MSPEC USER MANUAL

HANDHELD PORTABLE SPECTROMETER

RADCOMM SYSTEMS CORP.

REVISION 6.0 AUGUST 5, 2015

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Revision History			
Rev	**Date**	**ECO**	**Description**
1	November 9, 2012	N/A	Released
2	January 24, 2013	676	Add minor changes
3	March 8, 2013	682	Minor changes
4	May 16, 2013	707	Adds Neutron operation
5	October 8, 2014	843	Add “Nuclide ID TIP”
6	August 5, 2015	947	Add spectrum display

Product Manual - Disclaimers:

Due to our efforts to continuously improve this product; specifications, dimensions, operating features and procedures described in this manual are subject to frequent changes. The printed version of this manual reflects only the configuration current at the time of printing. The most current version of the manual is provided in electronic format on the Product Support CD supplied with the instrument. Please refer to the electronic version of the manual for the most accurate interpretation. Contact RadComm Systems Corp. at www.radcommsystems.com

CONFIDENTIAL DISCLOSURE

USERS ARE HEREBY NOTIFIED THAT THIS MANUAL CONTAINS TECHNICAL INFORMATION OF A PROPRIETARY NATURE. THIS INFORMATION IS NECESSARY FOR TECHNICALLY KNOWLEDGEABLE USERS TO UNDERSTAND SYSTEM OPERATION AND TO SATISFY THEMSELVES THAT THE SYSTEM IS PERFORMING CORRECTLY.

RADCOMM ACCEPTS THAT IT IS THE RIGHT OF SUCH USERS TO BE PRIVY TO THIS INFORMATION. HOWEVER THIS DOCUMENTATION IS PROVIDED SOLELY FOR THE BENEFIT OF OWNERS OF THE MSpec PORTABLE DETECTOR AND DISSEMINATION OF THE DETAILED TECHNICAL INFORMATION PROVIDED MAY BE CONSIDERED AS LEGALLY CONTRAVENING THE NORMAL SUPPLIER/CUSTOMER RELATIONSHIP.

UNAUTHORIZED RELEASE OF DETAILED TECHNICAL INFORMATION TO A THIRD PARTY WILL BE CONSIDERED AS A CONTRAVENTION OF USER AGREEMENTS.

RADCOMM
RADIATION DETECTION SYSTEMS

Manufactured by RadComm, 2931 Portland Dr, Oakville, Ontario, Canada, L6H 5S4

INTRODUCTION

The MSpec is a Mini handheld gamma spectrometer. It was designed to provide primarily, but not limited to the waste and medical industries as a solution to prevent the accidental disposal of radioactive medical waste, including Gamma Sources up to 3 MeV.

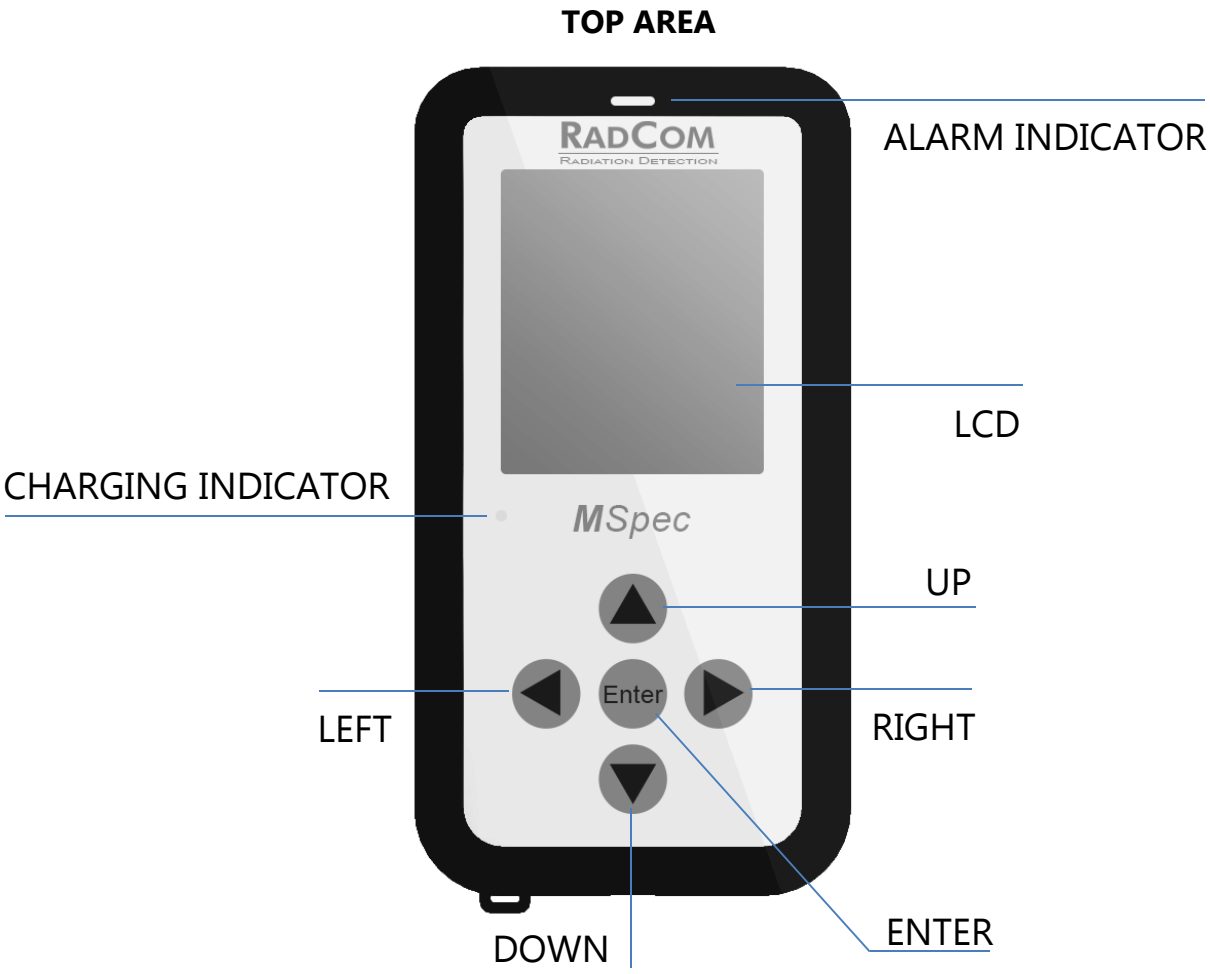
The MSpec can be used in countries where it is illegal to dispose or handle medical waste. Specific types of radioactive material are considered a health hazard and must be removed from the general public and non-Nuclear workers.

The MSpec is also ideally suited for the detection and identification of isotopes that were detected by large scale portal radiation detection systems.

The MSpec can easily fit into the palm of the hand and is lightweight. The instrument, once setup, it is extremely easy to navigate and only requires a "One-Button" turn ON before use. The internal rechargeable battery can be recharged via standard USB port.

GETTING STARTED

Getting to know the MSpec



BATTERY CHARGE & PC CONNECTION

The MSpec is delivered with a mini USB cable. This cable allows you to connect the MSpec to any PC running Windows XP or later.

When connected to a PC the MSpec will automatically charge its battery or the MSpec can also be charged with the supplied wall adaptor.

BATTERY STATUS

CHARGING INDICATOR

WHEN CHARGING, THE INDICATOR WILL LIGHT UP GREEN.

WHEN CHARGING IS COMPLETE THE INDICATOR WILL TURN OFF.

Power On

To turn on the MSpec press and release the Enter button.

During power-up the unit vibrates, followed by the LCD displaying the welcome screen.

Welcome Screen

The Welcome Screen displays the current mode.

TURNING OFF

When you are not using your MSpec, you may turn it off by pressing and holding the Up button for 3 seconds.

STABILIZATION REQUIRED

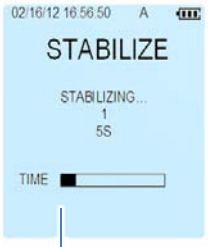
STABILIZATION REQUIRED MEANS SOMETHING IN THE INSTRUMENT HAS CHANGED THAT REQUIRES THE RECALCULATION OF THE PEAK ENERGY POSITION FOR ^{137}Cs

When the MSpec is first powered up, the message STABILIZATION REQUIRED may be displayed. Stabilization sets the instruments energy calibration to current conditions. Without the proper instrument stabilization inaccurate Isotope identification(s) will result. To stabilize the MSpec you will require the ^{137}Cs test source that was shipped with the instrument. Locate the ^{137}Cs test source on the front section of the instrument as shown below and hold it tightly in place (see next section for additional instructions). Once in place press the ENTER button and wait for the stabilization process to complete. The instrument will give notification that the MSpec has been successfully stabilized. If it fails to stabilize repeat the process again. After more than 5 attempts contact RadComm's Service department.

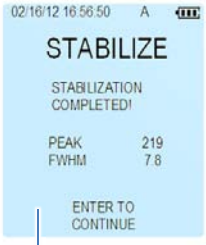
MAKE SURE TO POSITION THE 0.25 µCi SOURCE

Position the Test Source on contact with the top section of the instrument during stabilization.

Press Enter When Ready.



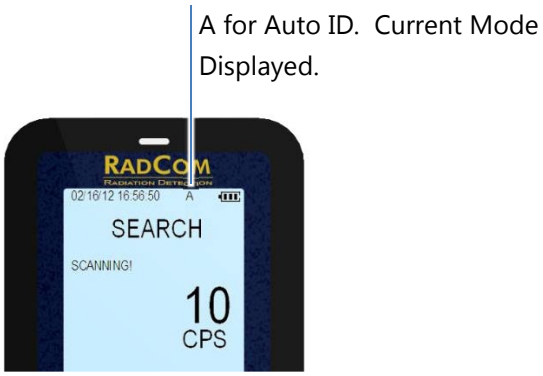
Stabilizing Progress bar.



Stabilization completed. Press Enter to Finish.

OPERATION MODES

The MSpec has two operation modes: Manual ID and Auto ID.



YOU CAN SELECT BETWEEN MANUAL ID AND AUTO ID MODE IN THE CONFIGURATION MENU.

MANUAL ID

The Manual ID Mode is a two-step operation:

- Search automatically begins when the MSpec is turned ON.
- Identify: the user chooses the Identify function by pressing the Enter button. Once the default sampling time (60 seconds) is complete the MSpec will automatically analyze the sample and display the identified result.

AUTO ID

The Auto ID Mode is a one-step operation:

Search + Identify automatically begins when the MSpec is turned ON.

A typical Screening Test can be performed as follows:

1. Start the MSpec in Auto ID Mode; the MSpec will begin the Search**.**
   The MSpec responds to radiation by placing the MSpec in front of the ^{137}Cs source (usually 9.25KBq 0.25 µCi ^{137}Cs provided with the instrument).

2. The MSpec should detect the radiation with an increasing display of measured units and varying audio tone before it automatically switches to the Identified Result (*Figure 1*) screen showing the sample detected. Also the unit will vibrate when the alarm threshold is exceeded (Alarm threshold can be set through PC software).

3. Once the sample is determined the system automatically analyzes the data collected, identifying the isotope of the source material. In the case of the provided test source the isotope should be ^{137}Cs .

Nuclide ID TIP: For successful Nuclide ID (either Manual or Auto) at least one-time routine is highly recommended, particularly if instrument was just received from vendor or agent:

By setting in instrument Menu the Stabilization mode to AUTO perform Stabilization routine with Cs-137. It will correct internal temperature compensation curve making isotope identification more reliable and adequate to local conditions.

SEARCH

Once the unit is ON, it displays the SEARCH screen.

Status Bar

Counts Per Second

The MSpec will automatically start scanning.

Place an isotope in front of the top end section of the instrument to start the identification sequence for the **Auto ID Mode**.

The **Manual ID Mode** will require the user to press Enter button.

IN AUTOMATIC MODE THERE IS A CONFIDENCE CPS AND DOSE RATE LEVELS THAT MUST BE ACHIEVED BEFORE THE INSTRUMENT WILL BEGIN THE IDENTIFICATION SEQUENCE. THIS LEVEL CAN BE SETUP IN THE RADVIEW PC SOFTWARE, IT CAN ALSO BE SETUP BY MSPEC CONFIGURE MENU.

IDENTIFY

To test the MSpec functions position the ^{137}Cs source on top of the unit.

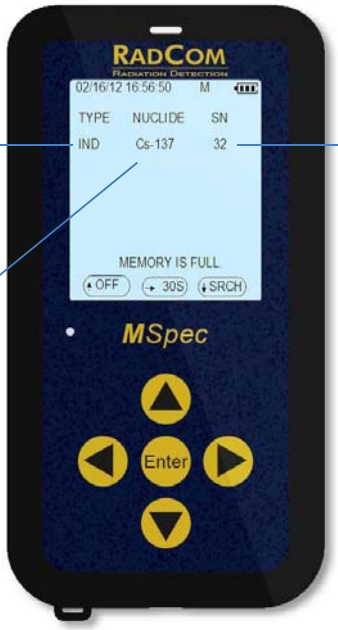
Position the test source or applicable Isotope on the top center section of the instrument to start the Identification sequence.

The counts will increase when the source is closer to the MSpec

Wait for the progress bar to be displayed and monitor the timer until it reaches the preset limit after which the Identified Isotope(s) will be displayed.

TYPE **IND** means category of isotope in accordance with the table on page 25. In this case **IND** stands for 'Industrial'

NUCLIDE **Cs-137:** is the name of the isotope identified



S:N 32 is the confidence of the Identification. The higher the number the more accurate the instruments result will be.

HL displays the isotope's half-life for isotopes with less than 8 months of half-life.

Figure 1
When the identification sequence has been completed the MSpec displays the identified Isotope(s).

S:N or HL displayed

Pressing LEFT toggles between S:N and HL

DISABLE THE AUDIO TEMPORARILY

The audio alarm can be temporarily disabled during the identification period by pressing the right arrow key.

COLLECT FOR ANOTHER 30SECONDS

->30S: Collect the spectrum for additional 30s to get better isotope identification.

MEMORY IS FULL MESSAGE

If the user clicks ->30s when memory is full, "MEMORY IS FULL" will flash at the bottom of the screen. The memory in MSpec can store 300 spectra.

Off – Press and hold the Up button to shut the unit off

30S adds an additional 30 seconds if the isotope was not identified

SRCH allows you to go back to the search mode.

STATUS BAR MESSAGES

The following is a list of status messages and definitions that may appear in the Search or Identify status bar.

HIGH DOSE RATE.MOVE AWAY!

The system has a preset maximum Dose Rate level – normally set at 10µSv/h (1000µR/h). Below this level Dose Rates are considered acceptable for system operation. However above this level it is recommended that users move away from the source of radiation to reduce the high radiation risk exposure.

CPS EXCEEDS THRESHOLD!

Counts per Second exceeds the CPS radiation alarm threshold. A distinct audio beep will be heard.

DOSE RATE EXCEEDS THRESHOLD!

The Dose Rate exceeds the Dose Rate radiation alarm threshold. A distinct audio beep will be heard.

STABILIZATION OFF. NO ID!

If Stabilization is OFF, the unit still has the ability to collect samples, but with NO ID.

STABILIZATION REQUIRED!

User can go to CONFIGURATION menu to stabilize the unit.

MEMORY IS FULL!

User can go to CONFIGURATION menu to erase the spectra saved on the memory.

CALIBRATION REQUIRED!

In order for the MSpec to maintain its high level of accuracy, the instrument should be calibrated by a certified company every 12 months. The MSpec will show the message "CALIBRATION REQUIRED" which is informing the operator that the MSpec should be calibrated.

ISO AND CNSC REQUIRE CALIBRATION EVERY 12 MONTHS

SCANNING!

The MSpec is scanning.

MOVE CLOSER!

THIS MESSAGE IS ONLY APPLICABLE TO THE IDENTIFY MODE

Move Closer means that the signal is very weak so if possible the user should move the unit closer to the suspect source of radiation. In many cases this is impossible so no action need be taken, but if possible move the unit closer until the message goes away.

MOVE AWAY!

THIS MESSAGE IS ONLY APPLICABLE TO THE IDENTIFY MODE

Move Away means that the signal is stronger than is necessary to take a proper sample. Correct action is to back away until the display shows SCANNING!

IT IS THE USERS CHOICE TO CONTINUE TO OPERATE WITH 'MOVE AWAY' MESSAGE ON THE SCREEN.

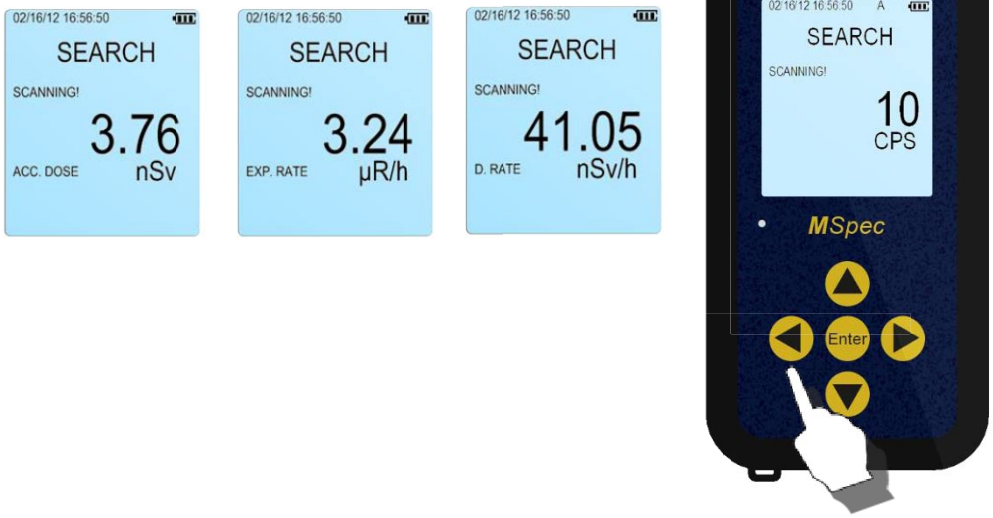
DISPLAY SPECTRUM

To display the spectrum, hold the Right button for 2 seconds. The graph displays accumulated spectrum. It resets every 10s, or until alarm is reset if the system is alarming.

To switch back to CPS display, also hold the Right button for 2 seconds.

CHANGING DISPLAY UNITS

To change between CPS, Dose Rate or Exposure Rate and Accumulated Dose, press the Left button to toggle the units.



Press the left button to toggle the units.

THE ACCUMULATED DOSE CAN BE RESET BY PRESSING AND HOLDING THE LEFT ARROW KEY FOR 2 SECONDS.

Menu

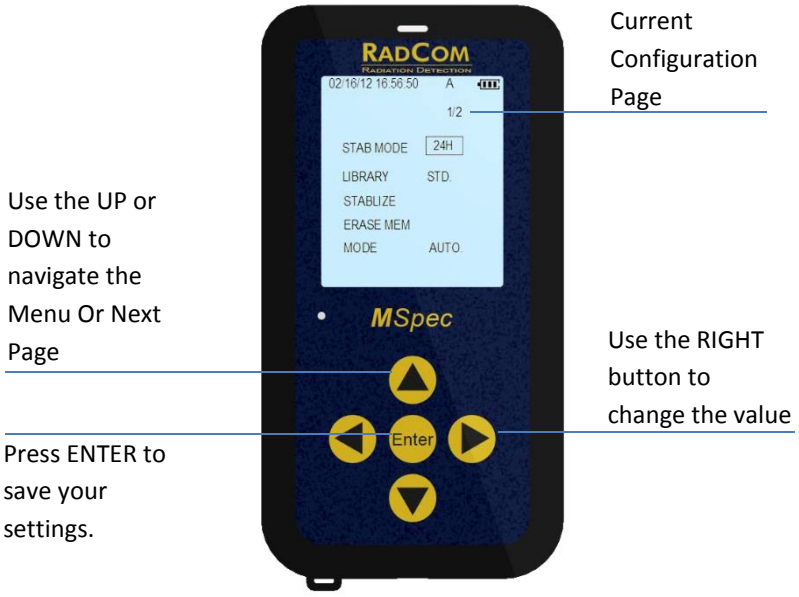
From the Search screen press and hold the down button for 2 seconds.

The Menu Screen

Use the Up or Down button to navigate the menu. Press Enter to choose your selection.

CONFIGURE

Configure allows you to make common selections in your MSpec. More Advanced options are available through the MSpec-PC software.



CONFIGURATION PAGE 1/2

STAB MODE	
OFF	When off, no warnings will be displayed to stabilize the unit.
12H	12 or 24 hours after the last stabilization a Stabilization Required warning message will be displayed.
24H	
AUTO (default)	AUTO option utilizes RadComm's proprietary temperature stabilization algorithm. The instrument will hold its stabilization between the temperatures of 5 to 55 °C. Temperature outside the range will require the stabilization with the 137Cs source.
LIBRAY	
STD (default)	Allows the user to select a library of nuclides to identify.
MED	
STABILIZE	

ENTER	Starts the Stabilization Required routine
ERASE MEM	
ENTER	Erase the spectrum stored in the memory
MODE	
AUTO (default)	Automatic Operation Mode
MANUAL	Manual Operation Model

CONFIGURATION PAGE 2/2

CPS AL-TH	
25 (default)	Cps threshold. When the counts are 25 counts higher than background the MSpec will start to alarm.
Values	OFF, 15, **25**, 50,100, 200, 300, 400, 500, 600, 700, 1K, 2K, 5K, 9Kcps
DOSE AL-TH	
50 µR/h (default)	When the dose rate is higher than 50uR/h the MSpec will start to alarm.
Values	OFF, 10, 20, **50**, 100, 200, 500, 1000, 2000, 4000, 5000, 9000 µR/h
ID TIME	
60 sec (default)	In the Manual Mode Identification the system will start collecting the spectrum for 60 seconds. After the 60 seconds is complete the MSpec will identify the isotope.
Values	10-50, 55, **60**-100, 200-600, 1200, 1800, 3600, 5400 SECS
NUCLIDE TH	
7 (default)	7 Standard Deviations (SD) as default. In NUCLIDE IDENT the PEAK THRESHOLD parameter is normally set at 3.0 SDs to determine whether a peak is used in NUCLIDE IDENT. The Peak Analysis engine produces a list of all peaks found and any peak below this setting (3SDs) are NOT used for NUCLIDE IDENT. This works very well for multi-peak isotopes but many complex spectra can easily produce aberrant peaks because of Pile-Up etc. and these can easily be misconstrued as being present whereas in fact they are scattering effects etc. The parameter NUCLIDE TH requires the SUM of all the peaks in an ID to exceed the Nuclide ID setting (default setting 7SDs).
Values	3, 5, **7**, 8, 9, 10, 11, 12, 15 (SD units)

INFORMATION

Displays Information about your MSpec instrument.

MSPEC WITH NEUTRON DETECTION

The following pages describe the operation and configuration of an MSpec with Neutron detection capabilities.

Neutron Detection is an Optional Add-On Detector

NEUTRON SEARCH

If there isn't any neutron reading, the MSpec operates as normal and the NEUT reading line is not displayed. When there is any Neutron reading detected a new line below status bar appears.

Normal Scanning No Neutron Readings

Neutron Readings Detected

NEUT 5 CPM

WHEN NEUTRON READINGS ARE DETECTED THE MSPEC DISPLAYS IT BELOW THE STATUS BAR.

When neutron readings are detected these values are shown below the status bar. A line message called "NEUT 5 CPM" is displayed.

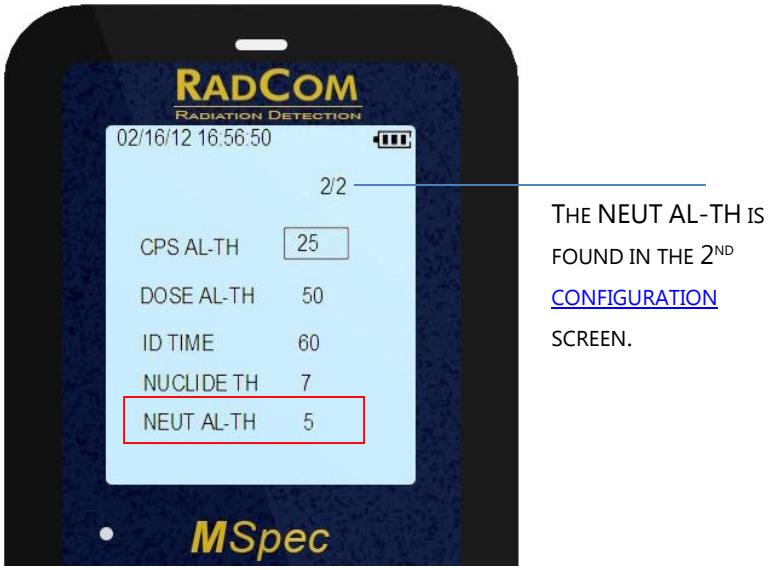
The value 5 CPM is the neutron reading of five counts per minute.

NEUTRON ALARM

In the event when the neutron readings Counts Per Minute are above the Neutron Alarm threshold, the MSpec notifies the user with a message, red LED flashes, audio beeps and the unit vibrates. Clicking Right button can reset neutron alarm.

NEUTRON ALARM THRESHOLD SETTING

Through the Configure menu the user can change the neutron alarm threshold **NEUT AL-TH** parameter. The unit is CPM.



NEUTRON IDENTIFY

When the user is in the Identify Mode and neutrons are detected the result is shown in the identification table. Click Left button, HL switches to S:N. For neutron, S:N column displays accumulated neutron counts during Identification period.

If "xxx CTS" is displayed under HL instead of POSSIBLE SNM, it means that the identification time is less than 1 minute and the neutron counts are below alarm threshold. There isn't enough statistics to positively identify neutron.

End of Neutron Operation Description

LIBRARIES

NUCLIDE LIBRARIES LEGEND

Type Of Isotope Definition	
Industrial	I
Medical	M
SNM	S
NORM	N

Standard Library (STD) Table

Name	Label	Type of Isotope
Am-241	Americium-241	I
Ba-133	Barium-133	I
Co-57	Cobalt-57	I
Co-60	Cobalt-60	I
Cs-134	Cesium-134	I
Cs-137	Cesium-137	I
Ga-67	Gallium-67	M
I-131	Iodine-131	M
Ir-192	Iridium-192	I
K-40	Potassium-40	N
Np-237	Neptunium-237	S
Pu-239	Plutonium-239	S
Ra-226	Radium-226	N
Tc-99m	Technetium-99m	M
Th-232	Thorium-232	N
Tl-201	Thallium-201	M
U-MIX	Uranium-MIX	N
U-235	Uranium-235	S
U-238	Uranium-238	N
Xe-133	Xenon-133	M

MEDICAL LIBRARY (MED) TABLE

Name	Label	Type of Isotope
Au-198	Gold-198	M
Cr-51	Cromium-51	M
Cs-134	Cesium-134	I
Ga-67	Gallium-67	M
I-123	Iodine-123	M
I-125	Iodine-125	M
I-131	Iodine-131	M
In-111	Indium-111	M
Ir-192	Iridium-192	I
K-40	Potassium-40	N
Ra-226	Radium-226	N
Sn-113	Tin-113	M
Tc-99m	Technetium-99m	M
Th-232	Thorium-232	N
Tl-201	Thallium-201	M
U-235	Uranium-235	S
U-238	Uranium-238	N
V-48	Vanadium-48	M
W-188	Tungsten-188	M

RECOMMENDED PARAMETERS

The following table describes the default and recommended MSpec manufacturing settings.

Parameters with a '*****' are available through the device's menu. The other parameters are accessible using the RadView software.

SETUP MENU	PARAMETER	DEFAULT	SELECTION
SEARCH	SPAN TIME	1	1, 2,3 -10, 20,30-60 SECS
	AUDIO SCALER	AUTO	OFF, AUTO, 50, 100, 150, 200, 250CPS
	***ALARM THRESHOLD**	25	OFF, 15,25,50,100, 200, 300, 400, 500, 600, 700, 1K, 2K, 5K, 9KCPS
	AVERAGING	3P	OFF, 3P, 5P, 10P
IDENTIFIED	***MEASURING TIME**	60	10-50, 55,60-100, 200-600, 1200, 1800, 3600, 5400 SECS
	PEAK THRESHOLD	3.0	2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0
	BASE DOSE THRES	20	10, 15, 20, 30, 40, 50 (µR/h units)
	***NUCLIDE THRES**	7	3, 5, 7, 8, 9, 10, 11, 12, 15 (SD UNITS)
DOSE	UNIT	SV	R, SV, GY
	SPAN TIME	2	1, 2-10, 20-60SECS
	AVERAGING	3P	OFF, 3P, 5P, 10P
	***ALARM THRESHOLD**	50	OFF, 10, 20, 50, 100, 200, 500, 1000, 2000, 4000, 5000, 9000 MR/H
MISCELLANEOUS	AABBCC-LANGUAGE	ENGLISH	ENGLISH, CHINESE, JAPANESE
STABILIZE	***STAB MODE**	AUTO	OFF, 12H, 24H, AUTO
LIBRARY	***ACTIVE LIB**	STANDARD	STANDARD, MEDICAL
MODE	***MODE**	AUTOMATIC	MANUAL,AUTOMATIC