

**INSTRUCTION
MANUAL**

PRE - AMPLIFIER



TYPE : PA311

NUCLEONIX SYSTEMS PRIVATE LIMITED

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NUCLEONIX SYSTEMS PVT. LTD

UNPACKING

The Pre - Amplifier Type :PA 311 base has been thoroughly tested and is despatched in ready to use condition with any compatible scintillation detector of St. Gobain / Bicron make. 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 is 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.

Ph: 91-040-27263701/27261882, FAX : 27262146, e-mail : info@nucleonix.com

In all correspondance regarding the instrument, please mention the type, serial number of the unit, date of supply etc., of the unit.

CHAPTER - I

INTRODUCTION

Pre-amplifier PA311 manufactured by NUCLEONIX essentially has a standard 14 contact socket, 10-stage voltage divider, pre-amplifier electronics. The Preamplifier is designed to suit a wide range of Standard detectors (Scintillation), integral assemblies of St. Gobain/ Bicron mage. NUCLEONIX offers integral assemblies with the above Preamplifier. This Preamplifier is directly compatible with all 2, 3 and 5 inch diameter PM tubes used in standard detectors.

FEATURES :

- Compact Solid state circuit design
- Suitable for wide range of NaI integral assemblies
- Choice of both focus and gain adjustments by presets
- Rise time 100 nano sec.
- Pre-amplifier base is designed for integration with vertical housing for mounting of integral assembly

CHAPTER - II

SPECIFICATIONS

| | |
|--------------------------|--|
| Socket | : Standard 14 contact pin |
| Voltage Divider | : 10 stage, directly compatible with all 2, 3 and 5 inch diameter PM tubes used in standard Bicron / St. Gobain detectors. |
| Connectors | : (a) Signal Output : Positive polarity, BNC receptacle, mates with BNC plug or equivalent. (b) EHT Connector : Standard MHV/UHF socket, which can mate with a MHV/UHF plug. (c) DC Pre-amp Power : 5 pin circular I/O connector (socket). |
| Noise | : Less than 50 micro volts rms referred to input. |
| Input | : Direct connection from photomultiplier tube anode to charge integrating pre-amplifier input circuit, negative charge. |
| Conversion Gain | : 5×10^{-11} Coulombs per volt with NaI (TI) or faster scintillators. |
| Rise Time | : 100 Nano Seconds |
| Decay Time | : 4 micro seconds (internally adjustable) |
| Output impedance | : 90 ohms (approx) |
| Gain stability | : 0.25% C from 0° to 50° centigrade. |
| Linearity | : 0.25% |
| Power requirement | : a. Pre-amp –12V at 10mA b. PM Tube voltage Divider Bias : Typically +600V to +850V (positive only) at 150 microamps. |

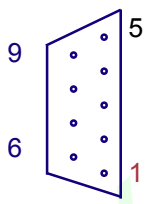
CHAPTER-III

CONNECTOR DETAILS

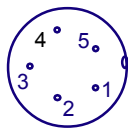
CONTROLS / CONNECTORS

- EHT (MHV) : High Voltage connector at which the EHT supply is applied to bias PMT of scintillation detector.
- Output (BNC) : BNC Co-axial connector at which output pulse from the Pre - Amplifier, appears.
- LV (Socket) : Five pin I/O connector at which, LV supply voltage is applied to power up pre-amplifier circuit.

CONNECTION DETAILS OF LV SOCKET 9 PIN D TYPE ON NIM STANDARD BIN (REAR SIDE)

| | Pin No. | Description |
|--|---------|-------------|
|  <p>9 Pin D Connector Seen from Rear Panel (Socket view)</p> | 2 | GND |
| | 4 | +12V |
| | 6 | -24V |
| | 7 | +24V |
| | 9 | -12V |
| | 1,3,5,8 | NC |

5 - pin circular I/O connector (on scintillation detector)

| | Pin No. | Description |
|---|---------|-------------|
|  | 1 | -12V |
| | 2 | -24V |
| | 3 | +12V |
| | 4 | +24V |
| | 5 | GND |

CHAPTER - IV

OPERATING PROCEDURE

Pre-amplifier PA311 is Charge integrating type of pre-amplifier designed primarily, for connecting to NaI scintillation detectors. It can take 2" & 3" scintillation detectors of St. Gobain / Bicron make integral assemblies. The following three connecting cables will be required to power up this PA311 (i) LV cable (ii) HV cable & (iii) Signal cable

- First plug-in either 2"x2" or 3"x3" flat or well type NaI scintillation detector of St. Gobain / Bicron integral assembly.
- Using 5-pin to 5-pin circular I/O connector cable between instrumentation bin & power supply of Nucleonix make type nos IB401 & PS401 or IB402 & PS402 or MB403/404 & pre-amplifier base. Apply -12V GN to power up pre-amplifier circuit.
- UHF to MHV/SHV cable (RG59) is used to provide detector bias voltage, from HV module to pre-amp.
- Third will be a pre-amplifier BNC to BNC signal cable. Output from pre-amp will go to a pulse shaping amplifier such as spectroscopy amplifier or Active filter amplifier or Linear amplifier.
- Once these connections are made, power up the pre-amplifier & apply required operating voltage to the detector. One can see the output of pre-amplifier in the oscilloscope by placing a radioactive gamma source such as Cs-137 on the detector crystal surface. This will be a fast rise slow decay pulse.

CHAPTER - V

CIRCUIT DESCRIPTION

This PA311 consists of dynode bias resistor chain consisting of R_1 to R_{10} . ($R_{23} + P_2$) is set to approximately equal to twice the value of $R_1 = R_2 = R_{10}$. Capacitors across Dynodes D_8 , D_9 & D_{10} provide D.C bias stability for higher dynodes. R_{11} (100K) serves as the load resistor & C_4 serves as the coupling capacitor, through which output signal is taken to pre-amplifier..

In Pre-amplifier circuit, D_1 & D_2 serve as the protection diodes against any voltage spikes of higher voltages. C_5 serves as the charge integrating capacitor.

R_{14} & R_{15} provide base bias to transistor T_1 . R_{14} & R_{15} along with C_5 decide on the fall time of the charge pulse generated at the output. Any -ve charge pulse created at C_4 due to charge collection at anode of PMT will result into charge integration through C_5 & results into a positive pulse at the collector of transistor T_2 . This in turn through emitter follower T_3 functioning as the output driver will give a positive pulse. This is A.C coupled through C_9 & provide signal at output BNC with an output impedance of 90 ohms (approx.)

Source such as Cs-137 on the detector crystal surface. This will be a fast rise slow decay pulse.

CHAPTER –XV

CONTACT US FOR AVAILING SERVICES

Postal/Mailing Address (Phone / Fax / Email)

Nucleonix Systems Pvt Ltd.
Plot No. 162 A&B, Phase II, I.D.A.,
Cherlapally, Hyderabad - 500 051, Telangana, India.
Phone: + 91-40-27263701, 040-27262146, 68888777
Mobile: 7331104480, 7331104481, 7331104482
Fax : + 91-40 - 27262146
Email : info@nucleonix.com

**For any information, Contact by email is always appreciated.
(This will help us to respond to you quickly)**

Marketing Department :

a) Sales / Commercial Information / Field installation and servicing

For any Commercial, Price information, Product information, customer coordination & quotation of our products customer related commercial services, please contact front office marketing staff through the listed Email Ids or Phone Nos. given below

Whom to Contact:

| Business Executives: | Contact Numbers | Contact by E-mail ID |
|--|---------------------------------|-----------------------------|
| 1. R.Maniram (Sr. Business Executive) | Mob:7331104481, Ph-040-27263701 | info@nucleonix.com |
| 2. Ch.Gayatri (Business Executive) | Mob:7331104481, Ph-040-27263701 | info@nucleonix.com |
| 3. K.Swapna (Business Executive) | Mob:7331104481, Ph-040-27263701 | info@nucleonix.com |

Note: Our business executives will also connect you to concerned Engineer or General Manager for any technical clarifications if required

b) Factory Services

For **Servicing and Calibration** factory services & follow up on the above jobs including dispatch related/payment related issues of serviced & calibrated items please contact

Ms. K.Sarika
(Executive services)

Mob:7331104482

E-mail: info@nucleonix.com

She will also connect you to concerned engineer or general manager if required, for any clarifications & deficiencies in services

c) Dispatch Related Issues (Production Items)

For dispatch related issues of your ordered equipments, including delays, purchase order related document deficiencies, payment proofs, dispatch docket details and bills etc.,contact

Ms.V.Anusha / Renuka
Devi (Executive Dispatch)

Ph:040-27263701, Ex-26

E-mail: info@nucleonix.com

d) Product Technical Information / Clarifications

Whom To Contact:

Contact any front office "Business Executive"- He/She will take your details and connect you to concerned product engineer for any technical clarifications. Best thing is to email your technical queries and obtain the reply, rather than on telephone.

You can also contact General Manager or Director (Tech) if required.

e) Marketing Manager

On business matters for all your marketing services / techno commercial requirements about Nucleonix Products contact:

Bhaskara I.V.

Mob:8019662500

Land lines : 91-40-27263701, 91-40-68888777

Email: info@nucleonix.com

f) General Manager

Dr.M.S.R.Murthy PhD (Nuclear physics)

Land line: 91-40-27263701, 91-40-68888777

Email: info@nucleonix.com

Contact General Manager for all sales / servicing and technical information including customer support related issues, on the delays, gaps & lapses by our staff. Contact G.M. regarding field installations & field servicing jobs schedule etc.

g) H.R -Incharge

Contact her regarding, job vacancies, sending resume for employment, H.R. related issues etc. contact

Ms. M.Swarna Jyothi

Mob:7331104480

Email: recruit@nucleonix.com

h) Director -Technical

Mr. J. Dheeraj Reddy

Email: jdreddy@nucleonix.com

Mobile No :+91-7674009005

Contact him for, any Technical Information and clarifications on products, which cannot be answered by General Manager / Customer support executives.

For any technical deficiencies in products, related issues & suggestions on product improvements you may contact by email or telephone. This will help the company to improve the product & serve you better.

Dealer's complaints, on commercials, lapses by our commercial staff, or any other discrepancy, or you like to give any feedback on any Nucleonix staff doing any wrong thing against cleaner / ethical business principles / practices can be complained to any of the directors or managing director.

i) Director - IT

Mr. J. Nishanth Reddy

Email: nishureddy@yahoo.com; info@nucleonix.com

Mobile No. +91-9966691000

For any deficiencies in product software's, related issues, & any suggestions or improvisations in software's can be contact by email or telephone. This will help the company to improve the product & serve you better.

j) Managing Director

Shri. J.Narender Reddy (Managing Director)

Email : jnreddy@nucleonix.com; info@nucleonix.com

Contact Managing Director for, Foreign relations, International Business co-operation, Joint ventures, Exports, Dealership in other countries, Policy matters, Technology tie-ups etc.

k) Dealers Complaints :

Dealers complaints, on commercials, lapses by our commercial staff, or any other discrepancy, or you like to give any feedback on any Nucleonix staff doing any wrong thing against cleaner / ethical business principles / practices can be complained to any of the directors or managing director.

**An innovative company working towards excellence
in the field of Nuclear Instrumentation**



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