

GAMMA RAY SPECTROMETER
(Microcontroller based)
TYPE: GR 611M

Technical Data



FEATURES :

- ❑ Microcontroller based, compact, rugged, light weight, portable and modular in construction.
- ❑ GR611M can be used with different sizes of scintillation detectors, both flat & well detectors can be connected & used.
- ❑ Uses Microcontroller based Counter/Timer with advanced features for data acquisition & data outputting.
- ❑ Highly regulated variable EHT from 0 to 2000V
- ❑ Linear amplifier with adj gain and choice of shaping time constants.
- ❑ Single channel analyser facilitates both integral, differential or window counting.

The Gamma Ray Spectrometer (Microcontroller based) Type GR 611M consists of a MINIM based modular counting unit and a Scintillation Detector Type SD 151 / 152F /152W / 153F / 153W. The Spectrometer can also be used for Gamma Counting applications. This MINIM based system has added advantage of savings in cost and also conserves bench space because of its optimal design.

This system is configured around MINI BIN and Power Supply Type: MB 403 with the following Modules:

High Voltage Unit Type: HV 502

Linear Amplifier Type: LA 520

Single Channel Analyser Type: SC 530

& Counter Timer Type: CT 541A

(Microcontroller based), having unique built-in user programmable features for data acquisition & data outputting.

MINIBIN AND POWER SUPPLY

MB 403 :

Mini bin :

Accommodates SIX / EIGHT single bit modules or combination of multiple widths with Amphenol connectors. Minibin is primarily designed with the objective of conserving bench space and to achieve significant saving in cost of the Minibin based systems. Bussed wiring is provided to the power connectors to distribute +/- 12V and +/- 24V. A control panel with ON/OFF switch, low voltage test sockets is provided on the right extreme side of the bin.

Minibin Dimensions :

34.4cm width X 22.1cm height X 27.4cm length.

SPECIFICATIONS

Minibin Weight : 8Kg with modules, 3.8Kg without modules.

Power supply :

This is either two and half bit module or a compact box type enclosure fitted at the back of this bin, which generates highly regulated D.C voltages.

Power Supply Dimensions :

33.6cm width X 12.4cm height X 23.8cm length.

Power Supply Weight : 5.9Kg

Input: (230V ± 10%) A.C, 50Hz.

D.C Output :

+12V @ 1.5A, -12V @ 1.5A, +24V @ 0.75A, -24V @ 0.75A 72 watts maximum.

Regulation : Better than ± 0.3%.

Noise & Ripple : Less than 3mV (rms).

Stability :

+/- 0.5% after a 24 hr warm-up at constant line, load & ambient temp.

II. HIGH VOLTAGE UNIT (HV 502) :

- a. Output voltage variable continuously from 0V to 2000 volts
- b. Output current (max) 1mA
- c. Load & Line regulations : Better than 0.05% of full scale
- d. Indefinite over load & short circuit protections and self recovery
- e. Output ripple less than 10mV (rms).
- f. Dimensions : Two bit module

III. LINEAR AMPLIFIER (LA 520) :

- a. Input Polarity : Positive or Negative
- b. Total gain (Typical) : 800 (approx)
- c. Output (Unipolar) : 0 to 8V
- d. Max. output (Unipolar) : 12V
- e. Dimensions : Two bit module

IV. SINGLE CHANNEL ANALYSER (SC 530) :

- a. Input : Unipolar or bipolar with a +ve leading edge 0 to 10V
- b. Pulse Pair resolution (approx): 0.6 micro sec.
- c. Output pulse polarity : +ve
Pulse amplitude : +5V
Pulse width : 0.5 micro sec
- d. LLD output pulse amplitude : +5V
Output pulse width : 0.5 micro sec
Base line variable by : 10 turn helipot dial
Base line variation : 0 to 10V by helical potentiometer
- e. Window width : Continuously variable by helical potentiometer
(0 - 1) V in window mode
(0 - 10) V in normal mode
- f. Dimensions : Single bit module

V. COUNTER TIMER (CT 541A) : COUNTER / RATEMETER:

This is a microcontroller based state-of-art Counter / Timer unit having lot of advanced features.

- a. Input : 100mV to 10V, unipolar or positive bipolar semi-gaussian pulse
- b. Pulse width : 0.5 microsec
- c. Polarity : Positive or Negative
- d. Input impedance : 1K (approx)
- e. Input Counts Capacity : 999999 counts

- f. Pulse Height Discrimination :100mV - 10V by a preset provided on front panel
- g. Counts Indication : 16x2 dotmatrix LCD display
- h. Modes of Data Acquisition : a. Counts for a preset time
b. CPS
c. CPM
- i. Storage facility : upto 1000 readings
- j. TIMER
Preset Time Setting : Programmable through tactile switch control buttons
- k. Preset Time / Elapsed Time :On 16x2 dot matrix LCD display
- l. Preset Time Range : 1 to 9999 Sec
- m. Built-in printer port facilitating direct data printing
- n. Additional Options :
i. Data communication software for down loading of data can be given at extra cost.

VI. APPLICATIONS :

The system finds wide range of applications in nuclear research and academic fields which include:
Analysis of gamma radiation Identification of unknown isotopes and their relative abundance.
Measures the strength of radio activity of sample.
Useful in radiotracer techniques.
Can be used for protein bound iodine studies in medicine using well type scintillation head etc.
Swipe sample counting in Health Physics Labs.

ACCESSORIES FOR GAMMA RAY SPECTROMETER SYSTEM

SCINTILLATION DETECTORS

Nucleonix Systems offers wide range of NaI Scintillation Detectors of different sizes both with flat & well type crystals, to meet the requirements of wide range of users for Gamma ray spectrometry measurements.

Scintillation detectors offered include 1"x1", 2"x2" & 3"x3" NaI integral assemblies with built-in pre-amplifiers. These detector assemblies give excellent stability, superior performance & good resolution in the range of 8.0 to 9.5% for Cs-137. Scintillation detectors of other sizes can be offered against user specific requirements also.



Important Specifications	Detector Type				
	SD 151	SD152F	SD152W	SD153F	SD153W
1. Flat/Well type NaI crystal	SD 151	SD152F	SD152W	SD153F	SD153W
2. Crystal Sizes	1" x 1"	2" x 2"	2" x 2"	3" x 3"	3" x 3"
3. a. Flat crystal or Well crystal	Flat	Flat	Well	Flat	Well
b. Well Size (applicable for well type detectors only)	Not applicable	Not applicable	0.75" dia X 1.43" deep	Not applicable	0.656" dia X 2.063" deep
4. Resolution (Better than)	8.5 %	8.5%	9 %	8.5%	9 %
5. Photo multiplier	R6095 of Hamamatsu or its equivalent	EMI 9857 or 9266 or its equivalent		EMI 9305 or its equivalent	
6. Pre-amplifier	Built – in	Built – in		Built – in	
7. Gain (Approx.)	25	25		25	
8. Noise (RMS. referred to input)	Less than 50 μ V	Less than 50 μ V		Less than 50 μ V	
9. Operating Voltage	600 to 900 V	700 to 900V		700 to 900V	
10. Out put	Positive Tail Pulse	Positive Tail Pulse		Positive Tail Pulse	
11. Output impedance	90 Ohms	90 Ohms		90 Ohms	
12. Power Requirement (Typical)	-12V @ 12 mA	-12V @ 12 mA		-12V @ 12 mA	

Important Note: All NaI Scintillation Detectors manufactured & supplied by Nucleonix systems, use integral assemblies of Saint Gobain who are world leaders.

**GAMMA REFERENCE STANDARD SET
TYPE: GS 290**

Gamma Reference Standard Set Type: GS290 consists of a set of FIVE Gamma sources evaporated and sealed on 25mm dia x 5mm plastic discs ranging from 100KeV upto 1.33MeV energies with activity in the range of 2 to 5 micro curie. A reference chart for this is given below. The accuracy of these sources is in the range of +/-10%.All these disc sources are enclosed in a neatly polished wooden box.

Isotope	Energy MeV	NominalActivity	Halflife
Co-57	0.123	2-5 μ Ci	273 Days
Ba-133	0.36 (Main)	2-5 μ Ci	7.5 Years
Na-22	0.511; 1.280	2-5 μ Ci	2.6 Years
Cs-137	0.662	2-5 μ Ci	30 Years
Co-60	1.17; 1.33	2-5 μ Ci	5.3 Years



**LEAD CASTLES FOR SCINTILLATION DETECTOR -
LS 249, LS250, LS251.**

This consists of 40mm thick lead shielding cylindrical rings assembled according to the detector. There is a provision in the bottom ring through which system connections are given to the detector, which is placed inside the lead shield.



For 1"X1" detector (9 lead assembling parts)

LS 249



For 2"X2 detector (10 lead assembly parts)

LS250



For 3"X3" detector(11 lead assembly parts)

LS251

The top ring has a holding knob through which sample can be loaded on to the scintillation detector, and this closes the lead castle from top side.