HPLC RADIOACTIVITY MONITORS

Model # SSS-33

FEATURES:

- HIGH SENSITIVITY H-3, C-14, ALL BETA EMITTERS AND LOW ENERGY GAMMA EMITTERS
- DUAL PM TUBE DESIGN
- WIDE CHOICE OF FLOW CELLS TO FIT ALL APPLICATIONS
- SOPHISTICATED COMPUTER DATA ANALYSES (OPTIONAL)

Figure 1: SSS-33

APPLICATION: The SSS-33 Radioactivity Monitors accurately quantitatively measure Carbon-14, Tritium and other radioactive labels used in conjunction with liquid chromatography and HPLC. These fine measurement systems are of particular interest to researchers working in fields of metabolism, toxicology, pesticides, agriculture, pharmacology, nuclear medicine, and other bio-chemistry areas. The SSS-33 Flow cell counting system allows high sensitivity and quantitative measurement of any Radioisotope labeled fluid stream from HPLC, LC or other source.
Single, dual or triple labeled samples can be measured.

SYSTEM DESCRIPTION:

Measuring Principle: The most sensitive method of detecting and quantitating beta emitting isotopes is to intimately mix the effluent stream with liquid or granular scintillator and count each individual scintillation event with a dual photo-multiplier coincidence counter. Then the signal is further selected by an energy analyzer and this true signal is taken as a function of time. Sophisticated computer data analysis and hard copy print out are provided.
Sample Stream Flow Path: sample stream from HPLC, LC or other source -

(a) is continuously mixed with precisely measured amount of liquid scintillation fluor, or,
(b) flows directly into packed detection flow cell.

Detection flow cell is optically coupled to two selected photo-multiplier tubes which count in coincidence mode. Coincidence counting eliminates photo-cathode noise pulses that are always present in any one PM tube system. Extremely good sensitivities and figure of merit for low energy betas such as H-3 and C-14 are thus achieved.
Alternatively, in case (b) above, a “packed” flow cell is utilized. That is, the flow cell is packed with small scintillation crystals, like fine sand. The sample flows through this bed of chemically inert crystals. Scintillation counting occurs, and the sample stream emerges pristine, i.e., no scintillation fluor dissolves in the sample stream.
Flow cells are available packed with CaFl crystals or anthracene for aqueous solutions, glass scintillation crystals for corrosive solutions, or plastic scintillators for amino acid analysis.
Gamma ray counting is achieved by inserting and optically coupling a NaI(Tl) scintillation crystal between the flow cell and one or both of the PM tubes. (Coincidence counting is not used for gammas.) Other flow cell types are available on request.
The various fractions in the sample stream can be collected in a fraction collector, or the sample can be further measured or purified, if desired.
Optional peak detection and flow time delay features allow peak(s) to be collected while waste liquid flows into separate container.

TA TECHNICAL ASSOCIATES
7051 ETON AVENUE * CANOGA PARK, CA 91303 TELEPHONE (818) 883-7043 * FAX(818) 883-6103

$Revision: 1.2 $

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DATA ANALYSIS AND PRESENTATION:
Scintillation counts which are detected simultaneously by both PM tubes are processed by a fully adjustable single channel analyzer which is centered on the energy peak of the isotope being measured. This deletes both higher energy pulses from background radiation and lower energy counts from the PM tube or circuit noise. The pulses are then fed to a counter and then to a computer, printer, 8" chart recorder and/or standard chromatography integrator. (This allows long count times for measurement of very minute samples as well as completely elimination artifacts caused by ratemeter time constants such as tailing or spreading of peaks.)

Optional Interfaces and Outputs:

- Integrator Interface (Analogue System) Module # **MPL-5AV** for input into all chromatography integrators and data collection/analysis systems.
- TTL Pulse output (all systems)
- Computer Interface RS-232 serial output, Module # **MCC-23**. Complete plug compatibility with the standard input for **computer**.

Computer Integration and Analysis with additional Hard Copy Readout:
Data Processor
(The following specifications are based on use of TA's SSS-33 with independent chromatography system. SSS-33 can drive any chromatography integrator analyzer.)

- Internal memory for up to 6 hours general chromatogram storage.
- BASIC programming capability is standard.
- Full alphanumeric capability.

Data processor provides all data processing functions required in chromatography.
Only three minutes needed for reprocessing of one-hour chromatogram.

- One chromatogram can be reprocessed any number of times using different parameters.
- Long term chromatogram (e.g. 6 hours at 0.5 second sampling) can be accurately stored. Several different chromatograms can be stored.

Graphics, such as calibration curves and bar graphs, can be displayed and hard-copied on printer/plotter by simple keyboard command.

Data Analysis and Read-Out Options:

1. Data goes directly to computer by RS-232 interface to be analyzed and displayed by chromatography peak analysis software available from TA or use customer's software package.
2. Data goes to stand-alone chromatography integrator from HP, Nelson, Shimadzu, etc...
3. Raw Data printed on digital printer.
4. Raw Data drives 8" analog chart recorder.

For each of these items: PC, PC software, integrator, printer, or chart recorder can be provided either by Technical Associates or the customer can provide their own.

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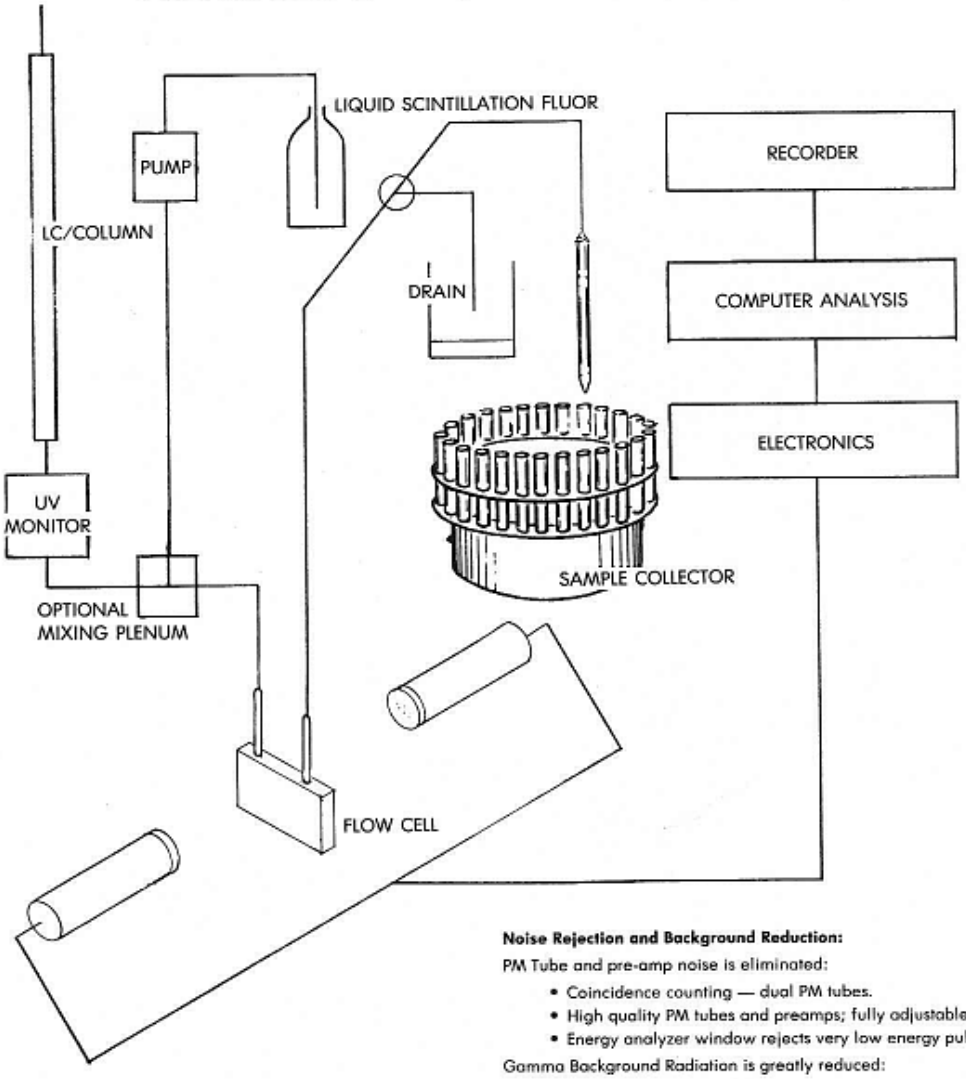
SCHEMATIC OF FLOW PATH FOR SSS-33



Flow Cells:

Guaranteed light tight mounting.
Quick installation or substitution.
Excellent repeatable optical coupling to dual PM tubes.
See attached chart for detailed specifications.

Noise Rejection and Background Reduction:

PM Tube and pre-amp noise is eliminated:

- Coincidence counting — dual PM tubes.
- High quality PM tubes and preamps; fully adjustable.
- Energy analyzer window rejects very low energy pulses.

Gamma Background Radiation is greatly reduced:

- Lead shielding around detector.
- Low scintillator volume.
- Energy Analyzer window rejects high energy pulses.

Stray Light is eliminated:

- Fully light tight flow cell enclosure.

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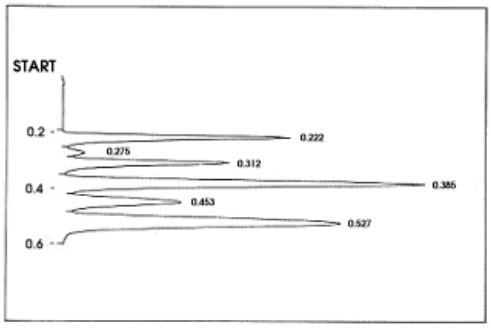
Ideal Signal Processing Capability

High-fidelity chromatograms

High-resolution printer/plotter records even the sharpest peaks clearly and accurately. Additionally the zero point can be freely set.

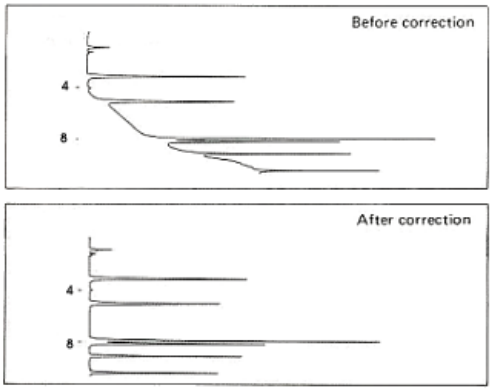


- Peak detection markers are given in the chromatogram.

Large chromatogram memory (134 ~ 172K byte)

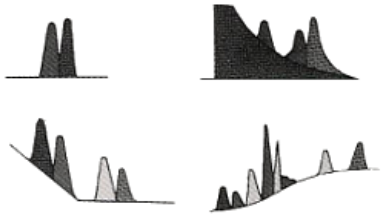
- Chromatograms can be totally memorized to be reprocessed with different processing parameters.
- Dozens of chromatograms can be stored.

- Background drift can be memorized so that the baseline can be corrected using that memory.



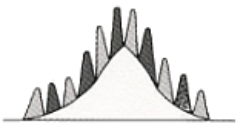
Reliable peak processing

- Parameters are automatically set and varied.
- At a touch of the S. TEST key, the noise level of the chromatograph is monitored and the peak detecting sensitivity is determined automatically.
- With widening of peaks, two parameters — peak detecting sensitivity and peak width — are automatically changed.
- Correction of baseline drift, separation of unresolved peaks, skimming of peaks on tails are all processed automatically for optimal and reliable integration.



- Even noisy chromatograms can be reliably processed.
- Sharp and broad peaks in one chromatogram can be processed with individually optimized parameters.

- Sharp peaks as narrow as 0.2 second in half width can be measured.
- Uninteresting peaks can be rejected.
- Areas (or heights) of peaks on an envelop can be measured.



- Peak heights can be measured.
- Peak areas and peak heights can be measured simultaneously.
- Manual setting of parameters is also possible.
- Parameters can be automatically changed during a run, by Time Program.
- The C-R3A can process up to 4000 peaks.
- Peak areas can also be measured on a time band basis.

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