ORTEC®

trans-SPEC®-DX-100
trans-SPEC®-N

Portable Integrated HPGe Spectrometer

User's Manual

Printed in U.S.A. ORTEC Part No. 931042 1014
Manual Revision C

Advanced Measurement Technology, Inc.
("AMT")

WARRANTY

AMT warrants that the items will be delivered free from defects in material or workmanship. AMT makes no other warranties, express or implied, and specifically NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

AMT's exclusive liability is limited to repairing or replacing at AMT's option, items found by AMT to be defective in workmanship or materials within one year from the date of delivery. AMT's liability on any claim of any kind, including negligence, loss, or damages arising out of, connected with, or from the performance or breach thereof, or from the manufacture, sale, delivery, resale, repair, or use of any item or services covered by this agreement or purchase order, shall in no case exceed the price allocable to the item or service furnished or any part thereof that gives rise to the claim. In the event AMT fails to manufacture or deliver items called for in this agreement or purchase order, AMT's exclusive liability and buyer's exclusive remedy shall be release of the buyer from the obligation to pay the purchase price. In no event shall AMT be liable for special or consequential damages.

Quality Control

Before being approved for shipment, each AMT instrument must pass a stringent set of quality control tests designed to expose any flaws in materials or workmanship. Permanent records of these tests are maintained for use in warranty repair and as a source of statistical information for design improvements.

Repair Service

If it becomes necessary to return this instrument for repair, it is essential that Customer Services be contacted in advance of its return so that a Return Authorization Number can be assigned to the unit. Also, AMT must be informed, either in writing, by telephone [(865) 482-4411] or by facsimile transmission [(865) 483-2133], of the nature of the fault of the instrument being returned and of the model, serial, and revision ("Rev" on rear panel) numbers. Failure to do so may cause unnecessary delays in getting the unit repaired. The AMT standard procedure requires that instruments returned for repair pass the same quality control tests that are used for new-production instruments. Instruments that are returned should be packed so that they will withstand normal transit handling and must be shipped PREPAID via Air Parcel Post or United Parcel Service to the designated AMT repair center. The address label and the package should include the Return Authorization Number assigned. Instruments being returned that are damaged in transit due to inadequate packing will be repaired at the sender's expense, and it will be the sender's responsibility to make claim with the shipper. Instruments not in warranty should follow the same procedure and AMT will provide a quotation.

Damage in Transit

Shipments should be examined immediately upon receipt for evidence of external or concealed damage. The carrier making delivery should be notified immediately of any such damage, since the carrier is normally liable for damage in shipment. Packing materials, waybills, and other such documentation should be preserved in order to establish claims. After such notification to the carrier, please notify AMT of the circumstances so that assistance can be provided in making damage claims and in providing replacement equipment, if necessary.

ADDITIONAL WARRANTY STATEMENT

Please note that the computer that controls the trans-SPEC is intended exclusively for the tasks detailed in this user's manual. Using this computer for any other purpose ***could void your warranty***.

In addition, the trans-SPEC contains ***no user-serviceable parts.*** Except for the battery hatch on the left side panel, which can be opened when the battery requires replacement, breaking the seal on the case ***voids your warranty.*** The trans-SPEC should be opened only by ORTEC-authorized service personnel.

If you have any questions about the use or maintenance of this instrument, please contact your ORTEC representative or our Global Service Center first.

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TABLE OF CONTENTS

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Safety Instructions and Symbols

This manual contains up to three levels of safety instructions that must be observed in order to avoid personal injury and/or damage to equipment or other property. These are:

DANGER Indicates a hazard that could result in death or serious bodily harm if the safety instruction is not observed.

WARNING Indicates a hazard that could result in bodily harm if the safety instruction is not observed.

CAUTION Indicates a hazard that could result in property damage if the safety instruction is not observed.

In addition, the following symbols may appear on the product:

DANGER – Hazardous voltage

ATTENTION – Consult the manual in all cases where this symbol is marked in order to determine the nature of the potential hazards and any actions that must be taken to avoid them

Protective earth (ground) terminal

Please read all safety instructions carefully and make sure you understand them fully before attempting to use this product.

Cleaning Instructions

To clean the instrument exterior:

- Disconnect the instrument from the power source.
- Remove loose dust on the outside of the instrument with a lint-free cloth.
- Remove remaining dirt with a lint-free cloth dampened in a general-purpose detergent and water solution. Do not use abrasive cleaners.

CAUTION	To prevent moisture inside of the instrument during external cleaning, use only enough liquid to dampen the cloth or applicator.

- Allow the instrument to dry completely before reconnecting it to the power source.


ORTEC
a division of AMETEK

1. INTRODUCTION

The ORTEC® trans-SPEC®-DX-100 and trans-SPEC®-N[1] are an industry first: for the first time, an HPGe gamma-ray spectrometer with everything you need in a single easy-to-handle package. No liquid nitrogen, no long cables; just one component, ready to go.

The trans-SPEC is full-featured:

- Rugged, battery-powered, portable HPGe gamma spectrometer requires no liquid nitrogen. Cooled by miniature, high-reliability mechanical cooler that runs from internal battery, supplemental external battery, line power, or automobile power outlet, all with automatic switchover.
- HPGe gamma spectrometer has 16k resolution digital electronics with ORTEC Low Frequency Rejector[2] (LFR) digital noise filter to minimize microphonic noise.
- Digital stability: consistent answers for long counts, changing temperatures and count rates.
- DX-100 model has P-type detector, nominal 65 mm diameter × 50 mm length, >40% relative efficiency.[3]
- N model has N-type detector that resists neutron damage, nominal 67 mm diameter × 69 mm length, >50% relative efficiency,[3] 40 keV to 11 MeV energy range for higher-energy prompt gammas from neutron interactions.
- Large crystal increases sensitivity and reduces time-to-MDA.
- Detector element encapsulated in high-reliability, low-loss, all-metal sealed cryostat.
- Designed for continuous availability and operation.
- Operates in standalone mode or attached to a computer.
- Color LCD touchscreen provides all software controls and live display of acquiring data.
- Energy calibration using the touchscreen.
- Real-time nuclide ID and activity calculation for nine regions of interest (ROIs).
- Uses high-capacity SecureDigital memory cards for unlimited spectrum storage capacity.
- High-speed USB communications, connects directly to your computer (MAESTRO® MCA Emulator Software included).

The trans-SPEC is a sister product of our Detective-EX/DX® family of portable nuclide identifiers, which were developed to meet the specific needs of homeland security. The trans-SPEC brings the latest developments in technology to a more general range of portable gamma-ray applications, including:

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[1]Hereinafter, the term *trans-SPEC* refers to all models, exceptions noted.

[2]Patent pending.

[3]ANSI/IEEE Std. 325-1996.

- Nuclear materials hold-up
- Nuclear safeguards inspection
- In-situ waste assay measurements
- Emergency response
- Reactor maintenance, e.g., corrosion product monitoring
- Medical physics
- A host of other applications previously impossible with LN_2-cooled HPGe detectors

Full hardware specifications are provided in Chapter 8.

1.1. HPGe Detector

The trans-SPEC-DX-100 detector is a P-type ("ORTEC GEM") crystal, nominally 65 mm × 50 mm. The trans-SPEC-N detector is an N-type crystal, nominally 67 mm × 69 mm. The instrument is cooled by a small, high-reliability Stirling cooler that draws less than 25 W when operating — no liquid nitrogen is required. A potential problem of mechanical coolers is vibration, which causes microphonic noise on the detector output signal and degrades the peak resolution. However, careful mechanical design and an active digital noise reduction filter — the ORTEC Low Frequency Rejector (LFR) filter — implemented in the trans-SPEC's digital spectrometer, yields excellent performance.

1.2. Features

The trans-SPEC has a color touchscreen and an audible signal with adjustable volume. In standalone (portable) mode, the unit can be controlled entirely from the touchscreen. You can access the instrument's full capabilities without attaching it to a computer.

The trans-SPEC's spectrum display is patterned after our MAESTRO software, in use on thousands of systems worldwide. The 240 × 160 pixel LCD display makes it easy to set up and monitor data acquisition and instrument settings status. The spectrum display allows you to select logarithmic or linear vertical scaling, mark ROIs, move from one ROI to ROI, zoom in/ out, and check ROI peak information.

The MAESTRO software included with the trans-SPEC provides a convenient graphical user interface for all the controls needed to adjust the trans-SPEC acquisition parameters from a computer, if preferred. Data acquisition, calibration, and ROI settings selected in MAESTRO are retained when the trans-SPEC is returned to standalone mode, and are easily changed in the field.

MAESTRO is a member of the CONNECTIONS family of ORTEC products, all of which provide full networking with other ORTEC spectrometers and supporting computers. MAESTRO

includes features for identifying peaks: editing libraries; and creating, printing and saving ROIs, performing energy calibrations, automating tasks using simple "job streams," and more. For more information on these operations, see Chapter 9.

Spectral data can be saved and later reanalyzed in more detail using a more sophisticated computer-based analysis package such as GammaVision®, ISOTOPIC, or FRAM.

To operate the trans-SPEC with your own software, we recommend using the CONNECTIONS Programmer's Toolkit with Microsoft® ActiveX® Controls (A11-BW). The instrument's firmware commands are given in Chapter 10.

1.2.1. GPS and Wireless Capabilities

The trans-SPEC can be purchased with built-in global positioning (GPS) hardware. The GPS coordinates are captured at the start of each acquisition and saved in the spectrum file if you select the ORTEC `Integer .SPC` file format during setup.

In addition, the trans-SPEC can be equipped with IEEE 802.11 wireless connectivity. Third-party software can be used to implement wireless communications (see our technical note, P/N 932735).

1.2.2. Security

The trans-SPEC allows you to assign a user password that prevents unauthorized use of the instrument, and an administrator password that gives access to the unit but blocks access to advanced settings; see Section 4.1.7.1. In addition, the **Lock Display** command (Section 4.1.7.3) allows you to hide the spectrum display. A unit in this mode cannot communicate with a computer.

1.3. trans-SPEC Power Sources

The trans-SPEC can draw power from a variety of sources, and is designed for continuous operation. The miniature Stirling cooler has a very long operational life measured in years. Cooldown from ambient temperature takes approximately 12 hours. Once cold, the trans-SPEC requires only a few tens of watts to sustain it.

The unit comes with a docking station or the more compact PAC-II power adapter/charger (collectively referred to as *charger bases*). Both types of charger base contain the charger for the internal battery. The docking station's fans both cool the charger unit and dissipate heat from the trans-SPEC when the unit is docked.

The trans-SPEC can operate for about 3 hours on the internal lithium-ion battery. The automobile accessory adapters (included) allow you to use 12-V power from an automobile battery. In addition, ORTEC offers optional battery belts to extend the remote operation time.

1.4. Spectrum Collection, Storage, Transfer, and Viewing

The live (currently displayed) spectrum and all the associated information are held in the spectrometer's memory. This information can then be saved, in ORTEC's Integer .SPC or Integer .CHN spectrum file format, in the computer's My Documents folder or on user-supplied, removable SecureDigital (SD) memory cards. The stored spectra are retained when power is turned off and when the battery is removed. However, the live spectrum is lost (see the note in the following section).

1.4.1. Live-Spectrum Memory

The live spectrum (i.e., the spectrum currently displayed on the Home screen) and its associated information, including presets, ROIs, calibration, and detector state-of-health (SOH) status, are held in the spectrometer's memory. This information can be saved on the computer or memory card in ORTEC's Integer .SPC or Integer .CHN spectrum file format.

NOTE	The live spectrum is retained when you exit the Micro-trans-SPEC software application and restart it, and when you display a stored spectrum. The live spectrum is *lost* (erased) when you tap the **CLEAR** (clear spectrum) button, reboot the computer, or put the computer in energy-saving mode.

1.4.2. Stored Spectra

In standalone mode, after you acquire a spectrum, simply tap the **Save** button to copy the spectrum and all the information associated with this acquisition, including the presets, ROIs, calibration, and SOH bits from the live memory to the computer's My Documents folder or removable memory card, in either the.SPC or .CHN format. The file can then be downloaded to a computer for further manipulation, archival, and so forth.

These .SPC files contains parameters in addition to the contents specified in the *ORTEC Software File Structure Manual for DOS and Windows Systems* (P/N 753800; hereinafter called the *File Structure Manual*):

- GPS coordinates
- The type of trans-SPEC used (e.g., Micro-trans-SPEC or trans-SPEC)

Stored spectra are retained until you delete them, even when the trans-SPEC is powered off and has been disconnected from all external and battery power.

Available storage capacity depends on the computer controlling the trans-SPEC and on the capacity of the memory card. You can collect and store spectra with any combination of conversion gain settings.

If you try to store a spectrum when the selected storage location is full, the trans-SPEC displays an `Error saving spectrum file` message.

The instrument's **Spectra** menu (Section 4.1.8) allows you to display and/or delete the stored spectra.

1.4.2.1. Spectrum Filenaming Conventions

The base filename is formatted as:

`YYYY_MM_DD_hh_mm_sss`

where `YYYY_MM_DD` is year/month/day, and `hh_mm_sss` is the acquisition start time, with seconds in decimal thousandths, according to the computer's current time and time zone settings.

1.4.3. File Transfer

There are two ways to transfer spectrum files from the trans-SPEC to an external computer:

- If using memory cards, you can copy the spectrum files directly to your computer by using a memory card reader and Windows Explorer.

- Via the rear-panel DATA port (Section 4.1.7.4). For computers running under Microsoft® Windows 8 or 7, this requires the Windows Mobile Device Center. Windows XP SP3 requires Microsoft ActiveSync®. See Chapter 5 for detailed instructions.

1.5. Before Using the trans-SPEC

The trans-SPEC must be set up, cooled, and calibrated as discussed in Chapters 2 and 3.

NOTES *The trans-SPEC is designed to function with the Regional Settings in Windows Mobile set to the English (United States) region and all of its default settings, as discussed in Section 6.12.* ***Using other than the factory default settings can cause operational problems.***

Although the trans-SPEC is ruggedly constructed, weather resistant, and easy to handle, it is a sensitive, precision instrument. *Always observe the cautions in Section 3.2.1 when using the trans-SPEC.*

1.6. The "Launcher" Interface for Multiple Identifier Applications

ORTEC supports our versatile trans-SPEC/Detective platform with a wide range of nuclide identification applications. When only one identifier application is installed on your instrument, it automatically starts up that application each time the unit is rebooted. If subsequent ORTEC applications are added to your instrument, our "Launcher" interface (Fig. 1) runs first, making it easy to switch between ORTEC identifier programs and exit to Windows Mobile. Simply tap the desired program.[4]

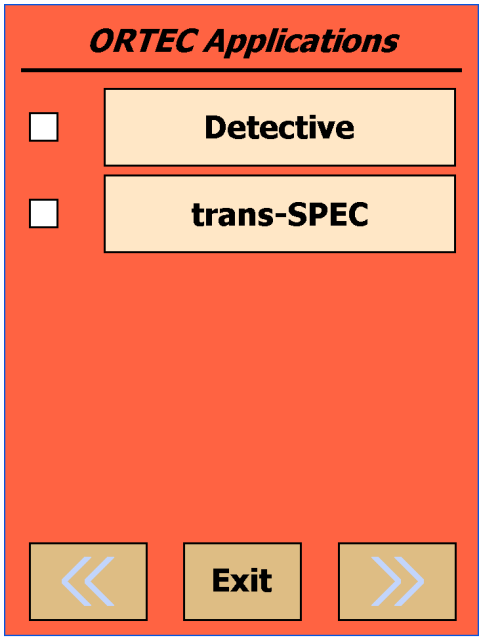

Figure 1. The Launcher Screen.

If you wish to specify one of the applications to auto-start when the trans-SPEC is rebooted, just mark the checkbox beside the desired application.

Figure 1 illustrates the Launcher screen for a trans-SPEC with the **Detective** program is also installed. Note that neither application is marked for auto-start. In this configuration, the Launcher screen is displayed after each reboot. If more than four applications are installed, the Launcher displays multiple pages; tap the scroll/paging indicator as needed.

IMPORTANT *Regardless of the hardware settings you use in the trans-SPEC program, starting the Detective program will return the identifier to all Detective factory calibration, gain, and rise-time settings, ensuring the instrument will operate as described in the Detective User's Manual.*

[4]If, on reboot, the Microsoft® Windows® Mobile desktop is displayed instead of the Launcher or a spectroscopy application, tap **Start** then **Launcher**. Alternatively, you can bypass the Launcher and start either program by tapping **Start**, **Programs**, and the application name.

1.7. Should You Take a Computer Into the Field?

The trans-SPEC is designed for standalone field use. However, there are a few situations where an external computer is useful. One use is for advanced analysis of the spectra where the Nuclide Report does not show enough detail. In this case, software such as GammaVision, ISOTOPIC, or other specialist applications can be used to process the spectra at the work site (see Chapter 9). The second is to provide storage for more spectra on the trans-SPEC's integrated computer. However, high-capacity SD cards make this unnecessary.

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2. THE TRANS-SPEC

This chapter takes you through the setup and startup procedures.

IMPORTANT	*The trans-SPEC is designed to function with the Regional Settings in Windows Mobile set to the English (United States) region and all of its default settings, as discussed in Section 6.12.* ***Using other than the factory default settings can cause operational problems.***

2.1. Unpacking and Setup

When you receive the trans-SPEC, the shipping box contains the following:[5]

- The trans-SPEC portable identifier and USB cable
- The trans-SPEC *User's Manual* (P/N 931042)
- Padded carrying strap
- Docking station or ac power adapter/charger
- Disposable plastic instrument covers (P/N 932725)
- An automobile accessory adapter to power the docking station or PAC-II charger from a 12 V battery
- An automobile accessory adapter to power the trans-SPEC directly from a 12 V battery

NOTE	If your Detective-EX was shipped in a foam-lined box, instead of a high-impact plastic case, be sure to keep the box and foam and use it for shipping the identifier.

Any options will be packaged separately with their own instructions.

2.2. The trans-SPEC

Figure 2 shows the trans-SPEC's main features.

2.2.1. Front Panel

- **ON/OFF Button** Located below the touchscreen, on the base of the bezel. To reboot the computer, press the power button. The computer will restart, then automatically launch the unit's software application (the cooler will stay on throughout).

[5]Subject to change without notice.

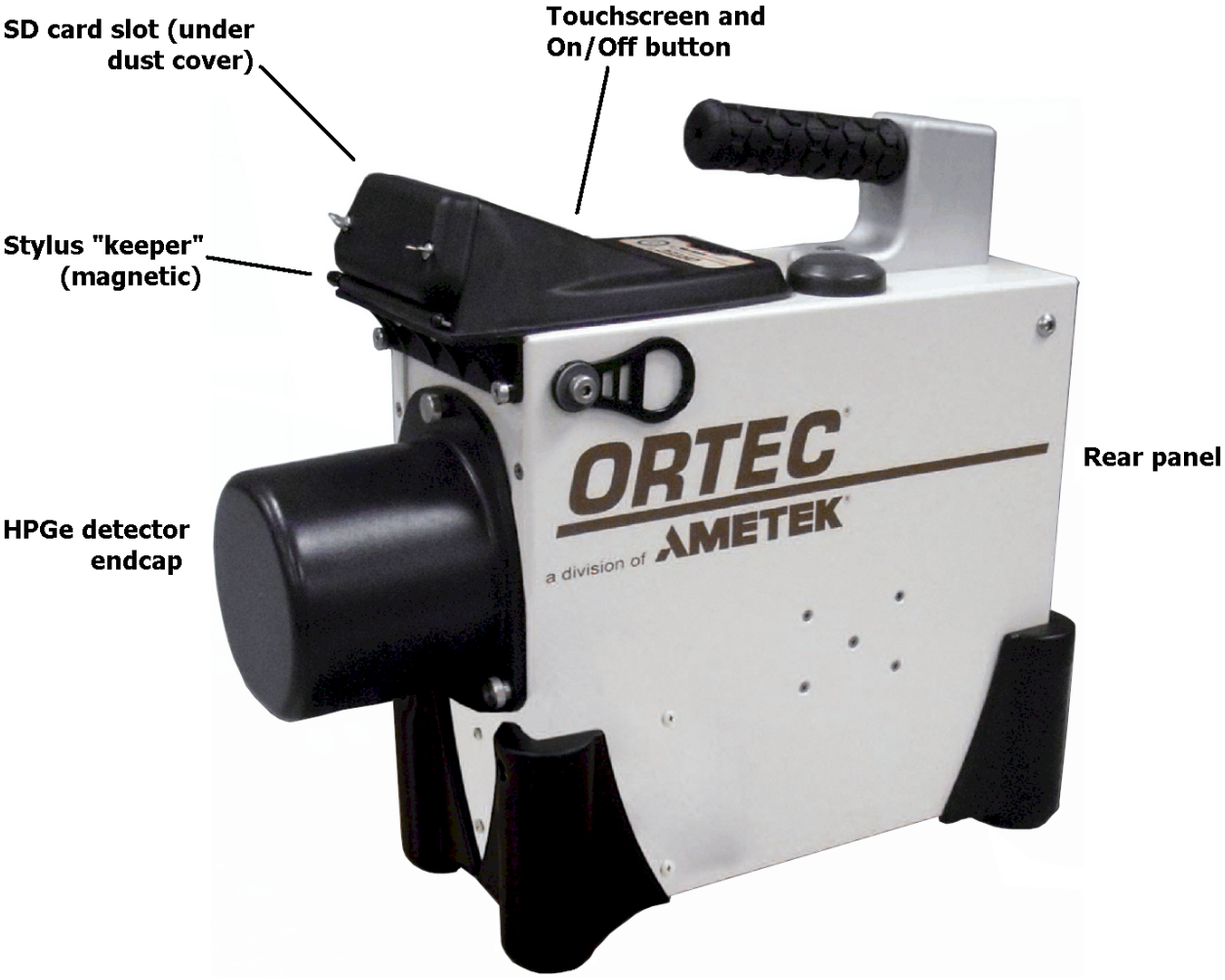

Figure 2. The trans-SPEC.

- **SD Card Slot** This is located on the front panel under the protective dust cover. To release the cover, press and rotate by a quarter turn the two captured, bayonet-mount screws. The SD slot is keyed so the memory card can only be inserted in one orientation. Insert the card and close the protective cover.

NOTE *We strongly recommend that the dust cover be fastened in place at all times to protect the card slots from moisture and particulates.*

Figures 3 and 4 show the docking station and PAC-II charger, respectively. The hardware specifications are in Chapter 8. Place the trans-SPEC on the docking station or beside the PAC-II.

Figure 3. The trans-SPEC Docking Station.

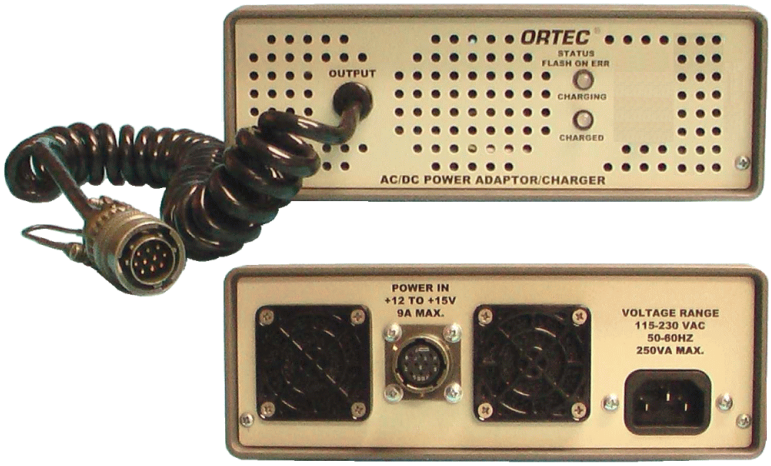

Figure 4. PAC-II Charger, Front and Rear Panels.

2.2.2. Connectors

Figure 5 shows the trans-SPEC rear-panel, including the three connectors:

- **INPUT POWER** — supplies external power for operating the trans-SPEC and recharging the internal battery.

- **DATA** — USB connector used to connect the trans-SPEC to a computer to retrieve stored spectra.

- **CONTROL** — USB port connects the trans-SPEC's MCA board to a computer for use as an HPGe spectrometer with MAESTRO. Stored spectra cannot be downloaded from this port.

- Headphone jack (🎧): for dose and count rate warning sounds. The headphone volume can be adjusted as described in Section 4.1.6.7.

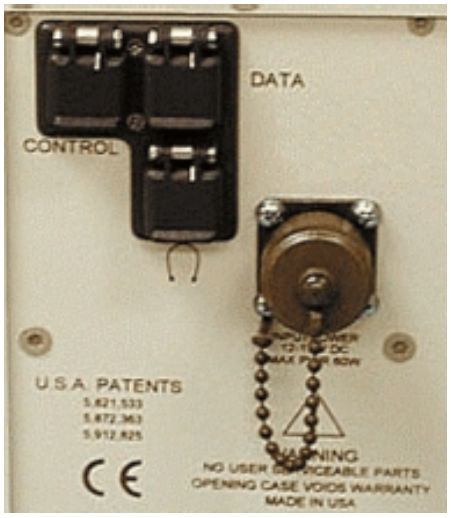

Figure 5. The trans-SPEC Rear Panel.

Each connector includes a dust cover.

NOTE *We strongly recommend that the dust cover be fastened in place at all times to protect the card slots from moisture and particulates.*

2.2.3. The Touchscreen

Figure 6 shows the trans-SPEC's user interface on the high-resolution touchscreen, which makes it easy to view data acquisitions as well as monitor and change the instrument settings.

To select a function, tap it with your finger or a stylus *(pens, pencils, and other objects will scratch the touchscreen and should not be used)*. In fields where alphanumeric input is needed, tap to open the "soft keyboard" at the bottom of the screen (see Fig. 29 on page 32).

In situations where the spectrum should not be viewed by the operator, the spectrum display can be disabled (Section 4.1.7.3).

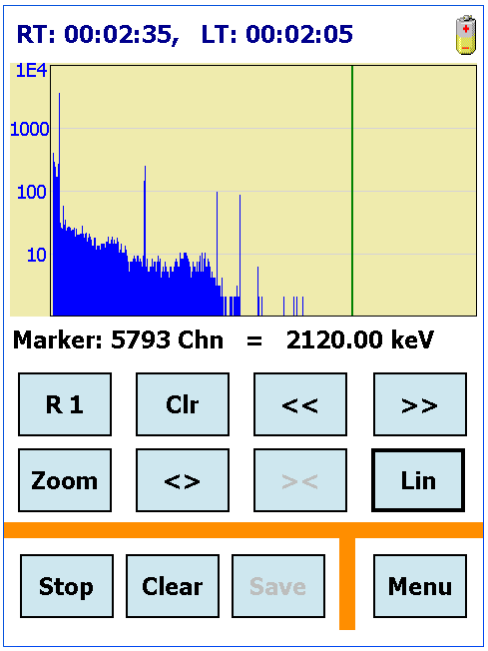

Figure 6. The trans-SPEC Display.

2.2.4. Attaching the Carrying Strap

The carrying strap should be installed on the diagonal corners of the trans-SPEC as shown in Fig. 7 (i.e., looking down on the display panel, the strap should be anchored to the left-front and right-rear corners or vice versa). To change the factory orientation, use a 5/32-in. hex key to exchange positions of the strap-hanger studs and the regular hex-head screws. Thread the strap-hanger stud through the hanger bracket, followed by the

two spacers, then insert the stud into the trans-SPEC and tighten until the hanger bracket resists rotation but still turns *(do not overtighten)*.

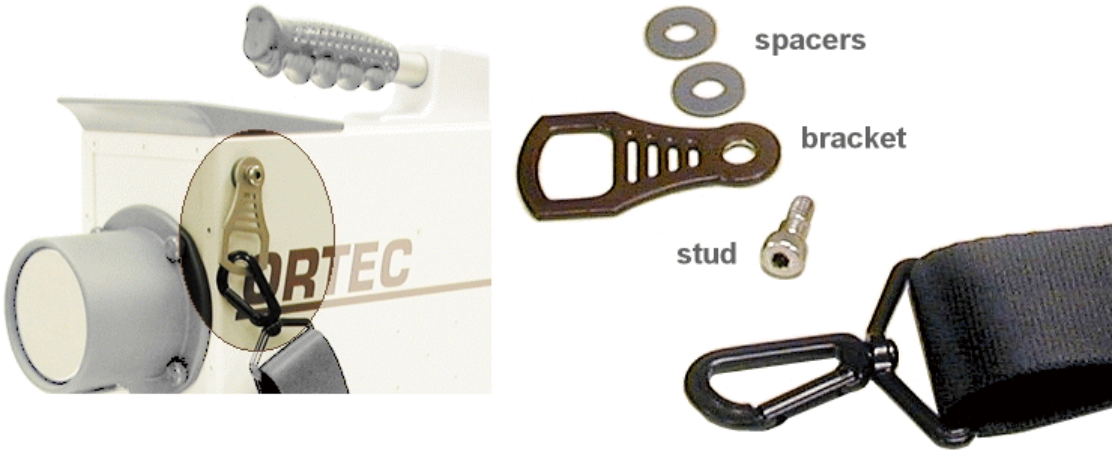

Figure 7. Carrying Strap Attachment.

2.3. The Docking Station

The docking station houses both the charger for the trans-SPEC's internal lithium-ion battery and two low-noise fans that assist heat exchange in the trans-SPEC. Figure 8 shows the connector, cable, and indicators on the docking station's front panel. Figure 9 shows the rear panel and ac power supply.

Place the docking station on a hard, level surface. The underside of the docking station should be kept clear so air can circulate to help dissipate the heat from the cooler. For more information on proper placement and treatment of the docking station, see the Section 3.1.1 setup instructions and the cautions in Section 3.2.1.

2.3.1. Connectors and Indicators

In addition to the built-in calibration source, the docking station features:

- Integral front-panel external power and battery charger cable that attaches to the trans-SPEC's INPUT POWER connector.

- Front-panel red and green CHARGE STATUS indicators. While the trans-SPEC's internal battery is charging, the red indicator is continuously lit. When the battery is fully charged, the green indicator turns on and the red indicator turns off.

- Rear-panel dc POWER IN connector attaches to the ac/dc power adapter or other 12 V power source.

Figure 8. Docking Station Front Panel and Battery Charger Cable.

Figure 9. Docking Station Rear Panel and AC/DC Power Adapter.

2.3.2. Strapping the trans-SPEC to the Docking Station

Use the supplied black nylon strap to hold the trans-SPEC and docking station together, if desired. Thread the strap through the silver brackets on the left and right sides of the docking station, and under the handle of the trans-SPEC, as shown on the left side of Fig. 10. Thread the end of the strap through the buckle as shown on the right side of the illustration, and tighten.

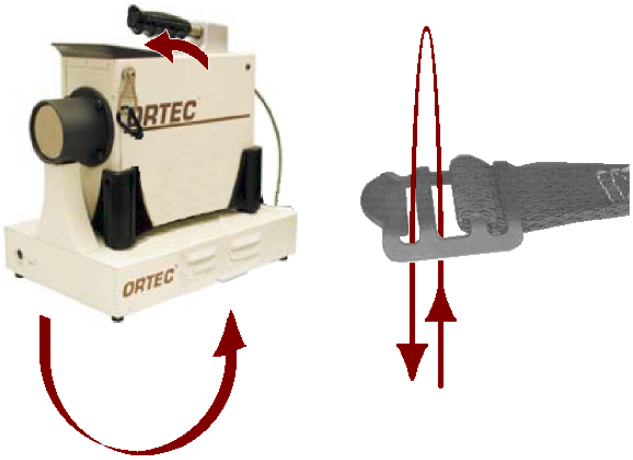

Figure 10. Strapping the trans-SPEC and Docking Station Together.

2.4. The PAC-II Charger

The PAC-II power adapter/charger is more compact than the docking station, and can charge the trans-SPEC's internal battery using either ac mains or 12 V dc power. The circuitry automatically determines whether the charger is connected to an ac or dc source. The PAC-II does not contain a calibration source nor is it designed to dissipate heat from the trans-SPEC. Figure 4 on page 11 shows the front-panel charging indicators and output cable; and the rear-panel ac and dc power supply connectors.

Place the PAC-II on a hard, level surface where air can adequately circulate around it. For more information on proper placement and treatment of the docking station or PAC-II, see the setup instructions in Section 3.1.1 and the cautions in Section 3.2.1.

To use the PAC-II, attach its OUTPUT cable to the trans-SPEC INPUT POWER connector, then connect either the ac or dc power cord (both supplied) to the appropriate rear-panel connector. While the trans-SPEC's internal battery is charging, the red LED on the PAC-II front panel is continuously lit. The red indicator flashes if you disconnect the Detector before its battery is fully charged, or if the trans-SPEC is connected but the internal battery is faulty. When the battery is fully charged, the green LED turns on and the red LED turns off.

2.5. The Automobile Accessory Adapter

The trans-SPEC is supplied with two automobile accessory adapters for use with a 12 V battery. One attaches to the POWER IN connector on either the docking station or the PAC-II, both operating the trans-SPEC and charging its internal battery. The other attaches to the trans-SPEC's rear-panel INPUT POWER connector and operates the trans-SPEC but does not charge the internal battery.

NOTE If the detector is warm, the power required to cool the detector can significantly discharge a standard automobile battery.

To use an adapter cable:

- Plug the adapter end into a 12-V auto-mobile accessory socket.

- Connect the cable to the appropriate connector. If using the adapter cable that connects to the docking station or PAC-II, plug it into the charger base's POWER IN connector. The internal battery will begin charging; if completely discharged, it will typically reach full charge in 3–4 hours.

  If using the adapter cable that connects directly to the trans-SPEC, unscrew the dust cap from the INPUT POWER connector on the rear panel; slide the coupling ring on the male (cable-end) connector fully open; align the 5 keys on the male connector with the slots on the rear-panel female connector; press to fully seat the male connector, then hold it in place; and rotate the coupling ring approximately 1/8th of a turn clockwise until it seats securely.

2.6. Internal and External Power

The trans-SPEC uses power in these ways:

- The internal battery provides approximately 3 hours of operation. The internal battery cannot be used to start the cooler or cool the detector from room-temperature; *external power is required*. The transition from internal to external power is automatic and does not interfere with data collection.

  NOTE Cooler startup without external power cause operational anomalies; these are discussed in troubleshooting Sections 6.5 and 6.6. An exhausted internal battery should be charged for 2 hours before the trans-SPEC is cooled using external power. In addition, we recommend that the internal battery be recharged before it is exhausted.

- The docking station or PAC-II provides external power to simultaneously start and operate the trans-SPEC, as well as charge the internal battery. In addition, the docking station fans help dissipate heat from the cooler. Both charger bases can be powered from ac mains or a 12 V source.

- As discussed in Section 2.5, external 12 V power (supplied by external battery belt or 12 V automobile battery) can start, cool, and operate the trans-SPEC, but does not charge the internal battery. The internal battery is charged only if the external source also powers the docking station or PAC-II. If extended remote operate is needed, use the external battery first, then the internal battery.

  NOTE If you are using a standard automobile battery as the external power source, note that detector cooling can significantly discharge the battery.

The icon in the upper right corner of the screen (Fig. 11) shows whether the trans-SPEC is operating on battery power or the charger.

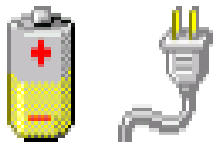

Figure 11. Power Source Indicators.

2.6.1. Recharging from Internal and External Power Sources

The recharging circuit for the internal battery is separate from external power so the external batteries are not consumed charging the internal battery. The internal battery is only recharged by a special lithium-ion battery charger unit built into the docking station and PAC-II using connections in the multi-pin power plug. The charging base will simultaneously supply both "external power" and connect to the battery charger to recharge the internal battery.

When connected to an external battery, the trans-SPEC relies on external power until the external voltage drops below 9 V. It then switches to the internal battery. The instrument makes the transition smoothly, and there is no effect on the energy resolution. If you begin with both batteries fully charged, the sum of the two battery capacities will be achieved. If the external battery has its own charge indicator, this can be used to determine when the changeover will occur. The trans-SPEC battery monitor indicates the available capacity in the internal battery, and when the switch over occurs, this indicator runs down in the usual manner.

NOTE When all power is exhausted, the high voltage and cooler will shut down and the detector will begin to warm. The trans-SPEC cannot be used again until the unit has cooled enough that the high voltage automatically switches on.

If you wish, you can select the **Battery Time Remaining** monitor for display on the Home screen's status line (Section 4.1.7.7).

2.6.2. The Internal Battery

The internal battery typically lasts 3–5 years. See Appendix K for instructions on replacing it. Note that the battery hatch is the only part of the trans-SPEC case that can be opened without voiding the warranty.

[Intentionally blank]

3. STARTUP AND OPERATION

3.1. Startup

Before using the trans-SPEC:

- Connect it to the power adapter/charger or other external power source. This will boot up the computer, start the cooler, and start the trans-SPEC software application at the Home screen.
- Wait for the detector to cool down to operating temperature.
- Depending on your power source options, charge the internal battery for 3–4 hours.
- Check the detector calibration.
- Set the data storage location.
- Choose the indicators for the Status Line and Marker Line.
- Confirm the unit's state-of-health (SOH) indicators are all **OK**

3.1.1. Connecting the trans-SPEC to External Power and Turning It On

- First, be sure to read the cautions in Section 3.2.1 (page 22).

- The next step is to connect the trans-SPEC to its docking station or power adapter/ charger to start the cooler and begin charging the internal lithium-ion battery. As noted in Section 2.6, cooler startup without external power and/or with an exhausted internal battery can cause operational anomalies that require the reset procedures discussed in troubleshooting Sections 6.5 and 6.6.

  — Place the charger base on a hard, level surface. If using the docking station, its underside must be kept clear so air can circulate to help dissipate heat from the cooler. See the cautions in Section 3.2.1 (page 22).

  — AC — Connect the charger base's output cable to the front-panel POWER IN connector, then connect the mains power adapter cord to mains power.

  or

  DC — Connect the dc power cord to the front-panel POWER IN connector, then to a suitable dc power source.

- Place the trans-SPEC on the docking station or beside the PAC-II, and attach the charger base's output cable to the trans-SPEC INPUT POWER connector. To attach the cable to the trans-SPEC, unscrew the dust cap from the INPUT POWER connector on the trans-SPEC's rear panel; slide the coupling ring on the male (cable-end) connector fully open; align the 5 keys on the male connector with the slots on the rear-panel female connector; press to fully seat the male connector, then hold it in place; and rotate the coupling ring

approximately 1/8th of a turn clockwise until it seats securely. The internal battery will begin charging and will typically reach full charge in 3–4 hours (well before the detector has cooled to operating temperature range).

- Press the computer's **On** button on the front panel. The computer will boot, the cooler will begin running, and the trans-SPEC software application will start up at the Home screen (Fig. 16). The software requires a few seconds to complete initialization and become active. If a user password has been set, enter the password according to Section 4.1.7.1.

- As noted above, cooldown requires up to 12 hours. If the cooler does not start by itself, see the next section.

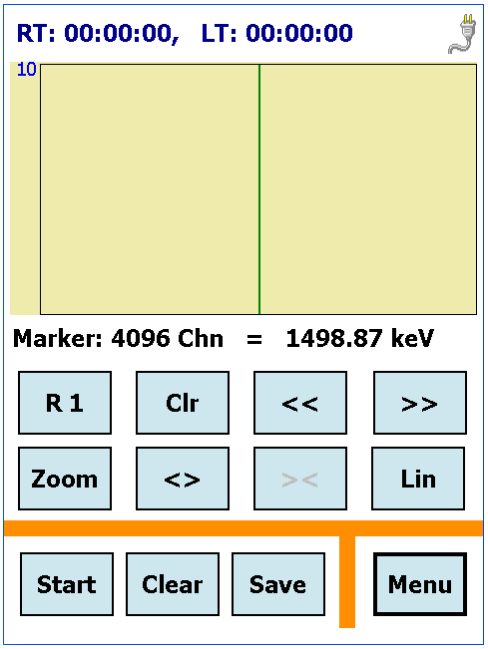

Figure 12. The Home Screen at Startup.

3.1.1.1. Manually Turning the Cooler On

The mechanical cooler should automatically turn on when the power is applied to the unit. If it does not, turn it on manually by tapping **Menu**, then **Turn Cooler On**. Tap **Back** to return to the Home screen.

3.1.1.2. Cooldown

The cooler requires approximately 12 hours to cool the trans-SPEC to operating temperature. When the detector reaches operating temperature, the trans-SPEC bias voltage automatically turns on. To see if the bias voltage is on or off, tap **Menu**, **View Status**, and check the **Bias Voltage (Volts)** entry. Figure 13 shows the status readouts for a room-temperature unit (thus, the HV is off) with a discharged battery.

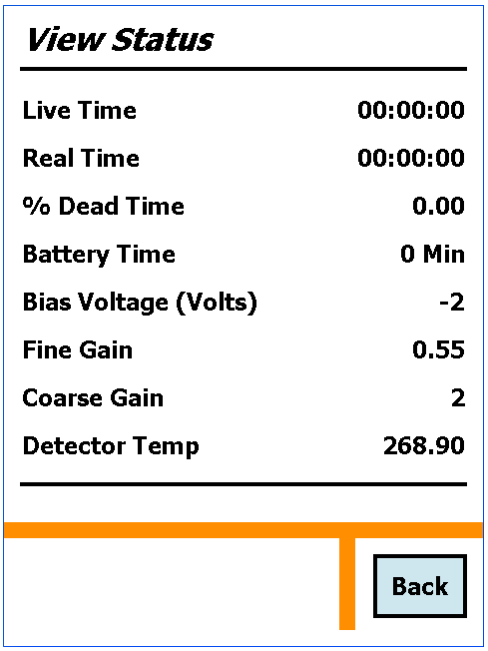

Figure 13. Instrument Warm, HV Off, Battery Discharged.

NOTE You can turn the cooler off for a brief period (e.g., 10 to 20 minutes) without significantly warming the detector. As soon as the cooler is restarted, the trans-SPEC is typically ready within a few seconds. Note also that the cooler can be restarted at any time, with-out harming

the detector crystal, regardless of whether the detector is warm, partially cooled, or cooled to operating temperature.

3.1.2. Selecting the Data Storage Location

Choose the spectrum file storage location by tapping **Main**, **Spectra**, then the **Data Location** field. Select **My Documents** or **Storage Card** (the latter is only displayed if a card is present), then tap **Back** as needed to return to the Home screen. See also Section 4.1.8.2.

3.1.3. Configuring the Marker and Status Lines

See Section 4.1.7.7 for instructions on selecting the Status Line and Marker Line parameters to be dis-played, respectively, above and below the spectrum. Figure 14 illustrates the real time and live time read-outs on the Status Line, and the marker position in channels and in energy on the Marker Line.

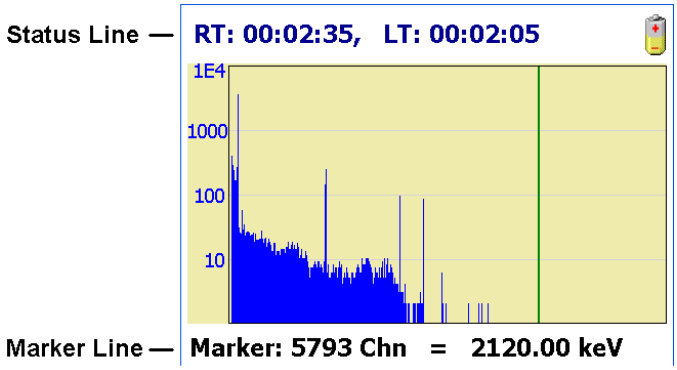

Figure 14. Configure the Status and Marker Line Readouts.

3.1.4. Calibration

Once the trans-SPEC is cooled down and the bias voltage turns on, the next step is to calibrate the instrument. See Section 4.1.7.5.

3.1.5. Checking Detector State of Health (SOH)

The last step is to confirm that all detector SOH readouts are **OK**. Tap **Menu**, **MCA Settings**, and **State of Health** (Fig. 15).

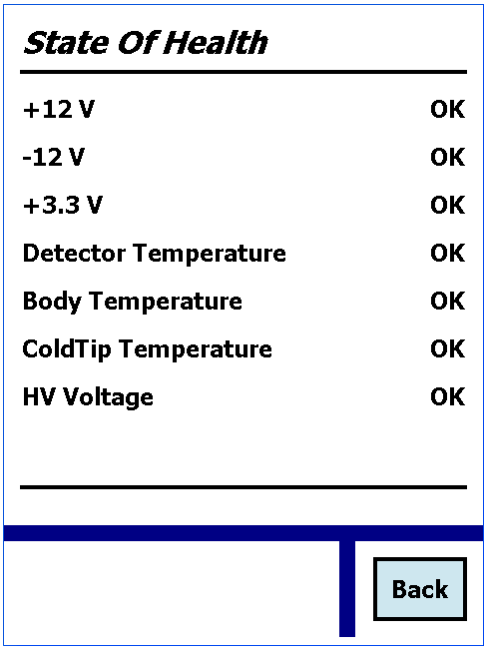

Figure 15. Check SOH.

3.2. Operation Overview

This section discusses:

- Operating cautions
- Moving through the menus and screens
- Spectrum display controls

3.2.1. Cautions

- Remember that there are no user-serviceable parts inside the trans-SPEC. Opening the trans-SPEC (except the battery hatch and the SD card drive's dust cover) voids the warranty.

- The cooler and detector are shock-sensitive, with a maximum tolerance of 20 g, so be careful not to drop the trans-SPEC. A shock in excess of this value will void the warranty.

- The trans-SPEC is splash-resistant, but not watertight. To avoid equipment failure, protect it from prolonged or heavy rainfall and from immersion. Heat is dissipated from the cooler via the trans-SPEC baseplate; therefore, do not place the trans-SPEC in mud, loose soil or sand, standing water, dense grass, or on thick carpet. Wrap or cover the unit to keep it clean and dry; we recommend the supplied plastic covers. Where possible, avoid placing it on warm surfaces, such as sun-heated pavement, for extended periods. All rear-panel connectors include an integral dust cap; keep all unused connectors capped.

- The docking station and PAC-II contain a portion of the battery-recharging system and should not be exposed to water. When using the docking station, be sure to keep the underside clear of obstructions so the fans can function properly. Both charger bases should ideally be placed on a dry, flat, level, and dust-free surface. When not in use, the charger base can be disconnected from the ac power supply, then covered to protect it from moisture and dirt. Any covering must be completely removed before reconnecting the docking station to either charger base to the input power source. Make sure the recharging connector on both the trans-SPEC and charger base are clean and dry before connecting to an the input power supply.

- The trans-SPEC is designed for use at temperatures between –15°C and +50°C, in relative humidity <90% at 35°C, non-condensing.

- To avoid damaging the cooler by overheating it (and, where applicable, to comply with transportation regulations), be sure to turn the cooler off before shipping the trans-SPEC (see Section 3.1.1). The unit can be shipped as soon as the cooler is turned off; there is no need to wait until the detector warms up.

- For best results, we recommend that you not allow the instrument's internal battery to become exhausted, and that you read Section 2.6 on the trans-SPEC's internal and external power sources.

NOTE You can turn the cooler off for a brief period (e.g., 10 to 20 minutes) without significantly warming the detector. In addition, the cooler can be restarted at any time without harming the detector crystal, regardless of whether the detector is warm, partially cooled, or cooled to the operating temperature range.

3.2.2. Moving Through the Menus

The movement through the dialogs is done by tapping on the displayed soft buttons with a stylus or your finger. The functions available are shown on the buttons.

NOTE *Do not use pens, pencils, or other objects as a stylus. They will scratch the touchscreen.*

The trans-SPEC is simple to use:

- When you first turn the unit on, it starts on the Home screen, as shown in Fig. 16. Tap **Menu** to open the main Menu.

- To select a command or option, tap it with a stylus or your finger.

- To return to the preceding menu or screen, tap **Back**. For example, tapping **Back** from the Main Menu returns you to the Home screen.

- To create or modify a setting, tap in the field to display a soft keyboard at the bottom of the screen. Tap on the desired character, then tap **Set**.

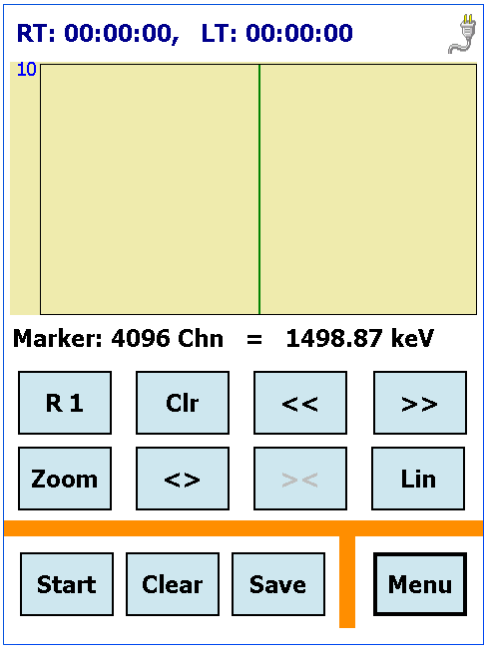

Figure 16. The Home Screen.

- To erase characters in an entry, tap to position the cursor then tap the <**Backspace**> soft key. Change the entry as needed, then tap **Set**.

- If you open a dialog by mistake, simply tap **Back** to return to the previous screen without changing any values. If you enter a field by mistake, leave the entry unchanged and tap **Set**. to leave the value unchanged.

3.2.3. Using the Controls

Figure 17 shows the Home screen, a typical spectrum display, the data acquisition and spectrum display controls, and the **Menu** button, which accesses all menu commands.

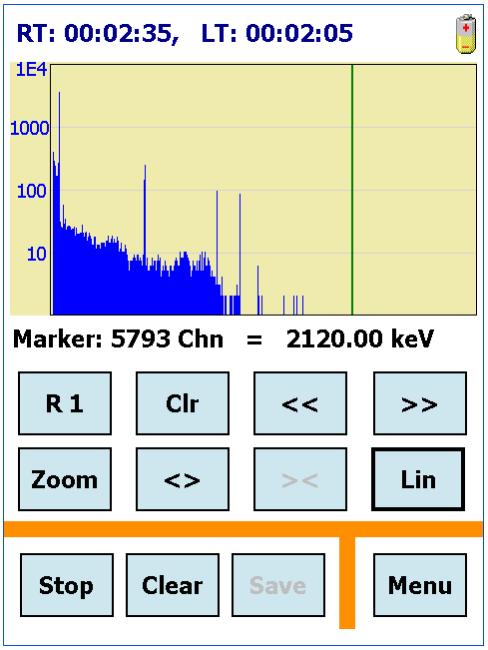

Figure 17. Spectrum Display Controls.

3.2.3.1. Data Acquisition Controls

The **Start** button controls data acquisition in conjunction with the real time and live time presets (if any are entered). The button label changes to **Stop** during acquisition.

To pause an acquisition, press **Stop** without **Clear**ing. As long as you do not **Clear** the spectrum, the spectrum will be retained in live-spectrum memory.

The **Clear** button deletes the spectrum and all associated information except marked ROI channels.

The **Save** button is only active when the unit is not acquiring data. This saves the current spectrum information to the current **Data Location** in the current **Save File Format** (Section 4.1.8).

3.2.3.2. Spectrum Window

The spectrum window is patterned after the MAESTRO display. You can select logarithmic or linear vertical scaling, mark ROIs, move from one ROI to ROI, zoom in/out, and check ROI peak information. Note the Status Line and Marker Line readouts, respectively above and below the spectrum window; see Section 4.1.7.7 for the list of readout options available.

Note the vertical marker line in the spectrum window. To move the marker, tap the desired position. The marker will jump to that location and the Status Line values will update correspondingly. You can also press on the display area and drag the marker left or right to the new location.

The spectrum display area is limited so a modified version of scientific notation is used when labeling the Y axes for numbers greater than or equal to 10,000: The number of trailing zeros in the number is replaced by "E" followed by the number of zeros. Some examples: 10,000 becomes **1E4**; 12,000 becomes **12E3**.

3.2.3.3. Spectrum Display Controls

The spectrum display control buttons are just below the spectrum window. You can use them to show the spectrum in different ways for better interpretation of the spectrum.

- **Zoom / Full** — **Zoom** expands the spectrum around the current view's center channel. Full restores the display to a view of all channels in the spectrum. In this way, you can easily look at the peaks in the spectrum in detail (**Zoom in**) and move quickly from energy to energy in Full mode.

- **<> (Zoom In)** — The **Zoom In** button expands the display by halving the number of channels in the current spectrum view, so the peaks appear wider. The marker position becomes the center channel of the new view. The vertical scaling does not change.

- **>< (Zoom Out)** — The **Zoom Out** button contracts the display by doubling the number of channels, so the peaks appear narrower. The marker position becomes the center channel of the new view. The vertical scaling does not change.

- **Lin / Log** — This button toggles between logarithmic vertical scaling and linear mode with automatic vertical limits. The **Lin** button changes to **Log** in the linear mode, and vice versa.

- **R1 / R2 (Marking ROIs)** — The trans-SPEC allows you to mark any number of ROIs in the spectrum. To do this, tap to position the cursor at one end of the region, then tap **R1**. The button label will change to **R2**. Tap to position the cursor at the other end of the region, then tap **R2**. The ROI will be indicated in red, and will be saved in the spectrum file.

  NOTE These ROIs are associated with the spectrum display, and are used in conjunction with features such the **Peak Info** command (Section 4.1.5) and the ROI Peak and ROI Integral presets (Section 4.1.6.3). They are not the same as the peak regions designated for the Nuclide Report (Section 4.1.6.6).

- **<< / >> (Next/Previous ROI)** — Tap to move to the next lower-energy (<<) or higher-energy (>>) ROI.

- **Clr (Unmarking ROIs)** — To unmark an ROI, tap or press << or >> to position the cursor in the desired ROI, then tap **Clr**.

  NOTE Marked ROI channels remain active until unmarked with the **Clr** button: if you clear a spectrum in which you have marked ROIs, the ROI channels will still be marked in the next spectrum you acquire. In addition, they will remain active when you connect to a computer running MAESTRO or similar applications (this is referred to as "MCA Mode," which you enter by connecting the trans-SPEC's rear-panel CONTROL port to the computer). Likewise, if you mark ROIs in MAESTRO while connected in MCA Mode, then disconnect and return to standalone mode, those ROIs will remain active on the trans-SPEC Home screen until unmarked with **Clr**.

3.2.3.4. Restricting Access to Advanced Settings and the Spectrum Display

The trans-SPEC allows you to assign a user password that prevents unauthorized use of the unit, and an administrator password that gives access to the instrument but blocks access to advanced settings; see Section 4.1.7.1.

In addition, the **Lock Display** command (Section 4.1.7.3) allows you to hide the spectrum display. In this mode, all commands are available except **Peak Info**. A unit in the **Lock Display** mode cannot communicate with a computer (otherwise the viewing restriction could be sidestepped).

4. MENU COMMANDS

This chapter describes the trans-SPEC menus, commands, and status screens in standalone (ActiveSync) mode.

4.1. The Main Menu

The main **Menu** screen is shown in Fig. 18.

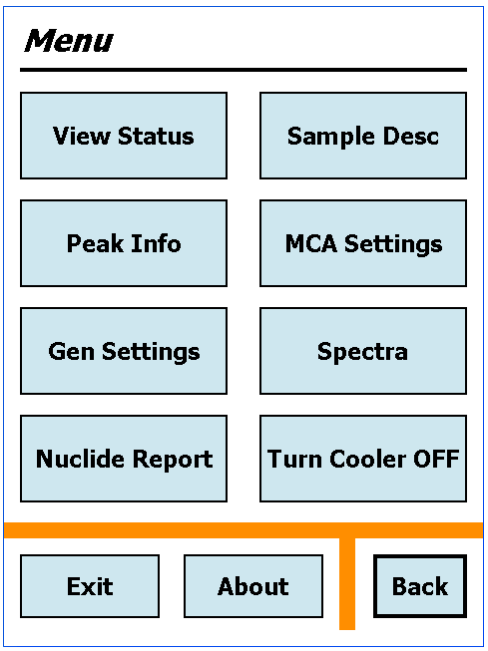

Figure 18. The Main Menu.

4.1.1. Exit

The **Exit** button closes the trans-SPEC application and takes you to the operating system. To restart the application, tap **Start**, **Programs**, **trans-SPEC**.

4.1.2. About

About displays version information for the software application and instrument firmware.

4.1.3. View Status

The status screen (Fig. 19) displays all of the major MCA settings at one time. Tap **Back** to return to the Main Menu.

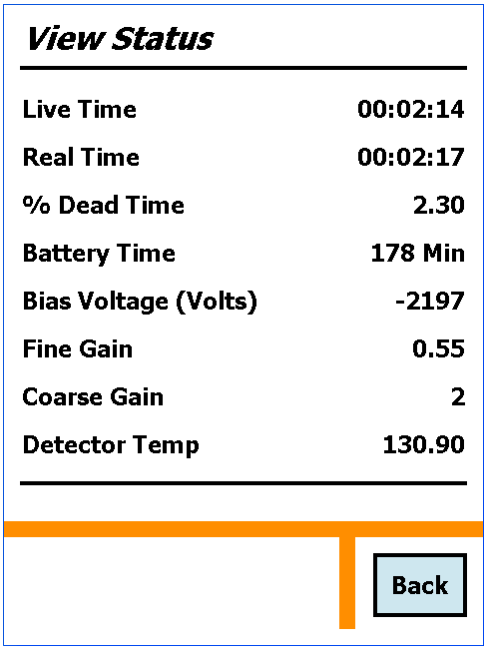

Figure 19. View Status.

4.1.4. Enter Sample Desc

Allows you to enter an alphanumeric identifier, up to 63 characters long, to describe the sample (Fig. 20). If you mark the **Ask for Sample Description** option on the Spectra Settings screen (Section 4.1.8.1), the description entered here will be displayed, for optional modification, each time a spectrum is saved.

Tap in the field to open the soft keyboard, then tap **Set** to complete the entry and close the keyboard, then tap **Back** to return to the previous menu.

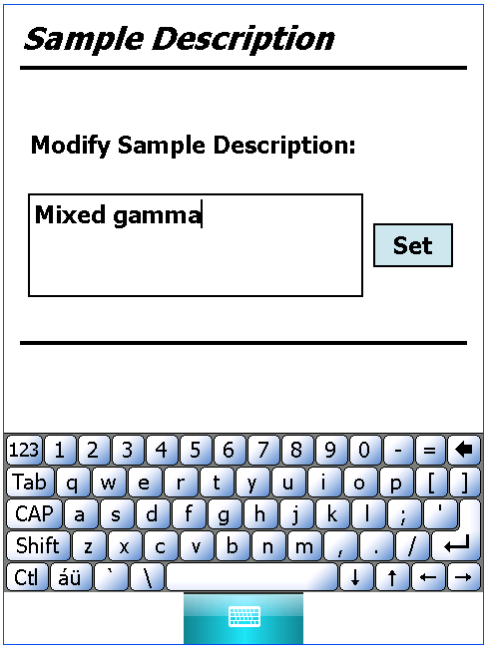

Figure 20. Enter Sample Description.

4.1.5. Peak Info

This dialog (Fig. 21) reports the centroid, FWHM, and net and gross counts for the region identified by the marker position. Access is denied when the spectrum display is locked. If the marker is not in an ROI, all values are shown as **N/A**.

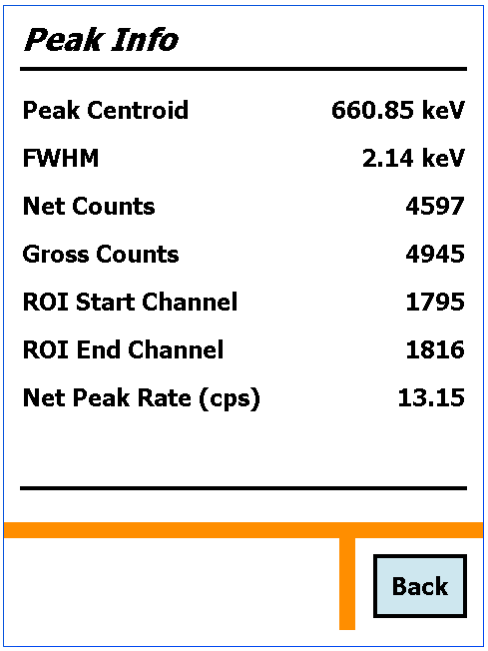

Figure 21. Peak Info.

4.1.6. MCA Settings

Figure 22 shows the MCA Settings menu.

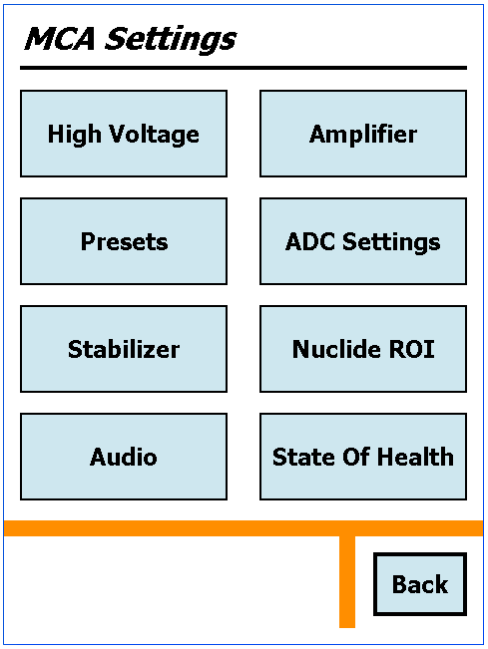

Figure 22. MCA Settings.

4.1.6.1. High Voltage

This dialog (Fig. 23) displays the HV on/off setting, the target and actual bias, and the live detector temperature.

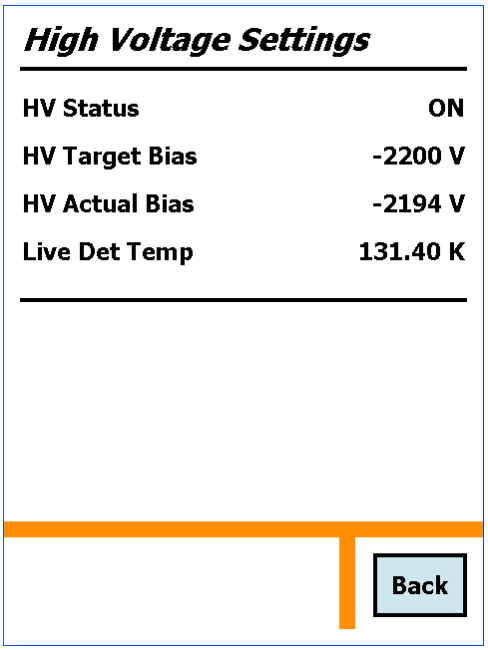

Figure 23. High Voltage Settings.

4.1.6.2. Amplifier

Allows you to set and/or review the various amplifier settings (Fig. 24).

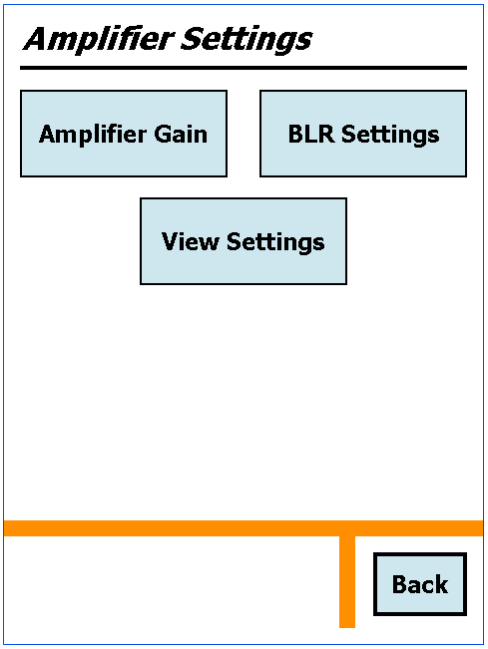

Figure 24. Amplifier Settings.

Amplifier Gain

This screen (Fig. 25) allows you to adjust the amplifier gain before or during acquisition. Click the up/down arrows to set the **Coarse Gain** to ×1, ×2, ×4, ×8, ×16 or ×32. Tap or click-and-drag the slider to set the **Fine Gain** to any value between 0.45 and 1.00.

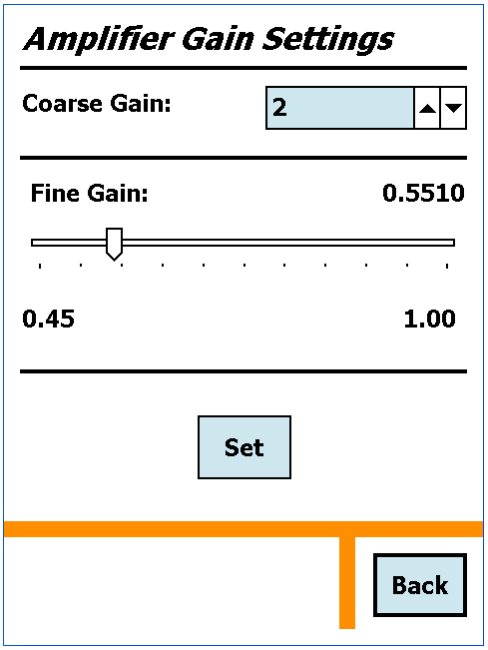

Figure 25. Amplifier Gain Settings.

BLR (Baseline Restorer) Settings

Choose a BLR setting (Fig. 26). **Auto** is the normal setting, **Fast** is typically used for high-count-rate situations, and **Slow** is typically for low-count-rate situations.

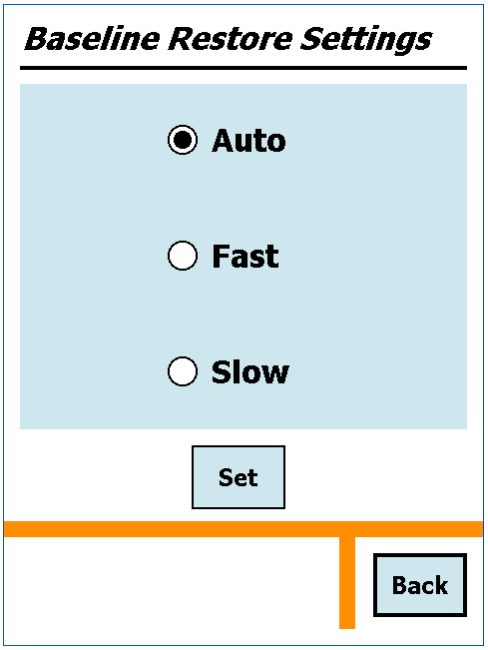

Figure 26. Set the BLR.

View Settings

This displays all the current amplifier settings (Fig. 27). The rise time can be adjusted in MCA Mode (i.e., con-nected via the CONTROL port) with MAESTRO.

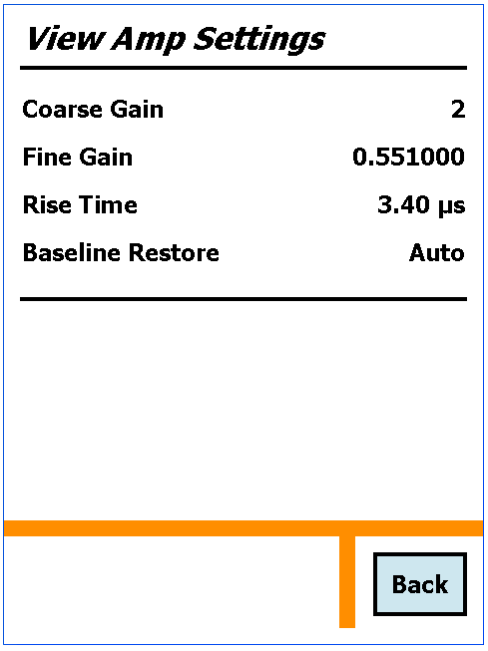

Figure 27. The Main Menu.

4.1.6.3. Presets

Figure 28 shows the Preset Settings menu.

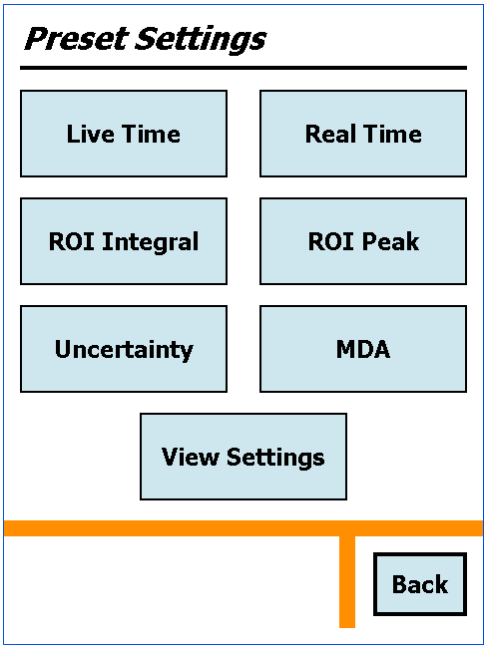

Figure 28. Presets Menu.

Live Time, Real Time, ROI Integral, ROI Peak

These four preset screens all function in the same way: Tap inside the preset field to display the soft keyboard, enter the preset value, then tap **Set** to complete the entry and close the soft keyboard. To clear a preset, delete or backspace over the entry, or enter zero.

The **Live Time** preset stops acquisition when the live time reaches the specified value.

The **Real Time** preset stops acquisition when the real time reaches the specified value.

The **ROI Integral** preset stops acquisition when the sum of all counts in all ROIs in the spectrum[6] reaches the specified value.

The **ROI Peak** preset stops the acquisition when any channel in any ROI reaches the specified value.

Figure 29 shows an example of the **Live Time** screen.

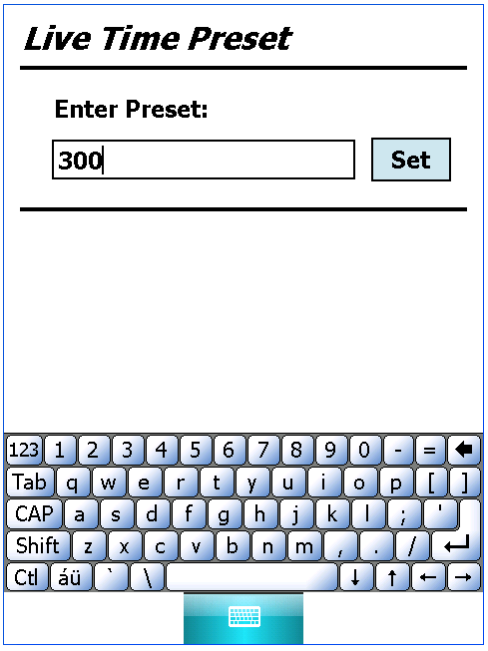

Figure 29. The Live Time Preset.

[6]As distinguished from any ROIs specified for the Nuclide Report.

Uncertainty Preset

The **Uncertainty** preset screen is shown in Fig. 30. This preset stops acquisition when the uncertainty of the selected peak reaches the specified value. The calculation is described in Section 7.1.

Enter the **Start Channel** of the peak and the peak **Width** (in channels). The region specified here should include *three channels of background on each side of the peak*. The region should not be wider than necessary, as the added width will increase the uncertainty value.

Enter the **Preset in %**, and tap **Set**.

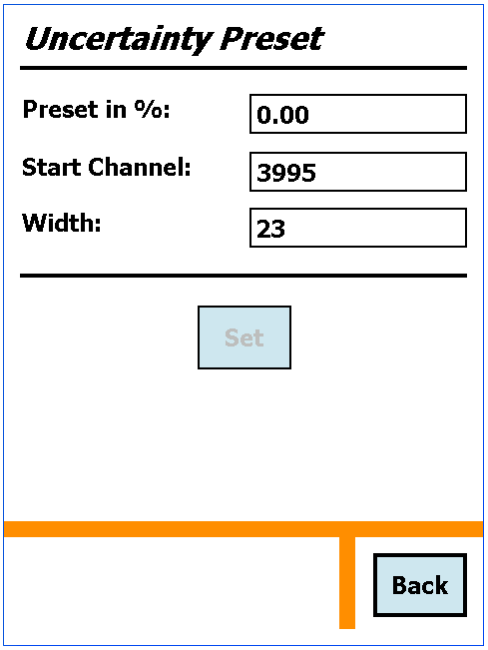

Figure 30. The Uncertainty Preset.

MDA Presets

This screen (Fig. 31) lets you establish MDA presets for up to 20 nuclides. The details of the calculations and the definitions of the coefficients are explained in Section 7.2. If a particular preset is not defined, it is marked as **(DISABLED)**. Setup can alternatively be performed with GammaVision or other ORTEC applications.

Data acquisition stops when the MDAs of all of the specified peaks reach their set value. The screen also shows the enable/disable status of the MDA presets. Scroll down to see the MDA preset for nuclides 11 to 20.

The presets must be set in numerical order beginning with **MDA - 0**. That is, you cannot skip an MDA entry; **MDA - 1** must be next.

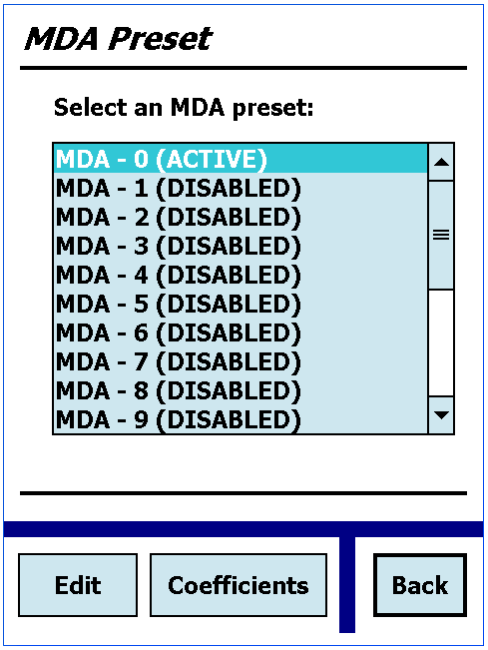

Figure 31. MDA Presets.

To define the three MDA coefficients used in the MDA calculation, tap **Coefficients**. This will display Fig. 32. Enter the coefficients as decimal numbers. These coefficients will be used for all MDA calculations. The values you enter will depend on the MDA formula you are using. You can enter any coefficients here, but to have the values correspond to the MDA value calculated in GammaVision (or other ORTEC analysis applications), use the values shown on GammaVision's MDA Preset tab under **Acquire/MCB Properties**.

To set up an MDA preset, tap to highlight the next available entry, then tap **Edit** to open the screen shown in Fig. 33.

- **Preset (User)** — The preset in activity units (Bq or µCi). GammaVision, MAESTRO, etc., also store this setting in the trans-SPEC memory.

- **EfficYield** — Enter the product of the detector efficiency and the gamma-ray yield (branching ratio). If you use MAESTRO, GammaVision, or other ORTEC applications to set up the MDA preset(s), the value for **EfficYield** is automatically entered. The yield is found in the gamma library file, and the efficiency can be calculated in GammaVision or similar programs.

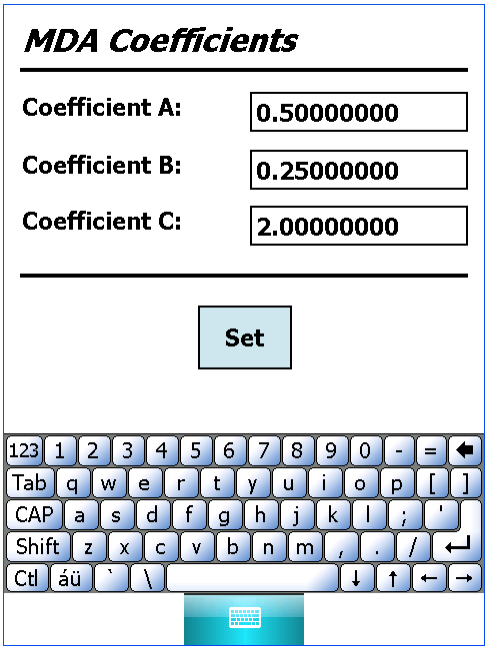

Figure 32. Define the MDA Coefficients.

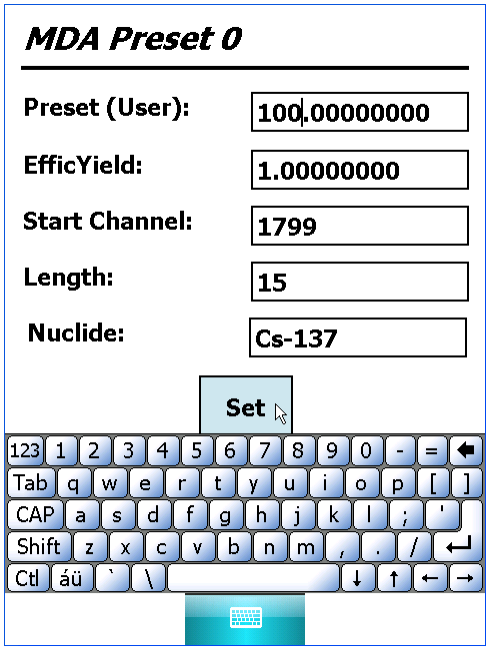

Figure 33. Set Up an MDA Preset.

- **Start Channel** — This is the low-energy starting point for the MDA peak. The region specified here should include *three channels of background on each side of the peak*. The region should not be wider than necessary, as the added width increases the MDA value.

- **Length** — Enter the number of channels for the peak region. The region should be wide enough to end in the background on the high-energy side of the peak. The three right-most channels should be background. The region should not be wider than necessary, as the unnecessary width increases the background and the MDA value.

- **Nuclide** — Enter the nuclide name to be displayed in the MDA table and in the software display.

Tap **Set** to complete entry, and **Back** to return to the MDA Preset screen.

Disabling an MDA Preset

To disable an MDA preset, tap to highlight the desired preset, tap the **Edit** button, then tap **Clear** and confirm that you wish to delete. This clears the **Preset (User)** field for the displayed preset and switches its status to **Disabled**. Note that the MDA **Coefficients** are *not* affected by this operation.

View Settings

This screen (Fig. 34) displays the values for all the current presets, including a listbox that allows you to see all of the MDA presets.

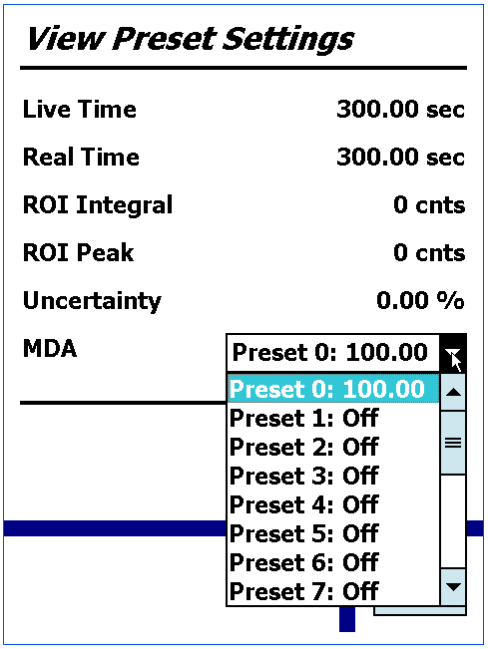

Figure 34. View All Presets.

4.1.6.4. ADC Settings

The dialog is shown in Fig. 35.

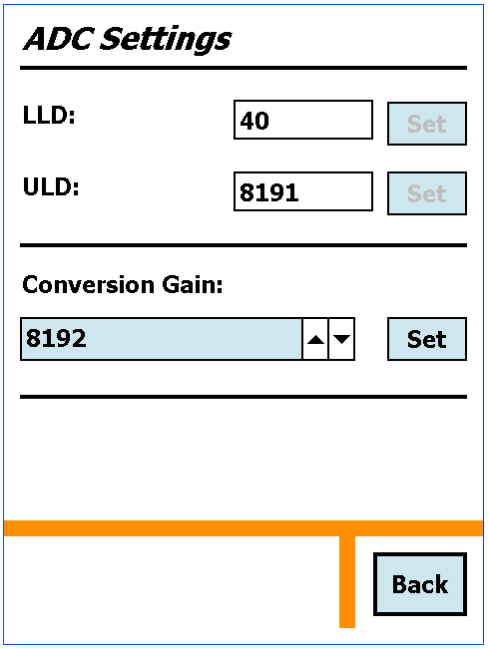

Figure 35. ADC Settings.

- **LLD** — This is the lower-level discriminator. It should be set to reject any low-level noise but not any useful peaks. We recommend a minimum setting of **40** because the trans-SPEC has a mechanical cooler.

- **ULD** — This is the upper-level discriminator. It is normally set to the conversion gain value. It is automatically set to the last channel when the conversion gain is changed.

- **Conversion Gain** — This is the number of channels in the spectrum. Select from 512, 1024, 2048, 4096, 8192, and 16384.

4.1.6.5. Stabilizer Settings

This menu (Fig. 36) allows you to set the stabilizers and view the current stabilizer settings. Gain and zero stabilization are discussed in the MAESTRO *User's Manual*.

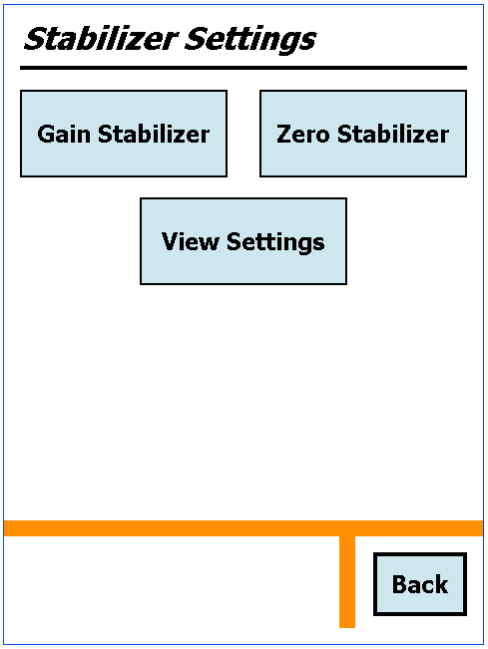

Figure 36. Stabilizer Settings.

Gain Stabilizer and Zero Stabilizer Settings

Both dialogs function in the same way. Figure 37 shows the Gain Stabilizer Settings dialog.

Before setting up the stabilizer, tap **Initialize** to reset the stabilizer adjustment to zero percent and clear the **Center** and **Width** entries (if any).

- **Center** — The center channel of the region used for the stabilization. The peak will be centered in this region by the stabilizer operation. The peak should be in the upper half of the spectrum and isolated from other peaks.

- **Width** — This is the width (in channels) of the peak region to be used. It should be only *slightly* wider than the peak.

- **Stabilizer Enabled** — When you have entered the **Center** and **Width**, tap to mark this box and enable the stabilizer.

View Settings

This screen (Fig. 38) displays the gain and zero stabilizer settings currently in use.

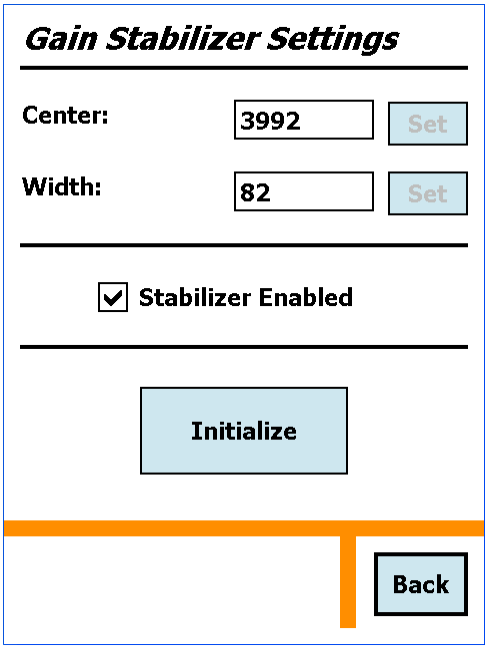

Figure 37. Gain Stabilizer Setup.

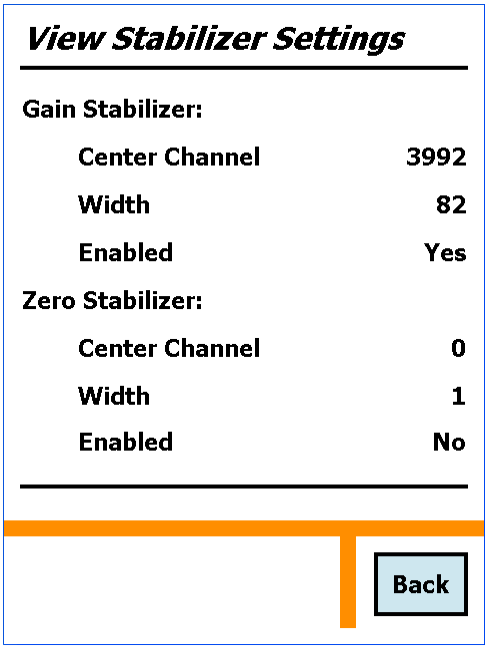

Figure 38. View Stabilizer Settings.

4.1.6.6. Nuclide ROI Settings

Figure 39 shows the ROI list for the Nuclide Report (see Sections 4.1.9 and 7.1). Each ROI is designated as **ACTIVE** (the ROI will be reported) or **DISABLED** (the ROI will not be listed in the nuclide report).

To set up a nuclide ROI, tap to highlight the desired entry, then tap **Edit** to open the screen shown in Fig. 40.

NOTE These peak regions are not the same as the ROIs set in the spectrum window, as discussed on page 25.

- **Label** — Nuclide label for this ROI, to a maximum of 6 characters.

- **Units** — Reporting units for all entries in the Nuclide Report, to a maximum of 6 characters. The most recently entered **Units** label for any ROI is used for all ROIs in the next Nuclide Report.

- **Start Channel** — The start channel of the ROI.

- **Length** — The number of channels in the ROI.

- **Constant** — The multiplier for the net peak area for the report, which reflects the detector efficiency and the nuclide yield (branching ratio) as described in Section 7.1. Enter a value of 1 to report the net peak count rate.

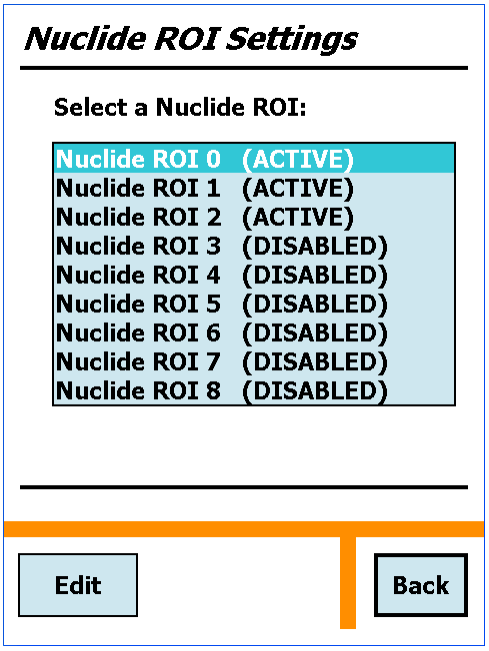

Figure 39. Nuclide Report ROIs.

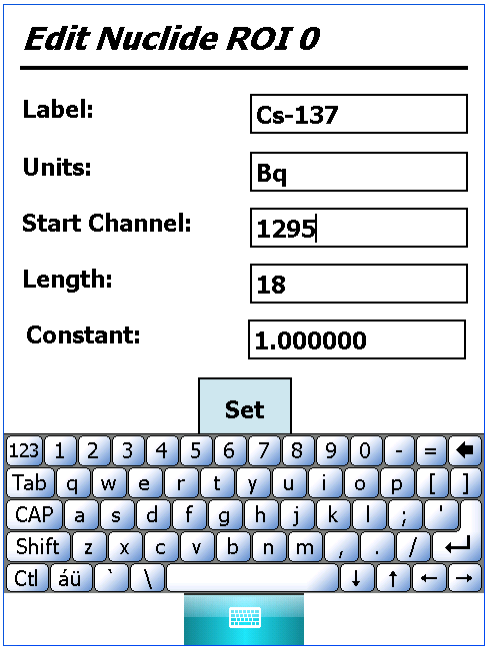

Figure 40. Set Up Nuclide Report ROIs.

Disabling a Nuclide Report Entry

To disable a Nuclide Report ROI, tap to highlight the desired ROI, tap the **Edit** button, then tap **Clear**. This clears all five fields and removes the nuclide from the Nuclide Report screen.

Viewing the Nuclide Report ROI Setup

For an overview of the active Nuclide Report ROIs and corresponding **Constant** values, see the listbox on the View Preset Settings screen (Fig. 34).

4.1.6.7. Audio

Drag the slider, or tap on the desired slider position to adjust the volume for the speaker and headphones (Fig. 41).

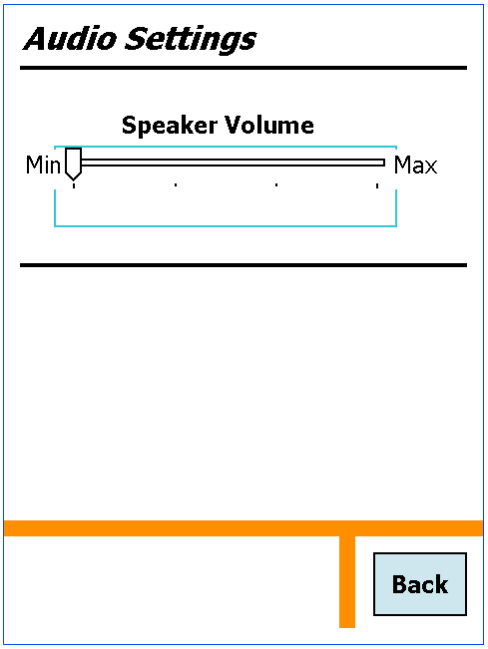

Figure 41. Audio Settings.

4.1.6.8. State of Health

Shows the trans-SPEC's current (live) diagnostic status (Fig. 42).

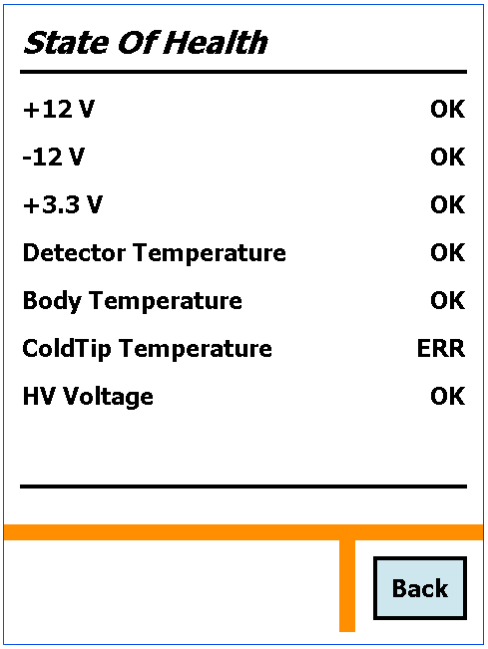

Figure 42. State of Health.

4.1.7. General Settings

These commands (Fig. 43) control user access, spectrum display security, and calibration.

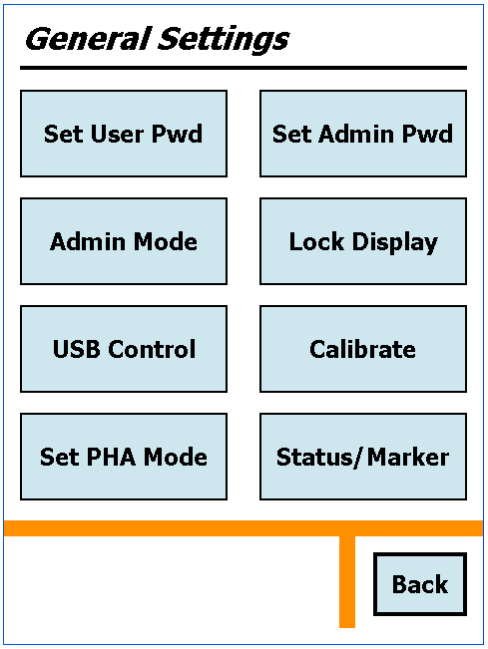

Figure 43. General Settings.

4.1.7.1. Set User Pwd and Set Admin Pwd

Both password screens function in the same way. Fig. 44 shows the screen for setting the administrator password. The "enter password" screen is identical except for the screen title. To enter a password, tap the number buttons, then tap **Done**. After a brief delay, the software will start up. If you make a mistake, tap **Clear** and try again.

NOTE ***There is no master administrator password.*** If you lose this password, contact your ORTEC service representative.

Set Admin Pwd — Setting an administrator password allows non-administrators to start the trans-SPEC application, but prevents them from changing the current trans-SPEC settings. The password is limited to 9 digits. When the administrator password has been set, non-administrators can view the current settings and the spectrum, unless the display is locked. They can also start and stop data acquisition, and save, clear, and view spectra. However, any attempt to change settings displays an "Access denied" message.

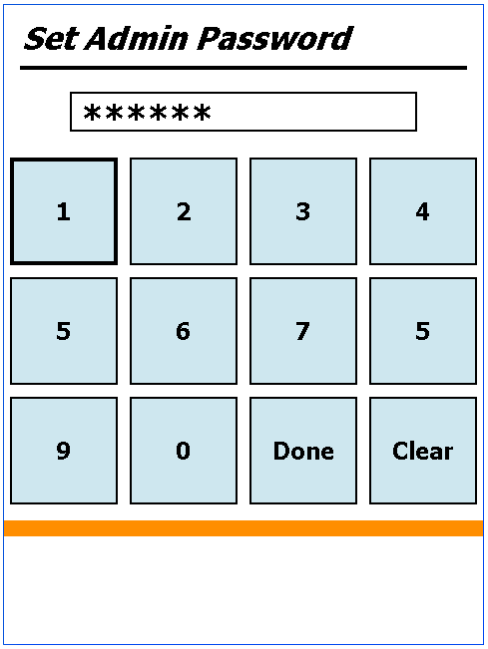

Figure 44. Create Password.

Set User Pwd — Setting a user password prevents unauthorized use of the trans-SPEC program. The password is limited to 9 digits. When the user password has been set, the trans-SPEC prompts for it on power-up (i.e., on program startup).

- Only administrators can create or clear passwords.

  — **Create** — To create a password, tap the number buttons, tap **Done**, then back out to the Main Menu and tap **Exit**. Finally, put the password into effect by tapping **Start**, **Programs**, **trans-SPEC**.

— **Clear** — To clear either password, open the desired screen and tap **Clear** then **Done**. It is not necessary to exit and restart the trans-SPEC application.

- If the administrator password *is not set*, entering the user password grants full administrator access to all functions.

- If the administrator password *is set*, entering the user password on application startup grants limited access. Entering the administrator password in the "user password" screen grants full access.

- If the user and administrator passwords *are identical*, entering either password grants full access.

4.1.7.2. Admin Mode

This command allows you to enter the administrator password so you can switch from user mode to administrator mode and change trans-SPEC settings. It is not necessary to exit and restart the trans-SPEC application.

4.1.7.3. Lock/Unlock Display

This locks (turns off) or unlocks (displays) the spectrum display and **Peak Info** command. The unit must be in Administrator Mode. To put the display lock in effect, you must return to the Main Menu and **Exit** the application, then restart it by tapping **Start**, **Programs**, **trans-SPEC**. Figure 45 shows the appearance of a locked display.

NOTE When the display is locked, the unit will not respond to software commands when connected to a computer in MCA Mode (i.e., when connected via the CONTROL port; see also Section 4.1.7.4).

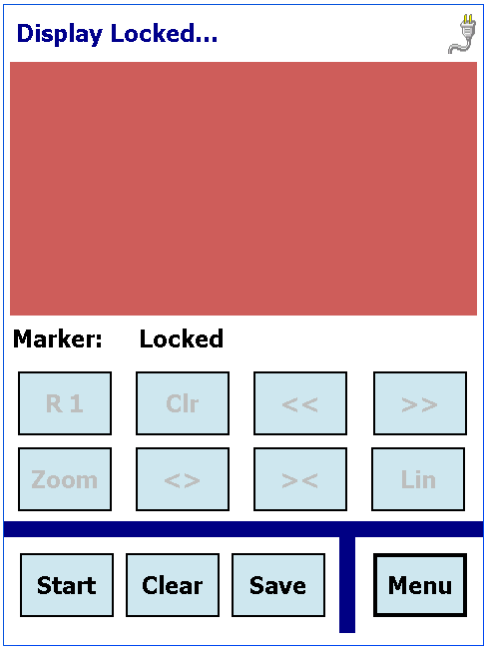

Figure 45. Display (and Peak Info Command) Locked.

4.1.7.4. USB Control

This feature is used by the Micro-trans-SPEC and is not required for the trans-SPEC.

To access the trans-SPEC's computer for data transfer, simply connect to the computer using the rear-panel USB port labeled **DATA**.

To access the unit's MCA board (MCA Mode) for use with MAESTRO or similar applications, connect to the computer using the **CONTROL** port. In MCA Mode, the screen and all functions except the On/Off button are disabled until you disconnect from the computer.

Note that when you switch modes, the unit beeps, then takes a few seconds to initialize in the new mode.

4.1.7.5. Calibrate

This function allows you to energy calibrate the trans-SPEC from multiple peak energy/ channel pairs. Figure 46 shows the table of calibration points. Figure 47 shows the entry screen for each point.

When the trans-SPEC is connected to a computer, the software application (e.g., MAESTRO, GammaVision) will read this calibration.

If you destroy the calibration in MAESTRO or GammaVision, when you disconnect and return to standalone (**ActiveSync**) mode, the spectrum on the Home screen will indicate only channel numbers, and the energy for all channels will be displayed as 0.00 keV. Note, however, that the calibration page will retain the table calibration points last entered. If you have not changed the gain, you can simply tap **Recalibrate** and the trans-SPEC will be recalibrated according to the points in the table.

Creating a Calibration

There are two ways to calibrate:

1) Determine all the peak centroid energies and corresponding channel numbers to be used, and enter them in the calibration table all at one time. To do this:

   For each point, tap **Add**, enter the calibration point and tap **Set**, then tap **Back**. Repeat until all values have been entered and are displayed on the Energy Calibration screen, then tap **Calibrate** *before* returning to the General Settings menu. *If you leave the Energy Calibration screen without tapping **Calibrate**, all your entries will be lost.*

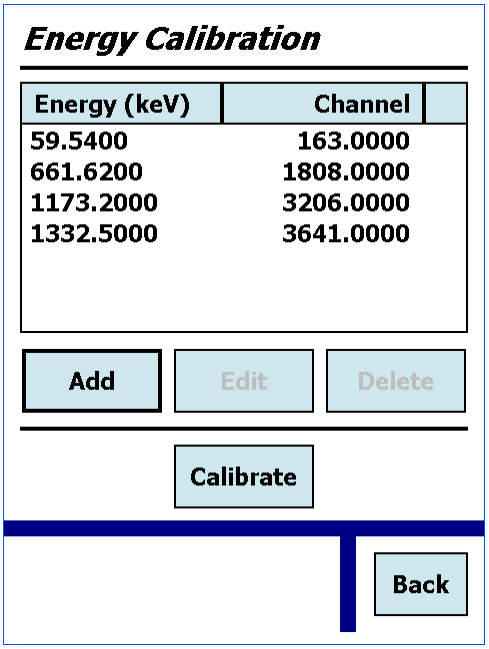

Figure 46. Table of Calibration Points.

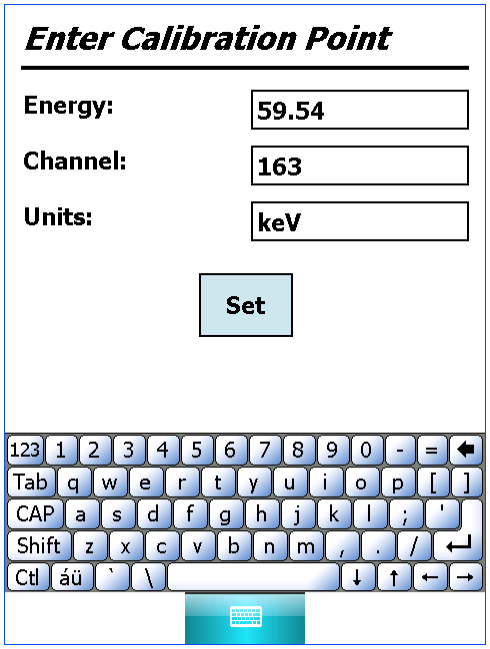

Figure 47. Display Stored Spectrum File.

2) Determine each peak centroid energy and channel individually, and enter it in the calibration table one-at-a-time. To do this:

   Obtain the peak information for the first point, then tap **Add**, enter the calibration point and tap **Set**, **Back**, and **Calibrate** (*again, if you leave the Energy Calibration screen without tapping **Calibrate**, all your entries will be lost*). Back out to the Home screen, obtain the information for the next point, return to the calibration screen, and repeat as for the first point. Repeat until all values have been entered and added to the calibration table displayed on the Energy Calibration screen.

Editing Calibration Points

To edit a point in the calibration table, tap to highlight the entry, then tap **Edit**. Make the desired changes, then tap **Set**, **Back**, and **Calibrate**.

Deleting Calibration Points

To delete a point, tap the calibration table to highlight the entry, then tap **Delete**. ***Note that this removes the selected entry without warning, and there is no "undo."***

4.1.7.6. Set PHA Mode

Sets the operation mode to pulse-height analysis (PHA). This is only needed when the previous user disconnected from the host computer with the trans-SPEC still in the ORTEC Insight™

Virtual Oscilloscope mode (see the InSight mode discussion in the MAESTRO *User's Manual*).

4.1.7.7. Status/Marker

This menu (Fig. 48) accesses the Status Line and Marker Line setup screens. Figure 49 shows the Status Line, above the spectrum display, and the Marker Line just below the spectrum. Each of these can be configured to show up to two parameter each, as follows.

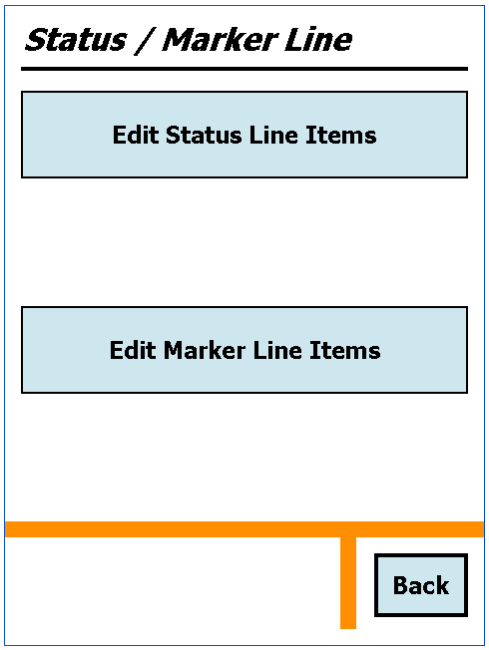

Figure 48. Select Status Line and Marker Line Displays.

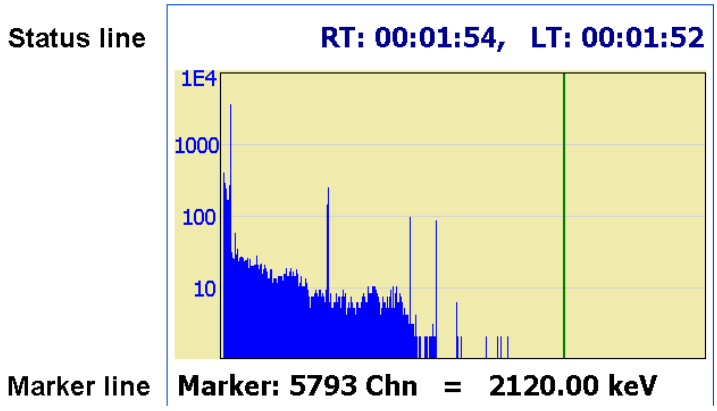

Figure 49. Status and Marker Line Readouts.

The order in which you select the parameters determines which is displayed on the left side of the screen and which is displayed on the right. When you mark the first item, a **1** appears beside your first selection. This parameter is displayed on the left. The second item is marked with **2** and is displayed on the right.

Status Line parameters

- Live Time
- Real Time
- Live Time Remaining
- Real Time Remaining
- Battery Time Remaining
- Count Rate
- Count Rate in ROI

Marker Line parameters

- Marker Location (Energy)
- Marker Location (Channel)
- Marker Counts

4.1.8. Spectra

Figure 50 shows the Spectra Settings screen. These options allow you to view and manage the spectra stored on the trans-SPEC, select the file format and storage location, and specify whether or not to ask for a sample description each time a spectrum is saved.

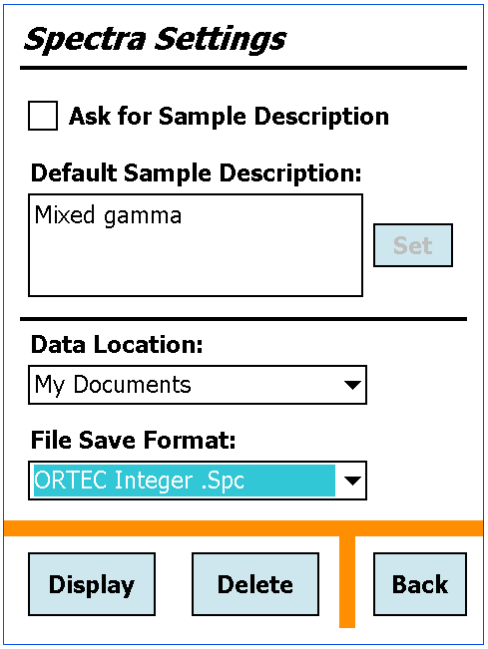

Figure 50. Spectra Settings.

4.1.8.1. Ask for Sample Description

If you mark this checkbox, each time a spectrum is saved, the **Default Sample Description** shown here will be displayed, for optional modification. The default description can be modified here or on the Sample Description screen (Section 4.1.4).

When you save a spectrum and the default description is displayed, you can:

- Tap **Set** to save the spectrum with the current default description.
- Edit the default description and tap **Set** to save with the spectrum and the modified description.
- Remove the description by tapping <**Backspace**> and **Set**.
- Tap **Back** to return to the previous menu without saving the spectrum.

4.1.8.2. Data Location

The trans-SPEC allows you to store spectra in the computer's **My Documents** folder or on a removable **Storage Card** (the latter is only displayed if a card is present). Tap to open the list, then tap to choose the location. This can be changed at any time.

4.1.8.3. File Save Format

Tap to select the **ORTEC Integer .Spc** or **ORTEC Integer .Chn** spectrum file format.

4.1.8.4. Displaying a Stored Spectrum

To display a stored spectrum, select the desired **Data Location**, then tap **Display** to show the list of spectra for that location (Fig. 51). Tap to highlight the desired file, then tap **Choose** to display

it (Fig. 52). The display screen show the filename and spectrum, and provide a subset of the Home screen's display control buttons.

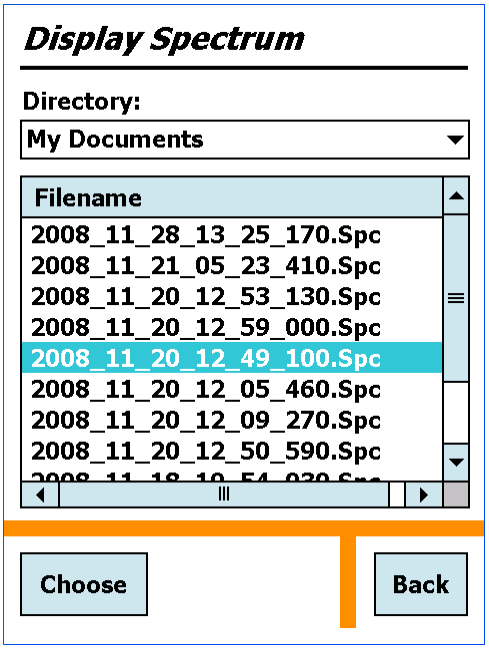

Figure 51. Choose the Spectrum to be Displayed.

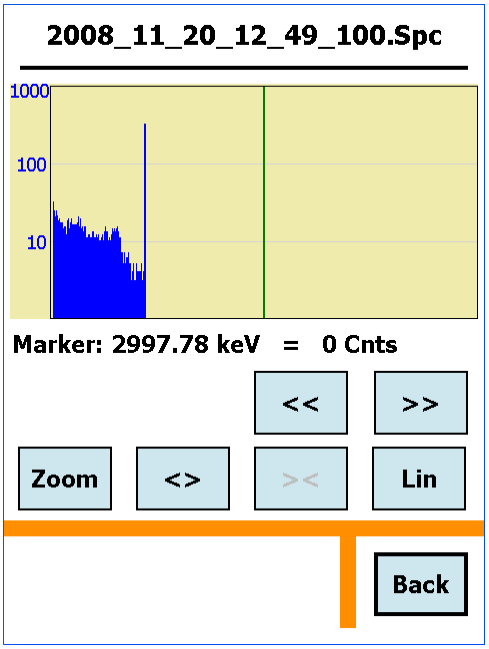

Figure 52. Display Stored Spectrum File.

NOTE Choosing to display a stored spectrum does not load it into (overwrite the current spectrum in) the detector's live-spectrum memory.

4.1.8.5. Deleting a Spectrum File

To permanently remove a spectrum file, select the desired **Data Location**, then tap **Delete** to display the list of available files (Fig. 53). Tap to highlight the desired file, tap **Choose**, then tap **Yes** to confirm that you wish to delete. ***There is no "undo" for this operation.***

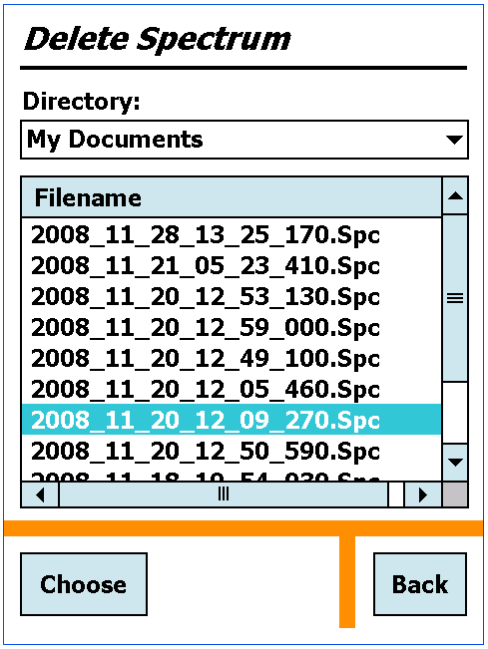

Figure 53. Choose the Spectrum to be Deleted.

4.1.9. Nuclide Report

The Nuclide Report (Fig. 54) is a very useful tool for monitoring nuclide count rates and activities in the field. The display is updated in real time so you can have a "live" reading of the selected nuclides. You can select up to nine gamma-ray energies located anywhere in the spectrum. The display shows the nuclide name, the energy, and the calculated value. The calculated value is the peak net area multiplied by a constant divided by the live time. (The details of the calculations are explained in Section 7.1.) The **Constant** is user-entered as discussed in Section 4.1.6.6, page 37. If you use a value of **1**, the calculated value is the net peak count rate. If the efficiency and yield (branching ratio) are included in the factor, the calculated value is the activity.

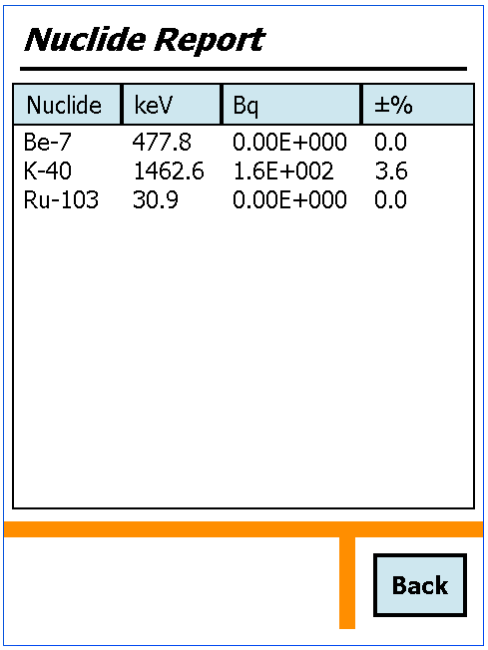

Figure 54. View the Nuclide Report.

4.1.10. Turn Cooler OFF/ON

This is a simple on/off toggle for the mechanical cooler (Fig. 55). The button label changes to reflect the next available action. For more information on the cooler, see Section 3.1.1.

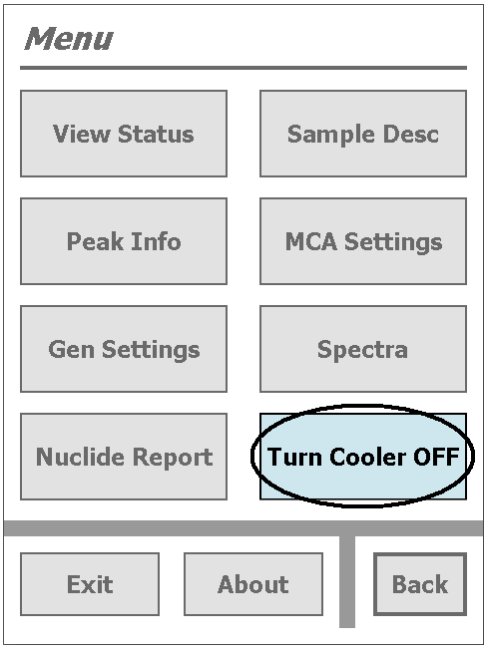

Figure 55. Cooler is On.

5. FILE TRANSFER TO COMPUTER

The trans-SPEC stores Identification Mode spectra in the ORTEC .SPC file format, and Search Mode spectra in the simpler .CHN format. Once you have downloaded the spectrum files, you can view and analyze them with ORTEC spectroscopy programs such as MAESTRO, Gamma-Vision, and ISOTOPIC. The file transfer method depends on your computer operating system and where your spectrum files are stored on the trans-SPEC.

- Spectra stored on the SD card (recommended) — The simplest method is to move the card to a computer with a memory card reader and Windows Explorer. Otherwise, transfer files using the Windows Mobile Device Center or ActiveSync as described below.

- Spectra stored in the trans-SPEC's My Documents folder:

  — **Windows 8/7**: You must download and install Windows Mobile Device Center, as described in Section 5.1, then copy files via Windows Explorer.

  — **Windows XP**: You must download and install Microsoft ActiveSync driver, as described in Section 5.2, then copy files via Windows Explorer.

IMPORTANT	*Before connecting the trans-SPEC to a computer for the first time*, install Windows Mobile Device Center or ActiveSync ***first.*** Otherwise, the unit may not be able to communicate properly with the computer. Contact our Global Service Center if you need assistance.

5.1. Windows 8 and 7

1) Download and install the free Windows Mobile Device Center from the Microsoft Download Center. Follow the wizard prompts, restart the computer, then start the Windows Mobile Device Center program.

2) Connect the trans-SPEC's DATA port to the computer. If this is the first time the trans-SPEC has been connected to this computer, Windows 8 and 7 will indicate that the hardware driver has been installed. Windows Mobile Device Center will then take several seconds to communicate with the trans-SPEC and indicate the its computer is **Connected** (Fig. 56). If Windows Mobile Device Center cannot connect to the trans-SPEC, see the troubleshooting steps in Section 6.10.

3) Click **Connect without setting up your device**. This will prevent the host computer and trans-SPEC from automatically synchronizing (i.e., exchanging files). ***Do not modify the Program and Services, transfer graphics or music to the trans-SPEC computer, or change the Mobile Device Settings.***

IMPORTANT *Remember that the trans-SPEC is not to be used for purposes beyond the monitoring tasks described in the user manual, and no changes should be made to the operating system settings.*

4) Hover over **File Management** to expand its topics, and click **Browse the contents of your device** (Fig. 57).

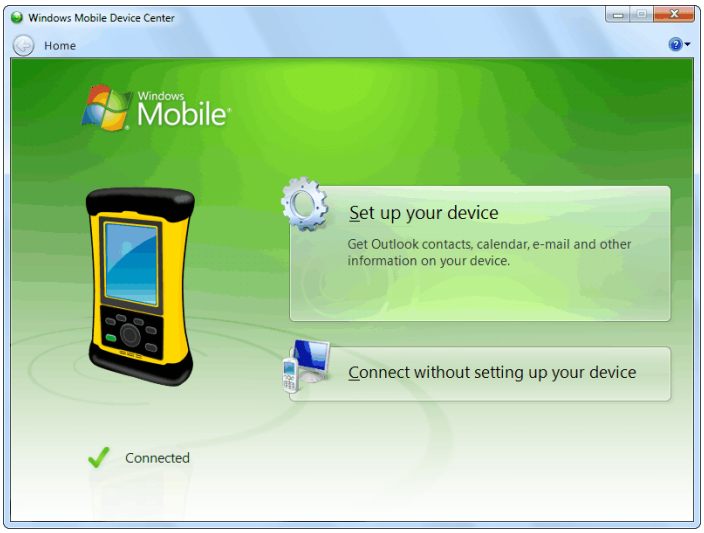

Figure 56. The trans-SPEC is Connected to the Computer.

Figure 57. Choose the File Management Browse Option.

5) Windows Explorer will open and the trans-SPEC's computer will be listed as shown in Fig. 58. Stored search and identification files will be located in the SD card's Data folder or in the My Documents folder, depending on the location set on the Spectra dialog (see Section 4.1.8.2).

6) If your files are stored on the SD card, select the Storage Card and open the Data folder. If your files are in the My Documents folder, select the Documents item on the left sidebar. Identification Mode spectra in the .SPC format have a "spectrum" icon with a green background. Search Mode files in the .CHN format have a "spectrum" icon with a gray background. Text files have the default file icon.

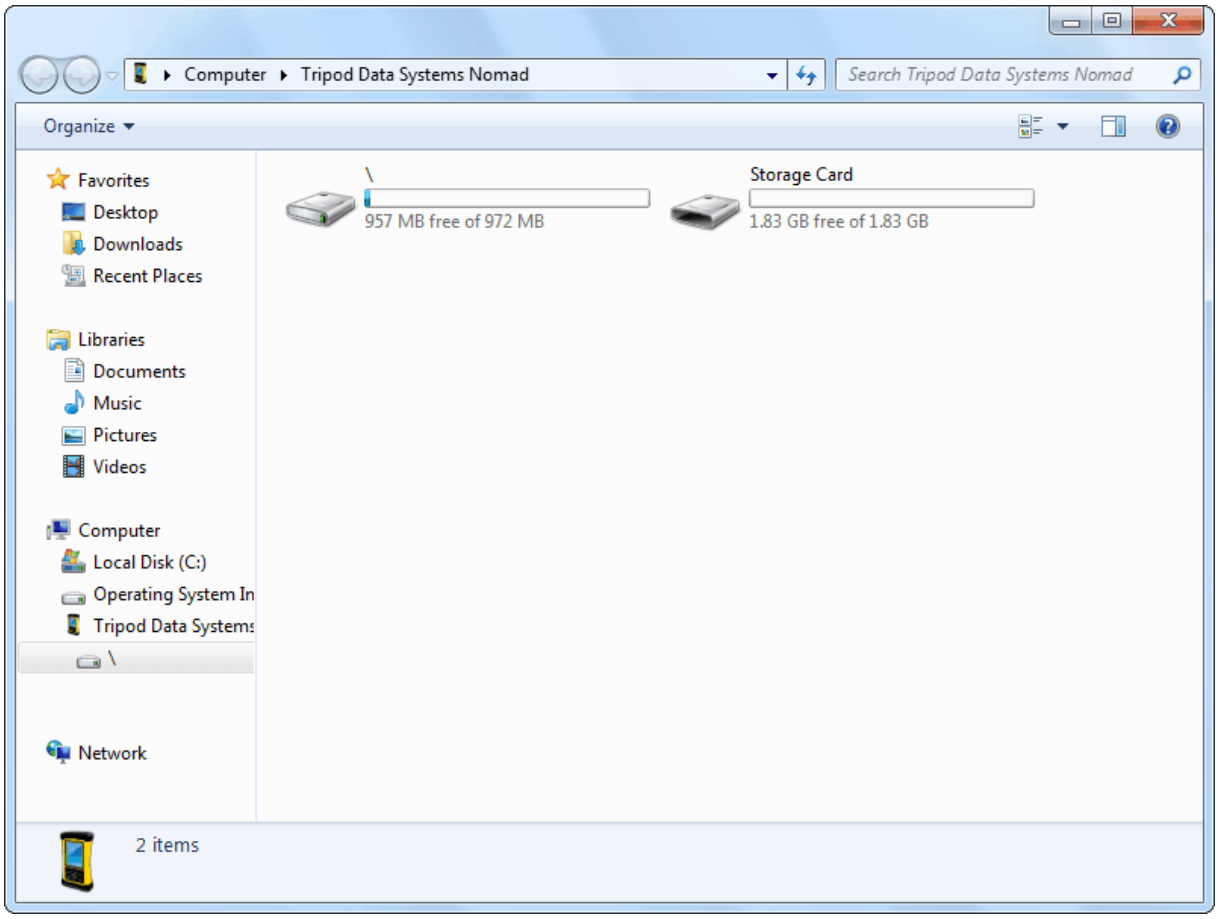

Figure 58. The trans-SPEC Computer's Top-Level File Structure.

5.2. Windows XP

1) Download the free ActiveSync v4.5 or higher from the Microsoft Download Center. When download is complete, select **Run**. This will automatically start installation. Follow the wizard prompts and restart the computer.

2) Connect the trans-SPEC's DATA port to the computer. If this is the first time the trans-SPEC has been connected to this computer, Windows XP will display a series of "Found New Hardware" messages indicating a mobile device (e.g., the trans-SPEC computer) has been detected. The Synchronization Setup Wizard will start. Follow the wizard prompts for a standard partnership according to step (3).

3) On the Synchronization Options screen, ***unmark ALL checkboxes, scrolling down as needed to ensure all items have been deselected*** (Fig. 59). This will prevent the host computer and trans-SPEC from automatically exchanging files.

IMPORTANT *Remember that the trans-SPEC is not to be used for purposes beyond the monitoring tasks described in the user manual, and no changes should be made to the operating system settings. Doing so could void your warranty.*

4) Continue with installation as directed. At the end of the wizard, the ActiveSync dialog will indicate the trans-SPEC computer is **Connected** (Fig. 60). If ActiveSync cannot connect to the trans-SPEC, see the troubleshooting steps in Section 6.10.

Figure 59. Unmark All Synchronization Options.

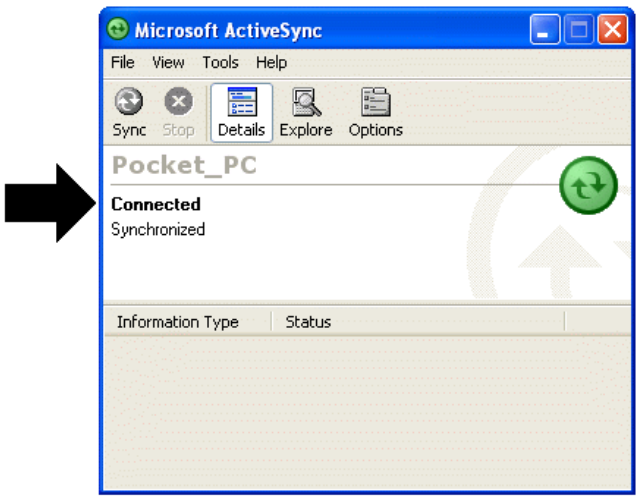

Figure 60. Connection Established.

5) You can now click the **Explore** toolbar button in the ActiveSync dialog to open Windows Explorer and view the new connection and its menu tree.

From the host computer, the trans-SPEC is displayed as My Windows Mobile-Based Device in the Mobile Device folder under My Computer (Fig. 61). Stored search and identification files will be located in the SD card's Data folder or the My Documents folder or, depending on the location set on the Spectra dialog (see Section 4.1.8.2). These locations are indicated by arrows in Fig. 61.

Identification Mode spectra in the .SPC format have a "spectrum" icon with a green background. Search Mode files in the .CHN format have a "spectrum" icon with a gray background. Text files have the default file icon.

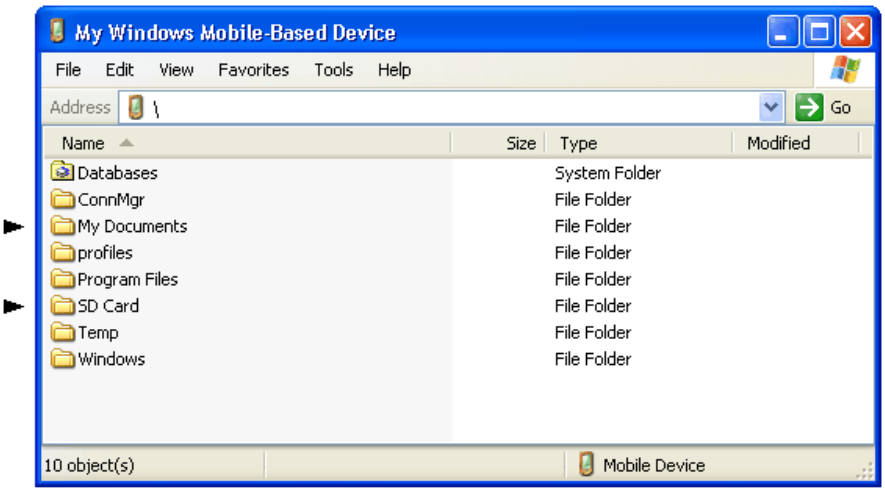

Figure 61. Exploring the trans-SPEC Computer's Files from the ActiveSync Window.

5.3. When File Transfer Is Complete

To return the trans-SPEC to standalone service, simply disconnect it from the USB cable and navigate back to the home screen.

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6. TROUBLESHOOTING

6.1. “Error Saving Spectrum File” Message

This message is generated if the spectrum storage location is set to a removable card drive and no card is in the specified drive. Insert the card and tap **Save** again. If you do not have a card for the specified drive, go to the Spectra screen and select a valid location. The spectrum will be retained in live-spectrum memory until you clear it or start another acquisition.

6.2. If the trans-SPEC Program Stops

The trans-SPEC incorporates a computer running the Windows Mobile operating system. Occasionally, the operating system will stop responding to external commands. Locate the on/off button under the dust cover beside the SD card drive or on the bezel at the top of the touchscreen, then press and hold it until the computer turns off. Press the button again to restart the computer (the mechanical cooler will continue running). This will reset the operating system and automatically relaunch the trans-SPEC application.

6.3. If You Drop the trans-SPEC

The trans-SPEC has been designed to be a rugged instrument, and should survive reasonable levels of mechanical abuse. It has been drop-tested to destruction in development and is known to have a high degree of survivability to “normal” shock and vibration.

If the instrument is dropped:

- Turn off the MCA electronics (not the cooler): to do this, disconnect from any external power source, disconnect any USB connection, press and hold the **On/Off** button. Wait 5 seconds, then turn the unit back on. This should reset any mechanical relays that might have been deactivated by the drop.

- Inspect the exterior for evidence of mechanical damage or distortion.

- *Listen* to the cooler: If you hear any unusual noises (rattling or pinging) emanating from the cooler, contact your ORTEC representative or our Global Service Center.

- Monitor the View Status screen for the next few hours to ensure that the cooler and bias voltage are functioning properly, and ensure that it is still calibrated. If the calibration is significantly changed, this could indicate a problem.

If the unit fails in one or more of these respects or if any message boxes indicate a failure, contact your ORTEC representative or our Global Service Center for further assistance. *Remember that there are no user-serviceable parts inside the trans-SPEC and opening the case will void the warranty.*

6.4. If the trans-SPEC Will Not Turn On

- Connect the trans-SPEC to an external power source. It should automatically boot up, turn the cooler on, and start the trans-SPEC software application.
- If the internal batteries are exhausted but can still hold a charge, see the next section.
- If the battery does not hold a charge, ensure that it is properly installed. If properly installed, the battery must be replaced according to the instructions in Appendix K.

6.4.1. Starting from an Exhausted Battery

If the internal battery is completely exhausted, connect the trans-SPEC to the docking station, PAC-II, or an alternative power source. If the battery is completely discharged, it will typically reach full charge in 3–4 hours. Once the system has been restarted, you can begin re-cooling the detector.

6.5. If the Docking Station Spontaneously Shuts Down and Restarts

If you attempt to cool the trans-SPEC when its internal battery is completely discharged, the high current draw could cause the docking station to shut down and restart approximately once every minute or two. The trans-SPEC will not be damaged by this "cycling," but the unit could take an excessive amount of time to cool and charge. To avoid this, allow the battery to charge for 2 hours before turning on the cooler.

6.6. If the Display is Lost or Posts a "Display Disabled" Message

The MCA board in the trans-SPEC could shut down in such a way that the software becomes unresponsive and pressing the front-panel ON/OFF button has no effect. This can occur if the instrument's internal battery is exhausted and the cooler turns off while the display is still on; or if you try to start the cooler using only the internal battery, that is, without connecting the trans-SPEC to either its charger base or an external power supply. To recover the display:

- Recharge the internal battery.
- Disconnect the trans-SPEC from the charger base or external power source and from any USB connections.
- Turn the unit off by pressing the ON/OFF button. Wait 15–20 seconds; this will return the MCA board to a normal off state.
- Press the ON/OFF button to power on the trans-SPEC display. It might take a few seconds for the display to appear, so wait at least 1 minute before trying the procedure again.

For further assistance, contact your ORTEC representative or our Global Service Center.

6.7. If the Unit Does Not Return to Standalone Mode When Disconnected from the Computer

If the Status: USB Host Enabled message persists (i.e., the unit does not switch back to stand-alone mode) when you disconnect the CONTROL port from the computer, reattach the USB cable to the CONTROL port, wait 12–15 seconds, and disconnect the cable. Repeat as needed until the message clears. If the message does not clear, locate the microprocessor's ON/OFF button and reboot it. The mechanical cooler will remain on during this procedure.

6.8. "Batteries Hot or Overheated" Message

If the battery in the computer that controls the trans-SPEC becomes overheated — for instance, if the unit is left in a vehicle on a very hot day — a "batteries hot or overheated" message might be displayed and the unit could perform unpredictably. Cool the instrument until the message disappears. The maximum operating temperature is 40°C (104°F).

6.9. If You Forgot the Administrator Password

There is no master password. Contact your ORTEC representative or our Global Service Center for assistance.

6.10. Windows Connectivity Problems

Typically, if ActiveSync or Windows Mobile Device Center cannot find the trans-SPEC, it is because the Windows connectivity software was not installed ***first***, before the unit was connected to the computer. If the Windows connectivity software has not been installed, when you

attach the trans-SPEC to the computer for the first time, the "new hardware" bubbles in the lower right corner of the screen will indicate that device driver installation failed.

- Confirm the USB cable is good. If connecting via a USB hub, ensure that it is correctly connected and functioning. If this does not resolve the issue, go to the next step. Finally, make sure you are connecting to the PC via the DATA port. If this does not resolve the issue, go to the next step.

- In Control Panel, open the Device Manager and check for an **Unknown Device** entry that disappears when you disconnect the trans-SPEC from the computer. If such an entry exists, reconnect the trans-SPEC, right-click on the **Unknown Device**, select **Uninstall**, and confirm that you wish to uninstall the instrument. Disconnect the trans-SPEC from the computer.

- Download and install (or uninstall and reinstall) the ActiveSync or Windows Mobile Device Center software, making sure you have downloaded the correct version; restart the computer; and start the connectivity program.

- Restart the trans-SPEC by pressing and holding the On/Off button for 5 seconds, until the screen goes dark and the instrument reboots. When the trans-SPEC program has fully reinitialized, reconnect to the computer. You should see one or more "new hardware" bubble messages indicating the trans-SPEC was successfully detected.

- If these steps do not resolve the issue, contact your ORTEC representative or our Global Service Center. In the meantime, if your spectrum files are stored in the instrument's My Documents folder, you may wish to exit the trans-SPEC program, use the computer's File Explorer program to copy the spectra to an SD card, then mount the SD card in the computer and transfer the files that way.

6.11. Troubleshooting MAESTRO-Related Problems

6.11.1. MAESTRO Does Not Connect with the trans-SPEC

If properly installed and functioning MAESTRO software (or other CONNECTIONS programs) cannot find and communicate with the trans-SPEC when it is connected to the computer via the rear-panel DATA port and being used as an MCA:

- Make sure the trans-SPEC is powered on and is connected to the computer via the DATA port.

- Make sure USB hubs are correctly connected and functioning.

- Run the MCB Configuration program according to the instructions in the MAESTRO *User's Manual*.

6.12. Other Problems with the trans-SPEC

Should the trans-SPEC exhibit other unusual behavior, confirm that the Regional Settings in the Windows Mobile operating system are set correctly, and restore them if necessary. The trans-SPEC is designed to function with Windows Mobile set to the **English (United States)** region and its default values for decimal symbol, digit grouping symbol, and time and date formats, as described below. *Using other than the factory default settings can cause operational problems.*

To check these settings:

- On the Main Menu screen, tap **Exit**, then confirm that you wish to end the trans-SPEC program.
- On the Windows desktop, tap the **Start** square in the upper left corner of the screen, then tap **Settings**.
- In the Settings dialog, tap the System tab, then select **Regional Settings**.
- On the Region tab, select **English (United States)** from the droplist.
- On the Number tab, choose the period (**.**) for the **Decimal symbol** and the comma (**,**) for the **Digit grouping symbol**.
- On the Time tab, select *h:mm:ss tt* as the **Time style** and the full colon (**:**) as the **Time separator**.
- On the Date tab, use *M/d/yy* as the **Short date**, the forward slash (**/**) as the **Date separator**, and the **Long date** format *dddd, MMMM dd, yyyy*.
- Tap the upper right **OK** circle, then the upper right **X** circle to return to the Windows desktop.
- Restart the trans-SPEC application by tapping **Start**, **Programs**, **trans-SPEC**.

For further assistance, contact your ORTEC representative or our Global Service Center.

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7. CALCULATIONS

7.1. The Nuclide Report

The Nuclide Report displays the activity of up to 9 user-selected peaks. Once the report is set up you can view the Nuclide Report at any time. The peak area calculations are the same as the calculations in MAESTRO and other ORTEC software, so the Report contents can be duplicated using the spectra stored in the computer. The calculated value is computed by multiplying the net peak count rate by a user-defined constant. If the constant includes the efficiency and branching ratio, the displayed value will be activity. The nuclide label and the activity units are entered by the user.

The report has this format:

Nuclide	keV	Bq	±%
CO-60	1332.5	1.21E+01	10.2
CO-60	1173.2	1.09E+01	12.3
CO-57	122.1	1.48E+00	86.2

7.1.1. Calculations

These are the calculations used to generate the Nuclide Report's activity, uncertainty, and peak values.

7.1.1.1. Activity

Activity is calculated as follows:

$$Activity = \frac{NetCounts \times Constant}{LiveTime}$$

where:

Constant is the **Constant** value entered on the Edit Nuclide ROI screen (Section 4.1.6.6). This is normally the inverse of the product of the efficiency and the yield (branching ratio). Note that the efficiency is the absolute counting efficiency for the source-detector geometry being used. Thus, in order to get meaningful activity results, as in any counting situation, you must have efficiency factors appropriate to the actual counting geometry. If *Constant* is set to 1, you will get the peak count rate on the display.

LiveTime is the current live time.

NetCounts is computed with the following equation:

$$NetCounts = GrossCounts - Background$$

GrossCounts is the sum of the counts in the ROI, excluding the first and last 3 channels of the ROI.

Background is:

$$Background = \frac{AvgCount\ first\ 3\ chan + AvgCount\ last\ 3\ chan}{2} \cdot ROIWidth$$

ROIWidth is:

$$ROIWidth = EndChannel - StartChannel + 1 - 6$$

7.1.1.2. Uncertainty

Uncertainty (in percent) is calculated as follows:

$$Uncertainty = \frac{\sqrt{GrossCounts + Background \cdot \frac{ROIWidth}{6}}}{NetCounts} * 100$$

7.1.1.3. Peak

Peak is the position of the maximum count and is computed with the following equation:

$$Peak = MaximumROIChan * EnergySlope + EnergyIntercept$$

where:

MaximumROIChan is the channel in the ROI with the most counts. If there are no data, the center channel of the ROI is used.

EnergySlope and *EnergyIntercept* are the energy calibration values as entered on the touchscreen (in standalone mode) or by software (when connected to a computer). If the values are not present, the result is given in channels.

7.2. MDA Preset Calculation

The formula for the MDA can be represented as follows:

$$MDA_i = \frac{a + \sqrt{b + c * Counts\ in\ ROI_i}}{Live\ time * Eff_i * Yield}$$

where:

MDA_i	=	Minimum detectable activity for the i^{th} nuclide (Bq)
a, *b*, *c*	=	Constants
$Counts\ in\ ROI_i$	=	Gross counts in i^{th} ROI
LiveTime	=	Counting live time (sec)
Yield	=	Branching ratio (gammas/Bq)
Eff_i	=	Detection efficiency for the i^{th} nuclide

The MDA values in the MCB are calculated, in becquerels, given the constants *a*, *b*, and *c*. *i* is an index from 0 to 19 that represents the 20 unique nuclides. The constants *a*, *b*, and *c*; MDA_i; Eff_i; and *Yield* are loaded into the MCB by the user.

The expected (preset) value is $Eff_i * Yield * MDA_i$. The calculated value is:

$$\left(a + \sqrt{b + c * Counts\ in\ ROI_i}\right) / Live\ time$$

The calculated values are compared with the expected values and when all are lower, acquisition is stopped. Note that *a*, *b*, and *c* are common for all nuclides while the ROI and the expected value are unique for each of the nuclides.

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8. SPECIFICATIONS[7]

Gamma-Ray Detector Internal, coaxial HPGe detector.

- **trans-SPEC-DX-100** P-type high-purity germanium, 65 mm diameter × 50 mm length, nominal.
  - — Relative efficiency: 40% typical (ANSI/IEEE 325-1996)
  - — Resolution: 1450 eV @ 122 keV and 2.15 keV @ 1332 keV (FWHM warranted at optimum settings).
  - — Peak shape: 1.9 typical (FWTM/FWHM).

- **trans-SPEC-N** N-type high-purity germanium, 67 mm diameter × 69 mm length, nominal.
  - — Relative efficiency: >50% typical (ANSI/IEEE 325-1996)
  - — Resolution: ≤1600 eV @ 122 keV and ≤2.5 keV @ 1332 keV (FWHM warranted at optimum settings)
  - — Peak shape: 1.9 typical (FWTM/FWHM).

If you must test the dose-rate measurement capability with a point source, especially at close range, it is important to know the reference points of the detector, since test procedures such as ANSI or IAEA prescribe use of point sources at specified distances from the reference point of the instrument. The reference point is the geometric center of the Ge detector endcap disk (see Fig. 62).

GPS Internal NMEA-compliant WAAS-capable.

Wireless Communication Built-in IEEE 802.11b wireless hardware; third-party software can be used to implement this option.

Stored-Spectrum Memory The Detective can store search and spectrum files on removable SecureDigital cards.[8] The number of spectra stored on an individual card depends on the card capacity. The instrument is shipped with a 4 GB card.

Cooler High-reliability, low-power Stirling cooler, dual-piston design, 1 W nominal lift at 100K. Initial cooldown time depends on ambient temperature, but at 25°C is typically <12 hours.

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[7]Subject to change without notice.

[8]Note that the computer also has a CF type II CompactFlash slot. However, the dust cover, which must be in place to prevent contaminating the card slots, blocks full insertion of the CF card.

Digital Noise Suppression ORTEC Low-Frequency Rejector filter.[9]

8.1. MCA Specifications

Display Color LCD touchscreen provides live spectrum display, status information, and analysis results.

Full Display and Zoom Modes Display of multiple ROIs.

Status Line User-configurable parameter display; choice of two from: live time, real time, live time remaining, real time remaining, battery life remaining, count rate, count rate in ROI, and counts.

Marker Line User-configurable parameter display; choice of two from marker location in energy, marker location by channel, and counts per channel at marker.

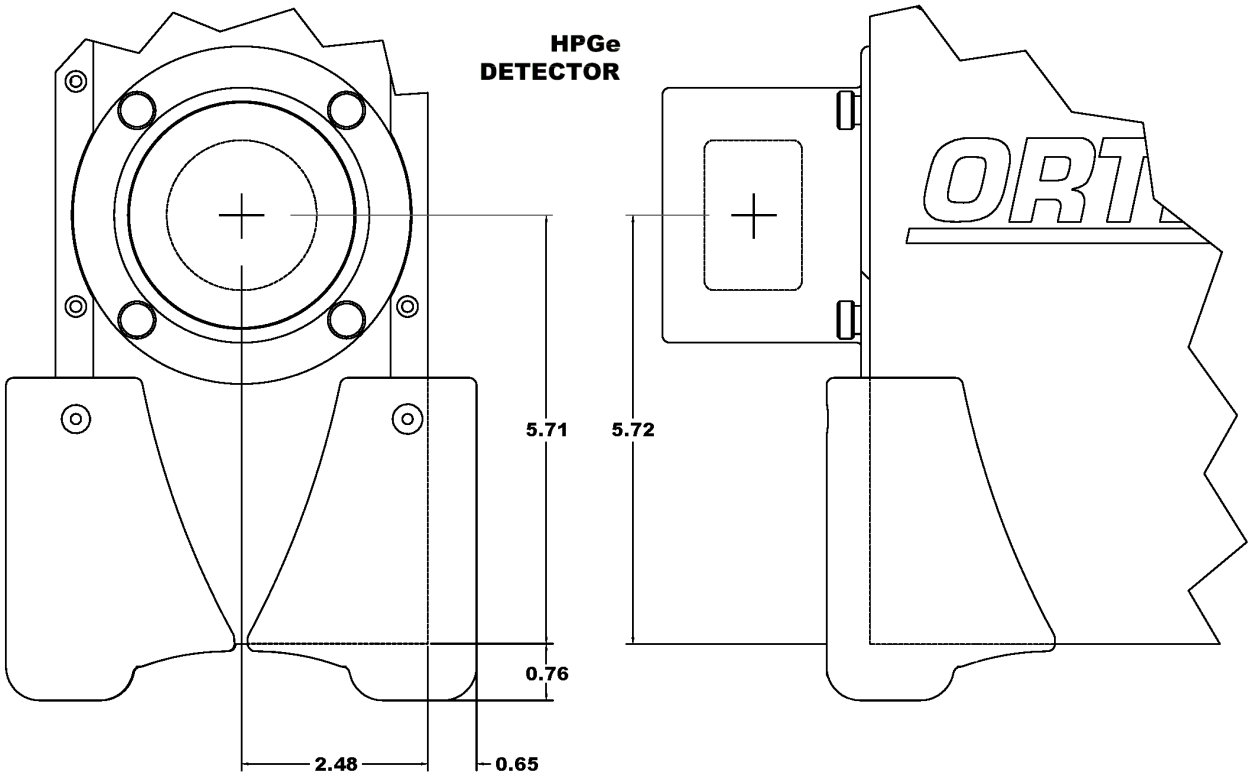

Figure 62. Reference Point for the HPGe Detector (all measurements in inches).

Energy Calibration Multi-point energy calibration using peak channel and energy.

[9]Patent pending.

Real-Time Activity Calculation (Nuclide Report) Onscreen reporting of real-time activity and uncertainty for up to 9 user-defined regions. Activity is calculated as net count-rate divided by user supplied efficiency factor.

System Gain Settings

- Conversion gain: Software controlled from 512 to 16k.
- Coarse gain: 1, 2, 4, 8, 16, or 32.
- Fine gain: 0.45 to 1.

Full-Scale Energy Range

- **trans-SPEC-DX-100**: With the available range of gain settings, the achievable full-scale energy range is 187 keV to ~7 MeV.
- **trans-SPEC-N**: With the available range of gain settings, the achievable full-scale energy range is ~40 keV to ~11 MeV.

Shaping-Time Constants

- Rise time: 0.8 μs to 23 μs.
- Flattop: 0.3 μs to 2.4 μs width.

Dead-Time Correction Extended live-time correction according to Gedcke-Hale method.[10] Accuracy: area of reference peak changes <±3% from 0 to 50000 cps.

Linearity

- Integral Nonlinearity: <±0.025% over top 99.5% of spectrum, measured with a mixed source (^{55}Fe at 5.9 keV to ^{88}Y at 1836 keV).
- Differential Nonlinearity: <±1% (measured with a BNC pulser and ramp generator).

Digital Spectrum Stabilizer Software-controlled, stabilizes gain and zero errors.

Temperature Coefficient

- Gain: <35 ppm/°C. [Typically 30 ppm/°C.]
- Offset: <3 ppm/°C.

Overload Recovery At maximum gain, recovers to within 2% of rated output from ×1000 overload in 2.5 non-overloaded pulse widths. (Measured using the InSight Virtual Oscilloscope.)

Pulse Pile-Up Rejector Automatically set threshold. Pulse-pair resolution typically 500 ns.

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[10]Ron Jenkins, R. W. Gould, and Dale Gedcke, *Quantitative X-Ray Spectrometry* (New York: Marcel Dekker, Inc.), 1981, pp. 266–267.

Digital Gated Baseline Restorer Software-controlled adjustment of the restorer rate (High, Low, and Auto).

LLD Digital lower level discriminator, set in channels. Hard cutoff of data in channels below the LLD setting.

ULD Digital upper level discriminator, set in channels. Hard cutoff of data in channels above the ULD setting.

Ratemeter Count-rate display on touchscreen and/or host computer screen.

Presets Multiple presets can be set within MAESTRO for any or all of the following:

- **Real Time** Stops data collection when the real time reaches this value (in increments of 1 s).

- **Live Time** Stops data collection when the live time reaches this value (in increments of 1 s).

- **ROI Integral** Integral count stops data collection when the sum of all ROI channels reaches this value.

- **ROI Peak** Peak count stops data acquisition when any ROI channel reaches this value (maximum value of $2^{32}-1$ counts [4×10^9]).

- **Uncertainty** Sets the required statistical accuracy on a key peak (for example: stop counting when the activity of ^{60}Co is known to be better than 5%).

- **MDA** Stops data collection when the value of the minimum detectable activity (MDA) for up to 20 user-specified MDA nuclides reaches the needed value. The presets are implemented in hardware so the computer does not have to poll the trans-SPEC for the preset to operate. See Section 7.2 for details on the MDA preset calculation.

Low Frequency Rejector (LFR) Filter[11] The digital signal processor incorporates ORTEC's exclusive LFR filter, designed to reduce microphonic and low-frequency periodic noise from germanium detector output signals, thereby producing significant improvement in spectral resolution. The LFR is specifically beneficial in systems cooled by mechanical coolers, which are known to often contribute microphonic noise to the spectrum (thereby degrading spectral resolution). The LFR is also capable of reducing any periodic noise signal resulting from surrounding electronics and equipment or ground loops.

[11]Patent pending.

8.2. trans-SPEC Physical Specifications

Maximum Overall Dimensions 39.4 cm L × 16.3 cm W × 34.9 cm H (15.5 in. × 6.6 in. × 13.8 in.) including handle, Ge detector endcap, and shock absorbers.

Weight 11.1 kg (24.4 lb).

Maximum Shock Tolerance 20 g. An accelerometer inside the instrument tracks the maximum shock to which the trans-SPEC has been subjected, and a shock in excess of 20 g will void the warranty.

Internal Battery Life >3 hours at 25°C with a cold detector on fully charged internal battery; battery lifetime may be extended indefinitely by the use of external battery packs which are available in "battery belt" formats. The unit is expected to be kept running once cold.

Input Power 10–17 V dc 30 W or via auto-sensing mains-powered battery charger.

Temperature Operation Range/Humidity –15°C to +50°C, relative humidity <90% at 35°C, non-condensing.

Communications Ports Rear-panel CONTROL and DATA USB ports protected by dust cover; INPUT POWER; and DC IN.

CE Conforms to CE standards for radiated and conducted emissions, susceptibility, and low-voltage power directives.

8.3. Docking Station

POWER IN Keyed, front-panel connector connects to the mains-powered dc power supply.

Power Supply Cable Integral rear-panel cable terminating in MS3112E12-10-s or Bendix PT02E-12-10S connector, center contact positive, attaches to the trans-SPEC's INPUT POWER connector to supply external power and charge the trans-SPEC's internal battery.

8.4. PAC-II Power Adapter/Charger

POWER IN Keyed, rear-panel connector attaches to a +12–15 V dc power supply, 9 A maximum.

AC Input Rear-panel connector, 115–230 V ac, 50–60 Hz, 250 VA maximum.

OUTPUT Integral front-panel cable terminating in MS3112E12-10-S or Bendix PT02E-12-10S connector, center contact positive, attaches to the trans-SPEC INPUT POWER connector to supply external power and charge the trans-SPEC's internal battery.

Charger Status LEDs Front-panel red and green LEDs. When the trans-SPEC's internal battery is charging, the red indicator is continuously lit. The red indicator flashes if you disconnect the unit before its battery is fully charged, or if the trans-SPEC is connected but the internal battery is faulty. When the battery is fully charged, the green indicator turns on and the red indicator turns off.

8.5. Computer Prerequisites

In addition to completely independent, standalone operation, the trans-SPEC can also be operated as a benchtop MCB, in conjunction with ORTEC spectroscopy applications such as MAESTRO, by connecting it to any computer running Windows 8, 7, or XP Professional SP3.

8.6. Shipping the trans-SPEC

To avoid damaging the cooler by overheating it and, where applicable, to comply with transportation regulations, be certain to turn the cooler off before shipping the trans-SPEC. To do this, go to the Main Menu and tap **Turn Cooler OFF**. The unit can be shipped as soon as the cooler is turned off. There is no need to wait until the detector warms up.

8.7. Long-Term Shutdown/Storage

CAUTION

This instrument should be cooled and brought to operational status for at least 48 hours every month. Failure to do this may result in degraded performance or cooling system failure.

This instrument uses a Stirling cycle refrigerator and all-metal-sealed cryostat designed for long operational life. The vacuum integrity inside the cryostat is maintained by "getters," which scavenge traces of residual material when cold; and by an ion pump that operates when the instrument is powered up. These two techniques maintain the system vacuum in peak condition during normal use. A good vacuum yields rapid cooldown and ensures operation at the high end of the instrument's operating temperature range.

Over time, in any cryostat system, residual contaminants can be released from the materials inside the evacuated cryostat by a process called *outgassing*.[12] It has become apparent that, in extended storage, the vacuum in our mechanically cooled identifiers may degrade to the point that, on trying to restart, the gas load inside the cryostat is too high and the unit fails to cool. The remedy is reasonably straightforward, if inconvenient: a "pump and bake" of the instrument is required at an ORTEC service center. Fortunately, you can easily avoid this problem:

We strongly recommend that instruments used only occasionally be turned on once a month, fully cooled to Ready status, and allowed to run for at least 48 hours. Doing this starts the ion pump and activates the internal getters, ensuring that the vacuum is maintained in good condition.

As well as maintaining the vacuum, this procedure keeps the system battery "topped up" and also provides peace of mind that the system will cool when required.

8.8. Feature Mask Bits

The following table describes the feature bits from the SHOW_FEATURES command discussed on page 110. If the feature is supported in the trans-SPEC the bit is set to 1; if the feature is not supported, the bit is 0.

Bit	Meaning
0	Software-selectable conversion gain
1	Software-selectable coarse gain
2	Software-selectable fine gain
3	Gain stabilizer
4	Zero stabilizer
5	PHA mode functions available
6	MCS mode functions available
7	List mode functions available
8	Sample mode functions available
9	Digital offset (e.g., 920)
10	Software-selectable analog offset
11	HV power supply
12	Enhanced HV (SET_HV, SET/SHOW_HV_POL, SHOW_HV_ACT)
13	Software-selectable HV range (ENA_NAI, DIS_NAI)
14	Auto PZ (START_PZ_AUTO)

[12]This is not to be confused with a vacuum leak, although both result in a degradation of the vacuum.

Bit	Meaning
15	Software-selectable manual PZ (SET/SHOW_PZ)
16	Battery-backed, real-time clock (SHOW_DATE/TIME, SHOW_DATE/TIME_START)
17	Sample changer support (SET/SHOW_OUTPUT, SHOW_INPUT)
18	One-button acquisition (ENA/DIS/SHOW_TRIG_SPEC, MOVE)
19	Nomadic (likely to move between opens)
20	Local app data (SET_DATA_APP, SHOW_DATA_APP)
21	Software-retrievable serial number
22	Power management commands
23	Battery status support (SHOW_STAT_BATT)
24	Software-selectable AMP polarity (SET/SHOW_GAIN_POLAR)
25	Support for flattop optimization (ENA/DIS_OPTI)
26	Stoppable AutoPZ (STOP_PZ_AUTO)
27	Network support (e.g., DSPEC)
28	Multi-drop serial support (e.g., MicroNOMAD®2)
29	Software-selectable DPM address (SET_DPM_ADDR)
30	Multiple devices (e.g., 919)
31	Software-selectable ADC gate mode (SET_GATE...)
32	Software-downloadable firmware
33	Time histogramming functions available (e.g., 9308)
34	Software-selectable lower level discriminator
35	Software-selectable upper level discriminator
36	MCS-mode SCA input available
37	MCS-mode positive TTL input available
38	MCS-mode fast-negative NIM input available
39	MCS-mode discriminator input available
40	Software-switchable MCS-mode discriminator edge
41	Software-programmable MCS-mode discriminator level
42	Software-programmable SCA upper and lower thresholds
43	Software-selectable MCS-mode input sources
44	Uncertainty/statistical preset (SET_UNCERT_PRES)
45	Features vary by input (SHOW_FEATURES depends on device/segment; multi-input MCBs only)
46	Software-selectable HV shutdown mode (SET/SHOW/VERI_SHUT)
47	Software-selectable shaping time constants (SET_SHAP)
48	Explorable shaping time constants (SHOW_CONFIG_SHAP)
49	Advanced shaping time (SET_SHAP_RISE, SET_SHAPE_FLAT, etc.)
50	Software-selectable BLR (ENA/DIS/SHO_BLR_AUTO SET/SHO/VERI_BLR)

Bit	Meaning
51	SHOW_STATUS command supported (returns $M record)
52	Overflow preset (ENA/DIS/SHO_OVER_PRES)
53	Software-enabled, MicroNOMAD-style audio clicker (ENA/DIS_CLICK)
54	Software-readable thermistor (SHOW_THERM)
55	Floating-point fine gain (SET/SHO/VERI/LIST_GAIN_FINE)
56	Software-enabled pileup rejector. (ENA/DIS/SHO_PUR, SET/VERI_WIDT_REJ)
57	Alpha-style HV power (SHOW_HV_CURRENT)
58	Software-readable vacuum (SHOW_VACUUM)
59	Acquisition alarms (ENA/DIS/SHO_ALARM)
60	Hardware acquisition trigger (ENA/DIS/SHO_TRIG)
61	Ordinal numbers for shaping times (SET_SHAP 0, SET_SHAP 1, ...)
62	Query gain ranges (LIST/VERI_GAIN_FINE, ..._COAR, ..._CONV)
63	Routable inputs (SET/SHOW_INPUT_ROUTE)
64	External dwell support (ENA/DIS_DWELL_EXT)
65	Selectable SUM or REPLACE MCS modes (ENA/DIS_SUM)
66	External start of pass support (ENA/DIS/SHO_START_EXT)
67	Explorable with MCS list commands (LIST_SOURCE, LIST_LLSCA & LIST_ULSCA)
68	Device supports the MDA preset
69	Software-selectable ADC type (Matchmaker™)
70	Has ability to daisy-chain MCBs (DART)
71	ZDT functions available (DSPEC® Plus)
72	DSPEC Plus-style Insight triggering (LIST/SET_TRIG_SAMP)
73	Multiple inputs per connection (for example, OCTÊTE® Plus)
74	Hardware count-rate meter (SH_CRM)
75	Has multiple ZDT modes (SET/SHOW/LIST_MODE_ZDT)
76	Has multi-nuclide MDA preset
77	Has MCS Replace then Sum Mode (SET_RPLSUM)
78	Has programmable external dwell voltage capability
79	No Peak Preset feature (M^3CA and OASIS)
80	Programmable pulser (OASIS)
81	Programmable Vacuum/HV interlock (OASIS)
82	Programmable Current/HV interlock (OASIS)
83	Explorable Stabilizer (LIST_GAIN_ADJU,LIST_ZERO_ADJU)
84	Has programmable input impedance (MCS)
85	Advanced shaping-time feature has no CUSP (Micro-trans-SPEC)
86	Selectable HV rise-time (SET/SHOW/LIST_HV_RISE) (SBS-60)

Bit	Meaning
87	—
88	Monitor command support (SHOW_MONI_MAX/LABEL/VALUE)
89	SMART-1 Detector support (SHOW_SMART_DET, SHOW_SNUM_DET, SHOW_HV_RECO)
90	Nuclide report (SET/SHOW_NUCL_COEF, SET/SHOW_ROI_NUCL, ...)
91	Interactive Display Features Such as Nuclide Report
92	Advanced Stored Spectra (SH_SPEC_COUNT, SET/SHOW_SPEC_ID, MOVE)
93	SET/SHOW_VIEW in MCBs with Dual-Port Memory or printer port interfaces, LIST_VIEW in all MCBs
94	Connected to MCB via RS-232 (slow) port
95	No SET_HV_POSI, SET_HV_NEGA, ENA_NAI and DIS_N
96	Low Frequency Rejecter (ENA/DIS/SHOW_LFR)
97	Resolution Enhancer (ENA/DIS/SH_RENHANCER, SET/SHOW_RETABLE idx,val)
98	SET_MODE_RELIST for Resolution Enhancer List Mode
99	Readable Sample mode time per channel (SH_TIME_SAMPLE)
100	Adjustable Sample mode time per channel (SET/LIST_TIME_SAMPLE)
101	List Mode data streamed and formatted as in digiBASE
102	Supports ETP mode (ENA/DIS/SHOW_ETP)
103	List Mode data streamed and formatted as in DSPEC Pro
104	SET/SHOW/LIST_PZ using floating point microseconds
105	Rise time, flattop width and cusp not changeable from property page
106	HV not user changeable from property page (requires Bit 12)
107	Coarse and fine gain not user changeable from property page
108	PZ and flattop tilt not user-selectable from property page
109	LFR not user changeable from property page (requires Bit 96)
110	Portal Monitor style List Mode Synch is available
111	DSPEC-Pro Auxilliary BNC input available
112	SET_DISPLAY is NOT used to select ZDT data view (requires Bit 93)
113	ID Reports (DO_ID, SHOW_REPORT, SHOW_REPO_LINES)
114	Has neutron detector (SHOW_CRM 2 returns valid number)
115	—
116	—
117	—
118	—

Bit	Meaning
119	—
120	—
121	—
122	—
123	—
124	—
125	—
126	—
127	Extended feature mask available (SH_FEAT_EXT)

[Intentionally blank]

9. USING THE TRANS-SPEC WITH ORTEC SPECTRUM ANALYSIS PROGRAMS

The trans-SPEC is intended for completely independent operation, with no external computer required. However, when you connect the CONTROL port to a computer running ORTEC spectroscopy applications such MAESTRO or GammaVision, you can use it as a high-performance HPGe spectrometer/digital MCB.

Be sure to install the accompanying versions of the CONNECTIONS Driver Update Kit (P/N 797230) and MAESTRO. These contain the most up-to-date drivers for the trans-SPEC and other ORTEC hardware. If you have any questions about software/hardware compatibility, contact your ORTEC representative or our Global Service Center. The MAESTRO *User's Manual* contains complete instructions on software installation and configuration of the MCBs attached to your PC. When installing CONNECTIONS, choose the **USB-Based Instruments** selection to install the correct driver for the trans-SPEC.

IMPORTANT

When both the trans-SPEC and Detective applications are installed on your identifier, ***the unit's operation depends on the application running when it is connected to the analysis computer.*** If running the Detective application, the allowable changes to hardware settings within MAESTRO are restricted. This includes the gain, rise time, calibration, and other settings that will affect the location of gamma peaks (see the Detective operation manual for complete details on allowable hardware settings). When you disconnect the identifier's CONTROL port from the computer, the unit automatically restores all factory settings for the standalone Detective.

If the unit is running the trans-SPEC application, almost all hardware settings are adjustable (see Section 9.3 for the allowable hardware settings). Any changes made in MAESTRO remain in effect when you disconnect from the computer and return to standalone trans-SPEC operation.

9.1. Connecting the trans-SPEC to a Computer

To enter MCA Mode, simply connect the trans-SPEC to the computer via the rear-panel CONTROL port. The trans-SPEC screen will display a Status: USB Host Enabled message above the spectrum window and all touchscreen features will be disabled. The unit can then be used as a high-performance MCB in MAESTRO, etc.

The first time this trans-SPEC is connected to a particular for use as an MCB, follow the installation instructions in Chapter 5 for the host computer's operating system.

The final step is to run the **MCB Configuration** program according to the instructions in the MAESTRO *User's Manual* to build **Master Instrument List** of all ORTEC MCBs accessible to the PC.

To monitor the battery time remaining from within MAESTRO, go to the Status tab under **Acquire/MCB Properties...**.

To return the trans-SPEC to standalone operation, simply disconnect from the computer. Within a few seconds, the touchscreen will become active in the normal standalone mode. Any changes made to the hardware settings via the computer will remain in effect until changed from the touchscreen.

NOTE MAESTRO and other ORTEC spectroscopy applications have a **Lock/Unlock Detector** command to prevent unauthorized users from changing detector settings, starting and stopping data acquisition, and clearing the detector memory. This locking command functions separately from the trans-SPEC passwords. If the trans-SPEC is password-locked within MAESTRO, you can still use it in the field without knowing the password; however, you cannot reconnect it to a PC and erase its memory. In addition, the next time you use it in MCA Mode with MAESTRO, it will still be locked. *Also note that if the trans-SPEC's display is locked, it cannot communicate with a computer* (Section 4.1.7.3).

9.2. Quantitative Analysis of trans-SPEC Spectra in GammaVision and ISOTOPIC

The trans-SPEC can be used to collect data for quantitative analysis, either as a standalone field instrument or a benchtop MCB connected to a PC. In both usage modes, the data are stored as .SPC-format spectrum files. The .SPC files can then be quantitatively analyzed on a PC using GammaVision or ISOTOPIC.

Note, however, that the trans-SPEC is not designed to store efficiency information in the .SPC files it creates. Therefore, for quantitative determinations, special attention is needed to prepare the calibration (.CLB) file so that GammaVision or ISOTOPIC will add the efficiency information during processing.

To prepare this calibration file, load a trans-SPEC calibration spectrum into GammaVision or ISOTOPIC. Use the software application's **Calibration Wizard** to obtain the additional efficiency calibration, keeping the existing energy calibration. After the efficiency calibration is computed, save the complete set of calibrations as a .CLB file.

To add the efficiency information to an existing .SPC file from a standalone trans-SPEC:

- Transfer the .SPC file from the trans-SPEC to the PC (see Chapter 5).
- Recall the .SPC file in GammaVision or ISOTOPIC.
- Load the .CLB file containing the proper efficiency information. This can be done either with the application's **Recall Calibration** command; or by specifying the .CLB file as the calibration override in the GammaVision analysis options (.SDF) file or the ISOTOPIC configuration.
- Save the .SPC file with or without further analysis.

NOTE If the .CLB file is specified in the GammaVision .SDF file or ISOTOPIC configuration, the .An1 file generated during analysis will contain the proper calibration information but the original .SPC file (without the efficiency information) will not change.

To load the efficiency information before acquiring a new spectrum (with the trans-SPEC attached to a PC):

- Load the .CLB file either with the **Recall Calibration** command; or by specifying the .CLB file as the calibration override in the GammaVision .SDF file or ISOTOPIC configuration.
- Acquire a new spectrum and save it in .SPC format.

9.3. trans-SPEC MCB Properties in MAESTRO

This section discusses the hardware setup dialogs you will see within MAESTRO when you use the **MCB Properties...** command on the **Acquire** menu. The MCB Properties dialog contains all of the instrument controls including acquisition presets, high voltage, hardware status indicators, and amplifier settings. To view the hardware parameters and Identification Mode reports for spectra downloaded from the trans-SPEC, simply move from tab to tab. Click on **Close** when finished.

When setting up a data acquisition, note that as you enter characters in the data-entry fields the characters will be underlined until you move to another field or until 5 seconds have lapsed since a character was last entered. During the time the entry is underlined, no other program can modify this value.

The changes you make on most property tabs take place immediately. There is no cancel or undo option for this dialog.

NOTES In MAESTRO, the **Download Spectra** and **View ZDT Corrected** commands on the **Acquire** menu and the **Smooth** and **Strip** commands on the **Calculate** menu are disabled for this instrument.

9.3.1. Amplifier

Figure 63 shows the Amplifier tab, which contains the controls for **Gain**, **Baseline Restore**, **Input Polarity**, and optimization (the Preamplifier Type cannot be changed).

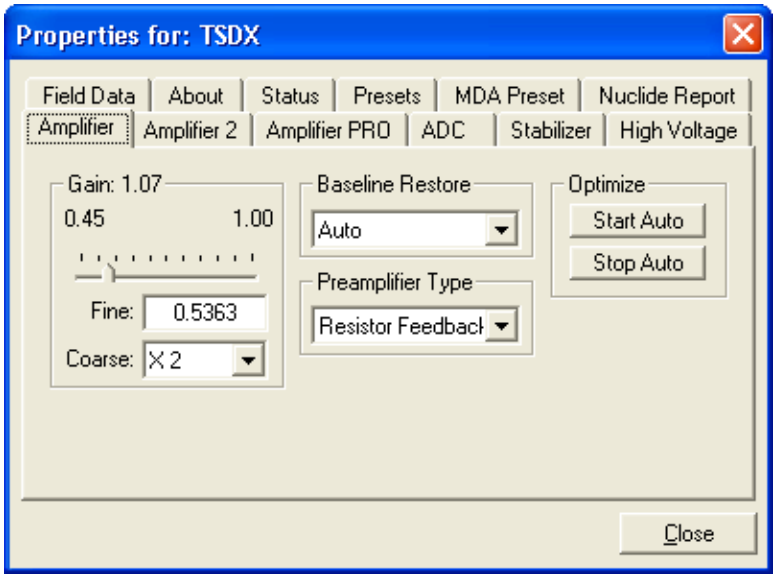

Figure 63. Amplifier Tab.

Gain — Set the amplifier coarse gain by selecting from the **Coarse** droplist, then adjust the **Fine** gain with the horizontal slider bar or the edit box, in the range of 0.45 to 1.00. The resulting effective gain is shown at the top of the **Gain** section. The two controls used together cover the entire range of amplification from 0.45 to 32.

Baseline Restore — Returns the baseline of the pulses to the true zero between incoming pulses. This improves the resolution by removing low frequency noise such as dc shifts or mains power ac pickup. The baseline settings control the time constant of the circuit that returns the baseline to zero. There are three fixed choices (**Auto**,[13] **Fast**, and **Slow**). The fast setting is used for high count rates, the slow for low count rates. **Auto** adjusts the time constant as appropriate for the input count rate. The settings are saved in the trans-SPEC even when the power is off. The time constant can be manually set on the InSight Virtual Oscilloscope display on the Amplifier 2 tab.

You can view the time when the baseline restorer is active on the InSight display as a **Mark** region. In the automatic mode, the current value is shown on the InSight sidebar. For a low-count-rate system, the value will remain at about 90. See the accompanying MAESTRO *User's Manual* for complete information on InSight Mode.

[13]U.S. Patent No. 5,912,825.

Optimize — The trans-SPEC is equipped with both automatic pole-zero logic[14] and automatic flattop logic.[15] The **Start Auto** optimization button uses these features to automatically choose the best pole zero and flattop tilt settings. During optimization, pole zeroes are performed for several rise-time values and the trans-SPEC is cycled through all the rise time values for the determination of the optimum tilt values. As all of the values for all the combinations are maintained in the trans-SPEC, the optimize function does not need to be repeated for each possible rise time.

As with any system, the trans-SPEC should be optimized any time the flattop width is changed. The detector should be connected in its final configuration before optimizing is started. Use a source with sufficient activity to produce a count rate of 5000 cps (monitor with MAESTRO's **Input Count Rate** command) unless a guidance message is displayed in the lower left of the tab. Click **Start Auto**. The process should take approximately 5 minutes to complete. If it does not, click **Stop Auto**, check the input count rate, and reposition the source as necessary before re-optimizing.

The effect of optimization on the pulse can be seen in the InSight mode, on the Amplifier 2 tab. Note, however, that if the settings were close to proper adjustment before starting optimization, the pulse shape might not change enough for you to see. (In this situation, you also might not notice a change in the shape of the spectrum peaks.) The most visible effect of incorrect settings is high- or low-side peak tailing or poor resolution.

9.3.2. Amplifier 2

Figure 64 shows the Amplifier 2 tab, which accesses the advanced shaping controls including the InSight Virtual Oscilloscope mode, which is discussed in the MAESTRO *User's Manual*.

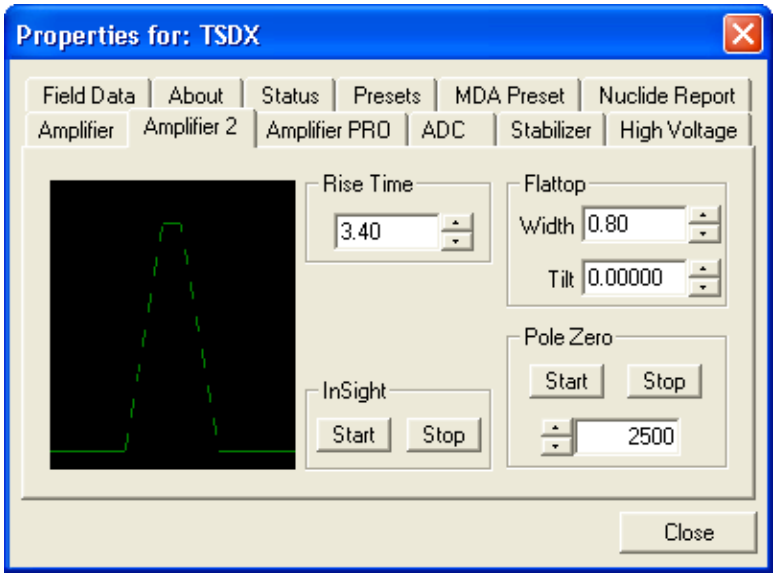

Figure 64. Amplifier 2 Tab.

The **Rise Time** value affects both the rise and fall times, thus, changing the rise time has the effect of spreading or narrowing the quasi-trapezoid symmetrically. The setting can range from 0.8 to 23.0. This range allows you to precisely control the tradeoff between resolution and throughput. Starting

[14]U.S. Patent No. 5,872,363.

[15]U.S. Patent No. 5,821,533.

with the default value, increase the rise time for better resolution for expected lower count rates; and reduce it when unusually high count rates are anticipated, for higher throughput with somewhat worse resolution.

The **Flattop** controls adjust the top of the quasi-trapezoid. The **Width** adjusts the extent of the flattop (from 0.3 μs to 2.4 μs). The **Tilt** adjustment varies the "flatness" of this section slightly. The **Tilt** can be positive or negative. Choosing a positive value results in a flattop that slopes downward; choosing a negative value gives an upward slope. Alternatively, the optimize feature on the Amplifier tab can set the tilt value automatically. This automatic value is normally the best for resolution, but it can be changed on this dialog and in the InSight mode to accommodate parti-cular throughput/resolution tradeoffs. The optimize feature also automatically adjusts the pole-zero setting.

The dead time per pulse is approximately $(3 \times \textit{Rise Time}) + (2 \times \textit{Flattop Width})$.

In the **Pole Zero** section, the **Start** button performs a pole zero at the specified rise time and other shaping values. Unlike the optimize feature, it performs a pole zero for only the one rise time. The pole-zero **Stop** button aborts the pole zero, and is normally not used. Use a source of sufficient activity to generate an input count rate of 5000 cps. The operation should take approximately 5 minutes.

After all the controls have been adjusted, return to the Amplifier tab and click on the **Start Auto** optimization button. The most recent settings are saved in the trans-SPEC firmware even when the power is turned off.

For the more advanced user, the InSight mode allows you to directly view all the parameters and adjust them interactively while collecting live data. To access the InSight mode, go to the **InSight** section and click **Start**. Once data acquisition is underway, the advanced user might wish to select **MCB Properties...** and click on the **InSight** section's **Start** button to adjust the shaping parameters interactively with a "live" waveform showing the actual pulse shape.

9.3.3. Amplifier PRO

Figure 65 shows the Amplifier PRO tab, which contains the **Low Frequency Rejector** (LFR) filter control. Turning it off causes shifting and/or broadening of peaks in addition to the acquisition of noise in the lowest-energy channels. We strongly recommend the LFR be enabled during all data acquisitions. Note, however, that you must turn the LFR *off* to pole-zero the Detective. Subsequent measurements can then be taken with the LFR filter on.

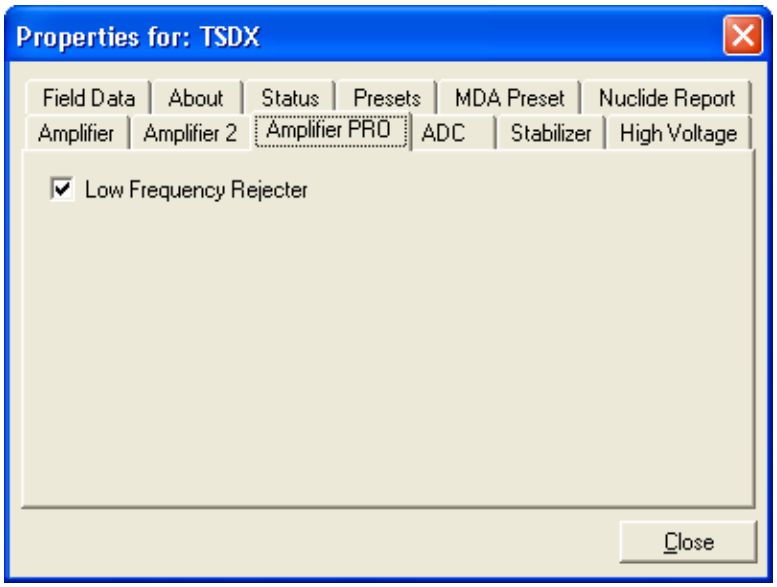

Figure 65. Amplifier PRO.

9.3.4. ADC

This tab (Fig. 66) contains the **Conversion Gain**, **Lower Level Discriminator**, and **Upper Level Discriminator** controls. In addition, the current real time, live time, and count rate are monitored at the bottom of the dialog.

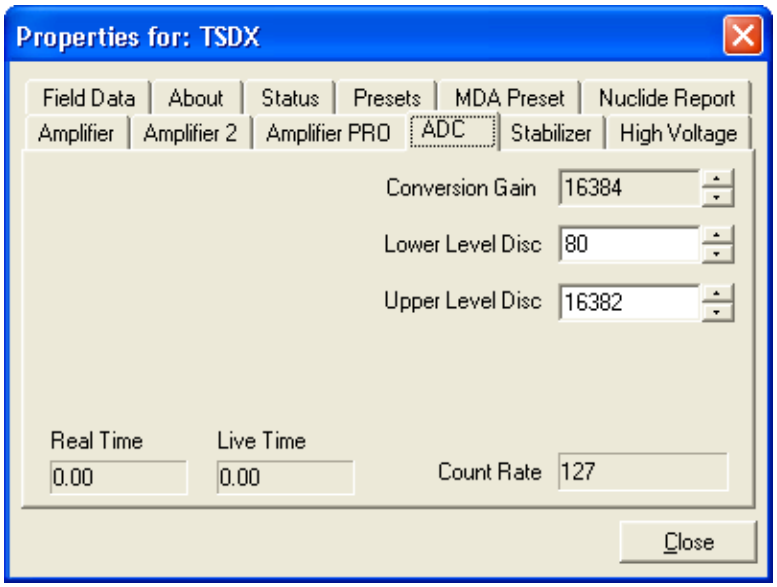

Figure 66. ADC.

Conversion Gain — This sets the maximum channel number in the spectrum. If set to 16384, the energy scale will be divided into 16384 channels. The conversion gain is entered in powers of 2 from 512 to 16384 channels. The up/down arrow buttons step through the valid settings for the instrument.

Upper- and Lower-Level Discriminators — The **Lower Level Discriminator** sets the level of the lowest amplitude pulse that will be stored. This level establishes a hard lower-level cutoff, by channel number, for ADC conversions. Setting that level above random noise increases useful throughput because the MCB is not unproductively occupied processing noise pulses. The

Upper Level Discriminator sets the level of the highest amplitude pulse that will be stored. This level establishes a hard upper-level cutoff, by channel number, for ADC conversions.

9.3.5. Stabilizer

The trans-SPEC has both gain and zero stabilizers. See the MAESTRO manual for a more detailed discussion of each.

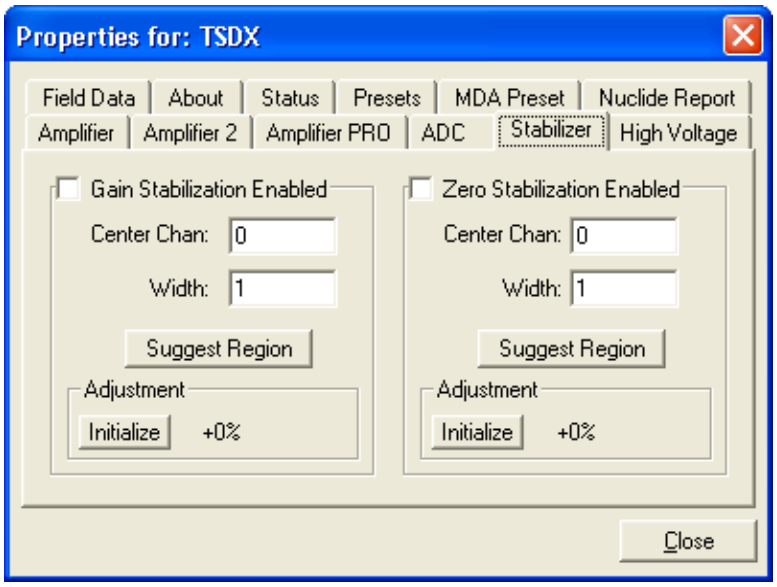

Figure 67. Stabilizer.

The Stabilizer tab (Fig. 67) shows the current values for the stabilizers. The value in each **Adjustment** section shows how much adjustment is currently applied. The **Initialize** buttons set the adjustment to 0. If the value approaches 90% or above, the amplifier gain should be adjusted so the stabilizer can continue to function — when the adjustment value reaches 100%, the stabilizer cannot make further corrections in that direction. The **Center Cha**nnel and **Width** fields show the peak currently used for stabilization.

To set up the stabilizer, enter the **Center Cha**nnel and **Width** values manually or click on the **Suggest Region** button. **Suggest Region** reads the position of the marker and inserts values into the fields. If the marker is in an ROI, the limits of the ROI are used. If the marker is not in an ROI, the center channel is the marker channel and the width is 3 times the FWHM at this energy.

Now click on the appropriate **Enabled** checkbox to turn the stabilizer on. Until changed in this dialog, the stabilizer will stay enabled even if the power is turned off. When the stabilizer is enabled, the **Center Cha**nnel and **Width** cannot be changed.

9.3.6. High Voltage

Figure 68 shows the High Voltage tab, which allows you to turn the bias voltage off and on, and monitor the **Actual** bias. You cannot adjust the bias voltage or polarity, nor can you change the **Shutdown** mode, which is fixed as **SMART**.[16]

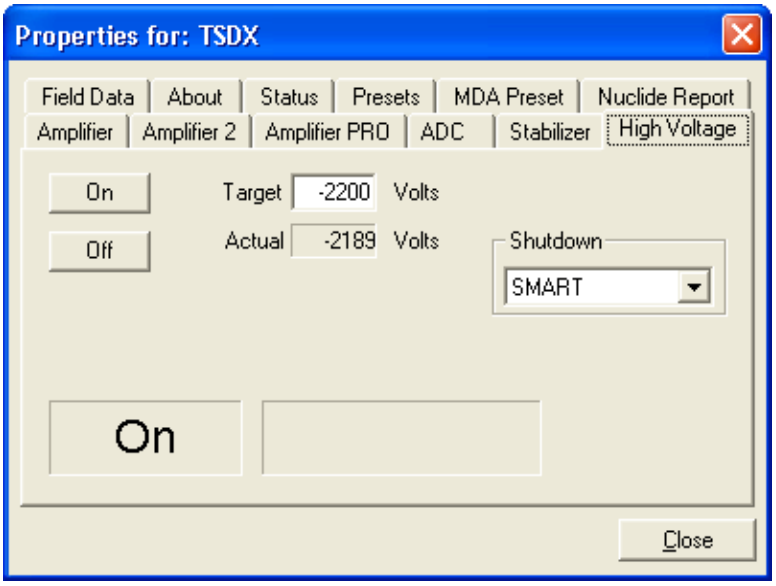

Figure 68. High Voltage.

9.3.7. Field Data

This tab (Fig. 69) is not used, and always displays 0 Stored Spectra in the lower left corner. To transfer stored spectra to a computer, see Section 5.

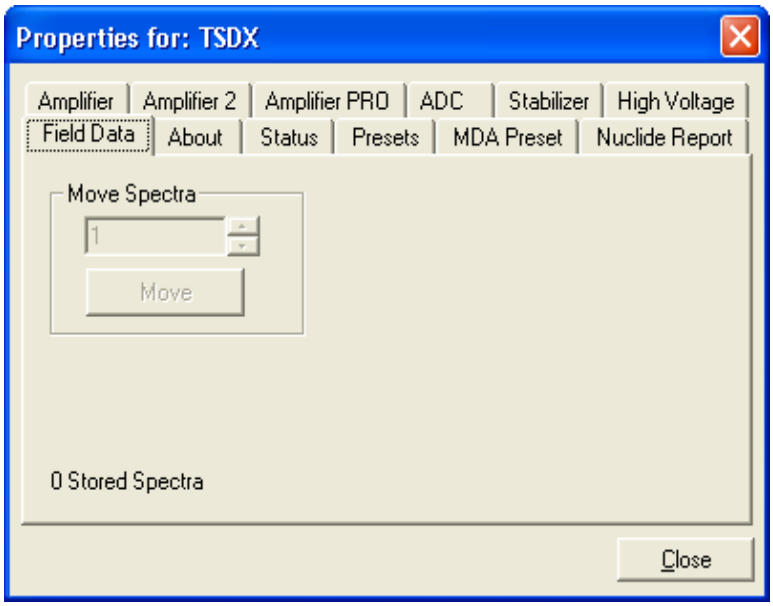

Figure 69. Field Data.

[16]This is a reference to the trans-SPEC's SMART-1™ detector technology. For more information on SMART-1, see the ORTEC catalog or visit www.ortec-online.com.

9.3.8. About

This tab (Fig. 70) displays hardware and firmware information about the trans-SPEC as well as the data **Acquisition Start Time**. In addition, the **Access** field shows whether the MCB is currently locked with a password by MAESTRO. **Read/Write** indicates the MCB is unlocked and **Read Only** means it is locked. See the MAESTRO *User's Manual* for more information.

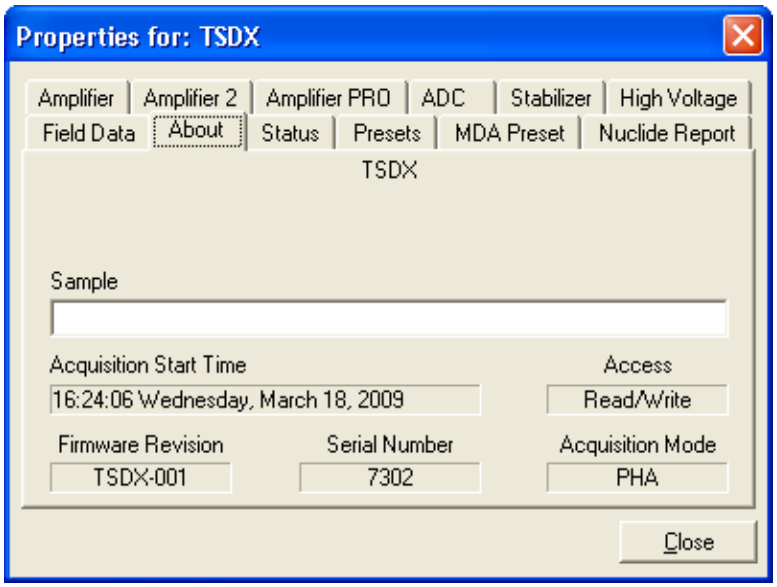

Figure 70. About.

Use the **Firmware Revision** field to determine the instrument type and firmware version. This parameter is formatted *TSDX-nnn*, where *nnn* is the firmware version. In the accompanying illustration, *TSDX-001* indicates a trans-SPEC running firmware v1. You can also use the About tab to view this information for .SPC format spectra downloaded from the trans-SPEC.

9.3.9. Status

Figure 71 shows the Status tab. Ten parameters are continuously monitored in real time. Satisfactory status is reported as OK or a numerical value. A failure is reported as ERR or a descriptive message. Use the drop-lists to select any six parameters to be displayed simultaneously. You can change the selected parameters at any time.

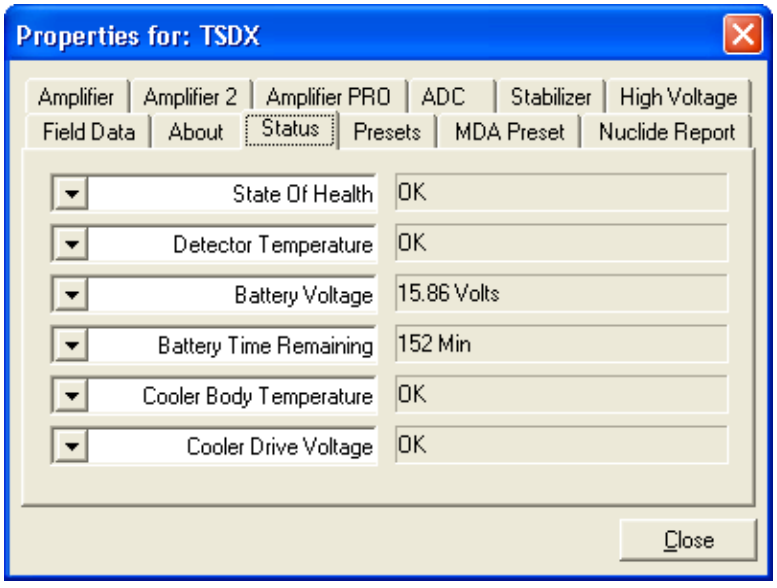

Figure 71. Status.

The monitored parameters are:

- Detector **State of Health** — reported as OK or ERR.
- **Gamma Dose Rate** — reported in µSv/h.

- **Detector Temperature** — reported as OK or ERR.
- **Battery Voltage** — reported in volts.
- **Battery Time Remaining** — in minutes.
- **Cooler Body Temperature** — OK or ERR.
- **Cooler Drive Voltage** — OK or ERR.
- **Cold-Tip Temperature** — OK or ERR.
- **HV Bias** — in volts.
- **ID Table Version** — not used by the trans-SPEC.

To resolve status problems, refer to Chapter 6. For further assistance, contact your ORTEC representative or our Global Service Center.

9.3.10. Presets

Figure 72 shows the Presets tab. The presets can only be set when the trans-SPEC is not acquiring data (during acquisition the preset field backgrounds are gray indicating that they are inactive). You can use any or all of the presets at one time. To disable a preset, enter a value of zero. If you disable all of the presets, data acquisition will continue until manually stopped.

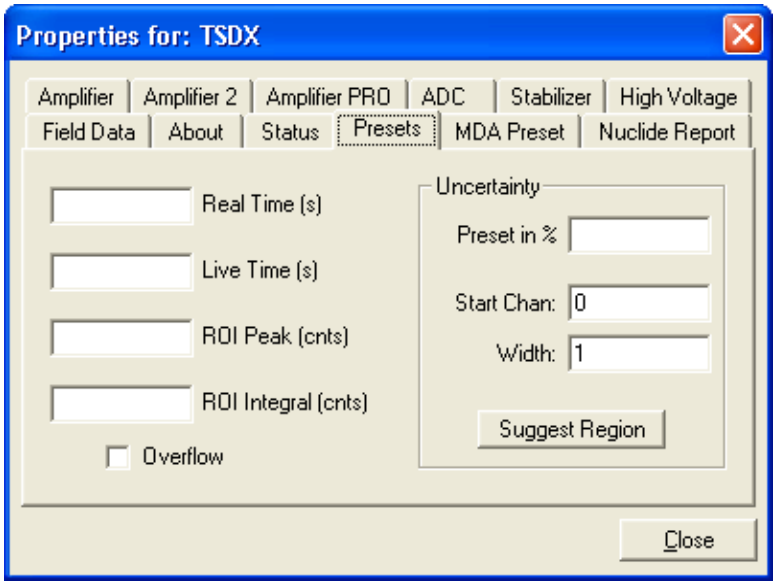

Figure 72. Presets.

When more than one preset is enabled (set to a non-zero value), the first condition met during the acquisition causes the MCB to stop. This can be useful when you are analyzing samples of widely varying activity and do not know the general activity before counting. For example, the **Live Time** preset can be set so that sufficient counts can be obtained for proper calculation of the activity in the sample with the least activity. But if the sample contains a large amount of this or another nuclide, the dead time could be high, resulting in a long counting time for the sample. If you set the **ROI Peak** preset in addition to

the **Live Time** preset, the low-level samples will be counted to the desired fixed live time while the very active samples will be counted for the ROI peak count. In this circumstance, the **ROI Peak** preset can be viewed as a "safety valve."

The values of all presets for the currently selected MCB are shown on the Status Sidebar. These values do not change as new values are entered on the Presets tab; the changes take place only when you **Close** the Properties dialog.

Enter the **Real Time** and **Live Time** presets in units of seconds and fractions of a second. These values are stored internally with a resolution of 20 milliseconds (ms) since the MCB clock increments by 20 ms. Real time means elapsed time or clock time. Live time refers to the amount of time that the MCB is available to accept another pulse (i.e., is not busy), and is equal to the real time minus the dead time (the time the MCB is not available).

Enter the **ROI Peak** count preset value in counts. With this preset condition, the MCB stops counting when any ROI channel reaches this value unless there are no ROIs marked in the MCB, in which case that MCB continues counting until the count is manually stopped.

Enter the **ROI Integral** preset value in counts. With this preset condition, the MCB stops counting when the sum of all counts in all channels for this MCB marked with an ROI reaches this value. This has no function if no ROIs are marked in the MCB.

The **Uncertainty** preset stops acquisition when the statistical or counting uncertainty of a user-selected net peak reaches the value you have entered. Enter the **Preset in %** value as percent uncertainty at 1 sigma of the net peak area. The range is from 99% to 0.1% in 0.1% steps. You have complete control over the selected peak region. Note that MAESTRO calculates this preset once per 40 seconds. Therefore, the software will continue data acquisition up to 40 seconds after the preset has been reached, and the uncertainty achieved for a high count-rate sample may be lower than the preset value.

Use the **Start Chan**nel and **Width** fields to enter the channel limits directly, or click on **Suggest Region**. If the marker is positioned in an ROI around the peak of interest, **Suggest Region** reads the limits of the ROI with the marker and display those limits in the **Start Chan** and **Width** fields. The ROI can be cleared after the preset is entered without affecting the uncertainty calculation. If the marker is not positioned in an ROI, the start channel is 1.5 times the FWHM below the marker channel and the width is 3 times the FWHM.

The net peak area and statistical uncertainty are calculated in the same manner as for the MAESTRO **Peak Info** command.

Marking the **Overflow** checkbox terminates acquisition when data in any channel exceeds $2^{31}-1$ (over 2×10^9) counts.

9.3.11. MDA Preset

The MDA preset (Fig. 73) can monitor up to 20 nuclides at one time, and stops data collection when the values of the *minimum detectable activity* (MDA) for *all* of the user-specified MDA nuclides reach the needed value. Presets are expressed in Bq, and are evaluated every 40 seconds. The detector must be calibrated for energy in all ORTEC spectroscopy applications, and for efficiency in all applications but MAESTRO.

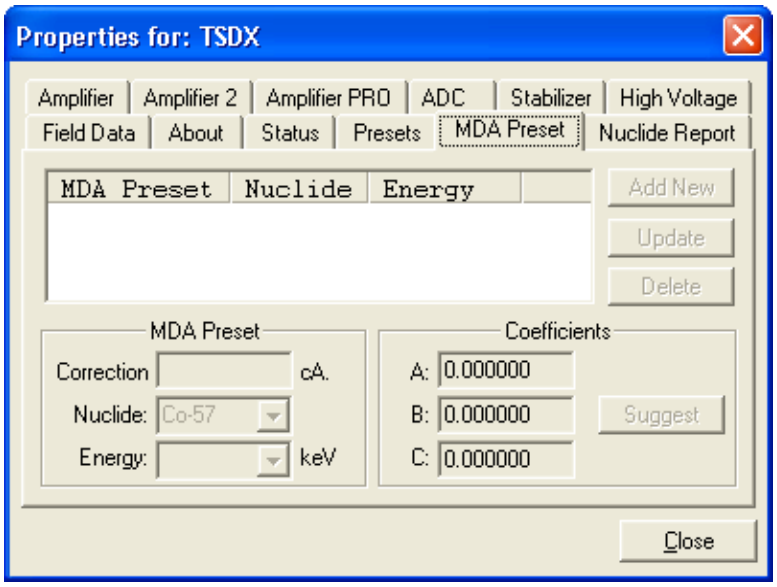

Figure 73. MDA Preset.

The MDA presets are implemented in the MCB (i.e., the entries you make on this screen are saved in the MCB memory), and have no direct link to MDA methods selected in the analysis options for applications such as GammaVision, ISOTOPIC, etc. The MDA preset calculation uses the following formula:

$$MDA = \frac{a+\sqrt{b+c*Counts}}{Live\ time * (CorrectionFactor)}$$

where:

a, *b*, and *c* are determined by the MDA criteria you choose.

Counts is the gross counts in an ROI that is 2.5×FWHM around the target peak energy.

Live time is evaluated in 40 second intervals for the MDA presets.

CorrectionFactor is the product of the calibration efficiency at the specified peak energy and the peak's branching ratio (yield) as listed in the working (active) library.

NOTE MAESTRO does not support efficiency calibration. The efficiency component in the *CorrectionFactor* is set to 1.0; the preset field is labeled **Correction** instead of

MDA; and the preset is based on counting activity (**cA**) instead of becquerels. You can enter the MDA preset either in counts; or corrected for factors such as sample volume, attenuation, or calculated efficiency. For example, if you manually calculate the efficiency for a peak, you can enter a corrected MDA target value by multiplying the desired MDA value times the calculated efficiency, and entering the product as the **Correction**.

To add an MDA preset, enter the preset value in the **MDA** or **Correction** field; select the **Nuclide** and **Energy**; enter the desired values for coefficients *a*, *b*, and *c*; then click **Add New**.

To edit an existing preset, click to highlight it in the table. This will load its **Nuclide, Energy**, and coefficients in the lower sections of the dialog. Change as needed, then click **Update**.

To remove a preset, click to highlight it in the table, then click **Delete**.

IMPORTANT These MDA presets *are not dynamically calculated.* Each time you add an MDA preset to this table, its *CorrectionFactor* value is calculated and stored in the MCB's memory. If you then load a different library, change the efficiency calibration, or change the system geometry, the spectroscopy application *will not update* the existing *CorrectionFactor*s, and your MDA presets may no longer be applicable.

When using spectrum analysis applications such as GammaVision and ScintiVision, you can create an analysis options file (.SDF or .SVD file) for each system geometry that you use; and include in it a set of MDA presets specific to that geometry, efficiency calibration, and nuclide library. You can then recall this tailored analysis options file as needed.

9.3.12. Nuclide Report

Figure 74 shows the Nuclide Report tab. The Nuclide Report displays the activity of up to 9 user-selected peaks. Once the report is set up you can view the Nuclide Report at any time on the trans-SPEC display. The peak area calculations in the hardware use the same methods as the MAESTRO **Peak Info** calculation, so the Nuclide Report display is the same as the **Peak Info** display on the selected peak in the spectra stored in the computer. The calculated value is computed by multiplying the net peak count rate by a user-defined constant. If the constant includes the efficiency and branching ratio, the displayed value is the activity. You enter the nuclide label and the activity units.

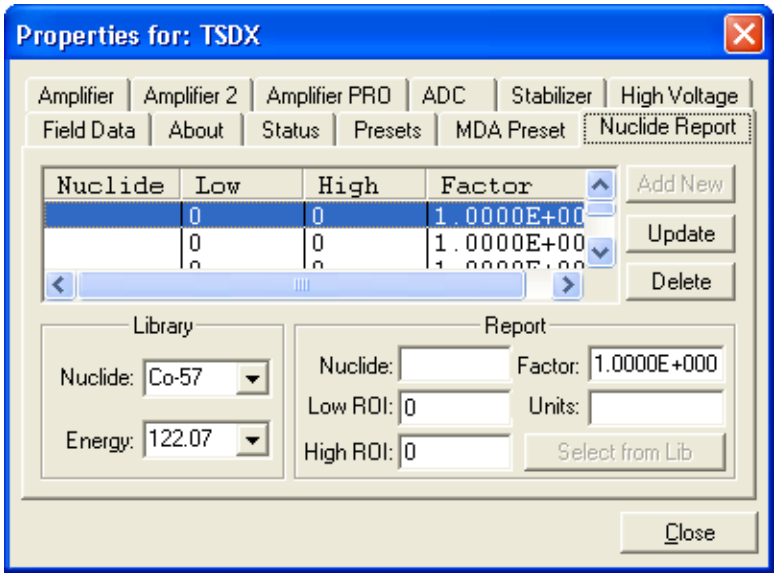

Figure 74. Nuclide Report.

The report format and calculations are discussed in detail in Section 7.1.

9.3.12.1. Add New

- **Manual Add** — Nuclides can be added to the list using the library to assist in the region definition or manually. To add a nuclide manually, enter the nuclide name, ROI start and end channels, multiplicative factor and units in the Report section. Now press **Add New** to add this nuclide to the list. The units need only be entered once, since they are the same for all nuclides in the table.

- **Library Add** — To use the library to aid in the definition, select the nuclide from the library nuclide drop down list. Now select the gamma-ray energy from the Energy drop down list. This defines what gamma ray to use. Now Press the **Select from Lib** button in the Report section. This will update all the entries in this section and show (as a yellow band) the region to be used in both the expanded spectrum and the full window. Now press **Add New** to add this nuclide to the list.

- **Edit** — To change any of the current nuclides, select the nuclide in the list (use the scroll bars if needed). This will show the current settings for this nuclide. Make any changes needed. Any or all of the entries can be changed. When finished with the changes, click on **Update**.

- **Delete** — To remove an entry, select the entry and press **Delete**.

When you close the Properties dialog, all the values entered are written to the trans-SPEC and are used when you view the Nuclide Report on the trans-SPEC display.

[Intentionally blank]

10. FIRMWARE COMMANDS AND RESPONSES

Most software communication with the trans-SPEC will be through the CONNEC-TIONS software layer. CONNECTIONS is used by all ORTEC software and can be accessed for other software development with our CONNECTIONS Programmer's Toolkit with Microsoft ActiveX® Controls (A11-BW). Use the DLL interface call MIOComm or the ActiveX control UCONN's Comm method to send commands to instruments and receive responses.

10.1. Command Format

The commands consist of a command header that may be followed by numeric parameter values. The header consists of a verb; a verb and noun; or a verb, noun, and modifier; each separated by underscores. The first four letters of a word in a command will always be enough to uniquely identify that word when composing commands for the instrument. For example, the command **ENABLE_GAIN_STABILIZATION** can be abbreviated to **ENAB_GAIN_STAB**.

Numeric parameters are unsigned integer numbers that follow the command header separated by one or more spaces. Specific commands require multiple parameters, separated by commas, that specify numeric quantities related to the operation of the MCB, such as live time or conversion gain. The command **SET_WINDOW 0,8192** has two parameters, 0 and 8192, which set the window of interest to start at channel 0 and continue for 8192 channels.

Some parameters are optional and are delimited by square brackets in the command prototype line to distinguish them from mandatory parameters (e.g., SET_WINDOW [start,length]). Commands with optional parameters can be sent to the MCB without the optional parameters, in which case the instrument behavior will be explained in the command description.

10.2. Error Codes

On each completion of the command, the MCB returns a macro error code and micro error code. The macro error code represents the general class of error with 0 meaning no error, and the micro error code represents the sub-class of error with 0 meaning no error. In case of error condition, you can use the MIOGetLastError (DLL interface) or GetErrMajor, GetErrMinor (ActiveX control interface).

Macro error codes:

0	Success
1	Power-up just occurred
2	Battery-backed data lost
129	Command syntax error

131	Command execution error
132	Invalid Command

For macro code 129 (syntax error) or 131 (execution error), the following apply:

1	Invalid Verb
2	Invalid Noun
4	Invalid Modifier
128	Invalid first parameter
129	Invalid second parameter
130	Invalid third parameter
131	Invalid fourth parameter
132	Invalid number of parameters
133	Invalid command
134	Response buffer too small
135	Not applicable while active
136	Invalid command in this mode
137	Hardware error
138	Requested data not found

Micro error codes:

0	Success
1	Input already started/stopped
2	Preset already exceeded
4	Input not started/stopped
64	Parameter was rounded (for decimal numbers)
128	No sample data available

10.2.1. Dollar Response Records

SHOW and STEP commands respond with a single dollar response record followed immediately by a percent response record. All valid dollar response records for each command are listed in the command dictionary.

The following list provides the general form of each dollar response record for the MCB API. In this list, lower case letters represent numeric values. The letters "**ccc**" always represent an 8-bit

unsigned checksum of all characters on the record up to but not including the checksum characters, and **<CR>** represents the ASCII carriage return character.

$Axxxccc<CR>	xxx is a single 8-bit unsigned number.
$Cxxxxxccc<CR>	xxxxx is a single 16-bit unsigned number.
$Dxxxxxyyyyyccc<CR>	xxxxx and yyyyy are 16-bit unsigned numbers.
$Exxxxxccc<CR>	xxxxx is a single 16-bit alarm mask.
$Fssss...<CR>	ssss... is a variable length ASCII character sequence (no checksum is sent with this record).
$Gxxxxxxxxxccc<CR>	xxxxxxxxxx is a single 32-bit unsigned number.
$IT<CR>	True response to a SHOW command (no checksum).
$IF<CR>	False response to a SHOW command (no checksum).
$Jxxxxxyyyyy...ccc<CR>	Response to SHOW_CONFIGURATION command.
$Mxxxxxxxxxx...ccc<CR>	Response to SHOW_STATUS command.
$Nxxxyyyzzzccc<CR>	xxx, yyy, and zzz are 8-bit unsigned numbers.

10.2.2. MCB Commands

This section lists each command with a description of its operation. The descriptions include a list of any error codes that may result. As described in the two preceding sections, the usual response is a macro error code of 0 and a micro error code of 0 (no errors). Though syntax and communication error responses may result from any command, in practice, these error responses rarely occur on systems with reliable communication hardware running debugged software.

The commands are listed in alphabetical order, each starting with a command prototype line. Uppercase letters, numeric digits, blank space, and special symbols such as the underscore "**_**" and comma 13 "**,**" in the prototype line are *literal text to be sent to the MCB exactly as they appear*. Lowercase letters in the prototype line represent numeric values as described in the accompanying text; they should not be sent literally to the MCB but should be replaced by an appropriate numeric value. In this section the term **<CR>** represents the ASCII carriage return character, decimal value 13; and the character "**_**" represents the ASCII underscore character, decimal value 95.

CLEAR

The channels of spectral data in the window of interest (see SET_WINDOW command) are set to zero. The live time and true time counters are also set to zero. This command is equivalent to the combination of CLEAR_COUNTERS and CLEAR_DATA commands.

CLEAR_ALL
This command is equivalent to the combination of CLEAR_COUNTERS, CLEAR_DATA, CLEAR_PRESETS, and CLEAR_ROI commands.

CLEAR_DATA
The channels of spectral data in the window of interest (see SET_WINDOW command) are set to zero. The ROI flags are not changed, nor are the presets changed.

CLEAR_HV_HEALTH
Clears (resets) the state-of-health bits.

CLEAR_MDA_PRESET
Clears all MCA preset values. This command is used to quickly clear the list of MDA preset values.

CLEAR_NUCLIDE [PeakNumber]
Clears all parameters for a specific nuclide peak number. This command is used to quickly clear the list of nuclide values.

CLEAR_NUCLIDE_ALL
Clears all nuclide values. This command is used to quickly clear the list of nuclide values.

CLEAR_PRESETS
The live time, true time, ROI integral, ROI peak, and overflow presets are all set to zero (disabled).

CLEAR_ROI
The region-of-interest flags for the channels in the window of interest (see SET_WINDOW command) in the currently selected device (see SET_DEVICE command) are cleared.

CLEAR_SPECTRUM_ALL
Clears all stored spectra from stored spectrum memory.

COMP
Selects the computer mode for the communication replies.

DISA_CLICKER
Turns off audio clicker.

DISABLE_BLRE_AUTOMATIC
Disables the automatic determination of baseline restorer time constant. See also ENABLE_BLRE_AUTOMATIC, SET_BLRE, and SHOW_BLRE.

DISABLE_GAIN_STABILIZATION
Stops stabilization of the gain peak while data is being acquired. The gain stabilization adjustment is held at its current value until either gain stabilization is reenabled with the ENABLE_GAIN_STABILIZATION command or reinitialized with the INITIALIZE_GAIN_STABILIZATION, SET_GAIN_PEAK or SET_GAIN_WIDTH command. See also SHOW_GAIN_STABILIZATION.

DISABLE_HV
Turns off the high-voltage enable signal of the trans-SPEC. See the section on the bias supply for more information about the high-voltage output. See also ENABLE_HV and SHOW_HV.

DISABLE_OPTI_NEED
Disables the reporting of an error when the trans-SPEC has not been optimized.

DISABLE_OVERFLOW_PRESET
Disables the overflow preset. Channels that receive a count when they contain 2147483647 counts, the maximum number of counts, will roll over to zero counts if the overflow preset is disabled. See also ENABLE_OVERFLOW_PRESET and SHOW_OVERFLOW_PRESET.

DISABLE_PZ_NEED
Disables the reporting of an error when the trans-SPEC has not been pole zeroed.

DISABLE_REMOTE
Disables the recognition of commands on the alternate communication path. See also ENABLE_REMOTE and SHOW_REMOTE.

DISABLE_THRESHOLD_AUTOMATIC
DISABLE_THRESHOLD_SAMPLE
DISABLE_TRIGGER_SPECIAL
No function in the trans-SPEC; included for backward compatibility.

DISABLE_ZERO_STABILIZATION
Stops stabilization of the zero peak while data is being acquired. The zero stabilization adjustment is held at its current value until either zero stabilization is reenabled with the ENABLE_ZERO_STABILIZATION command or reinitialized with the INITIALIZE_ZERO_STABILIZATION, SET_ZERO_CHANNEL or SET_ZERO_WIDTH commands. See also SHOW_ZERO_STABILIZATION.

ENABLE_BLRE_AUTOMATIC
Enables the automatic determination of baseline restorer time constant. See also DISABLE_ BLRE_AUTO, SHOW_BLRE, and SET_BLRE.

ENAB_CLICKER
Turns on audio clicker. Clicker makes a "Click" sound for each predefined number of gamma rays that strike the detector. (See Clicker_Sensitivity).

ENABLE_GAIN_STABILIZATION
Enables the stabilization of the gain peak by the previously selected method, either Gauss mode or point mode (see SET_MODE_GAUSS and SET_MODE_POINT). See also DISABLE_GAIN_STABILIZATION, SHOW_GAIN_STABILIZATION, and INITIALIZE_ GAIN_STABILIZATION.

ENABLE_HV
Turns on the high-voltage enable output of the trans-SPEC. See also DISABLE_HV and SHOW_HV.

ENABLE_OPTI_NEED
Enables the reporting of an error when the trans-SPEC needs optimizing.

ENABLE_OVERFLOW_PRESET
Enables the overflow preset. Channels that receive a count when they contain 2147483647 counts, the maximum number of counts, will stop the acquisition if the overflow preset is enabled. The channel that caused the preset to complete will contain 2147483647 counts. See also DISABLE_OVERFLOW_PRESET and SHOW_OVERFLOW_PRESET commands.

ENABLE_PZ_NEED
Enables the reporting of an error when the trans-SPEC needs pole zeroing.

ENABLE_REMOTE
Enables the recognition of commands on the alternate communication path. If this command is sent to the trans-SPEC via Ethernet, it enables command recognition on the serial line.

ENABLE_THRESHOLD_AUTOMATIC
Enables automatic determination of the positive and negative thresholds. See also DISABLE_THRESHOLD_AUTO, SHOW_THRESHOLD_ AUTO, SET_THRESHOLD_ NEGATIVE, and SET_THRESHOLD_POSITIVE.

ENABLE_THRESHOLD_SAMPLE
ENABLE_TRIGGER_SPECIAL
No function; included for backward compatibility.

ENABLE_ZERO_STABILIZATION
Enables the stabilization of the zero peak by the previously selected method, either Gauss mode or point mode (see SET_MODE_GAUSS and SET_MODE_POINT). See also DISABLE_ZERO_ STABILIZATION, SHOW_ZERO_STABILIZATION, and INITIALIZE_ZERO_STABILIZATION.

INITIALIZE
Returns the trans-SPEC to the factory default settings.

INITIALIZE_GAIN_STABILIZATION
Resets the gain peak stabilization adjustment to unity (no adjustment). This value is reported as 2048 by the SHOW_GAIN_ADJUSTMENT command. See also SET_GAIN_ ADJUSTMENT, ENABLE_GAIN_ STABILIZATION, and DISABLE_GAIN_ STABILIZATION.

INITIALIZE_ZERO_STABILIZATION
Resets the zero peak stabilization adjustment to unity (no adjustment). This value is reported as 2048 by the SHOW_ZERO_ADJUSTMENT command. See also SET_ZERO_ ADJUSTMENT, ENABLE_ZERO_STABILIZATION, and DISABLE_ZERO_ STABILIZATION.

LIST_BLRE
Lists the valid settings of the baseline restore function.

LIST_CLICKER_SENSITIVITY
List all possible sensitivity settings. Should report: CLICKER_SENS Maximum High Medium Low.

LIST_CORR_FLAT
Lists the valid settings of the flattop width.

LIST_GAIN_COARSE
Lists the valid coarse-gain settings.

LIST_GAIN_FINE
Lists the valid fine-gain settings.

LIST_HV
Lists the valid high-voltage settings.

LIST_ROI_SAMPLE
Lists the valid ROI sample settings.

LIST_SHAP_CUSP
Lists the valid cusp shape settings.

LIST_SHAP_FLAT
Lists the valid flattop width settings.

LIST_SHAP_RISE
Lists the valid rise-time settings.

LIST_SHUT
Lists the valid shutdown settings.

LIST_TRIG_SAMPLE
Lists the valid sample trigger settings.

SAMPLE
Sending this command causes another waveform to be captured in InSight mode. This command is invalid when not in InSight mode.

SET_BLRE baseline
This sets the baseline restorer time constant to the value baseline. Baseline is in microseconds with a range from 10 to 100. The specified value is only used if automatic baseline restorer mode is disabled. See also ENABLE_BLRE, DISABLE_BLRE, and SHOW_BLRE.

SET_DATA [start, chans],value
If the optional start and chans parameters are included in this command, the range of channels specified by start and chans is loaded with value. If start and chans are not specified, sets all channels of spectral data in the window of interest (see SET_WINDOW command) to the specified value. ROI flags are not affected.

SET_DATA_APPLICATION "string1","string2"
This is used to store information in the trans-SPEC internal memory that can be used by other programs, such as sample descriptions and energy calibrations. The Unified MCB Interface (UMCBI) structure and ORTEC CONNECTIONS make use of this feature. String1 = the data identifier, 32 bytes maximum; string2 = the data, 128 bytes maximum.

SET_DATE day,month,year

Sets the date stored in the battery backed-up system clock to the specified values. Day can be any value from 1–31; month any value from 1–12; and year any value from 0–99. The current date and time are stored for a device when an acquisition is started. See also SHOW_ DATE, SET_TIME, and SHOW_TIME.

SET_DATE_START day,month,year

Sets the start date to the specified values. Normally the start date and time are set automatically whenever a device is started with the START command. See also SHOW_DATE_ START, SET_TIME_START, and SHOW_TIME_START.

SET_DELAY_COLLECTION value

Controls the pileup rejector by setting a width threshold such that if a fast channel discriminator pulse is wider than value, the pulse is rejected. This portion of the pileup rejector rejects pulses that are too close together to be detected separately by the fast channel. Value is in microseconds with a range from 0.250 to 1.6 in steps of 0.05. See also SHOW_ DELAY_COLLECTION.

SET_DELAY_SAMPLE num

Delays the waveform collected in InSight mode by num points. Num must be between 0 and 65535. See also SHOW_DELAY_SAMPLE.

SET_GAIN_ADJUSTMENT value

Sets the gain stabilization adjustment to an arbitrary value from –65535 to 65535. This adjustment is usually made only by the gain stabilizer, and reset to 0 with the INITIALIZE_ GAIN_STABILIZATION command. See also SHOW_GAIN_ ADJUSTMENT.

SET_GAIN_CHANNEL chan

Sets the center channel for the stabilizer gain peak. If a gain channel is chosen such that the beginning channel or ending channel would be below channel 0 or above the maximum channel as determined by the conversion gain, the gain peak width is reduced until the peak fits the device boundaries. A gain channel and width must be set before gain stabilization can be enabled.

SET_GAIN_COARSE num

This sets the coarse gain to num, which must be 1, 2, 4, 8, 16, or 32. See also SHOW_GAIN_ COARSE.

SET_GAIN_CONVERSION chans

Sets the conversion gain. The conversion gain defines the number of channels within the device that will used for spectral data. This has the effect of altering the resolution of the

ADC from 15 bits (conversion gain = 16384) to 9 bits (conversion gain = 512) for the device. See also SHOW_GAIN_CONVERSION.

Legal Commands:

SET_GAIN_CONVERSION 0<CR>	Conversion gain set to default (16384).
SET_GAIN_CONVERSION 512<CR>	Conversion gain set to 512 channels.
SET_GAIN_CONVERSION 1024<CR>	Conversion gain set to 1024 channels.
SET_GAIN_CONVERSION 2048<CR>	Conversion gain set to 2048 channels.
SET_GAIN_CONVERSION 4096<CR>	Conversion gain set to 4096 channels.
SET_GAIN_CONVERSION 8192<CR>	Conversion gain set to 8192 channels.
SET_GAIN_CONVERSION 16384<CR>	Conversion gain set to 16384 channels.

SET_GAIN_FINE value

This sets the fine gain to value. Value is a floating point value from 0.45 to 1.0. See also SHOW_GAIN_FINE.

SET_GAIN_NEGATIVE

This sets the amplifier input polarity to negative.

SET_GAIN_POSITIVE

This sets the amplifier input polarity to positive.

SET_GAIN_PRESET count

Sets the Gauss mode stabilization preset for the gain peak. The preset represents the minimum number of incremental counts that must be collected in any one channel of the gain peak before the gain is evaluated by the stabilizer and potentially adjusted. See also SHOW_GAIN_PRESET.

SET_GAIN_WIDTH chans

Sets the width in channels for the stabilizer gain peak. The gain width must be chosen such that the beginning channel is no lower than channel 0 and the ending channel is no higher than the maximum channel as determined by the conversion gain. The gain channel and width must be set before gain stabilization can be enabled. The absolute minimum width for the gain peak is 3 channels, and the absolute maximum width for the gain peak is 256 channels in Gauss mode. In point mode there is no maximum peak width, though the chosen width must allow the peak to fit within the device's channel limits as stated above. See also SHOW_GAIN_WIDTH, SET_GAIN_CHANNEL and SHOW_GAIN_CHANNEL.

SET_HV value

Sets the HV bias to value, in volts.

SET_ID “<id string>”

Sets the sample id string. This string can be up to 16 characters long and can be set to any arbitrary value. The id string is intended to uniquely identify the sample being analyzed. The id string is also set by the BARCODE command and is stored with each spectrum acquired in field mode. See also SHOW_ID.

Example:

SET_ID “Site 123"

SET_INTEGRAL_PRESET count

Sets the ROI integral preset to the specified count. During data acquisition when the sum of the counts contained in the channels that have the ROI flag set reaches the integral preset count, the preset is complete and the acquisition is stopped. The actual number of counts in the ROI integral may exceed the preset value by up to 512 counts due to the pipelined architecture of the trans-SPEC. Setting an integral preset to 0 counts disables the preset. The integral preset may be set to from 0 (disabled) to 4294967295 counts. See also CLEAR_ PRESETS and SHOW_INTEGRAL_PRESET.

SET_LENGTH_SAMPLE length

Sets the number of points in the Insight mode display to the specified value. Normally this setting would remain at 1000.

SET_LIVE ticks

Sets the live-time counter to the specified number of ticks. The number represents live time in units of 20 ms (50 ticks/s). Normally this value is set by the trans-SPEC during data acquisition. See also CLEAR_COUNTERS and SHOW_LIVE.

SET_LIVE_PRESET ticks

Sets the live-time preset to the specified number of ticks (20 ms/tick). During data acquisition when the live-time counter reaches the preset number of ticks, the preset is complete and the acquisition is stopped. The preset should always be set to a multiple of 1 second. Setting a live-time preset to 0 ticks disables the preset. See also CLEAR_PRESETS and SHOW_ LIVE_PRESET.

SET_LLD chan

Sets the lower level discriminator to chan, which must be between 0 and 16383. See also SHOW_LLD.

SET_MDA_COEF a,b,c

Sets the coefficients in the MDA preset calculation to the specified values. A, b, and c are floating-point values. The MDA preset checks for the following condition to be met:

$$MDA\ Preset_i > \frac{a + \sqrt{b + c * CountsinROI_i}}{Live\ Time}$$

The calculation is performed once every 30 seconds with *i* starting at 0 and advancing through each of up to 20 unique MDA presets. *i* only advances once the preset has been met. Note that a, b, and c are the same for each of the unique presets. Only the ROI range and the MDA preset change when *i* advances. Once *i* reaches 20 or $MDAPreset_i$ equals 0, the acquisition terminates.

SET_MDA_PRESET MDAPreset,[PeakNumber]

Sets or reports the MDAPreset PeakNumber value as shown in the equation in the SET_ MDA_COEF description above. MDAPreset is usually the product of the desired MDA, the yield and the efficiency. PeakNumber is a parameter that specifies which of up to 20 (0–19) MDA presets to change. If PeakNumber is omitted in the set command, all MDA preset values will be set to 0 (disabled), and the supplied value will be applied to MDA Preset 0. This provides compatibility with old GammaVision products.

SET_MODE_PHA

The mode is set to PHA.

SET_MODE_SAMPLE

Starts InSight Virtual Oscilloscope mode.

SET_NUCLIDE_COEF NucCoef, [PeakNumber]

Sets or reports the NucCoef PeakNumber value as shown in the equation above. NucCoef is usually the product of the yield and the efficiency. PeakNumber is a parameter that specifies which of up to 9 (0–8) peaks to change. The coefficient can be any value from 0 to 65535.996 in steps of 1/256. (The add-in will convert the value to an unsigned long with a binary point between the left of the least significant byte.)

SET_NUCLIDE_DESC PeakNumber,"NucLabel"

Sets the nuclide label for the specified peak to the specified value. The label must be 6 characters or less.

SET_NUCLIDE_UNITS "units"

Sets the activity units to the specified string. The string may be no more than 6 characters.

SET_PEAK_PRESET count

Sets the ROI peak preset to the specified count. During data acquisition when the contents of any channel of a device that has the ROI flag set reaches the peak preset count, the preset is complete and the acquisition is stopped. The actual number of counts in the ROI peak may exceed the preset value by a small number of counts due to the pipelined architecture of the trans-SPEC. Setting a peak preset to 0 counts disables the preset. The peak preset may be set to from 0 (disabled) to 2147483647 counts. See also CLEAR_PRESETS and SHOW_PEAK_PRESET.

SET_ROI start_chan,number_of_chans

Sets the ROI flags for the specified channels. This command can be used multiple times to set ROI flags without affecting previously set flags. ROI flags specify channels within a device that are considered for ROI integral and ROI peak presets.

SET_ROI_MDA start,numchans, [PeakNumber]

Sets the region to use to compute the gross counts in the MDA calculation. PeakNumber is an optional parameter (assumed 0 if not present) that specifies which of up to 20 (0–19) MDA Presets to change.

SET_ROI_NUCLIDE start,numchans, [PeakNumber]

Sets the region to use to compute the net counts in the activity calculation. PeakNumber is an optional parameter (assumed 0 if not present) that specifies which of up to 9 (0–8) peaks to change.

SET_ROI_SAMPLE num

Selects which controls signals are displayed as an ROI on the captured waveform. Only a single bit can be turned on at a time. The following signals can be selected with the associated bit.

Bit 0:	Pileup reject.
Bit 1:	Negative baseline threshold.
Bit 2:	Baseline restorer gate.
Bit 3:	Positive baseline threshold.
Bit 4:	Busy.
Bit 5:	Gate.
Bit 6:	Reserved.
Bit 7:	Peak detect.
Bit 8:	Reserved.

SET_ROI_UNCERTAINTY start, chans

Sets the region to be used for the uncertainty preset calculation. See also SHOW_ROI_ UNCERTAINTY.

SET_SETTINGS num

Determines the software mode of the identifier when connected to an analysis computer. A num value of 0 configures the instrument to operate in Detective mode, in which factory-calibrated settings (such as gain, rise time, and calibration coefficients) cannot be modified. A num value of 1 configures the unit to operate in trans-SPEC mode, in which almost all hardware settings are adjustable.

SET_SHAP_FLAT value

Sets the width of the flattop to value. Value is in microseconds, ranging from 0.3 to 2.4 in steps of 0.1. See also SHOW_SHAP_FLAT.

SET_SHAP_RISE value

Sets the rise time to value. Value is in microseconds, ranging from 0.2 to 23 in steps of 0.2. See also SHOW_SHAP_RISE.

SET_THRESHOLD_NEGATIVE value

Sets the negative threshold to value. The negative threshold is normally set automatically by the trans-SPEC. See also ENABLE_ THRESHOLD_AUTOMATIC and SHOW_ THRESHOLD_NEGATIVE.

SET_THRESHOLD_POSITIVE value

Sets the positive threshold to value. The positive threshold is normally set automatically by the trans-SPEC. See also ENABLE_THRESHOLD_AUTOMATIC and SHOW_ THRESHOLD_ POSITIVE.

SET_TIME hour,min,sec

Sets the time stored in the battery backed-up system clock to the specified values. hour can be any value from 0–23; min and sec can be any value from 0–59. The current date and time are stored for a device when an acquisition is started. See also SHOW_TIME, SET_DATE, SHOW_DATE, SET_TIME_START, and SHOW_TIME_START.

SET_TIME_START hour,min,sec

Sets the start time to the specified values. Normally the start date and time are set automatically whenever a device is started with the START command. See also SHOW_TIME_ START, SET_DATE_START, SHOW_DATE_START, SET_DATE, and SET_TIME.

SET_TRIG_SAMPLE setting

Selects the triggering source in Insight Mode. See LIST_TRIG_SAMP for legal trigger sources.

SET_TRUE ticks

Sets the true-time counter to the specified number of ticks. The number represents true time in units of 20 ms (50 ticks/sec). Normally this value is set by the trans-SPEC during data acquisition. See also CLEAR_COUNTERS and SHOW_TRUE.

SET_TRUE_PRESET ticks

Sets the true-time preset to the specified number of ticks (20 ms/tick). During data acquisition when the true-time counter reaches the preset number of ticks, the preset is complete and the acquisition is stopped. Setting a true-time preset to 0 ticks disables the preset. The preset should always be set to a multiple of one second. See also CLEAR_PRESETS and SHOW_ TRUE_PRESET.

SET_ULD value

Sets the upper level discriminator to value, in channels.

SET_UNCERTAINTY_PRESET percent

Sets the uncertainty preset to the specified value in percent. percent is a floating point value from 0–99.9999. See also SHOW_UNCERTAINTY_PRESET.

SET_WINDOW [start, length]

Sets the window of interest to the specified start channel and number of channels. The channels of spectral data in the window of interest are affected by commands such as CLEAR, SET_DATA, and WRITE. If neither start nor length is provided, the window is set to the maximum size allowed by the conversion gain specified. The window of interest is always set to the maximum size after a SET_DEVICE command or a SET_SEGMENT command.

SET_ZERO_ADJUSTMENT value

Sets the zero stabilization adjustment to an arbitrary value from −65535 to 65535. The total range of the adjustment value represents ±256 channels. This adjustment is usually only made by the gain stabilizer, and reset to 0 with the INITIALIZE_ZERO_STABILIZATION command. See also SHOW_ZERO_ADJUSTMENT.

SET_ZERO_CHANNEL chan

Sets the center channel for the stabilizer zero peak. If a zero channel is chosen such that the beginning channel or ending channel would be below channel 0 or above the maximum channel, as determined by the conversion gain, the zero peak width is reduced until the peak fits the device boundaries. A zero channel and width must be set before zero stabilization can be enabled. See also ENABLE_ZERO_ STABILIZATION.

SET_ZERO_PRESET count

Sets the Gauss mode stabilization preset for the zero peak. The preset represents the minimum number of incremental counts that must be collected in any one channel of the zero peak before the zero offset is evaluated by the stabilizer and potentially adjusted. See also SHOW_ZERO_PRESET.

SET_ZERO_WIDTH chans

Sets the width in channels for the stabilizer zero peak. The zero width must be chosen such that the beginning channel is no lower than channel 0 and the ending channel is no higher than the maximum channel as determined by the conversion gain. The zero channel and width must be set before zero stabilization can be enabled. The absolute minimum width for the zero peak is 3 channels, and the absolute maximum width for the zero peak is 256 channels in Gauss mode. In point mode there is no maximum peak width, though the chosen width must allow the peak to fit within the device's channel limits as stated above.

SHOW_ACTIVE

Returns a 1 if the trans-SPEC is active (i.e., acquiring spectral data) or 0 if it is not active.

Responses:

$C00000087<CR>	Not active.
$C00001088<CR>	Active.

SHOW_BLRE

Shows the baseline restorer time constant in microseconds. See also SET_BLRE.

Responses:

BLUE 000000000000091	Time constant is 91 μs.

SHOW_BLRE_AUTOMATIC

Shows whether automatic selection of the baseline restorer constant is off or on.

Responses:

$IT<CR>	Automatic baseline is enabled.
$IF<CR>	Automatic baseline is disabled.

SHOW_CLICKER

Shows state of audio clicker.

Responses:

$IT<CR>	Clicker is enabled.
$IF<CR>	Clicker is disabled.

SET_CLICKER_SENSITIVITY sens

Sets sensitivity of clicker. Sens is an index into the list of sensitivity settings. Valid sens values are: 0, 1, 2, or 3 which correspond to Maximum, High, Medium, Low respectively.

SHOW_CLICKER_SENSITIVITY

Reports clicker sensitivity. Possible values are 0, 1, 2, or 3.

SHOW_CONFIGURATION

Returns a record that indicates the hardware configuration of the MCB. The record contains information about the number of segments in an MCB device (always 1 for the trans-SPEC), and the current conversion gain for each segment. The record is organized as follows:

$J1638400001aaaaa00000[65 zeros here for total of 75 zeros]00000ccc

where **aaaaa** represents the conversion gain for the one and only segment in the currently selected device, and **ccc** represents the record checksum. See the section on response records in this chapter for more information about response records and checksums.

SHOW_CONFIGURATION_MASK

Returns two masks, the first of which can be “anded” with data from the MCB to clear the ROI bit from the data. When the second mask value is “anded” with data from the MCB, the data bits are removed and only the ROI bit remains.

Response:

CONF_MASK 02147483647 02147483648

SHOW_CONFIGURATION_UART

Reports the baud rate, parity option, number of data bits, and number of stop bits for the serial interface.

Responses:

$F09600N81	9600 baud, no parity, 8 data bits, 1 stop bit.
$F19200E82	19200 baud, even parity, 8 data bits, 2 stop bits.
$F02400O71	2400 baud, odd parity, 7 data bits, 1 stop bits.

SHOW_CORRECTION_FLAT

Shows the flattop correction value. See also SET_CORR_FLAT.

Responses:

CORR_FLAT 000000000000000

SHOW_CRM

Returns the current reading of the count-rate meter.

Response:

$G0000050781096	Current input count rate is 50781 counts/s.

SHOW_DATA_APPLICATION “string”

If string matches “string1" in a previous SET_DATA_APPLICATION command, then string2 from that command is returned. The response is a $F record.

SHOW_DATE

Returns the day, month, and year of the current date as maintained in the battery-backed-up real time clock, in the form dddmmmyyy. The day is returned as a 3-digit integer number from 001–031, month as a 3-digit integer number from 001–012, and year as a 3-digit integer number from 000–099. See also SET_DATE_START.

Responses:

$N001001088052<CR>	Date reported as Jan 1, 1988.
$N031012099059<CR>	Date reported as Dec 31, 1999.
$N001001000036<CR>	Date reported as Jan 1, 2000.
...	**...**
$N031012087056<CR>	Date reported as Dec 31, 2087.

SHOW_DATE_START

Returns the day, month and year of the acquisition start date in the form dddmmmyyy. The day is returned as a 3-digit integer number from 001–031, month as a 3-digit integer number from 001–012, and year as a 3-digit integer number from 000–099. See also SET_DATE_START.

Responses:

$N001001088052<CR>	Date reported as Jan 1, 1988
$N031012099059<CR>	Date reported as Dec 31, 1999
$N001001000036<CR>	Date reported as Jan 1, 2000
...	**...**
$N031012087056<CR>	Date reported as Dec 31, 2087

SHOW_DELAY_COLLECTION

Shows the width of the PUR signal setting. See also SET_DELAY_ COLLECTION.

Responses:

DEL_COLL 0000000000001.6

SHOW_DELAY_SAMPLE

Shows the Delay Sample setting. See also SET_DELAY_SAMPLE.

Responses:

$C00003090	The sample number is 00003, and 090 is the checksum.

SHOW_DEV

Shows the currently selected device. Always 1 for trans-SPEC.

SHOW_FEATURES

Responds with four 32-bit masks indicating which features are present in the MCB. See Section 8.8 for a complete description of each bit in the mask.

Example Response:
FEATURES 00003741991 01082802188 00060822784 00000409097

SHOW_GAIN_ADJUST
Returns the gain-stabilize amplifier setting.

SHOW_GAIN_CHANNEL
Reports the current center channel for the stabilizer gain peak. See also SET_GAIN_ CHANNEL.
Responses:

$C00000087<CR>	Gain channel has not been set.
$C00002089<CR>	Gain channel is channel 2 (lowest possible channel).
...	**...**
$C16382107<CR>	Gain channel is channel 16382 (highest possible channel).

SHOW_GAIN_COARSE
Returns the coarse gain for the trans-SPEC internal amplifier. In operation, the resulting signal gain is the product of the coarse gain, the fine gain, and the super-fine gain (used by stabilizer). The coarse gain is returned in terms of an integer gain multiplier.
Responses:

$C00001088<CR>	Coarse gain reported as 1.
$C00002089<CR>	Coarse gain reported as 2.
$C00004091<CR>	Coarse gain reported as 4.
$C00008095<CR>	Coarse gain reported as 8.
$C00016094<CR>	Coarse gain reported as 16.
$C00032092<CR>	Coarse gain reported as 32.

SHOW_GAIN_CONVERSION
This command returns the conversion gain.
Responses:

$C00512095<CR>	Conversion gain reported as 512 channels.
$C01024094<CR>	Conversion gain reported as 1024 channels.
$C02048101<CR>	Conversion gain reported as 2048 channels.
$C04096106<CR>	Conversion gain reported as 4096 channels.
$C08192107<CR>	Conversion gain reported as 8192 channels.
$C16384109<CR>	Conversion gain reported as 16384 channels.
$C32768113<CR>	Conversion gain reported as 32768 channels.

SHOW_GAIN_FINE
Returns the current fine gain setting. See SET_GAIN_FINE.

Sample Response:
GAIN_FINE 0000000000000.5 Gain is 0.5.

SHOW_GAIN_POLARITY

Returns the polarity of the amplifier input as $F records.

Responses:

$INEG<CR>	The amplifier input is set to negative.
$IPOS<CR>	The amplifier input is set to positive.

SHOW_GAIN_PRESET

Reports the Gauss mode stabilization preset for the gain peak. The preset represents the minimum number of incremental counts that must be collected in any one channel of the gain peak before the gain is evaluated by the stabilizer and potentially adjusted. See also SET_GAIN_PRESET and CLEAR_PRESETS.

Responses:

$G0000000010076<CR>	Gain preset currently 10 counts (minimum).
$G0000000011076<CR>	Gain preset currently 11 counts.
...	**...**
$G2147483647121<CR>	Gain preset currently 2147483647 counts (maximum).

SHOW_GAIN_STABILIZATION

Reports the state of gain peak stabilization. See also ENABLE_GAIN_STABILIZATION and DISABLE_GAIN_STABILIZATION.

Responses:

$IT<CR>	Gain stabilization is currently enabled.
$IF<CR>	Gain stabilization is currently disabled.

SHOW_GAIN_WIDTH

Reports the current width for the stabilizer gain peak. See also SET_GAIN_WIDTH, SET_GAIN_CHANNEL, and SHOW_GAIN_CHANNEL.

Responses:

$C00001088<CR>	Gain width has not been set.
$C00003089<CR>	Gain width is 3 channels (lowest possible width).
$C00256100<CR>	Gain width is 256 channels (highest possible width in Gauss mode).
...	**...**
$C16383108<CR>	Gain width is 16383 channels (highest possible width in point mode with gain channel set to 8192).

SHOW_HV

Reports the current high voltage and the status of the high voltage power supply in the form:

$Dvvvvvssssccc<CR>

Where vvvvv represents the current output voltage if the high voltage is enabled, or the rear-panel high voltage setting if the high voltage is disabled. sssss represents the status of the high voltage bias supply as a 16-bit decimal number with the following bit definitions:

Bit 0 (LSB):	Bias supply polarity (0=positive, 1=negative).
Bit 1:	Bias supply overload (0=overload, 1=normal).
Bit 2:	High voltage enabled (0=disabled, 1=enabled).

Example Responses:

$D0200000003077<CR>	2000 V, negative, not overloaded, disabled.
$D0200000002076<CR>	2000 V, positive, not overloaded, disabled.
$D0200000007082<CR>	2000 V, negative, not overloaded, enabled.

SHOW_HV_ACTUAL

Returns the value of HV actually on the detector.

SHOW_HV_HEALTH

Returns the status of the state of health for the detector as reported by the DIM or SMART-1.

SHOW_HV_RECOMMEND

Returns HV, in ASCII, from SMART-1 detectors.

SHOW_HV_TARGET

Under normal operation, the HV will go to this value when the HV is enabled. Reports the current HV setting (see SET_HV) and the status of the HV power supply in the form:

$Dvvvvvssssccc<CR>

where **vvvvv** represents the HV setting, and **sssss** represents the status of the HV bias supply as a 16-bit decimal number with the following bit definitions:

Bit 0 (LSB):	Bias supply polarity (0=positive, 1=negative).
Bit 1:	Bias supply overload (0=overload, 1=normal).
Bit 2:	HV enabled (0=disabled, 1=enabled).

Example Responses:

$D0200000003077<CR>	2000 V, negative, not overloaded, disabled.
$D0200000002076<CR>	2000 V, positive, not overloaded, disabled.
$D0200000007082<CR>	2000 V, negative, not overloaded, enabled.

SHOW_HV_POLARITY

This returns the HV polarity setting in the trans-SPEC as a $F record.

Responses:

$INEG<CR>	The HV is set to negative.
$IPOS<CR>	The HV is set to positive.

SHOW_ID

Reports the sample ID string as was previously set by the SET_ID command. The sample ID string is stored with each spectrum acquired in field mode and is restored with the field mode spectral data by the MOVE command.

Example Response:

$FSite 123<CR>	ID set to "Site 123".

SHOW_INTEGRAL [start_chan,number_of_chans]

Reports the sum of the specified group of spectral data channels. If start_chan and number_of_chans is not provided, SHOW_INTEGRAL reports the sum of all channels in the currently selected segment that have their ROI flag set.

Responses:

$G0000000000075<CR>	Integral reported as 0.
...	**...**
$G4294967294131<CR>	Integral reported as 4294967294.
$G4294967295132<CR>	Integral reported as greater than or equal to 4294967295 (maximum reportable value).

SHOW_INTEGRAL_PRESET

Reports the current ROI integral preset value. For more information about the ROI integral preset, see SET_INTEGRAL_PRESET. See also SHOW_INTEGRAL.

Responses:

$G0000000000075<CR>	Integral preset reported as 0.
...	**...**
$G4294967295132<CR>	Integral reported as 4294967295.

SHOW_INTEGRAL_REMAINING

Reports the current ROI integral remaining value. For more information about the ROI integral remaining, see SET_INTEGRAL_REMAINING. See also SHOW_INTEGRAL.

Responses:

$G0000000000075<CR>	Integral remaining reported as 0.
...	**...**
$G4294967295132<CR>	Integral reported as 4294967295.

SHOW_LENGTH_SAMPLE

Reports the number of points in the Insight Mode Waveform.

Response:

$C010000088 1000 points in the waveform.

SHOW_LIVE

Reports the contents of the live-time counter in units of 20 ms (50 ticks/s). See also CLEAR_ COUNTERS and SET_LIVE.

Responses:

$G0000000000075<CR> Live time reported as 0 ticks.
$G0000000001076<CR> Live time reported as 1 tick (20 ms).
... **...**
$G4294967295132<CR> Live time reported as 4294967295 ticks (over 23000 days).

SHOW_LIVE_PRESET

Reports the current live-time preset in units of 20 ms (50 ticks/s). See also CLEAR_ PRESETS and SET_LIVE_PRESET.

Responses:

$G0000000000075<CR> Live-time preset reported as disabled.
$G0000000001076<CR> Live-time preset reported as 1 tick.
$G4294967295132<CR> Live-time preset reported as 4294967295 ticks.

SHOW_LIVE_REMAINING

Reports the current live-time remaining in units of 20 ms (50 ticks/s). See also SET_LIVE_ REMAINING.

Responses:

$G0000000000075<CR> Live-time remaining reported as disabled.
$G0000000001076<CR> Live-time remaining reported as 1 tick.
$G4294967295132<CR> Live-time remaining reported as 4294967295 ticks.

SHOW_LLD

Shows the lower level discriminator setting. See also SET_LLD.

Responses:

$C00050092 The LLD is 50.

SHOW_MDA [PeakNumber]

Reports current MDA for the MDA Preset selected by PeakNumber. PeakNumber is assumed to be 0 if not supplied.

Example response:

MDA 0000000000010.7

SHOW_MDA_COEF

Reports the current settings for coeffficients a, b, and c used for the MDA calculation. See SET_MDA_COEF.

Example Responses:

MDA_COEF 000000000002.71 000000000000000 00000021.700001

Coefficient a = 2.71, b = 0, and c = 21.7.

SHOW_MDA_PRESET [PeakNumber]

Reports MDA preset PeakNumber. If PeakNumber is omitted, 0 is assumed.

Example Response:

MDA_PRES 0000000000025.7

SHOW_MODE

Reports the current mode of operation (PHA or Sample [InSight Virtual Oscilloscope]). See also SET_MODE_PHA and SET_MODE_SAMPLE.

Responses:

$FPHA<CR>	PHA mode.
$FSAM<CR>	Sample mode (InSight).

SHOW_MODE_TEST

Reports whether the trans-SPEC is in test mode and, if in test mode, which test mode is it in. This command is normally only used for testing at the factory.

Responses:

$A000ccc	Not in test mode.
$A001ccc	ADC test mode.

SHOW_MONI_LABEL num

Returns with an ASCII string label designation for the monitor num.

SHOW_MONI_MAX

Returns with the number of monitors available for viewing.

SHOW_MONI_VALUE num

Returns with an ASCII representation of the value for the monitor.

SHOW_NEXT

Used in conjunction with the SHOW_ROI command, SHOW_NEXT reports the next continuous group of channels that have the ROI flag set. The response is of the form:

$Dsssssnnnnnccc<CR>

where sssss represents an integer number that is the number of the first channel of the "next" group of channels that all have their ROI bit set, and nnnnn represents an integer number that

is the number of channels in the group. If no more channels have their ROI bit set, SHOW_NEXT returns a first channel of 0 and a number of channels of 0. The SHOW_ROI command is used to report the “first” group of channels that all have their ROI bit set.

Example Responses:

$D0100000050078<CR>	Next ROI group starts at channel 1000 and is 50 channels long.
$D0215000150086<CR>	Next ROI group starts at channel 2150 and is 150 channels long.
$D0000000000072<CR>	No other ROI groups to report.

SHOW_NUCLIDE [PeakNumber]

Reports current activity and uncertainty for the nuclide selected by PeakNumber. PeakNumber is assumed to be 0 if not supplied.

Example:

NUCLIDE 0000000000010.7 0000000000001.2

Activity is 10.7 and uncertainty is 1.2%.

SHOW_NUCLIDE_COEFFICIENT [PeakNumber]

Reports the coefficient for a specific peak as a floating-point number that corresponds to the number set with SET_NUCLIDE_ COEF.

Example:

NUCLIDE_COEF 0000000000010.7

SHOW_NUCLIDE_DESC PeakNumber

Reports the nuclide label for the specified peak in a $F record.

SHOW_NUCLIDE_UNITS

Reports the nuclide activity units in a $F record.

SHOW_OVERFLOW_PRESET

Reports the state of the overflow preset.

Responses:

$IT<CR>	Overflow preset enabled.
$IF<CR>	Overflow preset disabled.

SHOW_PEAK

This command returns the contents of the ROI channel with the largest number of counts. An ROI channel is a channel that has the ROI flag set. The maximum possible value is 2147483647, which is the maximum number of counts that can be stored in a 31-bit channel.

Responses:

$G0000000000075<CR>	Maximum count in an ROI channel is zero or no ROI channels were found.
$G0000000001076<CR>	Maximum count in an ROI channel is 1.
...	**...**
$G2147483646120<CR>	Maximum count in an ROI channel is 2147483646.
$G2147483647121<CR>	Maximum count in an ROI channel is 2147483647.

SHOW_PEAK_CHANNEL

This command returns the number of the ROI channel with the largest number of counts. An ROI channel is a channel that has the ROI flag set. The lowest number ROI channel with the largest count is reported if more that one channel contains the largest number of counts. Channel 32767 is the highest numbered channel in any device.

Responses:

$C00000087<CR>	Maximum count was found in channel 0 or no ROI channels were found (see errors below).
$C00001088<CR>	Maximum count was found in channel 1.
...	**...**
$C16383108<CR>	Maximum count was found in channel 16383.

SHOW_PEAK_PRESET

Reports the value of the ROI peak preset. See SET_PEAK_PRESET for information about the ROI peak preset.

Responses:

$G0000000000075<CR>	Peak preset disabled.
$G0000000001076<CR>	Peak preset set to 1 count.
...	**...**
$G2147483646120<CR>	Peak preset set to 2147483646 counts.
$G2147483647121<CR>	Peak preset set to 2147483647 counts.

SHOW_PZ

Displays the PZ setting. See also SET_PZ.

Responses:

PZ_ENA 002200	Pole zero enabled and set to 2200.
PZ_DIS 001000	Pole zero disabled and set to 1000.

SHOW_RADIX
SHOW_RATE_ZDT
SHOW_REMOTE

Not used; included for backward compatibility.

SHOW_ROI

Used in conjunction with the SHOW_NEXT command, SHOW_ROI reports the first continuous group of channels that have the ROI flag set. The response is of the form:

$Dsssssnnnnnccc<CR>

where **sssss** represents an integer number that is the number of the first channel of the "first" group of channels that all have their ROI bit set, and **nnnnn** represents an integer number that is the number of channels in the group. The SHOW_NEXT command is used to report the "next" group of channels that all have their ROI bit set.

Responses:

$D0100000050078<CR>	First ROI group starts at channel 1000 and is 50 channels long.
$D0215000150086<CR>	First ROI group starts at channel 2150 and is 150 channels long.
$D0000000000072<CR>	No ROI groups to report.

SHOW_ROI_MDA

Reports the start channel and number of channels used in the MDA preset calculation.

Example Response:

$D0700000050ccc	Calculation is performed on channels 7000–7049.

SHOW_ROI_ NUCLIDE [PeakNumber]

Reports the region to use to compute the counts in the activity calculation. PeakNumber (assumed 0 if not present) specifies which of up to 9 (0–8) peaks to report.

Example Response:

$D0083200052092	Region starts at channel 832 and is 52 channels wide.

SHOW_ROI_SAMPLE

Displays the ROI Sample setting. See also SET_ROI_SAMPLE.

Responses:

$C00001088

SHOW_ROI_UNCERTAINTY

Reports the start channel and number of channels used in the uncertainty preset calculation. See also SET_ROI_UNCERTAINTY.

Response:

$D0700000050ccc	Calculation is performed on channels 7000–7049.

SHOW_SEGMENT

Returns the current segment number. Always 1 for the trans-SPEC.

SHOW_SHAP_FLAT

Reports the width of the flattop in μs. See also SET_SHAP_FLAT.

Responses:

SHAP_FLAT 0000000000001.2

SHOW_SHAP_RISE

Displays the rise-time setting in μs. See also SET_SHAP_RISE.

Responses:

SHAP_RISE 0000000000003.2

SHOW_SHUTDOWN

Shows the type of HV shutdown selected. Only the SMART-1 mode is available.

Responses:

$FSM1	SMART-1 mode

SHOW_SHUT_ACTUAL

Returns the current status of the bias remote shutdown input signal. This command is valid whether the bias supply is turned on or off.

Responses:

$IT	Shutdown is active (supply is shut down or can't be turned on).
$IF	Shutdown is inactive (supply is on or can be turned on).

SHOW_SNUM

Responds with a $F record indicating the serial number of the trans-SPEC.

Response:

$F100	Serial number is 100.

SHOW_STATUS

Returns system status information in the following format:

$Mlllllllllltttttttttaaaaahhhhhccc<CR>

where **lllllllll** represents the live time as returned by the SHOW_LIVE command, **ttttttttt** represents the true time for the current device as returned by the SHOW_TRUE command, **aaaaa** represents the active device mask as returned by the SHOW_ACTIVE_DEVICES command, and **hhhhh** represents the hardware status, which is an ASCII representation of a 16 bit decimal number with the following bit definitions:

Bit 0 (LSB):	Bias supply polarity (0=positive, 1=negative)
Bit 1:	Bias supply overload (0=overload, 1=normal)
Bit 2:	High voltage enabled (0=disabled, 1=enabled)
Bit 3:	Unused

Bit 4:	Amplifier PZ'd since initialization (0=normal, 1=needs PZ'ing)
Bit 5	Optimization since initialization (0=normal, 1=needed)
Bits 6–7:	Unused
Bit 8:	Amplifier automatic PZ (1=Auto PZ in progress, 0=normal)
Bit 9:	Optimization (0=normal, 1=in progress)
Bits 10–14:	Unused
Bit 15 (MSB):	Reserved

SHOW_THRESHOLD_AUTOMATIC

See also SET_THRESHOLD_AUTOMATIC.

Responses:

$IT<CR>	Automatic threshold is enabled.
$IF<CR>	Automatic threshold is disabled.

SHOW_THRESHOLD_NEGATIVE

See also SET_THRESHOLD_NEGATIVE.

Responses:

THR_NEG 0000379791 Negative threshold is 379791.

SHOW_THRESHOLD_POSITIVE

See also SET_THRESHOLD_POSITIVE.

Responses:

THR_POS 00000126811	Positive threshold is 126811.

SHOW_TIME

Reports the time from the battery backed-up system clock in the form

$Nhhhmmmssccc<CR>

where **hhh** represents a 3-digit integer hour (0–23), **mmm** represents a 3-digit integer minute (0–59), and **sss** represents a 3-digit integer second (0–59). See also SET_TIME, SET_DATE, and SHOW_DATE.

Example Responses:

$N010054017052<CR>	Time returned 10:54:17 (10 h, 54 min, 17 s).
$N020013037050<CR>	Time returned 20:13:37 (20 h, 13 min, 37 s).

SHOW_TIME_START

Reports the time of the last START command in the form:

$Nhhhmmmssccc<CR>

where **hhh** represents a 3-digit integer hour (0 through 23), **mmm** represents a 3-digit integer minute (0 through 59) and **sss** represents a 3-digit integer second (0 through 59). See also SET_TIME_START, SET_DATE_START, and SHOW_DATE_START.

Example Responses:

$N010054017052<CR>	Time returned 10:54:17 (10 h, 54 min, 17 s).
$N020013037050<CR>	Time returned 20:13:37 (20 h, 13 min, 37 s).

SHOW_TRIG_SAMPLE

Reports the trigger source in Insight Mode.

Responses:

$F0LLD	LLD is source.
$F1PKD	Peak-detect is source.
$F2RANDOM	Trigger happens randomly.
$F3Gate	Gate Input triggers the waveform.

SHOW_TRUE

Reports the contents of the true-time counter in units of 20 ms (50 ticks/s). See also CLEAR_COUNTERS and SET_TRUE.

Responses:

$G0000000000075<CR>	True time reported as 0 ticks.
$G0000000001076<CR>	True time reported as 1 tick (20 ms).
$G4294967295132<CR>	True time reported as 4294967295 ticks (over 23000 days).

SHOW_TRUE_PRESET

Reports the current true-time preset in units of 20 ms (50 ticks/s). See also CLEAR_PRESETS and SET_TRUE_PRESET.

Responses:

$G0000000000075<CR>	True time preset reported as disabled.
$G0000000001076<CR>	True time preset reported as 1 tick.
$G4294967295132<CR>	True time preset reported as 4294967295 ticks.

SHOW_TRUE_REMAINING

Reports the current true time remaining in units of 20 milliseconds (50 ticks per second). See also SET_TRUE_REMAINING.

Responses:

$G0000000000075<CR>	True time remaining reported as disabled.
$G0000000001076<CR>	True time remaining reported as 1 tick.
$G4294967295132<CR>	True time remaining reported as 4294967295 ticks.

SHOW_ULD

Returns the value of the ULD in channels, as a $C record.

SHOW_UNCERTAINTY

Returns the current value of the uncertainty for the peak in the uncertainty preset. See also SET_UNCERTAINTY.

Responses:

UNCE 0000000000008.5	Uncertainty of the peak is 8.5%.

SHOW_UNCERTAINTY_PRESET

Returns the current uncertainty preset setting. See also SET_UNCERTAINTY_PRESET.

Responses:

UNCE_PRES 000000000000000	No preset.
UNCE_PRES 0000000000008.5	Preset set to 8.5%.

SHOW_VERSION

Reports the trans-SPEC firmware version number in the form

Fmmmm-vvv<CR>

where **mmmm** is a 4-character model designator and **vvv** is a 3-character version designator.

Example Responses:

$FTSDX–001<CR>	Model trans-SPEC firmware version 1 reported.

SHOW_WINDOW

Reports the start channel and number of channels in the window of interest, in the form

$Dxxxxxyyyyyccc<CR>

where xxxxx is the start channel (0–16383) and yyyyy is the number of channels (1–16384). See SET_WINDOW for more information about the window of interest.

Example Responses:

$D0000016384094<CR>	Window of interest reported as starting at channel 0 and continuing for 16384 channels.
$D0000008192092<CR>	Window of interest reported as starting at channel 0 and continuing for 8192 channels (first 1/2).
$D0819208192112<CR>	Window of interest reported as starting at channel 8192 and continuing for 8192 channels (last 1/2).

SHOW_ZERO_ADJ

Returns the value of the zero offset for the zero stabilizer.

SHOW_ZERO_CHANNEL

Reports the center channel for the stabilizer zero peak. See also SET_ZERO_CHANNEL, SET_ZERO_WIDTH, and SHOW_ZERO_WIDTH.

Responses:

$C00000087<CR>	Zero channel has not been set.
$C00002089<CR>	Zero channel is channel 2 (lowest possible channel).

$C16382107<CR> Zero channel is channel 16382 (highest possible channel).

SHOW_ZERO_PRESET

Reports the Gauss mode stabilization preset for the zero peak. The preset represents the minimum number of incremental counts that must be collected in any one channel of the zero peak before the zero offset is evaluated by the stabilizer and potentially adjusted. See also SET_ZERO_PRESET and CLEAR_PRESETS.

Responses:

$G0000000010076<CR> Zero preset currently 10 counts (minimum).
$G0000000011076<CR> Zero preset currently 11 counts.
... **...**
$G2147483647121<CR> Zero preset currently 2147483647 counts (maximum).

SHOW_ZERO_STABILIZATION

Reports the state of zero peak stabilization. See also ENABLE_ZERO_STABILIZATION and DISABLE_ZERO_STABILIZATION.

Responses:

$IT<CR> Zero stabilization is currently enabled.
$IF<CR> Zero stabilization is currently disabled.

SHOW_ZERO_WIDTH

Reports the current width for the stabilizer zero peak. See also SET_ZERO_WIDTH, SET_ZERO_CHANNEL, and SHOW_ZERO_CHANNEL.

Responses:

$C00001088<CR> Zero width has not been set.
$C00003089<CR> Zero width is 3 channels (lowest possible width).
$C00256100<CR> Zero width is 256 channels (highest possible width in Gauss mode).
$C16383108<CR> Zero width is 16383 channels (highest possible width in point mode with zero channel set to 8192).

START [seg-mask]

Starts the acquisition of spectral data. The optional segment mask is provided for compatibility with other MCBs and may be any value from 0 to 65535 but is ignored by the trans-SPEC.

STOP [seg-mask]

Stops the acquisition of spectral data. The optional segment mask is provided for compatibility with other MCBs and may be any value from 0 to 65535 but is ignored.

APPENDIX A. CHANGING THE INTERNAL BATTERY

The typical service life of the trans-SPEC internal battery is 3–5 years. When the internal battery no longer retains a charge, it must be replaced. Contact ORTEC to obtain the appropriate replacement kit. Changing the battery takes just a few minutes, so the detector does not significantly warm up during the procedure. When connected to external power such as the docking station, the new battery will typically reach full charge within 3–4 hours.

To change the battery:

1) Turn off the cooler by going to the Main Menu and tapping **Turn Cooler OFF**. Then press and hold the ON/OFF button to shut down the trans-SPEC computer.

2) Figure 75 shows the battery hatch on the side panel. Remove the five (5) screws from the hatch with a Torx® T10 screwdriver (there is no sixth screw under the black rubber "foot"). Gently pry up one end of the hatch, then slip it from behind the rubber foot and expose the battery.

3) Open the tie that holds the battery in place. Note the orientation of the battery and connector as you disconnect and remove the old battery. The connecting wire for the new battery (Fig. 76) should feed from the front of the battery compartment, across the top edge of the battery pack (the edge closest to the top of the instrument), then toward the back of the compartment. Close the tie around the new battery.

4) Reverse Steps 2 and 3 to replace the hatch.

5) Connect the trans-SPEC to external power. Remember that the cooler cannot be restarted from the internal battery.

6) Restart the trans-SPEC, turn on the cooler, and wait for the instrument's state-of-health readouts to indicate the unit is ready for data acquisition.

7) Return the old battery to ORTEC for recycling.

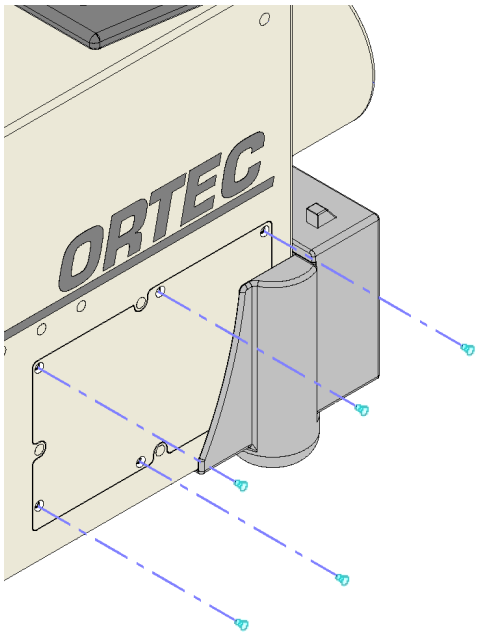

Figure 75. Remove the Screws from the Battery Hatch.

Figure 76. Internal Battery Pack and Connector.

INDEX