Liquid Scintillation Analyzers

Tri-Carb® 5110TR
Low Activity Liquid
Scintillation Analyzer

Tri-Carb 5110TR

Description

The Tri-Carb 5110TR is a computer-controlled bench top liquid scintillation analyzer for detecting small amounts of alpha, beta and gamma radioactivity.

Standard instrument features

- Powerful built in computer system with Windows 8.1 operating system 4 GB (minimum) RAM and 250 GB hard disk (minimum) 3 high speed USB ports and Dual Gigabit Ethernet support with 19 inch Wide LCD monitor with DVI-D video output and keyboard.

- Date and time clock provides real time display and time-stamped printouts; battery supported.

- Operational status indicator LED's.*

- Live SpectraView™ Automatic spectrum display aids in optimizing counting regions and helps evaluate complex sample situations. It allows setting temporary regions on the spectrum screen and enables the operator to monitor the effect of AEC (Automatic Efficiency Control) while the sample is counting.

- Quick-Count sample loading for 60 independent protocols (with unlimited assays) provides unrestricted access to sample changer and protocol selection plugs. Sample batches are processed by simply activating the Quick-Count protocol flags, thus minimizing any user programming.

- Anti-jam recovery of the sample changer mechanism protects samples, vials and the counting system from damage if obstructions occur.

- Automatic power-fail recovery restarts counting when power is restored and the instrument has reinitialized itself.

- Positive sample identification provides protocol number, cassette number, sample number, and user-selectable printout and data file storage for the counting time and date on each sample.

- Robust downloading sample changer mechanism with an electrostatic controller and a double light sealing shutter that allows the photomultiplier tube detectors to remain on for maximum stability even during sample changing.

- A cassette-loaded bi-directional sample conveyor mechanism is standard with a sample capacity of either 408 standard 20 mL vials, or 720 small 4 or 7 mL vials.*

- Varisette™ sample changer enables intermixing and counting of both large and small sample vials without special adapters. Includes both large vial (12-position) and small vial (18-position) cassettes.*

- Multi-parameter linear MCA (Multichannel Analyzer) with an effective resolution of 1/2 keV, offers an extended dynamic quench range and provides multi-parameter spectrum analysis to correct for luminescence, color quenching and background radiation.

- Patented TR-LSC® (Time-Resolved Liquid Scintillation Counting) is featured for high sensitivity, low background counting of LS samples. TR-LSC increases sample throughput.*

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- ^{133}Ba low energy external standard source and tSIE (transformed Spectral Index of External standard) calculations. The use of integral spectrum counts eliminates the need for repeat counting of the external standard and negates the effect of isotope on quench monitoring accuracy and precision. The ^{133}Ba external standard is centered under the sample vial which eliminates the effects of volume variations and assures reproducible quench monitoring for the life of the instrument.**

- User adjustable assay-specific sample precount delay permits dark adaptation of samples before counting.

Standard software features

- QuantaSmart™ software with comprehensive on-line context sensitive help for the Windows® 8 operating system is a 32-bit operating system software that provides a robust multitasking, easy networking environment and unlimited assays in a secure multiuser environment.**

- Dynamic color-corrected single and dual label DPM is based on tSIE with AEC. AEC corrects for differential quenching effects in multi-label samples. The low energy spectrum of the external standard ensures accurate tracking of ^{3}H, ^{14}C and other low energy sample spectra over a very wide quench range. Includes factory stored quench standards for ^{3}H and ^{14}C in classical and ULTIMA Gold™ cocktails with On-screen editing of quench. correction curves and recording of date last modified.**

- Enhanced Direct DPM technique determines the DPM of any single label pure beta or beta/gamma radionuclide in any cocktail without the use of quench standards.

- Spectral unfolding separates and displays in color the individual radionuclide spectra of dual label samples.

- Triple-Label DPM is based on tSIE/AEC for accurate spill correction.

- HSCM (High Sensitivity Count Mode) increases system sensitivity by implementing additional electronic background reduction via TR-LSC. It includes assay specific, user-selectable delay before burst settings for optimization of TR-LSC. Not available with ULLCM.

- 3D (three-dimensional) spectral mapping displays in color the quench standard spectra together with the spectrum of the unknown for single label DPM counting.

- Enhanced IPA™ (Instrument Performance Assessment) database for monitoring efficiencies, backgrounds, E2/B and Chi-square values for ^{3}H and ^{14}C over the life of the instrument. IPA flags impending problems and provides both running mean and fixed baseline charts and associated tables for retrospective quality control and pro-active system maintenance. Baseline acquisition is programmable for increased flexibility. The most recent IPA time and date stamped data are available on demand for reporting purposes. Each IPA printout includes instrument model, serial number, software version number and calibration standard information.**

- Decay computations automatically calculate decay corrected DPM values for commonly used radionuclide standards.

- Enhanced Replay sample post-processing provides complete recall and post-processing of historical count data to eliminate sample recounting. It enables changes to count conditions and reports as well as execution of user application software for optimization of data analysis.**

- SpectraBase counting and data management system provides region less counting and storing of complete spectra for all samples and standards. Features include automatic recall of spectra stored in the quench library for region-independent quench correction and post processing of sample data with the Replay™ feature.**

- Chemiluminescence correction with response normalization corrects for luminescence interference to speed up sample counting. Response normalization of the correction circuits eliminates the effect of component drift on the corrected results.

- Luminescence detection and correction with percent luminescence is flagged on printout to alert user of possible sample problems.

- Group PrioStat™ interrupt mode gives priority counting status to a batch of samples counted according to any stored protocol conditions. It automatically restores the interrupted protocol upon completion and stores PrioStat data for immediate viewing. Data is printed at protocol termination.

- Sample PrioStat™ interrupt mode allows special function priority counting of individual samples, with manual control over counting conditions.

- Background subtraction can be nominated via sample, entered value, or stored IPA background spectrum.

- SIS (Spectral Index of Sample) quench indicating parameter determines counting efficiency by analysis of sample spectrum.

- Preset time (up to 9,999.99 minutes) and preset error coincidence termination optimizes counting accuracy in the three counting regions.

- Assay-specific, user selectable, coincidence resolving time enables optimized counting of any fast or slow, liquid or solid scintillator, for SPAs (Scintillation Proximity Assays), solid scintillation filters and the newer liquid scintillation cocktails.

- Programmable single photon counting enables luminescence assay counting with optimized signal-to-background ratios. It overcomes problems associated with excessive luminescence.

- Heterogeneity monitor determines sample quality and flags non-homogeneous sample results.

- Computer-aided diagnostics are used to verify all system functions.

- Automatic spectrum plot (on demand) per sample allows spectral documentation of samples.

- Sample numeric data screening allows screening fields such as activity based on several criteria including background levels, a hard number or within a range of activities or values. Hits can easily be identified in reports with optional highlighting and custom hit flags.
- Printed header contains instrument serial number, user ID, and drive and path of all electronic stored data. Each printed page or RTF (Rich Text Format) file report is numbered and dated for GLP compliance.
- Password protection prevents unwanted changes to saved assays.
- User adjustable assay-specific sample precount delay permits dark adaptation of samples before counting.
- Automatic processing of count data to final results provides automatic, protocol specific data processing for all user applications, including commercial or user-generated software. No exporting of data to off board storage devices or computers is required.
- Half-life correction to any date and time is available for up to three radionuclides.
- Activity reporting is provided in Becquerels, micro- Curies, or picoCuries.
- Independent output formatting to printer, for each protocol provides almost unlimited flexibility in data reporting. Electronic data can be saved to disk in ASCII, RTF, or Microsoft® Excel® compatible formats. Reports can be customized for data content and protocol information.
- User-definable calculations are available for custom data reporting.
- Percent of standard calculations is present for single, dual and triple label samples.
- Sample worklist enables entry, editing and review of worklists for each assay. Automatic creation of worklists is possible with the 2D barcode option, which allows sample identification with user-specified codes for sample printouts and data files.

Hardware options

- Automatic 2D barcode reader (factory default setup). Barcode readings can be used to create the sample worklist and optionally save to a file or validate an existing worklist. Barcodes are enabled on individual assays giving the user maximum flexibility in barcode usage. Bar code configuration software program provided for custom setup.*
- Printer (ink jet or laser jet).
- Temperature-controlled refrigeration establishes and maintains optimum counting conditions for a wide variety of sample types.

Software options

- Alpha/Beta discrimination (PSA), allows simultaneous acquisition of pure alpha and beta spectra from mixed radiations of a sample. PSA is a necessary condition for sensitive liquid scintillation alpha counting. Alpha backgrounds are greatly reduced by PSA when compared with the total sample background, which is composed mostly of short, beta type pulses. Pulse Shape Analysis can also be used for background reduction in beta counting to cut slow fluorescence event background, which interferes, particularly in the ^{3}H energy region in glass vials.*
- Pulse Amplitude Comparator (PAC), high bias threshold, RF suppression and static eliminator.
- ULLCM (Ultra Low Level Count Mode) option includes Pulse Amplitude Comparison (PAC) which is a means to decrease the component of background produced by optical crosstalk in liquid scintillation counting,. Together ULLMC and PAC are used for low activity level beta samples increases system sensitivity (E2/B) to a factory test minimum of 500 for ^{3}H and 1,400 for ^{14}C. ULLCM may be used to provide optimal conditions in either the normal LS mode or alpha/beta mode for extra low level beta samples It includes SpectraWorks™ spectrum analysis software for the Windows® operating system and assay specific, user- selectable delay before burst settings for optimization of TR-LSC.
- Enhanced security option (ES) provides 21 CFR part 11 compatible software that includes instrument access security, electronic data security and audit logs.
- Easy View Raw data saved on the PC hard disk or a network drive can later be processed off-line with EASY View spectrum analysis software. EASY View displays up to 6 spectra simultaneously and allows spectral arithmetic, DPM calculations, statistical analyses and radiocarbon age dating.
- SpectraWorks™ spectrum analysis software for the Windows® operating system analyzes beta, alpha, and gamma spectra and provides simultaneous display for up to four spectra in stacked or overlaid mode. It features zooming to any part of the spectrum; six regions of interest; display of counts or CPM and linear or log spectra; provides automatic and manual scaling; calculates E^2/B, MDA, peak resolution; allows adding and subtracting of spectra and multiplication and division by constants.

Accessories

- Instrument utility cart functionally designed general purpose laboratory cart. Supports any PerkinElmer bench top system.
- See the Equipment, Chemicals & Supplies section in the PerkinElmer catalog.

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Physical data

Dimensions:

Height:	18.5 in.	(47 cm)
Width:	40.5 in.	(103 cm)
Depth:	32 in.	(81 cm)
Depth with refrigeration:	44 in.	(112 cm)

Weight:
477 lb (217 kg)

With refrigeration:	523 lb (238 kg)
Shipping weight: approximately 700 lb (318 kg)	

Electrical Requirements:
100-240 Vac 50/60 Hz

3-prong grounded plug

Power Consumption: <200 VA; <800 VA
with temperature control option

Environmental:
Operating ambient temperature 15 to 35 °C (59 to 90 °F)

Operating relative humidity 30% to 85%

Typical performance data

(As measured in the Singapore facility)

Energy Range:	0–2,000 keV	

Efficiency, Normal Count Mode:

Minimum Acceptable

^{3}H	0–18.6 keV	60%
^{14}C	0–156 keV	95%

Figure of Merit (E^2/B), Normal Count Mode (NCM):

^{3}H	1–18.6 keV	180
^{14}C	4–156 keV	380

Figure of Merit (E^2/B), Low Activity/High Sensitivity Count Mode

^{3}H	1–12.5 keV	300
^{14}C	14.5–97.5 keV	950

Figure of Merit (E^2/B), Ultra Low Level Count Mode (ULLCM):

^{3}H	1–12.5 keV	500
^{14}C	14.5–97.5 keV	1,400

Observed Background, NCM:

Average

^{3}H	0–18.6 keV	17 CPM
^{14}C	0–156 keV	26 CPM

Note: The efficiencies, backgrounds, and E^2/B values for the Normal Count Mode were determined using PerkinElmer sealed large vial glass standards set P.N. 6008500 verified with NIST standard activity. The HSCM and ULLCM values are determined using PerkinElmer low level sealed large glass vial standards set P.N. 6018914 verified with NIST standard activity. No maximum is specified for background.

Safety, Radiated Emissions and Immunity:
The Tri-Carb 5110TR has been tested and approved for safety, radiated emissions and immunity according to the standards of UL, IEC61010 and CE.

In the U.S.A. the UL approval satisfies the requirements of 29CFR 1910.399.

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