

Consultores de Radiacion
Medical e Industrial
David Rhoe
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Guaynabo, PR 00969

August 10, 1998

Nuclear Regulatory Commission
Region II
Atlanta Federal Center
61 Forsyth Street, SW, Suite 23T85
Atlanta, Georgia 30303-3415

Subject : License application dated March 25, 1998 (Docket No. 030-34704, Control No. 257874)

Dear Mr. Pelchat

Here is the additional information that you requested.

1. Description of the facility.

a. If I borrow a calibration source, the source will not be relocated from the facility and I will obtain written permission prior to calibrating any instruments. At this time, I have not been able to locate a source to use. Therefore I wish to apply for my own source but still would like to keep this option open.

b. Please see the area diagram of my facility. The office room is where the unit will be stored, used and secured when it is not in use. (Attachment 1)

2. The instrument calibrator will be obtained from Nuclear Associates. The source is a Cs-137 Model 773 and will not exceed 165 mCi (NIST traceable). The catalog does not mention who makes the unit. Please see attachment 2 – Nuclear Associates.

3. All radiation sources will be NIST traceable to +/- 5%. The radiation standards will not exceed 10 uCi. See attached – The standard will probably be obtained from Isotope Products Laboratories. Attachment 3.

4. The sources that I will be leak testing are sources used in Nuclear Medicine labs (Cs-137, Ba-133, Co-60, Co-57). I will also be leak testing Moisture/Density gauges for Engineering group (Am-241 & Cs-137), two Nickel foils 63 used in Perkin-Elmer model L413-0128 detector cells and Strontium 90 eye applicators used by physicians. Other sources will be added to the leak testing when needed.

*exempt
gty.*
5. The radiation sources (>10 uCi) will be secured from unauthorized removal in a secured room labeled office in the diagram. The two doors will be secured when the room is vacant.

OK
6. Training will follow the model program of REG Guide 10.8 and a refresher will be given once each year to personnel. I still request the exemption from the training requirements base on my experience.

7. Direct reading dosimeters will be used for personnel dosimetry program.

OK
a. A Multi-Dosimeter Checker will be used to calibrate the units. It will be obtained from Nuclear Associates. The source is a 9 uCi Cs-137 source. Attachment 4.

b. Calibration will take place in the office described in item 1.

c. Calculations to determine time of exposure and calibration procedure will follow manufacture guidelines. See attachment 4.

d. Calibrations will be done yearly.

8. Radiation Survey meter and counting system.

*Please see
Attachment 4*
a. The meter used for radiation surveys and leak test counting system will be the Ludlum model 2241-2 using the 44-9 pan probe, the 44-12 (gamma scintillation) well probe, and the 43-2-2 alpha/beta probe. Additional, the Aptec MCA board may be used. See attachment 5. Talking with Ludlum, I have decided to obtain the Ludlum equipment. Ludlum has performed the MDA calculations and have assured me that all the equipment that I will be purchasing is capable of detecting the 0.005 uCi. I will of course verify this information prior to collecting any samples for analysis. Please remove the Eberline E-520 and (LSC) system from my application.

b. The meter will be calibrated once each year and the well counter will be checked with a NIST traceable source prior to each usage.

c. A back up survey instrument will be available.

OK
9. Prior to calibrating any survey instrument, an area survey will be done to verify the limits set by 10 CFR 20.1201 and 1301. After the initial survey, the calibrator will be opened and a second area survey will be preformed. If the limits in part 20 are exceeded, (outside the fence line) shielding will be obtained to reduce the exposure rate prior to calibrating any survey instrument. The unit will be directed towards the open field when it is used.

OK
10. Please remove the electrical calibration from my application. All calibrations will be done with the Cs-137 source.

OK
11. Please see the response to item seven.

*not
clear
for
Answer*
12. Please see the response to item eight. This is to verify that counting of leak test samples will not be done unless the equipment is capable of detecting 0.005 uCi. Using a back ground of around 300cpm and the Efficiency of 0.1%, the MDA will be 0.0028 uCi which is below the 0.005 uCi limit.

13. Please see response to item eight and twelve.

14. Collection of sealed source leak test samples will be done according to manufacture directions. This will be done with the shutters in the closed position unless stated differently by the company. A survey meter will be available when the leak test samples are taken.

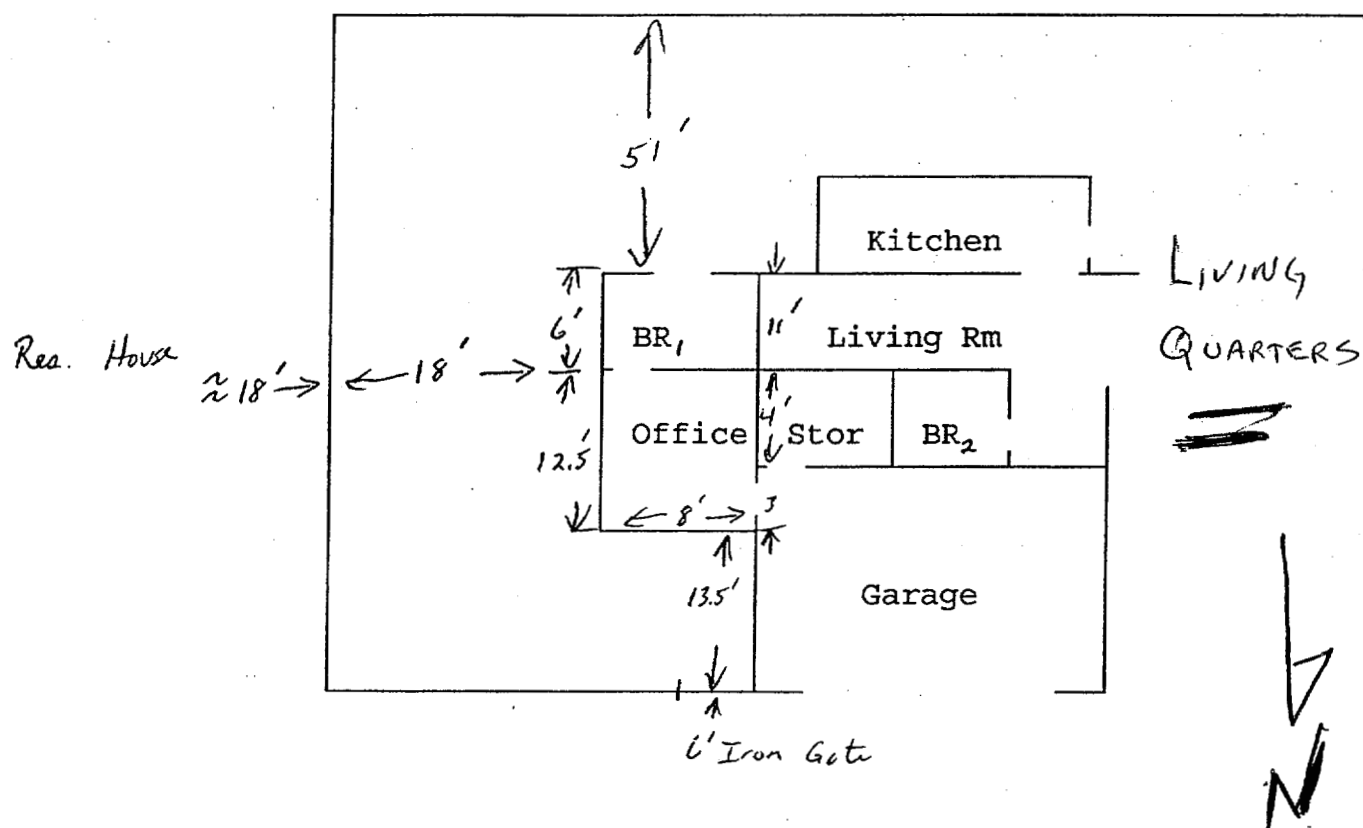
15. Have corrected the typo in the sample. Thanks!!

If you need any more information, please call me at (787) 316-7920.

Sincerely,


David Rhoe

OPEN FIELD



All walls are 8" cement block and are 6' or higher in height

BR₂ - Bathroom

BR₁ - Bathroom

Stor - Storage Room

The radiation source will be pointed towards the open field when it is used.

NUCLEAR ASSOCIATES



Division of VICTOREEN, INC.
100 VOICE ROAD • PO BOX 349
CARLE PLACE, NY 11514-0349 USA
(516) 741-6360 • FAX (516) 741-5414

1-888-466-8257 (1-888-GO-NUCLR) • E-Mail: sales@nuct.com
Visit us on the World Wide Web at: <http://www.nucl.com>

GAMMA SURVEY INSTRUMENT CALIBRATOR

Eliminates the expense, inconvenience and work-time lost when sending such instruments to an outside calibration service.

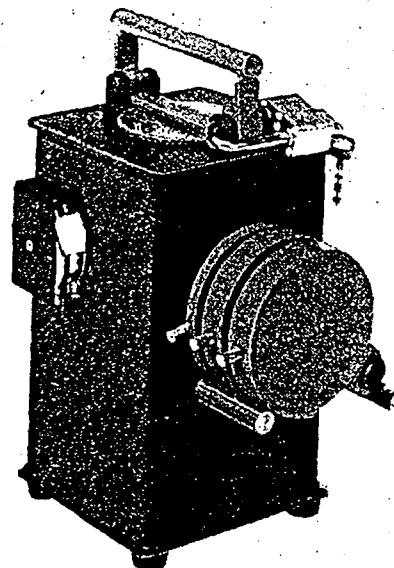
- Self-contained ^{137}Cs source.
- Calibrates instruments with ranges up to 2000 mR/hr.
- Calibration traceable to NIST.
- Attenuators eliminate repositioning for different scale measurements.
- Can be padlocked in closed position for safety.

This sturdy, easy-to-use device permits the safe, accurate calibration of instruments used for surveying gamma radiation. It enables users of dosage-measuring equipment to perform routine checks at will or as necessary to meet the regulations of the N.R.C. and Agreement States.

The heavy-duty lead container holds 165 mCi of cesium-137, encapsulated at one end of a control rod. Since ^{137}Cs has a long half-life (29 yrs.), there is no need to calculate a correction factor for at least 1 to 2 years after the instrument is shipped.

The source is kept in either of two positions: stored or exposed. In the fully-shielded "stored" position, radiation at the container's surface is less than 200 mR/hr; at 1 meter away it is less than 10 mR/hr. In the "exposed" position, the source faces a 36° (horizontal) x 20° (vertical) port at the shield's side. The radiation field can be varied by means of three built-in attenuators (transmission factors 0.25, 0.10 and 0.10). These permit calibration of three meter scales, each at 20% and 80% of full scale, using only one source-to-meter distance measurement. The source is moved from "stored" to "exposed" merely by raising the control rod. For safety, the ^{137}Cs source cannot be removed from its shield except by the manufacturer.

A built-in tape measure helps determine the distance from the ^{137}Cs source to the instrument being calibrated. A padlock (not included) prevents unauthorized use of the equipment. A convenient carrying handle is also included.



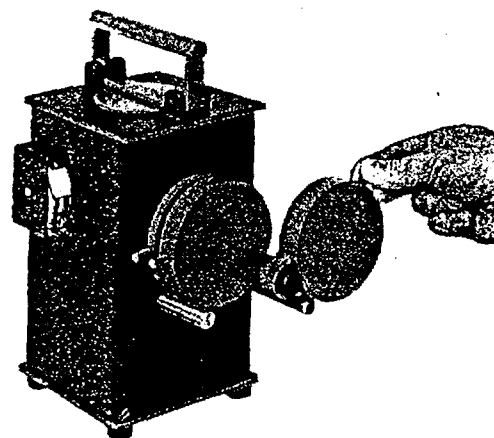
Gamma Survey Instrument Calibrator with three attenuators in place.

Specifications

Dimensions: 5" square x 8½" H.

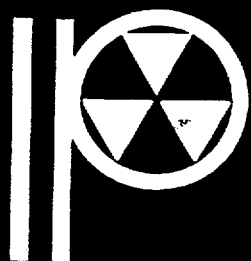
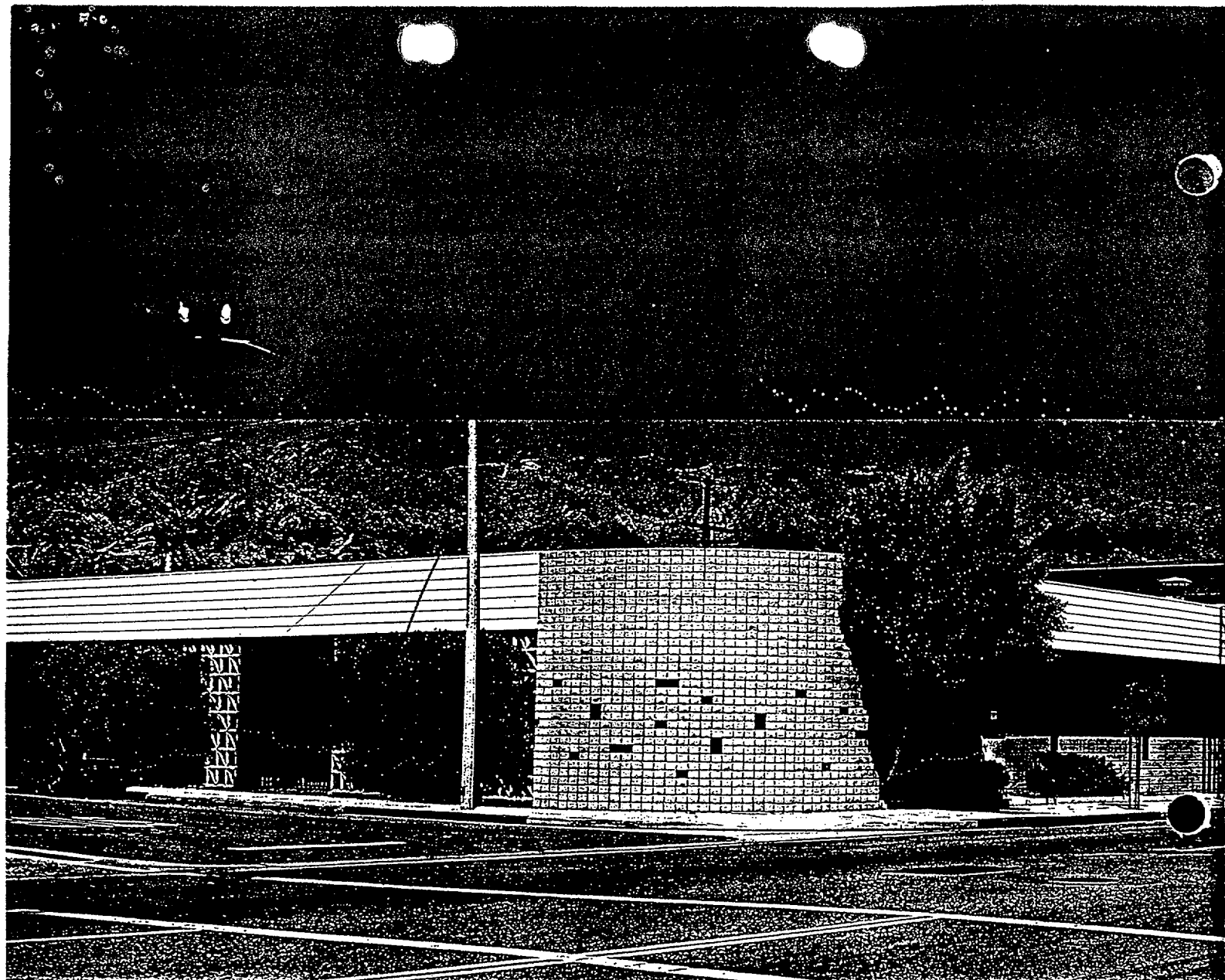
Weight: 52 lbs.

64-773 Gamma Survey Instrument Calibrator.....\$4,850.00*



Gamma Survey Instrument Calibrator with one attenuator removed from radiation path.

**An N.R.C. or Agreement State License is required (see page 1). When applying, please designate the source as Technical Operations model 773. A copy of your license must accompany the order.*



ISOTOPE PRODUCTS LABORATORIES

1800 N. KEYSTONE STREET, BURBANK, CALIFORNIA 91504

(818) 843-7000 Telex: 312429 FAX 818-843-6168

GAMMA AND X-RAY STANDARDS

Isotope Products Laboratories offers over 50 gamma and x-ray standards for research and educational use. Available isotopes span an energy range from 0.0059-3.25 MeV.

Methods of calibration are described on page 2.

A rod (type R) or disc (type D) configuration constructed of high strength plastic is offered for the routine calibration of scintillation and G.M. detectors. A thin "scatterless" disc source (type M) is available for critical applications involving high resolution solid state detectors. All styles are offered at the 100 μ Ci level to allow for the lower efficiencies of detection inherent in these devices.

Each configuration is available at the activity and price listed below. When ordering, be sure to indicate which style and activity level you wish: For Example:

2 each Model GF-137M Cs-137 1.0 μ Ci

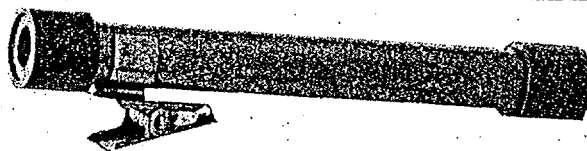
1 each Model GF-226R Ra-226 0.1 μ Ci

PRICE INCLUDES TRACEABILITY TO NBS

Model Number	Nuclide	Half-Life	Major Photon Emissions (MeV)	Price Schedule		
				0.1 or 1 μ Ci	10 μ Ci	100 μ Ci
GF-227	Actinium-227	21.8 Y	0.05 thru 0.90 (including daughters)	500	680	
* GF-241	Americium-241	432 Y	0.060 (36%), Np L x-rays	On Request		
GF-125	Antimony-125	2.71 Y	0.428 (30%), 0.464 (10.5%), 0.60 (23%), 0.64 (11.5%)			
GF-133	Barium-133	10.7 Y	0.027 Te K x-rays, 0.080 (34%), 0.303 (18%), 0.356 (62%)			
GF-007	Beryllium-7	53 D	0.478 (10.4%)			
GF-207	Bismuth-207	32.2 Y	0.570 (98%), 1.06 (74%)			
GF-109	Cadmium-109	1.24 Y	Pb L x-rays, 0.088 (3.8% from Ag 109m), 0.022 (Ag K x-rays)			
GF-139	Cerium-139	137 D	0.166 (80%), 0.033 (La K x-rays)			
GF-144	Cerium-144	284 D	0.134 (11%), 0.0696 (1.3%)			
GF-134	Cesium-134	2.06 Y	0.57 (24%), 0.60 (98%), 0.80 (85%)			
* GF-137	Cesium-137	30.2 Y	0.662 (85%), 0.032 (Ba K x-rays)	285	310	
GF-051	Chromium-51	27.7 D	0.320 (10%), 0.0049 (V K x-rays)			
GF-057	Cobalt-57	272 D	0.014 (9%), 0.122 (85.6%), 0.0064 (Fe K x-rays)			
GF-058	Cobalt-58	70.8 D	0.511 (30%), 0.810 (99%), 0.0064 (Fe K x-rays)			
GF-060	Cobalt-60	5.27 Y	1.173 (100%), 1.333 (100%)			
GF-152	Europium-152	13.2 Y	0.122 thru 1.408 Gd + Sm x-rays			
GF-154	Europium-154	8.5 Y	0.058 thru 1.895 Gd x-rays			
GF-155	Europium-155	4.96 Y	0.087 (34%), 0.105 (23%), Eu K x-rays			
GF-153	Gadolinium-153	242 D	0.974 (27%), 0.103 (20%), 0.041 (Eu x-rays)			
GF-068	Germanium-68	288 D	0.511 (176%), 1.08 (3.0%), Ga + Zn x-rays			
GF-166	Holmium-166m	1200 Y	0.08 thru 1.43	On Request		
GF-125	Iodine-125	60.3 D	0.035 (7%), 0.027 (Te K x-rays)			
GF-129	Iodine-129	1.6x10 ⁷ Y	0.040 (9%), 0.030, (Xe K x-rays)	0.1 μ Ci	1 μ Ci	10 μ Ci
GF-055	Iron-55	2.69 Y	0.0059 (Mn K x-rays)			
GF-059	Iron-59	44.6 D	1.10 (56%), 1.29 (43%)			
GF-054	Manganese-54	312 D	0.836 (100%), 0.0054 (Cr K x-rays)			

Continued on next page

HIGH-RANGE GAMMA DOSIMETER



Calibration Accuracy: $\pm 10\%$ at mid-scale using ^{60}Co and ^{137}Cs .
 Energy Dependence: $\pm 15\%$ of ^{60}Co response from 80 keV to ^{60}Co .
 Rate Dependence: $\pm 5\%$ up to 10,000 R/hr.
 Electrical Leakage: Less than 2% per 24 hrs.
 Environmental Temperature: -29°C to $+54^\circ\text{C}$.

06-866 Range: 1 R\$180.00



DOSIMETER Accessories



06-201

MULTI-DOSIMETER CHECKER

Allows simultaneous testing of up to five or six direct-reading pocket dosimeters.

- ^{137}Cs source requires no license.

Nuclear Associates' Multi-Dosimeter Checkers consist of a plastic cylinder containing either five or six holes surrounding a central, hermetically-sealed, 9 μCi ^{137}Cs source.

This device makes checking dosimeters easy! Properly charged and zeroed dosimeters are placed in the cylinder and exposed for the required period of time, depending on their range. Typically, a six-hour exposure of a properly-calibrated dosimeter will yield reading from 25 mR to 35 mR.

Specifications

Radioactive Source: 9 μCi ^{137}Cs source.

Cylinder Materials: Cylinder material is PVC.

Dimensions: Checker: $2\frac{3}{4}''$ H x $2\frac{1}{2}''$ diam.;

Holes: model 06-201; $2\frac{1}{2}''$ deep x $6\frac{1}{4}''$ diam. (6.35 cm x 1.59 cm)

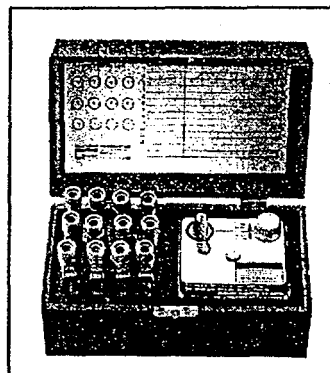
model 06-201-5000; $2\frac{1}{2}''$ deep x .807" diam. (6.35 cm x 2.05 cm)

Weight: 7 oz.

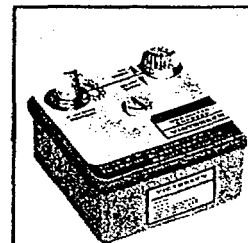
06-201 Multi-Dosimeter Checker; six holes\$199.00

06-201-5000 Multi-Dosimeter Checker; five holes.....199.00

06-907



06-912



DOSIMETER STORAGE CASE *with Charger*

For zeroing and storing direct-reading dosimeters.

Here you get Nuclear Associates' standard Dosimeter Charger (model 06-912) in a rugged leatherette-covered case that holds up to 12 dosimeters. A chart conveniently affixed inside the case permits quick identification of each dosimeter and its user. The charger can be easily removed for battery change.

Specifications

Dimensions: $9\frac{1}{2}''$ L x $5\frac{1}{4}''$ W x 5" high.

Weight: 5 lbs.

06-907 Dosimeter Storage Case with Charger\$155.00

06-907-1000 Dosimeter Storage Case without Charger52.00

DOSIMETER CHARGER

For zeroing direct-reading dosimeters.

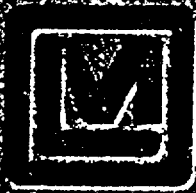
This transistorized power supply zeroes all direct-reading dosimeters. A safety spring in the charging socket prevents damage from excessive pressure on the dosimeter. A protective cap keeps the socket free of dust and moisture when charger is not in use. One standard 1.5V 'D' cell battery permits thousands of chargings (Battery not included).

Specifications

Dimensions: 4" x 4" x 3" high (10 cm x 10 cm x 7.6 cm).

Weight: 1 lb.

06-912 Dosimeter Charger.....\$125.00



**P.O. Box 810 • 501 Oak Street
Sweetwater, Texas 79556**

915-235-5494

FAX 915-235-4672

800-677-0828(USA)

Scaler/Ratemeter

Specifications

INDICATED USE: General purpose survey, gross counting

COMPATIBLE DETECTORS: G-M, proportional, scintillation

DET1/DET2: A locking toggle switch to allow for quick change between two detector setups

ALERT/ALARM: Indicated by annunciator on display and audible tone

DISPLAY: 4 digit LCD display with 0.5" (1.3cm) high digits, separate annunciators for display units, alert, alarm, low battery, detector overload, counting overflow, and scaler counting

BACKLIGHT: Push-button to activate

RATEMETER: Can display in R/hr, Sv/hr, cpm, or cps when control switch is in RATEMETER position

DISPLAY RANGE: Auto ranging from 0.0 μ R/hr - 9999 R/hr; 0.000 μ Sv/hr - 9999 Sv/hr; 0 cpm - 999k cpm; or 0 cps - 100k cps

SCALER: Activated by push-button in handle (count time adjustable from 1 - 9999 seconds in 1 second intervals)

HIGH VOLTAGE: Two independent controls; each adjustable from 200 - 2500 volts

DISCRIMINATOR: Adjustable from 2 - 100 mV

OVERLOAD: Indicated by OVERLOAD on display (adjustable depending on detector selected)

BATTERY LIFE: Typically 200 hours with alkaline batteries (low battery indicated on display)

SIZE: 6.5" (16.5cm)H X 3.5" (8.9cm)W X 8.5" (21.6cm)L

WEIGHT: 3.5 lbs (1.6kg) including batteries

The following parameters are adjusted by a removable switchboard. Once initial setup and calibration have been completed, the switchboard can be removed without affecting normal operation of the instrument (*Model 2241-2 may be ordered without switchboard*)

BACKLIGHT "ON" TIME: 5, 30, 60, 90, 180, or 240 seconds for the backlight to stay "ON" when activated.

SET MINIMUM DISPLAY: Allows lower limit of auto-ranging display to be fixed. For example, display can be set to not show values less than 1 μ R/hr.

RS-232 DATA DUMP MODE: Enables or disables dump mode to RS-232 port. When enabled data will be dumped every 2 seconds

RS-232 DETECTOR SETUP MODE: Allows for detector parameters to be input by RS-232 port

BAUD RATE: 150, 300, 600, 1200, 2400, 4800, 9600, or 19200 bps.

DEAD TIME: Adjustable from 0 - 9999 μ seconds

CALIBRATION CONSTANT: Adjustable from 0.001 - 280×10^9 counts/display unit

DISPLAY UNITS: Can read in R/hr, Sv/hr, cpm, or cps

TIME BASE: Can read in seconds or minutes

AUDIO DIVIDE: 1, 10, 100, or 1000 events-per-click

RESPONSE:

FIXED: FAST response time adjustable from approximately 2 - 50 seconds. SLOW response is 5 times fast setting

VARIABLE: Dependant on number of counts present. Typical times FAST - 4 - 25 seconds, SLOW - 4 - 60 seconds

(All times stated from 10% to 90% of final reading)

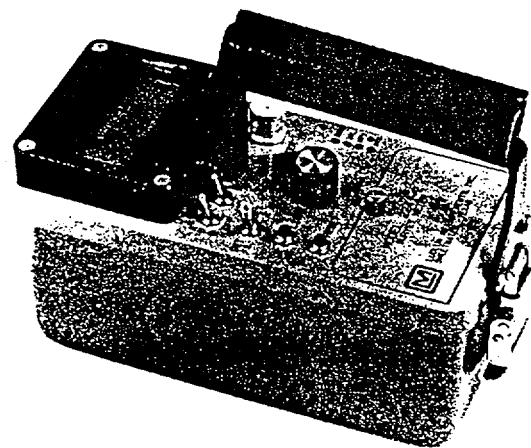
RATEMETER ALERT/ALARM: Set at any point corresponding to pre-selected ratemeter range

SCALER ALARM: Adjustable from 1 - 999999 counts

SCALER COUNT TIME: Adjustable from 1 - 9999 seconds

Model 2241-2

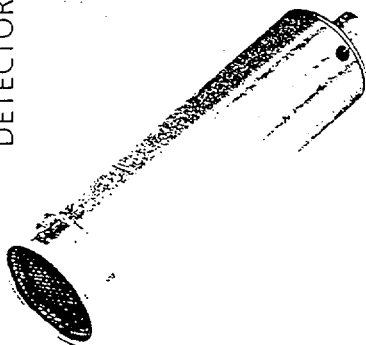
DIGITAL SCALER/RATEMETER



Alpha Beta-Gamma G-M

Model 44-7

END WINDOW G-M
DETECTOR



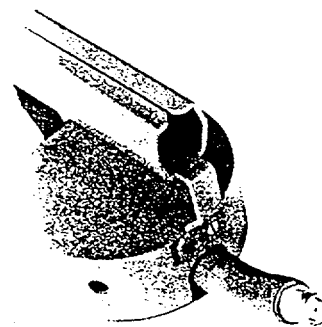
Model 44-9

PANCAKE G-M
DETECTOR



Model 44-40

SHIELDED PANCAKE G-M
DETECTOR



Common Specifications

INDICATED USE: Alpha, beta-gamma survey,
sample counting

WINDOW: 1.7 ± 0.3 mg/cm² mica

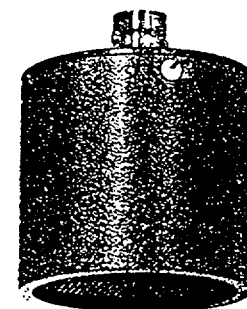
ENERGY RESPONSE: Energy dependant

COMPATIBLE INSTRUMENTS: General purpose
survey meters, ratemeters, and scalars

OPERATING VOLTAGE: 900 volts

Model 44-88

PANCAKE G-M
DETECTOR



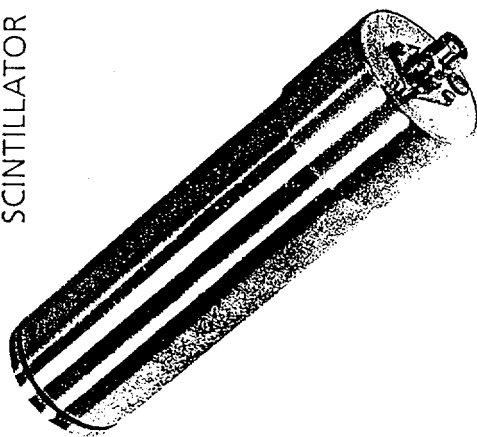
	44-7	44-9	44-40	44-88
DETECTOR	End window halogen quenched G-M	Pancake type halogen quenched G-M		
WINDOW AREA	6 cm ² active 5 cm ² open	15 cm ² active 12 cm ² open		
EFFICIENCY (4pi geometry)	2% - ¹⁴ C; 10% - ⁹⁰ S/ ⁹⁰ Y; 7% - ²³⁹ Pu	5% - ¹⁴ C; 22% - ⁹⁰ S/ ⁹⁰ Y; 19% - ⁹⁹ Tc; 32% - ³² P; 15% - ²³⁹ Pu		
SENSITIVITY	Typically 2100 cpm/mR/hr	Typically 3300 cpm/mR/hr		
DEAD TIME	Typically 200 μs	Typically 80 μs		
CONSTRUCTION	Anodized aluminum housing	Aluminum housing	Lead housing*	Aluminum housing
SIZE	1.8" (4.6cm) diameter 5.8" (14.7cm) L	1.8" (4.6cm) H 2.7" (6.9cm) W 10.7" (27.2cm) L	4.5" (11.4cm) H 4" (10.2cm) W 6.5" (16.5cm) L	2.3" (5.7cm) diameter 2.8" (7cm) L
WEIGHT	1 lb (0.5kg)	1 lb (0.5kg)	5.5 lbs (2.5kg)	0.5 lbs (0.2kg)

* Model 44-40-2 with aluminum cased lead shield is also available

Gamma Scintillation

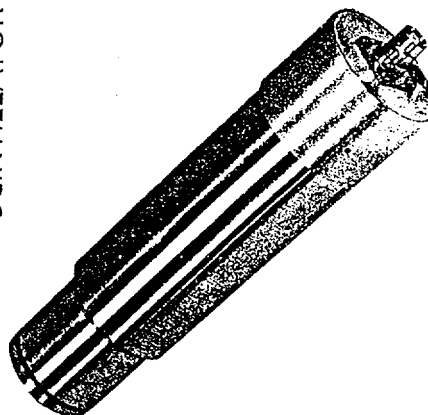
Model 44-11

INTEGRAL
SCINTILLATOR



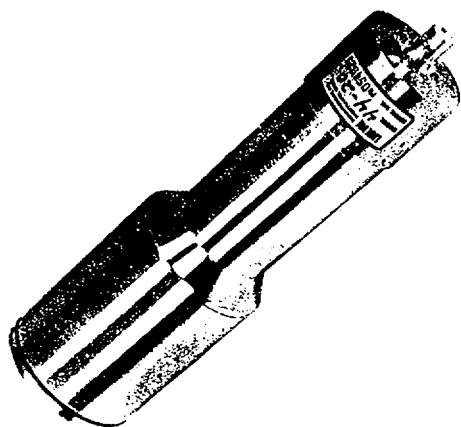
Model 44-12

INTEGRAL WELL
SCINTILLATOR



Model 44-20

INTEGRAL SCINTILLATOR



Common Specifications

ENERGY RESPONSE: Energy dependant

TUBE: 2" (5.1 cm) diameter magnetically shielded photomultiplier

OPERATING VOLTAGE: Typically 500 - 1200 volts

DYNODE STRING RESISTANCE: 60 megohms

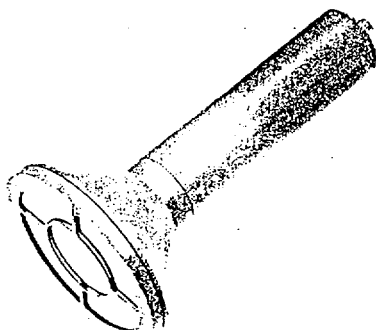
	44-11	44-12	44-20
SCINTILLATOR	2" (5.1cm) diameter 2" (5.1cm) thick NaI	1.8" (4.6cm) diameter 2" (5.1cm) thick NaI	3" (7.6cm) diameter 3" (7.6cm) thick NaI
WELL	N/A	0.7" (1.7cm) diameter 1.6" (3.9cm) deep	N/A
SENSITIVITY	Typically 900 cpm/ μ R/hr (^{137}Cs gamma)	Typically 900 cpm/ μ R/hr (^{137}Cs gamma)	Typically 2700 cpm/ μ R/hr (^{137}Cs gamma)
COMPATIBLE INSTRUMENTS	General purpose survey meters, ratemeters, and scalers	Scalers, ratemeters	General purpose survey meters, ratemeters, and scalers
SIZE	2.5" (6.4cm) diameter 10.5" (26.7cm)L	2.5" (6.4cm) diameter 10.5" (26.7cm)L	3.3" (8.3cm) diameter 11.3" (28.7cm)L
WEIGHT	1.4 lbs (0.6kg)	3 lb (1.4kg)	3.7 lbs (1.7kg)

LEADLUMMEASUREMENTS

Alpha Beta PhoSwitch Scintillation

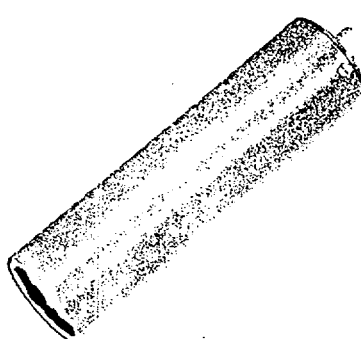
Model 43-1-1

ALPHA/BETA SCINTILLATOR

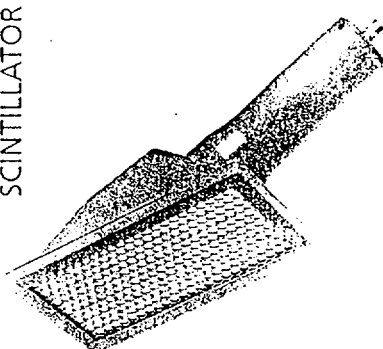


Model 43-2-2

ALPHA/BETA SCINTILLATOR



Model 43-89

100 cm² ALPHA/BETA SCINTILLATOR


Common Specifications

INDICATED USE: Alpha beta survey

SCINTILLATOR: ZnS(Ag) adhered to 0.010" thick plastic scintillation material

NON-UNIFORMITY: Less than 10%

CROSS TALK:

Alpha to beta - less than 10%

Beta to alpha - less than 1%

COMPATIBLE INSTRUMENTS: Models 2224, 2225, 2929

TUBE: 1.5" (3.8cm) diameter magnetically shielded photomultiplier

OPERATING VOLTAGE: Typically 500 - 1200 volts

DYNODE STRING RESISTANCE: 100 megohm

	43-1-1	43-2-2	43-89
WINDOW	0.8 mg/cm ² aluminized mylar (1.2 mg/cm ² recommended for outdoor use)		1.2 mg/cm ²
WINDOW AREA	83 cm ² active 75 cm ² open	12 cm ² active and open	126 cm ² active 100 cm ² open
EFFICIENCY (4pi geometry)	30% - ²³⁹ Pu; 30% - ⁹⁰ Sr/ ⁹⁰ Y; 5% - ¹⁴ C	25% - ²³⁹ Pu; 30% - ²³⁰ Th; 20% - ⁹⁰ Sr/ ⁹⁰ Y; 5% - ¹⁴ C	16% - ²³⁹ Pu; 15% - ⁹⁹ Tc; 16% - ⁹⁰ Sr/ ⁹⁰ Y
BACKGROUND	Alpha - 3 cpm or less Beta - Typically 300 cpm or less (10 µR/hr field)	Alpha - 3 cpm or less Beta - Typically 50 cpm or less (10 µR/hr field)	Alpha - 3 cpm or less Beta - Typically 300 cpm or less (10 µR/hr field)
SIZE	4.8" (12.2cm) diameter 9.8" (24.9cm) L	2" (5.1cm) diameter 7.3" (18.5cm) L	5.5" (13.9cm) H 4" (10cm) W 12.3" (33cm) L
WEIGHT	2 lbs (0.9kg)	1 lb (0.5kg)	1.5 lbs (0.7kg)

SERIES 2000 - PCMCA/W 1 ¹⁹⁹¹ # 22795

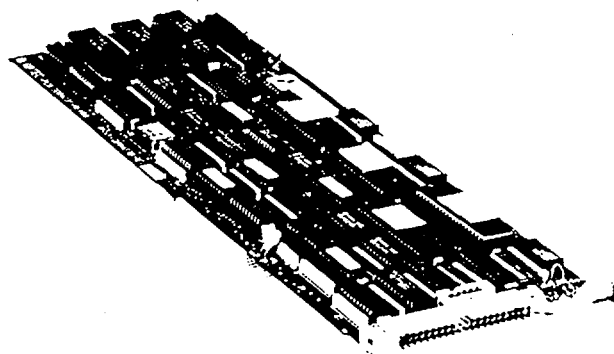
ADVANCED DATA ACQUISITION INTERFACE

The SERIES 2000 Multi-Channel Analyzer (MCA) is a high speed ADC-to-PC data acquisition interface card that is compatible with any commercially available NIM ADC or Flat Pack integrated spectroscopy processor. It converts an 80286 or 80386 PC (or compatible) into a full-featured Multi-Input MCA with choices of several different spectral data memory sizes to correctly match the ADC. Either Wilkinson ramp or fixed deadtime (successive approximation) ADCs are supported. The S2000 MCARD uses a proprietary data latch technique with the result that memory cycle time to add a pulse to memory is minimized, approximately 1 μ S per conversion. The MCARD and software are integrated to produce a full featured multi-input MCA with similar hardware/software architecture as would be found in the most expensive hardwired MCAs available, but with a much higher performance-to-price ratio.

All spectrum display and analysis functions are in PC RAM memory so that the superior processing speed of the host CPU can be used. An added benefit of this approach to distributed acquisition and analysis is that analytical upgrades are easily accomplished by diskette, hardware changes are not required. The MCARD has been designed so that all cards are identical (except for their addresses), and therefore MCARDs can be moved between slots or between P.C.s if required. SERIES 2000 MCARDs are software compatible with SERIES 500, 1100, or 3000 MCARDs.

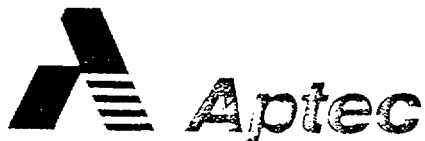
FEATURES

- ▶ Single slot ADC-to-PC interface card (MCARD) to convert a PC into a full-featured multi-input MCA.
- ▶ 1024 data channels, +/- 2 billion counts per channel.
- ▶ Multi-input capability, up to 4 MCARDs per PC.
- ▶ Supports Pulse-Height Analysis (PHA) or Multi-Channel Scaling (MCS) modes.
- ▶ MCS input data rates to 1 MHz, dwell times from 20 mS to 999 Sec per channel.
- ▶ Sample changer and remote control I/O signals.
- ▶ Compatible with 80386 or 80286 based PCs.
- ▶ Runs in PC/MS-DOS as an application program under WINDOWS/286 or /386 multi-tasking software.
- ▶ Includes advanced software for data acquisition, display, input/output, and basic spectrum analysis.
- ▶ Optional software is available for automation or qualitative and/or quantitative analysis.



HARDWARE

- Hi-speed data acquisition MCA card with memory expansion from 1024 up to 16,384 data channels.
- Distributed processing using an on-board 24 MHz clock, uProgrammable logic devices, and preset timers and counters for simultaneous acquisition and analysis.
- ▶ Spectrum capacity of +/- 2 billion counts per channel.
- Spectrum size selectable from 256 channels to MCARD maximum (2048, 4096, 8192 or 16,384 options available).
- On-board computer addressable timers (presets to 0.01 seconds) and gross counters.
- ▶ Plugs directly into any 8 or 16 bit slot of 80386 or 80286 based PCs.
- ▶ Optional interface for loss-free-corrector, "add-N" mode.
- 40 pin connector for ADC live time and spectral data.
- 9 pin connector for remote interfacing.
- ▶ Power is less than 9 watts per MCARD.
- Switch selectable memory address to prevent conflict with other PC boards.
- ▶ Sample changer/remote control with TTL signals for external "handshaking".
- ▶ MCARD size is one full length PC slot, 10 watts (maximum) power.



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