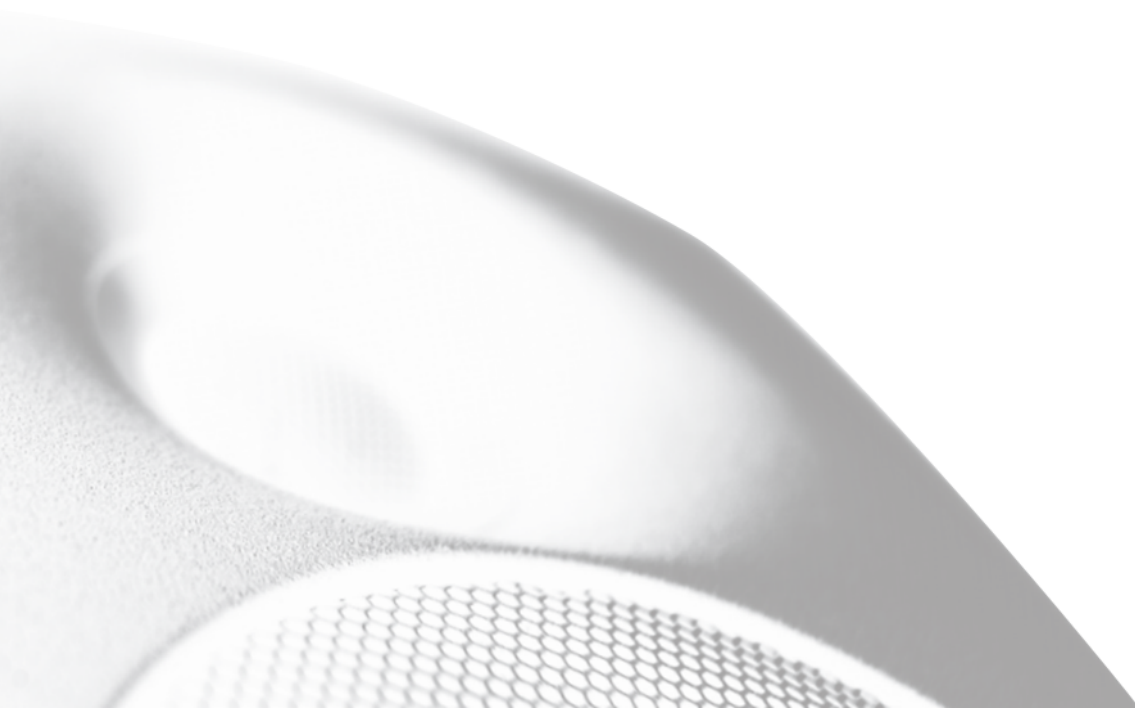# GENELEC®

4410A
Operating Manual

GENERAL DESCRIPTION

The bi-amplified Smart IP Genelec 4410A install loudspeaker is a compact two-way active loudspeaker for fixed installations. It requires only one CAT cable to connect, making installation easy. The 4410A loudspeaker is powered using the standard Power-over-Ethernet (PoE) technology, using PoE+ or PoE standards. The proprietary internal power supply in 4410A delivers an impressive short-term SPL.

The 4410A is a high-resolution loudspeaker delivering a signal path and acoustic output that extends to ultrasonic frequencies. It uses Genelec's Minimum Diffraction Enclosure (MDE) enclosure technology to reduce acoustic diffractions. Combined with the advanced Directivity Control Waveguide (DCW) surrounding the tweeter, this provides excellent frequency balance in difficult acoustic environments.

The 4410A loudspeaker supports Genelec Smart IP technology. The Smart IP technology provides scalable power, audio and loudspeaker configuration, supervision and calibration features via a standard CAT cable, offering integrators unrivalled power, flexibility, cost-effectiveness and simplicity of installation.

The 4410A has been designed for excellent sound quality and very long lifetime. The enclosure is made of environmentally friendly recycled die-cast aluminium. The 4410A is manufactured using certified sustainable methods. All essential parts of the loudspeaker can be recycled.

The 4410A is available in black or white colours. It is compatible with Genelec's extensive range of mounting accessories for floor, ceiling, wall, or truss mounting.

The 4410A loudspeaker contains

- highly efficient dedicated Class D power amplifiers, one for each driver

- switched-mode power supply technology offering high SPL output using standard PoE+ and PoE power supply with an IP switch or power injector

- active crossover filter

- electronic system protection

- audio-over-IP streaming input

- flexible room acoustic compensation tool set built in

Audio-over-IP streaming supports an unlimited number of channels in the playback system. These audio channels are automatically synchronized perfectly in time by the audio-over-IP streaming technology, forming a single playback system. The 4410A accepts AES67/ST2110 and Dante audio-over-IP streams. The streams are set up with Dante Controller or Dante Domain Manager software. Each 4410A supports reproduction of one or the sum of two audio input channels. The stream audio sample rate can range from 32-96 kHz, with 16-24 bit resolution.

The 4410A contains one rear panel CAT connector for standard Ethernet IP network connectivity. The network interface speed is 100 Mbps. The rear panel CAT connector also allows Genelec's Smart IP Manager software to work on the 4410A. This software is available for AV installers on Genelec web site and runs on Windows 10 computers. The software allows AV installers to configure an almost unlimited number of rooms, zones, loudspeakers and audio channels, and includes device discovery, a versatile room acoustic equalisation tool set, system organisation and status monitoring.

The 4410A contains an application programming interface (API) supporting control via third-party hardware, software or house automation. The API enables integration to all house and home automation systems. Detailed information about the API are provided in a separate document from Genelec.

The 4410A is designed for indoor use, in temperatures 15-35 Celsius and relative humidity 20-90 %.

PACKING CONTENT

- Genelec two-way active loudspeaker 4410A.

- Keyhole-type wall mount with screws.

POSITIONING AND MOUNTING THE LOUDSPEAKER

Place the loudspeaker so that the line of the acoustic axis points towards the main listening area. The AV install designers may indicate different aiming.

The minimum clearance for amplifier cooling and reflex port function around the loudspeaker is 3 cm (1 3/16 in) behind, above and on both sides of the loudspeaker. If the back side of the loudspeaker is blocked, it must be ventilated so that the ambient temperature remains below 35° C (95° F) at any moment of operation.
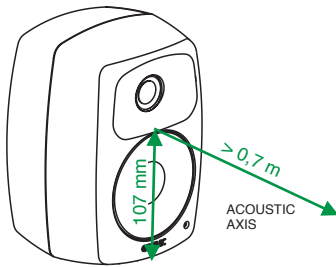
Figure 1. Location of the acoustic axis.

The two primary mounting points are on the rear side. Use these for mounting brackets or the keyhole wall mount adapter. They have metric M6 x 8.5 mm holes (thread type is metric M6, thread depth is 8.5 mm). Do not exceed the thread depth as this can result in failure of the thread. The base of the loudspeaker carries a 3/8 in UNC-threaded hole compatible with certain standard microphone stands. This can be used for additional support. The UNC thread is not compatible with metric threads. Do not use this point as the primary mounting point. Pay attention to mounting screw lengths. Do not use screws exceeding the depth of the hole as this can destroy the threads in the mounting points. Do not over-tighten. Do not use very short screws as the thread length covered by such a screw is not enough to hold the weight of the speaker.

See the Genelec Accessories Catalogue on www.genelec.com for a complete list of mounting hardware options. The accessories can come with instructions on the proper methods of installation.
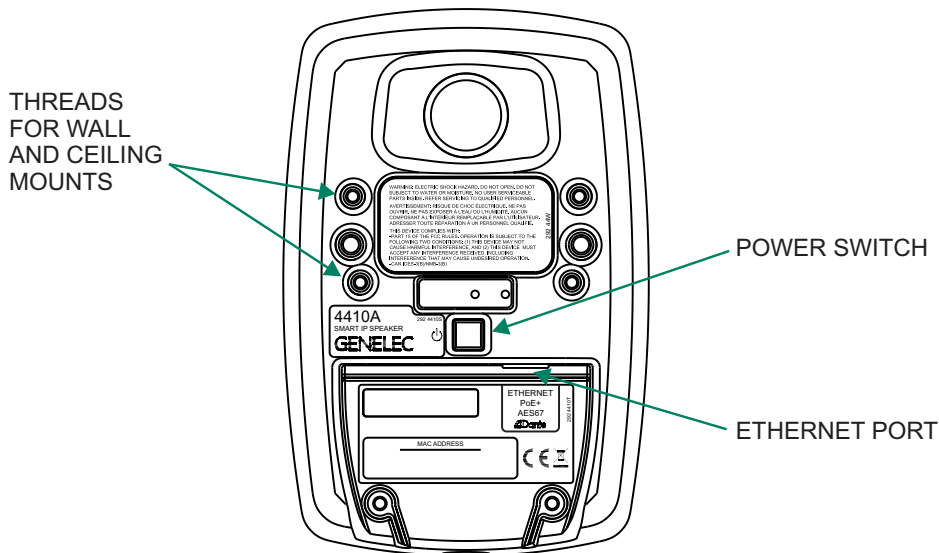

Figure 2. Connectors and controls in the 4410A rear panel.

CONNECTING LOUDSPEAKERS

To get started, connect an Ethernet cable from the PoE+ output of an IP switch to the 4410A Ethernet port. Use at least CAT5 cable or better. Press the power switch to power up the loudspeaker.

To create a working system, you will need

- IP switch with a PoE+ (802.3at) output for the 4410A loudspeaker or an IP switch with no PoE support and a PoE+ power injector
- CAT 5 or higher category Ethernet cable with RJ45 connectors
- AES67, ST2110 or Dante audio-over-IP stream source
- For 4410A setup and configuration, a computer running Windows 10 operating system
- Genelec Smart IP Manager software
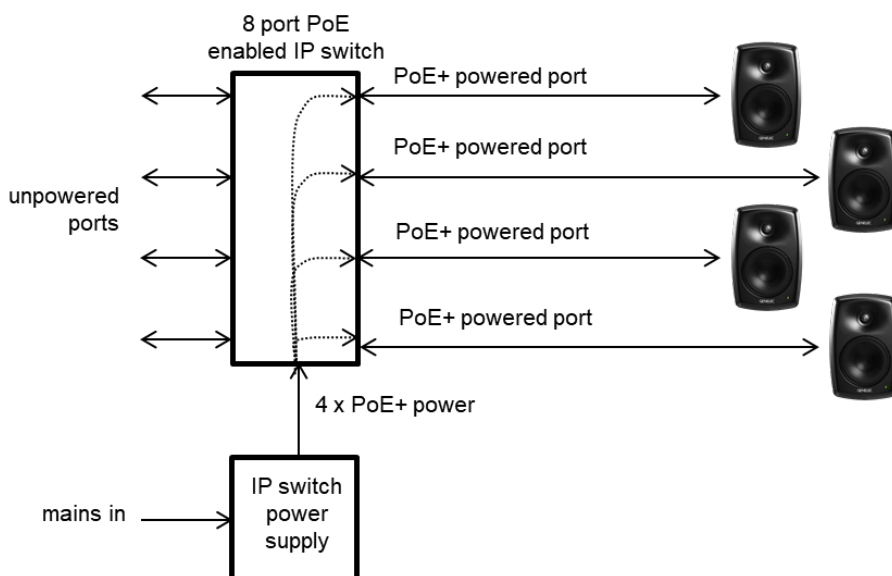- Dante Controller software or Dante Domain Manager software

Figure 3. 4410A powered with PoE+ IP switch.

An example of powering the 4410A with a PoE+ enabled IP switch. With this method, the power budget available for all outputs connected to the IP switch must enable each 4410A to run at full PoE+ power. For 4 loudspeakers, the power supply must support 4 x PoE+ power level.
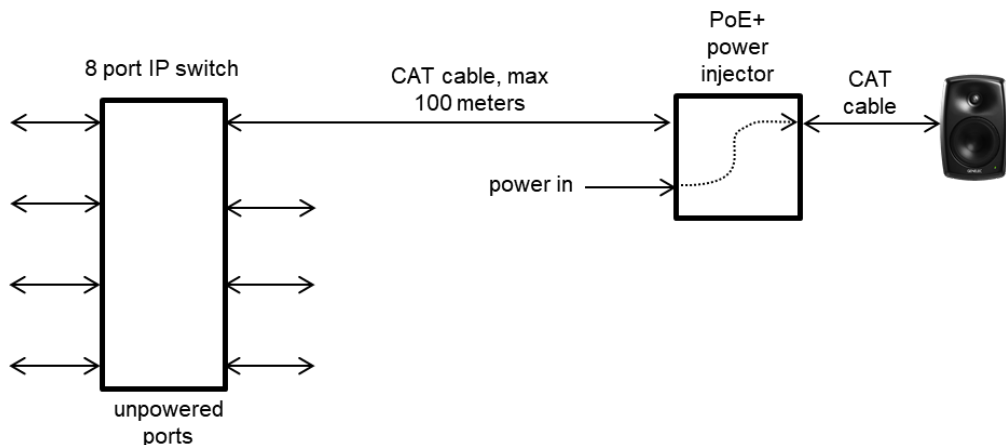
Figure 4. 4410A powered by an IP PoE+ power injector.

An example of powering the 4410A with a PoE+ power injector. This method enables the use of standard non-PoE IP switches. Each power injector must support full PoE+ power level into the device.

PoE budget calculation

The 4410A supports automatic negotiation with the IP switch or IP power injector to set the PoE power level. However, in some cases it may be necessary to set the PoE power level in the switch manually.

Table 1. PoE and PoE+ power levels.

Name	Standard	Power at switch	Min. power at 4410A
PoE	IEEE 802.3af-2003	15.4 W	12.95 W
PoE+	IEEE 802.3at-2009	30 W	25.5 W

There are several Power-over-Ethernet standards. The 4410A loudspeaker supports the PoE+ standard but also works with the lower power PoE standard. While the 4410A also works with the lower PoE power, the maximum SPL is affected by the PoE power available. Please consult the specification table in this manual for details. Genelec recommends using the PoE+ power level with 4410A.

Each PoE supply device (IP switch or power injector) has a certain maximum output power capacity. This can limit the number of PoE outputs that can be set on. For a 4410A loudspeaker, calculate the output power for each output as 15.4 W for PoE and 30 W for PoE+. Ensure that the total power does not exceed the switch or power injector total power.

Example: IP switch total power is 150 W. You use PoE+ and four outputs are connected. The total output power is 4 x 30 W = 120 W. This is smaller than the capacity of the IP switch, 150 W. This scenario is acceptable.

PoE cable loss calculation

There is power loss in the Ethernet cable. The reason for the power loss is that the CAT cable conductor is thin and has considerable resistance. The power loss increases with increasing cable length. The maximum cable length is 100 meters (333 feet). Calculate the power loss in cable at 25 mW/m or 7,4 mW/ft. The 4410A will automatically adapt to the power loss in the cable, but lower input power will slightly reduce the maximum SPL output. In order to minimize the cable loss and to maximize the duration at maximum SPL for very long cable runs, consider using power injectors close to the loudspeakers or short cable runs.

ISS AUTOSTART

The automatic power function ISS (Intelligent Signal Sensing) powers the loudspeaker automatically down when it is not in used and up when the use resumes. ISS can be activated and adjusted with the Smart IP Manager software. Powering down to standby happens after a set time when playback has ended. Playback automatically resumes with an input signal exceeding the level configured using the Smart IP Manager. There is a slight delay in the automatic powering up. If this is undesirable, ISS can be disabled with Smart IP Manager.

The intended use of this loudspeaker requires that the IP network interface is continuously enabled also in the standby mode. This enables the ISS to wake up with an API command or in response to IP audio stream. The power consumption in of a 4410A in standby mode is 3 W. To save more power, the PoE+ power supply in the Ethernet switch or PoE injector can be turned off. However, the loudspeaker wakeup when the PoE power is turned back on again will take a longer time and the loudspeaker does not respond to any IP network commands while it is not powered and until it has started.

SELECTION OF IP SWITCH

Smart IP and the 4410A are fully compatible with standard Ethernet and IP switch technology. Genelec recommends using gigabit speed managed IP switches with full PoE+ on each of the outputs intended for 4410A loudspeakers.

Managed IP switches offer the ability to configure, manage and monitor the local area network, typically using a web browser user interface, and this helps in creating a well working system.

The IP switches should support QoS and be media ready. Differentiated services (DiffServ) typically implements QoS prioritization of IP traffic. DiffServ marks IP packets according to priority. In response, IP switches can prioritize media traffic to improve system performance. Differentiated services code point (DSCP) markings in the IP packet headers are sensed by the QoS capable IP switch.

Genelec does not endorse certain IP switch brands as Smart IP works perfectly with all high-quality standard IP switches with these capabilities. Use of 100 Mbps IP switches is discouraged and use of higher capacity IP switches is encouraged.

NETWORK STRUCTURE

Genelec recommends always designing a network structure with a star topology. Only one IP device (for example, one 4410A) should be connected to one port of an IP switch. IP device ports should not be daisy chained to several IP devices.

Audio-over-IP requires the use of a cable-based LAN network. Low-latency uncompressed audio-over-IP streaming does not work over WLAN.

SETTING UP AUDIO STREAMS

Audio stream setup is done by using Dante Controller software. Download the software from https://www.audinate.com/products/software/dante-controller

An AES67/ST2110 audio stream supported by the loudspeaker can contain the maximum of 8 audio channels. Dante automatically divides a multichannel stream into several low channel count flows suitable for the speaker and this process is largely automatic.

The 4410A can select one audio channel or a sum of two channels in a stream.

The AES67 compatibility mode must turned ON to enable reception of AES67 or ST2110 streams. Follow these instructions:

- Double click on the loudspeaker to be configured. The **Device View** window opens.

- Click the **AES67 Config** -tab.

- In the **AES67 Mode** panel, go to **New**: and select **Enabled**.

- In the **Reset Device** panel, click **Reboot** to reboot the loudspeaker with AES67 enabled.
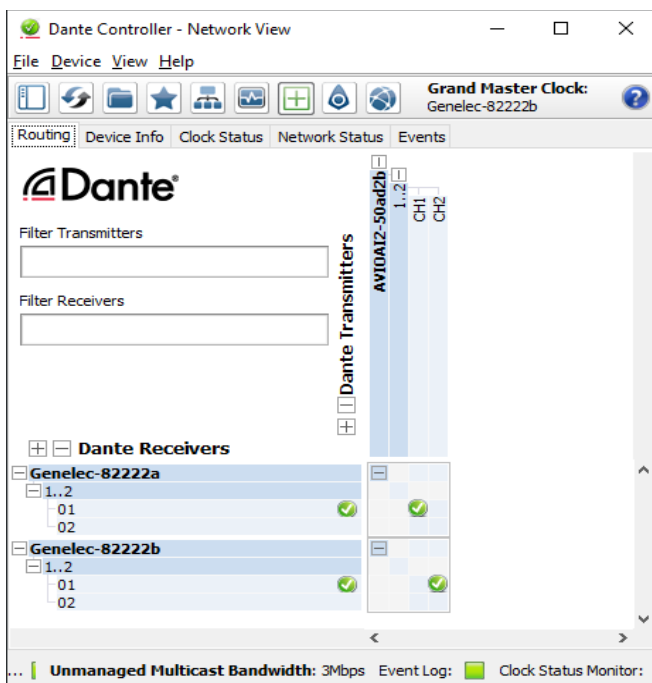
Figure 5. Configuring for AES67/ST2110 streams in the Dante controller.

GENELEC SMART IP MANAGER SOFTWARE

Acoustic calibration, zone setup, input selection and loudspeaker management are done using Genelec Smart IP Manager software. This is software intended for AV installers. Genelec recommends using the Application Programming Interface (API) inside the loudspeaker used with house automation systems for end-user control.

Download Smart IP Manager at https://www.genelec.com/smart-ip-manager and follow screen instructions to install. For detailed use of the Genelec Smart IP manager software, please refer to the Smart IP Manager operating manual.

Zone settings

A zone is a collection of loudspeakers working as a system. The settings collectively applied to a selection of loudspeakers called the Zone includes

- mute
- zone level control
- settings profile selection

Normally, level is adjusted at the stream source. In the Smart IP manager software, the output level of the Zone or a complete system can be set by adjusting the level in the Smart IP Manager software using the '-' and '+' buttons.

Each zone can have up to five different Profiles. A Profile contains a collection of settings including settings of all acoustical controls, the input selection and the level and delay alignments. These are first designed and stored in each loudspeaker. Then, each zone can work as a system. Selecting a Profile will collectively recall all settings stored under this profile in each loudspeaker belonging in this Zone.

Unallocated Smart IP devices are listed under "Default" zone.

Zone can be muted and level controlled with '-' and '+' buttons.

Turn on audio inputs:
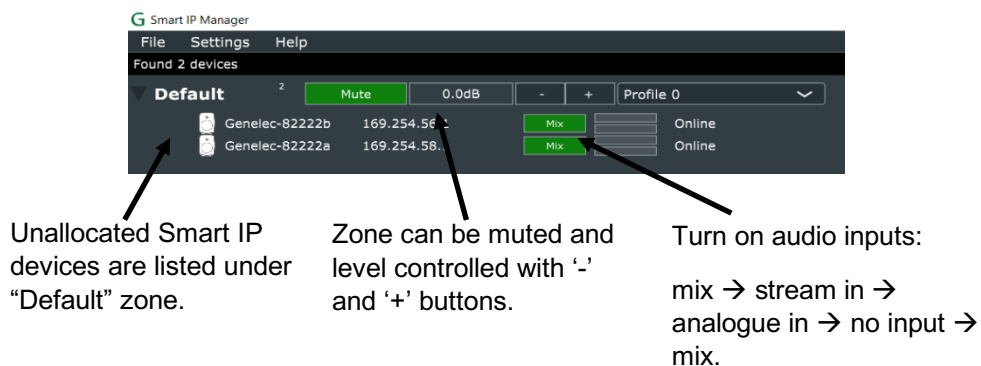
mix → stream in → analogue in → no input → mix.

Figure 6. Controlling the zone with Smart IP Manager software.

Editing acoustic settings

The frequency response of the 4410A can be compensated for the room's acoustical influences by editing the settings in the Acoustics tab in the Genelec Smart IP Manager. Acoustical calibration settings are specific to each loudspeaker.

To set, select one or more loudspeakers in the device list. Selecting more than one loudspeaker applies the settings to all selected loudspeakers at once.

To adjust, select the Acoustics tab. You have several controls in the tab

- delay (delay alignment control)
- sensitivity (to align this loudspeaker's output level with other loudspeakers)
- 20 parametric acoustic settings (to compensate room acoustic influences)

The acoustic measuring tool normally used by AV installers can be used to set these adjustments. Careful listening with test recordings is also recommended.

For each parametric filter, select the filter by clicking on the filter box icon. Select the function for this filter in the Type drop down box. Each parametric filter has up to three slider controls that set the parameter values. Quick selections are also provided for Bass Roll-off, Bass Tilt and Treble Tilt.
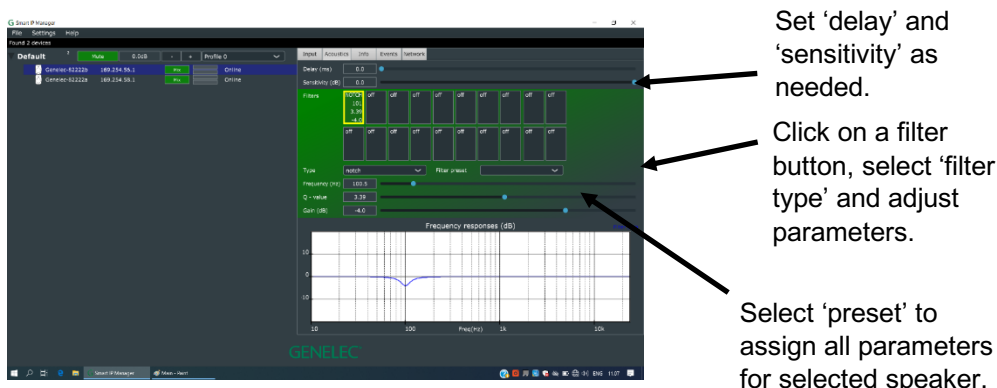

Set 'delay' and 'sensitivity' as needed.

Click on a filter button, select 'filter type' and adjust parameters.

Select 'preset' to assign all parameters for selected speaker.

Figure 7. Modifying the acoustic settings of a Smart IP loudspeaker.

Factory settings

The factory setting for all acoustic settings is "OFF", sensitivity attenuator set to 0 dB, and delay set to 0 ms. These give a flat anechoic response. Audio stream settings are reset. With the factory settings, all that is needed to play audio is to configure an audio-over-IP stream in the stream input. Set stream again to resume normal streaming operation.

To reset a 4410A to factory settings, press the power button for more than 10 seconds. The loudspeaker indicates that the reset process starts. Then, you can release the power button but do not disconnect power supplied by the Ethernet cable until the reset process is complete. Once the reset is complete, the loudspeaker again becomes available and active on the Smart IP Manager software. This typically takes less than one minute.

APPLICATION PROGRAMMING INTERFACE (API)

The 4410A Smart IP loudspeaker has a set of API commands that can be used to enable control using a house automation system or similar IP network connected device. The document describing the API command and how to use them is available from Genelec. Please visit www.genelec.com.

MAINTENANCE

There are no user-serviceable parts in the loudspeaker. Maintenance or repair of the 4410A must only be done by Genelec authorised service personnel. This is particularly important to maintain.

SAFETY CONSIDERATIONS

The 4410A has been designed in accordance with international safety standards. The following warnings and cautions must be observed to ensure safe operating conditions:

• Servicing and adjustment may only be performed by qualified service personnel.

• The loudspeaker must not be opened.

• Do not expose the loudspeaker to water or moisture.

• Do not place objects filled with liquid, such as vases, on the loudspeaker or near it.

• This loudspeaker can produce sound pressure levels in excess of 85 dB, which may cause permanent hearing damage.

• Free flow of air behind the loudspeaker is necessary to maintain sufficient cooling. Do not obstruct airflow around the loudspeaker.

• The loudspeaker is not disconnected from the power supply unless the CAT cable is removed from the loudspeaker. Powering down the speaker using the power switch does not disconnect power.

• Ensure that mountings for example to walls or ceilings are able to carry the full weight of the loudspeaker in all circumstances, the installations have been designed and are implemented according to the local safety regulations and follow principles of good workmanship.

• Genelec products and accessories can come with instructions on the proper methods of installation and use. Follow these instructions.

GUARANTEE

This product is guaranteed for a period of two years against faults in materials or workmanship. Refer to supplier for full sales and guarantee terms.

Specifications

SYSTEM SPECIFICATIONS	
Lower cut-off frequency, -6dB	≤ 67 Hz
Upper cut-off frequency, -6dB	> 40 kHz
Frequency response within ± 2.5 dB	74 Hz – 20 kHz
Maximum short-term sine wave output on axis in half space, average 100 Hz to 3 kHz, at 1 m, using PoE+ power	≥ 96 dB SPL
Maximum long-term RMS acoustic output in same conditions with IEC-weighted noise, at 1 m using PoE+ power (limited by driver unit protection circuit and the PoE power supply being used)	≥ 91 dB SPL
Maximum peak acoustic output per unit in a listening room with music material, at 1 m, using PoE+ power	> 100 dB SPL
Self-generated noise level in free space, at 1 m on the acoustical axis, A-weighted	≤ 5dB
Harmonic distortion at 80 dB SPL at 1 m on axis frequency range 70 – 200 Hz frequency range >200 Hz	< 3% < 0.5%
Dispersion angle (degrees), horizontal	130°
Dispersion angle (degrees), vertical	110°
Bass driver	76 mm (3 in) cone
Treble driver	19 mm (3/4 in) metal dome
Weight	1.5 kg
Height	181 mm (7 1/8 in)
Width	121 mm (4 3/4 in)
Depth	115 mm (4 1/4 in)

Maximum short-term output level is limited by the PoE technology being used and the crest factor of the audio signal. The stated values are typical for music and speech signals.

Maximum long-term output level can be further limited by loudspeaker system protection. Genelec recommends using PoE+ whenever possible. Using lower-power PoE can limit short-term maximum and long-term maximum, depending on the characteristics of the signal being reproduced.

User selectable filters can be set to positive gain. Positive gain must be used with care as it is possible to cause premature overload of the loudspeaker at specific frequencies.

INPUT / CROSSOVER SECTION	
Ethernet connection	100BASE-TX 1 x RJ45
Nominal SPL with 0 dBFS digital audio input at maximum sensitivity	130 dB SPL
Audio-over-IP streaming formats	AES67, ST2110-30, Dante
Crossover frequency, bass/treble	2.9 kHz
Number of user-adjustable filters	20
User selectable filters, choice of function for each user-adjustable filter	parametric notch high frq. shelve low frq. shelve bass roll-off bass tilt treble tilt
User selectable filters, parameter adjustment ranges for a notch filter • gain • Q-value center frequency	 -20…+2 dB 0.1…20 10 Hz…16 kHz
Sensitivity, adjustment range	-60…0 dB
Delay, adjustment range	0…98 ms

AMPLIFIER SECTION	
Bass amplifier output power, short-term	18 W
Treble amplifier output power, short-term	18 W
Supply power at switch, power-over-Ethernet PoE+ (Class 4) PoE (Class 3)	 30 W 15.4 W
Supported PoE standards PoE+ (supports signature and LLDP) PoE (supports signature)	 IEEE 802.3at IEEE 802.3af
CAT cable specification	5, 5e, 6
Maximum CAT cable length	100 m (333 ft)
Power consumption in idle	4 W
Power consumption in ISS standby mode	3 W

MEASUREMENTS
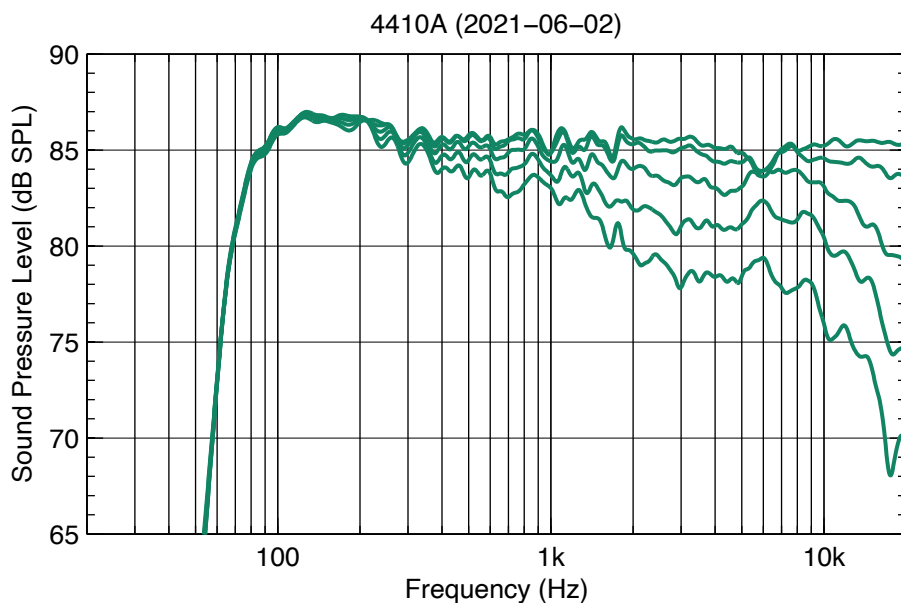
Figure 8. Frequency responses on the horizontal plane. Off-axis angle indicated in degrees.
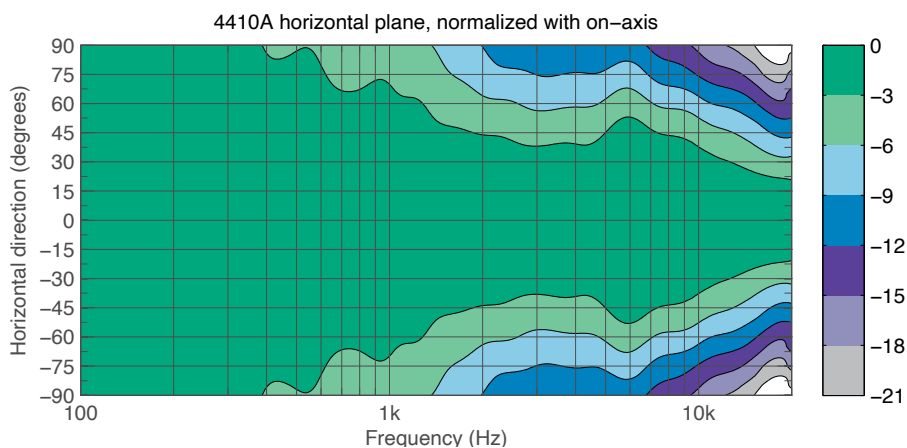
Figure 9. Horizontal directivity plot of the 4410A. Colour bar indicates dB level.
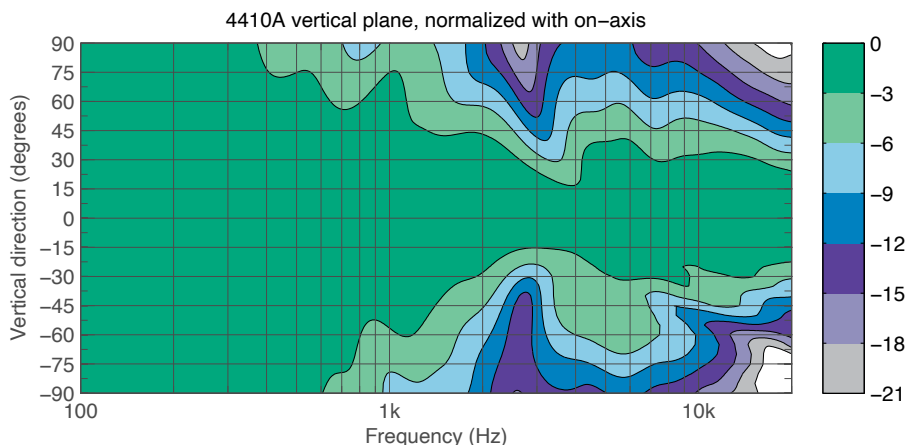
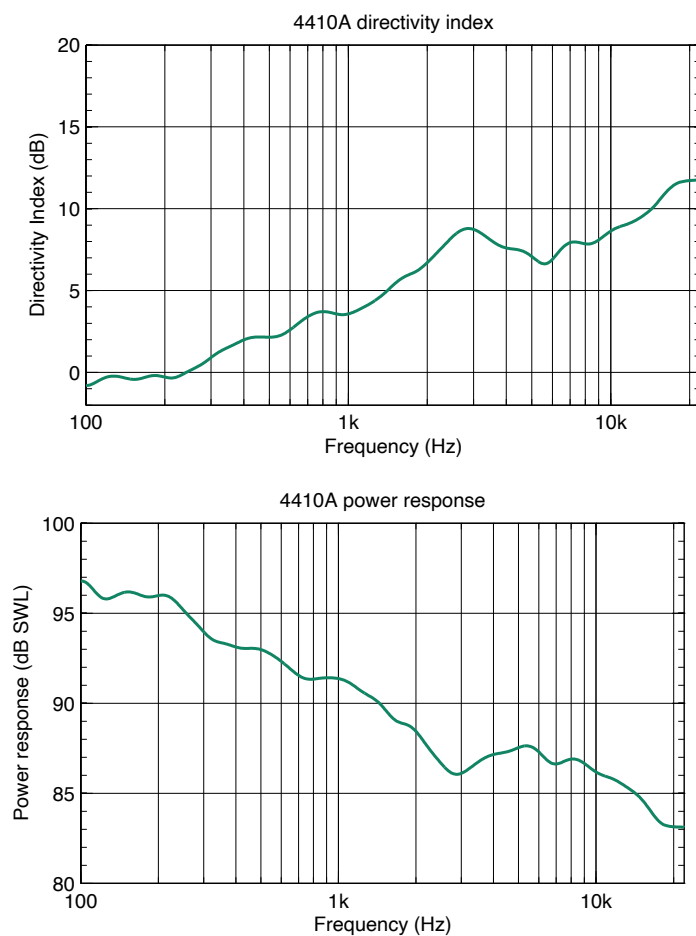Figure 10. Vertical directivity plots of the 4410A. Colour bar indicates dB level.

Figure 11. Directivity index (top) and power response (bottom).
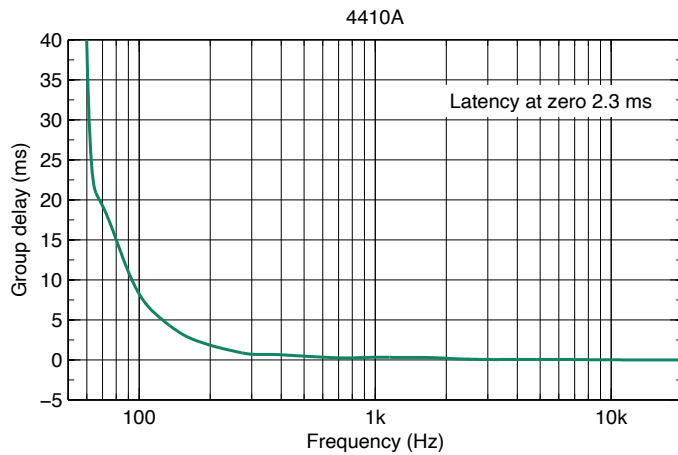
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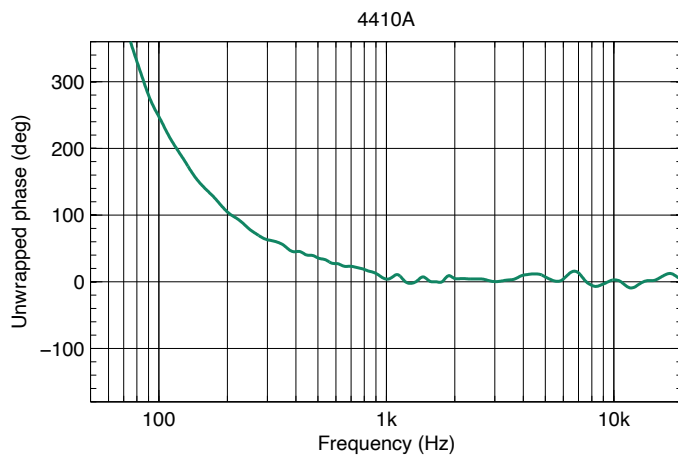Figure 12. System delay from the audio-over-IP stream input.

Figure 13. Phase response.

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