

PRESENTATION ON MINI GAMMA RAY SPECTROMETER GR611M



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1) INTRODUCTION

GR 611M manufactured by Nucleonix Systems is a state-of-art microcontroller based modular unit consisting of

- 1) High Voltage Unit.
- 2) Linear Amplifier.
- 3) Single Channel Analyser and Counter timer
(Microcontroller based) modules,housed in
MINIM BIN & Power Supply MB 403.



- 1) The Gamma Ray Spectrometer GR 611M accepts the input from a Scintillation Detector in the form of electrical pulses proportional in amplitude to the incident Gamma energy.
- 2) The High Voltage unit provides the necessary bias for the photo multiplier tube (PMT).
- 3) The PMT output amplified by Linear Amplifier is fed to the Single Channel Analyser for pulse height analysis.
- 4) The output events from SCA are counted for a preset time in Counter Timer unit (scalar).
- 5) SCA (Single Channel Analyse) is an important unit in GRS which scans the entire Gamma Spectrum.
- 6) All these applications initially systems is to be calibrated by operating SCA in window mode (WIN) & scanning for each of the standard isotopes such as Cs-137, Co-60, Ba-133 etc.

2) FRONT PANEL DIAGRAM



High Voltage Unit

Linear
Amplifier

Single
Channel
Analyzer
(SCA)

Counter Timer

Power
Mini
Bin

3) SPECIFICATIONS

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

1) High Voltage Unit Type: HV 502

- * Output voltage variable continuously from 0 to 2000 volts.
- * Output current (maximum) 1mA.
- * HV is adjustable by ten turn helipot with knob.

2) Linear Amplifier Type: LA 520

- * Input Polarity : Positive / Negative
- * Total Gain (Typical) : 250 (approx.)
- * Output (Unipolar/Bipolar) : 0-8V (usable recommended linear range)
- * Max. Output (Bipolar) : 10V (Saturation Level)

3) Single Channel Analyzer Type: SC 530

- * Input : Unipolar or Bipolar with a +ve leading edge 0 to 10V
- * Pulse Pair Resolution (approx.) : 1 micro sec
- * Output Pulse Polarity : Positive
Pulse Amplitude : +5V
Pulse Width : 1 micro sec



- * LLD (Lower Level Discriminator) output pulse amplitude : +5V

 - Output pulse width : 1 micro sec

 - LLD/Base line variable by : 10 turn helipot / Dial

- * Window width : Continuously variable by helical potentiometer / Dial

 - Window : 0-1V in WINDOW mode

 - ULD range: 0-10V in NORMAL mode

4) Counter Timer Type: CT 541A

- * Input : 100 mV to 10V, unipolar or positive bipolar semi Gaussian / Gaussian pulse

- * Polarity : Positive

- * Pulse width : 1 micro sec (min)

- * Polarity :Positive or Negative

- * Input Impedance : 10 K ohms

- * Input counts capacity : 999999 counts

- * Modes of Data Acquisition : Programmable through switch control buttons



ACCESSORIES

- 1) Scintillation detector with flat type NaI crystal. →
- 2) The output of these units (taken from preamplifier) is
POSITIVE for all Nucleonix make Scintillation detectors.
Hence the input polarity of the amplifier in GR611M (I) is to be
selected for POSITIVE.
- 3) Different isotopes Co-60, Ba-133, Na-22, Cs-137, SR-90, TL-204



1- Inch detector (8
lead assembling parts)



2 - Inch detector (9
lead assembly parts)



3 - Inch detector (10 lead
assembly parts)

GM Counter Keypad display

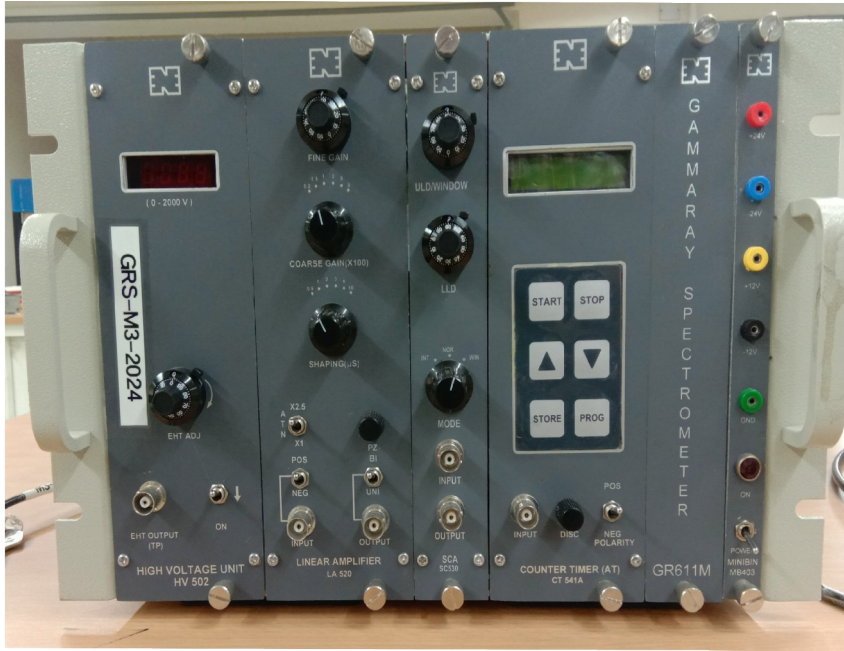


Mini Based GAMMA Ray Spectrometer keypad display

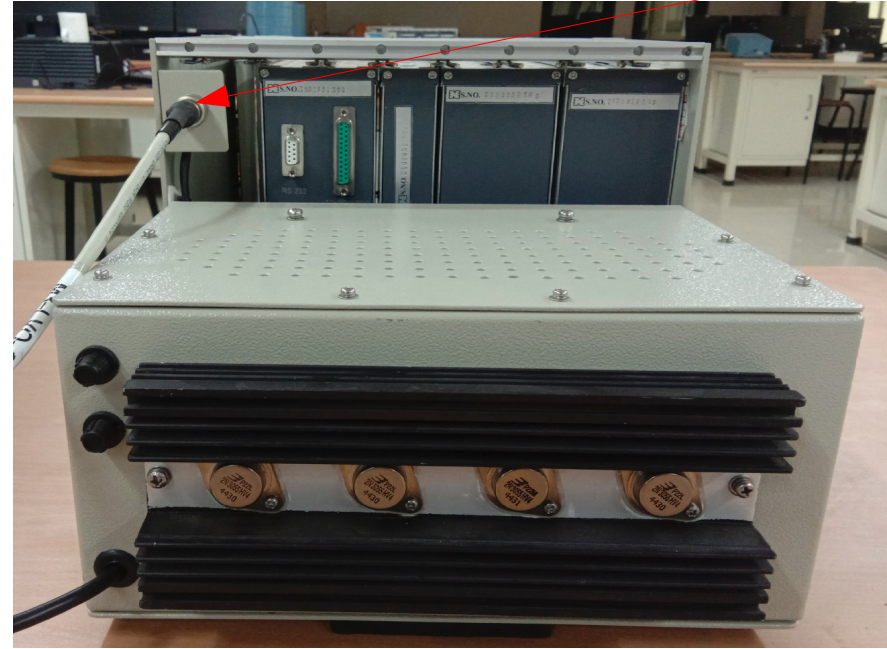


4) FRONT AND RARE PANEL CONTROLS

LV
Socket

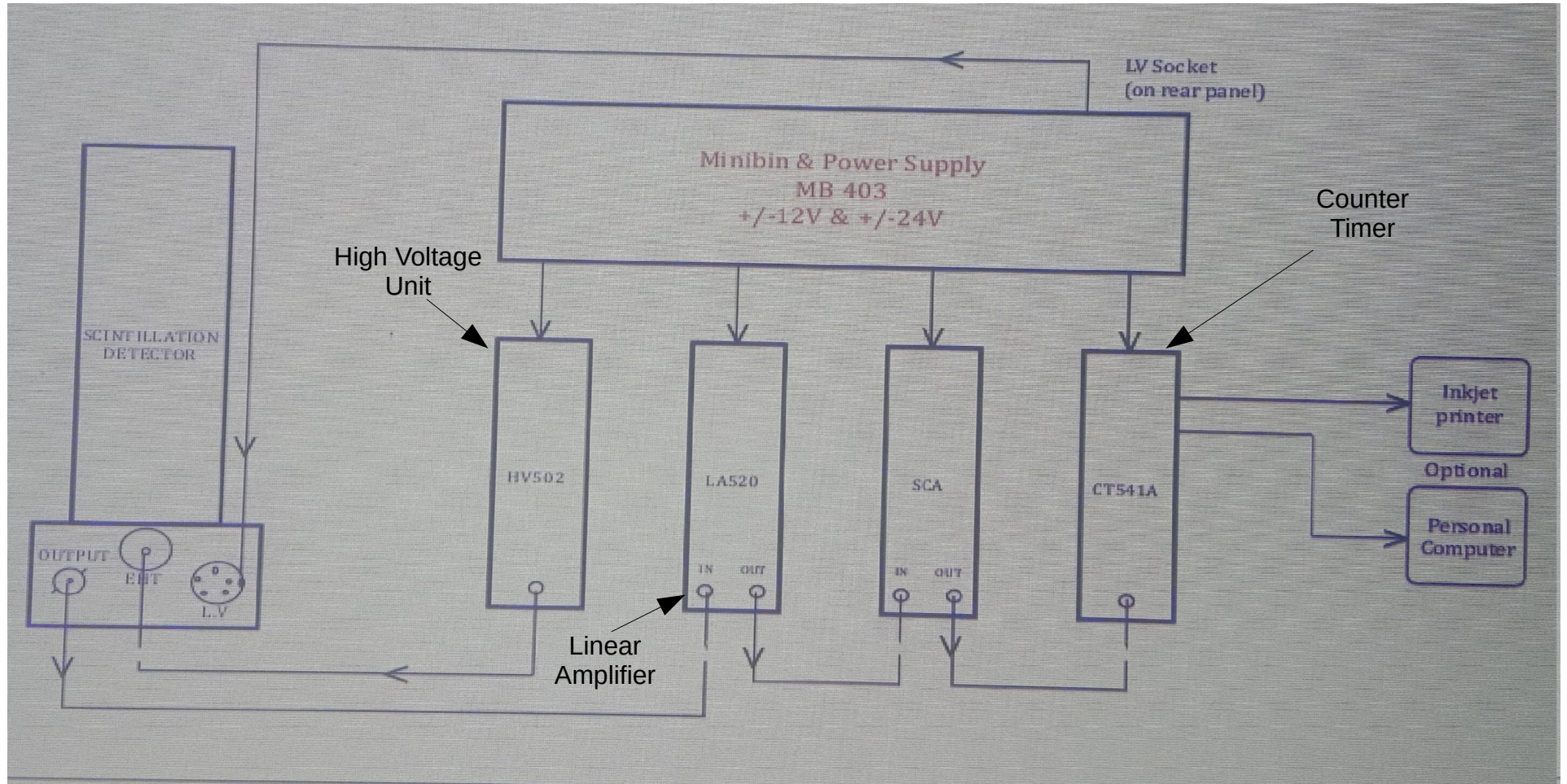


FRONT PANEL CONTROLS



RARE PANEL CONTROLS

5) BLOCK DIAGRAM



6) INTERCONNECTIONS AND OPERATING INSTRUCTIONS

S.No.	Type of Cable	Signal from	Signal to
1)	UHF to MHV EHT cable	EHT output MHV socket on HV	Scintillation detector UHF socket
2)	LV cable with two end 5 pin female circular I/O connectors .	Mini-hex / 9 pin of D or circular I/O from rear panel of Minibin	Scintillation detector Mini-hex socket/Circular I/O connector
3)	Signal Cable (BNC to BNC) 1 or 1.5 meter long	Scintillation Detector (O/P BNC)	I/P BNC recepticle on LA520
4)	Signal Cable (BNC to BNC) 0.3 or 0.5 meter long	OUTPUT BNC recepticle on LA520	I/P BNC on SC530
5)	Signal Cable (BNC to BNC) 0.3 or 0.5 meter long)	OUTPUT BNC recepticle on SC530	I/P BNC on CT541

INTERCONNECTIONS

OPERATING INSTRUCTIONS

1. Make sure all modules are inserted into the bin and module screws are tightened properly. All dials, rotary switches, toggle switches, BNC sockets are in good condition.
2. Before switching ON the system keep all the controls to default settings as mentioned below.
High Voltage Unit (HV502) toggle switch to **OFF position**
HV adjust knob at complete **anti-clockwise direction**
3. Linear Amplifier (LA 520) settings as per manual.
4. Single Channel Analyser (SC 530)
*MODE to 'WIN'
*LLD/Baseline dial to 'min' position
*ULD/Window dial to 1.0 (= 100mV)
5. Counter Timer (CT 542A) Polarity to 'POS'
6. Place the Scintillation detector inside the lead castle closely to the MINIM Gamma Ray Spectrometer unit.
7. Apply the highvoltage to the detector by rotating the HV knob /ten turn pot in the clock wise direction.
8. Place source (Cs-137) on top of the Scintillation detector, observe the Linear Amplifier output in a good oscilloscope(50 MHz/100 MHz) in 1V / DIV sensitivity.
9. Follow the procedure as mentioned in the Manual.

7) EXPERIMENTS WITH MINI BASED GAMMA RAY SPECTROMETER

- 1) Integral Rate at HV with fix threshold.
- 2) Study of energy resolution characteristics of a scintillation spectrometer as a function of applied high voltage and to determine the best operating voltage.
- 3) Study of CS-137 spectrum and calculation of FWHM (full width at half maximum) & resolution for a given scintillation detector.
- 4) Study of Co-60 spectrum and calculation of resolution of detector in terms of energy.
- 5) Energy calibration of Gamma Ray Spectrometer (Study of Linearity).

Thank You