MediaMatrix®

A Division of Peavey Electronics Corporation

NION™
Network Input Output Node

System Integrator's Manual

v.03

Intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

Intended to alert the user of the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

CAUTION: Risk of electrical shock — DO NOT OPEN!
CAUTION: To reduce the risk of electric shock, do not remove cover. No user serviceable parts inside. Refer servicing to qualified service personnel.

WARNING: To prevent electrical shock or fire hazard, do not expose this appliance to rain or moisture. Before using this appliance, read the operating guide for further warnings.

Este símbolo tiene el propósito, de alertar al usuario de la presencia de "(voltaje) peligroso" sin aislamiento dentro de la caja del producto y que puede tener una magnitud suficiente como para constituir riesgo de descarga eléctrica.

Este símbolo tiene el propósito de alertar al usario de la presencia de instruccones importantes sobre la operación y mantenimiento en la información que viene con el producto.

PRECAUCION: Riesgo de descarga eléctrica ¡NO ABRIR!
PRECAUCION: Para disminuír el riesgo de descarga eléctrica, no abra la cubierta. No hay piezas útiles dentro. Deje todo mantenimiento en manos del personal técnico cualificado.

ADVERTENCIA: Para evitar descargas eléctricas o peligro de incendio, no deje expuesto a la lluvia o humedad este aparato Antes de usar este aparato, lea más advertencias en la guía de operación.

Ce symbole est utilisé dans ce manuel pour indiquer à l'utilisateur la présence d'une tension dangereuse pouvant être d'amplitude suffisante pour constituer un risque de choc électrique.

Ce symbole est utilisé dans ce manuel pour indiquer à l'utilisateur qu'il ou qu'elle trouvera d'importantes instructions concernant l'utilisation et l'entretien de l'appareil dans le paragraphe signalé.

ATTENTION: Risques de choc électrique — NE PAS OUVRIR!
ATTENTION: Afin de réduire le risque de choc électrique, ne pas enlever le couvercle. Il ne se trouve à l'intérieur aucune pièce pouvant être réparée par l'utilisateur. Confiez l'entretien et la réparation de l'appareil à un réparateur Peavey agréé.

AVERTISSEMENT: Afin de prévenir les risques de décharge électrique ou de feu, n'exposez pas cet appareil à la pluie ou à l'humidité. Avant d'utiliser cet appareil, lisez attentivement les avertissements supplémentaires de ce manuel.

Dieses Symbol soll den Anwender vor unisolierten gefährlichen Spannungen innerhalb des Gehäuses warnen, die von Ausreichender Stärke sind, um einen elektrischen Schlag verursachen zu können.

Dieses Symbol soll den Benutzer auf wichtige Instruktionen in der Bedienungsanleitung aufmerksam machen, die Handhabung und Wartung des Produkts betreffen.

VORSICHT: Risiko — Elektrischer Schlag! Nicht öffnen!
VORSICHT: Um das Risiko eines elektrischen Schlages zu vermeiden, nicht die Abdeckung enfernen. Es befinden sich keine Teile darin, die vom Anwender repariert werden könnten. Reparaturen nur von qualifiziertem Fachpersonal durchführen lassen.

ACHTUNG: Um einen elektrischen Schlag oder Feuergefahr zu vermeiden, sollte dieses Gerät nicht dem Regen oder Feuchtigkeit ausgesetzt werden. Vor Inbetriebnahme unbedingt die Bedienungsanleitung lesen.

IMPORTANT SAFETY INSTRUCTIONS

WARNING: When using electrical products, basic cautions should always be followed, including the following:

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 a dry cloth.
7. Do not block any of the ventilation openings. Install in accordance with 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 has two blades and a third grounding plug. The wide blade or third prong is 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 they exit from the apparatus.
11. Note for UK only: If the colors of the wires in the mains lead of this unit do not correspond with the terminals in your plug, proceed as follows:

    a) The wire that is colored green and yellow must be connected to the terminal that is marked by the letter E, the earth symbol, colored green or colored green and yellow.

    b) The wire that is colored blue must be connected to the terminal that is marked with the letter N or the color black.

    c) The wire that is colored brown must be connected to the terminal that is marked with the letter L or the color red.
12. Only use attachments/accessories provided by the manufacturer.
13. Use only with a cart, stand, 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.
14. Unplug this apparatus during lightning storms or when unused for long periods of time.
15. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
16. Never break off the ground pin. Write for our free booklet "Shock Hazard and Grounding." Connect only to a power supply of the type marked on the unit adjacent to the power supply cord.
17. If this product is to be mounted in an equipment rack, rear support should be provided.
18. Exposure to extremely high noise levels may cause a permanent hearing loss. Individuals vary considerably in susceptibility to noise-induced hearing loss, but nearly everyone will lose some hearing if exposed to sufficiently intense noise for a sufficient time. The U.S. Government's Occupational and Health Administration (OSHA) has specified the following permissible noise level exposures:

Duration Per Day In Hours	Sound Level dBA, Slow Response
8	90
6	92
4	95
3	97
2	100
1 1/2	102
1	105
1/2	110
1/4 or less	115

According to OSHA, any exposure in excess of the above permissible limits could result in some hearing loss. Ear plugs or protectors to the ear canals or over the ears must be worn when operating this amplification system in order to prevent a permanent hearing loss, if exposure is in excess of the limits as set forth above. To ensure against potentially dangerous exposure to high sound pressure levels, it is recommended that all persons exposed to equipment capable of producing high sound pressure levels such as this amplification system be protected by hearing protectors while this unit is in operation.

SAVE THESE INSTRUCTIONS!

To prevent electrical shock or potential fire hazards, do not expose this product to moisture or rain. Before using this product, read the user manuals for further warnings and cautions.

The following cautions should be carefully observed when installing, wiring or using this product:

DO NOT use any other power supply or cable other than the one provided with this unit.

DO NOT remove the top cover of the unit. There are no user-serviceable parts inside. Refer service to qualified personnel.

DO NOT use solvents or other cleaners to clean the unit. Basic external care requires only a damp cloth. Disconnect the power supply cord before cleaning.

Read all safety and installation instructions and retain all documentation for further reference.

This product should be installed so that its mounting position does not interfere with proper ventilation. Do not block air intake or exhaust vents.

This product should not be installed or placed near a source of heat.

Power supply cords and associated connectors should be unplugged from the power source when the unit is not used for long periods of time or stored.

This product is designed for EIA rack mounting only. Use racks of sufficient depth and width to accommodate proper airflow and cable harnessing.

Care should be taken to ensure that the installation is clear of possible sources of contamination. Make sure that the product's ventilation openings are not exposed to possible sources of liquid, gases, or other contaminant's.

This product should be inspected by a qualified service technician if the power supply cord or connector has been damaged, if the unit has been dropped, or if a foreign substance has gained access to the interior electronic and electrical components.

The information contained in this manual is subject to change without notice. Peavey Electronics is not liable for improper installation or configuration. The information contained herein is intended only as an aid to qualified personnel in the design, installation and maintenance of engineered audio systems. The installing contractor or end user is ultimately responsible for the successful implementation of these systems.

Manual by WR

Table of Contents

Manual Version History

Because of the dynamic nature of NION technology and the associated products, NION manuals are subject to frequent updates. Please make sure you have the latest version of this manual by checking our website:

http://mm.peavey.com.

The complete version history is summarized below:

v.01 - 02-03-05. Initial release version provides basic information only including features, panel callouts and specifications.

v.02 - 04-1-05. Added GPIO section (currently located at pages 12-13).

v.03 - 04-25-05. Consolidated manual for both current NION DSP products (n6 and n3).

Thank You!

Thank you for purchasing the MediaMatrix® NION Network Input/Output Node. This product is designed to provide years of trouble-free operation and high quality performance. We are confident that you will find this product and other MediaMatrix products to be of the highest quality.

This manual includes information about the product's features, functionality and performance characteristics. If you require additional information that this manual does not provide, please let us know. We are always looking for better ways to provide information about our products, and your input is always appreciated. If you have a comment about this manual or would like to make a suggestion, please write to: Peavey Electronics Corp., MediaMatrix Division, 711 A St., Meridian MS, 39301. Thank you again for using MediaMatrix!

What's In The Box?

NION Series products are packaged in a single container. This container includes the following items:

1- NION n6 or n3 Network Input/Output Node
1- IEC removable power supply cable (120 VAC Domestic)
1- Shielded CAT 6 Cable, 1'
1- Software Installation CD
1- User Manual/Literature Package

If any of these items are missing, please contact your Authorized Peavey MediaMatrix contractor/dealer.

Description

The NION (n. nee-on) n6 and n3 are programmable digital audio processing nodes designed for professional and commercial audio and communications applications. Coupled with floating-point DSPs and the industry's most efficient audio algorithms, the NION extends the world-class power of MediaMatrix to levels never seen before. The internal processing core is supported by a wide range of features including MediaMatrix's Scalable I/O Architecture, a modular I/O scheme that supports a variety of optional plug-in cards for maximum versatility. Four module bays support up to 64 simultaneous analog audio channels each while the integrated CobraNet port provides another 64 channels, for a total of 320 simultaneous configurable audio channels. The NION is built on a new embedded Linux architecture designed for stable, efficient and robust performance. A new 512-channel digital audio bus allows for seamless stacking and redundant, self-healing configurations. Low-latency audio across all I/O ports makes NION perfect for performance audio projects, in addition to applications where a large amount of audio processing is required. Software support includes an all-new Windows-based interface that works with multiple nodes across an Ethernet network. Additional support for third party control and SNMP management tools is included. An intuitive front panel interface features an LCD display, soft buttons and rotary encoder to enable access to common system functions. Additional control interfacing is provided by both RS-232 and RS-485 ports, while a new configurable GPIO system makes interface with hard-contacts and logic systems easier than ever.

Features

- Floating point DSP Engine with 6 (n6) or 3 (n3) DSP chips
- World-famous MediaMatrix audio algorithms
- 320 channels total audio I/O (not including XDAB)
- 32 bits processing engine
- 24 bit conversion
- Scalable I/O Architecture with four 64-channel bays
- Low latency audio performance
- Integrated, modular CobraNet I/O
- Network-centric architecture
- Supports centralized, distributed or hybrid system models
- Integrated serial support
- X-DAB bus supports up to 512 bi-directional audio channels
- Front panel interface with intuitive user input controls
- Robust Linux embedded system controller
- Integrated flash-based storage
- Supports optional hard-disk storage systems
- Windows configuration and control client
- Full support for SNMP network management tools
- Universal industrial-grade power supply
- Software support for large-scale multi-node systems
- Advanced DSP compiler
- Configurable GPIO with optional DIN rail connector block
- Transparent control grouping across physical nodes
- Supports redundant, self-healing configurations
- Supports sample rates of 48 kHz and 96 kHz
- Stand alone or combined operation

Applications

- Stadiums
- Auditoriums
- Arenas
- Civic centers
- Performing arts centers
- Theaters
- Courts of law
- Houses of worship
- Campus buildings
- Theme parks
- Hotel meeting rooms
- Conference centers
- Schools
- Cruise ships
- Teleconferencing
- Distance learning
- Large-scale paging
- Multi-purpose facilities
- Retail
- Restaurants & bars
- Gaming
- Institutional paging
- Communications
- Correctional facilities
- Professional complexes
- Residential

Front Panel Features
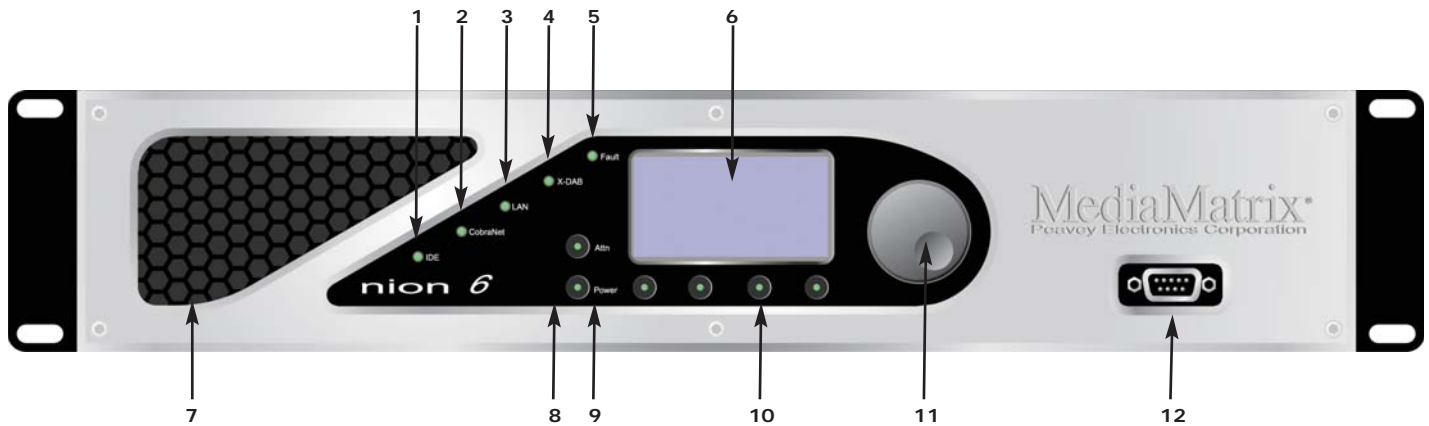
1. IDE Single-color LED indicates activity to/from the internal IDE storage media.

2. CobraNet Single-color LED indicates activity to/from the internal CobraNet audio transport.

3. LAN Single-color LED indicates activity to/from the Ethernet network interface.

4. XDAB Single-color LED indicates activity to/from the XDAB audio expansion bus.

5. Fault Single-color LED indicates a hardware and/or software fault condition.

6. LCD Display Backlit graphical display provides access to system hardware monitoring, configuration and status functionality.

7. Air Vent Air intake vent provides fresh air flow to internal cooling system. Do not block or obstruct this vent. Proper airflow must be maintained for proper operation.

8. ATTN Dual function device includes a single-color LED that illuminates when user response is required. Momentary push button allows user to bring unit out of standby or to request status from the LCD display.

9. Power Dual function device includes a single-color LED that illuminates when mains power is applied to the rear-panel IEC connector. Momentary push button allows user to power the unit on or off in conjunction with the LCD display.

10. Soft Buttons (4) Momentary buttons used in conjunction with the LCD display allow user input and navigation of hardware functionality. The function of each button is dependent on the function of the LCD display graphic nearest the corresponding button.

11. Wheel Continuous action rotary encoder and imbedded push-button provide navigation and data entry functionality in conjunction with the LCD display. The function of these controls is dependent on the active function of the LCD display.

12. Serial Port Female DB-9 panel connector provides access to system level configuration and monitoring functionality via RS-232 communications protocol.

Rear Panel Features
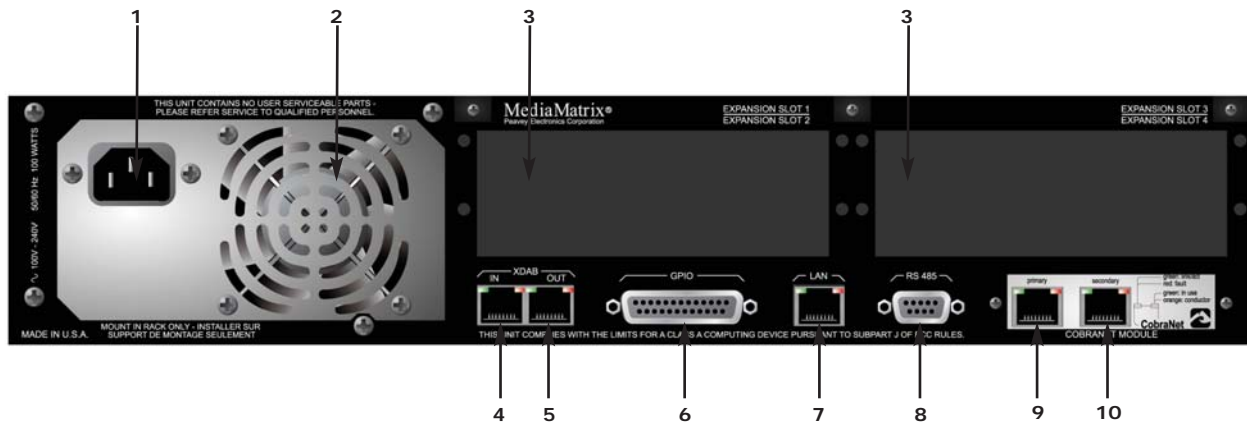
1. Power Receptacle Flush-mount IEC power receptacle for connecting a compatible IEC power cable (included). Use only the supplied cable or an equivalent international version.

2. Power Supply Industrial AT format power supply with exhaust fan.*

3. Module Bays Housing bays for Nion Series expansion cards. Up to 4 Nio Series I/O cards can be installed.

4. XDAB In RJ-45 panel connector terminates a shielded CAT 6 data cable for transport of the proprietary NION digital audio input bus.

5. XDAB Out RJ-45 panel connector terminates a shielded CAT 6 data cable for transport of the proprietary NION digital audio output bus.

6. GPIO Female DB-25 panel connector terminates a standard DB-25 parallel cable and DIN rail breakout assembly (not included) to provide access to the internal GPIO control functionality.

7. LAN RJ-45 panel connector terminates a CAT 5 data cable for data transport to/from the internal network interface.

8. RS-485 Female DB-9 panel connector terminates a standard DB-9 parallel cable (not included) to provide access to the internal RS-485 control protocol.

9. CobraNet Primary RJ-45 panel connector terminates a CAT 5 data cable for data transport to/from the internal CobraNet audio transport network interface.

10. CobraNet Secondary RJ-45 panel connector terminates a CAT 5 data cable for data transport to/from the secondary internal CobraNet audio transport network interface.

*Additional air exhaust is provided on the left (intake side) side panels. Install with at least 2″ of free clearance on sides of unit. Do not block any air intake or exhaust vent.

GPIO Overview

NION Series products include a versatile GPIO (General Purpose Input Output) system for terminating external logic, controls, relays and other external systems. Each port is supported by the NWare software for configuration, control and monitoring. Any combination of ports may be used simultaneously, regardless of the configuration. For information on the GPIO configuration options, please refer to the NWare Help, included with the software.

The GPIO system provides the following features:

Configurable General Purpose ports (16 Ports)

These ports represent the bulk of the NION's GPIO functionality. Each of these ports can be configured as follows:

Digital In (3.0V TTL logic)
Digital Out (3.0V TTL logic)
Analog In 1K, 12V
Analog In 10K, 12V
Analog In 10K, 24V
Analog In 1K, self powered
Analog In 10K, self powered
Rotary Encoder (requires 2 ports)
Raw (all modes available, software configurable)

High current output ports (4 Ports)

Each high current port provides a dry contact output with a .5A sink rating. Each high current port can be configured for straight logic or PWM (Pulse Width Modulation) operation.

Fault relay

A single system relays is configured for supervising hardware faults. This Form C relay includes 1A contacts and is usually used for external supervisory alarms, fault signalling, etc.

Connection

The rear panel of the NION includes a 25 pin DSub connector (DB-25) for accessing the GPIO functions. Although it is possible to terminate GPIO functions directly to the DB-25 connector, we strongly recommend that you purchase the optional breakout accessory (Peavey Part# 00510490). The breakout accessory is a convenient way to access each port and facilitates easy rack wiring and troubleshooting. The breakout accessory is a DIN rail package and includes removable Euro connectors for terminating the pins. A single DB-25 male/female cable connects the breakout accessory to the NION.

The illustration and the table on the following page shows the pin assignments for the GPIO system. The illustration shows the rear panel DB-25 pinouts while the table lists the functions by pin numbers. If you are using the breakout accessory, use the pin numbers to identify the functions. The breakout accessory has a different pin layout than the DB-25 connector. Refer to the manual for the breakout accessory for information.

GPIO Pin Assignment
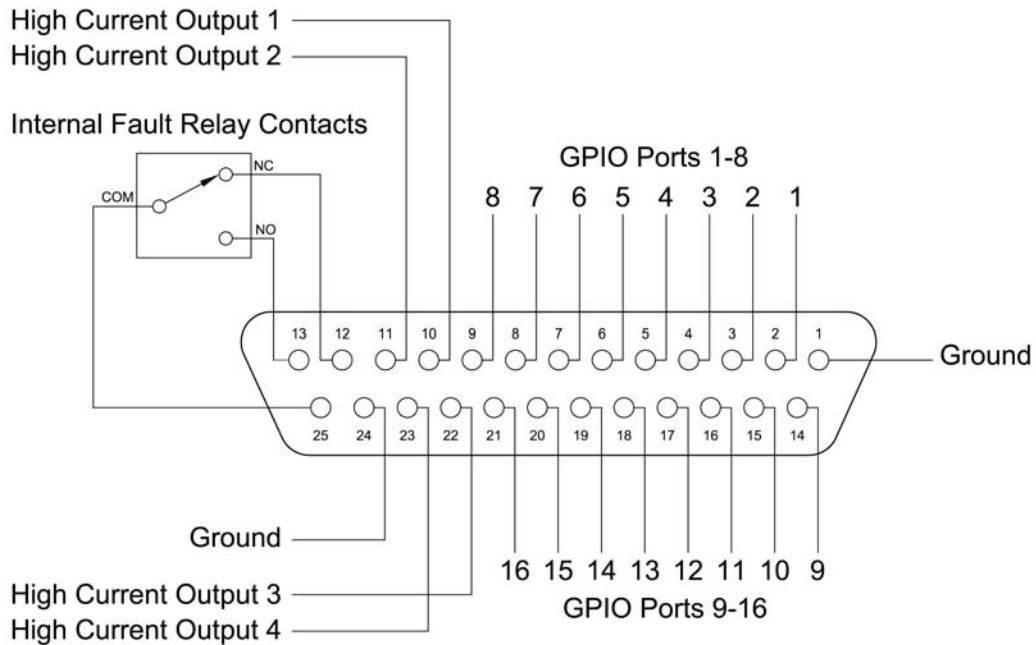
PIN NUMBER	FUNCTION
1	Ground
2	Configurable GPIO Port 1
3	Configurable GPIO Port 2
4	Configurable GPIO Port 3
5	Configurable GPIO Port 4
6	Configurable GPIO Port 5
7	Configurable GPIO Port 6
8	Configurable GPIO Port 7
9	Configurable GPIO Port 8
10	High Current Output Port 1
11	High Current Output Port 2
12	Fault Relay N.C.
13	Fault Relay N.O.
14	Configurable GPIO Port 9
15	Configurable GPIO Port 10
16	Configurable GPIO Port 11
17	Configurable GPIO Port 12
18	Configurable GPIO Port 13
19	Configurable GPIO Port 14
20	Configurable GPIO Port 15
21	Configurable GPIO Port 16
22	High Current Output Port 3
23	High Current Output Port 4
24	Ground
25	Fault Relay Common

Specifications

Rear Panel Connections

Mains Power: 100v > 240v 50/60 Hz 300W A/C

LAN: Female RJ-45 - transports control and communications via Ethernet on standard CAT-5 cabling.

XDAB: Dual Female RJ-45 Connector - proprietary LVDS signaling via shielded CAT-5 cable terminated with shielded male RJ-45 jacks, max. length 15'.

RS485 Serial: Female DB-9 - supports bi-directional RS485 mutli-dropped serial communications.

CobraNet: CM-1 Module with 2 Female RJ-45 connectors - transports digital audio via CobraNet audio network on CAT-5 cabling terminated with male RJ-45 jacks.

GPIO: Female DB-25 - breaks out configurable general purpose logic and status connections to external DIN terminating block (optional).

I/O Bays: 4x Proprietary I/O Card Slots - supports proprietary audio and interface cards, available separately.

Front Panel Connections

RS232 Serial: Female DB-9 - supports general purpose RS-232 communications.

Digital Audio Performance

Data Format: 32-bit floating point audio.

Processing: PowerPC Host (Linux OS) with 6 (n6) or 3 (n3) ADI Sharc Hammerhead digital signal processors.

DSP MFLOPS: 2400 sustained, 3600 peak.

Sample Rate: Configurable, 16KHz, 22.05KHz, 24KHz, 32KHz, 44.1KHz, 48KHz, 64KHz, 88.2KHz, 96KHz., supports multi-rate processing.

Latency: Configurable, minimum latency (analog in to analog out @ 48kHz sample rate, 8 sample vector) 1.8msec. Total latency varies with audio configuration.

Storage: 256 Mbit Compact Flash, supports OS, configuration, control and .wav audio.

XDAB Performance

Data Format: 32-bit floating point audio.

Protocol: Proprietary.

Channels: 512 channels at 48kHz, 256 channels at 96kHz.

Maximum XDAB Latency: 3 sample vectors.

Synchronization: +/-20ns box-to-box word clock sync.

Redundancy: Dual counter-rotating rings.

Cable Length: 15 foot (4.5 m) maximum cable length.

CobraNet Performance

Data Format: 20/24-bit audio.

Protocol: Ethernet w/ Proprietary CobraNet protocol.

Channels: 64 channels at 48kHz, 32 channels at 96kHz.

Maximum CobraNet Latency: 3 sample vectors.

Cable Length: 328 foot (100 m) maximum cable length between nodes.

GPI/O

Connections: 16 ports configurable ports via optional DIN rail package.

Configurations: Digital Input / Analog Input / Digital Output software selectable.

Digital Input: Vin < 0.8v = logic 0; Vin > 2.0v = logic 1 (1.2v hysteresis).

Analog Input: 0.0v < Vin < 24.0v; 12-bit analog converter precision.

Digital Output: logic 0 Vout = 0.0v, Isink <= 2mA; logic 1 Vout = 3.3v, Isource <= 2mA.

High Current Outputs: 4 ports, each with a 0.5A self-resetting fuse and protection diodes for driving inductive loads. Vout = 11.5v nominal @ Isource = 0.5A. Direct short protection from ground to +36v.

Relay Contacts: Form C contacts rated at 0.3A @ 125VAC or 110VDC, or 1A @ 30VDC.

Mechanical Specifications

Chassis Style: 2RU EIA rack package

Installation: EIA rack mount only

Dimensions: 19 in. W x 16.8 in. D x 3.5 in. H

Cooling: Forced air, front panel intake, rear and side panel exhaust.

Architect's & Engineer's Specifications

Audio Processing Node

The audio processing node shall be a 2RU industrial package designed for fixed installation in engineered audio and communications systems. The unit shall include an architecture based on an integrated floating-point DSP engine with at least 3 DSP chips. The DSP shall operate with a common digital audio bus with support for at least 512 simultaneous high-speed digital audio channels. The digital audio bus shall include an external expansion port that supports bus-level connectivity for additional units. Separate transmit and receive ports shall be provided for the digital audio bus. Software devices shall be included to allow the digital audio expansion ports to be easily integrated into the configuration file. The audio processing node shall include a software-based configuration and control. The DSP shall be completely configurable via a Windows-based software system, with additional tools for creating user interface clients and integration with third-party control system included. Audio device algorithms shall support custom I/O, control and signal flow design and shall be integrated within the design environment for intuitive system configuration. This software shall include an XML architecture and support for standard Ethernet management, including, but not limited to SNMP shall be standard from an integrated, rear-panel LAN port. The audio processing node shall include an embedded Linux operating system. The operating system shall reside on non-mechanical IDE storage media. The storage system shall include support for reading/writing data from the operating system, configuration software or the front panel. Audio file support, including but not limited to, .wav audio shall be standard and shall be completely integrated with the unit's software tools. A Compact Flash device of at least 256M shall be used as the primary storage media and operating system root. The audio processing node shall include a modular I/O card bay system for support individual 8-channel audio cards. Cards shall be available for mic and line level analog audio with options for digital and proprietary audio transports. The audio node shall include a modular CobraNet audio transport module with support for at least 64 20-bit digital audio channels. Separate software devices shall be provided for integrating CobraNet audio I/O into the configuration file. The audio processing node shall include support for serial data transport including a front panel RS-232 and rear panel RS-485 port. All data transports, including Ethernet, shall be available simultaneously and shall include separate software devices for integration into the configuration file. The audio processing node shall include an integrated GPIO breakout system with at least 16 configurable logic ports and 4 configurable high-current ports. All GPIO ports shall include software devices for integrating their function into the configuration file. The GPIO connections shall be externally terminated with a DIN-rail breakout assembly. The audio processing node shall include a front panel interface with LCD display. Navigation of the display shall include a rotary data wheel with push switch and at least four context-sensitive soft buttons. Dual color status LEDs shall be included on the front panel for monitoring network status, storage and power conditions. The audio processing node shall be fan cooled with a front-panel exhaust and shall operate with a universal computer-grade modular power supply. The audio processing node shall be the MediaMatrix NION n6 or n3 or approved equal.

MediaMatrix ®
Peavey Electronics Corporation

80303100