

INSTRUCTION

MANUAL

SPECTROSCOPY AMPLIFIER



TYPE: SA 524

NUCLEONIX SYSTEMS PRIVATE LIMITED

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Note: Manufactured by NUCLEONIX SYSTEMS, Hyderabad based on the technology transfer from Baba Atomic Research Centre (BARC), Mumbai.

CHAPTER - I

INTRODUCTION

Spectroscopy Amplifier SA524 manufactured by NUCLEONIX SYSTEMS is a high performance nuclear pulse shaping amplifier, ideally suited for use with all types of detectors such as germanium, silicon surface barrier and Si (Li) detectors. This is a single width NIM module with gated baseline restorer (BLR), auto-threshold, diode limited unipolar output. Some of the main applications of spectroscopy amplifier involve nuclear pulse height spectroscopy, nuclear timing spectroscopy, counting systems etc.

The input accepts either positive or negative polarity from a detector preamplifier combination. The output pulses, 0 to 10V for unipolar pulse and $\pm 10V$ for bipolar pulse, provided on front panel are suitable for use with single channel and multi channel pulse height analyzers. When long connecting cables are used between preamplifier output and the amplifier input, noise induced in the cable from ground loop currents can reduce the signal to noise ratio thereby causing spectrum degradation. This may be minimized by using amplifier in the differential input mode. Six different shaping time constants are provided for optimizing resolution and count rate performance. To minimize baseline shift due to drift a gated baseline restorer (BLR) has been incorporated. Automatic noise threshold stage derives a threshold voltage proportional to the noise level and ensures that BLR gating works just above noise level.

CHAPTER - II
Front Panel & Rear Panel Diagrams



SA524 Front panel



SA524 Rear panel

CHAPTER - III

SPECIFICATIONS & CONTROLS

3.1. PERFORMANCE

Gain Range	Continuously variable from X4 to X1500.
Pulse Shaping	Quasi-Gaussian and quasi-triangular.
Shaping time	0.5, 1, 2, 3, 6 and 10 μ s
Input Noise	5 μ V r.m.s with 3 μ s shaping time
Overload	Recovers to within 2% of baseline in 15x shaping time from x200 overload.
Integral Non-Linearity	< 0.05% from 0 to 10V.
Crossover Walk	Bipolar zero cross over walk is < \pm 3 ns in 50:1 dynamic range.

3.2. CONTROLS

FINE GAIN	Front panel 10 turns precision potentiometer provides a continuously adjustable, gain factor from 0.5 to 1.5.
COARSE GAIN	Front panel six-position switch selects gain factors of X20, X50, X100, X200, X500 and X1000.
PZ	Screwdriver adjustment of the PZ cancellation using 20-turn potentiometer on the front panel.
POS/NEG	Front panel toggle switch for selecting either positive or negative input signals.
ATN	A front panel toggle switch selects an input attenuation factor of X1 or X2.5
SHAPING	Front panel six position switch for selecting shaping times of 0.5, 1, 2, 3, 6 and 10 μ s
TRI/GAUSS	Front panel toggle switch for selecting Quasi-Gaussian or quasi-triangular uni-polar output shape.
BAL	Screwdriver adjustment to match the gains of normal and differential reference inputs for maximum common mode noise rejection in DIFF mode using 20 turn potentiometer on the front panel
LIM	A push-button switch on the front panel to prevent oscilloscope input from overloading and thus enabling observation of the baseline in sensitive ranges of the scope

3.3 INPUTS

NAME	SR.NO.	FUNCTION
IN	CN1	BNC connectors on front panel accepts 0 to 10V of either polarity.

3.4. OUTPUTS

UNI	CN2	Unipolar output on front panel BNC, full-scale linear range 0 to +10V
BI	CN3	Bipolar output on front panel BNC, linear range of $\pm 10V$

3.5. POWER CONNECTORS

NIM / Amphenol Power	CN13	Rear panel power connector provides module power (+24V, -24V, +12V, -12V and ground)
Preamp Power	CN12	Rear panel power connector provides preamp power (+24V, -24V, +12V, -12V and ground) to the associated preamplifier.

CHAPTER - IV

USING INPUTS & CONTROLS

4. USING INPUTS AND CONTROLS

4.1. INPUT SETTINGS

The input stage performs amplification/attenuation and input polarity selection.

The input polarity switch should be set in the positive or negative positions for positive or negative input signals respectively.

The NORM/DIFF switch selects the normal or differential input mode of operation. In normal applications single-ended input is used for which the switch should be in the NORM position. When there is ground current noise due to a switching mode power supply in the system, as in a PC, or other sources, signal to noise ratio may be improved by connecting the input in the differential mode. The connection to ground is through a termination resistance of the same value as in the other signal output connector. The common noise in the two cables may still not be balanced. The BAL trimpot on the front panel is adjusted to get minimum non-random noise on the amplifier output baseline.

4.2. POLE ZERO CANCELLATION

This is done with the PZ trimpot on the front panel. The unipolar output is observed in an oscilloscope and the trimpot is adjusted to get the fastest return to baseline without undershoot. Since even minor mis-adjustment results in considerable degradation of the spectrum, the return to baseline is usually monitored in a sensitive range of the oscilloscope such as 50mV/div. However for large signals (~10V) many oscilloscopes may introduce an additional undershoot in ranges below 200mV/div so that a perfectly adjusted signal will appear to be under compensated. If the PZ trimpot is adjusted now to achieve fastest return to base line on the oscilloscope, the actual signal may be overcompensated. If however the LIM switch on the front panel is pressed, the unipolar output signal is limited within 0.7V. Thus the portions of the signal relevant for PZ adjustment (within 100mV of baseline) may be observed in sensitive ranges of the oscilloscope without distortion or additional undershoot. If shaping time is changed, pole zero cancellation must be readjusted. It is also advisable to readjust if the attenuation or coarse gain is changed.

4.3. GAIN CONTROL

Gain of the amplifier is controlled by a combination of the input attenuator switch, coarse gain control and fine gain control, all on the front panel. A particular net gain may be achieved in either setting of the attenuator switch, but the signal to noise ratio would be better for the x1 setting of the switch. Hence the input attenuator is normally to be kept at x1 position and the x2.5 position is used for input amplitude levels of 1V or more. The range of the fine gain control is such as to have overlap of net gain in adjacent coarse gain settings. The net gain depends only approximately upon the reading of the fine gain helipot dial.

4.4. SHAPING

The shaping time usage for different detectors is as follows:

Detector	Shaping time
NaI(Tl)	1 μ s
Proportional counter	2 μ s or greater depending upon charge collection time
Surface barrier detector	0.5 μ s to 2 μ s
HPGe	2 μ s to 6 μ s depending upon count rate and size
Si(Li)	6 μ s to 10 μ s depending upon count rate and size

For the same shaping time the triangular shaping will usually give better resolution and ballistic deficit performance without degradation of count rate performance. The Gaussian shaping is better suited for monitoring the pulse shaping since the full width of the unipolar pulse at half maximum is twice the shaping time. Bipolar pulse shaping is suitable for high count rate applications with AC-coupled analyzers. This shaping is also used in zero-crossover timing applications.

CHAPTER – V

ANNUAL MAINTENANCE CONTRACT (AMC)

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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 & 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:

- 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 electronics 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.

CHAPTER –VI

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

Mob:7331104482

E-mail: info@nucleonix.com

(Executive services)

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

Ph:040-27263701, Ex-26

Email: info@nucleonix.com

Devi

(Executive Dispatch)

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.