1480 WIZARD 3" Automatic Gamma Counter

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DESCRIPTION

The 1480 WIZARD® 3" is an automatic, 1000-sample capacity single detector computer-controlled benchtop gamma counter with a high efficiency well-type detector, specially configured 75 mm solid lead shielding, 2000 keV energy range and a unique sample changer design. It provides industry-leading performance in terms of background and crosstalk reduction. A truly universal gamma counter, it is ideal for multilabel counting applications or for counting high energy gamma emitters, low activity samples or environmental samples.

STANDARD FEATURES

- **Detector system** consists of a thallium activated, sodium iodide crystal of the end-well design. The crystal height is 80 mm (3.15 in.) and diameter 75 mm (2.95 in.). Special counting geometry ensures optimal counting efficiency of any sample volume without the need for manual setting of counting positions.

- **Radiation shielding** is present for the detector assembly and the conveyor. The detector assembly is surrounded by a minimum of 50 mm of lead shielding above and below. The shielding against the conveyor is solid lead 75 mm (2.95 in.). The shielding weight is 225 kg (495 lbs.).

- **Conveyor to detector crosstalk** resulting from the influence of higher energy nuclides is eliminated by a 75 mm lead shielding against the samples in the conveyor.

Conveyor to detector, single source, worst case	
^{59}Fe	< 0.05%
^{60}Co	< 0.06%

- **Sample changer** is a bi-directional automatic conveyor system with a storage capacity of 100 racks (sample rack 1, total of 1000 samples) or 54 racks (sample rack 2, total of 270 samples).

- **Elevator system** consists of a robotic arm system with cast aluminum grip units.

- **Linear multichannel analyzer** with 1024 channels and a 12-bit analogue/digital converter, calibrated 1 keV/channel or 2 keV/channel. Dead time is 5.25 microseconds.

- **Built-in computer** controlling the system is a 16-bit, industry standard computer having a 3.5", 1.44 MB disk drive and a hard disk. The computer contains 1 MB of RAM memory, two serial RS232C ports and a parallel port.

- **Built-in LCD display** includes a black and white liquid crystal display.

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precisely.

- **Alphanumeric keyboard** is an IBM-compatible "AT style" keyboard on a pullout shelf, located immediately underneath the display.

- **Operation keyboard** is a touch-sensitive keyboard, located immediately underneath the display.

- **Automatic GLP documentation** automatically monitors 9 detector parameters including background, efficiency, resolution, calibration, normalization and Chi-square performance. Automatically evaluates monitored data for quality assurance and provides out-of control warnings. Provides QC documentation to comply with Good Laboratory Practice (GLP) for regulatory agencies.

- **Sample tube** specifications are shown in the table below.

	In Normal Operation
Maximum diameter:	28 mm
Minimum diameter:	No limit
Minimum height:	No limit
Maximum height:	100 mm (including cap)
Tube shape:	No restrictions

- **Sample racks** of two different types can be used. They can be intermixed on the conveyor and are automatically identified and processed accordingly. Use of an ultrasonic bath instead of machine wash is recommended for cleaning. Maximum temperature: 40 °C. Racks are provided with individual sample carriers, which can be replaced in case of contamination. Racks of type 1 are compatible with most centrifuges. Maximum centrifugation force: 2500 x G.

Sample rack 1	Sample rack 2
10 samples/rack	5 samples/rack
Length: 164 mm	Length: 164 mm
Width: 18 mm	Width: 33 mm
Maximum sample diameter: 13 mm	Maximum sample diameter: 28 mm

- **Positive sample rack information** can be accomplished by permanently labeling each rack with a bar code, which is read when the samples in the rack are counted. The label can be attached to the rack on a removable clip.

- **Sample ID** is facilitated using two barcodes which can be provided for each rack. Each has the capacity for 2 digits or a special code word.

- **Automatic background correction** is accomplished by automatic subtraction of background counts in each counting region. Complete background spectra are stored.

- **High activity counting** on the 1480 WIZARD reaches maximum activity to 10,000,000 DPM (8,000,000 CPM) in normal mode for ^{125}I and maximum activity to 30,000,000 DPM in high activity mode. Dead time error < 1% to 2 million CPM.

- **Volume dependency**, measured in 20 mL LSC vial, is < 1%/mL change in relative counting efficiency for any nuclide in the range 0−20 mL.

- **Radionuclide library** consists of 48 nuclides, including the following:

^{125}I	^{77}Br	^{137}Cs	^{123}I	^{22}Na	^{47}Sc
^{57}Co	^{11}C	^{171}Er	^{129}I	^{95}Nb	^{75}Se
^{51}Cr	^{47}Ca	^{18}F	^{131}I	^{15}O	^{53}Sm
^{76}As	^{109}Cd	^{59}Fe	^{111}In	^{203}Pb	^{113}Sn
^{195}Au	^{141}Ce	^{67}Ga	^{114m}In	^{86}Rb	^{85}Sr
^{198}Au	^{58}Co	^{153}Gd	^{42}K	^{103}Ru	^{87m}Sr
^{133}Ba	^{60}Co	^{68}Ge	^{43}K	^{125}Sb	^{99m}Tc
^{139}Ba	^{134}Cs	^{203}Hg	^{13}N	^{46}Sc	^{201}Tl

Open window (15−2000 keV).

The user can customize all nuclide preset values, including the nuclide name and ID number. Dual label counting can use any pair included in the library.

- **Energy range** is 15 keV to 2000 keV.

- **Gain stabilization** in the optimized window setting for each nuclide is based on the use of multichannel analyzer techniques. The stability and reproducibility of the results are ensured by checking resolution, efficiency, spectrum drift and background. Efficiency variation < 0.5% (excluding statistical counting error).

- **Live spectrum display** of counts, CPM or CPS values can be displayed on screen. Counting spectrum can be displayed or plotted on the printer. Energy scale is linearity corrected and can be zoomed.

- **Spectrum files** can be automatically saved to hard disk. They can be copied to the data logger diskette or transmitted to another computer. Saved spectra can also be examined off-line with separate software, e.g. Microsoft® Excel.

- **Hard copy** can be printed of screens and protocol contents.

- **Multi-user capability** stores 99 assay protocols which can be called into use automatically with barcode clips.

- **Multitasking operation environment** allows simultaneous protocol and file manipulation while counting is in process.
- **Help utility** includes full screen helps available at all stages of operation.
- **Two simultaneous counting regions** enable two nuclides to be processed simultaneously. Nuclides can be preset or user selected. Spillup and spilldown correction is carried out automatically. Special dual label normalization is not needed.
- **Decay correction** corrects for nuclide decay in both counting regions to any date, time or assay beginning. Decay correction also works in normalization, e.g. ^{99m}Tc. Half life values are included in the nuclide library.
- **Automatic normalization** is carried out by using a normalization cassette for each defined nuclide. Waste radioactivity can be used for any nuclide normalization. No separate normalizations for different volumes are needed.
- **Contamination guards** are inherent in rack construction, protecting the detectors from contamination. Samples are separated from the detectors by liquid tight, disposable sample holders.
- **Decontamination facilities** are freely accessible to the user, including the conveyor, sample changer and detectors at all stages of operation. Decontamination is very fast and easy.
- **Automatic power failure recovery** enables an assay in process to be automatically restarted after power failures of up to 30 days.
- **Date and time** includes battery support for 30 days. Internal clock can be synchronized by via PC port.
- **Connections** include a serial ASCII interface RS232C, 2 output terminals: a serial printer and a system PC (external MultiCalc®) and a parallel printer data connection. Printers must be able to print in MS-DOS. They must be Epson compatible or accept PCL Level 3 commands.
- **Programmable computer and printer I/O.** Each RS232C interface port can be individually programmed for data format, baud rate and hand-shaking mode. All ports can be de-activated.
- **Datalogger** enables all assay results to be automatically stored in MS-DOS ASCII format on 1.44 MB diskettes. Files are transportable, as .TXT files, to popular spreadsheet programs such as Lotus® 1-2-3 or Microsoft Excel.
- **Remote instrument control** via PC port using character based-command language is applicable for some non-PerkinElmer Windows® software as well.

RIACALC WIZ SOFTWARE

RIACalc WIZ software is standard on all WIZARD counters and includes a built-in RIA evaluation and quality assurance program. It supports RIA, IRMA or screening types of assays, single or dual label.

- **Curve fitting techniques** support all usual response calculations such as linear interpolation, linear to cubic regression, either unweighted or weighted, and interpolation or RIA/IRMA model-based spline. Four-parameter logistic fit. X-axis transformations include lin dose, log dose or lin/log dose. Response transformations are either CPM, B/Bo, logit (B/Bo), log(B), B/T, Bo/B or T/B.
- **Assay protocols** (up to 99) are RIACalc RM/DM-compatible. SAVE (to floppy) and LOAD (from floppy) functions are provided. Protocols can be password-protected.
- **Assay recalculation and reevaluation** for assays with erroneous samples can be done without recounting. Full editing is possible for standards, patient samples and controls. Previously saved curves can be used in evaluation.
- **Assay counting without standard samples** enables previously saved curves to be used in evaluation.
- **Multiple nuclide work** is facilitated on 1480 WIZARD counters (MIA=multi-isotope assay). Theoretically up to 20 radionuclides can be counted simultaneously. Raw count results as well as spillover-corrected CPM results are reported in up to 20 discrete energy regions. All individual nuclides are corrected for background and nuclide decay. Heavy overlap of spectra may occur in practice and often maximum number of labels may be 6 or less.
- **Unknown samples** can include a maximum of 10 dilution groups; each can have individual (maximum 5) replicate groups. Blank subtraction is automatic. Blank samples are either common for standard and unknown samples, or common for all unknowns or for same dilution group. Six standard flags.
- **Control samples** can be included in each protocol. Each control file can have a maximum of 12 values. Either individual or average values can be automatically collected, in six levels. Levy-Jennings charts can be plotted after an assay. The maximum number of assays is 50. The maximum number of saved values

is 12*6*50*99 = 356,400. The saved value can be any field; factory setting is concentration. Special view mode is provided.

- **Trend files** enable 12 trends from the 125 assays to be followed. Levy-Jennings chart can be plotted after an assay. Special view mode is provided.

- **Curve editing** can be done during automatic run, before processing unknown samples. Conditional halt, based on to the goodness of fit is provided for automatic entry to the on-screen editor during evaluation.

- **Automatic outlier rejection** of bad standard points can occur according to two different criteria; difference from mean or from standard curve. Halt for curve edit can also be made conditional depending on the number of outliers.

- **Precision profiles and histograms** are generated and plotted after an assay.

- **Result files** format selectable results to be automatically saved to hard disk. They can be copied to the data logger diskette or transmitted to an external computer with proper software, e.g. MultiCalc.

- **Special assay protocol creation** is supported by RIACalc WIZ for assays such as hepatitis screening, RAST screenings, ratio assays such as T_3 Uptake or ETR, dual label Shilling test, combined assays such as FTI, Chromium Release studies, or RIAs with variable NSB, e.g. Renin.

Available Configurations

Model	Detectors	Sample Capacity
1480-011	1	1000

Options

1221-244	UltroTerm III Terminal Emulator Software for MS-DOS
1224-310	MultiCalc Advanced Data Management Software (requires an external PC)
1409-208	Floor Stand

Typical Performance Data

Background:

^{125}I	30 CPM
^{51}Cr	25 CPM
15–2000 keV	350 CPM

Typical values at PerkinElmer factory, Turku, Finland. (Background may vary elsewhere due to local conditions.)

Efficiency:

^{125}I	82% (typical)
^{51}Cr	7.0% (typical)
^{137}Cs	47% (typical)

Efficiency = CPM/DPM x 100%, window 15 keV–1000 keV

Energy resolution:

^{125}I	< 28%
^{137}Cs	< 10%

Spilldown:	
^{57}Co into ^{125}I	< 3% (uncorrected)
Preset regions	< 1% (corrected)

Physical Data

Dimensions:

Height:	650 mm (25.6 in.)
Width:	1179 mm (46.1 in.)
Depth:	650 mm (25.6 in.)
Weight:	Approx. 315 kg (690 lb.) Transportation weight: 355 kg or 780 lbs.

Electrical requirements:
115/230 V ± 10% at 50/60 Hz, 200 VA maximum

Environmental requirements:
Temperature range from +15 °C to +35 °C
Max. humidity 85%

Electrical Safety Requirements
The design of the instrument is based on the following electrical safety requirements:
EN 50082-1992; EN 50081-1: 1992
EN 61010-1: 1993 (IEC 1010-1)
EN 61000-3-2:_1995 + A1: 1998 + A2: 1998 + A14: 2000
EN 61000-3-3: 1995
EN 61010-1: 2001
UL 61010A-1: 2002 R12.02
CAN/CSA-C22.2 No. 1010.1-92 + A2: 97

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