PET FACILITY RADIATION MONITORING SYSTEM

MODEL ~ PET-CAM-511

FEATURES:

- COMPLETE PET FACILITY AIR MONITORING SYSTEM
- REAL-TIME CONTINUOUS
- 9 DETECTION CHANNELS
- 2 AREA MONITORS
- EASY INTEGRATION INTO FACILITY INFRASTRUCTURE
- HIGH CAPACITY OIL-LESS AIR PUMP
- DETECTION OF:
  - POSITRON
  - PARTICULATE BETA/GAMMA
  - IODINE
  - NOBLE GASES
- 3 IN-PROCESS DETECTOR MONITORS: DUCTS OR CHARCOAL TRAPS
- FINAL RELEASE STACK MONITOR HAS 3 DETECTORS
- PHYSICALLY SEPARATES AND MONITORS CONTAMINANTS INTO:
  - PARTICULATES
  - AIRBORNE CHEMICALS
  - AIRBORNE AERSOLS
  - NOBLE & INERT GASES
- RUGGED SKID OR CASTER MOUNTED

DESCRIPTION:

The PET-CAM-511 is a continuous duty, high capacity, rugged skid or caster mounted systems.

Electronics:

- Plug-in modules allowing change or addition of function as needed and allowing rapid repair by substitution of modules in the field.
- The modular system is covered by T/A's unique exchange warranty, in addition to the full one year warranty covering all T/A products.
- Computer with 17" COLOR LCD Monitor.

Shields:

- Void free lead encased in welded steel with stainless steel liners for long, useful life and easy decontamination.
- Open for filter change or cleaning with minimum effort.
- All connections and openings sealed against air leaks.

Filters are easily changed via quick disconnect, o-ring sealed filter holder

Air Moving System is based on a high capacity oil less air pump capable of delivering 120 lpm (4cfm) free air including Real Time flow rate measurement and data analysis.

Monitor Sensitivity: More sensitive on all channels by factors of 5 to 500 than is required by USNRC and other Regulatory Agencies.

TECHNICAL ASSOCIATES Divisions of US NUCLEAR CORP

OVERHOFF TECHNOLOGY

7051 Eton Ave., Canoga Park, CA 91303

818-883-7043 (Phone) 818-883-6103 (Fax)

tagold@nwc.net WWW.TECH-ASSOCIATES.COM

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CHANNEL & SENSOR SPECIFICATIONS

LOCATION	SENSOR	FILTER TRAP	SETTING	DETECTION
IN PROCESS CHANNELS				
Cyclotron Vault	2" NaI	Duct	511 KeV	
		(Strap On Style)	511 KeV	
Hot Cells (2 ea)	2" NaI	Filter Bank	511 KeV	
FINAL RELEASE CHANNELS				
Particulates	2" dia GM	Particulate Filter	Beta/Gamma	Beta/Gamma
Chemicals	2" NaI	Charcoal	511 KeV	
Gases	2" dia GM	Gas Chamber	Beta/Gamma	^{13}N, $^{11}CO_2$
Bypass Flow	Mass Flow	Venturi	Liters/Minute	LPM
AREA MONITOR CHANNELS				
Cyclotron Vault	GM	n/a	Gamma	mR/hr (or uSv/h)
Chemistry Lab or Hot Cell	GM	n/a	Gamma	mR/hr (or uSv/h)
OPTIONAL				
Wide Gamma	3" NaI	Strap On Style	Wide Gamma	All Gamma
Wide Gamma MCA	3" NaI+	Duct or Filter	MCA	Isotope Identifier per Library

THE SYSTEM CONSISTS OF 3 SUB-SYSTEMS.

1. Main console including final release sensors.

   The entire system is mounted in a self-contained rugged cabinet and comes complete with all cabling, connectors, and software in place, setup, and ready to operate.

   The standard unit is operated from 115 V single phase, 60 Hz; 220V optional, 50 or 60 Hz.
2. Interactive control station computer with full read-outs and alarms can be placed in control room or RAD supervisors' office, etc.
3. In-Process & Area Monitor Detectors- report to the main control **(1)** and to control station **(2).**

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SPECIFICATIONS FOR PET-CAM-511

CHANNELS: Nine (9)

ACTIVITY DETECTED: Positron Annihilation, Beta-Gamma Particulate, Airborne Chemicals, Noble Gas.

ACTIVITY DETECTED	POSITRON	BETA-GAMMA PARTICULATE	AIRBORNE CHEMICALS	NOBLE OR INERT GASES
SAMPLE COLLECTOR	Existing Ducts	2" dia Filter	2.5" dia x 1" thick	One Liter Chamber
FILTER TYPE	Existing Ducts	Glass Fiber Filter	TEDA Activated Charcoal Cartridge	Stainless Steel Lined
SAMPLE COLLECTION EFFICIENCY	Per Best Geometry	Up to 99% Efficiency at 0.3 micron particle size	60 KeV to 3 MeV (25 KeV to 7 MeV optional)	60 KeV to 3 MeV (7 MeV optional)

Detector: 5 each **Positron**: 511 KeV: 2 inch diameter NaI(Tl) (Spectroscopic Grade)

1 each **Particulate Beta-Gamma:** 2 inch diameter GM or optional Proportional Detector

1 each **Iodine:** 2 inch diameter NaI(Tl) Model PGS-3LI (Spectroscopic Grade)

2 each **Noble Gas Standard Range:** 2 inch diameter GM or Optional Proportional Detectors

Shielding: 3 inch Lead; 4pi. Plus 1 inch lead placed between adjacent detectors

Detector Sensitivity: Monitor is more sensitive on all channels by factors of 5 to 500 than is required by USNRC and other Regulatory Agencies.

Calibration: On screen instructions for user-assisted automatic calibration.

Decontamination: Shields are straight-through bore with Stainless Steel liner for easy decontamination. Other wetted parts are stainless steel or quick and easy replacement

Corrosion: Each detector is protected against moisture by design, construction and 0.0005" window.

Type of Detector	1 Minute	1 Hour	10 Hours	1 Day	1 Week
Particulate Beta-Gamma Cs-137, Co-58, etc	6×10^{-10} uCi/ml/min	1×10^{-11} uCi/ml 3.7×10^{-7} Bq/ml	1×10^{-12} uCi/m 3.7×10^{-8} Bq/ml	6×10^{-13} uCi/ml 2.4×10^{-8} Bq/ml	1 x 10-13 Bq/ml 4 x 10-9 Bq/ml
Airborne Chemicals 511KeV, etc.	3×10^{-9} uCi/ml/min	1×10^{-11} uCi/ml 3.7×10^{-1} Bq/ml	1×10^{-12} uCi/m 3.7×10^{-8} Bq/ml	6×10^{-13} uCi/ml 2.4×10^{-2} uCi/ml	1 x 10-13 Bq/ml 4 x 10-9 Bq/ml
Gas-Standard Range Xe-133, etc	6×10^{-7} uCi/ml	1×10^{-7} uCi/ml 3.7×10^{-3} Bq/ml	2.7×10^{-8} uCi/ml 1×10^{-3} Bq/ml	1×10^{-8} Bq/ml 3.7×10^{-4} Bq/ml	2.7 x 10-9 Bq/ml 1 x 10-4 Bq/ml

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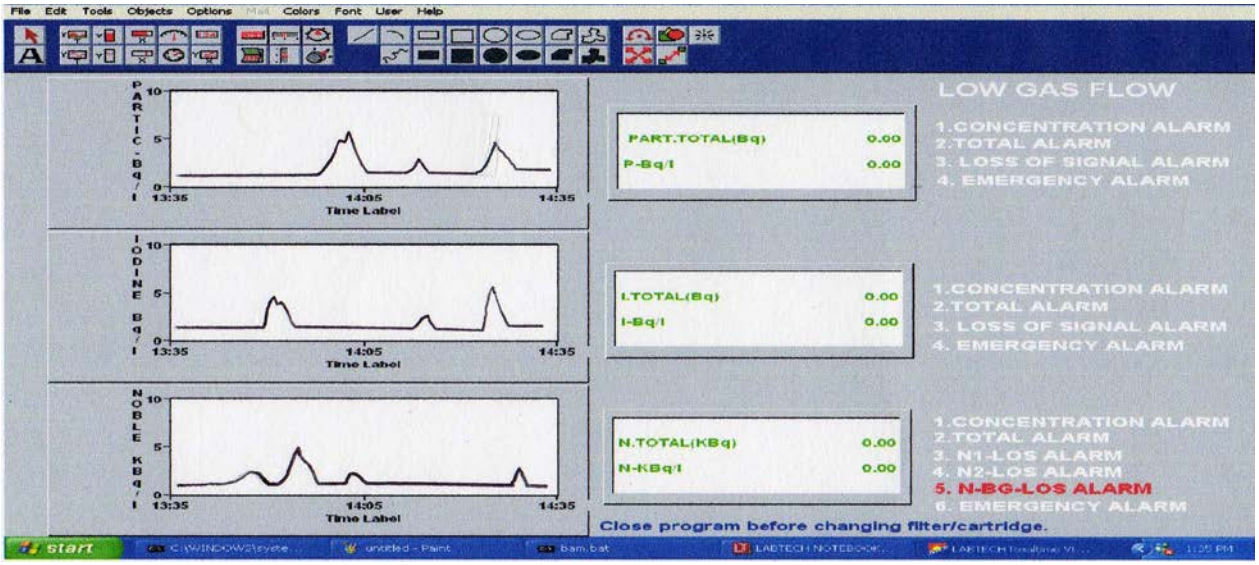
Display Mode: Model PET-CAM-511 features a Intel Processor Computer with a Color LCD Monitor. Reads out directly in concentration Bq/m^3 or other units.

Operation: When PET-CAM-511 continuous air monitor is in normal operation, the Color LCD Monitor displays:



High Voltage Supply: Separately variable from 0 to 2000 VDC at 200 uA on scintillation or proportional channels.

LCD Color Monitor: 17 inch Monitor shows Real Time Concentration & Accumulated Dose for all Channels

ACCURACY: ± 10% except for resolution loss and statistical variation.

ALARMS: Alarms are pre-settable to any trigger level.

- **Low level Alarm:** Automatic Reset
- **High Level Alarm:** High level alarm remains activated until RESET button is pushed.
- **Alarm Indicator Lights:** Each of the 8 channels has on-screen, RED High alarm indicator & also activates audio alarm and relay.
  Each of the 8 channels also has on-screen low count/self-test indicator which can also activate a maintenance required relay.
- **Audio:** ` 1000 Hz, greater than 80db.

AIR MOVING SYSTEM: For Effluent Channels

- **Air Pump:** Extremely rugged continuous duty.
- **Pumping System:** Pump noise is reduced by heavy duty internal muffler.
- **Oil less Pump Motor** 1/3 Horsepower, 50/60hz, capacitor start, induction run.
- **Real-time Flow rate:** On screen Flow Rate Display 0 to 4 or 0-120 lpm.
- **Inlet and Outlet:** 20 foot 1" hose inlet: 6 meter 2.5 cm I.D.
  20 foot 1" hose outlet. May be extended.

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Flow Rate: Factory setting is at 4 cfm.
Mass flow meter feeds Real Time data to PET-CAM-511 software.

Outputs: Alarm Condition Outputs:
1. Logic Level Signal, **2.**Contact Closure or opening, **3.**Ethernet LAN Connection

INSTALLATION: Cabinet of heavy gauge steel.
Skid or caster mounted With 4 five inch ball bearing casters. Two of these are full 360 degree swiveling.

Special Safety: Loss of system vacuum air flow alarm and relay switch closure.
Loss of signal alarm.
All System Circuits are Fused.

OPTIONS: Three Channel push-button check sources (License Exempt Quantities) to **Detect** & **Test** any of the lead shielded channels.
Flow rate can be increased to 30 cfm with minor changes in the plumbing.

Features: Thermal Protection on Motor. Positive displacement Pump

WEIGHT & DIMENSIONS:

Dimensions: 29" wide by 31" long by 41" high exclusive of casters.

Weight: 1,600 lbs. (Lighter weight models are available with 1" Shielding.

Shipping Weight: 1,750 lbs.

ELECTRONIC SYSTEM:

1. CPU with data acquisition
2. High Resolution, 17" LCD Color Monitor Display
3. Mouse
4. OPTIONAL: Graphic Printer for hard copy –graphical printout shows trend data.
5. 4-20mA interface is provided for up to 3 channels.
6. Keyboard
7. Audio
8. Manuals
9. Minimum 200 gigabyte hard drive – Stores programs, plus room to add additional new software functions in the future.
10. Specialized Air Monitor software custom tuned and designed for the CAM-33 Air Monitor.
11. Ethernet-LAN port allows for duplicate PC display in supervisor's office.

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TECHNICAL ASSOCIATES STANDARD MODULAR SERIES – ALL SOLID STATE:

- **1 ea**. Digital Acquisition Board
- **4 ea**. 5202 with amplifiers including fully adjustable single channel analyzer for scintillation detectors.
- **1 ea.** MV-5.12.24 Low Voltage Power Supply Module.
- **4 ea**. HV individual +/- 1% stable high voltage for each detector group.
  Once the high voltage levels are set by the technician, they do not change.
- **1 ea.** HP DeskJet Color Inkjet Printer -OPTIONAL
- **2 ea.** MAL-B3 Alarm Module
- **1 ea**. BAM-SWX Pump Power Control Module
- **1 ea.** Mass Flow Meter with on-screen display

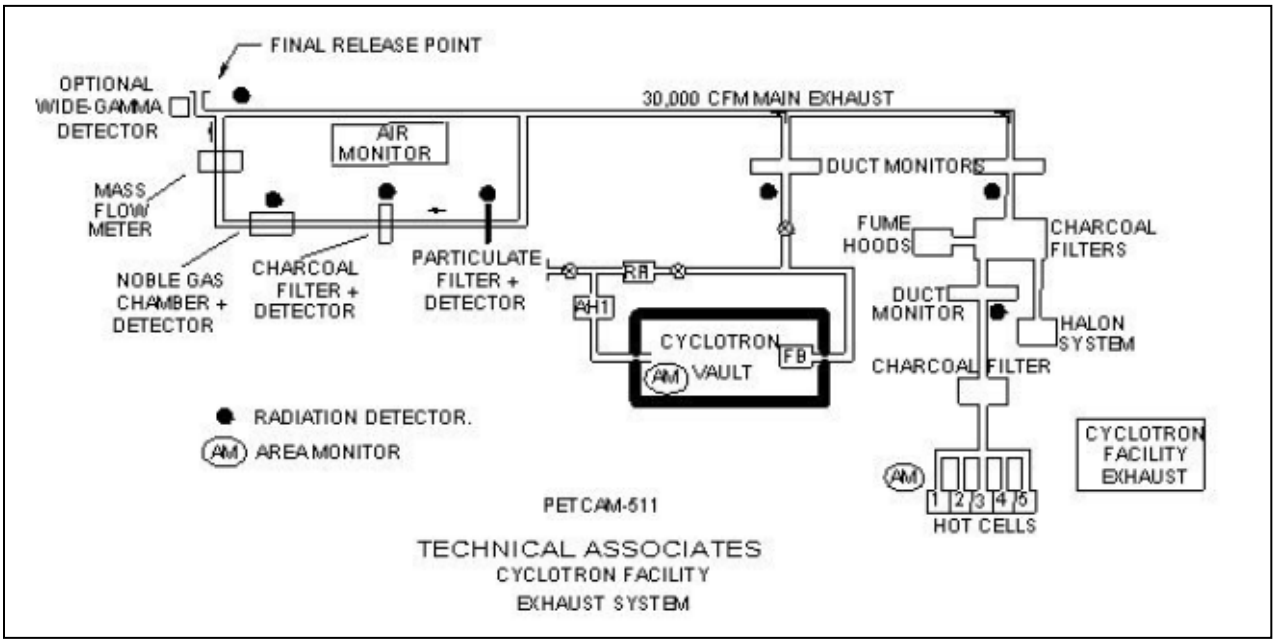
IMPORTANT FEATURES TO NOTE WITH TA'S PET-CAM-511 Air Monitors

- 4-20mA output signals – 3 channels
- Big 17" Color LCD Monitor
- LABTECH Virtual Instrument Software
- Real-Time Mass Flow meter
- Final release detectors with 3" Lead (Pb) shields light weight with compact Beta/Gamma Detectors
- Positive Position check sources with "throw length" and trouble free operation.

PLEASE SEE SOFTWARE "SCREEN SHOTS" FOR CAM-33 ON TA'S WEB PAGE "ALPHABETICAL LIST OF PRODUCTS"

Recommended Reading

Gaseous Radioactive Effluent Restrictions, Measurements, And Minimization At A PET/Cyclotron Facility.
P.S. Plascjak, K.K.Kim, S.W. Googins and W.C. Meyer Jr.
Cyclotron Facility, National Institutes of Health, Bethesda, MD 20892, USA



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