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HAZARDOUS MATERIALS
AND WASTE MANAGEMENT

October 8, 2010

Jennifer T. Opila, MPA
Unit Leader
Radiation Management Unit
Hazardous Waste and Waste Management Division
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, CO 80246-1530

Subject: **Request for Authorization for the Use of the Canberra InSpector 1000 Digital Hand-Held Multi Channel Analyzer, License Number Colo. 1102-01**

Via: **Electronic Transmission and Fed-Ex**

Dear Ms. Opila,
We are requesting authorization for the use of an additional type of portable gamma spectrum analyzer in compliance with Section 8.8 of SOP 15.WAC.01, Revision 2: Regulated Waste Acceptance.

SOP 15.WAC.01 rev. 2, section 8.8 mandates the use of the SAIC Exploranium Model GR 135 portable gamma spectrum analyzer to identify radionuclides present in a waste shipment and screen for the presence of unauthorized waste. Unfortunately, as of earlier this year, SAIC has indicated that they no longer support this model. CHDT would like to propose the use of alternate instruments that would be suitable for complying with the procedure.

One such alternate instrument proposed for use is the Canberra InSpector 1000 Digital Hand-Held Multi Channel Analyzer. Like the SAIC Exploranium GR 135, The InSpector 1000 utilizes a 2" X 2" Sodium Iodide Detector and a GM detector. The InSpector 1000 utilizes a built in multichannel analyzer and an internal spectral library to identify radionuclides. As with the SAIC Exploranium, the spectra can be downloaded to a computer for additional viewing and analysis. Specification literature on this instrument is attached. CHDT currently has one of these instruments on site on a "loaner" basis for the purposes of evaluation. Evaluation testing indicates that it would be suitable for complying with the SOP requirements.

CHDT intends to develop an SOP for use of this instrument and provide modification to other SOPs that are relevant. Since we are in the middle of the License renewal process at this time, CHDT would prefer not to modify the existing procedures but would like to modify only the

proposed new procedures for the sake of simplicity. For this reason, we are seeking temporary authorization to use this instrument. Delivery time on this instrument is approximately 4 weeks and CHDT would like to be sure that it will meet with CDPHE approval before committing financial resources.

Please contact Jack Kehoe or Clyde Christman at 970-386-2293 for questions on this request.
Regards,

John H. (Jack) Kehoe, MS
Facility General Manager
Clean Harbors Deer Trail, LLC

Clyde Christman, RRPT
Radiation Safety Officer
Clean Harbors Deer Trail, LLC

Cc: David Nielsen

Attachments

CANBERRA

InSpector™ 1000 Digital Hand-Held Multichannel Analyzer

Features

- Simple, real time isotope identification and classification
- Available with fully stabilized NaI probe (optional)
- Gamma Locator Mode, for quickly determining the location of sources
- Full featured, portable MCA with advanced gamma analysis for a wide range of sources
- Dose rate equivalent H*(10) and count rate display and bar graph
- Audible warning and alarm limits for gamma dose rate
- Easy Mode available for simple Locate and Identify requirements
- Real time isotope identification with activity and dose by isotope calculation
- High-performance spectroscopy reduced to one button simplicity – no spectroscopy knowledge required!
- One hand operation with detachable gamma probe allows best possible monitoring of narrow area
- Decontaminable, portable, ruggedized and spill-proof design
- Hand-held, battery operated instrument with high resolution color LCD – visible day and night
- Battery life up to 9 hours
- Optional Neutron Probe

Description

The InSpector™ 1000 is a high-performance, hand-held NaI spectrometer for use primarily in first responder, customs, homeland security, and health-physics applications. One-click simplicity masks the sophisticated spectral processing facilities that lie within the instrument – providing a level of performance previously available only in more complicated laboratory systems. The InSpector 1000 is an instrument that provides answers not just data! With the InSpector 1000, users from law enforcement officers to Health Physics technicians can obtain the results they desire with an easy to use, intuitive interface.

InSpector 1000 has been designed for easy operation. The high-resolution color LCD display is clearly visible from bright sunlight to night conditions. The unit can be held and operated in one hand (even if wearing gloves). The convenient hand strap leaves the hand positioned to easily reach the controls with the thumb. This leaves the second hand free for other operations – holding a ladder, sorting through suit cases or packages, etc. In addition, for applications requiring flexible positioning of the detector relative to the object being inspected, the detector can be detached from the instrument body and placed in any position or
narrow gap. This greatly increases the probability of detecting small amounts of radiation and precisely locating sources by reducing the measurement distance.

InSpector 1000 was designed to be used in all types of environmental conditions. Its ruggedized, light weight packaging meets the IP 54 specifications and is easily decontaminated. It also has a wide operating range for both temperature and humidity. The InSpector 1000 instrument has been designed to survive a one meter drop onto concrete.

InSpector 1000 is an easy-to-use digital multichannel analyzer, ideally suited for homeland security applications, custom and border protection, health-physics, treaty and non-proliferation compliance, monitoring of nuclear transportation, and *in situ* measurement of objects, surfaces etc. The user interface provides the ultimate flexibility in field operations. The InSpector 1000 is readily usable by less sophisticated users without the need of extensive training and also offers high-level spectrometry analysis

Phone contact information

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For other international representative offices, visit our web Site: www.**canberra.com** or contact the CANBERRA U.S.A. office.

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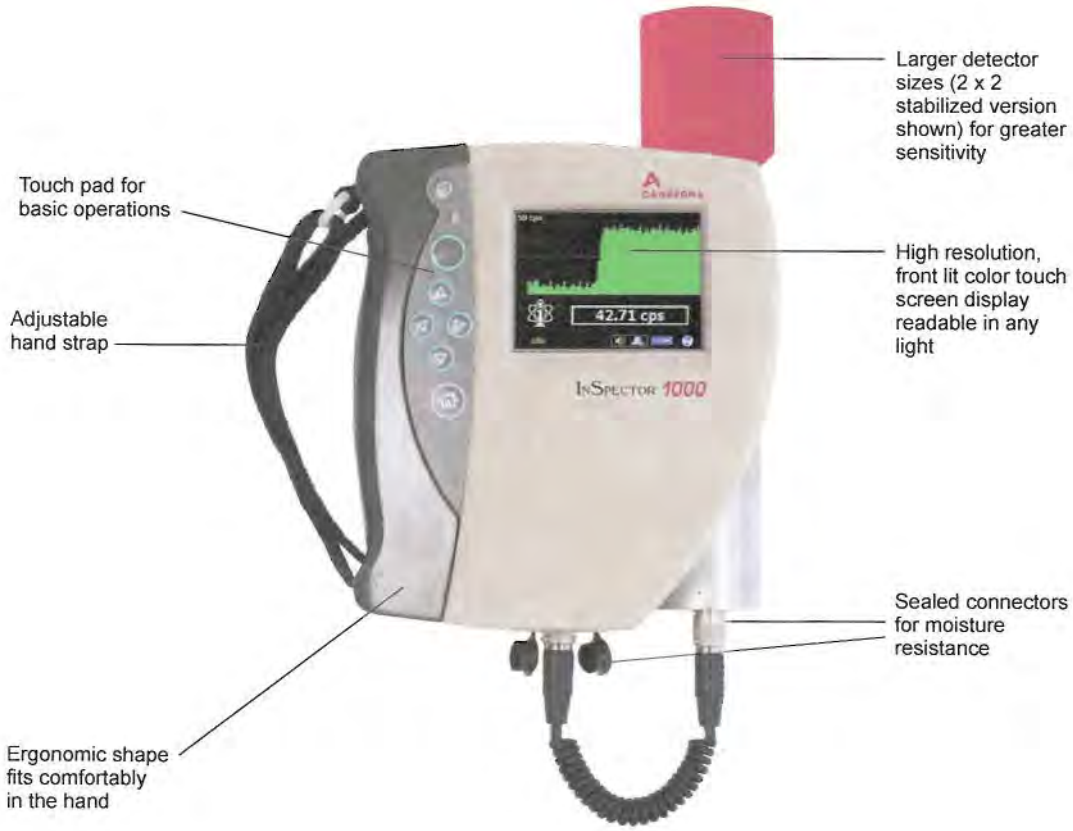
InSpector 1000 Digital Hand-Held Multichannel Analyzer



InSpector 1000 Digital Hand-Held Multichannel Analyzer

capabilities for expert users. It can be used in any field measurement application requiring nuclide identification, activity measurements, dose/count rate measurements, or spectrum acquisition and analysis.

Although the instrument has a powerful suite of spectroscopy functions, the InSpector 1000's simple user interface isolates the user from complicated spectrum analysis while still providing this data to more advanced users.

Operate in one hand for comfort and convenience, then separate the detector when you get in close.

Optional Neutron Probe

For applications requiring the detection of both gamma and neutron radiation, an optional neutron probe is available. This detector mounts directly onto the body of the InSpector 1000. With the additional probe, the instrument automatically updates all relevant displays to show both the gamma and neutron signals. Also, additional alarm and warning thresholds are available for the real-time neutron levels.

Optional Sourceless Stabilized Probe

This new, patented* technique has revolutionized the field of handheld nuclear identification instruments by virtually eliminating the need for constant energy recalibration. Traditional Sodium Iodide gamma detectors are extremely temperature dependent. So, when an instrument is calibrated indoors and then taken outdoors to use, the calibration can change enough to significantly degrade the identification accuracy and also increase the number of false positive identifications given.

The new sourceless stabilized probes from CANBERRA continuously monitor and adjust the gain of the detector automatically to ensure consistent performance throughout the entire temperature range. The consistent performance allows users to perform nuclear identifications under all conditions and environments that are typically encountered in the field, while maintaining the highest confidence in the results obtained by the instrument.

OPERATION

Easy Mode Operation

In Easy Mode, one touch of a button toggles between the Locator screen function and the Nuclear Identification screen. The user moves the instrument around and watches the Locator screen to see if the radiation field is changing over time. A histogram/trend display helps the user to precisely locate the source, moving the instrument for maximum signal. A single button push and the Nuclear Identification screen appears. Data is collected, analyzed and all isotopes present are listed with their dose rate. This Mode is perfect for First Responders who need to quickly determine if radioactive sources are present and then locate and identify them to help isolate the problem. It is also valuable for follow-up response to alarms from portal or large area monitors.

Standard Mode Operation

In Standard Mode, the instrument adds in a Dose screen and high performance spectroscopy functionality. Genie™ 2000 advanced analysis algorithms are built in. The unprecedented performance of the InSpector 1000 derives from advanced analysis techniques previously available only in systems with separate computers. Unlike traditional hand-held instruments with primitive ROI analysis, the InSpector 1000 supports a full mathematical peak search and fit capability – deconvoluting multiplets and using full confirming lines nuclide identification. This greatly improves the confidence of nuclide identification, raising sensitivity while reducing "false positives".

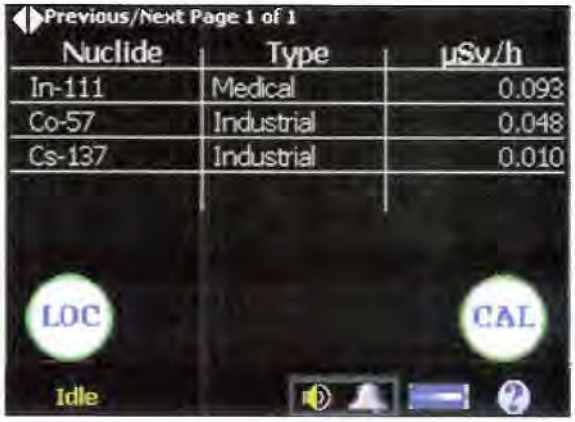
*US Patents 7,005,646B1 and 7,049,598

InSpector 1000 Digital Hand-Held Multichannel Analyzer

Source Locator View

The Locator view allows the user to locate a source of radiation. The histogram allows the user to move the instrument around a suspected area while viewing a time variation trend of the radiation received. This provides a relative comparison on how the radiation field has been changing over time/location. This type of comparative measurement is well suited for finding the highest radiation field in a given area and hence locating an unknown source. The detachable detector probe, coupled with the source finder mode, makes it easy to precisely locate lost, hidden or contraband sources in a wide range of search applications.

Nuclide Identification and Quantification View



The Nuclide Identification view provides real-time identification of individual isotopes contributing to the measured radiation field. When a radiation field is present the NID view is used to start a data acquisition and analyze the results to identify all of the isotopes present and their calculated activities in either Bq or µCi. InSpector 1000 integrates nuclide identification techniques that use the complete gamma signature, multiplet deconvolution, interference correction and gain shift correction. These ensure positive identifications across comprehensive nuclide sets while avoiding false positives.

The NID results are displayed as a chart showing nuclide, activity and nuclide type. More information can be displayed, such as dose rate and confidence. Configuration of the nuclide library is performed through Genie 2000 on the host computer using the standard Nuclide Library Editor then downloading these files to the instrument. Multiple libraries files can be maintained in the InSpector 1000. For example, the user may wish to maintain separate libraries for use with various isotope types to maintain the ability to respond to different types of monitoring.

InSpector 1000 Digital Hand-Held Multichannel Analyzer

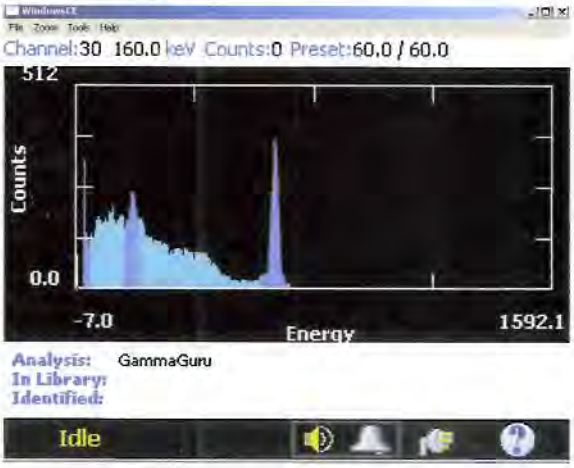
Dose Rate Measurement View

The dose/count rate screen (Dose view) gives a quick view of dose rate information from a variety of display options. Dose rate measurement (CANBERRA's unique time-to-count method) is always performed and warning or alarm reported, in all modes. Dose and total count rates are both presented as bar graph displays. This provides both a relative indication and a numerical display for an absolute indication. Dose rate units are user-selectable units of mSv or mR per hour. The bar graph's full scale indication can be auto-scaling or set to a constant value. During any data acquisition, the bar graphs and numerical presentations are updated in real time.

Radiation Alarms and Warnings

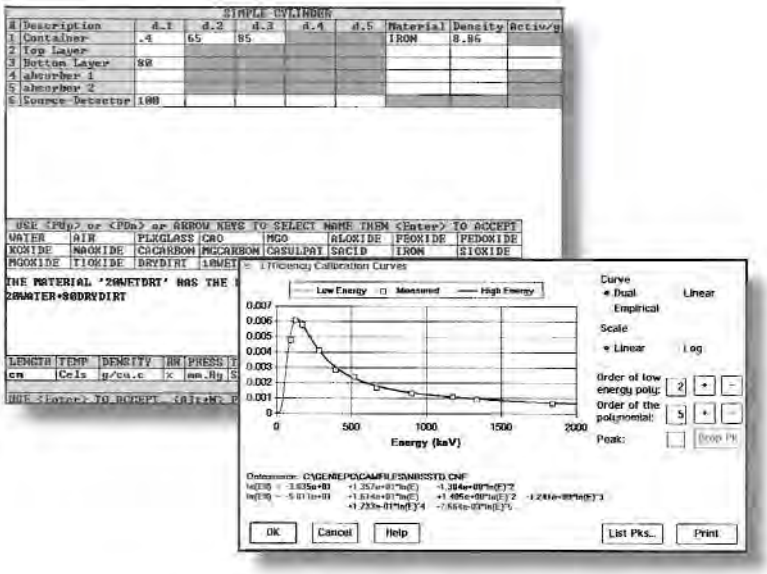
Preset alarm and warning gamma level thresholds are available to indicate the user is approaching radiation levels of concern. The gamma levels are continuously monitored and compared to the preset alarm/warning thresholds. This ensures the quickest possible response to an elevated radiation field. When the instrument reaches a preset threshold, both a visible and audible indication is given.

Spectroscopy View



InSpector 1000 has considerable spectroscopy power (Spectrocopy view). The crisp color spectrum display gives constant visual feedback during data collection. Region of Interest (ROI) and channel information are displayed according to the cursor position. Total and net areas, isotope at the cursor position, and energy level are also displayed. Different display scale functions are available including logarithm, linlog, square root, linear, manual or automatic. The zoom function lets the user focus in on specific areas of the spectrum for more detailed views. The algorithm set up parameters are the same as Genie 2000 algorithms; they are pre-set on the host, then downloaded to InSpector 1000 allowing the field spectroscopist the capability of performing high precision measurements.

InSpector 1000 Digital Hand-Held Multichannel Analyzer



A special NaI version of CANBERRA *In Situ* Object Calibration Software (ISOCS™) is available for the InSpector 1000.

Genie 2000 Software Support

The InSpector 1000 computer interface software is Genie 2000. Through the Genie 2000 framework, the user can easily upload or download nuclide libraries, efficiency calibration information (including mathematically generated efficiency calibration), certificate information and spectral data (including ROI definitions). Genie 2000 provides a highly sophisticated tool for post analysis. The analysis can be customized and evaluated step by step. The user can also create analysis sequence files dedicated to InSpector 1000; this gives the user ultimate flexibility in tailoring analysis sequences for individual applications. The use of Genie 2000 and the InSpector 1000 host software allows the user to have the full benefits of other Genie 2000 layered option such as Gamma Analysis Software, Nuclide Identification Software, Quality Assurance Software and so forth. The dynamic link between the instrument and the host computer is made via a fast USB communication port.

InSpector 1000 Digital Hand-Held Multichannel Analyzer

Specifications

INPUTS
- DC POWER/CHARGER – 12 V, 2 A dc output; universal ac/dc adapter input with IEC 320 power connector.

OUTPUTS
- USB DEVICE – USB device interface for connection to host computer for spectrum upload and library/efficiency download.

DETECTORS
- GM TUBE – Internal Geiger-Mueller tube for high dose/count rate measurements. Operates in CANBERRA's unique time-to-count mode.
- NaI PROBES – External NaI(Tl) detector with integrated preamplifier and programmable HVPS. Sensitivity referenced to ^{137}Cs.
  - IPRON-1: 1.5" x 1.5"; 6000 cps/mrem/h ±3.5%.
  - IPROS-2: Stabilized 2" x 2" NaI probe*; 13 000 cps/mrem/h ±3.5%.
  - IPROS-3: Stabilized 3" x 3"; 32 000 cps/mrem/h ±3.5%.
  - IPROL-1: Stabilized 1.5" x 1.5" LaBr probe 8 000 cps/mrem/h ±3.5%.
- PULSE SHAPE – Tail pulse from detector preamplifier, positive or negative polarity.
- AMPLITUDE – 0.16 V to 1.6 V, full scale output.
- NEUTRON PROBE – External detector; moderated ^{3}He tube (8 cm active length – 2 atm); intrinsic neutron sensitivity ≈1%, using an unmoderated ^{252}Cf fast neutron source; weight: 1.36 kg (3 lb).

DISPLAY
- TYPE – 9 cm (3.5 in.) backlit color LCD and touch panel.
- RESOLUTION – 320 x 240 pixels.

INDICATOR
- CHARGE INDICATOR – Yellow LED on keypad.

AUDIO
- AUDIBLE ANNUNCIATOR – Indicates touch screen selection.
- AUDIBLE COUNT RATE INDICATOR – Off or one beep for every 100, 1000 or 10 000 counts; user selectable.
- AUDIBLE ALARM/WARNING INDICATOR – Alarms/warnings using tones; user configurable.

COUNT/DOSE RATE DISPLAY
- DOSE RATE BARGRAPH FULL SCALE – 0.1, 1.0, 10, 100, 1000, 10 000, Auto; user selectable.
- DOSE RATE UNITS – µR/h, mR/h, R/h; µSv/h, mSv/h; µrem/h, mrem/h, rem/h; user selectable.

PERFORMANCE
- ENERGY RANGE –
  - For 1.5, 2 and 3 in. NaI detectors – 50 keV to 3 MeV.
  - For GM detector – 30 keV to 1.4 MeV.
  - For 1.5 in. LaBr detector – 30 keV to 3 MeV.
- INTEGRAL – 0.1% over top 99% of conversion range.
- THROUGHPUT – >50 kcps.
- INPUT COUNT RATE – >500 kcps total, if not limited by detector/probe.
- LIVE TIME CORRECTION – Live Time Correction (LTC) of spectral data.
- PRESETS – Live time preset: 1 – 1 000 000 s; Real time preset: 1 – 1 000 000 s.
- SPECTRAL DATA STORAGE – More than 512 spectra of 1024 channels each (CAM file format).
- CHANNEL STORAGE – 32 bits.
- NUCLIDE IDENTIFICATION ENERGY TOLERANCE WINDOW – ±4%.
- MINIMUM DOSE RATE EQUIVALENT H*(10) – 10 nSv/h.
- MAXIMUM DOSE RATE EQUIVALENT H*(10) – 100 mSv/h.
- TOTAL (cumulative) DOSE EQUIVALENT H*(10) RANGE – 100 nSv to 1 Sv.
- DOSE UPDATE RATE – 3–10 s; user selectable.

BATTERY
- TYPE – Two-cell rechargeable Li-ion battery.
- CAPACITY – 2.2 AH.
- OPERATING TIME – Approximately 9 hours while acquiring with battery at full charge (frequent use of backlight reduces battery life).
- CHARGE TIME – Approximately 3 hours.

EXTERNAL POWER
- DC POWER/CHARGER – 12 V dc output, 2 A universal ac/dc adapter input with IEC 320 power connector.

PHYSICAL
- SIZE – InSpector alone: 19.0 x 16.5 x 6.4 cm (7.5 x 6.5 x 2.5 in.); with an IPRON-N probe: 25.4 x 24.1 x 14.0 cm (10 x 9.5 x 5.5 in.).
- WEIGHT – With batteries and an IPRON-2 probe: <2.4 kg (5.4 lb); with batteries, and both an IPRON-2 probe and an IPRON-N probe: 3.5 kg (7.7 lb).

ENVIRONMENTAL
- OPERATING TEMPERATURE – Range: –10 to +50 °C, ambient.
- HUMIDITY – Up to 80%, non-condensing.
- SHOCK – Shock proof design (not including the detector). Can withstand a drop from 1 m onto concrete.
- PROTECTION RATING – Meets IP 54 specifications (complete dust and splash/low pressure spray protection).
- DIRECTIVES – Meets all relevant EU safety, RFI and EMI directives (CE compliance).

*Stabilized Scintillation Detector. U.S. Patent Numbers 7,005,646 B1 and 7,049,598.

InSpector 1000 Digital Hand-Held Multichannel Analyzer

ORDERING INFORMATION

IN1KN-1 – InSpector 1000 and IPRON-1 1.5" x 1.5" NaI Intelligent Probe.

IN1KS-3 – InSpector 1000 and IPROS-3 3" x 3" NaI Stabilized Intelligent Probe.

IN1KS-2 – InSpector 1000 and IPROS-2 2.0" x 2.0" NaI Stabilized Intelligent Probe.

IN1KL-1 – InSpector 1000 and IPROL-1 1.5" x 1.5" LaBr Stabilized Intelligent Probe.

- All include cables, charger, padded soft case, Model S504 Genie 2000 InSpector Basic Spectroscopy Software, utility software and a set of manuals.

IN1KN-1N – InSpector 1000 with IPRON-1 1.5" x 1.5" NaI Intelligent Probe, and Neutron Probe.

IN1KS-2N – InSpector 1000 with IPROS-2 2.0" x 2.0" NaI Stabilized Intelligent Probe, and Neutron Probe.

IN1KL-1N – InSpector 1000 with IPROL-1 1.5" x 1.5" LaBr Stabilized Intelligent Probe and Neutron Probe.

- All equipped with gamma probe, moderated ^{3}He probe, cables, charger, padded soft case, Model S504 Genie 2000 InSpector Basic Spectroscopy Software, utility software and set of manuals.

PROBES ONLY

IPRON-1 – 1.5" x 1.5" NaI Intelligent Probe.

IPROS-3 – 3" x 3" NaI Stabilized Intelligent Probe.

IPROS-2 – 2" x 2" NaI Stabilized Intelligent Probe.

IPROL-1 – 1.5" x 1.5" LaBr Stabilized Intelligent Probe.

- Included in the probe's housing are the PMT, the HVPS, the preamplifier and the communication interface.

IPRON-N – InSpector 1000 Neutron Probe (Moderated ^{3}He Tube).

- Included in the probe's housing are the ^{3}He tube, the HVPS and the communication board. The associated InSpector 1000 must have V1.1 or greater software installed. Backward compatible with existing InSpector 1000's.

ACCESSORIES

IN1KCAR – InSpector 1000 Car Adapter/Charger.

IN1KHCA – Hard Case for the InSpector 1000 Digital Hand-Held MCA.

IPRONC – Short Probe Cable (8 in.) for the InSpector 1000.

IPRONL – 20 ft Probe Cable for the InSpector 1000.

IN1KBAT – Battery Pack for the InSpector 1000 Digital Hand-Held MCA.

ISXCLNA2 – ISOCS/LabSOCS™ Characterization for 2" x 2" NaI Detectors.

- For characterization of InSpector 1000 IPRON-2 detectors.
- Accuracy estimated at 15–25%, 1 standard deviation.
- Requires S573 ISOCS or S574 LabSOCS calibration software.

ISXCLNA3 – ISOCS/LabSOCS Characterization for 3" x 3" NaI Detectors.

- For characterization of InSpector 1000 IPRON-3 detectors.
- Accuracy estimated at 10–20%, 1 standard deviation.
- Requires S573 ISOCS or S574 LabSOCS calibration software.

ISXCLNS2 – ISOCS/LabSOCS characterization for 2" x 2" NaI Stabilized Detectors.

- For characterization of InSpector 1000 IPROS-2 probe.
- Accuracy estimated at 15-25%, 1 standard deviation.
- Requires S573 ISOCS or S574 LabSOCS calibration software.

ISXCLLA1 – ISOCS/LabSOCS characterization for 1.5" x 1.5" LaBr Stabilized Detectors.

- For characterization of InSpector 1000 IPROL-1 probe.
- Accuracy estimated at 15-25%, 1 standard deviation.
- Requires S573 ISOCS or S574 LabSOCS calibration software.

ISO 9001 SYSTEM CERTIFIED

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