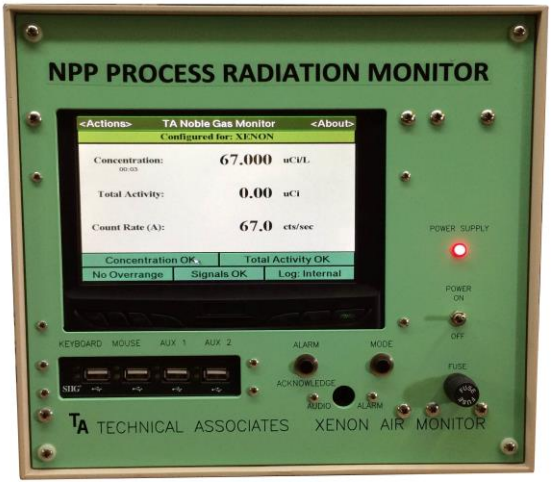
NUCLEAR POWER PLANT PROCESS MONITOR

Model FM-9W-IC-25-HT Ion Chamber System

FEATURES:

- HIGHLY SENSITIVE GAMMA
- MEETS LOCA REQUIREMENTS,
  (Loss of Coolant Accident Prevention)
- ALL PLUG-IN MODULAR
- RACK MOUNTED OR CASE
- SINGLE OR MULTIPLE CHANNEL
- SEALED ION CHAMBER FOR EXCELLENT RADIATION RESPONSE
- LOCAL OR REMOTE MONITORING; USB/ETHERNET OUTPUT
- SMART ELECTRONICS- ON-BOARD MICROPROCESSOR AND DATA-LOGGING; LCD COLOR DISPLAY
- USER-SETTABLE ALARMS – AUDIO & VISUAL, UNITS OF MEASUREMENT, ETC.
- SAFETY CLASS QUALIFIED FOR NUCLEAR POWER PLANT
- **DETECTOR: IP67**
- **ELECTRONICS: IP 63**



FM-9W ELECTRONICS

APPLICATION:

Area monitoring in and around nuclear reactors, reactor pools, hot cells, irradiators and other facilities handling radioactive materials or x-rays.

DESCRIPTION:

- The FM-9W Series Radiation Monitors incorporate micro-processor driven smart electronics with color LCD display.
- On-board data-logging and user-adjustable parameters are featured. The plug-in modular construction, allows the addition of channels or functions.
- Ion chamber and circuit design prevent the system readings from falling below full scale during an over range condition.
- Both the detector and connecting cables are designed for optimal performance in strenuous conditions, such as in containment buildings.
- High level alarm can be set to any value desired. Alarm activation produces red light on front panel and piercing audio tone.
- Optional relay is also closed (or opened) for activation of remote alarms. Stand-by battery power is optional. Rack or case mounting is supplied.

TECHNICAL ASSOCIATES Divisions of US NUCLEAR CORP
OVERHOFF TECHNOLOGY
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GENERAL SPECIFICATIONS:

DETECTOR:

Range: **STANDARD: 5 decades**	1 µGy/h to 0.1 Gy/h (100 µR/h to 10 R/h)	
Range: **OPTIONAL: 6 decades**	1 µGy/h to 1 Gy/h (100 µR/h to 100 R/h)	
Energy Rejection:	Thermal Neutrons, Alphas, Betas	
Energy range:	80 KeV to 7 MeV	
Response Time:	0.5 to 3 seconds (slower at lower decade, faster at higher decade)	
Environment:	**Temperature:**	165° C duration of 12 Hours
	Relative Humidity:	Up to 95%
	Total Integrated Dose:	2 x 10^6 Gy
Temperature Dependence:	<.2% / °C	
Storage Temperature Range:	-40°C to 85°C	

ELECTRONICS (LPDU) FM-9W:

Read Out:	Alpha-Numeric	
Modes (Five):	Alert, High, High-High, Operation, Test	
• **Alarms:**	User Settable To Any Trigger Level.	
Alarms – Beacon Assembly:	Green, Yellow, Red	
	Visual:	(High-High) Red Flashing when Radiation Reaches Set Point
	Audio:	90 dB at 1 meter
Low Level Alarm:	Automatic reset.	
High Level Alarm:	High level alarm remains activated until ACKNOWLEDGE & RESET button is pushed.	
Alarm Clearance:	Automatic Reset	
Visual Alarm:	On-screen alarms and warnings. **Red:** High level. **Amber:** Low level	
Environment:	**Temperature:**	Up to 50° C
	Relative Humidity:	Up to 95%
	Total Integrated Dose:	10 Gy
Weight & Dimensions:		
Size:	12” x 12” x 12”	
Weight:	26 lbs	

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FM-9W SERIES HUB

ELECTRONICS (RDU) FM-9W SERIES HUB:

Display:	Color LCD display
Display Read Out:	Digital Alpha-Numeric
Read Out Units:	Gy/h (User Settable)
Modes (Five):	Alert, High, High-High, Operation, Test
Alarms:	Green, Yellow, Red
	Warning, Equipment Failure, Over-Range, Detector Status
	Audio: 90 dB at 1 meter
	Visual: Red Flashing when Radiation Reaches Set Point
Alarm Acknowledgement:	Silent Mode Push Button
Low Level Alarm:	Automatic reset.
High Level Alarm:	High level alarm remains activated until ACKNOWLEDGE & RESET button is pushed.
Alarm Clearance:	Automatic Reset
Visual Alarm:	On-screen alarms and warnings. **Red:** High level. **Amber:** Low level
Output:	USB/Ethernet
Power supply:	120v 60 hz or 230v 50 hz or 24 volt DC, 2 Amp
Relay output:	230v, 10 Amp

Outputs:

Buffered isolated 4-20 mA Logarithmic Analog Output Covering the full range of the monitor.

- Stable Within 1% Due to Drift, Temperature, or Line Variations
- Logic Level Signals
- Contact Closure or Opening
- HIGH Radiation Level Relay De-energized When Signal Exceeds Set Point
- Equipment Failure Relay De-energized with Equipment Failure

Weight & Dimensions:

Size:	13.5” W X 11” H X 3.6”
Weight:	8 lbs

CBRN Real - Time Air & Water Specialists

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OPTIONAL:

Junction Transfer Box:

- Power Supply Signal
- Detector Signal
- Communication Signal
- Wall or Rack Mount – User Specified.
- **Weight & Dimensions:**
- **Size:** 8” x 10” x 4”
- **Weight:** 10 lbs

OPTIONAL JUNCTION TRANSFER BOX

ADDITIONAL SYSTEM DESCRIPTION:

- Ion chamber is designed and built to withstand maximum temperature of 170°C and total integrated dose of 10^8 Rads.
- Materials which might be compromised by these conditions are excluded from chamber construction.
- Insulators in ion chamber are specifically mineral or treated glass materials.
- Internal chamber itself is made primarily of stainless steel.
- Cable insulation is mineral
- Length of this cable is determined by user when ordering.
- Electrometer box specially built essentially eliminates possibility of extracameral response.

FM-9W ELECTRONICS MODULE:

- **Installation**
  FM-9W & FM-9W Series HUB Wall or Rack Mount – User Specified.
- **Processor:**
  FM-9W & FM-9W Series HUB Advanced processor computer
- **High Voltage Power Supply:**
  FM-9W Separately variable from 0 to 1500v. Extremely stable high voltage.
- **Monitor Display**
  FM-9W & FM-9W Series HUB Monitor shows both real-time concentration & accumulated dose.
- **Read Out:**
  FM-9W Data is shown alpha-numerically
  FM-9W Series HUB Data is shown both graphically & alpha-numerically.

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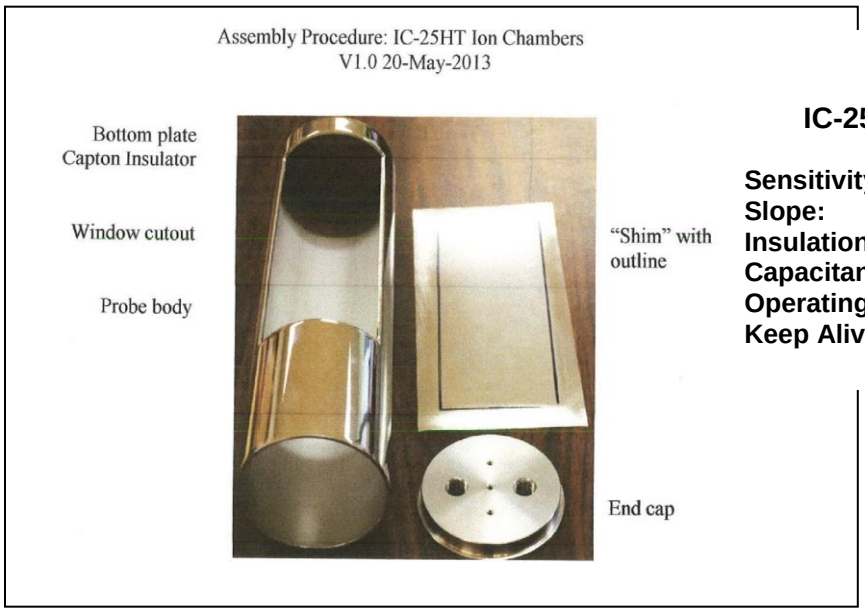

IC-25 Sealed Ionization Chamber Detector:

Sensitivity:	1.3×10^{-9} amps R/hr
Slope:	0.10% per 100 Volts or less
Insulation value for inner chamber:	>4T ohms
Capacitance of inner chamber:	<15 pF
Operating Voltage:	-200 to -800 V
Keep Alive Source:	10 µCi Cs-137

PRE-AMPLIFIER:

- The pre-amplifier is a current to voltage amplifier.
- Very high input impedance amplifier with high meg feedback resistors.
- Input current starts from sub-pico amp range.
- Amplified voltage drives a pulse generator feeding into the counter/display module.
- Ultra-quiet high voltage supply delivers a flat VDC as required.

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DETECTOR CABLE:

Mineral Insulated Cable:	2 each (HV and Signal)
Length:	5 to 15 feet; Sheath: 0.250" O.D. (User Specified)
Insulation:	High-purity (99.4%) Magnesium Oxide (MgO)
Melting Temp.:	2500°F, 1370°C
Max. Temp. in Air:	1650°F, 900°C

ADDITIONAL CABLE SPECIFICATIONS:

Sheath Diameter: ±0.001 inch (±0.0025mm) or 1% of Nominal diameter, whichever is greater

Wall Thickness: 10% of sheath diameter as a minimum

Thermocouple Wire Calibration: Meets Standard Limits of Error tolerance on calibration per **ASTM E-230**.

Insulation Resistance At Room Temperature:

Greater than 1000 megohms@50VDC
(sheath diameters of 0.080 inch/ 2.0mm and less),

1000 megohms@500VDC
(sheath diameters of 0.120 inch / 3.0mm and greater).

High Temperature Insulation Resistance:

0.040" diameter at 600°F (316°C) One foot length will be in excess of 10 megohms.

0.62" diameter & larger at 600°F (316°C) One foot length will be in excess of 100 megohms.

Dielectric Strength: ***These are reference values for application to conductor cable only.***

Data is at 60Hz and 70°F (21°C).

Straight: - 100VAC per mil of insulation thickness. **Bent**: - 45VAC per mil of insulation thickness.

Temperature: Insulation Range: –450°F (-270°C) to 3000°F (1650°C) without change of phase or chemical reaction with adjacent metals.

Melting Temperature of Insulation: 4800°F (2640°C). Limiting temperature is associated with metals used.

Pressure: Can withstand external pressure up to 50,000psi (3500kg/cm^2).

Nuclear: Insulation can be subjected to a mean neutron flux of 2×10^{11}n.cm^{-2}S^{-1}@100°C and a total peak irradiation of 8×10^{18}n.cm^{-2} with no significant change in characteristics.

Formability: Can be bent around a mandrel having a radius equal to twice the sheath diameter without rupturing the sheath or causing loss of insulation resistance.

Fabrication: Sheath can be welded, brazed, and soldered using normal care for the metals and thickness involved without changing insulation resistance.

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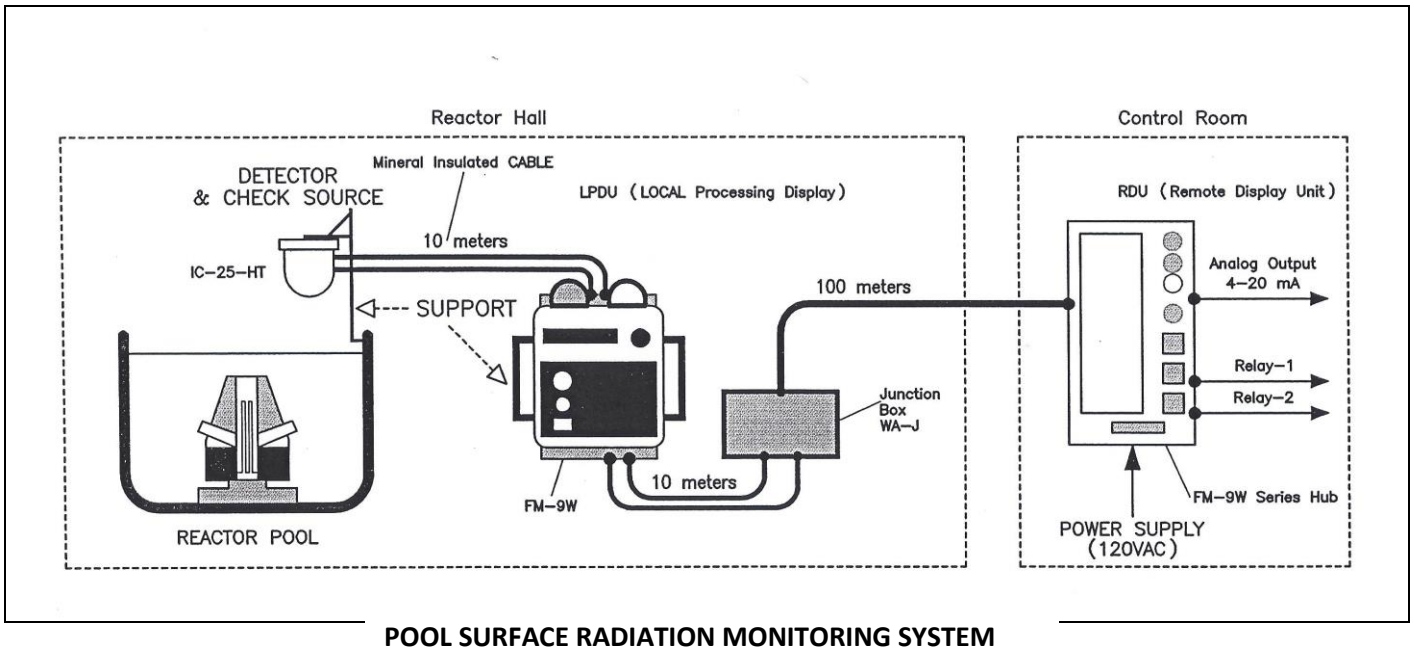
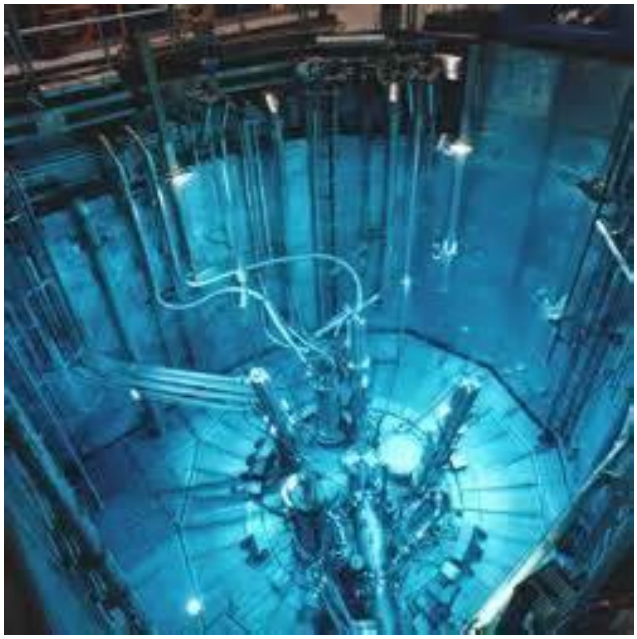


POOL SURFACE RADIATION MONITORING SYSTEM



REACTOR POOL

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