

Operator's Manual for

RADIOLOGICAL DETECTION SYSTEM (RDS) BASE UNIT and PROBES

BASE UNIT (NSN 6665-01-671-4539)

ALPHA-BETA PROBE (NSN 6665-01-671-4479)

BETA PHOTON PROBE (NSN 6665-01-671-4352)

SENSITIVE GAMMA PROBE (NSN 6665-01-671-4250)

SMALL AREA BETA GAMMA PROBE (NSN 6665-01-671-4413)

**FIELD INSTRUMENT FOR DETECTION OF LOW ENERGY
RADIATION PROBE (NSN 6665-01-671-4239)**

NEUTRON PROBE (NSN 6665-01-671-4376)



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WARNING SUMMARY

This warning summary contains general safety warnings and hazardous materials warnings that must be understood and applied during operation and maintenance of this equipment. Failure to observe these precautions could result in serious injury or death to personnel. All warnings will be accompanied by the icon included below.

WARNINGS



Batteries. Batteries should not be opened or burned. Exposure to the ingredients contained within or their combustion products could be harmful causing respiratory irritation, skin irritation, eye irritation and chemical burns. Do not handle leaking or damaged batteries without neoprene or rubber gloves. Do not puncture, mutilate, or attempt to disassemble batteries. Do not heat them above 100°C (212°F). Do not mix battery types. Failure to comply may result in injury.



Cesium (Cs)-137 Check Source. Avoid prolonged use of Check Sources, return them to case or other protective location promptly after each use to minimize exposure. Do not ingest source. Do not attempt to open or crush source housing. Do not handle damaged sources. The cesium (Cs-137) check source contains less than 1 microCurie (μCi) of Cs-137. Coordinate disposal with your Radiation Safety Officer (RSO). Failure to comply may result in injury.



Radiation/Known Faults and Malfunctions. Operation of Base Unit or probes with known faults could lead to incorrect radiation readings. Refer to Section 3.2.1 for definition of icons and to Health Menu (Section 3.17.2) for instructions on accessing the system Health to view any system notifications. Continued use of a malfunctioning Base Unit or any one of the six probes may result in over exposure to radiation or excessive radioactive dose, and/or radiation contamination. Failure to comply may result in injury.



Total Dose. Total dose on the RDS may not be utilized as the radiological exposure medical dose of record. Refer to use of authorized dosimeters. Failure to comply may result in injury to personnel.

CAUTION SUMMARY

This caution summary contains general safety and usage cautions that must be understood and applied during operation and maintenance of this equipment. Failure to observe these precautions could result in damage to the equipment. All caution statements will be accompanied by the icon included below.

CAUTIONS



Alpha-Beta Probe. Do not attach Alpha-Beta Probe to Telescoping Pole or attempt to use it with Telescoping Pole. Failure to comply will result in damage to Alpha-Beta Probe.



Alternating Current / Direct Current (AC/DC) Power Adapter. Operator must power off the RDS Base Unit prior to disconnecting the AC/DC power adapter from the power outlet if batteries are not already inserted into the Base Unit. Failure to comply may cause damage to the Base Unit.



Automatic Pressure Valve. RDS Kit Transit Cases have an automatic pressure valve. Do not tamper with automatic pressure valve. Failure to comply may damage the Transit Case.



Batteries. This instrument may be powered by alkaline or NiMH batteries. Do not puncture, mutilate, or attempt to disassemble batteries. Do not heat them above 100°C (212°F). Do not mix battery types. Failure to comply may cause damage to the Base Unit and/or probes.



Beta Window Base Unit. Do not place anything inside the beta window of the Base Unit or place the Base Unit beta window directly on top of the check source or any object with the beta window cap off. Doing so may damage the low dose Geiger-Mueller (GM) tube or cause an object to become wedged inside the beta window obscuring readings. Failure to comply may cause damage to Base Unit.



Beta Window Beta Photon Probe. Do not place anything inside the beta window of the Beta Photon Probe. Do not place the Beta Photon Probe window directly on top of the check source or any object with the beta window cap off. Doing so may damage the low dose GM tube or cause an object to become wedged inside the beta window obscuring readings. Failure to comply may cause damage to Beta Photon Probe.



Captive Screw. Only hand tighten the Alpha-Beta Protective Grate captive screw. Do not over tighten captive screw. Failure to comply may cause damage to probe.



Common Probe Cable. Do not try to disconnect Common Probe Cable by pulling on cable strain relief. Failure to comply may cause damage to Common Probe Cable, Base Unit, or probe.



Deletion of Data. Deleting all data on Base Unit cannot be undone. Only delete all data after confirming with unit Standard Operating Procedures (SOP) that all data can be deleted. Failure to comply may result in lost data.



Drop. Do not drop Base Unit or any of the probes. If dropped, perform Preventive Maintenance Checks and Services (PMCS) to include the source check on that item to confirm functionality before continuing mission. Failure to comply may cause damage or degrade performance.



Known Faults or Malfunctions. Operation of Base Unit or probes with known faults could lead to damage to the equipment. Refer to Section 3.2.1 for definition of icons and to Health Menu instructions (Section 3.17.2) for instructions on accessing the system Health to view any system notifications. Failure to comply may cause damage to the Base Unit and/or probes.



Mylar Window. The Alpha-Beta Probe mylar window (underneath protective grate and mesh screen) is very thin. If this layer is penetrated, the performance of Alpha-Beta Probe will degrade or cease to function altogether. Avoid direct contact with surface being monitored to prevent damaging mylar window and/or contamination of probe face. Do not wipe or clean the mylar window, replace as necessary. Failure to comply may result in inaccurate readings and damage to the probe.



Puncture. Do not force anything into the protective grates or puncture the detector face on the Base Unit and probes as applicable. Failure to comply may result in damage.



Scintillator. Alpha-Beta Probe full detection capability will not be ready until scintillator that sits below mylar window has settled for 2 hours after exposure to light. Failure to comply may result in inaccurate readings.



Storage. Batteries must be removed prior to storage. Failure to comply may cause damage to the Base Unit.



Telescoping Pole. Cam latch screw has been adjusted at the factory at the correct distance. Do not rotate or adjust cam latch. Do not force probe into Telescoping Pole probe cup. Failure to comply may cause damage to Telescoping Pole or probe.



Telescoping Pole. Do not use the probe cup as a handle to extend the Telescoping Pole. Grip only by the tube of the Telescoping Pole. Failure to comply may result in damage to the Telescoping Pole.



Troubleshooting. If any system fault remains after following the recommended corrective action, return the unit to manufacturer for repair. Failure to comply with these instructions can result in damage to the Base Unit and/or probes.

SAFETY, CARE, AND HANDLING

RADIATION SAFETY

The RDS components, except for the Cesium (Cs)-137 check source, do not contain radioactive components, parts, or materials. Do not touch damaged sources. Disposal of sources, whether damaged or non-damaged, must be coordinated with your Radiation Safety Officer (RSO). Within each section of this manual, the use of the check sources will be preceded by the following warning:

WARNING



Cesium (Cs)-137 Check Source. Avoid prolonged use of Check Sources, return them to case or other protective location promptly after each use to minimize exposure. Do not ingest source. Do not attempt to open or crush source housing. Do not handle damaged sources. The cesium (Cs-137) check source contains less than 1 microCurie (μCi) of Cs-137. Coordinate disposal with your Radiation Safety Officer (RadSO). Failure to comply may result in injury.

Operators performing their mission may encounter unknown radioactive sources and contamination. Follow all mission guidelines for setting thresholds and performance of the mission. It is critical that the system is working appropriately while being used in an operational mission. Within each section of this manual, the steps for operational use of the equipment will be preceded by the following warning:

WARNING



Radiation/Known Faults and Malfunctions. Operation of Base Unit or probes with known faults could lead to incorrect radiation readings. Refer to Section 3.2.1 for definition of icons and to Health Menu (Section 3.17.2) for instructions on accessing the system Health to view any system notifications. Continued use of a malfunctioning Base Unit or any one of the six probes may result in over exposure to radiation or excessive radioactive dose, and/or radiation contamination. Failure to comply may result in injury.

CHEMICAL, BIOLOGICAL, RADIOLOGICAL, AND NUCLEAR (CBRN) DECONTAMINATION

The RDS set of equipment, excluding the mylar window of the Alpha-Beta Probe, shall be decontaminated by washing the equipment with warm, clean water, a mild detergent, and a clean rag. A mylar window that is determined to be contaminated by hazardous material shall be treated as contaminated waste and replaced with a spare mylar window.

NUCLEAR SURVIVABILITY

When the system detects a prompt gamma event (nuclear blast), it immediately powers off. The electronics are then protected from resulting surge of energy. The unit can be powered back on after a prompt gamma event and continue to detect radiation and give dose rate information. Actions to take regarding use after a nuclear blast can be found in Section 7.1.3. The RDS components are not affected by Electromagnetic Pulse (EMP) and require no actions based on an EMP alone.

BATTERIES

Each Base Unit contains internally one lithium cell battery (BR2032). Under normal conditions of use, batteries are hermetically sealed. Potential for exposure should not exist unless the battery leaks, is exposed to high temperature, is accidentally swallowed, or is mechanically, physically, or electrically abused. Operators will not have access to this battery. Should the Base Unit be destroyed in some manner

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that it has internal contents exposed, disposal of the Base Unit to include the lithium cell battery should be completed in accordance with federal and local laws for the disposal of electronics and batteries.

The Base Unit uses four (4) AA batteries, alkaline or rechargeable Nickel Metal Hydride (NiMH) for power. Under normal conditions of use, batteries are hermetically sealed. Potential for exposure should not exist unless the battery leaks, is exposed to high temperature, is accidentally swallowed, or is mechanically, physically, or electrically abused. Within each section of this manual, use of batteries will be preceded by the following warning:

WARNING



Batteries. Batteries should not be opened or burned. Exposure to the ingredients contained within or their combustion products could be harmful causing respiratory irritation, skin irritation, eye irritation and chemical burns. Do not handle leaking or damaged batteries without neoprene or rubber gloves. Do not puncture, mutilate, or attempt to disassemble batteries. Do not heat them above 100°C (212°F). Do not mix battery types. Failure to comply may result in injury.

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MANUAL CONTENTS

GENERAL

This manual contains operator instructions, information, and operator maintenance for the RDS Base Unit and Probes operation.

TABLE OF CONTENTS

The table of contents lists the chapters and sections of this manual. It includes a list of illustrations and a list of tables.

CHAPTER 1 – GENERAL INFORMATION

This chapter describes items supplied, the system's purpose, kit contents, nomenclature cross reference list with part numbers and North Atlantic Treaty Organization (NATO) stock numbers (NSN), and a list of abbreviations.

CHAPTER 2 – EQUIPMENT DESCRIPTION

Provides RDS equipment functions, characteristics, and specifications, theory of operation, power information, environmental information, and pouches information.

CHAPTER 3 – BASE UNIT OPERATING INSTRUCTIONS

Provides a detailed description and use of controls including complete menu selection graphical user interface (GUI) for all modes of operation. Includes instructions for using the Base Unit including pre-operational checks and operational steps. Menu contents, to include data logging and viewing of data instructions are included in this chapter.

CHAPTER 4 – RDS PROBES OPERATION

Provides instructions on how to operate RDS Probes with the Base Unit. Includes pre-operation checks for probes.

CHAPTER 5 – RAD EXTENDER, DOWNLOAD DATA FILES

Provides how to connect the Base Unit to a computer and download the data files for use in analysis and reporting.

CHAPTER 6 – TELESCOPING POLE OPERATION

Provides instructions on how to operate the telescoping pole.

CHAPTER 7 – OPERATION UNDER UNUSUAL CONDITIONS

Provides instructions on how to operate RDS equipment in unusual conditions.

CHAPTER 8 – SHIPMENT AND STORAGE

Provides information on placing the system into storage, shipping, and transportation preparation instructions.

CHAPTER 9 – TROUBLESHOOTING PROCEDURES

Provides troubleshooting steps to follow when issues are encountered with RDS equipment.

CHAPTER 10 – OPERATOR MAINTENANCE AND CLEANING

Provides instructions to perform routine checks and services to keep the equipment in good working order. It contains the preventive maintenance checks and services (PMCS) instructions and operator corrective maintenance such as battery change instructions, replacement of the mylar window or protective screen on the Alpha-Beta Probe, placement of the strap on the Field Instrument for Detection of Low Energy Radiation (FIDLER) and Neutron probes.

CHAPTER 11 – UNIT OF MEASURE CONVERSIONS

Contains common units of measure and conversions from the International System of Units (SI) to common unit terminology, conversion equivalence for radiation units of measure, and prefixes used with SI Units.

CHAPTER 12 – QUICK START GUIDE

Provides a Quick Start Guide that can be printed out and used as a job aid with the RDS.

Chapter 1

General Information

Section 1 Radiological Detection System (RDS)

1.1.1 Purpose of the RDS Equipment

RDS is a suite of equipment that is used for detection, classification, and quantification of gamma, beta, alpha, x-ray, and neutron radiation. The equipment utilizes Geiger-Mueller (GM) detection, scintillation, photomultiplier tube (PMT), and solid-state semiconductor-based technology to detect the various forms of radiation. Detection capabilities are found in the Base Unit and in six different probes, each suited to different missions or purposes. Chapter 2 provides additional information and specifications for detection ranges and characteristics for the Base Unit and each of the six probes.



Figure 1.1. Radiological Detection System (RDS).

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1.1.2 Available Items in the RDS Suite of Equipment

Below is a list of RDS items with NSNs and manufacturer part numbers. The transit case shown below is an example. RDS equipment is sold in various configurations based on the end customer's needs.



Figure 1.2. RDS Equipment.

Table 1.1. RDS Equipment.

ITEM #	ITEM NAME	MANUFACTURER PART NUMBER	NATO STOCK NUMBER	DESCRIPTION
-	RDS Kit Transit Case	V067518 (Shown), Various	To Be Determined (TBD)	A hard case that contains RDS equipment. Item shown is only one example, case will depend on the kit configuration ordered.
(1)	Telescoping Pole	V066099 (shown - short), V041227 (long)	TBD, 5120-01-672-9428	A pole that extends the reach of the Beta Photon Probe and Sensitive Gamma Probe. Two sizes are available.
(2)	Alpha-Beta Probe	V040005	6665-01-671-4479	A RDS probe used to detect alpha and beta radiation.
(2a)	Mylar Window (located under Alpha-Beta Probe)	V040250	6665-01-672-8578	An expendable item located on the Alpha-Beta Probe used to prevent light from

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				reaching the scintillator.
(3)	Cs-137 Check Source (<1uCi)	V005824	6665-01-702-3955	A check source that emits beta and gamma radiation.
(4)	Base Unit	V038429	6665-01-671-4539	Equipment that is used to detect gamma and beta radiation as well as provides interfaces for the Rad Extender, Probes, headset, and AC/DC Power Adapter.
(5)	Small Area Beta Gamma (SABG) Probe	V038820	6665-01-671-4413	A RDS probe used for radiation contamination and frisking operations.
(6)	Beta Photon Probe	V038276	6665-01-671-4352	A RDS probe used to detect beta and gamma (photon) radiation.
(7)	RDS Operator's Manual	V069272	Not Applicable (N/A)	Paper manual containing the instructions for operating the RDS.
(8)	RDS Quick Start Guide	V062815	N/A	A laminated sheet with abbreviated operating instructions.
(9)	RDS Kit Case Contents Card	V067331 (Shown), Various	N/A	A laminated sheet with pictures showing the location of the contents in the transit case.
(10)	Common Probe Cable	V038669	6150-01-672-7428	A cable used to connect the Base Unit to any RDS Probe.
(11)	Headset (Earpiece)	V067725	TBD	An earpiece that can be used to hear the audible sounds from the Base Unit.
(12)	Probes Carrying Pouch	V041068	6625-01-685-2757	A pouch used to carry up to two probes (not including FIDLER or Neutron Probe).
(13)	Base Unit Carrying Pouch	V041066	6625-01-685-2742	A pouch used to hold the Base Unit when an operator needs to hold other items in their hands.

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(14)	AC/DC Power Adapter	V038666	6130-01-685-2752	A cable that allows powering of the Base Unit from a 110 Volt electrical socket.
(15)	Rad Extender	V062817	TBD	A small, encapsulated single board computer with cables and connectors extending to the Base Unit and a non-networked computer. It provides a means for cybersecure download of files from the Base Unit to the computer.
(16)	Battery Charger and Cable	V062807	TBD	Provides the ability to recharge up to four Nickel Metal Hydride (NiMH) AA batteries at one time.
(17)	Nickel Metal Hydride (NiMH) Batteries (8 each)	V062808	6140-01-413-3926	Provides battery power to the Base Unit.
-	Alkaline Batteries	003-360013R00	6135-00-985-7845	Provides battery power to the Base Unit.
-	Protective Screen	V043270	6625-01-685-8635	User maintenance replaceable protective screen for Alpha-Beta Probe that protects the mylar window.
-	Small Area Beta Gamma (SABG) Probe Shield	V041621	6665-01-685-6616	Shield that can be attached to the SABG Probe for use in high background environments to limit the background effects on the reading at the face of the detector.

1.1.3 Items Supplied with Sensitive Gamma Probe Kit (V062798)

Below is a list of kit contents with NSNs and manufacturer part numbers along with its location within each kit.



Table 1.2. Sensitive Gamma Probe Kit Contents.

ITEM #	ITEM NAME	MANUFACTURER PART NUMBER	NATO STOCK NUMBER	DESCRIPTION
-	Sensitive Gamma Probe Transit Case	20-001219-000	TBD	A hard case that contains the Sensitive Gamma Probe Kit contents.
(1)	Sensitive Gamma Probe	V038313	6665-01-671-4250	A RDS probe that is used to detect gamma radiation.

1.1.4 Items Supplied with Field Instrument for Detection of Low Energy Radiation (FIDLER) Probe Kit (V062799)

Below is a list of each kit contents with NSNs and manufacture part numbers along with its location within each kit.



Table 1.3. FIDLER Probe Kit Contents.

ITEM #	ITEM NAME	MANUFACTURER PART NUMBER	NATO STOCK NUMBER	DESCRIPTION
-	FIDLER Probe Transit Case	V040456	8145-01-672-8743	A hard case that contains the FIDLER Probe Kit contents.
(2)	FIDLER Probe	V038863	6665-01-671-4239	A RDS probe that detects low energy radiation and discriminates into four separate channels.
(3)	Shoulder Strap	V042883	5340-01-672-8625	Adjustable strap for carrying probe on shoulder.

1.1.5 Items Supplied with Neutron Probe Kit (V062800)

Below is a list of each kit contents with NSNs and manufacture part numbers along with its location within each kit.



Table 1.4. Neutron Probe Kit Contents.

ITEM #	ITEM NAME	MANUFACTURER PART NUMBER	NATO STOCK NUMBER	DESCRIPTION
-	Neutron Probe Transit Case	V040455	8145-01-672-9119	A hard case that contains the Neutron Probe Kit contents.
(2)	Neutron Probe	V039097	6665-01-671-4376	A RDS probe that detects neutrons.
(3)	Shoulder Strap	V042883	5340-01-672-8625	Adjustable strap for carrying probe on shoulder.

1.1.6 Manufacturer & Support

RDS equipment is manufactured by D-tect Systems, a division of Ludlum Measurements, Incorporated (Inc.), Commercial and Government Entity (CAGE) Code 1V7Q3.

For support to assist in troubleshooting, answering general questions about the RDS, warranty information on your system, and to process an item for Return Merchandise Authorization (RMA) to obtain additional maintenance please use the following information:

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D-tect Systems
 313 W 12800 S, Suite 302
 Draper, UT 84020 USA
 Phone: +1-801-260-4069
 E-mail: RDSMILSupport@dtectsystems.com
 Support website: <http://www.dtectsystems.com/support/rds>

Support personnel will assist with directions appropriate to the system based on the contract it was purchased under. Please have the serial number of the item available when making contact, a description of the problem, troubleshooting performed if applicable and, most importantly, your email address, physical mailing address, and telephone number.

1.1.7 Nomenclature and NSN Cross Reference List

Table 1.5. RDS NSN Nomenclature Cross-Reference List.

FUNCTIONAL/ COMMON NAME	OFFICIAL NOMENCLATURE	MANUFACTURER PART NUMBER	NATO STOCK NUMBER
AA Alkaline Battery	BATTERY, NONRECHARGEABLE	003-360013R00	6135-00-985-7845
AA NiMH Battery	BATTERY, STORAGE	DC1500B4	6140-01-413-3926
Alpha-Beta Probe	PROBE, RADIAC	V040005	6665-01-671-4479
AC/DC Power Adapter	POWER SUPPLY	V038666	6130-01-685-2752
Base Unit	RADIACMETER	V038429	6665-01-671-4539
Base Unit Carrying Pouch	CASE, ELECTRICAL- ELECTRONIC TEST AND MEASUREMENT EQUIPMENT	V041066	6625-01-685-2742
Battery Charger, NiMH, AA, 4 Position	CHARGER, BATTERY	CHFC	6130-01-413-3929
Beta Photon Probe	PROBE, RADIAC	V038276	6665-01-671-4352
Cesium-137 (Cs-137) 1 µCi Check Source	RADIOACTIVE TEST SAMPLE	V005824	6665-01-702-3955
Common Probe Cable	CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL	V038669	6150-01-672-7428
FIDLER Probe	PROBE, RADIAC	V038863	6665-01-671-4239
FIDLER Probe Transit Case	SHIPPING AND STORAGE CONTAINER, MISCELLANEOUS	V040456	8145-01-672-8743
Headset	TBD	V067724	TBD
Mylar Window	COVER, ACCESS	V040250	2590-01-672-8578
Neutron Probe	PROBE, RADIAC	V039097	6665-01-671-4376
Neutron Probe Transit Case	SHIPPING AND STORAGE CONTAINER, MISCELLANEOUS	V040455	8145-01-672-9119
Probe Carrying Pouch	CASE, ELECTRICAL- ELECTRONIC TEST AND MEASUREMENT EQUIPMENT	V041068	6625-01-685-2757
Protective Screen	COVER, ELECTRICAL- ELECTRONIC TEST	V043270	6625-01-685-8635
Rad Extender	TBD	V062817	TBD
Sensitive Gamma Probe	PROBE, RADIAC	V038313	6665-01-671-4250

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FUNCTIONAL/ COMMON NAME	OFFICIAL NOMENCLATURE	MANUFACTURER PART NUMBER	NATO STOCK NUMBER
Sensitive Gamma Probe Transit Case	TBD	20-001219-000	TBD
Shoulder Strap	STRAP, RETAINING	V042883	5340-01-672-8625
SABG Probe	PROBE, RADIAC	V038820	6665-01-671-4413
SABG Probe Shield	SHIELD, RADIAC DETECTOR	V041621	6665-01-685-6616
Telescoping Pole (short)	TBD	V066099	TBD
Telescoping Pole (long)	POLE, TELESCOPING	V041227	5120-01-672-9428

1.1.8 List of Abbreviations

The following is a list of abbreviations and acronyms used in this manual.

Table 1.6. Abbreviations and Acronyms.

%	percentage
μ	Micro- (displayed on Base Unit as "u")
°C	Degrees Celsius
°F	Degrees Fahrenheit
AC	Alternating Current
AC/DC	Alternating Current/Direct Current
Am-241	Americium-241
Avg	Average
BIT	Built-In Test
C-14	Carbon-14
CAGE	Commercial and Government Entity
CBRN	Chemical, Biological, Radiological, and Nuclear
CCSI	Common CBRN Sensor Interface
Cf-252	Californium-252
Ci	Curie
cm	centimeter
cm ²	centimeter squared
Cnt	Count
cpm	Counts per minute
cps	Counts per second
Cs-137	Cesium-137
csv	Comma Separated Value
DC	Direct Current
DHCP	Dynamic Host Configuration Protocol
EMP	Electromagnetic Pulse
EMR	Electromagnetic Radiation
eV	Electron Volts
FIDLER	Field Instrument for Detection of Low Energy Radiation
ft	feet
Gd-148	Gadolinium-148
GM	Geiger-Mueller
GMT	Greenwich Mean Time
GPS	Global Positioning System
GUI	Graphical User Interface
Gy	Gray (unit of measure of radiation absorbed dose)
Gy/hr	Gray per hour
H	High Dose GM Tube
HDPE	High Density Polyethylene

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hr	hour
HV	High Voltage
i.e.	id est, which is Latin for "that is"
IAW	in accordance with
in	inch
in ²	inch squared
Inc	Incorporated
Init	Initial
INV	Invalid
IP	Internet Protocol
k	Kilo-
keV	kilo-electron Volt
kg	kilogram
L	Low Dose GM Tube
lbs	pounds
LCD	Liquid Crystal Display
m	Milli-
M	Mega-
Mcpm	Mega counts per minute
MeV	Mega Electron Volt
min	minute
mm	millimeter
MOLLE	Modular Lightweight Load-carrying Equipment
n	Nano-
N/A	Not Applicable
Nal(Tl)	Thallium-doped Sodium Iodide
NATO	North Atlantic Treaty Organization
NiMH	Nickel Metal Hydride
NSN	NATO Stock Number
PC	Personal Computer
PCBA	Printed Circuit Board Assembly
PMCS	Preventive Maintenance Checks and Services
PMT	Photomultiplier Tube
Pu-239	Plutonium-239
R	Roentgens (unit of measure of radiation exposure)
R/hr	Roentgen per hour
RAD	Radiation Absorbed Dose (unit of measure of radiation absorbed dose)
Rad/hr	Radiation Absorbed Dose per hour
RADIAC	Radioactivity, Detection, Indication and Computation
RDS	Radiological Detection System
rem	Roentgen Equivalent Man (0.01 sievert) (unit of measure of radiation dose equivalent)
rem/hr	Roentgen Equivalent Man per hour
RJ-45	Registered Jack 45 (same as Ethernet Jack)
RMA	Return Merchandise Authorization
RSO	Radiation Safety Officer
Ru/Rh-106	Ruthenium/Rhodium-106
S/N	Serial Number
SABG	Small Area Beta Gamma
sec	second
SI	International System of Units
SOP	Standard Operating Procedure
Sr/Y-90	Strontium/Yttrium-90
Sv	Sievert (unit of measure of radiation dose equivalent)
Sv/hr	Sievert per hour

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TBD	To Be Determined
Tc-99	Technetium-99
Th-230	Thorium-230
txt	text
U-235	Uranium-235
U-238	Uranium-238
US	United States
V	Volt
VAC	Voltage in Alternating Current
VDC	Voltage in Direct Current
WiFi	Trademarked phrase that refers to IEEE 802.11x standards.
WMD	Weapons of Mass Destruction
Z	Zulu
ZnS:Ag	Zinc Sulfide Phosphor

Chapter 2 Equipment Description

Section 1 Base Unit

2.1.1 RDS Equipment Overview

RDS equipment includes the Base Unit and six “smart” probes: Beta Photon Probe, Alpha-Beta Probe, Small Area Beta Gamma (SABG) Probe, Sensitive Gamma Probe, Field Instrument for Detection of Low Energy Radiation (FIDLER) Probe, and Neutron Probe.

2.1.2 Base Unit Purpose and Function

The Base Unit (Figure 2.1) is designed to detect both beta and photon (gamma and x-ray) radiation. It was designed to have a wide range of detection capabilities with two detectors, a low dose Geiger-Muller (GM) tube and a high dose GM tube. Detection capabilities for the Base Unit include detection of beta and gamma radiation with quantification of gamma radiation. The Base Unit is not calibrated for beta radiation detection, therefore can only be used to distinguish if beta radiation is present by removing the Beta Window Cap and observing the readings.

The Base Unit is a microprocessor-based system that controls all functions of the RDS by providing communications and power to external devices such as probes and the Rad Extender. The Base Unit has its own internal detectors and provides display and control capabilities for the entire RDS. The Base Unit has ports for connections to interoperable equipment as well as additional probes for specific detection capabilities (Figure 2.2). The Base Unit has data logging modes used to record data during use.



Figure 2.1. Base Unit, Powered On Example.

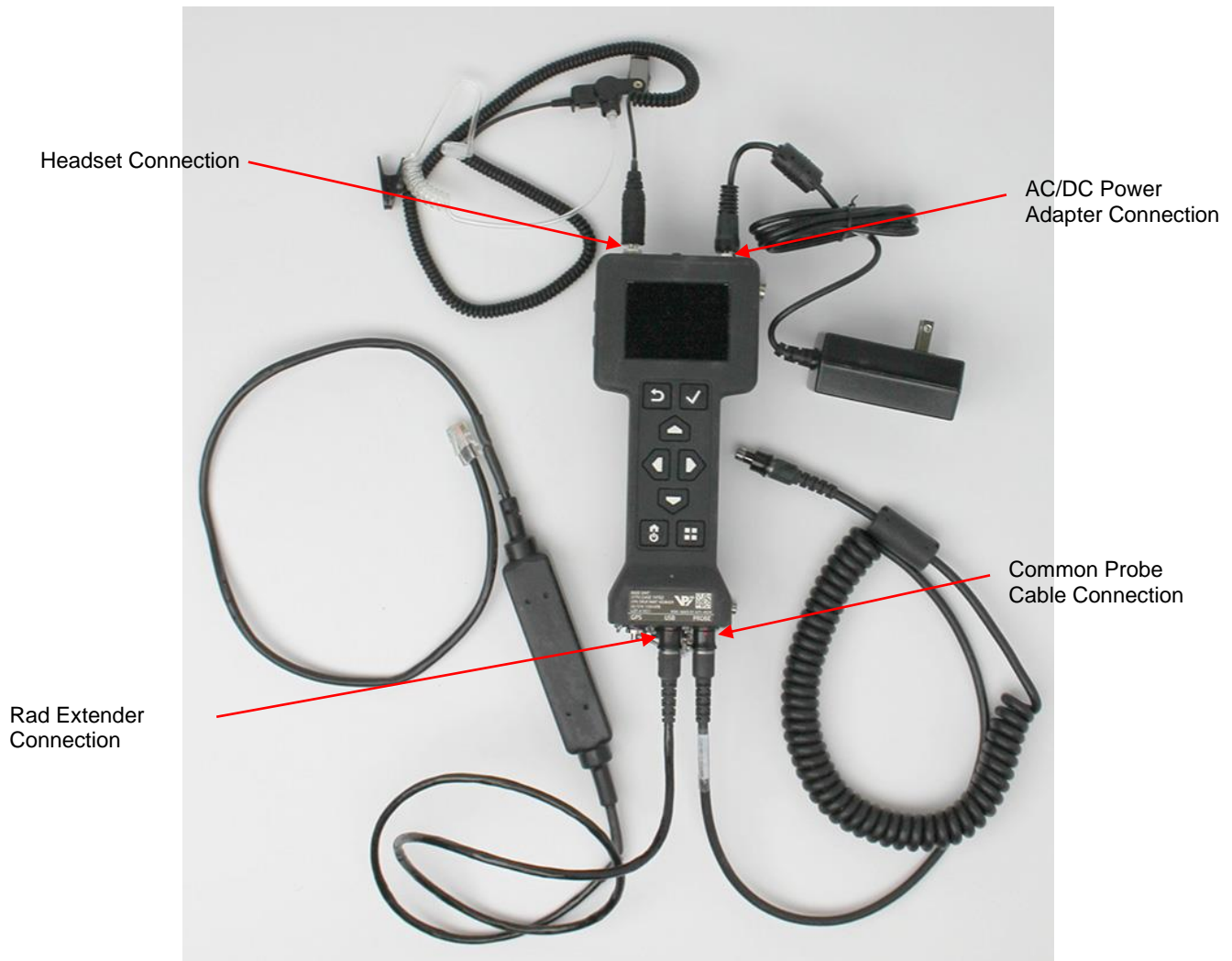


Figure 2.2. RDS and External Interfaces.

2.1.3 Base Unit Operation

The Base Unit is designed to be held in the operator's hand or in a carrying pouch when using it with a probe. It is powered by four (4) AA batteries, (Nickel Metal Hydride (NiMH) rechargeable is preferred but may also use alkaline batteries) or by use of an Alternating Current/Direct Current (AC/DC) power adapter (Figure 2.3) which bypasses the battery circuit. AC/DC power adapter provides 110-240 Voltage in Alternating Current (VAC) input with 9-28 Voltage in Direct Current (VDC) output and 50-60 Hertz.



Figure 2.3. AC/DC Power Adapter.

There is a total dose feature used to monitor the total amount of radiation to which the Base Unit or Probe has been exposed. The Base Unit has a stealth mode for operation at night when the operator needs to be undetected while using the RDS. Refer to Section 3.2.1.

The Graphical User Interface (GUI) menu system (Figure 3.6) allows the operator to set up the Base Unit and associated probe parameters such as display output, audio sounds, and alarm thresholds. The Base Unit has connections for a headset, AC/DC power adapter, Common Probe Cable, and Rad Extender.

The Base Unit only supplies low Direct Current (DC) voltages through the Common Probe Cable to the probes. It is not necessary to power down the Base Unit to change probes. Probes can be “hot swapped” without damage to the probes or the Base Unit.

The Base Unit performs a series of internal Built in Tests (BIT) to ensure proper functionality. If the Base Unit fails one or more of the BIT, the Base Unit will display a fault indication. If the Base Unit indicates a fault, follow troubleshooting steps as required. The Base Unit performs a BIT when powered on and every second while it remains on. The BIT will also check any attached probe every five seconds. A complete list of notification and fault messages produced by the BIT is provided in Table 9.1 and Table 9.2.

The Base Unit is capable of displaying multiple measurements, units, and formats. Configuration changes to units of measurement, thresholds, lighting, sound are all user settable. When used with various probes, the Base Unit automatically loads the appropriate setup from the connected probe. Connecting a new probe immediately re-configures the instrument as necessary to support that particular probe. Settings for each probe are contained in the Base Unit, therefore pre-mission set up on the Base Unit enables any probe to be attached during a mission and automatically takes on the settings placed into the Base Unit for that type of probe.

2.1.4 Base Unit Features

The Base Unit consists of a front housing that has an Liquid Crystal Display (LCD) screen and keypad on the front and probe connection on the bottom. There are connectors for Global Positioning System (GPS) (United States (US) Military GPS only), a data connection port on the bottom used for downloading data log files to a Personal Computer (PC) through the Rad Extender system, and a probe connection port for connecting the Base Unit to various RDS probes through a Common Probe Cable. The rear housing contains the battery cap on the bottom. On the top the rear housing contains an AC/DC power adapter connection (Alternating Current (AC) Power Connection), headset connection (Audio Connection), and the beta window cap. Additionally the rear housing has a speaker port on the left side and magnetized area for holding the beta window cap when it is removed from the beta window on the right side. Refer to Figure 2.4 through Figure 2.7.

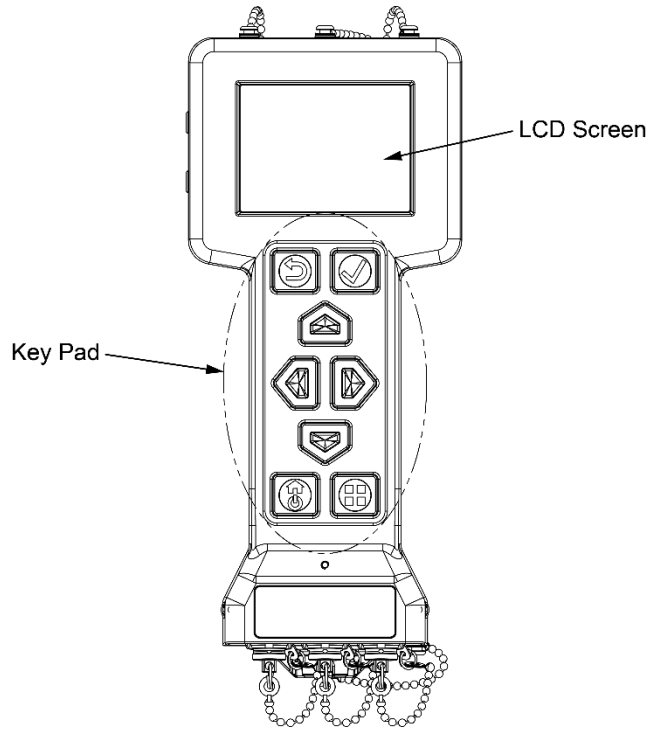


Figure 2.4. Base Unit Front View.

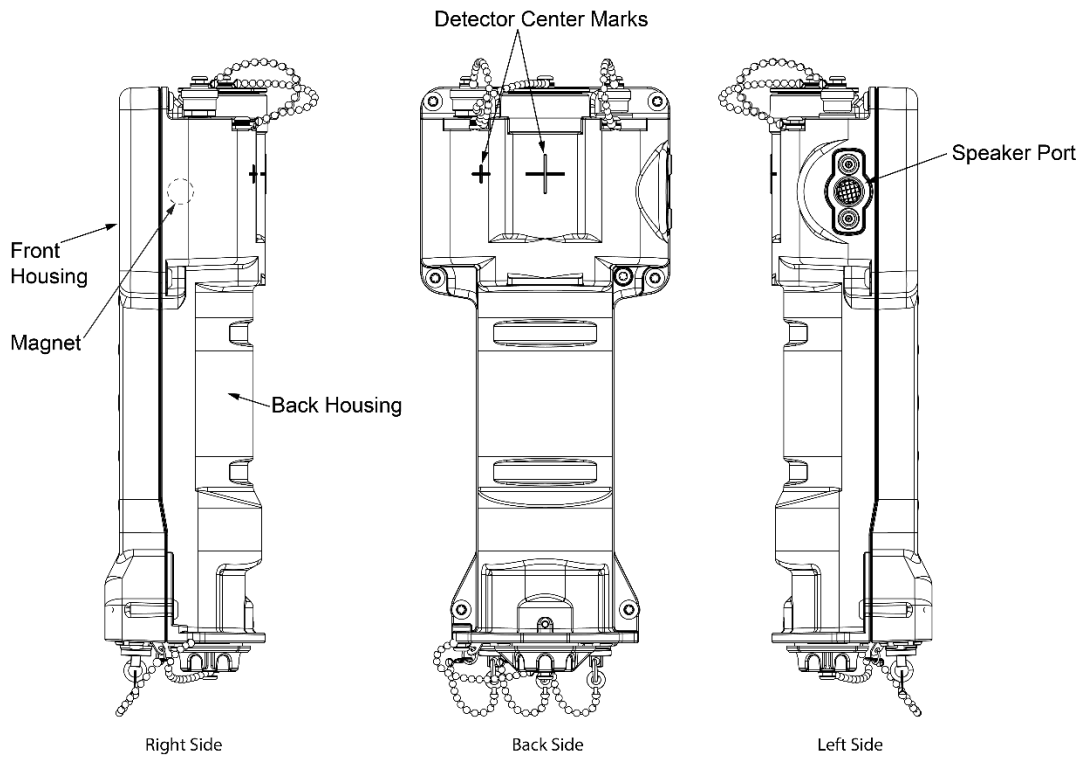


Figure 2.5. Base Unit Right, Back and Left Views.

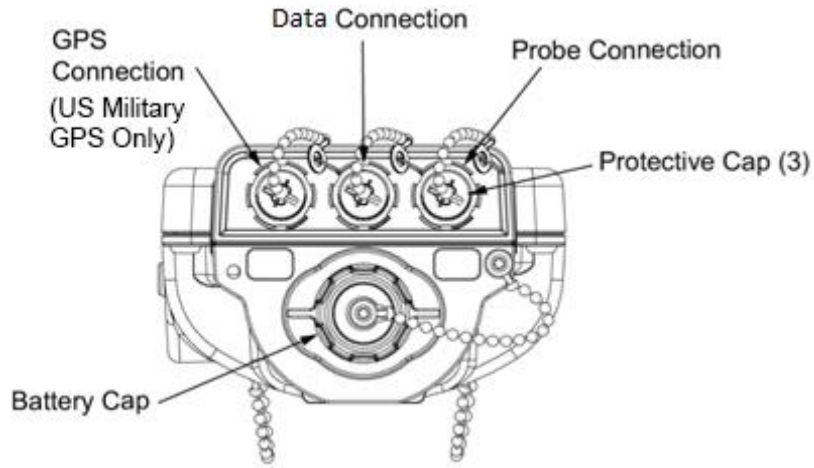


Figure 2.6. Base Unit Bottom View.

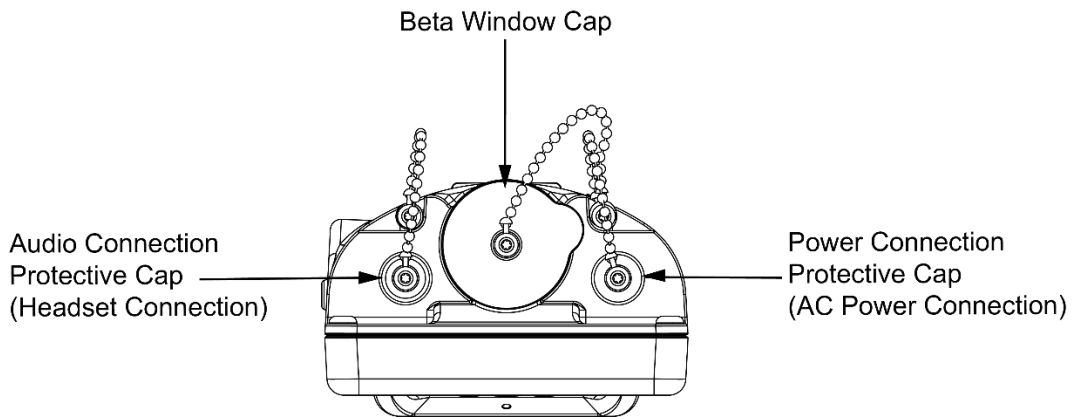


Figure 2.7. Base Unit Top View.

2.1.5 Base Unit to Probes Interface

The Base Unit and Probes communicate using the Common Probe Cable (Figure 2.8).



Figure 2.8. Base Unit Attached to Beta Photon Probe via Common Probe Cable.

The Base Unit ensures that a probe is a valid device when a probe is connected to the Base Unit. The Base Unit receives detector measurement data and BIT data from the probe after connection.

The Base Unit supports “smart” probes. A “smart” probe contains electronics that include both a microprocessor and High Voltage (HV) circuitry. The detection capability and calibration of a “smart” probe is self-contained and thus can be used with any Base Unit without need for recalibration. All RDS Probes are “smart” probes.

The “smart” probe stores the probe type and calibration information required by the Base Unit for operation in its on-board memory. When it is connected to a Base Unit, it will display the type of probe and a radiation measurement window on the LCD screen. When the probe’s image and radiation measurement window is visible on the LCD screen, the system is ready for operation.

The “smart” probe generates its own high voltage. The Common Probe Cable carries only low voltages and digital data. This removes the need for the Operator to make any adjustment to the high voltage when switching between other probes available to the RDS.

The probe can be “hot swapped” meaning the Common Probe Cable can be connected or disconnected without having to power down the Base Unit.

2.1.6 Base Unit to Computer Interface

When a Base Unit is properly connected to a computer (Figure 2.9) with a Rad Extender, captured data logs and system logs can be downloaded to the computer.



Figure 2.9. Base Unit Attached to Computer via Rad Extender Cable.

The Rad Extender (Figure 2.10) is self-contained system consisting of a single board computer that provides a web server interface using cybersecurity protocols and cables that connect to the Base Unit and an Ethernet port on a computer. It can be connected to a computer for the purpose of downloading data or a system log to that non-networked PC without a need for any specialized software utilizing common browsers such as Edge and Chrome.



Figure 2.10. Rad Extender

The purpose of the Rad Extender is to facilitate a cybersecure way to move data from the Base Unit to where it can be analyzed.

When connected to the Base Unit, the Rad Extender is powered from the Base Unit and offers two modes of operation: PC or Transfer. When PC is selected, by default the Base Unit is configured for downloading accumulated data log files from the Base Unit to the non-networked PC. Data log files or the system log file can be downloaded to a non-networked PC. The Base Unit is used to select which data logs or the system log to download. A browser is used on the non-networked PC to receive downloads from the Base Unit. No special software is needed on Microsoft Windows 10 or 11 systems, only the browser (Edge or Chrome) and notepad or comma separated value (.csv) file which can be opened and saved through any spreadsheet software (most common is Microsoft Excel). The selection of Transfer when the Rad Extender is attached to the Base Unit is used by US military only to transfer data via military data radios to specialized software (US Military only). The transfer capability may be included in future updates for other users.

2.1.7 Base Unit Performance Characteristics and Specifications

Base Unit detectors achieve a wide range of detection by using two different detectors for low to high range dose and dose rate measurements. The low range GM detector is a gas-filled end-window detector

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sensitive to both photon (gamma and x-ray) and beta radiation with the beta window cap removed. High range photon/gamma detection is achieved by a high range GM detector. For the detector center marks on the exterior of the Base Unit, refer to Figure 2.5. The larger "+" indicates the low range GM detector location while the smaller "+" indicates the high range GM detector.

The Base Unit was designed to withstand the environmental conditions listed below. It has been tested for conditions on air, land, and sea. Its environmental and operational specification details are listed in Table 2.1.

Table 2.1. Base Unit Characteristics.

Environmental	
Humidity	3% to 100%
Temperature Operating Range	-30° to 50°C (-22° to 122.7°F)
Temperature Storage Range	-50° to 60°C (-58° to 140°F)
Weight and Dimensions	
Width	8.8 cm (3.45 in)
Length	21.1 cm (8.31 in)
Depth	5.7 cm (2.23 in)
Weight with 4 AA batteries	0.75 kg (1.66 lbs)
Altitude storage and transport	15,240 meters (50,000 ft)
Altitude operational	4,572 meters (15,000 ft)
Radiation Measurements	
Dose Rate Range in Sieverts (in the units of Gray)	0.1 μ Sv/hr to 100 Sv/hr (0.1 μ Gy/hr to 100 Gy/hr)
Exposure Rate Range (in Units of R)	10 μ R/hr to 10,000 R/hr
Selectable Exposure and Dose Rate Units	μ Sv/hr, μ Gy/hr, mRad/hr, mrem/hr, mR/hr
Selectable Total Exposure and Dose Units	μ Sv, μ Gy, mRad, mR, mrem
Count Rate Range	0 to 1.5M cpm
Selectable Count Rate Units	cps (counts/sec), cpm (counts/min)
Photon Energy Response	60 keV to 3 MeV
Beta Energy Response	200 keV to 3 MeV

2.1.8 Additional Environmental Information

- (1) The Base Unit performs under the following conditions:
 - (a) Solar and ultra-violet exposure: 1-year exposure.
 - (b) Rain.
 - (c) Blowing sand and dust.
- (2) The Base Unit performs under the following induced environmental conditions:
 - (a) Shock that may be encountered in wheeled vehicles, shipboard shock.
 - (b) Shock that may be encountered in land, sea, and air transportation.

- (c) Shock while being carried by field personnel.
- (d) Shock that may be encountered on bench top during servicing.
- (e) Vibration encountered during loose and secure transportation and operation.
- (f) Electromagnetic radiation (EMR).
- (g) Immersion (1 meter of salt water for 30 minutes).

2.1.9 Shipping and Handling Precautions for all RDS Components



CAUTION

Automatic Pressure Valve. RDS Kit Transit Cases have an automatic pressure valve. Do not tamper with automatic pressure valve. Failure to comply may damage the Transit Case.



CAUTION

Storage. Batteries must be removed prior to storage. Failure to comply may cause damage to the Base Unit.

RDS equipment should be shipped in its original transit case. If the original transit case is not available, ship in a container with sufficient packing material, i.e. two layers of bubble wrap or equivalent. Remove the batteries from the Base Unit before packing. Disconnect all cables. Follow all procedures in Section 8.1.1 to prepare the system for storage properly. Follow all procedures in Section 8.1.2 to prepare the system for shipment properly.

Section 2 Beta Photon Probe

2.2.1 Purpose and Function

The Beta Photon Probe (Figure 2.11) is designed to detect both beta and photon (gamma and x-ray) radiation. It is to be used with the Base Unit for radiological detection operations. The Beta Photon Probe was designed with the same detectors as the Base Unit with the intention of extending the capabilities of the Base Unit, especially when the Beta Photon Probe is connected to the Telescoping Pole. The Beta Photon Probe is designed to be held in the operator's hand or can be installed in the Telescoping Pole.



Figure 2.11. Beta Photon Probe

2.2.2 Theory of Operation

The Beta Photon Probe detects both beta and photon (gamma and x-ray) radiation. The Beta Photon Probe is illustrated in Figure 2.12 showing two different detectors for low to high range dose and dose rate Measurements. The end of the probe with a beta window cap has a low range GM tube sealed by a mica window thin enough to allow beta and gamma radiation to pass into the tube. Inside the tube is a positive electrode (central wire) and a negative electrode on the sides. Radiation enters the tube and ionizes the gas inside which creates positive and negative charged particles. The negative charged particles migrate towards the positive charged electrode and the positive charged particles goes to the negative electrode. A high range GM tube is seated behind the low dose GM tube to capture higher readings on gamma radiation in the same manner.

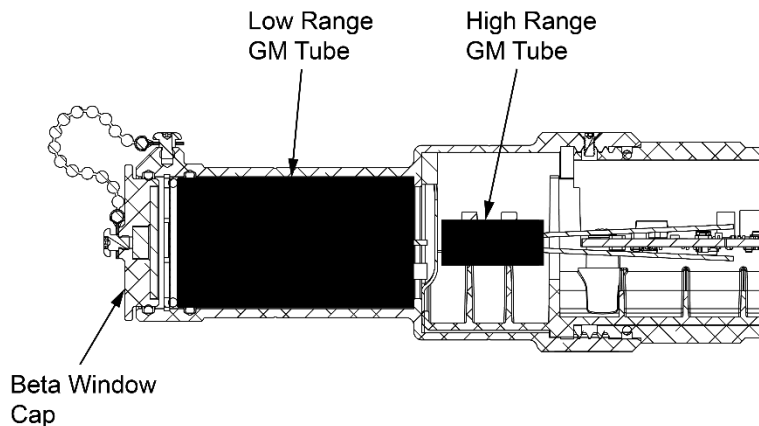


Figure 2.12. Cutaway Diagram of the Beta Photon Probe.

2.2.3 Probe Description and Characteristics

The Beta Photon probe is designed to be held by the handle (Figure 2.13), to prevent the operator's body from shielding the probe and affecting the radiation reading or to be attached to the Telescoping Pole. Orientate the Beta Photon Probe with the flat spot pointing at suspected radiological source while monitoring. The handle end contains the connection for the Common Probe Cable that will connect the Beta Photon Probe to the Base Unit. The detector end contains the Beta Window Cap, when removed can assist in discrimination of beta radiation. Instructions for the operation of the beta window cap are contained in Section 4.2.8. The Beta Photon Probe can be used with the Telescoping Pole for detection in hard-to-reach places as well as create a standoff distance from the source during missions (Chapter 6).

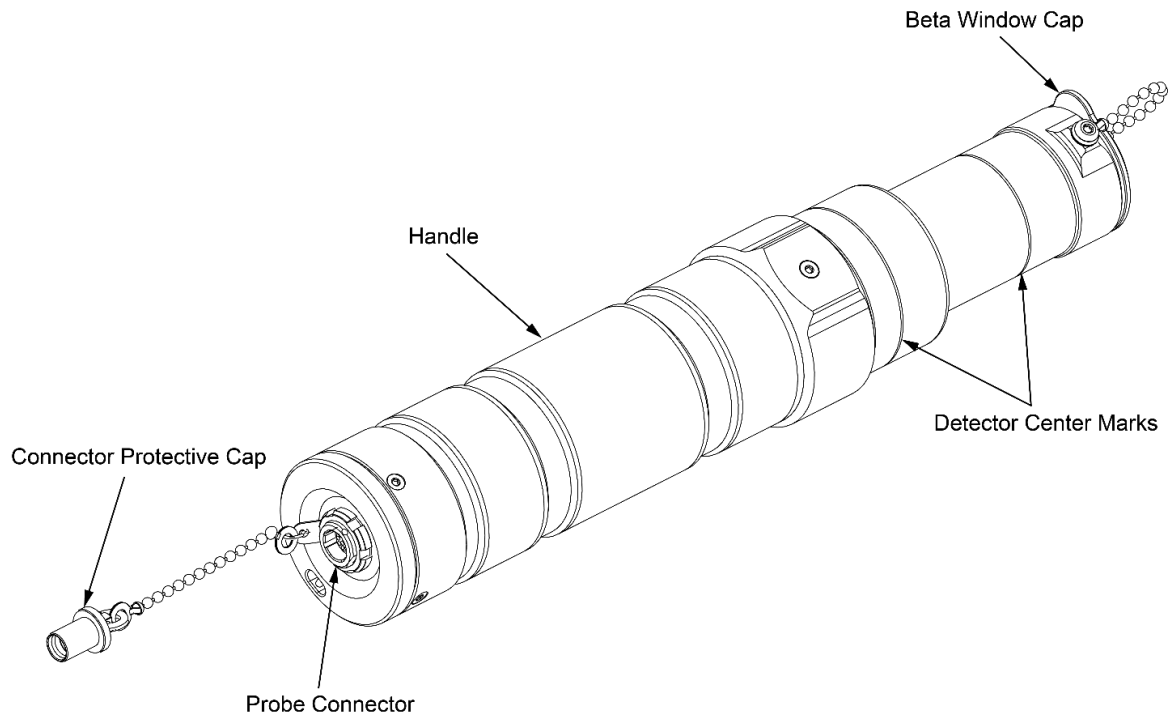


Figure 2.13. Beta Photon Probe.

2.2.4 Probe Performance Specifications and Environments

The Beta Photon Probe specifications are provided in Table 2.2. The Beta Photon Probe may be used both indoors and outdoors in the conditions listed in Table 2.2.

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Table 2.2. Specifications for the Beta Photon Probe.

Environmental	
Humidity	3% - 100%
Temperature Operating Range	-30° to 50°C (-22° to 122° F)
Temperature Storage Range	-50° to 60°C (-58° to 140°F)
Weight and Dimensions	
Length	23.5 cm (9.26 in)
Detector End Width	3.1 cm (1.23 in)
Handle End Width	4.0 cm (1.57 in)
Weight	0.35 kg (0.78 lbs)
Radiation Measurements	
Dose Rate Range in the units of Sieverts (in the units of Gray)	0.1 μ Sv/hr to 100Sv/hr (0.1 μ Gy/hr to 100Gy/hr)
Selectable Units	μ Sv/hr, μ Gy/hr, mRad/hr, mRem/hr, mR/hr
Count Rate Range	0 to 1.5 Mcpm
Selectable Count Rate Units	cps (counts/sec), cpm (counts/min)
Photon Energy Response	60 keV to 3 MeV
Beta Energy Response	200 keV to 3 MeV

2.2.5 Power

The Beta Photon Probe requires low voltage power that is provided by the Base Unit through the common Probe cable.

2.2.6 Shipping and Handling

Ship the Beta Photon Probe in its original shipping container. Disconnect the probe from the Common Probe Cable and install the cable connector protective cap onto the connector. Place the probe in its original position in the foam cut-out in the shipping container. If the original shipping container is not available, ship in a container with sufficient packing material, i.e., two layers of bubble wrap or equivalent. Follow all procedures in Section 8.1.1 to prepare the system for storage properly. Follow all procedures in Section 8.1.2 to prepare the system for shipment properly.

Section 3 Small Area Beta Gamma Probe

2.3.1 Purpose and Function

The Small Area Beta Gamma (SABG) Probe (Figure 2.16) detects beta and gamma radiation. The SABG Probe is designed to be held in the operator's hand in close proximity to the surface being interrogated. It is generally used for beta/gamma contamination monitoring work and is also known as a "Frisker" or "Pancake" probe.



Figure 2.14. Small Area Beta Gamma (SABG) Probe

2.3.2 Theory of Operation

The SABG Probe has a single GM tube in a pancake configuration illustrated in Figure 2.15. It uses a GM Pancake Tube that is sensitive to beta and gamma radiation. The detector is in a pancake configuration to provide a 15.5 cm² sensitive detection area in a small and lightweight probe.

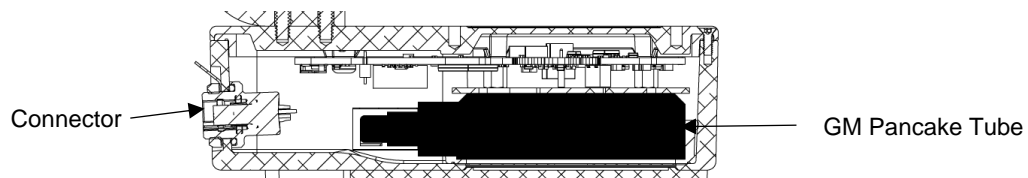


Figure 2.15. Cutaway Diagram of the SABG Probe.

2.3.3 Probe Description and Characteristics

It has a front face of 15.5 cm² surface area for the detection of radiation. The unit of measurement is count rate or count rate per unit area (counts per second, counts per minute; or counts per second/cm², counts per minute/cm²). The count rate range is 0 to 1.5 Mcpm. The unit is provided with the detector protective cover, a removable “clip-on” thin shield to protect the front face of the detector (Figure 2.16). The connector from the Common Probe Cable is located on the lower detector housing under the handle. An optional aluminum clad lead shield (Figure 2.17) is available for performing radiological detection operations in high background radiation areas.

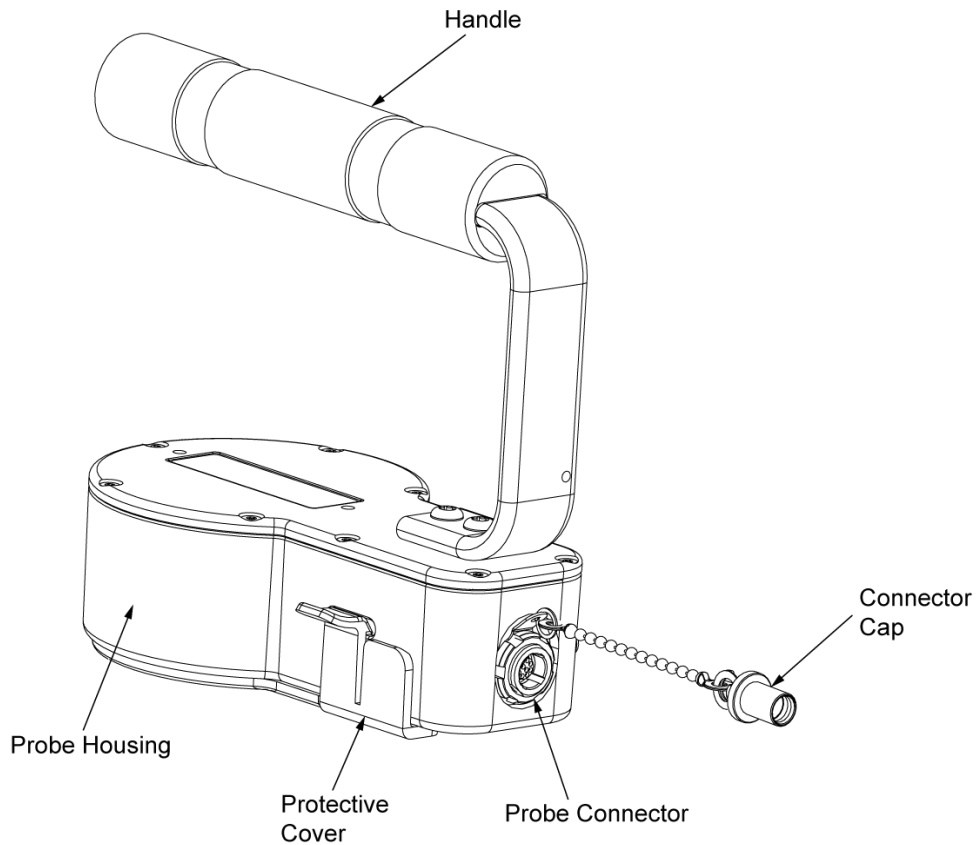


Figure 2.16. Small-Area Beta Gamma Probe.



Figure 2.17. Small-Area Beta Gamma Probe Shield.

2.3.4 Probe Performance Characteristics and Environments

The SABG Probe specifications are provided in Table 2.3. The SABG Probe may be used both indoors and outdoors in the environmental conditions listed in Table 2.3.

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Table 2.3. Specifications for the Small Area Beta Gamma Probe.

Environmental	
Humidity	3% - 100%
Temperature Operating Range	-30° to 50°C (-22° to 122°F)
Temperature Storage Range	-50° to 60°C (-58° to 140°F)
Weight and Dimensions	
Length	13.7 cm (5.4 in)
Width	6.9 cm (2.7 in)
Height	11.9 cm (4.7 in)
Weight	0.47 kg (1.04 lbs)
Detection Area	15.5 cm ² (2.4 in ²)
Radiation Measurements	
Count Rate Range	0 to 1.5 Mcpm
Selectable Count Rate Units	cps (counts/sec), cpm (counts/min) cps/cm ² (cps/square cm) cpm/cm ² (cpm/square cm)
Beta Efficiencies (2π)	
Source	Typical Efficiency (3mm from probe face)
Carbon (C) -14	15%
Technetium (Tc)-99	15%
Strontium/Yttrium (Sr/Y)-90	22%
Ruthenium/Rhodium (Ru/Rh)-106	26%

2.3.5 Power

The probe only requires low voltage power that is provided by the Base Unit through the Common Probe Cable.

2.3.6 Shipping and Handling Precautions

Ship the SABG Probe in its original shipping container. Disconnect the probe from the Common Probe Cable and install the cable connector protective cap onto the connector. Ensure the protective cover is placed on the detector face of the probe. Place the probe in its original position in the foam cut-out in the shipping container. If the original shipping container is not available, ship in a container with sufficient packing material, i.e., two layers of bubble wrap or equivalent. Follow all procedures in Section 8.1.1 to prepare the system for storage properly. Follow all procedures in Section 8.1.2 to prepare the system for shipment properly.

Section 4 Alpha-Beta Probe

2.4.1 Purpose and Function

The Alpha-Beta Probe (Figure 2.18) enables detection for both alpha and beta radiation with a single probe. The Alpha-Beta Probe is designed to be held in the operator's hand in close proximity to the surface being interrogated. It is often used for contamination monitoring work.



Figure 2.18. Alpha-Beta Probe

2.4.2 Theory of Operation

The probe design uses scintillation detection technology. It uses a detector that combines two types of scintillation detectors in a single assembly. A Zinc Sulfide Phosphor (ZnS:Ag) crystal is used for alpha detection and a thin plastic scintillator is placed behind this for beta detection. The scintillator material is in close contact with a plastic light pipe that is attached to a PMT. A scintillator absorbs the radiation and converts it to light in the visible spectrum. This light is then collected by a PMT that converts the light into an electrical signal. It is important to ensure that the detector inside the probe is not exposed to ambient light. The detector is shielded by a mylar window. This mylar window is protected by a protective screen and a protective grate on the front face of the probe. When not in operation a protective cover is provided to place over the protective grate for additional protection. It is important to avoid penetrating the mylar window under the protective screen with sharp objects. If the mylar window is penetrated, the detector will become flooded with light and be unable to detect alpha and beta radiation. If the penetration is large enough, the PMT may be damaged.

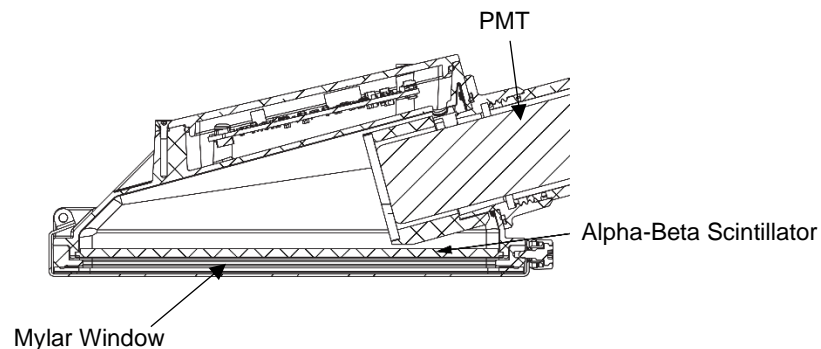


Figure 2.19. Cutaway Diagram of the Alpha-Beta Probe.

2.4.3 Probe Description and Characteristics

The Alpha-Beta Probe detects both alpha and beta radiation. Its ability to distinguish between alpha and beta radiation enables the probe to generate data for alpha and beta radiation simultaneously.

It has a front face of 100 cm² surface area for the detection of radiation. The unit of measurement is count rate or count rate per unit area (counts per second, counts per minute; or counts per second/cm², counts per minute/cm²). The total count rate range is 0 to 1.5 Mcpm.

The handle (Figure 2.20) contains the connection for the Common Probe Cable that will connect the probe to the Base Unit for use. An operator replaceable mylar window is located next to the scintillator and protected by a protective screen and the protective grate. When not in operation a protective cover is provided to place over the protective grate for additional protection. The hinged protective grate and grate thumb screw, which is a captive screw, allows the operator to replace the mylar should it become damaged or contaminated.

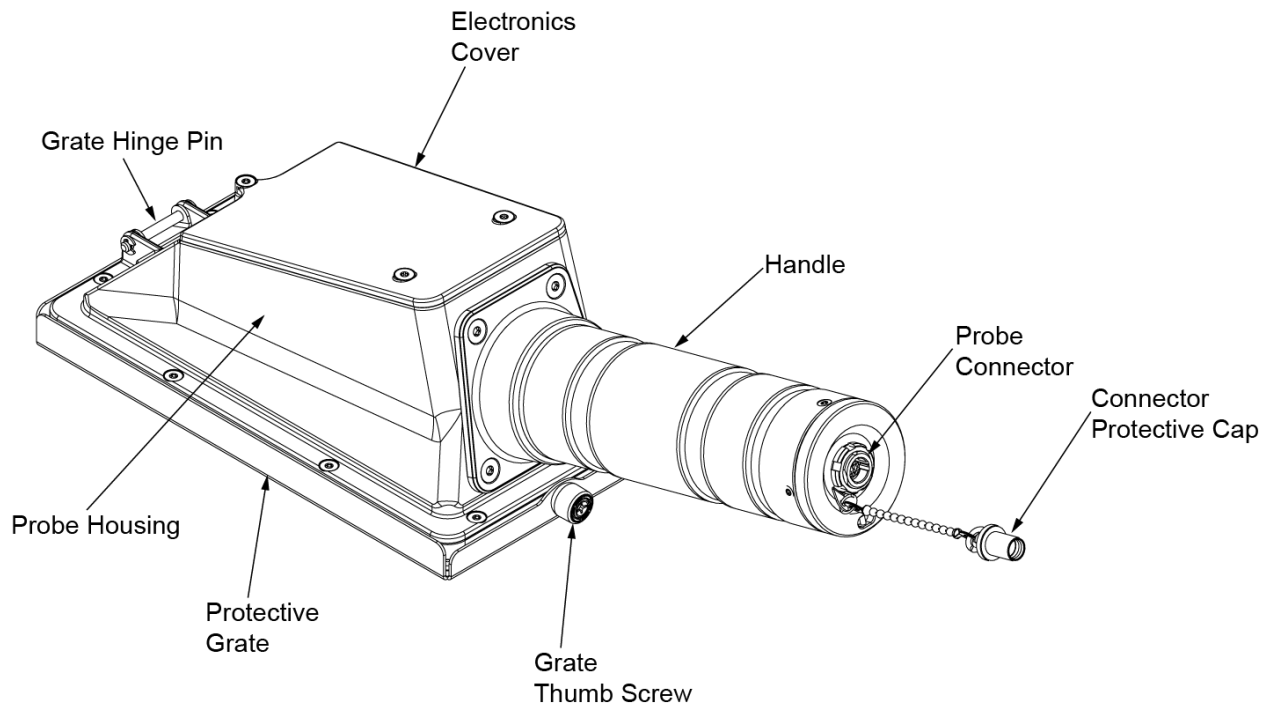


Figure 2.20. Alpha-Beta Probe Major Features.

2.4.4 Probe Performance Specifications and Environments

The Alpha-Beta Probe specifications are provided in Table 2.4. The Alpha-Beta Probe may be used both indoors and outdoors in the environmental conditions listed in Table 2.4.

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Table 2.4. Specifications for the Alpha-Beta Probe.

Environmental	
Humidity	3% - 100%
Temperature Operating Range	-30° to 50°C (-22° to 122°F)
Temperature Storage Range	-50° to 60°C (-58° to 140°F)
Weight and Dimensions	
Length	29.5 cm (11.6 in)
Width	9.4 cm (3.7 in)
Height	9.6 cm (3.8 in)
Weight	0.86 kg (1.9 lbs)
Detection Area	100 cm ² (15.5 in ²)
Radiation Measurements	
Count Rate Range	0 to 1.5 Mcpm
Selectable Count Rate Units	cps (counts/sec), cpm (counts/min) cps/cm ² (cps/square cm) cpm/cm ² (cpm/square cm)
Alpha Energy Response	3 MeV to 8 MeV
Beta Energy Response	100 keV to 5 MeV
Alpha Efficiencies (4π)	
Source	Typical Efficiency (3mm from probe face)
Gadolinium (Gd)-148	4%
Uranium (U)-238	13%
Thorium (Th)-230	14%
Plutonium (Pu)-239	17%
Americium (Am)-241	17%
Californium (Cf)-252	24%
Beta Efficiencies (4π)	
Source	Typical Efficiency (3mm from probe face)
C -14	10%
Tc -99	18%
Sr/Y -90	25%
Ru/Rh -106	30%

2.4.5 Power

The probe requires low voltage power that is provided by the Base Unit through the Common Probe Cable.

2.4.6 Shipping and Handling Precautions

Ship the Alpha-Beta Probe in its original shipping container. Disconnect the probe from the Common Probe Cable and install the cable connector protective cap onto the connector. Ensure the protective cover has been placed on the detector face over the protective grate. Place the probe in its original position in the foam cut-out in the shipping container. If the original shipping container is not available, ship in a container with sufficient packing material, i.e., two layers of bubble wrap or equivalent. Follow all procedures in Section 8.1.1 to prepare the system for storage properly. Follow all procedures in Section 8.1.2 to prepare the system for shipment properly.

Section 5 Sensitive Gamma Probe

2.5.1 Purpose and Function

The Sensitive Gamma Probe (Figure 2.21) enables detection performance for a wide range of photon (gamma and x-ray) radiation but was designed specially to detect low levels of photon radiation. The Sensitive Gamma Probe is designed to be held in the operator's hand or used with the Telescoping Pole for hard-to-reach places or create standoff distance from suspected sources.



Figure 2.21. Sensitive Gamma Probe

2.5.2 Theory of Operation

The Sensitive Gamma Probe detects photon (gamma and x-ray) radiation. Its high sensitivity makes it ideal for low radiation exposure. The Sensitive Gamma Probe is illustrated in Figure 2.22. The Thallium-doped Sodium Iodide (NaI(Tl)) crystal in the Sensitive Gamma Probe is permanently fixed to a PMT and is encased in an aluminum housing. The NaI(Tl) scintillator crystal is a very dense crystal, making it highly sensitive to gamma radiation.

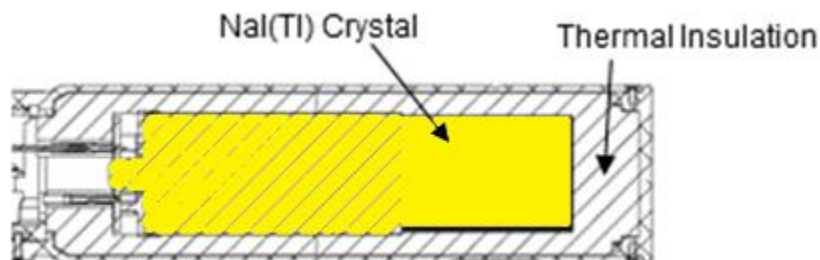


Figure 2.22. Cutaway Diagram of the Sensitive Gamma Probe.

2.5.3 Probe Description and Characteristics

The Sensitive Gamma Probe is suitable for search operations to locate gamma sources. The sensitive detector is cylindrical with a diameter of 3.2 cm (1.125 in) and a length of 3.8 cm (1.5 in). The exposure rate range is 0-5 mR/hr. The count rate range is 0-1.5 Mcpm. The Sensitive Gamma Probe measures the exposure rate over a broad range of energies. The connector for the Common Probe Cable is located on the end of the handle (Figure 2.23). The detector housing contains the center marks for the NaI(Tl) scintillator crystal for use when confirming functionality with the check source.

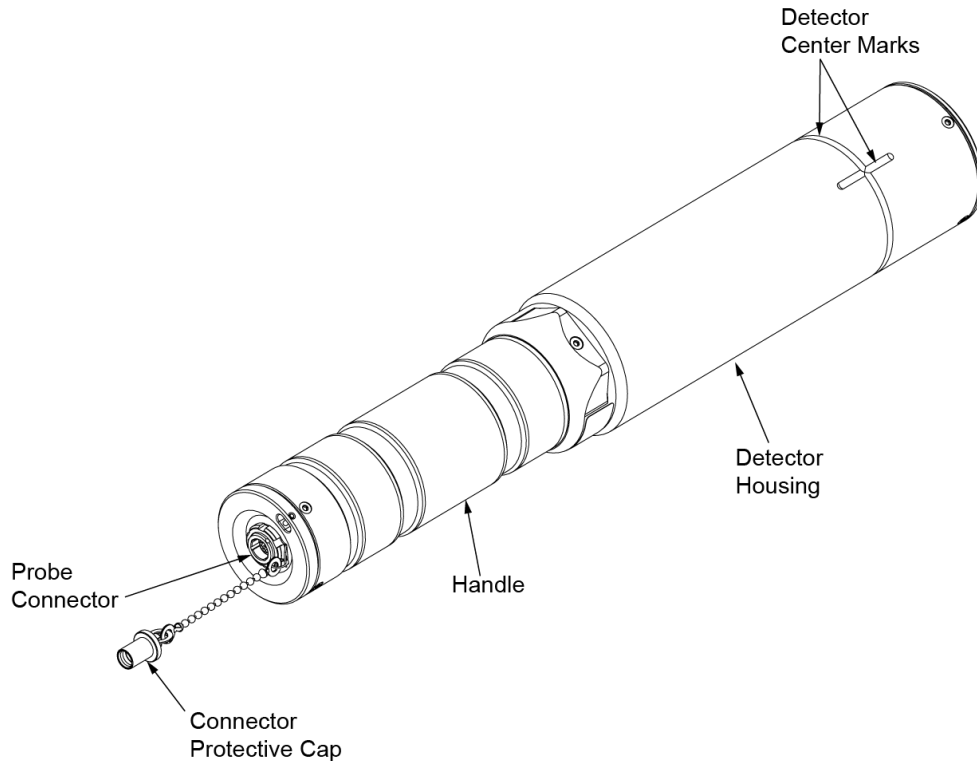


Figure 2.23. Sensitive Gamma Probe.

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2.5.4 Probe Performance Specifications and Environments

The Sensitive Gamma Probe specifications are provided in Table 2.5. The Sensitive Gamma Probe may be used both indoors and outdoors in the environmental conditions listed in Table 2.5.

Table 2.5. Specifications for the Sensitive Gamma Probe.

Environmental	
Humidity	3% - 100%
Temperature Operating Range	-30° to 50°C (-22° to 122°F)
Temperature Storage Range	-50° to 60°C (-58° to 140°F)
Weight and Dimensions	
Length	31.7 cm (12.49 in)
Detector End Width	5.0 cm (1.95 in)
Handle End Width	4.2 cm (1.65 in)
Weight	0.58 kg (1.27 lbs)
Radiation Measurements	
Exposure rate Range (in the units of R)	1 uR/hr to 5 mR/hr
Selectable Exposure Rate Units	mR/hr
Count Rate Range	0 to 1.5 Mcpm
Selectable Count Rate Units	cps (counts/sec), cpm (counts/min)
Gamma Energy Response	50 keV – 1.5 MeV
Photon Energy Response	60 keV – 3 MeV

2.5.5 Power

The probe requires low voltage power that is provided by the Base Unit through the Common Probe Cable.

2.5.6 Shipping and Handling Precautions



CAUTION

Automatic Pressure Valve. RDS Kit Transit Cases have an automatic pressure valve. Do not tamper with automatic pressure valve. Failure to comply may damage the Transit Case.

Ship the Sensitive Gamma Probe in its original shipping container. Disconnect the probe from the Common Probe Cable and install the cable connector protective cap onto the connector. Place the probe in its original position in the foam cut-out in the shipping container. If the original shipping container is not available, ship in a container with sufficient packing material, i.e., two layers of bubble wrap or equivalent. Follow all procedures in Section 8.1.1 to prepare the system for storage properly. Follow all procedures in Section 8.1.2 to prepare the system for shipment properly.

Section 6 Field Instrument for the Detection of Low Energy Radiation (FIDLER) Probe

2.6.1 Purpose and Function

The Field Instrument for the Detection of Low Energy Radiation (FIDLER) Probe (Figure 2.24) is designed to detect low energy gamma and X-ray radiation. The FIDLER Probe is designed to be held in the operator's hand at a mission specified distance from the surface being interrogated using the adjustable handle and shoulder strap. The FIDLER Probe monitors and can record data over all four of the following energy regions simultaneously by use of a multichannel discriminator. Analysis of this information can enable detection of materials commonly used in Weapons of Mass Destruction (WMD). The Base Unit Home screen has the ability to display up to two energy regions at a time, also allowing a one button press to toggle directly to the display of other energy regions on the reading panel.



Figure 2.24. FIDLER Probe

Table 2.6. FIDLER Probe Energy Regions.

NAME OF ENERGY REGION	ENERGY RANGE
Plutonium (Pu)-239 L X-ray	13 – 18 keV
Americium (Am)-241 gamma	59 – 60 keV
Uranium (U)-235 gamma	143 – 220 keV
X-ray/Low Energy Gamma (Gross)	13 – 220 keV

2.6.2 Theory of Operation

FIDLER Probe is illustrated in Figure 2.25. It has a large diameter thin NaI(Tl) scintillator permanently attached to a large clear plastic light pipe which in turn is attached to a PMT. The gamma NaI(Tl) scintillator is set back 5 cm (2 in) from the face of the probe installed in a large cylindrical housing that provides both protection against damage and thermal shock by supporting thermal insulation. This is a unique change to the design of the FIDLER Probe from Legacy FIDLER probes to assist in creating an instrument that can handle used in cold climates. The housing also provides a small amount of collimation. Collimation creates a cone of detection at a known angle. Refer to Figure 2.25. The handle is designed so that the probe may be placed over the area, spot, or object to be measured and its height adjusted to allow the operator to position the system at a predetermined distance. This provides for a better and reproducible measurement.

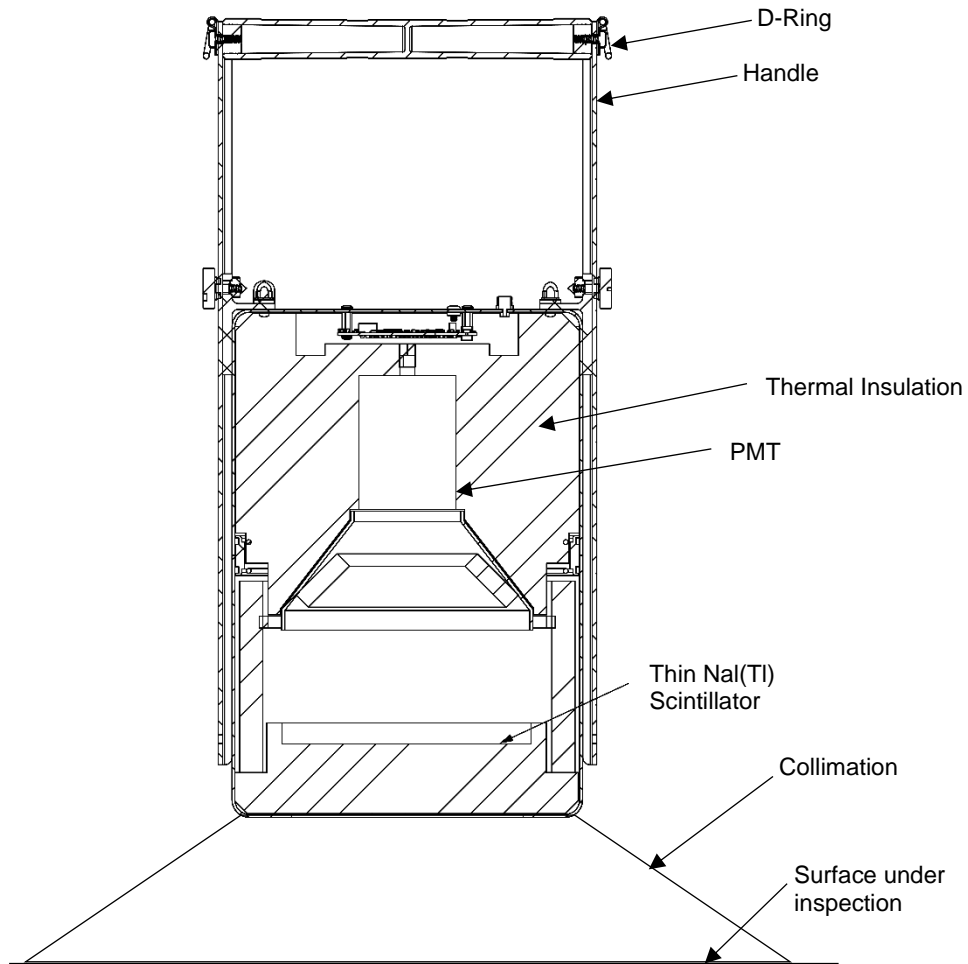


Figure 2.25. Cutaway Diagram of the FIDLER Probe.

2.6.3 Probe Description and Characteristics

An adjustable handle that can in turn be supported by an adjustable shoulder strap allows consistent survey height despite difference in personnel height. The top surface has the Common Probe Connector for attachment to the Base Unit. The detector surface is located 5 cm (2 in) from the face of the probe, which must be taken into account when determining the proper distance to use for the mission.

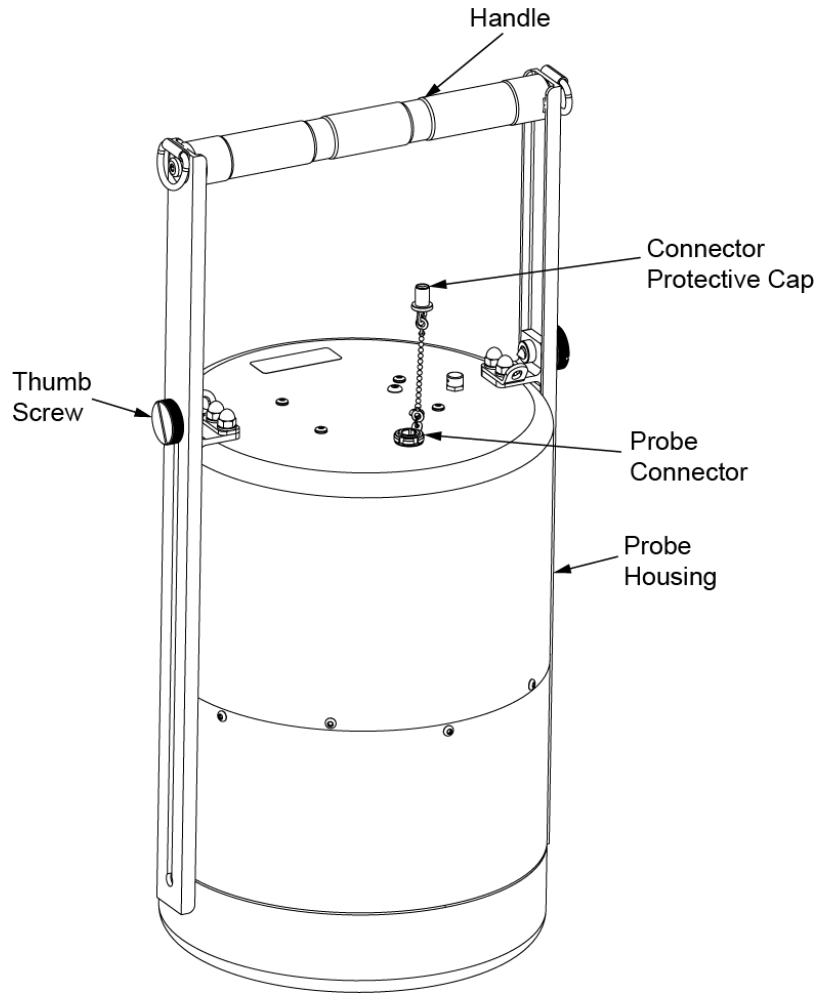


Figure 2.26. FIDLER Probe.

2.6.4 Probe Performance Characteristics and Environments

The FIDLER Probe specifications are provided in Table 2.7. The FIDLER Probe may be used both indoors and outdoors in the environmental conditions listed in Table 2.7.

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Table 2.7. Specifications for the FIDLER Probe.

Environmental	
Humidity	Maximum 95% (non-condensing)
Temperature Operating Range	-46° to 51.7°C (-51° to 125°F)
Temperature Storage Range	-51 to 71°C (-60 to 160°F)
Weight and Dimensions	
Height	Adjustable 43.69 cm to 67.82 cm (17.2 in to 26.7 in)
Length	31.7 cm (11.6 in)
Body Width	19.3 cm (7.6 in)
Max Width	21.6 cm (8.5 in)
Weight	3.3 kg (7.29 lbs)
Radiation Measurements	
Count Rate Range	0 to 1.5 Mcpm
Selectable Count Rate Units	cps (counts/sec), cpm (counts/min)
Energy Response Windows	13-18 keV, 59-60 keV, 143-220 keV, 13-220 keV
Efficiencies Point Source	Typical Efficiency and FIDLER Channel (26 cm (10.25 in)) from probe face)
AM-241	0.34% on 59–60 keV Channel
Pu-239	0.027% on 13–18 keV Channel
U-235	0.06% on 143–220 keV Channel

2.6.5 Power

The probe only requires low voltage power that is provided by the Base Unit through the Common Probe Cable.

2.6.6 Shipping and Handling Precautions



CAUTION

Automatic Pressure Valve. RDS Kit Transit Cases have an automatic pressure valve. Do not tamper with automatic pressure valve. Failure to comply may damage the Transit Case.

Ship the FIDLER Probe in its original shipping container. Disconnect the probe from the Common Probe Cable and install the cable connector protective cap onto the connector. Place the probe in its original position in the foam cut-out in the shipping container. If the original shipping container is not available, ship in a container with sufficient packing material, i.e., two layers of bubble wrap or equivalent. Follow all procedures in Section 8.1.1 to prepare the system for storage properly. Follow all procedures in Section 8.1.2 to prepare the system for shipment properly.

Section 7 Neutron Probe

2.7.1 Purpose and Function

The Neutron Probe (Figure 2.27) is designed to detect neutrons in the energy range from 0.025 eV (thermal or slow) neutrons to 15 MeV (fast). This very broad energy range (0.025 eV to 15 MeV) makes it suitable for all neutron detection work. The Neutron Probe is designed to be held in the operator's hand, with D-rings provided to add the shoulder strap to support the probe during use. A wall plate has been added to allow stability when holding it against a flat surface.



Figure 2.27. Neutron Probe

2.7.2 Theory of Operation

The Neutron Probe is illustrated in Figure 2.28. The probe consists of two molded hemispherical polyethylene moderators made of High-Density Polyethylene (HDPE), a special plastic that is installed around the detector in order to efficiently slow high-energy neutrons to a detectable level. The probe contains two different configurations of solid-state neutron detectors: one for low dose rates and one for high dose rates.

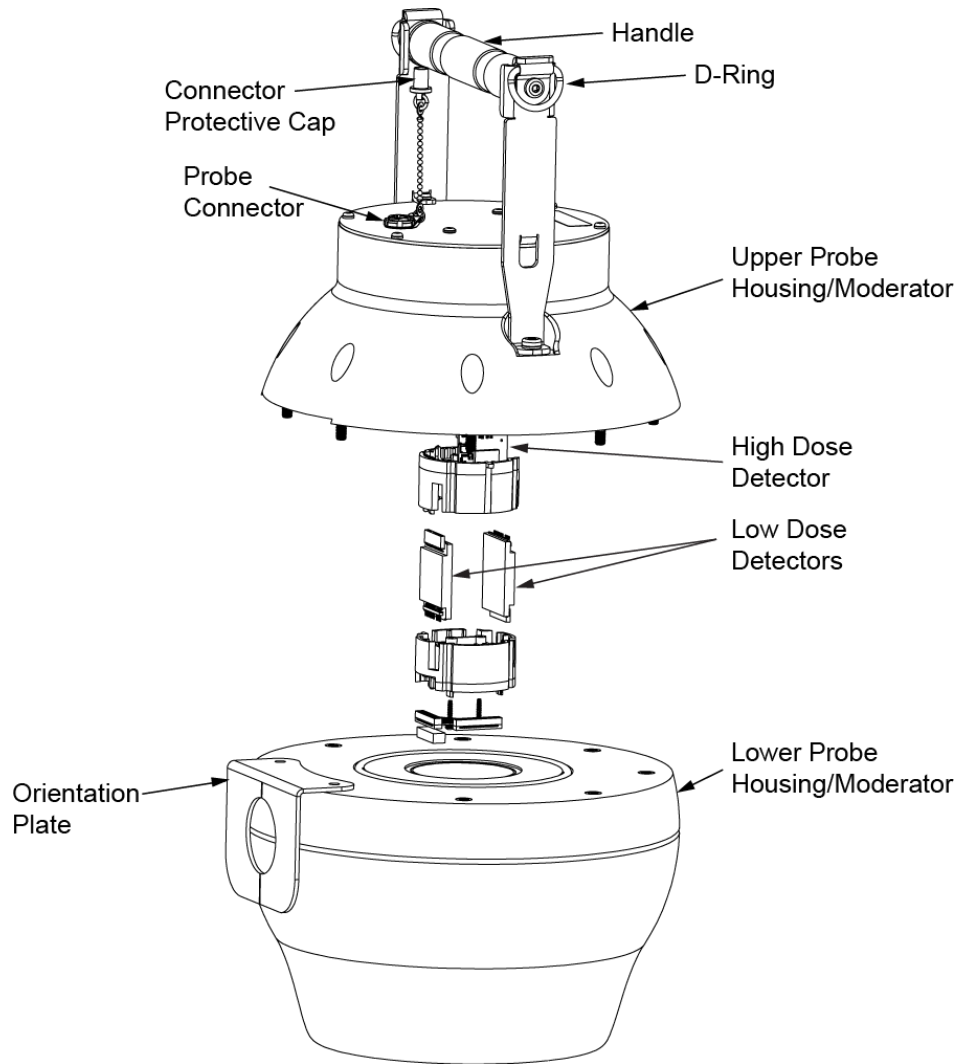


Figure 2.28. Cutaway Diagram of the Neutron Probe.

2.7.3 Probe Description and Characteristics

The weight and size of the detector is due to the special plastic HDPE sphere that is installed around the detector in order to efficiently slow high-energy neutrons to a detectable level. It is sensitive to neutrons coming in all directions. The Neutron Probe measures the dose rate and count rate from sources of neutron radiation over a broad energy range. A carrying handle (Figure 2.29) is attached for use during radiological operations. The handle has “D” rings for attaching a shoulder strap. There is a metal orientation plate on the probe for orienting the probe against flat surfaces during radiological operations to assist in holding it steady in place. The top surface holds the connector for the Common Probe Cable for attachment to the Base Unit.

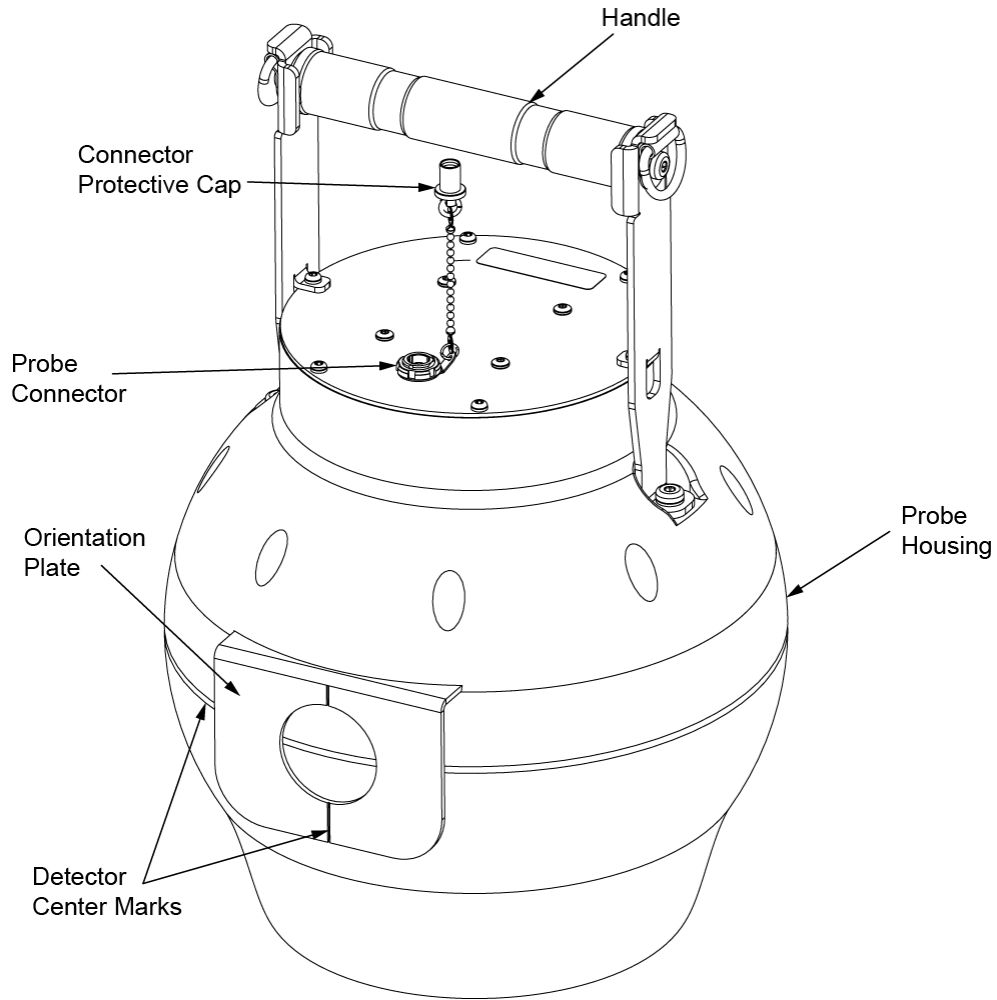


Figure 2.29. Neutron Probe.

2.7.4 Probe Performance Characteristics and Environments

The Neutron Probe specifications are provided in Table 2.8. The Neutron Probe may be used both indoors and outdoors in the environmental conditions listed in Table 2.8.

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Table 2.8. Specifications for the Neutron Probe.

Environmental	
Humidity	3% - 100%
Temperature Operating Range	-30° to 50°C (-22° to 122° F)
Temperature Storage Range	-50° to 60°C (-58° to 140°F)
Weight and Dimensions	
Height	31.5 cm (12.4 in)
Diameter	21.1 cm (8.3 in)
Weight	5.33 kg (11.76 lbs)
Radiation Measurements	
Dose Rate Range in units of Sv/hr (in the units of rem/hr)	1 μ Sv/hr to 0.1 Sv/hr (1 μ rem/hr to 10 rem/hr)
Selectable Dose and Exposure Rate Units	μ Sv/hr, μ Gy/hr, mRad/hr, mrem/hr
Count Rate Range	0 to 1.5 Mcpm
Selectable Count Rate Units	cps (counts/sec), cpm (counts/min)
Energy Response	0.025 eV – 15 MeV

2.7.5 Power

The probe requires low voltage power that is provided by the Base Unit through the Common Probe Cable.

2.7.6 Shipping and Handling Precautions



CAUTION

Automatic Pressure Valve. RDS Kit Transit Cases have an automatic pressure valve. Do not tamper with automatic pressure valve. Failure to comply may damage the Transit Case.

Ship the Neutron Probe in its original shipping container. Disconnect the probe from the Common Probe Cable and install the cable connector protective cap onto the connector. Place the probe in its original position in the foam cut-out in the shipping container. If the original shipping container is not available, ship in a container with sufficient packing material, i.e., two layers of bubble wrap or equivalent. Follow all procedures in Section 8.1.1 to prepare the system for storage properly. Follow all procedures in Section 8.1.2 to prepare the system for shipment properly.

Section 8 Base Unit Carrying Pouch

2.8.1 Purpose and Function

The Base Unit Carrying Pouch is supplied with the Base Unit and is used to protect the Base Unit while being used for radiological detection operations, while in storage, or while being carried. The Base Unit Carrying Pouch may be carried by means of an adjustable Shoulder Strap, or it is compatible with the Modular Lightweight Load-carrying Equipment (MOLLE) system. The Base Unit Carrying Pouch has openings for the connections on the top and bottom of the Base Unit. It also has storage locations for miscellaneous items. Refer to Figure 2.30.



Figure 2.30. Base Unit in Base Unit Carrying Pouch.

2.8.2 Base Unit Carrying Pouch Characteristics

The Base Unit Carrying Pouch Specifications are listed in Table 2.9.

Table 2.9. Specifications for the Base Unit Carrying Pouch.

Mechanical	
Length	24.8 cm (9.75 in)
Width	13.3 cm (5.25 in)
Height	10.2 cm (4 in)
Weight	0.5 kg (1.1 lbs)
Carrying Options	MOLLE Compatible and Shoulder Strap

2.8.3 Installing Base Unit into the Base Unit Carrying Pouch

The Base Unit can be carried or stored inside the Base Unit Carrying Pouch. Figure 2.30 shows the Base Unit in the Base Unit Carrying Pouch.

- (1) Open the Base Unit Carrying Pouch.
 - a. Unzip the Base Unit Carrying Pouch by pulling the Zipper Pulls. Refer to Figure 2.30.

- (2) Close the Base Unit Carrying Pouch.
 - a. Place the Base Unit in the foam cutout.
 - b. Zip the Base Unit Carrying Pouch closed by pulling the Zipper Pulls. Refer to Figure 2.31.



Figure 2.31. Opened Base Unit Carrying Pouch.

2.8.4 Top Connector Opening

The Base Unit Carrying Pouch has a Top Connector Opening to allow access to the Headset Connector and the AC Power Connector. Refer to Figure 2.32.



Figure 2.32. Top Connector Opening.

2.8.5 Bottom Connector Opening and Storage Locations

The Base Unit Carrying Pouch has a Bottom Connector Opening to allow access to the GPS Connector (US Military GPS only), the Rad Extender Connector, and the Probe Connector. Refer to Figure 2.33.

The Storage Location can be used to store backup batteries, writing utensils, or miscellaneous items.



Figure 2.33. Bottom Connector Opening and Storage Locations.

2.8.6 MOLLE System

The Base Unit Carrying Pouch is compatible with the MOLLE system. MOLLE straps are on 3 of the 6 faces of the Base Unit Carrying Pouch. Refer to Figure 2.34.



Figure 2.34. MOLLE Straps on 3 Faces.

Section 9 Probe Carrying Pouch

2.9.1 Purpose and Function

The probe carrying pouch (Figure 2.35) is designed to carry and protect up to two of any of the following probes: Beta Photon Probe, Alpha-Beta Probe, SABG Probe, and Sensitive Gamma Probe. The probes are protected by being held internally with Velcro straps and with foam padding in the walls of the probe carrying pouch. The probe carrying pouch has a Velcro sealed pouch for holding miscellaneous items. The probe carrying pouch may be used in three configurations: fully open, half open and closed. The probe carrying pouch is compatible with the MOLLE system.



Figure 2.35. Probe Carrying Pouch.

2.9.2 Configurations

Configuration 1 — Fully Open.

The fully open configuration is used to install probes into the Velcro straps and remove probes from the Velcro straps, but not for carrying (Figure 2.36).



Figure 2.36. Fully Open Probe Carrying Pouch.

Configuration 2 — Half Open.

The half open configuration is used for carrying probes when quick access to them is necessary (Figure 2.37).



Figure 2.37. Half Open Probe Carrying Pouch.

Configuration 3 — Closed.

The closed configuration is used for carrying probes while probes are not actively being used (Figure 2.35).

2.9.3 Characteristics

The Probe Carrying Pouch Specifications are listed in Table 2.10.

Table 2.10. Specifications for the Probe Carrying Pouch.

Mechanical	
Length	33 cm (13 in)
Width	16.5 cm (6.5 in)
Height	12.7 cm (5 in)
Weight	0.37 kg (0.82 lbs)
Carrying Options	MOLLE Compatible

MOLLE System

The probe carrying pouch is compatible with the MOLLE system. MOLLE straps are found on 4 of the 6 faces of the probe carrying pouch (Figure 2.38).



Figure 2.38. MOLLE Straps on Probe Carrying Pouch.

2.9.4 Probe Installation

Two of the following probes: Beta Photon Probe, SABG Probe, Sensitive Gamma Probe or Alpha-Beta Probe, can be carried or stored inside the Probe Carrying Pouch at a time. Figure 2.36 shows the Beta Photon Probe and Sensitive Gamma Probe stored in the Carrying Pouch.

- (1) Open the Probe Carrying Pouch.
 - a. Unlatch the buckle by squeezing the side releases and pulling apart.
 - b. Open the top cover.
 - c. Unzip the Probe Carrying Pouch by pulling the Zipper Pulls down toward the bottom of the carrying pouch.
- (2) Place up to two probes (Beta Photon Probe, SABG Probe, Sensitive Gamma Probe or Alpha-Beta Probe) into the Velcro straps.
 - a. Undo two Velcro straps on one side of the Probe Carrying Pouch
 - b. Place the probe across both opened straps.
 - c. Fasten those Velcro straps over the probe.
 - d. Repeat on the other side for the second probe.
- (3) Close the Base Unit Carrying Pouch.
 - a. Ensure the probes are securely fastened with the Velcro.
 - b. Zip the Probe Carrying Pouch closed by pulling the Zipper Pulls.
 - c. Adjust the top cover and zipper per the configuration chosen to be used, Section 2.9.2.
 - d. Latch the buckle by pushing the two halves together, as applicable.

Chapter 3

Base Unit Operating Instructions

A quick start guide can be found in Chapter 12.

Section 1 Preparing the Base Unit for Use After Delivery

3.1.1 Unpacking a New Base Unit

- (1) Remove the Transit Case from any initial shipment packaging.
- (2) Open Transit Case.
- (3) Remove top tray of Transit Case, if applicable.
- (4) Remove Base Unit from Transit Case.

3.1.2 Base Unit Inspection

The Base Unit must be visually inspected for any signs of mechanical damage. Inspect the Base Unit using the PMCS procedure for Before Interval to accomplish the exterior inspection (Table 10.1) and perform a Base Unit source check (Section 3.9.1) to ensure the detector is functional.

Perform troubleshooting as necessary. For damage found during inspection or as indicated in troubleshooting procedures, turn in the Base Unit to your authorized maintainer for repair if it is damaged or non-functional beyond the ability to restore based on Operator Troubleshooting procedures found in Chapter 9.

Section 2 Base Unit Controls and Indicators

3.2.1 Description and Use of Base Unit Controls and Indicators



CAUTION

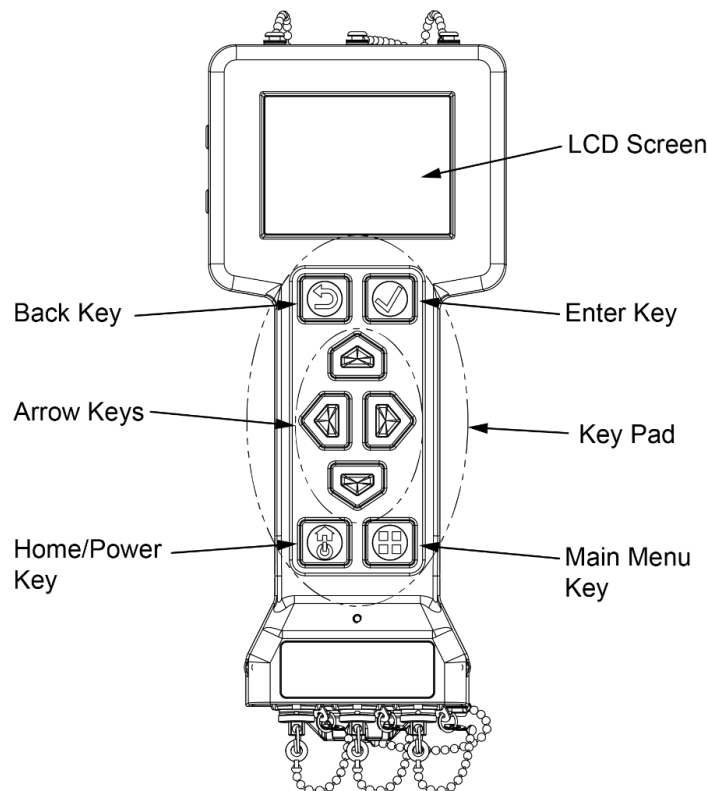
Drop. Do not drop Base Unit or any of the probes. If dropped, perform Preventive Maintenance Checks and Services (PMCS) to include the source check on that item to confirm functionality before continuing mission. Failure to comply may cause damage or degrade performance.

Descriptions of the controls and indicators for the RDS Base Unit are contained in this section. Figure 3.1 shows the location and description of control keys necessary to use the Base Unit and navigate through all functions and menus. Table 3.1 provides a description of each key's functions and comments on the operation of those keys. Table 3.2 describes the layout of the Home screen. Table 3.3 describes the Home screen status bar and its icons. Table 3.4 describes the Home screen footer bar and its icons. Table 3.5 provides additional icons found in the menu selection of Data, View Data screen. Figure 3.6 shows the navigation tree for the Base Unit GUI.

NOTE

Not all indicators will be displayed at the same time. Indicators are displayed depending on the status of the Base Unit and connected RDS Probes.







Items displayed on the screen vary according to the configuration settings selected by the operator. With no probe attached, the entire screen will show the current radioactivity reading amount and total dose detected by the Base Unit detectors. Display configurations can be set in the Base Unit settings (Section 3.17.4).



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Figure 3.1. Base Unit Control Keys.

Table 3.1. Base Unit Control Key Functions.

Key	Function	Comment
Home/Power 	(a) Power on	Short press
	(b) Return to home screen	Short press
	(c) Power off	Press and hold for 3 seconds. Acknowledge power off prompt.
Back 	Return to previous screen	Short press
Arrows (4) 	Navigate the screens	Short press
Enter 	Choose selected item	Short press
Main Menu 	Go to Main Menu	Short press
Stealth Mode 	Enter/Exit Stealth Mode	Press Enter and Back keys together until the screen goes dark or returns to normal (approximately 3 seconds).

3.2.2 Home Screen

NOTE

Not all indicators will be displayed at the same time. Indicators are displayed depending on the status of the Base Unit and connected RDS Probes.

Items displayed on the Home screen vary according to the configuration settings selected by the operator. With no probe attached, the entire Home screen will show the current radioactivity reading amount and total dose detected by the Base Unit detectors.



Figure 3.2. Example of Home Status Bar, Radiation Reading Panel, and Footer Bar.

Table 3.2. Home Screen Status Bar, Radiation Reading Panel, Footer Bar Descriptions.

Control/Indicator	Function
Home Screen Status Bar	Displays time, date, send data function, headset connectivity, alarms, and power status (Figure 3.3, Table 3.3) as applicable.
Home Screen Radiation Reading Panel	Displays radiation reading panel for the Base Unit when no probes are connected. Displays two radiation reading panels with a probe connected. When more than two radiation readings are available, radiation reading panels can be cycled by pressing the Enter <input checked="" type="checkbox"/> key.
Home Screen Footer Bar	Displays GPS information (US Military GPS only), image of attached probe, and data logging controls (Figure 3.4, Table 3.4) as applicable.

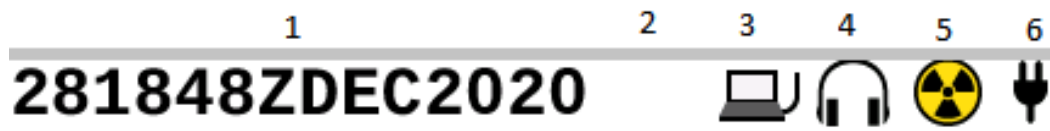













Figure 3.3. Home Screen Status Bar Description and Icon Locations Example.

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Table 3.3. Home Screen Status Bar Icon Descriptions.

Key	Control/Indicator	Function
(1)	Time and Date	Current time and date are shown as the day (2 digits), hour (2 digits), minute (2 digits), Z (indicating Zulu time (Greenwich Mean Time (GMT))), month (3 letters), and year (4 digits).
(2)	In Progress 	This icon indicates that data is in the process of being downloaded from the Base Unit to a computer or transferred via a set of radios to a remote computer.
(3)a	PC Mode 	This icon is displayed when a Rad Extender is attached to the Base Unit and the PC mode of operation was selected. This indicates that the Base Unit is ready to download already captured data logs or system logs to a non-networked PC. The operator can now use the Data Download menu to download saved data logs or the system log to a non-networked PC. Transfer of live data logging is not allowed in this mode.
(3)b	Ethernet Transfer Mode 	This icon is displayed when a Rad Extender is attached to the Base Unit and the Transfer Mode of operation was selected followed by selecting the Ethernet operation type. This indicates that the Base Unit is ready to transfer active, live data logging via the Rad Extender and a non-networked PC. The operator can now use the Data Transfer menu to transfer data via an Ethernet connection. This type of transfer requires compatible receiving software (US military only).
(4)	Headset Connected 	This icon indicates that a headset has been connected to the audio jack and all audio will be channeled through the audio jack to the headset. No audio will be heard through the Base Unit buzzer when this icon is present.
(5)a	Radiation Alarm 	This icon indicates that the low alarm threshold set for the Base Unit and/or an attached probe has been exceeded.
(5)b	System Alarm 	The system alarm icon will appear when the BIT detects a system fault. This icon indicates that one or more of the built-in tests has encountered an issue with the system. When an initial system alarm is triggered, a system fault message is displayed on the Base Unit screen that requires user acknowledgement. System alarms are also noted on the Health screen while they are occurring, but do not show once they are no longer applicable. System alarms often have faults that require some type of action or maintenance. Refer to Table 9.1 for troubleshooting a system fault alarm.

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(5)c	<p>System Warning</p> 	<p>The system warning icon indicates that one or more of the built-in tests has triggered a warning about the system. When an initial system warning is triggered, a system notification message is displayed on the Base Unit screen if visual alarms are turned on. System warnings are also noted on the Health screen while they are occurring, but do not show once they are no longer applicable. System warnings are often notifications and may or may not require action or maintenance. Refer to Table 9.2 for troubleshooting a system notification warning.</p>
(6)a	<p>Good (green) Battery Level</p> 	<p>This icon indicates that the AA batteries in the Base Unit are at approximately 1/3 capacity or higher.</p>
(6)b	<p>Low (yellow) Battery Level</p> 	<p>This icon indicates that the AA batteries in the Base Unit are lower than approximately 1/3 capacity but higher than approximately 15% capacity.</p>
(6)c	<p>Very Low (red) Battery Level</p> 	<p>This icon indicates that the AA batteries in the Base Unit are at approximately 15% or less capacity.</p>
(6)d	<p>Plugged In</p> 	<p>This icon indicates that the Base Unit is attached to an AC/DC power adapter and is operating on AC or DC power. Battery power is not used when this icon is present. Rechargeable batteries in the Base Unit will not be charged while plugged in, they must be removed from the Base Unit and placed on the appropriate charging system.</p>

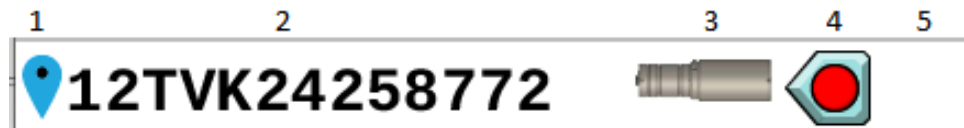

















Figure 3.4. Home Screen Footer Bar Description and Icon Locations Example.

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Table 3.4. Home Screen Footer Bar Icon Descriptions.

Key	Control/Indicator	Function
(1)a	GPS Attached Indicator 	Indicates a GPS device is attached. This function is only available with US military GPS equipment.
(1)b	GPS Not Attached Indicator 	Indicates a GPS device is not attached.
(2)	GPS Location 	Displays GPS location. This function is only available with U.S. military GPS equipment.
(3)a	Beta Photon Probe Attached 	Displays image of an attached Beta Photon Probe. This image alternates with a pen and paper logging icon every second when data logging is in progress.
(3)b	Alpha-Beta Probe Attached 	Displays image of an attached Alpha-Beta Probe. This image alternates with a pen and paper logging icon every second when data logging is in progress.
(3)c	Small Area Beta Gamma (SABG) Probe Attached 	Displays image of an attached SABG Probe. This image alternates with a pen and paper logging icon every second when data logging is in progress.
(3)d	Sensitive Gamma Probe Attached 	Displays image of an attached Sensitive Gamma Probe. This image alternates with a pen and paper logging icon every second when data logging is in progress.
(3)e	FIDLER Probe Attached 	Displays image of an attached FIDLER Probe. This image alternates with a pen and paper logging icon every second when data logging is in progress.
(3)f	Neutron Probe Attached 	Displays image of an attached Neutron Probe. This image alternates with a pen and paper logging icon every second when data logging is in progress.
(3)g	Pen and Paper Logging Icon 	Indicates the Base Unit is creating a log of data.
(4)a	Data Logging Controls — Start Data Logging 	Indicates that pressing the Left Arrow key on the keypad starts data logging (or recording of data logs).

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(4)b	Data Logging Controls — Pause Data Logging 	Indicates that pressing the Left Arrow key on the keypad will pause data logging.
(4)c	Data Logging Controls — Resume Data Logging 	Indicates that pressing the Left Arrow key on the keypad will resume data logging after it has been paused.
(4)d	Data Logging Controls — Take Data Log Snapshot 	Indicates that pressing the Left Arrow key on the keypad will take a data log snapshot.
(5)	Data Logging Controls — Stop Data Logging 	Indicates that pressing the Right Arrow key on the keypad will stop data logging. No icon is displayed if the Base Unit is not logging data.

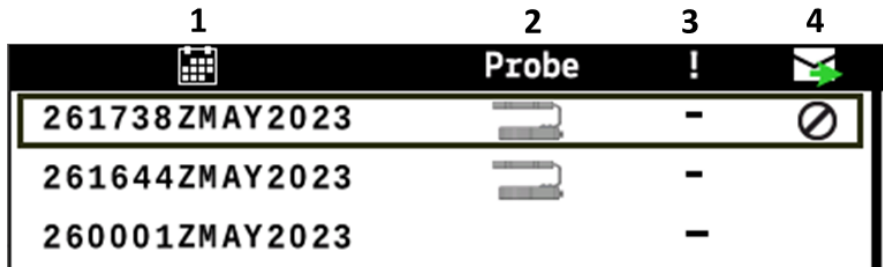















Figure 3.5. Data Menu, View Data Heading Descriptions Example.


Table 3.5. Data Menu, View Data Page Heading Descriptions.

Key	Heading/Icon Descriptions	Function
(1)a	Calendar 	In the column under the calendar icon is displayed the date and time the data log file was created. This is displayed in the format of day (2 digits), hour (2 digits using 24-hour clock), minutes (2 digits), Z (GMT), month (3 digits), and year (4 digits).
(2)	Probe 	In the column under the word "Probe" is displayed the icon of the probe that was attached while the data was logged. If there is a blank space under this column heading for a log, it indicates that no probe was attached, only Base Unit data will be available.

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(2)a	<p>Beta Photon Probe Data Included in Data Log</p> 	Displays image of Beta Photon Probe if data log contains data that was recorded from the attached Beta Photon Probe.
(2)b	<p>Alpha-Beta Probe Data Included in Data Log</p> 	Displays image of Alpha-Beta Probe if data log contains data that was recorded from the attached Alpha-Beta Probe.
(2)c	<p>Small Area Beta Gamma (SABG) Probe Data Included in Data Log</p> 	Displays image of SABG Probe if data log contains data that was recorded from the attached SABG Probe.
(2)d	<p>Sensitive Gamma Probe Data Included in Data Log</p> 	Displays image of Sensitive Gamma Probe if data log contains data that was recorded from the attached Sensitive Gamma Probe.
(2)e	<p>FIDLER Probe Data Included in Data Log</p> 	Displays image of FIDLER Probe if data log contains data that was recorded from the attached FIDLER Probe.
(2)f	<p>Neutron Probe Data Included in Data Log</p> 	Displays image of Neutron Probe if data log contains data that was recorded from the attached Neutron Probe.
(3)	<p>Exclamation Mark</p> 	The column under the icon of an exclamation point indicates whether a radiation alarm has been recorded in this data log.
(3)a	<p>Radiation Alarm</p> 	The entry of a Radiation Alarm icon in the column under the exclamation mark indicates that during the recording of this data log the readings have exceeded the low threshold.
(3)b	<p>Dash</p> 	The entry of a " – " in the column under the exclamation mark indicates that during the recording of this data log the low threshold was never exceeded.
(4)	<p>Envelope Transfer</p> 	The column under the icon of the envelope with the green arrow indicates whether that file has been transferred or downloaded. If there is a blank space under this column heading for a log, it indicates that the file was not created using the scaler logging mode and has not been transferred or downloaded.
(4)a	<p>Check Mark</p> 	A checkmark located under the column with the envelope icon indicates the file has been transferred or downloaded.

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(4)b	Circle with Slash 	A circle with a slash through it under the column with the envelope icon indicates that this file used a scaler logging mode and is not eligible to be transferred to a computer through data radios. It can however be downloaded to a computer.
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3.2.3 Graphical User Interface – Menus and Screens

The Base Unit interface controls a menu driven GUI navigation system shown in Figure 3.6.

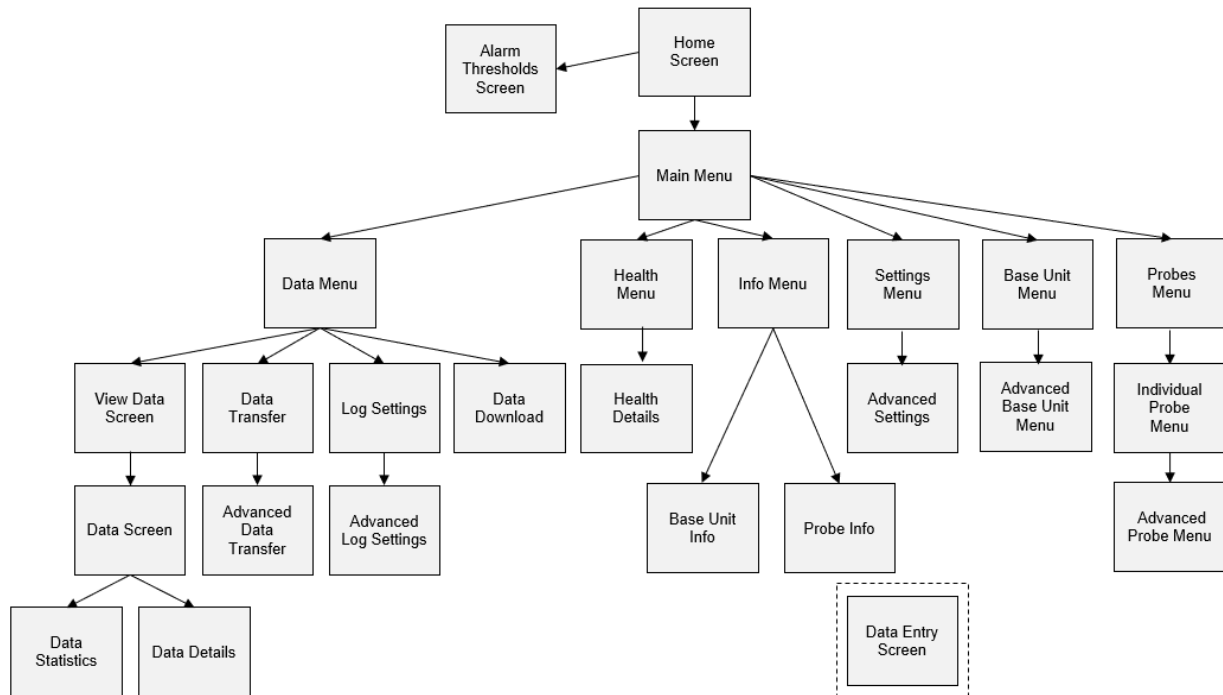



Figure 3.6. RDS GUI Navigation System.

Section 3 Probe Controls and Indicators

3.3.1 Probe Home Screen Indicators

When a probe is attached to the Base Unit, by default the screen will display radiation readings for that probe on the right panel of the screen or on both panels. A description of what is displayed by factory default when each type of probe is attached is contained in this section. Control functions for the probes are explained in detail in Section 3.17.8. A probe icon matching the attached probe will be visible in the footer bar. Instructions for changing radiation measurement units are in Section 3.17.8. The probes provide for three different radiation alarm threshold levels to be set: Low, Medium, and High. Instructions for changing alarm thresholds are in Section 3.17.8. For four of the probes, the Base Unit's beta/photon radiation reading is displayed on the left side of the Home screen by default when those probes are attached. For multichannel probes, Alpha-Beta Probe and FIDLER Probe the home screen will default to 2 probe channels with the other channels being available on the right panel by toggling using the Enter  key.

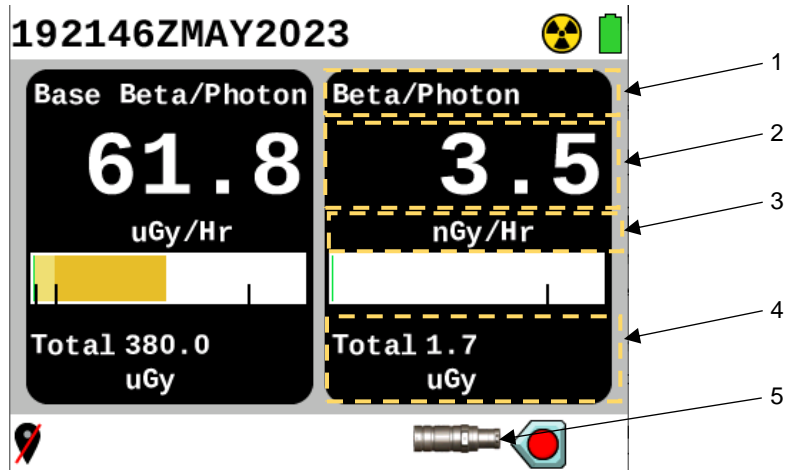


Figure 3.7. Home Screen for Beta Photon Probe Example.

Table 3.6. Home Screen with Beta Photon Probe Attached.

Key	Control/Indicator	Function
1	Probe Type	Attached probe type is displayed.
2	Current Probe Measurement	Radiation reading for attached probe displayed.
3	Radiation Measurement Units	Radiation measurement unit type is displayed.
4	Total Dose	Total dose is displayed
5	Beta Photon Probe Icon	Image showing the type of attached probe is displayed.

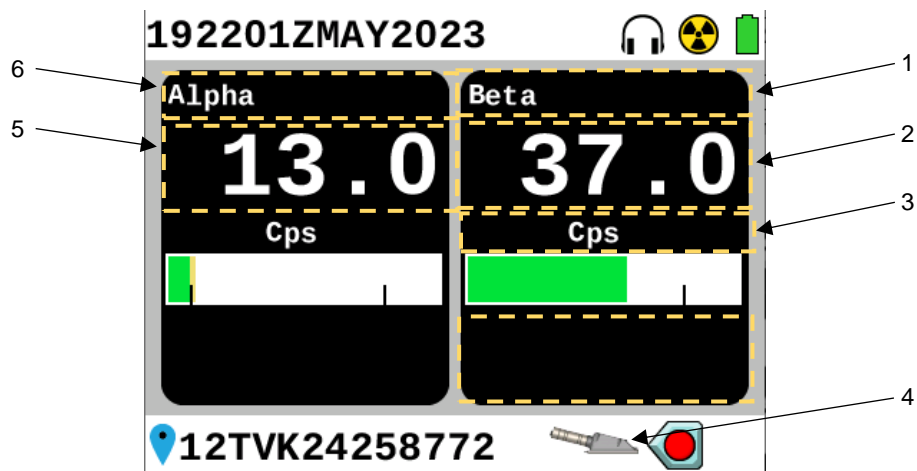


Figure 3.8. Home Screen for Alpha-Beta Probe Example.

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Table 3.7. Home Screen with Alpha-Beta Probe Attached.

Key	Control/Indicator	Function
1	Beta Channel	Indicates that the right panel is displaying Beta radiation measurement.
2	Current Beta Measurement	Beta radiation measurement is displayed in the right panel.
3	Radiation Measurement Units	Radiation measurement unit type is displayed.
4	Alpha-Beta Probe Icon	Image showing the type of attached probe is displayed.
5	Current Alpha Measurement	Alpha radiation measurement is displayed in the left panel.
6	Alpha Channel	Indicates that the left panel is displaying Alpha radiation measurement.

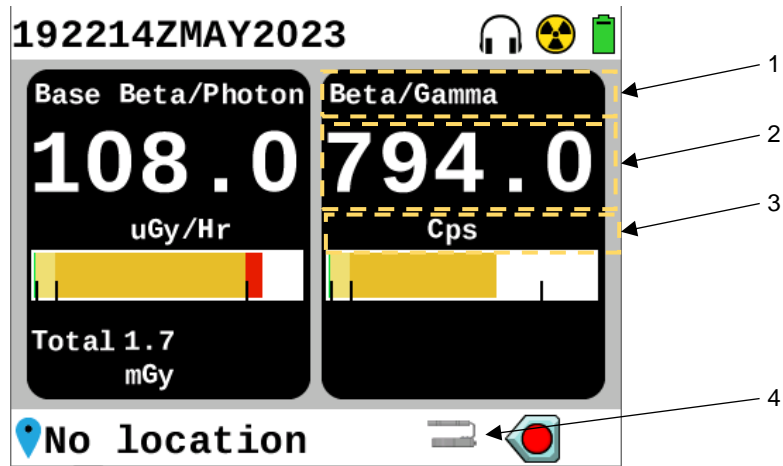


Figure 3.9. Home Screen for Small Area Beta Gamma Probe Example.

Table 3.8. Home Screen with Small Area Beta Gamma Probe Attached.

Key	Control/Indicator	Function
1	Probe Type	Attached probe type is displayed.
2	Current Probe Measurement	Radiation reading for attached probe displayed.
3	Radiation Measurement Units	Radiation measurement unit type is displayed.
4	Small Area Beta Gamma Probe Icon	Image showing the type of attached probe is displayed.

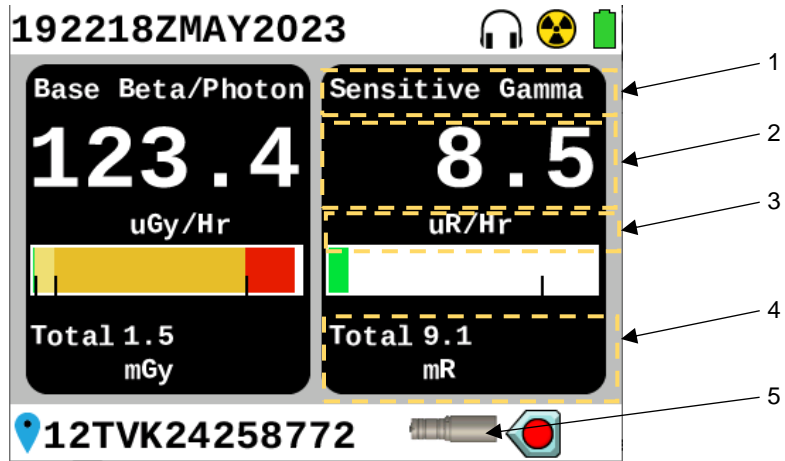


Figure 3.10. Home Screen for Sensitive Gamma Probe Example.

Table 3.9. Home Screen with Sensitive Gamma Probe Attached.

Key	Control/Indicator	Function
1	Probe Type	Attached probe type is displayed.
2	Current Probe Measurement	Radiation reading for attached probe displayed.
3	Radiation Measurement Units	Radiation measurement unit type is displayed.
4	Total Dose	Total dose is displayed.
5	Sensitive Gamma Probe Icon	Image showing the type of attached probe is displayed.

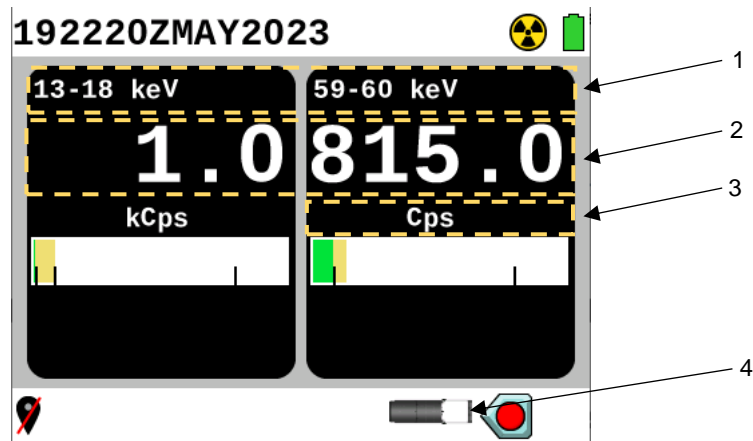


Figure 3.11. Home Screen for FIDLER Probe Example.

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Table 3.10. Home Screen with FIDLER Probe Attached.

Key	Control/Indicator	Function
1	Energy Range	Displays the currently selected energy range of the FIDLER Probe. Press the Enter <input checked="" type="checkbox"/> key to cycle through the other energy ranges of the FIDLER Probe and the Base Unit Beta/Photon measurement.
2	Measurement of Radiation for Energy Range Displayed	Radiation reading for energy range is displayed.
3	Radiation Measurement Units	Radiation measurement unit type is displayed.
4	FIDLER Probe Icon	Image showing the type of attached probe is displayed.

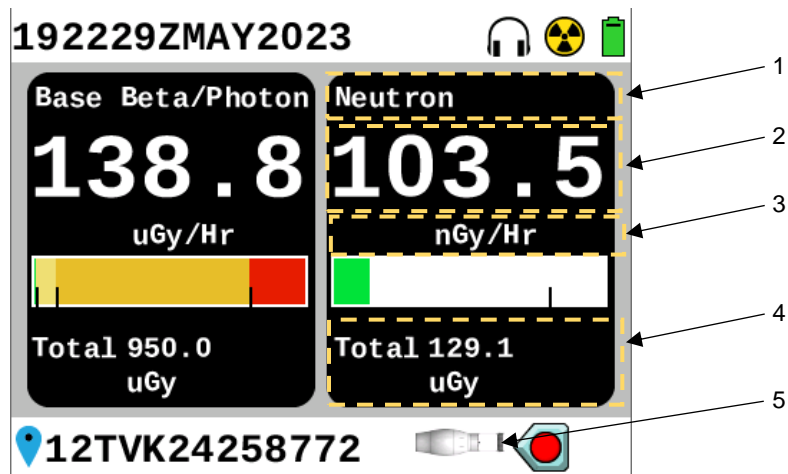


Figure 3.12. Home Screen for Neutron Probe Example.

Table 3.11. Home Screen with Neutron Probe Attached.

Key	Control/Indicator	Function
1	Probe Type	Attached probe type is displayed.
2	Current Probe Measurement	Radiation reading for attached probe displayed.
3	Radiation Measurement Units	Radiation measurement unit type is displayed.
4	Total Dose	Total dose is displayed.
5	Neutron Probe Icon	Image showing the type of attached probe is displayed.

Section 4 Battery Installation and Removal

WARNING



Batteries. Batteries should not be opened or burned. Exposure to the ingredients contained within or their combustion products could be harmful causing respiratory irritation, skin irritation, eye irritation and chemical burns. Do not handle leaking or damaged batteries without neoprene or rubber gloves. Do not puncture, mutilate, or attempt to disassemble batteries. Do not heat them above 100°C (212°F). Do not mix battery types. Failure to comply may result in injury.

CAUTION



Batteries. This instrument may be powered by alkaline or NiMH batteries. Do not puncture, mutilate, or attempt to disassemble batteries. Do not heat them above 100°C (212°F). Do not mix battery types. Failure to comply may cause damage to the Base Unit and/or probes.

NOTE

Refer to Figure 3.14 for correct battery orientation. Batteries may slightly vary in length. This can result in difficulty when removing battery cap with batteries installed with some batteries. Difficulty in opening battery cap when batteries are installed does not indicate that there is a problem with battery cap.

3.4.1 Remove Battery Cap

- (1) Orient the Base Unit to have the screen facing down so connector chains are out of the way.
- (2) Locate the battery cap shown in Figure 3.13.
- (3) Remove the battery cap by pressing it inward and turning it ¼ turn counter-clockwise. Refer to Figure 3.13.



Figure 3.13. Base Unit Battery Cap Removed.

3.4.2 Inspect Batteries, Battery Compartment, and Battery Cap

- (1) Inspect AA batteries for corrosion or damage, replace as necessary.
- (2) Inspect battery compartment for corrosion or damage, clean or send for maintenance as necessary.
- (3) Inspect battery cap for corrosion or damage, clean or send for maintenance as necessary.

3.4.3 Install Batteries

- (1) Install four (4) AA batteries into the battery compartment with two batteries being installed with the positive battery terminal facing up on the right side and two batteries being installed with the negative battery terminal up on the left side. Refer to Figure 3.14.

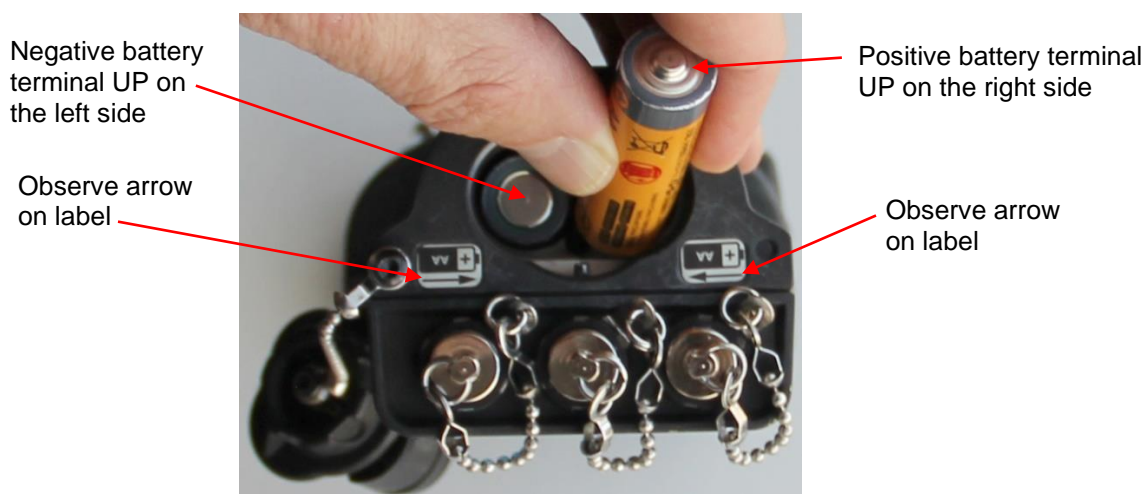



Figure 3.14. Battery Orientation.

- (2) Replace the battery cap and lock it into place by pushing it in and turning it ¼ turn clockwise.
- (3) Power Base Unit on by pressing the Home/Power  key.
- (4) Perform pre-operational check. Refer to Section 3.7.1.



3.4.4 Remove Batteries

- (1) Hold Base Unit with screen facing down as shown in Figure 3.14 so chains are out of way.
- (2) Remove battery cap by pressing it inward and turning cap 1/4 turn counterclockwise (Figure 3.13).
- (3) Remove AA batteries.
- (4) Install battery cap by turning cap 1/4 turn clockwise.

Section 5 Connect / Disconnect Base Unit with AC/DC Power Adapter

The AC/DC power adapter can be plugged into Base Unit with Base Unit powered on or off. When both AC/DC power adapter is attached and batteries are installed, preference will be given to AC/DC Power adapter to power the Base Unit.

3.5.1 Connect AC/DC Power Adapter

- (1) Ensure Base Unit is powered off (Section 3.6.2).
 - (a) Press and hold the Home/Power  key for approximately 3 seconds.
 - (b) The screen will display “Are you sure you want to power off the device?”.
 - (c) Press the Enter  key for yes.

- (2) Remove power connector protective cap (Figure 3.15, Item 2) by rotating counterclockwise.

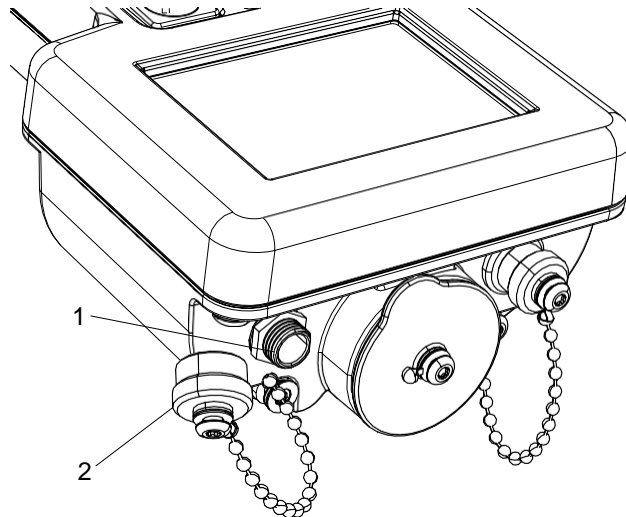


Figure 3.15. Remove Power Connector Protective Cap.

- (3) Attach AC/DC power adapter by inserting and threading collar on connector into Base Unit power connector (Figure 3.16).




Figure 3.16. AC/DC Power Adapter Connected to Base Unit.

- (4) Plug AC/DC power adapter into a known working 110 Volt (V) power outlet.

NOTE

If no batteries are installed and Base Unit is powered off, Base Unit will power on automatically when AC/DC power adapter is inserted into a power outlet.

- (5) Power Base Unit on, if necessary, by pressing the Home/Power  key.

- (6) Perform pre-operational check. Refer to Section 3.7.1.

3.5.2 Disconnect AC/DC Power Adapter from Base Unit



CAUTION



Alternating Current / Direct Current (AC/DC) Power Adapter. Operator must power off the RDS Base Unit prior to disconnecting the AC/DC power adapter from the power outlet if batteries are not already inserted into the Base Unit. Failure to comply may cause damage to the Base Unit.


NOTE

If batteries are installed and AC/DC power adapter is disconnected, the Base Unit will switch to battery power.



- (1) Power Base Unit off, if necessary.
 - (a) Press and hold the Home/Power  key for approximately 3 seconds.
 - (b) The screen will display "Are you sure you want to power off the device?".
 - (c) Press the Enter  key for yes.
- (2) Disconnect AC/DC power adapter from 110V power outlet.
- (3) Disconnect AC/DC power adapter by unthreading and removing collar from connector on Base Unit power connector (Figure 3.15, Item 1).
- (4) Install power protective cap (Figure 3.15, Item 2) by rotating clockwise.

Section 6 Powering Base Unit On and Off

3.6.1 Base Unit Power On

- (1) Press the Home/Power  key and the Base Unit will turn on.
- (2) Wait for approximately 10 seconds for the Home screen to display.

3.6.2 Base Unit Power Off

- (1) Press and hold the Home/Power  key for approximately 3 seconds.
- (2) The screen will display "Are you sure you want to power off the device?".
- (3) Press the Enter  key for yes.

Section 7 Base Unit Preparation for Use and Orientation

Base Unit will conduct a BIT every 1 second automatically. If a system fault or notification message is displayed refer to Section 9.2.1 for troubleshooting.

3.7.1 Base Unit Preparation for Use

- (1) Complete PMCS, Before Interval on Base Unit (Table 10.1).
- (2) Insert batteries (Section 3.4.3) or attach AC/DC Power Adapter (Section 3.5.1).
- (3) Power on the Base Unit (Section 3.6.1).
- (4) Configure the Base Unit per mission requirements (Sections Section 8
- (5) Perform Base Unit source check (Section 3.9.1).

Section 8 Configure Base Unit for Use

3.8.1 Base Unit Radiation Measurement Units

The radiation measurement units for the Base Unit are listed in Table 3.12. To view a list of acronyms and their meaning, see Section 1.1.8. To view a table of Base Unit specifications and detection ranges, see Section 2.1.7.


Table 3.12. Radiation Measurement Units for Base Unit.

Units	Abbreviation	Type
Roentgens per hour	R/hr	Exposure
Rads per hour	Rad/hr	Absorbed dose
Grays per hour	Gy/hr	Absorbed dose
Rems per hour	rem/hr	Dose Equivalent
Sieverts per hour	Sv/hr	Dose Equivalent
Counts per minute	cpm	Counts
Counts per second	cps	Counts

3.8.2 Verify Radiation Measurement Units

- (1) Verify radiation measurement units required for the mission are correct in accordance with (IAW) mission requirements and your local standard operating procedures.
 - (a) View the radiation reading panel on the Home screen and note the radiation units displayed.
 - (b) Compare the radiation measurement units displayed to the mission requirements and your local standard operating procedures or instructions.
- (2) Change radiation measurement units as necessary (Section 3.17.7).

3.8.3 Verify Alarm Thresholds

- (1) Press the Back  key and the Alarm Thresholds Screen will appear. This screen will only display for approximately 5 seconds, then it will return to the Home screen (Figure 3.17).

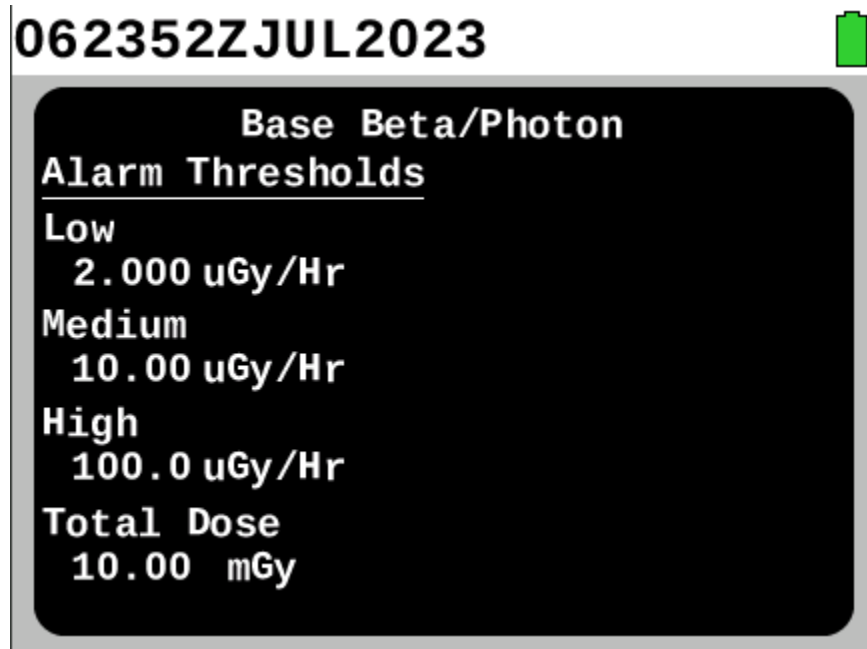


Figure 3.17. Alarm Thresholds Screen Example in $\mu\text{Gy/hr}$ Example.

- (2) Check alarm thresholds against values provided in your local standard operating procedures.
- (3) Make adjustments to alarm thresholds as necessary (Section 3.17.7).

Section 9 Base Unit Source Check

Performing a source check validates the functionality of the detectors in the Base Unit. Placing a gamma radiation source that contains a very small amount of radiation close to the detectors in the Base Unit and conducting a Rad Test validates the readiness of the Base Unit to perform missions. The Rad Test verifies both low dose GM tube and high dose GM tube functionality in the Base Unit to detect both beta and gamma radiation.

Cs-137 check source contains less than 1 μCi Cs-137. Before performing a source check, verify age of Cs-137 check source is less than 30 years. Controlled disposal of check sources required. Coordinate disposal of check sources with your Radiation Safety Officer (RSO). Cs-137 check source orientation will affect the reading. Always place the non-labeled side of check source against Base Unit crosshairs indicating detector locations as directed to get accurate radiation measurements. Incorrect placement will cause lower readings that might fall outside the acceptable range described below.

If a probe is attached, Base Unit will recognize probe and perform Rad Test based on attached probe, verifying functionality of detectors in an attached probe. To perform Rad Test on the Base Unit, verify that a probe is not attached.

3.9.1 Perform Source Check

WARNING



Cesium (Cs)-137 Check Source. Avoid prolonged use of Check Sources, return them to case or other protective location promptly after each use to minimize exposure. Do not ingest source. Do not attempt to open or crush source housing. Do not handle damaged sources. The cesium (Cs-137) check source contains less than 1 microCurie (μCi) of Cs-137. Coordinate disposal with your Radiation Safety Officer (RSO). Failure to comply may result in injury.


- (1) Power on the Base Unit by pressing the Home/Power  key if unit not already on.
- (2) Ensure beta window cap is installed (Figure 3.18).



Figure 3.18. Beta Window Cap Installed.

- (3) Locate and remove Cs-137 check source from transit case (Figure 3.19).



Figure 3.19. Cs-137 Check Source, Labeled Side.

- (4) Place Cs-137 check source with label facing away from detector, in direct contact with Base Unit on large crosshairs (+) (Figure 3.20) on back of Base Unit which is the location of the low dose GM tube detector.

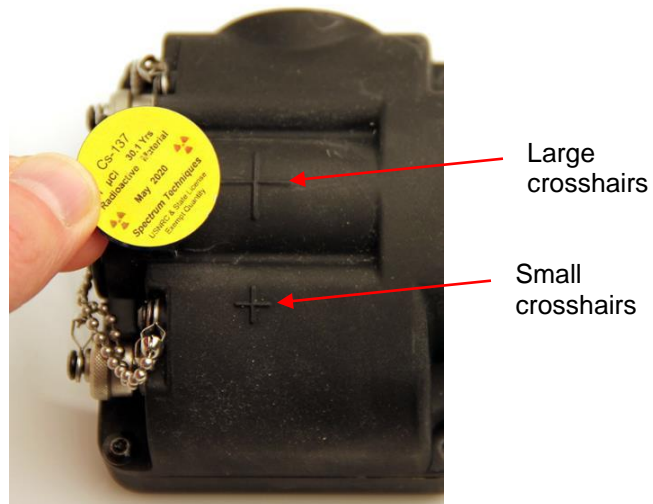





Figure 3.20. Check Source Orientation and Placement.

- (5) Acknowledge alarm by pressing Enter  key, as applicable.
- (6) Hold check source in place for at least 30 seconds allowing reading to settle.

NOTE

Displayed value shall fall within a range of 3 to 20 $\mu\text{Gy/hr}$ if age of Cs-137 check source is no older than 30 years. If value is outside range, Base Unit may still be used with any probe, but Base Unit detectors should not be considered to be reliable.

- (7) Check radiation reading value shown on Base Unit Home screen falls in range of 3 to 20 $\mu\text{Gy/hr}$ if age of Cs-137 check source is no older than 30 years.
- (8) Perform troubleshooting if reading does not fall within range (Section 9.2.7).
- (9) Press Menu  key.

(10) Highlight Health icon (Figure 3.21) using Arrow  keys.

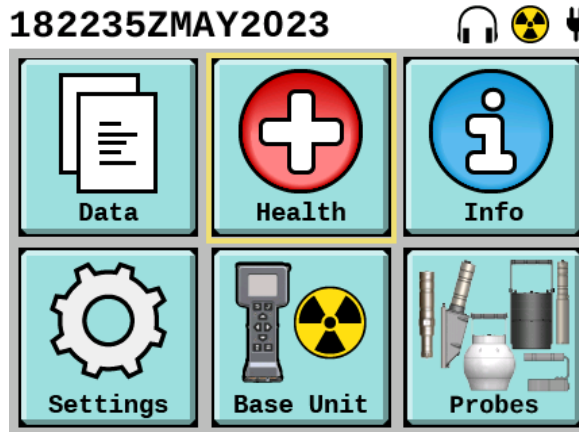



Figure 3.21. Highlight Health Icon on Main Menu.

(11) Press Enter  key.

(12) Highlight Rad Test button (Figure 3.22) using Arrow  keys.

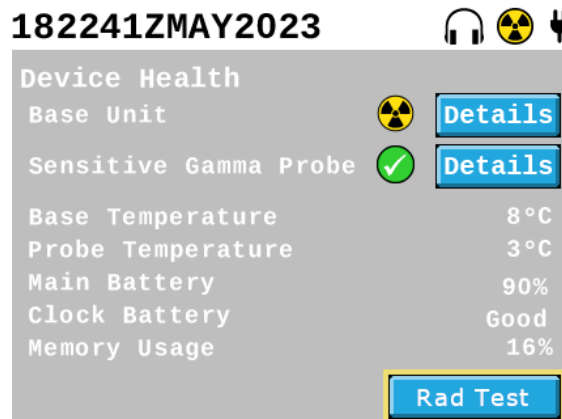


Figure 3.22. Rad Test Button Highlighted on Device Health Screen.

(13) Place the Cs-137 check source in direct contact with Base Unit on small crosshairs (+) (Figure 3.20) which is the location of the high dose GM tube detector.

(14) Press Enter  key.

(15) Leave Base Unit in direct contact with Cs-137 check source for up to one minute.

(16) Confirm "PASS" is displayed within one minute with Cs-137 check source in place (Figure 3.23).

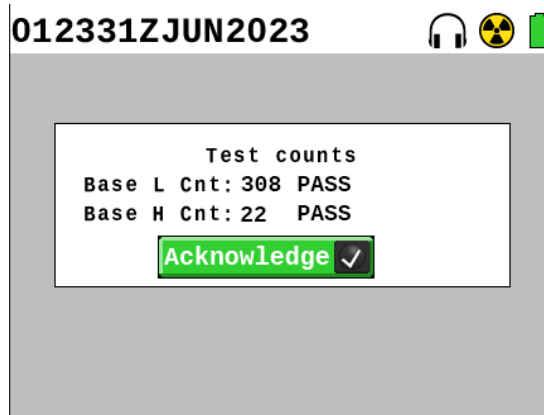


Figure 3.23. Base Unit Rad Test Passed.

(17) Confirm the following for Base Unit:

- (a) Base L Cnt (Base Unit Low Dose GM Tube Count) value displays at least 250 counts and no more than 5000 counts and displays "PASS" (Figure 3.23).
- (b) Base H Cnt (Base Unit High Dose GM Tube Count) value displays at least one count or higher and displays "PASS" (Figure 3.23).

(18) Press Enter  key to "Acknowledge".

(19) Press Home/Power  key to return to the Home screen.

(20) Send to maintenance if low dose detector counts are not in the range listed above for replacement of low dose detector or perform troubleshooting if high dose detector remains at zero for more than one minute (Section 9.2.7).

(21) Return Cs-137 check source to its storage in transit case.

Section 10 Base Unit Gamma Readings

3.10.1 Monitor for Gamma Radiation

WARNING



Radiation/Known Faults and Malfunctions. Operation of Base Unit or probes with known faults could lead to incorrect radiation readings. Refer to Section 3.2.1 for definition of icons and to Health Menu instructions (Section 3.17.2) for instructions on accessing the system Health to view any system notifications. Continued use of a malfunctioning Base Unit or any one of the six probes may result in over exposure to radiation or excessive radioactive dose, and/or radiation contamination. Failure to comply may result in injury.

CAUTION



Known Faults or Malfunctions. Operation of Base Unit or probes with known faults could lead to damage to the equipment. Refer to Section 3.2.1 for definition of icons and to Health Menu instructions (Section 3.17.2) for instructions on accessing the system Health to view any system notifications. Failure to comply may cause damage to the Base Unit and/or probes.

NOTE

The Base Unit will auto-range converting the reading into the appropriate metric prefix designation based on the number of digits able to be shown on the screen. Units of measure chosen in settings will remain the same.

- (1) Hold Base Unit in hand in any orientation or in carrying pouch to detect gamma radiation.
- (2) Observe radiation readings on Home screen.
- (3) Observe the units of measure and prefixes used in the reading on the Base Unit Home screen.

Section 11 Base Unit Beta Readings

3.11.1 Determine Presence of Beta Radiation

WARNING



Radiation/Known Faults and Malfunctions. Operation of Base Unit or probes with known faults could lead to incorrect radiation readings. Refer to Section 3.2.1 for definition of icons and to Health Menu instructions (Section 3.17.2) for instructions on accessing the system Health to view any system notifications. Continued use of a malfunctioning Base Unit or any one of the six probes may result in over exposure to radiation or excessive radioactive dose, and/or radiation contamination. Failure to comply may result in injury.

CAUTION

RDS Operator's Manual



Known Faults or Malfunctions. Operation of Base Unit or probes with known faults could lead to damage to the equipment. Refer to Section 3.2.1 for definition of icons and to Health Menu instructions (Section 3.17.2) for instructions on accessing the system Health to view any system notifications. Failure to comply may cause damage to the Base Unit and/or probes.

CAUTION



Beta Window Base Unit. Do not place anything inside the beta window of the Base Unit or place the Base Unit beta window directly on top of the check source or any object with the beta window cap off. Doing so may damage the low dose Geiger-Mueller (GM) tube or cause an object to become wedged inside the beta window obscuring readings. Failure to comply may cause damage to Base Unit.

NOTE

The Base Unit will auto-range converting the reading into the appropriate metric prefix designation based on the number of digits able to be shown on the screen. Units of measure chosen in settings will remain the same.

The GM tube is not calibrated for beta dose. Beta measurement is only to be used to confirm the presence of beta radiation. Beta radiation has a limited range in air. The Base Unit in this configuration is directional with beta detection only in the direction of the open window. When measuring for gamma/photon radiation, there is no need to hold the Base Unit in a particular orientation.

- (1) Orient Base Unit to be in close proximity perpendicular to suspected radiological surface to test for beta radiation (Figure 3.24) but not touching the suspected radiological surface.



Figure 3.24. Base Unit Being Held Perpendicular to Suspected Surface.

- (2) Observe reading with beta window cap on.
- (3) Note dose rate.
- (4) Remove beta window cap and place on side of Base Unit (Figure 3.25).



Figure 3.25. Beta Window Cap Removed and Placed on Side of Base Unit.

- (5) Observe reading with beta window cap off.
- (6) Note dose rate to determine whether beta radiation may be present. If there was a noticeable increase in radiation reading with the beta window cap off, then there may be beta radiation present.

- (7) Install beta window cap to close beta window.

Section 12 Alarms

3.12.1 Alarms

The radiation alarm will occur anytime one of the three (four if the Total Dose alarm is active) preset alarm thresholds are reached (the alarm thresholds are divided into “Low”, “Medium”, and “High”).

Audio alarms for different conditions can occur simultaneously and can vary based on severity. When an alarm condition occurs, the sounds will continue until the operator acknowledges the alarm or the alarm condition has cleared. Audio alarms increase in intensity as levels of radiation increase past threshold levels. Orientation of the marks on the analog bar graph below the radiation reading will vary depending on the user set thresholds (to change thresholds see Section 3.17.7).

The Base Unit Home screen Status Bar will show a radiation alarm icon (Figure 3.26) for a radiation detection event, and it will show a system alarm or warning icon (Table 3.3) for a system fault or notification event.

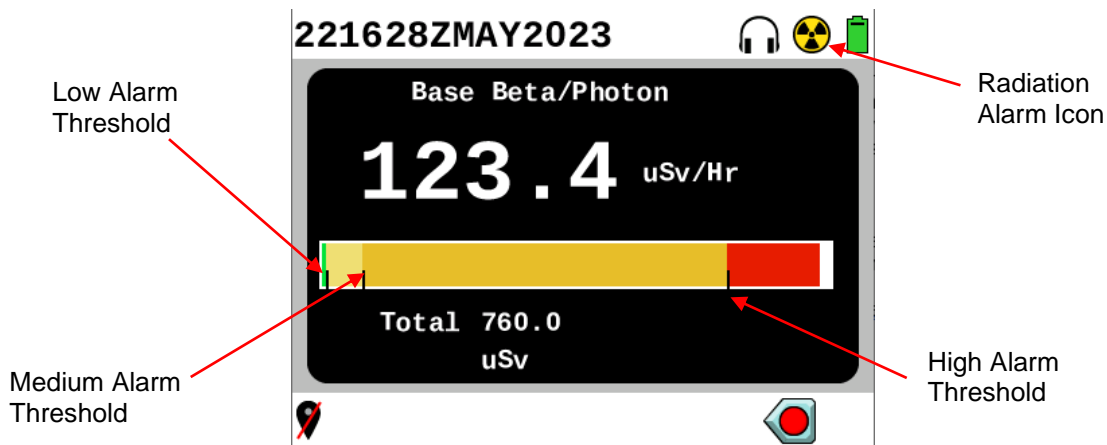


Figure 3.26. Example of Home Screen Displaying Alarm Thresholds.

- (1) Observe visual indications of radiation alarms on the analog bar graph below the radiation reading (Figure 3.26) and changes in color (Table 3.13) as alarm level changes.

Table 3.13. Radiation Reading Threshold Colors.



Color	Description
Green	Below Low Alarm Threshold
Yellow	Above Low Alarm Threshold
Amber	Above Medium Alarm Threshold
Red	Above High Alarm Threshold

- (2) Watch for system alarms (Table 3.3) which indicate fault conditions that prohibit full functionality of the RDS. Cease use until fault conditions have been fixed (Chapter 9, Section 9.2.1).
- (3) Watch for system warnings (Table 3.3) which indicate conditions that impact operation of the system, but these notifications do not prevent full functionality of the system. Address system notifications as indicated (Chapter 9, Section 9.2.1).

Section 13 Stealth Mode

3.13.1 Stealth Mode

Stealth Mode lets the operator continue to use the Base Unit, but in a darkened, silent mode by turning off the backlighting for both the screen and keypad and the audio alarm from the buzzer. Audio can still be heard through a headset, if connected.

- (1) Press Back  and Enter  keys at the same time and hold for 3 seconds until screen backlight turns off to enter Stealth Mode.
- (2) Repeat step 1 until the screen backlight turns on to exit Stealth Mode.

Section 14 Data Entry

3.14.1 Data Entry

The Data Entry Screen will display whenever the operator has selected a numerical value to be changed. Some examples are alarm thresholds and date/time entry. The Data Entry screen will show what value is being changed and its current value. In Figure 3.27, **Low alarm** is displayed and the current value of **2.000** is displayed. (The Base Unit displays “u” to indicate micro “ μ ”.) A new value of **5 μ Sv/Hr** has been entered for the Low Alarm threshold.

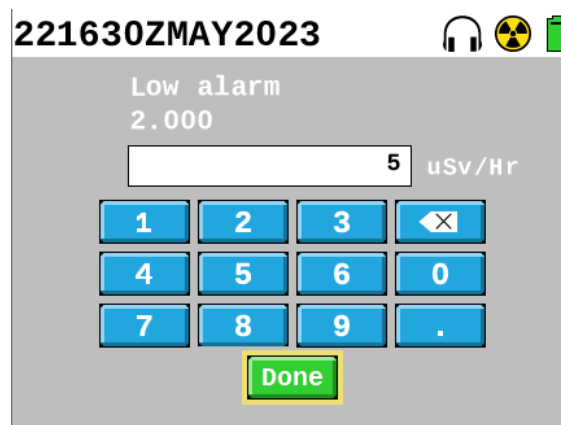


Figure 3.27. Data Entry Screen Example.

If there are no digits to the right of the decimal point, there is no need to enter a decimal point.

If a value is entered that is invalid for that field, the Base Unit will display a system notification (Figure 3.28). An example of an invalid value is when a Low Alarm Threshold value is set at a higher value than the Medium Alarm Threshold or High Alarm Threshold value. If an invalid value is entered, a system notification that the value entered is invalid is displayed and must be acknowledged. A valid value must be entered.

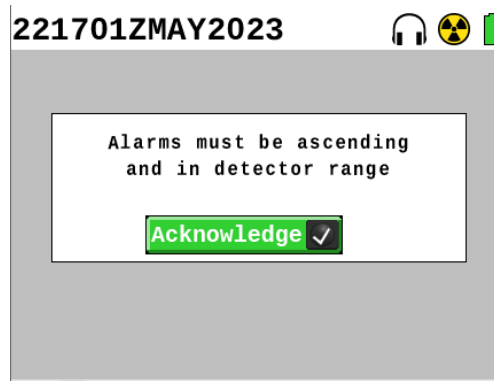









Figure 3.28. Invalid Entry System Alert Example.

- (1) Use the Arrow  keys to highlight the number field (date field, threshold field, or other) to be changed and press Enter  key to go to the Data Entry Screen (Figure 3.27).
- (2) Use the Arrow  keys to highlight the value (or backspace button  to delete a value) to be entered in the field.
- (3) Press the Enter  key to insert the highlighted value (or delete the value) in the data entry field.
- (4) Press the Arrow  keys to highlight the Done button when the desired number(s) has been entered in the data entry field.
- (5) Verify value was entered as intended, otherwise, repeat steps 2-4.
- (6) Press the Enter  key to actuate the Done button.
- (7) Acknowledge the Invalid value system notification if an invalid value was entered by pressing the Enter key and repeat above steps until a valid value is entered.

Section 15 Language Selection

By default, the Base Unit displays in the English language. Follow the steps below to change the language displayed on the Base Unit.

3.15.1 Select Language












- (1) Power off Base Unit (Section 3.6.2).
- (2) Press and hold up , left , and right  arrow keys and then press and hold Home/Power  key simultaneously for 10 seconds.
- (3) Highlight the desired language (Figure 3.29) using the up  and down  arrow keys and press the Enter  key to select.



Figure 3.29. Language Selection Screen Example.

- (4) Observe the Base Unit display. If a notification message appears, complete the following:
- (a) View message if presented that will state “This language is not supported.” in English (Figure 3.30).
 - (b) Acknowledge the message by pressing the Enter  key.
 - (c) Choose a different language using the up  and down  arrow keys.
 - (d) Press the Enter  key to select.

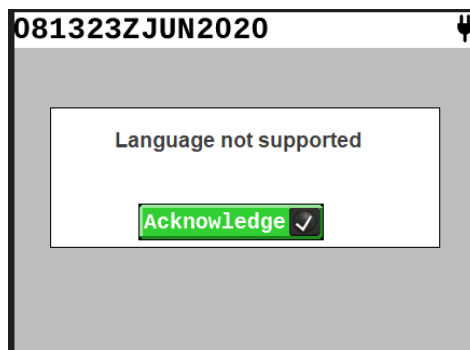


Figure 3.30. Language not Supported Example.

- (5) Observe the language displayed on the Base Unit home screen. If this is not the intended language, power off Base Unit (Section 3.6.2) and repeat procedure.

Section 16 Connecting and Disconnecting Headset

The headset can be used with the Base Unit by connection to the audio port on the top of the Base Unit. The connection is a standard 3.5mm audio plug with an added threaded collar for solid connection to the Base Unit audio port to prevent it from being dislodged during movement.

Volume settings are located on the Settings screen (Section 3.17.4). Once the headset is connected, the buzzer (speaker) will be bypassed and all audio will come through the headset. When using stealth mode (Section 3.13.1), the volume will automatically switch to the audio port for headset, bypassing the buzzer (speaker). Activating mute on the Settings screen (Section 3.17.4) will remove all sound from both the buzzer (speaker) and the headset.

3.16.1 Connecting Headset

- (1) Remove the audio connector protective cap (Figure 3.31) by rotating counterclockwise.

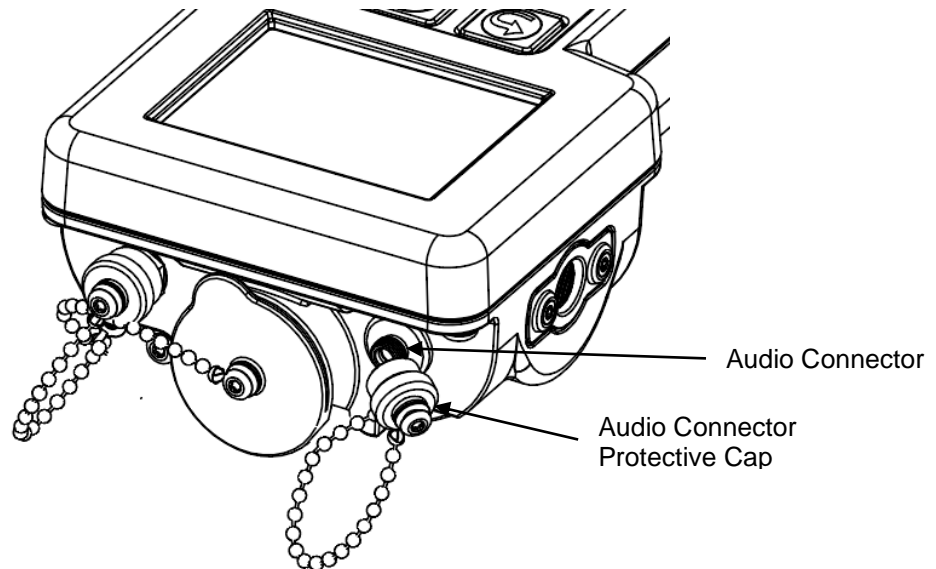


Figure 3.31. Remove and Install Audio Connector Protective Cap.

- (2) Attach the audio headset by inserting the connector plug (Figure 3.32) and threading the collar clockwise onto the audio connection port.

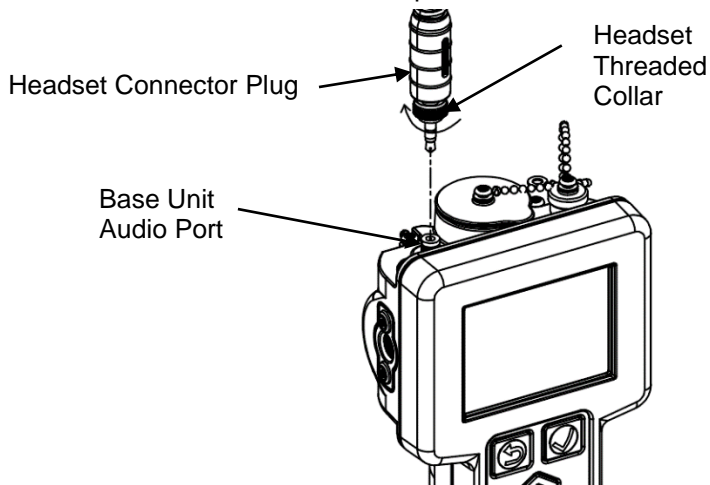


Figure 3.32. Connecting and Disconnecting Headset.

- (3) Arrange the headset over the desired ear and insert it into ear securely.
- (4) Attach clips as needed along uniform to secure the attachment and prevent movement from dislodging the headset from the ear.
- (5) Adjust volume using the Settings screen.

- (a) Press Menu  key.

- (b) Use Arrow   keys to highlight Settings icon (Figure 3.33) on Main Menu.

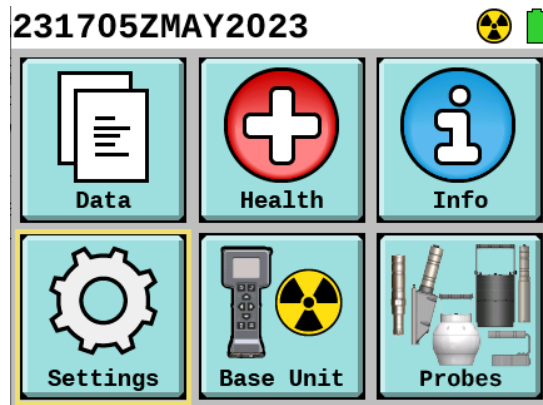


Figure 3.33. Settings Icon Highlighted.




- (c) Press Enter  key.
- (d) Press Up Arrow  and Down Arrow  keys to highlight volume setting (Figure 3.34).



Figure 3.34. Settings Screen, Volume Selected.

NOTE

The lowest volume setting is still audible.

- (e) Adjust volume setting for both speaker and headset when selected using Left Arrow  and Right Arrow  keys.
- (6) Press Home/Power  key to return to Home screen.

3.16.2 Disconnecting Headset

- (1) Disconnect the headset audio plug by unthreading counterclockwise and removing the collar from the audio connector on the Base Unit (Figure 3.32).
- (2) Install audio protective cap (Figure 3.31) on Base Unit audio connection by rotating clockwise.
- (3) Disconnect the clips from the uniform (Figure 3.35).

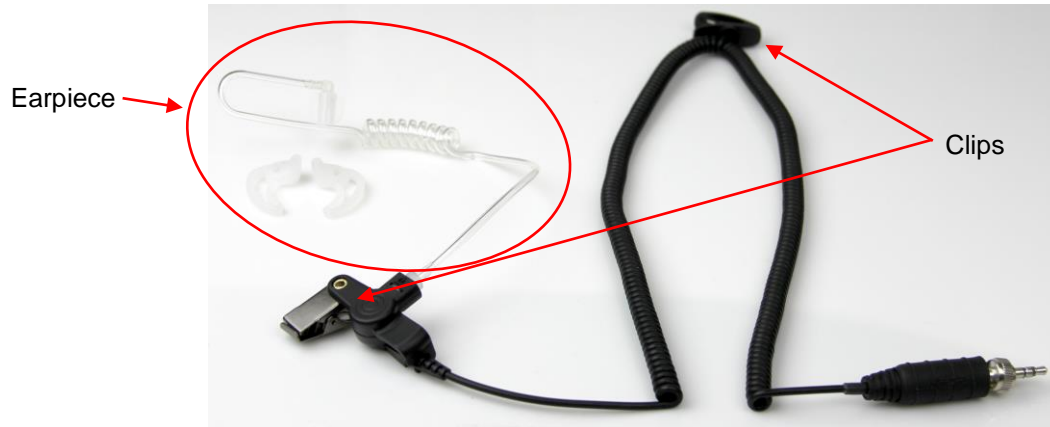



Figure 3.35. Earpiece and Clips on Headset.

- (4) Remove earpiece from ear (Figure 3.35).
- (5) Disconnect earpiece from rest of headset (Figure 3.35).
- (6) Clean earpiece with alcohol wipes or warm soapy water, rinse thoroughly, and ensure the earpiece is fully dried.
- (7) Reconnect earpiece to the headset (Figure 3.35).
- (8) Store in transit case.

Section 17 RDS Menus and Screens

3.17.1 Main Menu

This section explains how to access the main menu.

- (1) Press Menu  key to access Main Menu (Figure 3.36).

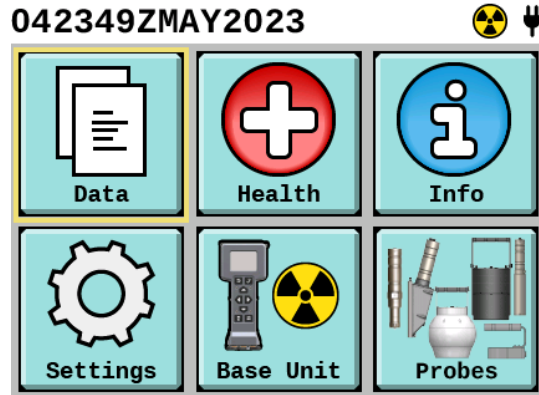






Figure 3.36. Main Menu.

- (2) Use the Arrow  keys to highlight menu icons to select them.
- (3) Press the Enter  key to view the next level of menu or screen for icon that was highlighted.

3.17.2 Device Health Screen

This task explains how to access health data, details screen, and explains the data that is available on this menu.

- (1) Press Menu  key.
- (2) Use Arrow  keys to highlight the Health icon (Figure 3.37) on Main Menu.

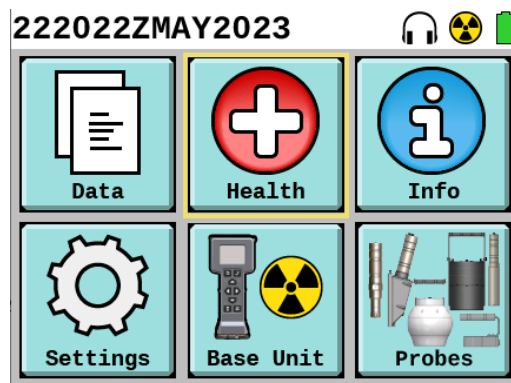


Figure 3.37. Health Icon Highlighted.

- (3) Press Enter  key to view Device Health screen (Figure 3.38).

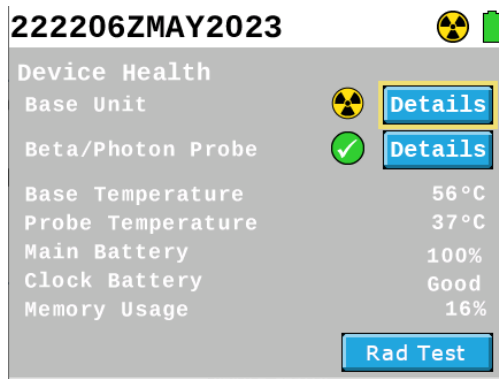






Figure 3.38. Device Health Screen.

- (4) Verify health of Base Unit or attached probe by observing icon shown to the right of device name (Table 3.14) on the Device Health screen (Figure 3.38) and also shown in the status bar at the top of the screen.


Table 3.14. Device Health Icons.

Icon	Meaning
	Radiation Alarm
	System Alarm
	System Warning
	All Okay

- (5) Observe device health information (Table 3.15) on the Device Health screen (Figure 3.38) which is intended to help with troubleshooting the device.

Table 3.15. Device Health Descriptions.


Device Health Item	Description
Temperature	The Base Unit temperature can be checked to verify that the Base Unit is operating within its specified operating temperature range (Section 2.1.7). The Probe temperature can be used to verify that the probe is operating within its specified operating temperature range.
Main Battery	The Main Battery percentage gives an indication of remaining battery life for the 4 AA installed batteries in the Base Unit. When the battery icon is green, 26% to 100% battery life remains. Yellow indicates 11% to 25% battery life remains. Red indicates 0% to 10% battery life remains.
Clock Battery	The Clock Battery gives the indication of either Good or Low. Clock battery should be replaced when status is Low, notify authorized level of maintenance.
Memory Usage	Memory Usage indicates the amount of memory used to store data log files.

- (6) Use Arrow  keys to highlight Details button on the Device Health screen (Figure 3.38) to right of Base Unit or probe to see additional information about alarms or notifications.

- (7) Press Enter  key to view details about Base Unit or probe health.

NOTE

Alarms and warnings will only be displayed on the Details page of the Health screen while they are occurring. To view alarms and warnings that occurred in the past, download a system file to a computer for viewing (Section 5.2.2). For radiation alarms that were captured in a data log they can be viewed on the Base Unit under Data, View Data menus (Section 3.18.3).

- (8) View health details and notifications (Figure 3.39); use Arrow  keys to scroll down if list continues below what is shown on initial page.

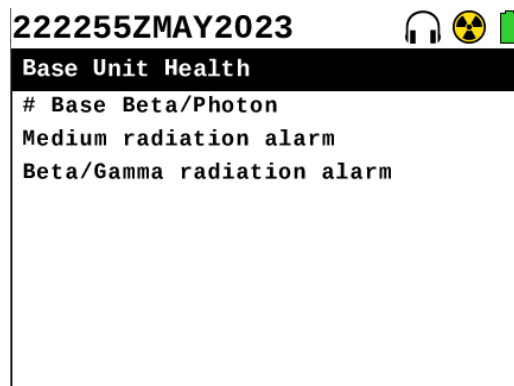






Figure 3.39. Device Health Details Screen Example.

- (9) Use Back  key to return to Device Health screen.
- (10) Use the Arrow  keys to highlight Rad Test button on the bottom right of Device Health screen (Figure 3.38).
- (11) Press Enter  key to conduct a Rad Test on Base Unit or a connected probe to verify function of detector(s).

3.17.3 Info Menu

This section explains how to access the Info Menu for Base Unit or an attached probe to view the information available to the user from this screen.

- (1) Press Menu  key.
- (2) Use Arrow  keys to highlight Info icon (Figure 3.40) on the Main Menu.

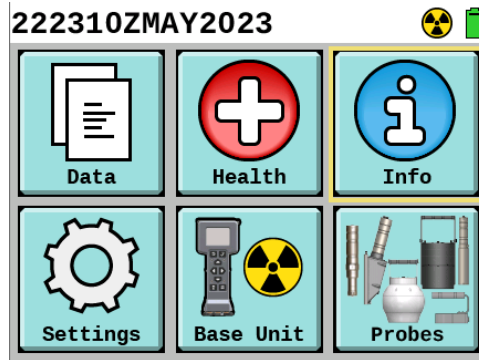



Figure 3.40. Info Icon Highlighted on Main Menu.

(3) Press Enter  key.

(4) Select Base Unit or probe (Figure 3.41) using Arrow  keys. If a probe is attached, that probe's icon will display.

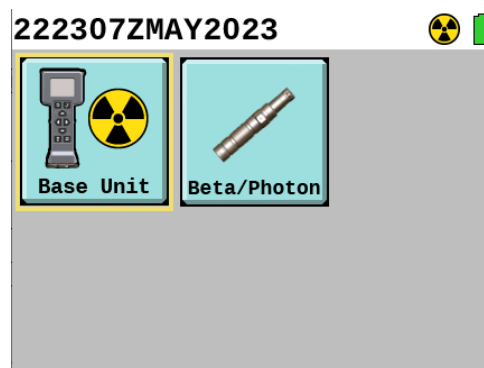


Figure 3.41. Info Menu.

(5) Press Enter  key.

(6) Review information presented on info screen (Figure 3.42). If probe was selected it will look the same as Base Unit screen example (Figure 3.42) but with a picture of the probe and details about that probe.

- (a) Observe any alert icons; they will display both after serial number (S/N) and in status bar at top of screen.
- (b) Observe Base Unit serial number (S/N) displayed on info screen.
- (c) Observe firmware version of Base Unit displayed on info screen.
- (d) Observe assembly version of Base Unit displayed on info screen.
- (e) Observe calibration status of Base Unit displayed on info screen.
- (f) Observe current calibration date of Base Unit displayed on info screen.

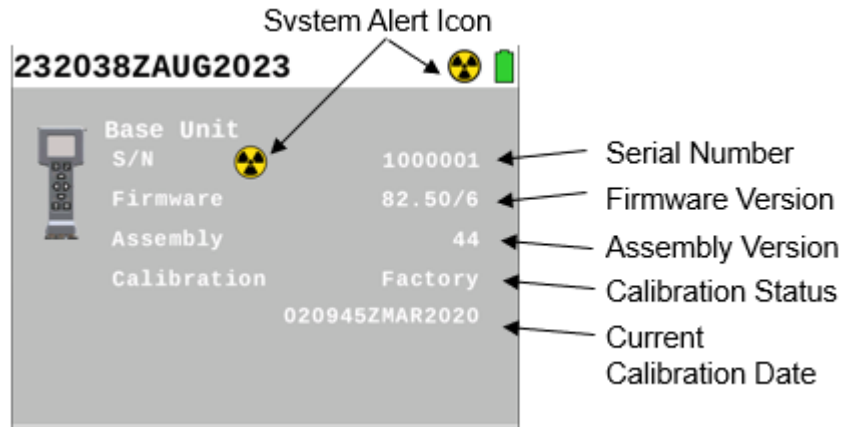





Figure 3.42. Base Unit Info Details Screen Example.

- (7) Press Back  key two times to exit to the Home screen when finished.

3.17.4 Settings Screen

This section explains how to access the Settings screen, what settings are available on this screen, and how to make changes to those settings.

- (1) Press Menu  key.
- (2) Use Arrow  keys to highlight Settings icon (Figure 3.43) on Main Menu.

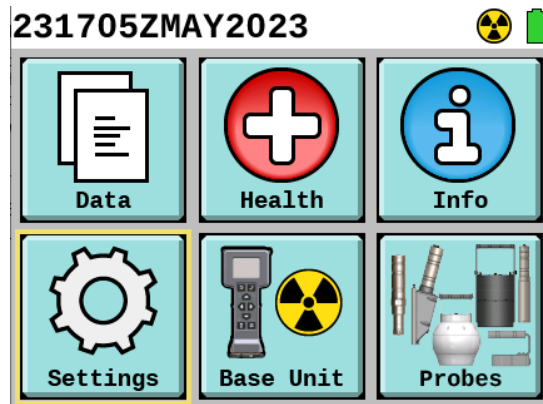





Figure 3.43. Settings Icon Highlighted.

- (3) Press Enter  key.
- (4) Press Up Arrow  and Down Arrow  keys to highlight setting to be changed (Figure 3.44).

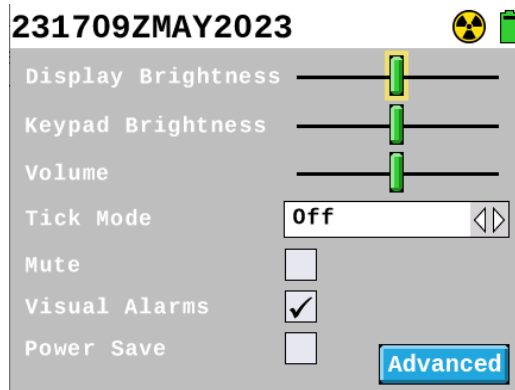


Figure 3.44. Settings Screen.

- (5) Adjust display brightness setting when selected using Left Arrow **◀** and Right Arrow **▶** keys.
- (6) Adjust keypad backlighting brightness setting when selected using Left Arrow **◀** and Right Arrow **▶** keys.

NOTE

The lowest volume setting is still audible.

- (7) Adjust volume setting for both speaker and headset when selected using Left Arrow **◀** and Right Arrow **▶** keys.
- (8) Use Tick Mode to provide an audible “ticking” sound that indicates the intensity of detected radiation.
 - (a) If the box beside “Mute” on the settings screen (Figure 3.44) is checked, this setting will cancel out the audible sound made when Tick Mode is On. See the next numbered item below for instructions on turning on and off the Mute function.
 - (b) Switch Tick Mode On or Off when using only Base Unit by pressing Left Arrow **◀** or Right Arrow **▶** keys to select On or Off (Figure 3.44).
 - (c) Switch Tick Mode to tick in response to radiation readings from either Base Unit detectors or an attached probe by pressing Left Arrow **◀** or Right Arrow **▶** keys to select Left Panel, Right Panel, or Off (Figure 3.45).

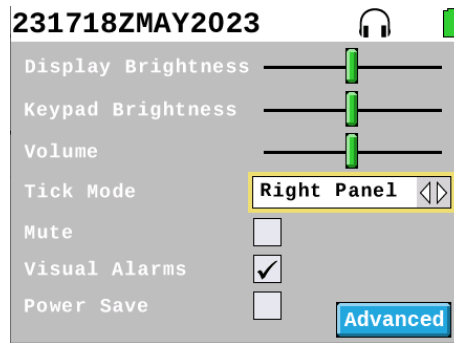


Figure 3.45. Settings Screen with Probe Attached - Tick Mode Example.

- (9) Turn Mute setting on to mute all sounds on Base Unit or off to allow sounds to be heard by pressing Enter key to toggle check mark.

NOTE

While visual alarms are turned off radiation alarms and notification messages will not appear on the screen, but an icon will appear in header bar and details can be viewed in health screen. System alarms will still provide a visual alarm even when turned off requiring operator acknowledgement due to the criticality to the system and/or operator safety.

- (10) Turn Visual Alarms setting on or off to enable visual alarms to be displayed by pressing Enter key to toggle check mark.

NOTE

When in Power Save mode the Base Unit will continue to monitor the radiation level. Any alert or alarm will cancel power save mode and display the alert or alarm screen. Pressing any key will also cancel power save mode and the display will return to the set brightness level. This key will not be acted upon when pushed to "awake" the Base Unit.

Power Save is not available during an alert or an alarm state.

- (11) Turn Power Save setting on or off to cause display and keypad backlighting to go to sleep after 2 minutes of inactivity by pressing Enter key to toggle the check mark.

3.17.5 Advanced Settings Screen

This section continues with the Advanced button found at the bottom right in the Settings screen. It provides instructions on how to access the Advanced Settings screen, what settings are located within the Advanced Settings screen, and how to make changes to those settings.

- (1) Highlight the Advanced button using the Arrow  keys to modify Advanced Settings (Figure 3.46).

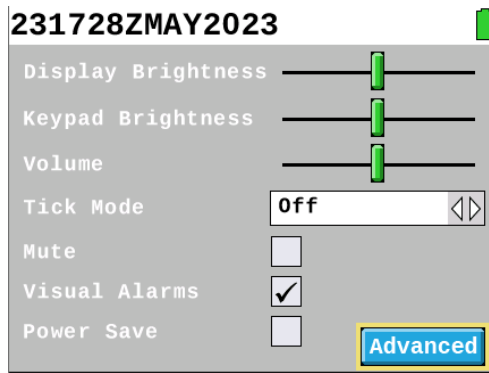


Figure 3.46. Advanced Settings Button Highlighted.

- (2) Press Enter key to access Advanced Settings screen (Figure 3.47).

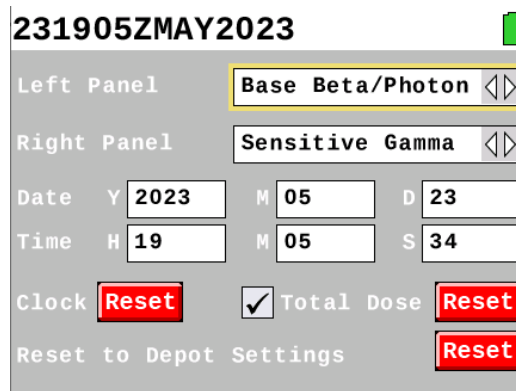


Figure 3.47. Advanced Settings Screen.

NOTE

Advanced Settings can only be modified when no data is being logged (Figure 3.48).

The Left Panel (Figure 3.47) will only list options when a probe is attached to the Base Unit. This field allows for the selection of what data to display in the Left Panel on the Home screen. This is the default panel and cannot be turned off.

The Right Panel (Figure 3.47) showing radiation readings on the Home screen will only be displayed when a probe is attached. The Right Panel display can be suppressed by selecting None.

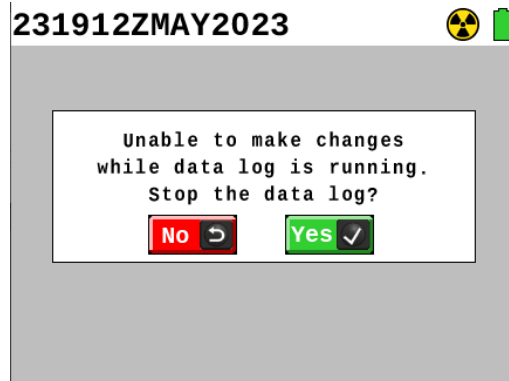






Figure 3.48. Unable to Make Advanced Setting Changes During Data Logging.

- (3) Observe the settings that can be changed using the Advanced Settings menu and note that there are differences in what will appear based on whether a probe is connected or not and the actual probe connected.
- (4) Adjust what is displayed on Home screen Left Panel by pressing Left Arrow  or Right Arrow  keys to toggle through screen options.
- (5) Adjust what is displayed on Home screen Right Panel by pressing Left Arrow  or Right Arrow  keys to toggle through screen options.
- (6) Set Date and Time.

NOTE

Date and time will be included in all data logs taken, providing the user with the ability to identify when the readings were taken. Date and time indicated on the data logs and on the Home screen will always contain the “Z” for Zulu time. It is important to set your time to Zulu to remove any confusion of the date and time stamp on data logs after they have been transferred or downloaded from a Base Unit.






- (a) Set date year.
 - (i) Highlight the Y field using Arrow  keys.
 - (ii) Press Enter  key.
 - (iii) Use data entry screen (Figure 3.49) to enter correct year.





Figure 3.49. Data Entry Screen Example.



1. Use Arrow  keys to highlight desired number.
2. Press Enter  key.
3. Repeat until all numbers have been entered.

(iv) Highlight Done button on data entry screen (Figure 3.49).


(v) Press Enter  key to set new Year value.

(b) Set date month.



- (i) Highlight the M field using Arrow  keys.
- (ii) Press Enter  key.
- (iii) Use data entry screen (Figure 3.49) to enter correct month.

1. Use Arrow  keys to highlight desired number.
2. Press Enter  key.
3. Repeat until all numbers have been entered.



(iv) Highlight Done button on data entry screen.

(v) Press Enter  key to set new Month value.

(c) Set date day.

- (i) Highlight the D field using Arrow  keys.
- (ii) Press Enter  key.


(iii) Use data entry screen (Figure 3.49) to enter correct day.

1. Use Arrow  keys to highlight desired number.
2. Press Enter  key.
3. Repeat until all numbers have been entered.

(iv) Highlight Done button on data entry screen.



(v) Press Enter  key.

(d) Set time hour.


(i) Highlight the H field using Arrow  keys.

(ii) Press Enter  key.


(iii) Use data entry screen (Figure 3.49) to enter correct hour.

1. Use Arrow  keys to highlight desired number.
2. Press Enter  key.
3. Repeat until all numbers have been entered.

(iv) Highlight Done button on data entry screen.



(v) Press Enter  key to set new Hour value.

(e) Set time minute.


(i) Highlight the M field using Arrow  keys.

(ii) Press Enter  key.


(iii) Use data entry screen (Figure 3.49) to enter correct minute.

1. Use Arrow  keys to highlight desired number.
2. Press Enter  key.
3. Repeat until all numbers have been entered.

(iv) Highlight Done button on data entry screen.



(v) Press Enter  key to set new Minute value.

(f) Set time seconds.


(i) Highlight the S field using Arrow  keys.

(ii) Press Enter  key.

(iii) Use data entry screen (Figure 3.49) to enter correct second.

1. Use Arrow  keys to highlight desired number.
2. Press Enter  key.
3. Repeat until all numbers have been entered.

(iv) Highlight Done button on data entry screen.

(v) Press Enter  key to set new Second value.

(7) Clock Reset

NOTE

The Clock Reset available on the Advanced Menu Settings is used to reset Base Unit circuits after exposure to a nuclear blast. The Base Unit will temporarily be inoperable for 4 seconds while the clock reset is being performed on the system. No audible alarms from Base Unit detectors can occur during the clock reset, Base Unit detection is disabled for the 4 second reset. Audible alarms from a probe detecting radiation can occur. Probes continue to function during the clock reset. Clock reset requires operators to re-enter current date/time. Additional information on use following nuclear detonation can be found in Section 7.1.3.

(a) Complete the steps in order provided for Operations After Nuclear Detonation, Section 7.1.3.

(b) Continue operations.

(8) Total Dose

WARNING







Total Dose. Total dose on the RDS may not be utilized as the radiological exposure medical dose of record. Refer to use of authorized dosimeters. Failure to comply may result in injury to personnel.

NOTE

Total Dose is not meant to take the place of a dosimeter for dose of record readings. It is available to be displayed on the Home Screen with the other readings and can be reset at





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the beginning of a mission. An alarm can also be set for total dose to provide a turn back dose alarm during a mission.

- (a) Adjust setting to turn on or off display of Total Dose value on Home screen by selecting check box to right of Total Dose and then press Enter  key.
 - (b) Reset Total Dose.
 - (i) Reset Total Dose value displayed on Home screen by Highlighting Reset button to right of Total Dose and then press Enter  key.
 - (ii) Confirm reset by pressing Enter  key for Yes or pressing Back  key for No.
- (9) Reset to Depot Settings

NOTE


The Reset to Depot Settings can be used by authorized individuals to assist in troubleshooting or at the end of a mission to return all Base Units back to their original settings that were put in place at the "Depot" level. Reset to Depot Settings will not affect the system's calibration or data logs. The Base Unit holds all settings for probes (Probes Menu), therefore a reset to depot settings will also reset the settings for the probes regardless of what probe is later connected and used with the Base Unit. Reset to Depot Settings will not interfere with stored data logs, system logs, calibration, or firmware.

- (a) Reset Base Unit to Depot Settings.
 - (i) Reset Base Unit to Depot Settings by highlighting Reset button to right of Reset to Depot Settings and pressing Enter  key.
 - (ii) Confirm reset by pressing Enter  key for Yes or pressing Back  for No.
- (b) Press Home/Power  key to return to Home screen.

3.17.6 Base Unit Settings

This section explains how to access the Base Unit settings screen and the Advanced settings associated with the Base Unit. Within the Base Unit settings screen, attenuation is set based on mission parameters. Attenuation is used to calculate what the radiation readings are outside of a shelter or vehicle that the user with the system is currently inside of.

- (1) Press Menu  key.

- (2) Highlight Base Unit icon (Figure 3.50) using Arrow  keys.

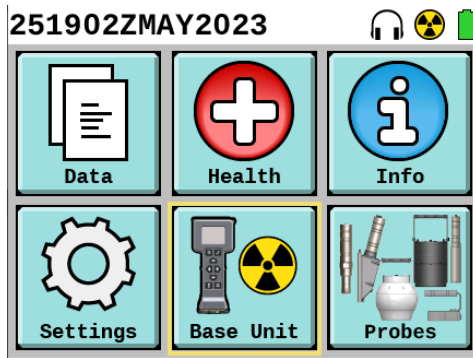



Figure 3.50. Base Unit Highlighted on Main Menu.

- (3) Press Enter  key to see Base Unit settings screen (Figure 3.51).

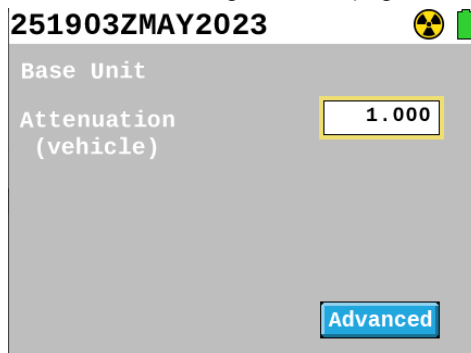







Figure 3.51. Base Unit Settings Screen.

NOTE

Shielded environments within a shelter or vehicle can attenuate or reduce the amount of radiation the Base Unit is detecting. The attenuation factor compensates for this. Valid range available for setting is 1-1000.

- (4) Use Arrow  keys to highlight Attenuation field.
- (5) Press Enter  key.
- (6) Set attenuation factor using the data entry screen.
- (7) Use the Arrow  keys to highlight desired number.
- (8) Press Enter  key to select one number at a time.
- (9) Repeat until all numbers have been selected.
- (10) Highlight Done button.
- (11) Press Enter  key to set the attenuation value.

3.17.7 Base Unit Advanced Settings Screen

Base Unit advanced settings include settings for what units of measure are used when radiation readings are displayed as well as allow the user to set up threshold and total dose alarm levels for their mission. Three levels of alarm thresholds are established on this screen. Low: the dose rate above which a Low Alarm will occur. Medium: the dose rate above which a Medium Alarm will occur. High: the dose rate above which a High Alarm will occur. A total dose alarm can also be set. Total Dose Alarm Threshold: the total accumulated dose above which a Total Dose Alarm will occur. All settings should be appropriately set per the mission specifications and your local standard operating procedures.

- (1) Press Down Arrow  key to highlight Advanced button (Figure 3.52).

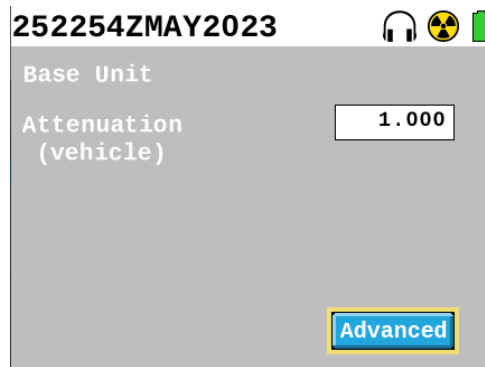



Figure 3.52. Advanced Button Highlighted on Base Unit Settings Screen.

- (2) Press Enter  key.

- (3) Highlight Units field by using Arrow  keys (Figure 3.53).

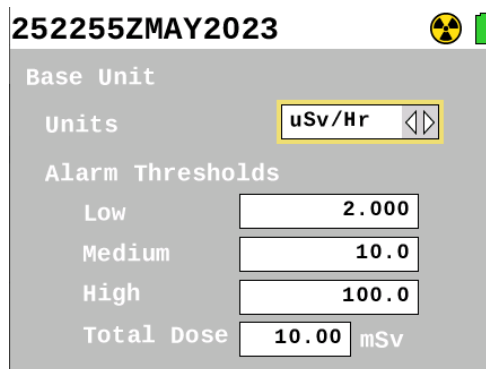



Figure 3.53. Base Unit Advanced Settings Screen.

- (4) Press the Left Arrow  and Right Arrow  keys to select the desired units of measurement.

- (5) Highlight Low field to change low alarm threshold using Arrow  keys.

- (6) Press Enter  key.

- (7) Use the data entry screen (Figure 3.54) to enter low alarm threshold.

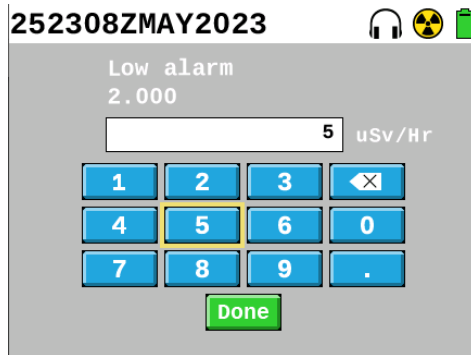

















Figure 3.54. Data Entry Screen for Low Alarm Threshold Example




- (a) Use the Arrow  keys to highlight desired number.
 - (b) Press Enter  key to select one number at a time.
 - (c) Repeat until all numbers have been selected.
 - (d) Highlight Done button.
 - (e) Press Enter  key to set the low alarm threshold.
-
- (8) Highlight Medium field to change medium alarm threshold (Figure 3.53) using Arrow  keys.
 - (9) Press Enter  key.
 - (10) Use the data entry screen (Figure 3.54) to enter medium alarm threshold.
 - (a) Use the Arrow  keys to highlight desired number.
 - (b) Press Enter  key to select one number at a time.
 - (c) Repeat until all numbers have been selected.
 - (d) Highlight Done button.
 - (e) Press Enter  key to set the medium alarm threshold.
-
- (11) Highlight High field to change high alarm threshold (Figure 3.53) using Arrow  keys.
 - (12) Press Enter  key.
 - (13) Use the data entry screen (Figure 3.54) to enter high alarm threshold.

- (a) Use the Arrow  keys to highlight desired number.
- (b) Press Enter  key to select one number at a time.
- (c) Repeat until all numbers have been selected.
- (d) Highlight Done button.
- (e) Press Enter  key to set the high alarm threshold.

(14) Highlight Total Dose field to change Total Dose Alarm Threshold (Figure 3.53) using Arrow  keys.

(15) Press Enter  key.

(16) Use the data entry screen (Figure 3.54) to enter total dose alarm threshold.

- (a) Use the Arrow  keys to highlight desired number.
- (b) Press Enter  key to select one number at a time.
- (c) Repeat until all numbers have been selected.
- (d) Highlight Done button.
- (e) Press Enter  key to set the total dose alarm threshold.

3.17.8 Probes Menu and Settings

This section explains how to access the Probes Menu, what settings are available on the individual probe settings screens, and how to make changes to those settings. The settings made on the Base Unit in the individual probe settings screen will apply to any probe connected to that Base Unit. This allows a user to prepare for a mission by making all threshold and unit of measure settings on the Base Unit without needing to connect to a probe.

(1) Press Menu  key.

(2) Highlight Probes icon (Figure 3.55) using Arrow  keys.

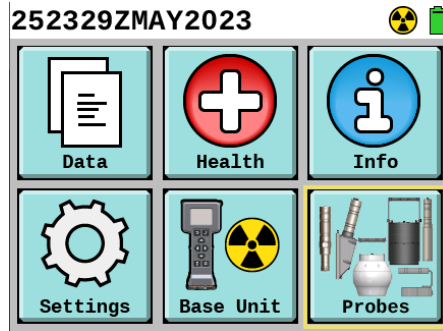



Figure 3.55. Main Menu with Probes Icon Highlighted.

- (3) Press Enter key to view Probes menu (Figure 3.56).



Figure 3.56. Probes Menu.

- (4) Press Arrow  keys to highlight icon for desired probe.

NOTE

Not all probes have multiple channels. For probes with multiple channels (Alpha-Beta Probe and FIDLER Probe), the channel chosen on the Probe Menu screen will be the channel that the advanced settings are set for. For multiple channel probes, units of measure and thresholds should be set appropriately to mission requirements and SOP for all channels.

- (5) Press Enter key to view probe's listed channel(s) (Figure 3.57), if applicable.

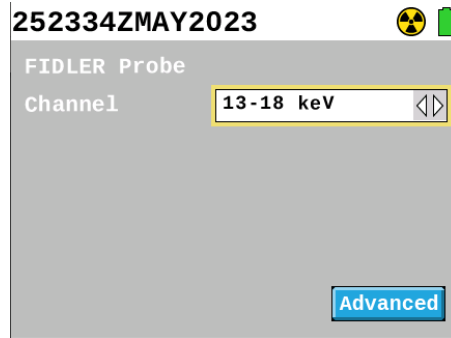








Figure 3.57. FIDLER Probe Channel Selection Screen Example.

- (6) Select desired channel (where applicable) by pressing Right Arrow  or Left Arrow  keys.
- (7) Press Down Arrow  key to highlight Advanced button.
- (8) Press Enter  key to access Advanced Probe Settings screen for the chosen channel.
- (9) Press Left Arrow  and Right Arrow  keys to change units of radiation measurement (Figure 3.58).

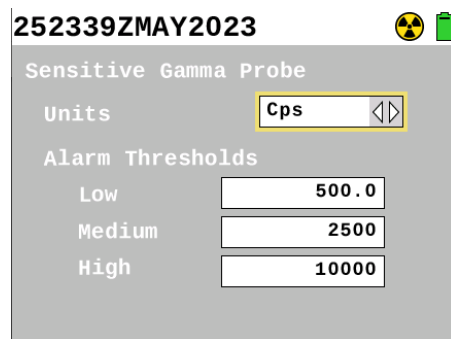









Figure 3.58. Advanced Probe Setting Screen for Sensitive Gamma Probe Example.

- (10) Highlight Low field to change Low Alarm Threshold (Figure 3.58) using Arrow  keys.
- (11) Press Enter  key.
- (12) Enter new value for Low Alarm Threshold using the data entry screen (Section 3.14.1).
- (13) Highlight Medium field to change Medium Alarm Threshold (Figure 3.58) using Arrow  keys.
- (14) Press Enter  key.
- (15) Enter new value for Medium Alarm Threshold using the data entry screen (Section 3.14.1).
- (16) Highlight High field to change High Alarm Threshold (Figure 3.58) using Arrow  keys.

(17) Press Enter  key.

(18) Enter new value for High Alarm Threshold using the data entry screen (Section 3.14.1).

(19) Highlight Total Dose field to change Total Dose Alarm Threshold (Figure 3.59, where applicable - not available for all probes) using Arrow  keys.

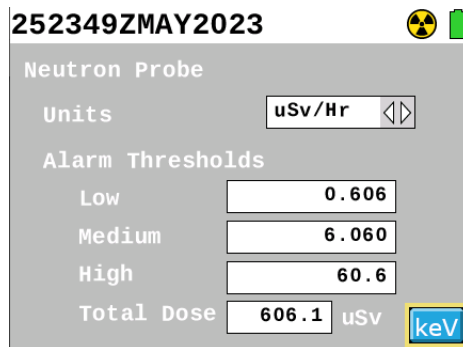
(20) Press Enter  key.

(21) Enter new value for Total Dose Alarm Threshold using the data entry screen (Section 3.14.1).

NOTE

Do not change the keV value for the Neutron Probe unless instructed to do so by a nuclear physicist who has calculated a specific value needed for a specific mission. Default value is 2300 keV.

(22) Enter a new keV value for the Neutron Probe (Figure 3.59) using the data entry screen (Section 3.14.1).




252349ZMAY2023	
Neutron Probe	
Units	uSv/Hr
Alarm Thresholds	
Low	0.606
Medium	6.060
High	60.6
Total Dose	606.1 uSv
	keV

Figure 3.59. Neutron Probe Advanced Settings Screen Example.

Section 18 Data Logging

This section contains information on how to start and stop the data logging process, select the appropriate data logging mode, and view the data that has been collected.

3.18.1 Perform Data Logging

(1) Press Home/Power  key to navigate to Home screen (Figure 3.60).

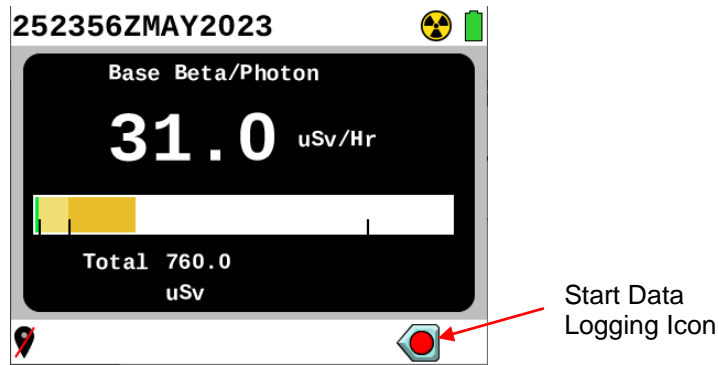



Figure 3.60. Base Unit Home Screen Displaying Start Data Logging Icon Example.

NOTE

The footer bar in the Home screen will have a Start Data Logging icon in the bottom right-hand corner with a red circle "Record Button" shown on the Left Arrow icon (Figure 3.60).

The data logging icons indicate what function will be activated when the Left Arrow and Right Arrow keys are pressed on the keypad.

- (2) Press Left Arrow  key on keypad to start data logging.

NOTE

Starting a data logging event creates a data log file that is named with the date and time the logging event commenced.

The Start Data Logging icon will change to an icon showing gray bars after Data Logging has started (the Pause Data Logging icon), the Stop Data Logging icon will appear (Figure 3.61).

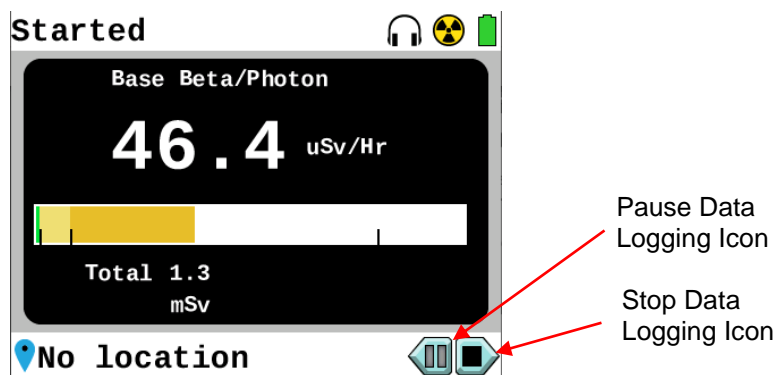



Figure 3.61. Home Screen Displaying "Started" Message and Pause and Stop Icons.

- (3) Press Left Arrow  key on keypad to pause data logging (Figure 3.61 and Figure 3.62).

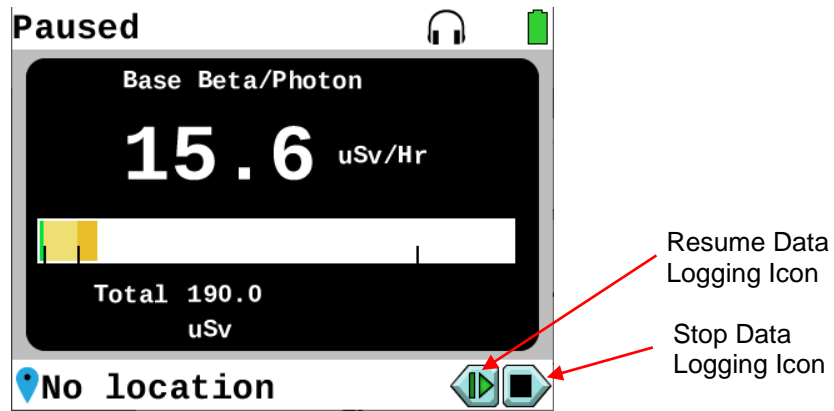



Figure 3.62. Home Screen Displaying "Paused" Message and Resume and Stop Icons.

(4) Press Left Arrow  key on keypad to resume data logging (Figure 3.63).

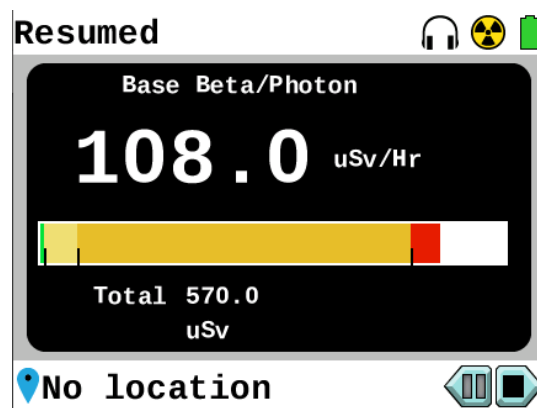



Figure 3.63. Home Screen Displaying "Resumed" and Pause and Stop Icons.

(5) Press Right Arrow  key to stop data logging (Figure 3.63).

3.18.2 Data Logging Modes



The RDS Base Unit offers four types of data logging modes: auto threshold, auto interval, multi-sample, and scaler. Each mode's function and purpose are described in Table 3.16.

Table 3.16. Home Screen Status Bar, Radiation Reading Panel, Footer Bar Descriptions.


Data Log Mode	Function	Purpose
Auto Threshold	Automatically logs data while alarm thresholds are exceeded.	Used when moving through an area to automatically identify radiation levels that are above a pre-determined threshold.
Auto Interval	Automatically logs data on an operator-set time interval.	Used when moving through an area to regularly record data on a fixed time interval.

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Multi Sample	Records data selected by the operator. One data sample will be recorded each time the operator presses the Left Arrow key.	Used when identifying specific levels of radiation in an area or on a piece of equipment.
Scaler	Records total counts received by the unit over an operator-set period of time.	Used when quantifying contamination levels.

When using the Multi Sample mode, the Pencil and Paper icon will flash indicating that a data set is ready to be recorded. This mode is used to collect multiple data samples at time intervals determined by the operator while conducting a survey. One data set is recorded each time the operator presses the Left Arrow  key. The status bar of the Home screen will briefly read "Snapshot" and the Base Unit will record a single data set to the current data log file when the Left Arrow  key is pressed to record a data sample. If a probe is connected to the Base Unit, a single data set for the probe will also be recorded as part of the same data log file. The Paper and Pencil icon will alternate with the Probe icon. For probes with multiple channels such as the Alpha-Beta and FIDLER Probes, data will be recorded for each channel.

(1) Press Menu  key.

(2) Highlight Data icon using Arrow  keys.

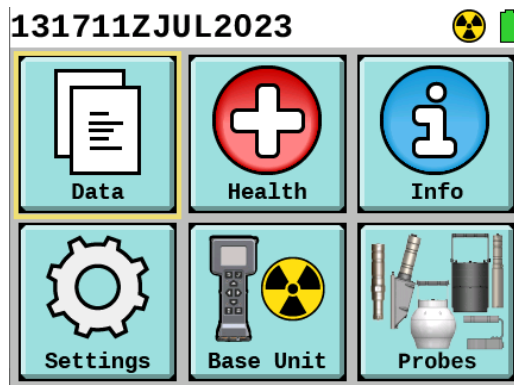



Figure 3.64. Main Menu with Data Icon Highlighted.

(3) Press Enter  key.

(4) Press Down Arrow  key to highlight Log Settings (Figure 3.65).

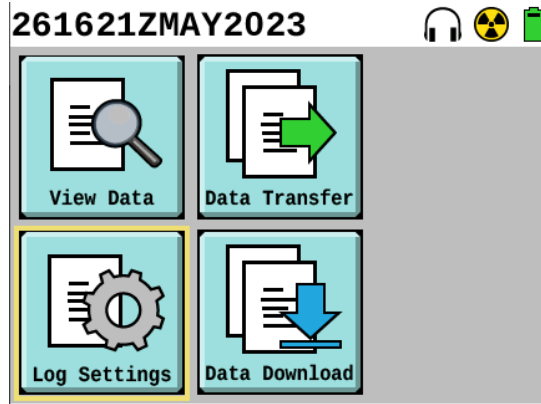




Figure 3.65. Log Setting Icon Highlighted.

(5) Press Enter  key.

(6) Press Arrow  keys to select the desired Data Log Mode (Figure 3.66). Data logging modes are defined in (Table 3.16).

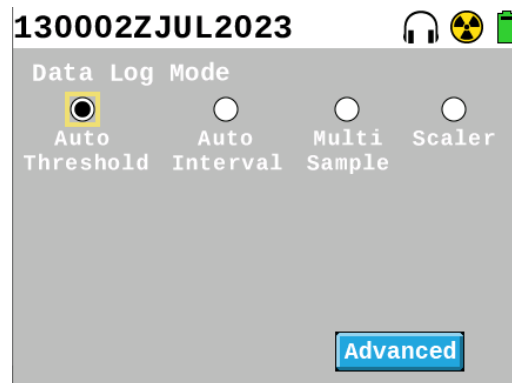





Figure 3.66. Data Log Mode Screen, Auto Threshold Mode.

NOTE

When using the Auto Threshold mode, set the Auto Log Interval time in seconds for recording data while radiation levels are above the Low threshold at the time interval set. For example, set the interval time at 10 seconds to record a data set once every 10 seconds while the radiation is above the low threshold.

(7) Use Auto Threshold Mode:

(a) Select Auto Threshold on Data Log Mode Screen (Figure 3.66) using Left Arrow  and Right Arrow  keys.

(b) Press Down Arrow  key to highlight Advanced button.

(c) Press Enter  key to view Advanced Log Settings screen (Figure 3.67).

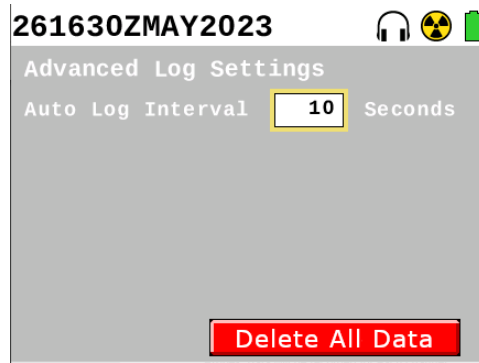






Figure 3.67. Advanced Log Settings Screen.

- (d) Press Enter  key to change Auto Log Interval in seconds using the data entry screen (Section 3.14.1).



CAUTION

Deletion of Data. Deleting all data on Base Unit cannot be undone. Only delete all data after confirming with unit Standard Operating Procedures (SOP) that all data can be deleted. Failure to comply may result in lost data.

- (e) Press Down Arrow  key to highlight Delete All Data if all data logs are to be deleted and press Enter  key.
- (f) Press Home/Power  key.
- (g) Begin data logging. Refer to Perform Data Logging task in Section 3.18.1 for instructions.

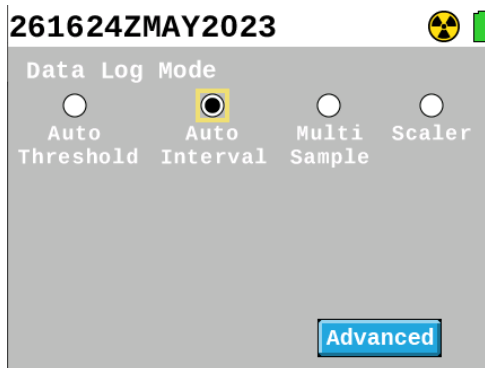






Figure 3.68. Data Log Mode Screen, Auto Interval Mode.

- (8) Use Auto Interval Mode:
- (a) Select Auto Interval mode on Data Log Mode Screen (Figure 3.68) using Left Arrow  and Right Arrow  keys.
- (b) Press Down Arrow  key to highlight Advanced button.

- (c) Press Enter  key to view Advanced Log Settings screen (Figure 3.67).

NOTE




When using the Auto Interval mode, set the Auto Log Interval time in seconds for recording data at the specified time intervals regardless of threshold settings.

- (d) Press Enter  key to change Auto Log Interval in seconds using the data entry screen (Section 3.14.1).



CAUTION

Deletion of Data. Deleting all data on Base Unit cannot be undone. Only delete all data after confirming with unit Standard Operating Procedures (SOP) that all data can be deleted. Failure to comply may result in lost data.

- (e) Press Down Arrow  key to highlight Delete All Data (Figure 3.67) if all data logs are to be deleted and press Enter  key.
- (f) Press Home/Power  key.
- (g) Begin data logging. Refer to Perform Data Logging task in Section 3.18.1 for instructions.

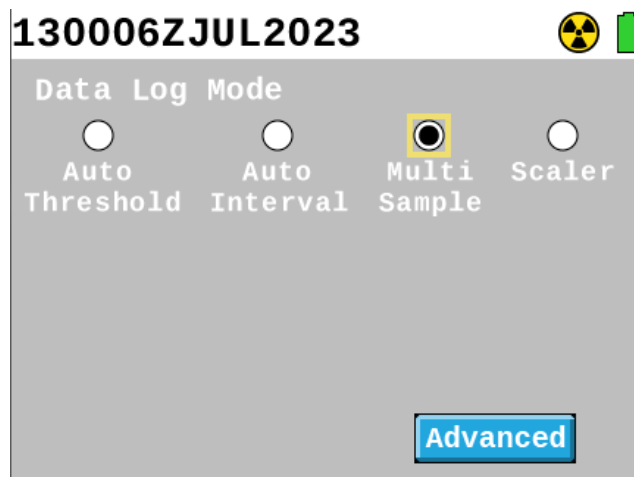




Figure 3.69. Data Log Mode Screen, Multi Sample Mode.



- (9) Use Multi Sample Mode:

- (a) Select Multi Sample mode on Data Log Mode Screen using Left Arrow  and Right Arrow  keys (Figure 3.69).

NOTE

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There is no need to access the Advanced Log Settings under Multi Sample mode unless deleting all data logs is desired.

- (b) Press Home/Power  key.
- (c) Begin data logging by pressing Left Arrow  key.
- (d) Verify Start Data Logging icon changes to be the Take Data Log Snapshot icon and the Stop Data Logging icon has also appeared (Figure 3.70).

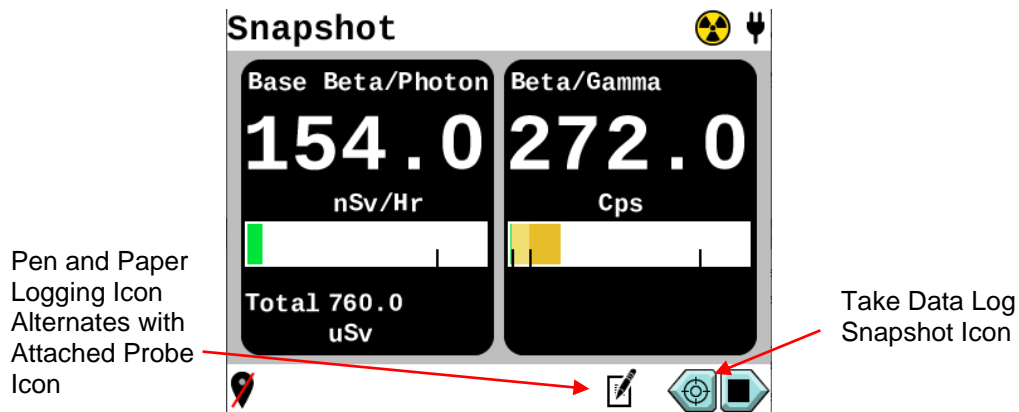





Figure 3.70. Take Data Log Icon and “Snapshot” Displayed on Home Screen.

- (e) Press Left Arrow  key again to record a data log.
- (f) Continue to press Left Arrow  key each time a data log is to be recorded.
- (g) Press Right Arrow  key on keypad to stop recording.

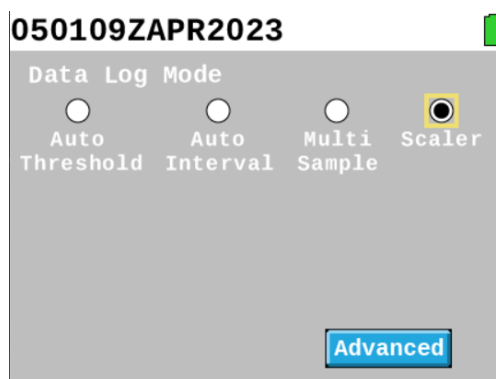






Figure 3.71. Data Log Mode Screen, Scaler Mode.

(10) Use Scaler Mode:

- (a) Select Scaler mode on Data Log Mode Screen using Left Arrow  and Right Arrow  keys (Figure 3.71).

- (b) Down Arrow  key to highlight Advanced button.
- (c) Press Enter  key to view Advanced Log Settings screen (Figure 3.72).

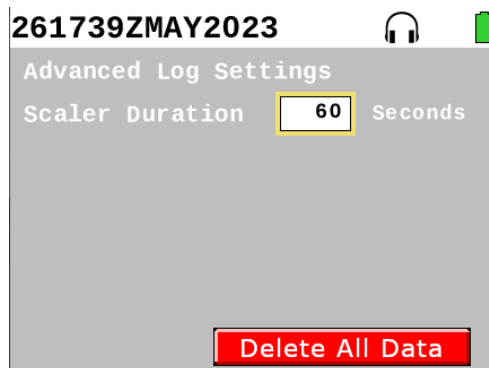



Figure 3.72. Advanced Log Settings Screen for Scaler Data Logging Example.

NOTE

When using Scaler mode, data will be logged for the duration set for the Scaler Duration value after the Left Arrow key is pressed on the Home screen. Before starting an initial Scaler data log, the value on the Home screen states 0.0 because the Scaler data log has not started and no radiation readings are being captured. When the Scaler data log is started, the value will increase as the Base Unit or an attached probe start detecting radiation. The final value of the radiation reading will continue to display after the Scaler duration has completed and will continue to display until another Scaler data log is started or a different data log mode is chosen.




To return to live radiation readings on the home page, the data logging mode must be changed to any other logging mode except Scaler (select Auto Threshold, Auto Interval, or Multi Sample).









- (d) Press Enter  key to change the Scaler Duration in seconds using the data entry screen (Section 3.14.1).

CAUTION






Deletion of Data. Deleting all data on Base Unit cannot be undone. Only delete all data after confirming with unit Standard Operating Procedures (SOP) that all data can be deleted. Failure to comply may result in lost data.

- (e) Press Down Arrow  key to highlight Delete All Data if all data logs are to be deleted and press Enter  key.
- (f) Press Home/Power  key.

- (g) Begin data logging. Refer to Perform Data Logging task in Section 3.18.1 for instructions.
- (h) Return to live readings on the Home screen once the Scaler readings are complete.
 - (i) Press Menu  key.
 - (ii) Highlight Data icon using Arrow  keys.
 - (iii) Press Enter  key.
 - (iv) Press Down Arrow  key to highlight Log Settings (Figure 3.65).
 - (v) Press Enter  key.
 - (vi) Select one of the other logging modes (Auto Threshold, Auto Interval, or Multi-Sample) on Data Log Mode Screen using Left Arrow  and Right Arrow  keys.
 - (vii) Press Home/Power  key.

3.18.3 Data Log Viewing

Data logs will be stored until the memory is full. The oldest data logs will automatically be deleted when the Base Unit's memory is low. Instructions to download data to a PC are in Section 5.2.2. If data logs are not deleted from the Base Unit, the system will eventually automatically start overwriting the oldest data logs as the memory becomes full. No action is needed if automatic deletion of the oldest data logs is acceptable.

- (1) Press Menu  key.
- (2) Highlight Data icon by pressing Arrow  keys.
- (3) Press Enter  key to view Data Menu (Figure 3.73).

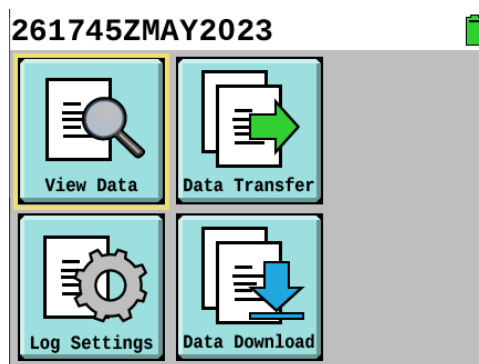




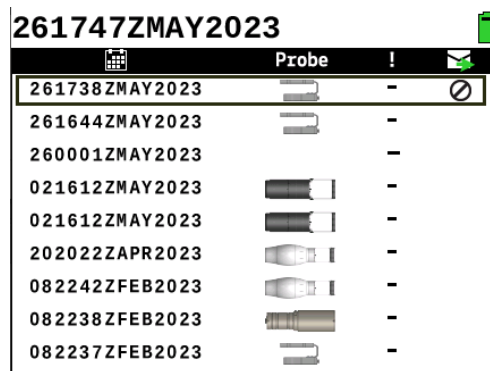


Figure 3.73. Data Menu.

- (4) Highlight View Data icon by pressing Arrow  keys.

- (5) Press Enter  key.
- (6) Press Up Arrow  and Down Arrow  keys to select a data log file to view (Figure 3.74).














	Probe	!	
261738ZMAY2023		-	 
261644ZMAY2023		-	
260001ZMAY2023		-	
021612ZMAY2023		-	
021612ZMAY2023		-	
202022ZAPR2023		-	
082242ZFEB2023		-	
082238ZFEB2023		-	
082237ZFEB2023		-	

Figure 3.74. View Data Log List.

NOTE

Data Menu, View Data icons are defined in Table 3.5.

Current date and time are shown in the header. The day (2 digits), hour (2 digits), minute (2 digit), Z (GMT time), month, and year are displayed under the calendar icon on the View Data screen indicating the date and time the data log file was created. If a probe was attached while data logs were recorded, that probe icon will appear under the Probe heading. A radiation icon will appear under the exclamation point ("!") heading if the Low threshold was exceeded in that data log file, otherwise a dash ("-") will be shown. The envelope icon indicates whether or not the file has been transferred via radio/ethernet (US Military Radios only) or downloaded to a computer using a Rad Extender. A check mark under the envelope icon indicates the file has been transferred or downloaded and the circle with a slash icon indicates a Scalar data log file that can't be transferred via radio/ethernet. Scalar data log files can be downloaded to a PC.

Details of information stored in the selected data log file are displayed in the Data Log File screen, including the date and time the data log file was created, the log mode that was used to create the data log file, total samples stored in the file, GPS location data where the data log file was created if attached (US Military GPS only), the serial number of the Base Unit, and the serial number of an attached probe if a probe was used during data logging.

- (7) Press Enter  key to view individual data log file (Figure 3.75).

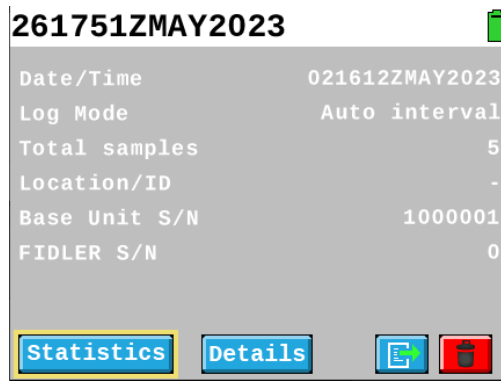




Figure 3.75. View Data Log File Screen.

- (8) Press Arrow  keys to highlight Statistics button.
- (9) Press Enter  key to view Statistics screen (Figure 3.76).

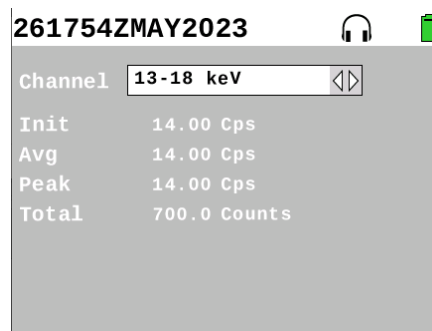






Figure 3.76. Statistics Screen Example.

NOTE

Init refers to the initial radiation reading recorded in the data log file, Avg refers to the average radiation reading over the duration of the data log, Peak refers to the peak radiation reading recorded in the data log file, and Total refers to the accumulated radiation readings recorded in the data log file.

- (10) Press Left Arrow  and Right Arrow  keys to select channels that were activated during the data logging event to view statistics about detections on that channel.
- (11) Press Back  key to return to View Data Log File screen (Figure 3.75).
- (12) Press Arrow  keys to highlight Details button (Figure 3.75).

NOTE

The Data Set Details screen displays the log entries for a specific log. It includes the date and time, GPS if connected (US Military only), dose rate, and channel (if applicable) for





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each data log entry captured in the data set. Each entry is based on the intervals set for the data logging mode. The example in Figure 3.77 shows that each interval of time logs a reading for all five channels, each of the four channels on the FIDLER and the one channel for the Base Unit. Then below this would be the reading at the next interval for all five channels and so on.

- (13) Press Enter  key to view Data Set Details screen (Figure 3.77).





Figure 3.77. Data Set Details Screen Example.

- (14) Press Back  key to return to View Data Log File screen (Figure 3.75).
- (15) Press Arrow  keys to highlight Transfer button (icon of document with arrow in Figure 3.75).
- (16) Press Enter  key to start the process of transferring data log file via a US military data radio or Ethernet to a specific software program (only available to US Military at this time).
- (17) Press Back  key to return to View Data Log File screen (Figure 3.75).

CAUTION



Deletion of Data. Deleting all data on Base Unit cannot be undone. Only delete all data after confirming with unit Standard Operating Procedures (SOP) that all data can be deleted. Failure to comply may result in lost data.

- (18) Press Arrow  keys to highlight Delete button (icon of garbage can on Figure 3.75).
- (19) Press Enter  key to view Deletion Confirmation screen (Figure 3.78).

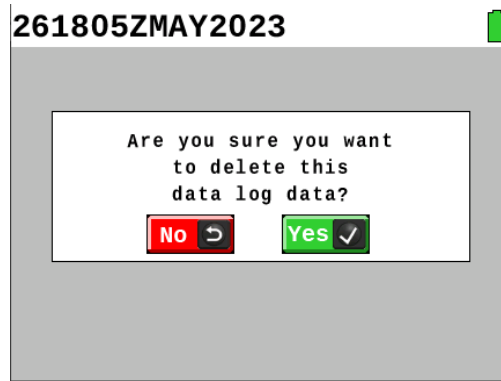




Figure 3.78. Data Log Deletion Confirmation Screen.

- (20) Press Enter  key to delete selected data log file or press Back  key to not delete the file (Figure 3.78).

Chapter 4

RDS Probes Operation

Section 1 Connect / Disconnect Common Probe Cable to Base Unit

4.1.1 Connect Common Probe Cable to Base Unit

- (1) Remove connector protective cap (Figure 4.1, Item 7) from the Probe connector (Figure 4.1, Item 1).

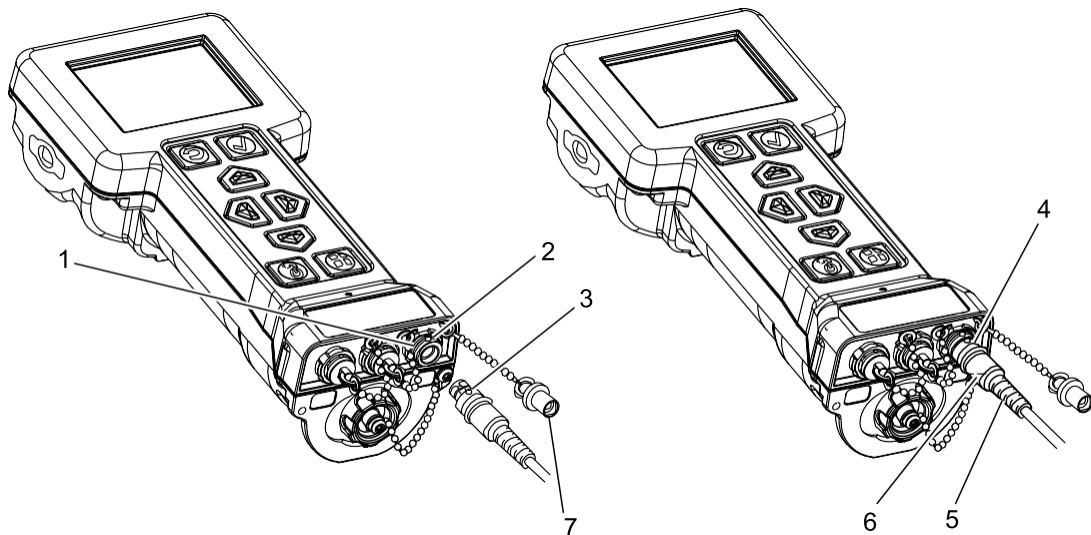


Figure 4.1. Common Probe Cable Installation to Base Unit.

- (2) Align red dot (Figure 4.1, Item 2) on Probe connector (Figure 4.1, Item 1) to red dot (Figure 4.1, Item 3) on Common Probe Cable (Figure 4.1, Item 6).
- (3) Insert until fully seated, gently pull on the cable to establish that it is connected.

4.1.2 Disconnect Common Probe Cable from Base Unit



CAUTION

Common Probe Cable. Do not try to disconnect Common Probe Cable by pulling on cable strain relief (Figure 4.1, Item 5). Failure to comply may cause damage to Common Probe Cable, Base Unit, or probe.

- (1) Grasp Common Probe Cable collar (Figure 4.1, Item 4) and pull.
- (2) Install connector protective cap (Figure 4.1, Item 7) on Probe connector (Figure 4.1, Item 1).

Section 2 Beta Photon Probe Preparation for Use and Operation

4.2.1 Beta Photon Probe Preparation for Use and Operation

Preparation for Use will include the following sections: 4.2.2, 4.2.4, 4.2.5, 4.2.6, and 4.2.7.

Probe can be “hot swapped”. Probe is only powered by Base Unit.

Base Unit will conduct BIT on probe every 5 seconds automatically. If a system error or notification message is displayed go to Chapter 9 for descriptions and instructions for those messages.

4.2.2 Connect Beta Photon Probe to Base Unit

- (1) Remove Beta Photon Probe and Common Probe Cable from transit case.

NOTE

Both ends of Common Probe Cable are compatible with connectors located on RDS Probes and Base Unit.

- (2) Connect Common Probe Cable to Base Unit (Section 4.1.1).

NOTE

There will be a few seconds delay between connecting or swapping a probe before correct radiation reading panel will be shown on Base Unit Home screen while probe and Base Unit communicate and exchange information.

- (3) Connect Common Probe Cable to probe.

- (a) Remove connector protective cap from probe connector (Figure 4.2).

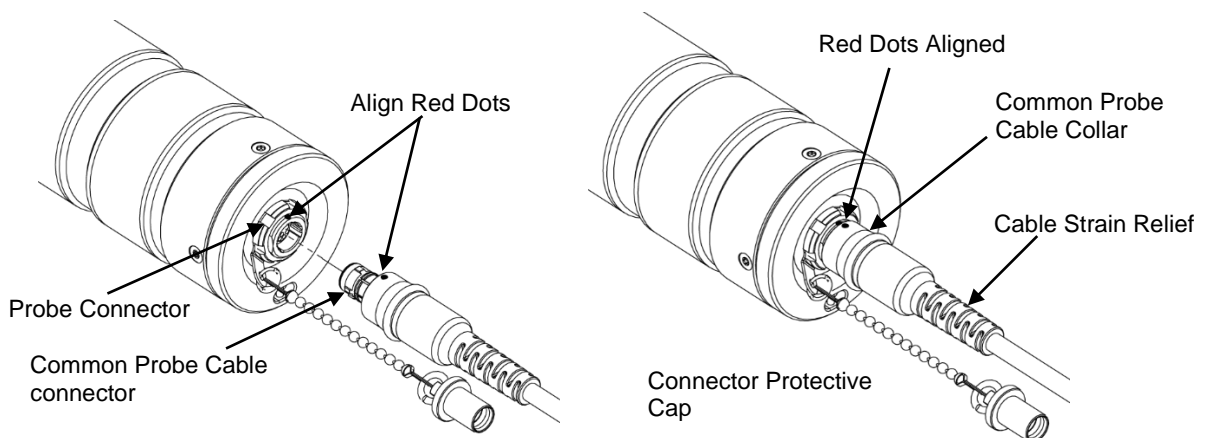



Figure 4.2. Common Probe Cable Connector Alignment.

- (b) Align red dot on connector to red dot on Common Probe Cable (Figure 4.2).

(c) Insert until fully seated.

- (4) Power Base Unit on by pressing the Home/Power  key.
- (5) Check that Base Unit is displaying Beta Photon Probe icon on bottom of Home screen.
- (6) Perform troubleshooting if no probe or incorrect probe icon is displayed (Section 9.2.10).
- (7) Configure Beta Photon Probe for use (Sections 4.2.4, 4.2.5, and 4.2.6).
- (8) Perform Beta Photon Probe source check (Section 4.2.7).

4.2.3 Beta Photon Probe Measurement Units

Radiation measurement units for Beta Photon Probe are listed in Table 4.1. To view a list of acronyms and abbreviations, see Section 1.1.8. To view Beta Photon Probe specifications and detection ranges, see Table 2.2.






Table 4.1. Radiation Measurement Units for Beta Photon Probe.

Units	Abbreviation	Type
Roentgens per hour	R/hr	Exposure
Rads per hour	Rad/hr	Absorbed dose
Grays per hour	Gy/hr	Absorbed dose
Rems per hour	rem/hr	Dose Equivalent
Sieverts per hour	Sv/hr	Dose Equivalent
Counts per minute	cpm	Counts
Counts per second	cps	Counts

4.2.4 Select Energy Windows to Display on Home Screen

Display of Beta Photon Probe readings can be set to either left side of the Home screen or right side of Home screen based on operator preference or direction from your local standard operating procedures.

(1) Navigate to Advanced Settings in Settings menu (Figure 4.3).

- (a) Press Menu  key.
- (b) Use Arrow  keys to highlight Settings icon on Main Menu.
- (c) Press Enter  key.
- (d) Highlight the Advanced button using the Arrow  keys.
- (e) Press Enter  key.

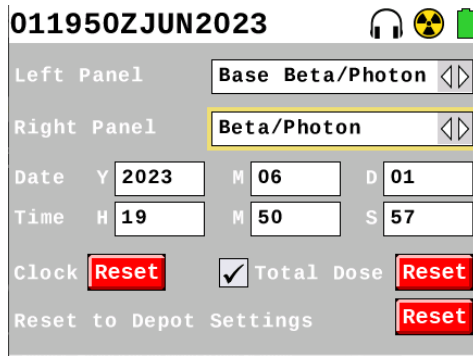



Figure 4.3. Energy Window Selection Example.

- (2) Select from options given (Figure 1) either Base Unit (“Base Beta/Photon”) or Beta Photon Probe (“Beta/Photon”) to display on Left Panel of Home screen.
- (3) Select from options given (Figure 1) either Base Unit (“Base Beta/Photon”) or Beta Photon Probe (“Beta/Photon”) to display on Right Panel of Home screen.
- (4) Return to Home screen by pressing Home/Power  key.

4.2.5 Verify Radiation Measurement Units

- (1) Verify measurement units required for mission are correct in accordance with your local standard operating procedures.
 - (a) View radiation reading panel on Home screen (Figure 4.4) and note radiation units displayed.
 - (b) Compare radiation measurement units displayed to mission requirements in your local standard operating procedures or instructions.

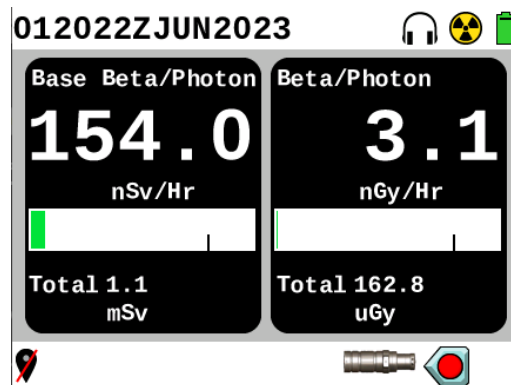


Figure 4.4. Home Screen Beta Photon Probe Attached Example.

- (2) Change radiation measurement units as necessary (Section 3.17.8).

4.2.6 Verify Alarm Thresholds

Alarm Thresholds screen will only display for 5 seconds and then display will return to Home screen. Radiation measurement units may vary depending on operator configured settings.

- (1) Press Back  key from Home screen to display alarm thresholds (Figure 4.5).

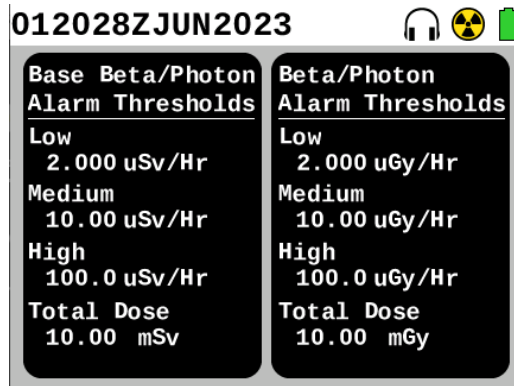


Figure 4.5. Alarm Threshold Screen Example.

- (2) Check alarm thresholds against values provided in your local standard operating procedures.
- (3) If alarm thresholds are incorrect, make adjustments as necessary (Section 3.17.8).

4.2.7 Beta Photon Probe Source Check

WARNING



Cesium (Cs)-137 Check Source. Avoid prolonged use of Check Sources, return them to case or other protective location promptly after each use to minimize exposure. Do not ingest source. Do not attempt to open or crush source housing. Do not handle damaged sources. The cesium (Cs-137) check source contains less than 1 microCurie (μCi) of Cs-137. Coordinate disposal with your Radiation Safety Officer (RSO). Failure to comply may result in injury.

Performing a source check validates functionality of detectors in Beta Photon Probe. Placing a gamma radiation source that contains a very small amount of radiation close to detectors in probe and conducting a Rad Test validates readiness of probe to perform missions. Rad Test verifies both low dose GM tube and high dose GM tube functionality in the Beta Photon Probe when it is attached to the Base Unit. Source checks shall be completed pre-operation, post-operation, and post-maintenance. Before performing a source check, verify age of Cs-137 check source is less than 30 years.

- (1) Ensure beta window cap is installed on probe.
- (2) Locate Cs-137 check source (Figure 4.6).



Figure 4.6. Cs-137 Check Source Labeled Side.

- (3) Place Cs-137 check source non-labeled side on low dose detector center mark (line that circumscribes the top of probe) with label facing away from probe (Figure 4.7).

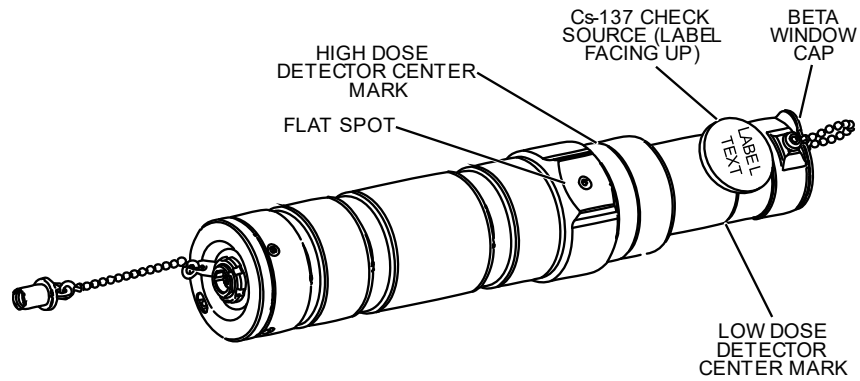





Figure 4.7. Cs-137 Check Source Placement on Low Dose Center Mark (Cable Omitted for Clarity).

- (4) Acknowledge alarm by pressing Enter  key, as applicable.
- (5) Hold check source in place for at least 30 seconds allowing reading to settle.
- (6) Check value shown on Base Unit Home screen. Displayed value shall fall within range of 3 to 20 $\mu\text{Gy/hr}$ if age of Cs-137 check source is less than 30 years.
- (7) Perform troubleshooting if reading does not fall within range (Section 9.2.11).
- (8) Press Menu  key on Base Unit.
- (9) Highlight Health icon (Figure 4.8) using Arrow  keys.

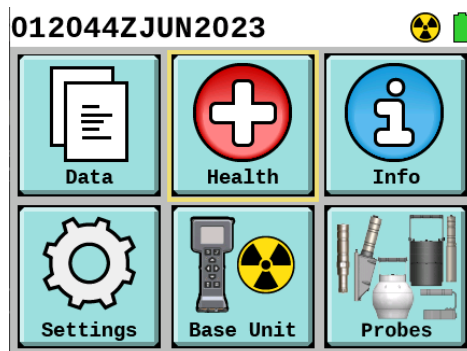




Figure 4.8. Health Icon on Main Menu Highlighted.

- (10) Press Enter  key.
- (11) Highlight Rad Test button (Figure 4.9) using Arrow  keys.

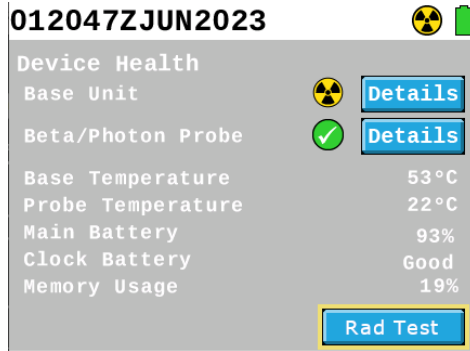


Figure 4.9. Rad Test Button Highlighted on Device Health Screen.

(12) Move Cs-137 check source to be placed directly on high dose detector center mark (line that circumscribes the probe just above the flat spot) (Figure 4.10).

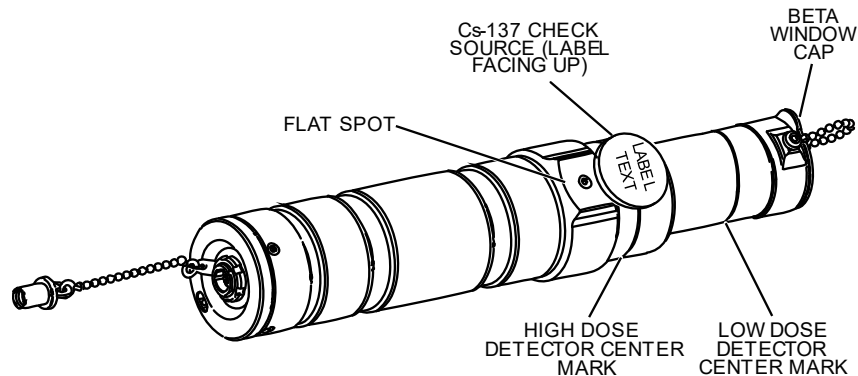


Figure 4.10. Cs-137 Check Source Placement on High Dose Center Mark (Cable Omitted for Clarity)

- (13) Acknowledge alarm by pressing Enter key, as applicable.
- (14) Press Enter key.
- (15) Leave Beta Photon Probe in direct contact with Cs-137 check source for up to one minute.
- (16) Confirm following for Beta Photon Probe:
- Probe L Cnt (Beta Photon Probe Low Dose GM Tube Count) value displays at least 250 counts and no more than 5000 counts and displays "PASS" (Figure 4.11).
 - Probe H Cnt (Beta Photon Probe High Dose GM Tube Count) value displays at least one count or higher and displays "PASS" (Figure 4.11).

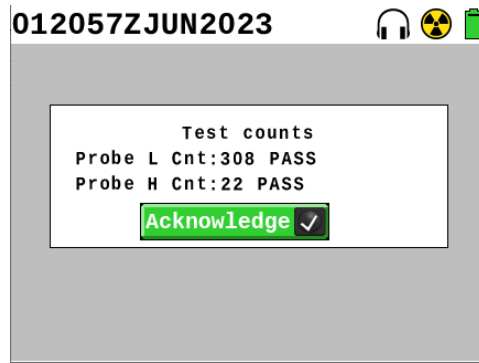


Figure 4.11. Rad Test for Beta Photon Probe Example.

- (17) Press Enter key to acknowledge.
- (18) Send to maintenance if low dose detector is not in range listed above for replacement of the low dose detector or perform troubleshooting if high dose detector counts remain at zero for more than one minute (Section 9.2.11).
- (19) Return Cs-137 check source to its storage in transit case.

4.2.8 Beta Photon Probe Operation and Orientation

When large changes in level of radiation are encountered, Base Unit automatically changes ranges to appropriate detection level.

Beta Photon Probe low dose GM tube is not calibrated for beta dose. Beta measurement is only to be used to confirm presence of beta radiation. Beta radiation only has a range of a few inches in air. Beta Photon Probe in this configuration is directional with beta detection only at end of probe with beta window cap removed.

If there is a noticeable increase in radiation reading with beta window cap removed, it is an indication that beta radiation may be present.

Base Unit automatically auto-ranges full scale reading to accommodate new levels. Operators must pay attention to the metric prefixes on the units of measure to ensure the reading is understood.

- (1) Orient Beta Photon Probe with flat spot (Figure 4.10) pointing at suspected radiological source when monitoring for photon or gamma radiation.
- (2) Keep hand(s) on probe handle (Figure 4.12) when performing operations to prevent shielding probe with your body and affecting radiation reading.



Figure 4.12. Beta Photon Probe with Beta Window Placed on Magnetic Area.

CAUTION



Beta Window Beta Photon Probe. Do not place anything inside the beta window of the Beta Photon Probe. Do not place the Beta Photon Probe window directly on top of the check source or any object with the beta window cap off. Doing so may damage the low dose GM tube or cause an object to become wedged inside the beta window obscuring readings. Failure to comply may cause damage to Beta Photon Probe.

- (3) Orient end with beta window cap pointing at suspected radiological source when monitoring to detect if beta radiation is present.
 - (a) Remove beta window cap (Figure 4.12) to check for beta radiation.
 - (b) Place beta window cap (Figure 4.12) against magnetic area on side of probe.
 - (c) Observe reading on Home screen with beta window cap removed to see if reading increased.
 - (d) Install beta window cap.
 - (e) Observe reading on Home screen with beta window cap installed to see if reading decreased.
 - (f) Determine if beta radiation is present by noting if there was a difference between readings, higher than when beta window cap off than when beta window cap on, indicates beta radiation is present.

4.2.9 Disconnect Common Probe Cable from Probe

- (1) Disconnect Common Probe Cable from probe.



CAUTION

Common Probe Cable. Do not try to disconnect Common Probe Cable by pulling on cable strain relief. Failure to comply may cause damage to Common Probe Cable, Base Unit, or probe.

- (a) Grasp Common Probe Cable collar (Figure 4.13) and pull.



Figure 4.13. Common Probe Cable Collar.

- (b) Install connector protective cap on probe connector.

- (2) Disconnect Common Probe Cable from Base Unit (Section 4.1.2).
- (3) Place Beta Photon Probe and Common Probe Cable into transit case.

Section 3 Alpha-Beta Probe Preparation for Use and Operation

4.3.1 Alpha-Beta Probe Preparation for Use and Operation

Alpha-Beta Probe Preparation for Use will include Sections: 4.3.2, 4.3.3, 4.3.5, 4.3.6, 4.3.7, and 4.3.8.

Probe can be “hot swapped”. Probe is only powered by Base Unit.

Base Unit will conduct BIT on probe every 5 seconds automatically. If a system error or notification message is displayed go to Chapter 9.

Alpha-Beta Probe is used to monitor for alpha and beta radiation. Both alpha and beta radiation have a very short range in air. Alpha/beta monitoring is performed with face of probe in close proximity to area being monitored for contamination.

4.3.2 Connect Alpha-Beta Probe to Base Unit

- (1) Remove Alpha-Beta Probe and Common Probe Cable from transit case.

NOTE

Both ends of Common Probe Cable are compatible with connectors located on RDS probes and Base Unit.

- (2) Connect Common Probe Cable to Base Unit (Section 4.1.1).



CAUTION

Alpha-Beta Probe. Do not attach Alpha-Beta Probe to Telescoping Pole or attempt to use it with Telescoping Pole. Failure to comply will result in damage to Alpha-Beta Probe.

NOTE

There will be a few seconds delay between connecting or swapping a probe before correct display will be shown on Base Unit Home screen while probe and Base Unit communicate and exchange information.

- (3) Connect Common Probe Cable to probe (Figure 4.14).
 - (a) Remove connector protective cap from probe connector.
 - (b) Align red dot on connector to red dot on Common Probe Cable.
 - (c) Insert until fully seated.

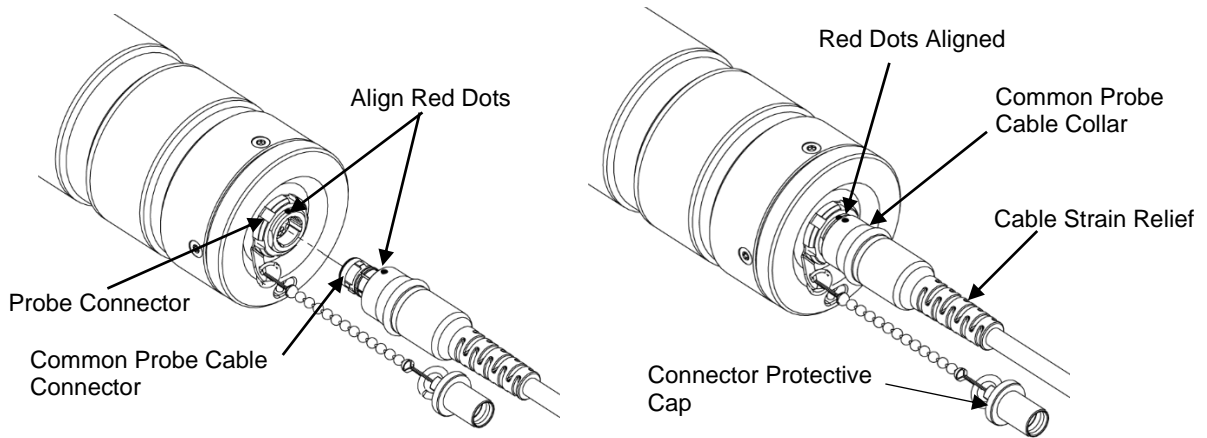



Figure 4.14. Common Probe Cable Connection to Probe.

- (4) Power Base Unit on by pressing the Home/Power  key.
- (5) Check that Base Unit is displaying Alpha-Beta Probe icon on bottom of Home screen and Alpha-Beta readings are displayed on Home screen.
- (6) Complete troubleshooting if no probe or incorrect probe icon is displayed (Section 9.2.12).
- (7) Remove protective cover from Alpha-Beta Probe (Figure 4.15) by sliding it off the front of the probe.

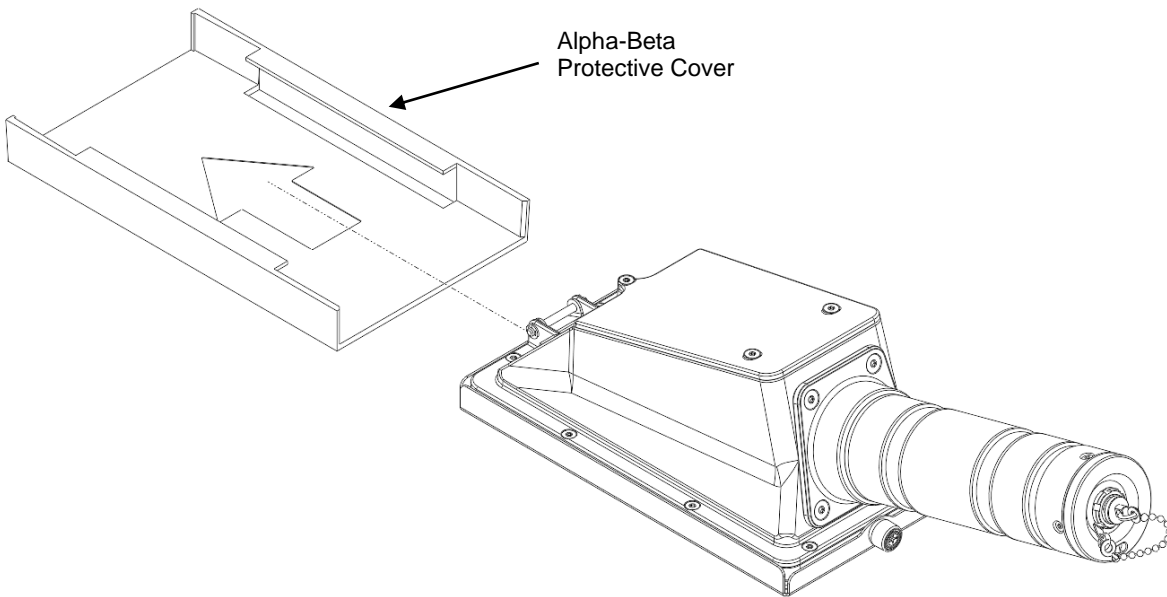


Figure 4.15. Remove and Replace Cover on Alpha-Beta Probe.

- (8) Conduct an Alpha-Beta Probe Light Leak Test (Section 4.3.3).
- (9) Configure Alpha-Beta Probe (Sections 4.3.5, 4.3.6, and 4.3.7).
- (10) Perform Alpha-Beta Probe source checks (Section 4.3.8).

- (11) Replace protective cover on the Alpha-Beta Probe by sliding it onto the probe from the front of the probe (Figure 4.15) until it fully covers the protective grate anytime probe is not in operational use.

4.3.3 Alpha-Beta Probe Light Leak Check

When an operator is using Alpha-Beta Probe in an area that has a known radiation background but alpha and/or beta readings are much higher than expected, there could be a light leak. Light leaks can occur due to even the smallest pin size hole in mylar or from mylar window not being seated properly. A light leak affects the probe's detection capability, causing abnormally high readings in one or both channels and therefore must be fixed before accurate readings can be obtained. The following procedures provide a test for determining if abnormally high readings are due to a light leak.

- (1) Connect the Alpha-Beta Probe to a powered on Base Unit.
- (2) Remove the protective cover from the Alpha-Beta Probe.
- (3) Turn face of Alpha-Beta Probe towards a source of light; if there is a light leak, alpha and/or beta count rates will increase significantly.
- (4) Observe readings, if no significant increase in alpha and or beta count rates, task is complete.
- (5) Verify increased count rates are due to a light leak.
 - (a) Cover the face of the Alpha-Beta Probe with an opaque material such as the protective cover, cardboard, or uniform jacket for 5 minutes.
 - (b) Observe readings, if caused by a light leak, elevated reading will slowly lower.
 - (c) Remove opaque material.
 - (d) Observe readings, if caused by light leak, alpha and/or beta count rate will rise abnormally high again.
- (6) Determine correct troubleshooting steps based on observations.
 - (a) Perform Alpha-Beta Probe troubleshooting in case of a probable light leak in accordance with Section 9.2.14.
 - (b) Perform Alpha-Beta Probe troubleshooting based on "Readings are not accurate" if a light leak is not suspected based on above procedure in accordance with Section 9.2.13.


4.3.4 Alpha-Beta Probe Measurement Units

Radiation measurement units for Alpha-Beta Probe are listed in Table 4.2. To view a list of acronyms and their meaning, see Section 1.1.8. To view Alpha-Beta Probe specifications and detection ranges, see Table 2.4.


Table 4.2. Radiation Measurement Units for Alpha-Beta Probe.

Units	Abbreviation	Type
Counts per minute	cpm	Counts
Counts per second	cps	Counts
Counts per second / square centimeter	cps/cm ²	Counts / Area
Counts per minute / square centimeter	cpm/cm ²	Counts / Area


4.3.5 Select Energy Windows to Display on Home Screen

Alpha-Beta Probe has two channels that are reported from: Alpha and Beta. Home screen can contain two reading screens at a time. Which two reading screens between Base Unit, Alpha channel or Beta channel to display is based on user preference or direction from your local standard operating procedures. The third channel that is not displayed (Base Unit, Alpha channel or Beta channel) may be toggled to right side of Home screen as needed by pressing Enter  key.


(1) Navigate to Advanced Settings in Settings menu (Figure 4.16).

(a) Press Menu  key.

(b) Use Arrow  keys to highlight Settings icon on Main Menu.

(c) Press Enter  key.

(d) Highlight the Advanced button using the Arrow  keys to modify Advanced Settings.

(e) Press Enter  key.

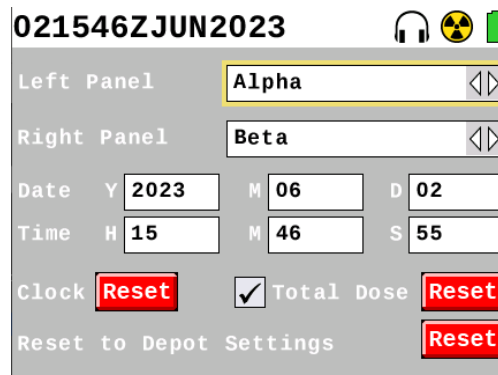




Figure 4.16. Energy Window Selection Example.

(2) Select from options given (Figure 1) either Base Unit (“Base Beta/Photon”), Alpha Channel (“Alpha”), or Beta Channel (“Beta”) to display on Left Panel of Home Screen.

(3) Select from options given (Figure 1) either Base Unit (“Base Beta/Photon”), Alpha Channel (“Alpha”), or Beta Channel (“Beta”) to display on Left Panel of Home Screen.

(4) Return to Home screen by pressing Home/Power  key.

(5) Press Enter  key to toggle between Right Panel selection on home screen and option that was not set for Left or Right Panel as needed.

4.3.6 Verify Radiation Measurement Units

(1) Verify measurement units required for mission are correct in accordance with your local standard operating procedures.

(a) View radiation reading panel on Home screen (Figure 4.17) and note radiation units displayed.

- (b) Compare radiation measurement units displayed to mission requirements in your local standard operating procedures.

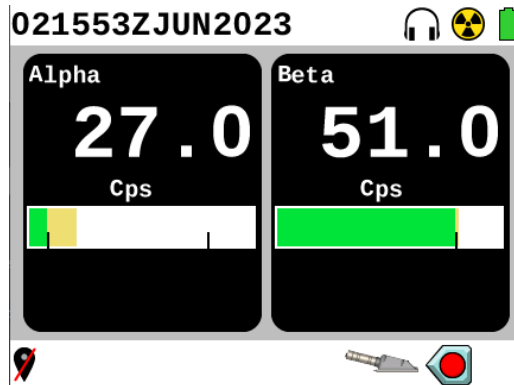



Figure 4.17. Alpha-Beta Probe Home Screen Example.

- (2) Change radiation measurement units as necessary (Section 3.17.8).

4.3.7 Verify Alarm Thresholds

Alarm Thresholds screen will only display for 5 seconds and then display will return to Home screen. Radiation measurement units may vary depending on operator configured settings.

- (1) Press the Back  key while on the Home screen to display alarm thresholds (Figure 4.18).
(2) Verify screen shows Alarm Thresholds (Figure 4.18).

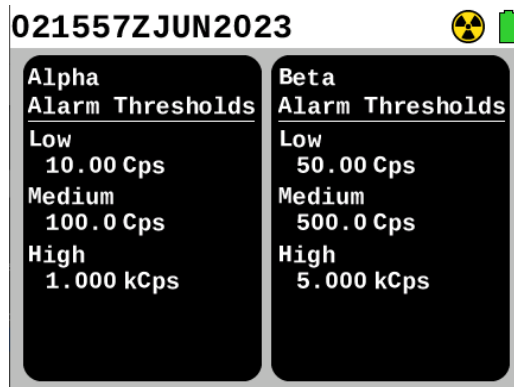


Figure 4.18. Alarm Thresholds Screen Example.

- (3) Check alarm thresholds against values provided in your local standard operating procedures.
(4) If alarm thresholds are incorrect, make adjustments as necessary (Section 3.17.8).

4.3.8 Alpha-Beta Probe Beta Source Check

WARNING



Avoid prolonged use of Check Sources, return them to case or other protective location promptly after each use to minimize exposure. Do not ingest source. Do not attempt to open or crush source housing. Do not handle damaged sources. The cesium (Cs-137) check source contains less than 1 microCurie (μCi) of Cs-137. Coordinate disposal of

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check sources with your Radiation Safety Officer (RSO). Failure to comply may result in injury.

NOTE

If performing this source check after replacing mylar window, wait at least 2 hours after replacing before completing source check. After replacement and completing this check, increase background monitoring frequency for up to 12 hours while background levels gradually decay as light saturation of Alpha-Beta Probe scintillator slowly dissipates.

Performing a source check validates functionality of detectors in Alpha-Beta Probe. Placing radiation check sources that contain a very small amount of radiation close to detectors in probe and conducting a Rad Test validates readiness of probe to perform missions. Source checks shall be completed pre-operation, post-operation, and post-maintenance. Before performing source check, verify age of Cs-137 is less than 30 years old.


- (1) Press Home/Power  key.
- (2) Locate Cs-137 check source (Figure 4.19).



Figure 4.19. Cs-137 Check Source, Labeled Side.

- (3) Place labeled side of Cs-137 check source away from face of detector.
- (4) Place Cs-137 check source in direct contact with Alpha-Beta Probe protective grate in center (Figure 4.20) with labeled side away from detector.

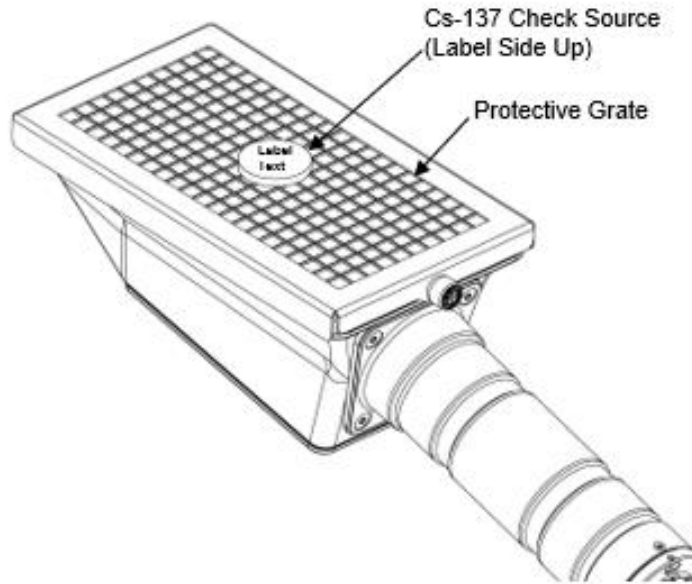





Figure 4.20. Cs-137 Check Source Position.

(5) Acknowledge alarm by pressing Enter  key, as applicable.

(6) Press Menu  key.

(7) Highlight Data icon (Figure 4.21) using Arrow  keys.

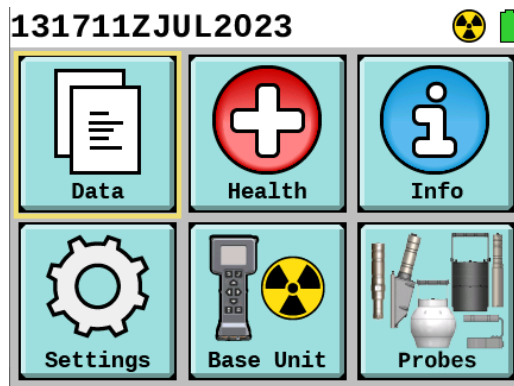



Figure 4.21. Main Menu with Data Icon Highlighted.

(8) Press Enter  key.

(9) Highlight Log Settings icon (Figure 4.22) using Arrow  keys.

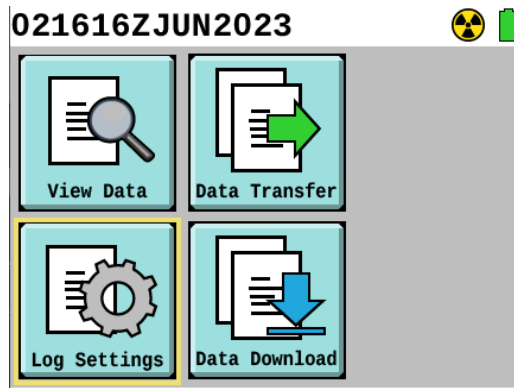



Figure 4.22. Log Settings Icon Highlighted.

(10) Press Enter  key.

(11) Use the Arrow  keys to select/highlight Scaler Data Log Mode (Figure 4.23).

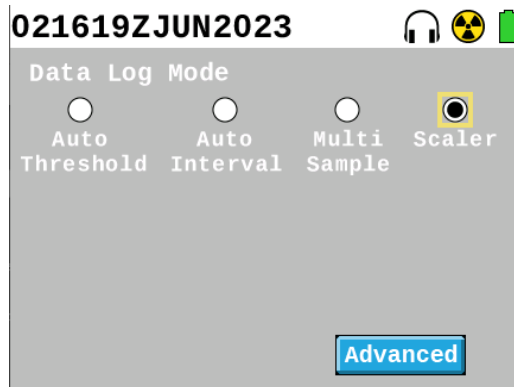



Figure 4.23. Highlight Scaler Mode.

(12) Highlight Advanced button (Figure 4.24) using Arrow  keys.

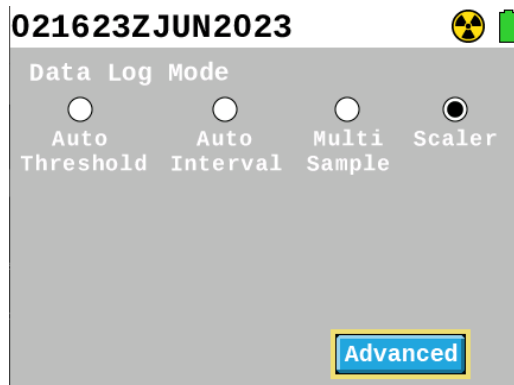



Figure 4.24. Highlight Advanced Button.

(13) Press Enter  key.

(14) Press Enter  key to set Scaler Duration (Figure 4.25).

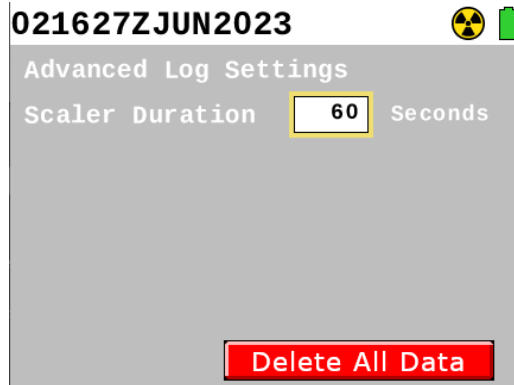





Figure 4.25. Scaler Duration Screen.


(15) Set Scaler Duration to 30 seconds.


(a) Press Enter  key.

(b) Highlight 3 using Arrow  keys.

(c) Press Enter  key.

(d) Highlight 0 using Arrow  keys.

(e) Press Enter  key.

(f) Highlight Done button using Arrow  keys.

(g) Press Enter  key.

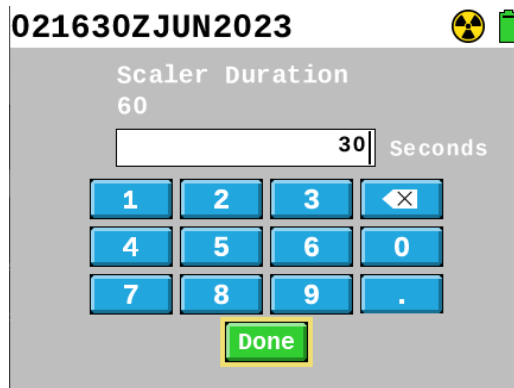


Figure 4.26. Set Scaler Duration to 30 Seconds.


(16) Press Home/Power  key to return to Home screen (Figure 4.27).



Figure 4.27. Home Screen with Scaler Mode Enabled.

NOTE

Counts for both the Alpha and Beta detection will display zero before you start taking readings while in the Scaler Data Logging mode for the first scaler reading. After starting a data log in Scaler mode, the counts should increase for the Beta channel as this is a beta source check. If they do not increase by the end of the 30 second data logging duration, perform troubleshooting (Section 9.2.13).











- (17) Press Left Arrow  key to start the scaler count.
- (18) Hold check source in place (Figure 4.20) for the duration of the scaler reading (countdown of 30 seconds).
- (19) Note the number of counts reported in the Beta radiation reading panel (Figure 4.28) at the end of the 30 second count.



Figure 4.28. Beta Reading within Range.

- (20) Verify radiation reading value falls within range of 13 kCounts to 95 kCounts.
- (21) Perform troubleshooting if reading does not fall within range (Section 9.2.13).
- (22) Change settings back to Auto Threshold Data Log Mode.
- (a) Press Menu  key.
 - (b) Highlight Data icon (Figure 4.21) using Arrow  keys.
 - (c) Press Enter  key.
 - (d) Highlight Log Settings icon (Figure 4.22) using Arrow  keys.
 - (e) Press Enter  key.
 - (f) Use the Arrow  keys to highlight Auto Threshold Data Log Mode.
 - (g) Press Home/Power  key to return to Home screen.
- (23) Press Menu  key on Base Unit.

(24) Highlight Health icon (Figure 4.29) using Arrow  keys.

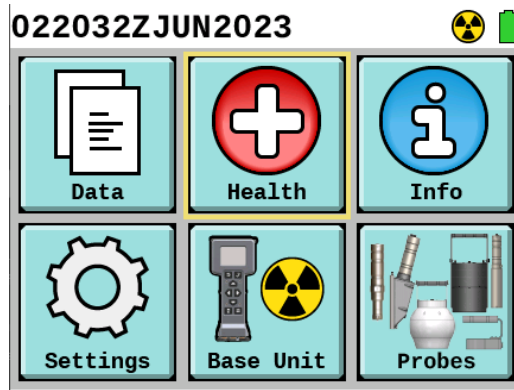



Figure 4.29. Health Icon Highlighted on Main Menu.

(25) Press Enter  key.

(26) Highlight Rad Test button (Figure 4.30) using Arrow  keys.

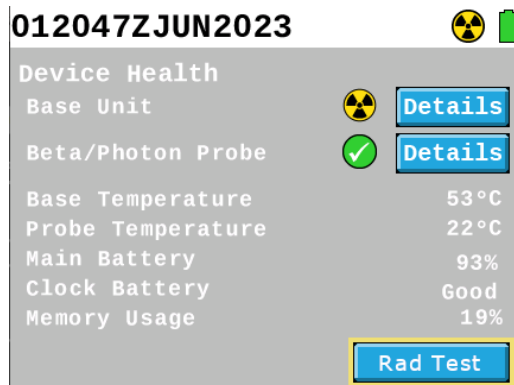



Figure 4.30. Rad Test Button Highlighted.

(27) Press Enter  key.

(28) Leave Alpha-Beta Probe in direct contact with Cs-137 check source for up to one minute.

(29) Acknowledge alarm by pressing Enter  key, as applicable.

(30) Verify that Probe Beta Cnt value displays at least one count or higher and displays PASS (Figure 4.31).

NOTE

Probe Alpha Cnt may or may not have counts as Cs-137 Check Source does not produce alpha radiation at a significant amount to be read. The Rad Test will check the functionality of the detector to read particles and therefore is an indicator it is functioning

for both alpha and beta radiation. An alpha specific source check is not required to verify the detector is working and will record alpha radiation counts.

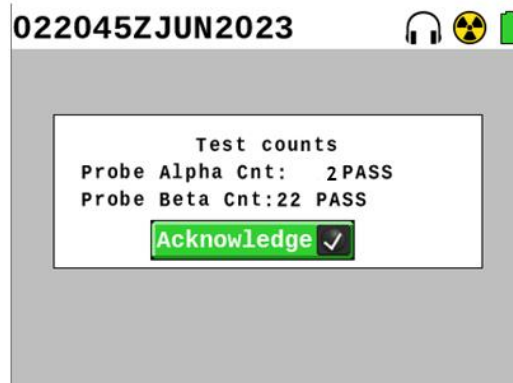



Figure 4.31. Rad Test Showing Beta Detector Counts Example.

- (31) Press Enter  key to acknowledge.
- (32) Perform troubleshooting if Probe Beta Cnt detector count remains at zero for more than one minute (Section 9.2.13).
- (33) Return Cs-137 check source to its storage in transit case.

4.3.9 Alpha-Beta Probe Operation and Orientation

If Alpha channel counts are higher than 90 cpm, Beta channel counts are not accurate. To take an accurate Beta measurement in such circumstances, a piece of paper may be placed between Alpha-Beta Probe and contamination surface.

CAUTION



The Alpha-Beta Probe mylar window (underneath protective grate and mesh screen) is very thin. If this layer is penetrated, the performance of Alpha-Beta Probe will degrade or cease to function altogether. Avoid direct contact with surface being monitored to prevent damaging mylar window and/or contamination of probe face. Do not wipe or clean the mylar window, replace as necessary. Failure to comply may result in inaccurate readings and damage to the probe.

- (1) Hold Alpha-Beta Probe by handle.
- (2) Hold probe close to suspected contaminated surface at height determined by your local standard operating procedures and move at a pace determined in accordance with your local standard operating procedures.

4.3.10 Disconnect Common Probe Cable

- (1) Disconnect Common Probe Cable from probe.

CAUTION



Do not try to disconnect Common Probe Cable by pulling on cable strain relief. Failure to comply may cause damage to Common Probe Cable, Base Unit, or probe.

- (a) Grasp Common Probe Cable collar (Figure 4.32) and pull.



Figure 4.32. Common Probe Cable Collar.

- (b) Install connector protective cap on probe connector.
- (2) Disconnect Common Probe Cable from Base Unit (Section 4.1.2).
- (3) Replace protective cover on the Alpha-Beta Probe by sliding it onto the probe from the front of the probe until it fully covers the protective grate.
- (4) Place Alpha-Beta Probe and Common Probe Cable into transit case.

Section 4 Small Area Beta Gamma Probe Preparation for Use and Operation

4.4.1 SABG Probe Preparation for Use

SABG Probe Preparation for Use will include Sections: 4.4.2, 4.4.3, 4.4.4, 4.4.5, 4.4.6, and 4.4.7.

Probe can be “hot swapped”. Probe is only powered by Base Unit.

Base Unit will conduct BIT on probe every 5 seconds automatically. If a system error or notification message is displayed go to Chapter 9.

4.4.2 Connect SABG Probe to Base Unit

- (1) Remove SABG Probe and Common Probe Cable from transit case.

NOTE

Both ends of Common Probe Cable are compatible with connectors located on RDS Probes and Base Unit.

- (2) Connect Common Probe Cable to Base Unit (Section 4.1.1).

NOTE

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There will be a few seconds delay between connecting or swapping a probe before the applicable radiation reading panel will be shown on Base Unit Home screen while probe and Base Unit communicate and exchange information.

- (3) Connect Common Probe Cable to probe (Figure 4.33).
 - (a) Remove connector protective cap from probe connector.
 - (b) Align red dot on connector to red dot on Common Probe Cable.
 - (c) Insert until fully seated.

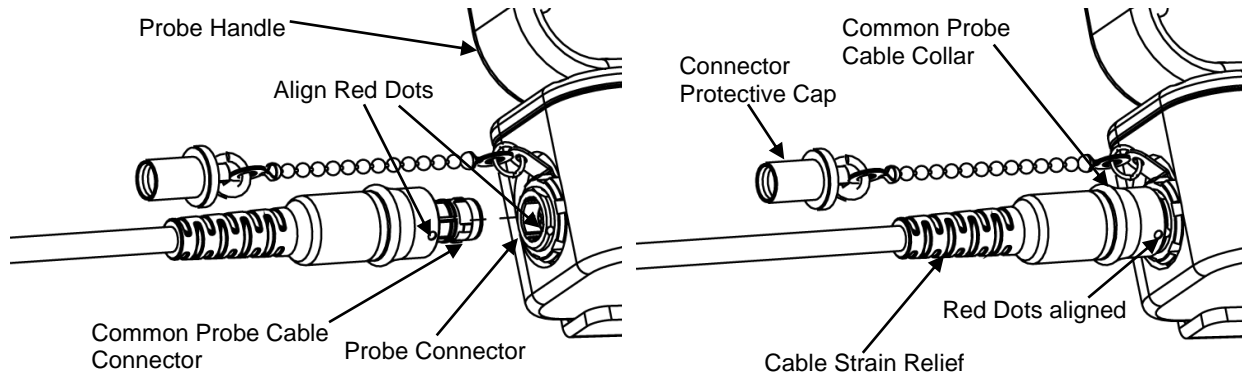



Figure 4.33. Common Probe Cable Alignment.

- (4) Power Base Unit on by pressing the Home/Power  key.
- (5) Check that Base Unit is displaying SABG Probe icon on bottom of Home screen.
- (6) Perform troubleshooting if no probe or incorrect probe icon is displayed (Section 9.2.15).
- (7) Configure SABG Probe for use (Sections 4.4.4, 4.4.5, and 4.4.6).
- (8) Perform SABG Probe source check (Section 4.4.7).

4.4.3 SABG Probe Measurement Units

Radiation measurement units for SABG Probe are listed in Table 4.3. To view a list of acronyms and their meaning, see Section 1.1.8. To view SABG Probe specifications and detection ranges, see Table 2.3.






Table 4.3. Radiation Measurement Units for Small Area Beta Gamma Probe.

Units	Abbreviation	Type
Counts per minute	cpm	Counts
Counts per second	cps	Counts
Counts per second / square centimeter	cps/cm ²	Counts / Area
Counts per minute / square centimeter	cpm/cm ²	Counts / Area

4.4.4 Select Energy Windows to Display on Home Screen

Display of SABG Probe readings can be set to either left side of Home screen or right side of Home screen based on operator preference or direction from your local standard operating procedures.

- (1) Navigate to Advanced Settings in Settings menu (Figure 4.34).

- (a) Press Menu  key.
- (b) Use Arrow  keys to highlight Settings icon on Main Menu.
- (c) Press Enter  key.
- (d) Highlight the Advanced button using the Arrow  keys to modify Advanced Settings.
- (e) Press Enter  key.

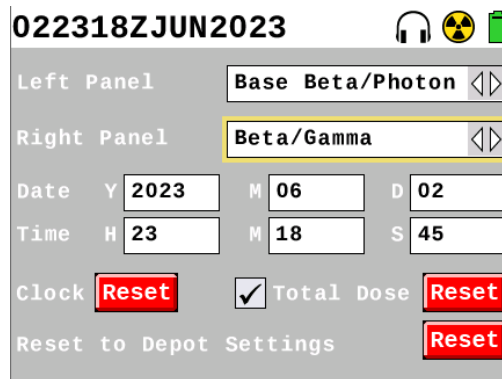



Figure 4.34. Energy Window Selection Example.

- (2) Select from options given (Figure 4.34) either Base Unit (“Base Beta/Photon”) or Small Area Beta Gamma (“Beta/Gamma”) to display on Left Panel of Home screen.
- (3) Select from options given (Figure 4.34) either Base Unit (“Base Beta/Photon”) or Small Area Beta Gamma (“Beta/Gamma”) to display on Right Panel of Home screen.
- (4) Return to Home screen by pressing Home/Power  key.

4.4.5 Verify Radiation Measurement Units

- (1) Verify measurement units required for mission are correct in accordance with (IAW) your local standard operating procedures.
 - (a) View radiation reading panel on Home screen (Figure 4.35) and note radiation units displayed.

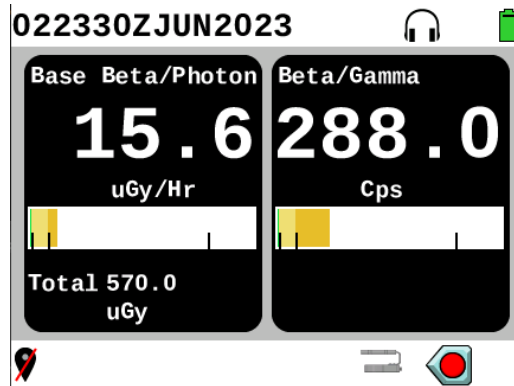


Figure 4.35. SABG Probe Home Screen Example.

(b) Compare radiation measurement units displayed to mission requirements in your local standard operating procedures or instructions.

(2) Change radiation measurement units as necessary (Section 3.17.8).

4.4.6 Verify Alarm Thresholds

Alarm Thresholds screen will only display for 5 seconds and then display will return to Home screen. Radiation measurement units may vary depending on operator configured settings.


(1) Press Back  key from Home screen to display alarm thresholds (Figure 4.36).



Figure 4.36. Alarm Threshold Screen Example.

(2) Verify screen shows Alarm Thresholds.

(3) Check alarm thresholds against values provided in your local standard operating procedures.

(4) Make necessary adjustments to incorrect alarm thresholds (Section 3.17.8).

4.4.7 SABG Probe Source Check

WARNING

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Cesium (Cs)-137 Check Source. Avoid prolonged use of Check Sources, return them to case or other protective location promptly after each use to minimize exposure. Do not ingest source. Do not attempt to open or crush source housing. Do not handle damaged sources. The cesium (Cs-137) check source contains less than 1 microCurie (μCi) of Cs-137. Coordinate disposal with your Radiation Safety Officer (RSO). Failure to comply may result in injury.


Performing a source check validates functionality of the pancake GM tube detector in the SABG Probe. Placing a gamma radiation source that contains a very small amount of radiation close to the detector in the probe and conducting a Rad Test validates readiness of the probe to perform missions. The Rad Test verifies pancake GM tube functionality in the SABG Probe when it is attached. Source checks shall be completed pre-operation, post-operation, and post-maintenance. Before performing a source check, verify age of Cs-137 check source is less than 30 years. Coordinate disposal of check sources with your Radiation Safety Officer (RSO).

- (1) Verify ambient temperature is above 0°C (32°F).
- (2) Locate Cs-137 check source (Figure 4.37).



Figure 4.37. Cs-137 Check Source, Labeled Side.

- (3) Press Menu  key.

- (4) Highlight Data icon (Figure 4.38) using Arrow  keys.

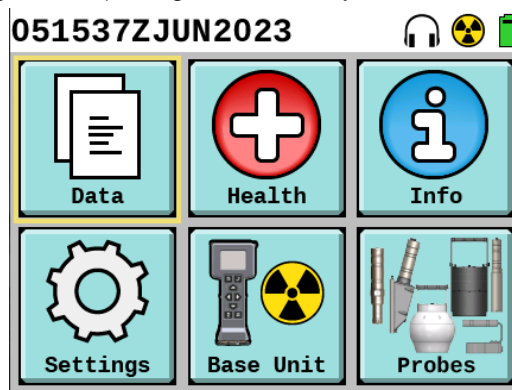



Figure 4.38. Data Icon on Main Menu Highlighted.

- (5) Press Enter  key.

- (6) Highlight Log Settings icon (Figure 4.39) using Arrow  keys.

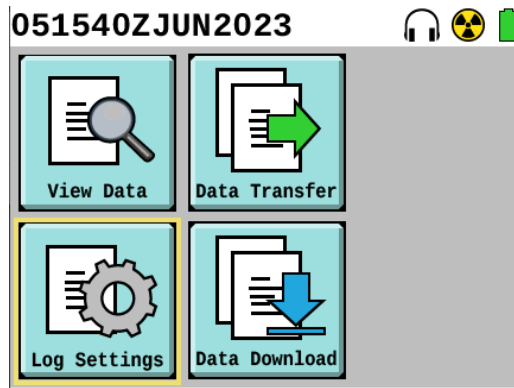



Figure 4.39. Log Settings Highlighted on Data Menu.

(7) Press Enter  key.

(8) Use the Arrow  keys to highlight the Scaler Data Log Mode (Figure 4.40).

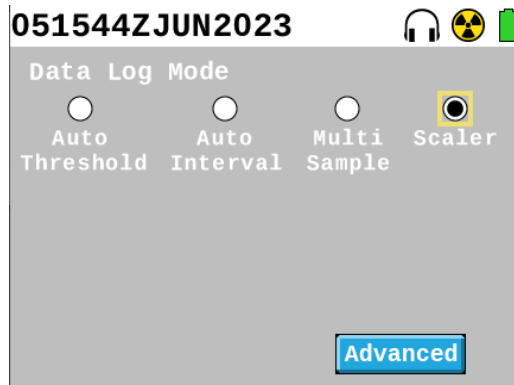


Figure 4.40. Scalar Data Log Mode Highlighted.

(9) Highlight Advanced button using  Arrow keys.

(10) Press Enter  key.

(11) Press Enter  key to set Scaler Duration (Figure 4.41).

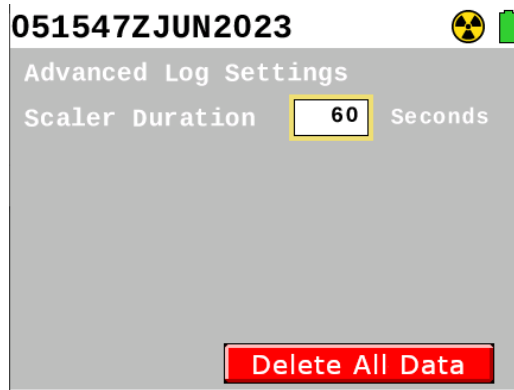



Figure 4.41. Set Scaler Duration.

(12) Set Scaler Duration to 30 seconds (Figure 4.42).

(a) Highlight 3 using Arrow  keys.

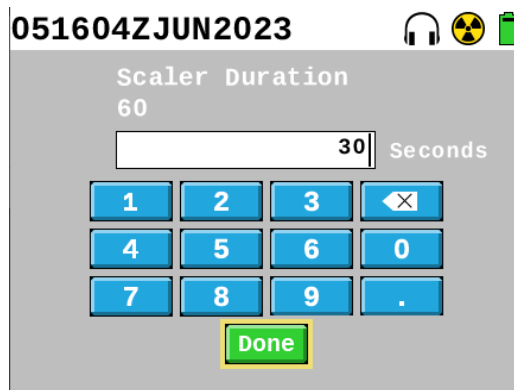





Figure 4.42. Data Entry Screen for Scaler Duration.

(b) Press Enter  key.

(c) Highlight 0 using Arrow  keys.

(d) Highlight Done button using Arrow  keys.

(e) Press Enter  key.

(13) Press Home/Power  key to return to Home screen (Figure 4.43).

NOTE

Counts for both the Base Unit and Beta/Gama (SABG Probe) detection will display zero before you start taking readings while in the Scaler Data Logging mode for the first scaler reading. After starting a data log in Scaler mode, the counts should increase for the Beta/Gamma channel as this is a beta and gamma source check. If they do not increase by the end of the 30 second data logging duration, perform troubleshooting (Section 9.2.16).



Figure 4.43. Home Screen Showing Base Unit and SABG Probe Reading Panels and Scaler Timer.

(14) Remove SABG probe protective cover and place on top of detector housing (Figure 4.44).

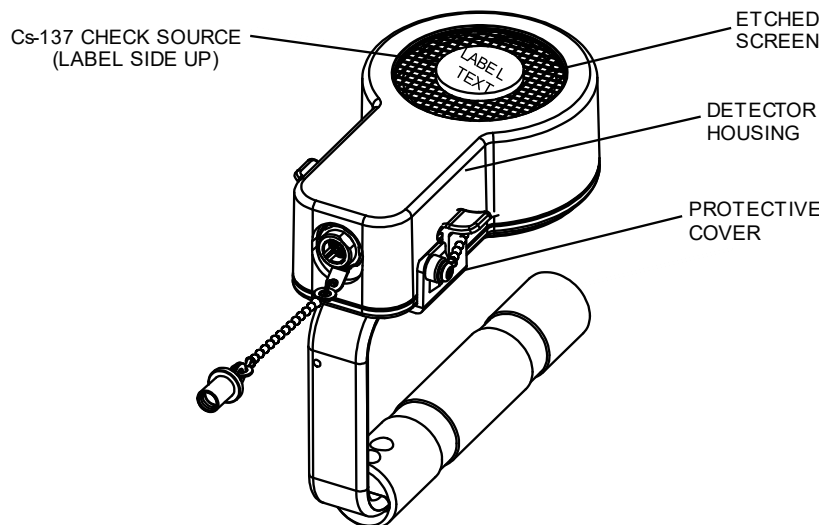



Figure 4.44. Cs-137 Check Source Position (Cable Omitted for Clarity).

(15) Place Cs-137 check source in direct contact with SABG Probe etched screen in center with labeled side facing away from probe (Figure 4.44).

(16) Acknowledge alarm by pressing Enter  key, as applicable.

(17) Press Left Arrow  key to start the scaler count.

(18) Hold check source in place for the duration of the scaler reading (countdown of 30 seconds).


- (19) Note the number of counts reported in the Beta/Gamma radiation reading panel (Figure 4.45) at the end of the 30 second count.





Figure 4.45. Scaler Mode Radiation Reading after 30 Seconds.

- (20) Verify radiation reading value falls within range of 50 kCounts to 165 kCounts if age of Cs-137 check source is no older than 30 years.
- (21) Perform troubleshooting if reading does not fall within range (Section 9.2.16).
- (22) Change settings back to Auto Threshold Data Log Mode.

(a) Press Menu  key.

(b) Highlight Data icon (Figure 4.38) using Arrow  keys.

(c) Press Enter  key.


(d) Highlight Log Settings icon (Figure 4.39) using Arrow  keys.


(e) Press Enter  key.


(f) Use the Arrow  keys to highlight Auto Threshold Data Log Mode.

(g) Press Home/Power  key to return to Home screen.

(23) Press Menu  key.

(24) Highlight Health icon using Arrow  keys.

(25) Press Enter  key.

(26) Highlight Rad Test button (Figure 4.46) using Arrow  keys.

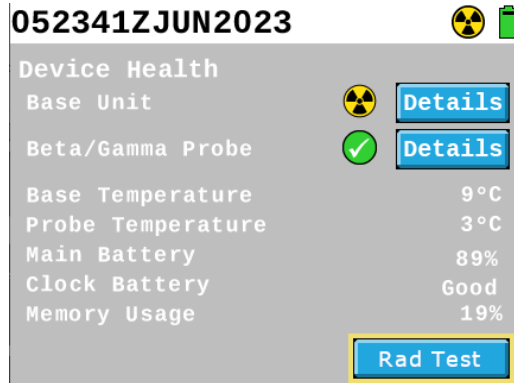



Figure 4.46. Rad Test Button on Device Health Screen.

(27) Press Enter  key.

(28) Place Cs-137 check source in direct contact with SABG Probe etched screen in center with labeled side facing away from probe (Figure 4.44).

(29) Acknowledge alarm by pressing Enter  key, as applicable.

(30) Leave SABG Probe in direct contact with Cs-137 check source for up to one minute.

(31) Verify Probe Cnt value displays at least one count or higher and displays PASS (Figure 4.47).

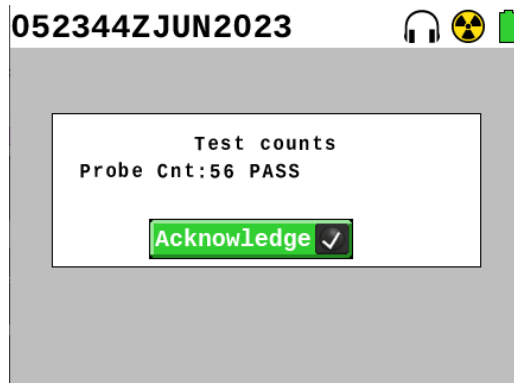


Figure 4.47. Example of Rad Test Screen for SABG Probe.

(32) Press Enter  key to acknowledge.

(33) Perform troubleshooting if detector counts remain at zero for more than one minute (Section 9.2.16).

(34) Return Cs-137 check source to its storage in transit case.

4.4.8 SABG Probe Operation and Orientation

It is important to keep probe from contacting surface or area being surveyed to prevent radiological contamination of probe causing inaccurate readings.

When large changes in level of radiation are encountered, the SABG Probe automatically auto-ranges full scale reading to accommodate new levels. Operators must pay attention to the metric prefixes on the units of measure to ensure the reading is understood.

Due to short range (even in air) of beta radiation, use probe in close proximity to area being monitored.

- (1) Remove protective cover (Figure 4.48, Item 1) from bottom of SABG Probe and place on top, exposing etched screen (Figure 4.48, Item 2).

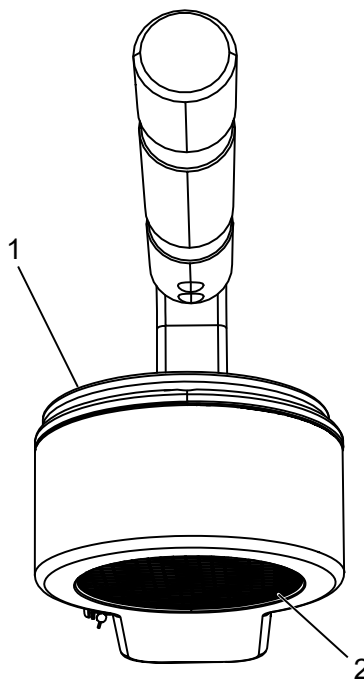


Figure 4.48. SABG Probe Protective Cover Removed.

- (2) Orient etched screen (Figure 4.48, Item 2) towards suspected contaminated surface.

4.4.9 Disconnect Common Probe Cable from Probe



CAUTION

Common Probe Cable. Do not try to disconnect Common Probe Cable by pulling on cable strain relief. Failure to comply may cause damage to Common Probe Cable, Base Unit, or probe.

- (1) Disconnect Common Probe Cable from probe.

- (a) Grasp Common Probe Cable collar (Figure 4.49) and pull.



Figure 4.49. Common Probe Cable Collar.

- (b) Install connector protective cap on probe connector (Figure 4.49).
- (2) Disconnect Common Probe Cable from Base Unit (Section 4.1.2).
 - (3) Place the protective cover on the bottom detector face of the SABG Probe, covering the etched screen.
 - (4) Place SABG Probe and Common Probe Cable into transit case.

Section 5 Sensitive Gamma Probe Preparation for Use and Operation

4.5.1 Sensitive Gamma Probe Preparation for Use

Sensitive Gamma Probe Preparation for Use will include Sections: 4.5.2, 4.5.4, 4.5.5, 4.5.6, and 4.5.7.

Probe can be “hot swapped”. Probe is only powered by Base Unit.

Base Unit will conduct BIT on probe every 5 seconds automatically. If a system error or notification message is displayed go to Chapter 9.

4.5.2 Connect Sensitive Gamma Probe to Base Unit

- (1) Remove Sensitive Gamma Probe and Common Probe Cable from transit case.

NOTE

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Both ends of Common Probe Cable are compatible with connectors located on RDS Probes and Base Unit.

- (2) Connect Common Probe Cable to Base Unit (Section 4.1.1).

NOTE

There will be a few seconds delay between connecting or swapping a probe before the correct radiation reading panel will be shown on Base Unit Home screen while probe and Base Unit communicate and exchange information.

- (3) Connect Common Probe Cable to probe (Figure 4.50).
 - (a) Remove connector protective cap from probe connector (Figure 4.50).
 - (b) Align red dot on connector to red dot on Common Probe Cable (Figure 4.50).
 - (c) Insert until fully seated.

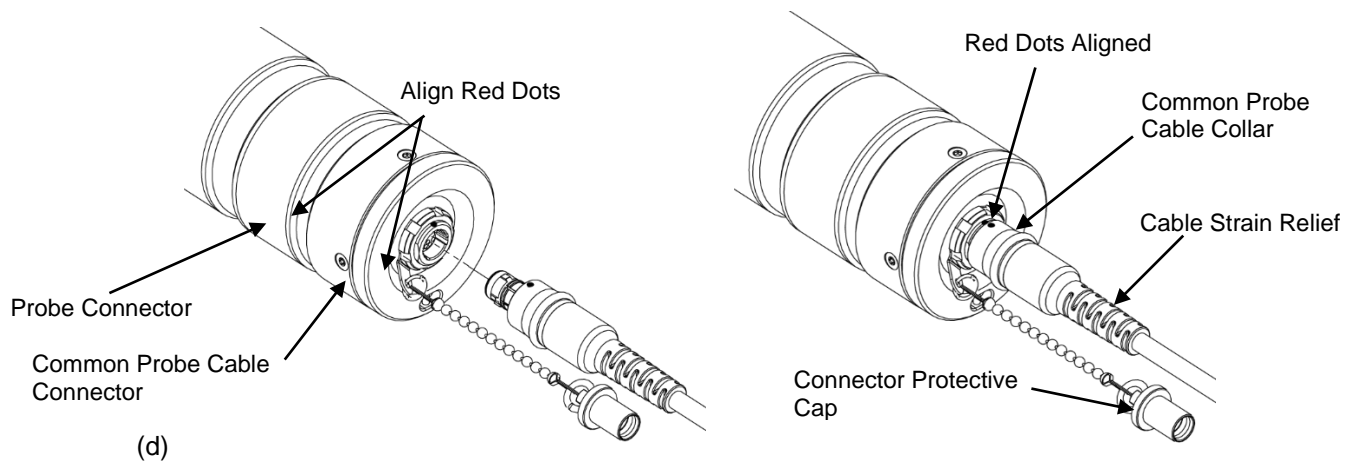



Figure 4.50. Common Probe Cable Connection to Probe.

- (4) Power Base Unit on by pressing the Home/Power  key.
- (5) Check that Base Unit is displaying Sensitive Gamma Probe icon on bottom of Home screen and Sensitive Gamma readings are displayed on Home screen.
- (6) Perform troubleshooting if no probe or incorrect probe icon is displayed (Section 9.2.17).
- (7) Configure Sensitive Gamma Probe (Sections 4.5.4, 4.5.5, and 4.5.6).
- (8) Perform Sensitive Gamma Probe source check (Section 4.5.7).

4.5.3 Sensitive Gamma Probe Measurement Units

Radiation measurement units for the Sensitive Gamma Probe are listed in Table 4.4. To view a list of acronyms and their meaning, see Section 1.1.8. To view Sensitive Gamma Probe specifications and detection ranges, see Table 2.5.

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Table 4.4. Radiation Measurement Units for Sensitive Gamma Probe.

Units	Abbreviation	Type
Counts per minute	cpm	Counts
Counts per second	cps	Counts
Roentgens per hour	R/hr	Exposure

4.5.4 Select Energy Windows to Display on Home Screen


Display of Sensitive Gamma Probe readings can be set to either left side of Home screen or right side of Home screen based on operator preference or direction from your local standard operating procedures.

(1) Navigate to Advanced Settings in Settings menu (Figure 4.51).

(a) Press Menu  key.

(b) Use Arrow  keys to highlight Settings icon on Main Menu.

(c) Press Enter  key.

(d) Highlight the Advanced button using the Arrow  keys to modify Advanced Settings.

(e) Press Enter  key.

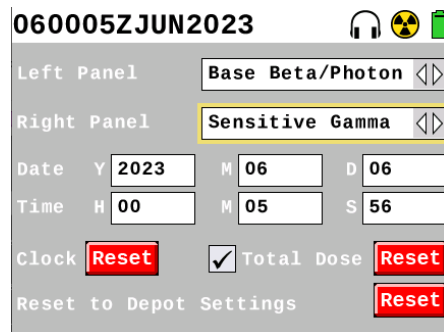



Figure 4.51. Energy Window Selection Example.

(2) Select from options given (Figure 4.51) either Base Unit (“Base Beta/Photon”) or Sensitive Gamma (“Sensitive Gamma”) to display on Left Panel of Home screen.

(3) Select from options given (Figure 4.51) either Base Unit (“Base Beta/Photon”) or Sensitive Gamma (“Sensitive Gamma”) to display on Right Panel of Home screen.

(4) Return to Home screen by pressing Home/Power  key.

4.5.5 Verify Radiation Measurement Units

(1) Verify measurement units required for mission are correct in accordance with your local standard operating procedures.

- (a) View radiation reading panel on Home screen (Figure 4.52) and note radiation units displayed.

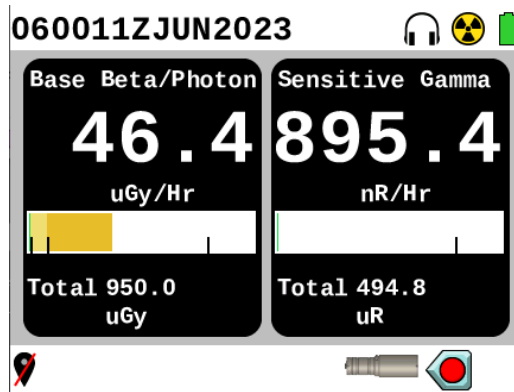


Figure 4.52. Sensitive Gamma Probe Home Screen Example.


- (b) Compare radiation measurement units displayed to mission requirements in your local standard operating procedures or instructions.

- (2) Change radiation measurement units as necessary (Section 3.17.8).

4.5.6 Verify Alarm Thresholds

NOTE

Alarm Thresholds screen will only display for 5 seconds and then display will return to Home screen. Radiation measurement units may vary depending on operator configured settings.

- (1) Press Back  key from Home screen to display alarm thresholds (Figure 4.53).

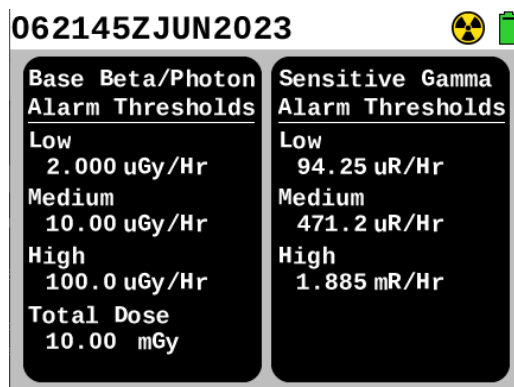


Figure 4.53. Alarm Threshold Screen Example.

- (2) Check alarm thresholds against values provided in your local standard operating procedures.
- (3) Make necessary adjustments to incorrect alarm thresholds as necessary (Section 3.17.8).

4.5.7 Sensitive Gamma Probe Source Check

WARNING



Cesium (Cs)-137 Check Source. Avoid prolonged use of Check Sources, return them to case or other protective location promptly after each use to minimize exposure. Do not ingest source. Do not attempt to open or crush source housing. Do not handle damaged sources. The cesium (Cs-137) check source contains less than 1 microCurie (μCi) of Cs-137. Coordinate disposal with your Radiation Safety Officer (RSO). Failure to comply may result in injury.

Performing a source check validates functionality of detector in Sensitive Gamma Probe. Placing a gamma radiation source that contains a very small amount of radiation close to detector in probe and conducting a Rad Test validates readiness of probe to perform missions. Rad Test verifies scintillator detector functionality in Sensitive Gamma Probe when it is attached to Base Unit. Source checks shall be completed pre-operation, post-operation, and post-maintenance. Before performing a source check, verify age of Cs-137 check source is less than 30 years.

- (1) Locate Cs-137 check source (Figure 4.54).










Figure 4.54. Cs-137 Check Source, Labeled Side.

- (2) Place Cs-137 check source in direct contact with Sensitive Gamma Probe's detector center mark with label facing away from probe (Figure 4.55).



Figure 4.55. Cs-137 Check Source Position on Sensitive Gamma Probe.

- (3) Acknowledge alarm by pressing Enter  key, as applicable.
- (4) Hold check source in place for at least 30 seconds allowing reading to settle.

- (5) Verify radiation reading value falls within range of 150 to 775 $\mu\text{R/hr}$ if age of Cs-137 check source is less than 30 years.
- (6) Perform troubleshooting if reading does not fall within range (Section 9.2.18).
- (7) Press Menu  key.
- (8) Highlight Health icon using Arrow  keys.
- (9) Press Enter  key.
- (10) Highlight Rad Test button using Arrow  keys.
- (11) Press Enter  key.
- (12) Leave Sensitive Gamma Probe in direct contact with Cs-137 check source for up to one minute.
- (13) Acknowledge alarm by pressing Enter  key, as applicable.
- (14) Verify that Probe Cnt value displays at least one count or higher and displays PASS (Figure 4.56).

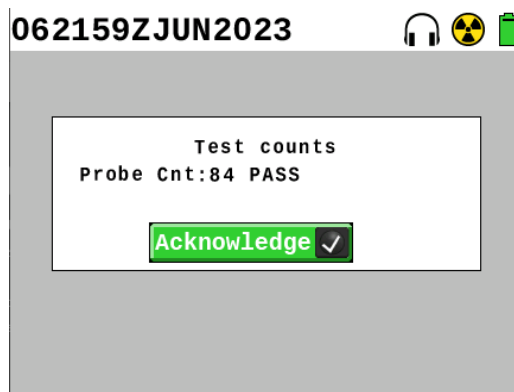



Figure 4.56. Example of Rad Test for Sensitive Gamma Probe.

- (15) Press Enter  key to acknowledge.
- (16) Perform troubleshooting if detector counts remain at zero for more than one minute (Section 9.2.18).
- (17) Return Cs-137 check source to its storage.

4.5.8 Sensitive Gamma Probe Operation and Orientation

Keeping hands on probe handle when performing operations prevents shielding probe with your body and affecting radiation readings.

Base Unit automatically auto-ranges full scale reading to accommodate new levels. Operators must pay attention to the metric prefixes on the units of measure to ensure the reading is understood.

Orientation of Sensitive Gamma Probe is not critical. However, for the most accurate dose rate, hold probe so that it is pointing towards source. Dose rate for Sensitive Gamma Probe is only accurate for Cs-137.

Hold Sensitive Gamma Probe so that it is pointing at suspected radiological source.

4.5.9 Disconnect Sensitive Gamma Probe

CAUTION



Common Probe Cable. Do not try to disconnect Common Probe Cable by pulling on cable strain relief. Failure to comply may cause damage to Common Probe Cable, Base Unit, or probe.

- (1) Disconnect Common Probe Cable from probe.
 - (a) Grasp Common Probe Cable collar (Figure 4.57) and pull.



Figure 4.57. Common Probe Cable Collar.

- (b) Install connector protective cap on probe connector.
- (2) Disconnect Common Probe Cable from Base Unit (Section 4.1.2).
- (3) Place Sensitive Gamma Probe and Common Probe Cable into transit case.

Section 6 FIDLER Probe Preparation for Use and Operation

4.6.1 FIDLER Probe Preparation for Use

FIDLER Probe Preparation for Use will include Sections: 4.6.2, 4.6.4, 4.6.5, 4.6.6, and 4.6.7.

The Field Instrument for the Detection of Low Energy Radiation (FIDLER) Probe can be “hot swapped”. Probe is only powered by Base Unit.

Base Unit will conduct BIT on probe every 5 seconds automatically. If a system error or notification message is displayed go to Chapter 9.

4.6.2 Connect FIDLER Probe to Base Unit

- (1) Remove FIDLER Probe and Common Probe Cable from transit cases.

NOTE

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Both ends of Common Probe Cable are compatible with connectors located on RDS Probes and Base Unit.

- (2) Connect Common Probe Cable to Base Unit (Section 4.1.1).

NOTE

There will be a few seconds delay between connecting or swapping a probe before correct radiation reading panels will be shown on Base Unit Home screen while probe and Base Unit communicate and exchange information.

- (3) Connect Common Probe Cable to probe (Figure 4.58).
 - (a) Remove connector protective cap from probe connector (Figure 4.58).
 - (b) Align red dot on connector to red dot on Common Probe Cable (Figure 4.58).
 - (c) Insert until fully seated.

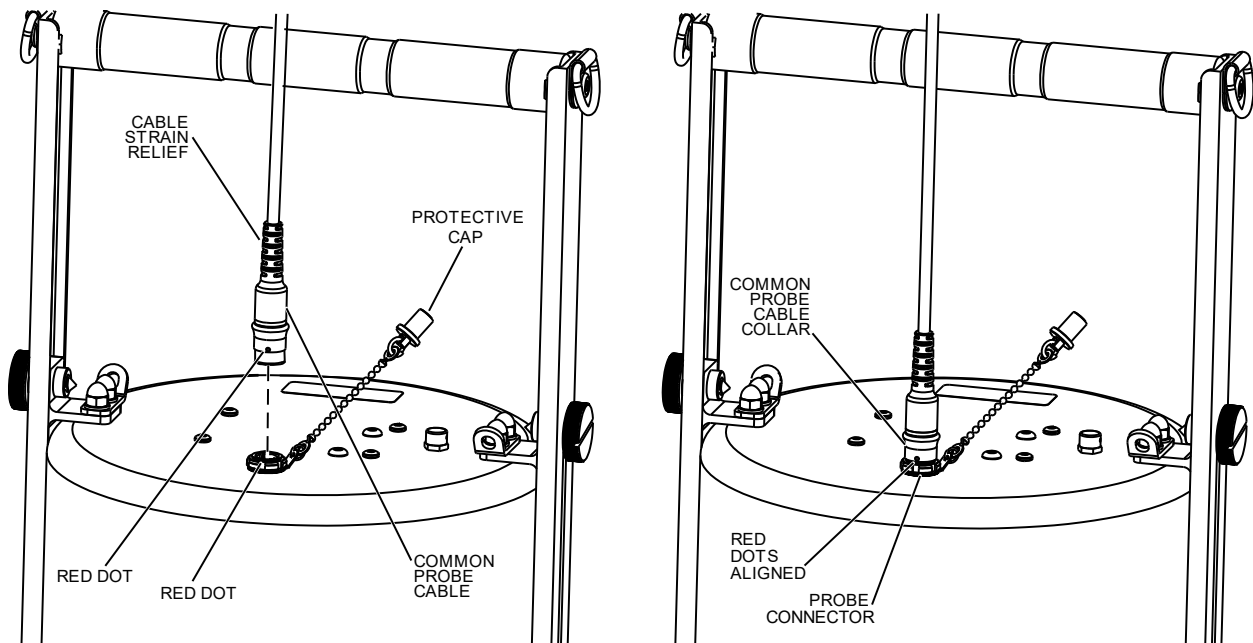



Figure 4.58. Common Probe Cable Alignment on FIDLER Probe.

- (4) Power Base Unit on by pressing the Home/Power  key.
- (5) Check that Base Unit is displaying FIDLER Probe icon on bottom of Home screen and FIDLER detection readings are displaying on Home screen.
- (6) Perform troubleshooting if no probe or incorrect probe icon is displayed (Section 9.2.19).
- (7) Configure FIDLER Probe for use (Sections 4.6.4, 4.6.5, and 4.6.6).
- (8) Perform FIDLER Probe source check (Section 4.6.7).

4.6.3 FIDLER Probe Measurement Units

Radiation measurement units for the FIDLER Probe are listed in Table 4.5. To view a list of acronyms and their meaning, see Section 1.1.8. To view FIDLER Probe specifications and detection ranges, see Table 2.7.

Table 4.5. Radiation Measurement Units for the FIDLER Probe.

Units	Abbreviation	Type
Counts per minute	cpm	Counts
Counts per second	cps	Counts

4.6.4 Select Energy Windows to Display on Home Screen

The FIDLER probe may be used for fissile radioactive materials or radioactive materials that provide a signature energy indicative of material used in nuclear devices. Its ability to detect low energy gammas and X-rays provides information that can enable operators to detect the presence of material of interest. The FIDLER Probe provides data in four different energy regions (Table 4.6).







The FIDLER Probe has four channels that are reported, see Table 4.6. Home screen can contain two reading screens at a time. Which two reading screens that are displayed will be based on direction from your local standard operating procedures. Other channels that are not chosen can be displayed on right side of Home screen as needed by pressing the Enter  key to toggle between screens.

Table 4.6. FIDLER Probe Energy Regions.

Name of Energy Region	Energy Range
Pu-239 L X-ray	13 – 18 keV
Am-241 gamma	59 – 60 keV
U-235 gamma	143 – 220 keV
X-ray/Low Energy Gamma (Gross)	13 – 220 keV

(1) Navigate to Advanced Settings in Settings menu (Figure 4.59).

- (a) Press Menu  key.
- (b) Use Arrow  keys to highlight Settings icon on Main Menu.
- (c) Press Enter  key.
- (d) Highlight the Advanced button using the Arrow  keys to modify Advanced Settings.
- (e) Press Enter  key.

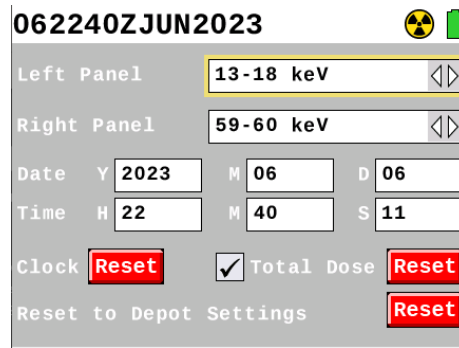





Figure 4.59. Example of Energy Window Selection for FIDLER Probe.

- (2) Select from options given (Figure 4.59) for Base Unit (“Base Beta/Photon”) or one of four FIDLER channels that are listed by Energy Range (Table 4.6) to be displayed on Left Panel of Home screen.
- (3) Select from options given (Figure 4.59) for Base Unit (“Base Beta/Photon”) or one of four FIDLER channels that are listed by Energy Range (Table 4.6) to be displayed on Right Panel of Home screen.
- (4) Return to Home screen by pressing Home/Power  key.
- (5) Press Enter  key to toggle Right Panel of Home screen until desired energy range shows on right panel of Home screen. (Enter  key will toggle display through four energy display panels and Base Unit detector display panel).

4.6.5 Verify Radiation Measurement Units

- (1) Verify measurement units required for mission are correct in accordance with your local standard operating procedures.
 - (a) View radiation reading panel on Home screen (Figure 4.60) and note radiation units displayed.

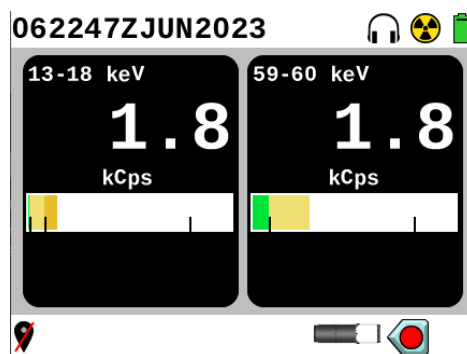


Figure 4.60. Example of FIDLER Probe Home Screen.

- (b) Compare radiation measurement units displayed to mission requirements in your local standard operating procedures.
- (2) Change radiation measurement units as necessary (Section 3.17.8).

4.6.6 Check Alarm thresholds.

Alarm Thresholds screen will only display for 5 seconds and then display will return to Home screen. Radiation measurement units may vary depending on operator configured settings.


- (1) Press Back  key from the Home screen to display alarm thresholds (Figure 4.61).



Figure 4.61. Example of Alarm Threshold Screen.

- (2) Check alarm thresholds against values that have been provided in your local standard operating procedures.
- (3) Make necessary adjustments to incorrect alarm thresholds (Section 3.17.8).

4.6.7 FIDLER Probe Source Check

WARNING



Cesium (Cs)-137 Check Source. Avoid prolonged use of Check Sources, return them to case or other protective location promptly after each use to minimize exposure. Do not ingest source. Do not attempt to open or crush source housing. Do not handle damaged sources. The cesium (Cs-137) check source contains less than 1 microCurie (μCi) of Cs-137. Coordinate disposal with your Radiation Safety Officer (RSO). Failure to comply may result in injury.

Performing a source check validates functionality of detector in the FIDLER Probe. Placing a gamma radiation source that contains a very small amount of radiation close to detector in probe and conducting a Rad Test validates readiness of probe to perform missions. Rad Test verifies detector functionality in the FIDLER Probe when it is attached to the Base Unit. Source checks shall be completed pre-operation, post-operation, and post-maintenance. Before performing a source check, verify age of Cs-137 check source is less than 30 years.

- (1) Locate Cs-137 check source (Figure 4.62).



Figure 4.62. Cs-137 Check Source, Labeled Side.








- (2) Select 13 – 220 keV window (Table 4.6) to be viewed on the Home screen, toggle using the Enter  key until it appears if it is not already set to show on the Home screen.
- (3) Place Cs-137 check source with label away from probe in direct contact with FIDLER probe at detector center marks on bottom of FIDLER Probe (Figure 4.63).



Figure 4.63. Cs-137 Check Source Placed on Crosshairs on Bottom of FIDLER Probe.

- (4) Acknowledge alarm by pressing Enter  key, as applicable.
- (5) Hold check source in place for at least 30 seconds allowing reading to settle.
- (6) Verify radiation reading value falls within range of 400 to 2100 cps if age of Cs-137 check source is less than 30 years.
- (7) Perform troubleshooting if reading does not fall within range (Section 9.2.20).
- (8) Press Menu  key.
- (9) Highlight Health icon using Arrow  keys.
- (10) Press Enter  key.
- (11) Highlight Rad Test button using Arrow  keys.
- (12) Press Enter  key.
- (13) Leave FIDLER Probe in direct contact with Cs-137 check source for up to one minute.
- (14) Verify that Probe Cnt value displays at least one count or higher and displays PASS (Figure 4.64).

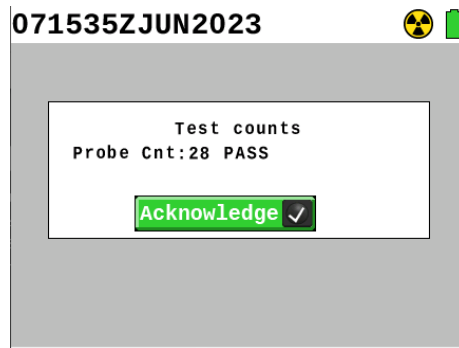



Figure 4.64. Rad Test for FIDLER Probe Example.

- (15) Press Enter  key to acknowledge.
- (16) Perform troubleshooting if Probe Cnt remains at zero for more than one minute (Section 9.2.20).
- (17) Return Cs-137 check source to its storage in transit case.

4.6.8 FIDLER Probe Operation and Orientation

- (1) Install shoulder strap per mission instructions.
- (2) Adjust handle as necessary.

NOTE

Never place FIDLER Probe in direct contact with suspected radiological surface to prevent face of probe from becoming contaminated with radioactive material or material that would provide radiation shielding and affect calibration of instrument.

Base Unit automatically auto-ranges full scale reading to accommodate new levels. Operators must pay attention to the metric prefixes on the units of measure to ensure the reading is understood.

- (3) Moving Radiological Operation
 - (a) Maintain bottom of FIDLER Probe at height above suspected contamination surface in accordance with your local standard operating procedures while moving.
 - (b) Do not exceed moving speed in accordance with your local standard operating procedures.
- (4) Stationary Radiological Operation
 - (a) Locate bottom of FIDLER Probe at height above suspected contamination surface in accordance with your local standard operating procedures.
 - (b) Proceed to next designated area and repeat in accordance with your local standard operating procedures.

4.6.9 Disconnect FIDLER Probe from Base Unit



CAUTION

Common Probe Cable. Do not try to disconnect Common Probe Cable by pulling on cable strain relief. Failure to comply may cause damage to Common Probe Cable, Base Unit, or probe.

- (1) Disconnect Common Probe Cable from probe.
 - (a) Grasp Common Probe Cable collar (Figure 4.65) and pull.

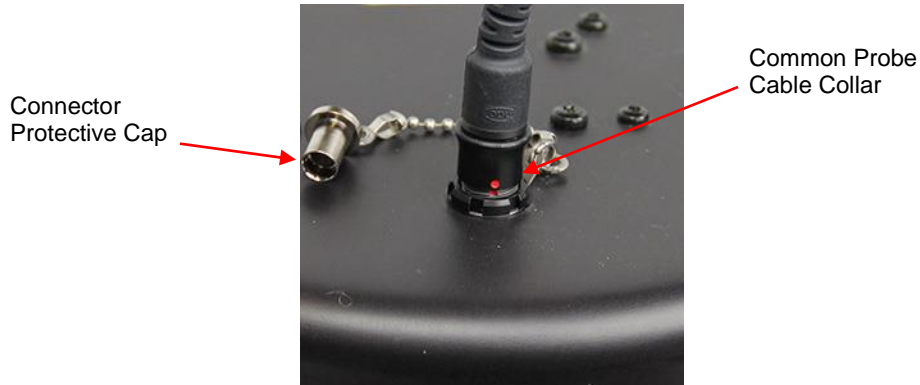


Figure 4.65. Common Probe Cable Collar.

- (b) Install connector protective cap on probe connector (Figure 4.65).
- (2) Disconnect Common Probe Cable from Base Unit (Section 4.1.2).
- (3) Remove shoulder strap as necessary and place in transit case.
- (4) Adjust handle to lowest setting.
- (5) Place FIDLER Probe into transit case and Common Probe Cable into transit case.

Section 7 Neutron Probe Preparation for Use and Operation

4.7.1 Neutron Probe Preparation for Use

Neutron Probe Preparation for Use will include Sections: 4.7.2, 4.7.4, 4.7.5, 4.7.6, and 4.7.7.

Probe can be "hot swapped". Probe is only powered by Base Unit.

Base Unit will conduct BIT on probe every 5 seconds automatically. If a system error or notification message is displayed go to Chapter 9.

4.7.2 Connect Neutron Probe to Base Unit

- (1) Remove Neutron Probe and Common Probe Cable from transit cases.

NOTE

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Both ends of Common Probe Cable are compatible with connectors located on RDS Probes and Base Unit.

- (2) Connect Common Probe Cable to Base Unit (Section 4.1.1).

NOTE

There will be a few seconds delay between connecting or swapping a probe before the correct display will be shown on Base Unit Home screen while probe and Base Unit communicate and exchange information.

- (3) Connect Common Probe Cable to probe.

- (a) Remove connector protective cap from probe connector (Figure 4.66).
- (b) Align red dot on connector to red dot on Common Probe Cable (Figure 4.66).
- (c) Insert until fully seated.

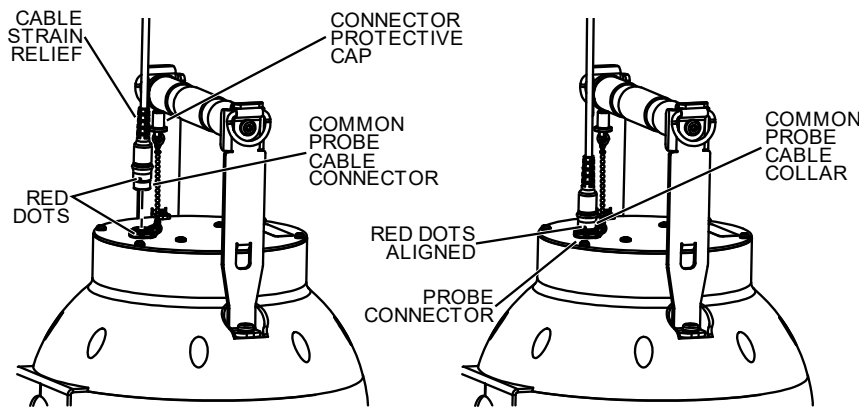



Figure 4.66. Common Probe Cable Alignment for Neutron Probe.

- (4) Power Base Unit on by pressing the Home/Power  key.
- (5) Check that Base Unit is displaying Neutron Probe icon on bottom of Home screen and Neutron reading panel is displayed on Home screen.
- (6) Perform troubleshooting if no probe or incorrect probe icon is displayed (Section 9.2.21).
- (7) Configure Neutron Probe for use (Sections 4.7.4, 4.7.5 and 4.7.6).
- (8) Perform Neutron Probe radiation check (Section 4.7.7).

4.7.3 Neutron Probe Measurement Units

Radiation measurement units for the Neutron Probe are listed in Table 4.7. To view a list of acronyms and their meaning, see Section 1.1.8. To view Neutron Probe specifications and detection ranges, see Table 2.8.

Table 4.7. Radiation Measurement Units for the Neutron Probe.

Units	Abbreviation	Type
Counts per second	cps	Counts

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Counts per minute	cpm	Counts
Grays per hour	Gy/hr	Absorbed dose
Rads per hour	Rad/hr	Absorbed dose
Rems per hour	rem/hr	Dose Equivalent
Sieverts per hour	Sv/hr	Dose Equivalent

4.7.4 Select Energy Windows to Display on Home Screen

Display of Neutron Probe readings can be set to either left side of Home screen or right side of Home screen based on operator preference or direction from your local standard operating procedures.

(1) Navigate to Advanced Settings in Settings menu (Figure 4.67).

(a) Press Menu  key.

(b) Use Arrow  keys to highlight Settings icon on Main Menu.

(c) Press Enter  key.

(d) Highlight the Advanced button using the Arrow  keys to modify Advanced Settings.

(e) Press Enter  key.

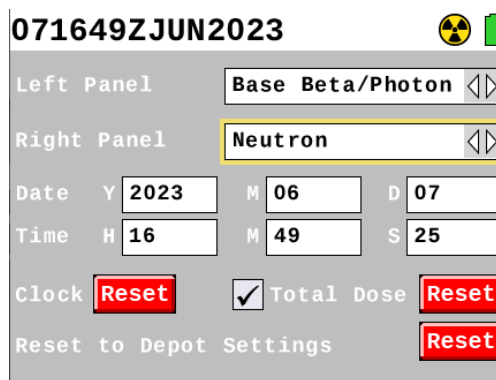



Figure 4.67. Energy Window Selection for the Neutron Probe Example.

(2) Select from options given (Figure 4.67) either Base Unit (“Base Beta/Photon”) or Neutron (“Neutron”) to display on Left Panel of Home screen.

(3) Select from options given (Figure 4.67) either Base Unit (“Base Beta/Photon”) or Neutron (“Neutron”) to display on Right Panel of Home screen.

(4) Return to Home screen by pressing Home/Power  key.

4.7.5 Verify Radiation Measurement Units

- (1) Verify measurement units required for mission are correct in accordance with your local standard operating procedures.
 - (a) View radiation reading panel on Home screen (Figure 4.68) and note radiation units displayed.

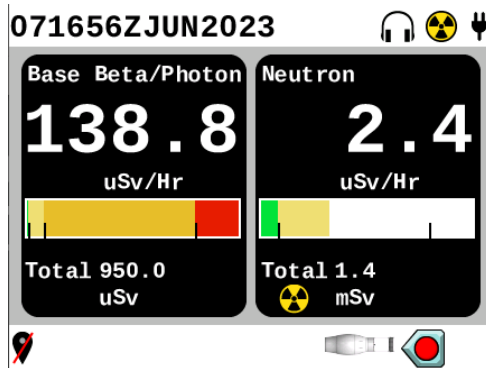



Figure 4.68. Neutron Probe Home Screen Example.

- (b) Compare radiation measurement units displayed to mission requirements in your local standard operating procedures.
- (2) Change radiation measurement units as necessary (Section 3.17.8).

4.7.6 Verify Alarm Thresholds

Alarm Thresholds screen will only display for 5 seconds and then display will return to Home screen.

Radiation measurement units may vary depending on operator configured settings.

- (1) Press Back  key from Home screen to display alarm thresholds (Figure 4.69).

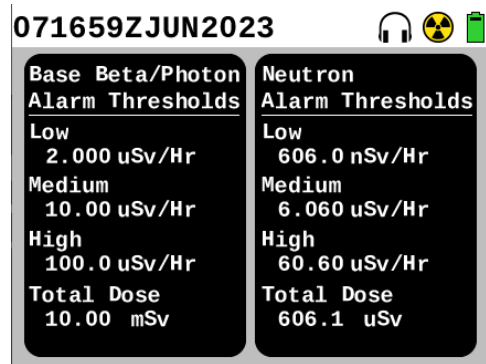







Figure 4.69. Example of Neutron Probe Alarm Thresholds.

- (2) Check alarm thresholds against values that have been provided in your local standard operating procedures.
 - (3) Make necessary adjustments to incorrect alarm thresholds (Section 3.17.8).

4.7.7 Neutron Probe Radiation Check

A neutron check source is NOT needed to perform neutron radiation check.

Performing a radiation check will validate functionality of detectors in Neutron Probe. Rad Test for Neutron Probe uses naturally occurring neutrons over time to test functionality. Radiation checks for Neutron Probe shall be completed pre-operation, post-operation, and post-maintenance.

- (1) Press Menu  key.
- (2) Highlight Health icon using Arrow  keys.
- (3) Press Enter  key.
- (4) Highlight Rad Test button using Arrow  keys.
- (5) Press Enter  key.
- (6) Observe until there is at least one count for Probe L Cnt and one count for Probe H Cnt, or until 50 minutes have passed. Once both detectors show PASS, the screen may be acknowledged and Rad Test is finished.
- (7) Verify that Probe L Cnt (low dose Neutron detector) value displays at least one count or higher and displays PASS as shown in (Figure 4.70) within 50 minutes.
- (8) Verify that Probe H Cnt (high dose Neutron detector) value displays at least one count or higher and displays PASS as shown in (Figure 4.70) within 50 minutes.

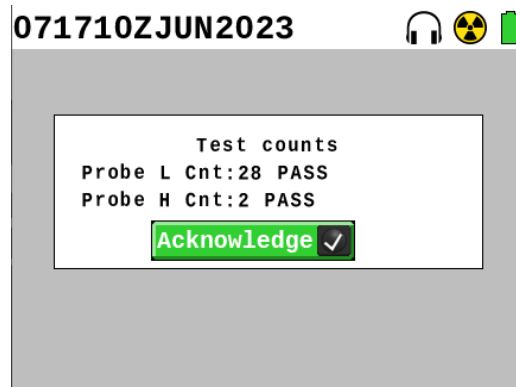



Figure 4.70. Neutron Probe Rad Test Example.

- (9) Press Enter  key to acknowledge.
- (10) Perform troubleshooting if either value remains at zero after 50 minutes of testing (Section 9.2.22).

4.7.8 Operation and Orientation of the Neutron Probe

The presence of materials such as water, oils, waxes, and plastics in the operational area will provide moderation to neutron field and can affect results.

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When monitoring for neutrons, probe can be held by handle in any orientation. Base Unit automatically auto-ranges full scale reading to accommodate new levels. Operators must pay attention to the metric prefixes on the units of measure to ensure the reading is understood.

- (1) Install shoulder strap per mission instructions.
- (2) Use Neutron Probe for neutron radiological detection operations, orientation toward source may be from any side.
- (3) Use flat wall plate to steady the probe when monitoring a flat surface such as a wall.

4.7.9 Disconnecting Common Probe Cable



CAUTION

Common Probe Cable. Do not try to disconnect Common Probe Cable by pulling on cable strain relief. Failure to comply may cause damage to Common Probe Cable, Base Unit, or probe.

- (1) Disconnect Common Probe Cable from probe.
 - (a) Grasp Common Probe Cable collar (Figure 4.71) and pull.

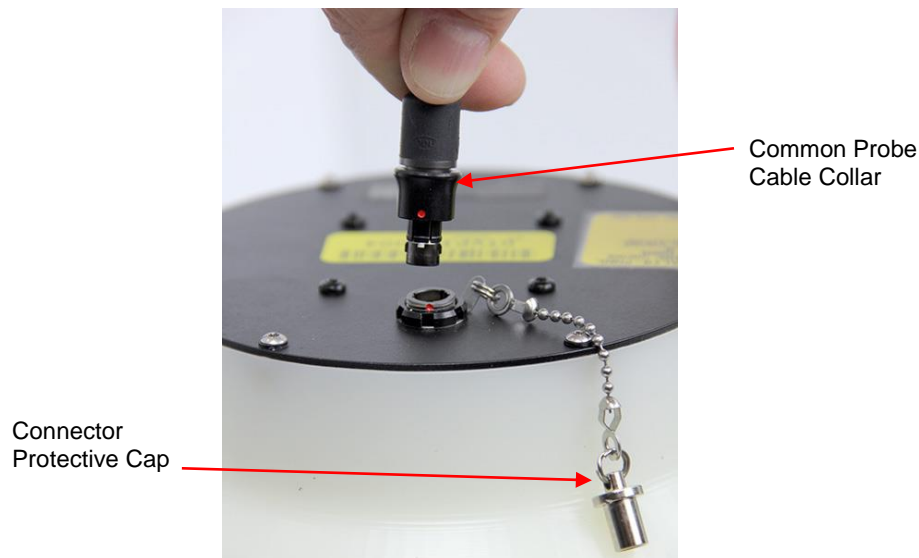


Figure 4.71. Common Probe Cable Collar.

- (b) Install connector protective cap on probe connector (Figure 4.71).
- (2) Disconnect Common Probe Cable from Base Unit (4.1.2).
- (3) Remove shoulder strap as necessary and place in transit case.
- (4) Place Neutron Probe into transit case and Common Probe Cable into transit case.

Chapter 5 Rad Extender, Data Log Download

This section contains the information on attaching the Rad Extender to the Base Unit, selecting the correct mode of operation, and connection to the non-networked, standalone PC.

This setup operation is used for downloading data logs or system logs to a PC. This operation assumes that the operator is using the Windows 10 operating system, and the system is disconnected from networks and WiFi. If a different operating system is used, contact your IT department for PC operating instructions.

The RDS web page is addressed as rds.local (192.168.0.102) using link-local networking. If unable to access the rds.local address in a web browser on non-networked PC with WiFi turned off, contact unit's information technology specialist for changing security and proxy settings to allow access to the rds.local address or to provide networking configuration support, as required.

The standalone PC needs to be enabled to receive an internet protocol (IP) address automatically via Dynamic Host Configuration Protocol (DHCP). This is a default Windows setting and requires no action on the part of the operator unless this setting has been changed. If a non-networked, standalone PC is not enabled to automatically receive an IP address via DHCP, contact unit's information technology specialist to provide networking configuration support, as required.

Connecting the Rad Extender to the Base Unit and a PC powers it up and it begins to function in the mode intended when connected to those items (Figure 5.1). The Base Unit will display PC or Transfer when communication is established. Once PC or Transfer has been chosen, to change to a different communication mode, ALL cables must be disconnected due to cybersecurity requirements. Disconnection of ALL cables will power down the single board computer housed inside the Rad Extender.



Figure 5.1. Rad Extender Connected to PC and Base Unit.

5.2.1 Connect Rad Extender to Base Unit and PC

The PC mode allows an operator to download data to a computer. The Transfer mode is used only with supported software installed on the PC (US Military only at this time).

- (1) Connect Registered Jack 45 (RJ-45) connector to PC (Figure 5.1).
- (2) Connect other end of Rad Extender to Base Unit's middle port (Figure 5.1) that is labeled either "USB" or "DATA".
- (3) Verify mode of operation choices are displayed (Figure 5.2).

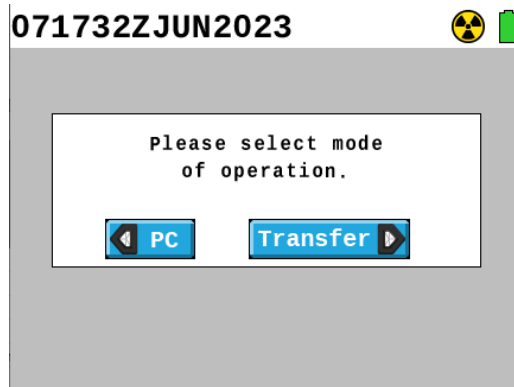



Figure 5.2. PC or Transfer Mode of Operation Selection Screen.

- (4) Press Left Arrow  key on Base Unit to select PC mode of operation (Figure 5.2).

5.2.2 Download Data Logs to a PC

Depending on browser and browser configuration, the internet browser you choose to use may provide an option to open or save files being downloaded from the Base Unit if the browser is not set to auto-download.

NOTE

Turn OFF all WiFi and unplug PC from any network connections before starting this task.

Data Download on the Base Unit cannot be accessed while actively collecting data.

- (1) Open a browser window on the connected PC and enter "http://rds.local" (without the quotes) or enter "192.168.0.102" (without the quotes) in the website address field.
- (2) Verify browser displays "Ready for Download" when the connection is made (Figure 5.3).

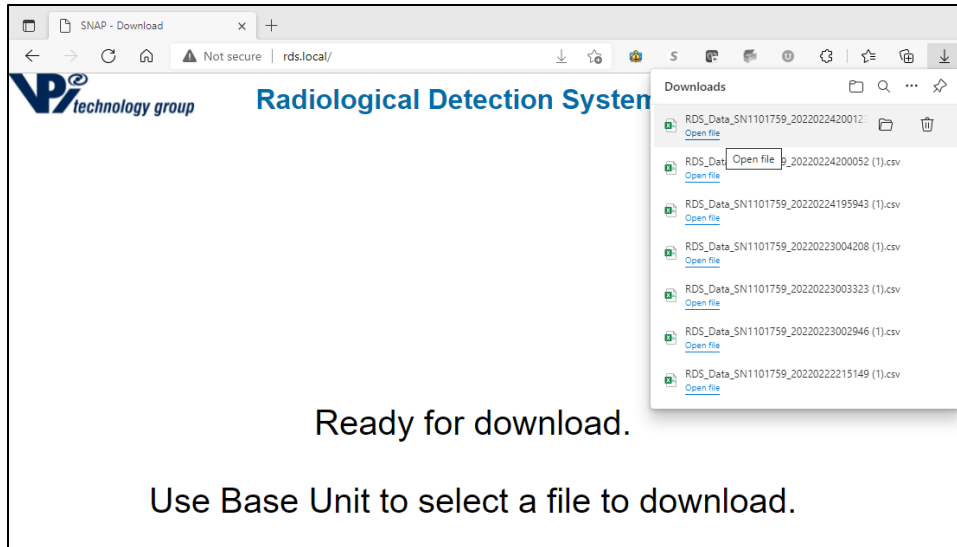






Figure 5.3. PC Web Browser Ready for Download, Download Files Example.

- (3) Press Menu  key on Base Unit.
- (4) Highlight Data icon using Arrow  keys.
- (5) Press Enter  key.
- (6) Select Data Download icon (Figure 5.4) using Arrow  keys.

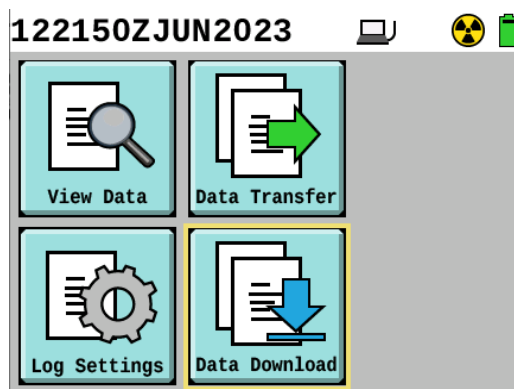




Figure 5.4. Data Download Icon Highlighted.

- (7) Press Enter  key.
- (8) Select CSV data file format to be downloaded from the two options listed (Figure 5.5) using Arrow  keys. (Common Chemical, Biological, Radiological, and Nuclear (CBRN) Sensor Interface (CCSI) is only used with special software by US Military.)

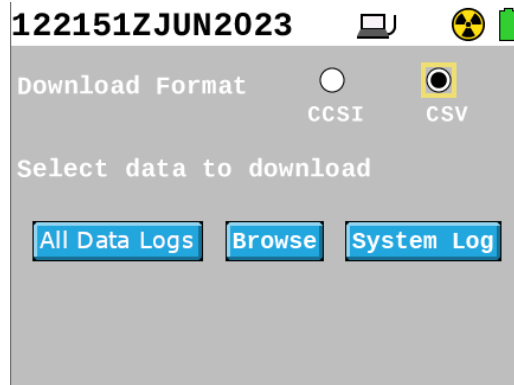


Figure 5.5. Data Download Screen Example.

NOTE

CSV files can be opened by spreadsheet software. CCSI files can only be opened by certain software available to only US Military at this time, which is not included with the RDS equipment.



Browse allows selective downloads of individual files one at a time.

You can press the Enter key to stop downloading data log files or system log file when the Stop button (Figure 5.6) is highlighted if desired.

(9) Download all data logs at once.

NOTE

The PC may ask the user to "Allow download of multiple files.", select Allow.

- (a) Highlight All Data Logs button (Figure 5.5) using Arrow  keys.
- (b) Press Enter  key to download all data logs.
- (c) Observe files while downloading (Figure 5.6).

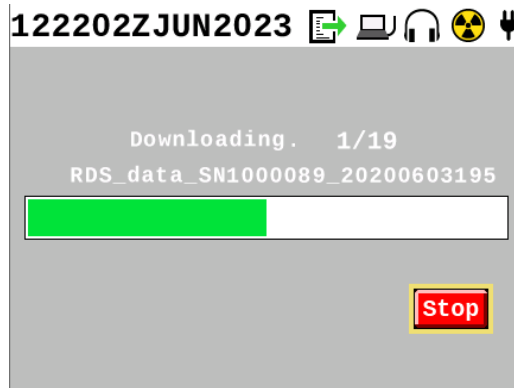





Figure 5.6. Downloading All Data Log Files Screen.

- (d) Save files on the PC using the prompts on your chosen browser, saving in your desired folder location.
- (10) Download individual data log files.

- (a) Highlight Browse button (Figure 5.5) using Arrow  keys.
- (b) Press Enter  key to choose individual data log files to be downloaded.
- (c) Navigate with Arrow  keys to desired file (Figure 5.7).

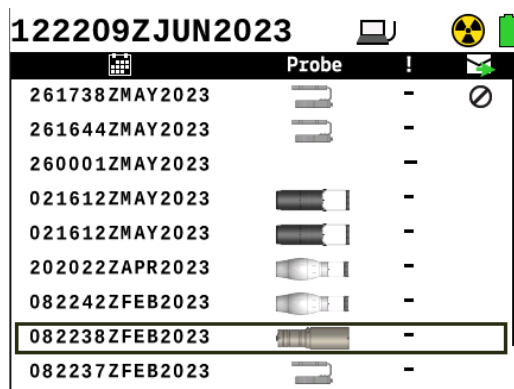


Figure 5.7. Select Individual Data Log Files to Download.

- (d) Press Enter  to download desired file.
- (e) Observe file while downloading (Figure 5.8).

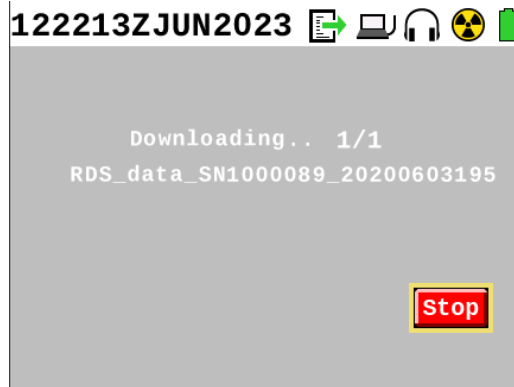




Figure 5.8. Downloading Individual Data Log Files Screen.

- (f) Save file on the PC using the prompts on your chosen browser, saving in your desired folder location.
- (11) Download system log files.

NOTE

System files will only download as a text (.txt) file.

System log files contain a list of all system alarms, warnings, notifications, and changes that have been made to the Base Unit. These files can be downloaded for troubleshooting purposes.

- (a) Highlight System Log button (Figure 5.5) using Arrow  keys.
- (b) Press Enter  key to download the system log.
- (c) Observe file while downloading (Figure 5.8).
- (d) Click save on PC choosing folder based on desired location.

Chapter 6

Telescoping Pole Operation

Section 1 Telescoping Pole

6.1.1 Purpose and Function

The Telescoping Pole is designed to extend the operator's reach when using the Beta Photon and Sensitive Gamma Probes. The short Telescoping Pole (V066099) is 113 cm (44 in) long when fully extended while the long Telescoping Pole (V041227) is 323 cm (127 in) long when fully extended. Probes are connected to the Base Unit with the Common Probe Cable. The Telescoping Pole acts as an extension to the Common Probe Cable. Probes attach to the Telescoping Pole in the probe cup (Figure 6.1) which has a connector that mates with those two probes. The Common Probe Cable is attached to the Telescoping Pole at the bottom of the pole near the grip (Figure 6.1) and also attached to the Base Unit. The traverse clamps (Figure 6.1) are used to extend the length of the telescoping pole. Both Telescoping Poles are used exactly the same way for attaching and detaching the probes and Base Unit as well as extending and retracting the segments. The following tasks are identical for both poles.

CAUTION



Alpha-Beta Probe. Do not attach Alpha-Beta Probe to Telescoping Pole or attempt to use it with Telescoping Pole. Failure to comply will result in damage to Alpha-Beta Probe.

Telescoping Pole. Cam latch screw has been adjusted at the factory at the correct distance. Do not rotate or adjust cam latch. Do not force probe into Telescoping Pole probe cup. Failure to comply may cause damage to Telescoping Pole or probe.

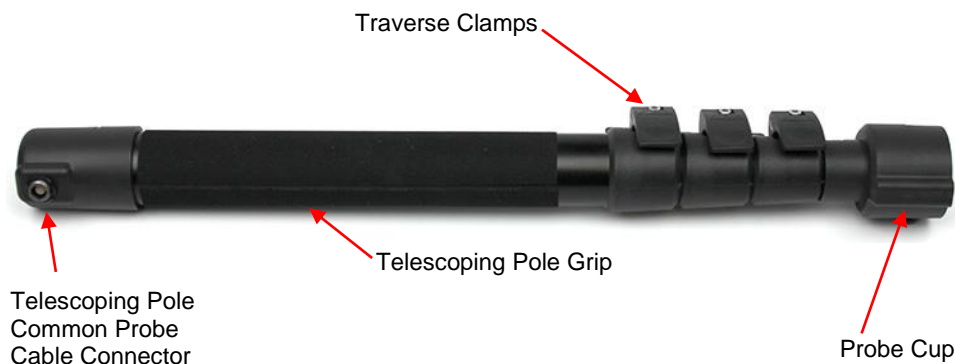


Figure 6.1. Telescoping Pole.

6.1.2 Telescoping Pole Performance Characteristics

The Telescoping Pole specifications are listed in Table 6.1.

Table 6.1. Specifications for the Short Telescoping Pole (V066099).

Characteristic	Measurement
Retracted Length	46 cm (18.1 in)
Extended Length	113 cm (44.4 in)
Handle End Width	3.6 cm (1.4 in)
Weight	0.69 kg (1.5 lbs)
Weight with Beta/Photon Probe	1.05 kg (2.3 lbs)
Weight with Sensitive Gamma Probe	1.28 kg (2.8 lbs)
Pole Tube Material	Anodized Aluminum

Table 6.2. Specifications for the Long Telescoping Pole (V041227).

Characteristic	Measurement
Retracted Length	101.1 cm (39.8 in)
Extended Length	323 cm (127 in)
Handle End Width	3.6 cm (1.4 in)
Weight	1.27 kg (2.81 lbs)
Weight with Beta/Photon Probe	1.62 kg (3.58 lbs)
Weight with Sensitive Gamma Probe	1.85 kg (4.08 lbs)
Pole Tube Material	Anodized Aluminum

6.1.3 Attaching and Disconnecting Probes and Telescoping Pole

- (1) Open cam latch to the fully open position (Figure 6.2).



Figure 6.2. Cam Latch Open, Ready to Insert Probe into Probe Cup.

- (2) Align the probe's connector protective cap chain with the probe cup channel (Figure 6.3). The connector protective cap chain will be retained within the probe cup channel when the probe is inserted into the probe cup (Figure 6.3).

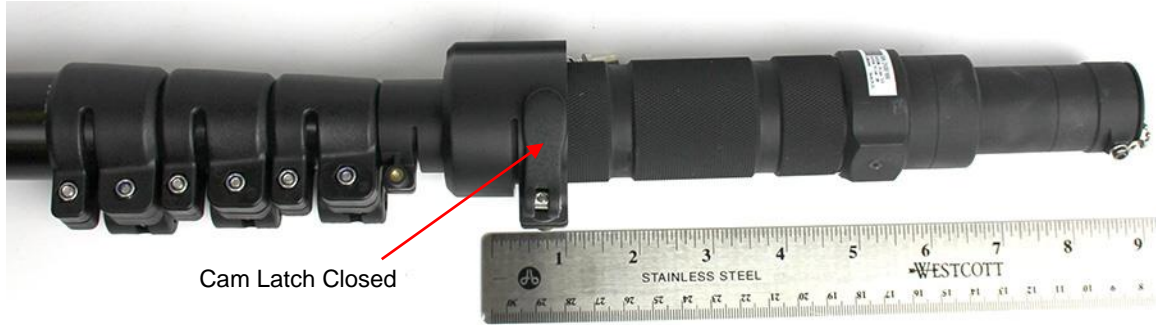


Figure 6.3. Probe Alignment in Telescoping Pole.

- (3) Insert probe into probe cup (Figure 6.3 and Figure 6.4) until fully seated. Probe will insert 2.54 cm (1 inch) into probe cup.

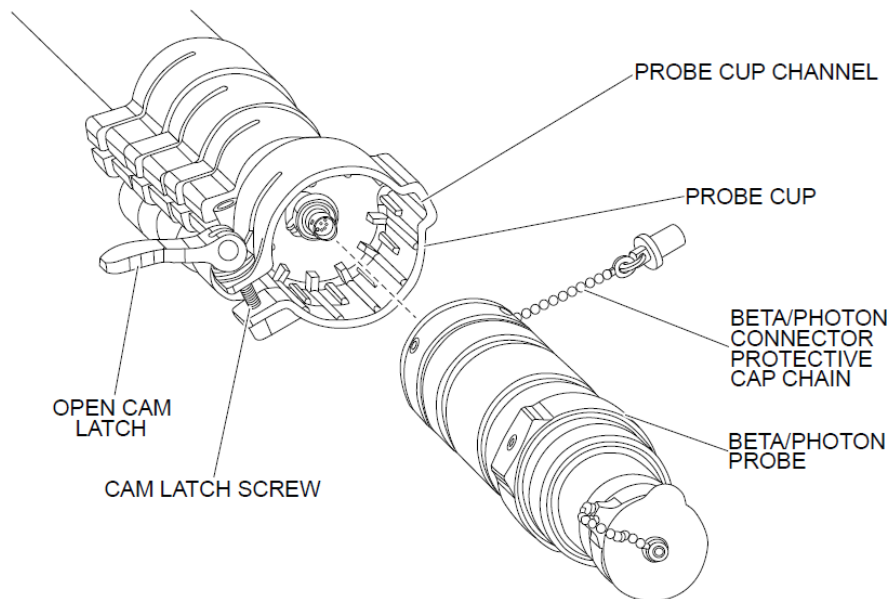


Figure 6.4. Probe Alignment.

- (d) Close cam latch. Refer to Figure 6.4.

6.1.4 Detach Probe from Telescoping Pole

- (1) Open cam latch (Figure 6.4).
- (2) Grasp probe by handle and pull from probe cup.
- (3) Install connector protective cap on probe connector.

6.1.5 Connect the Telescoping Pole to Base Unit



CAUTION

Common Probe Cable. Do not try to disconnect Common Probe Cable by pulling on cable strain relief. Failure to comply may cause damage to Common Probe Cable, Base Unit, or probe.

NOTE

Both ends of the Common Probe Cable are compatible with the Telescoping Pole connector.

- (1) Align the red dot on the Telescoping Pole connector to the red dot on the end of the Common Probe Cable collar (Figure 6.5).



Figure 6.5. Connect Common Probe Cable to Telescoping Pole.

- (2) Insert until fully seated.
- (3) Align red dot on other end of Common Probe Cable collar to red dot on Base Unit probe connector.
- (4) Insert until fully seated.

6.1.6 Disconnect Telescoping Pole from Base Unit.

- (1) Grasp Common Probe Cable collar (Figure 6.5) and pull, repeating for both ends of Common Probe Cable.
- (2) Install connector protective cap on Base Unit Probe connector.

6.1.7 Extending and Retracting Telescoping Pole



CAUTION

Telescoping Pole. Do not use the probe cup as a handle to extend the Telescoping Pole. Grip only by the tube of the Telescoping Pole. Failure to comply may result in damage to the Telescoping Pole.

- (1) Extend Telescoping Pole segment(s).
 - (a) Pull traverse clamp(s) open to unlock the movement of individual segment(s). Refer to Figure 6.6.

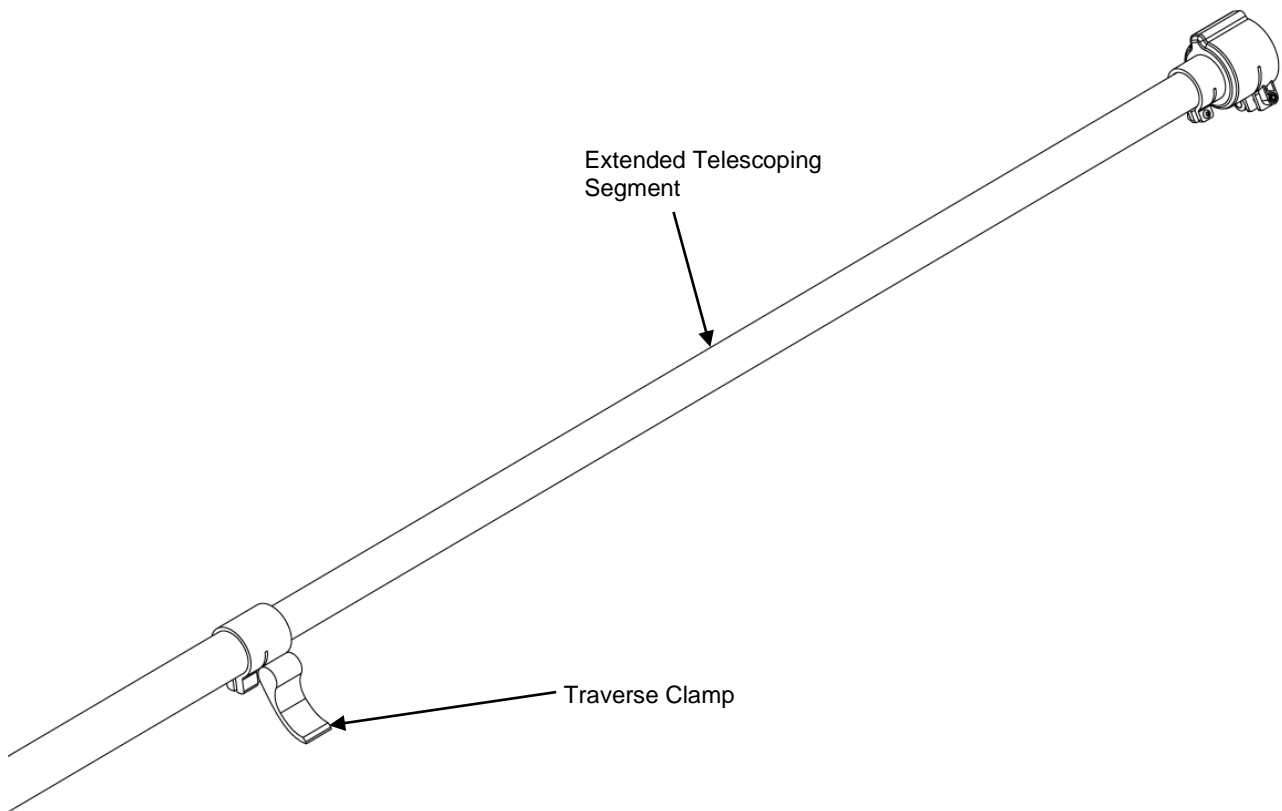



Figure 6.6. Traverse Clamp.

- (b) Extend pole segment(s) to desired length.
 - (c) Push down on traverse clamp(s) to lock the movement of individual segment(s).
 - (2) Retract Telescoping Pole segment(s).
 - (a) Pull up on traverse clamp(s) to unlock the movement of individual segment(s).
 - (b) Retract pole segment(s) to desired length.
 - (c) Push down on traverse clamp(s) to lock the movement of individual segment(s).

6.1.8 Operating Telescoping Pole

- (1) Place Base Unit in Base Unit carrying pouch.
- (2) Place carrying pouch strap around neck and on shoulder.
- (3) Attach Common Probe Cable to Base Unit and Telescoping Pole.
- (4) Attach probe to Telescoping Pole.
- (5) Hold Telescoping Pole with both hands while operating.
- (6) Power Base Unit on by pressing the Home/Power  key.
- (7) Verify probe icon for attached probe displays on Home screen. If probe icon does not appear, perform troubleshooting (Section 9.2.24).
- (8) Conduct operations in accordance with your standard operating procedures.

Chapter 7

Operation Under Unusual Conditions

Section 1 Operating RDS Equipment Under Unusual Conditions

This chapter contains information about using the RDS under unusual conditions. This applies to Base Units operating standalone or Base Units attached to a probe.

7.1.1 Extreme Temperatures

In cold environments {-30°C (-22°F) to 0°C (32°F)}, operate the Base Unit with Nickel Metal Hydride (NiMH) AA rechargeable batteries for the best battery life. The Base Unit will operate in cold environments using standard alkaline AA batteries, but battery life will be reduced to 2 hours or less. When the Base Unit detects a temperature under -30°C, a system notification will display (Section 9.2.1), move Base Unit to a warmer location.

The Base Unit is not designed to be operated in temperatures above 50°C (122.7°F); when the Base Unit detects a temperature above 50°C, a system notification will display (Section 9.2.1). If notification is displayed, move Base Unit to a cooler location.

The temperature in which the Base Unit is operated affects the battery life indicator. For example, the battery life indicator might read 10% in freezing temperatures, but then jump to 90% if the Base Unit is moved to a warmer area. Options for continuation of operation in cold temperatures would include:




- (1) Operate the Base Unit using NiMH AA rechargeable batteries to remain operational in temperatures from 0°C (32°F) to -30°C (-22°F).
- (2) Operate the Base Unit using standard alkaline AA batteries for only 2 hours or less in temperatures of 0°C (32°F) to -30°C (-22°F).

7.1.2 Nuclear Survivability


When the Base Unit detects a prompt gamma event (nuclear blast), it immediately powers off. The electronics are then protected from the resulting surge of energy. The unit can be powered back on after a prompt gamma event and continue to detect radiation and give dose rate information.

7.1.3 Operations After Nuclear Detonation

If a Base Unit is in the vicinity of a nuclear detonation (within 10 km (6.2 miles)) at the time of detonation, follow the steps below.

- (1) Remove batteries (Section 3.4.4) from Base Unit and wait one minute.
- (2) Install batteries (Section 3.4.3).
- (3) Power Base Unit on by pressing the Home/Power  key.
- (4) Press Menu  key.
- (5) Use Arrow  keys to highlight Settings.

(6) Press Enter  key.

(7) Use Arrow  keys to highlight Advanced button (Figure 7.1).

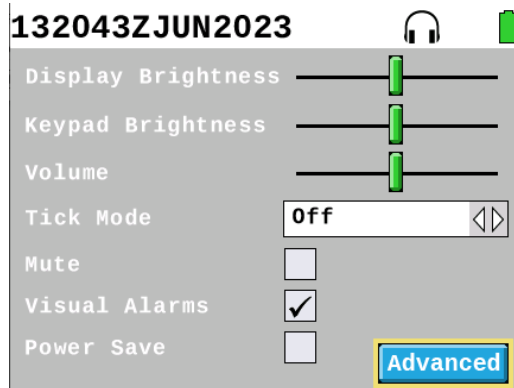



Figure 7.1. Advanced Settings Button Highlighted.

(8) Press Enter  key.

(9) Use Arrow  keys to highlight Reset to right of Clock to reset the Base Unit's internal clock circuit (Figure 7.2).

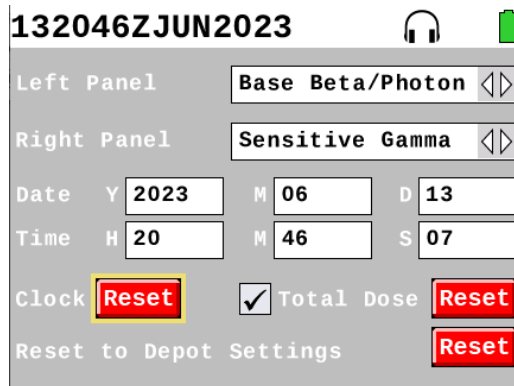





Figure 7.2. Base Unit Internal Clock Reset Button Highlighted.


(10) Press Enter  key.

(11) Wait 4 seconds while clock battery is reset.
















(12) Press Enter  key to acknowledge clock battery reset.

(13) Press Enter  key to acknowledge date not current message.














(14) Press the Arrow  keys to highlight the year (Y) field and enter the correct year.

(a) Use the Arrow  keys to highlight desired numbers.

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- (b) Press Enter  key to select one number at a time.
 - (c) Repeat until all numbers have been selected.
 - (d) Highlight Done button.
 - (e) Press Enter  key to set Year.
- (15) Press the Right Arrow  key to highlight the month (M) field and enter the correct month.
- (a) Use the Arrow  keys to highlight desired numbers.
 - (b) Press Enter  key to select one number at a time.
 - (c) Repeat until all numbers have been selected.
 - (d) Highlight Done button.
 - (e) Press Enter  key to set Month.
- (16) Press the Right Arrow  key to highlight the day (D) field and enter the correct day.
- (a) Use the Arrow  keys to highlight desired numbers.
 - (b) Press Enter  key to select one number at a time.
 - (c) Repeat until all numbers have been selected.
 - (d) Highlight Done button.
 - (e) Press Enter  key to set Day.
- (17) Press the Arrow  keys to highlight the hour (H) field and enter the correct hour.
- (a) Use the Arrow  keys to highlight desired numbers.
 - (b) Press Enter  key to select one number at a time.
 - (c) Repeat until all numbers have been selected.
 - (d) Highlight Done button.
 - (e) Press Enter  key to set Hour.
- (18) Press the Right Arrow  key to highlight the minute (M) field and enter the correct minutes.

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- (a) Use the Arrow  keys to highlight desired numbers.
- (b) Press Enter  key to select one number at a time.
- (c) Repeat until all numbers have been selected.
- (d) Highlight Done button.
- (e) Press Enter  key to set Minute.
- (19) Press the Right Arrow  key to highlight the seconds (S) field and enter the correct seconds.
- (a) Use the Arrow  keys to highlight desired numbers.
- (b) Press Enter  key to select one number at a time.
- (c) Repeat until all numbers have been selected.
- (d) Highlight Done button.
- (e) Press Enter  key to set Second.
- (20) Reset Total Dose.
- (21) Press Menu  key.
- (22) Use Arrow  keys to highlight Settings.
- (23) Press Enter  key.
- (24) Use Arrow  keys to highlight Advanced button (Figure 7.1). Press Enter  key.
- (25) Use Arrow  keys to highlight Reset to right of "Total Dose" to reset the Total Dose reading back to zero (Figure 7.3).

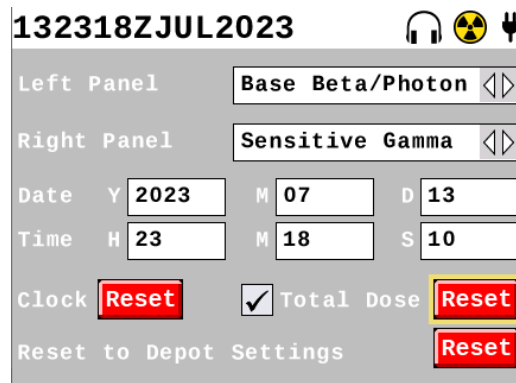




Figure 7.3. Total Dose Reset Button Highlighted Example.











- (26) Press Enter  key.
- (27) Return to reading panels by pressing Home/Power  key.
- (28) Monitor for increased battery usage.

7.1.4 Security Measures for Electronic Data

- (1) Delete any data that is required to be deleted before transport using steps in Section 3.18.1.

NOTE

A Factory Reset may be used to prevent data, both radiation readings and system log files from falling into enemy hands. Performing a Factory reset will remove all files to include the system file but will also reset all Depot settings back to Factory settings. It will not disable the system from use for radiation detection and can continue to be used as necessary, only previous data and settings will be deleted, calibration and firmware will remain.

- (2) Delete all data and system logs by completing a Factory Reset.
 - (a) Power off Base Unit (Section 3.6.2).
 - (b) Press and continue to hold Back  key, Enter  key, and Menu  key.
 - (c) Press and continue to hold along with the above three keys the Home/Power  key.
 - (d) Hold all four keys until the Base Unit turns on.
- (3) Verify that all data has been deleted.
 - (a) Press the Menu  key.
 - (b) Highlight the Data icon using the Arrow  keys, as necessary.
 - (c) Press Enter  key.
 - (d) Highlight the View Data icon using the Arrow  keys, as necessary.
 - (e) Press Enter  key.
 - (f) Observe whether any log files are present. If any log files are still present, repeat procedure for Factory Reset.
- (4) Return to reading panels by pressing Home/Power  key.
- (5) Avoid any actions that allows the data to be accessed by unauthorized personnel.

7.1.5 Cleaning and Decontamination

- (1) Clean RDS equipment, excluding mylar window of Alpha-Beta Probe, with warm water, a mild detergent such as dishwashing soap, and a rag.
- (2) Decontaminate RDS equipment with the same procedures used for electronic equipment per your local standard operating procedures, avoiding caustic detergents and use warm water, a mild detergent such as dishwashing soap, and a rag.
- (3) Treat Alpha-Beta Probe mylar windows that have been determined to be contaminated as contaminated waste and dispose of in accordance with your standard operating procedures.

Chapter 8

Storage and Shipment

Section 1 Shipping and Storage Instructions

8.1.1 Preparation for Storage

WARNING



Batteries. Batteries should not be opened or burned. Exposure to the ingredients contained within or their combustion products could be harmful causing respiratory irritation, skin irritation, eye irritation and chemical burns. Do not handle leaking or damaged batteries without neoprene or rubber gloves. Do not puncture, mutilate, or attempt to disassemble batteries. Do not heat them above 100°C (212°F). Do not mix battery types. Failure to comply may result in injury.

CAUTION



Storage. Batteries must be removed prior to storage. Failure to comply may cause damage to the Base Unit.

NOTE

If the original transit case is not available when packing unit for storage, use adequate packing and storage material, i.e. two layers of bubble wrap or equivalent and sturdy box or case to protect unit from damage during storage.

The procedures here are used to prepare the system for storage each time the system or components of the system are not in operational use. This applies to both short term and long term storage of the system.

Prepare the RDS for Storage:

- (1) Perform PMCS in Section 10.1.2, using the interval for after PMCS procedures.
- (2) Remove the batteries from the Base Unit. Refer to Section 3.4.4.
- (3) Disconnect all cables (headset, AC/DC power adapter, Rad Extender, and probe cables).
- (4) Place all protective caps on the cable connectors.
- (5) Verify beta window cap is installed on Base Unit and/or Beta Photon Probe.
- (6) Verify Small Area Beta Gamma (SABG) probe protective cover is installed.
- (7) Verify the protective cover is in place covering the protective grate of the Alpha-Beta Probe.
- (8) Place equipment in its original transit case, if possible, and verify it is placed correctly in foam cutout as applicable to the transit case configuration being used.
- (9) Close transit case(s) and secure all latches.

8.1.2 Preparation for Shipment

WARNING



Batteries. Batteries should not be opened or burned. Exposure to the ingredients contained within or their combustion products could be harmful causing respiratory irritation, skin irritation, eye irritation and chemical burns. Do not handle leaking or damaged batteries without neoprene or rubber gloves. Do not puncture, mutilate, or attempt to disassemble batteries. Do not heat them above 100°C (212°F). Do not mix battery types. Failure to comply may result in injury.

WARNING



Cesium (Cs)-137 Check Source. Avoid prolonged use of Check Sources, return them to case or other protective location promptly after each use to minimize exposure. Do not ingest source. Do not attempt to open or crush source housing. Do not handle damaged sources. The cesium (Cs-137) check source contains less than 1 microCurie (μCi) of Cs-137. Coordinate disposal with your Radiation Safety Officer (RSO). Failure to comply may result in injury.

CAUTION



Storage. Batteries must be removed prior to storage. Failure to comply may cause damage to the Base Unit.

NOTE

If the original transit case is not available when packing unit, use adequate packing and storage material, i.e. two layers of bubble wrap or equivalent and sturdy box or case to protect unit from damage during shipment.

Follow the below procedure when preparing the RDS for shipment.

Prepare the RDS for Shipment:

- (1) Complete all steps for preparation for storage (Section 8.1.1).
- (2) If the original shipping container is not available when packing the unit, use adequate packing material, i.e. two layers of bubble wrap or equivalent to protect the unit from damage during shipment.
- (3) Coordinate shipping of kits with the Radiation Safety Officer if any check sources (Cs-137) will remain in the case during shipment. Proper labeling must be applied when sources are contained in the shipment if the shipping regulations in your country do not consider the 1 μCi check source to be an exempt source.
- (4) Coordinate shipping of kits with the hazmat transportation specialist for the proper labeling to be applied for the lithium, BR2032 coin cell battery (1 each per Base Unit) and batteries contained in the cased being shipped as required by your local shipping regulations.

Chapter 9

Troubleshooting Procedures

Section 1 Troubleshooting Procedure Index and Introduction

WARNING



Radiation/Known Faults and Malfunctions. Operation of Base Unit or probes with known faults could lead to incorrect radiation readings. Refer to Section 3.2.1 for definition of icons and to Health Menu (Section 3.17.2) for instructions on accessing the system Health to view any system notifications. Continued use of a malfunctioning Base Unit or any one of the six probes may result in over exposure to radiation or excessive radioactive dose, and/or radiation contamination. Failure to comply may result in injury.

CAUTION



Known Faults or Malfunctions. Operation of Base Unit or probes with known faults could lead to damage to the equipment. Refer to Section 3.2.1 for definition of icons and to Health Menu instructions (Section 3.17.2) for instructions on accessing the system Health to view any system notifications. Failure to comply may cause damage to the Base Unit and/or probes.

9.1.1 Troubleshooting Introduction

The troubleshooting index lists common malfunctions that may occur during RDS operation. Find the malfunction to be eliminated and go to the indicated troubleshooting work package that follows. The index cannot list all malfunctions that may occur, all tests or inspections needed to find the fault, nor all actions required to correct the fault. If an existing malfunction is not listed, or cannot be corrected through this troubleshooting index, notify next higher level of maintenance as authorized.

Troubleshooting procedures are provided for each major component of the RDS equipment. The Troubleshooting Index (Section 9.1.2) lists the procedures by malfunction and symptom. Each symptom is linked to a troubleshooting procedure representing the starting point in the troubleshooting sequence. As the troubleshooting activity progresses through to the conclusion of a particular sequence, a reference is made to the next logical step.

The procedures assume that only one fault is present. To identify the proper troubleshooting procedure for the malfunction symptom observed, locate the malfunction/symptom in the index, and perform the troubleshooting procedure in the indicated troubleshooting procedure. Each troubleshooting procedure is headed by an initial setup. This setup outlines what is needed, as well as certain conditions which must be met before starting the troubleshooting procedure. Do not begin a troubleshooting procedure until the task is understood and all equipment, tools, materials, and references are available.

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9.1.2 Malfunction/Symptom Index

<u>Malfunction/Symptom</u>	<u>Troubleshooting Procedure</u>
Alpha-Beta Probe High Readings in Known Background and Does Not Pass Light Leak Test	9.2.14
Alpha-Beta Probe Plugged In and Alpha-Beta Probe Icon Not Displayed.....	9.2.12
Alpha-Beta Probe Readings Are Not Accurate, Passes Light Leak Test or Display Zero During Source Check	9.2.13
Base Unit Alternating Current / Direct Current (AC/DC) Power Adapter No Power	9.2.3
Base Unit Attached to Rad Extender Does Not Present Mode Options	9.2.8
Base Unit Does Not Power on With Batteries	9.2.2
Base Unit No Audio with Headset	9.2.6
Base Unit No Buzzer Audio	9.2.5
Base Unit Only Displays Logo	9.2.4
Base Unit Readings Are Not Accurate, Display Zero During Source Check, or INV.....	9.2.7
Beta Photon Probe Plugged In and Beta Photon Probe Icon Not Displayed	9.2.10
Beta Photon Probe Readings Are Not Accurate, Display Zero During Source Check, or INV	9.2.11
FIDLER Probe Plugged In and FIDLER Probe Icon Not Displayed	9.2.19
FIDLER Probe Readings Are Not Accurate or Display Zero During Source Check	9.2.20
Neutron Probe Plugged In and Neutron Probe Icon Not Displayed.....	9.2.21
Neutron Probe Readings Are Not Accurate, Display Zero During Radiation Check, or INV	9.2.22
Probe Attached to Telescoping Pole, Probe Icon Not Displaying on Home Screen.....	9.2.24
Probe Communication Error.....	9.2.9
Rad Extender Not Communicating	9.2.23

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Sensitive Gamma Probe Plugged In and Sensitive Gamma Probe Icon Not Displayed	9.2.17
Sensitive Gamma Probe Readings Are Not Accurate or Display Zero During Source Check	9.2.18
Small Area Beta Gamma (SABG) Probe Plugged In and SABG Probe Icon Not Displayed	9.2.15
Small Area Beta Gamma (SABG) Probe Readings Are Not Accurate or Display Zero During Source Check	9.2.16
System Fault and Notification Messages Troubleshooting	9.1.1

Section 2 Troubleshooting Procedures

9.2.1 System Fault and Notification Messages Troubleshooting

The Base Unit conducts BIT automatically every one second. When a probe is attached to the Base Unit, a BIT is conducted on that probe every five seconds. These tests can generate a fault message or a system notification message. Table 9.1 lists and describes system fault messages and Table 9.2 lists and describes system notification messages. Fault messages will produce a system alarm icon on the status bar and on the Health menu screen as well as always require operator acknowledgement, notification messages will produce a warning icon on the status bar and on the Health menu screen, to view these icons go to Table 3.3.







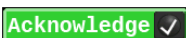
Follow the instructions in the Referenced Troubleshooting Procedure or Resolution Steps column when a System Fault message () is displayed on the Base Unit screen.

Table 9.1. System Fault Messages.

System Fault	Screen Shot	Referenced Troubleshooting Procedure or Resolution Steps
Analog module fault	Base Unit Analog module fault 	Send to proper level of maintenance to replace Base Unit Main Printed μrcuit Board Assembly (PCBA).
Invalid reading (INV)	Base Unit Invalid reading 	This system fault message informs operators that the Base Unit or an applicable attached probe has encountered a reading that is defined to be invalid. Complete troubleshooting for the Base Unit (Section 9.2.7), Beta Photon Probe (Section 9.2.11), or Neutron Probe (Section 9.2.22).
Sensor test failed	Base Low Sensor No counts detected Go to Health, run Rad Test 	Complete a pre-operational check on the Base Unit including the source check (Section 3.9.1).
Calibration missing	Base Unit Calibration missing 	Send Base Unit for calibration.
Firmware fault	Base Unit Firmware fault 	Notify maintainer to update firmware.
Bad high voltage charge	Base Unit Bad high voltage charge 	Send to proper level of maintenance to replace Base Unit Main PCBA.

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Bad voltage	<p>Base Unit Bad voltage</p> <p>Acknowledge ✓</p>	Send to proper level of maintenance to replace Base Unit Main PCBA.
Probe communication error	<p>Base Unit Probe communication error</p> <p>Acknowledge ✓</p>	Complete probe communication troubleshooting (Section 9.2.9).
Unidentified Probe	<p>Base Unit Unidentified probe</p> <p>Acknowledge ✓</p>	Complete probe communication troubleshooting (Section 9.2.9).
Communication error, Check connection	<p>Base Unit Communication error Check connection</p> <p>Acknowledge ✓</p>	Complete Rad Extender Not Communicating troubleshooting (Section 9.2.23).
Settings corrupted, Restoring original settings	<p>Base Unit Settings corrupted Restoring original settings</p> <p>Acknowledge ✓</p>	A system notification that Base Unit saved settings were lost or corrupted and Depot settings have been restored. No action is required.
Data log corrupted, Data log deleted, memory repaired	<p>Base Unit Data log corrupted Deleted, memory repaired</p> <p>Acknowledge ✓</p>	<p>A system notification that the selected data log file is detected as corrupt. System has deleted the data log file and repaired the memory.</p> <p>Corruption of data logs is a hardware memory issue that is detected by the system and automatically repaired, but the corrupt data log file is deleted. Restart desired data log (Section 3.18.1).</p>
System Log corrupted. Log erased, memory repaired	<p>Base Unit System log corrupted Log erased, memory repaired</p> <p>Acknowledge ✓</p>	<p>The main system log file is detected as corrupt. Base Unit deletes the system log file and repairs the memory. Corruption of system log is a hardware memory issue that is detected by the system and automatically repaired, but the corrupt system log file is deleted, and a new empty system log file is created. System log files contain a history of system alarms and warnings, firmware version information, and settings changes. This information is displayed on the Health Details screen (Section 3.17.2) and settings screens (Section 3.17.4) when the information is occurring, but not stored there after the occurrence ends. Turn the Base Unit off (Section</p>

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		3.6.2) and then back on (Section 3.6.1).
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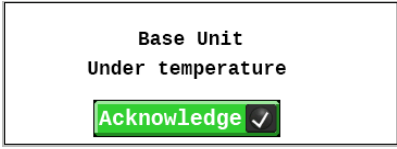
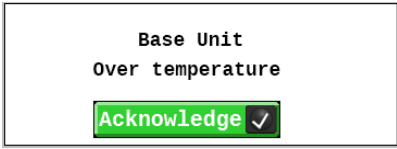

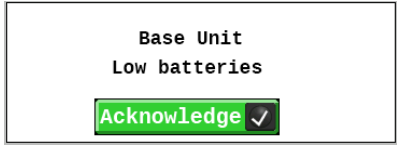
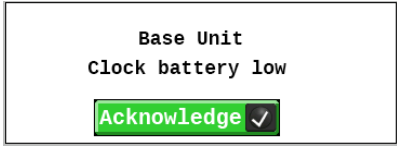
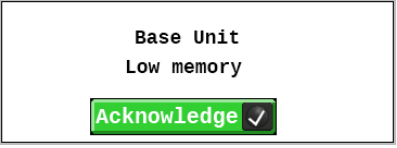
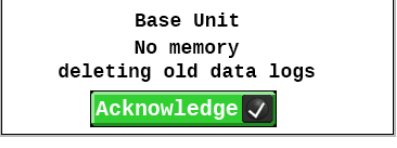
Follow the instructions in the Referenced Troubleshooting Procedure or Resolution Steps column when a System Notification message () is displayed on the Base Unit screen.

Table 9.2. System Notification Messages.

System Notification	Screen Shot	Referenced Troubleshooting Procedure or Resolution Steps
Under temperature		Make sure Base Unit is operating in temperatures above -30°C (-22°F). Move to warmer location (Section 7.1.1).
Over temperature		Make sure Base Unit is operating in temperatures below 50°C (122.7° F). Move to a cooler location (Section 7.1.1).
Sensor overload (OVER)		This system notification message and/or reading on the Home screen informs operators that the Base Unit or an attached probe has encountered a reading that has exceeded the detection ranges (Chapter 2) for the detectors in that piece of equipment. Readings will not return until levels of radiation are below the detectable range. This notification is included for informational purposes and requires no troubleshooting actions but may require operational action.
Low batteries		Replace AA batteries (Section 10.2.2).
Clock battery low, Check date		Make sure Base Unit time is correct before use. Send to proper level of maintenance for replacement of clock battery.
Low memory		Delete unneeded data log files (Section 3.18.3), as desired.
No memory, deleting old data logs		Notification that the Base Unit is deleting the oldest data log files to allow space for new data log files to be stored. Delete unneeded data log files (Section 3.18.3), as desired.

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Unable to power probe, Check batteries	<p style="text-align: center;">Base Unit Unable to power probe Check batteries</p> <p style="text-align: center;">Acknowledge ✓</p>	Replace AA batteries (Section 10.2.2).
Unable to power SNAP Cable, Check batteries	<p style="text-align: center;">Base Unit Unable to power SNAP cable Check batteries</p> <p style="text-align: center;">Acknowledge ✓</p>	This refers to the generic name for the Rad Extender. At this point the batteries are too low to power the Rad Extender. Replace AA batteries (Section 10.2.210.2.1).
Date not current, please update	<p style="text-align: center;">Base Unit Date not current, please update.</p> <p style="text-align: center;">Acknowledge ✓</p>	Make sure Base Unit time is correct before use. Send to proper level of maintenance for replacement of clock battery.
Time expired - Data log stopped and saved	<p style="text-align: center;">Base Unit Time expired - Data log stopped and saved</p> <p style="text-align: center;">Acknowledge ✓</p>	Notification that system stopped logging data to a file because the maximum time of 72 hours (or a maximum of 259,200 samples) for logging a file has been reached. If additional logging is required, start a new data log (Section 3.18.3).
Probe changed - Data log stopped and saved	<p style="text-align: center;">Base Unit Probe changed - Data log stopped and saved</p> <p style="text-align: center;">Acknowledge ✓</p>	If a probe is changed in the middle of capturing a data log, the system will stop logging to the data log file and save it when the probe was disconnected from the Base Unit. If a different probe has been connected, a new data log will need to be started (Section 3.18.1).
Max samples reached, Data log stopped and saved	<p style="text-align: center;">Base Unit Max samples reached, Data log stopped and saved</p> <p style="text-align: center;">Acknowledge ✓</p>	A maximum number of 100 samples can be saved to a single data log file when in Multi-sample logging mode. Once the maximum has been reached, the Base Unit stops recording the data log and saves the file. A new data log file will then be required to be started to continue logging on a multi-sample basis to a single data log file (Section 3.18.1).

TROUBLESHOOTING PROCEDURE

RESOLUTION OF SYSTEM FAULT OR SYSTEM NOTIFICATION

TESTING – BRANCH 1

- (1) Determine if the message displayed on the Base Unit screen is a fault or a notification by finding it in the tables above.

CONDITION / INDICATION

Is the message a system fault?

DECISION

YES – Go to TESTING - BRANCH 2.

NO – Go to TESTING – BRANCH 3.

TESTING – BRANCH 2

(2) Acknowledge the system fault by pressing the Enter key.

(3) Follow the instructions in the referenced troubleshooting procedure or resolution steps column of the above table.

CONDITION / INDICATION

After following the instructions in the referenced troubleshooting procedure or resolution steps column, did the system fault display again?

DECISION

YES – Send to the appropriate level of maintenance as authorized.

NO – Troubleshooting complete.

TESTING – BRANCH 3

(4) Acknowledge the system notification by pressing the Enter key.

(5) Follow the instructions in the referenced troubleshooting procedure or resolution steps column of the above table.

CONDITION / INDICATION

After following the instructions in the referenced troubleshooting procedure or resolution steps column, did the system fault display again?

DECISION

YES – Send to the appropriate level of maintenance as authorized.

NO – Troubleshooting complete.

END OF TROUBLESHOOTING PROCEDURE

9.2.2 Base Unit Does Not Power on With Batteries

REQUIRED:

- Base Unit Powered Off (Section 3.6.2)

GENERAL INFORMATION:

The Base Unit is not able to be powered on when using batteries.

TROUBLESHOOTING PROCEDURE

BASE UNIT DOES NOT POWER ON WITH BATTERIES

TESTING – BRANCH 1

- (1) Remove battery cap (Figure 9.1, Item 1) by turning cap 1/4 turn counter-clockwise and pulling outward from battery compartment.

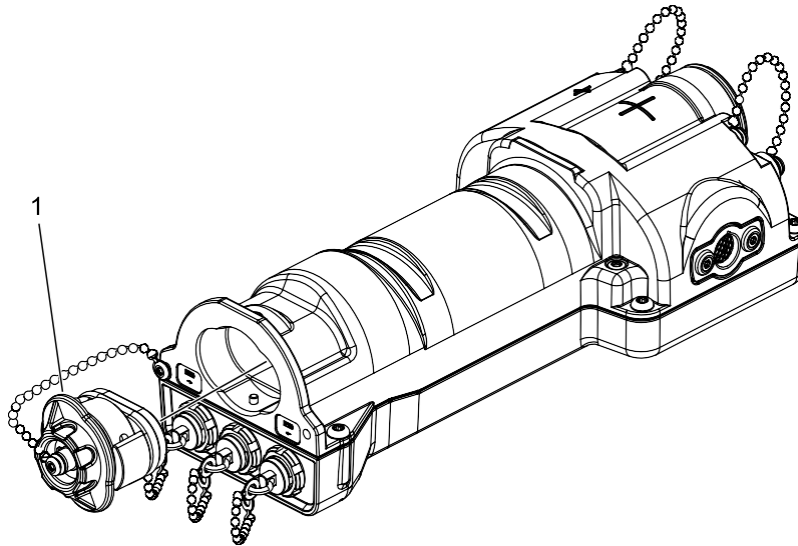


Figure 9.1. Battery Cap Removal.

- (2) Confirm all four batteries are installed in the proper direction (Figure 9.2).

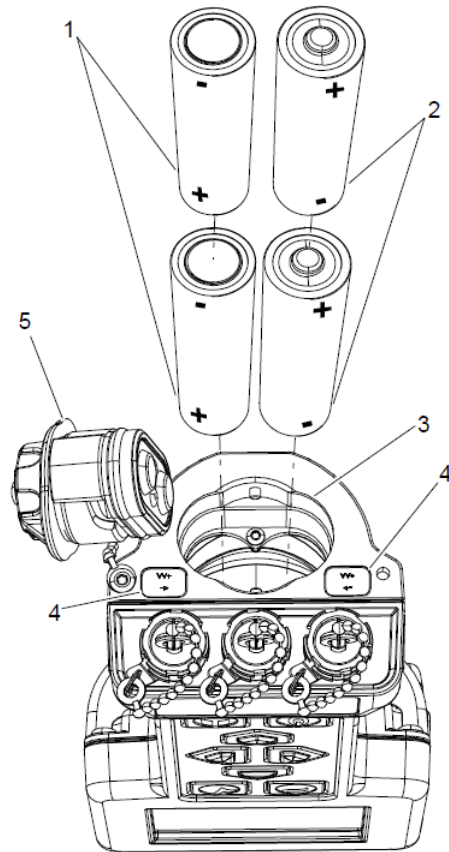


Figure 9.2. Correct Orientation for Battery Installation.

CONDITION / INDICATION

Are batteries installed correctly?

DECISION

YES – Go to TESTING - BRANCH 2.

NO – Install batteries correctly (Section 3.4.3).

TESTING – BRANCH 2

(3) Install battery cap by pushing cap (Figure 1, Item 1) into battery compartment and turning cap $\frac{1}{4}$ turn clockwise.

(4) Power on Base Unit by pressing the Home/Power  key.

CONDITION / INDICATION


Does Base unit power up correctly?

DECISION

YES – Troubleshooting complete.

NO – Go to TESTING – BRANCH 3.

TESTING – BRANCH 3

- (5) Replace with new alkaline AA batteries or fully charged NiMH rechargeable batteries (Chapter 10.2.2).
- (6) Power on Base Unit by pressing the Home/Power  key.






CONDITION / INDICATION

Does Base Unit power up correctly?

DECISION

- YES – Troubleshooting complete.
- NO – Go to TESTING – BRANCH 4.
-

TESTING – BRANCH 4

- (7) Power Base Unit off by pressing the Home/Power  key for 3 second and acknowledge the prompt with the with the Enter  key, if applicable.
- (8) Perform Depot Settings Reset by pressing Back , Menu , and Home/Power  keys simultaneously for 10 seconds.

CONDITION / INDICATION

Does Base Unit power up correctly?

DECISION

- YES – Troubleshooting complete.
- NO – to the appropriate level of maintenance as authorized.

END OF TROUBLESHOOTING PROCEDURE

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9.2.3 Base Unit Alternating Current / Direct Current (AC/DC) Power Adapter No Power

REQUIRED:

- Base Unit Powered Off (Section 3.6.2)

GENERAL INFORMATION:

The AC/DC power adapter is not providing power to the Base Unit.

TROUBLESHOOTING PROCEDURE

BASE UNIT DOES NOT POWER ON WITH BATTERIES

NOTE

If the AC/DC power adapter has been properly connected to a 110 VAC outlet and to the Base Unit and is functioning, a plug icon will appear in the right-hand corner of the screen replacing the battery icon to indicate that the Base Unit is running on AC/DC power.

TESTING – BRANCH 1

- (1) Check AC/DC power adapter for corrosion, frayed wires, or other visible damage.

CONDITION / INDICATION

Does AC/DC power adapter have visible corrosion, fraying wires, or other visible damage?

DECISION

YES – Replace AC/DC power adapter. Troubleshooting complete.

NO – Go to TESTING - BRANCH 2.

TESTING – BRANCH 2

- (2) Check AC/DC power adapter is connected correctly (Section 3.5.1).

- (3) Verify AC/DC power adapter icon is visible in status bar (Section 3.2.1).

CONDITION / INDICATION

Is AC/DC power adapter connected correctly (Section 3.5.1)?

DECISION

YES – Go to TESTING - BRANCH 3.

NO – Connect AC/DC Power adapter correctly (Section 3.5.1).

TESTING – BRANCH 3

- (4) Check the power source.

CONDITION / INDICATION

Was it connected to a functioning power source?

DECISION

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YES – Go to TESTING – BRANCH 4.

NO – Connect AC/DC power adapter to a functioning power source.

TESTING – BRANCH 4

(5) Check cord connections to power outlet and to Base Unit.

CONDITION / INDICATION

Is AC/DC power adapter now providing power to Base Unit?

DECISION

YES – Troubleshooting complete.

NO – Send to the appropriate level of maintenance as authorized.

END OF TROUBLESHOOTING PROCEDURE

9.2.4 Base Unit Only Displays Logo

REQUIRED:

- Base Unit Powered Off (Section 3.6.2)


GENERAL INFORMATION:

The Base Unit screen only displays the logo.

TROUBLESHOOTING PROCEDURE

BASE UNIT ONLY DISPLAYS LOGO

TESTING – BRANCH 1

- (1) Power Base Unit on by pressing the Home/Power  key.
- (2) Confirm logo appears on screen for 2 minutes or longer post power up.


CONDITION / INDICATION

Is logo still displayed after 2 minutes?

DECISION

- YES – Go to TESTING - BRANCH 2.
NO – Troubleshooting complete.
-

TESTING – BRANCH 2

- (3) Power off Base Unit by pressing the Home/Power  key for 3 seconds and acknowledging the prompt with the with the Enter  key, if applicable.

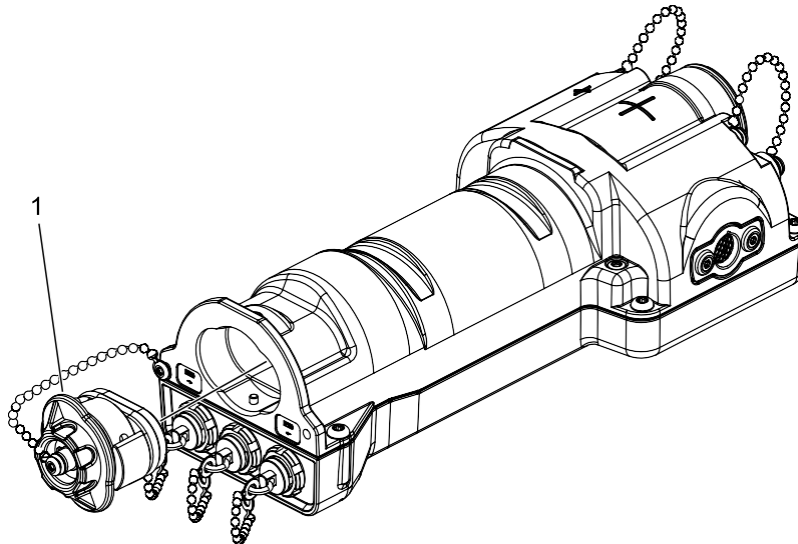





Figure 9.3. Battery Cap Removal.

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- (4) Remove battery cap (Figure 9.3, Item 1) by turning cap $\frac{1}{4}$ turn counter-clockwise and pulling outward from battery compartment to reset power.
- (5) Install battery cap by pushing cap (Figure 9.3, Item 1) into battery compartment and turning cap $\frac{1}{4}$ turn clockwise.
- (6) Perform Depot Settings Reset by pressing Back , Menu , and Home/Power  keys simultaneously for 10 seconds.

CONDITION / INDICATION

Is logo still displayed after 2 minutes?

DECISION

YES – Send to the appropriate level of maintenance as authorized.

NO – Troubleshooting complete.

END OF TROUBLESHOOTING PROCEDURE

9.2.5 Base Unit No Buzzer Audio

REQUIRED:

- Base Unit Powered On (Section 3.6.1)

GENERAL INFORMATION:

No audio can be heard from the Base Unit buzzer.

TROUBLESHOOTING PROCEDURE

BASE UNIT NO BUZZER AUDIO

TESTING – BRANCH 1

- (1) Verify Base Unit Mute setting is not checked (Section 3.17.4).
- (2) Use Base Unit settings to modify volume (Section 3.17.4).



CONDITION / INDICATION

Does volume increase/decrease?

DECISION

- YES – Troubleshooting complete.
NO – Go to TESTING - BRANCH 2.
-

TESTING – BRANCH 2

- (3) Power off Base Unit by pressing the Home/Power  key for 3 seconds and acknowledging the prompt by pressing the Enter  key.
- (4) Remove battery cap (Figure 9.4, Item 1) by turning cap ¼ turn counterclockwise and pulling outward from battery compartment to reset power.

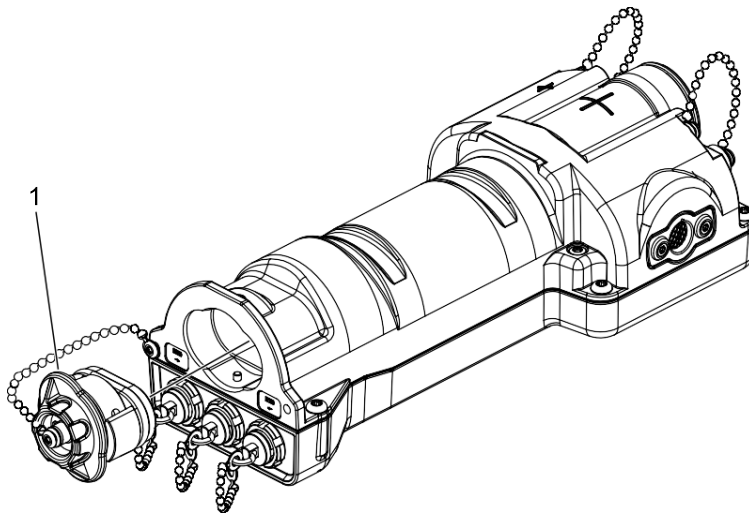





Figure 9.4. Battery Cap Removal.

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- (5) Install battery cap by pushing cap (Figure 1, Item 1) into battery compartment and turning cap $\frac{1}{4}$ turn clockwise.
- (6) Perform Depot Settings Reset by pressing Back , Menu , and Home/Power  keys simultaneously for 10 seconds.
- (7) Verify low alarm threshold is set (Section 3.17.7) at a value that will produce an audible alarm with a source check.
- (8) Perform source check (Section 3.9.1).

CONDITION / INDICATION

Did an audible alarm sound from the buzzer when source check was performed?

DECISION

YES – Troubleshooting complete.

NO – Send to the appropriate level of maintenance as authorized.

END OF TROUBLESHOOTING PROCEDURE

9.2.6 Base Unit No Audio with Headset

REQUIRED:

- Base Unit Powered On (Settings 3.6.1)

GENERAL INFORMATION:

No audio can be heard through the headset when connected.

TROUBLESHOOTING PROCEDURE

BASE UNIT NO AUDIO WITH HEADSET

TESTING – BRANCH 1

- (1) Use known working headset.
- (2) Verify Base Unit Mute setting is not checked (Section 3.17.4).
- (3) Use Base Unit settings to modify volume (Section 3.17.4).



CONDITION / INDICATION

Does volume increase/decrease in headset?

DECISION

- YES – Troubleshooting complete.
NO – Go to TESTING - BRANCH 2.
-

TESTING – BRANCH 2

- (4) Power off Base Unit by pressing the Home/Power  key for 3 seconds and acknowledging the prompt by pressing the Enter  key.
- (5) Remove battery cap (Figure 9.5, Item 1) by turning cap ¼ turn counterclockwise and pulling outward from battery compartment to reset power.

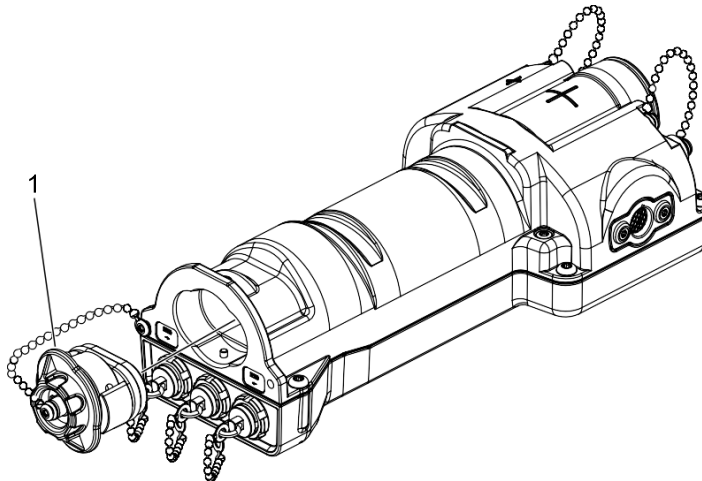





Figure 9.5. Battery Cap Removal.

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- (6) Install battery cap by pushing cap (Figure 9.5, Item 1) into battery compartment and turning cap $\frac{1}{4}$ turn clockwise.
- (7) Perform Depot Settings Reset by pressing Back , Menu , and Home/Power  keys simultaneously for 10 seconds.
- (8) Verify low alarm threshold is set (Section 3.17.7) at a value that will produce an audible alarm with a source check.
- (9) Perform source check (Section 3.9.1).

CONDITION / INDICATION

Did the audible alarm sound in the headset?

DECISION

YES – Troubleshooting complete.

NO – Send to the appropriate level of maintenance as authorized.

END OF TROUBLESHOOTING PROCEDURE

9.2.7 Base Unit Readings Are Not Accurate, Display Zero During Source Check, or INV

REQUIRED:

- Base Unit Powered On (Section 3.6.1)

GENERAL INFORMATION:

The Base Unit has an expanded range of detection by including both low dose and high dose detectors. When radiation counts are not consistent between two detectors (for example, when high dose detector counts are larger than low dose detector counts), an 'INV' or invalid reading is displayed. This INV system fault can be temporary or it can be persistent. If the "INV" fault displays more than 3 times in a week of usage, it is considered persistent and may indicate incorrect detector connections or a problem or malfunction with one of the detectors, complete these troubleshooting steps. If the "INV" fault is only displayed once over an extended period of usage, the issue is a temporary anomaly, there is no need to perform troubleshooting.

If the Base Unit is being operated in an area with a known radiation background and the reading is at least 10% or greater than the known background value, complete these troubleshooting steps.

If during a source check either detector, the low dose GM tube "L Cnt" or the high dose GM tube "H Cnt" display a zero ("0") for the counts at the end of one minute during the Rad test portion, complete these troubleshooting steps.

TROUBLESHOOTING PROCEDURE

BASE UNIT READINGS ARE NOT ACCURATE, DISPLAY ZERO DURING SOURCE CHECK, OR INV

TESTING – BRANCH 1

- (1) Complete source check (Section 3.9.1).


CONDITION / INDICATION

Did both detectors pass source check within one minute?

DECISION

- YES – Go to TESTING - BRANCH 2.
 - NO – Go to TESTING - BRANCH 3.
-

TESTING – BRANCH 2

- (2) Press the Home/Power  key.
- (3) Verify Home screen shows inaccurate readings or INV.



CONDITION / INDICATION

Does Home screen still show inaccurate readings or INV?

DECISION

- YES – Go to TESTING - BRANCH 3.
 - NO – Troubleshooting complete.
-

TESTING – BRANCH 3

- (4) Power off Base Unit by pressing the Home/Power  key for 3 seconds and acknowledging the prompt by pressing the Enter  key.
- (5) Remove battery cap (Figure 9.6, Item 1) by turning cap ¼ turn counter-clockwise and pulling outward from battery compartment to reset power.

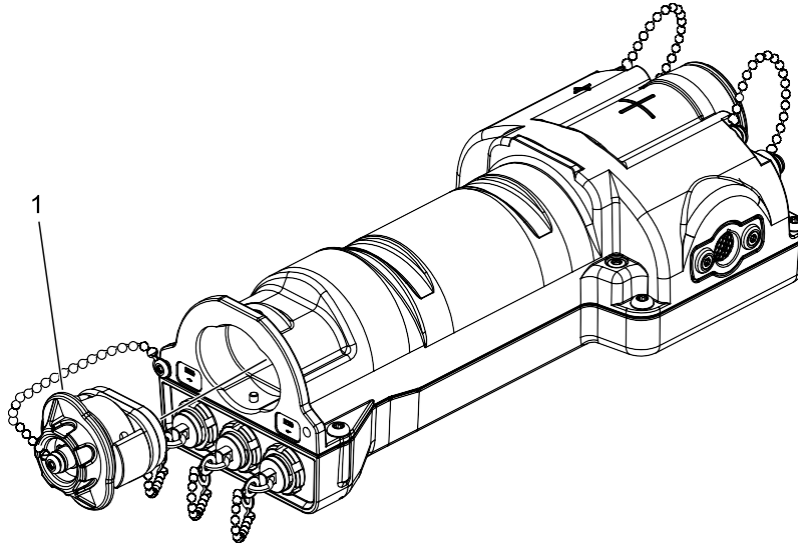





Figure 9.6. Battery Cap Removal.

- (6) Install battery cap by pushing cap (Figure 9.6, Item 1) into battery compartment and turning cap ¼ turn clockwise.
- (7) Perform Depot Settings Reset by pressing Back , Menu , and Home/Power  keys simultaneously for 10 seconds.
- (8) Verify low alarm threshold is set (Section 3.17.4) at a value that will produce an audible alarm with a source check.
- (9) Complete source check (Section 3.9.1).

CONDITION / INDICATION

Does the Base Unit pass source check with accurate readings and no INV displayed on screen?

DECISION

YES – Troubleshooting complete.

NO – Send to the appropriate level of maintenance as authorized.

END OF TROUBLESHOOTING PROCEDURE

9.2.8 Base Unit Attached to Rad Extender Does Not Present Mode Options

REQUIRED:

- Base Unit Powered On (Section 3.6.1)

GENERAL INFORMATION:

When the Rad Extender is connected to the Base Unit it does not present the mode options for selection.

TROUBLESHOOTING PROCEDURE

BASE UNIT ATTACHED TO RAD EXTENDER DOES NOT PRESENT MODE OPTIONS

TESTING – BRANCH 1

- (1) Disconnect if applicable and reconnect the Rad Extender to the Base Unit (Section 5.2.1).

CONDITION / INDICATION

Does PC or Transfer Mode option display (Figure 9.7)?

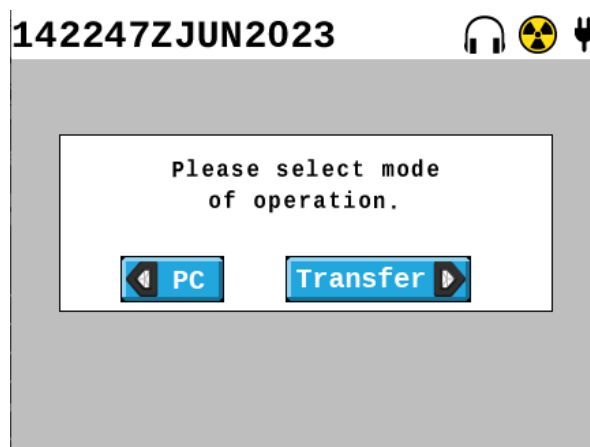




Figure 9.7. PC or Transfer Mode Options.

DECISION

- YES – Troubleshooting complete.
- NO – Go to TESTING - BRANCH 2.
-

TESTING – BRANCH 2

- (2) Disconnect Rad Extender from Base Unit (Section 5.2.1).
 - (3) Power off Base Unit by pressing the Home/Power  key for 3 seconds and acknowledging the prompt by pressing the Enter  key.
 - (4) Remove battery cap (Figure 9.8, Item 1) by turning cap ¼ turn counter-clockwise and pulling outward from battery compartment to reset power.
-

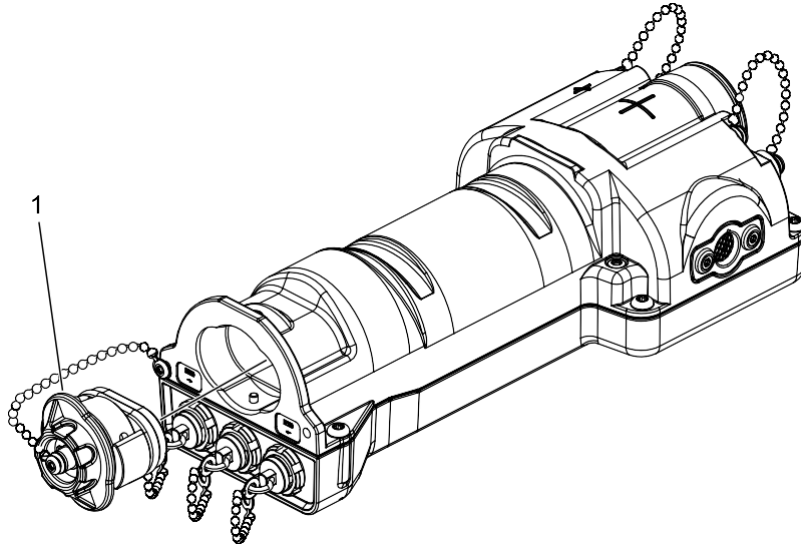





Figure 9.8. Battery Cap Removal.

- (5) Install battery cap by pushing cap (Figure 9.8, Item 1) into battery compartment and turning cap $\frac{1}{4}$ turn clockwise.
- (6) Perform Depot Settings Reset by pressing Back , Menu , and Home/Power  keys simultaneously for 10 seconds.
- (7) Connect Rad Extender to Base Unit (5.2.1).

CONDITION / INDICATION

Does PC or Transfer Mode option display (Figure 9.7)?

DECISION

YES – Troubleshooting complete.

NO – Send to the appropriate level of maintenance as authorized.

END OF TROUBLESHOOTING PROCEDURE

9.2.9 Probe Communication Error

REQUIRED:

- Base Unit Powered On (Section 3.6.1)
- Probe Attached to Base Unit (Section 4.1.1)

GENERAL INFORMATION:

This section is for troubleshooting communication between any probe and the Base Unit.

A system notification message stating Probe Communication Error will generally be displayed if there is a communication issue between the Base Unit and a probe.

TROUBLESHOOTING PROCEDURE

PROBE COMMUNICATION ERROR

TESTING – BRANCH 1

- (1) Disconnect Common Probe Cable from Base Unit (Section 4.1.1).
- (2) Reconnect Common Probe Cable to Base Unit (Section 4.1.1).



CONDITION / INDICATION

Did reconnecting the probe correct the probe communication error?

DECISION

- YES – Troubleshooting complete.
- NO – Go to TESTING - BRANCH 2.
-

TESTING – BRANCH 2

- (3) Disconnect Common Probe Cable from Base Unit (Section 4.1.1).
- (4) Power off Base Unit by pressing the Home/Power  key for 3 seconds and acknowledging the prompt by pressing the Enter  key.
- (5) Remove battery cap (Figure 9.9, Item 1) by turning cap ¼ turn counter-clockwise and pulling outward from battery compartment to reset power.

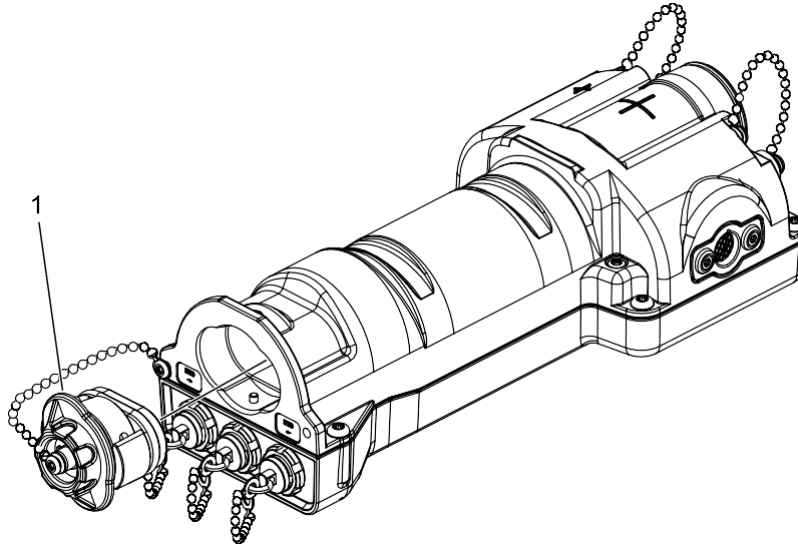












Figure 9.9. Battery Cap Removal.

- (6) Install battery cap by pushing cap (Figure 9.9, Item 1) into battery compartment and turning cap $\frac{1}{4}$ turn clockwise.
- (7) Perform Depot Settings Reset by pressing Back , Menu , and Home/Power  keys simultaneously for 10 seconds.
- (8) Connect Common Probe Cable to Base Unit (Section 4.1.1).
- (9) Navigate to the Health menu and observe if the probe communication error message is still displayed under details in the Base Unit or Probe Details screen.
 - (a) Press Menu  key.
 - (b) Highlight Health icon (Section 3.17.1) using Arrow  keys.
 - (c) Press Enter  key to view Health Menu (Section 3.17.2).
 - (d) Check Details screen of Base Unit.
 - i. Highlight Details button for Base Unit using the Arrow  keys.
 - ii. Press Enter to view the Details screen.
 - iii. Observe for communication error.
 - (e) Use Back  key to return to Health menu.
 - (f) Check Details screen of probe.

- i. Highlight Details button for probe using the Arrow  keys.
- ii. Press Enter to view the Details screen.
- iii. Observe for communication error.

(10) Exit Details screen by pressing Home/Power  key.

CONDITION / INDICATION

Does probe communication error message continue to display?

DECISION

YES – Send to the appropriate level of maintenance as authorized.

NO – Troubleshooting complete.

END OF TROUBLESHOOTING PROCEDURE

9.2.10 Beta Photon Probe Plugged In and Beta Photon Probe Icon Not Displayed

REQUIRED:

- Base Unit Powered On (Section 3.6.1)
- Beta Photon Probe Connected to Base Unit (Section 4.2.2)

GENERAL INFORMATION:

The Beta Photon Probe is connected by the Common Probe Cable to the Base Unit, but the probe icon is not appearing in the bottom right of the footer bar, the reading panel for the Beta Photon Probe did not appear on the Home screen, and no power is being received by the Beta Photon Probe.

TROUBLESHOOTING PROCEDURE

BETA PHOTON PROBE PLUGGED IN AND BETA PHOTON PROBE ICON NOT DISPLAYED

TESTING – BRANCH 1

- (1) Verify Common Probe Cable is connected correctly (Section 4.2.2).

CONDITION / INDICATION 7

Is Common Probe Cable connected correctly (Section 4.2.2)?

DECISION

YES – Go to TESTING - BRANCH 2.

NO – Connect Common Probe Cable correctly (Section 4.2.2).

TESTING – BRANCH 2

- (2) Verify Beta Photon Probe icon is displayed on Home screen, right side of footer bar.

CONDITION / INDICATION

Is Beta Photon Probe icon displayed on Home screen?

DECISION

YES – Troubleshooting complete.

NO – Send to the appropriate level of maintenance as authorized.

END OF TROUBLESHOOTING PROCEDURE

9.2.11 Beta Photon Probe Readings Are Not Accurate, Display Zero During Source Check, or INV

REQUIRED:

- Base Unit Powered On (Section 3.6.1)
- Beta Photon Probe Attached to Base Unit (Section 4.2.2)

GENERAL INFORMATION:

Beta Photon Probes have an expanded range of detection by including both low dose and high dose detectors. When radiation counts are not consistent between two detectors (for example, when high dose detector counts are larger than low dose detector counts), an 'INV' or invalid reading is displayed. This INV system fault can be temporary or it can be persistent. If the "INV" fault displays more than 3 times in a week of usage, it is considered persistent and may indicate incorrect detector connections or a problem or malfunction with one of the detectors, complete these troubleshooting steps. If the "INV" fault is only displayed once over an extended period of usage, the issue is a temporary anomaly, there is no need to perform troubleshooting.

If the Beta Photon Probe is being operated in an area with a known radiation background and the reading is at least 10% or greater than the known background value, complete these troubleshooting steps.

If during a source check either detector, the low dose GM tube "L Cnt" or the high dose GM tube "H Cnt" display a zero ("0") for the counts at the end of one minute during the Rad test portion, complete these troubleshooting steps.

TROUBLESHOOTING PROCEDURE

BETA PHOTON PROBE READINGS ARE NOT ACCURATE, DISPLAY ZERO DURING SOURCE CHECK, OR INV

TESTING – BRANCH 1

- (1) Complete probe source check (Section 4.2.7).

CONDITION / INDICATION


Did both detectors pass source check within one minute?

DECISION

YES – Go to TESTING - BRANCH 2.

NO – Go to TESTING - BRANCH 3.

TESTING – BRANCH 2

- (2) Press the Home/Power  key.
- (3) Verify Home screen shows inaccurate readings or INV.

CONDITION / INDICATION



Does Home screen still show inaccurate readings or INV?

DECISION

YES – Go to TESTING - BRANCH 3.

NO – Troubleshooting complete.

TESTING – BRANCH 3

- (4) Disconnect Common Probe Cable from Base Unit (Section 4.1.2).
- (5) Power off Base Unit by pressing the Home/Power  key for 3 seconds and acknowledging the prompt by pressing the Enter  key.
- (6) Remove battery cap (Figure 9.10, Item 1) by turning cap ¼ turn counterclockwise and pulling outward from battery compartment to reset power.

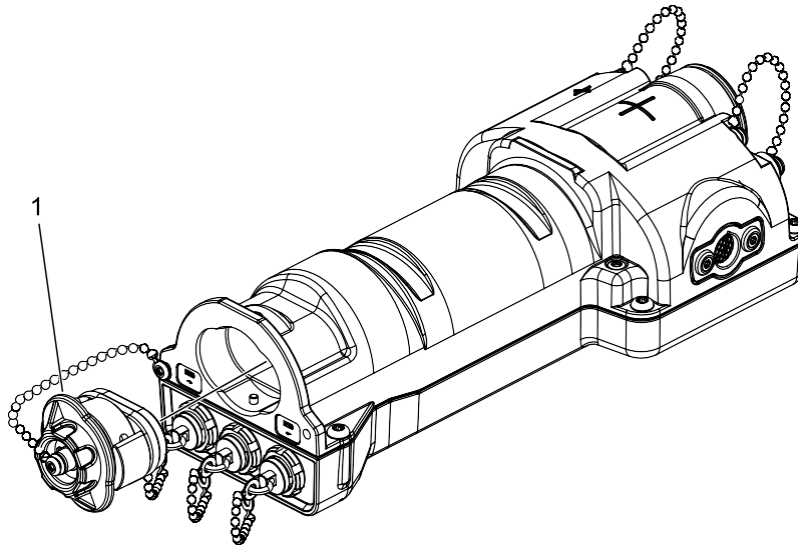





Figure 9.10. Battery Cap Removal.

- (7) Install battery cap by pushing cap (Figure 9.10, Item 1) into battery compartment and turning cap ¼ turn clockwise.
- (8) Perform Depot Settings Reset by pressing Back , Menu , and Home/Power  keys simultaneously for 10 seconds.
- (9) Connect Common Probe Cable to Base Unit (Section 4.1.1).
- (10) Complete probe source check (Section 4.2.7).

CONDITION / INDICATION

Does both detectors pass source check with accurate readings and no INV displayed on screen?

DECISION

YES – Troubleshooting complete.

NO – Send to the appropriate level of maintenance as authorized.

END OF TROUBLESHOOTING PROCEDURE

9.2.12 Alpha-Beta Probe Plugged In and Alpha-Beta Probe Icon Not Displayed

REQUIRED:

- Base Unit Powered On (Section 3.6.1)
- Alpha-Beta Probe Connected to Base Unit (Section 4.3.2)

GENERAL INFORMATION:

The Alpha-Beta Probe is connected by the Common Probe Cable to the Base Unit, but the probe icon is not appearing in the bottom right of the footer bar, the reading panels for the Alpha-Beta Probe did not appear on the Home screen, and no power is being received by the Alpha-Beta Probe.

TROUBLESHOOTING PROCEDURE

ALPHA-BETA PHOTON PROBE PLUGGED IN AND ALPHA-BETA PROBE ICON NOT DISPLAYED

TESTING – BRANCH 1

(1) Verify Common Probe Cable is connected correctly (Section 4.1.1 and 4.3.2).

CONDITION / INDICATION

Is Common Probe Cable connected correctly (Section 4.1.1 and 4.3.2)?

DECISION

YES – Go to TESTING - BRANCH 2.

NO – Connect Common Probe Cable correctly (Section 4.1.1 and 4.3.2).

TESTING – BRANCH 2

(2) Verify Alpha-Beta Probe icon is displayed on Home screen, right side of footer bar.

CONDITION / INDICATION

Is Alpha-Beta Probe icon displayed on Home screen?

DECISION

YES – Troubleshooting complete.

NO – Send to the appropriate level of maintenance as authorized.

END OF TROUBLESHOOTING PROCEDURE

9.2.13 Alpha-Beta Probe Readings Are Not Accurate, Passes Light Leak Test or Display Zero During Source Check

REQUIRED:

- Base Unit Powered On (Section 3.6.1)
- Alpha-Beta Probe Attached to Base Unit (Section 4.3.2)
- Alpha-Beta Probe Does Pass Light Leak Test (Section 4.3.3)

GENERAL INFORMATION:

If the Alpha-Beta Probe is being operated in an area with a known radiation background and the reading is at least 10% or greater than the known background value but no light leak has been detected, complete these troubleshooting steps.

This troubleshooting procedure is also to be used if during the source check the detector count after one minute during the Rad Test portion remains at zero counts for beta counts. Alpha counts may remain at zero when using the Cesium (Cs)-137 check source as it does not provide alpha radiation. The Alpha-Beta Probe has one detector, therefore the counts seen on the detector for beta radiation provide the functionality check needed to ensure the probe is in working condition for both types of radiation.

TROUBLESHOOTING PROCEDURE

ALPHA-BETA PROBE READINGS ARE NOT ACCURATE, PASSES LIGHT LEAK TEST OR DISPLAY ZERO DURING SOURCE CHECK

TESTING – BRANCH 1

- (1) Complete Alpha-Beta Probe source check (Section 4.3.8).

CONDITION / INDICATION

Did the Alpha-Beta probe pass the Rad test portion of the source check within one minute?

DECISION

YES – Go to TESTING - BRANCH 2.

NO – Send to the appropriate level of maintenance as authorized.

TESTING – BRANCH 2

CAUTION



Scintillator. Alpha-Beta Probe full detection capability will not be ready until scintillator that sits below mylar window has settled for 2 hours after exposure to light. Failure to comply may result in inaccurate readings.

- (2) Verify that at least 2 hours have passed since the mylar window was replaced (Section 10.2.3).

CONDITION / INDICATION

Has 2 hours passed since the mylar window was replaced?

DECISION

YES – Go to TESTING - BRANCH 3.

NO – Wait until 2 hours have passed and go to TESTING – BRANCH 3.

TESTING – BRANCH 3

(3) Verify Base Unit displays inaccurate readings for Alpha-Beta Probe in known background.

CONDITION / INDICATION

Does Base Unit still display inaccurate readings for Alpha-Beta Probe in known background?


DECISION

YES – Go to TESTING - BRANCH 4.

NO – Troubleshooting Complete.

TESTING – BRANCH 4

(4) Disconnect Common Probe Cable from Base Unit (Section 4.1.2).

(5) Power off Base Unit by pressing the Home/Power  key for 3 seconds and acknowledging the prompt by pressing the Enter  key.

(6) Remove battery cap (Figure 9.11, Item 1) by turning cap ¼ turn counter-clockwise and pulling outward from battery compartment to reset power.

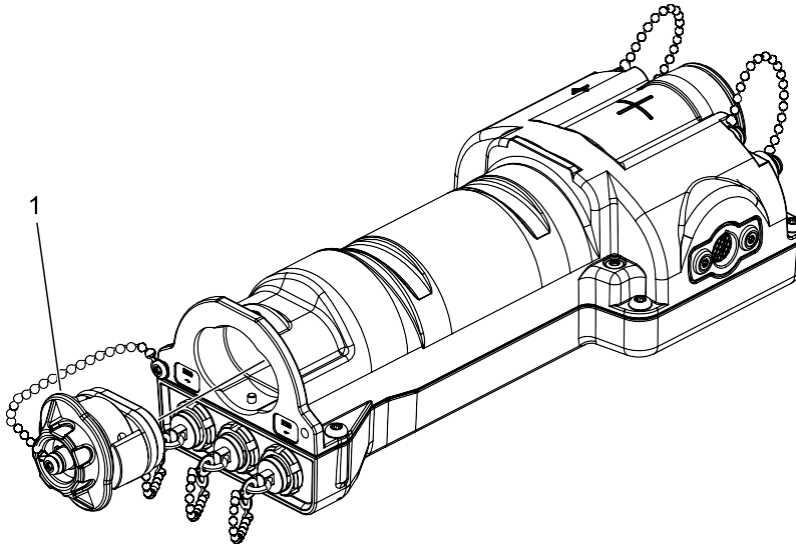





Figure 9.11. Battery Cap Removal.

(7) Install battery cap by pushing cap (Figure 9.11, Item 1) into battery compartment and turning cap ¼ turn clockwise.

(8) Perform Depot Settings Reset by pressing Back , Menu , and Home/Power  keys simultaneously for 10 seconds.

(9) Connect Common Probe Cable to Base Unit (Section 4.1.1).

(10) Complete Alpha-Beta Probe source check (Section 4.3.8).

CONDITION / INDICATION

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Does the Alpha-Beta Probe pass source check with accurate readings for the range given (Section 4.3.8)?

DECISION

YES – Troubleshooting complete.

NO – Send to the appropriate level of maintenance as authorized.

END OF TROUBLESHOOTING PROCEDURE

9.2.14 Alpha-Beta Probe High Readings in Known Background and Does Not Pass Light Leak Test

REQUIRED:

- Base Unit Powered On (Section 3.6.1)
- Alpha-Beta Probe Attached to Base Unit (Section 4.3.2)
- Alpha-Beta Probe Does Not Pass Light Leak Test (Section 4.3.3)

GENERAL INFORMATION:

When an operator is using the Alpha-Beta Probe in an area that has a known radiation background but the alpha and/or beta readings are much higher than expected, there could be a problem with ambient light being able to enter through a damaged mylar window or one that is not seated correctly. If there is a light leak, higher radiation readings than expected or found during a source check may be seen when holding the Alpha-Beta Probe towards a light source. Follow the troubleshooting steps presented for the described symptoms.

TROUBLESHOOTING PROCEDURE

ALPHA-BETA PROBE HIGH READINGS IN KNOWN BACKGROUND AND DOES NOT PASS LIGHT LEAK TEST

TESTING – BRANCH 1

- (1) Inspect mylar window for tears, holes, and other damage.

CONDITION / INDICATION

Is mylar window damaged?

DECISION

YES – Replace mylar window (Section 10.2.3).

NO – Go to TESTING - BRANCH 2.

TESTING – BRANCH 2

- (2) Confirm protective grate has held mylar window in place for at least 2 hours.
- (3) Observe (without opening the protective grate) the protective screen and mylar window for correct positioning under the protective grate (Section 10.2.3).

CONDITION / INDICATION

Has mylar window been correctly installed for at least 2 hours?

DECISION

YES – Go to TESTING – BRANCH 3.

NO – Install mylar window correctly (Section 10.2.3).

TESTING – BRANCH 3

- (4) Perform light leak test (Section 4.3.3).
- (5) Verify if Alpha-Beta Probe is displaying high readings.

CONDITION / INDICATION

Does Alpha-Beta Probe still display high readings?

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DECISION

YES – Go to TESTING – BRANCH 4.

NO – Troubleshooting complete.

TESTING – BRANCH 4

(6) Replace mylar window (Section 10.2.3) and wait for 2 hours.

(7) Perform light leak test (Section 4.3.3).

(8) Verify if Alpha-Beta Probe is displaying high readings.

CONDITION / INDICATION

Does Alpha-Beta Probe still display high readings?

DECISION

YES – Send to the appropriate level of maintenance as authorized.

NO – Troubleshooting complete.

END OF TROUBLESHOOTING PROCEDURE

9.2.15 Small Area Beta Gamma (SABG) Probe Plugged In and SABG Probe Icon Not Displayed

REQUIRED:

- Base Unit Powered On (Section 3.6.1)
- SABG Probe Connected to Base Unit (Section 4.4.2)

GENERAL INFORMATION:

The SABG Probe is connected by the Common Probe Cable to the Base Unit, but the probe icon is not appearing in the bottom right of the footer bar, the reading panel for the SABG Probe did not appear on the Home screen, and no power is being received by the SABG Probe.

TROUBLESHOOTING PROCEDURE**SABG PROBE PLUGGED IN AND SABG PROBE ICON NOT DISPLAYED**

TESTING – BRANCH 1

- (1) Verify Common Probe Cable is connected correctly (Section 4.4.2).

CONDITION / INDICATION

Is Common Probe Cable connected correctly (Section 4.4.2)?

DECISION

YES – Go to TESTING - BRANCH 2.

NO – Connect Common Probe Cable correctly (Section 4.4.2).

TESTING – BRANCH 2

- (2) Verify SABG Probe icon is displayed on Home screen, right side of footer bar.

CONDITION / INDICATION

Is SABG Probe icon displayed on Home screen?

DECISION

YES – Troubleshooting complete.

NO – Send to the appropriate level of maintenance as authorized.

END OF TROUBLESHOOTING PROCEDURE

9.2.16 Small Area Beta Gamma (SABG) Probe Readings Are Not Accurate or Display Zero During Source Check

REQUIRED:

- Base Unit Powered On (Section 3.6.1)
- SABG Probe Attached to Base Unit (Section 4.4.2)

GENERAL INFORMATION:

If the SABG Probe is being operated in an area with a known radiation background and the reading is at least 10% or greater than the known background value, complete these troubleshooting steps.

If the display remains at zero ("0") counts at the end of one minute during the Rad test portion of the source check, complete these troubleshooting steps.

TROUBLESHOOTING PROCEDURE

SABG PROBE READINGS ARE NOT ACCURATE OR DISPLAY ZERO DURING SOURCE CHECK

TESTING – BRANCH 1

- (1) Complete probe source check (Section 4.4.7).

CONDITION / INDICATION


Did detector show counts within one minute for Rad Test?

DECISION

YES – Go to TESTING - BRANCH 2.

NO – Go to TESTING - BRANCH 3.

TESTING – BRANCH 2

- (2) Press the Home/Power  key.
- (3) Verify Home screen still shows inaccurate readings.

CONDITION / INDICATION



Does Home screen still show inaccurate readings?

DECISION

YES – Go to TESTING - BRANCH 3.

NO – Troubleshooting complete.

TESTING – BRANCH 3

- (4) Disconnect Common Probe Cable from Base Unit (Section 4.4.9).
 - (5) Power off Base Unit by pressing the Home/Power  key for 3 seconds and acknowledging the prompt by pressing the Enter  key.
 - (6) Remove battery cap (Figure 9.12, Item 1) by turning cap ¼ turn counter-clockwise and pulling outward from battery compartment to reset power.
-

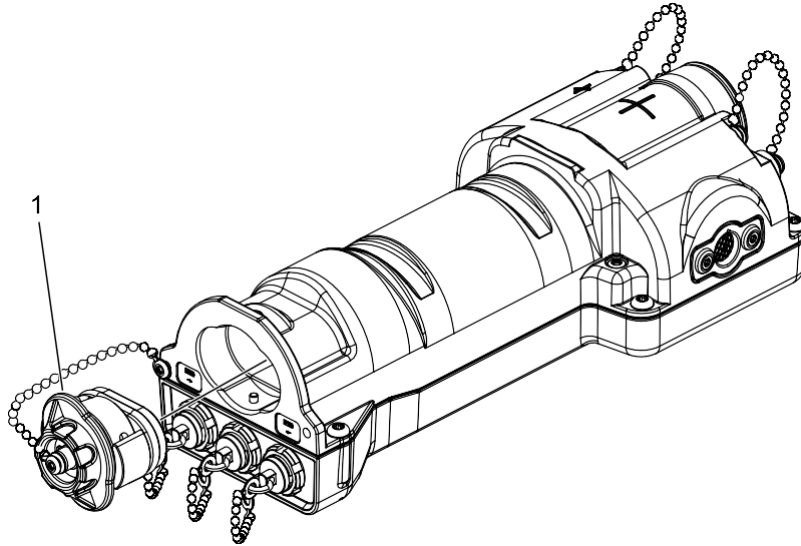





Figure 9.12. Battery Cap Removal.

- (7) Install battery cap by pushing cap (Figure 9.12, Item 1) into battery compartment and turning cap $\frac{1}{4}$ turn clockwise.
- (8) Perform Depot Settings Reset by pressing Back , Menu , and Home/Power  keys simultaneously for 10 seconds.
- (9) Connect Common Probe Cable to Base Unit (Section 4.1.1).
- (10) Complete probe source check (Section 4.4.7).

CONDITION / INDICATION

Did detector pass source check with accurate readings?

DECISION

YES – Troubleshooting complete.

NO – Send to the appropriate level of maintenance as authorized.

END OF TROUBLESHOOTING PROCEDURE

9.2.17 Sensitive Gamma Probe Plugged In and Sensitive Gamma Probe Icon Not Displayed

REQUIRED:

- Base Unit Powered On (Section 3.6.1)
- Sensitive Gamma Probe Connected to Base Unit (Section 4.5.2)

GENERAL INFORMATION:

The Sensitive Gamma Probe is connected by the Common Probe Cable to the Base Unit, but the probe icon is not appearing in the bottom right of the footer bar, the reading panel for the Sensitive Gamma Probe did not appear on the Home screen, and no power is being received by the Sensitive Gamma Probe.

TROUBLESHOOTING PROCEDURE**SENSITIVE GAMMA PROBE PLUGGED IN AND SENSITIVE GAMMA PROBE ICON NOT DISPLAYED**

TESTING – BRANCH 1

(1) Verify Common Probe Cable is connected correctly (Section 4.5.2).

CONDITION / INDICATION

Is Common Probe Cable connected correctly (Section 4.5.2)?

DECISION

YES – Go to TESTING - BRANCH 2.

NO – Connect Common Probe Cable correctly (Section 4.5.2).

TESTING – BRANCH 2

(2) Verify Sensitive Gamma Probe icon is displayed on Home screen, right side of footer bar.

CONDITION / INDICATION

Is Sensitive Gamma Probe icon displayed on Home screen?

DECISION

YES – Troubleshooting complete.

NO – Send to the appropriate level of maintenance as authorized.

END OF TROUBLESHOOTING PROCEDURE

9.2.18 Sensitive Gamma Probe Readings Are Not Accurate or Display Zero During Source Check

REQUIRED:

- Base Unit Powered On (Section 3.6.1)
- Sensitive Gamma Probe Attached to Base Unit (Section 4.5.2)

GENERAL INFORMATION:

If the Sensitive Gamma Probe is being operated in an area with a known radiation background and the reading is at least 10% or greater than the known background value, complete these troubleshooting steps.

If the display remains at zero ("0") counts at the end of one minute during the Rad test portion of the source check, complete these troubleshooting steps.

TROUBLESHOOTING PROCEDURE

SENSITIVE GAMMA PROBE READINGS ARE NOT ACCURATE OR DISPLAY ZERO DURING SOURCE CHECK

TESTING – BRANCH 1

- (1) Complete probe source check (Section 4.5.7).


CONDITION / INDICATION

Did detector show counts within one minute for Rad Test?

DECISION

- YES – Go to TESTING - BRANCH 2.
 - NO – Go to TESTING - BRANCH 3.
-

TESTING – BRANCH 2

- (2) Press the Home/Power  key.
- (3) Verify Home screen still shows inaccurate readings.



CONDITION / INDICATION

Does Home screen still show inaccurate readings?

DECISION

- YES – Go to TESTING - BRANCH 3.
 - NO – Troubleshooting complete.
-

TESTING – BRANCH 3

- (4) Disconnect Common Probe Cable from Base Unit (Section 4.1.2).
 - (5) Power off Base Unit by pressing the Home/Power  key for 3 seconds and acknowledging the prompt by pressing the Enter  key.
-

- (6) Remove battery cap (Figure 9.13, Item 1) by turning cap $\frac{1}{4}$ turn counter-clockwise and pulling outward from battery compartment to reset power.

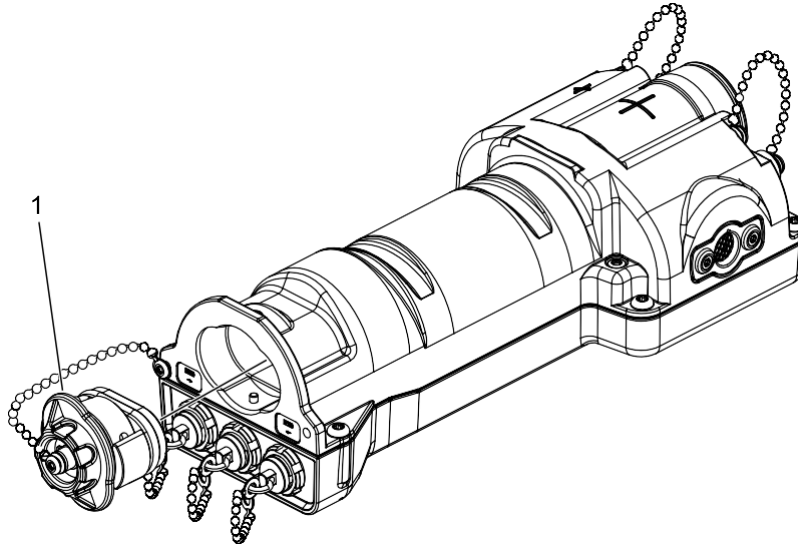





Figure 9.13. Battery Cap Removal.

- (7) Install battery cap by pushing cap (Figure 9.13, Item 1) into battery compartment and turning cap $\frac{1}{4}$ turn clockwise.
- (8) Perform Depot Settings Reset by pressing Back , Menu , and Home/Power  keys simultaneously for 10 seconds.
- (9) Connect Common Probe Cable to Base Unit (Section 4.1.1).
- (10) Complete probe source check (Section 4.5.7).

CONDITION / INDICATION

Did detector pass source check with accurate readings?

DECISION

YES – Troubleshooting complete.

NO – Send to the appropriate level of maintenance as authorized.

END OF TROUBLESHOOTING PROCEDURE

9.2.19 FIDLER Probe Plugged In and FIDLER Probe Icon Not Displayed

REQUIRED:

- Base Unit Powered On (Section 3.6.1)
- FIDLER Probe Connected to Base Unit (Section 4.6.2)

GENERAL INFORMATION:

The FIDLER Probe is connected by the Common Probe Cable to the Base Unit, but the probe icon is not appearing in the bottom right of the footer bar, the reading panels for the FIDLER Probe did not appear on the Home screen, and no power is being received by the FIDLER Probe.

TROUBLESHOOTING PROCEDURE

FIDLER PROBE PLUGGED IN AND FIDLER PROBE ICON NOT DISPLAYED

TESTING – BRANCH 1

- (1) Verify Common Probe Cable is connected correctly (Section 4.6.2).

CONDITION / INDICATION

Is Common Probe Cable connected correctly (Section 4.6.2)?

DECISION

YES – Go to TESTING - BRANCH 2.

NO – Connect Common Probe Cable correctly (Section 4.6.2).

TESTING – BRANCH 2

- (2) Verify FIDLER Probe icon is displayed on Home screen, right side of footer bar.

CONDITION / INDICATION

Is FIDLER Probe icon displayed on Home screen?

DECISION

YES – Troubleshooting complete.

NO – Send to the appropriate level of maintenance as authorized.

END OF TROUBLESHOOTING PROCEDURE

9.2.20 FIDLER Probe Readings Are Not Accurate or Display Zero During Source Check

REQUIRED:

- Base Unit Powered On (Section 3.6.1)
- FIDLER Probe Attached to Base Unit (Section 4.6.2)

GENERAL INFORMATION:

If the FIDLER Probe is being operated in an area with a known radiation background and the reading is at least 10% or greater than the known background value, complete these troubleshooting steps.

If the display remains at zero ("0") counts at the end of one minute during the Rad test portion of the source check, complete these troubleshooting steps.

TROUBLESHOOTING PROCEDURE

FIDLER PROBE READINGS ARE NOT ACCURATE OR DISPLAY ZERO DURING SOURCE CHECK

TESTING – BRANCH 1

- (1) Complete probe source check (Section 4.6.7).


CONDITION / INDICATION

Did detector show counts within one minute for Rad Test?

DECISION

- YES – Go to TESTING - BRANCH 2.
 - NO – Go to TESTING - BRANCH 3.
-

TESTING – BRANCH 2

- (2) Press the Home/Power  key.
- (3) Verify Home screen still shows inaccurate readings.



CONDITION / INDICATION

Does Home screen still show inaccurate readings?

DECISION

- YES – Go to TESTING - BRANCH 3.
 - NO – Troubleshooting complete.
-

TESTING – BRANCH 3

- (4) Disconnect Common Probe Cable from Base Unit (Section 4.1.2).
 - (5) Power off Base Unit by pressing the Home/Power  key for 3 seconds and acknowledging the prompt by pressing the Enter  key.
 - (6) Remove battery cap (Figure 9.14, Item 1) by turning cap ¼ turn counter-clockwise and pulling outward from battery compartment to reset power.
-

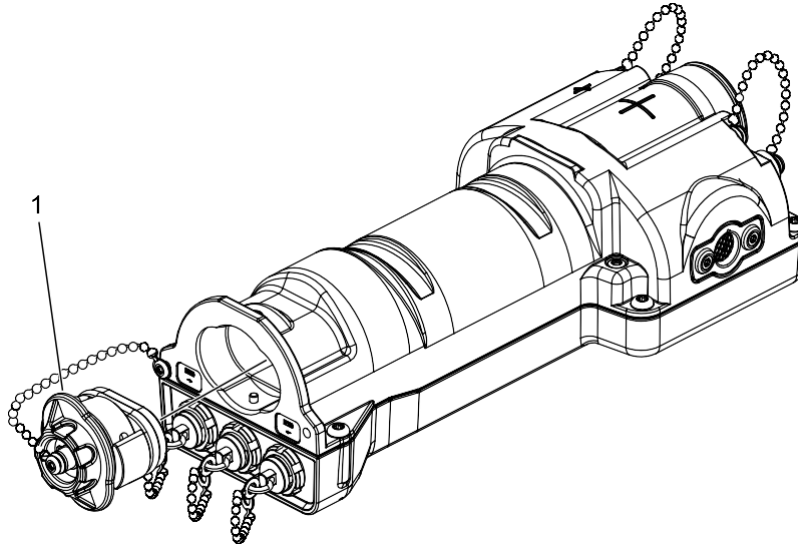





Figure 9.14. Battery Cap Removal.

- (7) Install battery cap by pushing cap (Figure 9.14, Item 1) into battery compartment and turning cap $\frac{1}{4}$ turn clockwise.
- (8) Perform Depot Settings Reset by pressing Back , Menu , and Home/Power  keys simultaneously for 10 seconds.
- (9) Connect Common Probe Cable to Base Unit (Section 4.1.1).
- (10) Complete probe source check (Section 4.6.7).

CONDITION / INDICATION

Did detector pass source check with accurate readings?

DECISION

YES – Troubleshooting complete.

NO – Send to the appropriate level of maintenance as authorized.

END OF TROUBLESHOOTING PROCEDURE

9.2.21 Neutron Probe Plugged In and Neutron Probe Icon Not Displayed

REQUIRED:

- Base Unit Powered On (Section 3.6.1)
- Neutron Probe Connected to Base Unit (Section 4.7.2)

GENERAL INFORMATION:

The Neutron Probe is connected by the Common Probe Cable to the Base Unit, but the probe icon is not appearing in the bottom right of the footer bar, the reading panel for the Neutron Probe did not appear on the Home screen, and no power is being received by the Neutron Probe.

TROUBLESHOOTING PROCEDURE**NEUTRON PROBE PLUGGED IN AND NEUTRON PROBE ICON NOT DISPLAYED**

TESTING – BRANCH 1

- (1) Verify Common Probe Cable is connected correctly (Section 4.7.2).

CONDITION / INDICATION

Is Common Probe Cable connected correctly (Section 4.7.2)?

DECISION

YES – Go to TESTING - BRANCH 2.

NO – Connect Common Probe Cable correctly (Section 4.7.2).

TESTING – BRANCH 2

- (2) Verify Neutron Probe icon is displayed on Home screen, right side of footer bar.

CONDITION / INDICATION

Is Neutron Probe icon displayed on Home screen?

DECISION

YES – Troubleshooting complete.

NO – Send to the appropriate level of maintenance as authorized.

END OF TROUBLESHOOTING PROCEDURE

9.2.22 Neutron Probe Readings Are Not Accurate, Display Zero During Radiation Check, or INV

REQUIRED:

- Base Unit Powered On (Section 3.6.1)
- Neutron Probe Attached to Base Unit (Section 4.7.2)

GENERAL INFORMATION:

Neutron Probes have an expanded range of detection by including both low dose and high dose detectors. When radiation counts are not consistent between two detectors (for example, when high dose detector counts are larger than low dose detector counts), an 'INV' or invalid reading is displayed. This INV system fault can be temporary, or it can be persistent. If the "INV" fault displays more than 3 times in a week of usage, it is considered persistent and may indicate incorrect detector connections or a problem or malfunction with one of the detectors, complete these troubleshooting steps. If the "INV" fault is only displayed once over an extended period of usage, the issue is a temporary anomaly, there is no need to perform troubleshooting.

If the Neutron Probe is being operated in an area with a known radiation background and the reading is at least 10% or greater than the known background value, complete these troubleshooting steps.

If the display remains at zero ("0") counts at the end of fifty (50) minutes during the Rad Test portion of the radiation check, complete these troubleshooting steps.

TROUBLESHOOTING PROCEDURE

NEUTRON PROBE READINGS ARE NOT ACCURATE, DISPLAY ZERO DURING RADIATION CHECK, OR INV

TESTING – BRANCH 1

- (1) Complete probe radiation check (Section 4.7.7).

CONDITION / INDICATION


Did detector show counts within 50 minutes?

DECISION

YES – Go to TESTING - BRANCH 2.

NO – Go to TESTING - BRANCH 3.

TESTING – BRANCH 2

- (2) Press the Home/Power  key.
- (3) Verify Home screen still shows inaccurate readings or displays INV.

CONDITION / INDICATION



Does Home screen still show inaccurate readings or display INV?

DECISION

YES – Go to TESTING - BRANCH 3.

NO – Troubleshooting complete.

TESTING – BRANCH 3

- (4) Disconnect Common Probe Cable from Base Unit (Section 4.1.2).
- (5) Power off Base Unit by pressing the Home/Power  key for 3 seconds and acknowledging the prompt by pressing the Enter  key.
- (6) Remove battery cap (Figure 9.15, Item 1) by turning cap ¼ turn counter-clockwise and pulling outward from battery compartment to reset power.

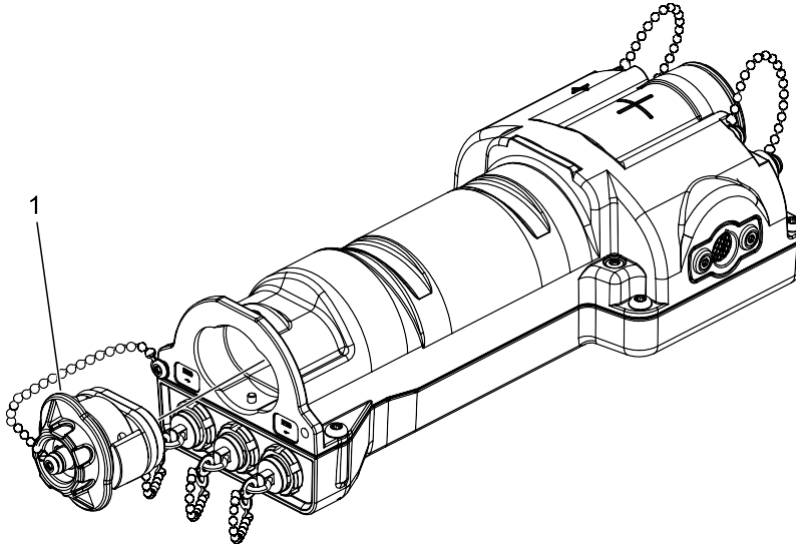





Figure 9.15. Battery Cap Removal.

- (7) Install battery cap by pushing cap (Figure 9.15, Item 1) into battery compartment and turning cap ¼ turn clockwise.
- (8) Perform Depot Settings Reset by pressing Back , Menu , and Home/Power  keys simultaneously for 10 seconds.
- (9) Connect Common Probe Cable to Base Unit (Section 4.1.1).
- (10) Complete Neutron Probe radiation check (Section 4.7.7).

CONDITION / INDICATION

Did Neutron Probe pass radiation check with no INV reporting on the screen?

DECISION

YES – Troubleshooting complete.

NO – Send to the appropriate level of maintenance as authorized.

END OF TROUBLESHOOTING PROCEDURE

9.2.23 Rad Extender Not Communicating

REQUIRED:

- Base Unit Powered Off (Section 3.6.2)

GENERAL INFORMATION:


The housing in the middle of the Rad Extender contains a single board computer. The single board computer acts as a cyber security device and provides the interaction between a Base Unit and a PC. If the Base Unit does not respond to the Rad Extender being connected by displaying PC and Transfer options, there is a problem with Rad Extender.

If there are problems with network IP addresses on the non-networked PC, consult with your IT department.

TROUBLESHOOTING PROCEDURE

RAD EXTENDER NOT COMMUNICATING

TESTING – BRANCH 1

- (1) Power on the Base Unit by pressing the Home/Power  key.
- (2) Connect Rad Extender to Base Unit middle port labeled “USB” (or “DATA”).

CONDITION / INDICATION

Does PC or Transfer Mode option display (Figure 9.16)?

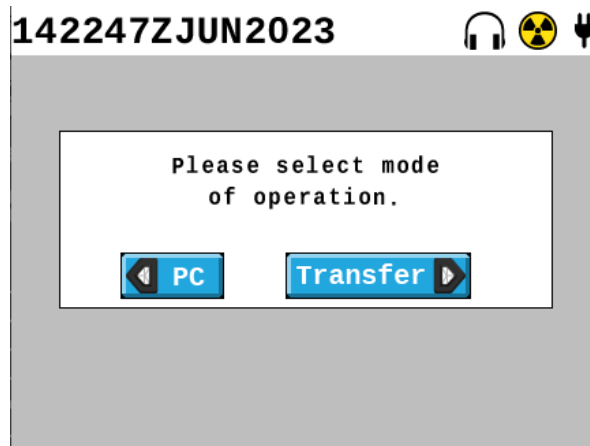


Figure 9.16. PC or Transfer Mode Options.

DECISION

- YES – Go to TESTING - BRANCH 4.
- NO – Go to TESTING - BRANCH 2.

TESTING – BRANCH 2

- (3) Disconnect Rad Extender from Base Unit.

(4) Inspect Rad Extender cable for obvious damage to connectors on both ends.

CONDITION / INDICATION

Is there obvious damage to either connector?



DECISION

YES – Replace Rad Extender (Section 1.1.1).

NO – Go to TESTING - BRANCH 3.

TESTING – BRANCH 3

(5) Disconnect Rad Extender from Base Unit.

(6) Power off Base Unit by pressing the Home/Power  key for 3 seconds and acknowledging the prompt by pressing the Enter  key.

(7) Remove battery cap (Figure 9.17, Item 1) by turning cap ¼ turn counter-clockwise and pulling outward from battery compartment to reset power.

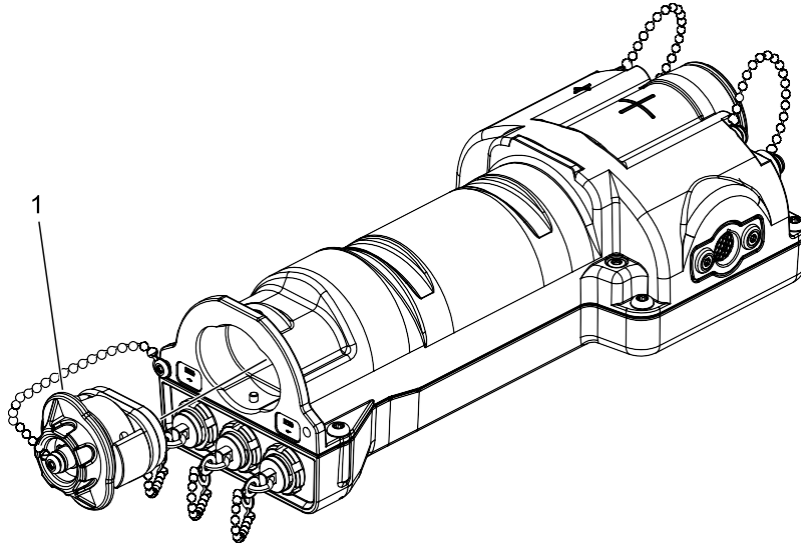





Figure 9.17. Battery Cap Removal.

(8) Install battery cap by pushing cap (Figure 9.17, Item 1) into battery compartment and turning cap ¼ turn clockwise.

(9) Perform Depot Settings Reset by pressing Back , Menu , and Home/Power  keys simultaneously for 10 seconds.

(10) Connect Rad Extender to Base Unit middle port labeled “USB” (or “DATA”).

CONDITION / INDICATION


Does PC or Transfer Mode option display (Figure 9.16)?

DECISION

YES – Go to TESTING - BRANCH 4.

NO – Send to the Rad Extender and Base Unit to the appropriate level of maintenance as authorized.

TESTING – BRANCH 4

- (11) Disconnect Rad Extender from Base Unit and PC if applicable.
- (12) Connect Rad Extender to PC using the RJ45 port.
- (13) Connect Rad Extender to Base Unit middle port labeled “USB” (or “DATA”).
- (14) Verify mode of operation choices PC or Transfer are displayed.
- (15) Press Left Arrow Left Arrow  key on Base Unit to select PC mode of operation.
- (16) Following steps in Section 5.2.1, open browser and verify web browser page states “Ready for Download”.

CONDITION / INDICATION

Does web browser display “Ready for Download”?

DECISION

YES – Troubleshooting complete.

NO – Send to the Rad Extender and Base Unit to the appropriate level of maintenance as authorized.

END OF TROUBLESHOOTING PROCEDURE

9.2.24 Probe Attached to Telescoping Pole, Probe Icon Not Displaying on Home Screen

REQUIRED:

- Base Unit Powered On (Section 3.6.1)
- Probe Attached to Telescoping Pole (Section 6.1.3)
- Base Unit Attached to Telescoping Pole (Section 6.1.5)

GENERAL INFORMATION:

This troubleshooting procedure is for troubleshooting communication between a Beta Photon Probe or a Sensitive Gamma Probe attached to a Telescoping Pole, and the Telescoping Pole attached to a Base Unit using a Common Probe Cable. Instructions for connection of the Telescoping Pole to these two probes and to the Common Probe Cable to the Base Unit is found in Operation of Telescoping Pole (Chapter 6). Connection of the Common Probe Cable to each probe is provided in the following sections: Beta Photon Probe (Section 4.2.2); Sensitive Gamma Probe (Section 4.5.2).

TROUBLESHOOTING PROCEDURE

PROBE ATTACHED TO TELESCOPING POLE, PROBE ICON NOT DISPLAYING ON HOME SCREEN

TESTING – BRANCH 1

- (1) Disconnect Common Probe Cable from Base Unit (Section 4.1.2) and from Telescoping Pole (Section 6.1.6).
- (2) Reconnect Common Probe Cable to Base Unit (Section 4.1.1) and to Telescoping Pole (Section 6.1.5).

CONDITION / INDICATION

Did reconnecting the Common Probe Cable cause the applicable probe icon to display?

DECISION

- YES – Troubleshooting complete.
- NO – Go to TESTING - BRANCH 2.
-

TESTING – BRANCH 2

- (3) Disconnect probe from Telescoping Pole (Section 6.1.4).
- (4) Reconnect probe to Telescoping Pole (Section 6.1.3).

CONDITION / INDICATION

Does the attached probe icon display on Base Unit Home screen after reconnecting the probe properly to telescoping pole?

DECISION

- YES – Troubleshooting complete.
- NO – Go to TESTING - BRANCH 3.
-

TESTING – BRANCH 3

- (5) Disconnect probe from Telescoping Pole (Section 6.1.4).
 - (6) Disconnect Common Probe Cable from Telescoping Pole (Section 6.1.6).
 - (7) Connect probe to Common Probe Cable still attached to Base Unit (Section 4.2.2 or 4.5.2).
-

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CONDITION / INDICATION

Does the attached probe icon display on Base Unit Home screen after attaching the probe to Base Unit using Common Probe Cable only?

DECISION

YES – Send Telescoping Pole to the appropriate level of maintenance as authorized.

NO – Go to TESTING - BRANCH 4.

TESTING – BRANCH 4

(8) Disconnect the probe from the Common Probe Cable (Section 4.2.9 or 4.5.9).

(9) Connect a different probe to Common Probe Cable still attached to Base Unit (Section 4.2.2 or 4.5.2).

CONDITION / INDICATION

Does the attached probe icon display on Base Unit Home screen after attaching a different probe to Base Unit using the same Common Probe Cable only?

DECISION

YES – Send nonfunctional probe to the appropriate level of maintenance as authorized.

NO – Send nonfunctional Common Probe Cable to the appropriate level of maintenance as authorized.

END OF TROUBLESHOOTING PROCEDURE

Chapter 10

Operator Preventive and Corrective Maintenance

This chapter includes operator maintenance and cleaning instructions.

Section 1 Preventive Maintenance Checks and Services (PMCS)

10.1.1 PMCS Introduction

The operator is required to:

- (1) Review procedures in this section prior to starting.
- (2) Ensure the required materials and tools are available.
- (3) Perform each task item listed in this section as applicable.
- (4) Contact next level maintainer immediately if a fault is found that degrades the equipment operation or makes it unavailable for the mission.

10.1.2 PMCS Procedures

PMCS procedures are arranged in a table (Table 10.1) with each procedure assigned to a row. The entries are arranged according to their intervals. The table columns are labeled Item Number, Interval, Item to be Checked or Serviced, Procedure and Equipment Not Ready/Available If:

Column 1 - Item Number.

Column 2 - Interval. The interval designates how often the procedure should be performed. Intervals include: Before Mission, During Mission, After Mission, Annually, Periodic and Other.

Column 3 - Item to be Checked or Serviced. This entry designates the component that is to be inspected.

Column 4 - Procedure. This entry describes the actual PMCS action that must be carried out.

Column 5 - Equipment Not Ready/Available If: An entry in this column describes a condition that will prevent the equipment from being used for the mission.

If the entry is preceded by "Degraded If:" the equipment can still be used if this condition exists, but it is not fully mission capable. Use of this degraded equipment must be authorized by a higher authority or prescribed by local directives.

CAUTION



Drop. Do not drop Base Unit or any of the probes. If dropped, perform Preventive Maintenance Checks and Services (PMCS) to include the source check on that item to confirm functionality before continuing mission. Failure to comply may cause damage or degrade performance.

Puncture. Do not force anything into the protective grates or puncture the detector face on the Base Unit and probes as applicable. Failure to comply may result in damage.

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Mylar Window. The Alpha-Beta Probe mylar window (underneath protective grate and mesh screen) is very thin. If this layer is penetrated, the performance of Alpha-Beta Probe will degrade or cease to function altogether. Avoid direct contact with surface being monitored to prevent damaging mylar window and/or contamination of probe face. Do not wipe or clean the mylar window, replace as necessary. Failure to comply may result in inaccurate readings and damage to the probe.


Table 10.1. RDS Preventive Maintenance Checks and Services.

Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
1	Before	Base Unit	<ol style="list-style-type: none"> 1. Remove Base Unit from transit case. 2. Inspect the exterior of Base Unit for any obvious damage. 3. Remove beta window cap (Figure 10.1, Item 6) and inspect beta window cap and exterior O-ring (Figure 10.1, Item 4) for damage. 	<p>Missing.</p> <p>Degraded if obvious damage is present.</p> <p>Degraded if damaged or missing.</p>
Figure 10.1. Base Unit Inspection Items (1).				
1	Before	Base Unit	<ol style="list-style-type: none"> 4. Inspect etched screen (Figure 10.1, Item 3) inside beta window for damage. 5. Place beta window cap against side of Base Unit in the location shown in Figure 10.1 and verify it sticks to internal magnet (Figure 10.1, Item 6) and then install beta 	<p>Degraded if dented or punctured.</p> <p>Degraded if beta window cap does not stick to side of Base Unit or chain is missing/damaged.</p>

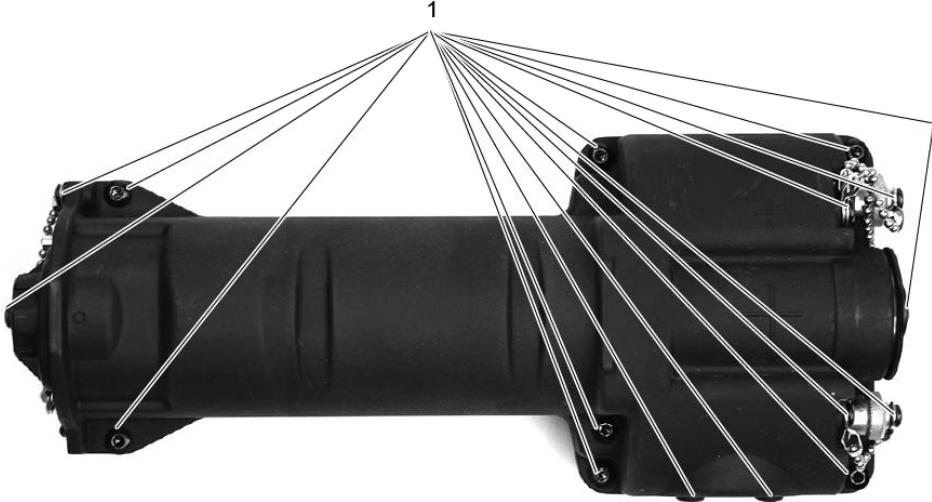
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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
			window cap. Ensure chain is present and attaches beta window cap to Base Unit.	
			6. Remove audio and power protective caps (Figure 10.1, Items 2, 5) by rotating counterclockwise and inspect internal audio and power connections for any physical damage.	Degraded if damaged.
			7. Install audio and power protective caps (Figure 10.1, Items 2 and 5) by rotating clockwise and verify cap and chain assemblies are correctly installed, including chain connecting the caps with the Base Unit	Degraded if damaged or missing.
			8. Inspect keypad (Figure 10.1, Item 1) for tears, holes, and other damage.	Damaged or not functional.
			9. Inspect keypad icons on keys (Figure 10.1, Item 1) for legibility.	Missing or not visible.
			10. Inspect calibration label affixed to the unit (Figure 10.1, Item 7) and confirm date is current.	Missing, not legible, or out of date.
			11. Inspect serial number data plate (Figure 10.1, Item 8) affixed to the unit and confirm data plate data is legible.	Degraded if missing or not legible.
			12. Remove cable connector protective caps (Figure 10.2Figure 10.2. Base Unit Inspection Items (2)., Item 3) and inspect cable connectors for any physical damage.	Cable connector damaged.

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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
 <p style="text-align: center;">Figure 10.2. Base Unit Inspection Items (2).</p>				
1	Before	Base Unit	<p>13. Install cable connector protective caps and verify their chains and anchors are present and installed (Figure 10.2, Item 3).</p> <p>14. Inspect buzzer cover for damage (Figure 10.2, Item 1).</p> <p>15. Inspect screen for cracks or scratches that prevent use, and visible damage (Figure 10.2, Item 2).</p> <p>16. Remove battery cap by turning 1/4 turn counterclockwise and inspect battery cap, contacts on battery cap and its O-ring for corrosion or damage and clean by wiping with a rag dipped in warm water as necessary (Figure 10.2, Item 4).</p> <p>17. Inspect battery compartment and battery contacts for foreign debris, moisture, damage, and corrosion. Install battery cap.</p>	<p>Degraded if caps, chains, or anchors are damaged or missing.</p> <p>Degraded if damaged.</p> <p>Damaged or not functional.</p> <p>Damaged or missing.</p> <p>Damage, corrosion, or debris unable to be removed.</p>

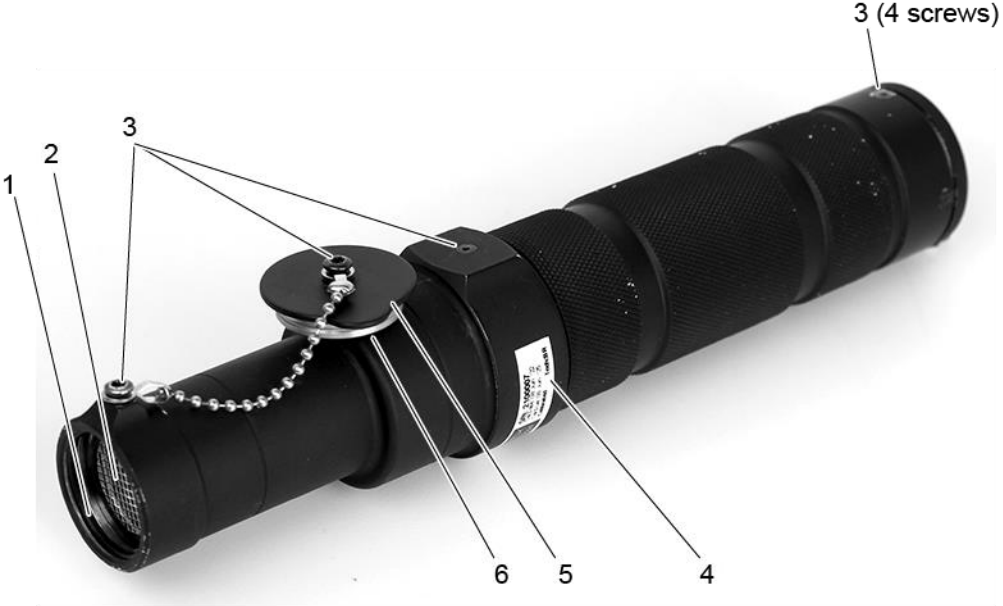
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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
				
1	Before	Base Unit	<p>18. Inspect all screws to ensure they are present (Figure 10.3, Item 1).</p> <p>19. Remove headset from transit case and inspect wires and connectors for fraying or other obvious damage.</p> <p>20. Remove batteries from transit case and inspect them for corrosion. Replace batteries, as necessary.</p> <p>21. Remove AC/DC power adapter from transit case and inspect for damage or exposed wires.</p> <p>22. Remove Cesium (Cs)-137 Check Source from transit case. Inspect to ensure it has not been broken, crushed, or damaged. Check the date listed as creation date on the source to ensure it is less than 30 years old. For disposal or replacement contact your Radiation Safety Officer (RSO).</p> <p>23. Complete Base Unit Preparation for Use (Section 3.7.1). Perform operator troubleshooting, if applicable.</p>	<p>Degraded if missing any screws.</p> <p>Fraying or damage.</p> <p>Missing or corroded.</p> <p>Damage or exposed wires.</p> <p>Broken, crushed, damaged, or greater than 30 years old.</p> <p>Failed source check.</p>
2	Before	Battery Charger	<p>1. Remove Battery Charger from transit case.</p>	<p>Missing.</p>

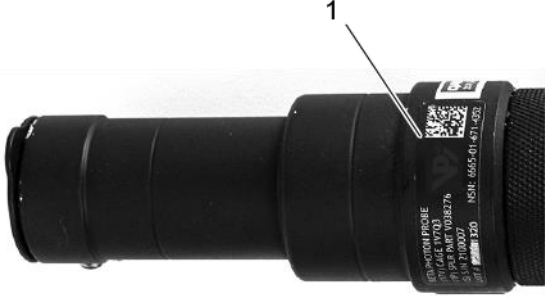
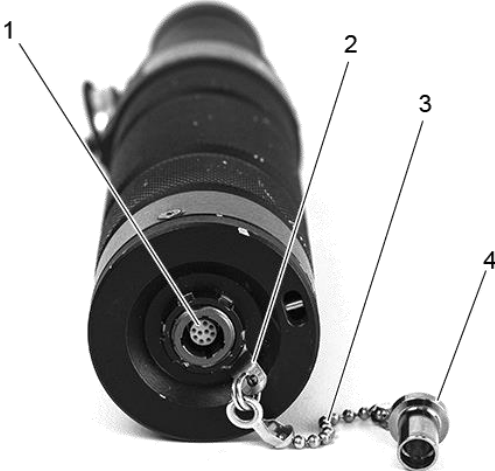
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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
			<ol style="list-style-type: none"> 2. Inspect for obvious external damage to the battery charger, connectors, or to contacts in the charging slots. Ensure there is no corrosion in the battery charging area. Clean contacts with a rag dipped in warm water, as necessary. 3. Inspect cable and cable connectors for damage, exposed wires, corrosion, and for bent pins 	<p>Damaged, corrosion that cannot be removed.</p> <p>Damaged</p>
3	Before	Common Probe Cable	<ol style="list-style-type: none"> 1. Remove Common Probe Cable from transit case. 2. Inspect cable and cable connectors for damage, exposed wires, corrosion, and for bent pins. 3. Check secure connection by connecting each connector end, one at a time, to the Base Unit and lightly pulling on cable to ensure a secure connection. 	<p>Missing.</p> <p>Damaged.</p> <p>Common probe cable does not securely attach to Base Unit.</p>
4	Before	Beta Photon Probe	<ol style="list-style-type: none"> 1. Remove Beta Photon Probe from transit case. 2. Inspect exterior of Beta Photon Probe for any obvious damage. 3. Remove beta window cap (Figure 10.4, Item 5) and inspect beta window cap and exterior O-ring (Figure 10.4, Item 1) for damage. 	<p>Missing.</p> <p>Degraded if obvious damage is present.</p> <p>Degraded if damaged or missing.</p>

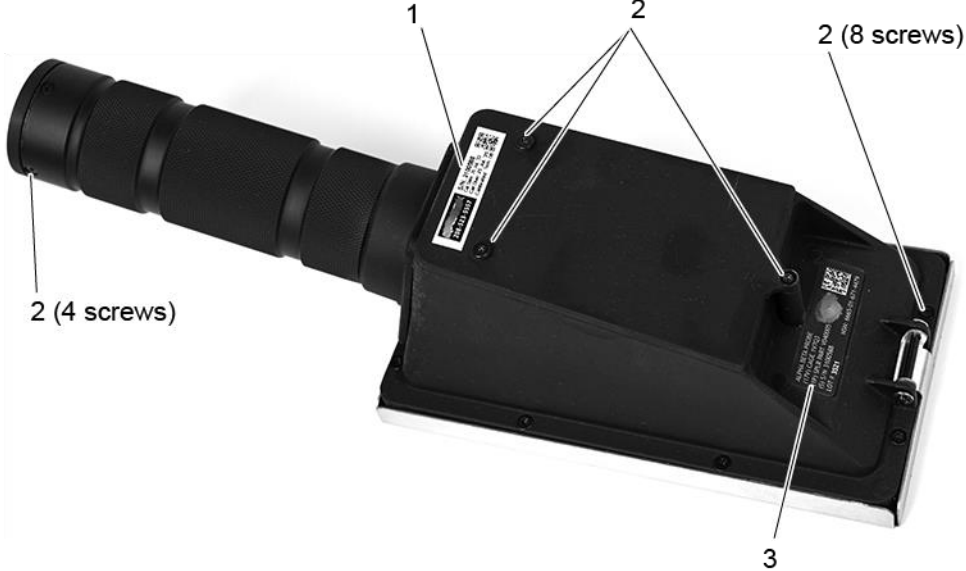
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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
				
<p>Figure 10.4. Beta Photon Probe Inspection Items (1).</p>				
4	Before	Beta Photon Probe	<ol style="list-style-type: none"> 4. Inspect etched screen (Figure 10.4, Item 2) inside beta window for damage. 5. Place the beta window cap (Figure 10.4, Item 5) against side of Beta Photon Probe in the location shown in Figure 10.4 and verify it sticks to magnetic area (Figure 10.4, Item 6) and then install beta window cap. Ensure chain is present and attached to the cap and Beta Photon Probe. 6. Inspect calibration label (Figure 10.4, Item 4) affixed to the unit and confirm date is current. 7. Inspect all screws (Figure 10.4, Item 3) to ensure they are present. 8. Inspect serial number data plate (Figure 10.5, Item 1) affixed to unit and confirm data plate data is legible. 	<p>Degraded if dented or punctured.</p> <p>Degraded if beta window cap does not stick to side of Beta Photon Probe. Chain is missing or damaged.</p> <p>Missing, not legible or out of date.</p> <p>Degraded if damaged or missing any screws.</p> <p>Degraded if missing or not legible.</p>

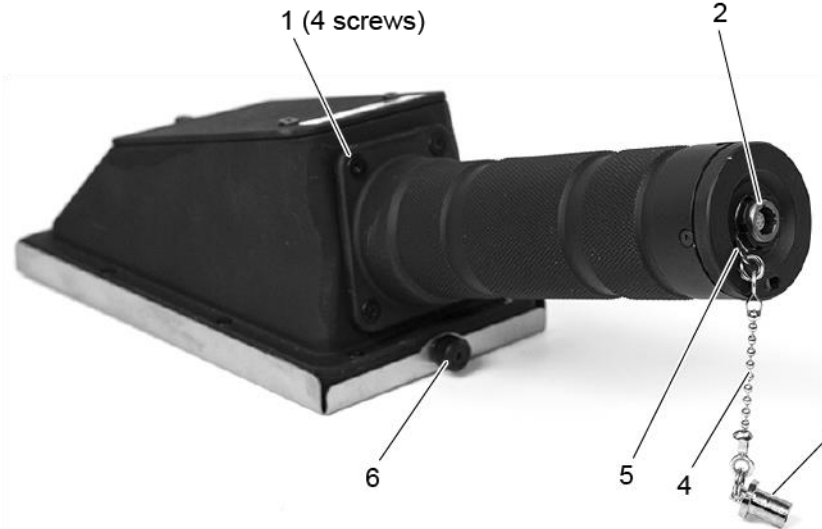
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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
 <p style="text-align: center;">Figure 10.5. Beta Photon Probe Inspection Items (2).</p>				
4	Before	Beta Photon Probe	<p>9. Remove cable connector protective cap (Figure 10.6, Item 4) and inspect cable connector (Figure 10.6, Item 1) for any physical damage.</p> <p>10. Install cable connector protective cap (Figure 10.6, Item 4) and verify its chain (Figure 10.6, Item 3) and anchor (Figure 10.6, Item 2) are present and installed.</p> <p>11. Complete Beta Photon Probe preparation for use (Section 4.2.1). Perform operator troubleshooting, if applicable.</p>	<p>Cable connector damaged.</p> <p>Degraded if cap, chain or anchor are damaged or missing.</p> <p>Failed source check.</p>
 <p style="text-align: center;">Figure 10.6. Beta Photon Probe Inspection Items (3).</p>				
5	Before	Alpha-Beta Probe	<p>1. Remove Alpha-Beta Probe from transit case.</p>	Missing.

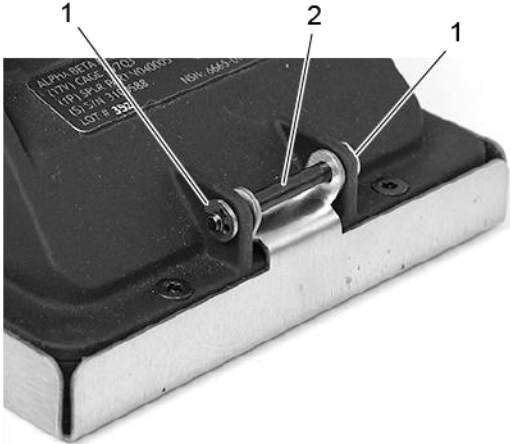
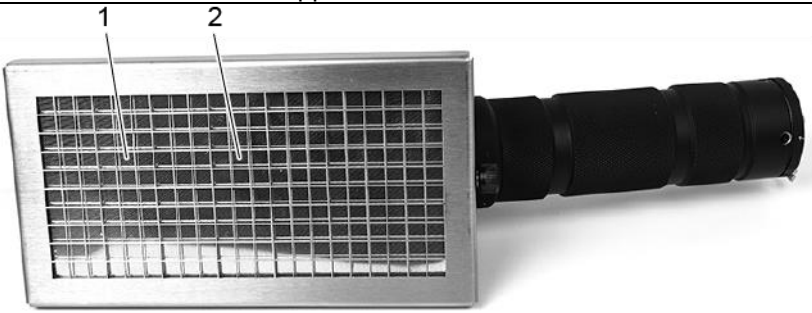
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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
			<ol style="list-style-type: none"> 2. Inspect exterior of Alpha-Beta Probe for any obvious damage. 3. Inspect calibration label (Figure 10.7, Item 1) affixed to the unit and confirm date is current. 	<p>Degraded if obvious damage is present.</p> <p>Missing, not legible, or out of date.</p>
 <p>Figure 10.7. Alpha-Beta Probe Inspection Items (1).</p>				
5	Before	Alpha-Beta Probe	<ol style="list-style-type: none"> 4. Inspect serial number data plate (Figure 10.7, Item 3) affixed to the unit and confirm data plate data is legible. 5. Remove cable connector protective cap (Figure 10.8, Item 1) and inspect connector (Figure 10.8, Item 2) for damage. 	<p>Missing, not legible, or out of date.</p> <p>Cable connector damaged.</p>

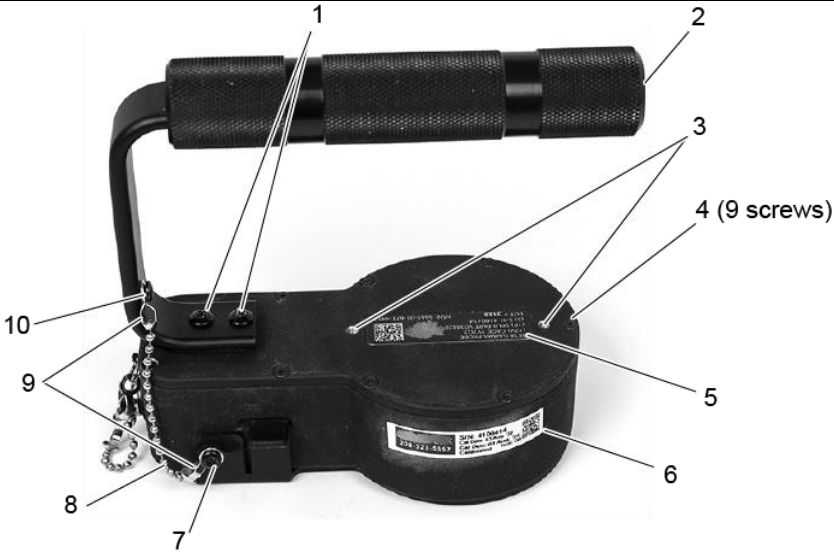
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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
 <p style="text-align: center;">Figure 10.8. Alpha-Beta Probe Inspection Items (2).</p>				
5	Before	Alpha-Beta Probe	<p>6. Install cable connector protective cap (Figure 10.8, Item 3) and verify the chain (Figure 10.8, Item 4) and anchor (Figure 10.8, Item 5) are present and installed.</p> <p>7. Inspect all 19 screws (Figure 10.8, Item 1 and Figure 10.7, Item 2) to ensure they are present.</p> <p>8. Remove protective cover. Inspect protective cover, protective grate, E-clips (Figure 10.9, Item 1), hinge pin (Figure 10.9, Item 2), and captive screw (Figure 10.8, Item 6) for damage.</p>	<p>Degraded if cap, chain, or anchor are damaged or missing.</p> <p>Degraded if damaged or missing any screws.</p> <p>Damaged or missing any parts.</p>


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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
				
<p>Figure 10.9. Alpha-Beta Probe Inspection Items (3).</p>				
5	Before	Alpha-Beta Probe	<p>9. Inspect captive screw (Figure 10.8, Item 5) to verify it is fully installed and hand tight. Secure captive screw only hand tight, if applicable.</p> <p>10. Inspect in place (do not open protective grate) protective screen (first layer under the metal outer protective grate) (Figure 10.10, Item 1) and mylar window (shiny layer that resides under the protective screen) (Figure 10.10, Item 2) for punctures, holes, or tears. Replace mylar window and/or protective screen, if applicable.</p>	<p>Protective grate not secured.</p> <p>Damaged.</p>
				
<p>Figure 10.10. Alpha-Beta Probe Inspection Items (4).</p>				
5	Before	Alpha-Beta Probe	<p>11. Complete Alpha-Beta Probe preparation for use (Section 4.3.1). Perform operator maintenance or troubleshooting, if</p>	<p>Failed light leak test or source check.</p>

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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
			applicable. Replace protective cover when not in operational use.	
6	Before	Small Area Beta Gamma (SABG) Probe	<ol style="list-style-type: none"> 1. Remove SABG Probe from transit case. 2. Inspect exterior of SABG Probe for any obvious damage. 3. Inspect calibration label (Figure 10.11, Item 6) affixed to the unit and date is current. 	<p>Missing.</p> <p>Degraded if obvious damage is present.</p> <p>Missing, not legible, or out of date.</p>
 <p style="text-align: center;">Figure 10.11. SABG Probe Inspection Items (1).</p>				
6	Before	Small Area Beta Gamma (SABG) Probe	<ol style="list-style-type: none"> 4. Inspect serial number data plate (Figure 10.11, Item 5) affixed to the unit and date is current. 5. Remove and inspect SABG sensor protective cover (Figure 10.12, Item 2) for damage, affix protective cover to top of SABG Probe. Verify chain (Figure 10.11, Item 8), anchors (Figure 10.11, Item 8), and screws (Figure 10.11, Items 7 and 10) are present that attach the protective cover to the SABG probe. 	<p>Degraded if missing or not legible.</p> <p>Degraded if damaged, unable to affix to top of SABG Probe, or missing any of the inspected items.</p>



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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
 <p style="text-align: center;">Figure 10.12. SABG Probe Inspection Items (2).</p>				
6	Before	Small Area Beta Gamma (SABG) Probe	<ol style="list-style-type: none"> <li>6. Inspect etched screen (Figure 10.12, Item 3) protecting SABG sensor (pancake GM tube) for damage. <li>7. Inspect handle (Figure 10.11, Item 2) for damage and ensure the knurled handle is attached to the bow of the handle with two screws (Figure 10.12, Item 1) and the entire handle is attached with two handle screws (Figure 10.11, Item 1) to the body of the probe on the top housing cover. <li>8. Inspect the nine screws (Figure 10.11, Item 4) connecting the top housing cover to the bottom housing to ensure they are present. (When the SABG Probe Shield is not attached to the SABG, there will be two intentionally open holes (Figure 10.11, Item 3) in the top of the SABG Probe.) <li>9. Remove cable connector protective cap (Figure 10.12, Item 4) and inspect cable connector for damage. 	<p>Damaged, dented, or punctured.</p> <p>Degraded if damaged, missing, or loosely attached.</p> <p>Degraded if missing any screws.</p> <p>Cable connector damaged.</p>




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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
			<p>10. Install cable connector protective cap (Figure 10.12, Item 4) and verify its chain (Figure 10.12, Item 5) and anchor (Figure 10.12, Item 6) are present and installed.</p> <p>11. Complete SABG Probe preparation for use (Section 4.4.1). Perform operator troubleshooting, if applicable.</p>	<p>Degraded if cap, chain, or anchor are damaged or missing.</p> <p>Failed source check.</p>
7	Before	Carrying Pouches	<ol style="list-style-type: none"> 1. Remove Carrying Pouches from transit case. 2. Inspect Base Unit carrying pouch (Figure 10.13, Item 2) shoulder strap for Base Unit Carrying Pouch (Figure 10.13, Item 1) and probes carrying pouch (Figure 10.14) for fraying, tears, or rips and damaged or missing hardware. 	<p>Missing.</p> <p>Pouches or strap are damaged or missing hardware.</p>


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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
 <p>Figure 10.13. Base Unit Carrying Pouch.</p>				
 <p>Figure 10.14. Probes Carrying Pouch.</p>				
8	Before	Rad Extender	<ol style="list-style-type: none"> <li>1. Remove Rad Extender from transit case. <li>2. Inspect Rad Extender for obvious physical damage, exposed wires, damaged connectors, or corrosion. 	<p>Missing.</p> <p>Damaged.</p>


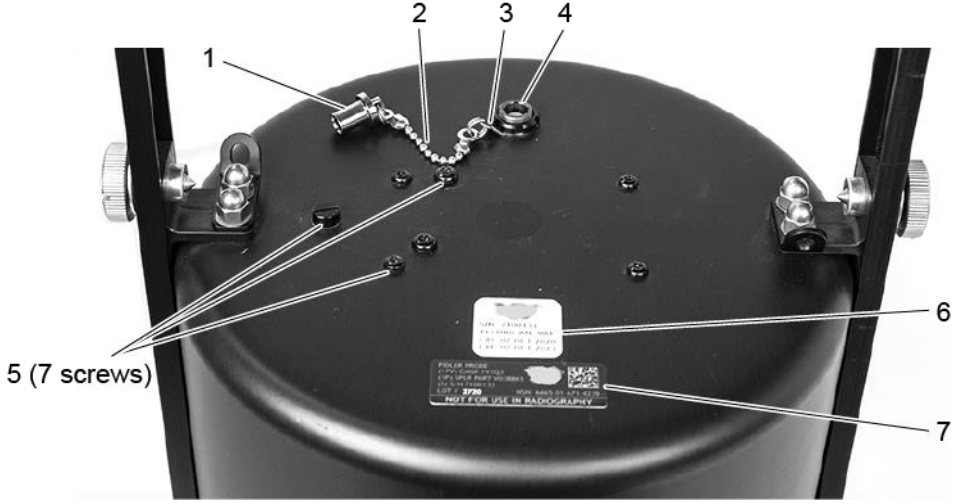
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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
 <p>Figure 10.15. Rad Extender.</p>				
9	Before	Telescoping Pole	<ol style="list-style-type: none"> 1. Remove Telescoping Pole from transit case. (Procedure is the same for both poles.) 2. Check Telescoping Pole (Figure 10.16) for loose, missing, or damaged parts. 	<p>Missing.</p> <p>Degraded if damaged, loose, or missing parts.</p>
 <p>Figure 10.16. Telescoping Pole.</p>				
9	Before	Telescoping Pole	<ol style="list-style-type: none"> 3. Inspect probe connector inside probe cup for visible signs of damage, corrosion, or bent pins. 4. Inspect Common Probe Cable connection (Figure 10.17) on opposite end of Telescoping Pole for visible signs of damage or corrosion. 	<p>Damaged.</p> <p>Damaged.</p>
 <p>Figure 10.17. Telescoping Pole Common Probe Cable Connection.</p>				
9	Before	Telescoping Pole	<ol style="list-style-type: none"> 5. Open cam latch and extend each telescoping segment to ensure functionality of all pieces. Retract all segments, closing traverse clamps to lock the movement of the segments, then close cam latch. 	<p>Any parts are non-functional, damaged, or missing.</p>

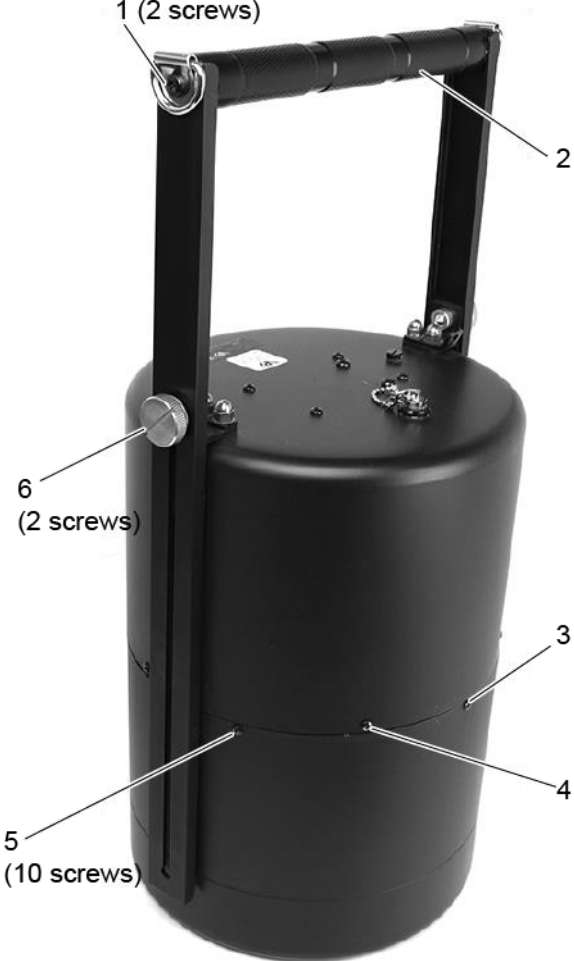
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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
10	Before	Sensitive Gamma Probe	<ol style="list-style-type: none"> 1. Remove Sensitive Gamma Probe from transit case. 2. Inspect exterior of Sensitive Gamma Probe for any obvious damage. 3. Inspect calibration label (Figure 10.18, Item 1) affixed to the unit and confirm date is current. 	<p>Missing.</p> <p>Degraded if obvious damage is present.</p> <p>Missing, not legible, or out of date.</p>
 <p>Figure 10.18. Sensitive Gamma Probe Inspection Items (1).</p>				
10	Before	Sensitive Gamma Probe	<ol style="list-style-type: none"> 4. Inspect serial number data plate (Figure 10.18, Item 2) affixed to the unit and confirm data plate data is legible. 5. Remove cable connector protective cap (Figure 10.18, Item 5) and inspect connector (Figure 10.18, Item 3) for any physical damage. 6. Install cable connector protective cap (Figure 10.18, Item 5) and verify its chain (Figure 10.18, Item 6) and anchor (Figure 10.18, Item 4) is present and installed. 7. Inspect all nine screws (Figure 10.19, Items 1, 2, and 3) to ensure they are present. 	<p>Degraded if missing or not legible.</p> <p>Cable connector damaged.</p> <p>Degraded if cap, chain, or anchor are damaged or missing.</p> <p>Degraded if damaged or missing any screws.</p>


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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
 <p style="text-align: center;">Figure 10.19. Sensitive Gamma Probe Inspection Items (2).</p>				
10	Before	Sensitive Gamma Probe	8. Complete Sensitive Gamma Probe preparation for use (Section 4.5.1). Perform operator troubleshooting, if applicable.	Failed source check.
11	Before	FIDLER Probe	<ol style="list-style-type: none"> 1. Remove FIDLER Probe from FIDLER Probe transit case. 2. Inspect exterior of FIDLER Probe for any obvious damage. 3. Inspect calibration label (Figure 10.20, Item 6) affixed to the unit and confirm date is current. 	<p>Missing.</p> <p>Degraded if obvious damage is present.</p> <p>Missing, not legible or out of date.</p>
 <p style="text-align: center;">Figure 10.20. FIDLER Probe Inspection Items (1).</p>				
11	Before	FIDLER Probe	<ol style="list-style-type: none"> 4. Inspect serial number data plate (Figure 10.20, Item 7) affixed to the unit and confirm data plate data is legible. 5. Remove cable connector protective cap (Figure 10.20, Item 1) and inspect connector (Figure 10.20, Item 4) for any physical damage. 	<p>Degraded if missing or not legible.</p> <p>Cable connector damaged.</p>

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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
			<p>6. Install cable connector protective cap (Figure 10.20, Item 1) and verify its chain (Figure 10.20, Item 2) and anchor (Figure 10.20, Item 3) is present and installed.</p> <p>7. Inspect handle (Figure 10.21, Item 2) for damage, missing, or loose parts.</p>	<p>Degraded if cap, chain, or anchor are damaged or missing.</p> <p>Degraded if damaged, missing, or loose parts.</p>
 <p style="text-align: center;">Figure 10.21. FIDLER Probe Inspection Items (2).</p>				
11	Before	FIDLER Probe	<p>8. Inspect all twenty-one screws (total of 7 screws on top cover, 4 screws on handle, and 10 around body of probe) (Figure 10.20, Item 5 and Figure 10.21, Items 1, 5, and 6) to ensure they are present.</p>	<p>Any damaged or missing screws on FIDLER Probe (other than handle assembly). Degraded if any damaged or missing screws on the FIDLER probe handle assembly.</p>

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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
			<ol style="list-style-type: none"> 9. Inspect to ensure there is a lock washer under each screw on the bottom row (Figure 10.21, Item 3) and under each screw on the top row (Figure 10.21, Item 4). 10. Complete FIDLER Probe preparation for use (Section 4.6.1). Perform operator troubleshooting, if applicable. 	<p>Any of the 10 lock washers are missing.</p> <p>Failed source check.</p>
12	Before	FIDLER Probe Shoulder Strap	<ol style="list-style-type: none"> 1. Remove FIDLER Probe Shoulder Strap from transit case. 2. Inspect shoulder strap (Figure 10.22) for fraying, tears, or rips and damaged or missing hardware. 	<p>Missing.</p> <p>Degraded if shoulder strap is damaged or missing hardware.</p>
 <p>Figure 10.22. Shoulder Strap.</p>				
13	Before	Neutron Probe	<ol style="list-style-type: none"> 1. Remove Neutron Probe from transit case. 2. Inspect exterior of Neutron Probe for any obvious damage. 3. Inspect calibration label (Figure 10.23, Item 7) affixed to the unit and confirm date is current. 	<p>Missing.</p> <p>Degraded if obvious damage is present.</p> <p>Missing, not legible or out of date.</p>

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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
<p style="text-align: center;">Figure 10.23. Neutron Probe Inspection Items.</p>				
13	Before	Neutron Probe	<ol style="list-style-type: none"> 4. Inspect serial number data plate (Figure 10.23, Item 8) affixed to the unit and confirm data plate data is legible. 5. Remove cable connector protective cap (Figure 10.23, Item 2) and inspect connector (Figure 10.23, Item 5) for any physical damage. 6. Install cable connector protective cap Figure 10.23, Item 2) and verify its chain (Figure 10.23, Item 3) and anchor (Figure 10.23, Item 4) is present and installed. 7. Inspect handle (Figure 10.23, Item 1) for damage, missing, or loose parts. 8. Inspect wall plate for damage or missing screws that hold it in place. 9. Inspect all twenty-two screws (Figure 10.23, Item 6) to ensure they are present. 	<p>Degraded if missing or not legible.</p> <p>Cable connector damaged.</p> <p>Degraded if cap, chain, or anchor are damaged or missing.</p> <p>Degraded if damaged, missing, or loose parts.</p> <p>Degraded if damaged or missing screws.</p> <p>Degraded if damaged or missing any screws.</p>

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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
			10. Complete Neutron Probe preparation for use (Section 4.7.1). Perform operator troubleshooting, if applicable.	Failed source check.
14	Before	Neutron Probe Shoulder Strap	<ol style="list-style-type: none"> 1. Remove Neutron Probe Shoulder Strap from transit case. 2. Inspect shoulder strap (Figure 10.22) for fraying, tears, or rips and damaged or missing hardware. 	<p>Missing.</p> <p>Degraded if shoulder strap is damaged or missing hardware.</p>
15	Before	Transit Cases	<ol style="list-style-type: none"> 1. Close transit cases, secure latches and inspect hardware such as handles and hinges, to observe all parts ensuring they are present and functional. Lay transit cases flat, unlatch, and open. 2. Inspect foam for both layers (as applicable) and lid to ensure it is intact with no holes or tears, there is no moisture, mold, or mildew. Ensure the handles on the top layer are intact (if applicable). 3. Inspect data plate affixed to the exterior of cases and confirm data plate data is legible. 	<p>Missing, damaged, or non-functional parts.</p> <p>Damage, mold, mildew, or moisture.</p> <p>Degraded if missing or not legible.</p>
16	During	Base Unit	<ol style="list-style-type: none"> 1. Monitor for system fault messages during mission (Table 9.1). Perform operator troubleshooting, if applicable. 	A fault occurs.
17	During	Alpha-Beta Probe	<ol style="list-style-type: none"> 1. Monitor for puncture or damage occurring to the mylar window or protective screen during operations. Complete operator corrective maintenance (Section 10.2.3), as applicable. 2. Observe spikes in alpha or beta counts during operation of the probe that are outside of current known background. Perform troubleshooting (Section 9.2.13 or 9.2.14), as applicable. 	<p>Damage.</p> <p>High radiation reading in alpha and/or beta channel at background.</p>
18	After	Base Unit	<ol style="list-style-type: none"> 1. Remove dust, moisture, and loose dirt from the outside surface by wiping with a rag dipped in warm water. If necessary, it may be cleaned with a mild solution of 	Degraded if obvious damage is present.

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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
			ordinary detergent soap (for example, dishwashing soap) and water and thoroughly dried. Inspect exterior for any obvious damage.	
			2. Remove beta window cap (Figure 10.1, Item 6) and inspect beta window cap and exterior O-ring (Figure 10.1, Item 4) for damage.	Degraded if damaged or missing.
			3. Inspect etched screen (Figure 10.1, Item 3) inside beta window for damage.	Degraded if dented or punctured.
			4. Place beta window cap against side of Base Unit in the location shown in Figure 10.1 and verify it sticks to internal magnet (Figure 10.1, Item 6) and then install beta window cap. Ensure chain is present and attached to the cap and Base Unit.	Degraded if beta window cap does not stick to Base Unit. Chain is missing or damaged.
			5. Remove audio and power protective caps (Figure 10.1, Items 2, 5) by rotating counterclockwise and inspect internal audio and power connections for any physical damage.	Degraded if damaged.
			6. Install audio and power protective caps (Figure 10.1, Items 2 and 5) by rotating clockwise and verify cap and chain assemblies are correctly installed, including chain connecting the caps with the Base Unit.	Degraded if damaged or missing.
			7. Inspect keypad (Figure 10.1, Item 1) for tears, holes, and other damage.	Damaged or not functional.
			8. Inspect keypad icons on keys (Figure 10.1, Item 1) for legibility.	Missing or not visible.
			9. Inspect calibration label affixed to the unit (Figure 10.1, Item 7) and confirm date is current.	Missing, not legible, or out of date.
			10. Inspect serial number data plate (Figure 10.1, Item 8) affixed to the unit and confirm data plate data is legible.	Degraded if missing or not legible.

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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
			<p>11. Remove cable connector protective caps (Figure 10.2, Item 3) and inspect cable connectors for any physical damage.</p> <p>12. Install cable connector protective caps and verify their chains and anchors are present and installed (Figure 10.2, Item 3).</p> <p>13. Inspect buzzer cover for damage (Figure 10.2, Item 1).</p> <p>14. Inspect screen for cracks or scratches that prevent use, and visible damage (Figure 10.2, Item 2).</p> <p>15. Remove battery cap by turning 1/4 turn counterclockwise and inspect battery cap, contacts on battery cap and its O-ring for corrosion or damage and clean by wiping with a rag dipped in warm water as necessary (Figure 10.2, Item 4).</p> <p>16. Remove AA batteries from battery compartment (Section 3.4.4).</p> <p>17. Inspect battery compartment and contacts for foreign debris, moisture, damaged, or corrosion. Install battery cap. Remove any foreign debris and moisture, if applicable.</p> <p>18. Inspect all screws to ensure they are present (Figure 10.3, Item 1).</p> <p>19. Install batteries (Section 3.4.3) and complete Base Unit source check (Section 3.9.1). Perform operator troubleshooting, if applicable.</p>	<p>Cable connector damaged.</p> <p>Degraded if caps, chains, or anchors are damaged or missing.</p> <p>Degraded if damaged.</p> <p>Visibly damaged.</p> <p>Damaged or missing.</p> <p>Corroded or damaged. Dispose of in accordance with federal, state, and local laws.</p> <p>Damage, corrosion, or debris unable to be removed.</p> <p>Degraded if missing any screws.</p> <p>Failed source check.</p>
19	After	Common Probe Cable	<p>1. Remove dust, moisture, and loose dirt from outside surface by wiping with a rag dipped in warm water and thoroughly dry.</p>	

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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
			<ol style="list-style-type: none"> 2. Inspect cable and cable connectors for damage, exposed wires, corrosion, and for bent pins. 3. Check secure connection by connecting each connector end, one at a time, to the Base Unit and lightly pulling on cable to ensure a secure connection. 	<p>Damaged.</p> <p>Common probe cable does not securely attach to Base Unit.</p>
20	After	Beta Photon Probe	<ol style="list-style-type: none"> 1. Remove dust, moisture, and loose dirt from outside surface by wiping with a rag dipped in warm water. If necessary, it may be cleaned with a mild solution of ordinary detergent soap (for example, dishwashing soap) and water and thoroughly dried. Inspect exterior for any obvious damage. 2. Remove beta window cap (Figure 10.4, Item 5) and inspect beta window cap and exterior O-ring (Figure 10.4, Item 1) for damage. 3. Inspect etched screen (Figure 10.4, Item 2) inside beta window for damage. 4. Place the beta window cap (Figure 10.4, Item 5) against side of Beta Photon Probe in the location shown in Figure 10.4 and verify it sticks to magnetic area (Figure 10.4, Item 6) and then install beta window cap. Ensure chain is present and attached to the cap and Beta Photon Probe. 5. Inspect calibration label (Figure 10.4, Item 4) affixed to the unit and confirm date is current. 6. Inspect all screws (Figure 10.4, Item 3) to ensure they are present. 7. Inspect serial number data plate (Figure 10.5, Item 1) affixed to unit and confirm data plate data is legible. 	<p>Degraded if obvious damage is present.</p> <p>Degraded if damaged or missing.</p> <p>Degraded if dented or punctured.</p> <p>Degraded if beta window cap does not stick to Beta Photon Probe. Chain is missing or damaged.</p> <p>Missing, not legible, or out of date.</p> <p>Degraded if missing any screws.</p> <p>Degraded if missing or not legible.</p>

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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
			<ol style="list-style-type: none"> 8. Remove cable connector protective cap (Figure 10.6, Item 4) and inspect cable connector (Figure 10.6, Item 1) for any physical damage. 9. Install cable connector protective cap (Figure 10.6, Item 4) and verify its chain (Figure 10.6, Item 3) and anchor (Figure 10.6, Item 2) are present and installed. 10. Complete Beta Photon Probe source check (Section 4.2.7). Perform operator troubleshooting, if applicable. 11. Place item in transit case. 	<p>Cable connector damaged.</p> <p>Degraded if cap, chain, or anchor are damaged or missing.</p> <p>Failed source check.</p>
21	After	Alpha-Beta Probe	<ol style="list-style-type: none"> 1. Remove dust, moisture, and loose dirt from outside surface (do not wipe mylar window) by wiping with a rag dipped in warm water. If necessary, it may be cleaned with a mild solution of ordinary detergent soap (for example, dishwashing soap) and water and thoroughly dried. Inspect exterior for any obvious damage. 2. Inspect calibration label (Figure 10.7, Item 1) affixed to the unit and confirm date is current. 3. Inspect serial number data plate (Figure 10.7, Item 3) affixed to the unit and confirm data plate data is legible. 4. Remove cable connector protective cap (Figure 10.8, Item 1) and inspect connector (Figure 10.8, Item 2) for damage. 5. Install cable connector protective cap (Figure 10.8, Item 3) and verify the chain (Figure 10.8, Item 4) and anchor (Figure 10.8, Item 5) are present and installed. 6. Inspect all 19 screws (Figure 10.8, Item 1 and Figure 10.7, Item 2) to ensure they are present. 	<p>Degraded if obvious damage is present.</p> <p>Missing, not legible, or out of date.</p> <p>Degraded if missing or not legible.</p> <p>Cable connector damaged.</p> <p>Degraded if cap, chain, or anchor are damaged or missing.</p> <p>Degraded if missing any screws.</p>

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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
			<ol style="list-style-type: none"> 7. Remove protective cover. Inspect protective cover, protective grate, E-clips (Figure 10.9, Item 1), hinge pin (Figure 10.9, Item 2), and captive screw (Figure 10.8, Item 6) for damage. 8. Inspect captive screw (Figure 10.8, Item 5) to verify it is fully installed and hand tight. Secure captive screw only hand tight, if applicable. 9. Inspect in place (do not open protective grate) protective screen (first layer under the metal outer protective grate) (Figure 10.10, Item 1) and mylar window (shiny layer that resides under the protective screen) (Figure 10.10, Item 2) for punctures, holes, or tears. Replace mylar window and/or protective screen, if applicable. 10. Perform light leak check (Section 4.3.3). Perform operator maintenance or troubleshooting, if applicable. 11. Complete Alpha-Beta Probe source checks (Section 4.3.8). Perform operator maintenance or troubleshooting, if applicable. 12. Replace protective cover and place item in transit case. 	<p>Damaged or missing parts.</p> <p>Protective grate not secured.</p> <p>Damaged.</p> <p>Failed light leak check.</p> <p>Failed source check.</p>
22	After	Small Area Beta Gamma (SABG) Probe	<ol style="list-style-type: none"> 1. Remove dust, moisture, and loose dirt from outside surface (do not wipe mylar window) by wiping with a rag dipped in warm water. If necessary, it may be cleaned with a mild solution of ordinary detergent soap (for example, dishwashing soap) and water and thoroughly dried. Inspect exterior for any obvious damage. 2. Inspect calibration label (Figure 10.11, Item 6) affixed to the unit and date is current. 	<p>Degraded if obvious damage is present.</p> <p>Missing, not legible, or out of date.</p>

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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
			3. Inspect serial number data plate (Figure 10.11, Item 5) affixed to the unit and date is current.	Degraded if missing or not legible.
			4. Remove and inspect SABG sensor protective cover (Figure 10.12, Item 2) for damage, affix protective cover to top of SABG Probe. Verify chain (Figure 10.11, Item 8), anchors (Figure 10.11, Item 9), and screws (Figure 10.11, Items 7 and 10) are present that attach the protective cover to the SABG probe.	Degraded if damaged, unable to affix to top of SABG Probe or missing any of the inspected items.
			5. Inspect etched screen (Figure 10.12, Item 3) protecting SABG sensor (pancake GM tube) for damage. Replace SABG sensor protective cover over SABG sensor and etched screen for protection.	Damaged, dented, or punctured.
			6. Inspect handle (Figure 10.11, Item 2) for damage and ensure the knurled handle is attached to the bow of the handle with two screws (Figure 10.12, Item 1) and the entire handle is attached with two handle screws (Figure 10.11, Item 1) to the body of the probe on the top housing cover.	Degraded if damaged, missing, or loosely attached.
			7. Inspect the nine screws (Figure 10.11, Item 4) connecting the top housing cover to the bottom housing to ensure they are present. (When the SABG Probe Shield is not attached to the SABG, there will be two intentionally open holes (Figure 10.11, Item 3) in the top of the SABG Probe.)	Degraded if missing any screws.
			8. Remove cable connector protective cap (Figure 10.12, Item 4) and inspect cable connector for damage.	Cable connector damaged.
			9. Install cable connector protective cap (Figure 10.12, Item 4) and verify its chain (Figure 10.12, Item 5) and anchor (Figure 10.12, Item 6) are present and installed.	Degraded if cap, chain, or anchor are damaged or missing.

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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
			10. Complete SABG Probe source check (Section 4.4.7). Perform operator troubleshooting, if applicable. 11. Place item in transit case.	Failed source check.
23	After	Telescoping Pole	1. Remove dust, moisture, and loose dirt from outside surface (do not wipe mylar window) by wiping with a rag dipped in warm water. If necessary, it may be cleaned with a mild solution of ordinary detergent soap (for example, dishwashing soap) and water and thoroughly dried. (Procedure applies to either Telescoping Pole.) 2. Check Telescoping Pole (Figure 10.16) for loose, missing, or damaged parts. 3. Inspect probe connector inside probe cup for visible signs of damage, corrosion, or bent pins. 4. Inspect Common Probe Cable connection (Figure 10.17) on opposite end of Telescoping Pole for visible signs of damage or corrosion. 5. Open cam latch and extend each telescoping segment to ensure functionality of all pieces. Retract all segments, closing traverse clamps to lock the movement of the segments, then close cam latch. 6. Place item in transit case.	Degraded if damaged, loose, or missing parts. Damaged. Damaged. Any parts are non-functional, damaged, or missing.
24	After	Rad Extender	1. Remove dust, moisture, and loose dirt from outside surface by wiping with a rag dipped in warm water and thoroughly dry. 2. Inspect Rad Extender (Figure 10.15) for obvious physical damage, exposed wires, damaged connectors, or corrosion.	Damaged.

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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
			3. Place item in transit case.	
25	After	Pouches	<ol style="list-style-type: none"> 1. Remove dust, moisture, and loose dirt from outside surface by wiping with a rag dipped in warm water. If necessary, it may be cleaned with a mild solution of ordinary detergent soap (for example, dishwashing soap) and water and thoroughly dried. 2. Inspect Base Unit carrying pouch, shoulder strap for Base Unit Carrying Pouch and probes carrying pouch for fraying, tears, or rips and damaged or missing hardware. 3. Place items in transit case. 	Pouches or strap are damaged or missing hardware.
26	After	Sensitive Gamma Probe	<ol style="list-style-type: none"> 1. Remove dust, moisture, and loose dirt from outside surface by wiping with a rag dipped in warm water. If necessary, it may be cleaned with a mild solution of ordinary detergent soap (for example, dishwashing soap) and water and thoroughly dried. Inspect exterior for any obvious damage. 2. Inspect calibration label (Figure 10.18, Item 1) affixed to the unit and confirm date is current. 3. Inspect serial number data plate (Figure 10.18, Item 2) affixed to the unit and confirm data plate data is legible. 4. Remove cable connector protective cap (Figure 10.18, Item 5) and inspect connector (Figure 10.18, Item 3) for any physical damage. 5. Install cable connector protective cap (Figure 10.18, Item 5) and verify its chain (Figure 10.18, Item 6) and anchor (Figure 10.18, Item 4) is present and installed. 6. Inspect all nine screws (Figure 10.19, Items 1, 2, and 3) to ensure they are present. 	<p>Degraded if obvious damage is present.</p> <p>Missing, not legible, or out of date.</p> <p>Degraded if missing or not legible.</p> <p>Cable connector damaged.</p> <p>Degraded if cap, chain, or anchor are damaged or missing.</p> <p>Degraded if missing any screws</p>

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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
			<ol style="list-style-type: none"> 7. Complete Sensitive Gamma Probe source check (Section 4.5.7). Perform operator troubleshooting, if applicable. 8. Place item in Sensitive Gamma Probe transit case. 	Failed source check.
27	After	FIDLER Probe	<ol style="list-style-type: none"> 1. Remove dust, moisture, and loose dirt from outside surface by wiping with a rag dipped in warm water. If necessary, it may be cleaned with a mild solution of ordinary detergent soap (for example, dishwashing soap) and water and thoroughly dried. Inspect exterior for any obvious damage. 2. Inspect calibration label (Figure 10.20, Item 6) affixed to the unit and confirm date is current. 3. Inspect serial number data plate (Figure 10.20, Item 7) affixed to the unit and confirm data plate data is legible. 4. Remove cable connector protective cap (Figure 10.20, Item 1) and inspect connector (Figure 10.20, Item 4) for any physical damage. 5. Install cable connector protective cap (Figure 10.20, Item 1) and verify its chain (Figure 10.20, Item 2) and anchor (Figure 10.20, Item 3) is present and installed. 6. Inspect handle (Figure 10.21, Item 2) for damage, missing, or loose parts. 7. Inspect all twenty-one screws (total of 7 screws on top cover, 4 screws on handle, and 10 around body of probe) (Figure 10.20, Item 5 and Figure 10.21, Items 1, 5, and 6) to ensure they are present. 8. Inspect to ensure there is a lock washer under each screw on the bottom row (Figure 10.21, Item 3) and under each screw on the top row (Figure 10.21, Item 4). 	<p>Degraded if obvious damage is present.</p> <p>Missing, not legible, or out of date.</p> <p>Degraded if missing or not legible.</p> <p>Cable connector damaged.</p> <p>Degraded if cap, chain, or anchor are damaged or missing.</p> <p>Degraded if damaged, missing, or loose parts.</p> <p>Any damaged or missing screws on FIDLER Probe (other than handle assembly). Degraded if any damaged or missing screws on the FIDLER probe handle assembly.</p> <p>Any of the 10 lock washers are missing.</p>

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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
			<ol style="list-style-type: none"> 9. Complete FIDLER Probe source check (Section 4.6.7). Perform operator troubleshooting, if applicable. 10. Place item in FIDLER Probe transit case. 	Failed source check.
28	After	Neutron Probe	<ol style="list-style-type: none"> 1. Remove dust, moisture, and loose dirt from outside surface by wiping with a rag dipped in warm water. If necessary, it may be cleaned with a mild solution of ordinary detergent soap (for example, dishwashing soap) and water and thoroughly dried. Inspect exterior for any obvious damage. 2. Inspect calibration label (Figure 10.23, Item 7) affixed to the unit and confirm date is current. 3. Inspect serial number data plate (Figure 10.23, Item 8) affixed to the unit and confirm data plate data is legible. 4. Remove cable connector protective cap (Figure 10.23, Item 2) and inspect connector (Figure 10.23, Item 5) for any physical damage. 5. Install cable connector protective cap Figure 10.23, Item 2) and verify its chain (Figure 10.23, Item 3) and anchor (Figure 10.23, Item 4) is present and installed. 6. Inspect handle (Figure 10.23, Item 1) for damage, missing, or loose parts. 7. Inspect all twenty-two screws (Figure 10.23, Item 6) to ensure they are present. 8. Inspect wall plate for damage or missing screws that hold it in place. 9. Complete Neutron Probe radiation check (Section 4.7.7). Perform operator troubleshooting, if applicable. 	<p>Degraded if obvious damage is present.</p> <p>Missing, not legible, or out of date.</p> <p>Degraded if missing or not legible.</p> <p>Cable connector damaged.</p> <p>Degraded if cap, chain, or anchor are damaged or missing.</p> <p>Degraded if damaged, missing, or loose parts.</p> <p>Degraded if missing any screws.</p> <p>Degraded if damaged or missing screws.</p> <p>Failed source check.</p>

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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
			10. Place item in Neutron Probe transit case.	
29	After	Shoulder Straps	<ol style="list-style-type: none"> 1. Remove dust, moisture, and loose dirt from outside surface by wiping with a rag dipped in warm water. If necessary, it may be cleaned with a mild solution of ordinary detergent soap (for example, dishwashing soap) and water and thoroughly dried. 2. Inspect shoulder straps for fraying, tears, or rips and damaged or missing hardware. 3. Place items in the appropriate transit case. 	Degraded if shoulder strap is damaged or missing hardware.
30	After	Headset	<ol style="list-style-type: none"> 1. Remove dust, moisture, and loose dirt from outside surface by wiping with a rag dipped in warm water and thoroughly dry. 2. Inspect wires and connectors for fraying or other obvious damage. 3. Clean ear portion of headset with Isopropyl Alcohol or antibacterial soap. Replace ear portion if available. 4. Place item in the appropriate transit case. 	Fraying wires or damaged.
31	After	Batteries	<ol style="list-style-type: none"> 1. Observe battery indicator on Base Unit before powering off following the final probe source check. If batteries are dead or low, place rechargeable batteries in the battery charger for charging or if using non-rechargeable batteries, dispose of used batteries per local laws. 2. Inspect batteries for damage or corrosion. Dispose of in accordance with local guidelines. 3. Place damage free, charged or new batteries into appropriate transit case. 	Batteries are low or dead. Corroded or damaged.
32	After	AC/DC Power Adapter	<ol style="list-style-type: none"> 1. Remove dust, moisture, and loose dirt from outside surface by wiping with a rag dipped in warm water and thoroughly dry. 	

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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
			<ol style="list-style-type: none"> 2. Inspect for damage or exposed wires. 3. Place item in the appropriate transit case. 	Damage or exposed wires.
33	After	Battery Charger	<ol style="list-style-type: none"> 1. Remove dust, moisture, and loose dirt from outside surface by wiping with a rag dipped in warm water and thoroughly dry. 2. Inspect for damage, corrosion, or exposed wires. 3. Place item in the appropriate transit case. 	Damage, corroded, or exposed wires.
34	After	Cs-137 Check Source	<ol style="list-style-type: none"> 1. Remove dust, moisture, and loose dirt from outside surface by wiping with a rag dipped in warm water and thoroughly dry. 2. Inspect to ensure it has not been broken, crushed, or damaged. 3. Check the date listed as creation date on the source to ensure it is less than 30 years old. For disposal or replacement contact your RSO . 4. Place item in the appropriate transit case. 	<p>Broken, crushed, or damaged. (Do not handle damaged check source, contact RSO)</p> <p>Greater than 30 years old.</p>
35	After	Transit Cases	<ol style="list-style-type: none"> 1. Remove dust, moisture, and loose dirt from outside surface by wiping with a rag dipped in warm water. If necessary, it may be cleaned with a mild solution of ordinary detergent soap (for example, dishwashing soap) and water and thoroughly dried. 2. Inspect all foam layers, as applicable, to ensure they are intact with no holes, tears, moisture, mold, or mildew. Ensure the handles on the top layer are in working condition, if applicable. 	Damage, mold, mildew, or moisture.

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Item No.	Interval	Item to be Checked or Services	Procedure	Equipment Not Ready/Available If:
			<ol style="list-style-type: none"> 3. Close transit cases, secure latches, and inspect hardware such as handles, hinges, and wheels to observe all parts ensuring they are present and functional. Lay transit case flat, unlatch and open. 4. Inspect serial number data plate affixed to the exterior of case and confirm data plate data is legible. 	<p>Missing, damaged, or non-functional parts.</p> <p>Degraded if missing or not legible.</p>
36	After	All	<ol style="list-style-type: none"> 1. Verify all authorized components are present in transit cases by comparing the contents to transit case contents cards. 2. Prepare kits for storage (Section 8.1.1) 	Authorized equipment missing.

Section 2 Operator Corrective Maintenance Procedures

10.2.1 Maintenance Procedure Index

Title	Maintenance Procedure
Alpha-Beta Probe Mylar or Protective Screen Replace	10.2.3
Base Unit Battery Replace	10.2.2
Probe Strap Replace	10.2.4

10.2.2 Base Unit Battery Replace

REQUIRED:

- AA Batteries (4)
- Base Unit Powered Off (Section 3.6.2)

WARNING



Batteries. Batteries should not be opened or burned. Exposure to the ingredients contained within or their combustion products could be harmful causing respiratory irritation, skin irritation, eye irritation and chemical burns. Do not handle leaking or damaged batteries without neoprene or rubber gloves. Do not puncture, mutilate, or attempt to disassemble batteries. Do not heat them above 100°C (212°F). Do not mix battery types. Failure to comply may result in injury.

CAUTION



Batteries. This instrument may be powered by alkaline or NiMH batteries. Do not puncture, mutilate, or attempt to disassemble batteries. Do not heat them above 100°C (212°F). Do not mix battery types. Failure to comply may cause damage to the Base Unit and/or probes.

NOTE

Batteries may slightly vary in length. This can result in difficulty when removing battery cap with batteries installed with some batteries. Any difficulty in opening the battery cap when batteries are installed does not indicate that there is a problem with battery cap.

GENERAL INFORMATION:

This maintenance procedure provides Operator Level Maintenance instructions for replacement of Base Unit batteries.

REMOVE BASE UNIT BATTERIES

- (1) Orient the Base Unit to have the screen facing down so connector chains are out of the way.
- (2) Locate the battery cap shown in Figure 10.24.
- (3) Remove the battery cap by pressing it inward and turning it ¼ turn counter-clockwise. Refer to Figure 10.24.



Figure 10.24. Base Unit Battery Cap Removed.

- (4) Hold Base Unit with screen facing down as shown in Figure 10.25 so chains are out of way.
- (5) Remove AA batteries.

INSPECT

- (1) Inspect AA batteries for corrosion or damage.
- (2) Inspect battery compartment for corrosion or damage.
- (3) Inspect battery cap for corrosion or damage.
- (4) Clean off any corrosion with warm damp cloth, if unable to adequately clean the item:
 - (a) Replace AA batteries and install per below instructions.
 - (b) Send to next level maintenance as authorized for replacement of battery cap or compartment.


INSTALL BASE UNIT BATTERIES

- (1) Install four (4) AA batteries into the battery compartment with two batteries being installed with the positive battery terminal facing up on the right side and two batteries being installed with the negative battery terminal up on the left side. Refer to Figure 10.25.



Figure 10.25. Battery Orientation.

(2) Replace the battery cap and lock it into place by pushing it in and turning it $\frac{1}{4}$ turn clockwise.

(3) Power Base Unit on by pressing the Home/Power  key.

END OF MAINTENANCE PROCEDURE

10.2.3 Alpha-Beta Probe Mylar or Protective Screen Replace

REQUIRED:

- Mylar Window
- Protective Screen
- Common Probe Cable Disconnected (Section 4.1.2)

CAUTION



Scintillator. Alpha-Beta Probe full detection capability will not be ready until scintillator that sits below mylar window has settled for 2 hours after exposure to light. Failure to comply may result in inaccurate readings.

NOTE

Replacement of mylar window can be done in dark conditions to try to limit light exposure. However, if mylar window was damaged, scintillator will likely have already been saturated with light and will still need 2 hours to settle after replacement of mylar window. After mylar window replacement and completing Alpha and Beta source checks, increase background monitoring frequency for up to 12 hours while background levels gradually decay as light saturation of Alpha-Beta Probe scintillator slowly dissipates.

GENERAL INFORMATION:

This maintenance procedure provides Operator Level Maintenance instructions for replacement of a damaged Alpha-Beta Probe mylar window or protective screen.

REMOVE MYLAR WINDOW AND PROTECTIVE SCREEN

- (1) Remove protective cover and store it in the transit case.
- (2) Face probe up as shown (Figure 10.26).

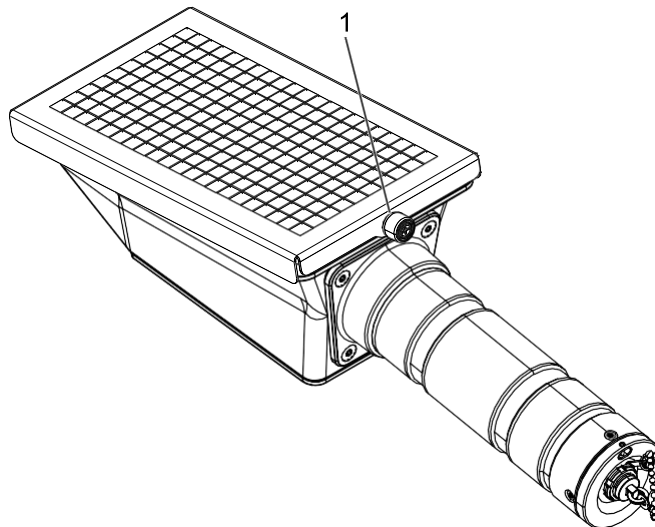


Figure 10.26. Alpha-Beta Probe Captive Screw.

- (3) Loosen captive screw (Figure 10.26, Item 1).
- (4) Open hinged protective grate (Figure 10.27, Item 1).

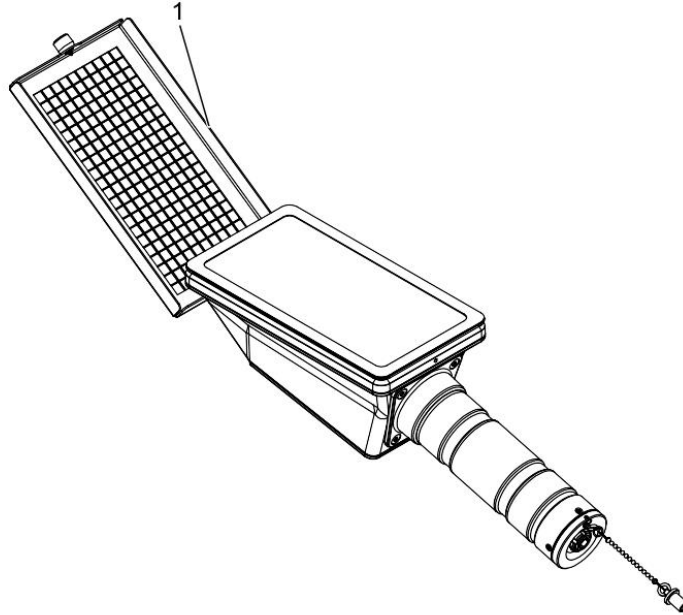


Figure 10.27. Alpha-Beta Probe Open Hinged Protective Grate.

- (5) Remove protective screen (Figure 10.28, Item 1).
- (6) Remove mylar window (Figure 10.28, Item 2).

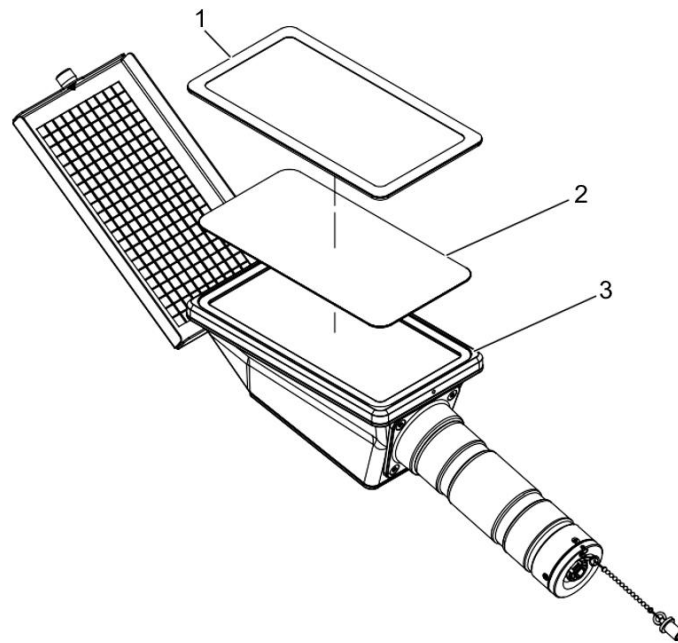


Figure 10.28. Mylar Window and Protective Screen Remove and Install.

INSPECT MYLAR WINDOW AND PROTECTIVE SCREEN

- (1) Inspect protective screen for damage, discard if damaged.
- (2) Inspect mylar window for damage, discard if damaged.

INSTALL MYLAR WINDOW AND PROTECTIVE SCREEN

NOTE

Replace only the damaged item(s).

- (1) Install new mylar window (Figure 10.28, Item 2) into mylar window well (Figure 10.28, Item 3), black frame towards probe.
- (2) Install retained protective screen (Figure 10.28, Item 1) on top of mylar window (Figure 10.28, Item 2), with padded side towards mylar window.
- (3) Close hinged protective grate (Figure 10.27, Item 1).
 - (a) Apply pressure on edge of protective screen and mylar window (Figure 10.29, Item 1) to hold in place while closing protective grate.



Figure 10.29. Protective Grate Closure.



CAUTION

Captive Screw. Only hand tighten the Alpha-Beta Protective Grate captive screw. Do not over tighten captive screw. Failure to comply may cause damage to probe.

- (4) Ensure captive screw engages with threads in hole in probe and tighten (Figure 10.26, Item 1).
- (5) Replace protective cover on Alpha-Beta Probe while not in operation.
- (6) Wait 2 hours before connecting to Base Unit and powering on.

END OF MAINTENANCE PROCEDURE

FOLLOW-ON MAINTENANCE

Perform Source Check on Alpha-Beta Probe (Section 4.3.8).

10.2.4 Probe Strap Replace

REQUIRED:

- Shoulder Strap

GENERAL INFORMATION:

This work package contains the procedure to remove or install the shoulder strap to a probe handle. This can be done for the FIDLER Probe or the Neutron Probe. There is also an identical shoulder strap to use with the Base Unit Carrying Pouch.

REMOVE PROBE STRAP

Remove shoulder strap (Figure 10.30, Item 1) from handle D-Rings (Figure 10.30, Item 2).

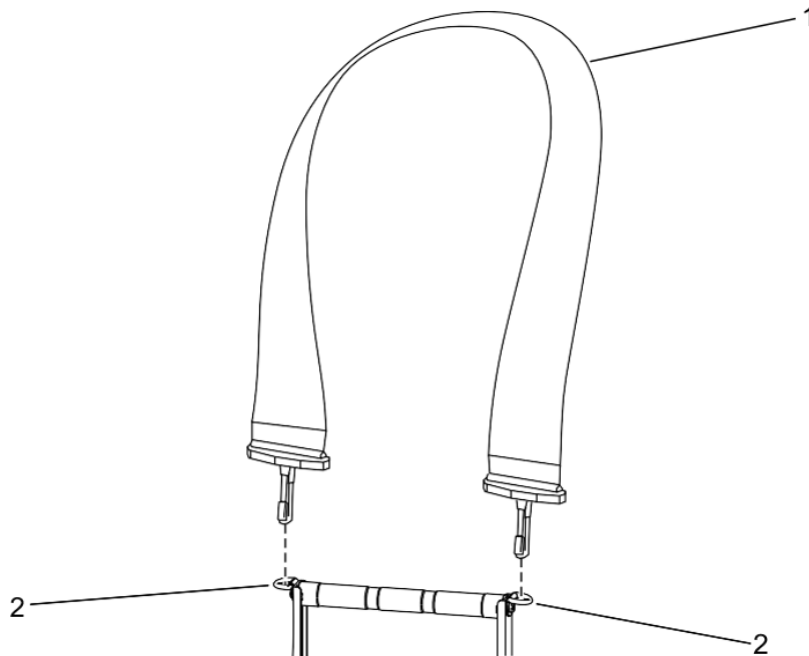


Figure 10.30. Remove and Install Shoulder Strap.

INSTALL PROBE STRAP

Install shoulder strap (Figure 10.30, Item 1) onto handle D-Rings (Figure 10.30, Item 2).

END OF INSTALL TASK

Chapter 11

Unit of Measure Conversions

Section 1 Weights & Measures

THE METRIC SYSTEM AND EQUIVALENTS

<p>Linear Measure</p> <p>1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches 1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches 1 Kilometer = 1000 Meters = 0.621 Miles</p> <p>Weights</p> <p>1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces 1 Kilogram = 1000 Grams = 2.2 Pounds 1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons</p> <p>Liquid Measure</p> <p>1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces 1 Liter = 1000 Milliliters = 33.82 Fluid Ounces</p>	<p>Square Measure</p> <p>1 Sq Centimeter = 100 Sq Millimeters = 0.155 Sq Inches 1 Sq Meter = 10,000 Sq Centimeters = 10.76 Sq Feet 1 Sq Kilometer = 1,000,000 Sq Meters = 0.386 Sq Miles</p> <p>Cubic Measure</p> <p>1 Cu Centimeter = 1,000 Cu Millimeters = 0.06 Cu Inches 1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet</p> <p>Temperature</p> <p>9/5 °C + 32 = °F 5/9 (°F - 32) = °C 212° Fahrenheit is equivalent to 100° Celsius 90° Fahrenheit is equivalent to 32.2° Celsius 32° Fahrenheit is equivalent to 0° Celsius</p>
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APPROXIMATE CONVERSION FACTORS

To Change	To	Multiply By
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Sq Inches	Sq Centimeters	6.451
Sq Feet	Sq Meters	0.093
Sq Yards	Sq Meters	0.836
Sq Miles	Sq Kilometers	2.590
Acre	Sq Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Sq Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

To Change	To	Multiply By
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Sq Centimeters	Sq Inches	0.155
Sq Meters	Sq Feet	10.764
Sq Meters	Sq Yards	1.196
Sq Kilometers	Sq Miles	0.386
Sq Hectometers	Acre	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Sq Inch	0.145
Kilometers per Liter	Miles per Gallon	2.354
Kilometers per Hour	Miles per Hour	0.621

Section 2 Radiation Units of Measure Conversions

Cited from US Department of Health and Human Services, <https://remm.hhs.gov/radmeasurement.htm>.

11.2.1 International System of Units (SI) Unit and Common Unit Terminology

	SI Units*	Common Units
Radioactivity	becquerel (Bq)	curie (Ci)
Absorbed Dose	gray (Gy)	rad
Dose Equivalent	sievert (Sv)	rem
Exposure	coulomb/kilogram (C/kg)	roentgen (R)

* SI Units: International System of Units

Note: In the table above the common units and SI units in each row are not equivalent in value, i.e., 1 curie does not equal 1 becquerel, but they both measure the same parameter.

11.2.2 Conversion Equivalence

1 curie	=	3.7 x 10 ¹⁰ disintegrations per second
1 becquerel	=	1 disintegration per second
1 millicurie (mCi)	=	37 megabecquerels (MBq)
1 rad	=	0.01 gray (Gy)
1 rem	=	0.01 sievert (Sv)
1 roentgen (R)	=	0.000258 coulomb/ kilogram (C/kg)
1 megabecquerel (MBq)	=	0.027 millicuries (mCi)
1 gray (Gy)	=	100 rad
1 sievert (Sv)	=	100 rem
1 coulomb/ kilogram (C/kg)	=	3,880 roentgens

11.2.3 Prefixes Often Used with SI Units

Multiple	Prefix	Symbol
10^{12}	tera	T
10^9	giga	G
10^6	mega	M
10^3	kilo	k
10^{-2}	centi	c
10^{-3}	milli	m
10^{-6}	micro	μ
10^{-9}	nano	n

Chapter 12

Quick Start Guide

The following pages may be printed as a Quick Start Guide.

RDS Operator's Manual

RDS BASE UNIT QUICK START GUIDE

Keypad Functions

Key	Function	Comment
Home/ Power	(a) Power on	Short press
	(b) Return to Home screen	Short press
	(c) Power off	Press and hold for 3 seconds, acknowledge power off
Back	Return to previous screen	Short press
Arrows (4)	Navigate Base Unit screens	Short press
Enter	Choose highlighted item	Short press
Main Menu	Go to Main Menu	Short press
Stealth Mode	Enter/exit Stealth Mode	Press Enter and Back keys together until the screen goes dark or returns to normal (~ 3 seconds)

Install Batteries

1. Remove battery cap by pressing it inward and turning it ¼ turn counterclockwise.
2. Install four (4) charged AA batteries into battery compartment with battery positive and negative terminals installed as shown.
3. Install battery cap and lock it into place with a ¼ turn clockwise.

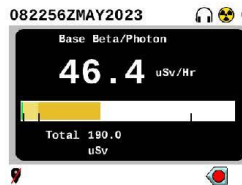


Power On

Press the **Home** key.

Preoperational Checks

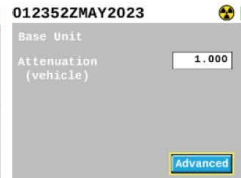
1. Verify radiation measurement units are set correctly for the mission by viewing the radiation units of measurement on the Home screen radiation reading panel.



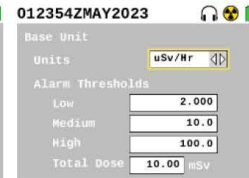
- a. Change radiation measurement units by pressing the **Main Menu** key, use arrow keys to highlight the Base Unit icon (or highlight the Probes icon if setting a probe's radiation measurement units), and press the **Enter** key.



- b. Press **Enter** key to highlight Advanced then press the **Enter** key.



- c. Press **Left** and **Right** keys to change the radiation units of measurements.

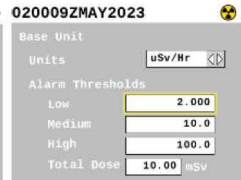


2. Verify alarm thresholds are set correctly.

- a. While on the Home screen, press the **Back** key to view alarm thresholds.



- b. Change settings as necessary by pressing **Main Menu** key, use the arrow keys to highlight Base Unit (or highlight Probes to set probe thresholds), and press the **Enter** key.



- c. Press the **Enter** key to highlight the Advanced button and press the **Enter** key.



- d. Press the **Down** key to highlight the threshold setting to be changed and press the **Enter** key.

- e. Enter a new value by using the arrow keys to highlight a number and press the **Enter** key for each number in the new value.

- f. Highlight the Done button when completed and press the **Enter** key.

- g. Return to the Home screen by pressing the **Home** key.

3. Perform a source check.

- a. Place the Cs-137 check source on the small crosshairs on back of Base Unit and verify that radiation readings increased on Home screen. Hold the Cs-137 check source in place.



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RDS BASE UNIT QUICK START GUIDE

- Press the **✓** key to acknowledge any radiation alarms.
- Press **⏏** key, use the arrow keys to highlight Health icon, and press the **✓** key.
- Press **⏏** key to highlight Rad Test and press **✓** key.
- Verify Base Unit L Counts and Base Unit H counts are greater than zero and state "Pass".
- Return to the Home screen by pressing the **⏏** key.



Connect Probes

- Remove connector protective cap from the Base Unit PROBE connector.



- Align red dot on PROBE connector to red dot on common probe cable and insert until an audible click is heard.
- Remove connector protective cap from probe.
- Align red dot on probe's connector to red dot on common probe cable and insert until an audible click is heard.

Disconnect Probes

- Grasp the sleeve at the end of the common probe cable connector and pull.
- Disconnect the common probe cable from the Base Unit and the attached probe.
- Install connector protective caps on the Base Unit and probe connectors.



Toggle Radiation Reading Panel with Multi-Channel Probes

In order to see other channels when an Alpha Beta Probe or a FIDLER probe is attached, you will need to press the **✓** key while on the Home screen to cycle through the radiation reading panels for each channel for the respective probes.

Operate Base Unit and Probes

- Hold the Base Unit or the Probe facing towards suspected radiological sources.
- Radiation readings will auto-scale.
- Acknowledge any alarm by pressing the **✓** key.

Technical Manual

Refer to the technical manual for warnings, cautions, and other instructions.

Change Language

- Power off Base Unit by pressing and holding the **⏏** key for 3 seconds.
- Simultaneously press and hold the **⏏** and **⏏** and **⏏** keys; without releasing the arrow keys, press and hold the **⏏** key until Base Unit turns on.
- Highlight the desired language using the **⏏** and **⏏** keys and press the **✓** key to select.

Power Off

Press and hold the **⏏** key for three seconds and then press the **✓** key to confirm power off.