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AUDIOMODULE
Documentation

Version: 1.3.5
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Article no.: 10512; 10516; 10522; 10526

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EN

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1   INTRODUCTION

Congratulations on your purchase of the new **AUDIO**MODULE and thank you for your confidence in our product. We are certain that you will enjoy every minute with your **AUDIO**MODULE.
To get the best from your new device from the very start, we recommend that you read the operating instructions carefully.

In this way, you will familiarise yourself quickly and thoroughly with the **AUDIO**MODULE. In addition, the operating instructions offer you useful tips on installing and using your new device.

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Figure 1 AUDIO MODULE Speaker KNX/TP

Product name: **AUDIO**MODULE Speaker Standalone,
                       AUDIOMODULE Line Standalone,
                       AUDIOMODULE Speaker KNX,
                       AUDIOMODULE Line KNX
Function: Audio streaming client/ server based on the Squeezebox Technology.
                       Optionally with KNX/TP connection.
Design: REG (series installation)
Article number: 10512 (Standalone Speaker)
                       10516 (KNX/TP Speaker)
                       10522 (Standalone Line)
                       10526 (KNX/TP Line)

1.1   OVERVIEW OF FUNCTIONS

The **AUDIO**MODULE enables you to set up a multi-room audio system. The **AUDIO**MODULE, in combination with e.g. the EIB**PORT** or **CUBEVISION**MODULE provides the option of controlling the audio system by means of visualisations, KNX pushbuttons or touch displays.
One **AUDIO**MODULE is used for each music zone.

The **AUDIO**MODULE is either connected to an existing hi-fi system or active loudspeaker (Line version) or the connected speakers are fed via the integrated amplifier (only Speaker version).

The **AUDIO**MODULEs unique feature is that it can be controlled directly via KNX (only KNX/TP) without additional hardware and comes with a Line In (audio input via phone connector).

1.2   AUDIO MODULE FUNCTIONAL PRINCIPLE

The **AUDIO**MODULE is based on the **Squeezebox** (*SQB*) Technology. This has a central **Server** (*Squeezebox Server respectively Logitech Media Server (LMS)*) to which several streaming **Clients** (*Squeezebox Client*) are connected.

The **AUDIO**MODULE not only has an integral SQB client, but also an integral SQB server. This means it can be operated in both modes: "client mode" and "server-client mode".

a) **Client mode**:
    In the client mode, the **AUDIO**MODULE acts as a streaming client and plays back music from a remote Server. The **AUDIO**MODULE receives the audio files in digital form via the network in data packets from the server and then converts these into an analogue music format so that they can be played back by the speakers.

b) **Server-client mode**:
    In this mode the **AUDIO**MODULE acts simultaneously as an server and as a client. In other words, the internal client accesses the internal server so that the device can also be used in "Standalone" mode. In this mode, however, there are restrictions. It is only possible to connect storage media with a total capacity of up to 32 GB, i.e. one USB stick with 32 GB or two USB sticks of 16 GB each can be connected.

The specifics of how to control the **AUDIO**MODULE via KNX differ, depending on the version.

a) **The AUDIO**MODULE **Standalone version**
    is controlled through the *Ethernet* solely via the EIB**PORT** or **CUBEVISION**MODULE from the Company BAB TECHNOLOGY GmbH.

b) **The AUDIO**MODULE **KNX / TP version**
    can receive commands directly from the *KNX bus* (for example, from any KNX switch sensor). <u>Of course this version can also additionally controlled through the Ethernet via the EIBPORT or CUBEVISION MODULE.</u>

* *The SqueezeBox Server (The software was originally developed from Slim Devices) is also known under the name Logitech Media Server (hereinafter referred to by the abbreviation „LMS")*

2 AUDIO MODULE SPEAKER & AUDIO MODULE LINE

The **AUDIO**MODULE is available as four different types of device.
- **AUDIO**MODULE Speaker Standalone,
- **AUDIO**MODULE Line Standalone,
- **AUDIO**MODULE Speaker KNX,
- **AUDIO**MODULE Line KNX

2.1 AUDIO MODULE SPEAKER STANDALONE (ART.NO. 10512) AND KNX/TP (ART.NO. 10516)

As "**AUDIO**MODULE SPEAKER", the **AUDIO**MODULE is connected direct to the speakers through integral amplifiers. The stereo audio output of the integrated amplifier produces 2x 20 W RMS at 4Ω.

Figure 2 AUDIO MODULE Speaker Standalone

2.2   AUDIO MODULE LINE STANDALONE (ART.NO. 10522) AND KNX (ART.NO. 10526)

The "**AUDIO**MODULE LINE", is connected via a line out output to an existing Hi-Fi system or active loudspeaker. This is an audio line-out (3.5mm stereo phone connector) of 2 V_{rms} at 10 kΩ.

In the KNX version is still a KNX bus connector in the upper left corner present.

Figure 3 AUDIO MODULE Line KNX/TP

2.3   SCOPE OF SUPPLY AND INTERFACES

The **AUDIO**MODULE is supplied in a white cardboard shipping box with the following contents:

- 1x **AUDIO**MODULE
- 1x 2-pole screw terminal for power supply
- 1x 2-pole screw terminal for KNX bus (only KNX variant)
- 1x 4-pole screw terminal for loudspeaker (only Speaker variant)

A power supply unit for the device is NOT included!

Apart from the connection for the power supply **(Speaker 24 V DC, Line 10-32 V DC**), the **AUDIO**MODULE offers the following ports:

- 1x KNX®: twisted pair via terminal (for Art. No. 10525 and 10515)
- 1x 3.5 mm phone connector for Line In (audio in)
- 1x 3.5 mm phone connector for Line In (audio out; only Line variant)
- 1x 4-pole screw terminal for 2 loudspeaker (loudspeaker out; only Speaker variant)

- 1x RJ 45: Ethernet 100 Mbit/s full duplex
- 4x USB ports

- Speaker variant: 2x speaker outputs, 2x20 W RMS at 4 Ω, **Operating voltage 24 V DC**
- Line variant: Audio line-out, 2 V_{rms} at 10 kΩ, **Operating voltage 10-32 V DC**

Factory settings at shipment

- **IP address**   **192.168.1.226**
- **Username**   **admin**
- **Password**   **admin**
- Device Name   AUDIOMODULE

3   INSTALLING THE AUDIO MODULE

3.1   AUDIO MODULE SPEAKER

The operating voltage for the AUDIOMODULE Speaker is 24 V DC.

The device shown here is the **AUDIO**MODULE Speaker. DIN rail mounting housing 4 units wide.
Dimensions (width x height x depth): 72 x 90 x 63 mm

To make connection of the speakers and the power supply easier, the 4-pole screw terminals for the loudspeaker and the 2-pole screw terminal for the power supply (Figure 4 AUDIO MODULE Speaker KNX) are removed from the unit.
The **AUDIO**MODULE Version KNX has an additional 2-pole screw terminal for the KNX bus.

The power supply cables are now connected to the screw terminals (Figure 4 AUDIO MODULE Speaker KNX). Attention must be paid to the correct **polarity**: **(Left: Plus (+), Right: Minus (-)).**

In order to connect the speakers and hi-fi system correctly, attention must also be paid here to the correct **polarity** (Fig. 4): **(- Left + | - Right +)**

The KNX bus cable is attached to the smaller 2-pole screw terminal, as shown on the front panel (as shown below Figure 4 AUDIO MODULE Speaker KNX).
Pay attention to the correct polarity! **(Left: Black (-), Right: Red (+))**.

The screw terminals can now be reinserted into the **AUDIO**MODULE.
If desired, you can now connect an external audio source, such as TV, CD-, DVD-Player, with a 3.5 mm jack connector to the Line In input.

The **AUDIO**MODULE can now be snapped onto the DIN rail complying with EN 60715.

Important note: Before you disconnect the power supply, please shut down the DATA LOGGER via its web interface first (Configuration/System)!

	AUDIO MODULE Speaker properties
(1)	Line In (audio input, 3.5mm stereo phone connector)
(2)	Power supply via 24 V DC screw terminal
(3)	USB port
(4)	RJ45 socket for Ethernet LAN
(5)	2 x 20 W at 4 Ω - L + | - R +
(6)	KNX bus connector (only KNX/TP version)

(1)   (5)   (6)

(3)   (2) & (4)

Figure 4 AUDIO MODULE Speaker KNX

The **AUDIO**MODULE has two DUO-LEDs, each of which has one green and one red LED. ("Power/Boot" and "Status")

Explanation:
The green "Power/Boot" LED lights up as soon as the **AUDIO**MODULE is supplied with power.
Two or three seconds after the power is connected, this LED changes to red and starts flashing. Once the boot-up process is complete, this LED changes back to green.

After the **AUDIO**MODULE has booted up, the status LED flashes continuously with two quick pulses followed by a short pause.

This flashing also indicates the load level on the **AUDIO**MODULE: the higher the frequency of the flashing LED, the greater the load on the **AUDIO**MODULE.

The **AUDIO**MODULE now requires **2 minutes** to boot up.

3.2   AUDIO MODULE LINE

The operating voltage of for the AUDIO MODULE Line is 10-32 V DC.

The device shown here is the **AUDIO**MODULE Line. DIN rail mounting housing 4 units wide. Dimensions (width x height x depth): 72 x 90 x 63 mm

To make connection of the speakers and the power supply easier, the screw terminals (see Figure 5 AUDIO MODULE Line KNX) are removed from the unit.
The **AUDIO**MODULE Version KNX has an additional 2-pole screw terminal for the KNX bus.

The power supply cables are now connected to the screw terminals (see Figure 5 AUDIO MODULE Line KNX). Attention must be paid to the correct **polarity**: **(Left: Plus (+), Right: Minus (-))**.

To connect active loudspeakers or hi-fi system used a 3,5mm jack plug and insert it into the "line-out" socket (see Figure 5 AUDIO MODULE Line KNX).

The KNX bus cable is attached to the smaller 2-pole screw terminal, as shown on the front panel (as shown below see Figure 5 AUDIO MODULE Line KNX).
Pay attention to the correct polarity! **(Left: Black (-), Right: Red (+))**.

The screw terminals can now be reinserted into the AUDIOMODULE.
If desired, you can now connect an external audio source, such as TV, CD-, DVD-Player, with a 3.5 mm jack plug to the "line in" socket (see Figure 5 AUDIO MODULE Line KNX).

The device can now be snapped onto the DIN rail complying with EN 60715.

NOTE for operation with the AUDIO AMP (item no. 10540) or active loudspeakers (built in power amp):

Set the AUDIO AMP, or your active speakers with built in amp, to a low volume setting initially, and the AUDIO MODULE to a high volume level.
Gradually increase the volume level of the AUDIO AMP (or your active speakers) during the first playback if needed, and store its final volume level.

This prevents you from accidentally destroying your speakers by starting your first playback at maximum levels.

For active speakers, the procedure is the same as for the AUDIO AMP.

	AUDIO MODULE Line properties
(1)	Line In (audio input, 3.5mm stereo phone connector)
(2)	Power supply via 12-24 V DC screw terminal
(3)	USB port
(4)	RJ45 socket for Ethernet LAN
(5)	Line Out (audio output), 2 V_{rms} at 10 kΩ
(6)	KNX bus connector (only KNX/TP version)

Figure 5 AUDIO MODULE Line KNX

The **AUDIO**MODULE has two DUO-LEDs, each of which has one green and one red LED. ("Power/Boot" and "Status")

Explanation:
The green "Power/Boot" LED lights up as soon as the **AUDIO**MODULE is supplied with power.
Two or three seconds after the power is connected, this LED changes to red and starts flashing. Once the boot-up process is complete, this LED changes back to green.

After the **AUDIO**MODULE has booted up, the status LED flashes continuously with two quick pulses followed by a short pause.

This flashing also indicates the load level on the **AUDIO**MODULE: the higher the frequency of the flashing LED, the greater the load on the **AUDIO**MODULE.

The **AUDIO**MODULE now requires **2 minutes** to boot up.

4   COMMISSIONING

GENERAL

Environmental requirements

Operating voltage:	**Line: 12- 32 V DC, Speaker: 24 V DC**
Power input:	**AUDIO**MODULE Speaker: max. 72 W
	AUDIOMODULE Line: <=5 W

Environmental conditions:	compliant with EN 50090-2-2
Ambient temperature:	-5 to 35°C
Storage temperature:	-10 to +60°C
Relative humidity (no condensation):	5% - 80%

Connect device
Snap the device onto the DIN rail complying with EN 60715.

Power supply
When assembling the power supply, make sure that sufficient power is available. Connect the power supply in accordance with the labelling on the screw terminal.

Network
Connect the **AUDIO**MODULE with your network.

Audio input
Connect the **AUDIO**MODULE via the Line In input with the external source.

KNX bus
Connect the **AUDIO**MODULE via the KNX bus connector with the KNX bus.

ADDITIONAL NOTES FOR AUDIO**MODULE** SPEAKER

Connect device
  ▪ Connect the loudspeaker.

ADDITIONAL NOTE FOR AUDIO**MODULE** LINE

Connect device
  ▪ Connect the hi-fi system, the amplifier or active loudspeaker.

If the **AUDIO**MODULE has been correctly installed, as shown in Section 3 - Installation, it can now be put into service by switching on the power supply. In order to configure the device as required, the following conditions must be met, see below:

4.1 LED STATUS

The **AUDIO**MODULE has two DUO LEDs (Power/Boot and Status). Each DUO LED has a green and a red LED. The upper DUO LED shows the state of Power/Boot, and the lower DUO LED the state of the **AUDIO**MODULE.

POWER / BOOT LED

LED indicator	State
OFF	The device is not ready for use. There is no operating voltage.
GREEN	The device is ready for use.
BLINKING ORANGE	The device is booting.

STATUS-LED

LED indicator	Status
OFF	The device is booting.
BLINKING GREEN	The device has booted. The LED simulates a heartbeat. The blinking frequency increases with the device's usage.
BLINKING RED	Communication with the KNX bus.

Explanation:

The green LED of the Power/Boot DUO LED lights up as soon as the **AUDIO**MODULE is powered. Two to three seconds later, the red LED of the DUO LED begins to flash until the boot process is completed (this makes the Power/Boot DUO LED appear orange).
As soon as the boot process is complete, the Power/Boot LED stays green, while the Status LED flashes green (it simulates a heartbeat). The flashing frequency increases with the usage of the **AUDIO**MODULE.

The **AUDIO**MODULE requires about **2 minutes** starting.

4.2   ESTABLISHING CONNECTIONS

In order to configure the **AUDIO**MODULE (Speaker/Line) and to retrieve the web interface, a current browser and a network connection to the device are required. If the device is in the condition on delivery, it can be accessed at the above-mentioned IP address and the network settings must be adjusted to the address range, where necessary. To do this, please follow the instructions provided in chapter "Adjusting the network settings of your computer".
The **AUDIO**MODULE (Speaker/Line) has the standard IP address **192.168.1.226**.

4.3   DISCOVERY TOOL

If you do not know the network settings of the device, the DiscoveryTool can help you to find out with which IP address the device is available. The "DiscoveryTool" software is platform-independent and can be run on any operating system. It can be found on the supplied CD or in the download section at www.bab-tec.de.
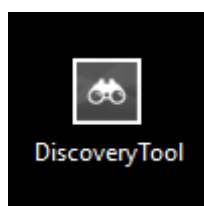

Figure 6 Discovery Tool icon

Double-click the program icon in order to start the software. All devices available in the network are shown in the program window with their respective device names and serial numbers. An **AUDIO**MODULE can be recognised by means of a serial number starting with "BT102…"!

Figure 7 Discovery Tool Software

The colour marking of the devices shown in the DiscoveryTool has the following meaning:
- Grey = Information is being retrieved
- Green = Device is in the same network area as the PC
- Yellow = Device is NOT in the same network area as the PC

Mark the required device in the list. The device information available is displayed in the fields below. If the device is marked green, you can immediately call up the start page of the device by pressing the "Open in Browser" button. If the device is marked yellow, change the network settings of your PC correspondingly (see chapter below).

4.4   ADJUSTING THE NETWORK SETTINGS OF YOUR COMPUTER

In order to adjust the network settings of your computer and establish a connection to the device, please proceed as described below:

- Open the IP address settings (under Windows 7):
- Click
  "Start Button" -> "Control Panel" -> "Network and Internet" -> "Network and Sharing Center"
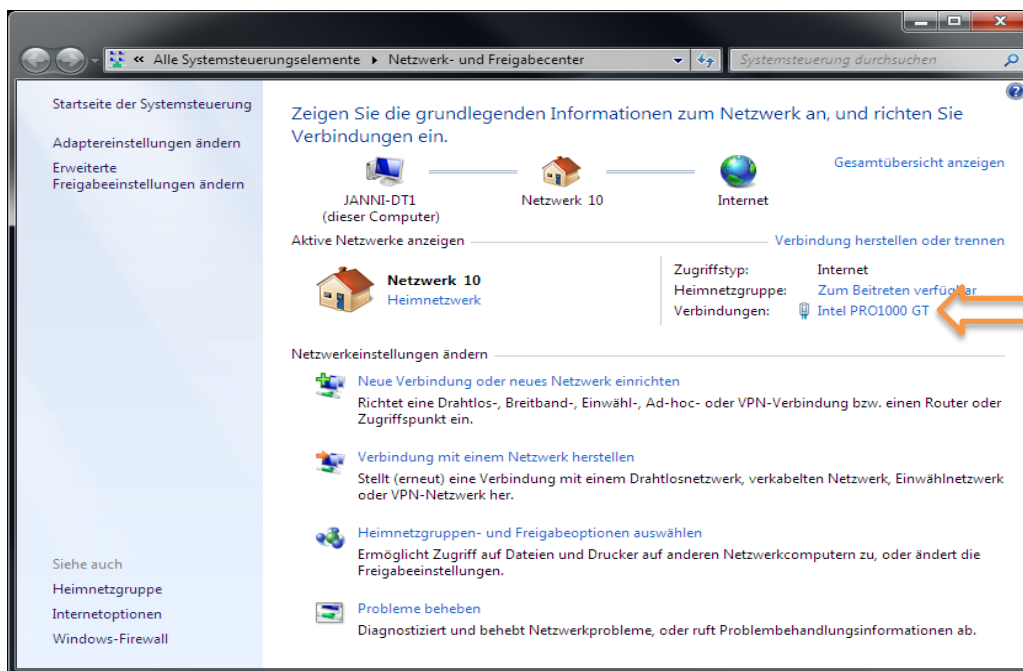- Select "Network Connection", then "LAN Connection" ("Intel PRO1000 GT" in the figure below).

Figure 8 Network and Sharing Center
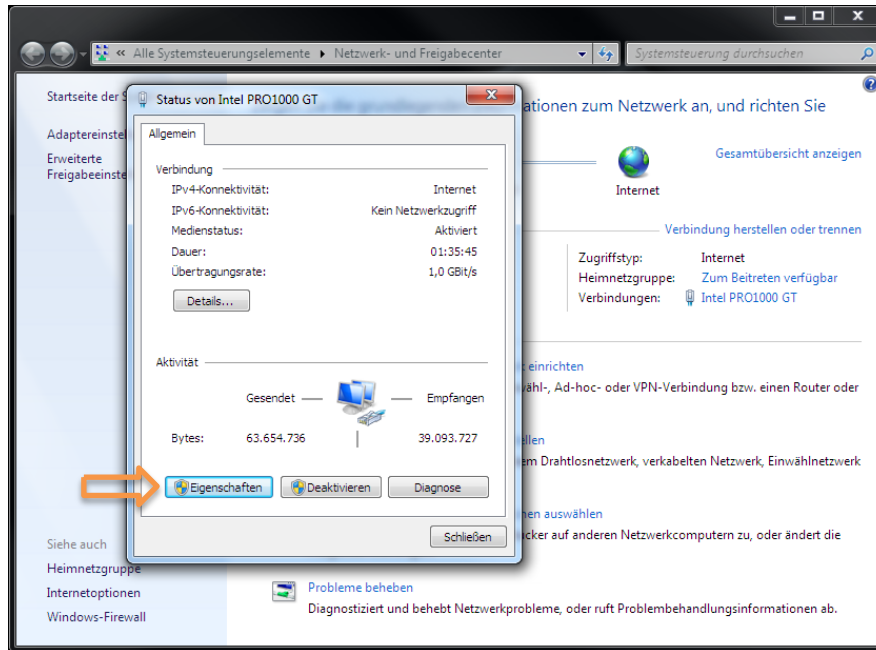
▪ Next, click on Properties.

Figure 9 Network properties

▪ Select "Internet protocol Version 4 (TCP/IPv4)" and click "Properties" again:
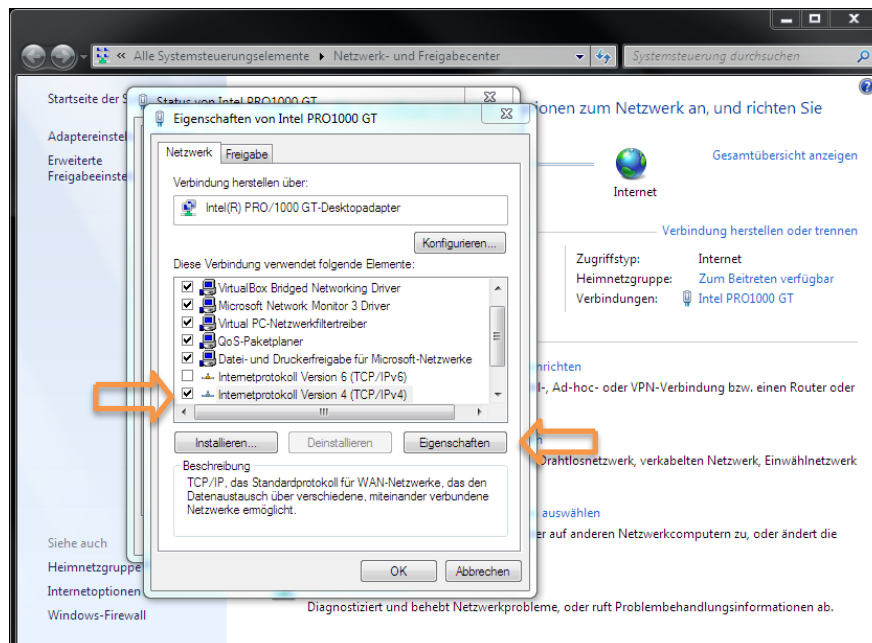

Figure 10 Properties of the network interface

- Now note down the current IP address settings or take a screenshot in order to ensure that you can reset the IP address setting following the configuration of the **AUDIO**MODULE.
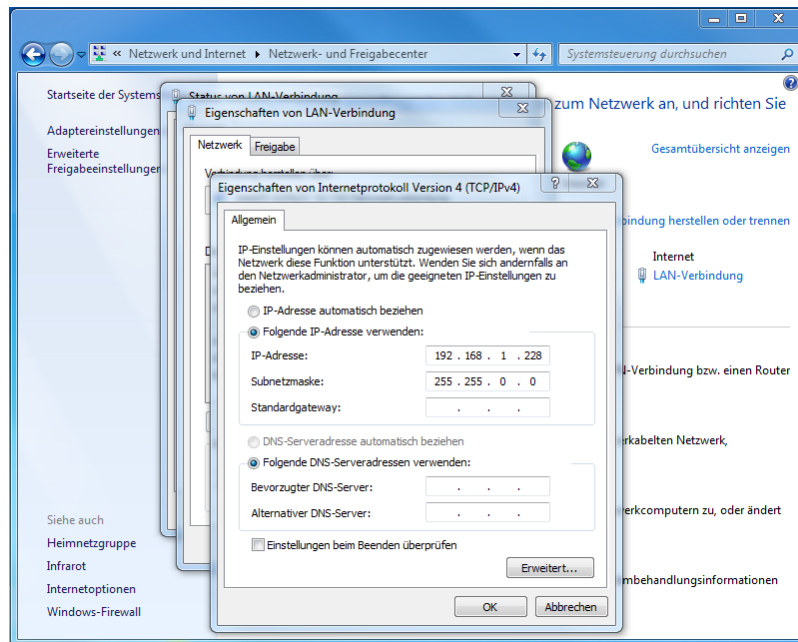- Now change the IP address settings (IP address and subnet mask) as required:

Figure 11´Properties of the Internet Protocol

Example of a valid configuration for the factory settings of the **AUDIO**MODULE:
- Free IP address: 192.168.1.228
- Subnet mask: 255.255.255.0

- Now confirm your input with "OK".
- Close all windows until the "Windows Network and Sharing Center Settings" window is shown.

Thus, you have adjusted the network settings of your PC to those of the **AUDIO**MODULE. The web interface of the **AUDIO**MODULE can be accessed by means of the browser. Restore the original network settings of your PC by following the steps described above as soon as you have configured the **AUDIO**MODULE correspondingly.

4.5   ADJUSTING THE NETWORK SETTINGS OF THE AUDIO MODULE

If the network prerequisites have been created, you can now access the configuration of the **AUDIO**MODULE in order to adjust the network settings to the local requirements there. To do this, please proceed as described below:

- Enter the IP address of the **AUDIO**MODULE in the address line of your browser (for factory settings: 192.168.1.226).
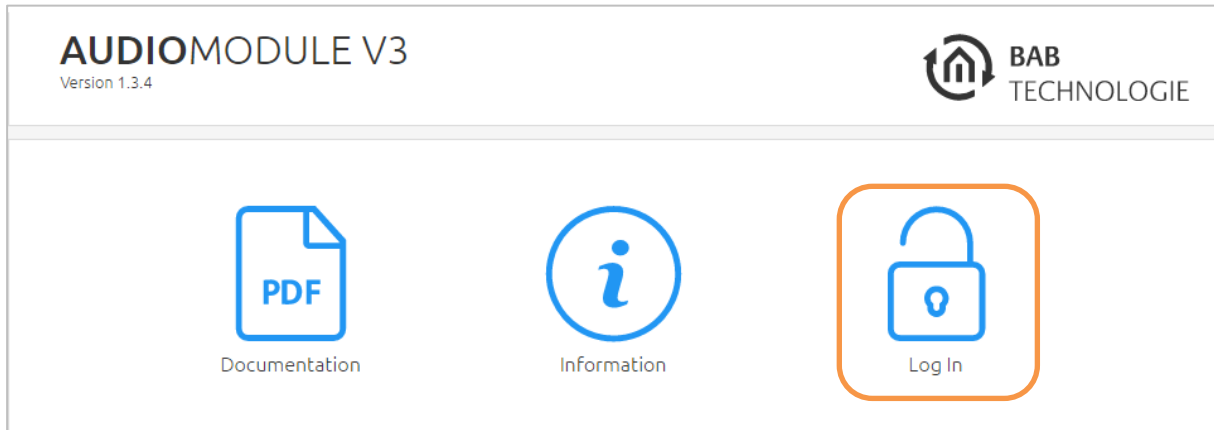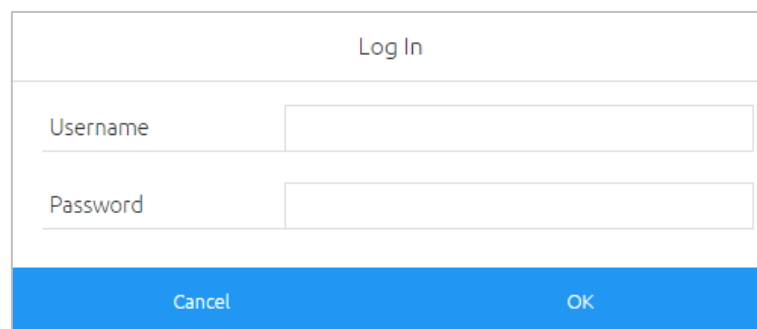

Figure 12 Login AUDIO MODULE Web interface

- The start page of the AUDIO**MODULE** opens up. Click "Log In" on the top right-hand corner of the screen (see figure above, orange circle).
- A login dialog appears. For factory settings, the login data is as follows:

Username:	**admin**
Password:	**admin**

Note: The password must be changed immediately when logging in for the first time. If the password is lost, the device cannot be reset!

Note: Logging in only works if the browser is authorised to save cookies!

After the log in, you can access the four following menus:

- MEDIA SERVER
- SOURCE MANAGMENT
- CONFIGURATION
- INFORMATION
- LOG OUT

In order to change the IP address of the AUDIO**MODULE**, please click "CONFIGURATION" (see orange circle, figure below).
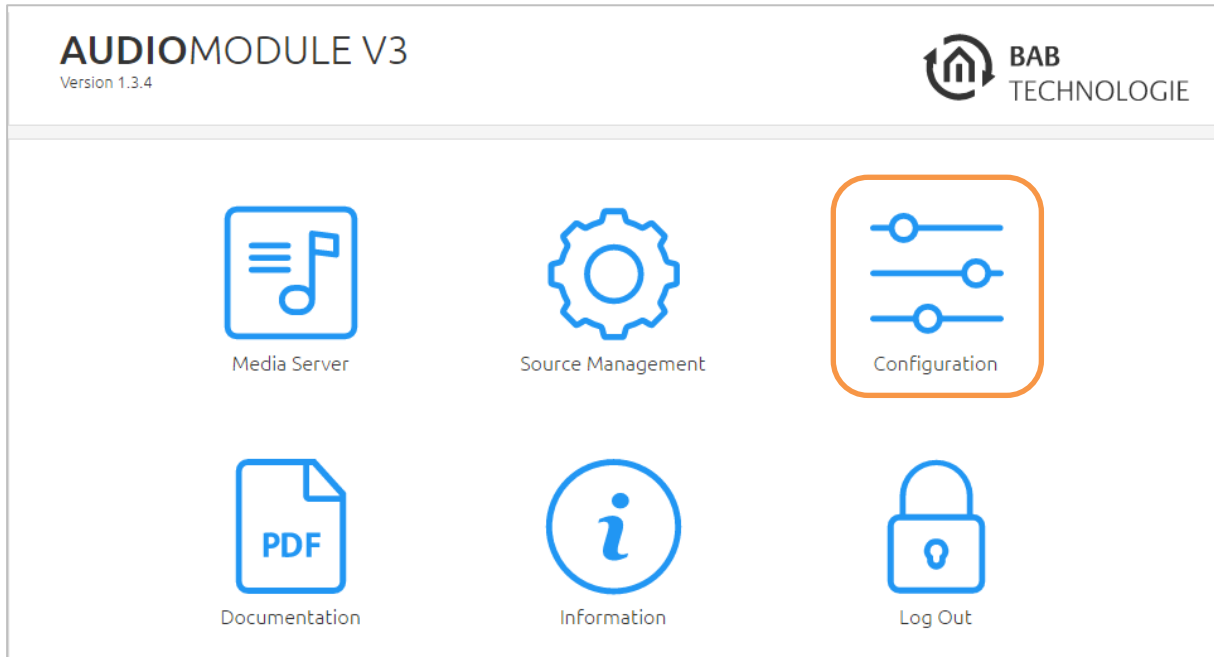

Figure 13 Web interface - open configuration

The configuration menu opens up. You can make the following settings in the "Network" menu item:

DHCP: If the DHCP is activated, the device will automatically load the network settings. A DHCP server must be available in the local network.

IP address / subnet mask / gateway:

If DHCP is not activated, you must adapt the typical network parameters to the existing network.

DNS server: DNS stands for Domain Name System. The DNS server converts an Internet address, e.g. www.bab-tec.de/ into an IP address 85.214.89.170 and vice versa.

NTP server: Configure an NTP server so that the device can synchronize its internal clock. NTP server list: e.g. http://www.pool.ntp.org/zone/europe

Figure 14 Network configuration

Change the IP address settings as required. In order to save the settings made, click "Save Configuration". The server in the device is restarted; the browser automatically connects to the new IP address if possible.

You must now log out, then give your PC the old IP address (Section 4.2) and log in again at the **AUDIO**MODULE Web interface.

Note: Please bear in mind that you might have to reset the IP address of your computer to the initial value in order to be able to access the AUDIO MODULE after the change has been made.

Special feature when activating DHCP
If you have activated DHCP for the AUDIO**MODULE** according to the steps mentioned above, please use the DiscoveryTool as described in chapter "DiscoveryTool" in order to find out the current IP address configuration of the AUDIO**MODULE**.

General operating information can be found in Section 6.

4.6   SETUP MULTIROOM SYSTEM

To establish a multi-room system with **AUDIO**MODULE and an external Logitech Media Server (LMS), proceed as follows:

1) Put the Logitech Media Server (LMS) and the first **AUDIO**MODULE in operation.
2) Change to the **AUDIO**MODULE configuration menu item "Device Name" and assign a unique name for the first **AUDIO**MODULE.
3) Only now connect the second **AUDIO**MODULE and change the name (see Step 2).
4) Continue with further **AUDIO**MODULE according to this principle.

Connect all the **AUDIO**MODULEs one after another, so you can assign each newly connected device a unique name.

4.7   SET UP EIB PORT JOB / LINK WITH KNX (AUDIO MODULE WITHOUT KNX/TP)

To integrate the audio controls into the KNX/EnOcean system, a gateway such as the EIB**PORT**, for example, can be used. Via the internal "SB-Control Job" service, the xPL (SQB protocol) is implemented in the EIB**PORT**. Using this service, the audio functions can be linked with KNX-Gateway systems or EnOcean profiles and thereby controlled by means of visualization and/or pushbuttons. Further information and descriptions of this service can be found in the latest EIB**PORT** documentation.

To integrate the audio control in the **CUBEVISION**MODULE happens automatically.

4.8   CONTROL AUDIO MODULE DIRECTLY WITH KNX
(ONLY AUDIO MODULE WITH KNX/TP CONNECTOR)

The **AUDIO**MODULE Speaker KNX / TP and **AUDIO**MODULE Line KNX / TP have a KNX bus connector and can be connected directly to the KNX bus.

Source Control AUDIO MODULE V3 KNX

Source – Preset. This source will be selected by default after start-up the **AUDIO**MODULE. This setting will be overridden if "automatic source selection" is active.

Enable Automatic Source Selection by default. Preset for the "automatic source selection" function.

Note: It is possible that the **AUDIO**MODULE may also switch to the Line In when an audio cable is connected without an attached source (open end).

Automatic Source Selection - Default Fallback Source. If the automatic source selection is active, this source will be the default source after start-up.

Automatic Source Selection - Silence Tolerance (Timeout in Seconds) .The time for which the **AUDIO**MODULE will wait before switching back to the default source when it does not receive a audio signal.
Assures that pauses in or between songs do not causes a source switch.

Equalizer. The **AUDIO**MODULE has10 different in-build audio profiles to adjust the audio output that can be set using this pull down menu. The chosen audio profile will be loaded into the Digital Sound Processor (DSP) and activated once you press "Save Configuration".
The profile for the digital sound processor can also be selected here. The selected profile will be activated after saving the configuration,

The following audio profiles are available:

- (1) Without Optimisation
- (2) Bass Boost
- (3) Stereo Widening
- (4) Flat
- (5) Party
- (6) Pop
- (7) Rock
- (8) House
- (9) Speech
- (10) Mono

Equalizer (EIS14). The different audio profiles can also be activated directly via a KNX group address and a value. For this purpose, the value of the desired audio profile has to be sent to the specified KNX group address. The associated values are listed in brackets in the description of the configuration field **Equalizer**.
NOTE: If a KNX group address is configured, the DSP profile cannot changed manually via the web interface (see pull down menu "Equalizer").

Equalizer – Callback (EIS14). Report the active DSP profile as EIS14 value.

Default Volume

- **Line-In**. The volume which is used at start-up of the **AUDIO**MODULE for the source Line-In. This value can be overwritten via a KNX telegram. A later change of this configuration, however, will overwrite the KNX given value.
- - **Media Server**. The volume which is used at start-up of the **AUDIO**MODULE for the source Media Server.
The value can be overwritten via a KNX telegram. A later change of this configuration, however, will overwrite the KNX given value.

Note 1 Standard volume: If the volumes (default volume Line-In and Media Server) change via the corresponding KNX group address, these settings will be overwritten.

Note 2 Standard volume: Changing these parameters in this configuration menu, and saving the configuration, will override any previous changes made via KNX.

Energy Saving Mode - Timeout (Minutes). Applies only the **AUDIO**MODULE Speaker model.
The time for which the **AUDIO**MODULE will wait before going into stand-by when it does not receive a signal.

Notice: The value "0" (zero) disables this feature.

Group Addresses for Dynamic Configuration.

Group Addresses for Dynamic Configuration		
Standby (EIS1)	2/1/4	>
Standby - Callback (EIS1)	2/1/5	>
Source Select (EIS1)	2/1/6	>
Source Select - Callback (EIS1)	2/1/7	>
Source Information (EIS15)	2/1/8	>
Source - Name - Media Server	Medienserver	
Source - Name - Line-In	Line-In	
Enable Automatic Source Selection (EIS1)	2/1/9	>
Enable Automatic Source Selection - Callback (EIS1)	2/1/10	>
Default Source (EIS1)	2/1/11	>
Default Source - Callback (EIS1)	2/1/12	>

Standby (EIS1). Switches the integrated amplifier of the **AUDIO**MODULE Speaker on and off. Function of trigger values:

- 0 Power off
- 1 Power on

Standby – Callback (EIS1). Report whether the **AUDIO**MODULE is in standby mode (telegram value 1).

Source Select (EIS1). With this KNX group address you can switch manually between the sources "Media Server" and "Line-In" via the KNX bus. The manually switching between the sources, will be disabled the automatic source selection. The following KNX telegram values are assigned to the sources

- 0 for the Media Server
- 1 for the Line-In input

Source Information (EIS15). The given name of the current selected source is sent as EIS15 text values on this KNX group address. The names of the sources are awarded in the following two text fields.

Source - Name - Media Server. The text which will sent when the Media Server is selected.

Source - Name - Line-In. The text which will sent when the Line-In is selected.

Enable Automatic Source Selection (EIS1). The source can automatically be selected depending on the input signal and standard source. The following KNX telegram values are assigned to the function

- 0 Input signals will not cause an automatic switch of the source
- 1 The source will be selected automatically based on input and default source.

Note: It is possible that the **AUDIO**MODULE may also switch to the Line In (because of disturbing noise) when an audio cable is connected without an attached source (open end).

Default Source (EIS1). The standard source for automatic source selection. If no signal is detected on the non-standard source, this source will be selected. The following KNX telegram values are assigned to the function

- 0 For Media Server
- 1 For the Line-In Input

Group Addresses for Volume Control.

Group Addresses for Volume Control

Volume Absolute (EIS6)	2/1/13
Volume Absolute - Callback (EIS6)	2/1/14
Volume Dimmer With Step Length Information (EIS2)	2/1/15
Volume dimmer (EIS2)	2/1/16
Volume +/- (EIS1)	2/1/17
Volume +/- Step Length (%)	5
Volume Minimum	1
Volume Minimum - Group Address (EIS6)	2/1/18
Volume Minimum - Group Address - Callback (EIS6)	2/1/19
Volume Maximum	100
Volume Maximum - Group Address (EIS6)	2/1/20
Volume Maximum - Group Address - Callback (EIS6)	2/1/21
Mute (EIS1)	2/1/22
Mute - Callback (EIS1)	2/1/23

Volume Absolute (EIS6). Control volume with absolute KNX telegram values. The volume for the currently inactive source remains unchanged. Only the currently active source will be adjusted.

Volume Absolute – Callback (EIS6). Feedback of the current absolute volume. There are stored volumes for both sources. Only the currently active source will be sent.

Volume Dimmer With Step Length Information (EIS2). Set volume relative with step length. Dims only the volume of the current active audio source. The volume of the inactive source will not change.

Volume dimmer (EIS2). Change the volume with the dimming function (via start and stop dimming command principle). Changes only the volume of the current active source. The volume of the inactive source will not change.

Volume +/- (EIS1). This KNX group address adjusts the volume stepwise with the configured step width. The size of each step can be configured as well with the next configuration field. The following KNX telegram values are assigned to the function

- 0 Decrease the volume with the configured step width
- 1 Increase the volume with the configured step width

Volume +/- Step Length (%). Step width of the step to change the volume stepwise.

Volume Minimum. The pre-configured minimum selectable value for the volume level.

Volume Minimum - Group Address (EIS6). The pre-configured value for the minimum volume can be overridden by an EIS6 telegram with this KNX group address.

Volume Minimum - Group Address – Callback (EIS6). Report the minimum permitted volume level.

Volume Maximum. The pre-configured maximum selectable value for the volume level.

Volume Maximum - Group Address (EIS6). The pre-configured value for the maximum volume can be overridden by an EIS6 telegram with this KNX group address.

Volume Maximum - Group Address – Callback (EIS6). Report the maximum permitted volume level.

Note: If the maximum or minimum volume changes via KNX group address the **AUDIO**MODULE will store this new value even after a restart.

Mute (EIS1). Mute the sound. The function mute will not forget the previous volume. The playback (if the media server is active) will be not interrupted in this case.

Mute – Callback (EIS1). Report whether the AUDIO MODULE is muted (telegram value 1) or unmuted (telegram value 0).

Group Addresses for Playback Control

Group Addresses for Playback Control

Play/Pause (EIS1)	2/1/24	>
Play/Pause - Callback (EIS1)	2/1/25	>
Current Title Seek - Dimming (EIS2)	2/1/26	>
Current Title Seek - +/- (EIS1)	2/1/27	>
Current Title Seek - Step length	5	
Media Server - Title +/- (EIS1)	2/1/28	>
Media Server - Playlist +/- (EIS1)	2/1/29	>

Play/Pause (EIS1). This KNX group address manages the Play Pause function. The following KNX telegram values are assigned to the function

- 0 For pause
- 1 For play

Play/Pause – Callback (EIS1). Status feedback of the Play/Pause function. Play mode (value 1); Pause mode (0). Is only sent when the **AUDIO**MODULE is in media server mode.

Current Title Seek - Dimming (EIS2). EIS2 object (with the start and stop "dimming" principle) for a seek in configurable steps of seconds.

Current Title Seek - +/- (EIS1). EIS 1 object for the search function within the current track in steps. The increment of the search is determined in the next configuration field. The following telegram values are assigned to the function

- 0 step backward
- 1 step forward

Current Title Seek - Step length. Length of seek for every steps in seconds.

Media Server - Title +/- (EIS1). On the Media Server it is possible within the active playlist to jump to the previous or next title. The following telegram values are assigned to the function

- 0 Previous title
- 1 Next title

Media Server - Playlist +/- (EIS1). On the Media Server it is possible to change the active playlist. The following telegram values are assigned to the function. The playlists skip function is a loop, i.e. calling "previous playlist" when the first playlist is playing will open the last playlist, and vice versa.

- 0 Previous playlist
- 1 Next playlist

Media Server Title Informations.

Media Server Title Informations		
Text View (EIS15)	2/1/19	>
Text View - Events - Show for Seconds	3	
Album (EIS15)	2/1/20	>
Artist (EIS15)	2/1/21	>
Title (EIS15)	2/1/22	>
Playlist (EIS15)	2/1/23	>

Text View (EIS15). Meant for KNX switch sensors with text displays. On this KNX group address, the **AUDIO**MODULE will send a variety of information. By default, it will display current track information. However, if an action, such as change volume, change playlist, start, stop or mute, is triggered the current track information will be interrupted and the current action will be shown. The duration of this action display is set in the next configuration field.

Text View - Events - Show for Seconds. The duration for which the triggered action will be displayed on the Text View. After this time the current title information will be displayed again.

Album (EIS15). The name of the current album will be sent to this KNX group address.

Artist (EIS15). The name of the current artist will be sent to this KNX group address.

Title (EIS15). The name of the current title will be sent to this KNX group address.

Playlist (EIS15). The name of the current playlist will be sent to this KNX group address.

Playlist – Selection.

Playlist - Selection		
Playlist - Display Row 1 (EIS15)	2/1/24	>
Playlist - Display Row 2 (EIS15)	2/1/25	>
Playlist - Display Row 3 (EIS15)	2/1/26	>
Playlist - Display Row 4 (EIS15)	2/1/27	>
Scroll Playlists (EIS1)	2/1/28	>
Playlist selection (EIS14)	2/1/29	>

These communication objects have been implemented to create a set of four EIS15 texts listing available playlists. One use case is a dynamic playlist selection via visualisation. Scrolling the playlists, if there are more than four, is done with an additional EIS1 object („Scroll Playlists (EIS1) "). Starting a playlist is realized with an EIS14 object.

Playlist - Display 1 (EIS15). First playlist entry.

Playlist - Display 2 (EIS15). Second playlist entry.

Playlist - Display 3 (EIS15). Third playlist entry.

Playlist - Display 4 (EIS15). Fourth playlist entry.

Scroll Playlists (EIS1). Via this group addresses the next or previous four playlists will be requested. Consequently, those four playlist names will be sent on the four display KNX addresses. The following telegram values are assigned to the function

- 0 requests the names of the previous four playlists to be sent to the display KNX addresses (Playlist - Display 1 … Playlist - Display 4)
- 1 requests the names of the next four playlists to be sent to the display KNX addresses (Playlist - Display 1 … Playlist - Display 4)

Playlist selection (EIS14). Via this group address and its value, one of the currently displayed four playlists will be started. The following telegram values are assigned to the function

- 1 for the playlist displayed on Playlist - Display 1
- 2 for the playlist displayed on Playlist - Display 2
- 3 for the playlist displayed on Playlist - Display 3
- 4 for the playlist displayed on Playlist - Display 4

Direct Playlist Selection.

Playlist (EIS14). Via this KNX group address, playlists can be started through assigned values. In the next configuration parameter the playlists can be assigned to values.

Assign Playlist. In this list, the playlists are linked with corresponding values. Add create a new entry. Copy, Edit and Delete are also available for processing the entries.

Two information are required for a new entry:

- The Playlist and
- The (trigger-) Value.

The following figure shows the configuration of a new entry. The play list is selected by using a pull-down menu.

Corresponding Integer (0-255) in the next configuration field is the assigned trigger value to start the selected play list.

Notification List. . If this option is activated, the playlist will be temporarily inserted into the current playlist. This means that after the playlist is finished, the previous state will be restored.
For example, previously played internet radio station will be reloaded again, and if another playlist had been playing, it will be resumed at the point of interruption

5   CLIENT AND SERVER-CLIENT OPERATING MODE

There are two different ways to operate the **AUDIO**MODULE.
As "client mode", use with an external server (LMS) or as "server-client mode" (Standalone), the **AUDIO**MODULE operate with the internal server (LMS).

5.1   CLIENT MODE: COMMISSIONING AS AUDIO MODULE WITH EXTERNAL SERVER

In the client mode, the **AUDIO**MODULE acts as a streaming client and plays back music from a remote Logitech Media Server (LMS).

Requirements:
• 	A PC with JAVA version 1.5 or higher
• 	A current browser (e.g. Firefox, Chrome, Safari etc.)
• 	EIB**PORT**
• 	Network and network cable
• 	Media server, xPL hub + ExPL plugin
• 	Power supply
• 	Speaker or hi-fi system, depending on **AUDIO**MODULE

In order to use the LMS, you need the xPL hub and ExPL plugin.

5.1.1   LOGITECH MEDIA SERVER (XPL HUB + EXPL PLUGIN)

The xPL hub can be downloaded free of charge from the xPL homepage:

http://xplmonkey.com/xplhub.html

and the ExPL plugin can be downloaded free of charge from our homepage

 http://bab-tec.de/index.php/download_en.html

By installing these files you can ensure that your PC meets the requirements for control using the EIB**PORT**.

5.1.1.1   PREINSTALLED NAS SERVER

Another option is offered by our preinstalled NAS server. In this NAS server, everything you require is already preinstalled. This means that you do not have to download or install any other files. This enables you to work directly with the NAS server and the EIB**PORT**.

5.1.1.2   SERVER: SYNOLOGY DISK STATION

In this configuration, the Synology Disk Station is the central server on which the audio files are stored and from which they are retrieved again.
This enables you to play back different audio files at the same time in different "music zones" or rooms using a single server.
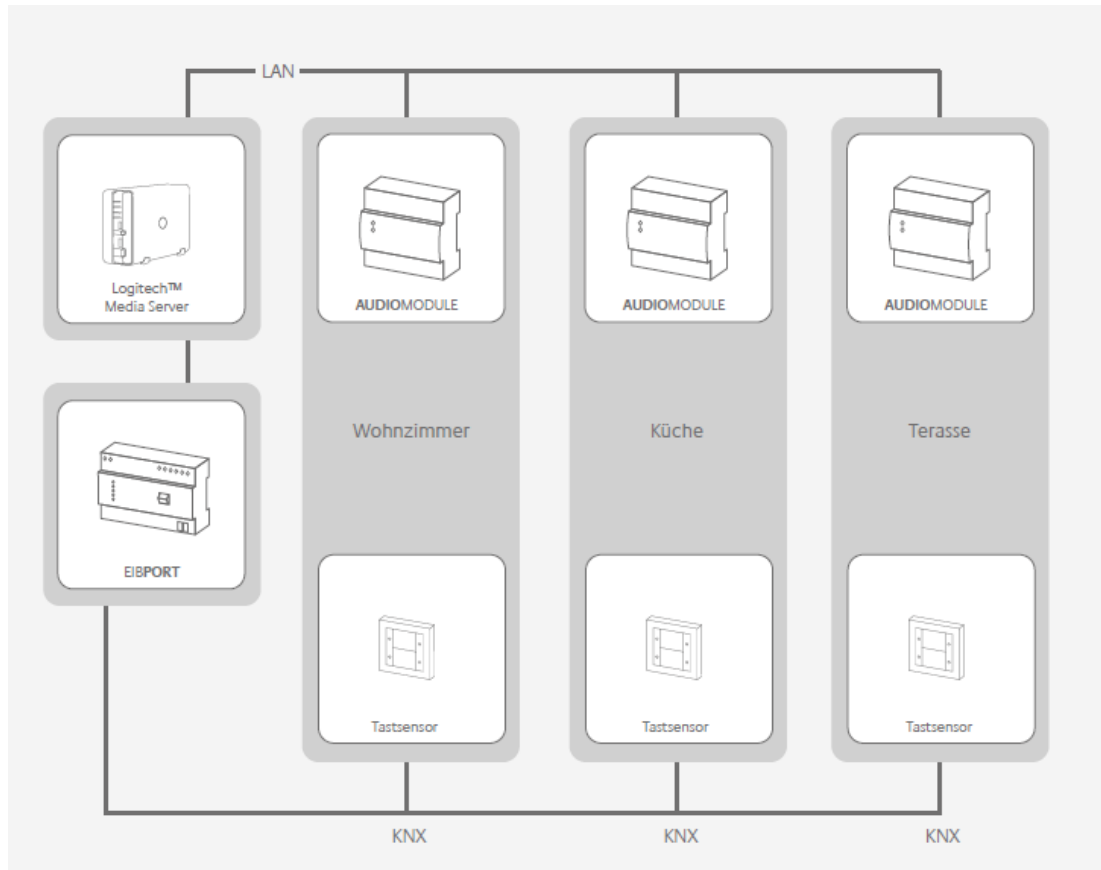
Figure 15 Structure

5.1.2   ASSIGN LOCAL SERVER (STANDALONE)

To assign a server to the **AUDIO**MODULE, log in again on the Web interface.
In the main menu, select the "MEDIA SERVER" option. This opens the window shown below:
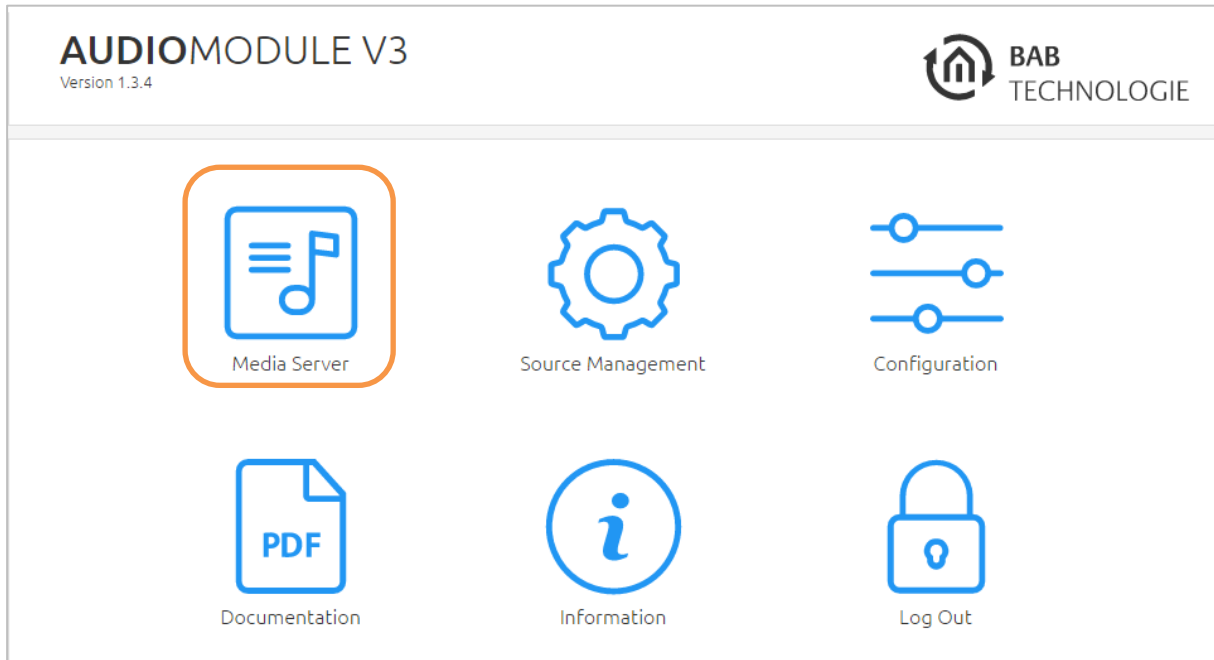
Figure 16 Logitech Media Server selection

Click on "SELECT" will open another window in which the server for this **AUDIO**MDOULE can be selected.
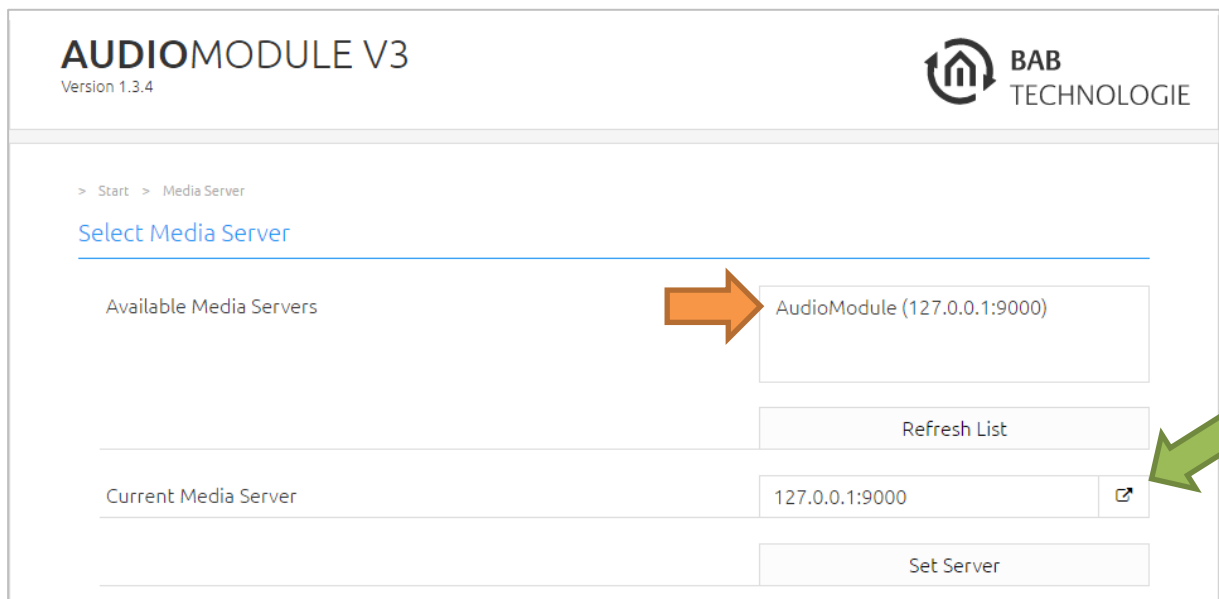
Figure 17 Select Logitech Media Server

The currently available servers are displayed with their names and IP addresses.
Click on "Refresh List" to update the list with all the latest available servers.

To change the server, select the server with the IP address 127.0.0.1 (special local IP address) from the list of "Available Media Servers" and click on "Apply Server"

"Current Media Server": This shows which server is currently being used.

The **AUDIO**MODULE is now linked with the required external server.

Access the media server via the green arrow.

Note:
If the server that the AUDIO MODULE should access is changed during operation, the Logitech Media Server must be closed and then opened again.
As the IP address of the LMS also changes when the server is changed, it would otherwise not be possible to play back the audio files.

5.2   SERVER-CLIENT MODE: COMMISSIONING THE AUDIO MODULE WITH AN INTERNAL SERVER

In this case the **AUDIO**MODULE functions simultaneously as server, LMS and client. In other words, the internal client accesses the internal server so that the device can also be used in "Standalone" mode. In this mode, however, there are restrictions. It is only possible to connect storage media with a total capacity of up to 32 GB, i.e. one USB stick with 32 GB or two USB sticks of 16 GB each can be connected.

5.2.1   ASSIGN SERVER

You will now see the start window in which you can select one of three menu options:
- MEDIA SERVER
- CONFIGURATION
- INFORMATION

To assign a server to the **AUDIO**MODULE, select the menu option "MEDIA SERVER". This opens the window shown below:
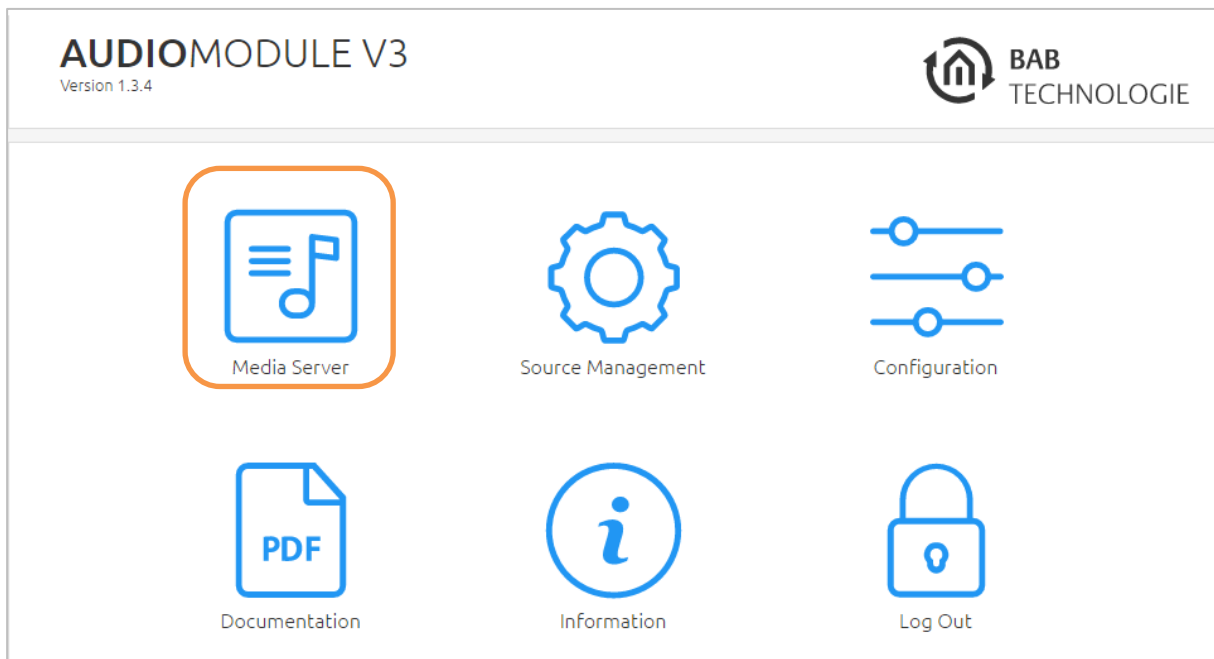
Figure 18 Logitech Media Server selection

Click on "SELECT" and another window will open in which the server can be selected.
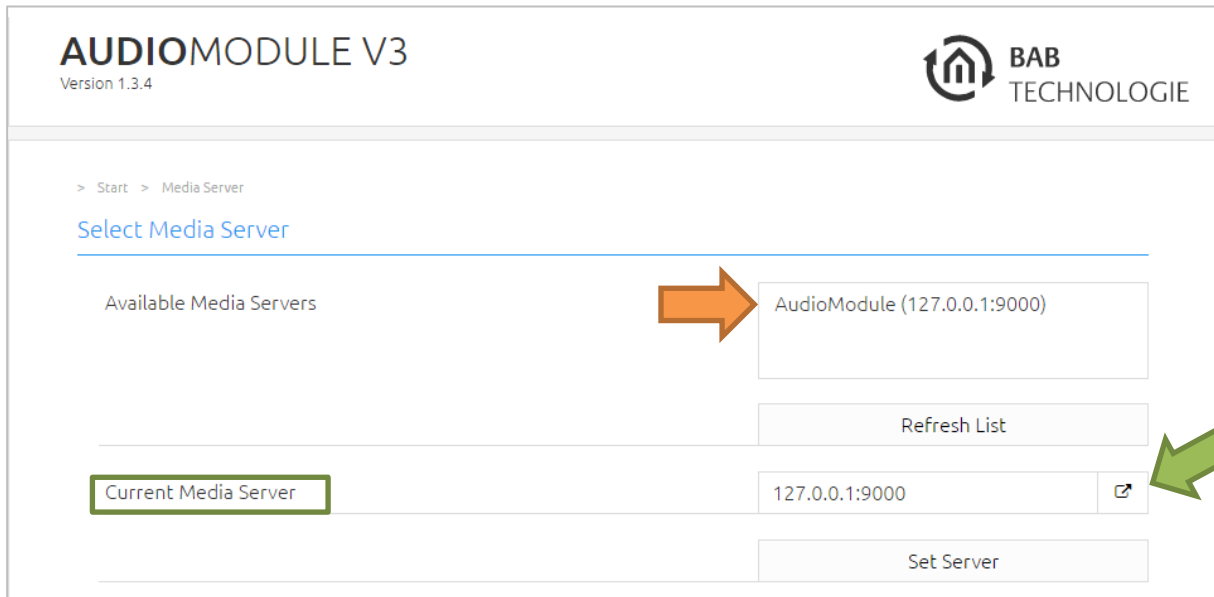
Figure 19 Select server for AUDIO MODULE

The currently available servers are displayed with their names and IP addresses.
Click on "Refresh List" to update the list with all the latest available servers.

To change the server, select the external server you require from the list of "Available Media Servers" and click on "Apply Server".

"Current Media Server": This shows which server is currently being used.

The **AUDIO**MODULE is now linked with the required external server.

Note:
If the server that the AUDIO MODULE should access is changed during operation, the Logitech Media Server must be closed and then opened again.
As the IP address of the LMS also changes when the server is changed, it would otherwise not be possible to play back the audio files.

General operating information can be found in Section 6.

5.3　　ACCESS THE MEDIA SERVER

To open the web interface of the Media Server click on the button (see green arrow) under the entry "CURRENT MEDIA SERVER" in the menu "MEDIA SERVER".

5.4   CONNECTING THE USB STICK

One or two USB sticks can be directly connected to the **AUDIO**MODULE.
This offers even greater flexibility. Before you insert the USB stick, however, you must follow a couple of instructions:

- The USB stick must be formatted as NTFS or FAT32 (Windows) or ext2 or ext3 (MacOS, Linux).

- Under no circumstances may the USB interface be extended with a USB hub.

- We recommend that you do not use more than two USB sticks with a capacity of 16 GB each.

- As soon as a USB stick is connected, the Logitech Media Server requires several minutes to scan it. The duration of the scanning process depends not only on whether you have connected one or two USB sticks, but also on the storage capacity of the individual USB stick, what format the audio files have (wave or mp3) and how many playlists are stored on the stick. A cover has a crucial influence on this duration. If each audio file in each folder has its own cover, this will prolong the scanning process significantly. If there are two USB sticks with a capacity of 16 GB each, the scanning process will take 20 minutes on average.

- **The storage location for the playlist shall not be modified!**

- As soon as a USB stick has been removed the audio files can no longer be played and must be rescanned the next time the stick is connected.

To ascertain how far the scanning process has progressed, click on "Settings" in the LMS (Fig. 26, circled in yellow).
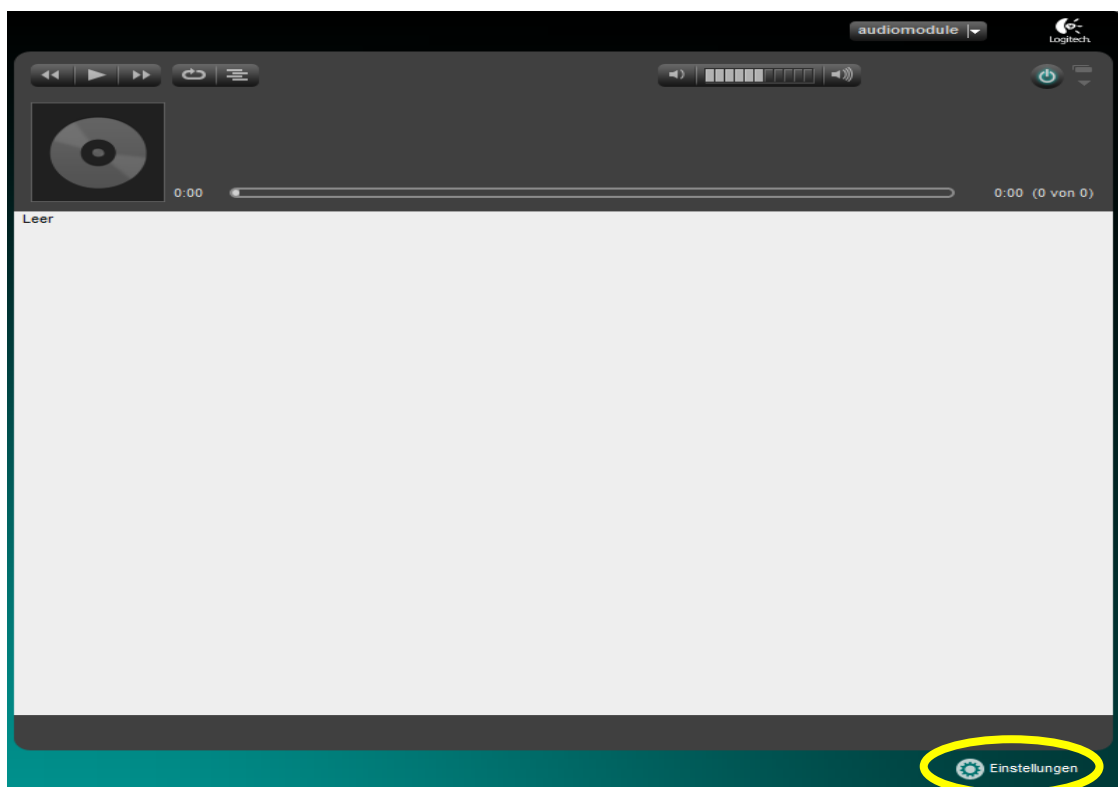
Figure 20 Open Logitech Media Server settings

Now click on the last tab, "Information" (Fig. 27, circled in red).
Steps that have to be performed before the scanning process is completed (circled in green):

- Files/Folders
- New music files
- New files
- Playlists
- Album covers

Please do not play any music files during the scanning process, as this could overload the CPU and cause the scan to start again from the beginning.

Once the LMS has scanned all the audio files they can be played back.
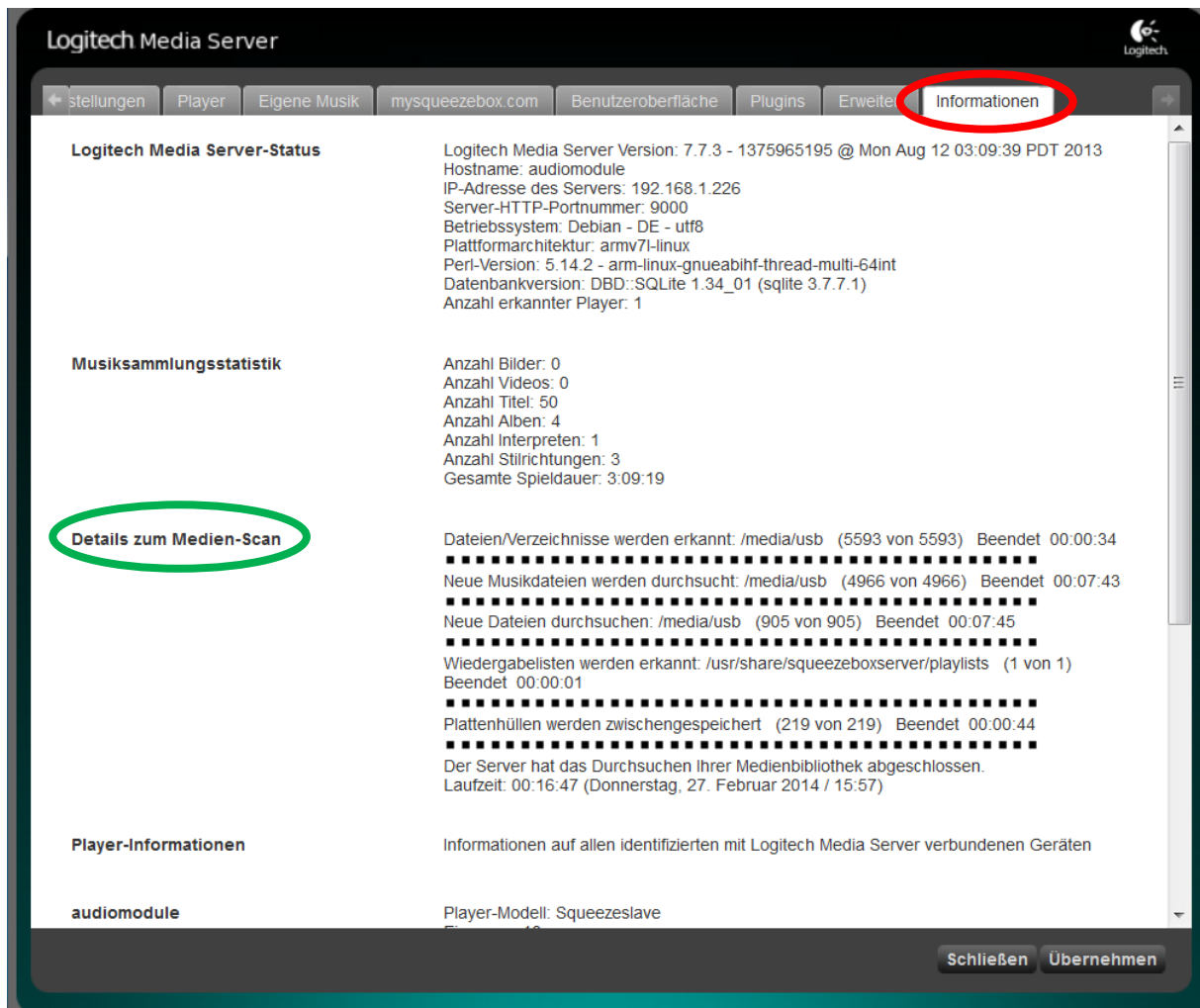
Figure 21 Details of the media scan

5.5   UPNP CONTROL

If the **AUDIO**MODULE is operated in the server-client mode, the **AUDIO**MODULE can be used completely independently as a "Standalone" device. By means of the Logitech Media Server which is started on the **AUDIO**MODULE, the **AUDIO**MODULE is simultaneously a "UPnP-renderer" and "UPnP-server".

In this way, the **AUDIO**MODULE can easily be controlled by means of a UPnP application, e.g. from a smartphone.

UPnP means "Universal Plug and Play", a term that can be subdivided into three categories in relation to A/V controllers: Server, renderer and control point.

1. Server: Provides audio and video data. In this case, it can also be the mobile phone.

2. The renderer replays audio and video files, but the **AUDIO**MODULE only replays audio files and not video files.

3. The control point: this controls the **AUDIO**MODULE, for example with a UPnP-compatible smartphone or tablet.

By downloading the software, e.g. "BubbleUPnP" for androids or "imediashare" for iOS, you can make your smartphone or tablet control point compatible.

6   ADDITIONAL FUNCTIONS

This section describes additional functions that are important not only for the **AUDIO**MODULE Speaker and the **AUDIO**MODULE Line, but also for the various functions of the **AUDIO**MODULE, Client Mode and Server-Client Mode.

6.1   CHANGING THE AUDIO MODULE NAME

The "Device Name" is used for unique identification of the **AUDIO**MODULE. This means that the **AUDIO**MODULE will not only be accessible in the browser under "Devicename.local", but will also bear this name as an SQB Client in the LMS.

There is a possibility of changing the device name of the **AUDIO**MODULE and of the LMS in one process. In other words, it is not necessary to make changes in two different places!
To change the "Device Name", proceed as follows:

1. Open the Web interface of the **AUDIO**MODULE
2. Change the device name of the **AUDIO**MODULE under the "Configuration" menu option
3. The player name of the LMS will adapt itself automatically.

Note: You should now make no further changes to the name in the AUDIOMODULE or the LMS, as otherwise you will have two different names for one AUDIOMODULE.

6.2   SETTING UP PLAYLISTS

NOTE: The location of the playlist may not be changed!
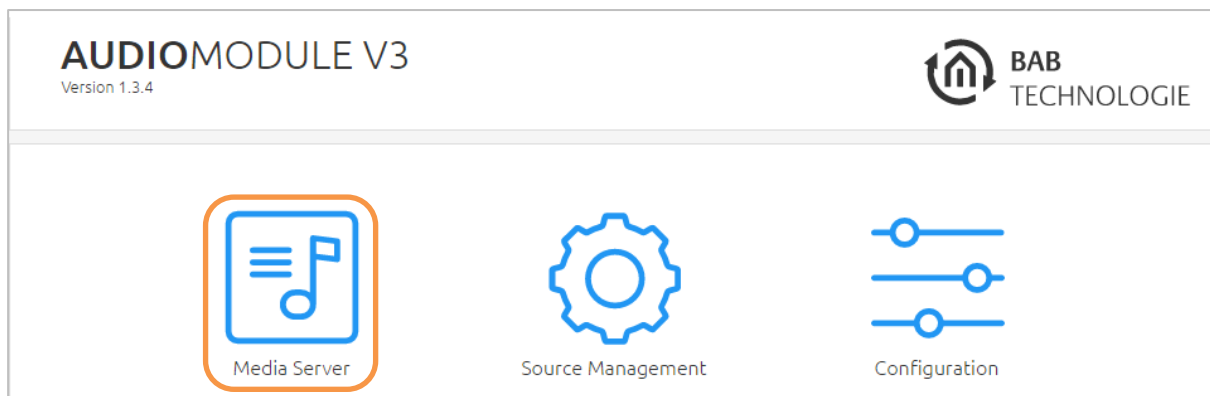
In order to set up playlists, open the menu of the Logitech Media Server (LMS).
Do this by clicking on the button (see orange arrow) under the entry "CURRENT MEDIA SERVER".
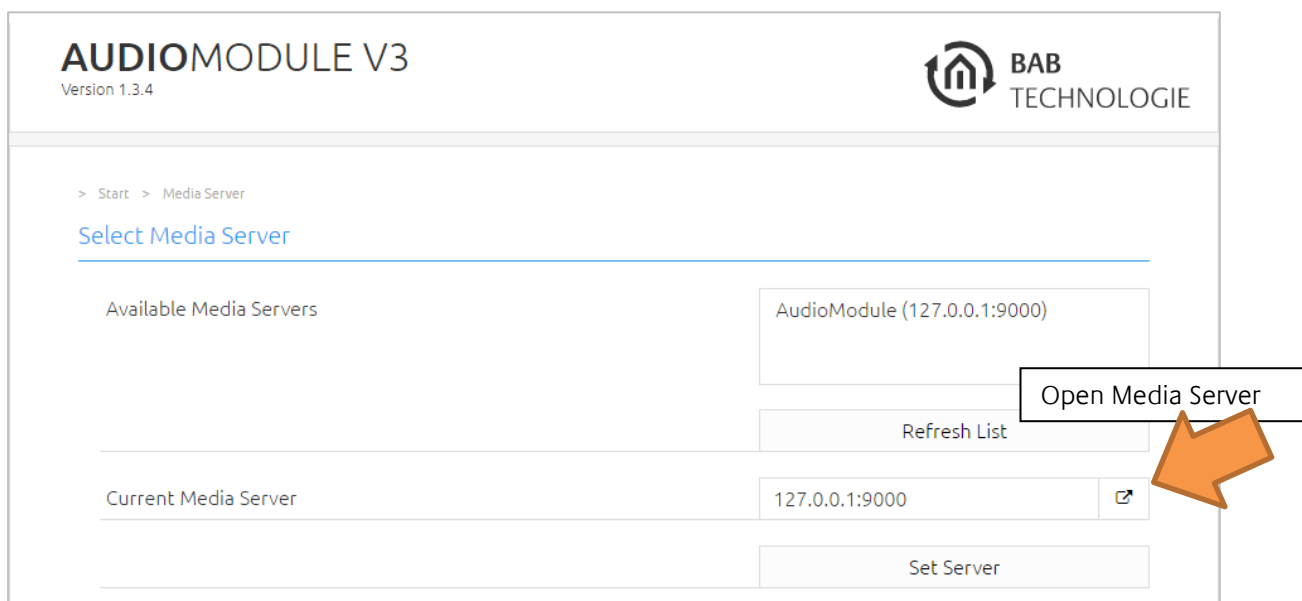
Figure 22 Open the Logitech Media Server
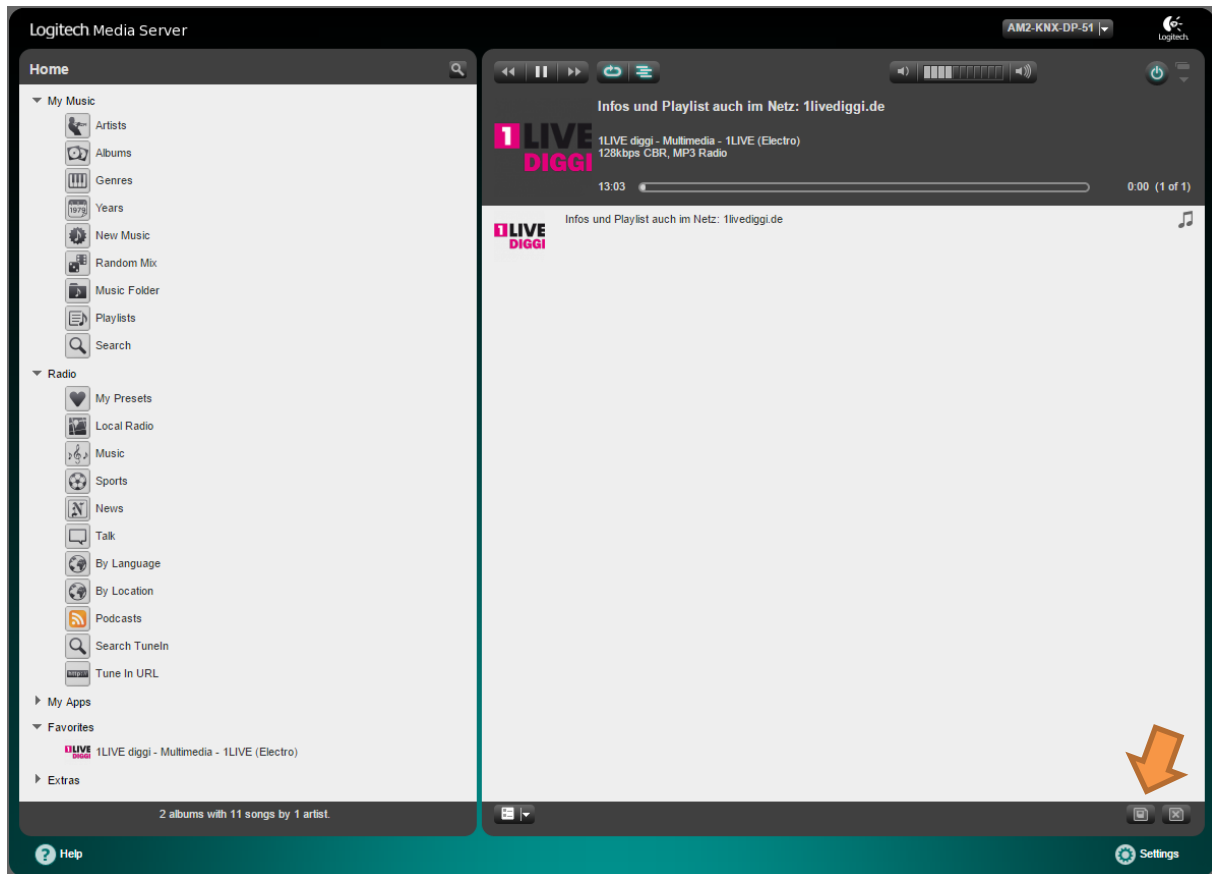
Figure 23 Logitech Media Server main menu

In the main menu you will find all the music files, sorted by artist, album and musical style. These can add to the current playlist (start directly play with the Play symbol or append to the current play list with the plus symbol). After choose the content for the playlist you want to create, click on SAVE (orange arrow) to safe the current playlist.
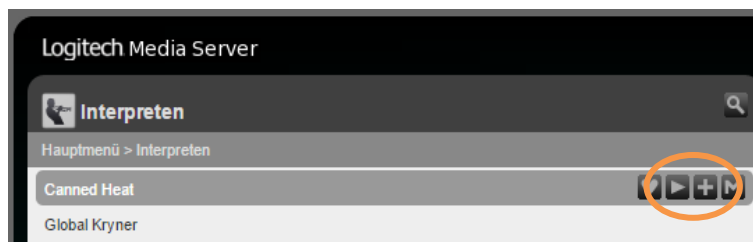
You can find further information on the LMS at: http://wiki.slimdevices.com/index.php/Main_Page

6.3   IMPLEMENT CURRENT COVER IN THE VISUALISATION

The visualisation element (e.g. the EIB**PORT** or **CUBEVISION**MODULE) "Image" has the possibility to "show external images". In this way the cover of the current audio track can show on a visualisation. If the cover image exists, the EIB**PORT** or **CUBEVISION**MODULE can be found under the following URL:

http://<server>:<port>/music/current/cover.jpg? player=<playerid>

The player ID is the assigned name of the **AUDIO**MODULE.

Example:
Assuming the **AUDIO**MODULE is configured as follows:

-    the IP address is 192.168.1.226
-    the port of the Logitech Media Server is **9000** (standard)
-    and the name of the **AUDIO**MODULE is **livingroom**

Then the URL to the cover of the current audio track is:

http://192.168.1.226:9000/music/current/cover.jpg?player=livingroom

6.4   INTEGRATING MUSIC VIA NETWORK (UPNP)

The **AUDIO**MODULE can also access music from the network. This is done via UPnP. Shared music can be provided by a PC or NAS drive.

The following steps are necessary to access music over the network
(Here an example with a Synology Disk Station NAS drive):

1. Activate the UPnP function on the NAS drive.
   The figure below shows how the UPnP function on a Synology DiskStation will be activated (circled in red).
   A software package for this function is needed. In this example, the "Media Server from Synology" (green circle) will be used. You will find the Media Server under "Package Center" (yellow circled)
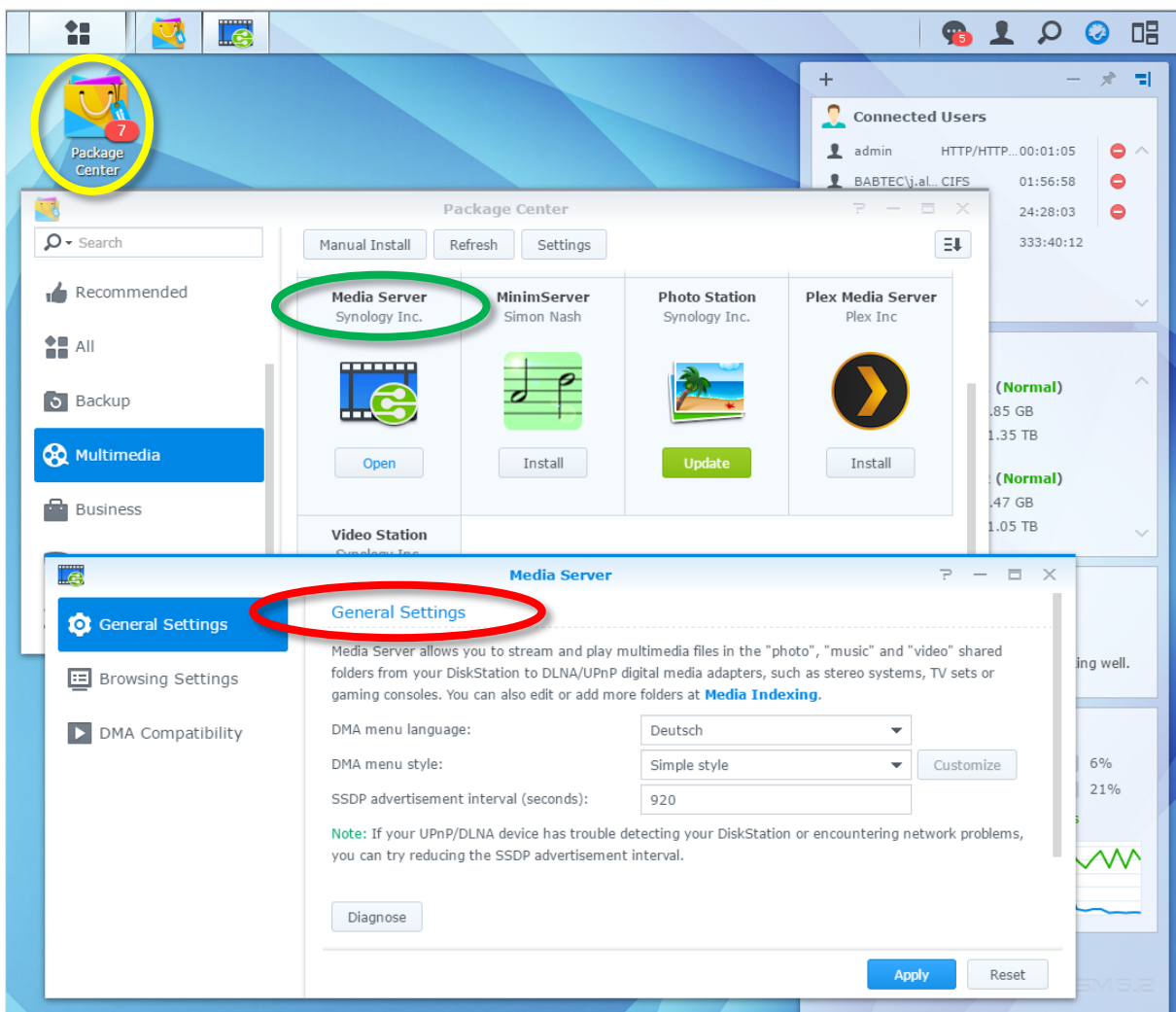
Figure 24 DiskStation Package Center – (UPnP) Media Server

2. Activate the UPnP function on the **AUDIO**MODULE.
   The "UPnP / DLNA" plugin is required to access music via UPnP. Activate the plugin under the tab "Plugins" (orange arrow).

Figure 25 Logitech Media Server configuration – activate UPnP plugin

3. Enable the UPnP client function on the **AUDIO**MODULE.
    If the UPnP plugin is activated, the UPnP client function must be also enabled as a last step. the
    The UPnP client can be enabled under the "advanced settings" in the category "Network"
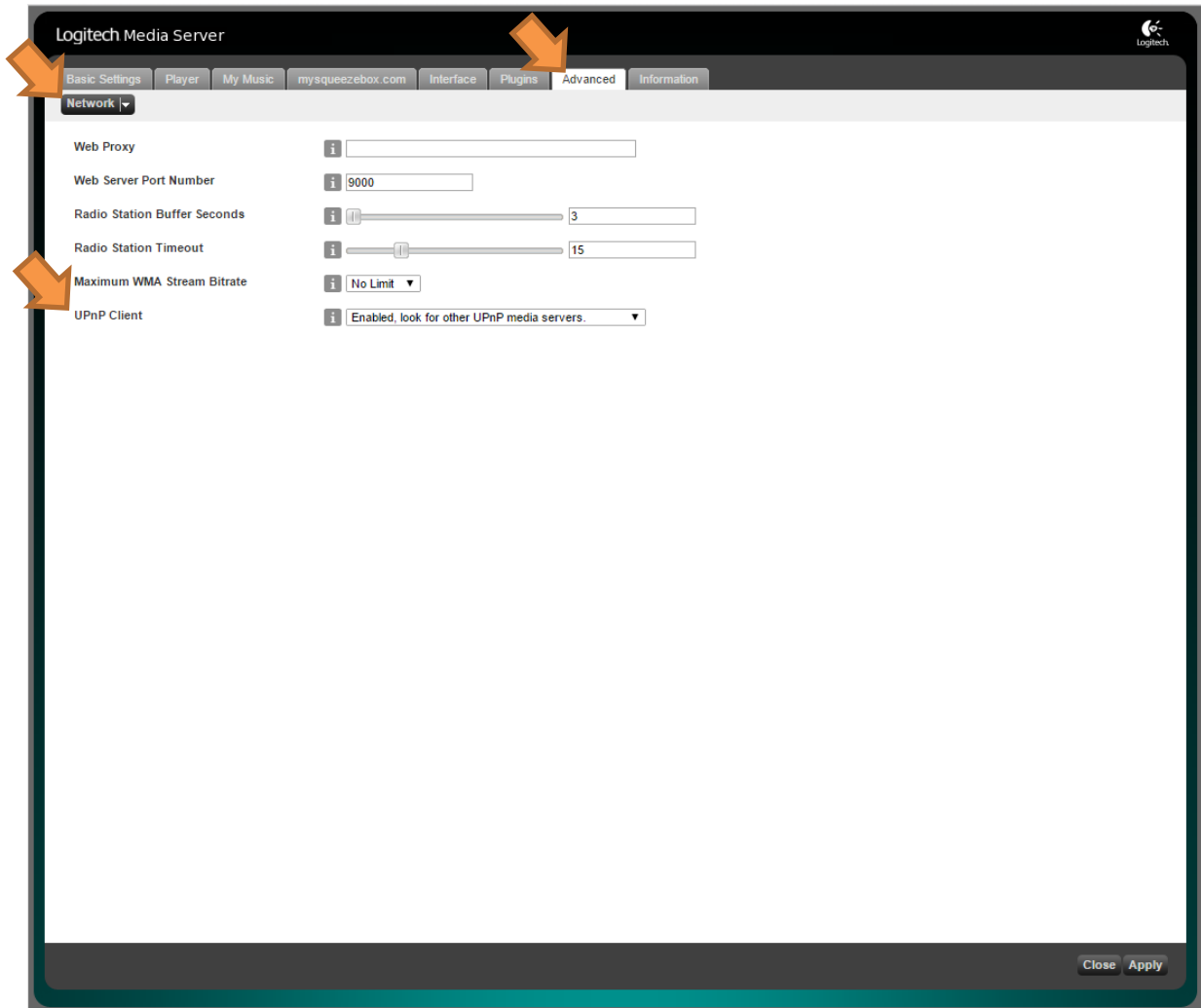   (orange arrows).

Figure 26 Logitech Media Server advanced configuration – enable UPnP Client

After the **AUDIO**MODULE has been rebooted, a new entry with the name of the computer (in this example, the name of the DiskStation will be shown) will appear in the "My Music" folder. This entry provides the UPnP shared music (orange arrow), sorted by album, artist, genre, …
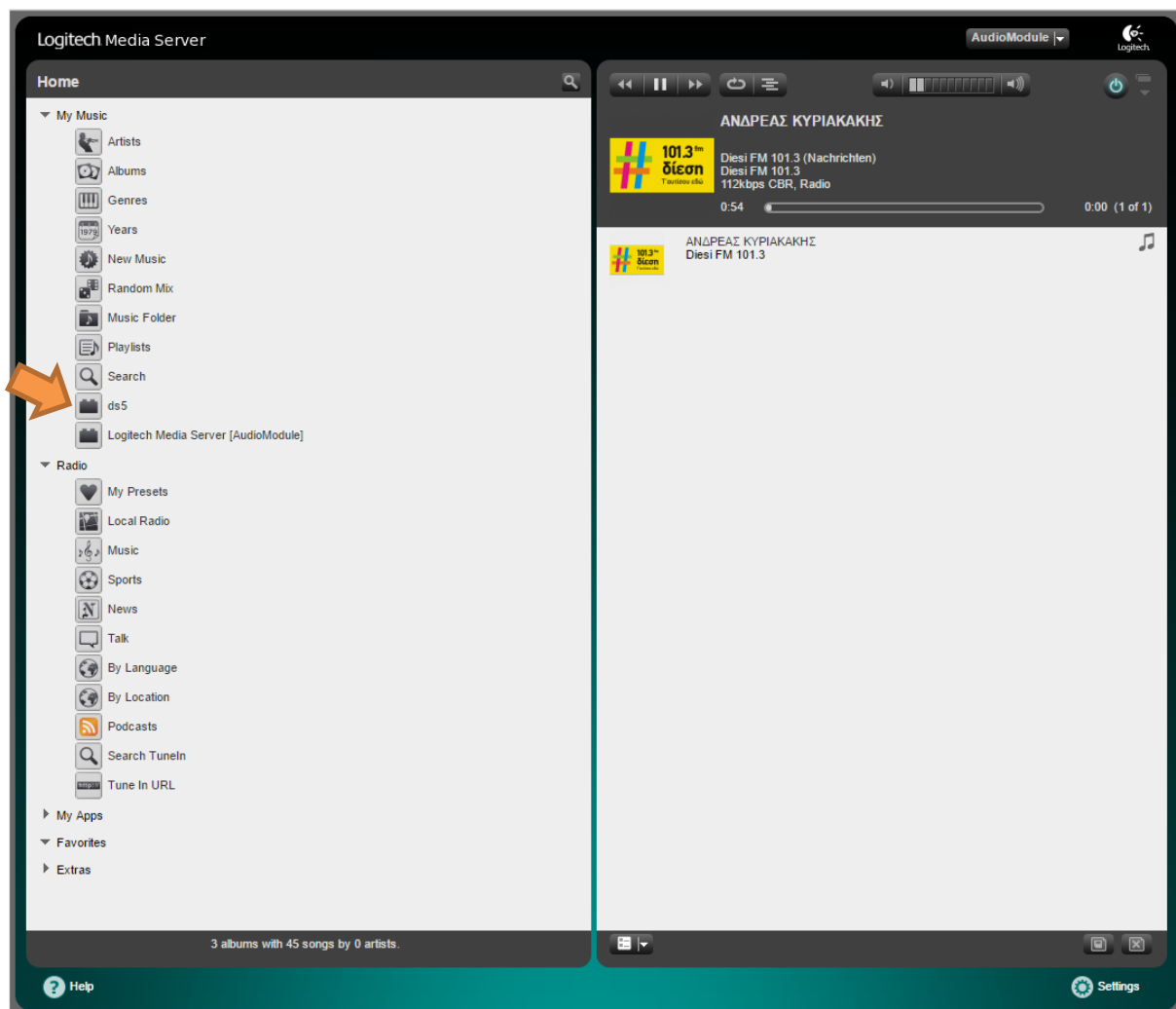

Figure 27 UPnP music content under "My Music"

6.5   SET UP SPOTIFY

If you want to listen to music from your Spotify account on your **AUDIO**MODULE, you have to perform additional setup steps in the Logitech Media Server. Please proceed as follows:
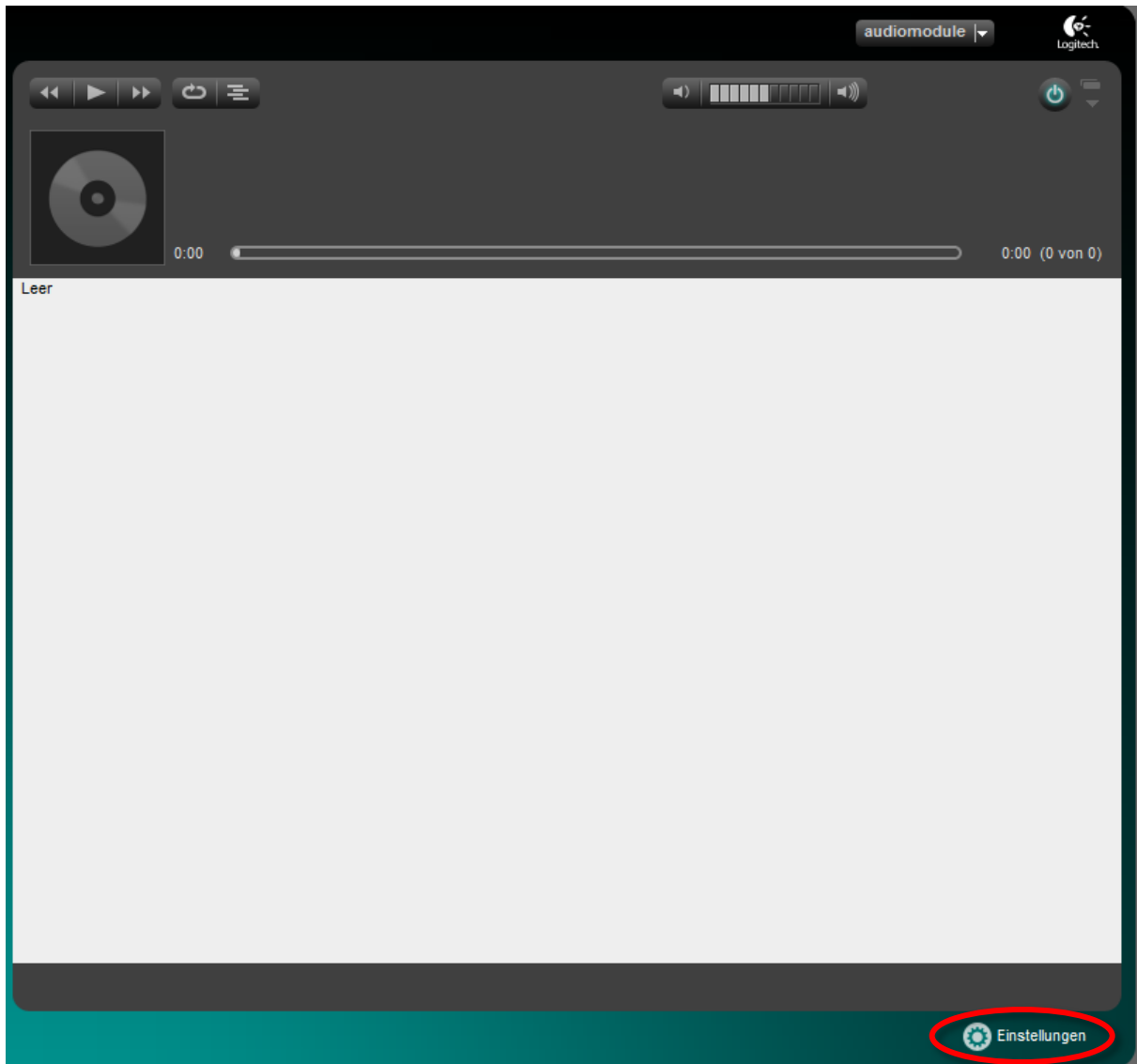
1.   Click on Settings (Figure 28 red circle).

Figure 28 Logitech Media Server Player main menu (right side)

2. Now go to the tab "Plugins" (Figure 29 " yellow circle) in the LMS settings.
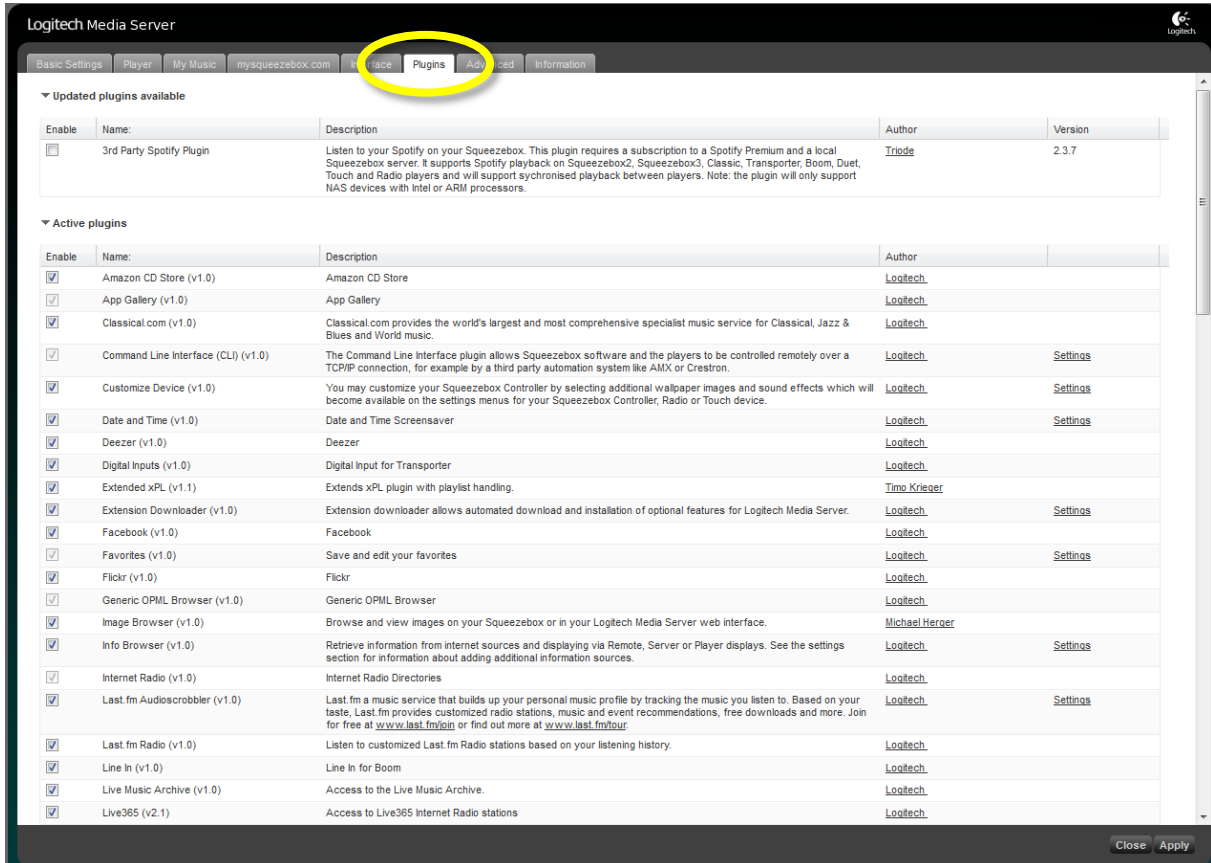

Figure 29 Configuration menu tab "Plugins"

3. Now, enable the Spotify plugins (V2.3.6) and (v1.2). After the plugins have been activated, it is necessary to restart the **AUDIO**MODULE.
   After the restart, click on "Settings" (Figure 30 circled in red) to adjust the Spotify settings.
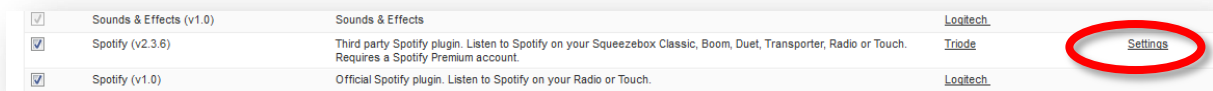

Figure 30 Enter Spotify Plugin configuration

4. Now you have to enter your Spotify username and password (Figure 31).
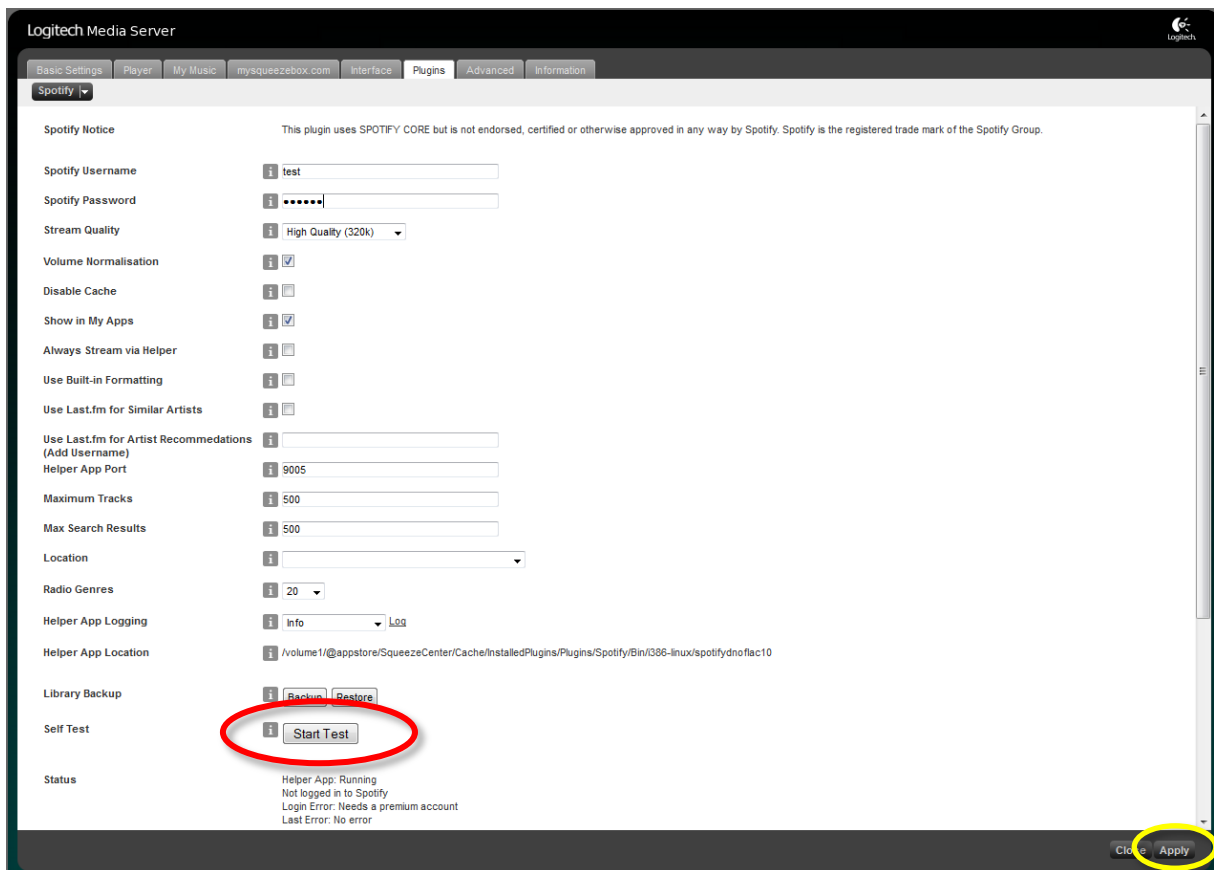
Figure 31 Spotify Settings

You can change further settings as needed, and also start a test, to check whether the login credentials are valid (red circle Figure 31).

Finally, click the Apply button in the bottom right corner (yellow circle Figure 31).

6.6   ADDITIONALLY, EDIT OR DELETE USERS

In order to edit the user or add new users, you must click on "User Administration" under the menu option "Configuration".
In User Administration you can then ADD, EDIT or DELETE USERS. (Orange circle)
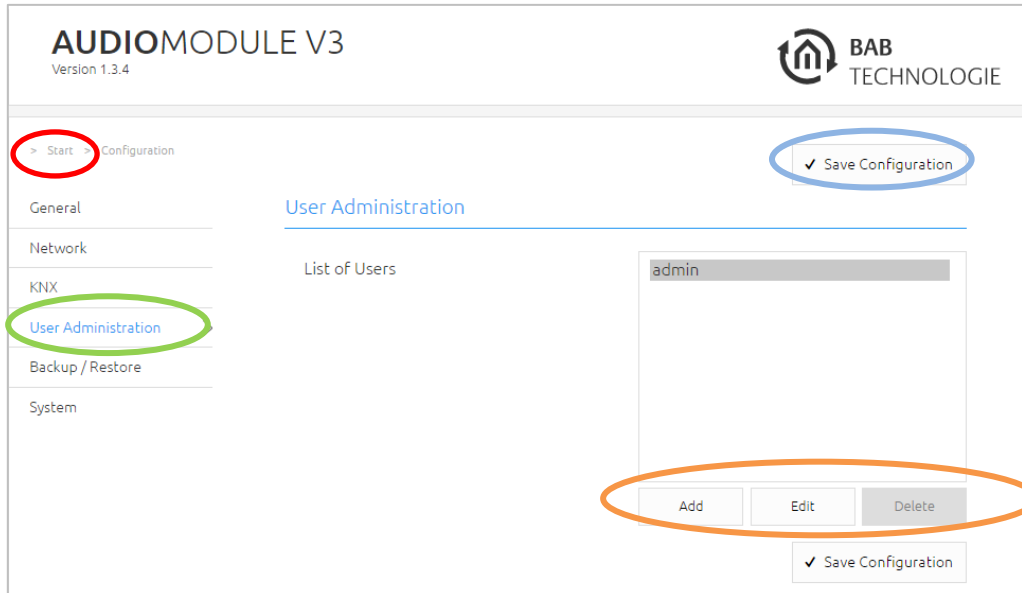
Figure 32 User administration

6.7   SAVE CONFIGURATION

As soon as <u>any</u> "Configuration" has been performed, such as IP address or Device Name, and these have been saved, you must click the "Save Configuration" field/button. (Blue circle)

6.8   EXITING THE CONFIGURATION MENU

To leave the configuration menu and return to the main menu, click on the header (green circled Figure 33) or use the "back-button" of the web browser (orange circled Figure 33).

6.9   LOGGING OUT

To log out from the Web interface, click on the "Log Out" button (blue circled Figure 33).

Figure 33 Header of the web interface

6.10   INFORMATION

Here you will find all the information you require on your **AUDIO**MODULE. Please retain this information in case you need to call for support.
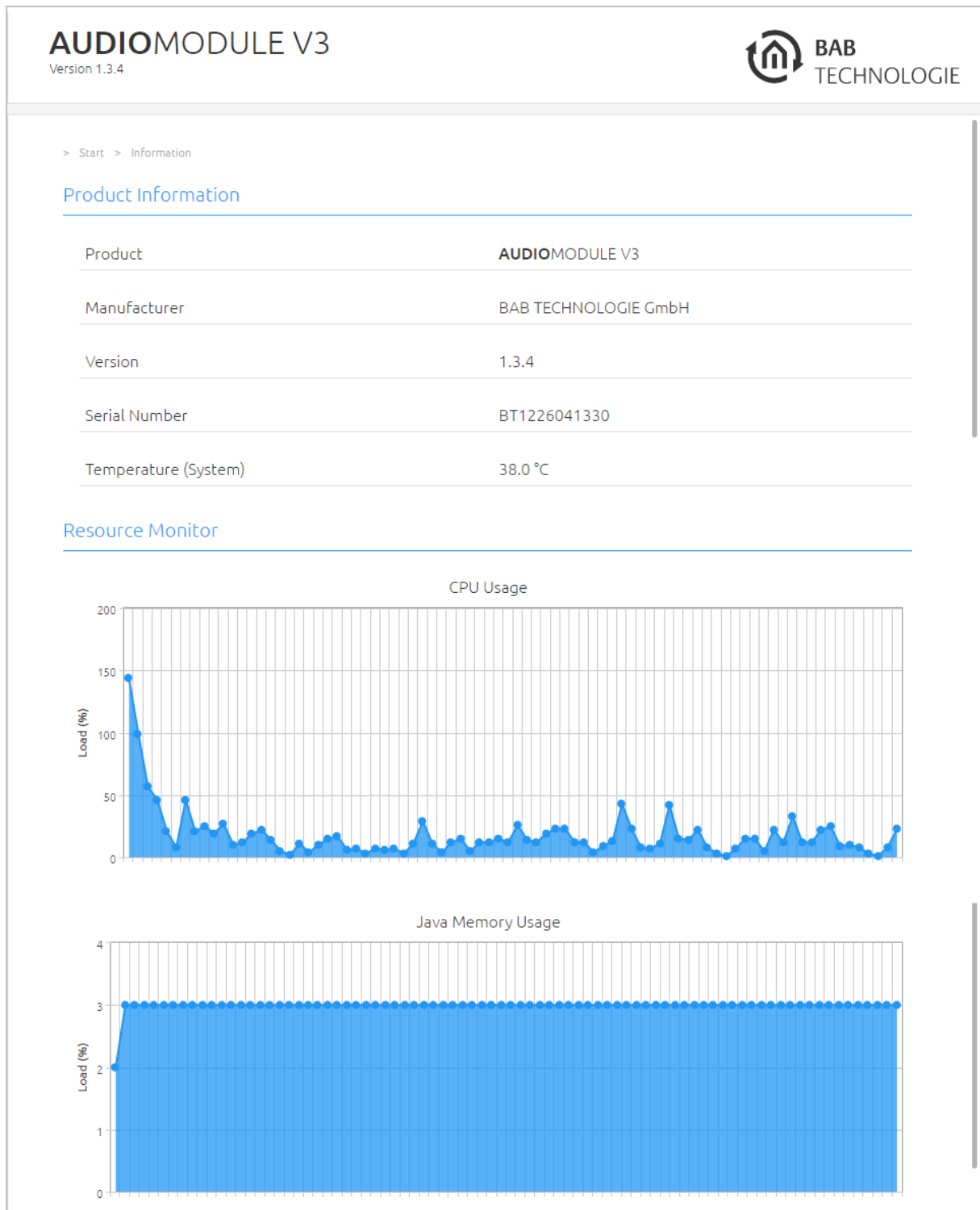
Figure 34 Information about the AUDIO MODULE

7   FIRMWARE UPDATE
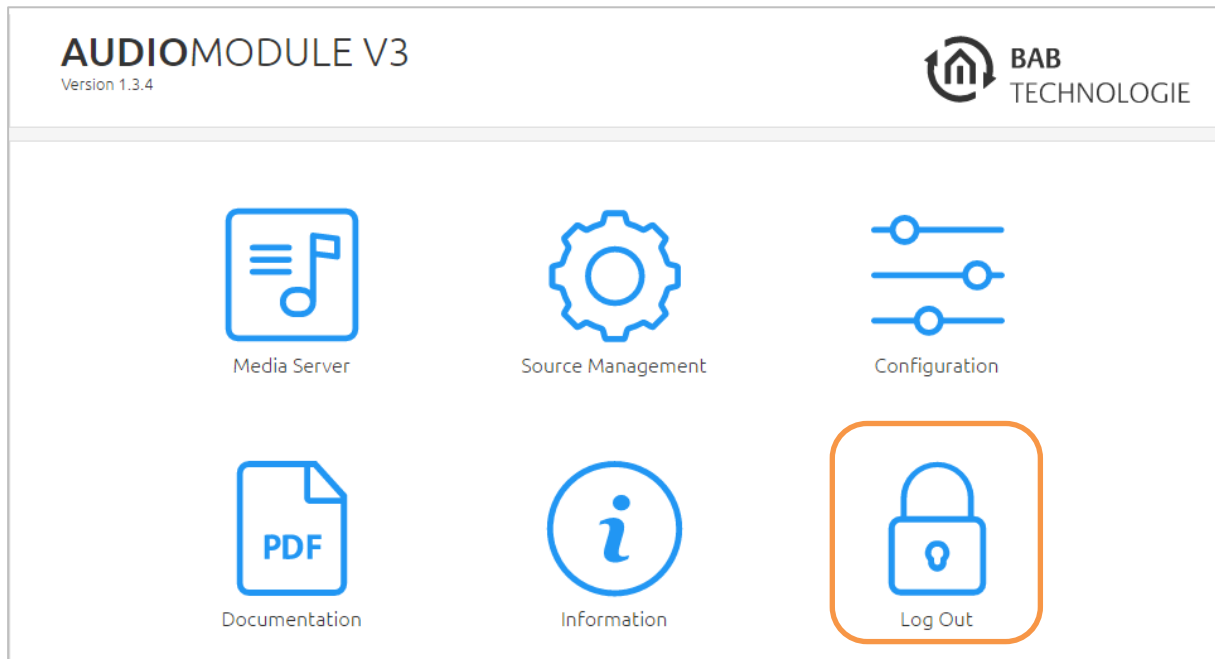
All **AUDIO**MODULE firmware versions 1.3.0 and above can be updated.
The firmware update is free of charge. You will find the latest firmware files on the BAB Homepage.
Download the latest firmware for the **AUDIO**MODULE as follows:

http://www.bab-tec.de/index.php/download_en.html

1. Under "Configuration" – "System", select **AUDIO**MODULE
2. Now, in the "Firmware Update" window click "Browse" to select the downloaded firmware file on your hard disk.
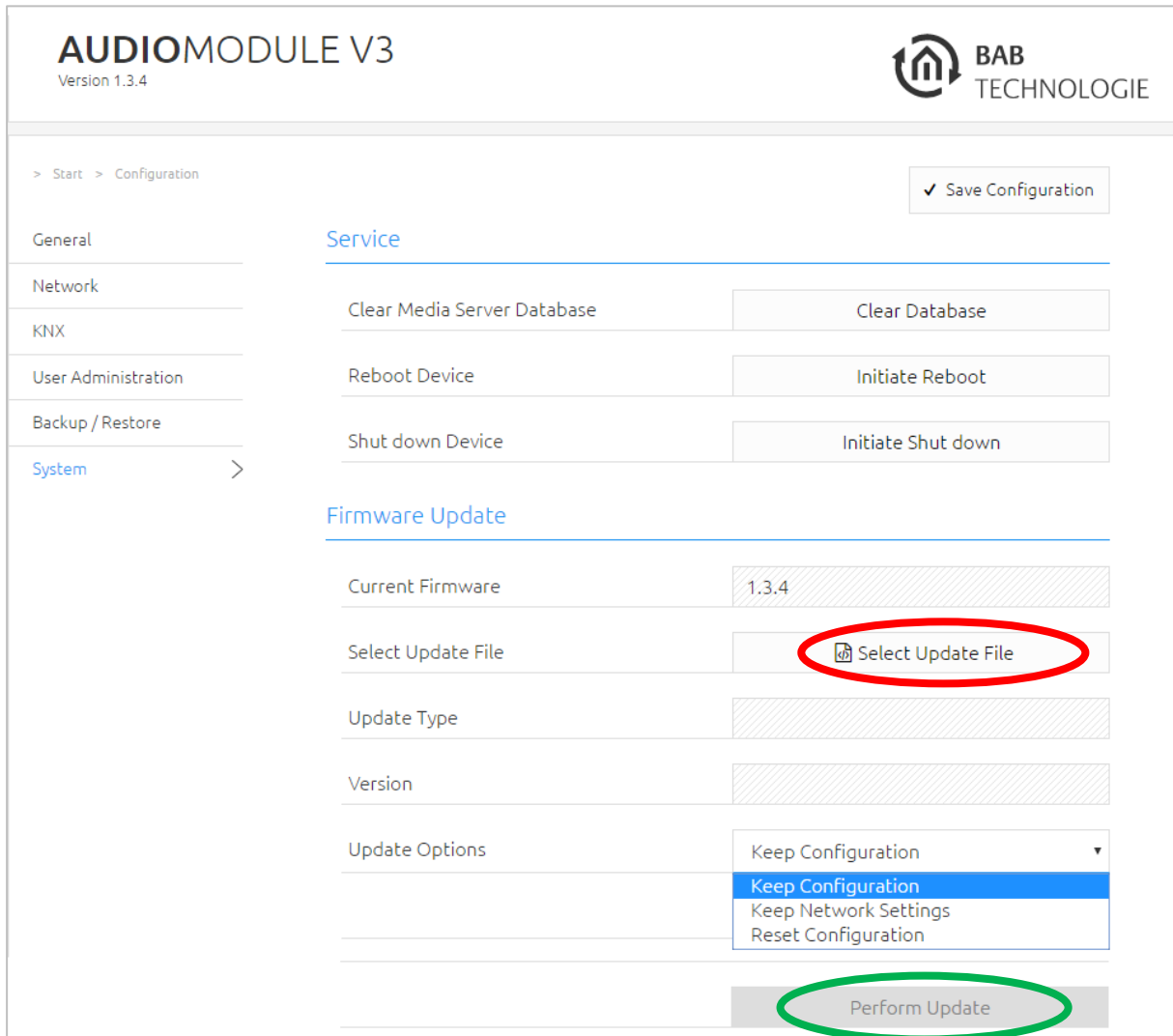
Figure 35 Firmware update menu

3. Leave the "Keep Network Settings" box checked if the **AUDIO**MODULE is to retain its IP address setting after the update. Alternatively, you can select the option "Keep configuration" or "Reset configuration".

NOTE: In any case, please make a backup for secure.
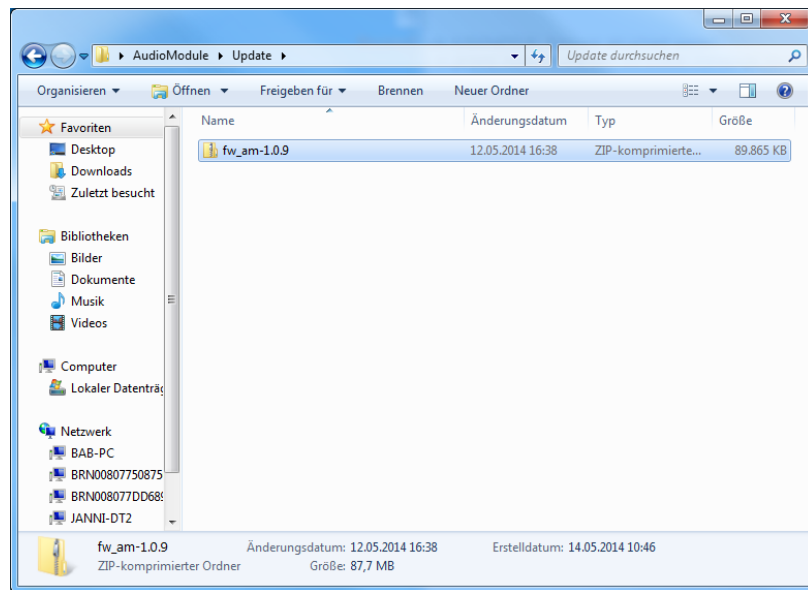
Figure 36 Firmware update file selection

4. Click on "Perform Update"

8 LOGITECH MEDIA SERVER

The Logitech Media Server (LMS) offers you easy and uncomplicated operation. You can save your audio files centrally on a single server and access them with every **AUDIO**MODULE.
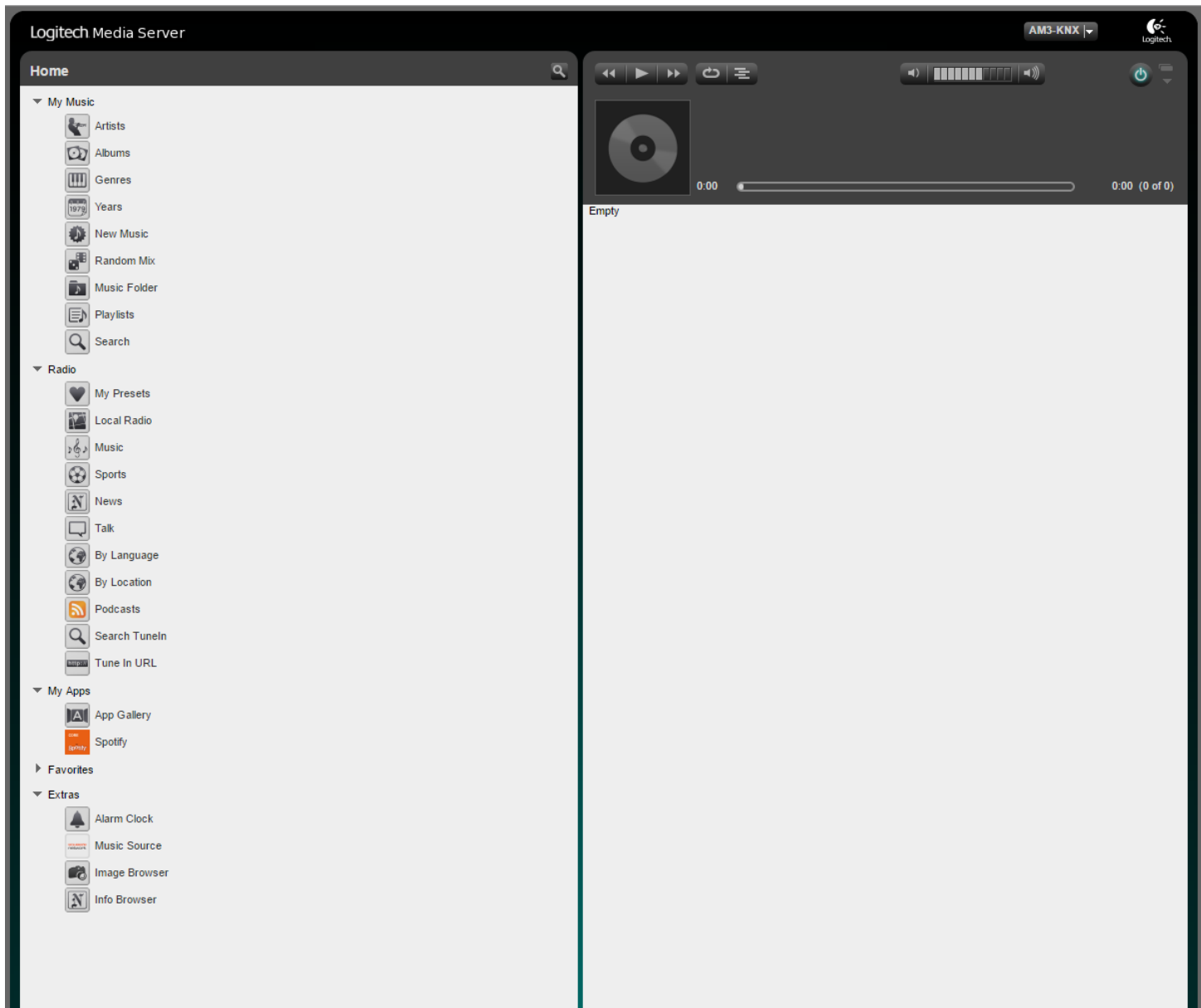
Figure 37 Logitech Media Server Webinterface

The audio files are managed centrally here by the LMS.
In the main menu you can perform a series of settings as shown in Fig. 46. Not only playlists can be created, but also extras such as setting alarms, or naming favourites.

Further information on the Logitech Media Server can be found at:
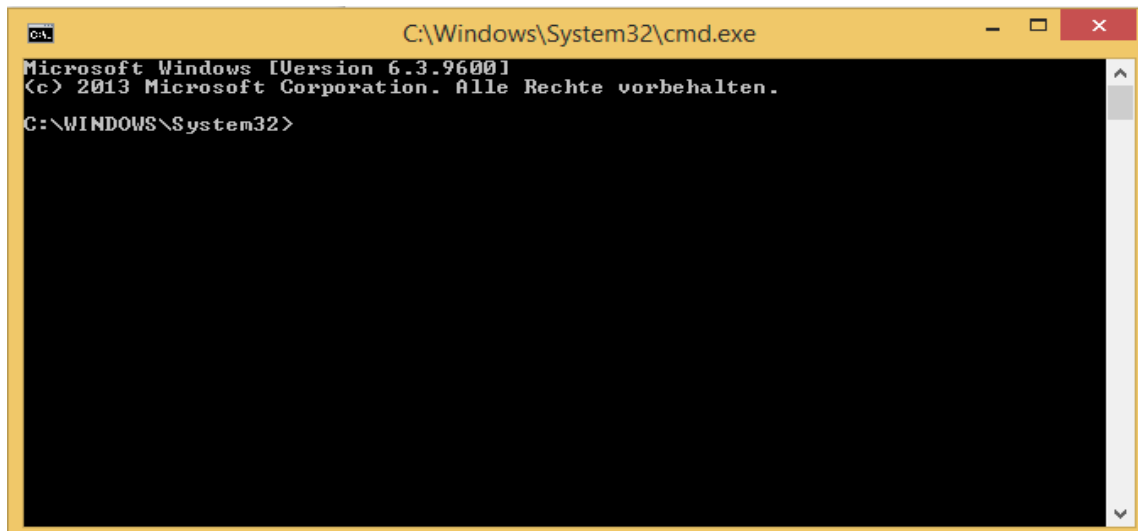
http://wiki.slimdevices.com/index.php/Main_Page

9   TROUBLESHOOTING

If the **AUDIO**MODULE does not connect itself, you can check the two IP addresses in the console (manually or using the Discovery Tool, Fig. 12).

To check now whether your computer and your **AUDIO**MODULE are in the same IP circle, click on the Start button and enter "cmd" in the search field.

A console window now appears:

Figure 38 CMD

To check which IP address your **AUDIO**MODULE has, enter "ping audiomodule.local".

And to check the IP address of your computer, enter "ipconfig".

10   APPENDIX

10.1   SUPPORTED MEDIAFORMATS

Der Logitech Media Server is a DLNA-/UPnP-Media server for Audio. It supports the audio formats:

- MP3
  (MPEG Audio Layer III; file extension: .mp3),
- FLACC
  (Free Lossless Audio Codec; file extension: .flac),
- WAV
  (Windows Media Audio; file extension: .wma),
- AIFF
  (Audio Interchange File Format; file extension: .aiff),
- WMA / WMA PRO
  (Windows Media Audio; file extension: .wma),
- Ogg Vorbis
  (Vorbis; file extension: .ogg),
- HE-AACv2
  (High Efficiency - Advanced Audio Coding;   file extension: .aac, .3gp, .mp4, .m4a, .m4p),
- Apple Lossless
  (Apple Lossless Audio Codec (ALAC);   file extension.m4a, .mp4)

MP3, WAV, WMA, WMA PRO and FLAC audio files has been checked in different quality grades:

MP3 (nach Sample Rate sortiert)

BITRATE		SAMPLE RATE	BITRATE		SAMPLE RATE
60kB/s	CBR	8.0 kHz	128kB/s	CBR	44.1 kHz
			158kB/s	VBR	44.1 kHz
59kB/s	CBR	11.025 kHz	148kB/s	VBR	44.1 kHz
			192kB/s	CBR	44.1 kHz
59kB/s	CBR	12.0 kHz	192kB/s	CBR	44.1 kHz
			192kB/s	CBR	44.1 kHz
123kB/s	CBR	16.0 kHz	192kB/s	CBR	44.1 kHz
			256kB/s	CBR	44.1 kHz
120kB/s	CBR	22.05 kHz	256kB/s	CBR	44.1 kHz
			279kB/s	VBR	44.1 kHz
118kB/s	CBR	24.0 kHz	281kB/s	VBR	44.1 kHz
			320kB/s	CBR	44.1 kHz
			320kB/s	CBR	44.1 kHz
96kB/s	CBR	32.0 kHz	320kB/s	CBR	44.1 kHz
96kB/s	VBR	32.0 kHz	320kB/s	CBR	44.1 kHz
96kB/s	CBR	32.0 kHz	320kB/s	CBR	44.1 kHz
104kB/s	VBR	32.0 kHz	320kB/s	CBR	44.1 kHz
118kB/s	CBR	32.0 kHz	320kB/s	VBR	44.1 kHz
320kB/s	VBR	32.0 kHz			
			125kB/s	CBR	48.0 kHz
			320kB/s	VBR	48.0 kHz

FLAC

BITRATE		SAMPLE RATE	SAMPLE SIZE
389kB/s	VBR	44.1 kHz	16 Bit
491kB/s	VBR	44.1 kHz	16 Bit
480kB/s	VBR	44.1 kHz	16 Bit
2178kB/s	VBR	96.0 kHz	24 Bit
2605kB/s	VBR	96.0 kHz	24 Bit
2255kB/s	VBR	96.0 kHz	24 Bit
4477kB/s	VBR	192.0 kHz	24 Bit
5547kB/s	VBR	192.0 kHz	24 Bit
4680kB/s	VBR	192.0 kHz	24 Bit

WAV

BITRATE		SAMPLE RATE	SAMPLE SIZE
1411kB/s	CBR	44.1 kHz	16 Bit

WMA

BITRATE		SAMPLE RATE	SAMPLE SIZE
64kB/s	CBR	44.1 kHz	16 Bit
80kB/s	CBR	44.1 kHz	16 Bit
96kB/s	CBR	44.1 kHz	16 Bit
128kB/s	CBR	44.1 kHz	16 Bit
160kB/s	CBR	44.1 kHz	16 Bit
192kb/s (215kB/S)	VBR	44.1 kHz	16 Bit

WMA PRO

BITRATE		SAMPLE RATE	SAMPLE SIZE
128kB/s (151kB/s)	VBR	44.1 kHz	24 Bit
192kb/s (213kB/s)	VBR	44.1 kHz	24 Bit
256kb/s (269kB/s)	VBR	44.1 kHz	24 Bit

10.2   SAMPLE RATE:

Sampling Frequency	System Clock Frequ					
	$64\,f_S$	$128\,f_S$	$192\,f_S$	$256\,f_S$	$384\,f_S$	$512\,f_S$
8 kHz	$-^{(1)}$	$1.0240^{(2)}$	$1.5360^{(2)}$	2.0480	3.0720	4.0960
16 kHz	$-^{(1)}$	$2.0480^{(2)}$	$3.0720^{(2)}$	4.0960	6.1440	8.1920
32 kHz	$-^{(1)}$	$4.0960^{(2)}$	$6.1440^{(2)}$	8.1920	12.2880	16.3840
44.1 kHz	$-^{(1)}$	$5.6488^{(2)}$	$8.4672^{(2)}$	11.2896	16.9344	22.5792
48 kHz	$-^{(1)}$	$6.1440^{(2)}$	$9.2160^{(2)}$	12.2880	18.4320	24.5760
88.2 kHz	$-^{(1)}$	$11.2896^{(2)}$	16.9344	22.5792	33.8688	45.1584
96 kHz	$-^{(1)}$	$12.2880^{(2)}$	18.4320	24.5760	36.8640	49.1520
176.4 kHz	$-^{(1)}$	22.5792	33.8688	45.1584	$-^{(1)}$	$-^{(1)}$
192 kHz	$-^{(1)}$	24.5760	36.8640	49.1520	$-^{(1)}$	$-^{(1)}$
384 kHz	24.5760	49.1520	$-^{(1)}$	$-^{(1)}$	$-^{(1)}$	$-^{(1)}$

(1)   This system clock rate is not supported for the given sampling frequency.
(2)   This system clock rate is supported by PLL mode.

Figure 39 Samplerate