Network System Controller Series

Digital Signal Processor

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Safety and Regulatory Infomation

IMPORTANT SAFETY INSTRUCTIONS

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this apparatus near water.
6. Clean only with dry cloth.
7. Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
8. Do not install near any heat sources such as radiators, heat registers, stoves or other apparatus (including amplifiers) that produce heat.
9. Do not defeat the safety purpose of the polarized or grounding type plug. A polarized plug has two blades with one wider than the other. A grounding type plug had two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
10. Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles and the point where they exit from the apparatus.
11. Only use attachments / accessories specified by the manufacturer.
12. Use only with the cart, tripod, bracket or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart / apparatus combination to avoid injury from tip-over.
13. Unplug this apparatus during lightning storms or when unused for long periods of time.
14. Refer all servicing to qualified service personnel. Service is required when the apparatus has been damaged in any way, such as power-supply cord or plug damaged, liquid has been spilled or objects have fallen into the apparatus, this apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
15. The apparatus shall not be exposed to dripping or splashing and no objects filled with liquids, such as vases, shall be placed on the apparatus.
16. Permanent disconnection from the mains supply is to be achieved by removing the supplied cord connector from the back of the unit. This connector must remain readily operable.

WARNING
Do not remove any covers, loosen any fixings or allow items to enter any aperture.

WARNING
This product must be earthed. Use only a flexible cable or cord with a green and yellow core which must be connected to the protective earthing terminal of a suitable mains plug or the earthing terminal of the installation

WARNING
The rear of the product may get hot. Avoid direct skin contact during operation and for at least 5 minutes after power has been isolated.

WARNING
This product is designed for permanent installation. It must be fitted in to a 19” rack enclosure and not operated unless so installed. The rack enclosure must allow free air movement through the product.

CONSIGNES DE SÉCURITÉ IMPORTANTES

1. Lisez ces instructions.
2. Conservez ces instructions.
3. Respectez tous les avertissements.
4. Suivez toutes les instructions.
5. Ne pas utiliser cet appareil près de l'eau.
6. Nettoyer uniquement avec un chiffon sec.
7. Ne pas bloquer les ouvertures de ventilation. Installer conformément aux instructions du fabricant.
8. Ne pas installer près de sources de chaleur telles que radiateurs, registres de chaleur, poêles ou autres appareils (y compris les amplificateurs) qui produisent de la chaleur.
9. Ne supprimez pas le dispositif de sécurité de la fiche polarisée ou mise à la terre. Une fiche polarisée possède deux lames dont l'une est plus large que l'autre. Une prise de terre a eu deux lames et une troisième broche de terre. La lame large ou la troisième broche sont fournies pour votre sécurité. Si la fiche fournie ne rentre pas dans votre prise, consultez un électricien pour remplacer la prise obsolète.
10. Protéger le cordon d'alimentation soit écrasé ou pincé, particulièrement au niveau des fiches, des prises et le point où ils sortent de l'appareil.
11. Utilisez uniquement les accessoires spécifiés par le fabricant.
12. Utilisez uniquement le chariot, le trépied, le support ou la table spécifiés par le fabricant, ou vendu avec l'appareil. Quand un chariot est utilisé, soyez prudent lorsque vous déplacez l'ensemble chariot / appareil afin d'éviter toute blessure en cas de chute.
13. Débranchez cet appareil pendant les orages ou lorsqu'il n'est pas utilisé pendant de longues périodes de temps.
14. Adressez-vous à un personnel qualifié. Une réparation est requise lorsque l'appareil a été endommagé de quelque façon que ce soit le cordon d'alimentation ou la fiche endommagé, du liquide a été renversé ou des objets sont tombés dans l'appareil, cet appareil a été exposé à la pluie ou à l'humidité, ne fonctionne pas normalement, ou s'il est tombé.
15. Le dispositif ne doit pas être exposé à des gouttes ou des éclaboussures et aucun objet rempli de liquides, tels que des vases, doit être placé sur l'appareil.
16. Déconnexion permanente de l'alimentation secteur doit être atteint en supprimant le connecteur du cordon fourni à l'arrière de l'unité. Ce connecteur doit être facilement utilisable.

WARNING
Ne retirez pas les couvercles, ne desserrez pas les fixations et ne laissez aucune pièce s'introduire dans les ouvertures.

WARNING
Ce produit doit être mis à la terre. Utilisez uniquement un câble souple avec un noyau vert ou vert / jaune qui doit être relié à la borne de terre de connecteur d'alimentation ou la borne de terre de l'installation.

WARNING
Le radiateur arrière de cet appareil devient chaud. Evitez tout contact direct avec la peau pendant le fonctionnement et au moins 5 minutes après la mise hors tension de l'appareil.

WARNING
Ce produit est conçu pour une installation permanente. Il doit être installé dans un boîtier rack 19 ". L'enceinte du rack doit permettre un mouvement de l'air libre à travers le produit.

COMPLIANCE

FOR CUSTOMERS IN EUROPE

This product complies with both the LVD (electrical safety) 2014/35/EU and EMC (electromagnetic compatibility) 2014/30/EU directives issued by the commission of the European Union.

Compliance with these directives is demonstrated by conformity with the following European standards:

EN60065 8th EditionElectrical safety

EN55032-2012EMC emissions

EN55035-2017EMC immunity

NOTICE

This equipment is compliant with Class A of CISPR 32. In a residential environment this equipment may cause radio interference in which case the user may be required to take separate measures.

WARNING

THIS PRODUCT MUST BE EARTHED. Use only a flexible cable or cord with a green and yellow core which must be connected to the protective earthing terminal of a suitable mains plug or the earthing terminal of the installation. The cord must be a maximum of 2m long, have at least a 0.75mm2 CSA, a 300/500V rating and comply with EN50525-2-11 / H05W-F (105oC).

FOR CUSTOMERS IN THE USA

This product complies with UL60065 8th edition for electrical safety.

WARNING

THIS PRODUCT MUST BE EARTHED. Use only a flexible cable or cord with a green or green / yellow core which must be connected to the protective earthing terminal of a suitable mains plug or the earthing terminal of the installation. The cord must be a maximum of 6' long, be at least 18AWG, 105oC have a rating SJ, SJT, SJE or 300/500V H05W-F and be marked VW-1.

NOTICE

FCC SUPPLIER'S DECLARATION OF CONFORMITY (SDoC) : We, Linea Research Ltd. of 1 Marquis Business Centre, Royston Road, Baldock, Hertfordshire, SG7 6XL, England, represented in the United States by Allied Professional Technologies, LLC - www.alliedprotech.com , declare under our sole responsibility that the ASC family of products comply with Part 15 of the FCC Rules. Products covered by this declaration have model numbers of the form ASCxx where 'x' may be any number between 1 and 9.

FCC NOTE : An example of this equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 subpart B of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC CAUTION: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

FOR CUSTOMERS IN CANADA

This product complies with CA /CSA C22.2 No.60065-03 for electrical safety.

Ce produit est conforme avec CA /CSA C22.2 No.60065-03 pour la sécurité électrique.

DECLARATION OF CONFORMITY WITH CANADIAN ICES-003.

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

WARNING

THIS PRODUCT MUST BE EARTHED. Use only a flexible cable or cord with a green or green / yellow core which must be connected to the protective earthing terminal of a suitable mains plug or the earthing terminal of the installation. The cord must be a maximum of 6’ (2m) long, be at least 18AWG, (0.75mm2 CSA), 105oC have a rating SJ, SJT, SJE or 300/500V H05W-F and be marked VW-1.

WARNING

CE PRODUIT DOIT ÊTRE MIS À LA TERRE. Utilisez uniquement un câble souple avec un noyau vert ou vert / jaune qui doit être relié à la borne de terre de connecteur d'alimentation ou la borne de terre de l'installation. Le cordon doit être un maximum de 6' (2m) de long, être d'au moins 18 AWG (0.75mm2 CSA), 105oC être classé SJ, SJT, SJE ou 300/500V H05W-F et être marquée VW-1

FOR CUSTOMERS IN SINGAPORE

This product complies with IEC60065 8th edition for electrical safety.

WARNING

THIS EQUIPMENT ISONLY FOR PROFESSIONAL INSTALLATION and must onlybe used with a flexible, certified mains power cord-set. This cord-set must be a maximum of 2m long, have at least a 0.75mm2 CSA, a 300/500V rating and be terminated in a mains plug compliant with Singapore standard SS145-1:2010.

NOTICE

THIS PRODUCT MUST BE EARTHED. Ensure that the earth terminal of the certified cord-set is connected to the protective earthing system of the installation.

Introduction and Unpacking

The Linea Research NSC Digital Signal Processor is an advanced digital signal processor (DSP) designed for professional sound system control and optimisation. This 4-input, 8-output processor provides comprehensive loudspeaker management capabilities for touring sound reinforcement, fixed installations, and high-performance audio applications.

At its core, the NSC Digital Signal Processor revolutionises system processing through its innovative Drive Module architecture. Rather than traditional channel-based processing, Drive Modules represent complete loudspeaker subsystems, allowing you to think in terms of your actual speaker configuration rather than individual processor channels.

The processor operates at 96kHz sampling frequency, ensuring exceptional audio quality with minimal latency. Whether you're managing a simple two-way system or complex multi-zone installations, the NSC Digital Signal Processor delivers the precision and flexibility demanded by today's professional audio environments.

What's in the Box

Your NSC Digital Signal Processor package includes:

- NSC Digital Signal Processor Advanced System Controller unit
- IEC mains power cable (European specification)
- Safety instructions leaflet
- Certificate of conformity (CE)

IMPORTANT

Upon unpacking, inspect all items carefully for any signs of shipping damage. Should you discover any damage, notify the carrier immediately and retain all packaging materials. As the consignee, you are responsible for initiating any damage claims with the shipping company.

Key Features & Capabilities

Core Processing Power

- 4 independent input channels with comprehensive DSP
- 8 independent output channels with advanced processing
- 96kHz sampling rate for superior audio quality
- Ultra-low latency signal path design
- 4th generation Analogue Devices SHARC DSP platform

Innovative Drive Module System

- Speaker-centric processing approach
- Up to 4 Drive Modules simultaneously
- Module Groups for simplified multi-zone control
- 50 Module Preset locations
- Component-level on-device preset management

Advanced Filtering and Protection

- LIR (Linear Impulse Response) crossover technology - exclusive linear phase filtering without using FIR
- VX Limiter system for passive 2-way loudspeaker protection
- Thermal modelling limiters for long-term driver protection
- FIR linear phase system equalisation

Professional Features

- 12 layers of parameter overlays for complex routing
- Automatic input fallover (Dante → AES3 → Analogue)
- Secure mode for tamper-proof operation
- Snapshot storage and recall (device-wide presets)

Installation

Mandatory Installation Instructions

WARNING
QUALIFIED PERSONNEL ONLY. Installation must be performed by qualified personnel in accordance with local electrical codes and regulations.

Essential Requirements

EARTH CONNECTION

- The product must be earthed via the mains cable protective earth conductor.
- Use only cables with green/yellow earth wire.
- Maximum cable length: 7.5 metres
- Minimum rating: 10A, marked VW-1, SJ, SJT, or SJE

VENTILATION REQUIREMENTS

- Minimum clearance all sides: 100mm (4 inches)
- Never install in sealed enclosures.
- Do not restrict airflow around the rear panel.
- Operating temperature range: 0°C to +45°C

ENVIRONMENTAL RESTRICTIONS

- Indoor use only (Pollution Degree 2)
- Maximum altitude: 2000m without derating
- Humidity: 0-80% relative, non-condensing
- Protected from liquid ingress

MOUNTING REQUIREMENTS

- Use only manufacturer-approved mounting hardware.
- Support unit adequately - do not rely on front panel screws alone.
- Consider cable weight when rack mounting.

Rack Mounting

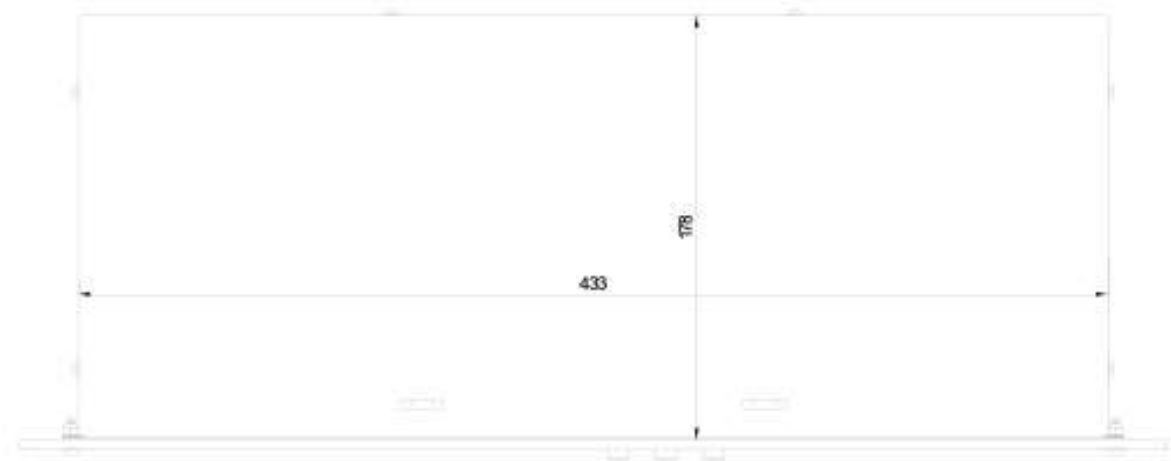
The NSC Digital Signal Processor occupies 1U (44mm) of standard 19-inch rack space. When selecting a mounting position, consider both operational access and system cabling requirements.

WARNING

Warning: Never operate the unit in a completely sealed enclosure. Inadequate ventilation can cause thermal shutdown and potentially damage components.

Mounting Requirements

- Standard 19-inch equipment rack (IEC 60297 compliant)
- Four rack screws (M6 or 10-32 UNC depending on rack type)
- Support rails recommended for touring applications
- Minimum rack depth: 300mm from front mounting rails



Installation Procedure

- Ensure the rack is stable and properly earthed
- If using rear support rails, install these first according to manufacturer's specifications
- With assistance, position the unit at the desired rack height
- Insert and hand-tighten all four front panel mounting screws
- Verify the unit is level before fully tightening screws
- If applicable, secure the rear of the unit to support rails

NOTE

The unit weighs 2.7kg. Whilst manageable for a single person, assistance during installation prevents potential equipment damage and ensures proper alignment.

Ventilation Requirements

WARNING
Never operate the unit in a completely sealed enclosure. Inadequate ventilation can cause thermal shutdown and potentially damage components.

Enclosed Racks

- Install fan panels if the ambient temperature may exceed 35°C
- Position exhaust fans above the unit (heat rises naturally)
- Ensure intake vents are unobstructed and filtered
- Monitor internal rack temperature during extended operation

Open Frame Racks

- Maintain specified clearances even in open installations
- Avoid positioning directly above high-heat equipment
- Consider blank panels above and below in high-density installations

Thermal Considerations

The rear panel features heat-dissipation surfaces that may become warm during operation. Normal operating temperature rise is approximately 20°C above ambient. If the rear panel becomes too hot to touch comfortably (>60°C), review ventilation immediately.

Power Requirements

The NSC Digital Signal Processor features a universal switch-mode power supply that accommodates worldwide mains voltages without requiring manual configuration.

Electrical Specifications

- Input voltage range: 85-240VAC
- Frequency: 50-60Hz
- Power consumption: 30W typical, 35W maximum
- Mains fuse: T1AL 250V (internal, not user-replaceable)
- Connector type: IEC C14 inlet

Mains Connection Requirements

Cable Specifications

- IEC C13 to appropriate regional plug (UK: BS 1363, EU: CEE 7/7)
- Minimum conductor size: 0.75mm² (18 AWG)
- Maximum cable length: 7.5 metres
- Cable rating: 10A minimum
- Must include protective earth conductor

Earth Connection: This equipment must be connected to a protective earth (PE) via the mains cable. The earth connection is essential for:

- Electrical safety (fault protection)
- EMC compliance
- Optimal audio performance (minimising interference)

Never operate the unit with the earth connection defeated or disconnected. Doing so violates safety regulations and voids all warranties.

Power Distribution Considerations

- Connect to a circuit with appropriate overcurrent protection (10A minimum)
- Avoid circuits shared with high-current draw equipment (lighting dimmers, motors)
- Use power conditioning or UPS systems in areas with an unstable mains supply
- Implement proper power sequencing (Switching the processor on before switching power amplifiers on)

Environmental Considerations

The NSC Digital Signal Processor is designed for professional indoor and outdoor use. Adhering to environmental specifications ensures reliable operation and a long service life.

Operating Environment

- Temperature: 0°C to +45°C
- Humidity: 0% to 80% relative humidity, non-condensing
- Altitude: Sea level to 2000m without derating
- Atmosphere: Indoor use only (Pollution Degree 2)

Storage and Transport

- Temperature: -20°C to +60°C
- Humidity: 0% to 90% relative humidity, non-condensing
- Shock/Vibration: Use original packaging or equivalent flight case
- Orientation: Store and transport horizontally

Environmental Precautions

Moisture Protection

- Never expose to rain or water spray
- Avoid installation below air conditioning units (condensation risk)
- Allow unit to acclimatise if moved from cold storage to warm environment
- Do not place liquid containers on or near the unit
- Avoid exposure to smoke machines without protection

Dust and Contamination

- Install in clean, dust-controlled environments where possible
- Use rack filters in dusty locations
- Schedule periodic cleaning of ventilation areas

Electromagnetic Compatibility The NSC Digital Signal Processor complies with EN55103-1 (emissions) and EN55103-2 (immunity) for E1-E4 environments:

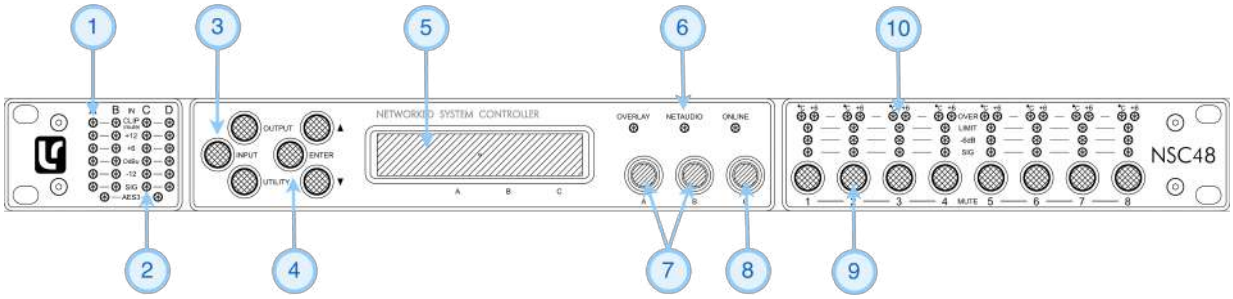
- E1: Residential environments
- E2: Commercial and light industrial
- E3: Urban outdoors
- E4: Controlled EMC environment (broadcast, recording studios)

Position sensitive equipment at least 1 metre from the unit. Use high-quality shielded cables for all audio connections to maintain EMC compliance.

User Interface

Front Panel Layout

The NSC Digital Signal Processor's front panel provides comprehensive local control through a carefully organised interface combining physical controls with visual feedback.



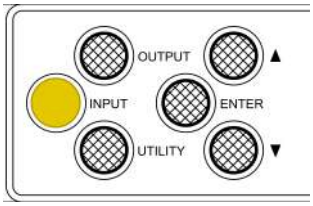
1. **Input Clip/mute Indicators** - Warn the user of input overload and operate at 1dB before clip. The "**CLIP**" The indicator will only come on when all other signal lights are illuminated. This indicator also shows a muted input state and will remain illuminated at all times whilst mute is active. Input mute is turned on/off in the <**INPUT>** gain page. This indicator will also flash regularly if a Module Group has muted this channel.
2. **Input Signal Indicators-** A set of five indicators shows **"Sig**", "**-12**", "**0dBu**", "**+6**" and "**+12**" for each of the DSP inputs "**A**" "**B**" "**C**" "**D**". The signal present Indicators operate at approximately –40 dBu, giving a useful indication of even relatively low input signal levels. The "**0dBu** Indicators are intended to show the nominal operating level and can also be useful for setting the system gain structure.
3. **Menu Buttons - There are three buttons to select** which section of the device to view or edit. The <**OUTPUT**> button displays pages of parameters associated with a particular output channel. The <**INPUT**> button displays pages of parameters associated with a particular input socket or input DSP channel. Pressing the <**INPUT**> or <**OUTPUT**> buttons repeatedly will scroll through the processor's inputs and outputs. After the last channel, navigation returns to the Home screen. The <**UTILITY**> button displays pages of miscellaneous parameters not associated with any particular channel. Whilst in Edit mode, one of these three buttons will be illuminated. They are mutually exclusive – pressing one of the buttons will deselect any others that are active. Pressing the Utils key will return to the Home screen.
4. **Page Selection Buttons-** When one of the buttons <**INPUT**>, <**OUTPUT**> or <**UTILITY**> is illuminated, the up <**↑**>and down <**↓**> arrows will also illuminate, informing the user that these buttons may be used to scroll through the various pages of parameters that may be viewed and edited. The <**ENTER**> button is used to confirm an operation such as storing or recalling a preset or snapshot. It will illuminate when the user is being invited to press it. It will flash when warning the user that pressing this button will activate an important function.
5. **Graphical Display: When the device is switched on, it displays** the Home screen. This provides a useful overview of channel allocation and Drive Module presets. The screen contrast can be changed by pressing the <**UTILITY**> button to navigate to "Screen" and using encoder "**A**" will change the percentage; this can also optimise the viewing angle. In most pages the currently selected channel and parameter information is displayed on the upper part of the screen and the parameter value on the lower part of the screen.
6. **Status Indicators**- The "**OVERLAY**" The indicator indicates when parameters are active on a group layer that the user cannot access through the device's front panel. The "**NETAUDIO**" The indicator shows that a networked digital audio card is installed and routed (Such as Dante™). The "**ONLINE**" indicator has three states: Off – the unit is offline and not connected to a computer or network. Flashing: the unit is searching for an IP address; if it does not find one, it will assign itself an IP address automatically, and the indicator will stop flashing. On- the unit is online and connected with the software. IP settings can be viewed or changed within the <**UTILITY>** pages.
7. **Selection Indicators-** Each page that is visited when navigating will usually show either one, two or three parameters labelled "**A**", "**B**" and "**C**", each of which can be edited by turning the Encoder associated with that parameter also labelled "**A**", "**B**" and "**C**"

8. **Parameter Encoders-** Three velocity-sensitive parameter encoders are used to adjust the parameters shown on the display. Up to three parameters at a time are displayed on the screen. The parameter name is shown above the parameter value in each of the three screen sections.
9. **Mute Buttons-** DSP output mute status is indicated and controlled by an illuminated button for each channel. These flash when the entire unit is muted from the AUX port or from System Engineer Mute-All.
10. **Limiter Indicators-** The output indicators shows the status of the limiter and output level relative to the limiter threshold. The <**SIG**> indicator indicates signal presence and illuminates when a signal is present at the output. The second indicator <**-6dB**> indicates that the signal is 6dB below the limiter threshold. The third <**LIMIT**> indicator indicates that the threshold of that output channel has been reached. The fourth <**+6**> indicates a signal 6dB higher than the limiter threshold. The <**+6dB**> indicator also refers to the excursion limiter and will illuminate when its threshold is exceeded. The <˚**C**> The indicator shows that the thermal limiter is active, protecting against long-term thermal stress. Please note that because of the long release time of the thermal limiter, the <˚**C**> The indicator may remain illuminated for several seconds after the signal on that channel is reduced.

Control Elements

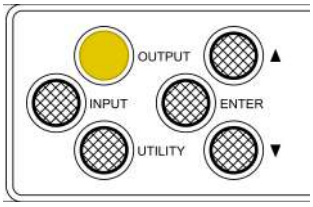
Menu Navigation Buttons

INPUT Button



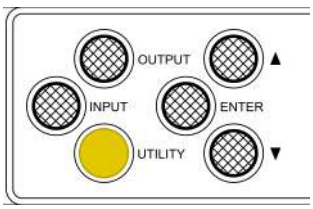
- Accesses input channel parameters
- Successive presses cycle through channels A-D
- LED illuminates when in Input mode
- Returns to Home after channel D

OUTPUT Button



- Accesses output channel parameters
- Successive presses cycle through channels 1-8
- LED illuminates when in Output mode
- Returns to Home after channel 8

UTILITY Button

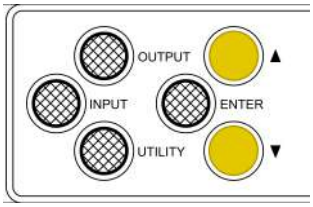


- Accesses system configuration

- Single press enters Utility menu
- LED illuminates when in Utility mode
- Press again to return to Home
- Hold 5 seconds for Secure Mode

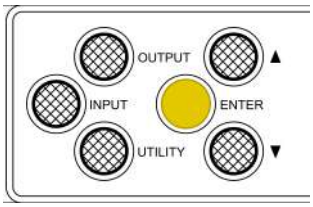
Parameter Navigation

Arrow Buttons (▲▼)



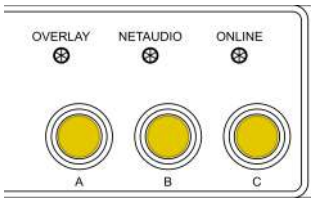
- Navigate through parameter pages
- Illuminate when navigation is available
- Auto-repeat when held
- Context-sensitive operation

ENTER Button



- Confirms operations
- Solid illumination: Press to proceed
- Flashing: Important operation pending
- Used for preset storage/recall confirmation

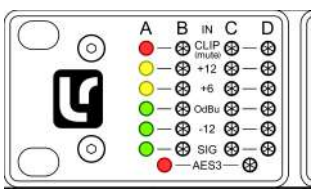
Parameter Encoders (A, B, C)



- Three velocity-sensitive encoders
- Mapped to on-screen parameter zones
- Acceleration for rapid adjustment

Status Indicators

Input Monitoring



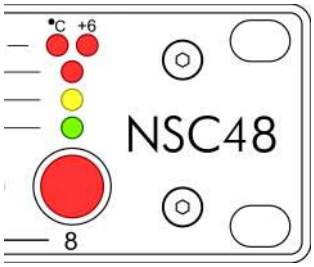
Each DSP input (A-D) features five-segment LED metering:

- SIG (Green): Signal present (≈ -40dBu)
- -12 (Green): -12dBu input level
- 0dBu (Yellow): Nominal operating level
- +6 (Yellow): +6dBu input level
- +12 (Yellow): +12dBu input level
- CLIP (Red): Input overload warning
- AES3 (Red): Input pair set to AES3

The CLIP indicator also shows mute status:

- Solid: Channel muted
- Flashing: Module Group mute active

Output Monitoring



Each output channel features a comprehensive status indication:

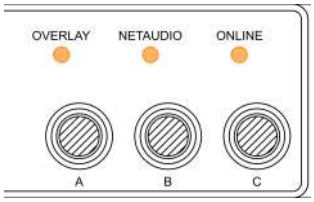
MUTE Button/Indicator

- Press to toggle output mute
- LED on: Output muted
- LED flashing: Global mute active

Limiter Indicators

- SIG (Green): Output signal present
- -6dB (Yellow): 6dB below limiter threshold
- LIMIT (Red): Limiter threshold reached
- +6 (Red): 6dB above threshold (heavy limiting)
- °C (Red): Thermal limiter active
- Combined display shows the worst-case limiting

System Status Indicators



OVERLAY

- Illuminates when parameter overlays are active
- Indicates Module Group control in effect
- Cannot be edited from the front panel

NETAUDIO

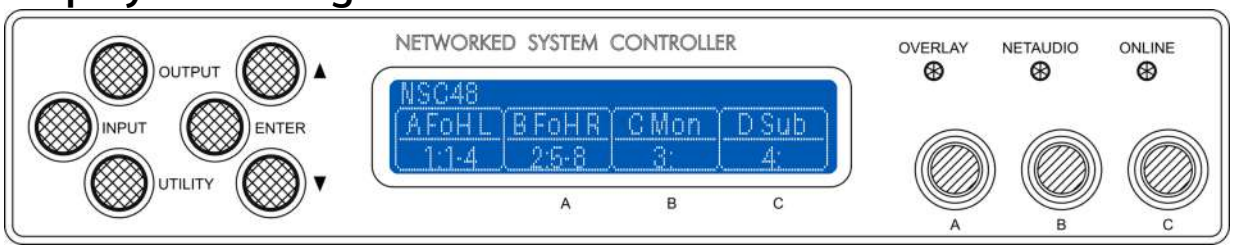
- Illuminates when the Dante option is installed

- Shows network audio routing active
- Remains lit even without a physical connection

ONLINE

- Off: No network connection
- Flashing: Searching for IP address
- Solid: Connected to network/control system

Display and Navigation

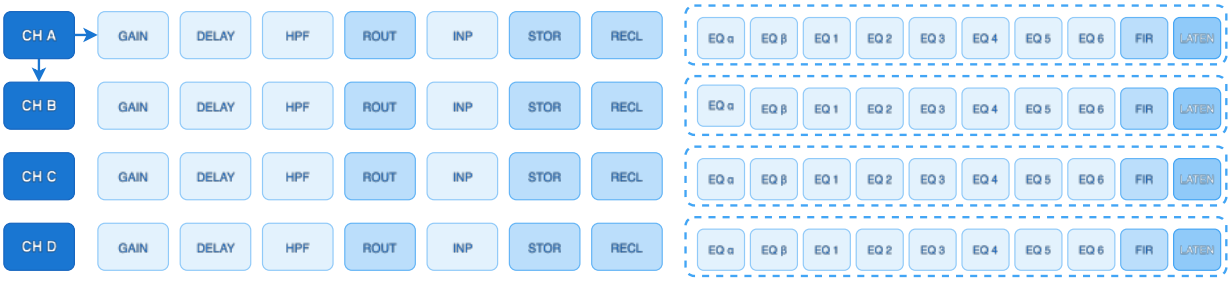


Graphical Display. The backlit LCD provides clear parameter visibility in all lighting conditions:

- Multi-line parameter display
- Menu navigation feedback
- System status information
- Contrast adjustable for viewing angle

Navigation Structure: The interface follows a logical hierarchy:

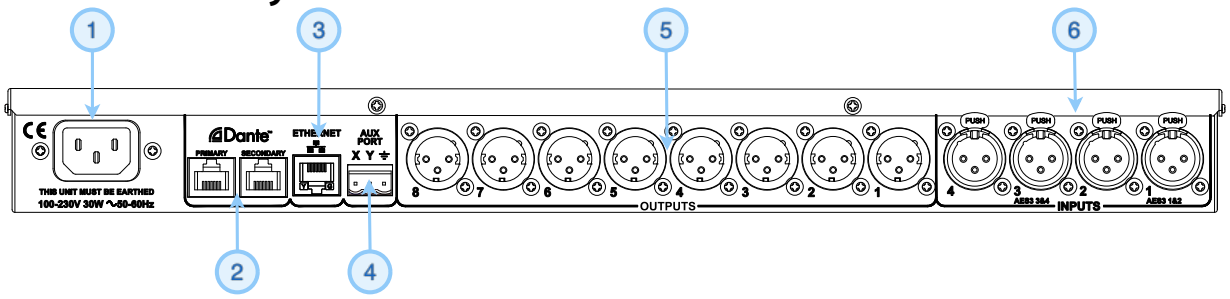
INPUT CHANNELS



UTILITY MENU

Connections

Rear Panel Layout



1. **Power Inlet**- The NSC Digital Signal Processor unit should be connected to a suitable mains electricity supply using an earthed IEC C14 connection power lead. The processor has a switch-mode power supply that is capable of operating with a nominal mains voltage of 85V to 240V, 50/60Hz, without re-configuration.

> **IMPORTANT**
> The NSC Digital Signal Processor must be earthed to a suitable power earth; failure to do so may affect performance and/or operation and will invalidate warranty and could be potentially hazardous.

2. **Networked Audio Ports**- The NSC Digital Signal Processor has the option for networked audio ports; if none are required a blanking plate will be fitted. There are several options for networked audio, including Dante™. For a full list please consult your vendor.
3. **Ethernet Communications Port-** The device may be controlled entirely by another controller, typically a Personal Computer running an application compliant with the ObCom standard, such as System Engineer 8. Connection will normally be made to the controller via this Ethernet port connector. This port is also used to update the unit's firmware.
4. **Auxiliary Port-** The auxiliary port may be configured to recall snapshots or apply muting
5. **Audio Output Connectors-** The processed outputs are impedance-balanced and wired: pin-1 directly bonded to ground, pin-2 hot, and pin-3 cold.
6. **Audio Input Connectors-** All audio connections are fully balanced and wired: pin-1 to ground (as required by the AES48 standard), pin-2 hot & pin-3 cold. When AES3 operation is selected on an input pair, the Odd channel connector is used for both channels (e.g. Input 1 is used for channels 1 and 2).

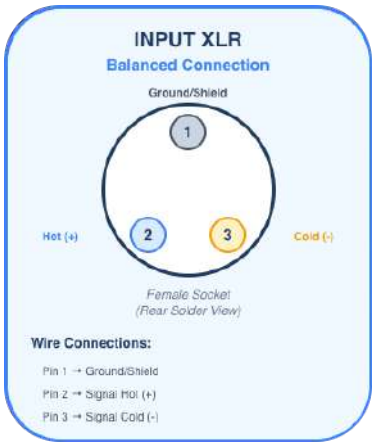
Audio Input Connections

The NSC Digital Signal Processor provides four balanced audio inputs using industry-standard XLR connectors. Each input can accept analogue signals or, when configured appropriately, digital AES3 signals on odd-numbered channels.

Analogue Input Connections

- Connector Type: Female XLR (3-pin)
- Input Impedance: >10kΩ balanced
- Maximum Input Level: +20dBu
- Nominal Operating Level: 0dBu

Balanced Connection Wiring

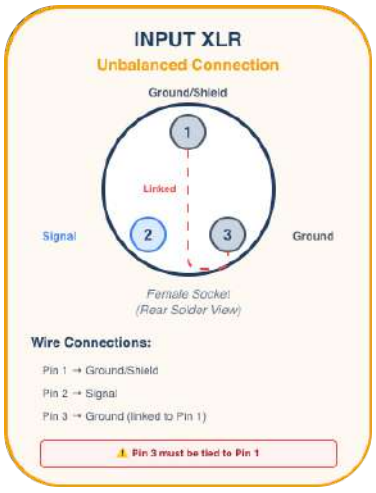


All inputs are electronically balanced and should be wired according to international standards:

- Pin 1: Shield/Ground (connected to chassis)
- Pin 2: Hot/Positive (+) signal
- Pin 3: Cold/Negative (–) signal

IMPORTANT
Always connect the cable shield to Pin 1 at both ends of the cable to ensure proper EMC performance and compliance with safety regulations.

Unbalanced Source Connections



Whilst balanced connections are strongly recommended for professional applications, unbalanced sources can be accommodated when necessary:

1. Connect the signal conductor to Pin 2 (Hot)
2. Connect the source ground to Pin 3 (Cold)
3. Link Pin 1 to Pin 3 with a short jumper at the input connector
4. Use the shortest cable length practical to minimise interference

NOTE
Unbalanced connections are more susceptible to interference and ground loops. Use balanced connections wherever possible for optimal performance.

Audio Output Connections

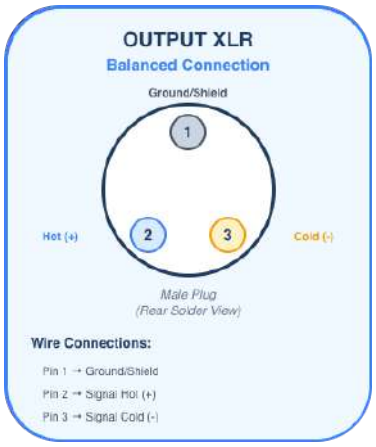
Audio Output Connections

The NSC Digital Signal Processor features eight outputs with impedance-balanced drive circuits, providing excellent common-mode rejection whilst maintaining compatibility with both balanced and unbalanced destination equipment.

Analogue Output Connections

- Connector Type: Male XLR (3-pin)
- Output Impedance: <100Ω impedance-balanced
- Maximum Output Level: +18dBu into 600Ω
- Output Configuration: Impedance-balanced (Pin 2 driven, Pin 3 via impedance)

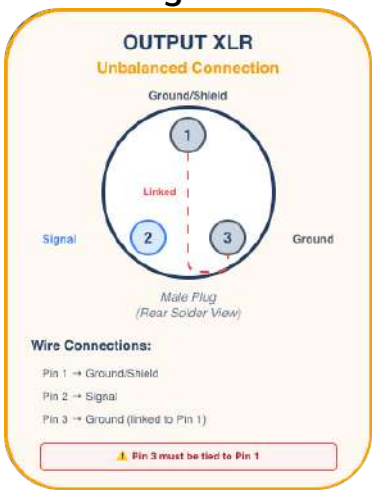
Output Wiring Configuration



- Pin 1: Shield/Ground (directly bonded to chassis per AES48)
- Pin 2: Hot/Positive (+) signal
- Pin 3: Cold/Negative (–) reference

The impedance-balanced output design maintains the benefits of balanced operation whilst requiring only a single active driver, improving reliability and reducing power consumption.

Connecting to Unbalanced Inputs



When connecting to unbalanced equipment:

1. Connect Pin 2 (Hot) to the signal input
2. Connect Pin 3 (Cold) to the equipment ground

3. Connect Pin 1 (Shield) to ground at the destination equipment
4. Keep cable lengths minimal to reduce noise pickup

Digital Audio (AES3/Dante)

The NSC Digital Signal Processor seamlessly integrates digital audio connectivity alongside traditional analogue I/O, providing flexibility for modern system designs.

AES3 Digital Audio

Format: AES3 (AES/EBU) professional digital audio sample Rates:

- Input: 28kHz to 108kHz (automatic detection)

Channel Configuration:

- Inputs 1&2: Carried on the Input 1 XLR connector
- Inputs 3&4: Carried on the Input 3 XLR connector

To enable AES3 operation, navigate to the Input TYPE menu and select "AES3" for the desired channel pair. The AES3 indicator LED will illuminate when the AES3 interface is active.

NOTE

AES3 gain trim is available to compensate for different digital reference standards. Adjust in the Input Route menu to align 0dBFS with your system's analogue reference level.

Dante Audio Networking

When fitted with the optional Dante interface, the NSC Digital Signal Processor becomes a powerful node in your audio network infrastructure.

Specifications:

- Channels: 8 inputs, 8 outputs (configurable)
- Sample Rates: 48kHz, 96kHz
- Latency: 0.5ms typical (device to device)
- Network: 100Mbps/1Gbps Ethernet
- Redundancy: Primary and secondary network support

Automatic Fallover Configuration: The NSC Digital Signal Processor can automatically switch between digital sources based on signal availability:

- Dante > AES3: Switches to AES3 if Dante stream fails
- Dante > Analogue: Switches to analogue if Dante stream fails
- Manual: User-controlled source selection

Configure the fallover behaviour in the Input TYPE menu using the Fallover parameter.

Auxiliary Connections

The auxiliary port enables external control for snapshot recall and system muting, ideal for installation and broadcast applications.

Connector Details

- Type: Phoenix/Euroblock removable terminal block
- Terminals: 3 positions (X, Y, Ground) Wire Gauge: 0.2-2.5mm² (24-14 AWG)
- Input Type: Contact closure or logic level Logic
- Threshold: <0.5V = active, >2.0V = inactive Maximum Input: +24V DC

Control Modes

The AUX port supports multiple operational modes, configured via Utility > AUX Style:

2+Mute Mode (Event or State)

- Terminal X to Ground: Recall Snapshot 1
- Terminal Y to Ground: Recall Snapshot 2
- Both to Ground: System mute

3 Snaps Mode (Event or State)

- Open/Open: No change
- X to Ground: Recall Snapshot 1
- Y to Ground: Recall Snapshot 2
- Both to Ground: Recall Snapshot 3

4 Snaps Mode (State only)

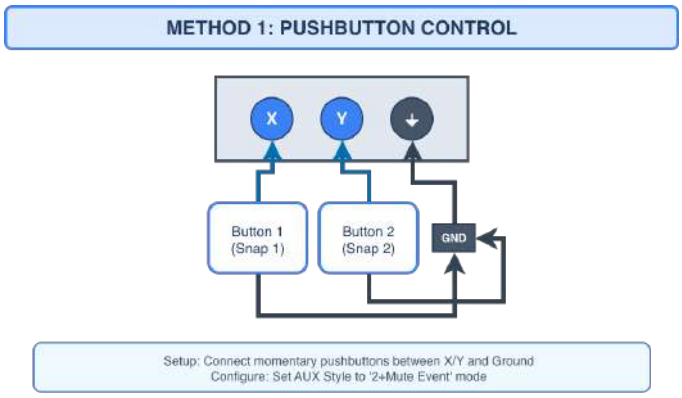
- Binary state encoding for 4 snapshot selection
- Maintained contact closure required

3+Mute Mode (State only)

- Three snapshot selections plus mute function
- Maintained contact closure required

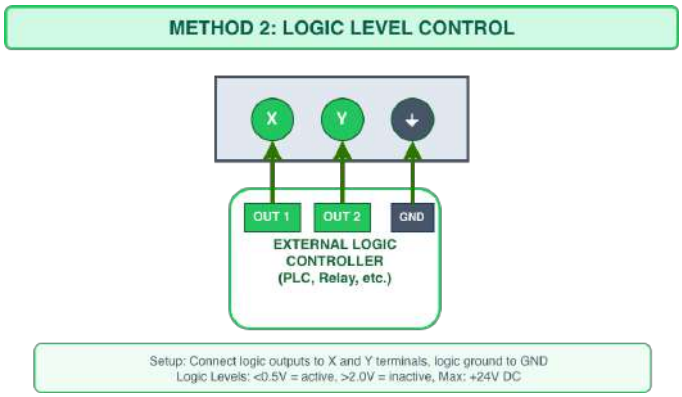
Wiring Examples

Simple Pushbutton Control:



1. Connect momentary pushbuttons between terminals and ground
2. Set AUX Style to "2+Mute Event"
3. Press button briefly to trigger snapshot change

External Logic Control:



1. Connect logic outputs to X and Y terminals
2. Connect the logic ground to the Ground terminal
3. Ensure logic levels are within specification
4. Configure AUX Style for the appropriate mode.

NOTE
When AUX control is active in State mode, front panel and software snapshot recall is disabled. The active snapshot number appears on the home screen as a reminder.

Network Setup

The NSC Digital Signal Processor's Ethernet interface enables comprehensive remote control via System Engineer 8 software and supports various network configurations to suit your infrastructure.

Physical Connection

Connector: Shielded RJ45 Speed: 10/100Mbps auto-negotiating Cable: Cat5e or better, shielded recommended Maximum Length: 100 metres per Ethernet standards

Network Configuration Modes

DHCP (Recommended) The unit automatically obtains an IP address from your network's DHCP server. This is the simplest configuration for most installations:

1. Connect the Ethernet cable
2. Power on the unit
3. Wait for the Online indicator to stop flashing (typically 10-30 seconds)
4. The unit is ready for discovery by System Engineer 8

Auto-IP (Automatic Private IP) When no DHCP server is available, the unit automatically assigns itself an address in the 169.254.x.x range:

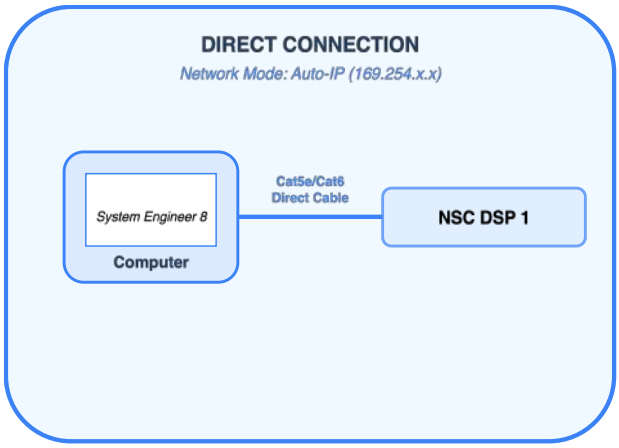
1. Connect directly to a computer or via an unmanaged switch
2. Allow 60 seconds for Auto-IP negotiation
3. Ensure your computer is also using Auto-IP or is in the same subnet

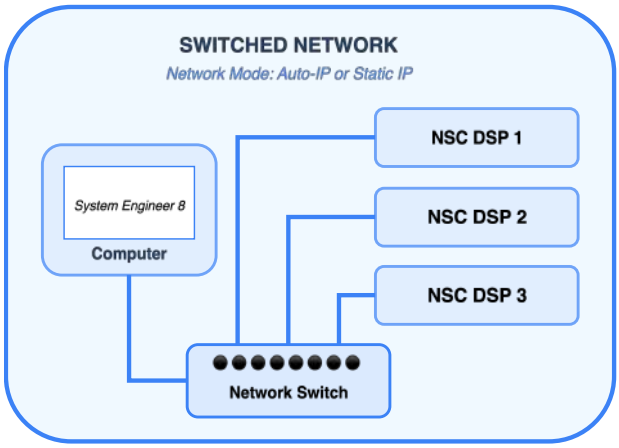
Static IP for fixed installations requiring consistent addressing:

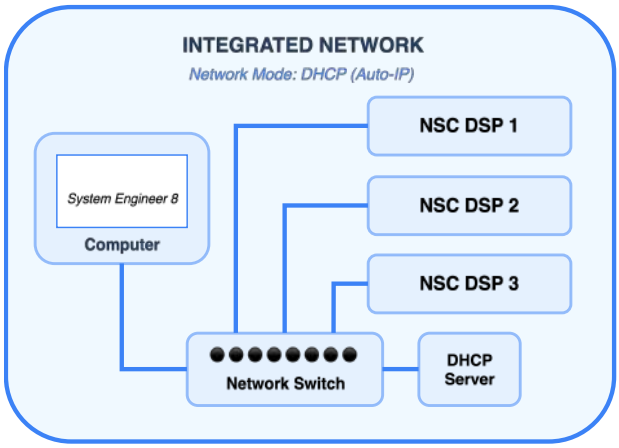
1. Navigate to Utility > IP Mode
2. Select "Static"
3. Use the encoders to set your desired IP address
4. Ensure the address matches your network subnet

WARNING

Use Static IP mode only when required by your network infrastructure. In Static mode, the device cannot be automatically discovered by System Engineer 8 if incorrectly configured.







Network Troubleshooting

If System Engineer 8 cannot locate the unit:

- Verify the ONLINE LED status (solid = connected, flashing = searching)
- Check firewall settings allow System Engineer 8 network access
- Confirm that the computer and NSC Digital Signal Processor are on the same subnet
- Try a direct connection
- Allow up to 2 minutes for network initialisation after connection changes

Understanding the NSC Digital Signal Processor

Drive Modules Explained

The NSC Digital Signal Processor introduces a paradigm shift in system processing through its Drive Module architecture. Rather than thinking in terms of individual processor channels, Drive Modules allow you to work with complete loudspeaker subsystems as unified entities.

What is a Drive Module?

A Drive Module comprises one DSP input channel and one or more DSP output channels, linked through routing to represent a complete loudspeaker system. For example:

- A 2-way loudspeaker uses one input and two outputs (LF and HF drivers)
- A 3-way system uses one input and three outputs (LF, MF, and HF drivers)
- A subwoofer uses one input and one output

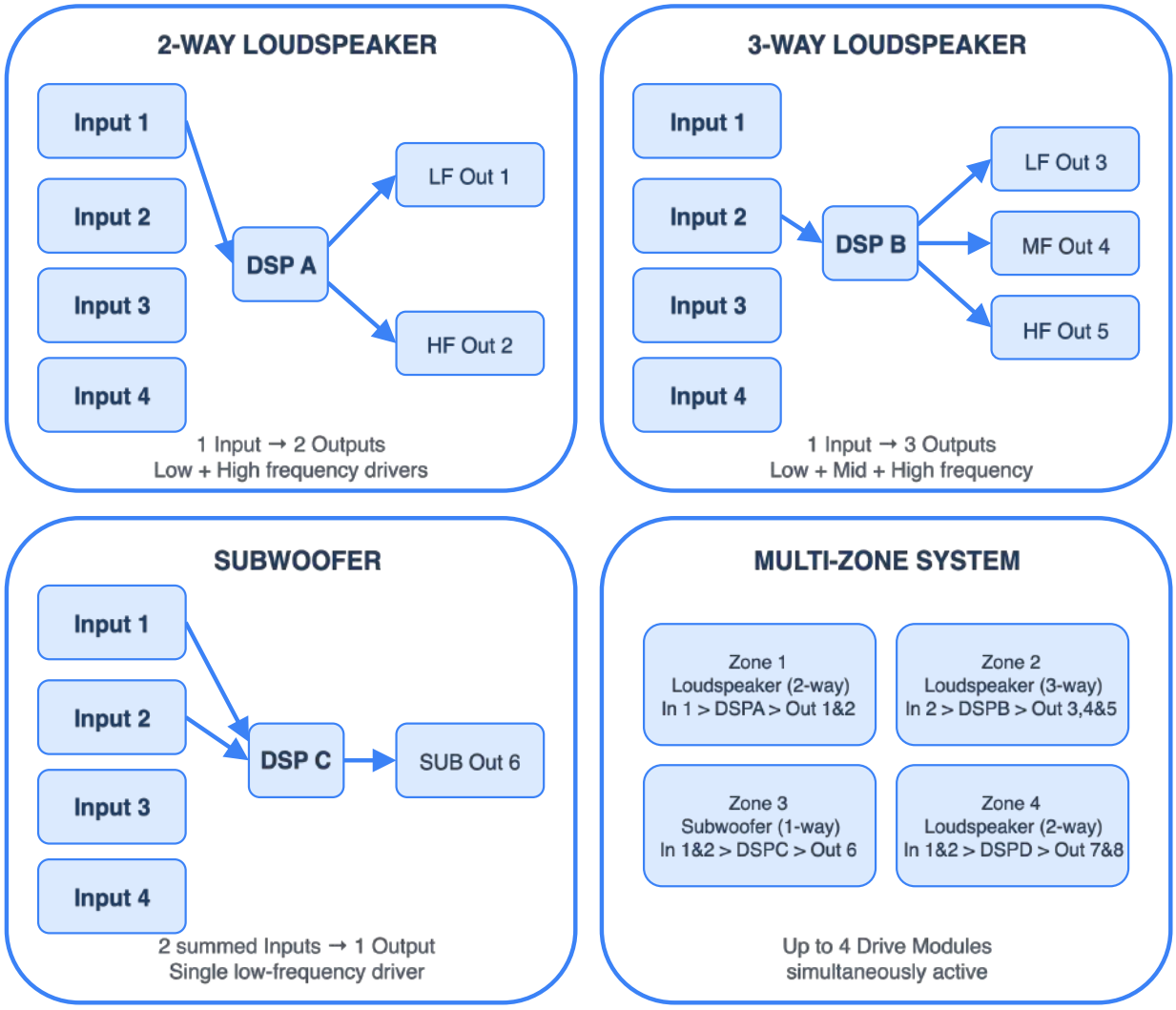
The NSC Digital Signal Processor can operate up to four Drive Modules simultaneously, allowing control of four independent loudspeaker subsystems or zones.

Why Drive Modules Matter

Traditional processors force you to configure individual channels and manually maintain relationships between them. Drive Modules automatically:

- Maintain phase coherence across all drivers in a loudspeaker
- Apply consistent system-wide processing
- Simplify preset management
- Enable logical grouping for multi-zone systems
- Preserve driver relationships during preset recalls

DRIVE MODULE CONFIGURATIONS



System Architecture Overview

The NSC Digital Signal Processor employs a flexible matrix architecture that separates physical inputs from DSP channels, enabling sophisticated routing and redundancy options:

4 Input x 8 Output NSC Controller

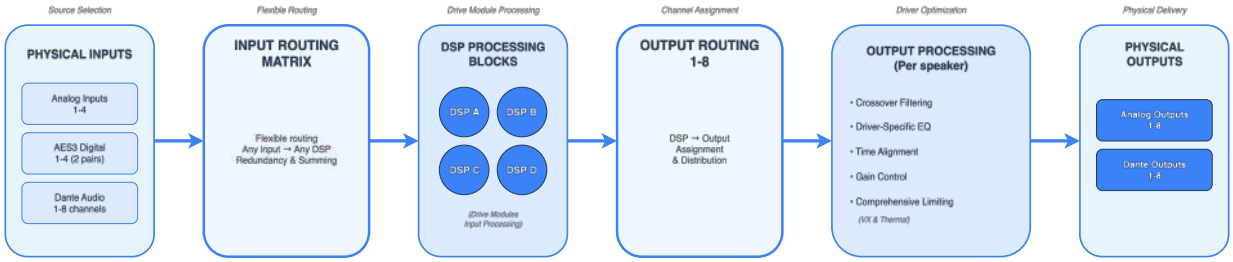
Signal Flow Structure:

1. Input Stage
   - Four physical inputs (Analogue/AES3/Dante)
   - Matrix routing to 4 DSP input channels
   - Automatic source selection with fallover
2. DSP Input Processing
   - Gain and polarity control
   - System delay (up to 998ms)
   - High-pass filtering
   - 9-band parametric equalisation
   - FIR shelving equalisation
3. Drive Module Formation
   - Input DSP channels route to output channels
   - Creates logical loudspeaker subsystems
   - Maintains phase coherence across drivers
4. DSP Output Processing
   - Crossover filtering (including LIR linear phase)
   - 10-band parametric equalisation
   - Output delay alignment
   - Comprehensive limiting (VX, Thermal)
   - Output routing to physical connections
5. Output Stage
   - 8 physical outputs (Analogue)
   - Impedance-balanced outputs
   - Full metering and monitoring

This architecture ensures maximum flexibility whilst maintaining signal integrity throughout the processing chain. The Drive Module concept simplifies complex configurations by allowing you to work with complete loudspeaker systems rather than individual channels.

Signal Flow Overview

Understanding the NSC Digital Signal Processor's signal path architecture is essential for effective system design and troubleshooting.



Input Matrix Routing - Physical inputs (Analogue, AES3, or Dante) connect to DSP input channels through a flexible matrix. This separation enables:

- Any physical input to feed any DSP channel
- Multiple DSP channels from a single physical input
- Input redundancy and automatic fallover
- Summed inputs for increased flexibility

Processing Stages

1. Input DSP Processing - Applied to the entire Drive Module
   - System gain and polarity
   - Global delay alignment
   - High-pass filtering
   - System equalisation
2. Output DSP Processing - Applied to individual drivers
   - Crossover filtering
   - Driver-specific equalisation
   - Time alignment between drivers
   - Comprehensive limiting
3. Output Routing - DSP outputs to physical connections
   - Flexible assignment to physical outputs
   - Format selection (Analogue/AES3/Dante)

Module Presets vs Components vs Snapshots

The NSC Digital Signal Processor employs a three-tier preset system, each serving distinct purposes in your workflow:

Module Presets

- Store complete Drive Module configurations
- Include all parameters for one loudspeaker system
- 50 storage locations available
- Can be factory-supplied or user-created
- Recalled to specific DSP input channels
- Can be stored and recalled locally on a computer using System Engineer 8 control software

Component Presets

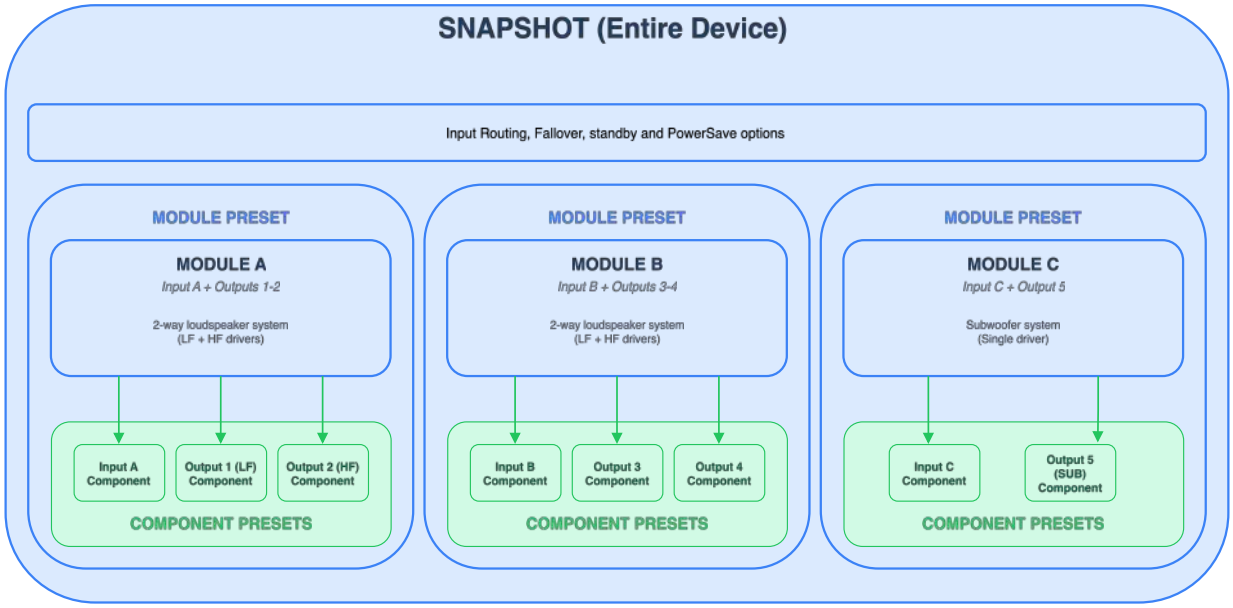
- Store individual output channel settings
- Allow mixing and matching of driver configurations
- Enable asymmetric system creation
- Useful for replacing individual drivers
- Can be extracted from any Module Preset

Snapshots

- Store complete device state
- Include all module assignments and routing
- Capture system-wide configurations
- 20 storage locations
- Recallable via front panel, software, or external control

Hierarchy and Workflow

Snapshot (Entire Device)



Processing Architecture

The NSC Digital Signal Processor's processing architecture optimises both audio quality and operational efficiency through careful signal path design.

Latency Management

The processor maintains minimal latency through intelligent processing allocation:

- Base latency: 1.53ms (at 96kHz)
- Additional latency only when using:
  - FIR shelving EQ: +0.6ms
  - LIR crossovers: Variable based on frequency
  - VX limiting: Variable based on configuration
  - Output FIR filtering

All outputs within a Drive Module are automatically time-aligned, ensuring phase coherence regardless of individual processing requirements.

Parameter Overlays The overlay system enables sophisticated control for complex installations:

- 12 independent overlay layers
- Non-destructive parameter modification
- Maintains base settings while applying offsets
- Essential for Module Groups in multi-zone systems
- Indicated by "[]" suffix on affected parameters

Processing Precision

- 32-bit floating-point DSP calculations
- 96kHz internal processing rate
- 24-bit converters (>120dB dynamic range)
- Dithered output to maintain resolution

Basic Configuration

Initial Setup

When powering on your NSC Digital Signal Processor for the first time, or after a factory reset, follow this systematic approach to establish your base configuration.

Power-On Sequence

1. Connect mains power - The unit powers on automatically (no power switch)
2. Observe startup sequence:
   a. All LEDs illuminate briefly (self-test)
   b. Display shows bootloader information
   c. Application firmware version appears
   d. All MUTE buttons illuminate temporarily
   e. Home screen appears showing current Drive Module configuration
3. Verify firmware version - Shown briefly during startup or in Utility menu
4. Check network connection - ONLINE LED indicates network status

Basic Routing

The NSC Digital Signal Processor's routing matrix provides complete flexibility in signal distribution whilst maintaining logical Drive Module relationships.

Input Routing Principles

Physical inputs connect to DSP channels through the routing matrix:

Available Input Sources:

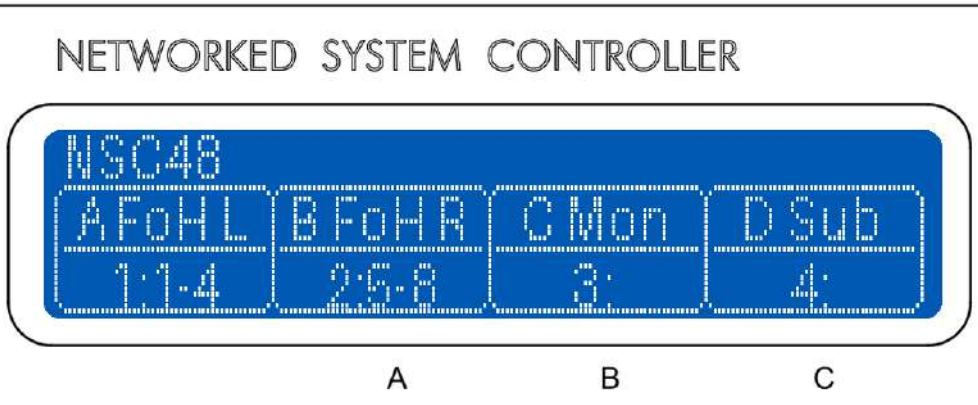
- Analogue (balanced XLR)
- AES3 (digital audio pairs)
- Dante (network audio when fitted)

DSP Input Assignments: Each DSP input (A-D) can receive signal from:

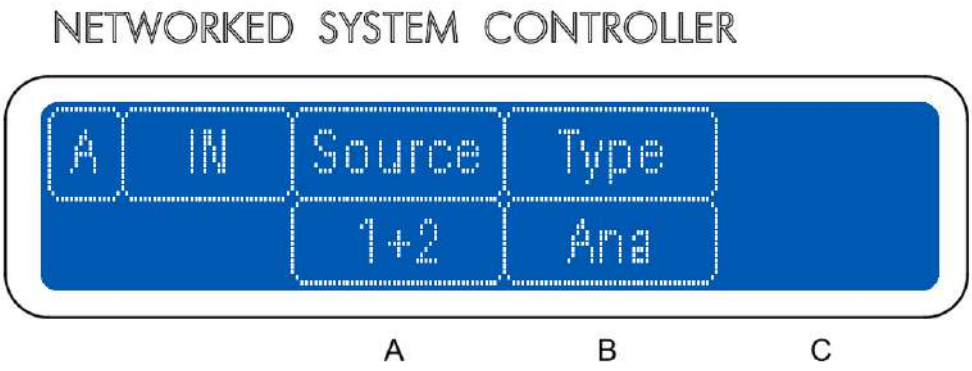
- Single physical input (1, 2, 3, or 4)
- Summed input pairs (1+2, 3+4, 1+3, 1+4, 2+3, 2+4)

Configuring Input Routing

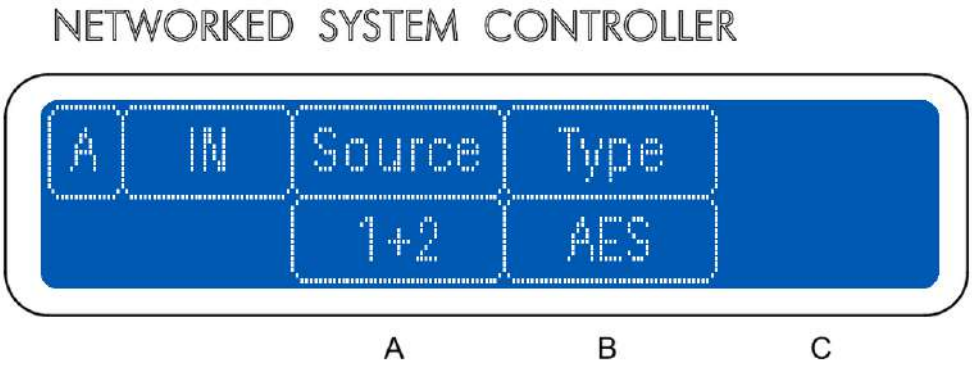
1. Access Input Route Menu
   a. Press INPUT button
   b. Select desired DSP channel (A-D)
   c. Navigate to "IN" page using ▼ button



2. Select Source
    a. Rotate Encoder A to choose physical input
    b. Options: 1, 2, 3, 4, or summed combinations
    c. Display updates immediately



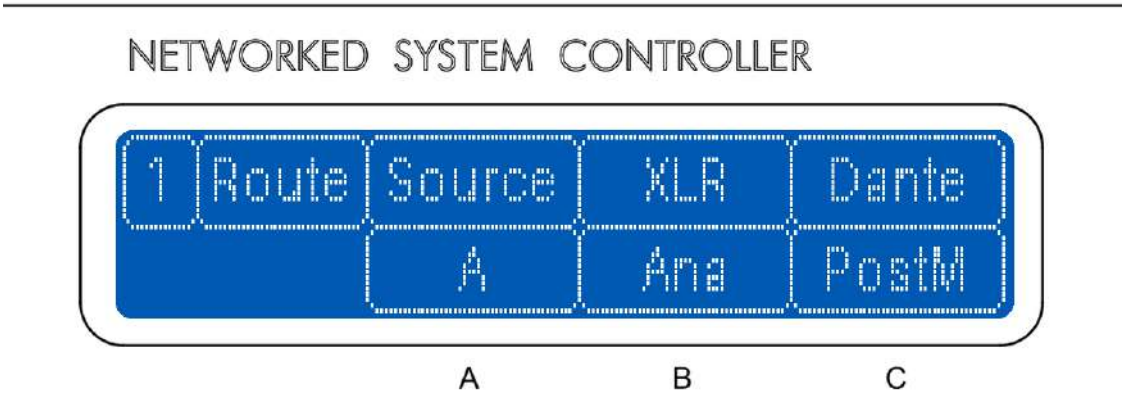
3. Adjust Input Type (if using digital sources)
    a. Navigate to "TYPE" page
    b. Select: Analogue, AES3, or Dante
    c. Configure fallover if required



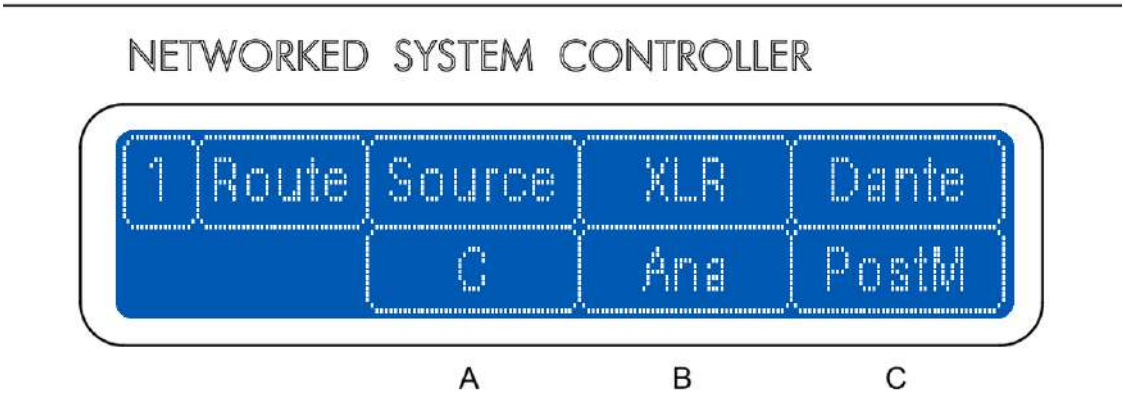
Output Routing for Drive Modules

Output routing is typically automatic when recalling Module Presets, but manual configuration is possible:

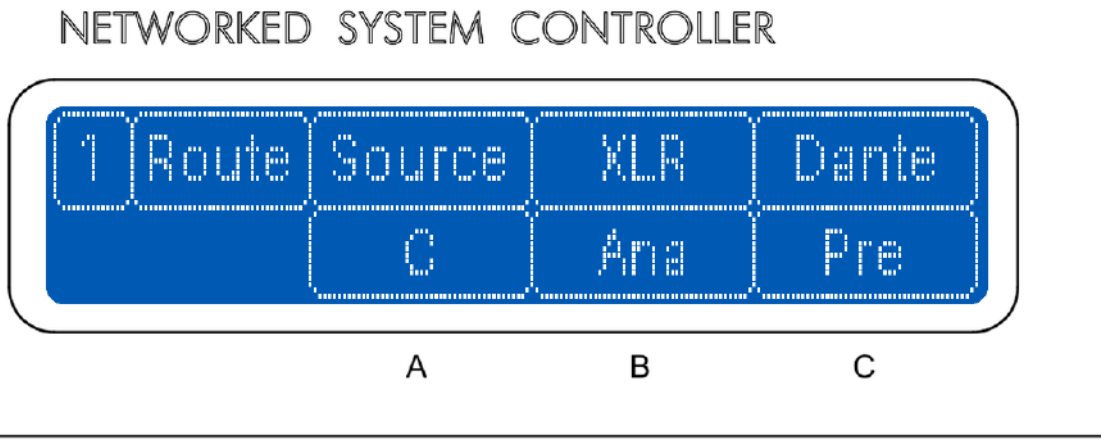
1. Access Output Route Menu
    a. Press OUTPUT button
    b. Select specific output (1-8)
    c. Navigate to "ROUT" page



2. Assign DSP Source
   a. Rotate Encoder A to select input source
   b. Options: A, B, C, D, or None
   c. Maintains Drive Module integrity



3. If using Dante outputs, choose the pick-off point in the DSP path you want to route to the Dante output.



IMPORTANT
Manual routing changes may break Drive Module relationships. Always verify module structure after manual adjustments.

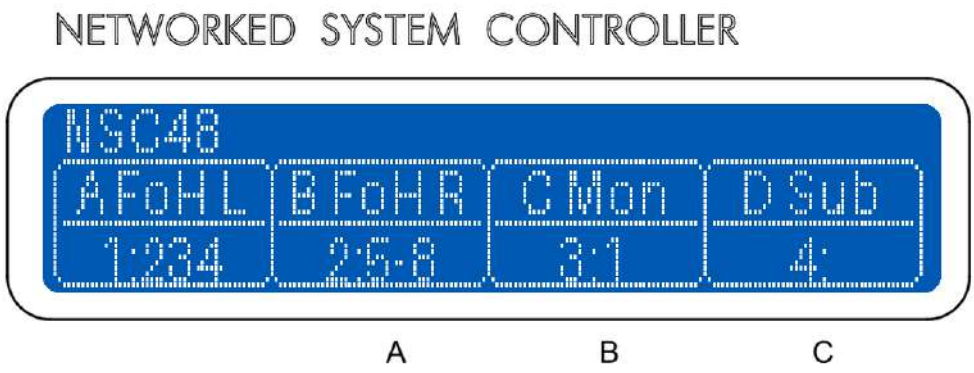
Storing and Recalling Presets

The NSC Digital Signal Processor's comprehensive preset system ensures quick setup and consistent performance across venues and applications.

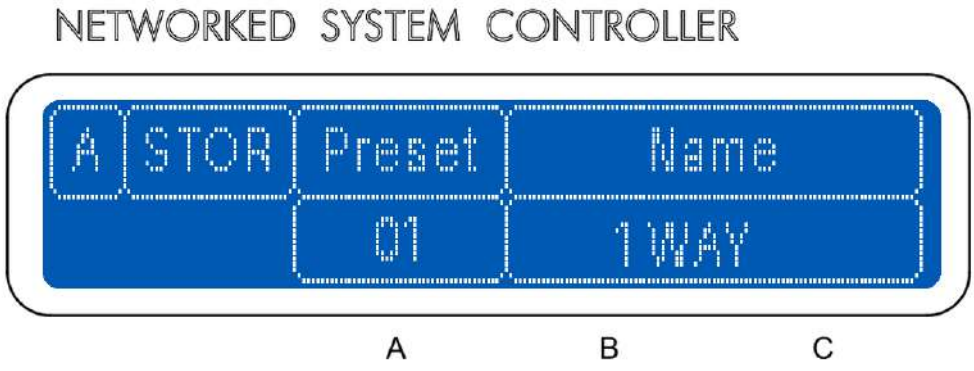
Module Preset Storage

Save your carefully crafted Drive Module configurations for future use:

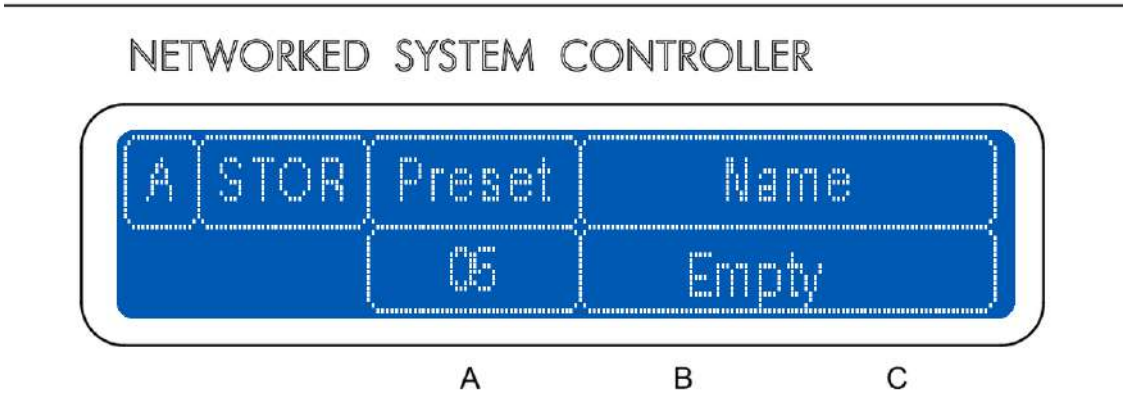
1. Prepare for Storage
   a. Complete all parameter adjustments
   b. Verify routing configuration
   c. Test system performance
   d. Ensure outputs are consecutive (required for module presets)



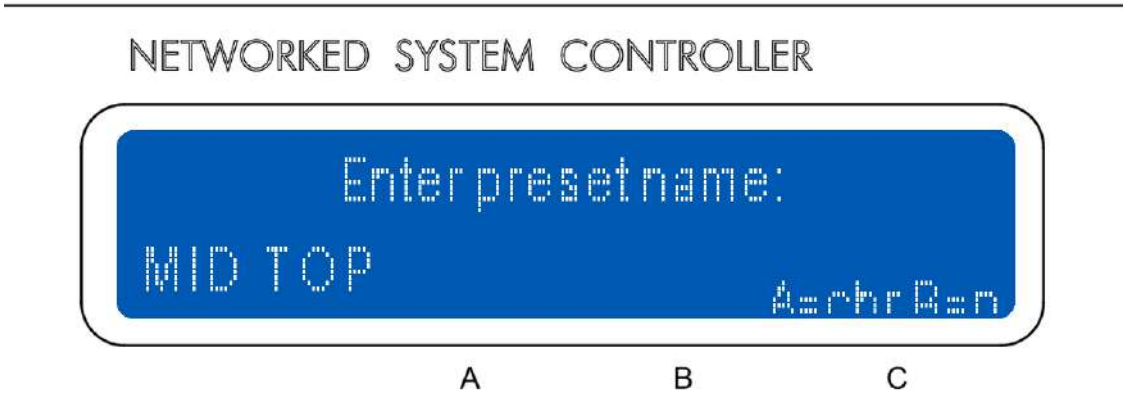
2. Access Storage Function
   a. Press INPUT button
   b. Select the input channel containing your module
   c. Navigate to "STOR" page using ▼ button



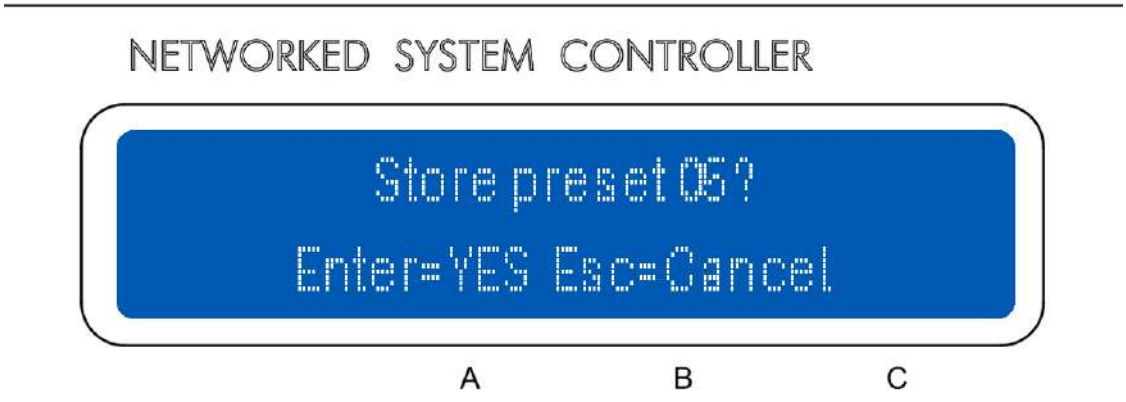
3. Select Preset Location
   a. Rotate Encoder A to choose location (1-50)
   b. Locked presets show padlock symbol (cannot overwrite)
   c. Empty locations show "Empty"
   d. Existing presets display their names

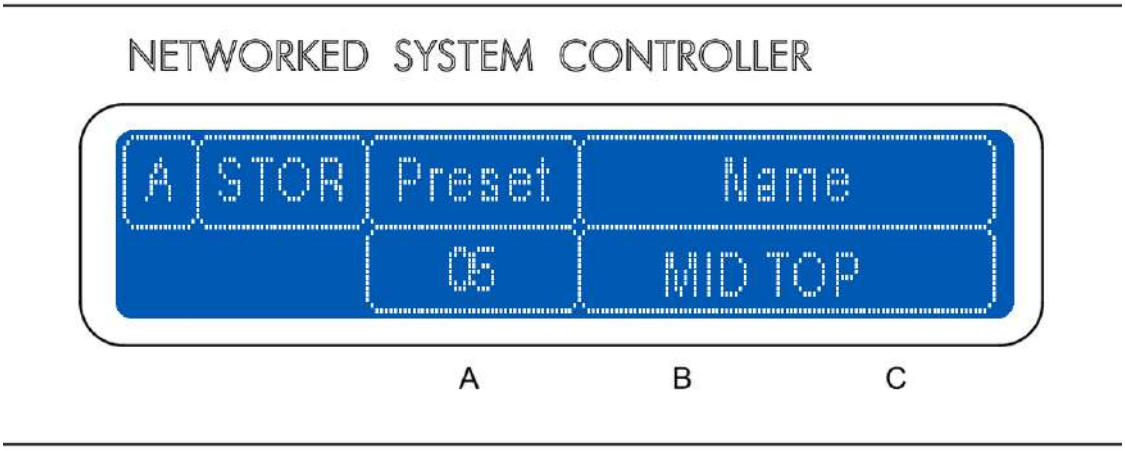


4. Name Your Preset
   a. Press ENTER to enable naming
   b. Character to edit becomes highlighted
   c. Rotate Encoder C to change the character
   d. Rotate Encoder B to move the cursor position
   e. Maximum 16 characters



5. Confirm Storage
   a. Press ENTER after naming
   b. Display shows "Enter to confirm or ▼ to exit"
   c. Press ENTER to store
   d. "Stored" confirmation appears briefly

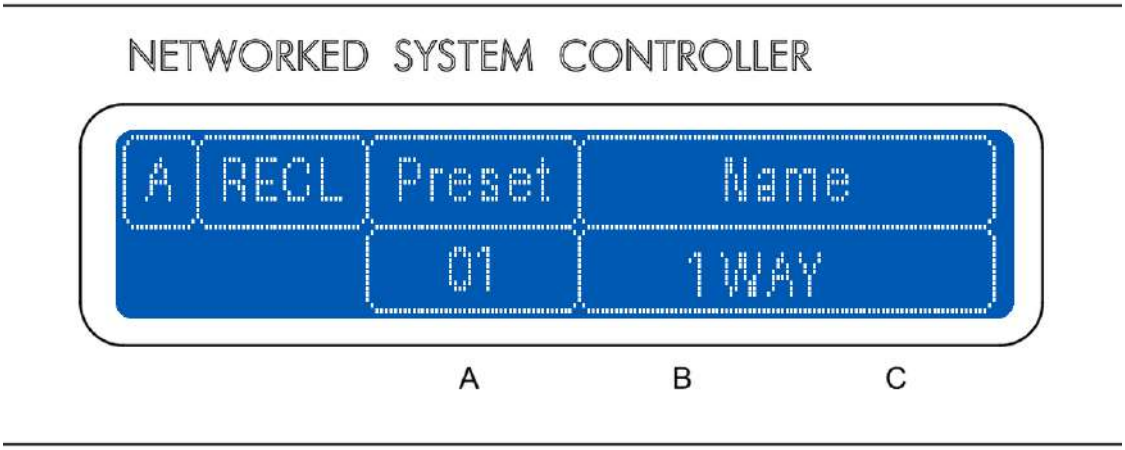




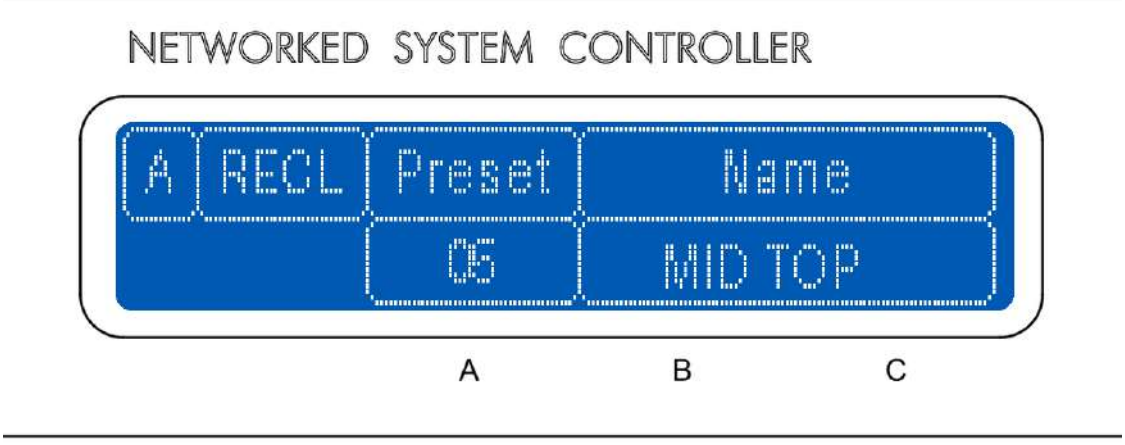
Module Preset Recall

Load existing presets to quickly configure your system:

1. Access Recall Function
   a. Press INPUT button
   b. Select target input channel
   c. Navigate to "RECL" page

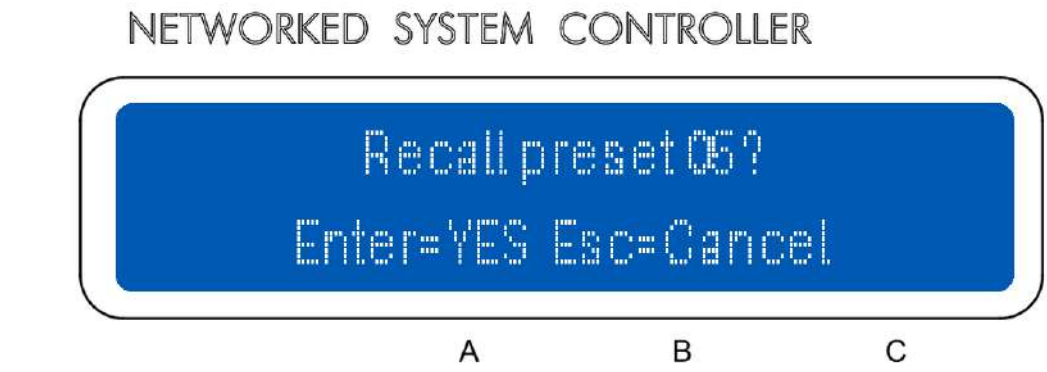


2. Browse Available Presets
   a. Rotate Encoder A to scroll through presets
   b. Display shows: Number • Name • Size
   c. Size indicates number of outputs (2x, 3x, 4x)



3. Load Preset
   a. Press ENTER when desired preset is selected

b. Confirm with ENTER again
c. Module automatically configures
d. Previous routing is replaced

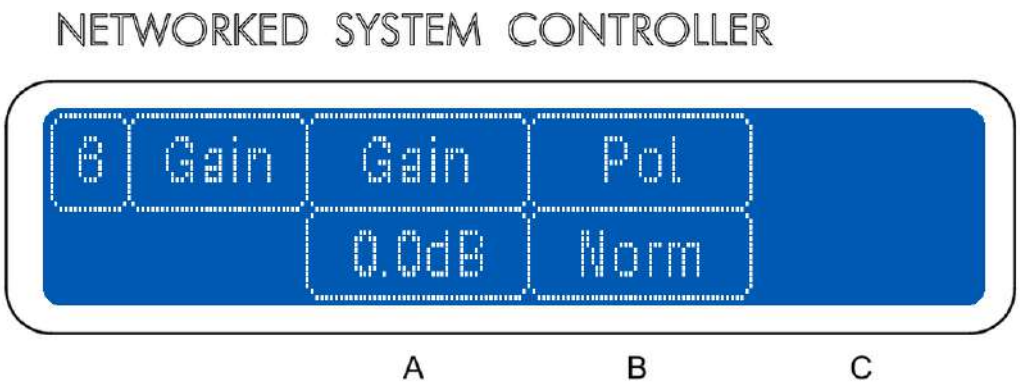


Component Preset Operations

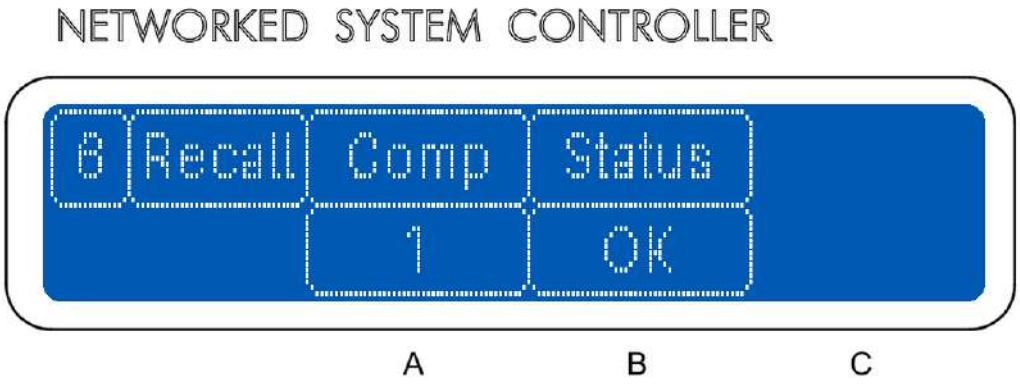
Component presets offer granular control over individual outputs:

Recalling Components:

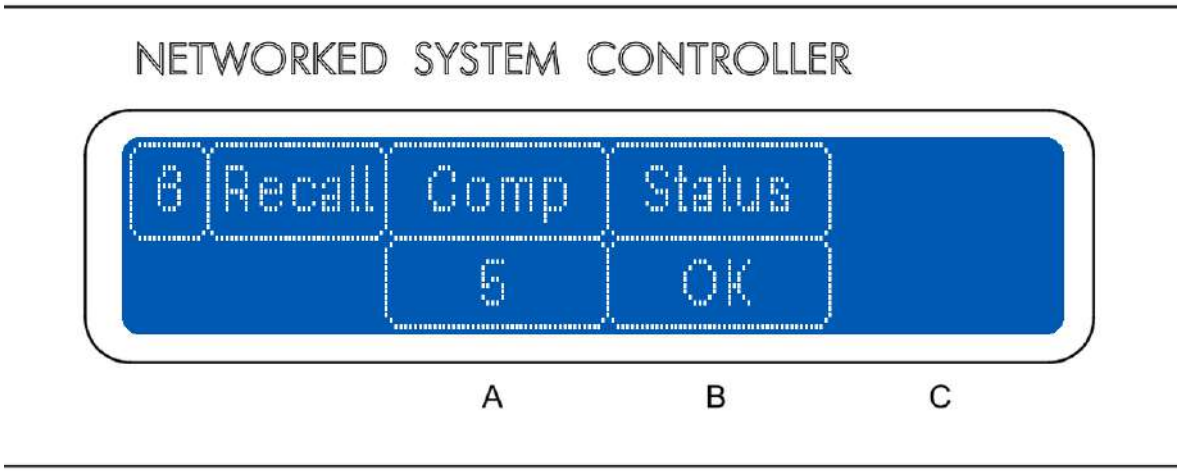
1. Press OUTPUT button
2. Select target output channel



3. Navigate to "RECL" page



4. Browse using Encoder A (shows: Module.Component)



5. Press ENTER twice to load

Component Applications:

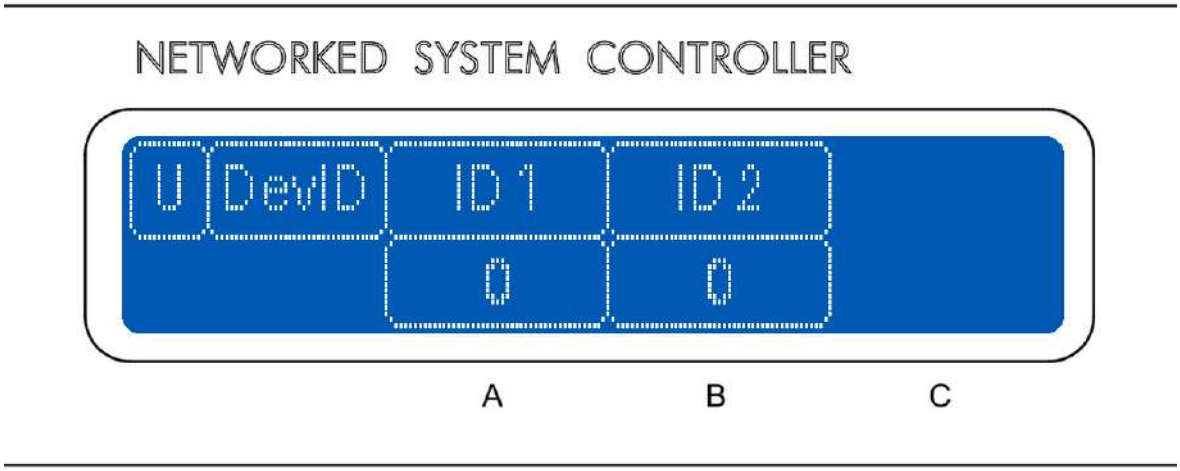
- Mix and match drivers from different systems
- Create asymmetric configurations
- Replace individual driver settings
- Build custom hybrid systems

Snapshot Management

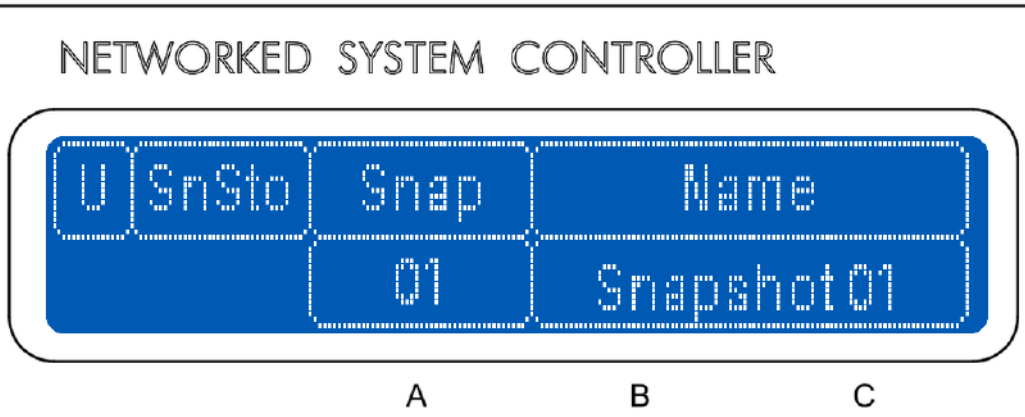
Snapshots capture complete system states:

Storing Snapshots:

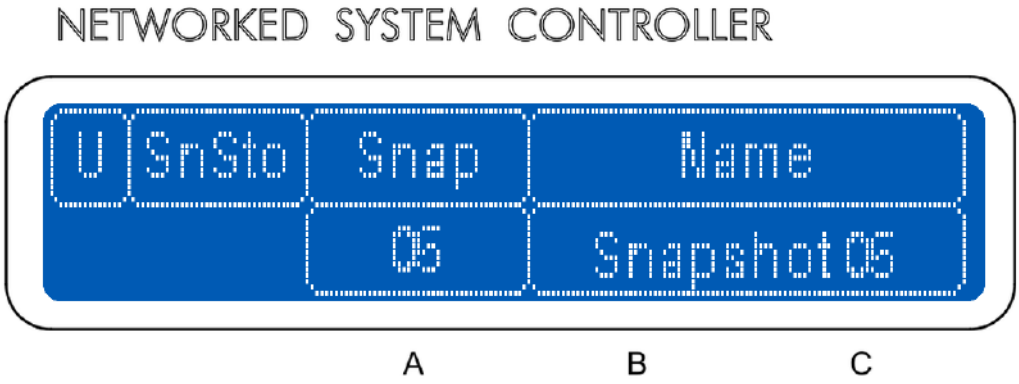
1. Press UTILITY button



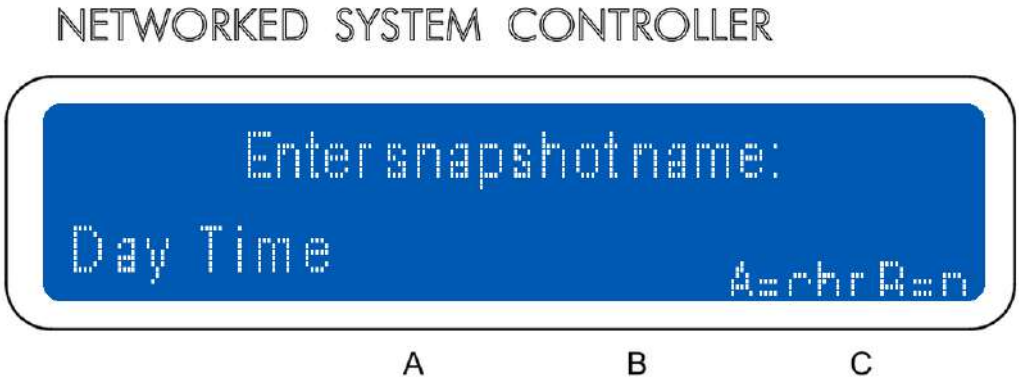
2. Navigate to "Store Snap"



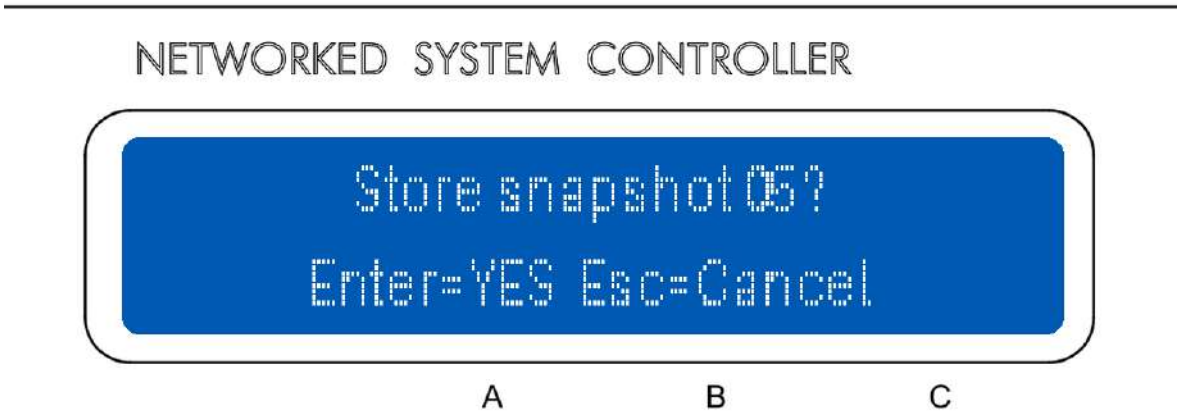
3. Select location (1-20)

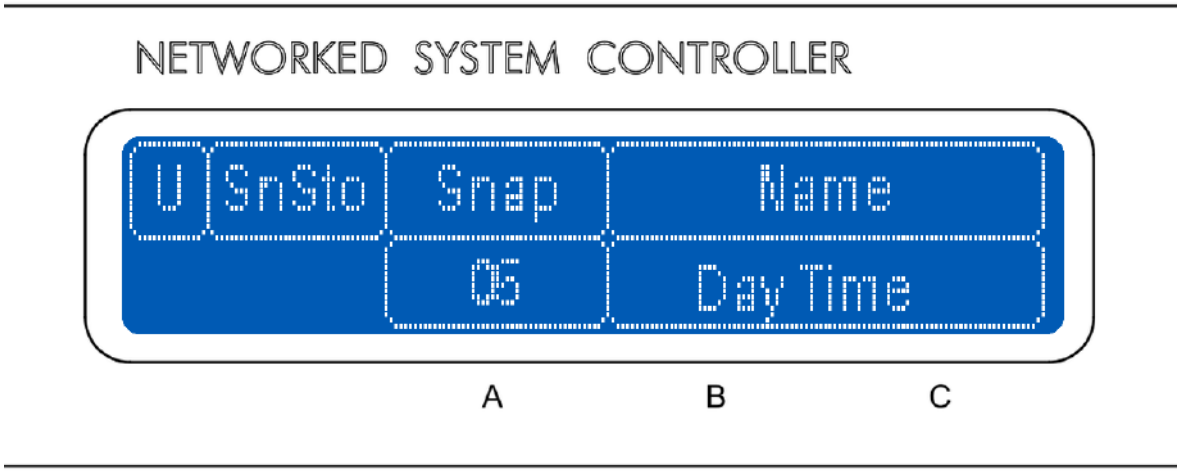


4. Name snapshot (optional)



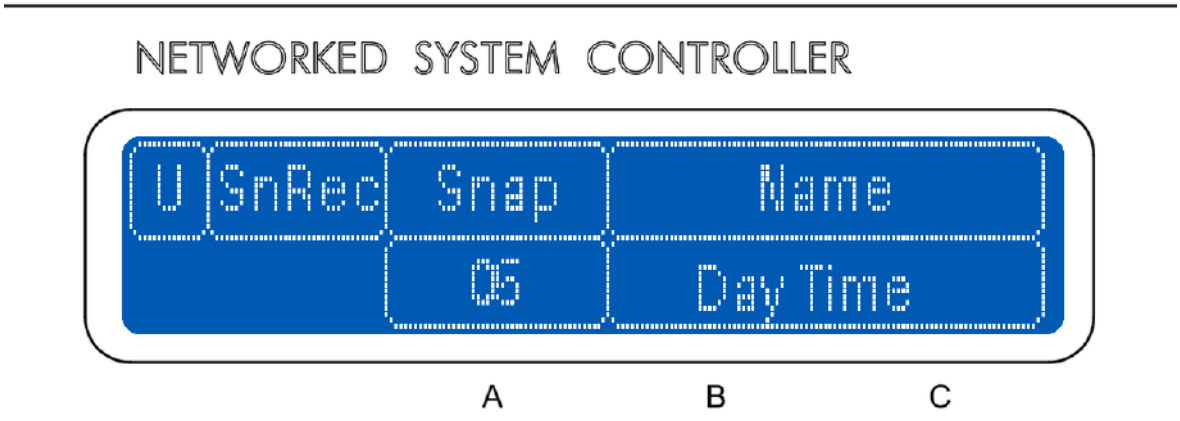
5. Press ENTER to store



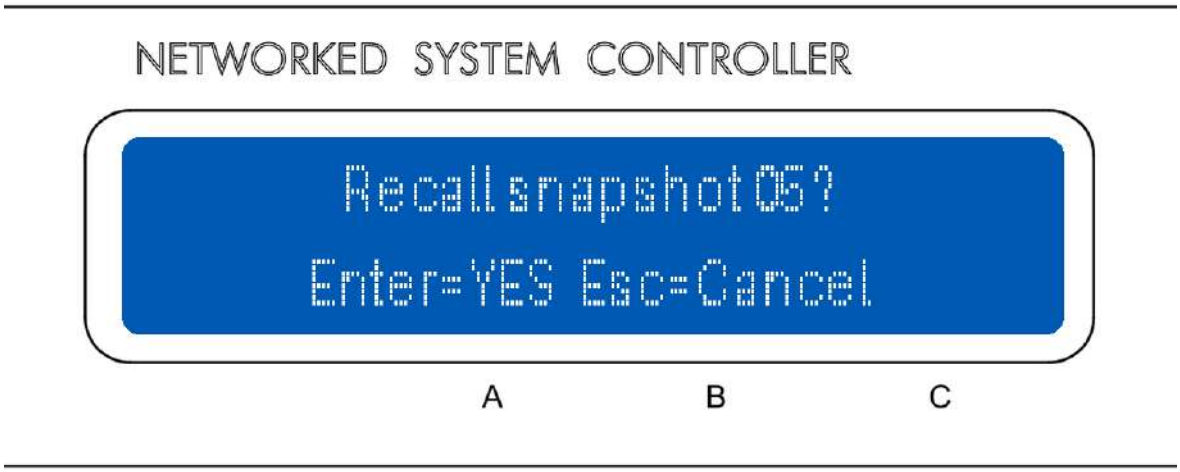


Recalling Snapshots:

1. Via front panel: Utility → Recall Snap
2. Select Snapshot



3. Press Enter to Recall



It is also possible to recall Snapshots via the AUX port with external switching, as well as via the System Engineer 8 control software.

Snapshot Contents:

- All Drive Module assignments
- Complete routing configuration
- Input/Output component numbers
- System-wide settings
- AES3/Analogue selections

NOTE
Snapshots reference component numbers rather than storing actual parameters. This allows preset updates without restoring snapshots.

Input Configuration

The NSC Digital Signal Processor separates physical inputs from DSP channels, enabling flexible signal routing and redundancy configurations essential for professional installations.

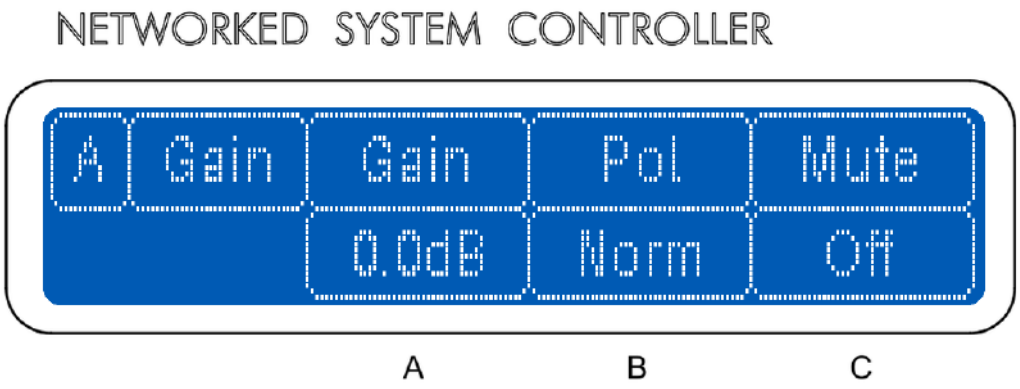
Input Selection & Routing

Each physical input can operate in different modes:

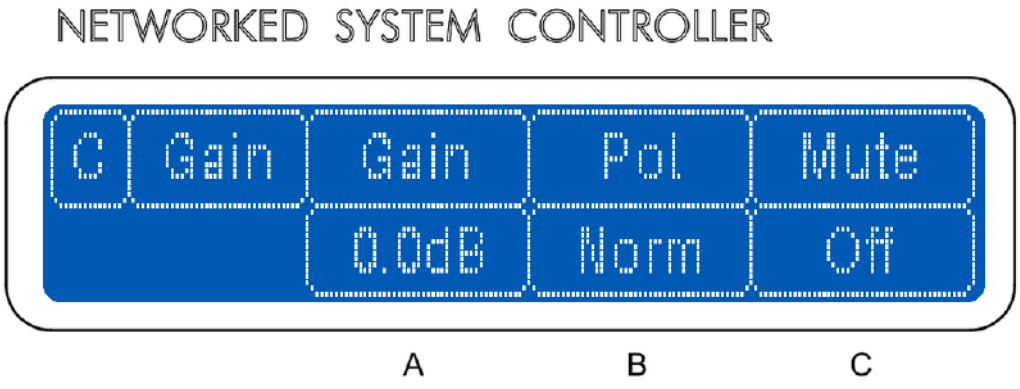
1. Analogue Mode (Default)
   - Balanced audio via XLR
   - Independent channels 1-4
   - +20dBu maximum input capability
2. AES3 Digital Mode
   - Channels paired (1&2, 3&4)
   - Odd-numbered XLR carries both channels
   - Automatic sample rate detection (28-108kHz)
   - Internal processing at 96kHz
3. Dante Network Audio (Optional)
   - 4 receive channels available
   - Configurable channel mapping
   - Primary/secondary network redundancy

Configuring Input Types

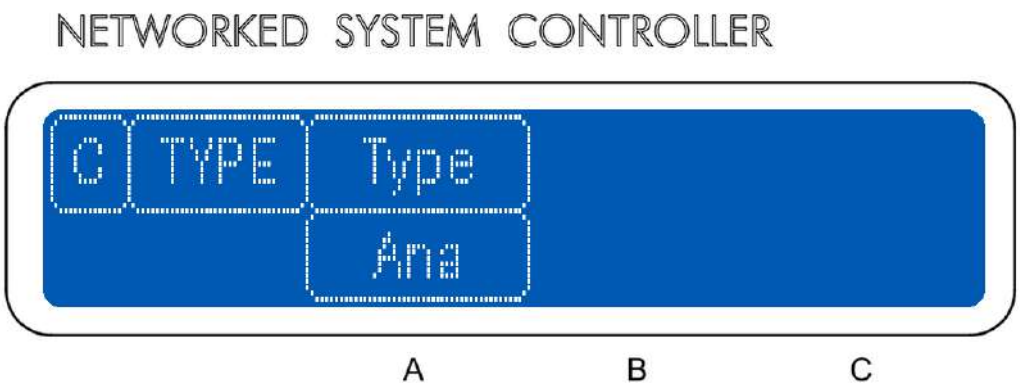
1. Press INPUT button



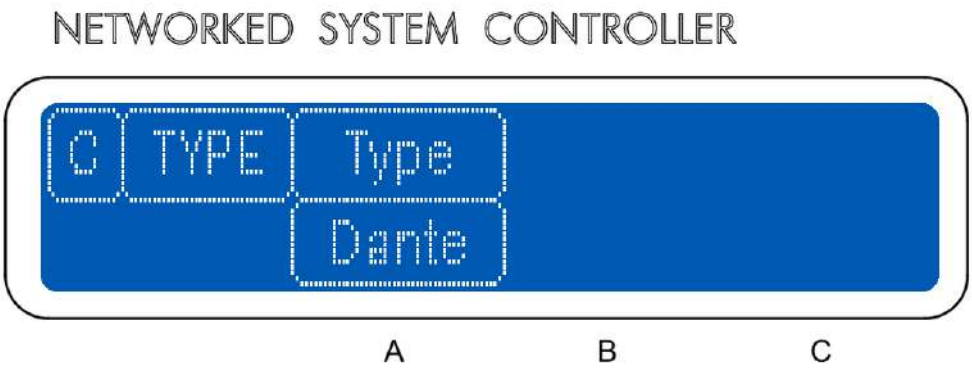
2. Select desired channel (A-D)



3. Navigate to "TYPE" page



4. Rotate Encoder A to select:
   a. Analogue
   b. AES3
   c. Dante (if fitted)



Automatic Fallover Configuration

The Input Source Fallover options allow users to configure redundant audio sources that will switch over when the primary audio source is interrupted or lost. There are three components to Fallover: Failover Mode, Fallover Detect, and Fallback Speed.

Fallover Mode

The Fallover Mode determines the order in which the audio sources will Fallover. In Auto Mode, the sequence is Dante > AES > Analogue.

Fallover Detect

When a Dante Card is installed in the device, you will have two options for audio detection. Choosing ***Audio*** will detect the audio stream, and choosing ***Dante*** will detect the Dante Stream connection.

NOTE
The loss of the Dante stream connection can take up to 5 seconds to detect.

Fallback

Remember the following details: Fallback options determine how quickly the audio source will return to the primary source after being re-detected. The default setting is ***Auto***, which means the audio will immediately switch back to the primary source once re-detected. ***Slow*** will cause the audio to switch back after 5 minutes. In ***Latch*** mode, the audio will not switch back automatically; the user must manually select the audio source when Fallover occurs in Latch mode.

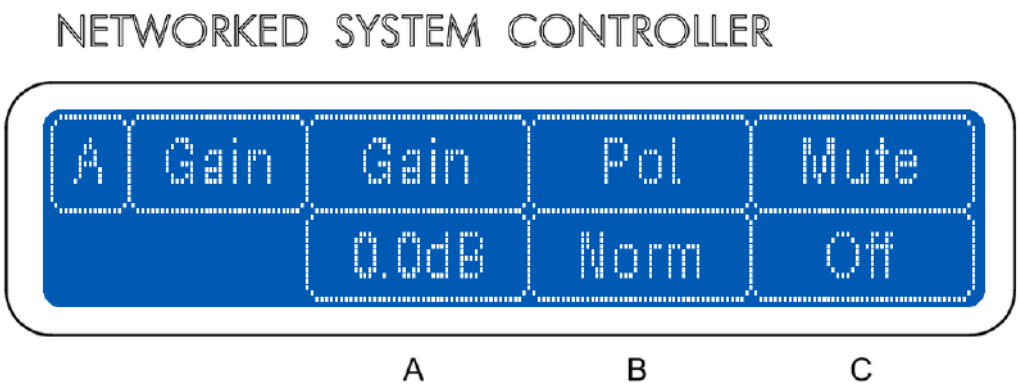
Protect against signal loss with intelligent source switching:

Available Fallover Modes:

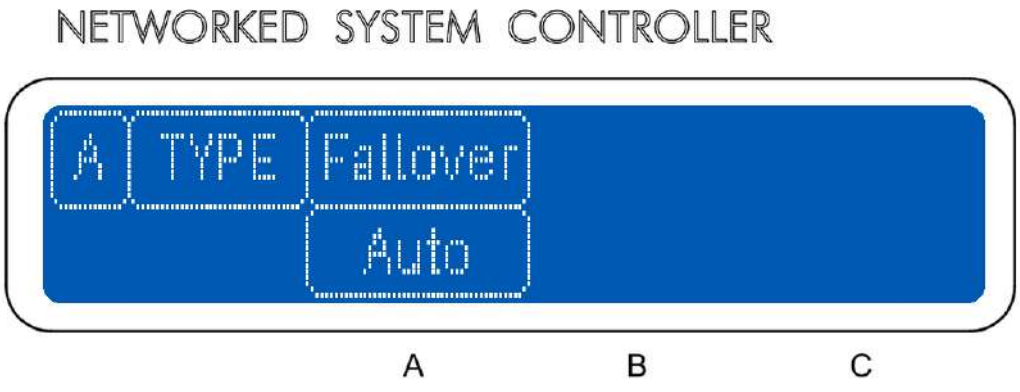
- Manual: User controls source selection
- Dante→AES3: Automatically switches to AES3 if Dante fails
- Dante→Analogue: Falls back to analogue on network failure
- AES3→Analogue: Reverts to analogue if digital signal lost

Configuration:

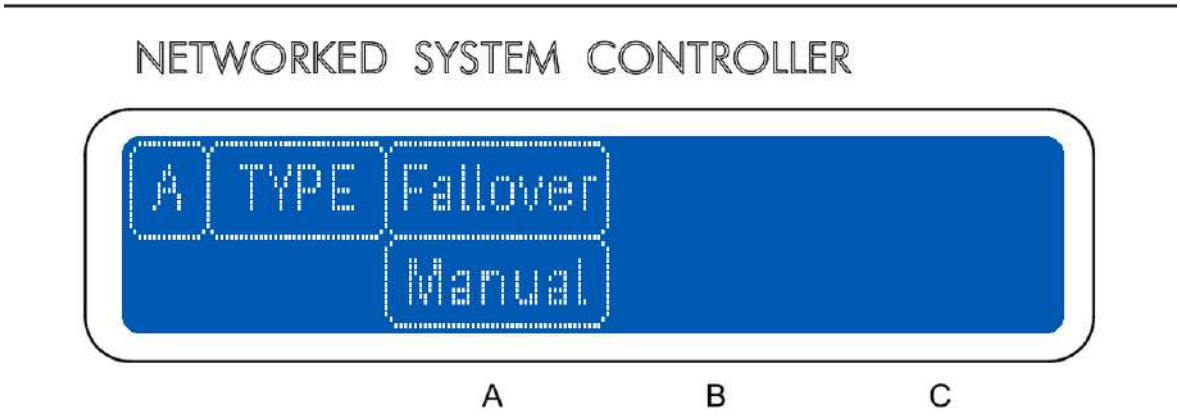
1. Press INPUT button.



2. Navigate to "TYPE" page



3. Rotate Encoder A to select the fallover type



4. System automatically manages switching

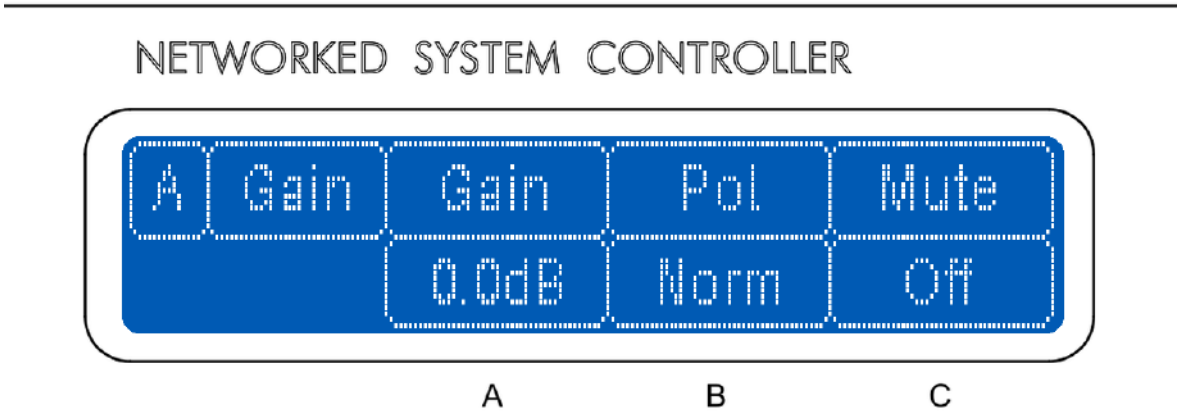
Gain Structure

Proper gain structure ensures optimal signal-to-noise ratio and prevents distortion throughout the signal chain.

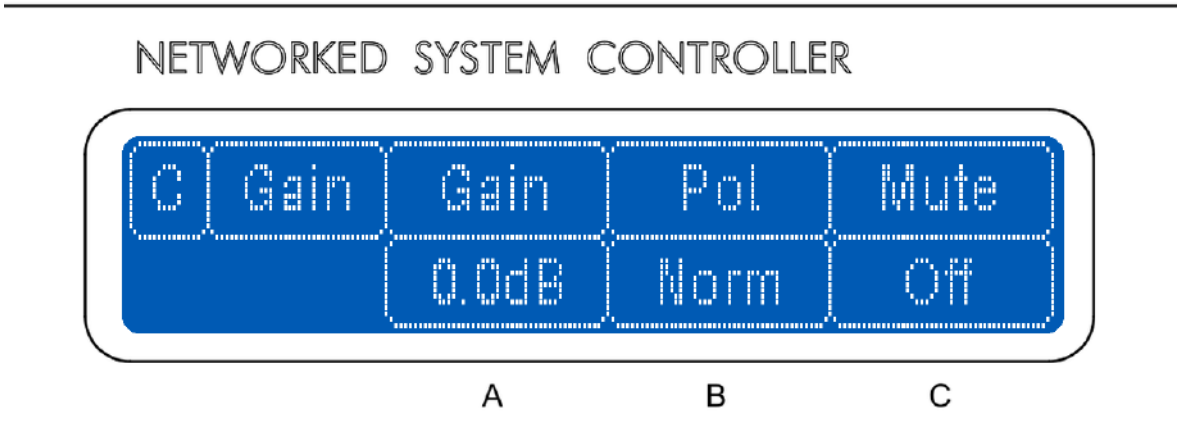
Input Gain Adjustment

Access the gain control:

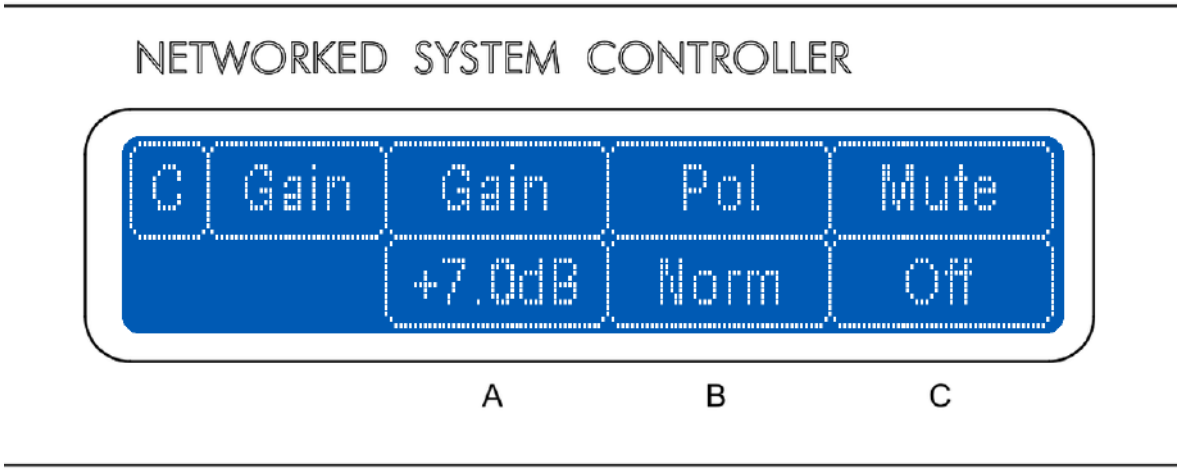
1. Press INPUT button



2. Select channel (A-D)



3. Navigate to "GAIN" page and use encode A to adjust Gain



Gain Parameters:

- Range: -40dB to +20dB
- Resolution: 0.2dB steps
- Polarity: Normal/Reverse
- Mute: On/Off

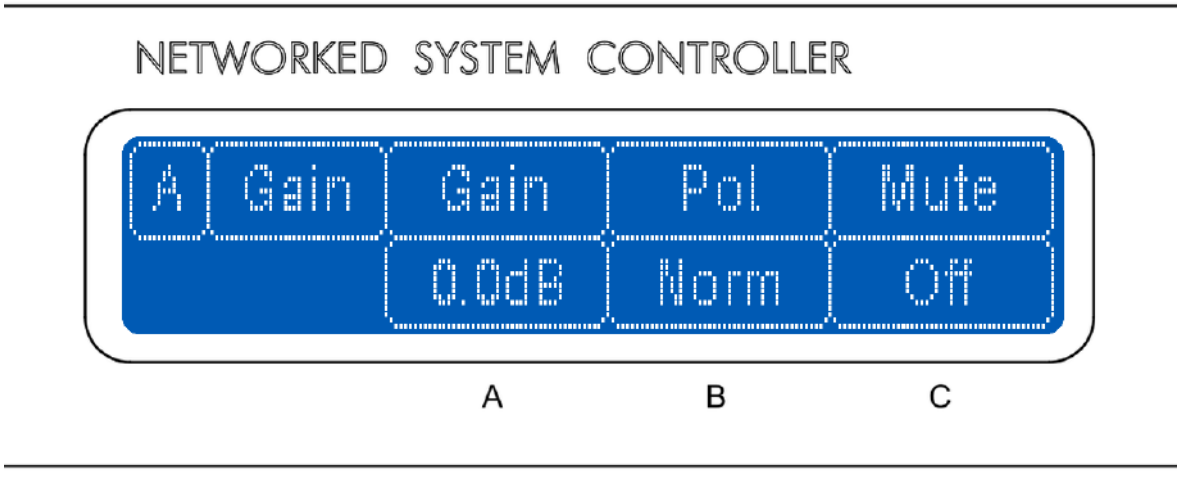
Setting Optimal Input Levels

1. Establish Reference Signal
   - Target: 0dBu indicator regularly illuminated
   - Peaks reaching +6dB acceptable
   - +12dB only on strongest transients
2. Monitor Input Meters
   - Green indicators: Safe operating range
   - Yellow indicators: Approaching maximum
   - Red (CLIP): Reduce input gain immediately
3. Digital Input Calibration
   - AES3 Trim: Align digital reference to analogue
   - Common settings:
     - 0dBFS = +24dBu: Set trim to +4dB
     - 0dBFS = +20dBu: Set trim to 0dB
     - 0dBFS = +18dBu: Set trim to -2dB

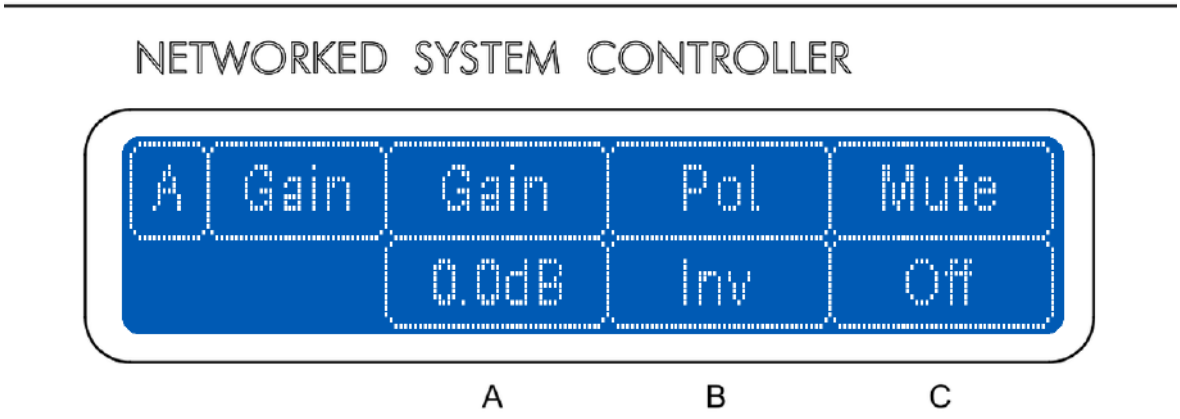
Polarity and Phase Management

Polarity Control. Each input features independent polarity switching:

1. Access via GAIN page (Encoder B)



2. Options: Normal (0°) or Reverse (180°)



3. Applied before all other processing

Applications:

- Correct reversed wiring
- Align multiple loudspeaker arrays
- Compensate for driver mounting differences

EQ and Filtering

System High-Pass Filtering

Protect loudspeakers and improve headroom with appropriate high-pass filtering at the input stage.

Filter Types Available:

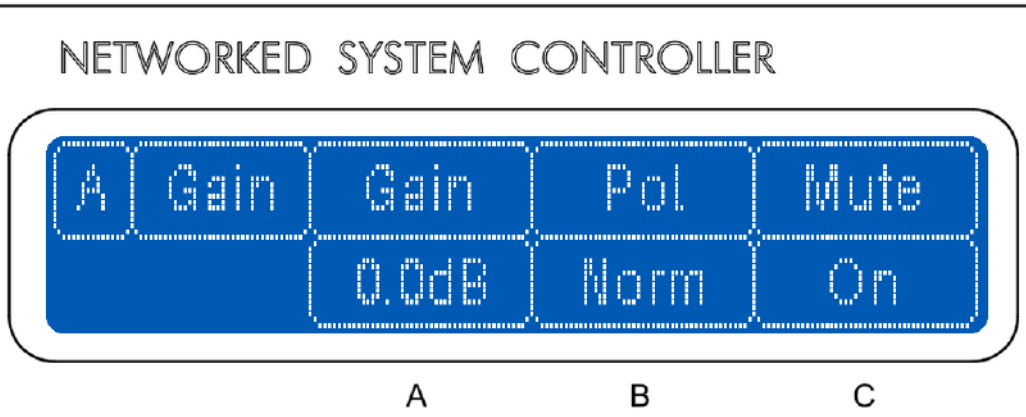
- Butterworth: Maximally flat passband response
- Linkwitz-Riley: Superior crossover summing
- Bessel: Linear phase in passband
- Hardman: Aggressive roll-off
- 1st Order: 6dB/octave gentle slope

Filter Slopes:

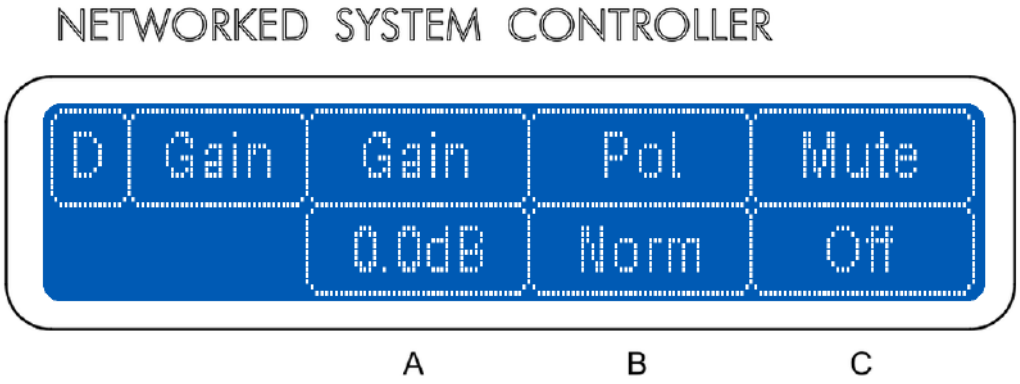
- 6dB/octave (1st order)
- 12dB/octave (2nd order)
- 18dB/octave (3rd order)
- 24dB/octave (4th order)

Configuration:

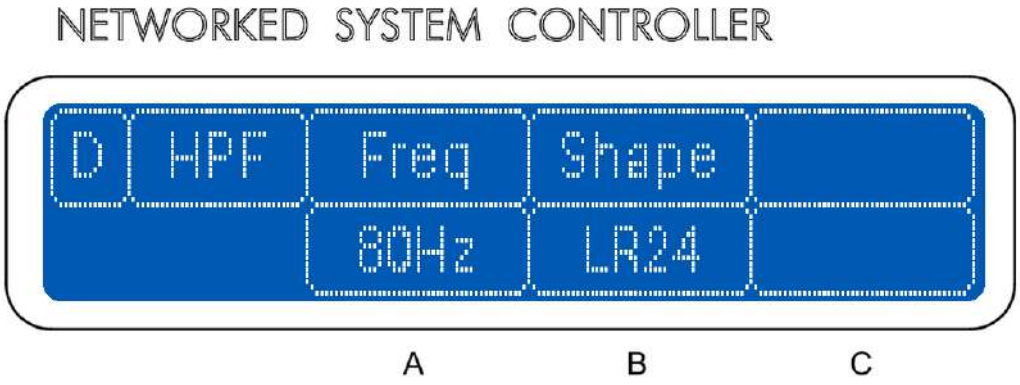
1. Press INPUT



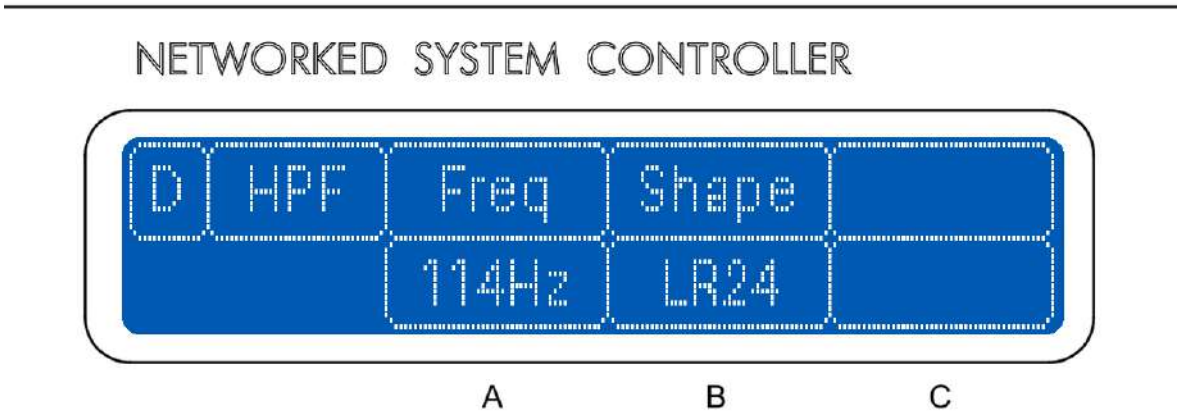
2. Select the Input you want to work with



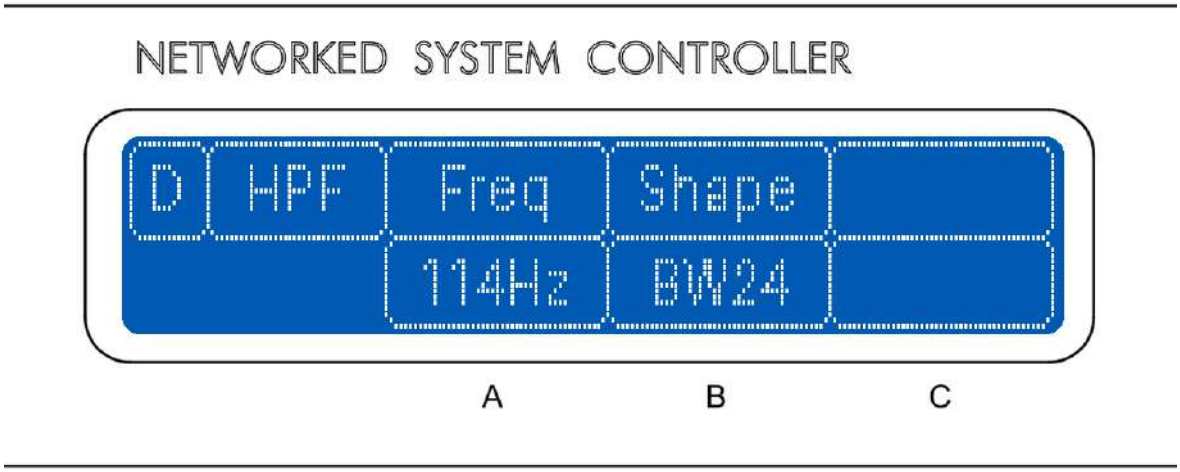
3. Navigate to "HPF" page



4. Set frequency - Encoder A



5. Select filter type - Encoder B



FIR Shelving Equalisation

The NSC Digital Signal Processor includes advanced linear-phase shelving EQ for system voicing without phase distortion.

Characteristics:

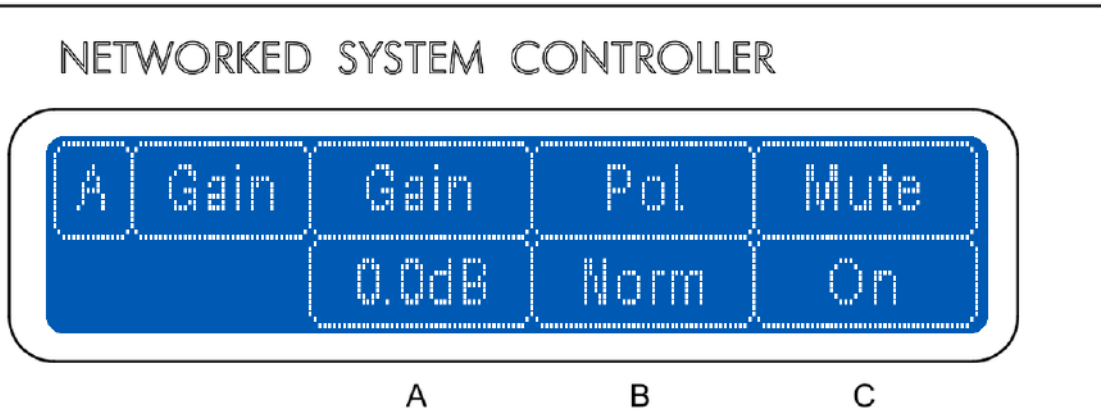
- Type: High-shelf only
- Frequency range: 2kHz-20kHz
- Gain range: ±15dB
- Processing: Linear phase FIR
- Latency: 0.6ms when enabled

Applications:

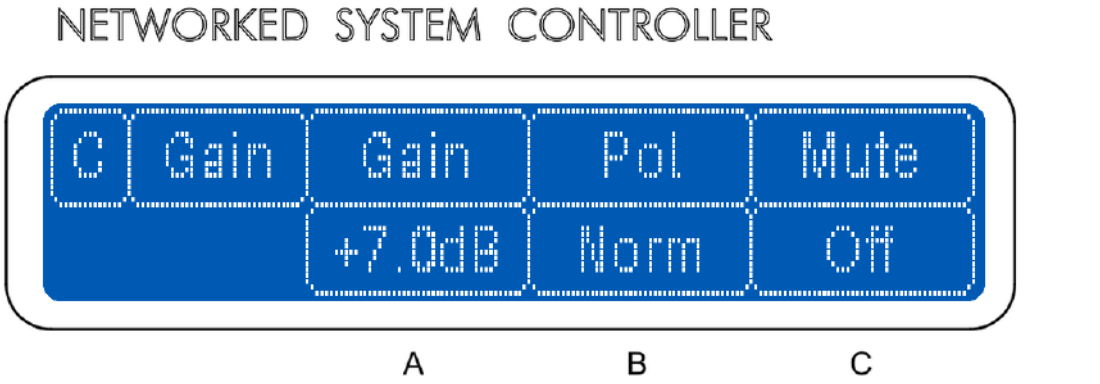
- HF absorption compensation
- Array throw equalisation
- Room correction
- System voicing

Configuration:

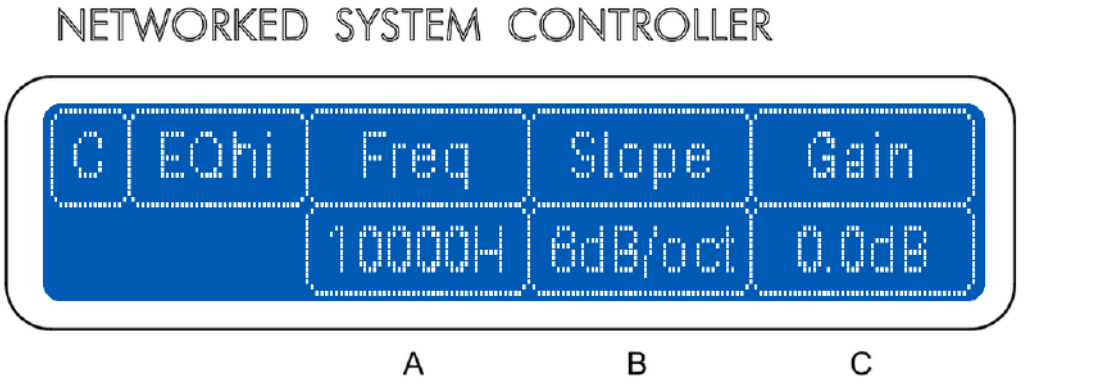
1. Press INPUT



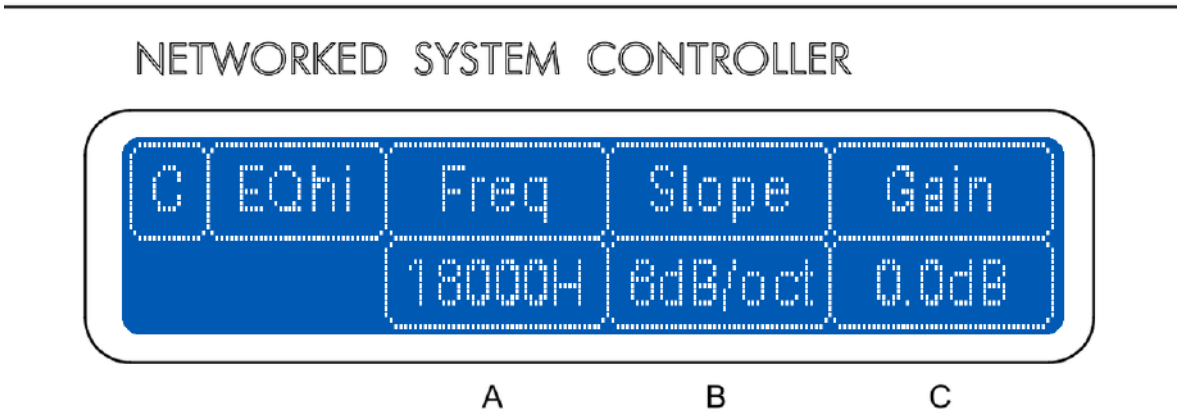
2. Select the Input you want to work with



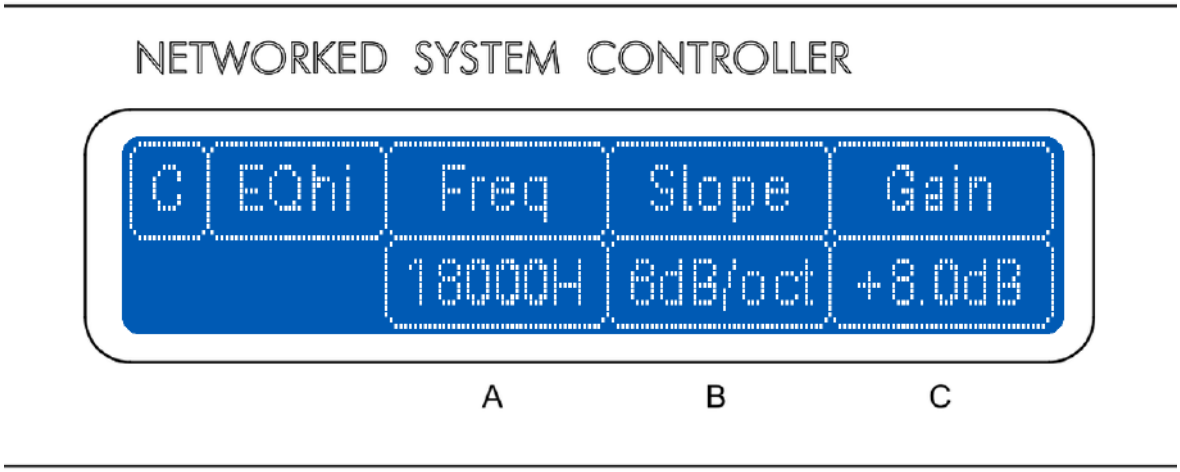
3. Navigate to "Eq HighShelf" page



4. Set frequency - Encoder A



5. Adjust gain - Encoder C



IMPORTANT
FIR EQ adds latency only when enabled. Set to "Off" when not required to minimise system latency.

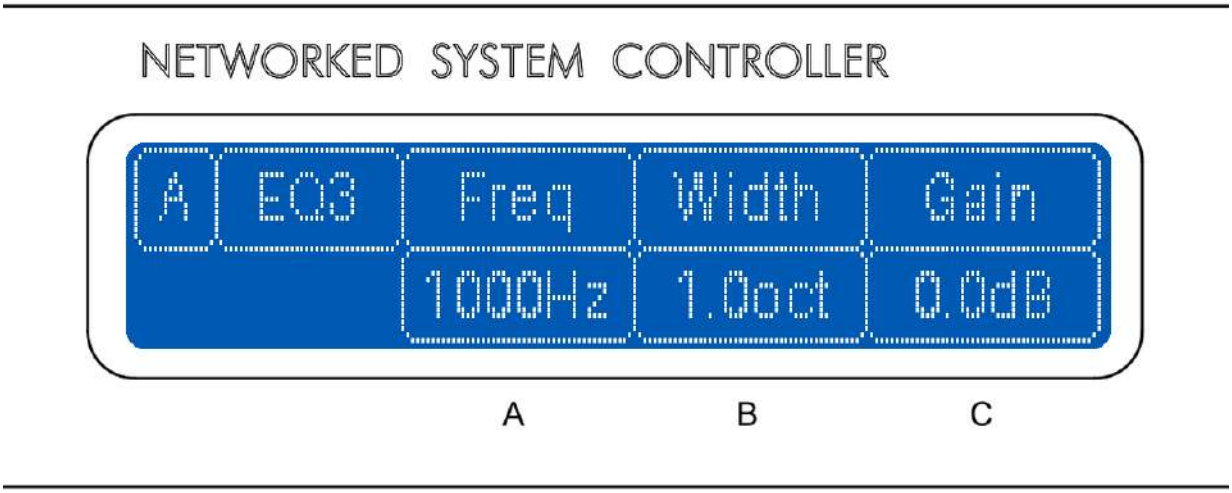
Parametric Equalisation

Nine bands of parametric EQ provide precise tonal control:

Input EQ Structure:

- Bands 1-2: Shelving filters (Low/High)
- Bands 3-8: Full parametric filters

Parametric Filter Controls:



- Frequency: 20Hz to 25.6kHz
- Bandwidth: 0.05 to 5.2 octaves (or Q: 0.3-28)
- Gain: ±15dB in 0.2dB steps

Filter Types:

- Bell (standard parametric)
- High-shelf
- Low-shelf
- Notch (infinite attenuation)

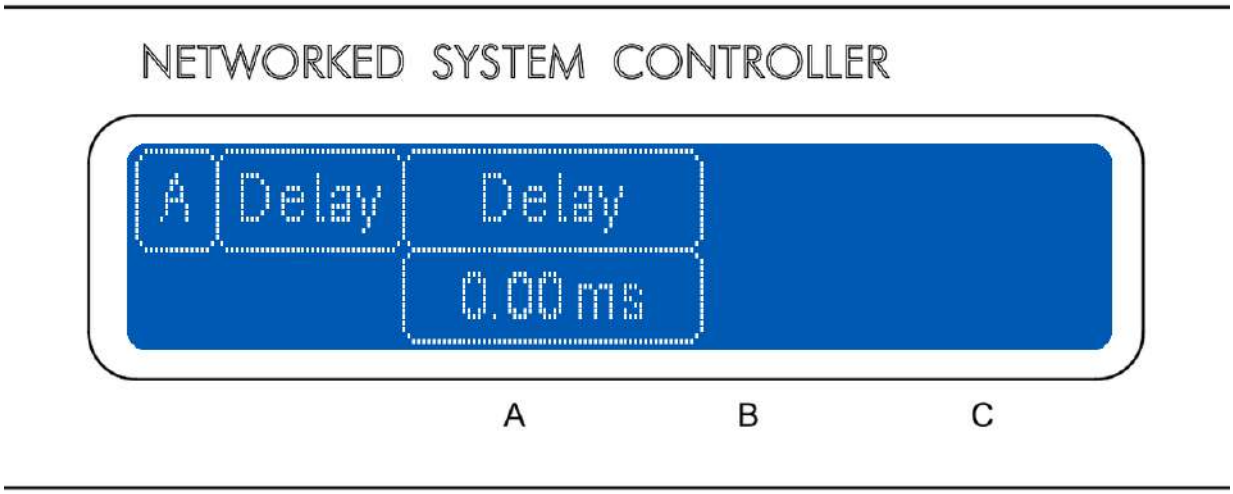
EQ Best Practices:

1. Corrective EQ First
   - Address room modes
   - Eliminate feedback frequencies
   - Compensate for acoustic issues
2. Creative EQ Second
   - System voicing
   - Tonal balance
   - Musical enhancement

System Delay Configuration

Time alignment ensures coherent arrival from multiple sources and compensates for physical positioning differences.

Input Delay Specifications:



- Range: 0 to 998 milliseconds
- Resolution: Variable (finer at lower values)
- Conversion: 1ms = 343mm at 20°C

Common Applications:

Delay Towers/Fills - Calculate required delay:

1. Measure distance from main PA to delay position
2. Add delay = distance(m) × 2.91ms/m
3. Fine-tune by ear or measurement

Front Fill Alignment - Align with main system:

1. Measure main PA to front fill distance
2. Subtract stage lip to front fill distance
3. Apply difference as delay

Video Synchronisation - Common video delay compensation:

1. IMAG systems: 40-80ms typical
2. Broadcast: 100-150ms possible
3. LED walls: 20-40ms

Delay Groups and Zones

When using Module Groups with parameter overlays:

Group Delay Application:

- Base delay set in Drive Module
- Overlay adds/subtracts offset
- Total shown in square brackets []
- Maximum combined: 998ms

Output Configuration

Crossover Setup

The NSC Digital Signal Processor offers comprehensive crossover filtering options, each with distinct characteristics suited to different applications.

Available Filter Types:

Butterworth

- Maximally flat magnitude response in passband
- -3dB at crossover frequency
- Good all-round performance
- Slopes: 18, 24octave

Linkwitz-Riley

- -6dB at crossover frequency
- Perfect magnitude summing when combined
- Industry standard for most applications
- Slopes: 12, 24, 48dB/octave

Bessel

- Linear phase response in passband
- Gentle transient response
- Less steep roll-off than other types
- Slopes: 12, 18, 24dB/octave

Hardman

- Elliptical filter response
- Extremely steep roll-off
- Specified by order rather than slope
- Orders: 4th, 8th

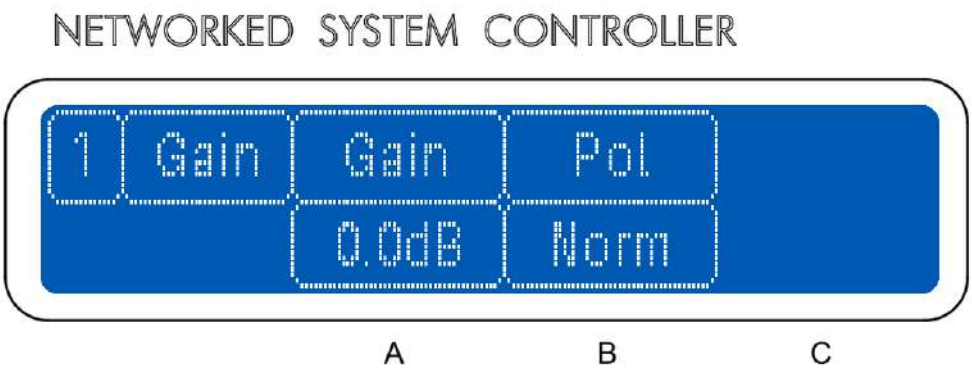
LIR (Linear Impulse Response) - Unique to Linea Research

- True linear phase throughout
- Zero group delay distortion
- Maintains transient accuracy
- Similar to 24dB/octave Linkwitz-Riley shape
- Ideal for critical applications

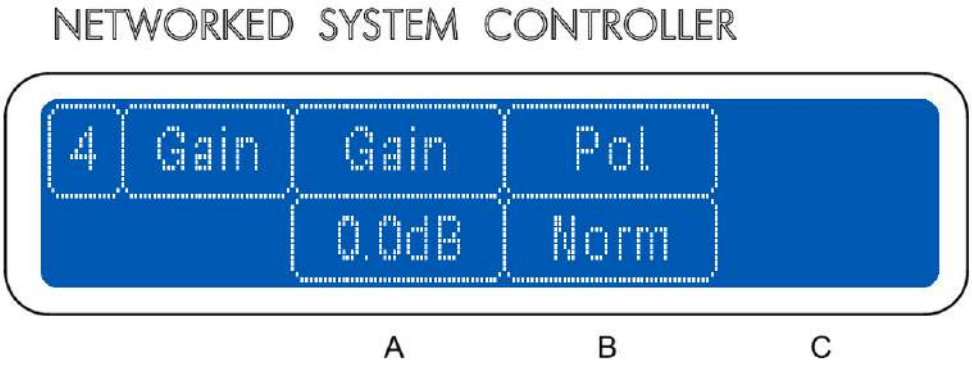
Configuring Crossover Filters

High-Pass Filter Setup

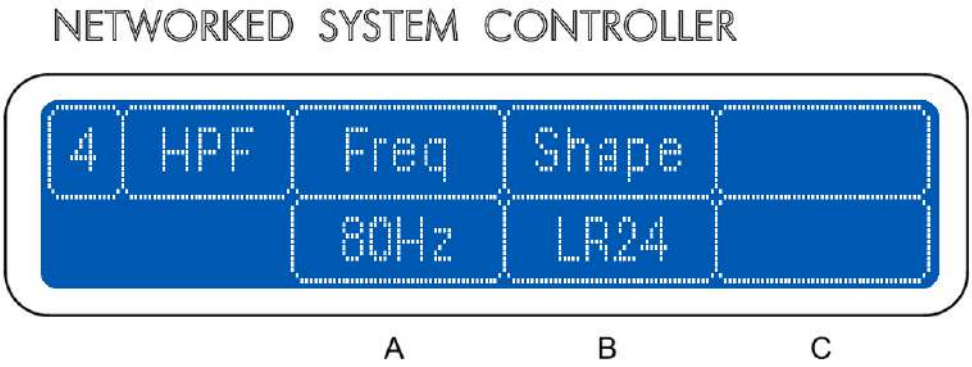
1. Access Filter Controls
   a. Press OUTPUT button



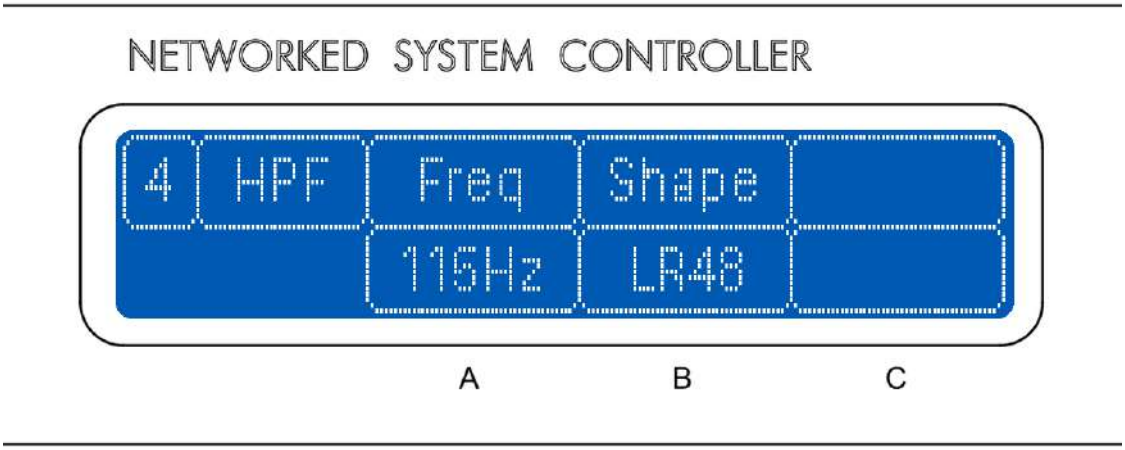
   b. Select output channel (1-8)



   c. Navigate to "HPF" page



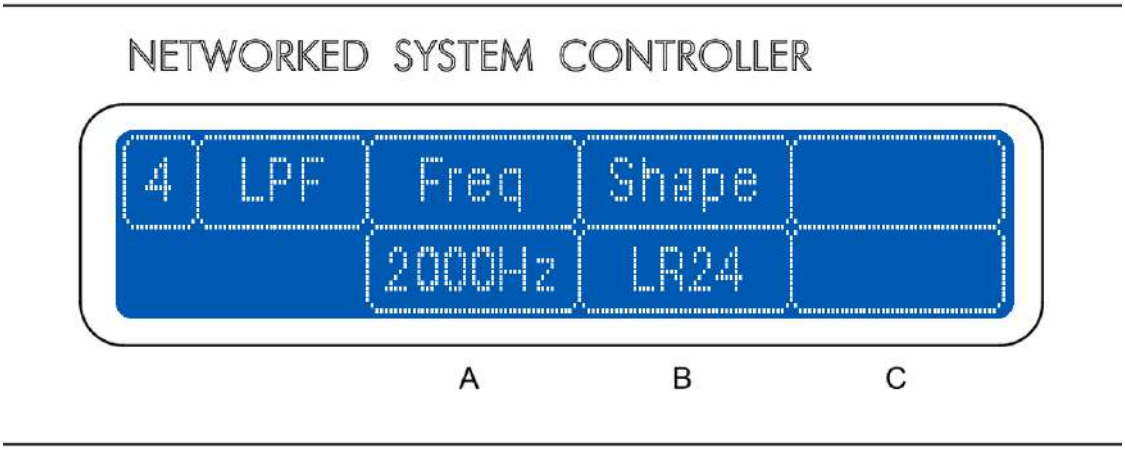
2. Set Parameters
   a. Frequency - Encoder A
   b. Filter type - Encoder B



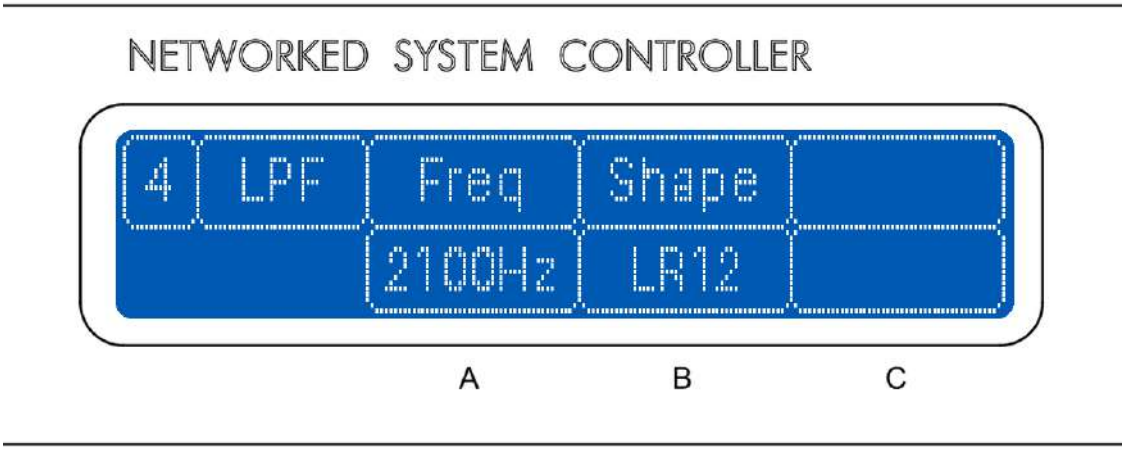
3. Typical Settings by Driver Type
   a. Subwoofer: 25-35Hz, 24dB/oct Butterworth
   b. Low-frequency: 80-120Hz, 24dB/oct Linkwitz-Riley
   c. Mid-frequency: 200-500Hz, 24dB/oct Linkwitz-Riley
   d. High-frequency: 1.2-2.5kHz, 24dB/oct Linkwitz-Riley

Low-Pass Filter Setup

1. Navigate to LPF Page
   - Same navigation as HPF



2. Configure Parameters
   a. Match filter types for proper summing
   b. Maintain phase coherence



IMPORTANT
Important Crossover Principles:

- Use matching filter types and slopes between adjacent drivers
- Linkwitz-Riley filters require matching slopes for flat sum
- Consider driver capabilities when setting frequencies
- Allow overlap for proper acoustic summing

LIR Linear Phase Crossovers

The NSC Digital Signal Processor's exclusive LIR technology eliminates group delay distortion inherent in conventional filters.

When to Use LIR:

- Multi-way systems requiring perfect impulse response
- Critical listening applications
- Broadcast and recording
- High-end installation systems

LIR Configuration:

1. Select "LIR" as filter type
2. Only 24dB/octave equivalent slope available
3. Automatic phase alignment between drivers
4. No manual phase adjustment required

Latency Considerations:

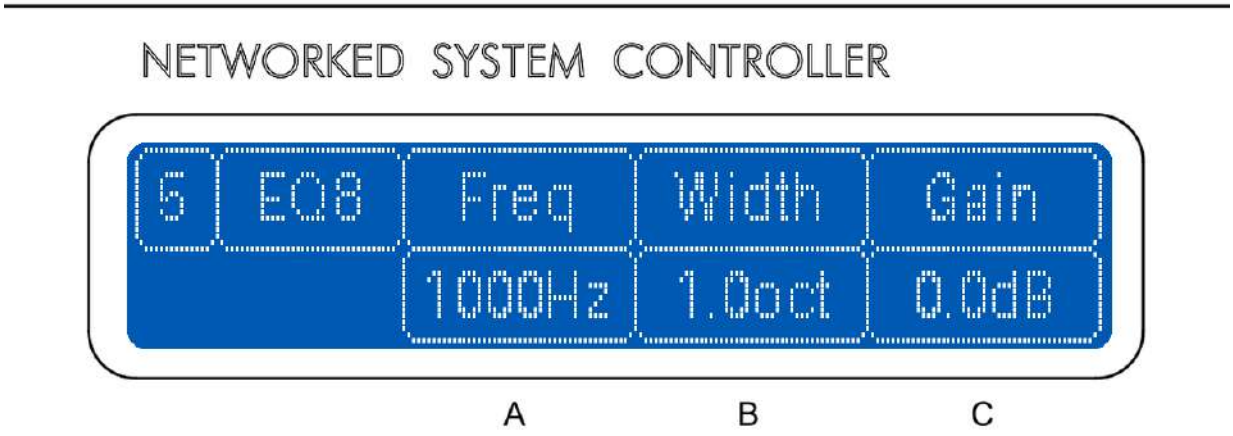
- LIR adds frequency-dependent latency
- Formula: 1.19ms per kHz of crossover frequency
- Maximum 30ms (automatically limited)
- All outputs in module aligned automatically

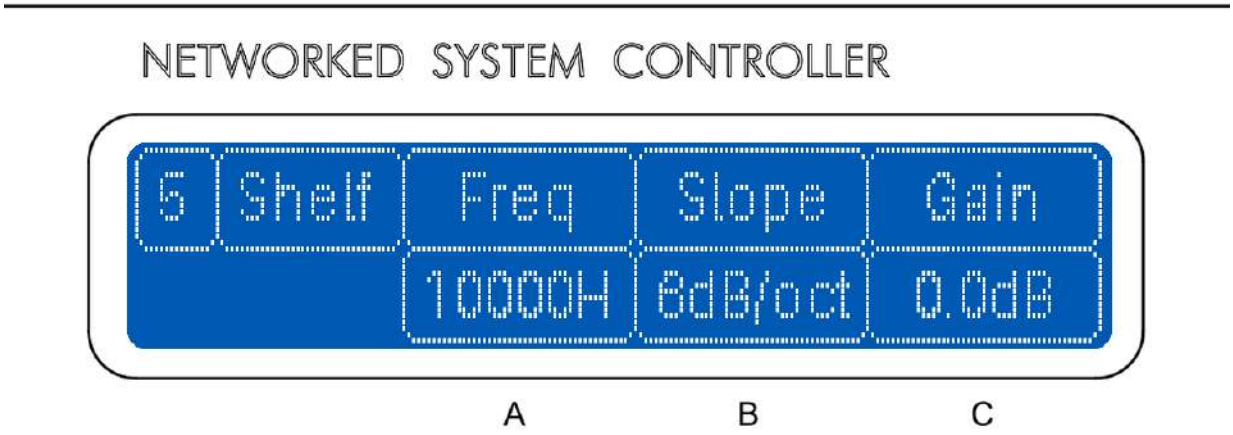
Note: For very low frequencies (<40Hz), LIR automatically reverts to Linkwitz-Riley to prevent excessive latency.

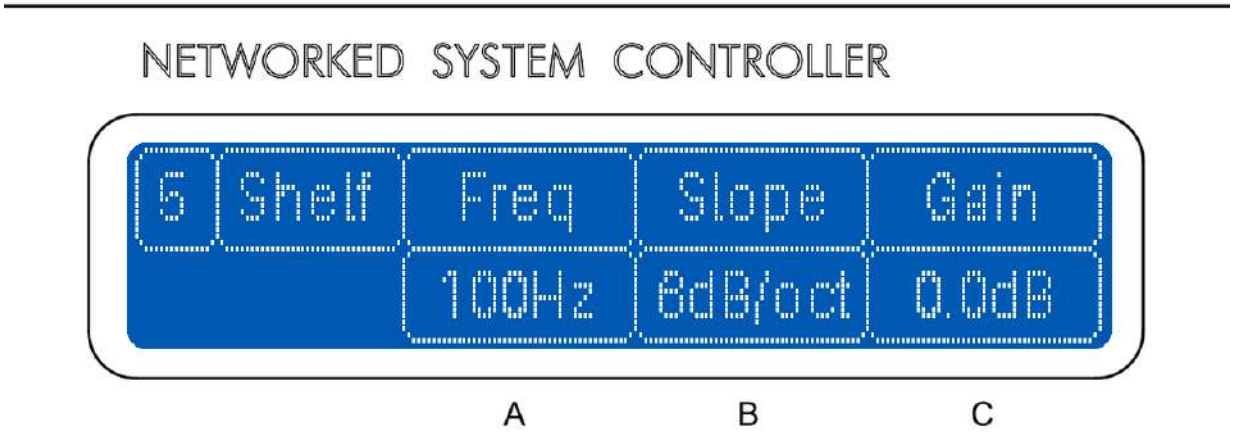
Output EQ

Parametric Equalisation

Each output features 10 equalisation bands for precise driver and system optimisation.







EQ Structure:

- Bands 1-2: Shelving filters (Low/High)

- Bands 3-10: Full parametric or All-Pass

Control Parameters:

- Frequency
- Bandwidth
- Gain

Driver Correction EQ

Phase Correction with All-Pass Filters

Six parametric bands can operate as all-pass filters:

Applications:

- Phase linearisation at crossover
- Time alignment correction
- Horn phase correction
- Compensate for physical offset

Configuration:

1. Enable All-Pass mode in System Engineer 8
2. Set centre frequency
3. Adjust bandwidth for phase rotation rate
4. No gain adjustment (phase only)

Driver Response Linearisation

Systematic approach to driver EQ:

1. Measure driver response in final position
2. Identify resonances and response irregularities
3. Apply inverse EQ to flatten response
4. Verify with measurement
5. Document corrections for future reference

System Voicing

Output Shelving EQ

High and low shelving filters for broad tonal adjustments:

- Low shelf: 20Hz-1kHz
- High shelf: 1kHz-20kHz
- ±15dB range
- 6 or 12dB/octave slopes

Best Practices:

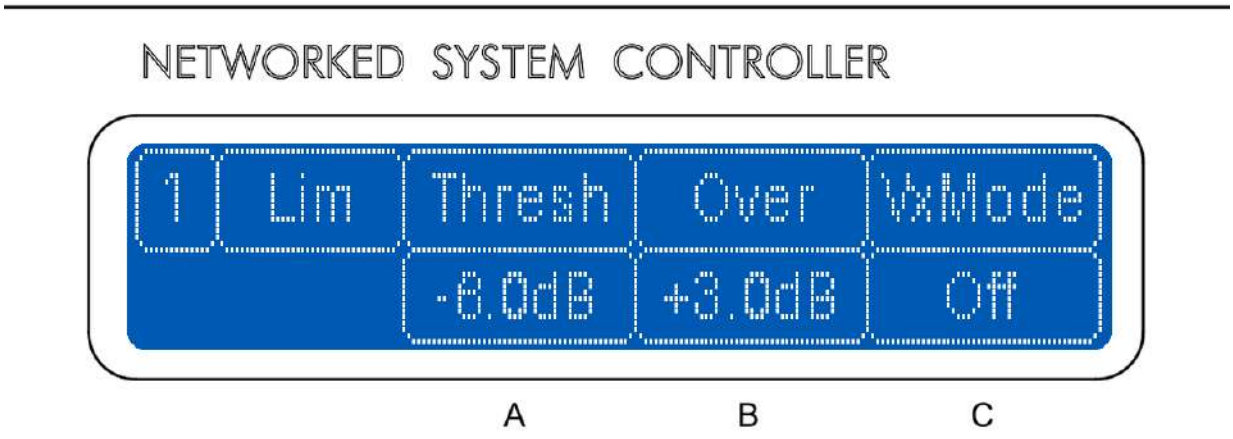
- Apply broad corrections at input stage
- Use output EQ for driver-specific needs
- Maintain headroom (avoid excessive boost)
- Document purpose of each filter

Limiter Configuration

The NSC Digital Signal Processor's VX limiter provides sophisticated protection with minimal sonic impact.

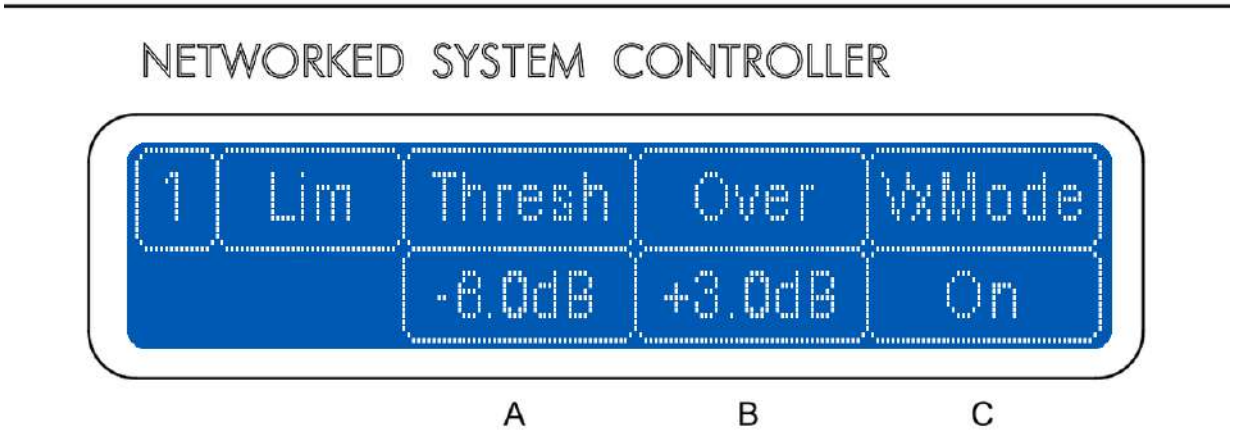
Standard Mode (VX Off)

Basic peak limiting:



- Threshold: Sets maximum output voltage
- Overshoot: Controls attack behaviour (2-15dB)

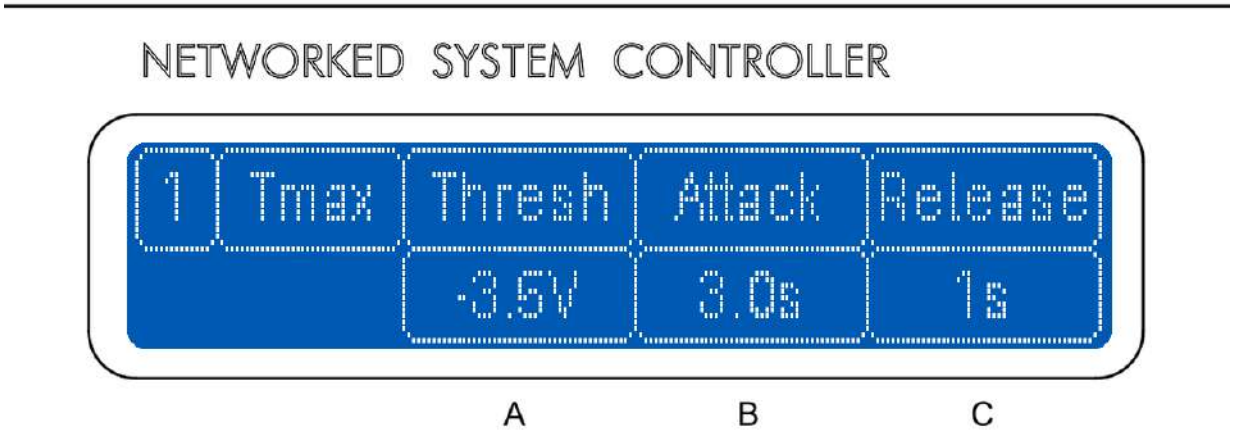
VX Mode (Virtual Crossover)



VX Advantages:

- Protects individual drivers in passive systems
- Prevents tweeter damage from LF overload
- Maintains tonal balance under limiting
- Optimised attack/release per band

Thermal Protection (Tmax)



Long-term thermal protection prevents voice coil damage from sustained high power.

Parameters:

Threshold

- Continuous RMS voltage rating
- Referenced to amplifier output
- Calculate: √(Power × Impedance)
- Range: 1-200V RMS

Attack Time

- Models thermal rise time
- Typical: 5-30 seconds for woofers
- Typical: 1-5 seconds for tweeters

Release Time

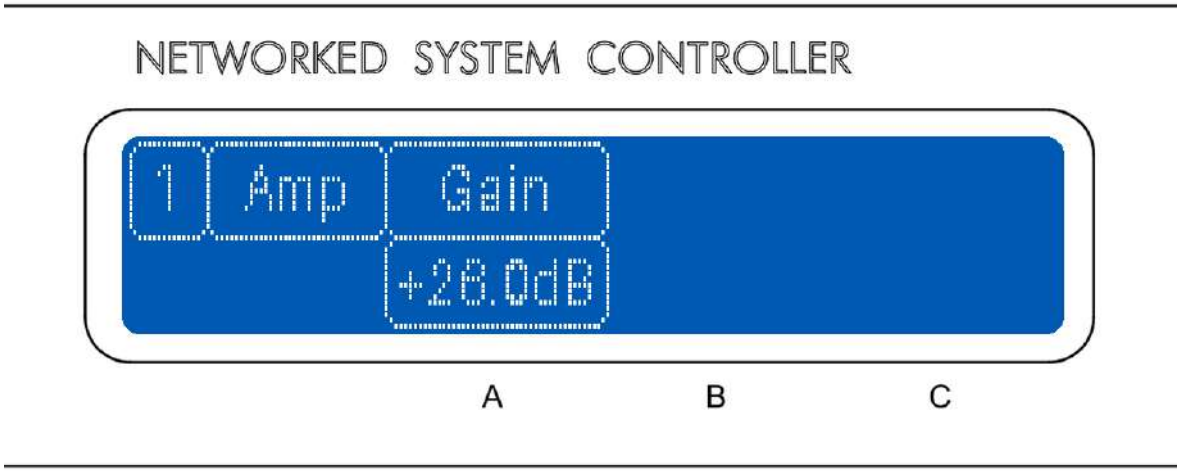
- Models cooling time
- Expressed as multiplier of attack
- Typical: 10-50x attack time

Amplifier Gain Setting

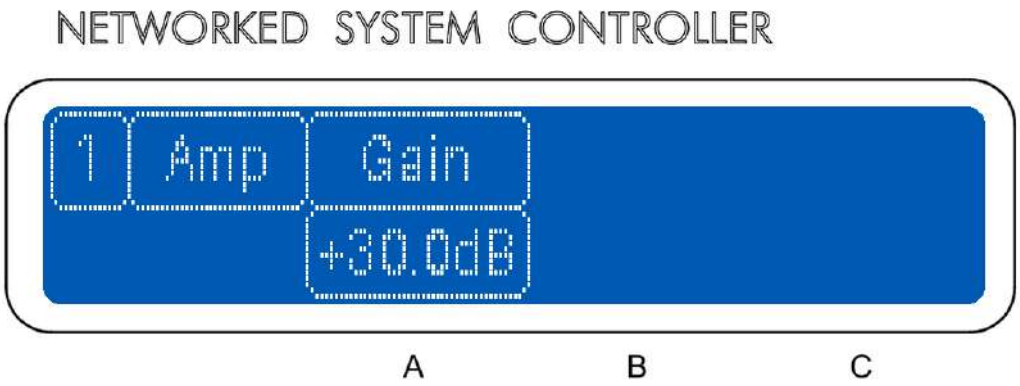
Critical for proper limiter calibration:

Setting Amplifier Gain:

1. Navigate to "AMP" page



2. Enter amplifier voltage gain in dB



3. Common values:
   - 26dB (20x) - Many installation amps
   - 32dB (40x) - Typical touring amps
   - 35dB (56x) - High-power touring amps

Important: Incorrect amplifier gain setting will miscalibrate all limiters, potentially causing damage or premature limiting.

Advanced Features

Module Groups & Overlays

Understanding Parameter Overlays

The NSC Digital Signal Processor's overlay system enables sophisticated multi-zone control without compromising individual Drive Module settings. This non-destructive approach maintains base configurations whilst applying zone-specific adjustments.

Overlay Architecture:

- 12 independent overlay layers available
- Applied on top of base parameters
- Additive/subtractive adjustment model
- Indicated by "[]" suffix on display
- Controllable only via System Engineer 8 software

How Overlays Work:

Base parameter + Overlay value = Effective parameter

Example:

- Base delay: 10ms
- Overlay delay: +5ms
- Effective delay: 15ms []

The square brackets indicate overlay presence, reminding operators that additional processing is active.

Configuring Module Groups

Module Groups unite multiple Drive Modules for coordinated control whilst maintaining individual characteristics.

Creating Module Groups (System Engineer 8 Required):

1. Define Group Members
   - Select Drive Modules to include
   - Groups can span different module types
   - Maintain logical system relationships
2. Assign Group Parameters
   - Input gain (master level control)
   - System delay (zone timing)
   - Input mute (zone muting)
   - System EQ (tonal adjustment)
3. Set Overlay Values
   - Relative to base parameters
   - Can be positive or negative
   - Limited by parameter ranges

Practical Applications:

Multi-Zone Venues

- Main PA: Base settings
- Balcony fill: +3dB gain, +25ms delay
- Under-balcony: +6dB gain, +15ms delay

- All controlled from single group fader

Distributed Systems

- Restaurant zones with individual levels
- Conference spaces with partition walls
- Retail environments with day/night modes

Festival Delay Towers

- Progressive delay for each tower
- Weather-based EQ compensation
- Unified level control

Managing Overlays

Viewing Active Overlays:

- OVERLAY LED illuminates when active
- Parameter values show "[]" suffix
- System Engineer 8displays overlay values separately
- Input channels flash when muted via overlay

Overlay Limitations:

- Cannot be edited from the front panel
- Requires System Engineer 8 for setting and adjustment
- Persist through power cycles
- Removed only by Overlay Flush or by unassigning in System Engineer 8

Overlay Flush Procedure:

To remove all overlays and return to base parameters:

1. Press and hold UTILITY + ENTER simultaneously
2. Hold for 5 seconds
3. "Overlay Flush" appears on display
4. All overlays removed
5. OVERLAY LED extinguishes

WARNING
Overlay Flush affects all parameters immediately. Ensure system levels are appropriate before executing.

Network Audio Integration

Dante™ Configuration

When equipped with optional Dante interface, the NSC Digital Signal Processor becomes a powerful network audio node.

Dante Capabilities:

- 8 input channels (configurable)
- 8 output channels depending on NSC model
- Primary/secondary network redundancy
- Automatic clock synchronisation
- Sub-millisecond latency

Initial Dante Setup:

1. Physical Connection
    a. Connect primary network to Port 1
    b. Connect secondary network to Port 2 (optional)
    c. Use CAT5e or better cabling
    d. Maintain Gigabit infrastructure where possible
2. Configure in Dante Controller
    a. Set device name
    b. Configure sample rate (48/96kHz)
    c. Establish subscriptions
    d. Set latency preferences
3. NSC Digital Signal Processor Configuration
    a. Set Input TYPE to "Dante"
    b. Configure fallover behaviour
    c. Adjust Dante input trim if needed
    d. Monitor NETAUDIO indicator

Secure Mode & System Protection

Secure Mode Operation

Protect system configuration from unauthorised adjustment in fixed installations or broadcast environments.

Activating Secure Mode:

1. Press and hold UTILITY button
2. Hold for 5 seconds
3. "Secure Mode Active" appears
4. Display shows "SECURE" continuously

Secure Mode Restrictions:

- No parameter adjustment from front panel
- Snapshot recall remains available
- Metering continues normally
- Network control unaffected

Deactivating Secure Mode:

1. Press and hold UTILITY button
2. Hold for 5 seconds
3. Normal operation restored
4. Display shows "SECURE OFF" continuously

Latency Management

Understanding System Latency

The NSC Digital Signal Processor maintains minimal latency whilst enabling advanced processing features.

Base Latencies:

- Analogue In → Out: 1.31ms (0.385 + 0.402 + 0.523ms)
- AES3 In → Out: 1.123ms
- Processing overhead: 0.523ms minimum

Additional Processing Latencies:

FIR EQ (Input)

- When enabled: +0.6ms
- When disabled: 0ms
- Applied to entire Drive Module

LIR Crossover Filters

- Formula: 1.19ms per kHz
- Example: 1kHz crossover = 1.19ms
- Maximum: 30ms (automatic limit)
- Applied to all module outputs

VX Limiter

- Standard mode: 0.12ms/kHz (HPF frequency)
- VX mode: 0.358ms/kHz (split frequency)
- Maximum: 1.53ms

Latency Optimisation Strategies

Minimising Latency:

1. Disable Unused Processing
   - Set FIR EQ to "Off" when not required
   - Use conventional crossovers for LF (<100Hz)
   - Disable VX mode if not needed
2. Strategic Processing Allocation
   - Apply system EQ at input (once)
   - Use output EQ only when necessary
   - Consolidate processing where possible
3. Monitor Module Latency
   - Check Input LATENCY page
   - Shows total module processing time
   - Plan for cumulative system latency

Latency Compensation:

When mixing processed and unprocessed signals:

1. Measure processing latency
2. Apply equivalent delay to unprocessed path
3. Verify with impulse response measurement
4. Document for system recall

Controlling NSC Digital Signal Processor with System Engineer 8 Software

Overview

System Engineer 8 (SE8) is Linea Research's comprehensive control software that provides full configuration, monitoring, and tuning capabilities for your NSC Digital Signal Processor controller. This section covers the essential steps to connect and control your NSC Digital Signal Processor using SE8. For detailed instructions on all features and capabilities, please refer to the complete System Engineer 8 User Manual.

Getting Started

Getting Started

System Requirements

- Operating System: Windows 10/11 (64-bit)
- RAM: 8 GB minimum
- Network: Ethernet connection to NSC Digital Signal Processor

Installation

1. Download System Engineer 8 from the Linea Research website
2. Run the installer and follow the installation prompts
3. Launch System Engineer 8 after installation

Connecting to Your NSC Digital Signal Processor

Network Configuration

The NSC Digital Signal Processor supports two IP modes:

Auto IP Mode (Default)

- NSC Digital Signal Processor will automatically obtain an IP address
- Orange LED flashes while waiting for IP assignment

- Connects automatically once IP is assigned

Static IP Mode

- Manually set IP address through NSC Digital Signal Processor front panel utility menu
- Configure your computer's network adapter to the same subnet
- Current IP address displays on NSC Digital Signal Processor home screen

Discovery

Once connected to the same network, System Engineer 8 will automatically discover your NSC Digital Signal Processor in the Setup Workflow.

Key Control Features

Setup Workflow

- Configure input/output routing matrix
- Select input types (Analogue, AES3, Dante)
- Set input fallover options
- Create Drive Modules (DSP processing blocks)
- Manage snapshots for instant recall

Preset Workflow

- Load and save Drive Module presets
- Organise preset libraries
- Transfer presets between the computer and the NSC Digital Signal Processor device memory.
- Import manufacturer preset libraries at: https://linea-research.co.uk/support/loudspeaker-presets/

Tune Workflow

- Full parametric EQ control (input and output)
- Crossover configuration
- Protection limiters (VX, Thermal)
- Gain, delay, and polarity adjustments
- Real-time metering and monitoring
- Overlay Groups for system-wide control

Essential Operations

Creating a Drive Module

1. Navigate to Setup Workflow
2. Select your NSC Digital Signal Processor from the Explorer view
3. Use the routing matrix to assign inputs to DSP blocks
4. Route DSP outputs to physical outputs

Loading Presets

1. Switch to Preset Workflow
2. Select the Drive Module to configure
3. Choose a preset from your library
4. Click "Load to Selected Modules"

Monitoring

- View real-time signal levels on all inputs and outputs
- Monitor protection limiting events
- Check system logs for performance data

Advanced Features

System Engineer 8 offers extensive capabilities beyond basic control:

- Multi-device management
- Complex signal routing
- FIR filter support
- Comprehensive protection strategies
- Device firmware updates

For complete documentation on these features and detailed operational procedures, please consult the full System Engineer 8 User Manual available at linea-research.co.uk.