ACCESSORIES :

Plastic scintillator detector assembly

Lead Shielding

SS sample tray

Contents

CHAPTER - I

INTRODUCTION

Low Background Beta counting system LB615 is primarily designed for the measurement of gross Beta activity / contamination in **water** and other **environmental samples**. It is highly recommended for **Radio analytical Labs** and **environmental survey labs** at Nuclear power stations for this application.

Counting of samples having very low specific beta activity becomes difficult with conventional G.M. Counters having high background and low efficiency. A thin plastic scintillation detector based beta counting system has twin advantage of low background and high efficiency when compared. This system uses thin plastic scintillation detector based main counter and another wide area plastic scintillator based guard counter. System works on the principle of anticoincidence. The detector assembly is provided with a 3" lead shield to reduce background.

Applications : This system is highly recommended for the estimation of gross Beta activity in Environmental samples, including air, water (river, lake, pond, ground & sea waters), soil, vegetation & biological sample. System can be used by testing labs, Environmental survey labs at Nuclear Plants, in normal or in a Nuclear disaster scenario.

FEATURES :

- Measures gross Beta activity / contamination in water and other environmental samples. Including Air, Water, Soil, Vegetation & Biological samples. Suggested products for Environmental Survey labs.
- Highly recommended for low beta counting of environmental samples at environmental survey labs / Nuclear power stations.
- Adequate Lead shielding has been provided to minimize background.
- Modular in construction.
- Stable high voltage continuously adjustable from 0V to 2000V.
- Uses coincidence technique. Gives out both COIN & ANTI-COIN output.
- Outputs on Dual Counter/Timer with two channels.

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CHAPTER - II

FRONT PANEL & REAR PANEL CONTROLS

2.1 CONTROLS ON POWER SUPPLY MB 403

All the controls of MINIM BIN are on the control strip MB 403.

POWER ON : DPST switch, to switch "ON" the mains supply to the instrument. Presence of mains supply is indicated by the pilot lamp glow.

VOLTAGE TEST POINTS : These are sockets for monitoring of the power supply output voltages +/-12V, +/-24V and GND marked against each sockets.

LV SOCKET : 9 pin D type connector / mini Hex. Connector contains all the low voltages of the power supply and is meant to power ancillary equipment such as a pre-amplifier of a Scintillation detector etc,.

Electrical connection details are given in a separate drawing at the end.

OUTPUT CONNECTORS : There are six, 42 pin NIM connectors Type : 202516-3 or 24 pin Amphenol type of rack and panel connectors mounted on the rear plate of the bin, wired in parallel and providing the power to work the modular units. Pinout details of the connections are given separately.

The 24 Pin output connector provides all the LV's with their sense points and also GND etc., the details of which are given at the back.

For fuses, voltage, current and over voltage protection adjustment, please see at the end in the enclosed drawings refer to detailed manual. LV output connector (on rear panel) either 9-pin D connector or a mini Hex connector or a circular I/O connector is provided. This is used for providing LV supplies to Scintillation detector.

2.2. OPERATIONAL CONTROLS OF HV 502

"ON" SWITCH : This is a toggle switch to switch ON the HV.

EHT OUTPUT : This is a MHV Socket or UHF socket from where one can draw the EHT output to the required load.

EHT ADJ. : EHT output can be set to desired value by a ten turn helipot with knob.

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EHT INDICATION : EHT indication by ten turn dial calibrated interms of EHT.

EHT POLARITY : User can select either POS or NEG polarity for EHT, by reversing the polarity PCB sitting on the main PCB inside the unit. For this one of the side cover is to be opened. By default usually POS polarity is set.

2.3. CONTROLS OF CT542A

2.3.1. POLARITY SWITCH

Positive & Negative : Selects the polarity of the input signal for counting.

2.3.2. INPUT

There are 2 individual (labelled 1 to 2) BNC connectors which receive the input pulses to be counted.

2.3.3. INTELLIGENT KEY PAD

(a) PROG key button : This key is an important one which facilitates the user to programme the operation of the instrument for different modes / conditions. More details are covered under section "Instructions on Intelligent keypad commands".

(b) START key button : This is used for starting of acquisition and printing, once all the programme parameters have been set.

(c) STOP key button : This key can be used to terminate acquisition and printing inbetween. In the normal course acquisition will stop automatically at the end of preset time and the data printing will stop once the end serial number setting for printing has reached.

(d) INC/DEC key button : These keys are used while setting the program parameters to increment and decrement a value or to change the option selected to another value available.

(e) STORE key button : This key is used for storing the readings or data values in the following way, in the manual mode of storing only.

At the end of acquisition for a preset time if user presses this button, data counts will be stored and the sl.no. in the display increments to the next value.

In CPS/CPM modes the current CPS/CPM is saved on pressing this button.

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2.3.4 LCD DOTMATRIX DISPLAY

This is a 16 X 2 alpha numeric LCD dotmatrix and responds to all the commands from the keypad and displays programme parameters, data counts, preset and elapsed times etc.

2.4 REAR PANEL CONTROLS AND INDICATIONS

2.4.1. TO PRINTER

This is a 25 pin D-female connector through which one can connect a printer (with centronics interface cable) for direct printing of data.

2.4.2 SERIAL PORT (RS232) :

This is a 9 pin D-female connector having RS232 compatiblesignals for serial data communication to a P.C. Under software control from a PC, the stored data readings from this unit can be downloaded into PC. (Software can be supplied at extra cost)

2.5 COINCIDENCE ANALYSER (CA570):

Guard HV	:	This is a UHF socket to which HV bias voltage is applied for the Guard scintillation detector PMT.
Guard counter	:	This is a UHF socket from this RG59 cable goes to Guard scintillation PMT.
Main HV	:	This is a UHF socket to which HV bias voltage is applied for the main scintillation detector PMT, through RG59 cable.
Main counter	:	This is a UHF socket from this RG59 cable goes to main scintillation PMT
Guard chk	:	This is a Guard scintillation PMT, TTL output provided on BNC socket. If required one can feed to Dual scalar & counter the events
Anti-Coin out	:	This output is connected to CH1 input of CT542A
COIN out	:	This is coincident counts output, due to both detectors giving output simultaneously. This can be fed to CH2 input of CT542A.

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2.5. INSTRUCTIONS ON INTELLIGENT KEYPAD COMMANDS

When we switch on the unit, the display will show up,

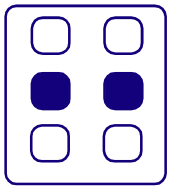
CT-542A	for 3 Sec.
NSPL HYD	for 3 Sec.

2.5.1. ACQUISTION MODE SELECTION

By default, display changes to,

ACQ. MODE PR.TIME

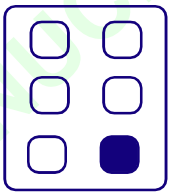
This signifies that by default "acquistion is in preset time mode". Because in majority of the situations counting is done for a preset time set.



If you want other modes of acquistion such as CPS (Counts per second) or CPM (Counts per minute) then press s or t keys to select required mode or else proceed as follows. If ACQ MODE required is PR. TIME then, skip the above selection and proceed as given below.

2.5.2. PRESET TIME SETTING

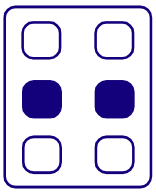
By pressing PROG key, display changes to,



Cursor position

PR ^ TIME XXXX

This displays the previous preset time for counting. We can change the preset time by the following way.



s Key can be used to change the value at the cursor position.

t Key can be used to shift the cursor position to the left.

By the above method set the required PRESET TIME for acquistion.

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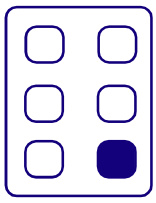
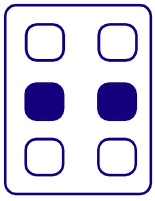
2.5.3. SAVING PROGRAMMED PARAMETERS

All the programmed parameters are to be saved by the user before he can start acquisition. Without saving, the system will use the previous parameters for acquisition.

By pressing PROG key, display changes to,





SAVE?
(PRG)

SAVE?
To save the above parameters press `s` or `t` keys

"OK" will be displayed on saving of parameters.

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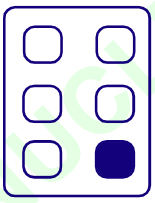
2.5.4. RECALL DATA READINGS

This is a very useful feature that has been provided in this unit. At the end of storing/ saving of a set of readings, this feature will enable the users to recall the readings on to the display, from the Sl.No. set in the "RECALL" mode. Changing of the Sl.No. is similar to that explained under "PRESET TIME" selection.

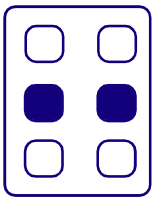
By pressing PROG key, display changes to,



REC 1 XXXXXX
IT-U1 2 XXXXXX

REC
This displays current Sl. No. from which data is recalled.

1 & 2 XXXXXX :
This shows up the counts in channel a & channel b.

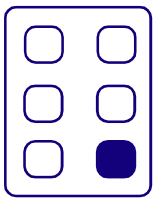


Recall serial number can be changed by `s` or `t` keys.

2.5.5. END SL.NO. "DATA READING" FOR PRINT OPTION

This option facilitates the users to set the end limit for printing of data readings. Starting point Sl.No. for the printing is set as explained under 4.2.3.

By pressing PROG key, display changes to,



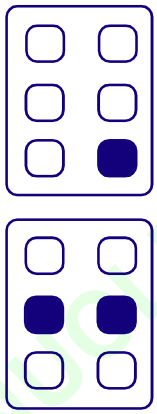
```
END      ^
PRNT  XXXX
```

XXXX : This is the last number to be printed, starting number can be selected from Sl.No. setting.

2.5.6. ITERATION PROGRAMMABILITY FOR A READING

Iteration programmability is another useful feature that has been provided. Sometimes user may like to iterate a reading 2 or 3 times. The system allows this and it displays averaged reading only, at the end of two or three iterations. Acquistion for iterations once initiated will go till all the iterations are completed. Users intervention is not required.

By pressing PROG key, display changes to,



```
ITERATIONS X
```

X: By default '1' is displayed. Number of iterations can be changed upto 9 iterations by using `s` or `t` keys

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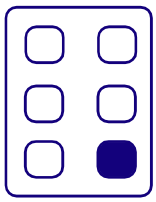
2.5.7. STORING OF DATA READINGS

This system has CMOS memory to store upto 1000 readings. Storing can be initiated in two ways.

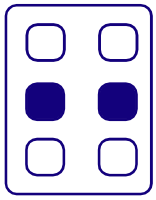
(a) MANUAL (b) AUTO

User can select any of these options. In manual mode at the end of acquisition of each reading the user has to press "STORE" command button once for each reading.
In AUTO mode, each of the data readings gets saved into memory along with lable. User intervention is not required.
While acquisition is going on, user may observe that at the end of each acquisition, the Sl.No. pointer will be incremented by one where the data counts will be stored.

By pressing PROG key, display changes to,



STORE (D)
AUTO



Default mode is AUTO, to change to manual mode press `s` or `t` key. AUTO mode is used to store data automatically after acquisition (PR. TIME).

Note : In case of CPS/CPM mode press STORE to store data at any time. AUTO storing is not valid in CPS/CPM mode.

2.5.8. DATA ACQUISITION BY PRESING START BUTTON

Once the user presses 'START" at the end of saving of programmed parameters, user will see a display as,

1: XXXXXX
ET XXX 2: XXXXXX

ET indicates elapsed time

The counts will get stored at the particular Sl.No. if STORE(DATA) mode is in AUTO condition. If the STORE(DATA) is in manual mode, the counts acquired can be stored by pressing STORE button. The count will not be stored if START button is pressed again. Hence this can be taken as fresh iteration.

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Menu	Options
ACQ mode	Pr. Time CPS CPM
Preset Time	-----
Save? (PRG)	OK / skip
Recall	-----
END NO. (PRINT)	-----
PRINT DATA	-----
ITERATION	1 / 2 ...../ 9
STORE DATA	AUTO MANUAL

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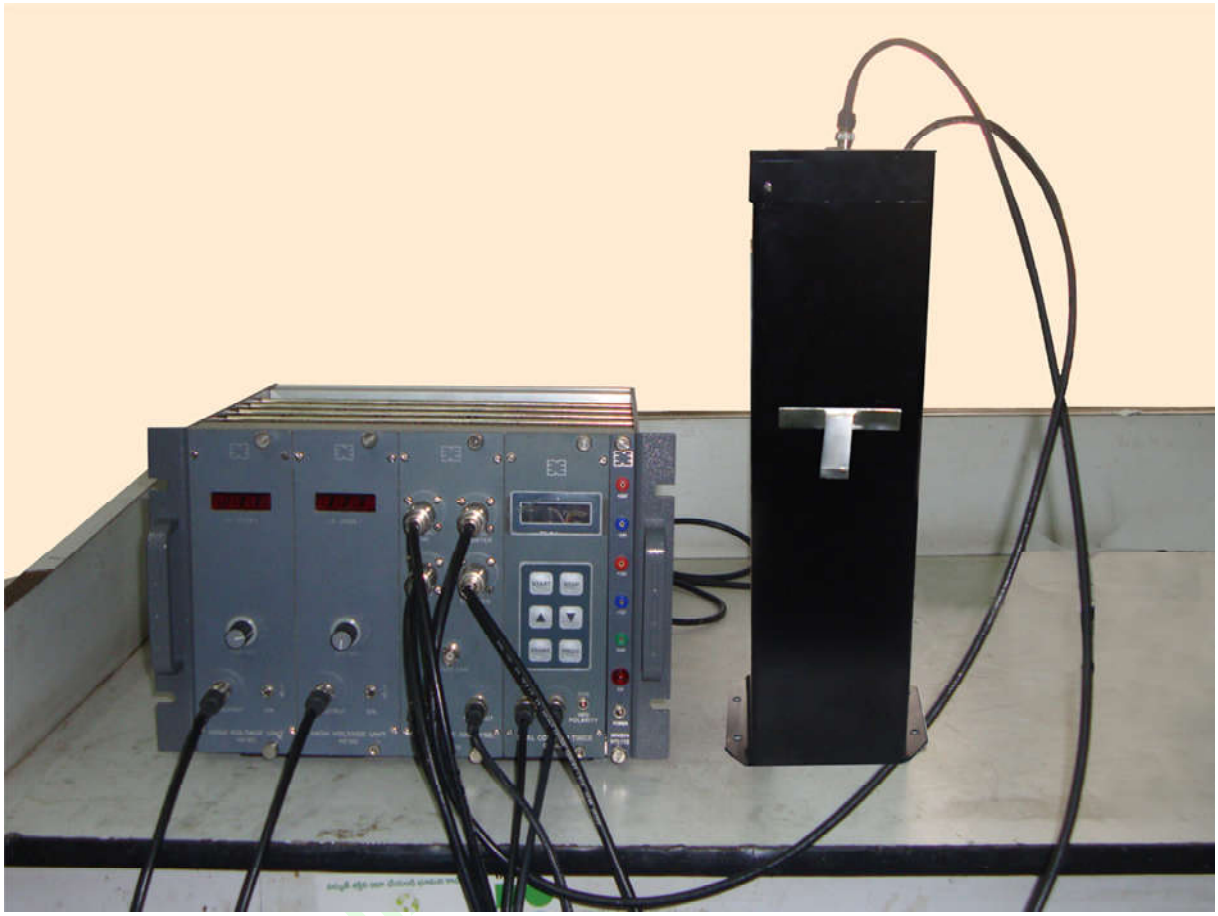
FRONT VIEW OF LOW BACKGROUND BETA COUNTING SYSTEM
TYPE : LB615



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CHAPTER - III

SPECIFICATIONS OF CONSTITUENT UNITS OF LB615

1. SPECIFICATIONS OF MIN BIN :

INTERCHANGELABILITY	:	Mechanical Tolerance are in accordance with TID 20893 (Rev)
PANEL DIMENSIONS	:	Standard rack 8 3/4 inches high and 11 3/4 inches wide (without flanges)
DEPTH	:	20 inches including heatsinks
MODULE CONNECTORS	:	8 NIM connectors per bin at the panel as specified by TID 20893 (Rev) or 24 pin of Amphenol connectors (for use in INDIA)
INSTALLED WIRING	:	All connectors of MINI BIN are wired in parallel for +12V,-12V,+24V and -24V, high quality GND and power return GND
CONSTRUCTION	:	Bin is constructed with two side aluminium flanges with casted handles, top and bottom S.S. Rod spot welded mesh supported with two aluminium bars at top and bottom, module guides with S.S.rods and connector plate at the back. All these parts are anodised/painted completely. The channels are milled, spot welded S.S.Rod guides provide precisely smooth and easy movement of modules into the bin.
MINIBIN ENCLOSURE DIMENSION:		13.6" wide X 8.8" height x 10.6" depth without accounting handles and heatsinks

1. SPECIFICATIONS OF POWER SUPPLY MB 403 :

INPUT		
Voltage	:	230V +/- 10% AC
Frequency	:	50Hz
Current	:	1.2A (Approx.) at 90W
DC OUTPUT	:	+12V DC at 1A ; -12V at 1A +24V DC at 0.5A ; -24V at 0.5A Total output load not to exceed 90W
REGULATION	:	for +/- 12V & +/- 24V +/- 0.50%

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STABILITY	:	for +/- 12V & +/- 24V, +/- 0.3% over any 24 hours period at constant ambient temperature. Over the combined range of no load to full load and specified mains variation after 60 min. warm-up.
TEMPERATURE Range	:	0 to 50° C ambient
TEMPERATURE COEFFICIENT	:	0.02% per o C over 0 to 50° C ambient.
NOISE AND RIPPLE	:	for +/- 12V & +/- 24V, 25mV rms
VOLTAGE ADJUSTMENTS	:	+/- 2% minimum range. Resetability +/- 0.5% of supply voltage
RECOVERY TIME	:	+/- 12V & +/- 24V outputs will recover within +/- 0.1% of steady state values with in 100 micro seconds following any change in specified line voltage or between 10 to 100% full load.
CIRCUIT PROTECTION	:	a. Input of the supply is protected by two fuses b. Output of the power supply is short circuit and overload protected by means of foldback electronic circuit. c. Recovery is automatic when overload or short circuit is removed. d. Continuous short circuit will not damage the power supply unit.

2. HIGH VOLTAGE UNIT TYPE : HV 502 (2 no's)

a. Output voltage variable continuosly from 0 to 2000 volts.

b. Output current (maximum) 1mA.

c. Load and Line Regulations : better than 0.05% of full scale

d. Indefinite overload and short circuit protections and self recovery.

e. Output ripple less than 50 mV.

f. Dimensions : Two bit Module.

g. HV is adjustable by ten turn helipot with knob.

h. HV indication is provided on a 3 1/2 LED DPM.

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3. DUAL COUNTER TIMER TYPE : CT542A

Count Input(s)		
IN1 & IN2	:	100mV to 10V, unipolar or positive bipolar semi-gaussian pulse
Pulse Width	:	1 micro sec (min)
Polarity	:	Positive or Negative
Input Impedance	:	1.0 K ohms
Input Counts Capacity	:	999999 counts
Input Frequency (max)	:	1 MHz
Pulse Height Discrimination	:	100mV - 10V by a trimpot provided (inside) on PCB
Counts Indication	:	16 x 2 dotmatrix LCD display
Modes of Data Acquisition	:	a. Counts for a preset time b. CPS c. CPM
TIMER: Preset Time Setting	:	Programmable through tuctile switch control buttons
Control Buttons	:	START, STOP, PROG, STORE, INC, DEC
Preset Time/Elapsed Time Indication	:	On 16 x 2 LCD Dot matrix display
Preset Time Range	:	1 to 9999
Printer Port	:	Built-in
Serial Port	:	RS 232C built-in
Additional Options:(at extra cost)	:	a. Data communication Software for down loading of data can be given at extra cost. b. Ext. hand held keypad with cable. c. Printer.

PRINTER (Optional) :

Inkjet printer of A4 size of any make can be connected to the GR611M with a printer cable on the rear panel of CT542A, for printing the data counts stored in the unit.

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CHAPTER - IV
BLOCK DIAGRAM & DESCRIPTION

This consists of minim based electronics unit which has the following modules

1. High Voltage Unit (S) (HV502)
2. Coincidence Analyser (CA570)
3. Dual Counter Timer (CT542A)

All these modules are housed in MB403 which provides ±12V & ± 24V to the modules +5V required for digital circuits is generated within each module separately.

Interconnection details between the modules & the detector system are indicated detector system consists of two plastic scintillator base PMTs namely Guard & Main Scintillation counter.

Detector module is totally coverted by a 75 mm lead shielding, to minimize back round. HV modules provide required bias to each of the detectors. Coincidence unit checks for COIN & ANTI-COIN condition & the TTL outputs from this unit are fed to Dual counter timer for recording the counts.

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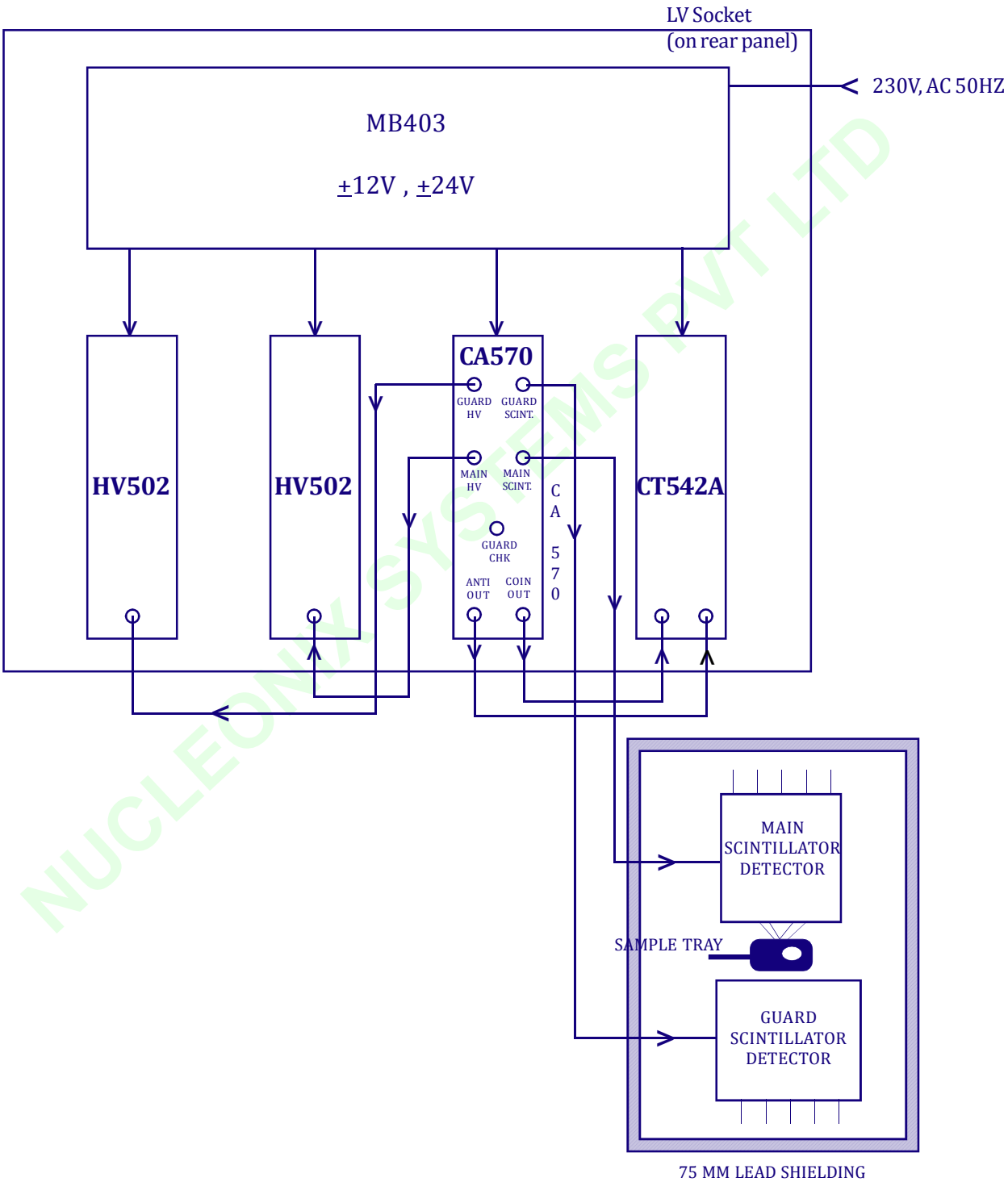
BLOCK DIAGRAM OF LOW BETA BACKGROUND COUNTING SYSTEM
TYPE : LB615



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CHAPTER - V

SYSTEM INTERCONNECTION DETAILS

5.1. SYSTEM INTERCONNECTIONS

Connection from	to	Remarks cable to be used
EHT output (MHV) socket on front panel of HV 502	'Guard HV' (UHF) socket on front panel of CA570	MHV to UHF cable
EHT output MHV socket on front panel of HV 502	'Main HV' (UHF) socket on front panel of CA570	MHV to UHF cable
'Guard scintillation detector' (UHF) socket front panel of CA570	MHV socket on guard scintillation detector	UHF to MHV cable
'Main scintillation detector' (UHF) socket front panel of CA570	MHV socket on Main scintillation detector	UHF to MHV cable
Anti-out BNC socket on front panel of CA570	IN1 (BNC socket) on front panel of CT542A	BNC to BNC cable
Coin-out BNC socket on front panel of CA570	IN2 (BNC socket) on front panel of CT542A	BNC to BNC cable

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CHAPTER - VI

SYSTEM DETAILS

6.1 SET UP DETAILS FOR COUNTER

For preparing the counter for actual operation, the counter is to be connected with proper as given in the inter connection details.

6.2 ELECTRONICS SYSTEM

This low background Beta counting system electronics consists of the following constituent units namely.

i. Minim bin & power supply (MB 103) ------ 1 No.
ii. High Voltage units (HV 502) ------ 2 No's
iii. Coincidence Analyser (CA 570) ------ 1 No.
iv. Dual Counter Timer (CT542A) ------ 1 No.
& associated inter connecting cables
v. Detector assembly (Main scintillation detector & Gaurd scintillation detector) with SS sample tray ---- 1 no.
vi. 75mm lead shielding, enclosing the detector assembly

The block diagram of the system indicate the interconnections between various constituent units & the detector assembly.

Required LV supplies to these modules are provided by Minim Bin & PS (MB403).

High Voltage modules (HV502) provide required HV bias (operating voltage) to the guard scintillation detector & also the main scintillation detector.

Coincidence analyser (CA570) receive HV bias supplied from the two (HV502) modules. Through load resistor circuits HV bias is applied to respective main & guard scintillation detector PMTs.

Once these counters are biased & the sample is loaded for counting after initial warm-up for 5 minutes stabilization, the detector pulses generated in the scintillation detectors are processed in CA570.
This module checks for the coincidence condition of main & guard outputs as defined precisely & generate the following outputs namely

i. Anti-coin output (main counter output)
ii. Coincidence output
iii. Guard counter output (Guard check)

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These outputs from CA570 are fed to a Dual Counter Timer (CT542A) to count Anti-Coin output (sample count) & coincidence output which is nothing but background obtained in coincident with guard counter.

A separate 'Guard check' output which is nothing but total background could be fed to CT542A to know the total background counts.

From the obtained data & by storing background counts standard & sample counts one can findout the 'sample activity' in bacqurels.

COUNTER PERFORMANCE CHARACTERISTICS

System Performance in Anticoincidence Mode

- Background (Anti-coin) : < 2 cpm.
- Efficiency for Sr-90 : > 40 % (approx)
- Outside lead sheild BG (Anti-coin) : 18 CPM (approx)
- Main counter BG : 28 CPM (approx)
- Guard counter BG : 400 CPM (approx)

EFFICIENCY AND BACKGROUND OF THE SYSTEM

When counters are connected in anticoincidence mode the system gives an efficiency of >50% for Sr-90 betas. As this system is dedicated to the measurement of low activity samples it is essential to maintain a standard of very low activity typically around 100 dpm (disintegrations per minute) As ^{40}K is a naturally occurring long lived radionuclide it is ideal for making standards of very low activity. These efficiency values obtained in this counting system are much higher compared with the efficiencies of the conventional end window G.M. Counter.
When counters are connected in anticoincidence mode the background of main counter is < 2cpm inside the shield. The background values for the counters separately and in anticoincidence mode have to be monitored regularly to ascertain the satisfactory operation of the system.

One can also use Sr-90 (Beta) as a standard source. Efficency of the order of >50% is given by this system.

COINCIDENCE REQUIREMENT

Set '**Guard counter'** output pulse width to 100 µsec

Set '**Main counter**' output pulse width to 100 µsec
Coin/Anti coin condition/requirement

If main counter output has occurred first and guard counter output has not occurred within 100 µsec, then treat main counter output as **'Anti-Coin' output** & the count shall be treated as **sample count**. If guard counter output occurs within 100µsec from the start of main counter output then treat it as **coin-output**.

If 'Guard counter output' has occurred first & within 100µsec. There is no main counter output, then treat it as B.G. & if main counter output also occurs within 100 µsec, then treat it as coin-output & B.G.

If only main counter output occurs & no guard counter output, then treat it as anti – coin output

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CHAPTER - VII

AVAILING OF MAINTENANCE/ CALIBRATION SERVICES AND WARRANTY CLAUSE (with in India)

7.1 GENERAL

As per the warranty clause of the company, we provide one year warranty during which period we provide free service at our works. Hence in case of any mal-function in our instruments, you are requested to send the unit back to our works by RPP/COURIER/SPEED POST PARCEL/GATI/XPS/door delivery. We shall arrange immediate rectification/replacement within two weeks from the date of receipt of the equipment at our place. Please note that the equipment will be serviced at our works only.

The equipment is to be sent to:

The Servicing Department
NUCLEONIX SYSTEMS PRIVATE LIMITED
Plot No: 162 A & B, PHASE II, I.D.A. Cherlapally,
Hyderabad - 500 051Ph: 040-27263701/329145448/32918055
E-mail: info@nucleonix.com www.nucleonix.com

For all the Radiation monitoring equipment, detectors built-in or external probes will not have one-year warranty, but only inspection warranty at the time of supply is provided. Since detectors will / may have fragile glass construction, we do not provide warranty. In case of failure of these components, Nucleonix will supply detector replacement at cost-cost price.

Note: In respect of all types of portable radiation monitors, it may be necessary to checkup and recalibrate the equipment once a year at our works.

7.2 EQUIPMENT REPAIRS / SERVICING POLICY (WITH IN INDIA)

(a) During Warrantee

The following procedure is to be followed by the customers with in India for availing services/ repairing facility during warrantee period.

- Equipments are to be sent to our works for availing free repair services during warrantee, after the customer receives approval from the customer support division, by sending an e-mail.
- For all equipments, costing less than 6.0 lakhs one year warrantee & free service is offered, when the equipments are sent to our works only. For larger systems such as installed systems, networked systems, specialized systems, costing more than 6.0 lakhs during one year warrantee, free service is offered at site. Field service Engineer will be deputed subject to warrantee terms & conditions.
- This does not include personal computer related problems, for which local computer service provider of the PC vendor is to be contacted. Also for software related problems online support will be provided. Software support doesn't include cleaning of virus problems etc.
- When the equipments are sent to our works for warrantee services, they are to be properly packed with adequate cushion to prevent any transportation damages. Nucleonix Systems is not responsible for damages or loss during transportation.
- Packing / Freight charge is to be borne by customer when he sends the equipment to our works. However when we return after servicing packing will be Nucleonix responsibility & Freight charges will be to your account. Only services are free.
- Please indicate in your correspondence equipment model & serial number.
- All the equipments are to be sent to our works only on door delivery basis.
- For Door Delivery Transportation contact XPS/GATI cargo in your city / town or a reliable courier service to pick the consignment from your place. For their nearest local address & phone no's look into their websites. Transit insurance if the customer feels is necessary it is to be covered.
- Nucleonix Systems will not receive the equipments sent by other modes of transportation, such as Rail/ Road.
- After servicing, equipments will be sent back by same mode of transport such as XPS/GATI/COURIER/ RPP.

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- All types of Radiation detectors, glass ware, PMTs etc which are fragile are not covered in warrantee, if the failure is due to physical damage, external or internal due to shock, dropping, miss-handling etc. If the failure is due to a natural fault then only it is covered under warrantee for a limited period of three months. However complete electronics is covered for 1 year warrantee.
- You can also send the equipment personally to our works for repairs either during or after warrantee, after fixing up with our service dept (Customer Support Division). If possible we may repair on same day or your person can stay for a day or two & get it repaired & or calibrated.

(b) After warrantee Services

- On expiry of 1yr warrantee if you like to send the equipment (low cost less than 6.0 lakhs) for repairs to our works, you may please observe the following procedure.
- Send an e-mail with details mentioning that you agree to pay service charges which includes: Basic service charges per unit / module in the range of Rs: 2500 to Rs : 10,000 depending on the sophistication of the unit calibration charges (if applicable for your equipment) + cost of components + packing charges + Return Freight charges @ actual.
- Once our customer support department responds & requests you to despatch the equipment to our works for repairs, you may do so by following the steps given below.
- Followed by this you can send the equipment straight away if it is within 5 yrs old. If the equipment is beyond 5 yrs old, then also you can send it for repairs, however only after you receive confirmation from Customer Support Division, that it is repairable & is not an obsolete model. If the design is obsolete then customer support division (CSD) may give you 'buy back' offer to replace with new model or upgrade it with electronic circuit boards & enclosure.
- For all installed equipments costing above Rs: 6.0 lakhs which are larger in size & for which field servicing only is recommended, you can obtain a quotation with relevant details by sending an e-mail & avail the services accordingly.
- For all field servicing jobs, since we need to depute engineers, it is likely, to take time & also it will cost more which includes Engineer's TA & DA etc., apart from basic service charges + cost of spares etc. Please note that basic service charges will be different for different products depending upon sophistication.
- Also in some cases it may not be possible to fix-up the problems in the field itself, in such cases we may advise you to send them to our works.
- For all jobs to be serviced in the field, customer is requested to provide adequate details on the nature of problems, to enable our engineer to come prepared with adequate spares.
- For any additional information send an e-mail to info@nucleonix.com, Atten: Customer support division.

7.3 EQUIPMENT REPAIRS / SERVICING POLICY (FOR EXPORTS)

Equipments, manufactured & exported are subjected to a well defined quality assurance (QA) plan & Factory acceptance tests (FAT). Nucleonix systems has the following policy to provide maintenance support to overseas customers either directly or through international dealers / distributors.

(a) During & after warranty:

- For minor problems, which can be handled by customers, servicing tips have been provided in the user manual / servicing manual.
- Also most of the equipments have built-in fault diagnostic features which will indicate to the user nature of problem in the equipment. Based on the visual indication in the instrument Display, user can take corrective action or contact Nucleonix systems by email for help.
- Nucleonix systems will guide in localizing the defective part / module or sub-system by interacting with the customer if required. Skype will be used for communication.
- During warranty free replacement of sub-system or board (PCB) will be done. However customer has to send defective sub-system back to Nucleonix system with-in 15 days on arranging replacement.
- During & after warranty, any Freight charges & customs clearance charges are to be borne by customers, both ways.
- If it is a manufacturing defect, then Nucleonix system will bear the replacement cost of sub-system / unit. However any Freight charges & customs clearance charges in their country are to be borne by customer.
- After warranty, services will be similar to that of services during warranty. However, customer will have to pay for cost of parts replaced, freight charges both ways & customs clearance charges in both the countries. Nucleonix systems plans to introduce audio visuals on web or on CDs to facilitate product demonstration, installation & minor maintenance very soon.

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7.4 HOW TO AVAIL CALIBRATION SERVICES (FOR INDIAN CUSTOMERS)

Nucleonix Systems offers radiation calibration services to its customers. Calibration services are provided for Nucleonix Systems manufactured products only, in general, as a company policy.

How to avail calibration services:
It is best advised that each of the Radiation monitors including Area monitors are calibrated once in a year. When you want to send your Radiation monitor / Area monitor / Contamination monitor for calibration to our works. You may send the equipment for calibration, by following the steps given below:

1. Our standard calibration charges per equipment (All types of Radiation monitors including portable survey meters, contamination monitors & Area Gamma Monitors) are Rs: 2500 + Packing + Freight charges. You can email a 'work order' accepting these charges.
2. Email your work order and despatch / send the equipment to our works if it is 5 years old or less including details of mode of transport sent with docket particulars.
3. Also mention in your work order & clearly indicate that you will agree to pay calibration charges & also equipment repair charges additionally if the unit is faulty & requires repairs before one can take it up for calibration.
4. You are requested to ensure good packing to avoid any transportation damages. Especially if there are external detector probes, they are to be packed with sufficient soft foam to ensure no damage in transportation.
5. Use only the specified following mode of transportation system for dispatching on door delivery basis. XPS/GATI cargo / Courier/RPP/Speed Post parcel etc. Send the equipment on freight paid basis. (Equipments sent by other methods such as Rail/Road etc will not be collected). Also you can cover for transit insurance both ways if you wish. Nucleonix system is not responsible for any transportation damages or loss during transportation both ways.
6. Immediately on receipt of the equipment, we will send an acknowledgement & also a proforma bill by email/ post.
7. Based on the proforma bill, once we receive the payment, equipment will be dispatched back by similar mode of transportation as mentioned above.

7.5 HOW TO AVAIL CALIBRATION SERVICES (FOR FOREIGN CUSTOMERS)

Foreign customers can calibrate Nucleonix make Radiation monitors/equipments in their country at any of their accredited Radiation calibration labs. Nucleonix systems will be happy to provide any help and guidance if needed, for calibration. Alternatively if you send the equipment here to India we can also provide calibration services.

Calibration Standards Lab & Facility:
We have two calibration labs.

i. Low Level Calibration Lab.
ii. High Dose Rate Calibration lab.

Low Level Calibration Lab: This has a Cs-137, 165 mci standard. "Gamma Survey Instruments Calibrator" from Amersham.
This calibration service has NIST Traceability standard. Calibration of all portable radiation monitors, survey meters, contamination monitors, Area monitors etc., is carried out in this lab upto 1 R/hr max dose rates.

Gamma Survey instruments calibrator has Cs-137 source 161.5 mCi as on 05 Aug 2002. It is basically a gamma survey instruments calibrator procured from AEA Technologies UK/USA. Has NIST traceability accuracy within +/- 7%

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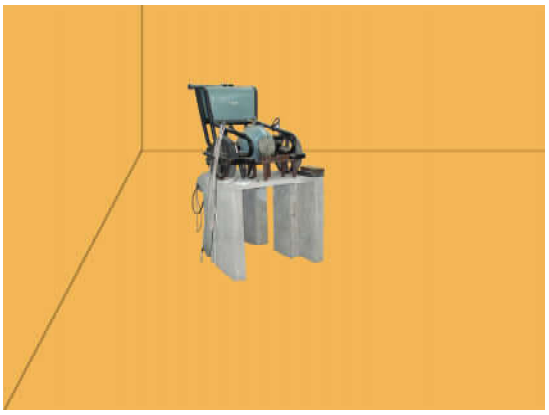

CRC-2 camera has Co-60 standard obtained from Bhabha Atomic Research Centre, Mumbai. It is a certified source.

7.5 ANNUAL MAINTENANCE CONTRACT (AMC)

Annual maintenance contract (AMC) services:

For all sophisticated instruments & systems and also for installed monitors & networked systems in a nuclear facility or a Radiological lab or in a Medical cyclotron facility where no. of instruments are networked, it is advised that customer enters into an economical Annual maintenance contract with Nucleonix system.

Detailed AMC proposal can be obtained from our customer support division (CSD), by giving required inputs.

Inputs required by our CSD to send you AMC proposal:

- Name, year & data of purchase, Sl. Nos. of equipments, Model No's, No. of equipments for which AMC is required. Additionally no. of calls per annum required for preventive & breakdown maintenance may also be indicated.

Advantage of entering into AMC:

- Equipment services offered will be prompt & timely
- Nucleonix systems maintain required spares, spare tested PCBs, detectors & other critical components which may become obsolete.
- Obsolescence in electrons is quite rapid. If you enter into AMC guaranteed service for the period of AMC will be the responsibility of Nucleonix Systems.
- Nucleonix Systems will maintain Engineers at your disposal to attend to AMC calls on time
- Without AMC prompt service calls are not guaranteed.
- If some critical components become obsolete, then Nucleonix systems may request you to upgrade the product with new model or new electronics which may be expensive if you are not under AMC.

Training on maintenance / servicing:

- To a limited extent, we offer training on maintenance / repairs at our works to customers on chargeable basis. Details can be obtained from our customer support division, by customers who may require such services.

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