300/400 SERIES - FIXED CONFIGURATION

FAMILY TREE

The 300 and 400 series instruments can be supplied with special ionization chambers so that measurements as low as $10^{-7}$ Ci/m$^3$, or as high as pure tritium can be reached.

This section covers specific models with a fixed configuration. These models have established designs made for specific applications. Options are available to suit different requirements for range of measurement, alarms and outputs.

See Section 3 for 300 and 400 series modular construction instruments. These monitors have more choices for options, such as ionization chambers, displays, alarms and outputs.

The 300 and 400 series monitors are classified into four basic groups:

311 series - single range ionization chamber, with single chamber
321 series - single range ionization chamber, with dual chambers

411 series - multirange ionization chamber, with single chamber
421 series - multirange ionization chamber, with dual chambers

300 SERIES MONITORS
(Single range ionization chambers)

The 300 series monitors use "single" range ionization chambers.

The standard versions use a 4/4 digit panel meter, the tritium monitor can measure over a 4 plus decade range of measurement 1 - 19,999.

Special versions use higher digit count displays, and the tritium monitor can measure as high as 5 decades of measurement 1 - 99,999.

400 SERIES MONITORS
(Automatically switched, multi-ranging ionization chambers)

The 400 series monitors use multiranging ionization chambers for a wider range of measurement. Seven decades of measurement are feasible for some ionization chamber configurations.
SPECIFIC MODELS

Each of the following models can include a variety of individual features and options described in the following pages.

SINGLE IONIZATION CHAMBER DESIGNS

MODEL 311

All Model 311 instruments use single ionization chambers and single "range" electrometers.

MODEL 411

Similar to the 311 series, the 411 instruments have a single ionization chamber. However, a wider range of measurement is afforded through the use of automatic, range-switching electrometer amplifiers (i.e. multirange ionization chambers).

DUAL IONIZATION CHAMBER DESIGNS

MODELS 321/421 (STANDARD)

These models feature dual ionization chambers for tritium specific or oxide of tritium specific measurements, and simultaneously, for the suppression of response to environmental gamma fields.

MODELS 321/421 NPPM (NUCLEAR POWER PLANT MONITOR)

An industrial version of the standard 321/421 tritium monitor configured for the special environmental conditions in heavy water CANDU nuclear power plants. Designed to measure HTO (or total T) in the presence of other radioactive gases. Available with contamination (plate-out) proof ionization chambers.

MODEL 357RM GENERAL PURPOSE ROOM AIR MONITOR

A low cost, table top monitor with single range ionization chambers, alpha (radon) pulse rejection, analog panel meter and dual 2L chambers with resolution to 1 µCi/m³.

MODEL 347 ROOM AIR MONITOR WITH BETTER SENSITIVITY

Using quadruple ionization chambers for optimum gamma compensation. Model 347 features highest sensitivity to tritium. Noise level and stability are ±0.5 µCi/m³.

COMMON FEATURES

The ionization chambers are normally furnished as separately or remote mounted, CODE ICR. Upon special request, chambers can be mounted inside the main electronics cabinet, use CODE ICR.

MEASUREMENT, RANGES AND SENSITIVITY

Using linear ionization chambers, OTC tritium monitors have been designed and built for measurement sensitivities from 0.1 µCi/m³ (1 s.d.) to pure tritium. As can be expected, chamber size and configuration is related to sensitivity.
ALARMS, MEASUREMENT

Single or two independent alarms with visual and acoustic signals. Front panel mounted potentiometers or thumb switches are used to adjust the level set point. 400 series multiranging instruments are further equipped with range selector switches so that alarm setting can be made over the entire range of measurement.

DISPLAYS

A variety of digital displays are available. Use CODE DDxx depending on the number of digits required.

300 series single range instruments are often equipped with 4 1/2 digit (0-19,999) digital panel meters, or with a 5 decade analog logarithmic output signals.

The 400 series employ moving decimal points on the panel meter and may include additional range indicating lights to identify the measurement decade in operation. Logarithmic analog outputs for 400 series instruments have scales of up to seven decades. Range switching is automatic and is not visible to the instrument operator.

OPTIONS

All electronic, pneumatic or mechanical options and features, as listed are available as far as applicable, for all 300 and 400 series. However, the 357 and 347 models are only available with a reduced set of special options.

REAR PANEL INTERFACE

All 300 and 400 series instruments have rear panel connections suitable for remote display, control or computer interface.

These include, as a minimum,

- Analog signal (0 - 10 V)
- Alarm functions, including remote acknowledge
- Supply voltages
- Range information (400 series)

Additional rear panel signals which are associated with special features.
MODEL 347

LOW COST MONITOR FOR ULTRA SENSITIVE DETECTION OF AIRBORNE RADIOACTIVE GASES QUADRUPLE IONIZATION CHAMBERS FOR BEST GAMMA COMPENSATION

A low cost very high sensitivity general purpose monitor for reliable measurements to as low as 0.5 µCi/m³ in the presence of significant external gamma fields.

OTC Model 347 tritium monitor will not respond to ambient radon, this instrument is fast, accurate and has long term zero stability.

This monitor is a simplified, lower cost, version of the 300 series instruments, but with a restricted number of available optional features.

The quadruple chambers are Kanne type arranged in a cruciform pattern.

A separately mounted pump system with HEPA and ULPA filters assures a sample free of particulates.

OPTIONAL EQUIPMENT AVAILABLE

- Remote Alarm Units
- Remote Meter Displays
- Tritium Gas Calibrator
- Calibration Resistor 4-20 mA Output
- Logarithmic Output
- RS232 Output
TECHNICAL SPECIFICATIONS

MEASUREMENT RANGES DISPLAY ACCURACY

STABILITY AND DRIFT LONG TERM

NOISE

GAMMA COMPENSATION

RESPONSE RATE ELECTRONIC

WARM-UP TIME

ALARM SYSTEM Tritium in Air Concentration
single, 0.1 to 1999.9 µCi/m³
Digital Meter, 4 1// digit LED
±10 % of reading, ±1 uCi/m³, whichever is greater
±1 uCi/m³, ambient temperature

<1 uCi/m³, 2 sigma, with 30 second time constant

second ionization chamber pair of equal volumes, mounted in cruciform pattern, serves to cancel effects of external gamma fields
two linear time constants, 30 seconds for <80 µCi/m³ 3 seconds for >80 µCi/m³
less than 5 minutes required for high voltage power supplies to stabilize

single alarm, with set point adjustable from 1 to 1000 µCi/m³

IONIZATION CHAMBER measuring:  2900 cm³

VOLUME total wetted: 4000 cm³

ENVIRONMENTAL Storage Temperature: -40°C to +60°C
Operating Temperature: 0°C to +50°C
Humidity: 0 to 95 % RH non-condensing

PHYSICAL CABINET Bench top, frame constructed of aluminum extrusions, front and rear panel

POWER 115 VAC or 240 VAC 50/60 Hz

DIMENSIONS 8.8“ [223mm] H x 19.0“ [483mm] W x 16.0“ [406mm] D

WEIGHT 45 lbs [20.4 kg]

FLOWMETER 0 -10 LPM adjustable rotameter
DUST FILTER and PUMP separately mounted

POWER  115 VAC or 240 VAC 50/60 Hz

DIMENSIONS  7.0" [178mm] H x 17.0" [432mm] W x 16.0" [406mm] D

WEIGHT  20 lbs [9.1 kg]
### Parts List for Model 347 Tritium Monitor

<table>
<thead>
<tr>
<th>Qty Req'd</th>
<th>Part No</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VCO-201-E1</td>
<td>120VAC Pump</td>
</tr>
<tr>
<td></td>
<td>or VCO301-P2</td>
<td>or 240VAC Pump</td>
</tr>
<tr>
<td>1</td>
<td>803562</td>
<td>HEPA Filter Cartridge (pack of three)</td>
</tr>
<tr>
<td>1</td>
<td>CWFG01PLV</td>
<td>Ultra Pure Filter Element</td>
</tr>
<tr>
<td>1</td>
<td>2-231-S604-70</td>
<td>O-Ring for Filter Cover (pack of ten)</td>
</tr>
<tr>
<td>1</td>
<td>2-036-S613-60</td>
<td>O-Ring for Filter Housing (pack of ten)</td>
</tr>
<tr>
<td>1</td>
<td>RMA-21-SSV</td>
<td>Flow Meter</td>
</tr>
<tr>
<td>1</td>
<td>AP-141-12-1</td>
<td>Digital Panel Meter, 120VAC</td>
</tr>
<tr>
<td></td>
<td>or AP-141-12-2</td>
<td>or Digital Panel Meter, 240VAC</td>
</tr>
<tr>
<td>1</td>
<td>A41-43-36</td>
<td>Mains Transformer</td>
</tr>
<tr>
<td>1</td>
<td>100251-ASSY</td>
<td>Main PCB Assembly for Model 347</td>
</tr>
<tr>
<td>1</td>
<td>100511-347</td>
<td>4-20mA Output &amp; Logarithmic Converter Board</td>
</tr>
<tr>
<td>1</td>
<td>100512-347</td>
<td>RS232 Output Board</td>
</tr>
<tr>
<td>1</td>
<td>KL-701</td>
<td>Knob Lock for Compensation Control</td>
</tr>
<tr>
<td>1</td>
<td>MS91528-1N2B</td>
<td>Knob for Compensation Control</td>
</tr>
<tr>
<td>1</td>
<td>MDL-1/4</td>
<td>Fuse, 1/4 Amp (pack of 5) AC</td>
</tr>
<tr>
<td>1</td>
<td>17501</td>
<td>Power Cord (USA and Canada)</td>
</tr>
</tbody>
</table>
LOW COST MONITOR FOR DETECTION AND MEASUREMENT OF AIR BORNE TRITIUM

The model 357 tritium monitor is stable to 1 μCi/m3. (1 S.D.)

Only OTC tritium monitors are designed and built to distinguish tritium against natural radon background. Instruments that do not have this feature will exhibit a noisy zero response even if the electronics is claimed to be stable.

With radon rejection, the Model 357 ignores radon and is, therefore, fast, sensitive and accurate. Once adjusted, it is long-term zero stable and, due to special electrometer design, its span calibration is permanently stable.

These monitors are simplified versions of OTC 300 series monitors which have been in continuous service for twenty years. They come in rack mount configuration and are also suited for table top use.

The only maintenance required for Model 357 is periodic service of the pump and replacement of the dust filter.

The sensitivity and noise level of Model 357 is superior to current competitive instrumentation by an order of magnitude.

OPTIONAL EQUIPMENT AVAILABLE

- Remote Alarm Units
- Remote Meter Displays
- Tritium Gas Calibrator
- Calibration Resistor
- RS232 Output
- Logarithmic Output
- 4-20mA Output
- Plate-Out proof wire grid chamber
### TECHNICAL SPECIFICATIONS

**MEASUREMENT**  
Tritium in Air Concentration 1 - 19,999 uCi/m³ Digital

**RANGE DISPLAY**  
Meter, 4¼/4" digit LED ±10 % of reading, ±1 uCi/m³

**ACCURACY**  
whichever is greater ±1 uCi/m³, ambient temperature

**STABILITY AND DRIFT**  
LONG TERM  
±1 uCi/m³, 2 sigma, with 20 second time constant

**NOISE**  
second ionization chamber of equal volume, coaxially mounted, serves to cancel effects of external gamma fields

**GAMMA COMPENSATION**  
two linear time constants 20 seconds for measurements below approximately 80 uCi/m³

**RESPONSE RATE**  
ELECTRONICS  
3 seconds for measurements above 80 uCi/m³

**ALARM SYSTEM**  
single alarm, with set point adjustable from 1 to 1,000 uCi/m³

**INDICATORS**  
acoustic signaler, red LED

**IONIZATION CHAMBER**  
VOLUME  
measuring: 1,600 cm³  
total wetted: 2,000 cm³

**ION TRAP**  
Kanne Type, coaxial integral hose barb

**PORTS**  
fittings for 3/16” I.D. vinyl tubing

**FLOWMETER**  
0-10 LPM adjustable rotameter

**DUST FILTER AND PUMP**  
High efficiency respirator type cartridge. Long life continuous duty oscillating piston positive displacement pump

**ENVIRONMENTAL**  
Storage Temperature: -40 °C to +60 °C  
Operating Temperature: 0 °C to +50 °C  
Humidity: 0 to 95 % RH non-condensing

**POWER**  
115 VAC or 240VAC, 50/60 Hz

**PHYSICAL**  
CABINET  
19” rack mount, frame constructed of aluminum extrusions, front and rear panel are 1/8” thick aluminum. Covers are aluminum sheet.

**DIMENSIONS**  
8.8” [223mm] H x 19.0” [483mm] W x 16.0” [406mm] D 40

**WEIGHT**  
lbs. [18.2Kg]

**OPTIONS**  
Plate-out proof chamber design

Choice of one additional output;  
RS232 Serial Data, 4-20mA or logarithmic Output
<table>
<thead>
<tr>
<th>Qty Req'd</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VCO-201-E1 or VCO301-P2</td>
<td>120VAC Pump</td>
</tr>
<tr>
<td>1</td>
<td>803562</td>
<td>HEPA Filter Cartridge (pack of three)</td>
</tr>
<tr>
<td>1</td>
<td>2-231-S604-70</td>
<td>O-Ring for Filter Cover (pack of ten)</td>
</tr>
<tr>
<td>1</td>
<td>2-036-S613-60</td>
<td>O-Ring for Filter Housing (pack of ten)</td>
</tr>
<tr>
<td>1</td>
<td>VFA-24-SSV</td>
<td>Flow Meter</td>
</tr>
<tr>
<td>1</td>
<td>AP-141-12-1 or AP-141-12-2</td>
<td>Digital Panel Meter, 120VAC or Digital Panel Meter, 240VAC</td>
</tr>
<tr>
<td>1</td>
<td>A41-43-36</td>
<td>Mains Transformer Transformer</td>
</tr>
<tr>
<td>1</td>
<td>A14-2.5-36</td>
<td>for High Voltage Power Supply</td>
</tr>
<tr>
<td>1</td>
<td>100251-ASSY</td>
<td>Main PCB Assembly for Model 357 4-</td>
</tr>
<tr>
<td>1</td>
<td>100511-Model 357</td>
<td>20mA Output &amp; Logarithmic Converter Board</td>
</tr>
<tr>
<td>1</td>
<td>100512-357</td>
<td>RS-232 Output Board</td>
</tr>
<tr>
<td>1</td>
<td>KL-701</td>
<td>Knob Lock for Compensation Control</td>
</tr>
<tr>
<td>1</td>
<td>MS91528-1N2B</td>
<td>Knob for Compensation Control</td>
</tr>
<tr>
<td>1</td>
<td>MDL-1</td>
<td>Fuse, 1 Amp (pack of 5)</td>
</tr>
<tr>
<td>1</td>
<td>17501</td>
<td>AC Power Cord</td>
</tr>
<tr>
<td>1</td>
<td>1020934 or 1020974</td>
<td>Ionization Chamber Assembly for Model 357</td>
</tr>
<tr>
<td>1</td>
<td>1021101</td>
<td>Ionization Chamber Assembly for Model 357</td>
</tr>
<tr>
<td></td>
<td>or</td>
<td>Dual Solid Wall Electrodes</td>
</tr>
<tr>
<td></td>
<td>or</td>
<td>Wire Grid Measure Side and Solid Wall Compensation Side</td>
</tr>
<tr>
<td></td>
<td>or</td>
<td>Dual Wire Grid Electrodes</td>
</tr>
</tbody>
</table>
The model 357BW is a single range, ionization chamber monitor for the measurement of tritium. It is contained in a NEMA 12 enclosure and is suitable for permanent installation and for continuous duty.

It is suited for the monitoring of rooms, glove boxes, fume hoods, exhaust stacks and systems, as well as process piping when supplied with external dedicated ionization chambers.

The enclosure has a hinged door with a tempered glass window. The enclosure is double-hinged so that it can be opened for servicing the various components inside. The audible alarm and a pushbutton for muting the audible alarm are located on the top of the enclosure. The sample inlet and exhaust fittings are located on top of the enclosure. Connector receptacles are mounted on the top of the enclosure for AC power entry and remote output.

Major distinguishing features include the following:

Display/Control Unit installed in a Wall Mount NEMA 12 enclosure.

Available with Dual or Quadruple ionization chambers

Single measurement range over four plus decades.

Plate out proof ionization chambers eliminate "background" zero drift
MODEL 357BW
TRITIUM MONITOR

PERFORMANCE SPECIFICATIONS

MEASUREMENT

Range Display Accuracy
4 digit panel meter, LED

Reproducibility
±5 % of reading, ±1 µCi/m³ whichever is greater

±5 % over the entire measurement range

Zero Drift
Less than ±0.3%/°C, total accumulated error <±10% relative to 20°C reading

Temperature Coefficient
two linear electronic time constants, 20 seconds for measurements below approximately 80 µCi/m³, 3 seconds for measurements above 80 µCi/m³

Response Time
second pair of ionization chambers of equal volume, mounted in a cruciform arrangement, serves to cancel effects of external gamma fields

Background Subtraction
less than five minutes

Warm Up Time Over Range Indication
All segments on digital panel meter display will flash when the measurement has exceeded 10,000 µCi/m³

ALARM SYSTEMS

High Level Alarm
Audible and Visual flashing red LED.

Indicator Mode
A toggle switch is used to select the operating mode, Latching or Non Latching with a momentary Reset position

Switch
Audible and Visual steady amber LED indicates when either one of two conditions occur, A failure of any one of the internal D.C. power supplies or malfunction of the electrometer

Malfunction Alarm
Audible and Visual steady amber LED indicates when the sample flow rate has dropped to below 2 LPM

Low Flow Alarm
silences the audible indicator for all of the above alarms

Acknowledge push button
measuring 1800 cm³

total wetted 4000 cm³
MODEL 357BW
TRITIUM MONITOR, continued

IONIZATION CHAMBER INTERNALLY MOUNTED

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ionization Chamber</td>
<td>Wire grid, contamination resistant</td>
</tr>
<tr>
<td>Electrode</td>
<td>Silicone rubber</td>
</tr>
<tr>
<td>Gaskets</td>
<td>0.1 to 2 atmospheres</td>
</tr>
<tr>
<td>Pressure Ports</td>
<td>1/4” stainless steel Swagelok</td>
</tr>
<tr>
<td>Material of Construction</td>
<td>chamber: stainless steel</td>
</tr>
<tr>
<td></td>
<td>electrometer housing: aluminum</td>
</tr>
</tbody>
</table>

SAMPLE FLOW SYSTEM INTERNALLY MOUNTED

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow Meter</td>
<td>0-10 LPM adjustable rotameter</td>
</tr>
<tr>
<td>Dust Filter and</td>
<td>high efficiency 99.99% at 0.1 microns, respirator type</td>
</tr>
<tr>
<td>Electrostatic Filter</td>
<td></td>
</tr>
<tr>
<td>Pump</td>
<td>long life continuous duty oscillating piston positive displacement pump. Medo VCO201 E1</td>
</tr>
</tbody>
</table>

ENVIRONMENTAL

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>-40 °C to +65 °C storage</td>
</tr>
<tr>
<td></td>
<td>0 °C to +55 °C operating</td>
</tr>
<tr>
<td>Humidity</td>
<td>0 - 95 % RH</td>
</tr>
<tr>
<td>Air Conditioning</td>
<td>Ventilation or air conditioning is not required.</td>
</tr>
</tbody>
</table>

PHYSICAL, MAIN CABINET

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>24.0” [610mm] wide x 24.0” [620mm] high x 19.0” [483mm] deep</td>
</tr>
<tr>
<td>Power</td>
<td>120 VAC ±10%, 60 Hz, 1A , 1 PH 1</td>
</tr>
<tr>
<td>Fuse</td>
<td>A slow blow fuse</td>
</tr>
<tr>
<td>Weight</td>
<td>160 pounds [73 kg]</td>
</tr>
</tbody>
</table>
The Model 357BWC is a single range, ionization chamber monitor for the measurement of tritium. It is contained on a mobile stainless steel cart and is suitable for moving to multiple sampling points and for continuous duty. The display/control unit is enclosed in a NEMA 12 enclosure on top the cart. It is suited for the monitoring of rooms, glove boxes, fume hoods, exhaust stacks and systems, as well as process piping. The NEMA enclosure has a hinged door with a tempered glass window and is double hinged so that it can be opened for servicing the various components inside.

Major distinguishing features include the following:

- 1-10,000 µCi/m³
- Quad 2L Ionization Chambers (gamma compensation)
- Contamination/Plate-out Proof Design (wire grids)
- Alpha Pulse Suppression (radon compensation)
- Dual Desiccant Dryer Cartridges (noble gas compensation)
- Heavy duty pump, HEPA filter and Flow Meter
MODEL 357BWC
CART MOUNTED TRITIUM MONITOR

PERFORMANCE SPECIFICATIONS

MEASUREMENT

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>Single, 1 - 19,999 µCi/m³</td>
</tr>
<tr>
<td>Display</td>
<td>4/4 digit panel meter</td>
</tr>
<tr>
<td>Accuracy Stability</td>
<td>±5 % of reading, ±1 µCi/m³ whichever is greater</td>
</tr>
<tr>
<td>and Drift</td>
<td>±1 µCi/m³ long term (thirty days), ambient temperature conditions</td>
</tr>
<tr>
<td>Noise Response</td>
<td>±1 µCi/m³, 1 sigma, with alpha suppression in use</td>
</tr>
<tr>
<td>Rate</td>
<td>Two linear electronic time constants approximately 20 seconds for signals up</td>
</tr>
<tr>
<td></td>
<td>to about 80 µCi/m³, approximately 3 seconds for signals above 80 µCi/m³</td>
</tr>
<tr>
<td>Offset Compensation</td>
<td>Manual compensation control provided to offset the effects of gamma radiation</td>
</tr>
<tr>
<td></td>
<td>and/or tritium build-up</td>
</tr>
<tr>
<td>Warm Up Time</td>
<td>Less than five minutes</td>
</tr>
</tbody>
</table>

ALARM SYSTEMS

<table>
<thead>
<tr>
<th>Alarm Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Level Alarm</td>
<td>A single set point alarm system is adjustable with digital thumb switches</td>
</tr>
<tr>
<td></td>
<td>over a 1 to 10,000 µCi/m³ range</td>
</tr>
<tr>
<td>Indicator Mode</td>
<td>Audible and Visual flashing red LED</td>
</tr>
<tr>
<td>Switch</td>
<td>A toggle switch is used to select the operating mode, Latching or Non</td>
</tr>
<tr>
<td></td>
<td>Latching with a momentary Reset position</td>
</tr>
<tr>
<td>Malfunction Alarm</td>
<td>Audible and Visual steady amber LED indicates when either one of two</td>
</tr>
<tr>
<td></td>
<td>conditions occur, A failure of any one of the internal D.C. power supplies</td>
</tr>
<tr>
<td></td>
<td>or malfunction of the electrometer</td>
</tr>
<tr>
<td>Low Flow Alarm</td>
<td>Audible and Visual steady amber LED indicates when the sample flow rate</td>
</tr>
<tr>
<td></td>
<td>has dropped to below 1 LPM</td>
</tr>
<tr>
<td>Acknowledge Push Button</td>
<td>Silences the audible indicator for all of the above alarms</td>
</tr>
</tbody>
</table>
MODEL 357BWC CART MOUNTED TRITIUM MONITOR, continued

IONIZATION CHAMBER

**Measuring volume** 1800 cm³
**Total wetted volume** 4,000 cm³
**Electrodes** Wire Grid, contamination resistant
**Gaskets** Silicone rubber
**Pressure** 0.1 to 2 atmospheres
**Ports** 1/4” Stainless Steel Gyrolok
**Material of Construction** Stainless Steel
**Electrometer Housing** Aluminum

SAMPLE FLOW SYSTEM

**Pump** 115Vac, 50/60 Hz, diaphragm type
Thomas 107CAB11
**Flow Rate** 6 LPM Maximum, 5 LPM recommended 1-
**Flow Meter** 10 LPM, Dwyer RMA-21-SSV HEPA
**Dust Filter** respirator type Scott 803562-01 103kPa (1
**Maximum Pressure** atmosphere) 1/4” stainless steel gyrolok
**Connections** tube fittings 316L Stainless Steel, 1/4’’ OD
**Tubing** Differential pressure switch, Dwyer Model 1823-2
adjusted to trip <1 LPM.
**Low Flow Sensor** ON/OFF circuit breaker power to pump

**Pump Control** Sample Mode; the sample stream passes through the
both the upstream and downstream ionization
chambers and exits through the sample outlet hose.

**Sampling Modes** Manually operated valves change the flow path to
exclude the ionization chambers and the desiccant
column.

**By-Pass Mode** Thermometer -20°C to +120°C Range

**Inlet Temperature** Parker Type S1P with visible coalescing element

**Moisture Trap** Parker Type S1P with visible coalescing element
ENVIRONMENTAL

Temperature  5° C to +50° C Operating
Humidity     0 - 95 % RH
Air Conditioning  Ventilation or air conditioning is not required.

PHYSICAL, MAIN CABINET

Mounting    The system is mounted on a heavy-duty cart of stainless steel construction with low friction casters (two swivel types at one end and two straight types at the other). The swivel casters have locking mechanisms.

Size        24” [610mm] Wide x 41.02’ [1042mm] Long x 36’ [914mm] Height to top shelf of cart with a 53” [1346mm] Overall Height

Enclosure Weight  NEMA 12 Rating

Inlet/Outlet Hoses  288 lbs [131kg]

Sample inlet and outlet hoses are braided stainless steel construction with quick connect couplers at each end. Length is 42’ [1.07 meters]
MODEL ASU-4
AIR SAMPLING UNIT

The Air Sampling Unit (ASU) is intended for simultaneous air sampling from 4 different locations. A portion of the sampled air is routed to a Tritium Monitor. Air can be sampled from a location up to 60m away. The ASU is a wall mount NEMA 12 enclosure. The enclosure has a hinged door that is furnished with a tempered glass window providing a view to the inside of the enclosure in order to visually check the air flow rate setting and signal lights. The enclosure is a double-hinged design, so that it can be opened for service.

Features include the following:

Components Installed in a Rugged, Wall Mount Industrial NEMA 12 Enclosure

Auto and Local Control Modes Programmable Logic Controllers

Programmable Display with a Color LCD Screen Flow Meters and Filters
## MODEL ASU-4 AIR SAMPLING UNIT

### TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Air Flow Rate</strong></td>
<td>3-25 LPM, Nominal Setting 10 LPM</td>
</tr>
<tr>
<td><strong>Operational</strong></td>
<td><strong>Temperature Range</strong> 10° to 40°C</td>
</tr>
<tr>
<td><strong>Operating Principle</strong></td>
<td>Air sample is pulled by a pump from 4 different locations into a manifold and then sent out through the exhaust line, which is sampled by a tritium monitor. Each flow rate from 4 inlet lines is adjusted by air flow meter. There is a separate purge air inlet.</td>
</tr>
<tr>
<td><strong>Air Mixing Manifold</strong></td>
<td>Built from aluminum bar stock with 5 inlets and one outlet. Inlets are for 4 sample lines and one purge line. The outlet is connected to the pump inlet.</td>
</tr>
<tr>
<td><strong>Flow Meter</strong></td>
<td>Polycarbonate body flow meter, with stainless steel valve, adjustable range from 1 to 25 LPM.</td>
</tr>
<tr>
<td><strong>Filters</strong></td>
<td>Respirator cartridge type HEPA filter for all four sample inlets and one purge inlet. Connection fittings are 1/4&quot; SS Swagelok fittings.</td>
</tr>
<tr>
<td><strong>Enclosure</strong></td>
<td>NEMA 12 rated, 24&quot; [600mm] wide x 18.8&quot; [478mm] high x 22.56&quot; [573mm] deep</td>
</tr>
<tr>
<td><strong>Differential Pressure Switch</strong></td>
<td>Diaphragm pressure switch used to detect low flow. Set point is ~ 5 LPM</td>
</tr>
<tr>
<td><strong>Programmable Logic Controller (PLC)</strong></td>
<td>Panasonic PLC with relay outputs, powered by a 24VDC power supply for. PLC also has RS232 serial data output for future expansion to include remote Capability.</td>
</tr>
<tr>
<td><strong>Pump</strong></td>
<td>Thomas reciprocating piston pump, model 2688CE44, 470W, 115VAC, 60Hz</td>
</tr>
<tr>
<td><strong>Solenoid Valves</strong></td>
<td>Brass body, nitrile rubber seals 130</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>lb [59 Kg]</td>
</tr>
</tbody>
</table>
NUCLEAR POWER PLANT TRITIUM MONITOR MODEL 321/421 NPPM

This tritium monitor is a version of the OTC standard 321/421 series, configured for the special environmental conditions associated with nuclear power plants, especially those of the CANDU type. This monitor can be used for other applications where tritium specific measurements in the presence of other radionuclides are required.

Major distinguishing features include the following:

- Measures tritium or tritium oxide specifically
- Immune to other radioisotopes, including reactor gases as well as radon
- Gamma compensated dual chamber design
- Plate out proof ionization chambers eliminate "background" zero drift
- Drift free "zero"
- Rugged industrial enclosure
- Unaffected by variations in temperature or humidity
- A variety of alarms and controls are available. Optional Remote Displays and Sampling Units can be built to suit different applications.

SENSITIVITY - NOISE LEVELS

The Model 421 NPPM has been designed to exhibit sensitivities commensurate with safety requirements associated with worker exposure in power plants. Sensitivity limits induced by background noise levels with instruments incorporating 2 liter ionization chambers approach 0.3 µCi/m³.

RANGE

The Model 421 NPPM is dual range, extending measurement to up to 6 plus decades.

MAINTENANCE

Except for routine attention the sample line dust filters and preventive maintenance to the sampling pump, the instrument will provide decades of trouble free service.

SUPERVISORY SIGNALS

Computer compatible outputs are provided to signal operational failure including loss of sample flow, pump failure, electrical failure including that of the electronics, and failure of the ionization chambers.
MEASUREMENT

Range, typical

two, automatically switch 0.1 - 10,000 µCi/m³ low range 1.00 - 200.00 mCi/m³ high range other ranges available

Display

4 1/2 digital panel meter

Accuracy

± 2 % of reading, ± L.S.D., whichever is greater

Stability and Drift

±1.0 µCi/m³ long term (thirty days), ambient temperature conditions

Noise Response

±1.5 µCi/m³, 1 sigma, with alpha suppression in use

Rate

three linear electronic time constants

approximately 40 seconds for signals up to about 80 µCi/m³

approximately 10 seconds for signals from 80 to 10,000 µCi/m³

approximately 3 seconds for signals above 1.00 mCi/m³

Warm Up Time

less than ten minutes

ALARM SYSTEMS

High Level

Low Range Level alarm with 4-digit thumb wheel potentiometer preset from 1 - 9,999 µCi/m³. High Range Level alarm with 3-digit thumb wheel potentiometer preset from 2 - 200 mCi/m³. Toggle switch selector for High or Low Range Level Set Points. An Alarm condition activates a visual (red LED) an acoustic indicator and fail-safe relay closure. Toggle switch selector for latching or non-latching modes and reset. Acknowledge push button to silence acoustic indicator after alarm is tripped.

Malfunction

Failure of any one three conditions will activate a non-latching visual indicator and fail-safe relay closure. One, a dc power supply monitor verifies all internal dc supplies are within specification. Two, verifies that the electrometer cable is connected. Three, sample flow monitored by a delta pressure switch.
IONIZATION CHAMBER
INTERNALLY MOUNTED

Measuring volume: 1,200 cm each
Total wetted volume: 2,000 cm³ each
Electrodes Wire Grid, contamination resistant
Pressure 0.1 to 2 atmospheres
Ports 1/4” stainless steel Swagelok

SAMPLE FLOW SYSTEM
INTERNALLY MOUNTED

Pump Flow Rate diaphragm type 115/230 VAC 50/60 Hz
Flow meter Dust 14 LPM maximum @ 0 psia
Filter Connection 0 - 10 LPM adjustable
Low Flow Sensor HEPA respirator type
1/4” stainless steel Swagelok tube fittings
Differential pressure switch

ENVIRONMENTAL

Temperature -40°C to +65°C storage
0°C to +55°C operating
Humidity 0 - 95 % RH Ventilation or air conditioning is not required.

PHYSICAL, MAIN CABINET

Size 29.37’ [747mm] High x 23.63’[600mm] Wide x 18.62’ [473mm] Deep wall mounted NEMA 12 painted steel enclosure with key lockable door
Power 115/230 VAC, 50/60 Hz, 50 W including pump and up to 4 remote indicators
Weight 186 lbs [84kg]
RECYCLING DRYER UNIT

Desiccant dual copper tube coaxial columns containing desiccant agent. Columns are equipped with internal heaters for the regeneration of the desiccant.

Cycling System

Motor driven cam timer controls solenoid valves and the heaters for sequential operation of each column.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>In use</td>
<td>1. heat column</td>
</tr>
<tr>
<td>In use</td>
<td>2. purge vapor</td>
</tr>
<tr>
<td>In use</td>
<td>3. cool column</td>
</tr>
</tbody>
</table>

The sequence of events takes six hours for completion, whereupon the sequence recommences for the opposite column.

VISUAL INDICATORS

Status Indicator

Rotary pointer knob indicates different sample/regenerate process for both desiccant columns.

Low Flow

indicates when purge pump flow is <2 LPM.

Power

115/230 V, 50/60 Hz, 1500 Watts

Circuit Protection

Circuit breaker/power ON/OFF switch

Physical Size

30" [762mm] W x 46.75" [1187.5mm] H x 13.5" [343mm]D wall mounted painted steel enclosure

Weight

245 lbs [111 kg]
TRITIUM SAMPLING UNIT (OPTIONAL)

Pump Flow Rate Flow Meter
Dust Filter Pressure 115/230 VAC, 50/60 Hz
Connections Low Flow Sensor 89 LPM Maximum at 0 psia
Vacuum Sensor 10-100 LPM
HEPA respirator type

CONTROLS
Power Control Pump Control 0.1 - 2 atmospheres
Sample Control Valve Selection 1/4" stainless steel Swagelok tube fittings

VISUAL INDICATORS
Manifold Low Flow Pushbutton switch for power
Connections Maintained pushbutton switch for power to pump

ENVIRONMENTAL
Temperature maintained pushbutton switch for MAIN/REMOTE control
Humidity controlled by a rotary switch
Air Conditioning red LED, "on" when purge pump flow fails or falls below 2 LPM.

PHYSICAL
Physical Size 1/4" stainless steel Swagelok tube fittings
Power Weight
-40 °C to +65 °C Storage
0 °C to +50 °C Operating
0 - 95 % RH
Ventilation or air conditioning is not required.

23.62’[600mm]Wide x 25.75’ [654mm] High x
15.16 ‘ [385mm] Deep NEMA 12 Enclosure
120VAC, 60Hz, 1Ph, 15A
101 lbs [46 kg]
REMOTE DISPLAY / CONTROL UNIT (OPTIONAL)

Power Control  
ON/ OFF toggle switch for power to unit

Pump Control  
ON/ OFF maintained pushbutton switch for power to pump

Sample Control  
MAIN/REMOTE maintained pushbutton switch for control unit selection

Valve Selection  
Valve selection controlled by PLC touch screen

VISUAL INDICATORS

Displays Tritium Concentration 120VAC, 60Hz, 1Ph, 2A

ENVIRONMENTAL

Temperature  
-40° C to +65° C Storage 0° C to +50° C Operating

Humidity Air  
0 - 95 % RH not required.

PHYSICAL

Physical Size  
23.62” [600mm] Wide x 25.75” [654mm] High x 15.16” [385mm] Deep Excluding Hardware

NEMA Rating  
NEMA 12

Power  
120VAC, 60Hz, 1Ph, 2A

Weight  
66 lbs [30 kg]