DN 3816

Digital audio 8x16
EtherSound Matrix

SOMMAIRE

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1 INTRODUCTION

The DN3816 matrix is a low-level switching matrix which uses EtherSound technology ; by using bidirectionnal transmission of 64 digital channels (24bits coding, sampling 48Khz), this technology gives possibility to build audio matrix on a dedicated 100 Mb/s LAN network.

Because this technology is totally compliant with Ethernet 802.3x requirements, all compliant components (switches, Cat5 cable, optic fiber, …) can be used to build the EtherSound network (layer 2 level).

Internal processing and signal processing are fully digital, using SHARC© Digital Signal Processing (DSP) technology. DSP technology provides the DN 3816 matrix with a wide range of audio signal processing options and at the same time allows extremely flexible configuration. This product is designed for using in applications where several high quality audio sources need to be selected and broadcasted to several audio outputs.

2 GENERAL TECHNICAL SPECIFICATIONS

The matrix has the following features:

- 8 audio analogue inputs
- 16 audio analogue outputs
- 8 logic inputs
- 16 logic outputs
- 1 x RS232 interface for use by configuration application “Matrix Control”
- 1 x dual RS485 interface for bus console management (GX3016, GXT4000, …)
- 1 x RS232 interface for communication with external equipment.
- 1 x EtherSound interface

The following digital audio processes can be applied to each audio input :

- level adjustment
- bass/treble
- adjustable noise gate
- mute

The following digital audio processes can be applied to each audio output:

- level adjustment
- 5 band parametric equaliser
- mute
- delay (up to 5s for each output)

3 GENERAL DESCRIPTION

The DN 3816 is a programmable digital audio routing matrix with a wide range of features and applications. Basically, the DN 3816 can be used to switch 8 audio input channels to 16 audio output channels. Switching may be triggered in a number of ways including according to audio input priority levels. The DN 3816 also offers audio signal processing such as sound detection, noise gate, tone adjustment and a 5 band parametric equaliser.

Two console buses (GX 3016, GXT 4000, …) can be connected to a single DN 3816 for broadcasting spoken announcements to one or more audio output channels. In addition, the matrix has 8 general purpose logic inputs (logic GPIs) and 16 general purpose logic outputs (logic GPOs). The logic GPIs provide dynamic switching control of the 8 audio input channels to the 16 audio output channels. The logic GPOs are used to provide information on the status of the matrix to other system equipment.

The matrix will run off either 230V AC. or off 24V DC using a suitable transformer.

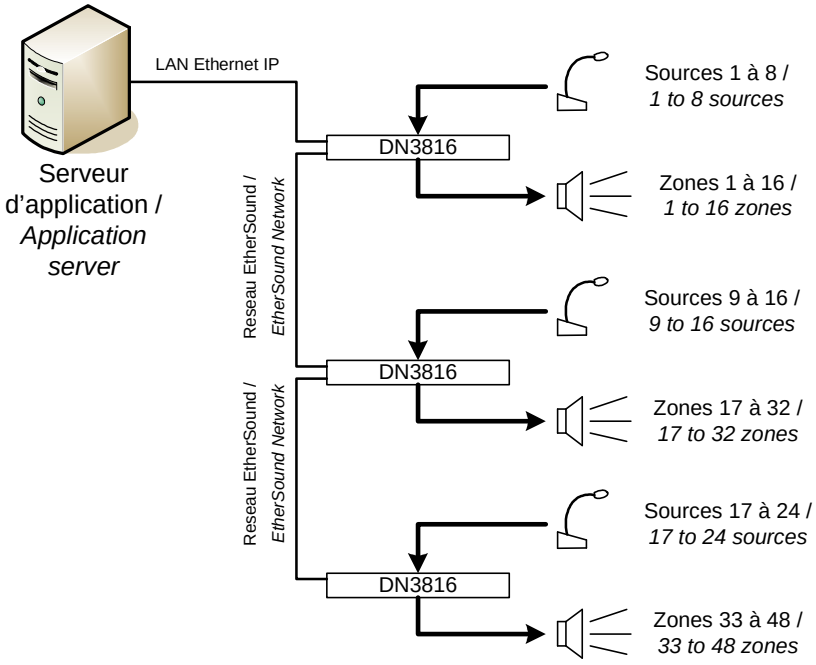
4 APPLICATIONS

4.1 Public-Address Matrix

Basically equipped with 8 inputs and 16 outputs, the DN3816 is designed to build all size audio switching matrix of which exploitation is managed by an application server (consult Bouyer for details explanations).

Due to the design, the DN3816 has a mixed operating mode ; that means that some actions can be dedicated to the DN 3816 (by preliminary settings) without intervention of the server application ; in this case, the server application is notified by the DN 3816 when actions are achieved ; this is possible, for example, when a source switching is always operated on one or several zones of the same matrix and when the triggering of this action is managed by the matrix (local console, local remote, …).

Design example : 24 inputs and 48 outputs audio matrix



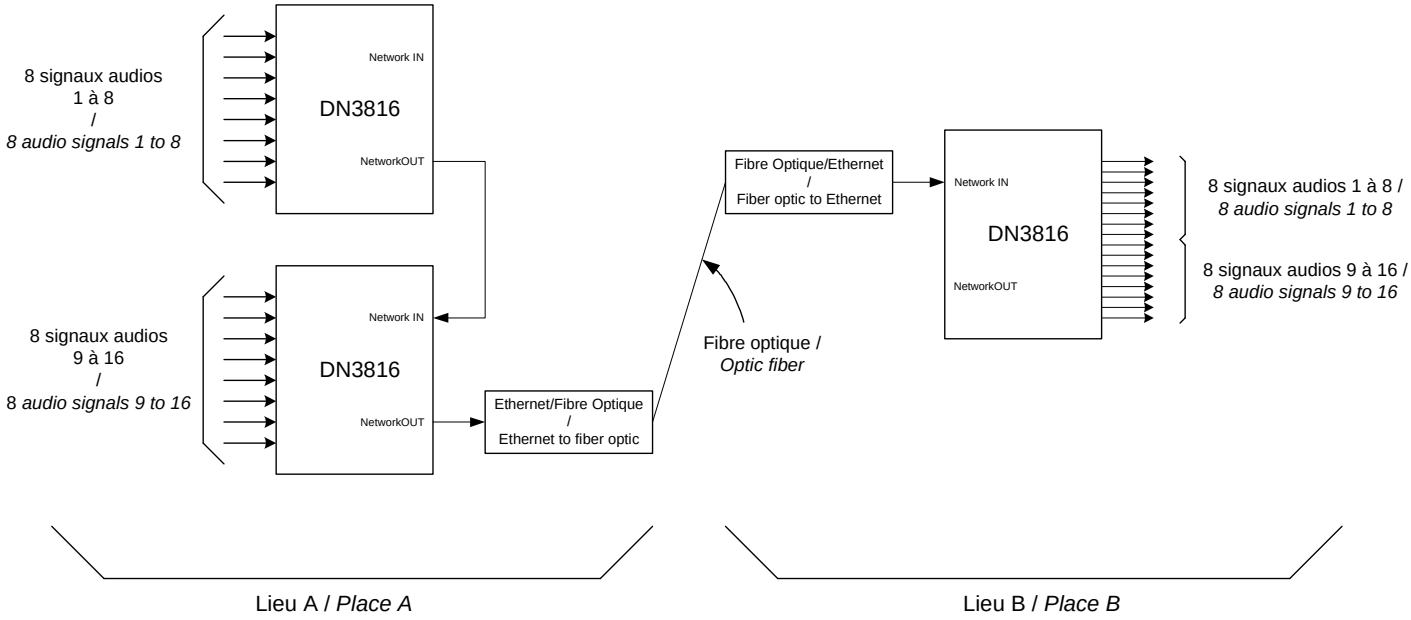
4.2 Audio signal transportation application

The DN3816 matrix can be used to achieve audio signal transportation between 2 or several distant places through an Ethernet link. This functionality doesn't require any application server.

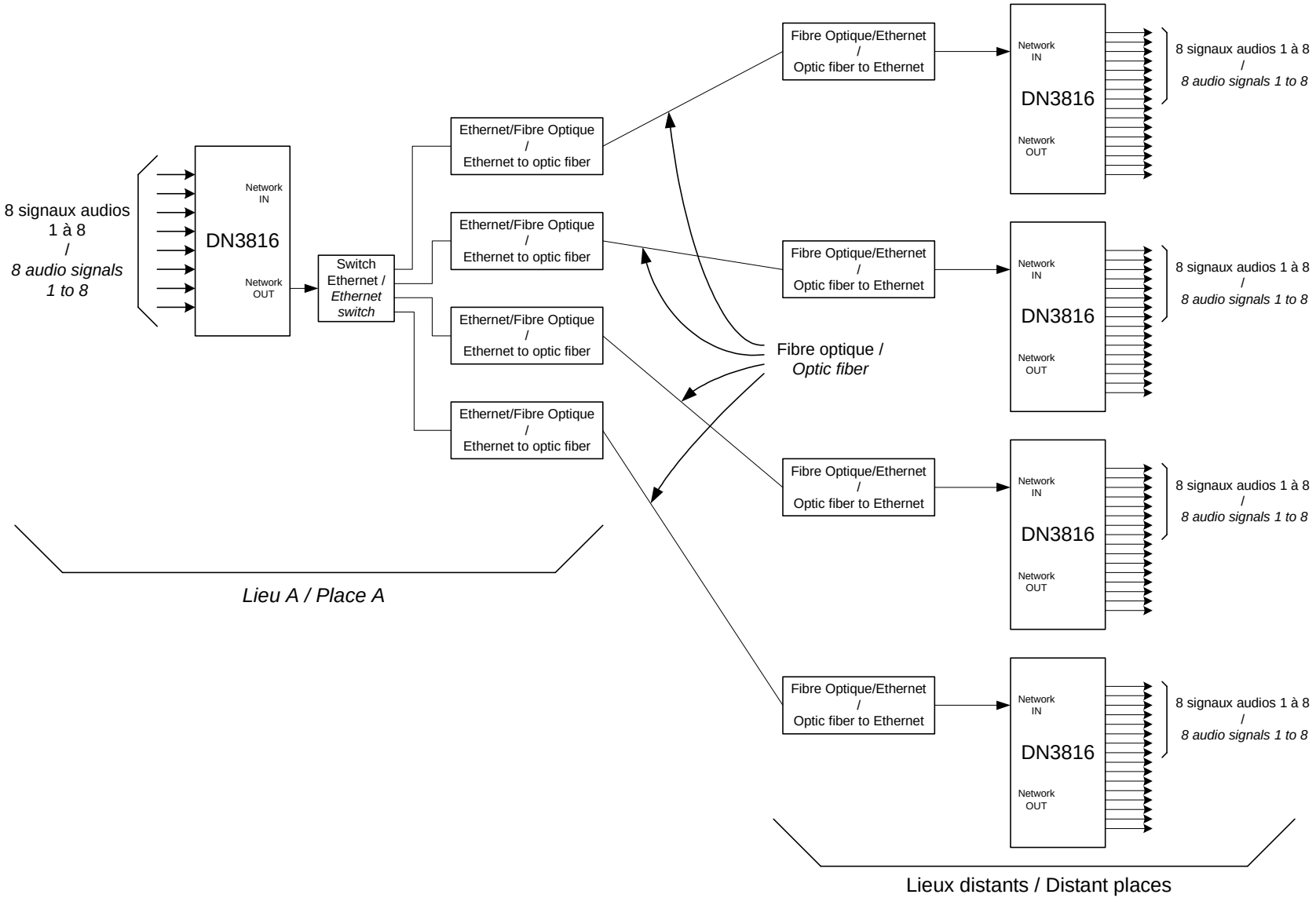
In all cases, transported signals benefit from all audio processing :

- volume, bass/treble, noise gate (settings to do on inputs side)
- volume, 5 band equalization, delay (settings to do on outputs side)

Example n°1 : transportation of 16 audio signals between 2 distant places through optic fiber link.



Exemple n°2 : transportation of 8 audio signals from 1 place to 4 distant places through optic fiber link



4.3 Use of « Matrix Control »

« Matrix Control » is a software application to do all settings of one DN3816 (audio inputs settings, audio outputs settings, priority level, source types, GPI and GPO settings) through a RS232 link (help document included in « Matrix Control » shows also how to use this software to do all the settings through a TCP/IP connexion by using an external IP/RS converter).

Depending on the application in use on the application server, « Matrix Control » can be optional or compulsory.

Details for using “Matrix Control” are given in §0 (Configuring the DN3816).

5 PRESENTATION

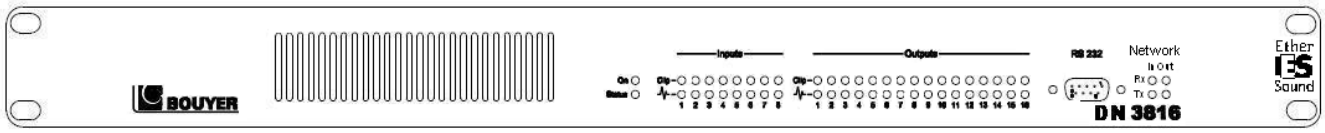
5.1 DN 3816 matrix package contents

The DN 3816 matrix is delivered complete with the following:

- One DN 3816 Matrix
- One User Manual (this document)
- One CD-ROM containing the « Matrix Control » installation software
- One 230 V AC mains power lead
- Twelve 6-pin audio connectors
- Six 5-pin GPI and GPO connectors
- One RS232 serial cable for connection to a PC (1.80 m length)

Before using the DN 3816, first check that none of the items are missing from the package.

5.2 Front panel



5.2.1 Ventilation grill

This allows the free circulation of air inside the unit, thus ensuring the internal electronic components do not overheat.

5.2.2 Green power ON indicator

When lit, the unit is powered on.

5.2.3 Green STATUS indicator

When lit, this indicates that the digital signal processing and control functions of the DN 3816 matrix are working correctly.

5.2.4 Green input SIGNAL indicators

These indicators light when an audio signal of more than -20 dBm is present at the corresponding inputs.

5.2.5 Red input CLIP indicators

These indicators light when an audio signal of more than -6 dBFS (or 14 dBm) is present at the corresponding input. For information, 0 dBFS is the absolute maximum acceptable level the digital signal processor input can handle.

5.2.6 Green output SIGNAL indicators

These indicators light when an audio signal of more than -20 dBm is present at the corresponding output.

5.2.7 Red output CLIP indicators

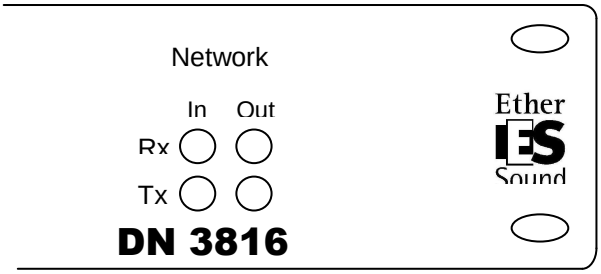
These indicators light when an audio signal of more than -6 dBFS (or 14 dBm) is present at the corresponding output. For information, 0 dBFS is the absolute maximum acceptable level the digital signal processor can handle.

5.2.8 RS232 socket

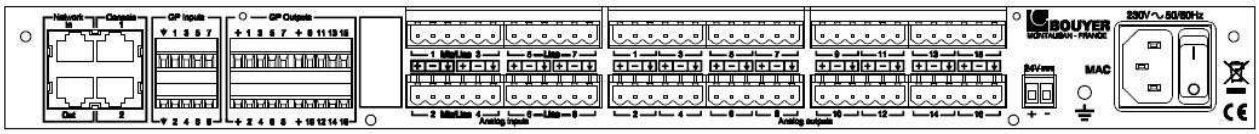
This 9-pin SUB-D female connector is used to connect a PC to the DN 3816 so the unit can be configured using the « Matrix Control » configuration software supplied. This connection is also used to update the DN 3816 firmware as necessary.

5.2.9 Network activity leds

The 4 leds In (Rx, Tx) et Out (Rx, Tx) give information on the network activity in the 2 directions Rx and Tx on the EtherSound network interfaces (In et Out). A blinking led indicates network activity.



5.3 Rear panel



5.3.1 NETWORK connector

These connectors (In et Out) are used to connect the DN3816 matrix to the EtherSound network ; the In connector is used to receive the incoming EtherSound Stream and the Out connector is used to transmit the outgoing stream.

5.3.2 CONSOLE connector

The Console 1 and Console 2 RJ45 connectors are used to connect two console buses (GX 3016, GXT 4000) to the unit.

The Console 2 connector also has an RS232 serial Data Link for connecting an additional control device.

5.3.3 GP Inputs connector block

The GP Inputs block comprises 8 opto-isolated logic inputs.

5.3.4 GP Outputs connector block

The GP Outputs block consists of 16 open-collector logic outputs.

5.3.5 Serial Number label

The label displays the serial number of the DN 3816.

5.3.6 Analog Inputs 1 to 8

The analogue inputs connector strip consists of 8 balanced analogue audio inputs.

5.3.7 Analog Outputs 1 to 16

The analogue outputs connector strip consists of 16 balanced analogue audio outputs.

5.3.8 24 V socket

This socket allows the unit to be powered using a 24V DC direct current supply instead of a 230V AC mains supply.

5.3.9 MAC address

This information is the MAC address of the DN3816 (used for software settings on application server.

5.3.10 Ground point

Use this connector to ground the DN 3816 matrix to earth when fitting the unit inside a rack cabinet. In certain circumstances, earthing the unit will considerably reduce hum, noise and interference.

5.3.11 Mains block

The earthed mains block should be used to connect the DN3816 to a suitable 230V AC mains supply using the lead provided.

5.3.12 ON / OFF switch

The ON/OFF switch on the mains block should be used to power the DN 3816 on and off.

6 INSTALLATION

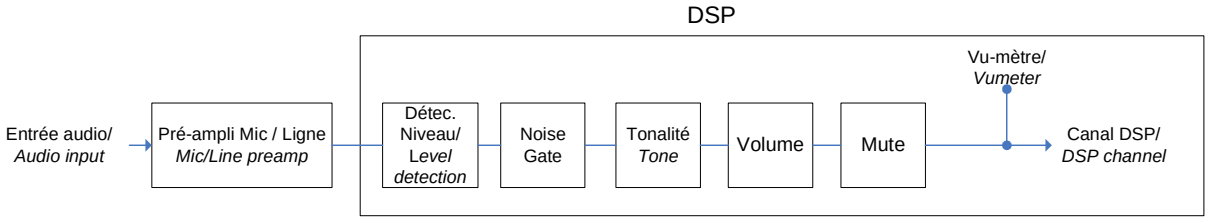
The unit comes complete with everything needed to mount it into a 19” rack. Just four M6 screws are used to rack the unit.

Warning

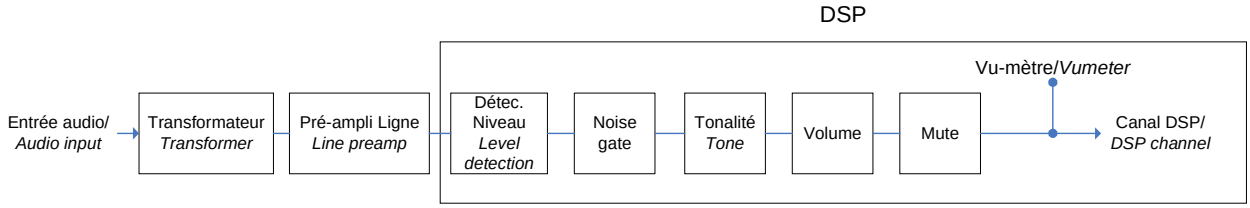
The DN 3816 must not be exposed to water (through splashing, from condensation, etc.).
Ensure the front and rear ventilation grills are kept clear at all times and that air flow around the unit is not restricted. Ensure there is sufficient room at the rear of the unit (at least 100 mm) to connect the cables.

6.1 Block diagram of the DN 3816 audio channels

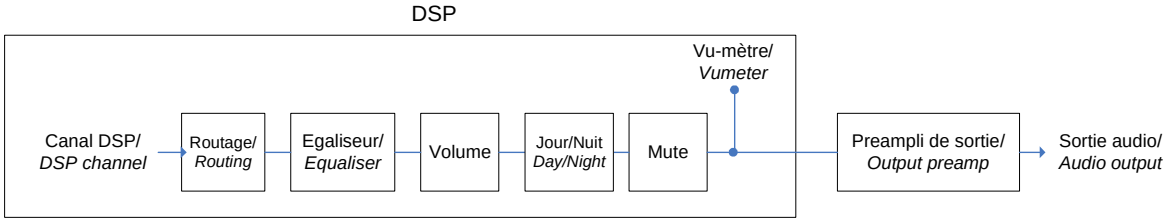
6.1.1 Mic/Line audio inputs (1 to 4)



6.1.2 Line audio inputs (5 to 8)



6.1.3 Audio outputs (1 to 16)

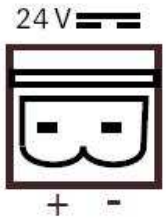


7 CABLING, CONNECTIONS AND STARTING UP THE DN 3816

7.1 Mains power connection

The DN 3816 is 230V AC mains powered using the power cable supplied.

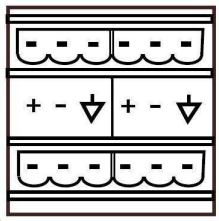
7.2 +24 V power supply



The DN 3816 may also be powered using a 24 V d.c. 60 W (minimum) power supply connected to the +24 V two pin connector block.

7.3 Audio input and output connections

The balanced audio inputs and outputs on the DN 3816 matrix use three pin connections as shown below:



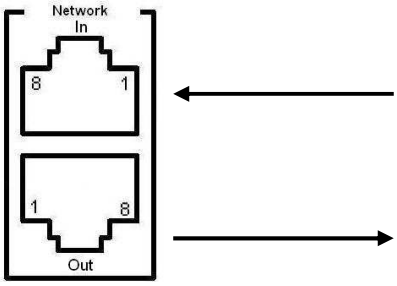
Signal + : positive

Signal - : negative

Signal ⏚ : ground

7.4 Connecting to EtherSound Network

Connexion to EtherSound network is made on the "Network In" connector for incoming EtherSound stream and on the "Network Out" for outgoing EtherSound stream.



Network In : incoming EtherSound stream

Network Out : outgoing EtherSound stream

7.5 Connecting GX 3016 consoles and an RS232 serial control device

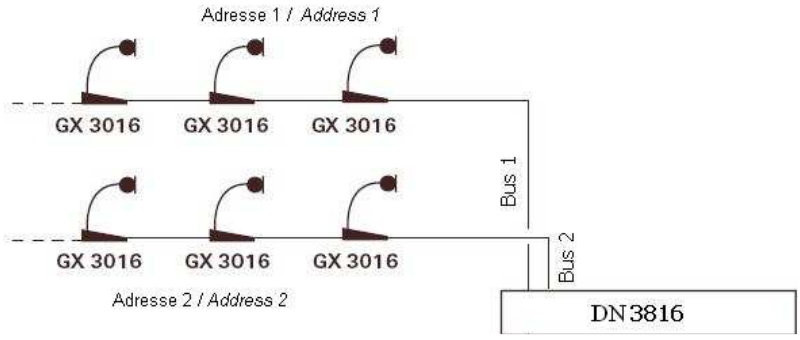
Preamble : the following explanation made for GX 3016 console is also available for all other bus console types (GXT 4000, …) from Bouyer.

The GX 3016 microphone console is a PA console with zone selection. It handles general PA broadcasting plus broadcasts in up to 16 different zones. It is designed to operate using an RS485 bus architecture, meaning that several consoles can be used on the same installation.

Up to two GX 3016 console buses can be connected to the DN 3816. All the consoles on the same RS485 bus occupy just one audio channel. The consoles determine automatically which gets to use (occupy) the single audio channel.

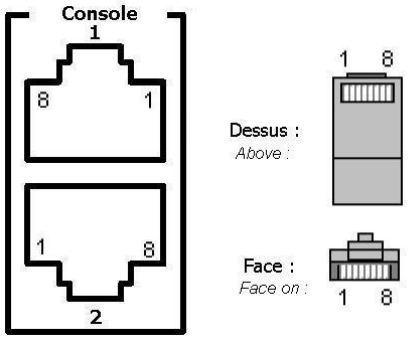
Bus 1 of the DN 3816 uses audio input 5 and bus 2 uses audio input 6.

Up to thirty-two GX 3016 consoles can be connected to a single DN 3816 matrix. The RS485 serial link allows the consoles to be chained together up to a total maximum length of 1200 m without use of a repeater. The GX 3016 consoles should be connected to either bus 1 or bus 2 depending on the type of application being implemented. For more information on installing and cabling the GX 3016 consoles, refer to the GX 3016 User Manual.



The GX 3016 consoles connected to bus 1 must be set to address 1 and the consoles connected to bus 2 to address 2 (see figure above). To set the addresses on the GX 3016 consoles, refer to the GX 3016 User Manual. Use the RJ45 cable to connect up the GX 3016 consoles (refer to the wiring details below).

RJ45 wiring details for the GX 3016:



1. Audio + (positive)
2. Audio – (negative)
3. RS232 Tx (RS232 device)
4. RS232 Rx (RS232 device)
5. 0 V
6. +24 V
7. RS485 data +
8. RS485 data –

Warning

The DN 3816 can power up to eight GX 3016 consoles via the RJ45. If the installation consists of more than eight consoles, then an external power supply should be added, to be connected to the Jack socket on the consoles.
Using GX 3016 consoles on bus 1 and/or 2 means that audio inputs 5 and/or 6 cannot be connected to any other sources, otherwise the system will not work correctly.

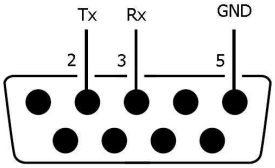
7.6 Connecting an RS232 serial control device to the Data Link

An RS 232 control device should be connected to pins 3 and 4 of the Console 2 socket. Where both a control device and a bus console need to be connected to the same socket, a BOUYER EL 720 type adapter should be plugged into the RJ45 to enable the bus console and the control device to be connected together.

7.7 RS232 socket on the front panel

The DN 3816 matrix is fitted with an RS232 port so it can be connected up to a PC. Use the 9-pin SUB-D male-female connector supplied to connect the PC to the DN 3816 matrix

Female connector RS232 pinout (DN3816 side)

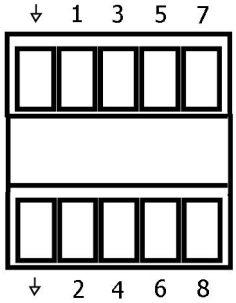


2 : Signal out - Tx
3 : Signal in - Rx
GND : Ground

7.8 Logic GPI (General Purpose Input) wiring

The DN 3816 matrix has 8 opto-coupled logic general purpose inputs (or logic GPIs). Switches or relay contacts of external equipment may be connected directly to the GPIs to achieve the operation required.

The GPI connector block

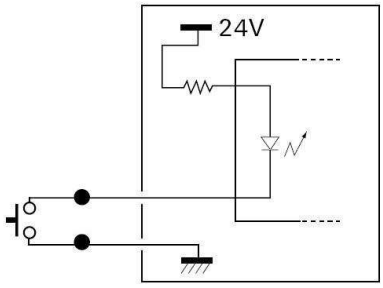


1. GPI 1 contact
2. GPI 2 contact
3. GPI 3 contact
4. GPI 4 contact
5. GPI 5 contact
6. GPI 6 contact
7. GPI 7 contact
8. GPI 8 contact

⏚ Ground for all GPIs

7.8.1 Using GPIs

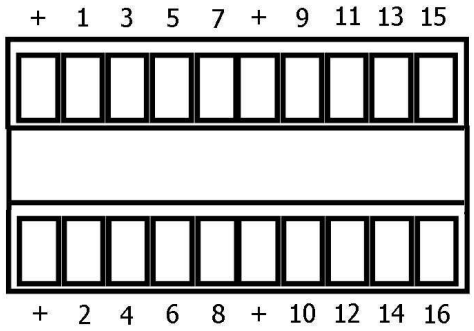
To activate a logic GPI, a dry contact must be connected between a GPI and the ground pin on the GPI connector block. (Refer to the figure below):



7.9 Logic GPO (General Purpose Output) wiring

The DN 3816 matrix has 16 logic open-collector transistor general purpose outputs (logic GPOs). The logic GPOs may be connected directly to the relay contacts of external equipment to provide them with information on the state of the matrix.

The GPO connector block

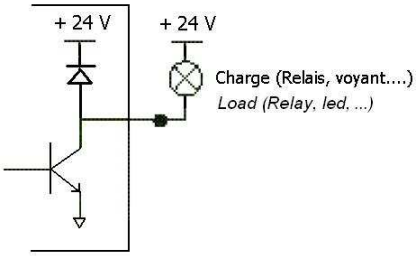


1. GPO 1
2. GPO 2
3. GPO 3
4. GPO 4
5. GPO 5
6. GPO 6
7. GPO 7
8. GPO 8
9. GPO 9
10. GPO 10
11. GPO 11
12. GPO 12
13. GPO 13
14. GPO 14
15. GPO 15
16. GPO 16

\+ : +24 V common

7.9.1 Using GPOs

To drive a relay type load using a GPO, the load needs to be connected between the output terminal and the +24 V common on the GPO connector block.



WARNING: The DN 3816 matrix supplies +24 V d.c. to power loads connected to the GPOs. The current is limited to 0.56 A. If a higher current load is required for the GPOs, then an additional external +24 V d.c. power supply should be used.

7.10 Starting up the DN 3816

Use the ON/OFF switch on the mains block on the rear panel to switch on the matrix unit.
The green ON indicator will light to show the unit is powered up.
Once the unit has initialised (which takes less then a second), the matrix will briefly display its software version number using the green audio input and output SIGNAL diodes. The version number is displayed in the form x.y, where x corresponds to the audio input number that lights up, and y the audio output number that lights up.

After the version number is displayed, the list of audio inputs and outputs in service on the matrix is displayed (corresponding leds are 'On') during 1s. During the display of the version and of the list of inputs and outputs in service, the green STATUS led is 'Off'.After displaying the list inputs and outputs in service, the green STATUS indicator comes 'On' permanently, at which point the matrix is fully operational.

WARNING : If during initialization, the number of inputs (normally 8) and outputs (normally 16) isn't correctly displayed, and if output 'Signal' leds are blinking permanently, that means that the DN3816 product is locked. In this case, the DN3816 product has to be unlocked ; this operation is achieved by using the Matrix Control software and need to enter an unlocking code that has to be delivered by Bouyer on demand.

8 CONFIGURING THE DN 3816

Configuring the DN 3816 is a 2 stage process that consists of configuring the hardware and configuring the software.

Hardware configuration involves setting the physical characteristics of each of the audio inputs where possible (microphone or line input level, use of phantom power).

Software configuration is split into 2 parts: defining the unit's operation and setting the digital process parameters. The software is configured using the « Matrix Control » application supplied. To install and use this program, refer to the software user manual (the CC3816.chm html Help file supplied with the software installation package).

This section explains the various different steps to follow to direct an input signal to one or more outputsThere are several steps which should be followed to configure the matrix :

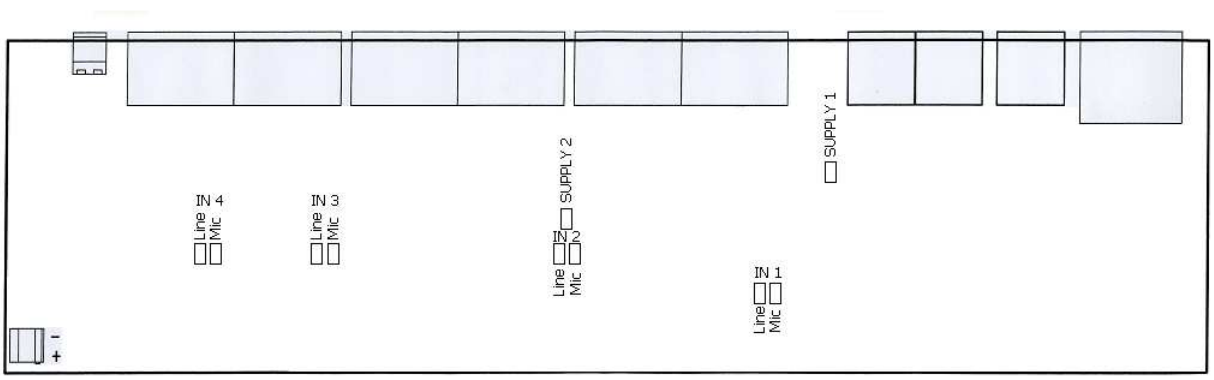
- Hardware configuration
  - Setting the audio input's physical parameters (Mic/Line, phantom power)
- Software configuration
  - Functional definition
    - > Types of source
    - > Priorities
    - > Declaration of groups
    - > Configuration of GX 3016 keys
    - > Use of GPIs
    - > Use of GPOs
  - Setting the digital process parameters
    - Per audio input
      - > Noise gate
      - > Bass/Treble
      - > Mute
      - > Volume
    - Per audio output
      - > 5 band parametric equaliser
      - > Volume
      - > Mute
      - > Delay

8.1 Hardware configuration: setting the physical parameters of the audio inputs

WARNING: These configuration instructions are for the attention of qualified personnel only. To reduce the risk of electric shock, do not undertake any operations other than those provided here. Switch off the DN 3816 and disconnect the power lead before carrying out any work.

The DN 3816 matrix input type on audio inputs IN 1 to IN 4 can be changed. This can be done using the configuration jumpers located on the interface board situated inside the matrix along the back plane.

The location of the various configuration jumpers on the interface board :



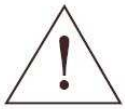
There are two possible configurations for inputs IN 1 to IN 4: Line input (0 dBm) or Micro input (-52 dBm). In addition, when audio inputs 1 and 2 are set to Micro, these can be supplied a phantom power supply for powering electret microphones. Whichever configuration is to be used, follow the procedure below to set the inputs according to the desired application.

To change the audio input type (IN 1, IN 2, IN 3 and IN 4), place the relevant jumper on the corresponding MIC or LINE pins as required. To enable a phantom supply (SUPPLY 1 and SUPPLY 2) on the corresponding inputs IN 1 or IN 2, fit the corresponding SUPPLY jumper:

- First ensure that the DN 3816 is switched off and that the power cable is unplugged before opening up the unit.
- To avoid electrostatic discharges, first ground yourself using an earthing lead before opening up the DN 3816.
- Open the cover by undoing the two screws on the rear panel.
- Locate the jumpers on the interface board located on the unit's rear plane and place them in the required positions.

Summary of possible configurations:

	IN 1		IN 2		IN 3		IN 4	
	Type	Jumper	Type	Jumper	Type	Jumper	Type	Jumper
Select Micro/Line	Mic Line	IN1 MIC IN1 LINE	Mic Line	IN2 MIC IN2 LINE	Mic Line	IN3 MIC IN3 LINE	Mic Line	IN4 MIC IN4 LINE
Phantom power	SUPPLY 1: YES/NO		SUPPLY 2: YES/NO		NO		NO	



IMPORTANT: As regards inputs IN 1 and IN 2, ensure that jumpers SUPPLY 1 and SUPPLY 2 are not fitted if the input is configured as a Line input, otherwise the unit will not operate correctly.

N.B.: Audio inputs IN 5 to IN 8 are fixed Line inputs and cannot be changed.

8.2 Software configuration

8.2.1 Functional definition

This section covers all the parameters that need to be set to determine how the matrix should work.

8.2.1.1 Setting the audio input source parameters

These parameters can be set under the « **Sources Types** » tab.

An audio input signal can be directed (switched) to one of the audio output channels if the audio input channel has been activated. An audio input channel may be activated by several trigger signals which depend directly on the parameter set under the « **Sources Types** » tab. The various trigger types are:

- Modulation detection
- Data link
- Persistent
- GPI remote control
- GX 3016
- External

In addition, each source type may be set to either « Speech » or Music. The complete range of source types available is therefore as follows:

- Speech type
  - Speech sound detection
  - GPI remote controlled speech
  - GX 3016
  - Data link
- Music type
  - Persistent music
  - Music sound detection
  - GPI remote controlled music

The concept of Speech and Music audio types exists so that, regardless of any priority levels set elsewhere, a « Speech » audio channel is always given priority over a « Music » audio channel.

8.2.1.1.1 Modulation detection

The modulation detection feature activates the option within the DN 3816 to detect a signal level. An input channel will be activated when the input signal level exceeds a preset trigger threshold. If the signal exceeds the trigger threshold on the input channel, it may then be directed to one of the output channels.

This type of source could, for example, be used to provide automatic noise level detection of a signal from such as a microphone. The input to which this microphone is connected will then be directed to an output if the signal level on this input exceeds the preset threshold. Accidental activation will be impossible so long as the input signal remains below this threshold.
Switching will then be deactivated once the input signal level drops below the predefined threshold.

8.2.1.1.2 DAS channel 1 and channel 2

The DAS feature allows an input channel to be selected and activated over the DN 3816's serial data link (for Digital Automatic System).

8.2.1.1.3 Persistent

The Persistent function is used to permanently activate an input channel. This feature should be used if an input signal needs to be available all the time for switching to one of the outputs. This configuration is especially useful in background (piped) music applications when combined with a CD player or satellite receiver.

8.2.1.1.4 GPI remote control

An input channel may be selected using a dry contact type logic GPI. A switch may be connected to one of the GPIs in order to switch an input channel to one of the audio outputs.

8.2.1.1.5 GX 3016

This source type is reserved exclusively for the DN 3816 matrix's audio inputs 5 and 6. Input channel 5 must be set to type GX 3016 if a set of GX 3016 consoles is to be connected to bus 1 of the switch matrix. Similarly, input channel 6 must be set to type GX 3016 if a set of GX 3016 consoles is to be connected to bus 2 of the matrix.

8.2.1.1.6 Modulation Detection parameters

The three parameters associated with this feature are Detection Threshold, Detection Time and Release Time, all of which are accessible under the « **Sources Types** » tab.

8.2.1.1.6.1 Detection threshold

This detection threshold is the level above which a Sound Detection-configured input channel is allowed to activate.

This threshold is adjustable from -50 to 0 dBm.

8.2.1.1.6.2 Detection time

This is the time duration from the moment the signal goes over the threshold to the moment the input channel is activated.

This time is adjustable from 10 to 100 ms.

8.2.1.1.6.3 Release time

This is the time duration from the moment the signal drops below the threshold to the moment the input channel is deactivated. This option prevents the channel from being deactivated unnecessarily during pauses between music tracks when an input is configured to use Modulation Detection and an audio CD is being played over that channel.

This time is adjustable from 10 to 10,000 ms.

8.2.1.2 Prioritising audio inputs according to audio outputs

These parameters can be set under the « **Priorities** » tab.

A powerful priority level management algorithm is used to control the switching of the audio inputs to the outputs. Each audio input is assigned a priority level (from 0 to 15) which can be adjusted according to the audio output used. Level 1 is the highest priority level and 15 the lowest. Level 0 indicates that the audio input cannot access that particular audio output. Thus if two audio input channels are active at the same time on the same audio output, then the one with the highest priority will be switched to the corresponding audio output. Where both inputs have the same priority value, priority is assigned to the one that requested the output channel first.

In addition, regardless of the priority levels, a « Speech » audio channel always gets priority over a « Music » audio channel.

8.2.1.3 Setting the Group parameters

These parameters can be set under the « **Groups** » tab.

The DN 3816 includes the option of programming groups of outputs so that, for example, an audio input can be directed to a group of audio outputs. In applications involving sound and PA systems in public places, different groups of outputs may correspond to different geographical zones, where each zone has its own particular set of loudspeakers.

With the DN 3816 switching matrix, up to 16 groups of 1 to 16 outputs can be programmed.

8.2.1.4 Setting the GX 3016 console key parameters

These parameters can be accessed under the « **GX 3016 1 Keys** » and the « **GX 3016 2 Keys** » tabs. These tabs relate to the GX 3016 address 1 consoles (bus 1) and the GX 3016 address 2 consoles (bus 2) respectively. The programming of each of the keys (Zone Selection, Group Selection) of the consoles is valid for all the GX3016 console connected on this same bus.

Thus, each key on the GX 3016 address 1 console may be configured with an audio output to switch the audio input 5 (that of the GX 3016 1) to the chosen audio output. Similarly, each key on the GX 3016 address 2 console may be configured with an audio output to switch the audio input 6 (that of the GX 3016 2) to the chosen audio output.

In addition, each key on the GX 3016 address 1 console may be configured with a group of audio outputs to switch the audio input 5 (that of the GX 3016 1) to the audio outputs of the chosen group. And similarly, each key on the GX 3016 address 2 console may be configured with a group of audio outputs to switch the audio input 6 (that of the GX 3016 2) to the audio outputs of the chosen group.

For more information on operating GX 3016 consoles, refer to the GX 3016 User Manual.

8.2.1.5 Setting the GPI parameters

These parameters can be set under the « **GPIs** » tab.

The DN 3816's eight logic GPIs may be used for controlling the following three main functions: Remote Control, Day/Night and Mute.

8.2.1.5.1 Remote Control

The first function, « Remote Control », is used to switch an audio input to one or several audio outputs when the GPI is active. Under the « **GPIs** » tab, use the Function menu to first select the required audio input (from 1 to 8). Next choose an audio output (from 1 to 16) or a group of audio outputs.

8.2.1.5.2 Day/Night

The Day/Night function is used to reduce the selected audio outputs by –6 dB when the GPI is activated. Under the « **GPIs** » tab, use the Function menu to first select the Day/Night option. Next choose an audio output (from 1 to 16) or a group of audio outputs.

8.2.1.5.3 Mute

The third function, Mute, is used to mute the selected audio outputs by deactivating the audio output signal when the GPI is active. Under the « **GPIs** » tab, use the Function menu to first select the Mute option. Next choose an audio output (from 1 to 16) or a group of audio outputs.

8.2.1.6 Setting the GPO parameters

These parameters can be set under the « **GPOs** » tab.

The 16 logic GPOs may be used to carry out a range of applications such as generate data on a broadcast in progress, maximum level restoration, etc.

To configure a logic GPO requires that the following three parameters are set : a function code, the selection of one or more audio inputs and the selection of an audio output.

8.2.1.6.1 Broadcast in progress

A GPO configured with the function *Broadcast in Progress* will be activated when at least one of the inputs selected is switched to the chosen audio output.

8.2.2 Setting the digital process parameters

8.2.2.1 Input audio adjustments

The audio settings for the inputs are available under the « **Control** » tab.

8.2.2.1.1 Using Noise Gate on audio inputs

Each of the DN 3816's inputs incorporates a digital noise gate which may be very useful for eliminating earth hum, interference and other system background noises which may randomly occur. The noise gate feature uses a powerful dynamic processor that works like an automatic gate that lets through only the useful part of the signal. In fact, the noise gate function only lets the signal through if it exceeds a predefined level. It thus separates out the signal's useful component from any background noise that may be present on the input.

The noise gate threshold can be adjusted from –90 to 0 dBm.

8.2.2.1.2 Setting Bass/Treble on audio inputs

A standard Baxendall tone control circuit is incorporated on each of the DN 3816's inputs for digitally adjusting bass and treble. The mid-range frequency for adjusting the bass is 100 Hz while the midrange frequency for adjusting the treble is 10 kHz.

The gain for each of these two frequencies is adjustable from -18 to +18 dB.

8.2.2.1.3 Setting Mute on the audio inputs

Each input channel has its own Mute function. This is used to deactivate the input signal.

8.2.2.1.4 Adjusting Volume on the audio inputs

Once all the audio input settings have been adjusted, the general volume of each input needs to be set. The volume may be set from between –60 and +10 dB using the input volume potentiometer.

To get the maximum dynamic range from the signal processing processor, the input volume should be set so that the average value of the signal is between –3 and 0 dB on the Vu-meter.

8.2.2.2 Output audio adjustments

The audio settings for the outputs are available under the « **Control** » tab.

8.2.2.2.1 5 band parametric equaliser

Each of the DN 3816's output channels incorporates its own wholly independent equaliser. Each of the output channel's equaliser sections can be used to make fine tone adjustments to the signal.

The equaliser section provides true 5 band parametric equaliser functionality including frequency adjustment Fc, quality factor Q and gain G for each band.

8.2.2.2.1.1 Frequency Fc

This is the centre frequency of the selected parametric equaliser band. The selected frequency determines the centre frequency that may be adjusted using Gain.

The frequency may be adjusted from 20 to 20,000 Hz.

8.2.2.2.1.2 Quality Factor Q

This is the frequency bandwidth around Fc. Setting Q to a high value can be used for example to produce a notch filter. With a notch filter, it is possible, for example, to attenuate the Larsen audio feedback effect (the resonant frequency sometimes produced by a microphone). A low Q value can be used to widen the frequency bandwidth affected.

Quality factor may be set to between 0.1 and 20.

8.2.2.2.1.3 Gain G

This determines the amount of gain or attenuation that can be applied to the selected frequency bandwidth.

Gain may be set to anywhere from +18 to –18 dB.

8.2.2.2.1.4 N.B.: The effect of equalisation on voice sounds

Central frequency	Effect on voice sounds
40 to 125 Hz	Sense of power for some singers with very low voices
160 to 250 Hz	Fundamentals of the voice
315 to 500 Hz	Important for the quality of the voice
630 to 1000 Hz	Important for the naturalness of the voice. ⇒ Too much gain on the 315 to 1000 Hz frequency range produces a 'telephone'-type voice.
1250 to 4000 Hz	These frequencies are important for the intelligibility of the spoken word. ⇒ Too much gain in the 2 to 4 kHz frequency range can mask some phonemes; for example, the 'm', 'b' and 'v' can become unintelligible. ⇒ Too much gain in the 1 to 4 kHz can result in listener fatigue.
5000 to 8000 Hz	Accentuation of the voice. The 1.25 to 8 kHz range determines voice clarity
10,000 to 16,000 Hz	Too much gain in this frequency range can cause sibilance (whistle in 's', 'ch' or 'sch' pronunciation).

8.2.2.2.2 Setting Mute on the audio outputs

Each output channel has a Mute function associated with it that can be manually activated. The Mute function can be used to simply deactivate – or mute – the output signal. The audio output Mute function can also be activated by a logic GPI (cf. Setting the GPI parameters).

8.2.2.2.3 Adjusting Delay on the audio outputs

The delay function can be used to insert a delay on an audio output ; this delay can be adjust from 0 to 5 seconds (equal to a delay from 0 to 1700 meters).

8.2.2.2.4 Adjusting Volume on the audio outputs

Once all the audio output settings have been adjusted, the general volume of each output needs to be set. The volume may be set from between –60 and +10 dB using the output volume potentiometer.To get the maximum dynamic range from the signal processing processor, the output volume should be set so that the average value of the signal is between –3 and 0 dB on the Vu-meter.

9 MONITORING THE DN 3816 SWITCH MATRIX STATUS

The various states of the matrix can be checked in real time either by directly observing the indicators on the DN 3816's front panel, or by using the « Matrix Control » software. The following paragraphs describe the various options available when using the software application.

9.1 Monitoring audio levels

The audio levels can be checked by observing the green SIGNAL and red CLIP indicators on the DN 3816's front panel.

However, a more precise indication of audio levels is provided by the matrix configuration software. Under the « Control » tab can be found an accurate -60 to +20 dBm digital Vu-meter for each audio input and output. In the case of the audio inputs, the Vu-meter shows the signal level after audio signal processing. In the case of the audio outputs, the Vu-meter shows the signal level after audio signal processing.

9.2 Verifying the DN 3816's switch matrix routing

Routing table data is available under the « Routing » tab.

The table shows which of the DN 3816's audio inputs are occupying each audio output. A green connection point shows that the audio output in question is occupied by the audio input in question, i.e. that the audio input concerned is switched to the audio output concerned.

9.3 Monitoring GPI status

GPI status data is provided under the « Routing » tab along the row labelled GPI Status. A green indicator means that the corresponding GPI is activated.

9.4 Monitoring GPO status

GPO status data is provided under the « Routing » tab along the column labelled GPO Status. A green indicator means that the corresponding GPO is activated.

10 DETAILED TECHNICAL SPECIFICATIONS

10.1 Audio inputs

Number of inputs : 8
Inputs 1 to 4 : .....Micro/Line, electronic balanced, RF filtered
Inputs 5 to 8 : .....Line level inputs, balanced on transformer, RF filtered
Nominal micro level :.....- 49 dbm
Nominal line level :.....0 dbm
Headroom : .....+ 20 db
Input impedance : .....> 9 kΩ
Phantom power supply : .....+ 15 V (inputs 1 and 2 in micro configuration, via 2k2Ω)
Connectors : .....Euroblock removable terminal blocks

10.2 Audio outputs

Number of outputs: 16
Level: .....0 dbm
Type: .....Electronic balanced
Impedance: .....220 Ω
Max. output level: .....+ 20 dBm
Connectors: .....Euroblock removable terminal blocks
Delay value .....from 0 to 5 seconds (from 0 to 1700 meters)

10.3 A to D converter specifications

Resolution: .....24 bits
Dynamic: .....102 dB (105 dB 'A' weighted)

10.4 D to A converter specifications

Resolution: .....24 bits
Dynamic: .....104 dB (106 dB 'A' weighted)

10.5 Audio specifications

Sampling frequency: .....48 kHz
Coding .....24 bits, PCM
Distortion: .....< 0.1%
THD+N (Line) : .....< -70 dbm
THD+N (Micro) : .....< -63 dbm
Frequency response: .....50Hz – 20 KHz ± 3 dB
Crosstalk .....> 70db (@100Hz, @1Khz, @10Khz)

10.6 EtherSound

Connectors : ..... RJ45 (Network In and Network Out)

10.7 GPI Specifications

Number of inputs: 8
Type: .....opto-isolated

10.8 GPO Specifications

Number of outputs: .....16 open-collector outputs
Max current per GPO: .....30 mA

10.9 Mains Power Supply

Input voltage: .....85-264 V AC, 50/60 Hz
Protection: .....short circuit (protection by polyswitch) and over-voltage
Consumption max : .....0.24 A (230VAC - with 8 Gx3016)

10.10 +24 Volt Power Supply

Input voltage: .....+24 V DC ±10%
Protection: .....short circuit (protection by polyswitch)
Consumption: .....1.96A max. (with 8 x Gx3016)

10.11 GX 3016 Power Supply

Output voltage: .....+ 24 V DC
Maximum current: .....560 mA (8 x GX 3016)
Protection: .....short circuit (protection by polyswitch)

10.12 Mechanical Specifications

Installation: .....19" rack mounted
Material: .....Metal
Colour: .....Matt black
Weight: .....3.400 kg
Dimensions: .....482 x 345 x 45 mm

11 RECOMMENDATIONS

Dear Customer,

Once your product has come to the end of its useful life, and if it is located within France or any French Overseas Territory, please contact BOUYER to arrange for it to be displosed of in compliance with DEEE directives.

Otherwise please ensure the product is disposed of in accordance with your country's local regulations.

Thank you.

12 APPENDICES

12.1 Factory Settings

The factory settings are the settings the DN 3816 switch matrix is configured with immediately before it leaves the factory.

12.1.1 Hardware Configuration

Audio input	Type
IN 1	Line
IN 2	Line
IN 3	Line
IN 4	Mic

12.1.2 Default configuration of the audio input source types

Audio input	Type
IN 1	Remote control speech
IN 2	Remote control speech
IN 3	Modulation Detection Music
IN 4	Modulation Detection Speech
IN 5	GX 3016
IN 6	GX 3016
IN 7	Modulation Detection Music
IN 8	Persistent music

12.1.3 Default configuration of priority levels

		AUDIO INPUTS							
		IN 1	IN 2	IN 3	IN 4	IN 5	IN 6	IN 7	IN 8
AUDIO OUTPUTS	Out 1	1	2	6	5	3	4	7	8
	Out 2	1	2	6	5	3	4	7	8
	Out 3	1	2	6	5	3	4	7	8
	Out 4	1	2	6	5	3	4	7	8
	Out 5	1	2	6	5	3	4	7	8
	Out 6	1	2	6	5	3	4	7	8
	Out 7	1	2	6	5	3	4	7	8
	Out 8	1	2	6	5	3	4	7	8
	Out 9	1	2	6	5	3	4	7	8
	Out 10	1	2	6	5	3	4	7	8
	Out 11	1	2	6	5	3	4	7	8
	Out 12	1	2	6	5	3	4	7	8
	Out 13	1	2	6	5	3	4	7	8
	Out 14	1	2	6	5	3	4	7	8
	Out 15	1	2	6	5	3	4	7	8
	Out 16	1	2	6	5	3	4	7	8

12.1.4 Default configuration of groups

Only group 1 is created: it is made up of all audio outputs.

	Audio outputs															
Group	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
G1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
G2																
G3																
G4																
G5																
G6																
G7																
G8																
G9																
G10																
G11																
G12																
G13																
G14																
G15																
G16																

12.1.5 Default configuration of the GX 3016 keys

Valid for two GX 3016 consoles (audio inputs 5 and 6)

Key	Function	Output or Group number
1	Select output	Out 1
2	Select output	Out 2
3	Select output	Out 3
4	Select output	Out 4
5	Select output	Out 5
6	Select output	Out 6
7	Select output	Out 7
8	Select output	Out 8
9	Select output	Out 9
10	Select output	Out 10
11	Select output	Out 11
12	Select output	Out 12
13	Select output	Out 13
14	Select output	Out 14
15	Select output	Out 15
16	Select output	Out 16

12.1.6 Default configuration of logic GPIs

		Function	Output / Group
GPIs	GPI 1	Select audio input 1	Group 1
	GPI 2	Select audio input 2	Group 1
	GPI 3	None	
	GPI 4	None	
	GPI 5	None	
	GPI 6	None	
	GPI 7	None	
	GPI 8	None	

12.1.7 Default configuration of logic GPOs

			Audio inputs								
		Function	1	2	3	4	5	6	7	8	Output n°
GPOs	GPO 1	Broadcast in progress	X	X	X	X	X	X	X	X	Out 1
	GPO 2										
	GPO 3										
	GPO 4										
	GPO 5										
	GPO 6										
	GPO 7										
	GPO 8										

This configuration is used to generate a “Broadcast in Progress” signal on GPO 1 by occupying output Out 1 with any one of 8 sources.

12.1.8 Default configuration of the sound detection parameters

Source type	Parameter	Value
Speech	Threshold	-20 dBm
	Detection time	30 ms
	Release time	3 s
Music	Threshold	-20 dBm
	Detection time	30 ms
	Release time	10 s

12.1.9

12.1.10 Default values of the audio signal processing parameters

The default values of the audio signal processing parameters are given in the table below:

Function	Parameter	Value	Comment
Input volume	Gain/Attenuation	0 db	For all inputs
Noise Gate	Status	Inactive	For all inputs
	Threshold	-90 dBm	
Input bass/treble	Gain/Attenuation	0 db	For all inputs
Output volume	Gain/Attenuation	0 db	For all outputs
Parametric filter n°1	Frequency	150 Hz	For all outputs
	Q	5	
	Gain	0 db	
Parametric filter n°2	Frequency	350 Hz	For all outputs
	Q	5	
	Gain	0 db	
Parametric filter n°3	Frequency	1200 Hz	For all outputs
	Q	5	
	Gain	0 db	
Parametric filter n°4	Frequency	3000 Hz	For all outputs
	Q	5	
	Gain	0 db	
Parametric filter n°5	Frequency	8000 Hz	For all outputs
	Q	5	
	Gain	0 db	

12.1.11 Default values for the delay parameters

The default value of the delay parameters are 0 (milliseconds or meter) for the value and inactive for the state.