbook.

STANDARDS: IAW TM 3-260, TM 3-261, and Radiological Safety Handbook DF340.

LESSON REFERENCES: TM 3-260; TM 3-261; Radiological Safety Handbook; NBS Handbook 73.

POI FILE: DF 350 Control and Reporting of Radioactive Material (U)

TYPE OF INSTRUCTION: 1C, 1PE2

HOURS:	PEACETIME	MOBILIZATION
	2	2

TRAINING OBJECTIVE:

TASK 1: Identify procedures for obtaining DA authorization and written permission for issue of radioactive material and use of radioactive substances on the RPO's installation.

CONDITIONS: Given Radiological Safety Handbook.

STANDARDS: IAW procedures prescribed in AR 385-11.

TASK 2: Describe supervision and operation of the installation radioactive material control point.

CONDITIONS: Given Radiological Safety Handbook.

STANDARDS: IAW procedures prescribed in AR 385-11 and Radiological Safety Handbook DF350.

TASK 3: Prepare reports and records from leakage test data.

CONDITIONS: Given Radiological Safety Handbook.

STANDARDS: Exercise completed with 100 percent accuracy IAW Radiological Safety Handbook DF350.

LESSON REFERENCES: AR 385-11; TM 3-260; TM 3-261; Radiological Safety Handbook DF350.

POI FILE: DF 370 Licensing and SOP Writing (U)

TYPE OF INSTRUCTION: 2C

	PEACETIME	MOBILIZATION
HOURS:	2	2

TRAINING OBJECTIVE:

TASK: Describe procedures for:

a. Preparing application for an NRC license.

b. Preparing application for renewal and amendments.

c. Routing and staffing of application requests.

d. DA controlling and reporting of nonlicensed radioactive material.

e. Preparing and administering SOPs.

CONDITIONS: Given Radiological Safety Handbook, Radiological Safety Handbook Supplement, Rad Div SOP, and Health Physics Safety SOP.

STANDARDS: IAW AR 385-11, Title 10 CFR, and NRC Regulatory Guide.

LESSON REFERENCES: AR 385-11; Title 10, CFR; Health Physics Safety SOP; Radiological Safety Handbook; Rad Div SOP; NRC Regulatory Guide.

POI FILE: DF 380 Air Sampling (U)

TYPE OF INSTRUCTION: 2PE1

	PEACETIME	MOBILIZATION
HOURS:	2	2

TRAINING OBJECTIVE:

TASK: Organize, establish, and conduct routine air sampling operations to include:

a. Removing, cutting, and preparing the air sample for counting.

b. Performing required radiation counting on the air sample.

c. Performing required calculations to determine long lived activity of the air sample.

CONDITIONS: In a radiological laboratory, given air sampler, scaler system, laboratory accessories, and sampling problems.

STANDARDS: Sampling and calculations completed with 100 percent accuracy IAW TM 3-260, TM 3-261, and Radiological Safety Handbook DF380.

LESSON REFERENCES: TM 3-260; TM 3-261; Radiological Safety Handbook.

POI FILE: DF 400 Transportation of Radioactive Material (U)

TYPE OF INSTRUCTION: .7C, .3T, 3PE2

	PEACETIME	MOBILIZATION
HOURS:	4	4

TRAINING OBJECTIVES:

TASK 1: Define and use terms pertinent to transportation of radioactive materials.

CONDITIONS: Given Radiological Safety Handbook.

STANDARDS: IAW Radiological Safety Handbook DF400.

TASK 2: Perform the following:

a. Apply regulations on packaging, marking, labeling, and sending/receiving radioactive material.

b. Brief drivers, furnish written instructions, and placard vehicles.

c. Calculate required shielding problems.

CONDITIONS: Given practical problems and Radiological Safety Handbook.

STANDARDS: Actions completed IAW AR 385-11, Titles 10 and 49 CFR, and Radiological Safety Handbook DF400.

LESSON REFERENCES: AR 385-11; TM 55-315; TM 38-250; Title 10, Part 19 and 20 and Title 49, CFR; BOI Tariff 600B; Radiological Safety Handbook; TV Tape OCS 1104.

POI FILE: DF 410 Disposal of Radioactive Waste Material (U)

TYPE OF INSTRUCTION: 1C, 1PE2

	PEACETIME	MOBILIZATION
HOURS:	2	2

TRAINING OBJECTIVES:

TASK 1: Identify and describe the following:

a. Disposal terminology.

b. Responsibilities and duties of all levels in CONUS regarding the Army's radioactive material procedures.

c. Actions of organizations with disposable radioactive material.

d. Requirements for the escort of radioactive material.

e. Requirements for the use of the sanitary sewage system.

f. Advantages and limitations of ultimate disposal methods.

CONDITIONS: Given Radiological Safety Handbook.

STANDARDS: IAW AR 385-11, Title 10 CFR, and Radiological Safety Handbook.

TASK 2: Perform computations on use of sanitary sewage system and disposal requests.

CONDITIONS: Given problems and Radiological Safety Handbook.

STANDARDS: Computations completed with 100 percent accuracy IAW Radiological Safety Handbook DF410.

LESSON REFERENCES: AR 385-11; TM 3-260; TM 3-261; Title 10, Part 20, CFR; Radiological Safety Handbook.

POI FILE: DF 420 Radiological Decontamination (U)

TYPE OF INSTRUCTION: 1C, 3PE1

	PEACETIME	MOBILIZATION
HOURS:	4	4

TRAINING OBJECTIVES:

TASK 1: Identify the following:

a. Definition and procedure for calculating residual number.

b. Principles of radiological decontamination.

c. Three conditions which must exist before decontamination is undertaken.

d. Categories of control of a contaminated area.

e. Principal methods of radiological decontamination.

CONDITIONS: Given Pam 25 and Radiological Safety Handbook.

STANDARDS: IAW Radiological Safety Handbook DF420.

TASK 2: Decontaminate various surfaces.

CONDITIONS: In a radiological laboratory, given contaminated surfaces, AN/PDR-27(), scaler system, handling tools, protective gear, water, soap, wetting agent, and organic solvent.

STANDARDS: Perform decontamination procedures IAW Radiological Safety Handbook DF420 and established safety requirements.

LESSON REFERENCES: FM 3-15; TM 3-220; TM 11-6665-209-20; General Dynamics Health Physics Handbook; Pam 25; Radiological Safety Handbook.

POI FILE: DF 430 Health Physics Environmental Survey (U)

TYPE OF INSTRUCTION: 2PE1

	PEACETIME	MOBILIZATION
HOURS:	2	2

TRAINING OBJECTIVE:

TASK: Perform environmental surveys, to include planning considerations and evaluation of contamination levels.

CONDITIONS: In a laboratory environment, given AN/PDR-27(), scaler system, smears, data collection material, and protective gear.

STANDARDS: Survey performed with 100 percent accuracy IAW AR 385-11, Title 10 CFR, and Radiological Safety Handbook DF430.

LESSON REFERENCES: AR 385-11; TM 11-6665-209-20; Title 10, Part 20, CFR; Rad Div SOP; Radiological Safety Handbook.

FILE: DF 440 Radiological Safety Involving X-Rays (U)

E OF INSTRUCTION: 1C, 2PE1

	PEACETIME	MOBILIZATION
JRS:	3	3

AINING OBJECTIVES:

TASK 1: Describe the following:

a. Principles of operation of an X-ray generator.

b. Safety requirements for X-ray operators and technicians.

c. Operation of survey instruments used for X-ray surveys.

d. Procedure for requesting X-ray surveys.

e. Procedure for inspecting and determining whether existing facilities meet requirements.

CONDITIONS: Given Radiological Safety Handbook.

STANDARDS: IAW Pam 25 and Radiological Safety Handbook DF440.

TASK 2: Execute the following:

a. Calculate shielding.

b. Determine the effects of shielding.

c. Charge X-ray survey instruments.

d. Operate neutron moisture density gauge.

CONDITIONS: In a radiological laboratory, given Victoreen Model 471 radiacmeter, Victoreen condensor "R" system, neutron moisture density gauge, and shielding problems.

STANDARDS: IAW procedures prescribed in Radiological Safety Handbook.

LESSON REFERENCES: TM 5-805-12; Pam 25; Radiological Safety Handbook; PHS Handbooks, Basic Radiological Health and Occupational Radiation Protection.

POI FILE: DF 450 Lasers - Operation and Safety (U)

TYPE OF INSTRUCTION: 2C, 1D

HOURS:	PEACETIME 3	MOBILIZATION 3

TRAINING OBJECTIVES:

TASK 1: Describe the following:

a. Operation of a laser system.

b. Hazards associated with lasers.

c. Application of regulations to hazard situations.

d. Agencies where aid in evaluation of hazards can be obtained.

CONDITONS: Given Radiological Safety Handbook.

STANDARDS: IAW AR 40-16 and Radiological Safety Handbook DF450.

TASK 2: Demonstrate operation of lasers, to include hologram and related safety equipment.

CONDITIONS: In a radiological laboratory, with lasers and optical system, hologram, associated laboratory equipment, and goggles.

STANDARDS: IAW laser operations procedures and Radiological Safety Handbook DF450.

LESSON REFERENCES: AR 40-46; TB Med 279; Radiological Safety Handbook; L. Goldman, Biomedical Aspects of the Laser; K. Stebbry, Lasers and Their Applications.

POI FILE: DF 460 Microwave Radiation and Safety Procedures (U)

TYPE OF INSTRUCTION: 1C, 1PE1

HOURS:	PEACETIME 2	MOBILIZATION 2

TRAINING OBJECTIVES:

TASK 1: Describe the following:

a. Procedures for microwave generation and transmission.

b. Uses of microwave radiation.

c. Physiological effects and protective measures used with microwave radiation.

d. Military and federal exposure criteria.

CONDITIONS: Given Radiological Safety Handbook.

STANDARDS: IAW guidelines prescribed in AR 40-583, TB Med 523, Pam 25, Lasers and Microwave Hazards, and Radiological Safety Handbook DF460.

TASK 2: Perform microwave oven surveys.

CONDITIONS: In a radiological laboratory, given Narda 8100 and 8200 series instruments, microwave oven, and associated laboratory equipment.

STANDARDS: Monitoring procedures performed IAW AR 40-583 and Radiological Safety Handbook DF460.

LESSON REFERENCES: AR 40-583; TB Med 523; Course Manual, Lasers and Microwave Hazards; USAEHA-EA, Biological Effects of Microwave Radiation, Vol 1; Pam 25; Radiological Safety Handbook.

POI FILE: DF 470 Radiation Protection Officer Case Studies (U)

TYPE OF INSTRUCTION: 4CS

	PEACETIME	MOBILIZATION
HOURS:	4	4

TRAINING OBJECTIVE:

TASK: Solve problems concerning radiological protection officer (RPO) duties.

CONDITIONS: Given case studies and all previous student references.

STANDARDS: Solutions IAW all governing regulations and Radiological Safety Handbook DF470.

LESSON REFERENCES: All references in radiological safety subannexes.

POI FILE: DF 490 NAICP Orientation (U)

TYPE OF INSTRUCTION: 1C

	PEACETIME	MOBILIZATION
HOURS:	1	1

TRAINING OBJECTIVES:

TASK 1: Identify DOD, DA, and other agency policies and responsibilities governing procedures for response to a nuclear accident/incident.

CONDITIONS: Given situations involving hypothetical nuclear accidents/incidents.

STANDARDS: IAW AR 50-5, FM 3-15, and Nuclear Weapons Accident Response Procedure (Draft).

TASK 2: Determine responsibilities and actions of personnel and response teams for nuclear accidents/incidents.

CONDITIONS: Given a situation concerning organization and functioning of response teams, NAIC, and division staffs, control measures and monitoring, survey, and decontamination procedures.

STANDARDS: IAW FM 3-15.

LESSON REFERENCES: AR 50-5; FM 3-15; Nuclear Weapons Accident Response Procedures (Draft); TVT NVWAX 79.

POI FILE: DF 501 SL-1 Accidents (U)

TYPE OF INSTRUCTION: 2T

	PEACETIME	MOBILIZATION
HOURS:	2	2

TRAINING OBJECTIVE:

TASK: Describe all required operations and controls at accident sites involving radioactive materials.

CONDITIONS: Provided NRC TV tapes on SL-1 accidents.

STANDARDS: IAW military and federal guidelines for operations and control at SL-1 accident sites.

LESSON REFERENCES: AR 385-11; Title 10, Part 19 and 20, CFR; NRC TV Tapes 1108, 1109, and 1110.

POI FILE: DF 510 Management of Radiation Accidents (U)

TYPE OF INSTRUCTION: .5C, 5.5CS

	PEACETIME	MOBILIZATION
HOURS:	6	6

TRAINING OBJECTIVES:

TASK 1: Describe the following:

a. Radiation accidents and incidents involving nonweapon material.

b. Causes of accidents/incidents and influencing factors.

c. Guidelines for emergency planning.

d. Accident/incident reporting.

e. Handling radiation accidents in safe and expeditious manner.

CONDITIONS: Given Radiological Safety Handbook.

STANDARDS: In compliance with applicable regulations and Radiological Safety Handbook DF510.

TASK 2: Solve problems concerning the management of radiation accidents.

CONDITIONS: Given case studies and all previous student references.

STANDARDS: Solutions IAW all governing regulations and Radiological Safety Handbook DF510.

LESSON REFERENCES: AR 385-11; AR 385-40; Title 10, Part 19 and 20, CFR; NCRP Report No. 29; PHS Training Manual, Management of Radiation Accidents; Radiological Safety Handbook.

POI FILE: DF 530 Medical Aspects of Ionizing Radiation (U)

TYPE OF INSTRUCTION: 2C

	PEACETIME	MOBILIZATION
HOURS:	2	2

TRAINING OBJECTIVE:

TASK: Describe the following:

a. Mechanism of the interaction of ionizing radiation with matter.

b. Manifestation of genetic damage at the cellular level, to include lethal and nonlethal effects, mutations, and relative radiosensitivity.

c. Clinical picture of radiation injury from both acute and chronic exposures.

CONDITIONS: Given Radiological Safety Handbook.

STANDARDS: IAW NRC Regulatory Guide No. 8-29 and Radiological Safety Handbook DF530.

LESSON REFERENCES: NRC Regulatory Guide No. 8-29; Radiological Safety Handbook.

POI FILE: DF 540 Computational Procedures in Physical Sciences (U)

TYPE OF INSTRUCTION: 2PE2

	PEACETIME	MOBILIZATION
HOURS:	2	2

TRAINING OBJECTIVE:

TASK: Solve practical problems related to material covered in subannexes B01-28 through B01-42.

CONDITIONS: Given practical problems, all references, and instructor assistance.

STANDARDS: Problems solved with 100 percent accuracy IAW Radiological Safety Handbook DF540.

LESSON REFERENCES: ST 3-155; Radiological Safety Handbook; Radiological Safety Handbook Supplement; Pam 25.

POI FILE: DF 548 Examination Radiological Safety III (U)

TYPE OF INSTRUCTION: 4E2

	PEACETIME	MOBILIZATION
HOURS:	4	4

TRAINING OBJECTIVE:

TASK: Demonstrate proficiency in performing radiological safety procedures.

CONDITIONS: Given examination and 200 minutes, with references during problem-solving portion only.

STANDARDS: 70 percent accuracy IAW school solution.

LESSON REFERENCES: All references in Radiological Safety III subannexes.

POI FILE: DZ 040 Seminar - Radiological Safety (U)

TYPE OF INSTRUCTION: 1S

	PEACETIME	MOBILIZATION
HOURS:	1	1

SCOPE: Provide student with an opportunity to evaluate and discuss the course of instruction and various problems offered from the class.

LESSON REFERENCES: All references in Radiological Safety III portion of instruction.

POI FILE: DZ 900 Course Critique and Closing (U)

TYPE OF INSTRUCTION: 2C

	PEACETIME	MOBILIZATION
HOURS:	2	2

SCOPE: Student will be able to critique the course of instruction; turn in texts and reference manuals; resolve problems concerning material presented.

LESSON REFERENCES: All previous instruction.

EQUIPMENT SUMMARY

LIN/NSN	NOMENCLATURE	TOTAL REQUIRED PER SINGLE COURSE ITERATION PEACETIME	TOTAL REQUIRED PER SINGLE COURSE ITERATION MOBILIZATION	AVERAGE STUDENT TO EQUIP RATIO PEACETIME	AVERAGE STUDENT TO EQUIP RATIO MOBILIZATION	REMARKS
--	Scales W/Pig W/GM2	12	12	2:1	2:1	
--	Standard Sources	2	2	12:1	12:1	
--	Hand and Foot Monitor	1	1	24:1	24:1	
--	External Monitor AN/PDR-27	3	3	8:1	8:1	
--	Neutron Rem Counter, Eberline Rascal Model PRS-2P/NRD	1	1	24:1	24:1	
--	Neutron Instrument, Eberline BF_3 Counter	2	2	12:1	12:1	
--	Neutron Dosimeter	2	2	12:1	12:1	
--	Bonner Sphere Neutron Detector	1	1	24:1	24:1	
--	Liquid Scintillation System	1	1	24:1	24:1	
--	Multichannel Analyzer	1	1	24:1	24:1	

LIN/NSN	NOMENCLATURE	TOTAL REQUIRED PER SINGLE COURSE ITERATION PEACETIME	MOBILIZATION	AVERAGE STUDENT TO EQUIP RATIO PEACETIME	MOBILIZATION	REMARKS
--	Single Channel Analyzer	1	1	24:1	24:1	
--	Scintillation Heads	2	2	12:1	12:1	
--	24V Staplex Air Sampler	1	1	24:1	24:1	
--	110V Staplex Air Sampler	1	1	24:1	24:1	
--	Victoreen Module 471 Radiacmeter	2	2	12:1	12:1	
--	Victoreen Condenser "R" Instrument W/Chamber	2	2	12:1	12:1	
--	Laser Eye Protective Goggles	2	2	12:1	12:1	
--	Laser and Optical System (He-Ne)	1	1	24:1	24:1	
--	Hologram	2	2	12:1	12:1	
--	Microwave Oven	1	1	24:1	24:1	
--	NARDA 8100 Series Microwave Instrument	2	2	12:1	12:1	
--	NARDA 8200 Series Microwave Instrument	2	2	12:1	12:1	
Q93303 6665-00-856-8235	M3A1 Source Set	1	1	24:1	24:1	

LIN/NSN	NOMENCLATURE	TOTAL REQUIRED PER SINGLE COURSE ITERATION PEACETIME	TOTAL REQUIRED PER SINGLE COURSE ITERATION MOBILIZATION	AVERAGE STUDENT TO EQUIP RATIO PEACETIME	AVERAGE STUDENT TO EQUIP RATIO MOBILIZATION	REMARKS
Q19613 6665-00-542-1587	AN/PDR-54 Radiac Set	1	1	24:1	24:1	
Q19681 6665-00-211-6895	AN/PDR-56 Radiac Set	12	12	2:1	2:1	
Q19750 6665-00-965-1516	AN/PDR-60 Radiac Set	14	14	2:1	2:1	Note 1
Q19339	AN/PDR-27 ( ) Radiac Set	14	14	2:1	2:1	Note 1
C75606 6665-00-179-9037	AD/UDM-2 Radiac Calibrator	12	12	2:1	2:1	
C74507 6665-00-767-7497	AN/UDM-6 Radiac Calibrator	12	12	2:1	2:1	
Q20798 6665-00-243-8199	IM-9E/PD Radiacmeter	24	24	1:1	1:1	
Q20935 6665-00-752-7759	IM-93 ( )/UD Radiacmeter	8	8	3:1	3:1	
Q21209 6665-00-542-0729	IM-147/PD Raciacmeter	2	2	12:1	12:1	

LIN/NSN	NOMENCLATURE	TOTAL REQUIRED PER SINGLE COURSE ITERATION PEACETIME	TOTAL REQUIRED PER SINGLE COURSE ITERATION MOBILIZATION	AVERAGE STUDENT TO EQUIP RATIO PEACETIME	AVERAGE STUDENT TO EQUIP RATIO MOBILIZATION	REMARKS
Q21483 6665-00-856-8037	IM-174/PD Radiacmeter	12	12	2:1	2:1	
Q21483 6665-00-999-5145	IM-174A/PD Radiacmeter	12	12	2:1	2:1	
E00533 6665-00-542-1177	PP-1578A/PD Radiac Detector Charger	8	8	3:1	3:1	

Note 1: Total equipment requirements that exceed the student to equipment ratio is for instructor and/or safety usage.

SPECIFICATION CHANGE NOTICE

(SEE MIL-STD-490 FOR INSTRUCTIONS)

DATE PREPARED

1. ORIGINATOR NAME AND ADDRESS	2.	3. CODE IDENT.	4. SPEC. NO.
Magnavox Electronics Systems Co. 1313 Production Road Fort Wayne, IN 46808	☐ PROPOSED ☒ APPROVED	37695 5. CODE IDENT. 37695	CR-CP-0091-B01 6. SCN NO. 001

7. SYSTEM DESIGNATION	8. RELATED ECP NO.	9. CONTRACT NO.	10. CONTRACTUAL ACTIVITY
FIST DMD	E4GJ057005	DAAB07-84-C-J057	Modification

11. CONFIGURATION ITEM NOMENCLATURE	12. EFFECTIVITY
Computer Program Configuration Item Specification Type B5	S/N 0001 A and Higher

THIS NOTICE INFORMS RECIPIENTS THAT THE SPECIFICATION IDENTIFIED BY THE NUMBER (AND REVISION LETTER) SHOWN IN BLOCK 4 HAS BEEN CHANGED. THE PAGES CHANGED BY THIS SCN BEING THOSE FURNISHED HEREWITH AND CARRYING THE SAME DATE AS THIS SCN. THE PAGES OF THE PAGE NUMBERS AND DATES LISTED BELOW IN THE SUMMARY OF CHANGED PAGES, COMBINED WITH NON-LISTED PAGES OF THE ORIGINAL ISSUE OF THE REVISION SHOWN IN BLOCK 4, CONSTITUTE THE CURRENT VERSION OF THIS SPECIFICATION.

13. SCN NO.	14. PAGES CHANGED (INDICATE DELETIONS)	* S	* A	15. DATE
001	i, ii, v, vi, vii, viii, ix, 39, 40, 61, 62, 91, 92, 117, 118, 139, 140, 169, 170, 185, 186, 189, 190, 211, 212, 213, 214	X X X		21 November
	10-3, 10-4, 10-5, 10-6, 10-9 through 10-36, 10-39 through 10-46	X X		
	40A, 40B, 91A, 91B, 139A, 139B, 170A, 170B, 186A, 186B		X	

16. TECHNICAL CONCURRENCE

PAUL A. TREMBLAY, FIST DMD System Manager

DATE 21 November 85

DD FORM 1696

"S" indicates supersedes earlier page. "A" indicates added page.