HE50 Hand Held Explosive Detector

Technical Description

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Notes

With continual development of our products Rapiscan Systems reserves the right to amend specifications without notice. Product pictures and software images are for general reference.

Please note that due to US laws and regulations, not all Rapiscan products are available for sale in all countries without restriction. Please contact your Rapiscan Systems sales representative for more information.

Document Revision History

Rev. #	Date	Author(s) / Approval	Description
1	Aug 9, 2012	BC/HP	Draft

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1.0   HE50 SYSTEM PRINCIPLES

The Rapiscan System Model HE50 is a hand held device used to detect both vapors and/or particulate from the ambient environment, packages, or other surfaces that may have adsorbed explosive residues. The system uses a non-contact inhalation sampling method that does not damage any interrogated surface. The handheld form factor allows the operator to screen packages/persons without contact, for all major explosives. The continuous sampling mode also allows for maximum throughput at security checkpoints and at industrial cargo screening applications.

1.1 HE50 Detection Technology

1. Ambient air from proximity of tested object is drawn into intake port, transferred into ionization chamber

2. Radiation interacts with incoming sample molecules to create positive and negative ions

3. Source of radiation is a radioactive material (HE50 employs AM-241)

4. The ions pass into the drift region of the spectrometer

5. Time it takes for ions to travel the length of drift region depends on specific explosive ion mobility (drift time)

6. From the drift time it is possible to calculate the exact specific identity of the tested explosive chemical agent
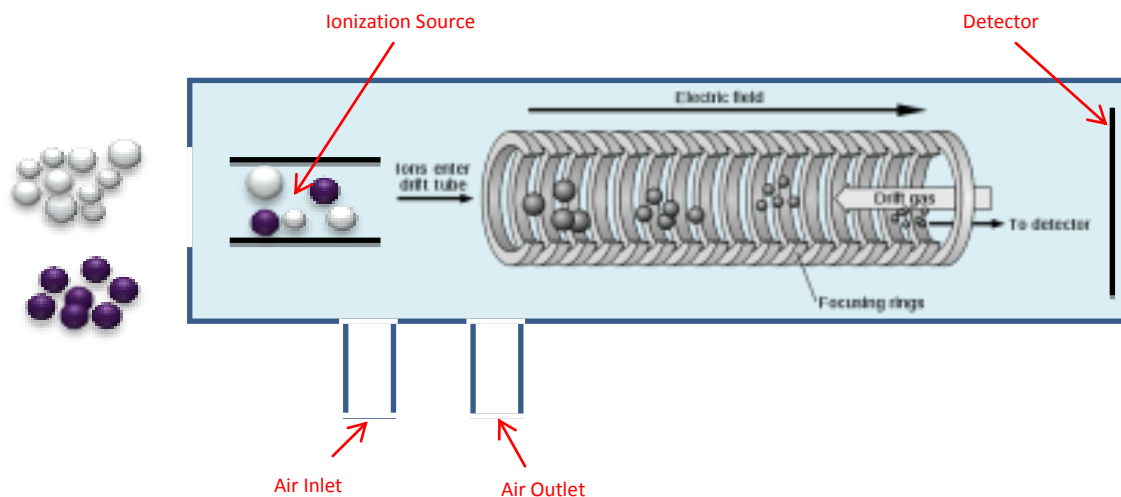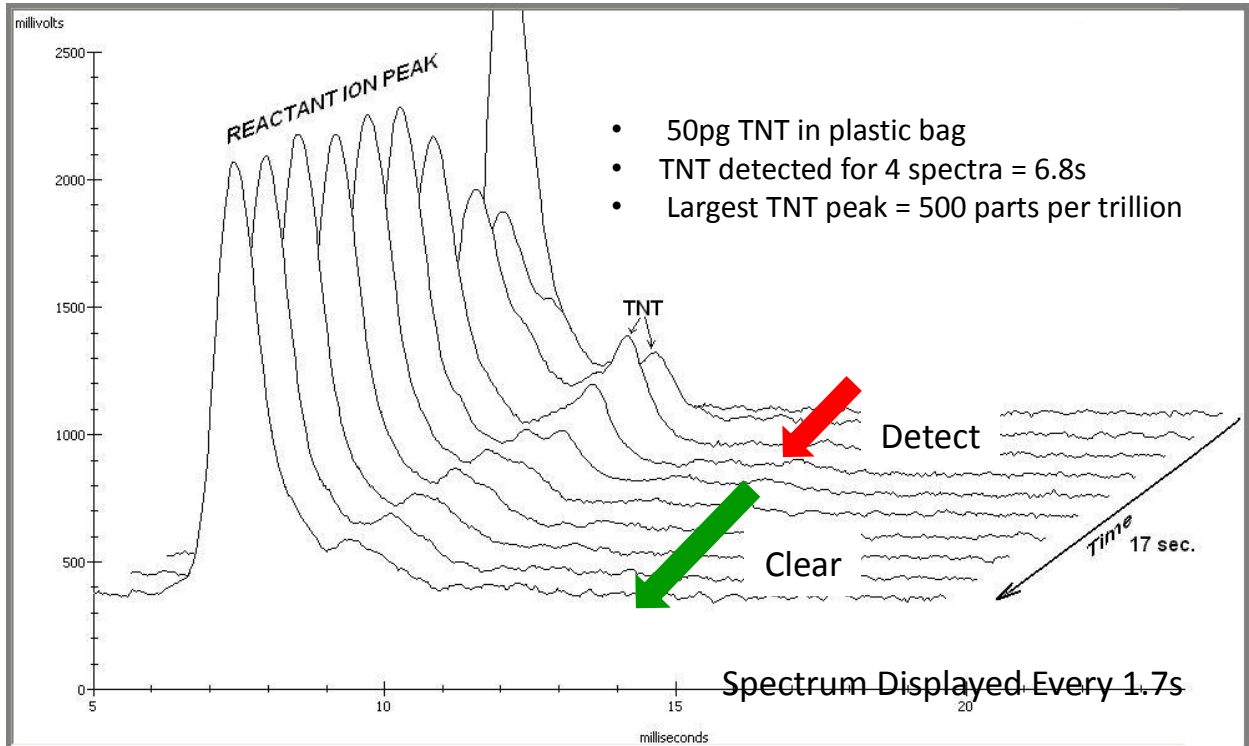
- 50pg TNT in plastic bag
- TNT detected for 4 spectra = 6.8s
- Largest TNT peak = 500 parts per trillion

1.2 HE50 Typical Operation

Each individual inspection requires the Rapiscan System Model HE50 to scan within approximately ½" of the surface in question. Particles, such as fibres or skin cells, and explosive vapors are inhaled into the instrument to enable a suspect surface or person to be examined without contact for the presence of these chemical.

A very small, low activity (20 µCi) sealed foil Americium-241 radioactive source is used to ionize the inhaled air and entrained trace vapours and particles, and a selective chemical technique is employed to detect the specific energetic molecules typical of most explosives. These molecules are analyzed by the on-board microprocessor running advanced detection algorithms which identify the peaks in the spectra, characterizes them and displays the explosives detected on an LCD screen at the top of the instrument. A broad range of chemicals can be uniquely detected and identified which include, but are not limited to the explosives: C4/RDX, TNT, PETN, DNT, EGDN, nitroglycerin NG, HMX, Semtex, various black powders, ANFO and ammonium nitrate.

If the scanned surface is large or does not easily release explosive particulates or vapours, disposable sample collection wipes can be used upon suspect surfaces or items and then be presented to the instrument for analysis directly off the wipe.

2.0   HE50 TRACE DETECTION SYSTEM FEATURES

HE50 is a hand-held Explosive Trace Detection system (ETD) with unparalleled levels of high sensitivity and selectivity while also providing industry leading low cost of operation.

The HE50 uses an inhaling, non-contact sampling method with a real-time analysis response for fast, reliable and specific identification of explosives. The 3 button control and fully automatic continuous calibration design facilitates easy integration into screening process.

Key Features

- Continuous non-contact vapour sampling technology

- Highest Throughput in Industry

- No Calibration traps, No Verification traps, No membrane or Grids required

- Fully Automatic, Continuous, Self-Calibration with no user intervention

- No Preventive Maintenance Required

- One handed Operation

- Easy-to Operate, Lightweight, Compact and Ergonomically Designed

- Highly Sensitive and Selective

  - Picogram Detection Sensitivity and Low False Alarms

- Lowest Consumable Cost in industry delivers Lower Total Cost of Ownership

Advanced Sampling Technology

The HE50 detects explosive traces in both forms of vapors and particulate from the ambient environment, packages, or other surfaces that may have absorbed explosive residues. The HE50 uses a non-contact inhalation sampling technology that does not damage the interrogated surface. Designed to minimize consumable costs, the HE50 uses a low cost dopant with an extended shelf life.

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For additional flexibility the HE50 is also able to analyze samples taken by a disposable sample wipe.

Exempt from US NRC Requirements

The HE50 uses a unique ionization source with US Nuclear Regulatory Commission (NRC) Exempt Distribution status that has no end-user documentation and no radiation leak testing requirements.

Non-contact Sampling

The lightweight, ergonomically designed HE50 allows the operator to screen without contact for all major explosives.

Detects Range of Explosives

The HE50 detects low Picogram levels of a broad range of explosives including

TATP	TNT	C4/RDX	Semtex
Nitroglycerin/Dynamite	PETN	EGDN	HMX
Black Powder	Smokeless Powder	AN	ANFO
DNT			

Easy-to-Operate

The HE50 offers a fully automatic continuous self-calibration technology without the need for manual calibration and traps and is ready to use in less than 10 minutes. Alarms can be configured with audible and visual detection indicators. With the large LCD screen the HE50 can be used in all lighting conditions.

The HE50 is ideal for customers that need a portable, versatile and effective explosive threat detection solution.

Built in hardware redundancy provides unsurpassed high availability and system operational uptime.

Highly Selective, Low False Alarms

On board digital signal processing and advanced detection algorithms also ensure that highly sensitive detection performance is accompanied with exceptionally low false alarms. Low false alarm rate performance will result in

increased operational screening performance as more time can be dedicated to investigating real alarms instead of employing time on innocuous false alarms.

3.0   HE50 MCDAQ SOFTWARE OVERVIEW

The HE50 Mini-Cell Data Acquisition & Management Software, called "MCDAQ", is operated in a Windows environment on a laptop or desktop computer.

Connection to the HE50 Handheld Unit is established by the provided micro-USB Cable.

3.1 HE50 MCDAQ Functionality

- Download data sample
- Review the sample data
- Pin the information by:
  - Timestamp
  - Frame Number
  - Type of Threat
- Archive and Transmit sample data

4.0   HE50 PACKAGE OVERVIEW

4.1 Basic System Kit

Part Number	Description
20104854	HE50 Handheld Trace Detector Unit (23105026)
	Ruggedized Transit Case (23104869)
	2 Li-Ion Battery Packs w/ Charger (23105027, 23105028)
	Dopant 6 Vial pack (10105031)
	Shoulder Strap (13105034)
	Confidence Sample (23105035)
	Operator Manual (92107955)
	HE50 PC-link Software (MCDAQ) CD (SW93105033)
	Nozzle and Vent Covers
	Micro-USB Cable

4.2 Consumables and Replacement Parts

Part Number	Description
10105031	Dopant 6 Vial Pack
23105035	Confidence Sample (1 Canister)
23105027	Li-Ion Battery Pack
92105032	Operator Manual CD
92107955	Operator Manual
23104869	Ruggedized Transit Case
13105034	Shoulder Strap HE50
23105028	Battery Charger
	Nozzle Cover
	Vent Cover

	Micro-USB Cable

5.0   HE50 WARRANTY – Rapiscan Global Service

- 1 Year parts and labor

6.0   HE50 SPECIFICATIONS

6.1 HE50 Specifications and Standards

Name and Model	Handheld Explosives Trace Detector HE50
Rapiscan Part Number	20104854 (Full kit)
Rapiscan Part Number	23105026 (HE50 Unit only, no battery, no case, no accessories)
Shipped Dimensions	508 mm Long x 406.4 mm Wide x 203.2 mm High (20 in. x 16 in. x 8 in.)
Shipped Packing Weight	6.6 kg (14.5lbs)
Product Dimensions	Length: 278 mm (10.9 inches) Width: 140 mm (5.5 inches) Height: 272 mm (10.7 inches)
Weight of HE50 System	1.9 kg (4.2lbs) with battery
Operating Temperature	-20ºC to +55ºC
Relative Humidity	0 to 100%
Altitude Tolerance	Sea Level to 2500 meters
Scan Time	Continuous sampling mode, 3 to 30 seconds
Sensitivity	Picogram level
Battery	Fast Full Charge Lithium Ion battery in 2.5 hours 4.5 hours of continuous operation (meets CE and UL requirements)
Cold Start-up time	Under 10 minutes
Battery Size and Voltage	4500mAh with 14.4V
Regulatory Testing - Certificates	• UL/cUL 61010-1, 2nd Edition • CSA 61010-1 • IEC 61010-1: 2005 • CE - Standard(s): IEC 61326-1

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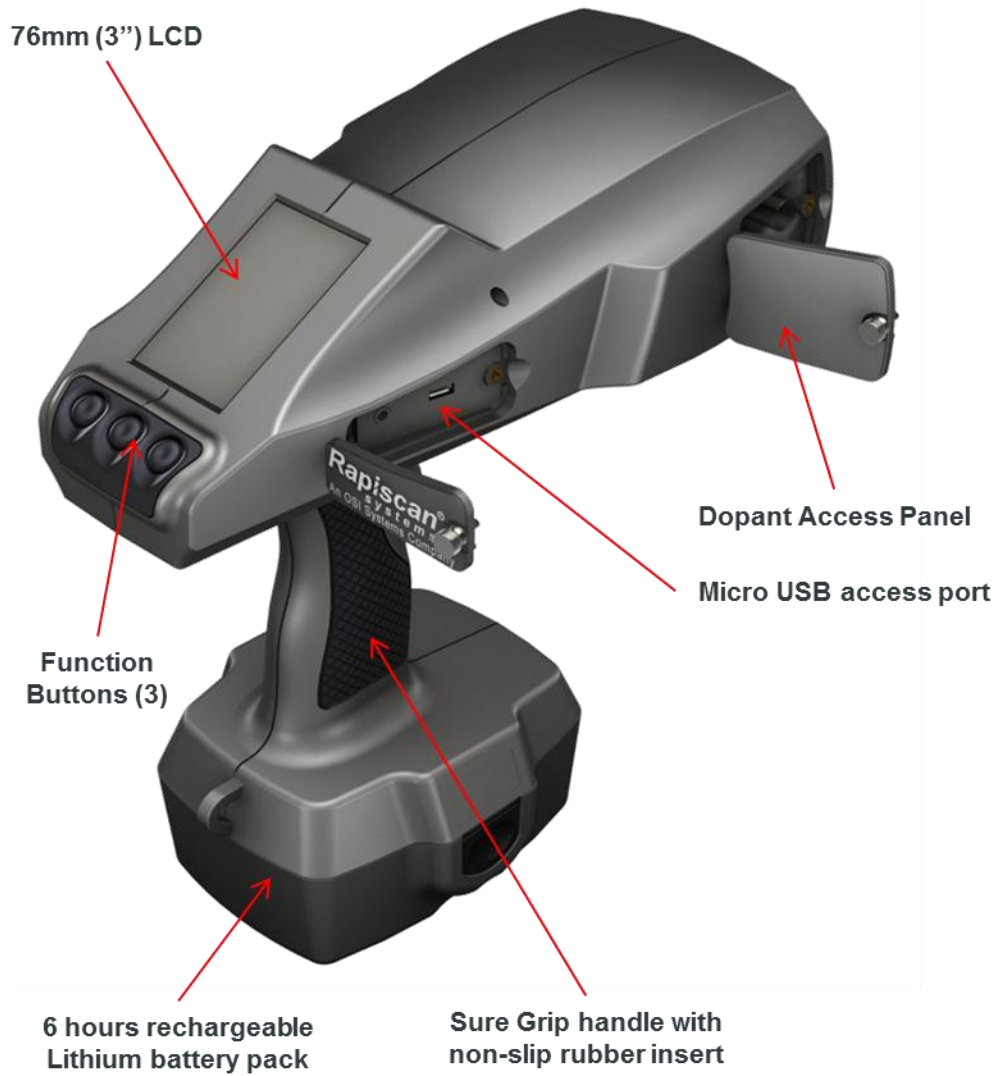| Environmental MIL-STD-810F	• Standalone and Encased Random Vibration, Bench Handling, Standalone and Encased Shock, Temperature • U.S. Highway truck and Composite two wheeled trailer vibration
Product Design Testing	• Highly Accelerated Life Testing HALT - Cold and Hot Temperature Step Stress, Rapid Thermal Transitions and Vibration Step Stress • Sealed radioactive source (low and high temp, drop, pressure) – NRC Std. • Battery and HE50 unit (low and high temp recovery)

CE UL
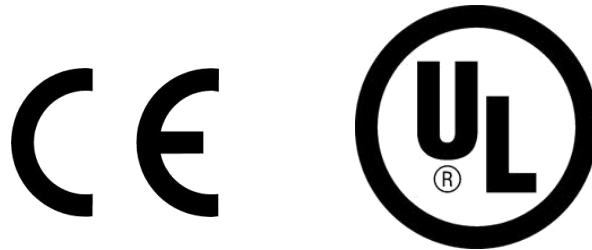
6.2 HE50 Dimensions

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6.3 HE50 Exterior Components

76mm (3") LCD

Dopant Access Panel

Micro USB access port

Function
Buttons (3)

6 hours rechargeable
Lithium battery pack

Sure Grip handle with
non-slip rubber insert

Metal Ring Hot During Operation

3 Air Pump Nozzles –
"Puffers"

Inlet Nozzle (Inhaler)

Dopant Vial
Puncture Tool

Dopant Vial
Receptacle

Micro USB access port

Headphone Jack

6.4 Assembly View of Major Components

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6.5 HE50 Dopant

HE50 Dopant Vial

Dopant Vial Seal
Puncture Tool

Dopant Vial
Receptacle
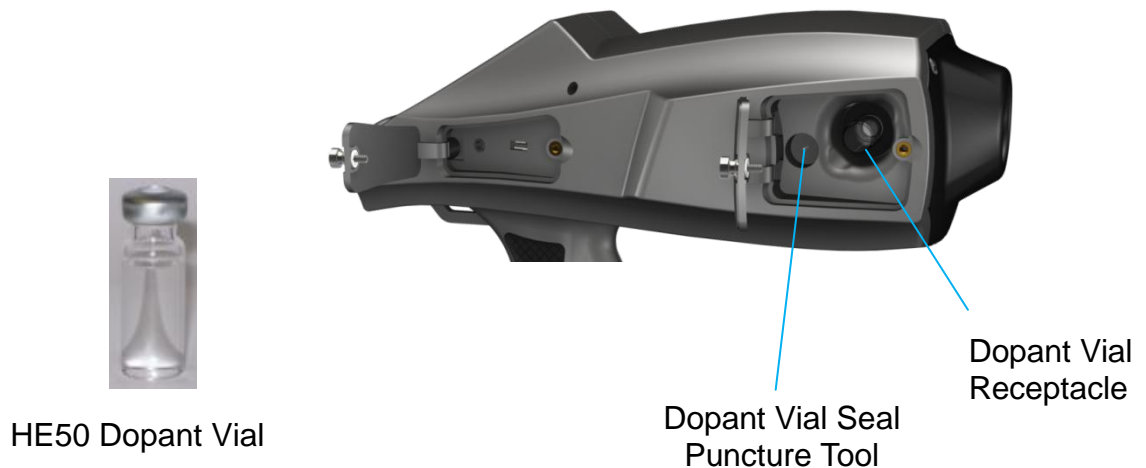
Dopant Specifications (p/n 10105031)

- Dichloro Methane, 1.5mL
- 14 days continuous operation
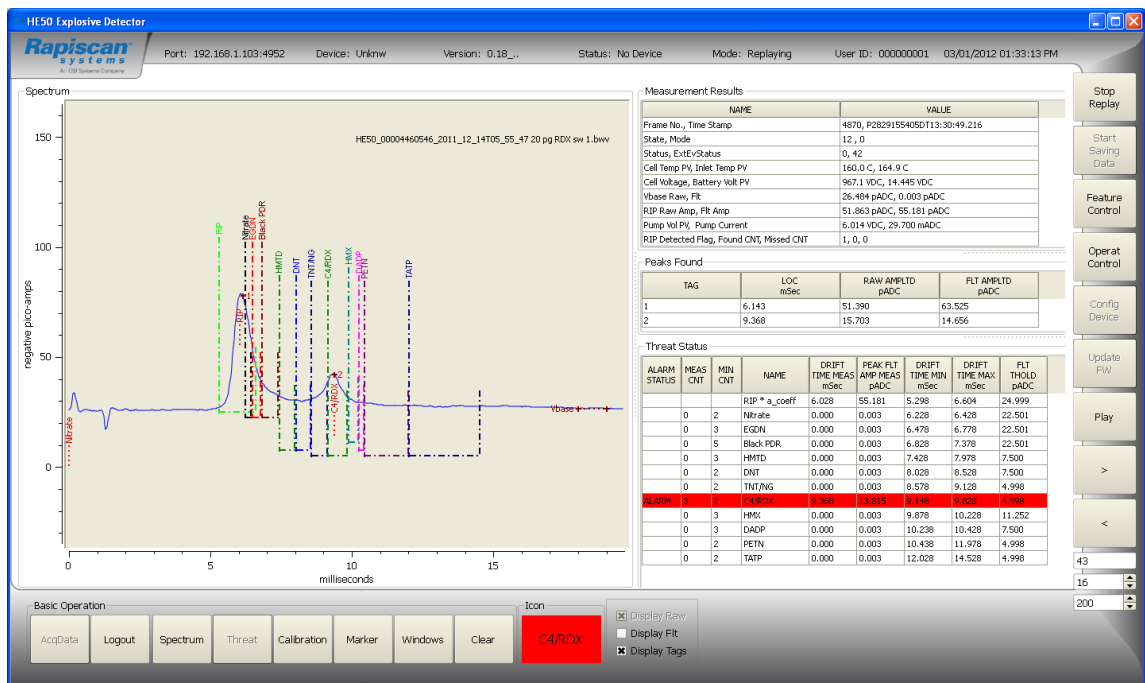- 1 year Shelf Life, Stored at Ambient Conditions

6.6 HE50 Onboard Computer

- Powerful Microprocessor with Multi-language capability
- Robust and fault tolerant hardware design
- Real Time Sample Analysis
- 4GB Flash Drive, stores up to 200,000 samples
- Data from every alarm event automatically recorded – can be uploaded to HE50 desktop software

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6.7 HE50 Desktop Software (MCDAQ, p/n SW93105033)

- Upload alarm data from HE50 Handheld unit

- Analyze recorded alarm data, annotate alarm files with Security Related information – create a file/record for evidence

- Analyze sample data in real time

- Simple user interface, graphics driven

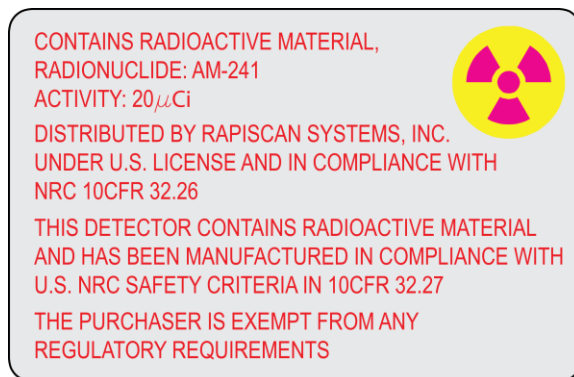## 7.0   Radiation Protection Requirement for Safe Use

The Rapiscan Systems Model HE50 contains an Americium-241 radioactive source similar to that used in commercial off-the-shelf smoke detectors and is NRC licensed for "exempt distribution".

The Rapiscan Systems Model HE50 has been manufactured in compliance with U.S. NRC Safety Criteria as defined in 10 CFR 32.27.

There are no additional regulatory required licensing, registration, or reporting requirements for the Model HE50 with any Federal or State agency.

There are no special disposal requirements or limitations and no radioactive sealed source leak testing is required by the owner and no materials such as drying agents, charcoal, or membranes require special disposal.

The NRC required label shown below must remain legible and maintained in good condition. This label has been affixed to the external surface of the Ion Mobility Spectrometer (IMS) located inside the Rapiscan Systems Model HE50 and on the external surface of the Model HE50 itself. An additional label has also been affixed to the external surface of the pelican storage case but this label does not include the 3-blade trefoil symbol. Only the Rapiscan Systems Model HE50 is required to be labeled with the 3-blade trefoil symbol included.

CONTAINS RADIOACTIVE MATERIAL,
RADIONUCLIDE: AM-241
ACTIVITY: 20μCi

DISTRIBUTED BY RAPISCAN SYSTEMS, INC.
UNDER U.S. LICENSE AND IN COMPLIANCE WITH
NRC 10CFR 32.26

THIS DETECTOR CONTAINS RADIOACTIVE MATERIAL
AND HAS BEEN MANUFACTURED IN COMPLIANCE WITH
U.S. NRC SAFETY CRITERIA IN 10CFR 32.27

THE PURCHASER IS EXEMPT FROM ANY
REGULATORY REQUIREMENTS

7.1 Handling Precautions

The Americium-241 sealed foil source device used in the Model HE50 has been registered with the NRC and approved for its intended use.

Americium-241 emits both alpha radiation and low energy gamma radiation which is used to ionize the incoming sample. These radiations cannot penetrate the IMS Cell Assembly or the

Model HE50 impact resistant plastic outer shell, therefore; there is no radiation hazard to the operator or surrounding personnel.