User's manual

NGM-164

Networked Audio Metering Unit

R59770028, Current Version

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	main issue	update
chapter 1	new	
chapter 2	new	
chapter 3	new	
chapter 4	new	
chapter 5	new	
chapter 6	new	
chapter 7	new	
chapter 8	new	

new: The corresponding chapters are new or completely revised.
corr.: Passages of the corresponding chapter were corrected; see modification bars.
add.: Passages of the corresponding chapter were added; see modification bars.

This manual refers to following hardware configurations of NGM-164:

NGM-164	**R9832280**

Document History

Modifications, which result in a new version, are indicated by a vertical bar.

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The environmental conditions as well as the servicing and maintenance regulations specified in this manual must be complied with by the customer.

Revision sheet

To:

- **Barco Control Rooms GmbH**
  An der Rossweid 5, D-76229 Karlsruhe
  Phone: +49-721-6201-0, Fax: +49-721-6201-298
  E-mail: docu.de.bcd@barco.com, Web: www.barcocontrolrooms.com

From: _____

Date: _____

Please correct the following points in this documentation (**R59770028**):

page	wrong	correct

Contents

1 Introduction

This chapter explains the structure of the manual itself and the used typographic styles and symbols. Safety information is provided concerning the operation of computer systems from Barco.

1.1 How this manual is organized

This section explains the structure of the manual itself and the used typographic styles and symbols. Safety information is provided concerning the operation of computer systems from Barco.

- **Summary**
  gives an overview about the features of NGM-164.
- **Getting Started**
  describes the set up of NGM-164 and provides you with a guide through the device configuration.
- **NGM-164 network protocol v1.0**
  is a reference to the NGM-164 network protocol
- **Maintenance**
  describes access to the boards and the maintenance of NGM-164.
- **Technical Appendix**
  gives tabular overviews about the technical details of NGM-164, its components and of their interfaces.
- **Troubleshooting**
  gives advice, if your NGM-164 does not operate properly.
- **Index**
  lists the keywords of the manual.

Chapters, pages, figures and tables are numbered separately. Chapters are indicated by a »point syntax«, e. g. **4.2.3**, pages by a »dash syntax«, e. g. **2-1**, as figures and tables are, e. g. **figure 5-4**.

1.2 Styles and Symbols

The typographic styles and the symbols used in this document have the following meaning:

Bold	Labels, menus and buttons are printed in **Bold** font.
Condensed	Links to both other chapters of this manual and to sites in the Internet are printed condensed. In the on-line version of this manual all hyperlinks appear teal.
`Courier`	Names of files and parts from programs are printed in the `Courier` font.
`Courier bold`	Inputs you are supposed to do from the keyboard are printed in **`Courier bold`** font.

↳	**Within a piece of programming code this arrow marks a line, that must be made up in two lines, though meant to be one line.**
	**If you do not heed instructions indicated by this symbol there is a risk of damage to the equipment!**
	**If you do not heed instructions indicated by this symbol there is a risk of electrical shock and danger to personal health!**
	**If you do not heed instructions indicated by this symbol there is a risk of damage to parts, which are sensitive towared electrostatic charge!**
	**If you do not heed instructions indicated by this symbol there is a risk to get harmed by sharp objects!**
	**If you do not heed instructions indicated by this symbol there is a risk that parts may explode!**
	**If you do not heed instructions indicated by this symbol there is a risk that hot parts impact persons or objects!**
	**The sheet icon indicates additional notes.**
	**Next to this icon you find further information.**
	**This hand icon marks tips.**
	**Next to this icon you find important notes.**

1.3 Safety Instructions

This section describes safety precautions, which must be observed when installing and operating a product from Barco.

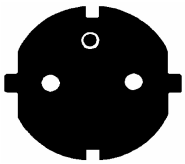
1.3.1 Precautions

For your own protection, observe the following safety precautions when installing, operating and servicing your device:

- Before operating the units please read this manual thoroughly and retain it for future reference!
- Observe all warnings and instructions printed on the devices!
- Servicing not explicitly mentioned in this manual should never be carried out by unauthorized personnel! Never open the case of the unit without first disconnecting the power supply cord!
- To prevent fire or electrical shock hazard, do not expose this unit to rain or moisture!
- This product should be operated from an AC power source!
- Check that the voltage and frequency of your power supply match those printed on the device label with the rated electrical values!
- If you are not sure of the type of AC power available, consult your dealer or local power company!
- This product is equipped with a 3-wire grounding plug, a plug having a third (grounding) pin. This plug will only fit into a grounding-type power outlet. This is a safety feature. If you are unable to insert the plug into the outlet, contact your electrician to replace your obsolete outlet. Do not defeat the purpose of the grounding-type plug!
- This equipment must be grounded (earthen) via the supplied 3 conductor AC power cable. (If the supplied power cable is not the correct on, consult your dealer.)

Mains lead (AC power cord) with CEE 7 plug:

The wires of the mains lead are colored in accordance with the following code:



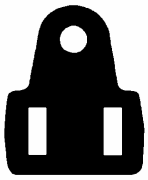
yellow + green	**Earth (Ground)**
blue	**Neutral**
brown	**Line (Live)**

Figure 1-1
CEE 7 plug

Power cord with NEMA 5-15 plug:

- The cord set must be UL-approved and CSA-certified.
- The minimum specification for the flexible cord is No. 18 AWG, Type SVT or SJT, 3-conductor.
- The cord set must have a rated current capacity of at least 10A.
- The attachment plug must be an Earth-grounding type with a NEMA 5-15P (10A, 125V) configuration.

The wires of the power cord are colored in accordance with the following code.



green or yellow + green	**Earth (Ground)**
blue or white	**Neutral**
brown or black	**Line (Live)**

Figure 1-2
NEMA 5-15 plug

- Do not allow anything to rest on the power cord. Do not locate this product where people will walk on the cord. To disconnect the cord, pull it out by the plug. Never pull the cord itself.
- If an extension cord is used with this product, make sure that the total of the ampere ratings on the products plugged into the extension cord does not exceed the extension cord ampere rating.
- Never push objects of any kind into this product through cabinet slots as they may touch dangerous voltage points or short out parts that could result in a risk of fire or electrical shock.
- Never spill liquid of any kind on the product. Should any liquid or solid object fall into the cabinet, unplug the set and have it checked by qualified service personnel before resuming operations.
- Lightning - For extra protection for this audio product during a lightning storm or when it is lift unattended and unused for a long period of time, unplug it from the wall outlet. This will prevent damage to the unit due to lightning and AC power-line surges.

1.3.2 Unpacking of Devices

Note advises on the packaging for unpacking!

1.3.3 Installation

- Do not place this unit on an unstable cart, stand, or table. The unit may fall, causing serious damage to it.
- Do not use this unit near water.
- Use only the power cord supplied with your unit. While appearing to be similar, other power cords have not been safety tested at the factory and may not be used to power the unit. For a replacement power cord, contact your dealer.
- Slots and openings in the cabinet and the sides are provided for ventilation; to ensure reliable operation of the unit and to protect it from overheating, these openings must not be blocked or covered. The openings should never be blocked by placing the product on a bed, sofa, rug, or other similar surface. This product should never be placed near or over a radiator or heat register. This unit should not be placed in a built-in installation or enclosure unless proper ventilation is provided.
- The maximum recommended ambient temperature for this equipment is 30° C.
- When using the unit in a multi-unit rack assembly or closed assembly the ambient temperature inside the assembly may not succeed the maximum rated ambient temperature.
- When installed in a rack, the installation should be such that the amount of air flow required for safe operation of the equipment is not compromised.
- The mounting of the equipment should be such that no hazardous condition is achieved due to uneven mechanical loading.

1.3.4 Servicing

Mechanical or electrical modifications others than described in this manual must not be made to the devices. Barco is not liable for damages resulting from modified devices.

Only authorized personnel should carry out other maintenance work not explicitly mentioned in this installation manual!

Never open the case of NGM-164 without first disconnecting all power supply cords! Measurements and tests with the opened device may be carried out only in the factory or by specially trained personnel, due to the dangers of electrical shock.

1.3.5 Cleaning

Unplug this product from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. See section 5.3 Cleaning for a cleaning instruction!

1.3.6 Re-Packing

Keep the original shipping carton and packing material; they will come in handy if you ever have to ship your unit. For maximum protection, repack your set as it was originally packed at the factory.

2 Summary

This chapter gives an overview about the features of NGM-164.

2.1 Properties

The NGM-164 – Networked Audio Metering Unit monitors up to 64 audio channels and streams the metering information and alarm notification over an Ethernet IP network for visualization. It provides conversion of analog or digital AES/EBU audio sources into data that represents audio level indication conforming to the most common international standards. The data may then be made available on a LAN for remote multi-channel level monitoring and may be rendered to screen on dedicated Barco controllers e.g. a HYDRA system where audio level indication and alarm functionality is required.

The NGM-164 provides the following features:

- Input card types automatically recognized
- All cards are hot-swappable
- 64 audio channels input capability, 4 slots of 16 channels (8 stereo pairs) each
- Scale and ballistic data coded in dB
- Level processing performed at 16 bit resolution
- Analog audio formats with +24 dB capability
- Digital audio format is AES/EBU on balanced or unbalanced input
- Digital audio input cards are 32, 44.1, 48, 96 KHz capable
- Alarm detection for audio loss, over level, out-of-phase on adjacent pairs; additionally carrier loss detection on digital audio input cards

The NGM-164 is by design a highly reliable device. All cards are hot-swappable and the firmware is stored in a reliable field programmable FLASH memory.

The NGM-164 requires little space. It comes in a 1U high chassis mountable in a 19" industrial rack. The cards are accessible behind the removable part of the front panel. There are slots for one controller board, up to four audio input cards and one audio output card available. Audio-, network- and power connectors are on the rear of the device.

3 Getting started

This chapter describes the set up of the NGM-164 and provides you with a guide through the device configuration.

3.1 Examining

3.1.1 The front

The outside

1	power switch
2, 3	securing screws of the front panel
4	removable part of the front panel

Figure 3-1
Front view of the NGM-164

On the front panel to the left there is the power switch [1]. The other part of the front panel can be removed by unscrewing the securing screws to access the hot pluggable boards of the NGM-164.

View inside

After removing the removable part of the front panel the device looks like in the figure below:

1	power switch	
5	slot for controller board	
6	slot for monitoring output board	
7 – 10	slots for audio input boards	
		e.g. in the device shown above:
7	slot 2	*digital audio input board*
8	slot 1	*analog audio input board*
9	slot 4	*empty slot*
10	slot 3	*empty slot*

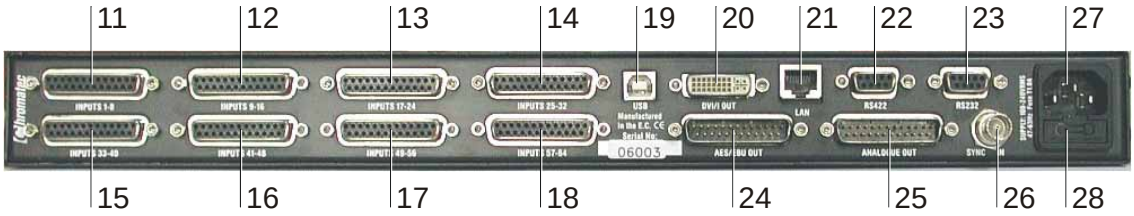
Figure 3-2
Interior view of the NGM-164

There are different types of input boards available: analog audio input board and digital audio input board. The figure above shows a digital audio input board in position [7] and an analog audio input board in position [8].

The front rack ears are intended to provide a means of retaining the unit in the rack. To ensure adequate support the unit must also be supported at the rear of the frame. Please ensure that ventilation is not impaired when selecting suitable supports.

3.1.2 The back

The outside



11	audio input channels 1 – 8
12	audio input channels 9 – 16
13	audio input channels 17 – 24
14	audio input channels 25 – 32
15	audio input channels 33 – 40
16	audio input channels 41 – 48
17	audio input channels 49 – 56
18	audio input channels 57 – 64
19	reserved for future use: *USB-B connector*
20	reserved for future use: *DVI-I connector*
21	network adapter
22	reserved for future use: *RS422 connector*
23	RS232 connector
24	optional: *audio output channels 1 – 4, AES/EBU audio*
25	optional: *audio output channels 1 – 4, analog audio*
26	reserved for future use: *BNC connector for synchronization*
27	mains connection
28	fuse drawer

Figure 3-3
rear view of the NGM-164

To protect the NGM-164 from overheating, the air supply openings at the side faces of the case and the top cover shall be kept free of obstructions!

To disconnect the NGM-164 from the power supply the power cord has to be pulled of the mains connection [26]. Therefore the back panel has to be easily accessible!

3.2 Cabling

3.2.1 Power supply

Check the power rating on your outlet before connecting the NGM-164 to the wall outlet or to a power strip. Contact your facilities manager or a qualified electrician if you are not sure what type of power is supplied to your building.

The NGM-164 is designed to operate with single-phase power systems having a grounded neutral conductor. To reduce the risk of electrical shock, do not plug into any other type of power system.

To connect NGM-164 to the power supply, follow these steps:

- Plug the female end of the power cords into the mains connections of the NGM-164 [26] (Figure 3-3).

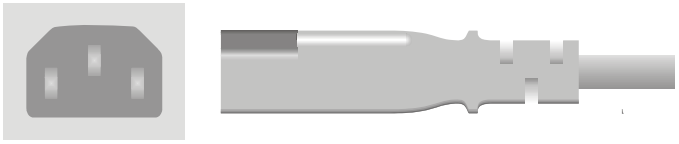


Figure 3-4
Mains connection

- Plug the male end of the power cord into a power outlet.

3.2.2 Network

For connecting the NGM-164 to the LAN (local area network) the **network adapter** [20] is available. It has the ability to establish a 10 Mbps or 100 Mbps connection. The connection speed is auto-detected.

The network adapter offers a Twisted Pair connection, plug a network cable into it:

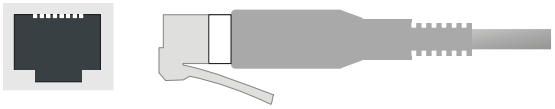


Figure 3-5
Connecting network adapter to the LAN

3.2.3 Audio input

There are altogether eight connectors for audio input on the rear of the NGM-164. Each two connectors are used to connect up to 16 audio channels to one audio input board. Up to four audio input boards may be mounted in the NGM-164, thus a total of 64 audio channels may be connected. Please refer to Figure 3-3 rear view of the NGM-164 for the arrangement of the connectors and to section 6.2 Interfaces for pin out.

3.2.4 Audio output

If the NGM-164 is equipped with a monitoring output board, then it can be listened to four of the connected audio sources. The output is provided as AES/EBU and analog signal simultaneously via the AES/EBU plug [24] and the analog plug [25] respectively and simultaneously as streaming data at the network interface [21]. Please refer to Figure 3-3 rear view of the NGM-164 for the arrangement of the connectors and to section 6.2 Interfaces for pin out.

3.3 Starting up

3.3.1 Connecting

Plug in the power cables on the back panel of the NGM-164. Please, refer to section 3.2.1 Power supply!

Connect the NGM-164 to the local area network by connecting the network to the network adapter! Please, refer to section 3.2.2 Network!

Connect the audio sources to the audio input connectors. Please refer to section 3.2.3 Audio input! If a monitoring output board is used suitable output device can be connected; please refer to section 3.2.4 Audio output.

3.3.2 Switching on

Switch on the NGM-164 by switching the **power switch** [1] (Figure 3-1) on the front! While the NGM-164 is powered the power switch lightens red.

When starting the device for the first time you have to adjust its network settings before you can use is; please refer to section 3.4.1 Configuration of network parameters. If the device is already configured it will be operable after a short initialization phase.

3.3.3 Switching off

Switch off the NGM-164 by switching the **power switch** [1] on the front!

3.3.4 System requirements

Network requirements

The NGM-164 must be connected to a network with sufficient bandwidth capabilities.

An NGM-164 frame with one active level/alarm stream requires 370 kbps.

Stream	Data rate
Alarm date only	85 kbps
Audio and phase levels plus alarms	370 kbps

Streamed audio bandwidth is dependent on monitoring audio quality and the number of stereo pairs being monitored. Full bandwidth quality requires 1.9 Mbps for each stereo pair so the maximum bandwidth needed for four stereo pairs would be 6.4 Mbps. This figure must be added to the bandwidth needed for all of the monitoring applications expected to be active at one time.

Audio streaming bandwidth is directly proportional to the number of audio pairs streamed and the quality levels used:

Audio stream quality	Data rate
full-bandwidth stereo pair	1.6 Mbps
12 kHz stereo pair	768 kbps
6 kHz stereo pair	384 kbps
6 kHz 8-bit µ-law encoded stereo pair	192 kbps

Network bit-rate does not change when multiple stations are listening to the same stream since multicasting is used for each stereo pair.

3.4 Configuring

3.4.1 Configuration of network parameters

The NGM-164 comes preconfigured to your site, except for the network settings. These settings can be adjusted by means of an IP setup program. You find the executable file IPsetup.exe on the CD-ROM R5976593 iSTUDIO documentation & supplement within the tools section.

System requirements

- The program IPSetup runs on a PC with Windows operating system
- The PC has to be connected to the same network as the NGM-164

Procedure

Copy the file **IPsetup.exe** from the CD-ROM to the PC and start it with a double click. When the IP setup program is started, it scans the network for NGM-164 devices and lists all found devices with their MAC address. If there are multiple NGM-164 devices in the network, which are not yet configured, the MAC address serves to distinguish them. (The MAC address is labeled on the controller board; please refer to section 5.1.2 Controller board for an instruction how to read it.)

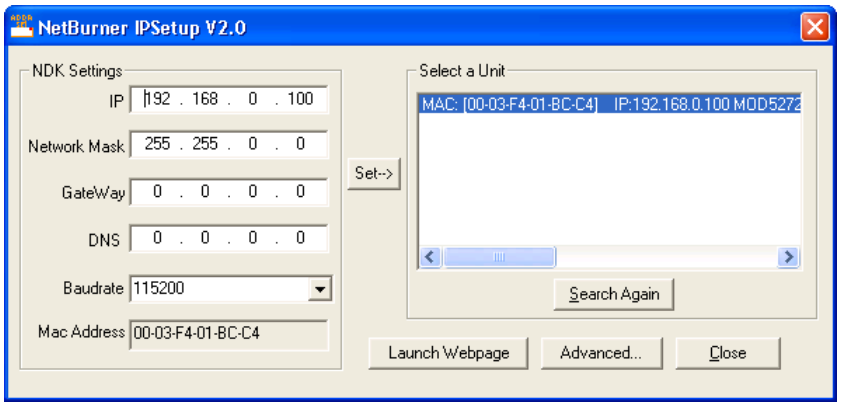


Figure 3-6
IPSetup showing basic view

In the IPSetup program adjust the IP address, network mask, gateway, DNS and baud rate. The table below lists the factory default settings and shows which values can be adjusted in which way:

	factory settings	**values**
IP	192.168. 0 .100	suitable network settings
Network Mask	255.255. 0 . 0	suitable network settings
GateWay	0 . 0 . 0 . 0	suitable network settings
DNS	0 . 0 . 0 . 0	suitable network settings
Baudrate	115200	19200, 38400, 57600, 115200
Mac Address	*dependent on the device*	*unchanged, dependent on the device*

Table 3-1
Configuration of the network settings

When you have entered suitable settings click the **Set** button. The values are transmitted to the NGM-164 and the device is rebooted. Click the **Search Again** button to refresh the list of units. While the device is rebooting it will not be found by the network scan. As soon as it is operable again (rebooting takes about 10 seconds) clicking the **Search Again** button will display it again.

You can exit the IPSetup program with the **Close** button. (Web access to the NGM-164 with the **Launch Webpage** button is currently not supported. Advanced settings which are accessible on the extended dialog after clicking the **Advanced** button are reserved for service personnel and should not be changed. Press the **Basic** button to collapse the dialog again.)

3.4.2 Stream and level configuration with iStudio

After assigning an IP address the setup of the NGM-164 metering and alarm parameters can be configured with the iSTUDIO software that is used to control the HYDRA controllers.

Information about the operation of iSTUDIO in general and the configuration of NGM-164 parameters can be found in the iSTUDIO user's manual. It is stored on the CD-ROM R5976593 iSTUDIO documentation & supplement.

3.4.3 Level configuration with testlevels.exe

The parameters of a metering information stream of an NGM-164 can also be adjusted with the software **testlevels.exe**. It is also available on the CD-ROM R5976593 iSTUDIO documentation & supplement within the tools section.

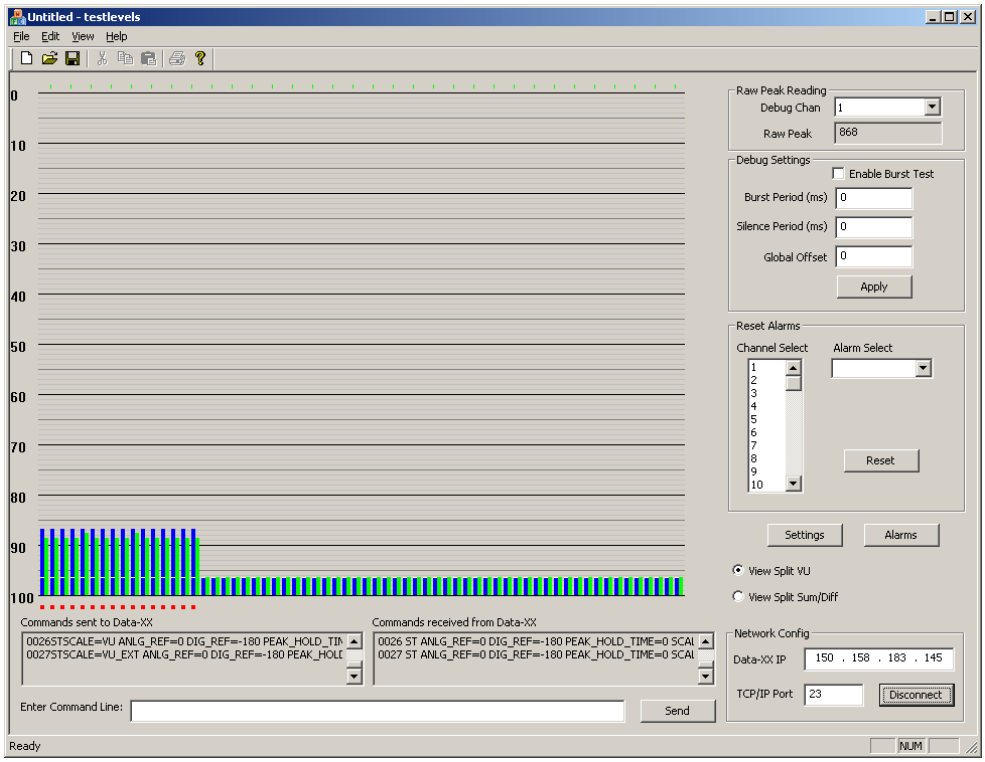


Figure 3-7
Audio level configuration with testlevels.exe – main window

First a connection to the NGM-164 must be established. Enter in the section **Network Config** the IP address and port number of the NGM-164 and click **Connect**.

For debugging the raw peak of a specific channel can be read within the **Raw Peak Reading** section and debug settings can be entered in the **Debug Settings** section.

In the section **Reset Alarms** a specific alarm of a specific channel can be reset.

With the **Enter Command Line** field a command of the NGM-164 network protocol can be send to the connected NGM-164. The history of the sent commands and the return of the NGM-164 are listed in the two boxes above the field. Please refer to chapter 4 NGM-164 network protocol v1.0. for the more information on the network protocol.

The **Settings** and **Alarms** buttons provide access to two additional dialogs for configuration:

Settings

On the Settings dialog the meter settings can be adjusted.

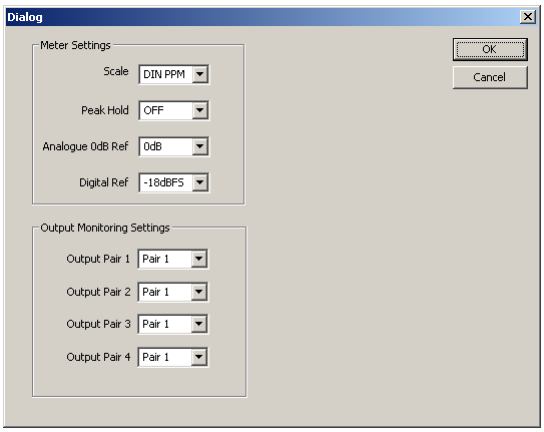


Figure 3-8
Audio level configuration – Settings dialog

Alarms

On the Alarms dialog threshold levels and timeouts for audio over alarms, audio loss alarms, out of phase alarms and carrier loss alarms can be set in the individual sections. With Alarm Auto Reset the time span after that an alarm is automatically reset can be chosen.

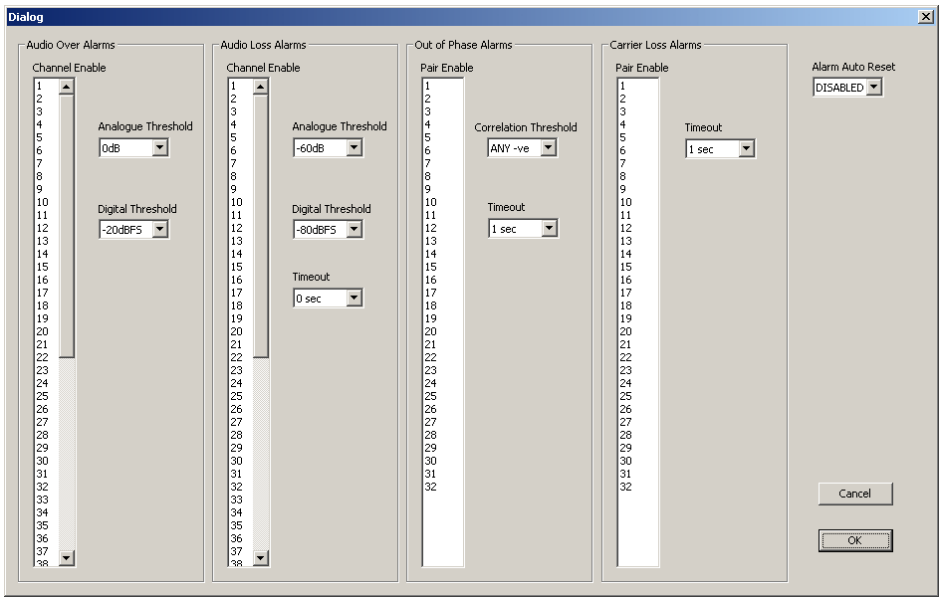


Figure 3-9
Audio level configuration – Alarms dialog

3.4.4 Audio output

Besides the audio signals provided via the audio output connectors, which can be connected directly to an appropriate audio device, the signals are also streamed and can be accessed via the network.

Streamed Audio

Audio is streamed using open standard RTSP/RTCP/RTP streaming media protocols. To request an audio stream the following URL must be used:

`rtsp://<ip_address>/stream<no>`

Where <ip_address> is the IP address of the NGM-164 and <no> is the number of the stream (1, 2, 3 or 4), e.g.:

`rtsp://150.158.181.131/stream3`

The audio stream can be played back by any media player compliant to the RTSP/RTCP/RTP standard. This includes Quicktime, VLC, and MPlayer. Others, such as Microsoft Media Player and RealPlayer use their own standards and can not be used.

It is advisable to use a player that provides cache control, such as VLC, because delay can be minimized. (To minimize the delay in VLC, go to Settings -> Preferences -> Input / Codecs -> Demuxers -> RTP/RTSP. Click the Advanced Options, and change the Caching value to 100. Anything less than this and the player may have problems playing data continuously.)

3.4.5 Firmware update

For a firmware update there are two files required:

- **DATAXX.BIN**
- **AMXXNET_APP.S19**

If a firmware update should become necessary, the new firmware files can be requested at the customer support; please refer to section 7.1 Hot Line.

Update via Ethernet

The firmware update usually can be done with FTP via the Ethernet:

- Establish an FTP connection with the IP address of the NGM-164.
- Transfer the two above mentioned firmware files to the device.
- When the FTP program closes the connection properly when the transfer is complete then the NGM-164 will reboot automatically. Otherwise switch the NGM-164 off and on again to reboot it.

The **AMXXNET_APP.S19** program contains the code for networking, including the FTP server of the NGM-164. This software will not get programmed into the memory until the complete file has been uploaded, so it is unlikely that a disturbance during uploading will corrupt the system and leave it with the network not functioning.

Update via RS232

If anyhow the procedure above fails, an update via RS232 may become necessary. In this case proceed as follows:

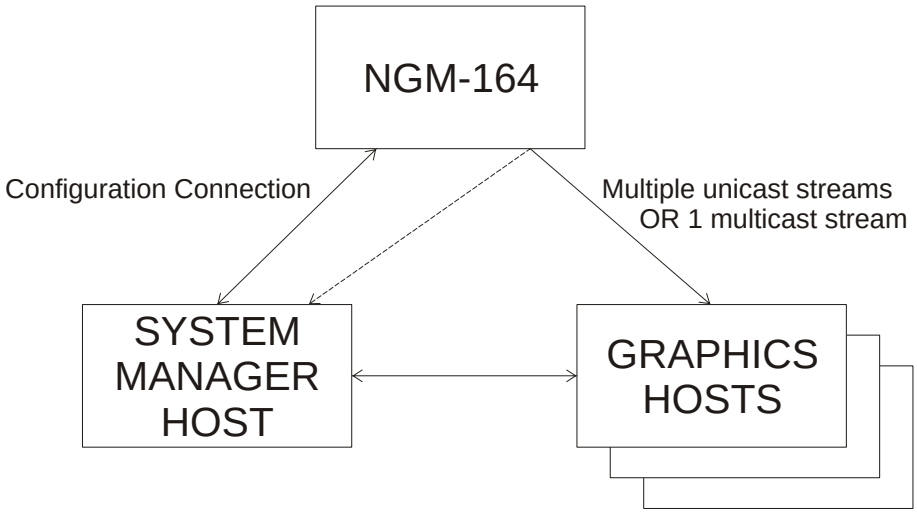
- Switch off the NGM-164.
- Make sure that the jumper J6 of the controller board is in the LAN position; please refer to section 5.1.2 Controller board.
- Use a communications program such as Windows HyperTerminal, with the communications settings: 115200 baud, no parity, 8 data bits, 1 stop bit, no hardware control.
- Connect a COM port of your computer to the RS232 connector [22] of the NGM-164 with a straight through serial cable.
- Switch on the NGM-164 again. You should see:
- In the terminal window the text `Waiting 2sec to start 'A' to abort` will appear.
- Press **A** immediately to stop the NGM-164 from booting and then type in **FLA <ENTER>**.
- The NGM-164 is now ready to receive the **AMXXNET_APP.S19** file. It must be transferred as text file. (In HyperTerminal, this is done by going to the Transfer menu, selecting Send Text File, and then locating and selecting the AMXXNET_APP.S19 file and selecting Open. This will upload the complete file.)
- The NGM-164 will reboot when transfer is complete.

After this the file **DATAXX.BIN** should be transferred with the FTP update mechanism via Ethernet; please see above.

4 NGM-164 network protocol v1.0

4.1 Introduction

The NGM-164 uses a 10/100 Ethernet port using TCP/IP protocols to communicate with other hosts. The data that is available to hosts includes audio and phase levels that the host can use to display on audio meters, and alarm status such as audio loss, over level, and phase errors. Commands that can be sent to the NGM-164 include initiating the sending of required data, resetting alarms, and setting of all parameters such as audio meter ballistics and alarm thresholds.



This drawing shows the networking model upon which the protocol is designed to work with. The System Manager host establishes a connection with the NGM-164 and configures all of its parameters. It also instructs the NGM-164 to start sending the audio information to specific hosts. If the System Manager instructs the hosts to join a multicast group and the NGM-164 to send the stream using this multicast address then only 1 stream is necessary. Alternatively multiple streams can be established to each host.

4.2 Notational conventions and generic grammar

name = definition

The name of a rule is simply the name itself (without any enclosing "<" and ">") and is separated from its definition by the equal character "=". Whitespace is only significant in that indentation of continuation lines is used to indicate a rule definition that spans more than one line. Certain basic rules are in uppercase, such as SP, LWS, HT, CRLF, DIGIT, ALPHA, etc. Angle brackets are used within definitions whenever their presence will facilitate discerning the use of rule names.

"literal"

Quote marks surround literal text.

[rule]

Square brackets contain optional elements.

rule1 | rule2

Elements separated by a bar ("|") are alternatives, e.g., "yes | no" will accept yes or no.

(rule1 rule2)

Elements enclosed in parentheses are treated as a single element. Thus, "(elem (foo | bar) elem)" allows the token sequences "elem foo elem" and "elem bar elem".

***rule**

The character "*" preceding an element indicates repetition. The full form is <n>*<m>element" indicating at least <n> and at most <m> occurrences of element. Default values are 0 and infinity so that "*(element)" allows any number, including zero; "1*element" requires at least one; and "1*2element" allows one or two.

SP = <US-ASCII SP, space (32)>

CR = <US-ASCII CR, carriage return (13)>

LF = <US-ASCII LF, line feed (10)>

NUL = <US-ASCII NUL, (0)>

4.3 System Manager host to NGM-164 configuration connection

To control the NGM-164, the System Manager must establish a TCP connection on port number 23. The connection must remain open to maintain any streams that it initiates. The System Manager controls the NGM-164 by sending command lines on the TCP connection as described in the following sections.

If the NGM-164 has not received any data from the System Manager for 10 seconds then it will check that the connection is still established by sending a Keep Alive command line. The System Manager must reply to this within another 10 seconds, otherwise the NGM-164 will close the connection and any non-permanent data streams that were activated by that connection.

4.3.1 Command lines

There are various types of command lines for controlling data streams and the settings that determine the content of the data streams. The first command line is for starting, stopping and modifying a data stream. It is of the following format:

```
[NUMID] "DS" 1*[PARAMETER = VALUE SP] CR | LF
```

The command line for setting or reading a NGM-164 parameter is of the following format:

```
[NUMID] "ST" *[PARAMETER [= VALUE] SP] CR | LF
```

where:

NUMID = up to 4 numerical digits representing a number from 0 to 9999 identifying this command line

PARAMETER = String name of a parameter

VALUE = String name of a parameter's value

The action of setting or reading a parameter is determined by whether or not the '=' and VALUE items are included in the command line – if they are not present then the current value of the parameter will be read and returned to the System Manager, otherwise the VALUE sent in the command line will be written to the PARAMETER. This option is not available for the data stream control command line – parameters can only be written to, not read.

When the NGM-164 receives a command, it will always reply using a command line of the same format. The optional NUMID code is for purposes of matching a reply from the NGM-164 to a command line sent by the System Manager. If the command line from the System Manager contains a NUMID code then the response from the NGM-164 will contain one with the same value.

Extra spaces are permitted between any elements in the command line except before or after the '=' sign between the PARAMETER and VALUE elements.

If the PARAMETER contains an index and the previous PARAMETER was the same type then only the index is necessary. For example, if all audio over alarms except channels 0 and 1 are to be turned off,

`AUD_OVER_EN=0 AUD_OVER_EN0=1 AUD_OVER_EN1=1.` (turns all off, then 0 + 1 back on)

can be shortened to:

```
AUD_OVER_EN=0 0=1 1=1.
```

A third type of command line is for sending system commands such as a reboot command. This is in the format:

```
"CM" COMMAND CR | LF
```

where:

COMMAND = String name of the command

This command line can only have one command in it. The reply from the NGM-164 will depend on the command sent, and is described in the section on System Commands.

Another command line exists for storing or retrieving user-defined data. The type and format of the data is entirely up to the developer. The format of this command line is:

```
"BD" *[PARAMETER [= VALUE] SP] CR | LF
```

See the User Binary Data section for more details on this command.

The final type of command line is for when the NGM-164 needs to check that the TCP connection is to be kept alive. The System Manager must respond to this message as described in the section on Keep Alive Command, otherwise the NGM-164 will close the connection. The format of this command line is:

```
"KA" CR | LF
```

4.3.2 Data Stream command line

System Manager to NGM-164 request

Necessary parameters:

"PORT" | "HANDLE" | "STOP" | "LIST"

Parameter Name	Parameter Values	Description	Default Value
PORT	1 to 65535	The TCP/IP port to use for the data stream	N/A
HANDLE	1 to 65535	A unique number to identify the stream. 40 of the handles, from 65496 to 65535, are reserved for streams that are to remain permanent (persist after the client that started the stream terminates). If the handle is in the range of 65496 to 65515 then the stream will persist until the next reboot. If the handle is in range of 65516 to 65535 then the stream will restart again after reboots.	N/A
STOP	-1 to 65535	A value of 1 to 65535 stops the data stream with the handle of that value. A value of 0 stops all data streams that were started by the host making the request. A value of -1 stops all data streams regardless of which host started them.	N/A
LIST	-1 to 65535	Lists the details of streams present. A value of 1 to 65535 lists the details of the stream with that value (returns the values of the PORT and all the optional parameters listed below). A value of 0 returns a list of all the handles of existing data streams that were started by the host making the request. A value of –1 lists all the data streams regardless of which host started them.	N/A

When starting a stream, PORT must be sent, HANDLE is optional. PORT identifies the TCP/IP port to use for a new stream. The System Manager can also assign a value to HANDLE. If the HANDLE parameter is not supplied then the NGM-164 will assign its own identifier.

When stopping a stream, only STOP is to be sent.

To modify an existing stream, the HANDLE parameter must be the first one in the command line. Set it to the value of the existing stream's handle. The parameters to modify will come after this. Settings relating to parameters that are not provided will remain unchanged.

Only one type of action can be present in a data stream command line. For example, it is not possible to instruct one stream to start and an existing stream to stop within one command line. It is also not possible to instruct more than one stream to start within one command line. Multiple streams can be stopped by setting STOP to 0 or –1, but stopping multiple streams by having multiple STOP parameters within the one line is not possible. The same applies to the LIST parameter.

Optional parameters:

Parameter Name	Parameter Values	Description	Default Value
IPADDR	Decimal dot notation of an IP address	The IP address to use for the data stream	IP address of the host making the request
CHAN_LEVEL	0000000000000000 to FFFFFFFFFFFFFFFF	Hexadecimal representation of channel levels to include in stream. The right digit represents the first 4 channels; second from right represents the next 4, etc. If not all channels are represented then those ones are not included.	FFFFFFFFFFFFFFFF (all channels)
LEVEL_CONTENT	LEVELS | NO_LEVELS | VU | NO_VU | SUM_DIFF | NO_SUM_DIFF | PEAK_HOLD | NO_PEAK_HOLD	Indicates which types of level data to include in the stream. By default, all types of levels (of the channels selected with the CHAN_LEVEL parameter) are sent. The levels, VU levels, peak hold or sum and diff levels can be switched off (or back on). For example, if the current ballistics are set to VU then the level readings will appear twice in the stream – once in the LEVEL data and again in the VU data. This redundant data can be switched off by LEVEL_CONTENT=NO_VU. This parameter only affects its complementary setting – i.e. the NO_VU value will not affect the state of the normal levels, peak holds or sum and difference presence. The on/off states of multiple level types are set by either stating the LEVEL_CONTENT parameter a multiple number of times (e.g. LEVEL_CONTENT=NO_VU LEVEL_CONTENT=NO_SUM_DIFF will switch VU and sum and diff levels off, leaving the normal levels and peak holds in their current on/off state).	LEVELS, VU, PEAK_HOLD and SUM_DIFF
CHAN_OVER	0000000000000000 to FFFFFFFFFFFFFFFF	Hexadecimal representation of channel over level alarms to include in stream. (See CHAN_LEVEL description).	FFFFFFFFFFFFFFFF (all channels)
CHAN_NO_AUD	0000000000000000 to FFFFFFFFFFFFFFFF	Hexadecimal representation of channel audio loss alarms to include in stream. (See CHAN_LEVEL description).	FFFFFFFFFFFFFFFF (all channels)
PAIR_CORR	00000000 to FFFFFFFF	Hexadecimal representation of pair phase correlation to include in stream. (See CHAN_LEVEL description).	FFFFFFFF (all pairs)
PAIR_NO_CARRIER	00000000 to FFFFFFFF	Hexadecimal representation of pair no carrier alarm to include in stream. (See CHAN_LEVEL description).	FFFFFFFF (all pairs)
PAIR_CORR_OUT	00000000 to FFFFFFFF	Hexadecimal representation of pair phase correlation alarm to include in stream. (See CHAN_LEVEL description).	FFFFFFFF (all pairs)
RATE	0 to 60	the number of times per second that data is to be updated. A value of 0 locks the data rate to the NGM-164 external video sync's field rate	0

NGM-164 to System Manager response

When starting a stream or modifying an existing one, the NGM-164 will respond with the values of the HANDLE, PORT, IPADDR and RATE parameters, along with all the values of the stream content parameters (CHAN_LEVEL, CHAN_OVER etc.). If the stream cannot be started due to an invalid value assigned to parameter then the response will be a HANDLE value of 0, along with some error parameters describing the cause of the error. (See section on errors).

When stopping a stream, the response will be a list of all the streams that have been stopped. If the host has requested a specific stream to be stopped, and that stream does not exist then the NGM-164 will respond with an invalid parameter value error message. If the host has requested all streams to be stopped (by assigning 0 or –1 to the STOP parameter), and there are no streams to stop then this will not generate an error; the NGM-164 will simply respond with "DS STOP=0" CR LF.

Examples

1) For a System Manager that requires levels of all channels to be sent on TCP/IP port 3000 back to itself at the video field rate, and no sum and difference levels or VU levels included, the command message to send will be:

```
"DS PORT=3000 LEVEL_CONTENT=NO_VU LEVEL_CONTENT=NO_SUM_DIFF” CR
```

Assuming that the NGM-164 assigns a handle of 10 to this stream, it will respond with:

```
"DS HANDLE=10 PORT=3000 IPADDR=" (IPADDR of host making the request)
"CHAN_LEVEL=FFFFFFFFFFFFFFFF" ...etc... CRLF
```

2) For a host that requires levels of channels 16 to 19 and 22 to 23 (zero-index based) to be sent on TCP/IP port 5000 to IP address 224.0.0.1 at a rate of 60 times per second, the command message to send will be:

```
"DS PORT=5000 RATE=60 CHAN_LEVEL=CF0000 IPADDR=224.0.0.1" CR
```

3) An erroneous command:

```
"DS PORT=5000 RATE=70 CHAN_LEVEL=FF IPADDR=224.0.0.1" CR
```

The value of RATE is not valid, so the NGM-164 will respond with:

```
"DS HANDLE=0 ERRCODE=3 ERRPARAM=RATE ERRMSG='INVALID PARAMETER VALUE'" CRLF
```

4) Stopping an existing stream with handle id 10:

```
"DS STOP=10" CR
```

The NGM-164 will respond with:

```
"DS STOP=10" CRLF
```

5) Listing all the active streams:

```
"DS LIST=0" CR
```

Assuming 2 streams are present, with handle values of 1 and 2, the NGM-164 will respond with:

```
"DS LIST=1 LIST=2" CRLF
```

6) View details of a stream with handle ID = 1

```
"DS LIST=1" CR
```

The NGM-164 will return all the details associated with this stream, similar to:

```
"DS HANDLE=1 PORT=5000 RATE=60 IPADDR=224.0.0.1…etc." CRLF
```

7) Stop all streams

```
"DS STOP=-1" CR
```

Assuming 2 streams are present, with handle values of 1 and 2, the NGM-164 will respond with:

```
"DS STOP=1 STOP=2" CRLF
```

4.3.3 Reading/Writing NGM-164 Settings

This command is used to read or write settings such as scale type, alarm thresholds and timeouts, and analog and digital audio reference levels. Multiple settings can be written and/or read within one command line. A read or write is determined by whether or not a value has been assigned to the parameter – if not then it is a read, otherwise it is a write.

System Manager to NGM-164 request

The following table lists all the parameters and their assignable values. As well as the assignable values listed here, any parameter that can be written to can also be assigned the value DEFAULT for restoring its default value, with the exception of the labels (see LABEL).

Parameter Name	Parameter Values	Description	Default Value
RELEASE	string in decimal dot notation	READ ONLY – the firmware version on the main controller card	N/A
NET_RELEASE	string in decimal dot notation	READ ONLY – the firmware version on the network card	N/A
MACH_CODE	string	READ ONLY – the machine hardware model	N/A
VID_STD	50, 60, or 0	READ ONLY – Fields/frames per second or 0 when no video input	N/A
CARD or CARD0..3	NONE, ANALOG, DIGITAL	READ ONLY – Types of audio input cards present	N/A
SCALE0..SCALE31 or SCALE for all scales	DIN, BBC, NORDIC, VU, VU_EXT, AES_EBU	Scale ballistics to use on each audio input pair	AES_EBU for digital channels, DIN for analog channels
SCALEANLG	DIN, BBC, NORDIC, VU, VU_EXT, AES_EBU	WRITE ONLY - Scale ballistics to use on all analog input pairs. The result of executing this parameter will be reported back as SCALE parameter.	DIN
SCALEDIG	DIN, BBC, NORDIC, VU, VU_EXT, AES_EBU	WRITE ONLY - Scale ballistics to use on all analog input pairs. The result of executing this parameter will be reported back as SCALE parameter.	AES_EBU
ANLG_REF0..31 or ANLG_REF	-120 to 120	dBu to 0dB scale reference level in units of 0.1dB (e.g. 40 corresponds to 4dBu=0dB on scale). Sets either individual pairs, or all pairs if no index used.	0
DIG_REF0..31 or DIG_REF	-100 to –300	Digital level that corresponds to 0dB on analog scales in units of 0.1dBFS. Sets either individual pairs, or all pairs if no index used.	-200
PEAK_HOLD_TIME0..63	time parameter[1]	Time for peak hold indicator to remain fixed at its peak. A value of 0 turns it off, and the data for it will not be present in the data stream.	3
CARRIER_LOSS_EN0..31 or CARRIER_LOSS_EN	1 or 0, ON or OFF	Enabled/disable individual or all carrier loss alarms	0
CARRIER_LOSS_TIME0..31 or CARRIER_LOSS_TIME	time parameter[1]	Time that the carrier on a digital pair has to be continuously lost before its alarm is triggered.	5

Parameter Name	Parameter Values	Description	Default Value
AUD_OVER_EN0..63 or AUD_OVER_EN	1 or 0, ON or OFF	Enable/Disable individual or all audio over alarms	0
ANLG_OVER_THRESH or ANLG_OVER_THRESH0..63	0 to 280	Representation of audio over alarm threshold in units of 0.1dB for analog scales.	0
DIG_OVER_THRESH or DIG_OVER_THRESH0..63	-200 to 0	Representation of audio over alarm threshold in dBFS units for digital scales	-200
AUD_OVER_TIME or AUD_OVER_TIME0..63	time parameter[1] in range of 0 to 10, and 192 to 254	Time that the audio has to be over the threshold before alarm is triggered.	0
AUD_LOSS_EN0..63 or AUD_LOSS_EN	1 or 0, ON or OFF	Enable/Disable individual or all audio loss alarms	0
AUD_LOSS_TIME or AUD_LOSS_TIME0..63	time parameter[1]	Time that audio has to be continuously below the loss threshold before alarm is triggered	30
ANLG_LOSS_THRESH or ANLG_LOSS_THRESH0..63	-600 to 0	Representation of audio loss alarm threshold in 0.1dB units for analog scales	-200
DIG_LOSS_THRESH or DIG_LOSS_THRESH0..63	-800 to –180	Representation of audio loss alarm threshold in 0.1dBFS units for digital scales	-400
ANTI_PHASE_EN0..31 or ANTI_PHASE_EN	1 or 0, ON or OFF	Enable/Disable individual or all channel's anti-phase alarms	0
ANTI_PHASE_TIME or ANTI_PHASE_TIME0..31	time parameter[1]	Time that a stereo pair has to be continuously out of phase before alarm is triggered	5
ANTI_PHASE_THRESH or ANTI_PHASE_THRESH0..31	-10 to 0	Representation of phase correlation scale's alarm threshold (0 to -10 represents 0 to -1 on scale)	0
ALARM_RESET_TIME	time parameter[1]	Time that any activated alarm must have its alarm condition continuously absent before it automatically resets. A value of 0 disables alarm auto reset.	30
AUD_OVER_RST [0..63], AUD_LOSS_RST [0..63], ANTI_PHASE_RST [0..31], CARRIER_LOSS_RST [0..31], CHAN_RST [0..63], PAIR_RST [0..31]	1 (to reset) or 0 (to do nothing). If no value is assigned then '1' automatically gets assigned. After the reset is done, the NGM-164 will always return the value of these parameters as being 0, indicating that the alarm has been reset but is no longer being held in a reset state (it is allowed to be triggered again if an alarm condition occurs).	Resets a single alarm, a set of one type of alarm, all alarms on a certain channel or pair, or all alarms. e.g. to reset audio over alarm on channel 0, state AUD_OVER_RST0. To reset all audio over alarms, state AUD_OVER_RST. To reset all alarms on channel 2, state CHAN_RST2. To reset all alarms, state CHAN_RST or PAIR_RST.	N/A
PEAK_HOLD_RST[0..63]	1 (to reset) or 0 (to do nothing to) peak hold.	Resets the peak hold for all channels (if no index is provided), or the specified channel (if an index is provided).	N/A

Parameter Name	Parameter Values	Description	Default Value
OUT_PAIR0..3	-1 to 31	Selects a pair of channels to monitor on 1 of the 4 monitoring outputs. e.g. assigning OUT_PAIR1=10 routes input pair 10 to output pair 1. A value of –1 turns the relevant output pair off.	-1
AUD_STREAM0..3	OFF, 16B, 16B24K, 16B12K, 8B12K	Sets the format of the audio in each stream. **16B** – 16-bit full bandwidth. **16B24K** – 16-bit 24kHz sample rate. **16B12K** – 16-bit 12kHz sample rate. **8B12K** – 8-bit u-law encoded 12k sample rate.	OFF
LABEL0..LABEL63 or LABEL for all labels	A string of characters. Any spaces or backslashes in the string must be preceded by a backslash character. (e.g. `LABEL 1` must be entered as: `LABEL\ 1`. `LEFT \ RIGHT` must be entered as: `LEFT\ \\\ RIGHT`). If a backslash is placed before any other character then the backslash will be ignored. A space that is not preceded by a backslash will be interpreted as the end of the string. Valid characters are ASCII codes from 32 to 126; all other characters will be ignored without any errors reported. Maximum length of label is 16 characters.	Assigns or reads back the label of a channel. Assigning a value to LABEL without any subscript will not have any affect. Reading back LABEL without any subscript will read back all labels.	No default value
SHOW_ALL		READ ONLY – returns all the parameters described here and their values	N/A
RESTORE_DEFAULTS		Stating this parameter will restore all parameters to their defaults. The NGM-164 will reply to this by sending back all the parameters and their new values.	N/A

Notes: 1) All time parameters adhere to:

0..60	number of seconds	64..127	minutes (minutes = value – 64)
61	0.25s	128..191	hours (hours = value – 128)
62	0.50s	192..254	video frames (frames = value – 192, 1 frame = approx 17ms)
63	0.75s	255	infinite

NGM-164 to System Manager response

The NGM-164 responds with the current values of the requested parameters if a read was requested, or the new values of the requested parameters if a write was requested. If an error occurs then an explanation of the error will be returned as described in the Errors section.

Examples

1) Read the type of audio cards present. In this case there is 1 digital card, 1 analog card, and slots 3 and 4 are empty. The System Manager sends:

```
"ST CARD0 CARD1 CARD2 CARD3" CR
```

The NGM-164 responds with:

```
"ST CARD0=DIGITAL CARD1=ANALOG CARD2=NONE CARD3=NONE" CRLF
```

Note here that CARD appears only once. After that, only the indices of the card numbers are sent. When only indices are sent, the parameter name of the indices is implied as being the last parameter name that was sent. The same can be done by the System Manager when it sends a command line, so in this case it could have shortened the command line to:

```
"ST CARD0 1 2 3" CR
```

2) Set the first scale to VU

```
"ST SCALE0=VU" CR
```

Assuming all other scales are currently DIN, the NGM-164 responds with:

```
"ST SCALE0=VU 1=DIN 2=DIN 3=DIN 4=DIN 5=DIN 6=DIN 7=DIN 8=DIN 9=DIN 10=DIN
11=DIN 12=DIN 13=DIN 14=DIN 15=DIN 16=DIN 17=DIN 18=DIN 19=DIN 20=DIN 21=DIN
22=DIN 23=DIN 24=DIN 25=DIN 26=DIN 27=DIN 28=DIN 29=DIN 30=DIN 31=DIN" CR
```

Note: This demonstrates how when a setting has indices, and the values assigned to each index are not the same, that the NGM-164 will return the values of all the indices for that parameter. Note also that SCALE only appears once. After that, only the indices of the card numbers are sent. When only indices are sent, the parameter name of the indices is implied as being the last parameter name that was sent. The System Manager can do the same when it sends a command line.

3) Set all scales to VU with an analog reference point of +4dBu=0dB and digital reference point of –20dBfs. The System Manager sends:

```
"ST SCALE=VU ANLG_REF=40 DIG_REF=-200" CR
```

The NGM-164 responds with:

```
"ST SCALE=VU ANLG_REF=40 DIG_REF=-200" CRLF
```

4) Erroneous command

The System Manager attempts to set the ANLG_REF parameter to an invalid value:

```
"ST SCALE=VU ANLG_REF=200 DIG_REF=-200" CR
```

Assuming the current analog reference is +4dBu the NGM-164 responds with:

```
"ST SCALE=VU ERRCODE=3 ERRMSG='INVALID PARAMETER VALUE' ERRPARAM=ANLG_REF
ANLG_REF=40 DIG_REF=-200" CRLF
```

Note: This demonstrates that the NGM-164 still continues to set parameters even after an error occurs. Only the parameter that has the error remains unchanged. ERRCODE is always the first error parameter to be sent, followed by the other error parameters that describe the error. The end of the error parameters can be determined when a non-error parameter is sent (or the end of the command line is reached). Multiple consecutive errors can be distinguished by the start of a new ERRCODE parameter.

5) Reset all alarms on all channels except channels 0 and 1:

```
"ST CHAN_RST CHAN_RST0=0 CHAN_RST1=0" CR
```

(or "ST CHAN_RST 0=0 1=0" CR)

The first parameter, CHAN_RST, sets all the channel reset flags, the next two parameters clear channels 0 and 1 reset flags. (The actual resetting is not done until the end of the command line is encountered, so setting reset flags and then clearing them within the same command line will only result in resets occurring to the channels that have the flags remaining in a set state at the end of the command line).

The NGM-164 will respond with

```
"ST CHAN_RST=0" CRLF
```

indicating that any channel reset flags that were set have been acted upon, and that the flags are now cleared, allowing future alarm conditions to still trigger an alarm.

4.3.4 User Binary Data

This command is used for storing or retrieving user defined data in non volatile memory. Up to 4096 bytes are available to the user. The format and type of the stored data is entirely up to the user. The system provides no protection from uninitialised data.

Data is sent and retrieved using the "BD" command followed by one or more of the following parameters.

Parameter Name	Description	Default Value
OFFSET	An integer from 0 to 4095 indicating the starting byte in the array that data is to written to / read from.	0
BYTE_COUNT	The number of bytes that are to be read. This can also be included in a write command line, but it will be ignored – when writing, the byte count is taken from the number of bytes of data sent.	4096
HEX_DATA	A string representing the data to write to the NGM-164. To read data, do not assign any value to this parameter, or simply do not include the parameter in the command line	N/A

Examples:

1) To read all the data:

```
"BD"
```

This leaves the OFFSET and BYTE_COUNT at their default values of 0 and 4096 respectively, and returns all the user data stored in the NGM-164. The return command line will be:

```
"BD OFFSET=0 BYTE_COUNT=4096 HEX_DATA="<BYTES 0 to 4096 of hexadecimal rep-
resented data>
```

2) To read bytes 10 to 19 of the array:

```
"BD OFFSET=10 BYTE_COUNT=10"
```

3) To write values of 0 to 15 to bytes 10 to 24 of the array:

```
"BD OFFSET=10 HEX_DATA=000102030405060708090A0B0C0D0E0F"
```

4.3.5 System Commands Command Line

Unlike the Settings and Datastream command lines that are for assigning values to or reading values from a parameter, the System Command command line is for giving a single instruction to the system. Commands are sent using the "CM" command followed by one of the following parameters

Command Name	Description
REBOOT	Reboots the NGM-164. Before rebooting the NGM-164 will echo the command line back to the System Manager. After the NGM-164 reboots, it will NOT restore any non-permanent data streams that were active before rebooting. The System Manager will need to reconnect and start the streams.
DIS_KEEP_ALIVE	This stops the NGM-164 from continually sending the Keep Alive enquiry to the System Manager and closing the connection if no response is received. When a session first connects the Keep Alive enquiry will be enabled – once this command is sent to the NGM-164 it will be disabled for the rest of the session. It only affects the session that it is sent to.

4.3.6 Keep Alive Command Line

This is a command line that the NGM-164 sends to the System Manager when there has been no communication between the two for more than 10 seconds. The System Manager must then echo this command line back or send any other type of command line to the NGM-164 within another 10 seconds to keep the connection alive. A CR or LF will also suffice. If the NGM-164 does not receive anything during this 10 second period then it will close the connection.

The System Manager can also regularly keep sending this command line at a rate of greater than once every 10 seconds to tell the NGM-164 to keep the connection open, but the NGM-164 will never reply to it, and will also never activate its own sending of this command since it is receiving a command line regularly. In this case the System Manager would only know if the connection was open if no TCP timeout occurred. If the System Manager needs to know immediately if the connection is still open then it can send an empty setting command line - "ST" CR. The NGM-164 will immediately respond with "ST" CRLF.

4.3.7 NGM-164 Error Responses

When a command line sent by the host contains an error, the command line sent back to the host will provide a description of the cause of the error using some or all of the following parameters.

Parameter Name	Parameter Values	Description
ERRCODE	1 to 255	A single byte code of the cause of the error. This parameter will always be sent when an error occurs.
ERRMSG	String, enclosed in single quote marks.	A description of the error defined by ERRCODE. This parameter will always be sent when an error occurs.
ERRPARAM	String name of the parameter that has caused the error	This parameter is only sent if the cause of the error is an unknown parameter name or an invalid value assigned to a parameter.

The ERRCODE values are defined here:

ERRCODE Value	Description
1	Unknown parameter – a parameter in the command line is not recognized. The ERRPARAM will contain the name of the unknown parameter
2	Missing parameter – a necessary parameter is missing. The ERRPARAM will contain the name of the missing parameter
3	Invalid parameter value – an invalid value has been assigned to a parameter. The ERRPARAM will contain the name of the parameter.
4	Failed to read back value of parameter – The communications between the network and main controller subsystems failed and the current value of a parameter could not be read. The ERRPARAM will contain the name of the parameter.
5	Too many data streams – the number of active data streams has reached the limit permitted.

4.4 Audio level, phase, and alarm data stream

4.4.1 Data Stream Structure

After the NGM-164 has responded successfully to a request from the System Manager to start a new data stream, it will commence sending the data stream. This is sent using UDP packets on the requested TCP/IP port. All the audio level, phase, and alarm status information is sent in one packet. Packets are sent at the requested repeat rate.

Each element (command, operand etc.) in the description of the structure below is a 16-bit word.

The structure of the packet is:

```
SOF_WORD SOF_WORD *(COMMAND *(OPERAND)) EOF_WORD EOF_WORD
```

4.4.2 Command Definitions

The commands referred to in the previous section are defined here:

SOF_WORD	Start Of Frame (0xFFF0)
COMMAND	16-bit command identifier. Command identifiers range from 0xFF01 to 0xFFFE
OPERAND	16-bit Operand(s) associated to COMMAND. Valid operand values range from 0x0000 up to 0xEFFF. The number of OPERANDs depends on the specified COMMAND.
EOF_WORD	End Of Frame (0xFFFF)

The following list describes the COMMANDs and their associated OPERAND length. All OPERANDs referred to here are 16-bit WORDs.

Command	Values	Description
DS_CONTENT	0xFF01	The data that follows this command defines which channels' level and alarm data is present in the stream. It will reflect the settings that were assigned when starting the stream. This command is not present in every packet sent, it is only occasionally sent for the purpose of reminding the receiving hosts about the content of the data. The data is in the format of 1 WORD sub-commands that define a level or alarm type, followed by data that indicates which channels or pairs of this level or alarm type are present in the stream. The sub-command values and data format is: 0x02NN, followed by 8 WORDS, the lower 8 bits of each word representing the presence of the levels for 8 channels. This is only dependent on the channels selected by the CHAN_LEVEL parameter. It will report these channels as being present even if all level content has been switched off by the LEVEL_CONTENT parameter. 0x05NN, followed by 4 WORDS, the lower 8 bits of each word representing the presence of the phase correlation for 8 pairs. 0x06NN, followed by 4 WORDS, the lower 8 bits of each word representing the presence of the no carrier alarms for 8 pairs. 0x07NN, followed by 8 WORDS, the lower 8 bits of each word representing the presence of the audio over alarms for 8 channels. 0x08NN, followed by 8 WORDS, the lower 8 bits of each word representing the presence of the audio loss alarms for 8 channels. 0x09NN, followed by 4 WORDS, the lower 8 bits of each word representing the presence of the out of phase alarms for 8 pairs. , where NN is the total number of channels (or pairs for phase correlation levels, no carrier alarms, and out of phase alarms) present in the stream, concerning each particular sub-command. For example, if only channels 0 and 1, and channels 62 and 63 (pairs 0 and 31)

Command	Values	Description
		are present for all types of commands, then the operands of the DS_CONTENT will be: 0x0204, 0x00C0, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0003, 0x0502, 0x0080, 0x0000, 0x0000, 0x0001, 0x0602, 0x0080, 0x0000, 0x0000, 0x0001, 0x0704, 0x00C0, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0003, 0x0804, 0x00C0, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0003, 0x0902, 0x0080, 0x0000, 0x0000, 0x0001
LEVELS	0xFF02	N WORDS follow with the channel's levels using the selected ballistics, where N = the total number of channels requested with the CHAN_LEVEL parameter. The first WORD is the level of the lowest value channel requested; the last WORD is the level of the highest value channel requested. If CHAN_LEVEL was not specified then all 64 levels are sent, starting from channel 0. If the LEVEL_CONTENT parameter was set to NO_LEVELS then this will not be present. Channel PPM levels are expressed in dB/10. Values can range from 0 to 963 (0,0dB to 96,3dB).
VU_LEVELS	0xFF03	N WORDS follow with the channel's VU levels. Same format as LEVELS. If the LEVEL_CONTENT parameter was set to NO_VU then this will not be present.
PEAK_LEVELS	0xFF04	N WORDS follow with the channel's PEAK levels. Same format as LEVELS. If the LEVEL_CONTENT parameter was set to NO_PEAK_HOLD then this will not be present.
CORR_VALUES	0xFF05	N WORDS follow with the phase correlation levels, where N = the total number of pairs requested with the PAIR_CORR parameter. The first WORD is the level of the lowest value pair requested; the last WORD is the level of the highest value pair requested. If PAIR_CORR was not specified then all 32 correlation levels are sent. Values range from 32448 to 33088 (subtract 32768 from these readings to get the true signed value of phase in the range of -320 to +320. Normalizing to a phase correlation meter, -320 represents -1 and +320 represents +1).
NO_CARRIER	0xFF06	INT((N+7)/8) WORDS follow with the status of the no carrier alarm for up to 32 digital pairs, where N = total number of pairs requested with the PAIR_NO_CARRIER parameter. The upper 8 bits of each WORD are set to zeroes, and the lower 8 bits represent the status of 8 alarms. 1=alarm on. The lowest value pair that was requested is in bit 0 of the first WORD, the next lowest in bit 1 ...etc. If PAIR_NO_CARRIER was not specified then all 32 pairs are sent in 4 WORDS. If the pair is an analog channel then its representative bit will always be 0.
OVLEV	0xFF07	INT((N+7)/8) WORDS follow with the status of the analog over level alarm for up to 64 channels, where N = total number of channels requested with the CHAN_OVER parameter. The upper 8 bits of each WORD are set to zeroes, and the lower 8 bits represent the status of 8 alarms. 1=alarm on. The lowest value channel that was requested is in bit 0 of the first WORD, the next lowest in bit 1...etc. If CHAN_OVER was not specified then all 64 channels are sent in 8 WORDS
NO_AUDIO	0xFF08	INT((N+7)/8) WORDS follow with the status of the analog audio loss alarm for up to 64 channels, where N = total number of channels requested with the CHAN_NO_AUD parameter. The upper 8 bits of each WORD are set to zeroes, and the lower 8 bits represent the status of 8 alarms. 1=alarm on. The lowest value channel that was requested is in bit 0 of the first WORD, the next lowest in bit 1...etc. If CHAN_NO_AUD was not specified then all 64 channels are sent in 8 WORDS.
CORR_OUT	0xFF09	INT((N+7)/8) WORDS follow with the status of the out of phase alarm for up to 32 pairs, where N = total number of pairs requested with the PAIR_CORR_OUT parameter. The upper 8 bits of each WORD are set to zeroes, and the lower 8 bits represent the status of 8 alarms. 1=alarm on. The lowest value pair that was requested is in bit 0 of the first WORD, the next lowest in bit 1 ...etc. If PAIR_CORR_OUT was not specified then all 32 pairs are sent in 4 WORDS.

Command	Values	Description
SUM_DIFF	0xFF0A	N WORDS follow with the channel's sum and difference levels. Assuming all channels are present then the first WORD will be pair 0's sum, the second WORD will be pair 0's difference, the third word will be pair 1's sum etc. Same dB format as LEVELS. If the LEVEL_CONTENT parameter was set to NO_SUM_DIFF then this will not be present.
Unassigned command Ids	0xFF0B to 0xFFFD	
DEBUG_INFO	0xFFFE	Various data for debugging

4.5 NGM-164 Network Configuration

The NGM-164 utilizes a protocol common to all Netburner network cards for reading or writing network settings such as the IP address and hostname. This protocol uses broadcasting to find all Netburner cards on the network. The NGM-164 can be distinguished from other Netburner devices by checking the APPLICATION_NAME (see table below).

The TCP/IP port used is 20034 on UDP.

The following table describes the structure of the data required for reading or writing the settings.

Byte Number	Name / Value	Description
HEADER		
0x00	HEADER0 (0x42)	First byte of 4 byte header
0x01	HEADER1 (0x55)	Second byte of 4 byte header
0x02	HEADER2 (0x52)	Third byte of 4 byte header
0x03	HEADER3 (0x4E)	Fourth byte of 4 byte header
0x04	ACTION ('R' or 'W')	Read or write settings
START OF CONFIG RECORD		
0x05	RECORD_LEN0 (0x00)	First of 4 byte record length
0x06	RECORD_LEN1 (0x00)	Second of 4 byte record length
0x07	RECORD_LEN2 (0x00)	Third of 4 byte record length
0x08	RECORD_LEN3 (0x94)	Fourth of 4 byte record length (The following record including the 4 bytes of RECORD_LEN is 0x94 bytes long)
0x09 to 0x0C	IPADDR0 to IPADDR3	IP address of unit (set to 0 to enable DHCP)
0x0D to 0x10	IPMASK0 to IPMASK3	IP netmask
0x11 to 0x14	GATEWAY0 to GATEWAY3	IP gateway
0x15 to 0x18	Unused	
0x19 to 0x1C	BAUD_RATE3 to BAUD_RATE0	Baud rate of RS232 port (read only)
0x1D	WAIT	Number of seconds to wait before booting (read only)
0x1E	BOOT	Boot to application (read only –always 1 for TRUE)
0x1F	EXCEPTION	Exception action (read only – always reads 0 to indicate re-boot)
0x20 to 0x6F	Unused	
0x70 to 0x75	MAC0 to MAC5	MAC address (read only)
0x76	Unused	
0x77 to 0x7A	DNS0 to DNS3	DNS IP Address
0x7B to 0x8F	HOST0 to HOST20	21 characters for hostname – must be terminated with 0x00
0x90 to 0x98	Unused	
END OF CONFIG RECORD		
0x99 to 0xA1	PLATFORM_NAME	The platform string (read only - always reads as "MOD5272", null terminated)
0xA2 to 0xF2	APPLICATION_NAME	Read only. Up to 80 characters for the application string. All NGM-164's will read as "NGM-164" (null terminated). This can be used to distinguish Data-xx's from other devices that may contain the same network card.

5 Maintenance

The NGM-164 requires very little maintenance. Ask authorized personnel, if anyhow maintenance work is necessary.

5.1 Accessing the inside of NGM-164

Some settings of the NGM-164 are hardware configured by means of jumper settings. Jumpers can be adjusted on the controller board and on the digital audio input board. On the controller board there is also the MAC address labeled.

The boards of NGM-164 are made of delicate electronic components that are extremely sensitive to static electricity. Ordinary amounts of static from your clothes or work environment can destroy them. Transport boards only in the original packaging as delivered from the manufacturer. Handle them only by their edges and their mounting bracket. Do not touch the components nor the edge connectors that plug into the expansion slots. Use a grounded workplace and wear a grounding wrist strap; at least, discharge your body's static electricity by touching a grounded surface, eg, a properly grounded system's metal chassis.

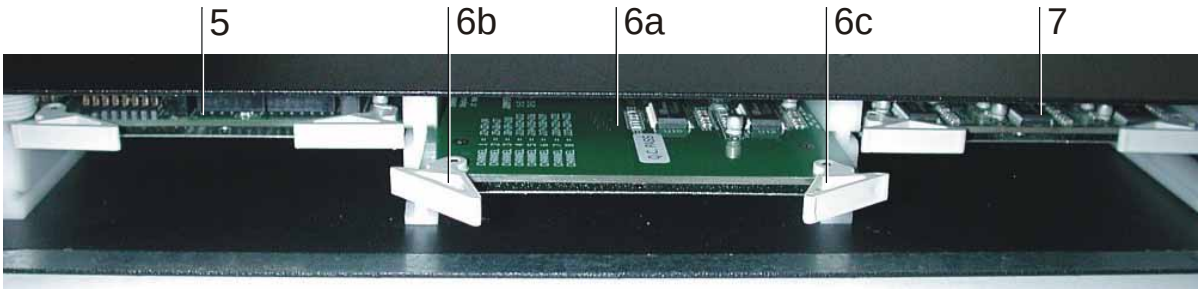
Barco recommends certain expansion cards for the use in the NGM-164; please refer to section 6.3 Order codes**!**

Using other cards might cause damage to the NGM-164 or might damage the cards themselves!

5.1.1 Removing and readjusting boards

The boards of the NGM-164 are hot-pluggable, so there is no need to switch the device off before unplugging a board. To unplug a board follow the instruction given below:

- Unscrew the securing screws [2] and [3] on the front panel of the NGM-164 and remove the right part of the front panel [4], see Figure 3-1 Front view of the NGM-164.
- Examine the boards in the device and find the board which you need to remove; please have a look at Figure 3-2 Interior view of the NGM-164.
- Take the two **levers** [b, c] of that board and turn them carefully sidewards. This helps to easily move the board forward and to release the connector of the board from the plug on the backplane of NGM-164.



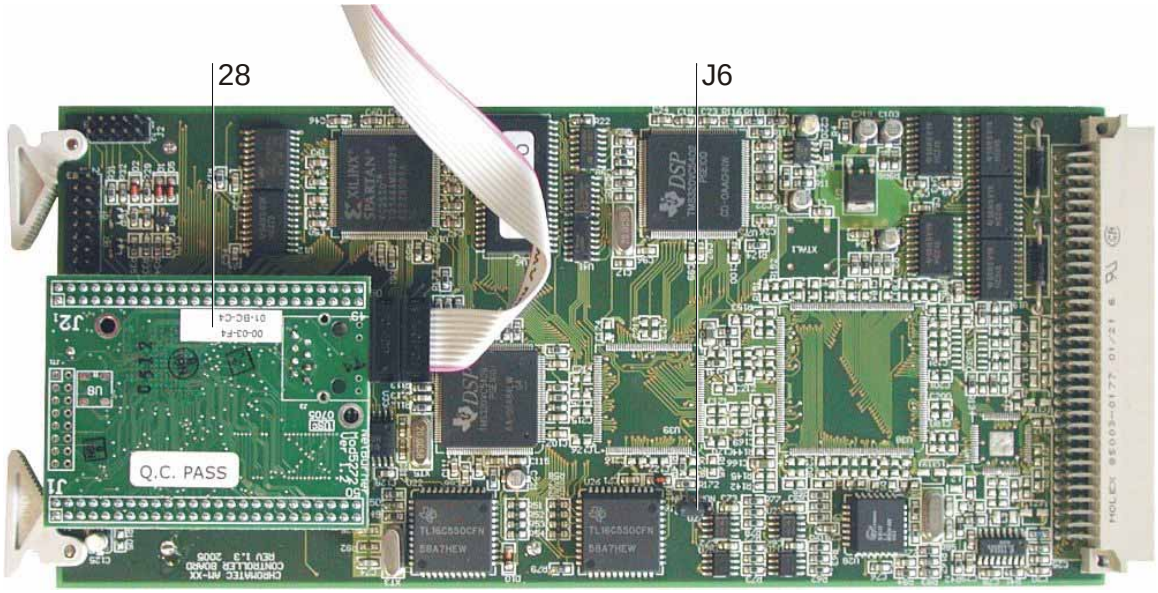
5	controller board
6a	digital audio input card (optional)
7	analog audio input card (optional)
6b, 6c	left and right levers of the card

- Carefully move the board outwards. If you remove the controller board take additionally care for the cable which is connected to the board. It is long enough, so that the board may remain connected while you adjust the jumper.
- Now you can set the jumpers to their correct positions.
- When done, move the board again into the slot where it has been before.
- When the board touches the connector on the back, you have to push it forceful into it.
- Readjust the front panel [4] and tighten the securing screws [2] and [3].

5.1.2 Controller board

Removing the controller board serves on the one hand to read the MAC address of the device and on the other hand to check the jumper position for the NGM-164 access settings.

While the controller board is removed, the NGM-164 is not able to send output. As soon as it is readjusted it automatically checks the configuration and processes those streams which have been configured as permanent streams.



28	Label with the MAC address of the device
J6	Jumper: LAN position towards the front of the card – left with respect to the figure above NORM position towards the back of the card – right with respect to the figure above

Figure 5-1
Controller board

MAC address

On the controller board there is a small piggyback board. On this piggyback board the MAC address of the card is labeled [28]. To read the MAC address, follow the instructions to eject a board given in the section above 5.1.1 Removing and readjusting boards. There is no need to move the card completely out of its slot. Only move it out so far that you can read the MAC address. Readjust it when done.

Jumper setting

The default setting of the jumper [J6] for standard operation of the NGM-164 is in the LAN position.

5.1.3 Digital audio input card

On the digital audio input board the jumpers have to be set according to the applied audio channels. It has to be determined between balanced or unbalanced sources. For each channel three jumpers have to be set. The jumper position **1-2** has to be selected with a balanced source; the jumper position **2-3** has to be selected with an unbalanced source.

Balanced and unbalanced channels can be connected to the board and processed simultaneously. Anyhow take care with the jumper settings; the channels are not arranged in a linear order!

The table below lists the channels and the corresponding jumper triples:

Channel 1	J2 + J3 + J4	**Channel 5**	J14 + J15 + J16
Channel 2	J5 + J6 + J7	**Channel 6**	J17 + J18 + J19
Channel 3	J8 + J9 + J10	**Channel 7**	J20 + J21 + J22
Channel 4	J11 + J12 + J13	**Channel 8**	J23 + J24 + J25

The picture below indicates the position of the jumpers. The jumper position is also labeled on the board.

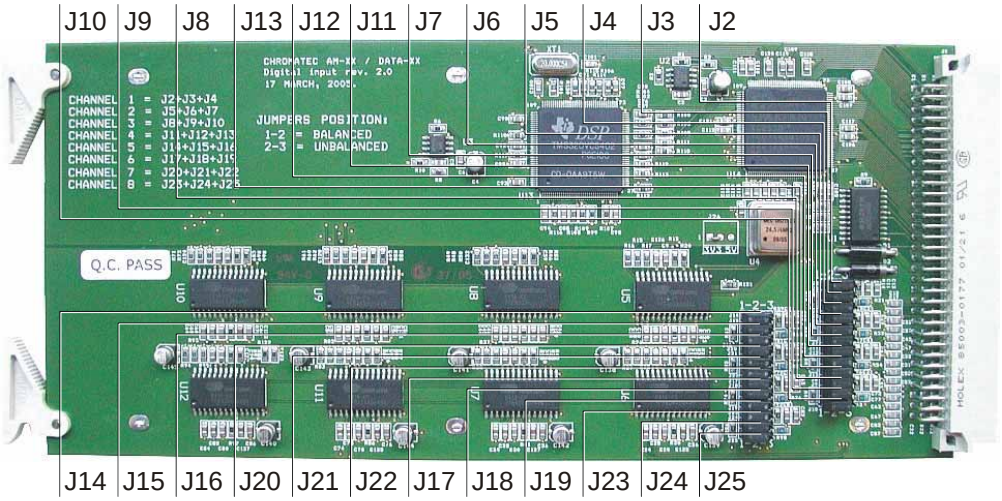


Figure 5-2
digital audio input board – position of jumpers

5.2 Exchanging parts

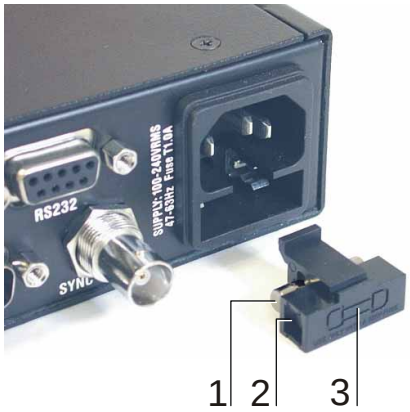
5.2.1 Exchanging the fuse

The power connector is equipped with a fuse; in case that it gets broken it can be replaced.

Before removing the fuse drawer, switch off the NGM-164 with the power button on the front!

Disconnect the power plug!

- Tear the fuse drawer outwards. There is a dimple which helps to get hold of the drawer.



1	fuse in use
2	spare fuse
3	fuse drawer

Figure 5-3
Fuse drawer and fuses

In the fuse drawer [3] there are two fuses the one in the rear part is the fuse that was actually used [1]. In the leading part there is a spare fuse [2].

- Remove the lastly used fuse and insert the spare fuse into the fitting.
- If you have an additional spare fuse of the same type (please check label and size) insert it in the spare fuses location.
- Readjust the fuse drawer

Now you can take the NGM-164 into operation again.

You should always store some fuses of the appropriate type as spare part!

5.3 Cleaning

Use a soft cloth to periodically clean the cabinet. Stubborn stains may be removed with a cloth lightly dampened with mild detergent solution. Never use strong solvents, such as thinner or benzine, or abrasive cleaners, since these will damage the cabinet.

Unplug the device from the wall outlet before cleaning.

Never clean the case of an NGM-164 device without first disconnecting the power supply cord! Please refer to seciton 3.3.3 Switching off**.**

Do not use liquid cleaners or aerosol cleaners!

6 Technical appendix

This chapter provides tabular overview about the technical details of NGM-164, its components and of their interfaces.

6.1 Technical data

NGM-164

dimensions overall (h/w/d)	44.5 mm / 483 mm / 367 mm | 1.75 in (1U) / 19 in / 14.45 in
weight	6.8 kg | 16 lbs.
power mains	100-240V, 60Hz/50Hz; auto select
power consumption	60 W
fuse type	T1A 250V fuse
network connection	10/100 Mbps auto-detect
operating conditions	0 .. 30 °C | 32 .. 84 °F at max. 70% relative humidity, non condensing

Table 6-1
NGM-164 base unit – technical data

Analog audio input board

input impedance	20 kΩ
input sensitivity	0 dBu = 0 dB scale reading
input sensitivity adjustment	+12, -12 dBu in 0.1 dB steps
maximum input level	+24 dBu
frequency response at -3 dB points	from 15 Hz to 23 kHz
frequency response at -0.5 dB points	from 60 Hz to 20 kHz
A/D converter	stereo 18 bit converter
sampling frequency	48 kHz per channel
rectifiers	software full wave rectifier
detectors	software peak detector
input connector	DB25 female

Table 6-2
analog audio input board – technical data

Digital audio input board

input type	differential (110 Ω terminated) or single-ended (75 Ω terminated) selection of balanced or unbalanced signal type with jumpers on the board
input compatibility	RS422
input connector	DB25 female
input interface	transformerless professional AES/EBU
sampling frequency	32 kHz1, 44.1 kHz, 48 kHz, 96 kHz detected via input
rectifiers	software full wave rectifier
detectors	software sample detector

Table 6-3
digital audio input board – technical data

Monitoring output board

output	up to 4 pairs
analog	balanced (max. +20dBu)
digital	AES/EBU (24 bit) (96kHz AES/EBU sources will be resampled to and sent out at 48kHz)

Table 6-4
monitoring output board – technical data

Scales

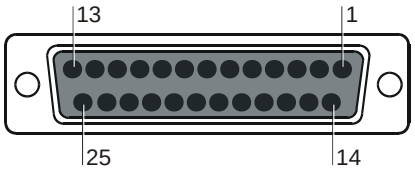
Scale / Category	Values
Nordic	
overall dynamic range	54 dB (+12 to -42 dB)
attack time	10 ms
decay time	1.7 s per 20 dB decay
DIN PPM	
overall dynamic range	55 dB (+5 to -50 dB)
attack time	10 ms
decay time	1.5 s per 20 dB decay
BBC PPM	
overall dynamic range	24 dB + 3 dB down "Mark 1" (+12 to -12 dB)
attack time	10 ms
decay time	2.8 s per 24 dB decay (from "Mark 7" to "Mark 1")
VU	
overall dynamic range	23 dB (+3 to -20 dB)
attack time	300 ms
decay time	300 ms per 20 dB decay
VU EXT	
overall dynamic range	60 dB (+10 to -50 dB)
attack time	300 ms
decay time	300 ms per 20 dB decay
AES/EBU	
overall dynamic range	60 dB (0 to -60 dB)
attack time	<5 ms
decay time	1.5 s per 20 dB decay

Table 6-5
scales – technical data

6.2 Interfaces

As viewed from the back of NGM-164:

Analog in and AES/EBU in



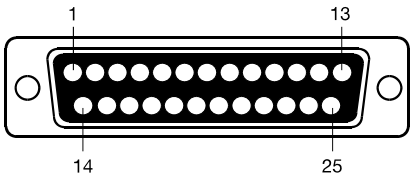
analog				digital			
pin	signal	pin	signal	pin	signal	pin	signal
1	In 8+	14	In 8-	1	–	14	–
2	In 8GND	15	In 7+	2	–	15	In 4+
3	In 7-	16	In 7GND	3	In 4-	16	In 4GND
4	In 6+	17	In 6-	4	–	17	–
5	In 6GND	18	In 5+	5	–	18	In 3+
6	In 5-	19	In 5GND	6	In 3-	19	In 3GND
7	In 4+	20	In 4-	7	–	20	–
8	In 4GND	21	In 3+	8	–	21	In 2+
9	In 3-	22	In 3GND	9	In 2-	22	In 2GND
10	In 2+	23	In 2-	10	–	23	–
11	In 2GND	24	In 1+	11	–	24	In 1+
12	In 1-	25	In 1GND	12	In 1-	25	In 1GND
13	–			13	–		

Figure 6-1
25 pole sub-D female connector – pin assignment

Internally all grounds are common.

With unbalanced sources the signal can be connected to +VE and the ground to -VE and GND!

Analog out and AES/EBU out



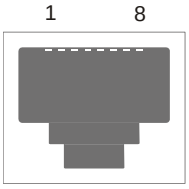
analog				digital			
pin	**signal**	**pin**	**signal**	**pin**	**signal**	**pin**	**signal**
1	Out 8+	**14**	Out 8-	**1**	Out 4+	**14**	Out 4-
2	Out 8GND	**15**	Out 7+	**2**	Out 4GND	**15**	Out 3+
3	Out 7-	**16**	Out 7GND	**3**	Out 3-	**16**	Out 3GND
4	Out 6+	**17**	Out 6-	**4**	Out 2+	**17**	Out 2-
5	Out 6GND	**18**	Out 5+	**5**	Out 2GND	**18**	Out 1+
6	Out 5-	**19**	Out 5GND	**6**	Out 1-	**19**	Out 1GND
7	Out 4+	**20**	Out 4-	**7**	–	**20**	-
8	Out 4GND	**21**	Out 3+	**8**	–	**21**	-
9	Out 3-	**22**	Out 3GND	**9**	–	**22**	-
10	Out 2+	**23**	Out 2-	**10**	–	**23**	-
11	Out 2GND	**24**	Out 1+	**11**	–	**24**	-
12	Out 1-	**25**	Out 1 GND	**12**	–	**25**	-
13	–			**13**	–		

Figure 6-2
Audio out connector – pin assignment

Internally all grounds are common.

Network adapter

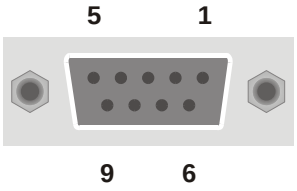
For complete cabling details, please refer to the **IEEE802.3** specification, section 8.4, **Coaxial Cables and Electrical Parameters**.



1	TD+	**5**	
2	TD–	**6**	RD–
3	RD+	**7**	
4		**8**	

Figure 6-3
RJ-45 connector – pin assignment

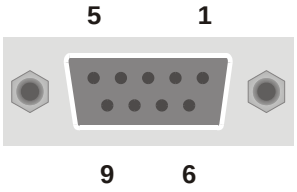
RS232



1	–	**6**	–
2	TxD	**7**	RTS (jumper JP 1 on 1 & 2)
3	RxD (inactive in half duplex mode)	**8**	–
4	DTR (jumper JP1 on 2 & 3	**9**	–
5	GND		

Figure 6-4
RS232 – pin assignment

RS422



1	GND	**6**	–
2	RxD-	**7**	RxD+
3	TxD-	**8**	TxD
4	–	**9**	–
5	–		

Figure 6-5
RS422 – pin assignment

6.3 Order codes

Documentation	
R59770028	user's manual NGM-164, English
R5976569	user's manual iSTUDIO, English
Hardware	
R9832280	NGM-164 base unit
R0PT2052	controller board for NGM-164
R0PT2054	audio input board 8×analog stereo
R0PT2055	audio input board 8×digital AES/EBU stereo
R0PT2056	network interface board
R0PT2057	monitoring output board
Software	
R5976593	CD-ROM iSTUDIO Documentation & Supplement, containing NGM-164 configuration software and documentation

Table 6-6

7 Troubleshooting

Check this chapter for help, if your NGM-164 does not operate properly and for information how to contact the technical support of Barco.

7.1 Hot Line

Feel free to contact us if you have any further questions!

- **BARCO N.V. Projection Systems - Europe**
  Noordlaan 5, B-8520 Kuurne
  Phone: +32-56-368-282, Fax: +32-56-368-251
  E-mail: support.controlrooms@barco.com, Web: www.barcocontrolrooms.com

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