STATION
AUDIO CONTROL®

MANUAL

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Manual

The Station Audio Control (SAC) is specially designed for monitoring and surveillance of large loudspeaker systems, e.g. station yards, stadiums, public spaces etc. It can measure audio levels from line inputs and from amplifier outputs of (100-volt) amplifiers. Deviations from preset values are signalled and reported to e.g. a server via SNMP traps and stored in a log. Impedances of loudspeaker networks are also checked whether they are still within the permissible range. Up to 4 loudspeaker networks with their corresponding amplifier inputs and outputs can be connected. The range of impedance measurement is from 2 to 5000 ohms.

When installing the system, a so-called calibration of the loudspeaker network must be done. Here, the impedance of the mains is measured and stored as a reference value. Every time the mains is measured, there is a comparison with this reference value. If there is a deviation greater than the set tolerance, a notification is made.

An automatic measurement of the impedance of the connected loudspeaker grids can be done once a day at a pre-set time, preferably at night, as it is quieter then; noise affects the outcome of the measurement.

Impedance is measured with a tone of 1000Hz. Four measurements are taken in succession at 1-second intervals.
If two or more of the 4 values deviate 10% or more from the first measured value, the measurement is taken again from the beginning. The measurement is repeated a maximum of 3 times. If there is still too much deviation, a message is sent and the measurement is stopped.
If the value is much too high (open connection) or much too low (short circuit), the display will show the message "TOO HIGH" or "TOO LOW" after the measurement. On the web page, we see this with the values high or low.

A second check that must take place is whether the amplifier is still functioning properly. This is done in the following way:
The audio signal enters the line input via an XLR connector. The circuit detects whether audio is present. At the same time, audio should then also be present on the amplifier's output. If not, a notification is sent. Similarly, if the amplifier's output signal deviates from the set value, a notification is sent.
To log all notifications at the correct time, the internal clock of the SAC should be synchronised with preferably the time server on the network at start-up. This way, all devices run synchronously.
The internal clock of the SAC can run for several weeks without power supply.

The enclosure's display shows the status and audio levels of the four sources. There is also a menu where settings can be realised. Furthermore, it is possible to log in via a web browser to configure the system via some five html pages.
The basic software of the SAC is Linux. A disadvantage of this is that in case of sudden power failure, the latest status changes are not written away in the logs. To prevent this, a battery has been placed in the SAC to ensure that in case of a power failure, the software is closed cleanly and files are saved. The battery is of lithium type and has a lifespan of 8 to 10 years. If the battery voltage becomes too low, a notification will come via SNMP and in the log.
As there is no fan in the SAC, it is therefore otherwise maintenance-free.

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Operation on the device

The menu can be operated by means of a rotary knob on the right of the display. By turning it to the left or right, you can scroll through the menu. Confirm a made selection by pressing the button.
After starting up, the display shows the text shown below.

This screen remains visible until the system boots up. If this does not happen, the network connection has not been detected. It may be that the SAC is set to dhcp and the network connection does not support it. In that case, pressing the rotary button (about 1 second) can access the menu. Select the option here:
3: SET IP ADDRESS Now choose a fixed set address: 192.168.0.5
Leave the menu and wait for this ip address to be set in the SAC.
This is made known by the following text on the display:

Briefly pressing the button now takes us to the standard screen

When the knob is turned to the right, the meter becomes visible showing a scale in dBs. This shows the audio of the line input on the upper half and the output signal of the amplifier on the lower half, all for channel 1. Another turn to the right gives the meter for channel 2 and finally, after 4 turns to the right, the meter for channel 4.

The scale of the meter; -50 dB to +6dB. The top bars indicate the level of the broadcast signal. The bottom row of bars is the level of the amplifier's output.

As soon as a deviation is detected, this text appears on the display:

In the menu, messages can be read out. To access the menus, press and hold the front button for more than 1 second. A number of menus are now visible in which settings can be made, or status changes can be read out.

There are 12 menus

> 1: CALIBRATION SETTINGS
> 2: MEASURE IMPEDANCE
> 3: SET IP ADDRESS
> 4: DISPLAY SETTINGS
> 5: AUDIO INPUT LINK
> 6: CONNECTED SPEAKERS
> 7: PASSWORD SETTINGS
> 8: VIEW SETTINGS
> 9: FACTORY RESET
> 10: RESTART SYSTEM
> 11: EXIT MENU

In the event of a fault, 1 more menu is added: 0: WARNINGS
This menu shows any possible failures. Naturally, status changes are also reported via SNMP traps. Once all reported faults have been remedied, the relevant texts will automatically disappear again.

Using some menus, a number of settings and measurements can be made. This is in line with the settings in the web browser.

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Operation on the device

Calibration Impedance

This menu consists of 3 submenus:

1 Calibrate Impedance
2 Calibrate Line input
3 Calibrate Amp(lifier) output

1: Calibrate Impedance

Allows the impedances of the 4 connected speaker networks to be calibrated or calibrated.
can be calibrated. These values are stored and used as reference for the measurements.
All channels can be calibrated separately. A channel that has an open line in this calibration, i.e. a high impedance, is automatically marked as inactive ("Not in use").

2: Calibrate line input

The audio level of the 4 line inputs can be set in this menu.

3: Calibrate Amp input

Same as above but for the loudspeaker outputs of the amplifiers.

Measure Impedance

Here, the different loudspeaker networks can be measured. This is done manually and is done separately for each channel. A log is kept of these measurements. This makes it possible to check whether the channel still meets the right requirements.

Set IP-adres

A fixed IP address can be selected from this menu. This is 192.168.0.5 or a dhcp address can be chosen. In this case, a router with a dhcp function must be present in the network so that the SAC automatically gets an ip address in the range of the connected network.

Display Settings

The backlight contrast and brightness settings are changed here. The backlight has the property that if no activity has taken place for 3 minutes, it slowly goes out, extending its lifespan and keeping energy consumption low.

Audio input link

Linking or bridging the audio inputs can be set here. Input 1 with 2, input 2 with 3 and input 3 with 4. In this way, a maximum of all 4 inputs can be linked together.

Connected speakers

In this menu, the 4 speaker networks can be disconnected from the amplifier. This is done on all four outputs simultaneously. This makes it possible to avoid unnecessary nuisance during calibration of the amplifier outputs. With 100-volt speakers, it is not necessary to connect the respective mains during calibration.

Should one forget to reactivate the grids after calibration (in this same menu), this will happen automatically as soon as an announcement is made on one of the grids. When the loudspeakers are switched off, the display shows the text: MUTE

```
Status: MUTE          10:40
```

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The web pages

Password Settings

There is possibility of entering a password so that not everyone can access the menu. This password can consist of a minimum of 1 and a maximum of 8 digits. (the numbers 0 to 9)

This password is only there when logging in to the enclosure itself!

When selecting CREATE PASSWORD, the display shows the digits 1 to 0, capital letter A (Accept) and capital letter C (Cancel) and a cursor flashes on the first digit.

Use the rotary knob to move the cursor to the next digit.

Use the cursor to select the first digit of the intended security number (password) and press the rotary knob.

The digit now becomes visible to the right of the capital C. In this way, an access code of up to eight digits can be selected. If the choice is incorrect, select the C (CANCEL) to abort the setting and start again or press and hold the button for more than 1 sec.

If the selection is correct, it can be confirmed with the A (ACCEPT).

Deleting an access code can be done by choosing DELETE PASSWORD in the menu.

View Settings

This menu contains the most important settings of the SAC, including the IP address.

Factory reset

Return to the factory settings stored in the SAC.

Restart system

A soft reset can be performed here to restart the unit.

Exit menu

By briefly pressing the button at exit menu, the SAC jumps back to the main screen.
Another option to exit the menu is to press and hold the button for more than 1 second in each menu at the "Return" or "Exit" option.

The web pages

To control the SAC via a PC, it is possible to log in via a web browser (e.g. google chrome, Firefox etc.). To do this, enter the IP address of the SAC at the top of the web browser. This ip address can be found under 'View settings' in the menu of the SAC.

When logging in, the first thing to do will be to enter the password.
There are 3 different levels namely: Administrator, Technician and User
The Administrator has all rights, the Technician can change all settings except the 'Settings' page. The User only has read-only rights.
The passwords at start-up are:
Administrator: admin
Technician: tech
User: user

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The web pages

Status audio pagina

We are now at the first page of web browser.
This is the Status Audio page.

For each channel, there is an indicator meter for the audio level of the line input and the corresponding amplifier output. Also, the field behind each meter shows whether the corresponding source is calibrated.
As these audio levels can be different from one location to another, the meter must be adjusted to the input signal. The bar labeled "Auto Calibrate" causes the meter to automatically adjust to the input signal of the respective sources.
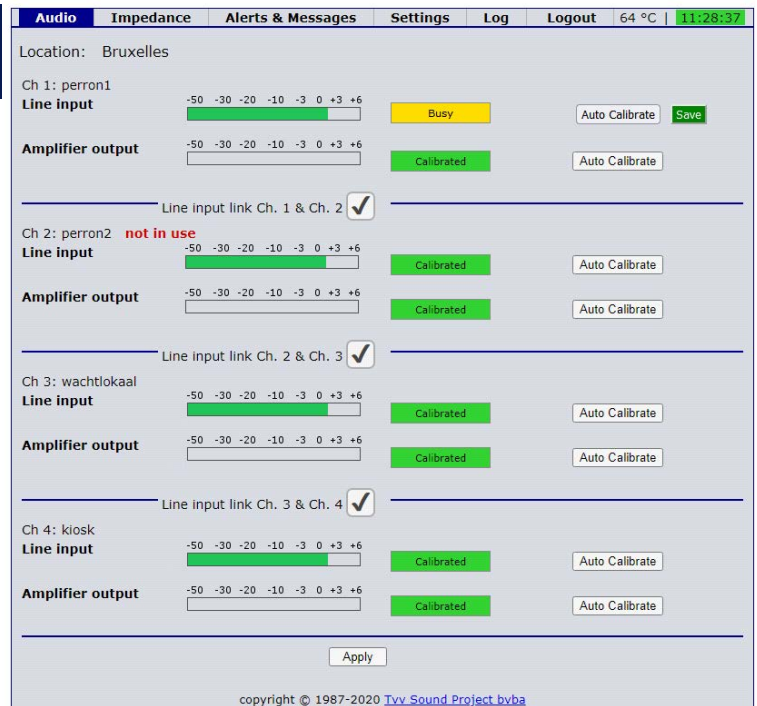
This can be done in two ways. The first way is a sinusoidal test tone of 1000Hz. The calibration should be done according to the level of the offered audio. If the audio level is maximum -10dBu, then the calibration will also have to be done with -10dBu, corresponding to a voltage of 245 mV.
(0dBu = 775 mV)
At commissioning, all line inputs are calibrated to this -10dBu by default.
The second way is using the audio level of the spoken texts. This way requires no additional equipment and does not cause a tone through the loudspeakers. To perform a calibration, the 'Auto Calibrate' button of the relevant channel is pressed.
The calibration is now started and, with a tone of 1000Hz, will be completed within a few seconds. With a spoken text, it will take between 20 and 30 seconds.
On completion of the calibration, a flashing Save button appears behind the Auto Calibrate button. If the calibration has been performed properly, it can be saved by clicking the "save" button. The indicator bar now turns green. The audio level now just passes 0 on the meter, as shown above for all line inputs.
If the button is not clicked, it disappears after 15 seconds and the setting is not saved.
If a time zone is active, e.g. at weekends or in the evening, pay attention when measuring with a tone. To calibrate the input to -10dBu, first subtract the value of the time zone currently in effect from the corresponding -10dBu.

Example: Therefore, if the time zone is currently -10dB, calibration will have to be done at -20dBu. NOTE: this only applies when using a 1000Hz tone coming from an external source.

Channel 2 displays "not in use"; this channel is not in use
The output volume of the amplifiers is likely to have a different value on each connection, and so will always need to be calibrated. Calibration is important though, because otherwise the messages will not be correct. With proper calibration of both inputs, there should be a reading on the meters averaging between -10 and +3 dB during a broadcast.
Last on this page is the possibility of linking inputs. This makes it possible to link the same input signal to several amplifier inputs. There are 3 possible pairings: input 1 and 2, input 2 and 3 and input 3 and 4.
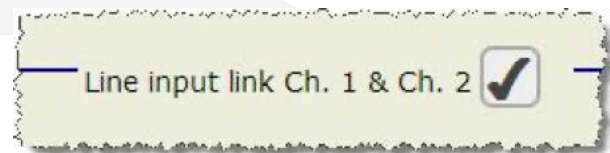
Here, channel 1 and 2 are paired with each other

Ticking the relevant box activates the link. The audio is also jumpered, as shown in the example. The status of this coupling is remembered because so-called latching relays are used; and will remain in this state even when the power is disconnected. To confirm the setting, click the "Apply" button.

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The web pages

Status Impedance pagina

| Audio | Impedance | Alerts & Messages | Settings | Log | Logout | 63 °C | 11:16:04 |

Location: Bruxelles

	Calibrated Impedance	Measured Impedance	Time	Status
Ch 1: perron1	264 Ω	266 Ω at	19:24	Correct
Ch 2: perron2	119 Ω	120 Ω at	19:26	Correct
Ch 3: wachtlokaal	1212 Ω	1213 Ω at	16:46	Correct
Ch 4: kiosk	2384 Ω	2175 Ω at	20:51	Correct

Calibrate Channel 1	Value 1 Ω	Measure Channel 1
Calibrate Channel 2	Value 2 Ω	Measure Channel 2
Calibrate Channel 3	Value 3 Ω	Measure Channel 3
Calibrate Channel 4	Value 4 Ω	Measure Channel 4
Save Calibration	Average Ω	Measure All

Scheduled measurement
Time: 00:30 ▾   Tolerance: 20 ▾ %
Apply

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Here is all the information about the impedance of the 4 speaker networks. The top half of the page shows the following information from left to right: Calibrated Impedance. Here are the values of the 4 speaker nets as measured when the network was commissioned. We call this the reference value. So these values serve as a reference in impedance measurements. A deviation of 10% or more of a measured impedance from this reference value will give a message.

Measured Impedance. These 4 columns show the values of the measured impedances and the time at which they were measured.

Status. These 4 buttons indicate the status of a measurement. As soon as they fall within the margin of tolerance, the corresponding button will be green, containing the text "Correct". If the measurement falls outside the tolerance value, a red button and the text "Out of Range" will give it. The exact values are displayed in the log.
If a measurement is in progress, the button of the corresponding channel will turn yellow containing the text "Busy".

In the middle part of the page are the buttons for the reference value (Calibrate Channel) and measuring impedances. On the left are the 4 buttons for outputting the reference value.
Pressing a button causes a reference measurement to start. The corresponding button then turns yellow to show which channel is active. Four measurements are taken at 1-second intervals. As ambient noise affects the measurement, because the speaker's cone then moves, there is a check for excessive differences between the 4 measurements.

Therefore, if there is too much deviation in the various measurements, the SAC will redo the measurement after a 30-second pause.
When a measurement is taken, the 4 values and the average value calculated from them will be visible in the 5 boxes on the "Status Impedance" web page. broadcasting is going on.
If a broadcast is taking place at the time of a measurement, this will be taken into account before the measurement starts. When the announcement is finished, the measurement starts. During the measurement of a channel, it will be finished when a broadcaster starts.
If several channels are measured (automatically) one after the other, it will be checked whether a call is in progress, before measuring the next channel.

For a reference measurement, the "Save Calibration" button should be pressed after completion to save the value. This value then appears in the "Calibrated Impedance" field behind the relevant channel.

Scheduled Measurement. Then finally, on the bottom half of the page, a time can be entered under "Scheduled measurement"; at this time, an automatic measurement is taken of all active channels. This measurement is done every day at the entered time.
N.B. The automatic measurement should preferably be done in the evening or at night, because then there is the least noise and therefore a measurement can be performed better.

Tolerance. At the bottom right of the page, the tolerance can be set in 10% increments (20 - 60%). The default value is 20%.
The tolerance determines how much an impedance measurement may deviate from the calibrated value of a channel. Suppose the calibrated value is 160 ohms and the tolerance is 30%.
Then the measured value may lie between 112 ohms and 208 ohms. Outside these values, a message is sent.

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The web pages

Alerts and Messages

| Audio | Impedance | Alerts & Messages | Settings | Log | Logout | 58 °C | 15:46:53 |

GENERAL	SNMP OID	VALUE
MAC	enterprises.55541.1.8.1.0	02:42:7D:4A:1A:B9
Firmware version	enterprises.55541.1.8.2.0	2.50
Node Name	enterprises.55541.1.8.3.0	Bruxelles
IP-address	enterprises.55541.1.8.4.0	192.168.2.7
Start of night	enterprises.55541.1.8.5.0	21:30
Stop of night	enterprises.55541.1.8.6.0	07:00

CHANNEL 1	SNMP OID	PRESENT VALUE
Current Line Input level	enterprises.55541.1.1.1.0	60
Current Amplifier Output level	enterprises.55541.1.1.2.0	69
Line Input level calibrated	enterprises.55541.1.1.3.0	Yes
Amplifier Output level calibrated	enterprises.55541.1.1.4.0	Yes
Calibrated loudspeaker impedance	enterprises.55541.1.1.5.0	264
Periodic measured impedance	enterprises.55541.1.1.6.0	266
Measured impedance out of range	enterprises.55541.1.1.7.0	No
Line Input level out of range	enterprises.55541.1.1.8.0	No
Line Input level missing	enterprises.55541.1.1.9.0	No
Silence detected on amplifier output	enterprises.55541.1.1.10.0	No

CHANNEL 2	SNMP OID	PRESENT VALUE
Current Line Input level	enterprises.55541.1.2.1.0	50
Current Amplifier Output level	enterprises.55541.1.2.2.0	50
Line Input level calibrated	enterprises.55541.1.2.3.0	Yes
Amplifier Output level calibrated	enterprises.55541.1.2.4.0	Yes
Calibrated loudspeaker impedance	enterprises.55541.1.2.5.0	119
Periodic measured impedance	enterprises.55541.1.2.6.0	120
Measured impedance out of range	enterprises.55541.1.2.7.0	No
Line Input level out of range	enterprises.55541.1.2.8.0	No
Line Input level missing	enterprises.55541.1.2.9.0	No
Silence detected on amplifier output	enterprises.55541.1.2.10.0	No

CHANNEL 3	SNMP OID	PRESENT VALUE
Current Line Input level	enterprises.55541.1.3.1.0	54
Current Amplifier Output level	enterprises.55541.1.3.2.0	50
Line Input level calibrated	enterprises.55541.1.3.3.0	Yes
Amplifier Output level calibrated	enterprises.55541.1.3.4.0	Yes
Calibrated loudspeaker impedance	enterprises.55541.1.3.5.0	1212
Periodic measured impedance	enterprises.55541.1.3.6.0	1213
Measured impedance out of range	enterprises.55541.1.3.7.0	No
Line Input level out of range	enterprises.55541.1.3.8.0	No
Line Input level missing	enterprises.55541.1.3.9.0	No
Silence detected on amplifier output	enterprises.55541.1.3.10.0	No

CHANNEL 4	SNMP OID	PRESENT VALUE
Current Line Input level	enterprises.55541.1.4.1.0	54
Current Amplifier Output level	enterprises.55541.1.4.2.0	50
Line Input level calibrated	enterprises.55541.1.4.3.0	Yes
Amplifier Output level calibrated	enterprises.55541.1.4.4.0	Yes
Calibrated loudspeaker impedance	enterprises.55541.1.4.5.0	2384
Periodic measured impedance	enterprises.55541.1.4.6.0	2175
Measured impedance out of range	enterprises.55541.1.4.7.0	No
Line Input level out of range	enterprises.55541.1.4.8.0	No
Line Input level missing	enterprises.55541.1.4.9.0	No
Silence detected on amplifier output	enterprises.55541.1.4.10.0	No

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Settings

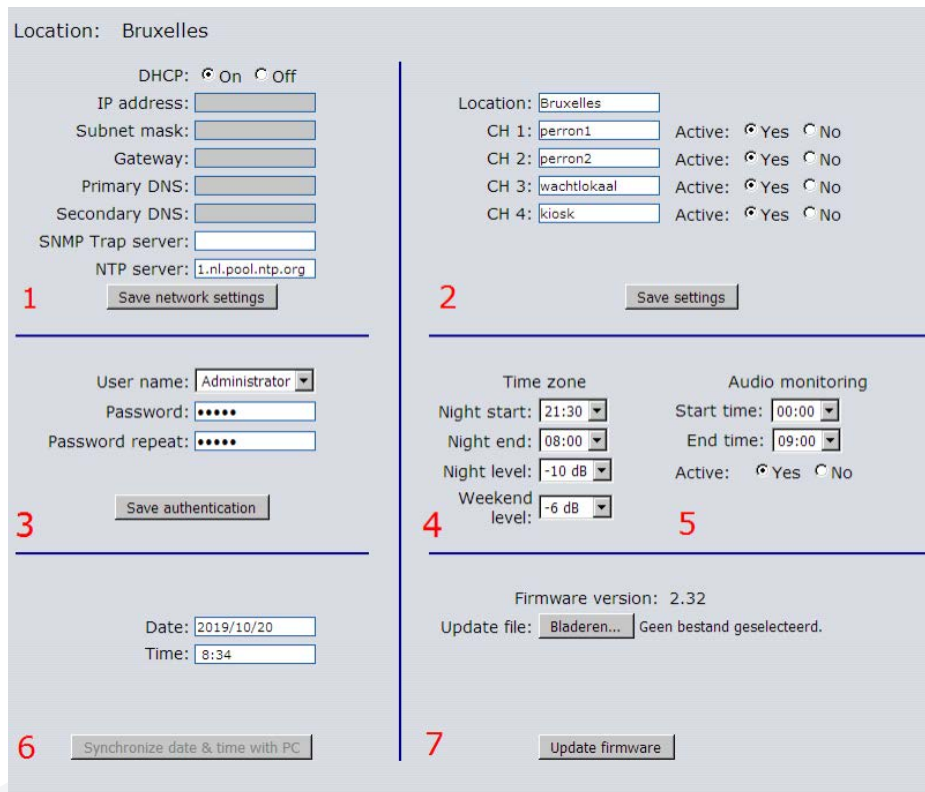A number of settings can be adjusted on this page.

Top left 1:
For the ip address, the SNMP trap server and the NTP server. The latter ensures that the time in the SAC is synchronised with a time server on the internet. There are several options for this. In our example this is: 1.nl.pool.ntp.org
N.B. Changing the ntp server data can also be done via an SNMP command. In this case, the machine will have to be rebooted with a reset command in order to make the change.

Top right 2:
The node name (location) and whether a channel is active or inactive. The latter values are also changed if during a calibration of an impedance the values are all "HIGH", i.e. an open line. The channel then becomes inactive.

Left middle 3:
The user names for the 3 levels with which users can login.

Middle 4:
The time zones; the settings for the time zones are over-ridden by the values sent from the central server.

Right middle 5:
The setting of whether there has been a broadcaster within a certain period of time

Bottom left 6:
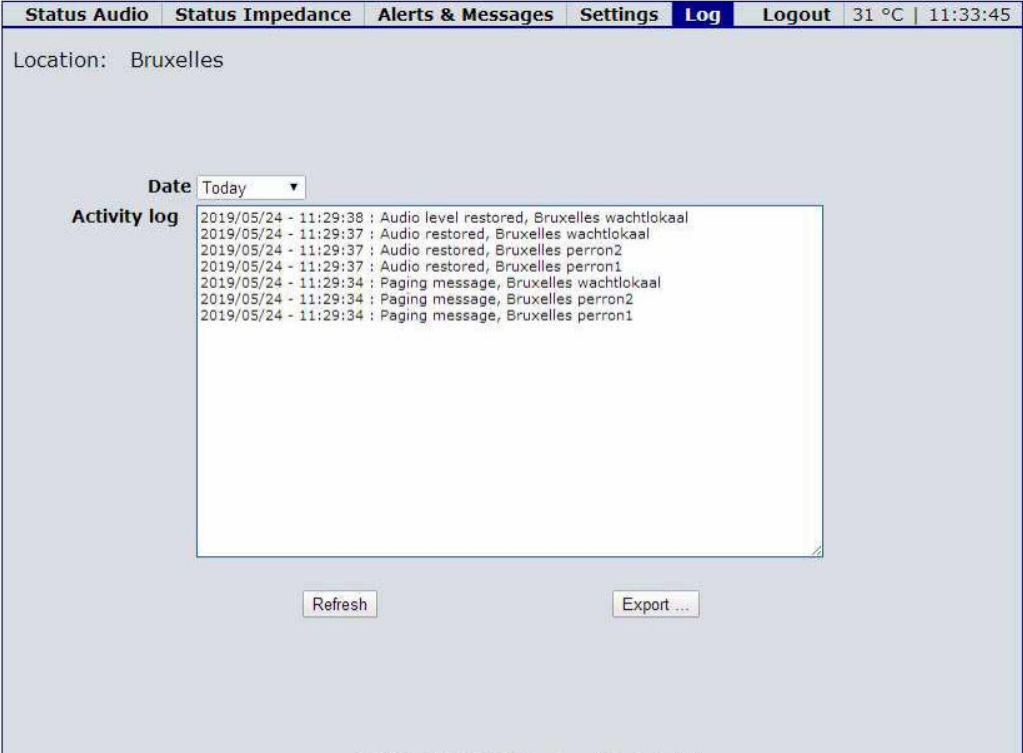The ability to synchronise a the time and date with a PC.

Right bottom 7:
Finally, a software update for the relevant SAC can be realised here. If the time has to be synchronised with the internet, a path is filled in at NTP server as in our example. If the time is to be synchronised with that of the PC, the field for Ntp server is left blank and then click on "save network settings". The text "none" now appears in the box.
The SAC now restarts with these new settings and then it is possible to synchronise the SAC with the time of the PC. To do this, click on the bar "Synchronize date & time with PC".

The settings on this page can only be done by the administrator.

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LOGS

All messages and status changes are recorded in a log. This log can also be exported and all these messages are also sent to the central server via SNMP traps.

| Status Audio | Status Impedance | Alerts & Messages | Settings | **Log** | Logout | 31 °C | 11:33:45 |

Location: Bruxelles

Date [Today ▾]

Activity log
```
2019/05/24 - 11:29:38 : Audio level restored, Bruxelles wachtlokaal
2019/05/24 - 11:29:37 : Audio restored, Bruxelles wachtlokaal
2019/05/24 - 11:29:37 : Audio restored, Bruxelles perron2
2019/05/24 - 11:29:37 : Audio restored, Bruxelles perron1
2019/05/24 - 11:29:34 : Paging message, Bruxelles wachtlokaal
2019/05/24 - 11:29:34 : Paging message, Bruxelles perron2
2019/05/24 - 11:29:34 : Paging message, Bruxelles perron1
```

[Refresh]   [Export …]

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Monitoring and control via SNMP

To monitor the SAC, the SNMP V2C protocol is supported. This allows the status of the SAC to be queried from a monitor programme, such as e.g. Zabbix or PRTG. In this monitor programme, the supplied MIB file is then first imported.

There are also SNMP traps in the system that allow any status change to be reported to a server. To receive the SNMP traps, the IP address (or domain name) of the trap server must be entered, in block 1 of the Settings page (see page 10).

Firmware update

A firmware update can be performed via the web interface, as described on page 10. For updating an individual device, this is the simplest option, as it requires no preparation or configuration.

For updating a (large) group of devices, the alternative is to give each device in that group the command to start a firmware update. You issue this command via SNMP. The relevant variable (as defined in the MIB file) is "firmware update". This is a numeric variable which normally reads as 0; if you set it to 1, the SAC will start an update.

The SAC retrieves the update file from an FTP server. The update file must have the name "sac_latest.tvv" and be in the (virtual) root of the FTP server. Also, the IP address and login details for the FTP connection must be configured in the SAC. Both are configurable with SNMP.

You can set the IP address and possibly the port with the SNMP variable "update server". This is an alphanumeric field. You can enter an IP address or a domain name here. If the FTP server does not use the default port 21, put the port number after the address, with a colon as a separator. For example: "88.77.66.55:123" (FTP server = 88.77.66.55, port number = 123).

You put the login details in SNMP variable "update-authetication". This is also an alphanumeric variable. In it, you put the username and password, separated by a colon. For example: "sac_update:secret" (user = sac_update, password = secret).