

**INSTRUCTION**

**MANUAL**

**HIGH VOLTAGE UNIT**



**TYPE : HV502**

**NUCLEONIX SYSTEMS PRIVATE LIMITED**

Plot No : 162 A & B, PHASE II, I.D.A.Cherlapally, Hyderabad - 500 051

Ph: 91-040-27263701/30918055, FAX : 27262146

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## IMPORTANT NOTES

### 1. POLARITY REVERSAL

Polarity indication is given on LED display of DPM. Either "-" for NEGATIVE polarity or no glow sign for POSITIVE polarity is visible. For POLARITY REVERSAL the following procedure may be followed :

- a. If the unit is in operation with a particular POLARITY, reduce the EHT to minimum and switch off the "EHT ON" switch.
- b. Open the right 'side cover'. (Open the screw on right side to open side cover and slide it out). or In respect of units without screw arrangement, simply slide the side cover outwards.
- c. Notice a small **POLARITY** (connector) (refer to Fig. no ----- on the next page) which is to be pulled out and plugged-in, again in the reverse way.
- d. Close the side cover and now the unit is ready for operation with POLARITY being reversed.

**OTHER NOTE :** (optimal feature provided only when ordered)

2. Before checking this unit, ensure that "PROGRAM-IN/OUT" switch which is on the rear panel of the module is in 'INT' position when internal reference is used and 'EXT' when programmed input is given through the BNC socket provided on the rear panel (Optional feature).
3. PROGRAM INPUT (Optional) should not exceed 5V.

## **UNPACKING**

The High Voltage Unit, Type : HV502 has been thoroughly tested and is despatched in ready to operate condition. However, on unpacking and prior to operation, it is advisable to check visually and make sure that there is no visible damage caused in transit.

If any damage to the instrument be observed, do not switch ON the unit and report the matter immediately to :

Customer Support Division  
Nucleonix Systems Private Limited  
Plot No : 162 A & B, PHASE II,  
I.D.A.Cherlapally,  
Hyderabad - 500 051.  
PHONE : 91-040-27263701/32918055,  
FAX : 91-040-27262146, e-mail : [info@nucleonix.com](mailto:info@nucleonix.com)

In all correspondance regarding the instrument, please mention the serial numbers of the unit, along with month and year of purchase of the unit, if possible.

# CHAPTER - I

## INTRODUCTION

NUCLEONIX offers a standard High Voltage Unit Type : HV502 which is a compact STANDARD/ NIM Module (2bit). This is designed to meet the full HV bias requirement for a broad range of Nuclear radiation detectors like G.M.detectors, ionization chambers, scintillation detectors (Alpha, Beta &Gamma), photo multiplier tubes, etc,. Apart from this range of applications it also can be used as a high voltage source in areas where high degree of regulation, stability and accuracy are required. Output can be varied by a precise ten turn helipot and output indication is provided on a DPM.

**FRONT VIEW**



**REAR VIEW  
(with amphenol connector)**



**REAR VIEW  
(with NIM connector)**



## CHAPTER - II

### SPECIFICATIONS

<b>Output Voltage</b>	:	0V to 2000V continuously variable by a ten turn helipot provided on front panel. (All specifications are valid from 10V to 2000V).
<b>Output Indication</b>	:	Provided on a 3 1/2 digit LED, DPM.
<b>Output Connector</b>	:	MHV Socket (by default)
<b>Output Current</b>	:	It can deliver upto a maximum of 1mA.
<b>Output Polarity</b>	:	The unit is offered with a choice of both POSITIVE or NEGATIVE POLARITY selectable by reversing a polarity connector. (Provided inside).
<b>Line &amp; Load Regulation</b>	:	Better than $\pm 0.025\%$ of full scale.
<b>Ripple</b>	:	Less than 25 mV peak to peak.
<b>Protections</b>	:	Indefinite protection against overload and short circuit . Under overload the unit doesn't meet the specifications whereas on removal of short circuit it will recover by itself.
<b>Power Requirement</b>	:	Draws power from a standard BIN / NIM Power Supply or MINIBIN power supply. +24V at 250mA +12V at 50mA -12V at 50mA
<b>Linearity</b>	:	Better than +/- 0.2%
<b>Temperature Stability</b>	:	Better than 100 PPM.(Better temperature stability can be offered at extra cost).
<b>Mechanical Dimentions</b>	:	Standard 2 bit.
<b>Rear Module Connector</b>	:	Amphenol connector Type:26-159-24P-H (24 pin type) or NIM standard connector as per AEC specifications TID 20893 (Rev) Type : AMP 2041865 optional. specifications TID 20893 (Rev) Type : AMP 2041865 optional.

## **CHAPTER - III**

### **INSTALLATION**

The High Voltage Unit Type : HV 502 is a standard HV unit of two bit wide offered in modular form. It is highly stable, well regulated with low ripple & noise and serves as a detector bias unit for various nuclear detectors.

#### **A. INSERTING THE MODULE INTO THE BIN**

The Bin is fitted with guide bars (SS rods) at the top and bottom to help guide and position the modules. To insert a module into the Bin, the projected edges at the top and bottom right hand side of the module should be positioned into the SS guide bar channel grooves and pushed right-in until the 24 pin / 42 pin power connectors of the bin and module are fully engaged. The captive screws on the module should then be tightened.

#### **B. POWER TO WORK THE MODULE**

The input power to work the module is fed through the rear panel connector of the module. This connector mates with one of the output connector sockets of instrumentation bin, when the module is slid into the bin.

## CHAPTER - IV

### OPERATING INSTRUCTIONS

#### A. OPERATIONAL CONTROLS

1. **"ON" SWITCH** : This is a toggle switch which facilitates one, either to choose the EHT or disable the EHT when not required.
2. **EHT OUTPUT** : This is MHV (by default) or amphenol UHF socket Type : 83-798-H or SHV connector (optional) through which one can draw the EHT output, to the required load.
3. **Ten turn Helipot & Dial / Knob** : The EHT output can be adjusted by this miniature ten turn helipot / dial or knob from 0V/10V to 2000 volts. One full turn of the POT corresponds to 200 volts and ten turns make it 2000V.

#### B. REAR PANEL OPERATIONAL CONTROLS : (OPTIONAL)

Provide only when ordered extra

1. **REMOTE SHUTDOWN (optional)** : This feature is provided only when ordered extra. In remote shutdown, there is facility to shutdown the EHT to zero by grounding the center pin of BNC socket in the rear panel.
2. **EXTERNAL INPUT (BNC) & Toggle switch** : A toggle switch is provided from which user can select either **internal reference** or **external** input ref. If user selects internal reference the system will work in NORMAL mode. If user selects external control then EHT o/p of the system will increase from 0 to maximum while varying the input of EXT INPUT ( Rear panel BNC socket ) from 0 to 5V.

#### C. HOW TO OPERATE THE UNIT

1. Insert the HV502 module into the bin as explained under "INSTALLATION".
2. Switch 'ON' the bin and HV502 module to generate EHT and set the knob or ten turn helipot to obtain the required EHT. HV value can be seen visually on DPM display.
3. One can measure HV at the MHV socket, if needed by using a proper hV probe & multimeter combination. Ordinary multimeters alone if used HV probe may load High Voltage & show less value.



# CHAPTER - V

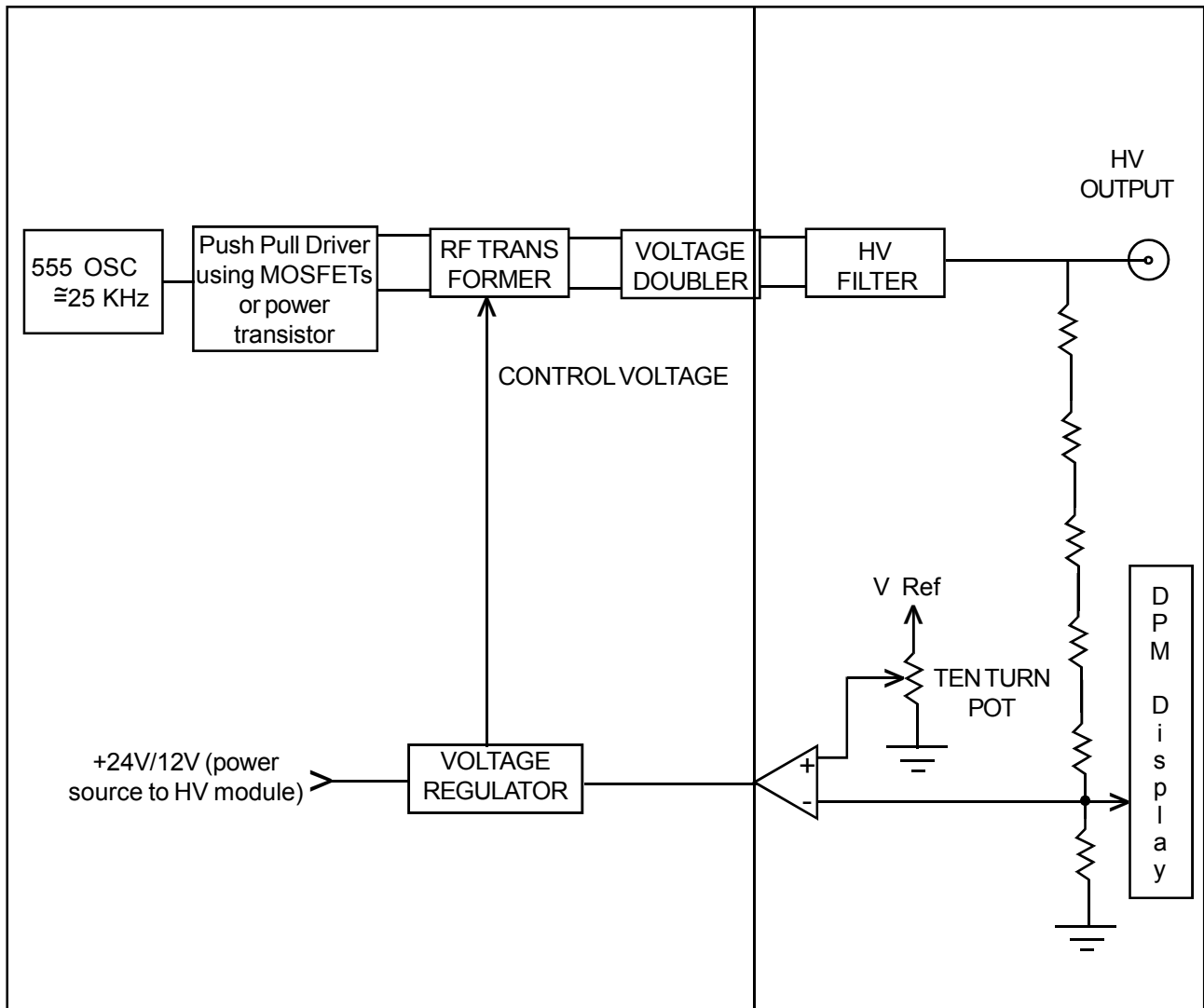
## BLOCK DIAGRAM DESCRIPTION

This High Voltage Circuit employed in this design essentially consists of an external driver oscillator ( 555 chip ). This generates square wave oscillations in the range of 25 to 35KHz. +12V supply from the bin is provided to this oscillator. This output is phase split and fed to the differential driver consisting of two power MOSFETs or transistors. Which are connected to the primary of the R.F. transformer. The center tap of this R.F. is fed with the control voltage, which in turn controls the primary swing or amplitude of the oscillations.

The stepped up R.F output is fed to a voltage doubler and HV filter. Output from this HV filter goes as HV output voltage.

A fraction of this output through a bleeder is taken and compared at the op-amp input with a standard reference voltage, applied through a ten turn pot. The output of this op-amp in turn generates corrective control voltage through a regulator chip for EHT regulation.

## BLOCK DIAGRAM of HIGH VOLTAGE (HV502)



## CHAPTER - VI

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

#### 6.1 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 - 500 051 Ph: 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.

#### 6.2 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.

- 1 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.
- 1 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.
- 1 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.
- 1 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.
- 1 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.
- 1 Please indicate in your correspondence equipment model & serial number.
- 1 All the equipments are to be sent to our works only on door delivery basis.
- 1 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.
- 1 Nucleonix Systems will not receive the equipments sent by other modes of transportation, such as Rail/Road.
- 1 After servicing, equipments will be sent back by same mode of transport such as XPS/GATI/COURIER/RPP.

- 1 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.
- 1 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**

- 1 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.
- 1 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.
- 1 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.
- 1 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.
- 1 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.
- 1 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.
- 1 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.
- 1 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.
- 1 For any additional information send an e-mail to [info@nucleonix.com](mailto:info@nucleonix.com), Atten: Customer support division.

#### **6.3 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:**

- 1 For minor problems, which can be handled by customers, servicing tips have been provided in the user manual / servicing manual.
- 1 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.
- 1 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.
- 1 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.
- 1 During & after warranty, any Freight charges & customs clearance charges are to be borne by customers, both ways.
- 1 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.
- 1 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.

#### 6.4 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.

#### 6.5 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.

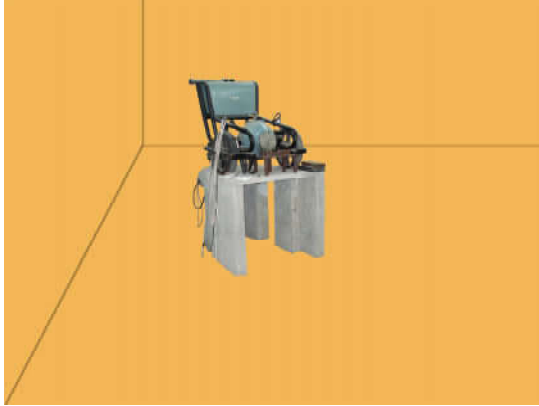
**Low Level Calibration Lab:** This has a Cs-137, 165 mCi standard. "Gamma Survey Instruments Calibrator" from Amersham.

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%

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%



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

## 6.5 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:**

- 1 Name, year & date 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:**

- 1 Equipment services offered will be prompt & timely
- 1 Nucleonix systems maintain required spares, spare tested PCBs, detectors & other critical components which may become obsolete.
- 1 Obsolescence in electronics is quite rapid. If you enter into AMC guaranteed service for the period of AMC will be the responsibility of Nucleonix Systems.
- 1 Nucleonix Systems will maintain Engineers at your disposal to attend to AMC calls on time
- 1 Without AMC prompt service calls are not guaranteed.
- 1 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:**

- 1 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.