



# Automated Flow Thru Tritium Water Monitor

## Model - Trimaran – H<sub>2</sub>O

- USB, Optional 4-20 mA
- Easy Integration into Facility Mainframe
- User Settable – Units, Alarm Limits, Flow Rate, Etc.
- Rugged, Reliable, Simple Operation
- Steel Frame Mounted
- **IP42**

## Application

Monitoring changes in Tritium concentration in primary and secondary coolant, entering or leaving the Recombiner, make-up pond or spent fuel pool, etc.

Other applications include monitoring Tritium in processed water, storm water, drain effluent, ground water, rivers, lakes, and ocean currents.

Eliminates the need for pulling samples manually; waiting on expensive lab results. This automated system frees valuable and expensive personnel for other duties.

## Features

- Sensitive Enough To Detect Run-off Changes In Groundwater Tritium Plumes
- Low Level Real Time Continuous Tritium-in-Water Monitor
- Optional: Capture & Hold Sampling System
- 6 Port Intake Manifold for Sampling 6 Individual Input Lines, Sampled in Series
- Tritium Only; Ignores Other Nuclides
- Sensitivity of 13,500 pCi/l in 8 Hours
- 6,750 pCi/l - Detectable in 24 Hours
- No LSC Fluid / No Waste Product
- Full On-board Computing System for Data Acquisition, Analysis, Archiving & Retrieval

### Low End Sensitivities

MDA	MDA	MDA	MDA
8 HOURS	24 HOURS	7 DAYS	ONE MONTH
500 Bq/L	250 Bq/L	40 Bq/L	TBD
13,500 pCi/L	6,750 pCi/L	1000 pCi/L	TBD



## TECHNICAL ASSOCIATES OVERHOFF TECHNOLOGY

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## Description

### Fully Integrated Package

Model Trimaran-H<sub>2</sub>O is a completely self-contained instrument for real time continuous detection of Tritium concentration in water. The instrument is mounted inside a rugged built 200 cm tall steel enclosure with reinforced anchoring feet and locked access.

P-10 gas (90% Argon, 10% Methane, non-combustible) cylinder is connected to the unit externally. This quantity is sufficient for 60 days of continuous operation.

The main subassemblies are:

1. Sample water input lines
2. Pre-filter
3. External cooling loop in case of hot samples
4. PRV and RV system with manifolds
5. Water purification system (oil-in-water and micron filter)
6. Sample water pump
7. Detection module
8. Data acquisition electronics module
9. System control module
10. Waste water output line, RV output line and sample bypass output lines
11. Sample Enrichment assembly

### Pressure Regulating Equipment

Pressure of input sample streams can be up to 103 kPa. The pressure is immediately reduced to 2-3psi via Pressure Regulating Valves (PRV).

Each PRV is associated with Pressure Relieve Valve set to open at 100 kPa, preventing the pressure in the system from being more than 100 kPa, in turn making it safe to handle.

This also makes the instrument **Class 6 Nuclear Device**.

### Low Minimum Detectable Activity (MDA):

- The Trimaran H<sub>2</sub>O detects Tritium decay extracting T<sub>2</sub> and H<sub>2</sub> from water, enriching/concentrating the sample.
- Sensitive measurement is made with matched gas flow proportional counters.
- 1/8" lead or equivalent shielding minimizes cosmic and Gamma radiation effects providing low back- ground noise.

**Optional** 1/2" lead or equivalent shielding.

### Remote Monitoring and Alarming:

- USB, Ethernet and **Optional** 4-20mA output.
- 2 alarm outputs and malfunction outputs in the form of dry, fail-safe, relay contacts.
- Alarms are user adjustable.
- Malfunction alarms activate in case of electronics and/or mechanical failures in the system.



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## PLC Control

- Sampling of input lines and control of alarms and pumps is done by PLC unit placed inside of the System Control Module.
- An alarm and a manual override are provided in case of PLC failure providing manual operation until PLC is replaced.
- **Manual operation is a backup system**; the unit normally operates in automatic mode.

## Routine Maintenance

Scheduled maintenance of consumables is required

P-10 gas cylinder needs to be replenished every 2 months

Sample air filters need to be replaced when needed

Periodic check of the efficiency & background is recommended if there is a possibility of increased background contamination and due to standard life cycle of electronics components

## Annual Inspection And Service

It is recommended that the instrument be inspected and serviced on an annual basis to ensure continuing trouble free operation. All components of the instrument should be inspected and instrument re-calibrated.

## Repair

Equipment failures of a minor nature can be repaired under local supervision by the operator of the equipment. When necessary, the manufacturer (Technical Associates / Overhoff Technology), or its agents can dispatch service personnel for quick remediate action.

## Documentation

All Technical Associates / Overhoff Technology equipment is accompanied by complete documentation, which includes the following:

1. User and Maintenance Manual that contains:
  - a) Theory of operation
  - b) Installation instructions
  - c) Operation instructions
  - d) Calibration procedure
  - e) Suggested maintenance
  - f) Repair instructions
  - g) Drawings, diagrams and schematics

Training will be provided by the manufacturer, at this factory, free of charge. Assistance with commissioning is also available by the manufacturer (Technical Associates / Overhoff Technology).



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## Advantages of Proportional Counting System Versus Liquid Scintillation

Prior to the development of the Trimaran H<sub>2</sub>O, the only detectors capable of measuring very low levels of Tritium in water were Liquid Scintillation Counting (LSC) based. The LSC approach has some obvious disadvantages, such as: the LSC fluid must be constantly refilled at a significant cost in labor, money, and space; LSC fluid is also hazardous material and mixing with tritium results in 'liquid mixed waste,' which must be carefully stored, transported and disposed of.

The **Trimaran H<sub>2</sub>O** utilizes proportional counting technology. A compact standard steel tank of proportional gas will last for more than a month and is readily available from a variety of suppliers.

The P-10 counting gas is 90% Argon and 10% Methane, is not toxic or combustible.

Measurement with this method achieves same or better low-end Tritium sensitivity, without having to deal with LSC fluid and waste.

The Trimaran H<sub>2</sub>O has a 6 port intake manifold for sampling 6 individual input lines, sampled in series.

### Sample Enrichment

With LSC and proportional counting detectors, Technical Associates / Overhoff Technology has pushed Tritium detection to the most sensitive limit.

Samples can be diluted even with large multi-liter detectors there are not enough disintegrations per second for good measurements. This issue is overcome by concentrating or enriching the sample.

This may be accomplished using iterative processes to concentrate the Tritium in water using phase change or other physical differences (not chemical processes since 1H, 2H, and 3H are chemically identical.)

Technical Associates / Overhoff Technology scientists have developed their own proprietary sample enrichment cycle, creating system sensitivities far beyond other automated flow-through systems

### Electronics and Measurement Specifications

<b>Measurement Range:</b>	0 kBq/L – 130 kBq/L
<b>Sensitivity:</b>	See Chart
<b>Detectable Limit:</b>	40 Bq/L (in 1 week) at confidence level of 95%
<b>Display:</b>	LCD Touch Screen Monitor
<b>Units:</b>	User Settable
<b>Measurement Method:</b>	Gas flow proportional counters
<b>Proportional Counters:</b>	Dual copper clad acrylic counter tubes, 2 liter active volume, 2.5 liter wetted volume, 0.001 inch tungsten collector anode
<b>Counter Gas:</b>	P-10 or "MAGIC" gas for high performance
<b>Flow Rate:</b>	250 cc/min, typical - Continuous Flow is Standard <b>OPTIONAL:</b> Capture and Hold Sampling
<b>On Board Computer:</b>	Data-analysis, Archive, Retrieval
<b>Output:</b>	USB and Ethernet <b>OPTIONAL</b> 4-20mA
<b>Signal Processing:</b>	Electronic signal processing of coincident pulses for Tritium specific wave shapes (height and duration)



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## Electronics and Measurement Specifications

**Sampling System:** See Diagram

### Environmental:

**Temperature:** 0° C to 50° C

**Humidity:** 0 to 95 % R. H.

**SEISMIC:** Withstands modest shock

**General:** Equipment to be sheltered from exposure to raw elements.

### Power:

**Electrical:** Power 110/230VAC, 10A main power, +24VDC for 4-20mA and connections for the remote alarms and monitoring

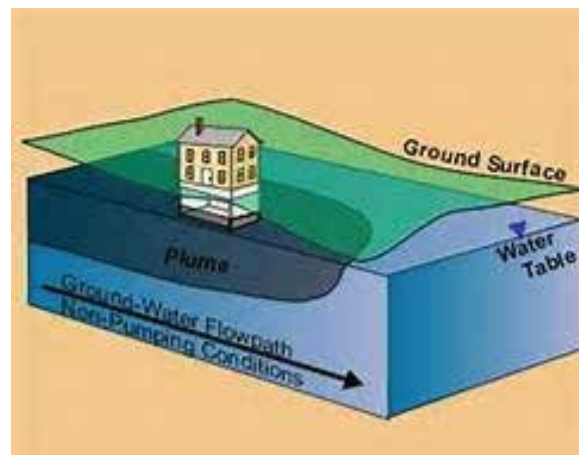
### Weight and Dimensions:

**Dimensions:** 31.5" W x 23.6" D x 84" H (800mm x 600mm x 2133mm)

**Weight:** 1100 lb (~500 kg)

**Mechanical:** Self-contained, mounted on a steel frame with lifting eyes for easy transport.

## Sensitive Enough To Detect Runoff Changes In Groundwater Tritium Plumes



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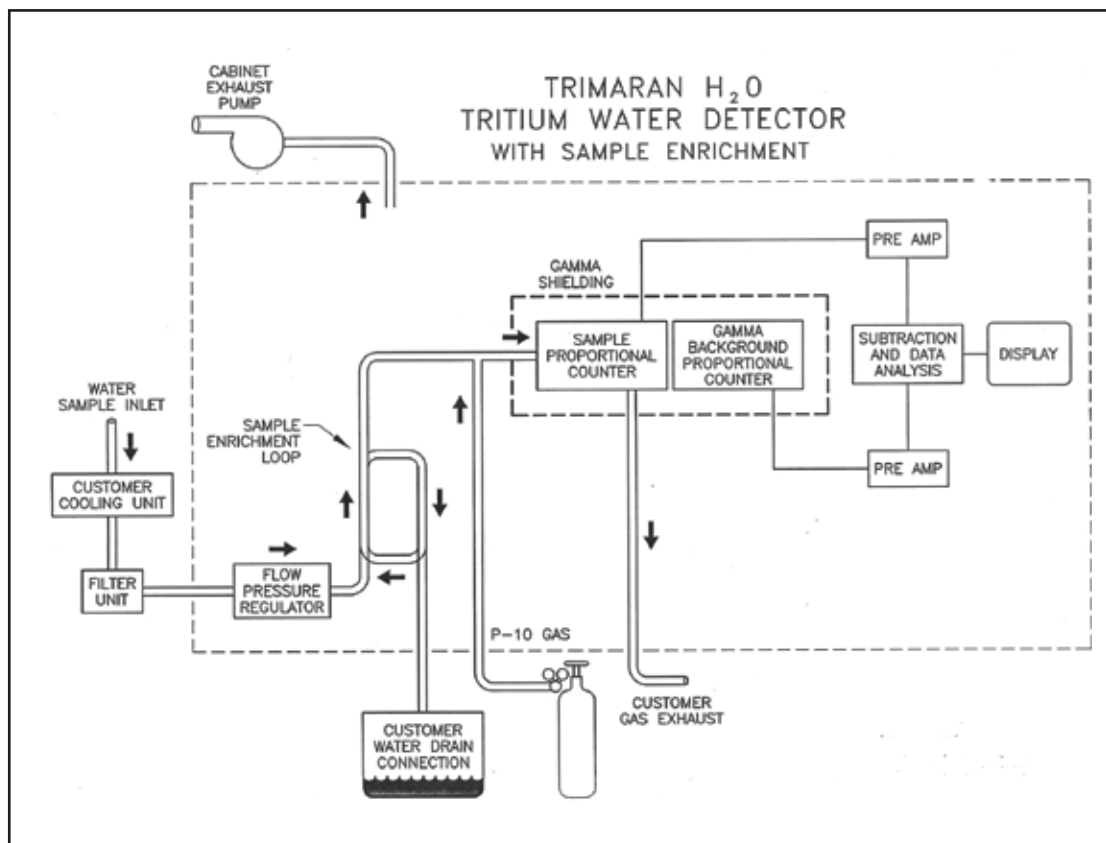


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Model - Trimaran – H<sub>2</sub>O

Trimaran-H<sub>2</sub>O Flow Path



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