E-PAC (V02)
E-Series Systems, C6, MAX
User Manual

d&b audiotechnik

References in the manual

WARNING!	**This refers to a potentially dangerous situation which may lead to personal injury.**
CAUTION!	**This refers to a potentially dangerous situation which may lead to damage to the equipment.**
IMPORTANT!	**This refers to a situation which may cause the equipment to malfunction.**

Symbols on the equipment

Please refer to the information in the operating manual.

WARNING! Dangerous voltage!

General Information

E-PAC (V02) User Manual

Version 4.0E, 09/1999, D2010.E.04

The information presented in this document is, to the best of our knowledge, correct. We will however not be held responsible for the consequences of any errors or omissions.

Technical specifications, weights and dimensions should always be confirmed with d&b audiotechnik AG prior to inclusion in any additional documentation.

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Safety precautions

Before you use our products, read the manual carefully and observe all the safety precautions. They will protect you and help to avoid equipment failures. Keep this manual in a safe place so that it is available for future reference.

If you supply d&b products, please draw the attention of your customers to these safety guidelines. Enclose the relevant manuals with the systems. If you require additional manuals for this purpose, you can order them from d&b (order form on the last page).

Information regarding use of the E-PAC

The device complies with the electromagnetic compatibility requirements of EN 55103 (product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use) for the environments E1 (residential), E2 (business and commercial), E3 (outdoor use in urban areas) and E4 (outdoor use in rural areas).

CAUTION!

Acoustic interference and malfunctions may occur if the unit is operated in the immediate vicinity of high-frequency transmitters (e.g. wireless microphones, mobile phones, etc.). Damage to the mainframe is unlikely, but cannot be excluded.

To meet the EMC requirements, use only shielded cables with properly connected plugs for all signal terminals (INPUT, INPUT LINK, MIX IN).

The following information is intended to prevent fires and possible electric shocks:

WARNING!

The E-PAC is a protective class 1 unit. Make sure that the earth (ground) contact is attached when the unit is in operation. A missing earth (ground) contact may lead to dangerous voltages in the housing and controls.

To reduce the possibility of audible hum the mainframe signal ground (XLR pin 1) to earth (ground) connection has a high impedance. It will prevent the unit from static charge but any voltage applied to signal ground will pass through all connectors. To prevent electric shock, make sure that all devices in the signal path are grounded properly.

Never connect an amplifier output pin to any other in- or output connector pin or earth (ground). This might damage the mainframe or lead to electric shock.

Lay all cables to and from the unit so that they cannot be crushed by vehicles or other equipment and that no-one can step on them.

Keep dust, moisture, water or other liquids well away from the unit.

Never operate the unit when it is open.

Always disconnect the mains power supply when replacing a defective fuse. Only use the type of fuse listed in the specifications.

WARNING!

Only carry out work specified in this manual and always disconnect the mains power supply.

All other work should be performed by trained service staff, especially in the following cases:

- Mains power cable or plug has been damaged
- Objects or liquids have entered the unit
- The unit is not operating normally
- The unit was dropped or the housing is damaged

Information regarding use of loudspeakers

WARNING!

Never stand in the immediate vicinity of loudspeakers driven at a high level. Professional loudspeaker systems are capable of causing a sound pressure level detrimental to human health. Seemingly non-critical sound levels (from approx. 95 dB SPL) can cause hearing damage if people are exposed to it over a long period.

In order to prevent accidents when deploying loudspeakers on the ground or when flown, please take note of the following:

When setting up the loudspeakers or loudspeaker stands, make sure they are standing on a firm surface. If you place several systems on top of one another, use straps to secure them against movement.

Only use accessories which have been tested and approved by d&b for assembly and mobile deployment. Pay attention to the correct application and maximum loading capacity of the accessories as specified in our Rigging Accessories Manual.

Ensure that all additional hardware, fixings and fasteners used for installation or mobile deployment are of an appropriate size and load safety factor. Pay attention to the manufacturers instructions and to the relevant safety guidelines.

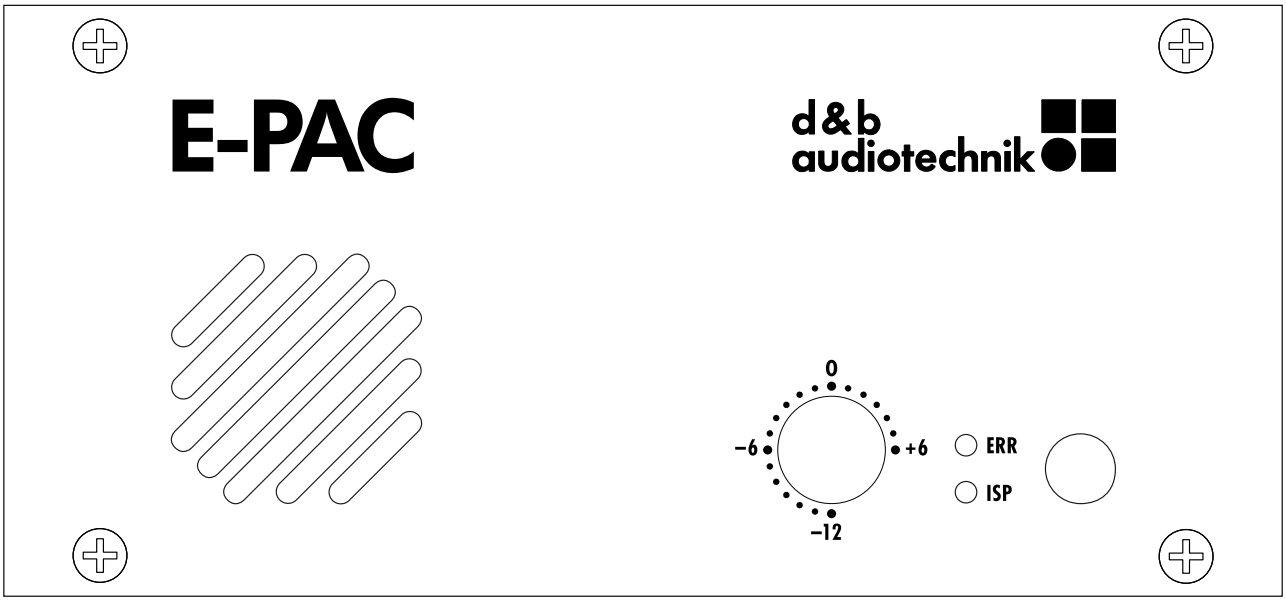
Regularly check the loudspeaker housings and accessories for visible signs of wear and tear, and replace them when necessary.

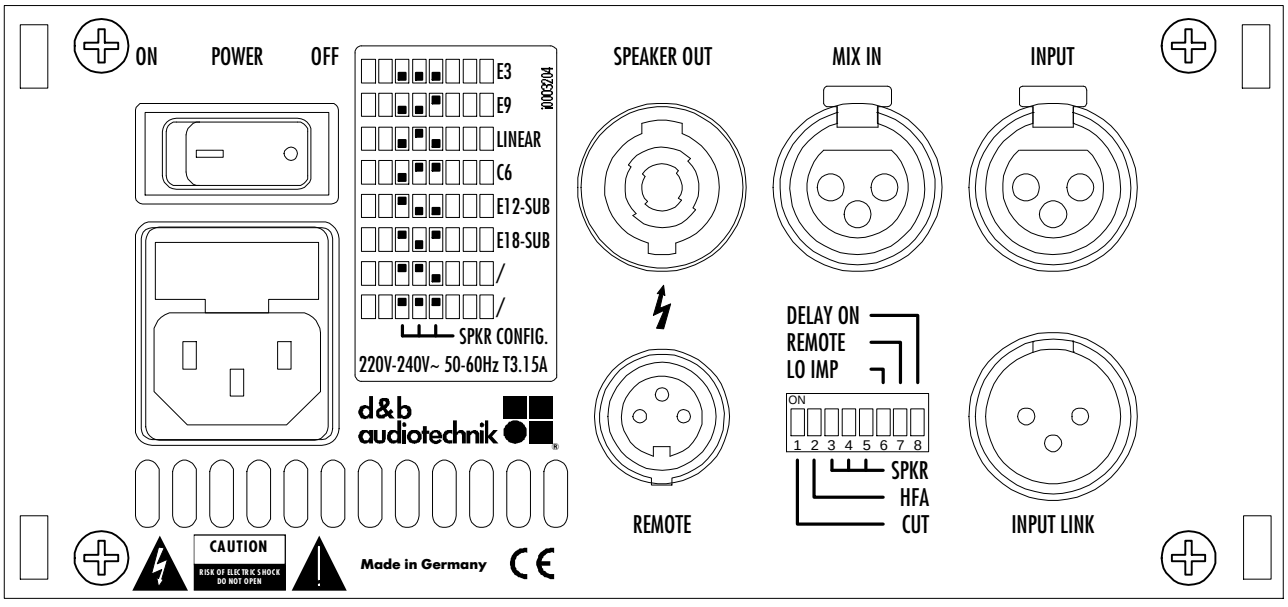
Regularly check all load bearing bolts in the mounting devices.

CAUTION!

Only use loudspeakers in the C and E-Series with the P1200A mainframe fitted with the correct controller modules or with a correctly configured E-PAC. The contoller monitors cone excursion and voice coil temperature of the drivers. When loudspeakers are operated without the correct controller, in addition to losses in tone, there is a risk of damage to the components. Any defects arising from operation other than those specified in this manual will be excluded from any warranty claims.

Loudspeakers produce a static magnetic field even if they are not connected or are not in use. Therefore make sure when erecting and transporting loudspeakers that they are nowhere near equipment and objects which may be impaired or damaged by an external magnetic field. Generally speaking, a distance of 0.5 m (1.5 ft) from magnetic data carriers (floppy disks, audio and video tapes, bank cards, etc.) is sufficient; a distance of more than 1 m (3 ft) may be necessary with computer and video monitors.





E-PAC power amplifier controller front and rear views

Contents

1. Introduction

This user manual describes the facilities and functions of d&b systems which are operated with the E-PAC power amplifier controller. It covers the operation of the E-PAC and the loudspeakers used in these systems.

d&b publishes additional application and technical information notes (TI). Examples for different applications and combinations of d&b C-Series and E-Series systems are given in TI 326.

A d&b publications list and order form is appended to this manual and we will gladly send you any of the listed publications on request. If you have any comments on the information presented, or feel that something is inadequately explained or not covered, then please tell us using the comments section of the publication order form.

1.1. System concept

All d&b loudspeaker systems are designed to meet the following criteria :

- Consistent neutral sound over the full working dynamic range
- Ease of operation
- Simple set up and wiring
- Safe and reliable operation
- Compact design

In order to satisfy these demands d&b developed a complete system concept incorporating the loudspeaker, the loudspeaker specific control electronics (the controller) and the power amplifier.

Fundamental to the performance of the loudspeaker is the care taken in the development of individual components resulting in well controlled dispersion, high efficiency and excellent dynamic response.

The controller creates the optimum mix of output level capability, operating reliability and longevity, and pure sound quality. Protective circuits continuously model the loudspeaker load through simulation of cone displacement and voice coil temperature ensuring signal level is only reduced when necessary to prevent driver damage. No signal compression takes place within the systems normal operating range and there is no dynamic manipulation of system frequency response enabling most applications and acoustic environments to require no additional signal processing.

The power amplifier and control for each loudspeaker are housed within the A1 and P1200A mainframes or the E-PAC power amplifier controller. All systems are compatible, easily combined and complementary, and can be accessed using the d&b remote control system to allow overview and control over the most complex applications.

1.2. E-PAC based systems

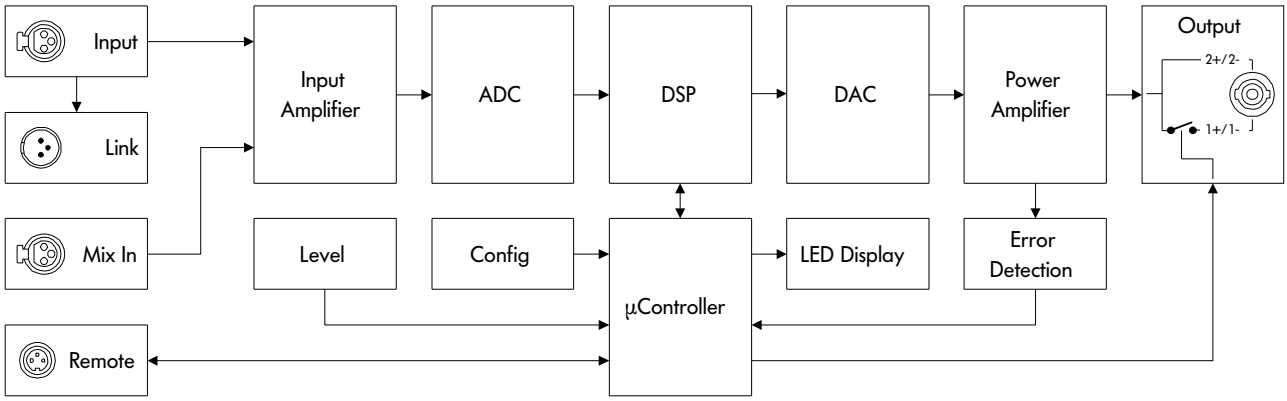
E-PAC, the E-Series Power Amplifier Controller, is a single channel amplifier with an internal controller for operating E-Series systems. Unlike the modular design of the controller modules for P1200A and A1 mainframes, the internal controller is based on Digital Signal Processing, DSP. The E-PAC is pre-programmed for E-Series and C6 loudspeakers and their different operational modes, the configurations are selected by setting DIP-switches on the rear panel. The E-PAC has an additional linear configuration for MAX loudspeakers.

The E-PAC is specifically designed for high impedance loads (200 W into 16 ohms, 300 W into 8 ohms), and therefore provides the same output power for a single 16 ohm E3 loudspeaker as one channel of a P1200A mainframe. The nominal 8 ohm impedance's of other E-Series loudspeakers result in a single cabinet having a maximum SPL of 2 dB less than when driven by a P1200A.

Up to four E3 loudspeakers or two 8 ohms loudspeakers can be driven with a reduced output level (–6 dB). This is useful for situations where multiple loudspeakers are needed but maximum output is not required.

All the functions of the E-PAC, including programmable internal delay settings, can be remotely interrogated and altered via the RIB, Remote Interface Bridge and a PC.

1.3. Block diagram



E-PAC power amplifier controller block diagram

2. E-PAC power amplifier controller

The E-PAC incorporates a power supply, single channel power amplifier, Digital Signal Processor (DSP), all necessary protection circuits, a remote interface, controls and indicators.

The E-PAC is housed in a 2 RU high, rugged enclosure and can be operated as a stand alone unit. Optional accessories allow installation of a single E-PAC in a standard 19" equipment rack, or a pair mounted side by side.

2.1. Digital controller

The controller incorporated in the E-PAC is based on a Digital Signal Processor, DSP, utilising sigma-delta signal conversion and is pre-programmed for E3, E9, C6, E12-SUB, E18-SUB and MAX (linear mode). These configurations can be selected by setting DIP-switches on the rear panel.

The signal processing includes correction of the frequency response, a high pass filter, limiting and complex protection circuits that model loudspeaker cone displacement and voice coil temperature.

CAUTION!

The DIP switch settings are specific to the characteristics of individual loudspeakers, affecting the frequency response and maximum output level. To ensure optimum performance and prevent damage to system components each type of loudspeaker has to be used in conjunction with a suitably configured E-PAC.

Delay settings up to 170 ms can be programmed into the controller using a RIB, Remote Interface Bridge, in conjunction with a PC running d&b ROPE control software.

IMPORTANT!

The E-PAC digital signal processing circuits introduce a processing delay of 0.7 ms into the signal path, equivalent to a sound path length of 24 cm. If two identical loudspeakers are driven by digital (E-PAC) and analogue (P1200A) controllers respectively, the 0.7 ms delay of the E-PAC effectively positions its respective loudspeaker at a distance of 24 cm behind the loudspeaker driven by the P1200A. Where the two loudspeakers form an array this will lead to an increase in comb filtering and unpredictable coverage patterns. If the distance between the cabinets is much greater than the path difference of 24 cm, this effect becomes negligible.

Please note that all digital signal processing equipment used in the signal path will delay the signal. For example digital equalizers have a typical processing delay of about 3 ms.

2.2. Power amplifier

The single channel power amplifier of the E-PAC maintains high linearity throughout it's operational range even into adverse loads. With fast response to, and recovery from overload conditions, stability and accurate performance is guaranteed. A two stage power supply keeps the losses through heat emission low.

The E-PAC can deliver 200 W continuous sine wave output power into a 16 ohm load or 300 W into an 8 ohm load. Selecting low impedance mode (LO IMP DIP switch) enables the E-PAC to deliver an output power of 150 W into 4 ohms. These values apply to continuous operation for a minimum of 30 minutes at a maximum ambient temperature of 24°C (75°F).

An E-PAC will normally be operated with speech or music programme, complex signals where the average power requirement is below peak power. The E-PAC will continue to operate indefinitely even where the signal has very a low peak to RMS ratio (Crest factor, see section 2.13.), provided the device is installed to enable the heat generated to be adequately dissipated.

2.3. Cooling

The aluminium enclosure acts as a heat sink for the E-PAC power amplifier; it is therefore convection-cooled. To prolong the life of components inside the E-PAC, a small fan intakes cooling air into the front of the E-PAC through an opening on the rear panel. The fan is very quiet and runs continuously as long as the E-PAC is running or in mute.

When operating and installing the E-PAC, make sure enough air can flow around the enclosure. Never cover or block the intake opening on the rear panel or the exit opening on the front panel. Also refer to Section 2.11., Installation.

IMPORTANT!

Do not touch the heat sink. During operation the cooling fins of the heat sink on the enclosure of the E-PAC can reach temperatures of 80°C (176°F). The front and rear panels do not form part of the heat sink and can be touched at any time.

WARNING!

2.4. Protective circuits

The E-PAC contains many integrated protective functions. If over temperature occurs, the device switches to mute. After it has cooled down, the output stage cuts in automatically. The output current limiter (SOA watchdog) prevents damage to the output stage that could occur from a short-circuit or incorrect cabling.

The mains power connection is protected by a fuse (see Section 2.8.).

A mains inrush current limiter provides a „soft start“ and enables several E-PACs to be powered up at the same time without overloading the mains power supply. The maximum current drain during the power up phase is 10 A (peak).

2.5. Remote control & monitoring

The E-PAC is fitted with a remote interface for various levels of remote control and system supervision. The remote interface connection is opto-coupled and floating.

Basic-Remote

The Basic Remote is the simplest way to implement a remote control system. E-PAC can be remotely powered on by simply applying an 18 - 28 VDC control voltage to the terminals of its remote interface connector. Connecting a simple detector circuit to the remote interface also allows remote warning of an E-PAC fault.

Details of basic circuits for remote power control and fault display are published in d&b technical information bulletin TI 212, available on request.

Control by the d&b Remote Interface Bridge (RIB)

The d&b RIB is a 19" rack mount device, 1 rack unit high. Up to 12 mainframes (A1 or P1200A) or E-PACs at distances up to 500 m (1650 ft) can each be directly connected via a twin wire to a RIB I/O port. From the front panel of the RIB each device can then be remotely powered on and off and its power and error status monitored. A group of E-PACs or mainframes can be switched directly by the RIB front panel MASTER ON/OFF switch or remotely via a connection to an opto-coupled input port on the rear panel of the RIB. Remote indication of the error status of a mainframe group can also be relayed by the RIB.

Computer/MIDI control

Using a PC and the d&b ROPE control software or a MIDI control device, up to eight RIBs can be controlled via RS232, RS422 or MIDI interface. With an E-PAC the following remote control and display options become available:

Remote control

- Power On/Off
- Level control from +6 to –57.5 dB in 0.5 dB steps
- MUTE switching
- Standby switching
- Configuration switching (CUT, HFA, SPEAKER, LO IMP, DELAY ON)
- Delay time up to 170 ms in 0.1 ms steps

Remote status information

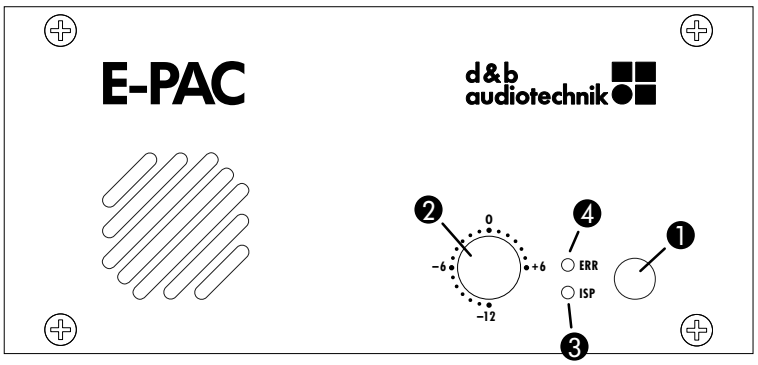
- Configuration switch status (all rear panel DIP switches)
- Mute/Standby switch status
- Level control setting
- Front panel indicator status (ISP, GR, ERR)
- Protect status (internal protect, short circuit protect, thermal protect)
- Temperature status (ok/warning/off)
- Available headroom (pre-limiter)
- Gain reduction (due to limiter operation)

A detailed description of remote control with the d&b RIB is given in the RIB user manual (d&b code D2903.E). The E-PAC object addresses for programming are to be found in section 2.14.

2.6. Controls and indicators

❶ Mute/Standby switch (green LED)

When the rear panel mains power switch is set to the on position, the combined Mute/Standby switch can be used to place the E-PAC either in mute or standby mode. The switch incorporates a green LED indicator which indicates three different states - ON, MUTE and STANDBY.



E-PAC front panel controls

- **LED on: ON**. The E-PAC is powered on and ready for use. A brief press of the Mute/Standby switch will mute the E-PAC, a longer press places the E-PAC in standby mode.
- **LED regular flashing** (1:1 mark space): **MUTE**. The E-PAC is muted. In the mute state, the input signal is muted but the power amp is still powered and connected to the speaker output. The E-PAC is unmuted by briefly pressing the Mute/Standby switch. A longer press of the Mute/Standby switch will place the E-PAC in standby mode.
- **Regular short flashes** (1:8 mark space): **STANDBY**. In standby mode the loudspeaker output is electronically isolated and the E-PAC idles, drawing minimal mains power. Pressing the Mute/Standby switch powers on the E-PAC ready for use. The E-PAC may also be powered back on by remote control from standby mode.

IMPORTANT!

When the E-PAC is set to STANDBY (or the mains power is turned off) the movement of the loudspeaker cones in the cabinets connected is no longer damped by the power amplifier output. This removal of the damping makes them susceptible to excitation by other loudspeakers in the surroundings. Audible resonances may occur, and even absorption of low frequency sound energy as the undamped loudspeakers act like a "bass trap". To permanently mute single subwoofer cabinets it is therefore preferable to use the MUTE function instead of STANDBY. The STANDBY mode, however, can be of advantage with mid-high systems, because it will remove any residual noise from the system.

IMPORTANT!

The Mute/Standby switch is a 'soft' switch which doesn't electrically isolate the E-PAC from the mains supply. The E-PAC circuitry can be electrically isolated from the mains supply by switching the rear panel mains power switch to its off position.

The setting of the Mute/Standby switch is stored in the E-PAC when the mains power is turned off or disconnected. After reconnecting the E-PAC it will revert to the same status as before disconnection.

❷ Level control

The detented level control adjusts the E-PAC input sensitivity and has a 18 dB range, -12 dB to +6 dB, calibrated in 0.5 dB steps. The level control is normally set to 0 dB.

❸ ISP LED- Input Signal Present (green)

– **Illuminates** when the E-PAC input signal exceeds -36 dBu. The ISP indication is unaffected by the setting of the level control and the MUTE function but will not operate in STANDBY mode.

❹ ERR LED - Error (red)

The ERR LED is a combined display for gain reduction, overload and error status of the E-PAC.

– **Illuminates depending on the input signal** (whilst the green ISP LED (3) also illuminates): **Gain Reduction.** The E-PAC limiter circuit reduces gain by more than 3 dB. This state is not critical at all but shows the system has reached its limits.

– **Illuminates depending on the input signal** (whilst the green ISP LED (3) goes off): **Overload**. Either the input signal level is too high or the E-PAC is trying to deliver too high an output current. If in doubt of the reason reduce the input gain at the E-PAC level control. If the error display disappears the output curent has been too high (load impedance too low from too many speakers connected or a defective cable or connector). If this does not affect the situation, the input signal to the E-PAC is too high (more than +18 dBu).

– **Flashes periodically: Temperature overload**. E-PAC is now electronically muted with the speaker output disconnected. When the E-PAC has cooled to normal working temperature it will automatically resume operation.

– **Illuminates continuously** whilst the Mute/Standby switch LED (1) flashes. An **external fault** has been detected such as a loudspeaker cable short or some other low impedance load condition. In this state the E-PAC is electronically muted and the speaker output disconnected. Once the cause of the fault has been identified and removed, the device has to be set to standby mode to leave the error status. A further brief press of the Mute/Standby switch will reset the E-PAC ready to resume normal operation.

– **Illuminates continuously** along with the Mute/Standby switch LED (1). An **internal fault** has been detected and the E-PAC electronically muted with the speaker output disconnected. As the E-PAC has no internal user serviceable parts, the unit will need the attention of an authorised d&b service partner.

2.7. Mains power switch

The on/off switch is located on the rear panel and isolates the mains power supply to the E-PAC. The switch on the front panel has the functions ON/MUTE/STANDBY and does not isolate the E-PAC from the mains power supply.

2.8. Mains power connection and fuse protection

A 3-pin IEC socket with an integrated fuse holder is provided for connecting the E-PAC to the mains power supply. A suitable power cable is supplied. Only connect the E-PAC to mains power supplies with an earth (ground) conductor.

WARNING!

Make absolutely sure that earth (ground) is connected correctly. Before you connect the device, check that the mains voltage and frequency corresponds to the specifications on the configuration sticker on the rear of the E-PAC.

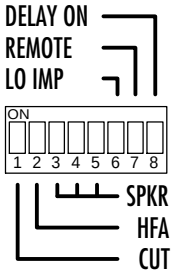
A replaceable 20 mm fuse is integrated in the IEC mains socket (230 V version: 3.15 A Time Lag (T), 100 V and 115 V versions: 5 A Time Lag (T)). It is connected in series to the primary winding of the mains transformer and fails if the current drain is exceeded. There is a spare fuse in the fuse holder.

WARNING!

If the fuse has failed disconnect the E-PAC from the mains supply before replacement. Only use a fuse of the correct type and nominal current value. Before restoring power to the E-PAC all cabling should be checked for faults. If in any doubt disconnect all signal and loudspeaker connections.

2.9. Configuration switches

There are a total of 8 DIP switches on the rear panel of the E-PAC for configuring the controller and the output stage.



E-PAC rear panel configuration switches

Switch 1 - CUT

Set to CUT, a high pass filter is inserted in the controller signal path. The speaker system is now configured for use with an active subwoofer.

The cut-off frequency is 110 Hz for all configurations except the linear mode (130 Hz). The CUT switch has no function in subwoofer configurations (E12-SUB, E18-SUB).

Switch 2 - HFA

In HFA mode (High Frequency Attenuation), the HF response of the speaker system is rolled off. The HFA circuit configures the loudspeakers to provide a natural, balanced frequency response when a unit is placed close to listeners in near field or delay use.

High Frequency Attenuation begins gradually at 1 kHz, dropping by approximately 3 dB at 10 kHz. This roll-off mimics the decline in frequency response experienced when listening to a system from a distance in a typically reverberant room or auditorium.

This switch has no function for subwoofer configurations (E12-SUB, E18-SUB).

Switches 3 to 5 - SPKR (SPEAKER)

Switches 3 to 5 configure the controller for specific loudspeaker types. The switch positions are listed on the configuration sticker at the rear of the device. Refer to the chapters on the individual loudspeaker systems for more details on the various modes.

Switch 6 - LO IMP

If LO IMP is selected, the speaker output of the E-PAC is set for driving low-impedance loads. Gain and the maximum output voltage is then reduced by half (–6 dB) so that the E-PAC can drive loads at a nominal 4 to 8 ohms at lower power. For example in LO IMP mode four E3 speakers can be operated.

Switch 7 - REMOTE

An E-PAC's power (on/off) and error status can be monitored by connection to a Remote Interface Bridge, RIB. Detailed display of the local settings and status can be read when a RIB is used in conjunction with a PC running ROPE control software.

Selecting the E-PAC REMOTE switch enables a RIB to control the E-PAC configuration and power status. The RIB/ROPE combination can be used to disable the E-PAC from local control, and allow remote setting of DIP Switches 1-6, DIP Switch 8 and the associated delay function, level control and the Mute/Standby switch.

IMPORTANT!

If the link to a RIB is disconnected with the REMOTE switch selected, the E-PAC will switch off.

Switch 8 - DELAY ON

The E-PAC Version 2 has a programmable internal delay function for setting delay times up to 170 ms. The step widths are in units of 0.1 ms and are set using the RIB in conjunction with a PC running ROPE control software. To programme the delay time switch 8, DELAY ON, is selected. This can be either manually or, when local operation is disabled, via the ROPE control software.

Any delay programmed into an E-PAC will be retained in the internal memory after the link to the RIB is disconnected. This enables a delay time for a particular application to be pre-programmed into the memory of an E-PAC and accessed by simply selecting the DELAY ON switch. To override the delay, switch 8 is deselected.

In the standard operational mode with no internal delay selected, all versions of the E-PAC introduce a processing delay of 0.7 ms into the signal path.

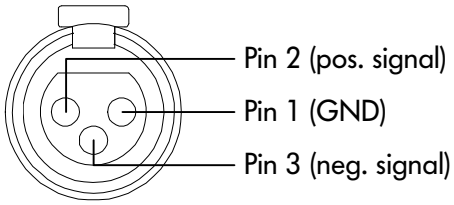
IMPORTANT!

If the E-PAC is operated without remote control and it has not been pre-programmed with a delay time for a specific application, the delay function should be disabled by deselecting DIP switch 8 on the rear panel.

2.10. Connections

INPUT and INPUT LINK

The E-PAC signal input connector is a 3 pin female XLR. Below and wired in parallel is a 3 pin male XLR input link connector used to feed the input signal on to the next device in the system signal chain.



Pin assignments on E-PAC signal inputs

MIX IN

A 3 pin female XLR connector provides a MIX IN input. A second signal fed to this input is summed to the main INPUT. If Left and Right components of a stereo source are fed to the main INPUT and MIX IN connections then a mono sum signal is derived from the speaker output. Please note that the resultant output is 3 dB higher.

The output on the INPUT LINK connector is derived from the signal fed to the INPUT connector. An additional signal fed to the MIX IN connector will not appear at the INPUT LINK output.

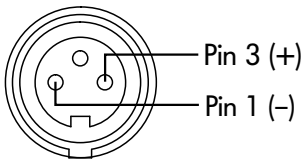
SPEAKER OUT

The E-PAC is fitted with a single Speakon-NL4 speaker output connector. With configuration settings which transmit full-range signal (e.g. E3 or LINEAR) all four pins on the Speakon connector are driven, pins 1+ and 2+ carry positive signal, 1– and 2– carry negative signal. With SUB configurations selected pin 1+ is disconnected automatically. This prevents mid-high cabinets from accidental damage by subwoofer signal.

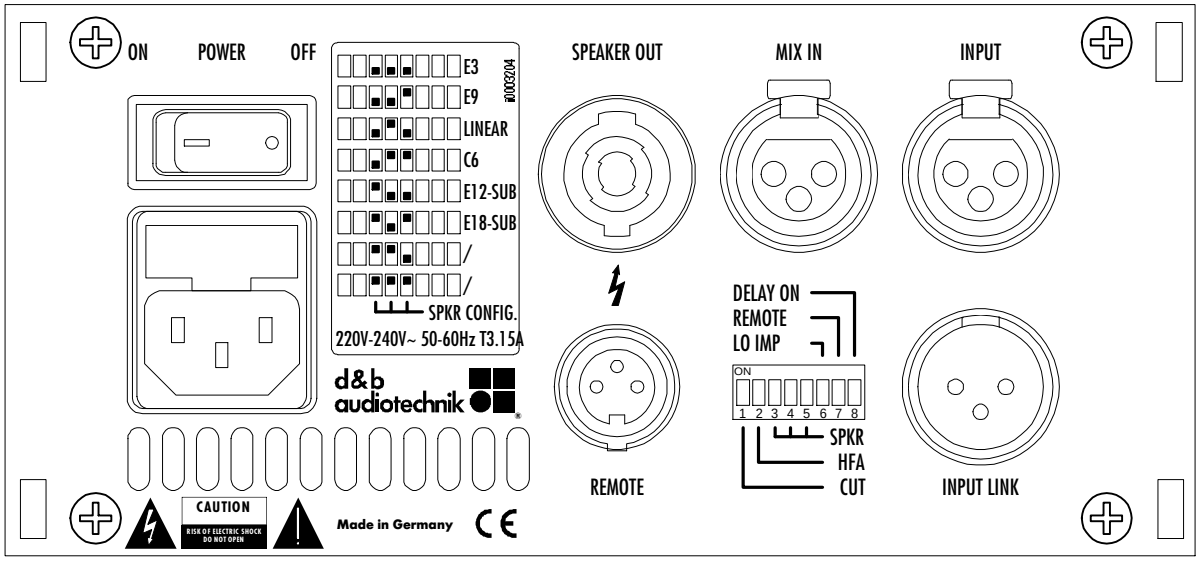
REMOTE

The E-PAC is fitted with a two-wire serial remote control interface. The 3 pin female DIN remote control connector is located beneath the speaker output. The connector is opto-coupled.

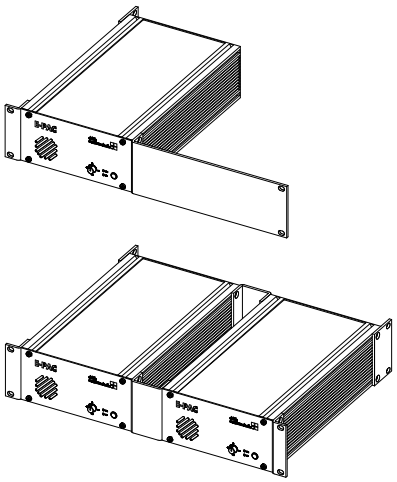
The remote functions are detailed in section 2.5. (Remote control and monitoring).



Pin assignment for remote control



E-PAC rear panel with connectors



E-PACs with single/dual rack mount kit

2.11. Installation

A single E-PAC, or a pair side by side, may be installed in a standard 19" equipment rack or flightcase. E-PACs require two rack units and, including connectors, a minimum rack depth of 40 cm (15.7 "), mounting ridge to rack rear panel.

The single rack mount kit (Z2501) allows one E-PAC to be mounted either to the left or the right hand side. It includes the following parts:

- 1 front blanking panel (5)
- 1 front rack mounting bracket (2)
- 1 rear mounted rack ear (3)
- 4 mounting rails (1)
- Allen screws (S), Allen (Hex) srew

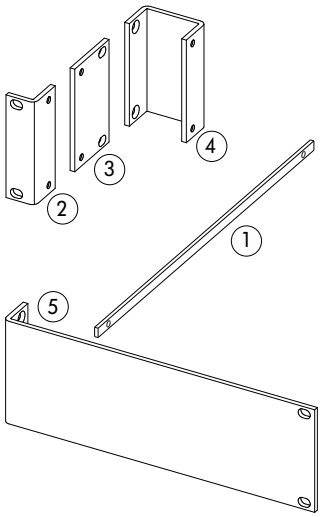
The dual rack mount kit (Z2502) includes the following parts:

- 2 front rack mounting brackets (2)
- 2 rear mounted rack ears (3)
- 2 connector brackets (4)
- 8 mounting rails (1)
- Allen screws (S), Allen (Hex) srew

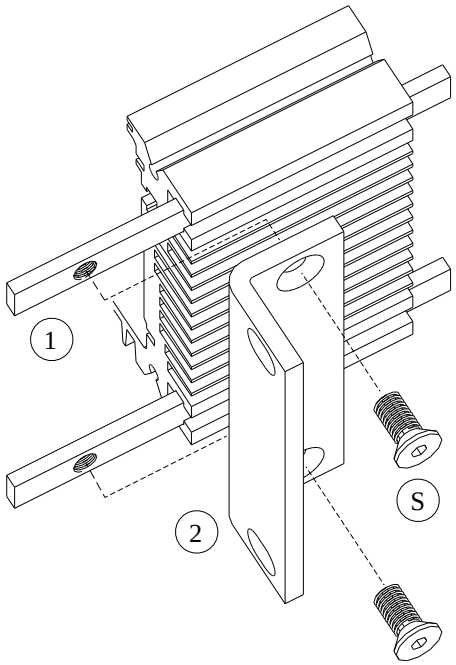
The mounting rails are inserted into channels located in the side walls of the E-PAC aluminum enclosure. The different fittings are attached using countersunk Allen screws.

IMPORTANT!

It is recommended that additional support be provided within the rack by using the rear mounted rack ears. This is particularly important if E-PACs are being racked for road use.



Rack mount kit parts



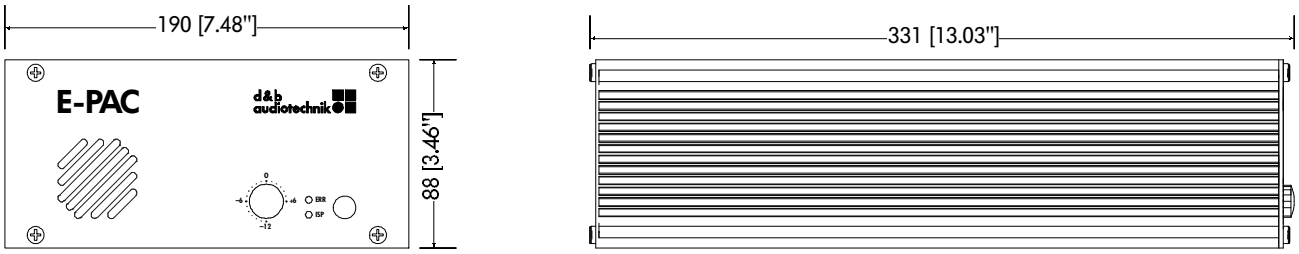
Attachment of brackets and rack ears

The E-PAC enclosure can get hot during operation, therefore allow an air gap of at least 2 cm (3/4") between an E-PAC and the rack top/bottom panels, or other equipment above or below. This is not necessary between adjacent E-PACs.

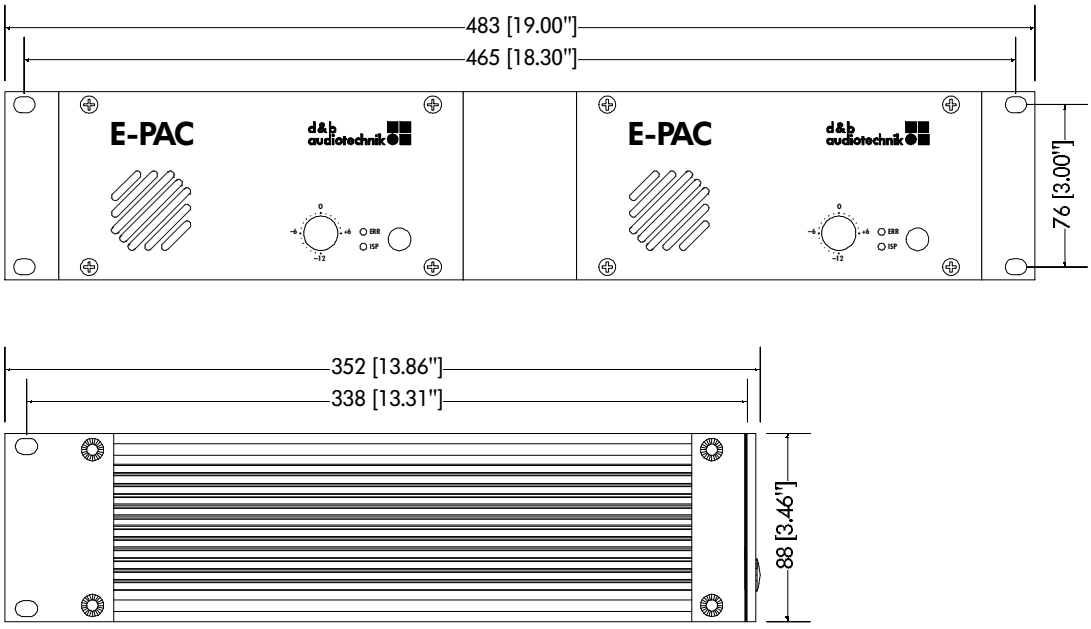
When installing E-PACs always allow sufficient free air flow around the enclosure and never block or cover the rear panel air intake vent or the front panel air outlet vent. If E-PACs are to be installed in sealed equipment racks, then additional fan modules will be needed. The E-PAC air intake is at its rear panel; therefore external fans should supply air to the inside of the rack.

IMPORTANT!

2.12. Dimensions



E-PAC enclosure dimensions in mm [inch]



E-PAC enclosure dimensions with rack mount kit in mm [inch]

2.13. Power consumption and power loss

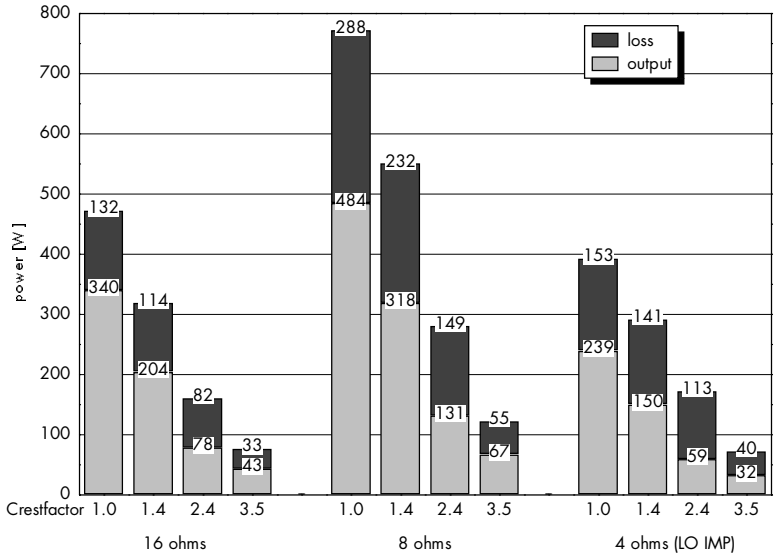
The power required from the mains supply and the waste heat produced by the amplifiers power loss are variable figures depending on the load impedance and the signal levels and characteristics (e.g. speech, music).

In practice, the theoretical peak power consumption of a system will only be sustained for a short period of time. Basing mains current and air conditioning plant requirements on the peak power consumption of the sound system would result in a generously over-specified installation. The key factor in power consumption calculations is the crest factor of the signal - the ratio of peak to sustainable RMS voltage of the signal.

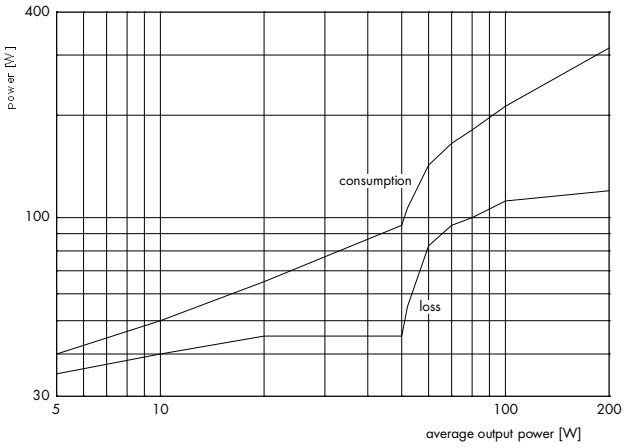
Power input and electrical (⇒ thermal) power loss for different signal and load conditions can be derived from the graphs shown below.

Signal waveform	Crest factor
Square wave	1
Sine wave	1.4
Pink noise, compressed music	3.5
Music with medium dynamic range	5
Speech, music with wide dynamic range	8

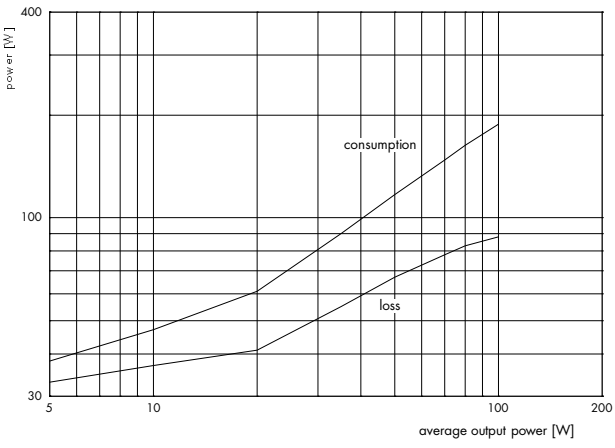
Examples of Crest factors



Maximum output power and power loss of E-PAC for different signal characteristics (Crest factors) at full level.



Power consumption and loss of E-PAC as a factor of output power (W RMS into 16 ohms) with sine wave signal



Average power consumption and loss of E-PAC as a factor of output power (W RMS into 16 ohms) with pink noise signal

2.14. REMOTE addressing

The basic structure of the E-PAC object addresses in the d&b RIB is identical to the A1 (LO channel) or P1200A (channel A) addresses.

Compared with Version 1, the E-PAC Version 2 has an extended functionality (programmable delay and additional system configurations).

All Version 1 functions and object addresses are retained unchanged on Version 2. Thus an E-PAC Version 2 can be operated with a RIB/ROPE control, which was set up for E-PAC Version 1.

Address	Read/ Write	Object	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	RD	Status Base Device		Gnrl-Error	SW-Rem	LockCmd	LockMode	PWR Ok	PWR On
0	WR	Status Base Device				LockCmd			PWR On
1	RD/WR	Switch Settings 2							DELAY ON
2	RD/WR	Potentiometer	Attenuation in steps of 0.5dB, 7-bit coded (0=+6dB, 127=–57.5dB)						
3	RD/WR	Switch Settings 1	MUTE	Switch 5	LO IMP	Switch 4	Switch 3	HFA	CUT
6	RD/WR	Delay time coarse	Delay in steps of 10 ms, 7-bit coded (max. 17 = 170 ms)						
7	RD/WR	Delay time fine	Delay in steps of 0.1 ms, 7-bit coded (max. 127 =12.7 ms)						
8	RD	Errors Base Device		Tmp Error	Tmp Warn		AMP Protect		AMP Error
10	RD	Output Signal							Present
12	RD	LED's Controller	ISP	GR	OVL				
13	RD	Headroom/GainRed	0..63:Headroom, 64..127:GainRed, 7-bit coded (0=32dB Hdrm, 64=0dB, 127=31.5dB GR)						

E-PAC (V02) object addresses for remote operation with the d&b RIB

2.15. Technical specifications

Nominal output power.....1 x 200 watts - 16 ohms
(THD < 0.1%, sine wave).....1 x 300 watts - 8 ohms
LO IMP setting .....1 x 150 watts - 4 ohms
Frequency response (–1 dB).....20 Hz ... 20 kHz
Distortion (THD+N).....< 0.05 %
from 1 W to rated output power, 20 Hz ... 20 kHz
Intermodulation distortion (SMPTE)..... < 0.05 %
from 1 W to rated output power
Residual noise..... > 98 dB
below rated output power, 22 Hz ... 22 kHz, unweighted, RMS, 0 dB input gain
Slew rate.....50V/uS
Damping factor at loudspeaker output..... > 100
1 kHz, 16 ohms load
Max. output current .....±15A peak
Input common mode rejection.....> 50 dB at 50 Hz
Max. input level.....+18 dBu
Sum of signals on INPUT and MIX IN

Digital signal processing

Sampling rate.....46.9 kHz
Resolution.....24 bit
Processing delay.....0.7 ms
Maximum delay setting.....170 ms

Protection circuits

Mains inrush current limiter.....< 10 A
Over temperature heat sink/transformer..... 80°C / 130°C
Output overload..... SOA Watchdog

Connections

INPUT.....XLR 3-pin female
Pin assignments..... 1 = GND, 2 = pos. signal input, 3 = neg. signal input
Input impedance.....44 kohms
INPUT LINK.....XLR 3-pin male
parallel to input
MIX IN.....XLR 3-pin female
Input impedance.....44 kohms
SPEAKER OUT Speakon-NL4
Pin assignments for full range speakers.....1+ / 1–, 2+ / 2–
Pin assignments for subwoofers.....2+ / 2–
REMOTE.....DIN, 3-pin, 1 = –, 2 = n.c., 3 = +

General

Height x width x depth ..... 2 rack unit x 190 mm (7.5") x 331 mm (13")
Weight..... 6.9 kg (15.2 lbs)
Mains voltage (min/nominal/max) ..... 195 /230 /265 V / 50 - 60 Hz
.....(115 V version: 98 / 115 / 132 V / 50 - 60 Hz)
.....(100 V version: 85 / 100 / 115 V / 50 - 60 Hz)
Fuse ..... 3.15 A Time Lag (T)
.....(100 V and 115 V versions: 5 A Time Lag (T))

3. Loudspeaker systems

On the following pages you will find data sheets for the d&b systems which can be operated with the E-PAC. The data sheets contain information about the loudspeakers and operation with their respective E-PAC and P1200 controller settings.

E3

E9

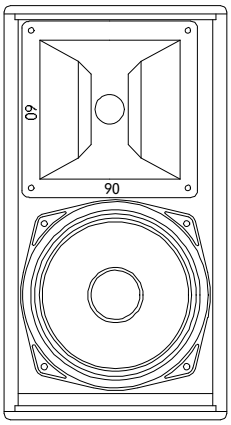
C6 / C690

MAX

E12-SUB

E18-SUB

E3



The E3 cabinet is a full range, two way bass-reflex enclosure. Fitted with a single 6.5" LF driver passively connected to a 1" HF compression driver coupled to a constant directivity horn with a 90° x 60° dispersion. Illustrated in the drawing on the left is an E3 with the standard 90° horizontal horn configuration. The horn can be rotated through 90° for a reversed 60° x 90° (h x v) dispersion.

The E3 cabinet is constructed from marine plywood with an impact resistant paint finish. The front of the loudspeaker cabinet is fitted with a rigid metal grill covered with a replaceable acoustically transparent foam. A connector plate with two parallel wired Speakon connectors, which can be swapped between the rear and side of the cabinet, together with pairs of M8 threaded inserts for mounting brackets on each panel allow the E3 to be mounted in almost any position.

The outstanding feature of the E3 is its neutral sound balance coupled with an extraordinarily high output capability for a cabinet of such a size. The E3 frequency response covers a 80 Hz to 17 kHz band making it extremely versatile and ideal for use in near field, delay, effects, ultra compact monitor and miniature array systems. Used with an auxiliary subwoofer system, the E3 can also easily reproduce high level music programs. Suitable subwoofers are E12-SUB, E18-SUB or C7-SUB.

With an asymmetrical cabinet design and an extensive range of mounting and rigging accessories (please refer to the E-Series brochure) E3 cabinets can be mounted or flown almost anywhere and used in pairs to create 120° or 180° horizontal arrays.

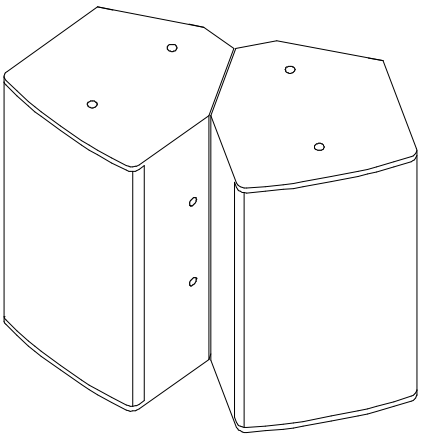
CAUTION!

Only operate E3 loudspeakers with a d&b P1200A mainframe fitted with E3 controller modules or a d&b E-PAC in E3 configuration, otherwise there is a risk of damaging the loudspeaker components.

Altering the HF horn dispersion

The E3 HF horn has a square flange allowing it to rotate through 90°. Two dispersion angles, 90° and 60°, are engraved on the flange, the value on the horizontal edge indicates the loudspeakers horizontal dispersion angle.

To change the horn dispersion, first remove the front grill by undoing the Allen screws (M4x25 mm) at the top and bottom of the grill using a 2.5 mm Allen key. Using a 3 mm Allen key, undo the 4 Allen screws (M4x25 mm) which hold the horn in place. The horn can then be rotated through 90°, refastened and the front grill replaced.



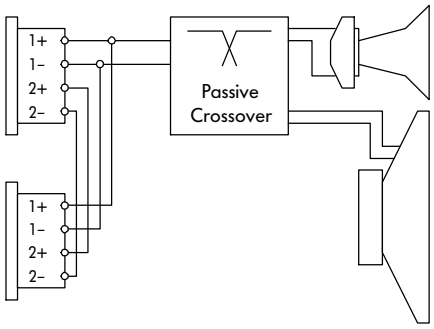
E3 array, 120° coverage

Connections

The E3 cabinet is fitted with a pair of Speakon-NL4 connectors. All four pins of both connectors are wired in parallel. The E3 uses the pin assignments 1+/1–. Pins 2+/2– are designated to active d&b subwoofers. Using one connector as the input, the second connector allows for direct connection to additional loudspeakers.

The connector plate is fitted to the E3 rear panel. Next to it, on the left hand side panel, is a metal blank plate with the cabinet details and serial number. The connector and blank plates can be swapped over to allow mounting brackets to be fitted to the back panel of the cabinet or to allow it to be placed on its back as a stage monitor.

The plates are removed by undoing the four 2.5 mm hex head screws securing each panel. The connector wiring is disconnected in order to swap the panels. Make sure when reconnecting the wiring that the red wire goes to pin 1+ and the black wire to pin 1– on the Speakon connector board.



Connector wiring

IMPORTANT!

Operation with P1200A

Up to four E3 loudspeakers can be driven by each P1200A power amplifier channel. Fitting one E3-CO and one subwoofer controller module allows a single mainframe to drive four E3 and two active subwoofer cabinets (E18-SUB or C7-SUB). All cabinets can be linked together locally and fed by a single four-wire cable from either mainframe output connector.

E3 controller module switches

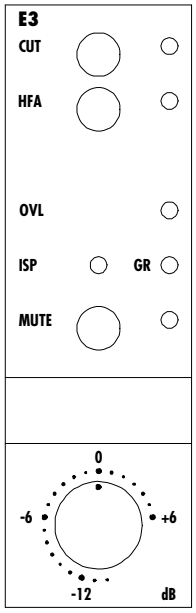
CUT switch and indicator

Set to CUT, a high pass filter with a 110 Hz cut-off frequency is inserted in the controller signal path. The yellow CUT LED illuminates. The E3 system is now configured for use with d&b C or E-Series active subwoofers.

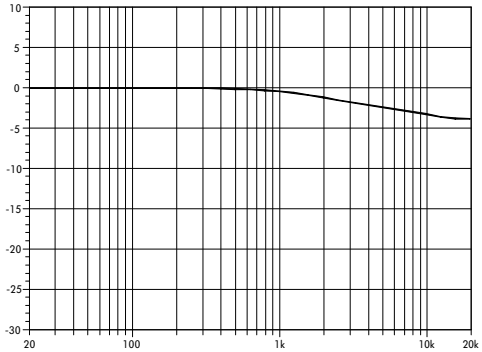
HFA switch and indicator

In HFA mode (High Frequency Attenuation), the HF response of the E3 system is rolled off. The yellow HFA LED illuminates. The HFA circuit configures the E3 loudspeakers to provide a natural, balanced frequency response when a unit is placed close to listeners in near field or delay use.

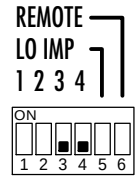
High Frequency Attenuation begins gradually at 1 kHz, dropping by approximately 3 dB at 10 kHz. This roll off mimics the decline in frequency response experienced when listening to a system from a distance in a typically reverberant room or auditorium.

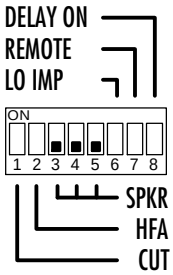


Controls on E3 controller module



Frequency response correction of HFA circuit





E-PAC version 1 **E-PAC version 2**

E-PAC Configuration for E3

Operation with E-PAC

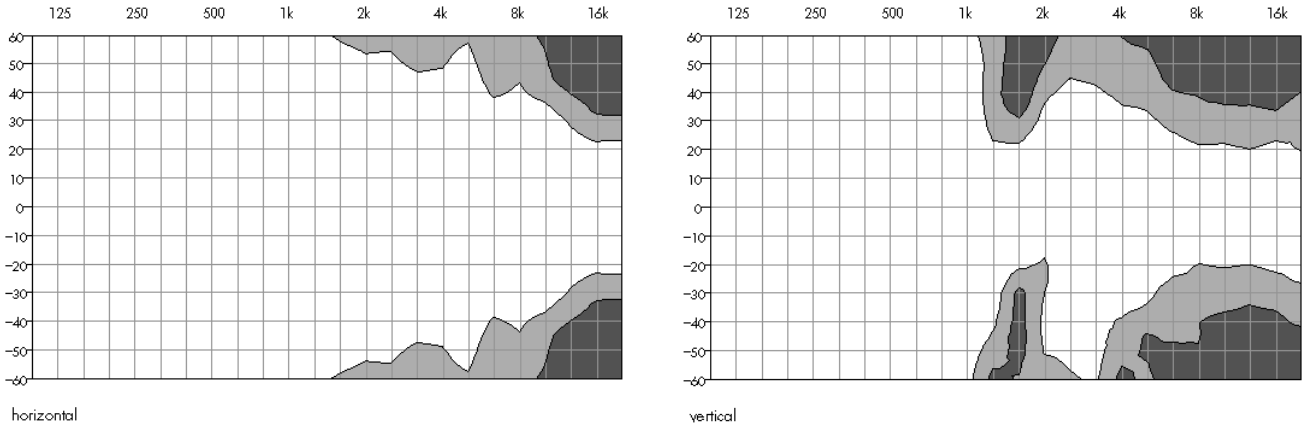
To drive E3 cabinets the E-PAC has to be configured to E3 mode by setting the appropriate DIP switches on the rear panel.

The E-PAC can drive up to two E3 cabinets at full output power. The rear panel LO IMP switch configures the E-PAC to drive a maximum of four E3 loudspeakers with a 6 dB reduction of input level to the speakers.

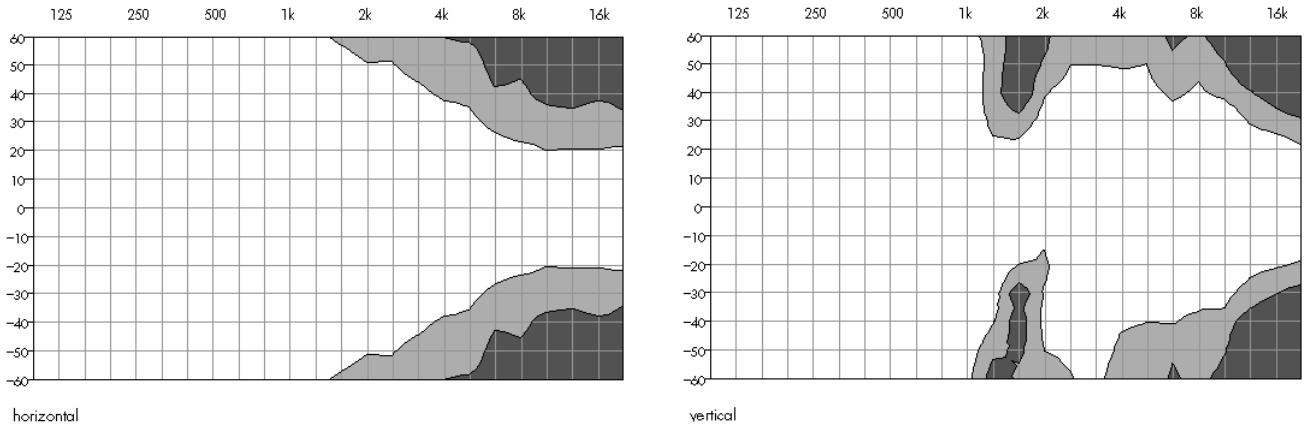
DIP switches 1 and 2 respectively allow CUT and HFA settings to be selected. The individual characteristics of these functions are explained on the previious page under the section "E3 controller module switches".

Dispersion characteristics

The diagrams below show dispersion angle vs frequency plotted using lines of equal sound pressure (isobars) at -6 dB and -12 dB.



E3 isobar diagram, configuration 90° horizontal (standard)



E3 isobar diagram, configuration 90° vertical

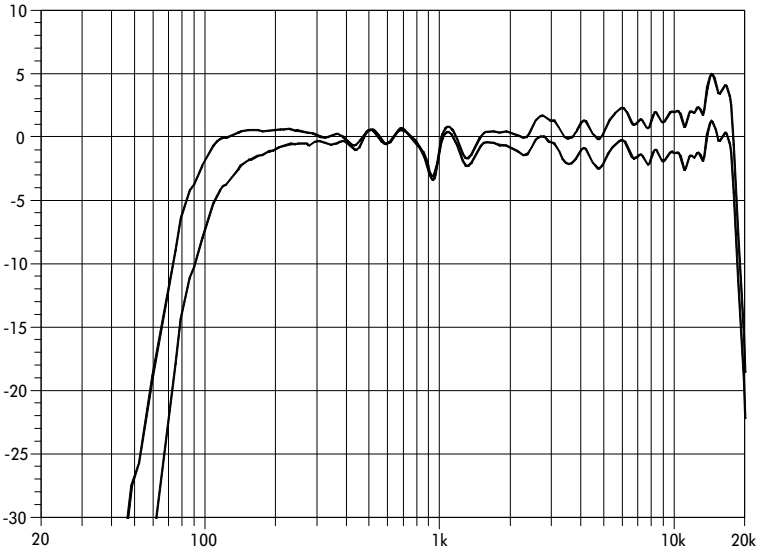
Technical specifications

E3 system data

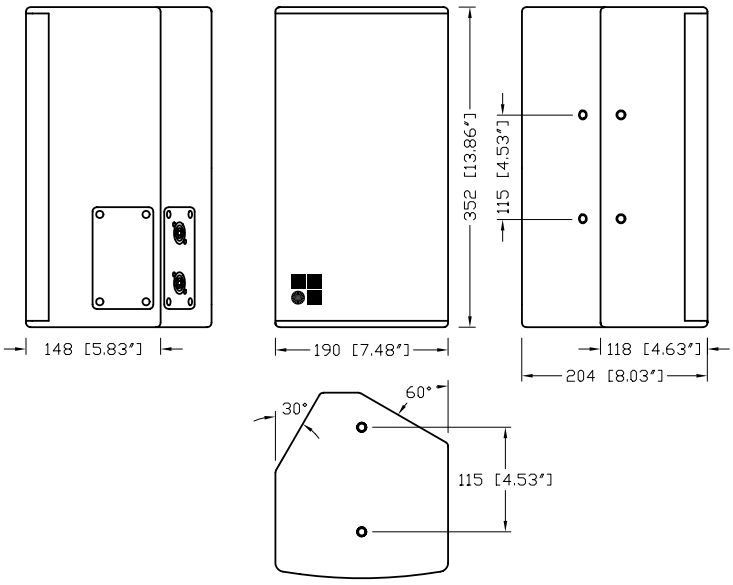
Frequency response (–5 dB) ..... 80 Hz ... 18 kHz
Max. sound pressure (1 m, free field) ..... 122 dB
(SPLmax peak, pink noise test signal with crest factor of 4)
Input level (SPLmax) ..... +9 dBu
Input level (100 dB-SPL / 1 m) ..... –10 dBu
Polarity to controller INPUT (XLR pin 2: + / 3: –) ..... LF: + / HF: –

E3 loudspeaker

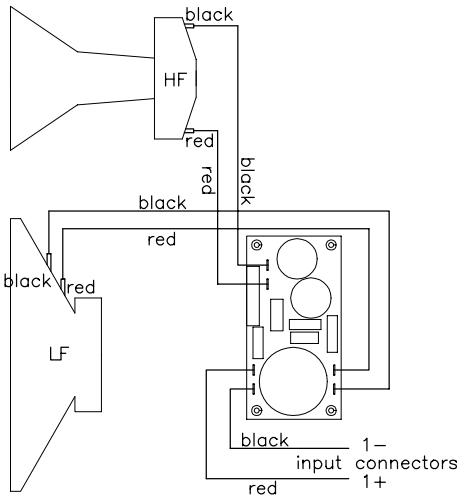
Nominal impedance ..... 16 ohms
Power handling capacity (RMS / peak 10 ms) ..... 120 / 480 W
Nominal dispersion angle (hor. x vert.) ..... 90° x 60°
..... (rotatable through 60° x 90°)
Connections ..... 2 x Speakon-NL4
Pin assignments ..... 1+ / 1–
Weight ..... 7.2 kg (16 lbs)



E3 frequency response, standard, CUT and HFA switch settings

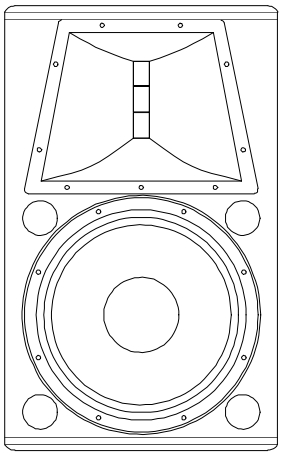


E3 cabinet dimensions in mm [inch]



E3 wiring diagram

E9



The E9 cabinet is a full range, two way bass-reflex enclosure fitted with a single 12" LF driver passively connected to a 2" HF compression driver coupled to a vertically asymmetrical 90° x 50° CD horn. The asymmetry of the HF horn means that the E9 has a vertical coverage pattern with a downward tilt. The actual vertical dispersion is 20° above and 30° below the cabinet axis.

The E9 cabinet is constructed from marine plywood and has an impact resistant paint finish. The front of the loudspeaker cabinet is fitted with a rigid metal grill covered with a replaceable acoustically transparent foam. The cabinet top plate has an integral handle and four M10 threaded inserts for mounting brackets and rigging. The L shaped metal plate at the bottom of the cabinet also incorporates a handle, four M10 threaded inserts, a socket to accept a loudspeaker stand and, on the rear panel, two parallel wired Speakon-NL4 or EP-5 connectors.

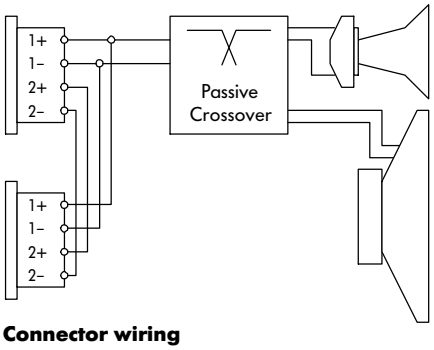
The E9 frequency response is truly full range covering a 50 Hz to 17 kHz band - even without an additional subwoofer, this is quite sufficient for many applications. The wide horizontal and asymmetric vertical dispersion makes the E9 especially suitable for close coverage applications up to 15 m (50 ft) where it can be deployed to best advantage mounted on a high stand.

The E9 can also be used as a stage monitor by simply placing the cabinet rear side down on stage (baffle angle 45°).

Within a larger system E9s are ideal as delays and for close, wide coverage work. The precisely angled rear side panels of the cabinet allow E9 cabinets to be simply placed side by side forming an array with accurate 90° horizontal coverage per loudspeaker. To simplify array construction an extensive range of mounting and rigging accessories are available - please refer to the E-Series brochure.

The E9 system can be used with the d&b active subwoofer systems E12-SUB, E18-SUB or C7-SUB. When operated with the P1200A mainframe the E9 may also be combined with the E15-BX passive bass extension.

Only operate E9 loudspeakers with a d&b P1200A mainframe fitted with E9 controller modules or a d&b E-PAC (version 2) in E9 configuration, otherwise there is a risk of damaging the loudspeaker components.



Connector wiring

CAUTION!

Connections

The E9 cabinet is fitted with a pair of Speakon-NL4 connectors. All four pins of both connectors are wired in parallel. The E9 uses the pin assignments 1+/1–. Pins 2+/2– are designated to C and E-Series active subwoofers. Using one connector as the input, the second connector allows for direct connection to additional loudspeakers.

The E9 can be supplied with EP-5 output connectors as an option. Pin equivalents of Speakon-NL4 and EP-5 connectors are listed in the table on the left.

EP-5	1	2	3	4	5
NL4	1+	1–	2+	2–	n.c.

Speakon- NL4 and EP-5 pin assignments

Operation with P1200A

Up to two E9 loudspeakers can be driven by each P1200A power amplifier channel. Fitting one E9-CO and one subwoofer controller module allows a single mainframe to drive two E9 and two active subwoofer cabinets (E18-SUB or C7-SUB). All cabinets can be linked together locally and fed by a single four-wire cable from either mainframe output connector.

The E9 can also be used with the E15-BX bass extension cabinet. The E15-BX cabinet is equipped with a passive crossover network and simply connects in parallel with the E9 cabinet without the need for any additional control electronics. One E9 and one E15-BX cabinet can be driven by each P1200A output channel.

E9 controller module switches

Standard setting

If the CUT switch and BX switch are not selected the module is configured for use with E9 loudspeakers when used as a stand alone system without subwoofers.

CUT switch and indicator

Set to CUT, a high pass filter with a 110 Hz cut-off frequency is inserted in the controller signal path. The yellow CUT LED illuminates. The E9 system is now configured for use with d&b C or E-Series active subwoofers.

BX switch and indicator

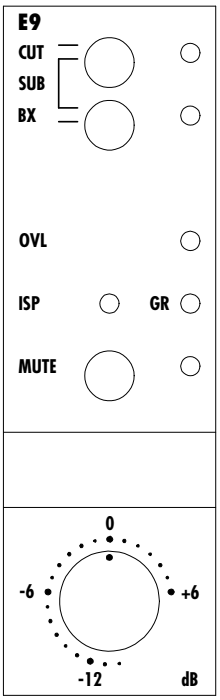
When the E9 is used with the passive E15-BX subwoofer, i.e. E9 and E15-BX are linked to the same amplifier output, the BX switch should be selected. The LF level - boosted by the bass extension cabinet - is then attenuated by 3 dB, thereby increasing headroom at bass frequencies.

When E9 loudspeakers are deployed as stage monitors selecting the BX switch reduces the low frequency energy gained from the coupling effect of floor placement.

SUB (CUT and BX both selected)

Selecting the CUT and BX switches activates a lowpass filter. The module now transmits frequencies from 50 to 110 Hz only, allowing the d&b E15-BX to be driven as an active subwoofer.

The E9-CO drives Speakon pins 1+/1– (EP-5: 1/2). Therefore the SUB setting is not suitable to drive d&b C/E-Series active subwoofer cabinets.



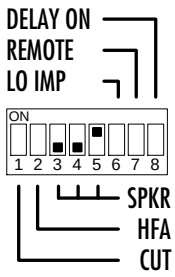
Controls on E9 controller module

IMPORTANT!

Operation with E-PAC

To drive E9 cabinets the E-PAC has to be configured to E9 mode by setting the appropriate DIP switches on the rear panel (only possible with E-PAC version 2).

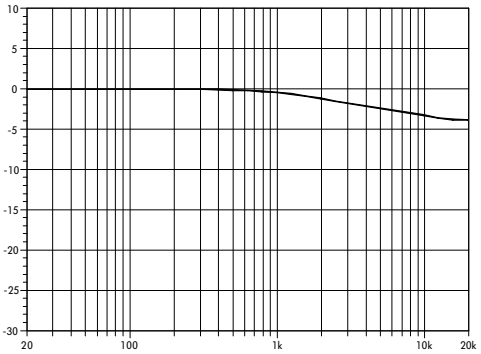
The E-PAC can drive a single E9 cabinet at an output power of 300 watts. The rear panel LO IMP switch configures the E-PAC to drive two E9 cabinets with a 6 dB reduction of input level to the speakers.



E-PAC Configuration for E9 (E-PAC version 2)

DIP switches 1 and 2 respectively allow CUT and HFA settings to be selected. The characteristics of the CUT setting are explained on the previious page under the section "E9 controller module switches".

The functions BX and SUB are not available with the E-PAC controller.



Frequency response correction of HFA circuit (only available with E-PAC)

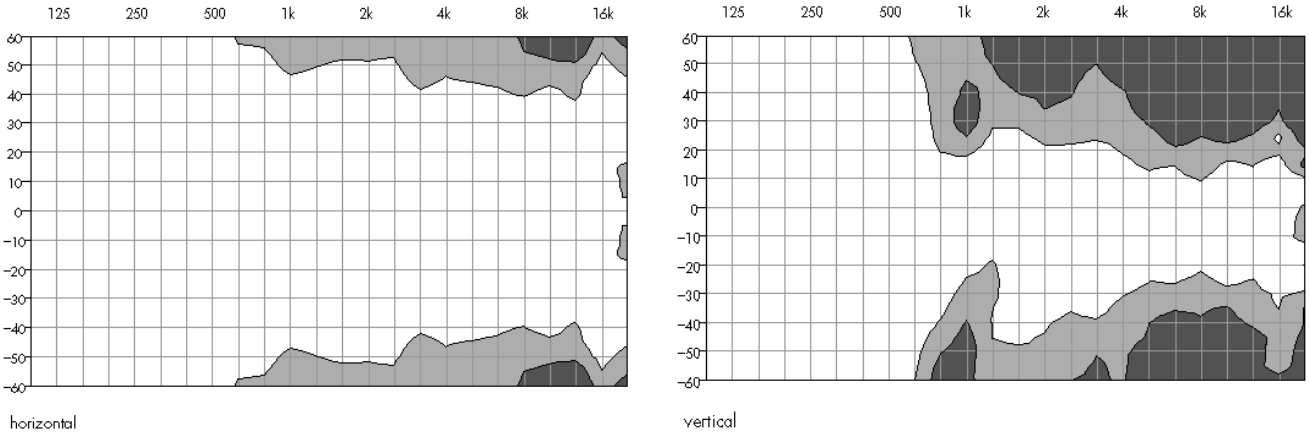
HFA setting

In HFA mode (High Frequency Attenuation), the HF response of the E9 system is rolled off. The HFA circuit configures the E9 loudspeakers to provide a natural, balanced frequency response when a unit is placed close to listeners in near field or delay use.

High Frequency Attenuation begins gradually at 1 kHz, dropping by approximately 3 dB at 10 kHz. This roll-off mimics the decline in frequency response experienced when listening to a system from a distance in a typically reverberant room or auditorium.

Dispersion characteristics

The diagrams below show dispersion angle vs frequency plotted using lines of equal sound pressure (isobars) at -6 dB and -12 dB. The nominal 90° horizontal dispersion is maintained from 20 kHz down to 900 Hz.



E9 isobar diagram

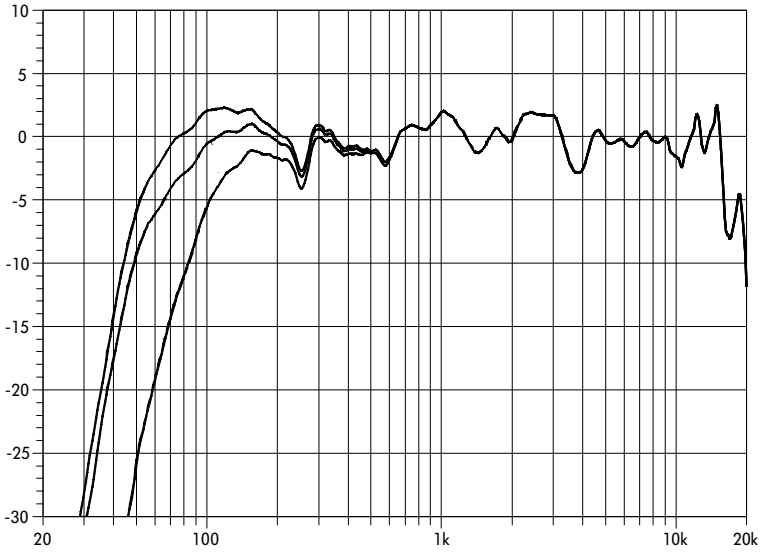
Technical specifications

E9 system data

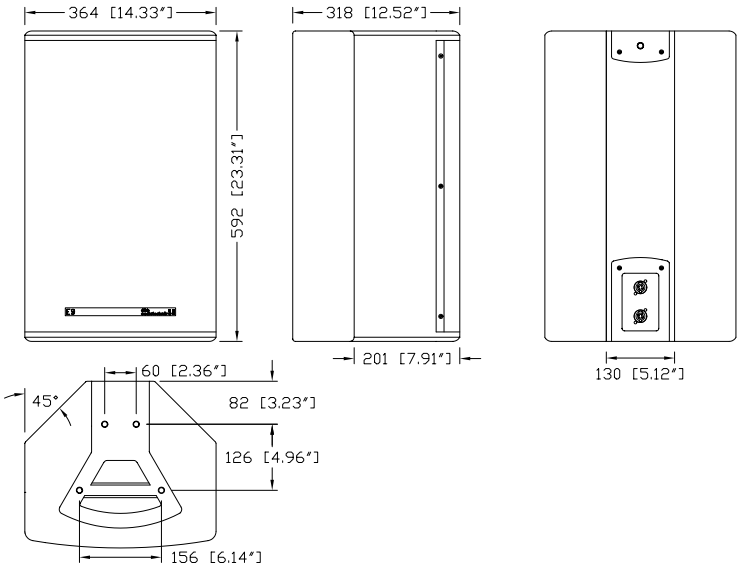
Frequency response (–5 dB) ..... 50 Hz ... 17 kHz
Max. sound pressure (1 m, free field) with P1200A ..... 128 dB
Max. sound pressure (1 m, free field) with E-PAC ..... 126 dB
(SPLmax peak, pink noise test signal with crest factor of 4)
Input level (SPLmax) ..... +12 dBu
Input level (100 dB-SPL / 1 m) ..... –13 dBu
Polarity to controller INPUT (XLR pin 2: + / 3: –) ..... LF: + / HF: –

E9 loudspeaker

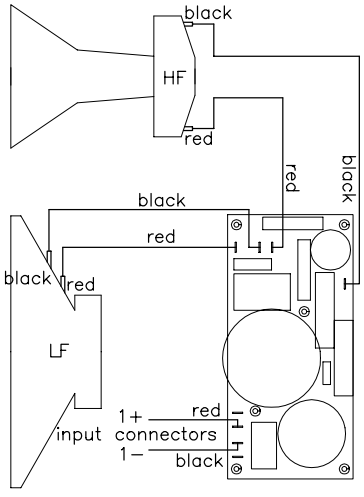
Nominal impedance ..... 8 ohms
Power handling capacity (RMS / peak 10 ms) ..... 200 / 800 W
Nominal dispersion angle ..... horizontal 90°, vertical +20° / –30°
Connections ..... 2 x Speakon-NL4
..... (optional 2 x EP-5)
Pin assignments ..... 1+ / 1–
..... (EP-5: 1 / 2)
Weight ..... 26 kg (57 lbs)



E9 frequency response, standard, BX and CUT switch settings

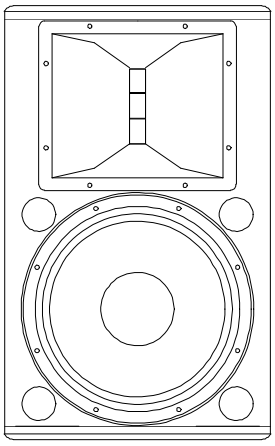


E9 cabinet dimensions in mm [inch]



E9 wiring diagram

C6



The C6 cabinet is a full range, two way bass-reflex enclosure fitted with a 12" LF driver passively connected to a 2" HF compression driver which is coupled to a 60° x 40° CD horn.

The C6 cabinet is constructed from marine plywood and has an impact resistant paint finish. The front of the loudspeaker cabinet is fitted with a rigid metal grill covered with a replaceable acoustically transparent foam. The cabinet top plate has an integral handle and four M10 threaded inserts for mounting brackets and rigging. The L shaped metal plate at the bottom of the cabinet also incorporates a handle, four M10 threaded inserts, a socket to accept a loudspeaker stand and, on the rear panel, two parallel wired Speakon-NL4 or EP-5 connectors.

The C6 frequency response covers a 70 Hz to 17 kHz band - quite sufficient for applications that don't require deep bass. However, for high level music reproduction, the C6 benefits from the bass extension and added power of active subwoofer systems E18-SUB, C4-SUB or C7-SUB.

The outstanding performance features of the C6 are its narrow dispersion angle and its very high output capability - these features are best used for audience coverage at distances to 20 m (65 ft) and beyond. Within a larger system C6 loudspeakers are ideal as high power delay systems and for high intelligibility speech reinforcement. The precisely angled rear side panels of the cabinet allow C6s to be simply placed side by side forming a powerful array with accurate 60° horizontal coverage per loudspeaker. To simplify array construction an extensive range of mounting and rigging accessories is available - please refer to the C6/C7 brochure.

CAUTION!

Only operate C6 loudspeakers with a d&b P1200A mainframe fitted with C6 controller modules or a d&b E-PAC (version 2) in C6 configuration, otherwise there is a risk of damaging the loudspeaker components.

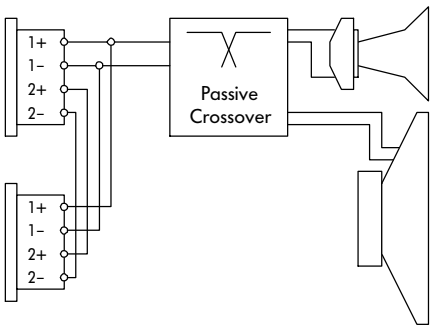
Version C690

The C690 has wider horizontal and vertical dispersion than the C6, the only difference being the 90° X 50° CD horn. C690 is driven by the same controller as the C6 and is suited to near field applications where wider coverage at high SPLs is required.

Connections

The C6 cabinet is fitted with a pair of Speakon-NL4 connectors. All four pins of both connectors are wired in parallel. The C6 uses the pin assignments 1+/1–. Pins 2+/2– are designated to C and E-Series active subwoofers. Using one connector as the input, the second connector allows for direct connection to additional loudspeakers.

The C6 can be supplied with EP-5 output connectors as an option. Pin equivalents of Speakon-NL4 and EP-5 connectors are listed in the table on the left.



Connector wiring

EP-5	1	2	3	4	5
NL4	1+	1–	2+	2–	n.c.

Speakon- NL4 and EP-5 pin assignments

Operation with P1200A

Up to two C6 loudspeakers can be driven by each P1200A power amplifier channel. Fitting one C6-CO and one subwoofer controller module allows a single mainframe to drive two C6 and two active subwoofer cabinets (E18-SUB, C4-SUB or C7-SUB). All cabinets can be linked together locally and fed by a single four-wire cable from either mainframe output connector.

C6 controller module switches

Standard setting

If the CUT switch and MON switch are not selected the module is configured for use with C6 loudspeakers used as a stand alone system without subwoofers.

CUT switch and indicator

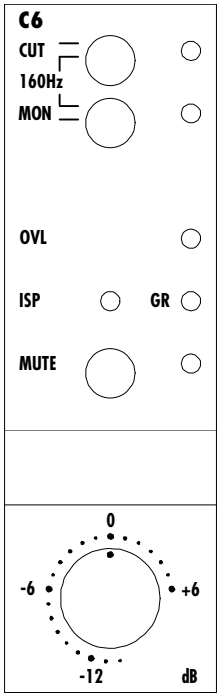
Set to CUT, a high pass filter with a 110 Hz cut-off frequency is inserted in the controller signal path. The yellow CUT LED illuminates. The C6 system is now configured for use with d&b C-Series active subwoofers.

MON switch and indicator

If the MON switch is selected the yellow MON LED illuminates and the low frequency level is reduced by 3 dB. This setting particularly applies to the C6-MON as this setting reduces the low frequency energy gained from the coupling effect of floor placement.

160Hz setting (CUT and MON switches both selected)

If the 160Hz mode is selected, a high pass filter is inserted in the controller signal path. The crossover frequency of 160 Hz is higher than in CUT mode and thus increases the available headroom in the C6 system. The 160Hz mode can be selected when the system is operated with d&b subwoofers C4-SUB, C7-SUB or E18-SUB (also in 160Hz mode, see manual section E18-SUB). This configuration is particularly useful when C6 loudspeakers are stacked directly on top of the subwoofer system.



Controls on C6 controller module

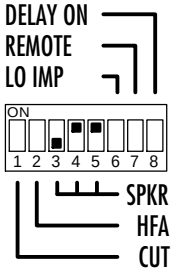
Operation with E-PAC

To drive C6 cabinets the E-PAC has to be configured to C6 mode by setting the appropriate DIP switches on the rear panel (only possible with E-PAC version 2).

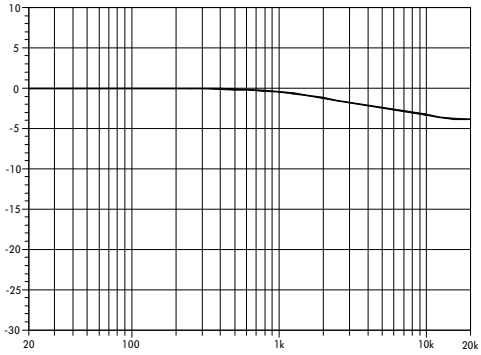
The E-PAC can drive a single C6 cabinet at an output power of 300 watts. The rear panel LO IMP switch configures the E-PAC to drive two C6 cabinets with a 6 dB reduction of input level to the speakers.

DIP switches 1 and 2 respectively allow CUT and HFA settings to be selected. The characteristics of the CUT setting are explained above under the section "C6 controller module switches".

The functions MON and 160Hz are not available with the E-PAC controller.



E-PAC Configuration for C6 (E-PAC version 2)



Frequency response correction of HFA circuit (only available with E-PAC)

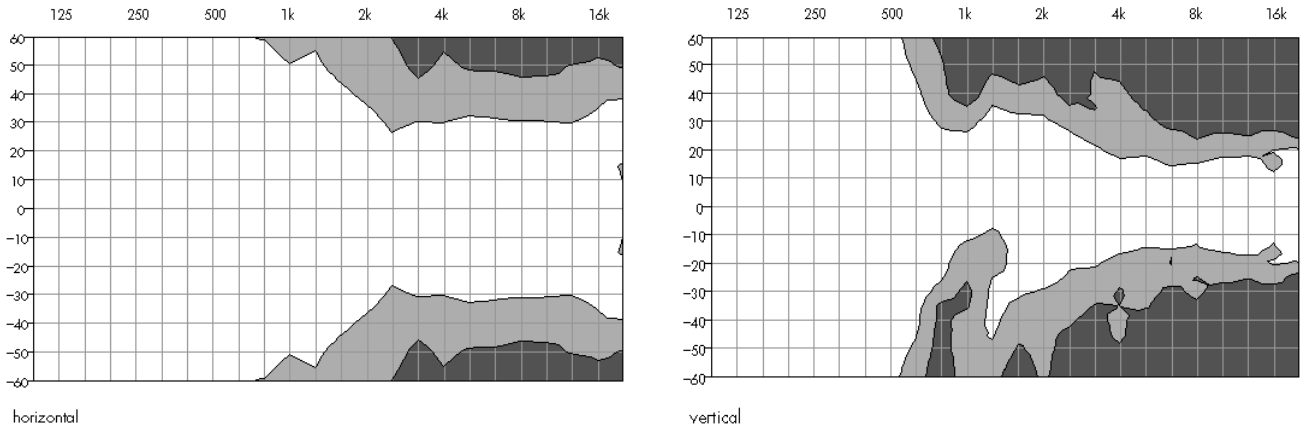
HFA setting

In HFA mode (High Frequency Attenuation), the HF response of the C6 system is rolled off. The HFA circuit configures the C6 loudspeakers to provide a natural, balanced frequency response when a unit is placed close to listeners in near field or delay use.

High Frequency Attenuation begins gradually at 1 kHz, dropping by approximately 3 dB at 10 kHz. This roll-off mimics the decline in frequency response experienced when listening to a system from a distance in a typically reverberant room or auditorium.

Dispersion characteristics

The diagrams below show dispersion angle vs frequency plotted using lines of equal sound pressure (isobars) at -6 dB and -12 dB. The nominal 60° horizontal dispersion is maintained from 20 kHz down to 2 kHz.



C6 Isobar diagram

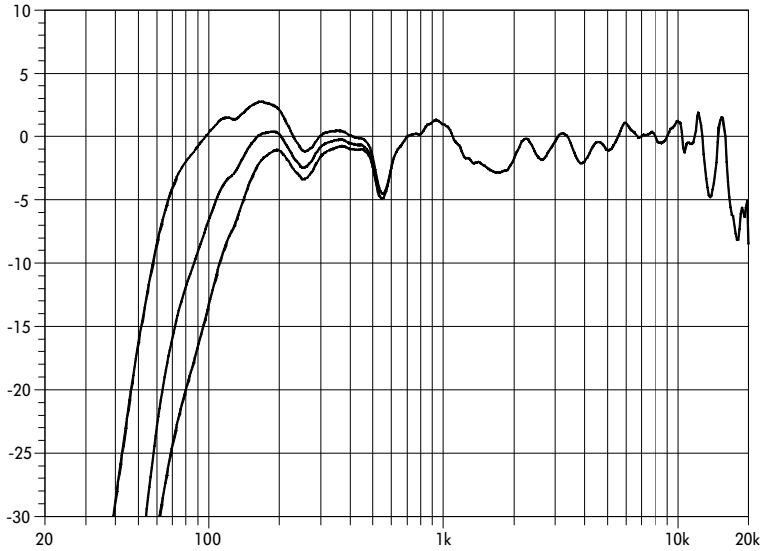
Technical specifications

C6 (C690) system data

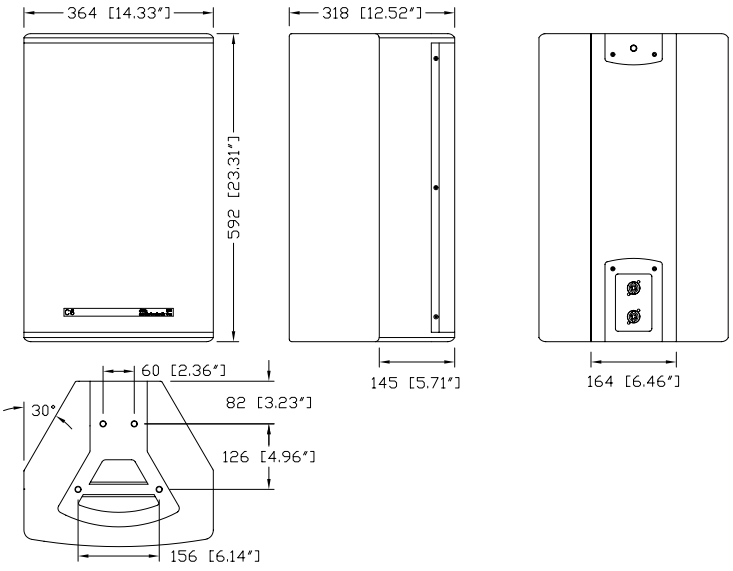
Frequency response (–5 dB) ..... 70 Hz ... 17 kHz
Max. sound pressure (1 m, free field) with P1200A ..... 133 (132) dB
Max. sound pressure (1 m, free field) with E-PAC ..... 131 (130) dB
(SPLmax peak, pink noise test signal with crest factor of 4)
Input level (SPLmax) ..... +16 dBu
Input level (100 dB-SPL / 1 m) ..... –14 (–13) dBu
Polarity to controller INPUT (XLR pin 2: + / 3: –) ..... LF: + / HF: –

C6 (C690) loudspeaker

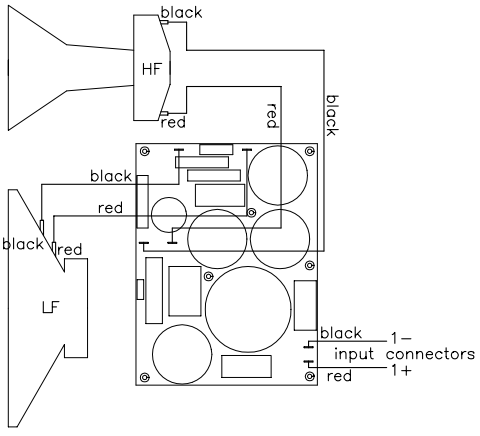
Nominal impedance ..... 8 ohms
Power handling capacity (RMS / peak 10 ms) ..... 200 / 800 W
Nominal dispersion angle (hor. x vert.) ..... 60° x 40° (90° x 50°)
Connections ..... 2 x Speakon-NL4
..... (optional 2 x EP-5)
Pin assignments ..... 1+ / 1–
..... (EP-5: 1 / 2)
Weight ..... 28 kg (62 lbs)



C6 frequency response, standard, CUT and 160Hz switch settings

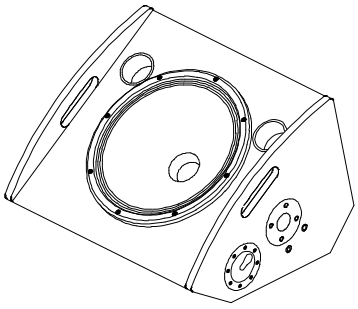


C6 cabinet dimensions mm [inch]



C6 wiring diagram

MAX



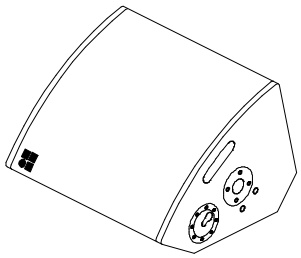
MAX is a 2-way floor monitor system and uses a 15"/2" coaxial driver combination with a passive crossover. The driver design allows the use of a compact, low height cabinet. MAX can be driven actively or passively.

Coaxially mounting the 2" HF and 15" LF drivers creates a very compact single driver whilst retaining the benefits of separate magnetic assemblies. The drivers are positioned together to utilise the combined shape and geometry of the LF cone and HF horn to create a single waveguide with a controlled, symmetrical, 60° conical dispersion.

The MAX cabinet is constructed from marine plywood and has an impact resistant paint finish. The front of the loudspeaker cabinet is fitted with a rigid metal grill covered with a replaceable acoustically transparent foam. A socket to accept a loudspeaker stand, a ratchet strap kelping bar and optional MAN CF4 studplates for flying complete the possible rigging options for MAX. Fitted on the rear panel are two parallel wired Speakon-NL4 or EP-5 connectors.

The MAX cabinet does not require special controller electronics. As a stage monitor MAX is preferably operated with the P1200A mainframe equipped with the ampMAX module. The ampMAX module can be configured for passive or 2-way active operation.

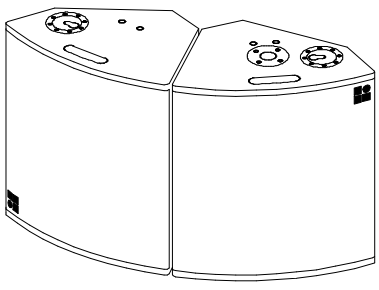
The negligible signal delay with this type of construction closely approximates the ideal acoustic point source. The result is a loudspeaker with remarkable vocal presence and clarity, a neutral, balanced sound, high feedback stability and a high sound pressure level capability. The frequency response covers a 85 Hz to 18 kHz band - sufficient for speech reinforcment and stage monitor use.



MAX as a stage monitor (baffle angle 35°)

MAX's angled side panels allow a choice of two set up angles when placed on stage (35° or 67°). Together with a comprehensive range of rigging hardware, the MAX cabinet allows fast and easy deployment, either as stage monitors or front of house in a main PA system. Viewed from the top, the angle between the MAX side panels is 45°. MAX cabinets can be deployed side by side to create semi-circular arrays, two cabinets result in an horizontal dispersion of 100° and three cabinets 145°.

For applications which require deep bass, the LF response can be extended by using additional active subwoofer systems C7-SUB or C4-SUB. MAX can also be combined with the E15-BX passive bass extension speaker (not recommended when MAX is driven with an E-PAC).



MAX as an array with 100° dispersion

MAX has been designed to match the dimensions of the C4 system cabinets. Fitted with optional MAN stud plates, MAX can be flown beneath a C4 system as downfills. To maintain the correct phase relationship MAX cabinets are used in passive mode when combined with C4 systems.

Only operate MAX loudspeakers with a d&b P1200A mainframe fitted with ampMAX or AMP-L controller modules or with an d&b E-PAC in linear configuration. As an alternative other high quality power amplifiers may be used, provided their output power does not exceed 500 watts into 8 ohms and an additional subsonic filter is used (25 Hz with 12 dB/octave minimum), otherwise there is a risk of damaging the loudspeaker components.

CAUTION!

Connections

The MAX cabinet is fitted with a pair of Speakon-NL4 connectors. All four pins of both connectors are wired in parallel. Using one connector as the input, the second connector allows for direct connection to additional loudspeakers.

MAX can be supplied with EP-5 output connectors as an option. Pin equivalents of Speakon-NL4 and EP-5 connectors are listed in the table on the right.

	LF+	LF–	HF+	HF–	n.c.
EP-5	1	2	3	4	5
NL4	1+	1–	2+	2–	n.c.

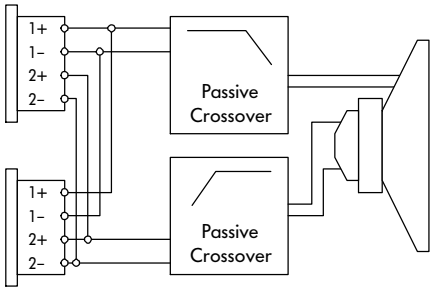
Four wire and two wire operation

To allow the choice of active or passive operation MAX cabinets are driven by a four core cable. The HF and LF drivers are each fed by their own pair of pins and separate passive crossovers. Pins assignments 1+/1– connect the LF driver, pins 2+/2– connect the HF driver, as illustrated on the right.

IMPORTANT!

For applications requiring dedicated passive use, the MAX cabinets internal wiring can be configured for connection to pins 1+/1– allowing use of a two core cable.

The passive two wire configuration is also used when MAX cabinets are combined with C-Series active subwoofers. Driven by a P1200A mainframe fitted with one AMP-L and one C-Series SUB controller module the cabinets can be fed by a single four core cable and linked together locally.

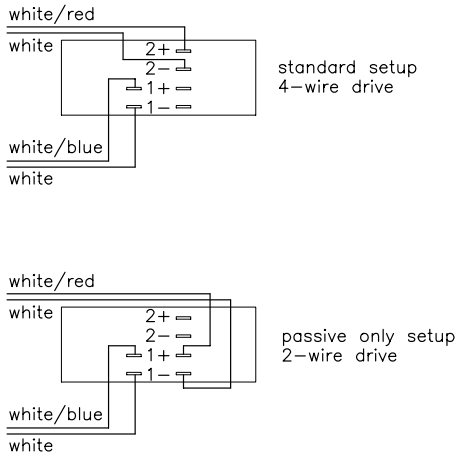


Connector wiring (four wire operation)

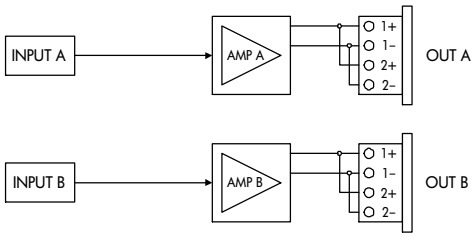
To configure the cabinet for twin wire use the connector panel has to be removed by undoing the four Allen screws with a 2.5 mm Allen key. The wiring on the back of the connector panel can be changed to that shown in the lower illustration on the right.

In the twin wire/passive configuration both the LF and HF drivers are connected to pins 1+/1–. Note that only the HF driver wiring (white and white/red) differs from that used in the four wire version.

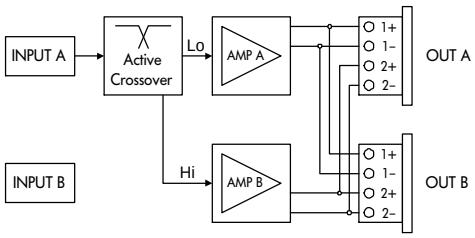
In the twin wire configuration MAX can also be used with amplifiers from other manufacturers. The amplifier or signal distribution box needs to have positive signal on pin 1+ and negative signal on pin 1– of it's speakon output connectors.



MAX internal wiring of the connector panel to the crossover board in four wire and two wire operation



P1200A with ampMAX, passive mode



P1200A with ampMAX, active mode

Operation with P1200A and ampMAX module

ampMAX is a two-channel controller module occupying both slots of a P1200A mainframe. The combination of P1200A and ampMAX allows MAX loudspeakers to be driven passively or in 2-way active mode.

Passive operation

In standard passive mode, ampMAX provides two linear amplifier channels, each amplifier driving all four pins on the channels Speakon output connector. Pins 1+ and 2+ carry positive and pins 1– and 2– carry the negative components of the signal. Two MAX cabinets can be driven by each P1200A amplifier channel.

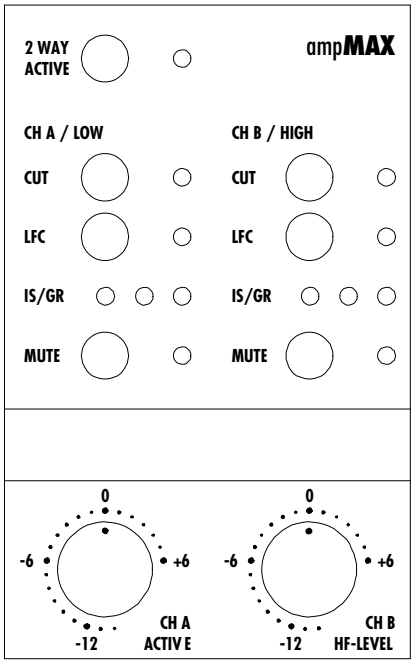
MAX can also be used with the E15-BX bass extension cabinet. The E15-BX cabinet is equipped with a passive crossover network and simply connects in parallel with the MAX cabinet without the need for any additional control electronics. One MAX and up to two E15-BX cabinets can be driven by each P1200A output channel.

2-way active operation

The ampMAX module contains a switchable electronic crossover which routes seperate LF and HF signals to the P1200A amplifier channels. Pins 1+/1– of both loudspeaker outputs carry the LF signal, 2+/2– carry HF signal. The output connector pin assignment is changed automatically when active operation is selected. The input signal is fed to INPUT A, INPUT B is not used.

A P1200A mainframe can drive two MAX loudspeakers in active mode, the extra headroom gained serves for the most demanding monitor applications.

When MAX systems are used as downfills or frontfills for C4 Systems passive operation is recommended. In active mode the phase response of MAX is not compatible with C4 systems.



Controls on ampMAX module

ampMAX module switches

2-WAY ACTIVE switch and indicator

Selecting this switch configures the P1200A for active operation of MAX cabinets - channel A drives the 15" LF loudspeaker, whilst channel B drives the 2" HF driver. The yellow LED next to the switch illuminates to indicate active mode.

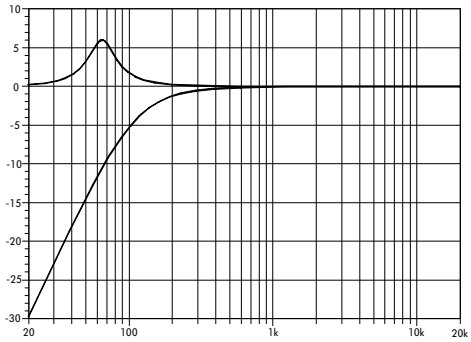
The left volume control (CH A / ACTIVE) now controls both channels and sets the overall level, the right volume control (CH B / HF-LEVEL) sets the **relative** HF level.

CUT switch and indicator

Set to CUT, a high pass filter with a 130 Hz cut-off frequency is inserted in the controller signal path. The yellow CUT LED illuminates. MAX is now configured for use with d&b C-Series active subwoofers. In active mode only the channel A CUT switch is functional.

LFC switch and indicator

When MAX cabinets are used without an active subwoofer selecting LFC, Low Frequency Compensation, extends the low frequency response of MAX cabinets down to 65 Hz. The yellow LFC LED illuminates. In active mode only the channel A LFC switch is functional.



Frequency response of CUT and LFC circuits

IS/GR indicators

These indicators give a three stage indication of ampMAX signal levels.

- **Input Signal Present** (green) illuminates when the signal presented to the controller input exceeds a -36 dBu threshold value. The ISP circuit is unaffected by the setting of the controller mute switch and level control.
- **Gain Reduction** (yellow) illuminates when the controller limiter reduces gain by more than 3 dB.
- **Overload** (red) illuminates when an overload occurs in the signal path (input signal too high) or when the amplifier gain is reduced because the output current is too high (e.g. due to a short circuit).

With active mode selected, the channel A indicators show the state of the LF channel and the channel B indicators show the state of the HF channel.

Level controls in passive mode

The CH A and CH B detented level controls adjust the controller input sensitivity and have a 20 dB range, -14 dB to +6 dB, calibrated in 1 dB steps. The level controls are normally set to 0 dB.

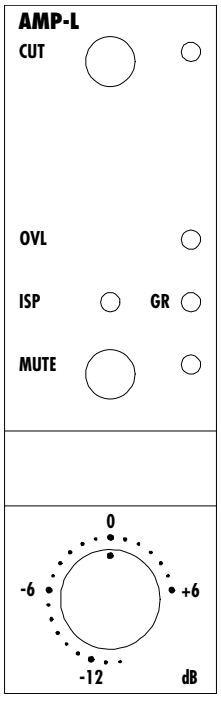
Level controls in 2-way active mode

In active mode the CH A / ACTIVE level control adjusts the controller input sensitivity and has a 20 dB range, –14 db to +6 dB, calibrated in 1 dB steps. The CH B/ HF-LEVEL control adjusts relative HF level in 0.5 dB steps. For a flat response, whatever the setting of the CH A / ACTIVE level control, the CH B / HF-LEVEL control should be set to 0 dB. The more precise 0.5 dB HF level detent settings invalidate the control scale markings. To account for the actual 10 dB range of HF level adjustment from –7 dB to +3 dB divide the control scale setting by two to arrive at the actual value for relative HF level.

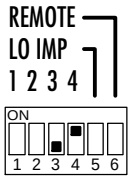
Operation with P1200A and AMP-L module

The AMP-L module occupies a single P1200A module slot and provides a single linear amplifier channel, which drives the pins 1+/1– of the respective output connector. For operation with the AMP-L module MAX cabinets have to be configured for two wire operation (see section "Four wire and two wire operation").

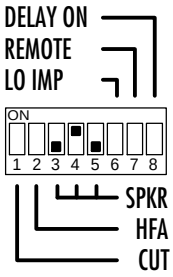
In passive mode up to two MAX loudspeakers can be driven by each P1200A power amplifier channel. Fitting one AMP-L and one subwoofer controller module allows a single mainframe to drive two MAX and two active subwoofer cabinets (C7-SUB or C4-SUB). All cabinets can be linked together locally and fed by a single four-core cable from either mainframe output connector.



Controls on AMP-L module



E-PAC version 1



E-PAC version 2

E-PAC Configuration for LINEAR mode

AMP-L module switches

CUT switch and indicator

Set to CUT, a high pass filter with a 130 Hz cut-off frequency is inserted in the controller signal path. The yellow CUT LED illuminates. MAX is now configured for use with d&b C-Series active subwoofers.

Operation with E-PAC

To drive MAX cabinets the E-PAC has to be configured to LINEAR mode by setting the appropriate DIP switches on the rear panel.

In LINEAR mode all four pins on the Speakon connector are driven by the E-PAC power amplifier, pins 1+ and 2+ carry positive signal, 1– and 2– carry negative signal. MAX loudspeakers can be used in either four wire or two wire configuration.

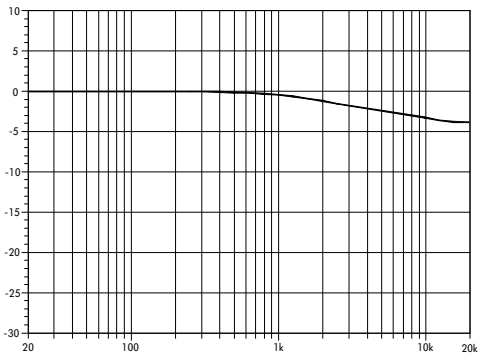
The E-PAC can drive a single MAX cabinet at an output power of 300 watts. The rear panel LO IMP switch configures the E-PAC to drive two MAX cabinets with a 6 dB reduction of input level to the speakers.

DIP switches 1 and 2 respectively allow CUT and HFA settings to be selected (only with E-PAC version 2). The characteristics of the CUT setting are explained above under "AMP-L module switches".

HFA setting

In HFA mode (High Frequency Attenuation), the HF response of the MAX system is rolled off. The HFA circuit configures MAX to provide a natural, balanced frequency response when a unit is placed close to listeners in near field or delay use.

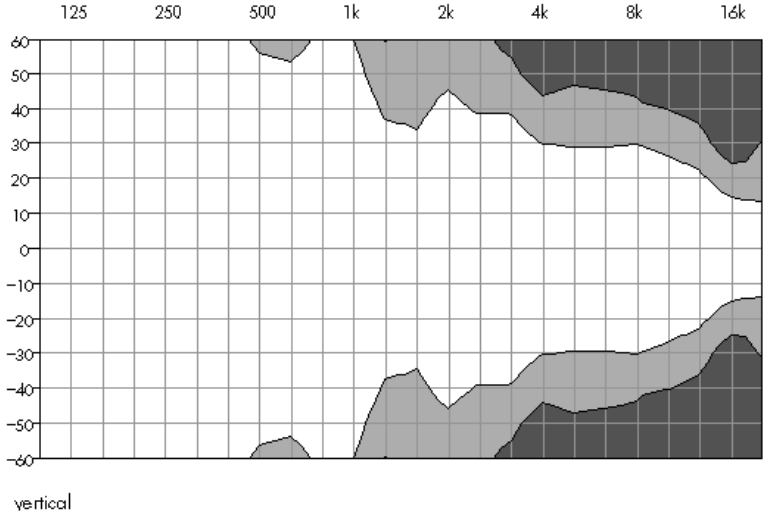
High Frequency Attenuation begins gradually at 1 kHz, dropping by approximately 3 dB at 10 kHz. This roll-off mimics the decline in frequency response experienced when listening to a system from a distance in a typically reverberant room or auditorium.



Frequency response correction of HFA circuit (only available with E-PAC version 2)

Dispersion characteristics

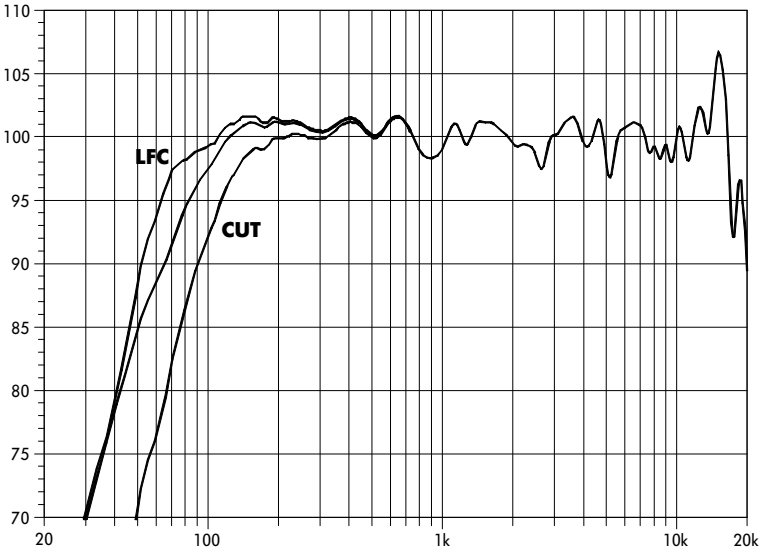
Due to the conical coverage pattern of the coaxial driver design, the horizontal and vertical dispersion characteristics of MAX are largely identical (slight differences which do occur are attributable to the asymmetric cabinet shape). The diagram below shows dispersion angle versus frequency plotted using lines of equal sound pressure (isobars) at -6 dB and -12 dB. The nominal 60° dispersion angle is maintained from 4 to 10 kHz.



MAX isobar diagram

Frequency response

The graph below shows the different response curves for MAX driven with the P1200A mainframe with ampMAX. The response in standard mode is equivalent to the operation with a linear power amplifier (SPL at a distance of 1 m, output voltage 2.83 V).



MAX frequency response, standard (linear), LFC and CUT switch settings

Technical specifications

MAX system data, passive setup

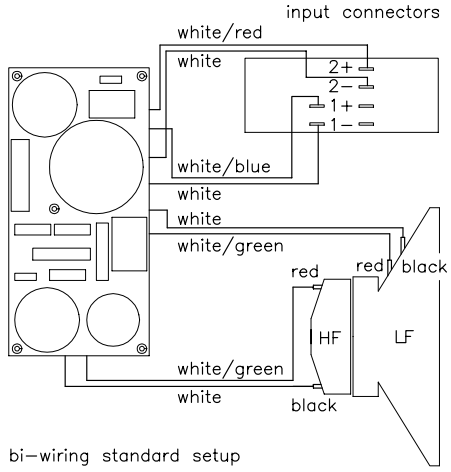
Max. sound pressure (1 m, free field) with P1200A.....133 dB
Max. sound pressure (1 m, free field) with E-PAC .....131 dB
(SPLmax peak, pink noise test signal with crest factor of 4)
Input level (SPLmax).....+13 dBu
Input level (100 dB-SPL / 1 m).....–17 dBu
Polarity to controller INPUT (XLR pin 2: + / 3: –) ..... LF: + / HF: –

MAX system data, active setup with ampMAX

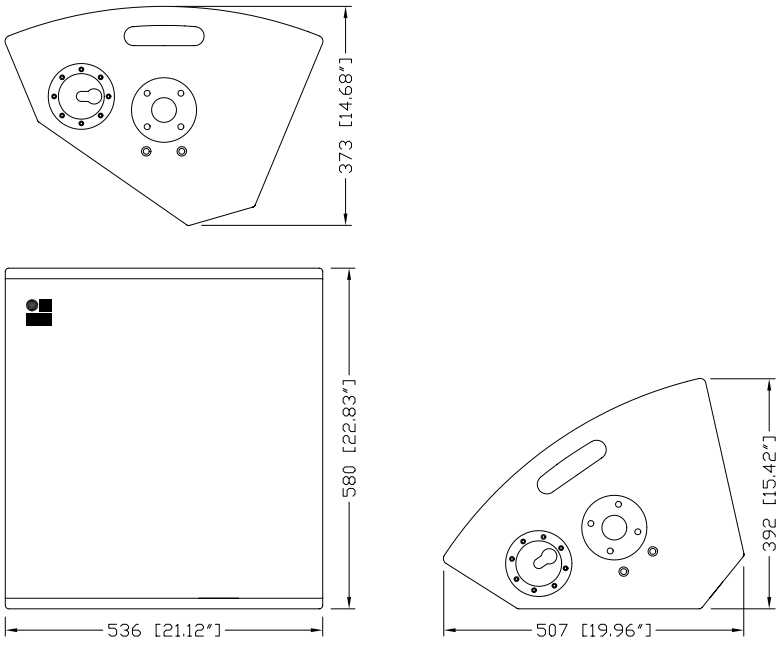
Max. sound pressure (1 m, free field) .....135 dB
(SPLmax peak, pink noise test signal with crest factor of 4)
Input level (SPLmax).....+15 dBu
Input level (100 dB-SPL / 1 m).....–17 dBu
Polarity to controller INPUT (XLR pin 2: + / 3: –) .....LF: + / HF: +

MAX loudspeaker

Frequency response (–5 dB)..... 85 Hz ... 18 kHz
Sensivity (2.83 V / 1 m).....100 dB
Nominal impedance .....8 ohms
Power handling capacity (RMS / peak 10 ms).....250 / 1200 W
Nominal dispersion angle .....60° conical
Connections.....2 x Speakon-NL4
.....(optional 2 x EP-5)
Pin assignments Speakon-NL4 ..... HF 2+ / 2–
.....LF 1+ / 1–
Pin assignments EP-5 .....HF 3 / 4
.....LF 1 / 2
Weight.....26 kg (57 lbs)

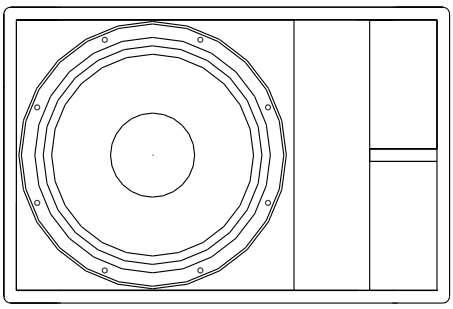


MAX wiring diagram



MAX cabinet dimensions in mm [inch]

E12-SUB



The E12-SUB is a compact bass-reflex design employing a high excursion 12" driver. The large, specially shaped reflex port enables the E12-SUB to achieve high sound pressure levels with minimal power compression and breathing effects.

The E12-SUB cabinet is constructed from marine plywood and has an impact resistant paint finish. The front of the loudspeaker cabinet is fitted with a rigid metal grill covered with a acoustically transparent foam. The cabinet incorporates a steel handle in one side and two parallel wired Speakon-NL4 connectors on the rear panel.

Fitted to the top panel is an M20 threaded flange to accept the Z5013 Loudspeaker stand for the deployment of a single E3 cabinet. To ensure sufficient stability the maximum permissible weight of 10 kg (22 lbs) for the cabinet mounted on top of the stand must not be exceeded.

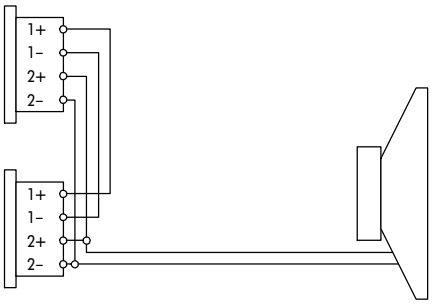
CAUTION!

Designed to be actively driven using the E-PAC Power Amplifier Controller the E12-SUB covers the 50 Hz to 120 Hz frequency band.

The compact E12-SUB has an extraordinarily high output capability for a cabinet of such a size - enough to support up to two E3 cabinets. It is ideal for permanent or mobile use in small and medium venues.

CAUTION!

Only operate the E12-SUB with a d&b E-PAC in E12-SUB configuration (SUB configuration with E-PAC version 1), otherwise there is a risk of damaging the loudspeaker components.



Connector wiring

Connections

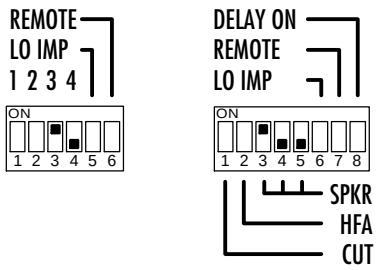
The E12-SUB cabinet is fitted with a pair of Speakon-NL4 connectors. All four pins of both connectors are wired in parallel. The E12-SUB uses the pin assignments 2+/2–. Pins 1+/1– are designated to C and E-Series full range cabinets. Using one connector as the input, the second connector allows for direct connection to additional loudspeakers.

Operation with E-PAC

To drive E12-SUB cabinets the E-PAC has to be configured to E12 mode by setting the appropriate DIP switches on the rear panel. The configuration E12-SUB on E-PAC version 2 is identical to configuration SUB on E-PAC version 1.

The E-PAC can drive a single E12-SUB at full output power. Connecting a second E12-SUB requires LO IMP mode to be selected on the E-PAC rear panel. Due to the 6 dB reduction of input level to the speakers in low impedance mode there is no gain in acoustical output.

DIP switches 1 and 2 (CUT and HFA) are not functional with the configuration for E12-SUB.



E-PAC version 1 **E-PAC version 2**

E-PAC Configuration for E12-SUB

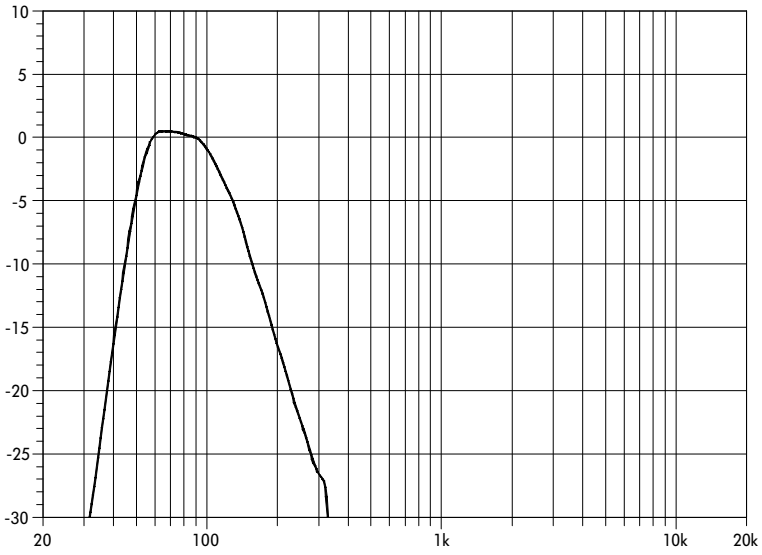
Technical specifications

E12-SUB system data

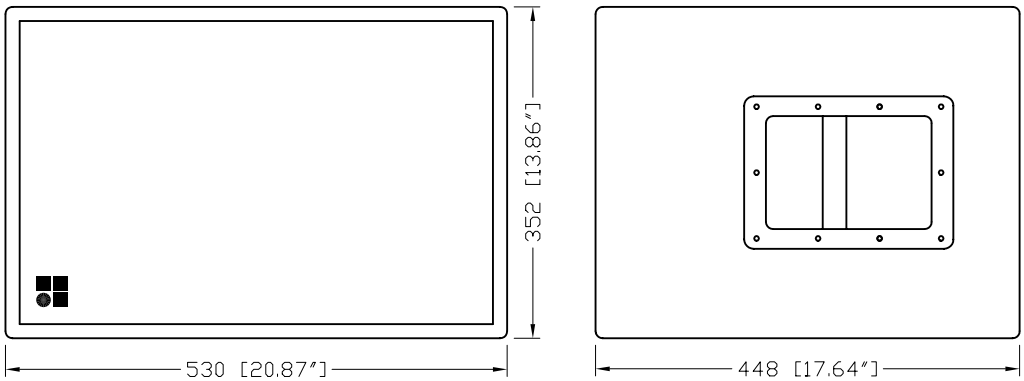
Frequency response (–5 dB) ..... 50 Hz ... 120 Hz
Max. sound pressure (1 m, free field) ..... 125 dB
(SPLmax peak, pink noise test signal with crest factor of 4)
Input level (SPLmax) ..... +14 dBu
Input level (100 dB-SPL / 1 m) ..... –8 dBu
Polarity to controller INPUT (XLR pin 2: + / 3: –) ..... LF: +

E12-SUB loudspeaker

Nominal impedance ..... 8 ohms
Power handling capacity (RMS / peak 10 ms) ..... 200 / 800 W
Connections ..... 2 x Speakon-NL4
Pin assignments ..... 2+ / 2–
Weight ..... 20 kg (44 lbs)

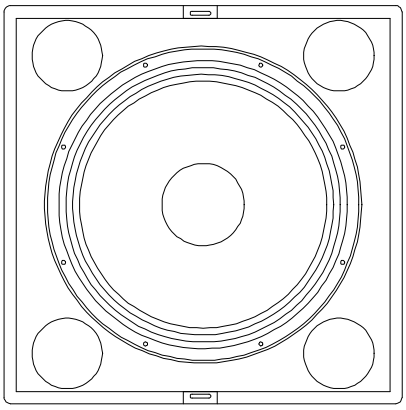


E12-SUB frequency response



E12-SUB cabinet dimensions in mm [inch]

E18-SUB



The E18-SUB is a compact, very low tuned bass-reflex design employing a single 18" driver.

The E18-SUB loudspeaker cabinet is constructed from marine plywood and has an impact resistant paint finish. The front of the loudspeaker cabinet is fitted with a rigid metal grill covered with a replaceable acoustically transparent foam. Also at the front, fittings at the top and bottom edges of the cabinet are used to secure an optional transport lid E7908. The cabinet incorporates a pair of steel handles and, on the rear panel, four heavy duty wheels and two parallel wired Speakon-NL4 or EP-5 connectors. Fitted to the top panel is an M20 threaded flange to accept the Z5013 Loudspeaker stand for the deployment of a a full range cabinet.

Designed to be actively driven using the d&b P1200A mainframe or the d&b E-PAC, the E18-SUB is normally used to support d&b full range cabinets such as the E9, C6 or E3 by covering the 38 Hz to 110 Hz frequency band.

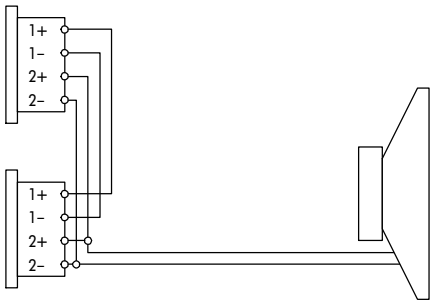
CAUTION!

Only operate E18-SUB loudspeakers with a d&b P1200A mainframe fitted with E18 controller modules or a d&b E-PAC (version 2) in E18-SUB configuration, otherwise there is a risk of damaging the loudspeaker components.

Connections

The E18-SUB cabinet is fitted with a pair of Speakon-NL4 connectors. All four pins of both connectors are wired in parallel. The E18-SUB uses the pin assignments 2+/2–. Pins 1+/1– are designated to C and E-Series full range systems. Using one connector as the input, the second connector allows for direct connection to additional loudspeakers.

The E18-SUB can be supplied with EP-5 output connectors as an option. Pin equivalents of Speakon-NL4 and EP-5 connectors are listed in the table below.



Connector wiring

EP-5	1	2	3	4	5
NL4	1+	1–	2+	2–	n.c.

Speakon- NL4 and EP-5 pin assignments

Operation with P1200A

Up to two E18-SUBs can be driven by each P1200A power amplifier channel. Fitting one E18-SUB-CO and one C or E-Series TOP controller module allows a single mainframe to drive two E18-SUB and two (E3: four) mid/high cabinets. All cabinets can be linked together locally and fed by a single four-wire cable from either mainframe output connector.

E18 Controller module switches

160Hz switch and indicator

If the 160Hz switch is selected (yellow 160Hz LED illuminated), the upper operating frequency of the system is raised from 110 Hz to 160 Hz. This setting can be used when E18-SUBs are used with the C6 system - the 160Hz setting on the C6-CO should also be selected to increase the C6 system's headroom (see C6 data sheet).

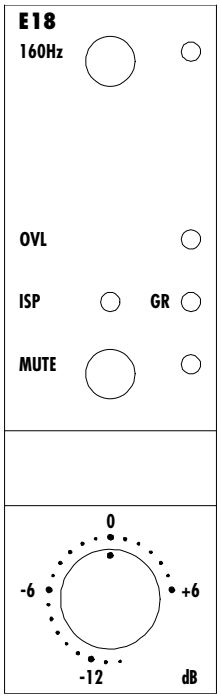
Operation with E-PAC

To drive E18-SUB cabinets the E-PAC has to be configured to E18 mode by setting the appropriate DIP switches on the rear panel (only possible with E-PAC version 2).

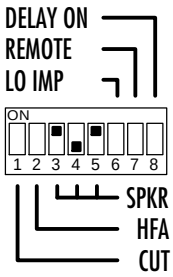
The E-PAC can drive a single E18-SUB at an output power of 300 watts. Connecting a second E18-SUB requires LO IMP mode to be selected on the E-PAC rear panel. Due to the 6 dB reduction of input level to the speakers in low impedance mode there is no gain in acoustical output.

DIP switches 1 and 2 (CUT and HFA) are not functional with the configuration E18-SUB.

The 160Hz mode of the E18 controller module is not available on the E-PAC controller.



Controls on E18 controller module



E-PAC Configuration for E18-SUB (E-PAC version 2)

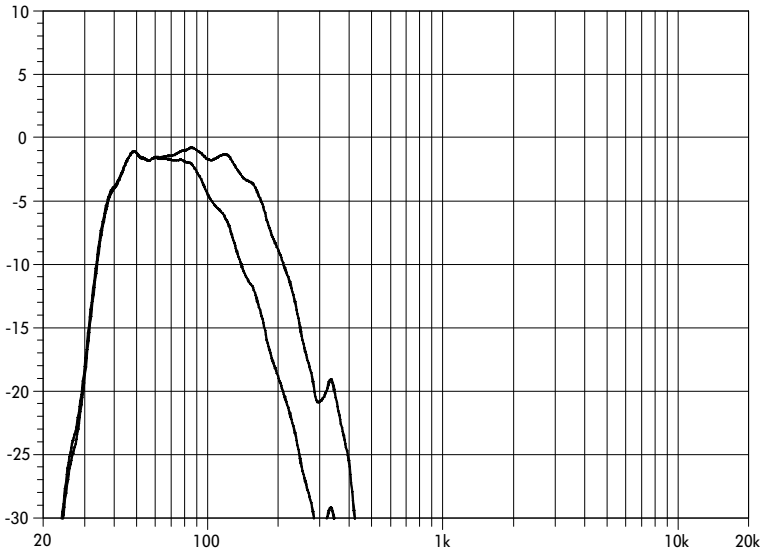
Technical specifications

E18 system data

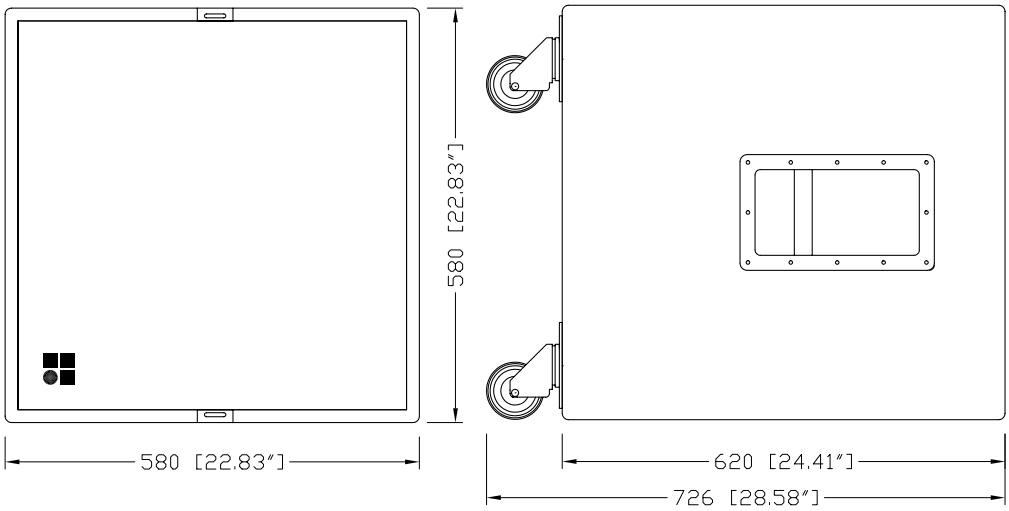
Frequency response (–5 dB) ..... 38 Hz ... 110 / 160 Hz
Max. sound pressure (1 m, free field) with P1200A ..... 130 dB
Max. sound pressure (1 m, free field) with E-PAC ..... 128 dB
(SPLmax peak, pink noise test signal with crest factor of 4)
Input level (SPLmax) ..... +15 dBu
Input level (100 dB-SPL / 1m) ..... –11 dBu
Polarity to controller INPUT (XLR pin 2: + / 3: –) ..... LF: +

E18-SUB loudspeaker

Nominal impedance ..... 8 ohms
Power handling capacity (RMS / peak 10 ms) ..... 200 / 800 W
Connections ..... 2 x Speakon-NL4
..... (optional 2 x EP-5)
Pin assignments ..... 2+ / 2–
..... (EP-5: 3 / 4)
Weight ..... 42 kg (93 lbs)



E18-SUB frequency response, standard and 160Hz switch settings



E18-SUB cabinet dimensions in mm [inch]

4. System operation

4.1. Setting up/stacking the loudspeakers

To get the best out of any high quality loudspeaker system it must be properly set up. Care and attention needs to be paid to the position of loudspeaker cabinets relative to each other and also to how they are angled and aimed towards the audience.

Vertical aiming

The aiming of the loudspeaker in the vertical plane is responsible for the coverage all the way from the stage to the furthest listening point. Both the height and vertical angle of the loudspeakers need careful adjustment. The best way to set the height and angle of cabinets independently to each other is to use a loudspeaker stand with the cabinet fitted to a swivel bracket. The loudspeaker stand can be the usual free standing type or a simple column stand fitted to the top of a subwoofer cabinet - both types are illustrated in the d&b system brochures.

The lower the loudspeaker height, then the greater the sound level difference between the audience area at the front of the stage and the area at the extreme range of the loudspeaker coverage. To give a relatively even level distribution the loudspeakers need to be placed as high as practicable.

In relatively confined spaces there is a risk of aiming too much energy towards the rear wall and ceiling, increasing the reverberant component in the room. In the worst case bad speaker aiming can create an audible slap echo from the rear wall, slightly tilting the loudspeaker cabinets down towards the audience can reduce this problem.

Because it's HF horn has a built-in 8° downward tilt, the E9 loudspeaker is ideally suited to this type of application. Usually there is no need to use a swivel bracket - the cabinet can be fixed straight on to a loudspeaker stand.

Horizontal aiming

The design of the C and E-Series cabinets simplifies horizontal aiming. The precisely angled rear side panels of the cabinets precisely define the edges of a cabinet's horizontal coverage. It is easy to gauge the extent of the horizontal coverage by sighting along a line from the surface of each rear side panel of the cabinet.

Arraying mid/high cabinets

With more than one loudspeaker source in a room, comb filter effects can create coverage problems. Comb filtering creates an uneven frequency response across an area which is reached by two or more sources at similar levels but at slightly different path lengths (interference between the signals).

Therefore arrays need to be constructed so that the coverage patterns of the individual loudspeakers combine with minimal overlap. Placing d&b C-Series cabinets with their rear angled side panels butted together guarantees minimal dispersion pattern overlap and hence minimal interference.

Vertically stacking the cabinets, rather than horizontally arraying them is particularly useful in deep rooms where more than one cabinet has to be used because a single cabinet has insufficient throw for the level needed at the back of the room. This helps reduce interference in the horizontal plane and gives more vertical directivity.

4.2. Wiring

In order to keep losses in tone and power low the length of cable run between mainframe and loudspeaker should be kept as short as possible. A conductor size of 1.5 mm^2 (16 AWG) is the minimum requirement, 2.5 mm^2 (12 AWG) is preferable.

When full range loudspeakers and actively driven subwoofers are operated together, then - due to the different pin assignments of the systems - four-core cables have to be used.

We recommend the use of d&b MC4 cable (4 x 2.5 mm^2 / 4 cond. 12 AWG). MC4 cables retain their flexibility even at low temperatures and can be supplied in various lengths.

If very long cable runs are unavoidable in an installation, a conductor size greater than 2.5 mm^2 (12 AWG) may be needed to reduce power loss and to achieve an acceptable damping factor (relation of load impedance to cable impedance). If the individual conductor size in a cable is insufficient, then it's permissible to use two or more of the conductors.

The following 'rule of thumb' formula allows you to estimate the maximum cable length with an acceptable damping factor (>10):

maximum (single) length of cable [m] =
3 x load impedance [ohms] x cross-section [mm^2]

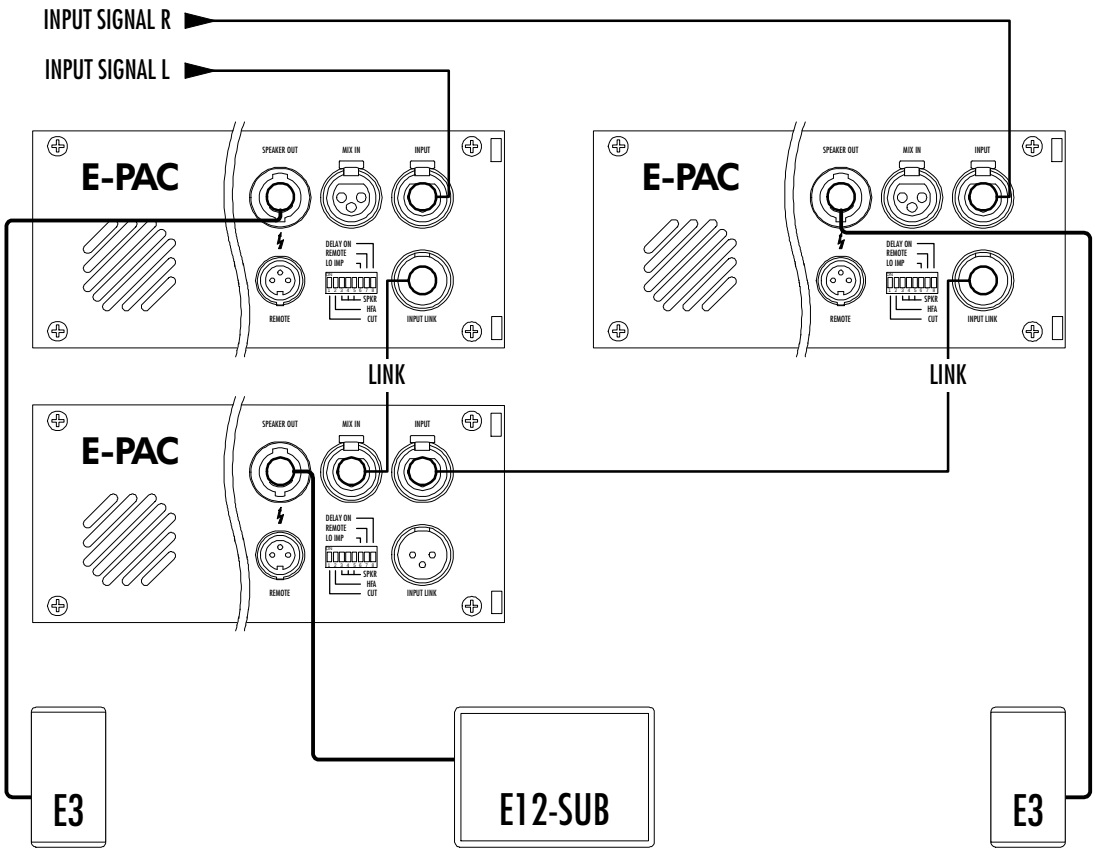
The parallel wired connectors fitted to all C-Series and E-Series loudspeakers allow the mainframe output signal to be fed directly from one cabinet to another dispensing with the need for signal distribution boxes.

4.3. Using the E-PAC MIX IN

The E-PAC is a single channel amplifier controller, the rear panel connectors allow for use in different configurations. The illustration below shows two E-PACs driving E3 loudspeakers from a stereo source, a third E-PAC drives an E12-SUB in mono. The left and right signals are summed to mono using the MIX input on the third E-PAC. Please note that the resultant output will be 3 db higher (see section 2.10.) .

IMPORTANT!

The output on the INPUT LINK connector is derived from the signal to the INPUT connector. An additional signal fed to the MIX IN connector will not appear at the INPUT LINK output.



Wiring of a stereo system with a mono subwoofer

4.4. Level setting of mid-high and SUB systems

With equal numbers of mid-high cabinets and corresponding active subwoofers the input gains of TOP and SUB controller will normally be set to the same level. This setting gives a correct sound balance and matches the characteristics of the active crossover filters in the controller modules.

Using different ratios of mid-high to subwoofer systems will affect the relative levels between the systems which will require correction using the controller module level controls.

The level gain by using multiple cabinets of the same type can be evaluated with the table on the right or with the following formula:

Level gain [dB] = 10 x log (number of systems)

Example: Using 10 subs together with 4 tops will give a level gain of 10 dB in the sub range and 6 dB in the top range. So the SUB controllers should be turned down by about 4 dB.

Relative to these nominal settings the balance between mid-high and subwoofers should not be changed more than approx. 3 dB, otherwise the crossover frequency between the systems is changed and overall sound quality may be deteriorated.

With E3 systems the correct balance is obtained using a ratio of two speakers to every subwoofer.

If the acoustic environment or the program material used requires a severe correction in sound balance, it is much better to use an external equaliser in the signal path before both the full range and subwoofer systems so that the level correction is applied equally to both systems. This allows the frequency response of the whole system to be tuned without influencing the level, phase and frequency response of the full range and subwoofer systems relative to each other.

The sensitivity values quoted for the systems are also a useful additional aid to relative level setting. The values in the technical specification for each loudspeaker give the input signal level expressed as the dBu value needed to produce a 100 dB (SPL) sound pressure level measured at one metre.

Example: the E9 system input sensitivity for a 100 dB-SPL is –13 dBu, and that for the E3 system is –10 dBu. For equal sound level from E3 and E9 loudspeakers used together, the E3 controller level needs to be set 3 dB higher than that of the E9 controller.

No. of systems	Level gain
1	0 dB
2	3 dB
3	5 dB
4	6 dB
6	8 dB
10	10 dB

Average level gain when using multiple loudspeaker cabinets of the same type.

5. Publications list

A number of publications with supplementary information on our products are available. These publications are listed below along with their respective catalogue numbers. If you are interested in receiving any of the listed publications then simply fill in the order form on the last page of the User Manual, send it to d&b and we will send you the requested information by return of post.

Title	**Cat. No.**
TI 212 A1/P1200A Basic Remote	D5212.E.
TI 326 C-Series/E-Series Configurations	D5326.E.
Rigging Accessories Manual	D2905.E.
d&b polar data disk for CADP2	D7501.000.
d&b polar data disk for EASE 2.x	D7502.000.
Brochure F-Series	D1102.E.
Brochure C4 System	D1310.E.
Brochure C6/C7 Systems	D1320.E.
Brochure E-Series	D1201.E.
Brochure d&b Monitors	D1401.E.
The Complete d&b	D0011.E.
International Agents List	D9220.D.
Complete Publications List	D9300.E.

6. EU declaration of conformity (CE symbol)

CE

EU conformity of loudspeakers

This declaration applies to loudspeakers manufactured by d&b audiotechnik AG and includes the types listed in the table below:

– **E1**	**Z0121**
– **E3**	**Z0300**
– **E9**	**Z2250/Z2260**
– **E12-SUB**	**Z0200**
– **E18-SUB**	**Z2253**
– **E15-BX**	**Z1200**
– **C6 / C690**	**Z2252/Z2262**
– **C6-MON**	**Z2256**
– **C7-TOP**	**Z2257/Z2263**
– **C4-TOP**	**Z2254**
– **C4-SUB**	**Z2255**
– **C7-SUB**	**Z2259**
– ***MAX***	**Z1100**

All production versions of these types are included, provided they correspond to the original technical version and have not been subject to any later design or electromechanical modifications.

We herewith declare that said products are in conformity with the provisions of the following EC directives including all applicable amendments:

– **89/336 Electromagnetic Compatibility**

The following standards have been applied:

– **DIN EN 55013:08-1991**
– **DIN EN 55020:05-1995**
– **DIN EN 50082-1:03-1993**

d&b audiotechnik AG of Backnang accepts responsibility for this declaration.

EU conformity of the E-PAC

This declaration applies to the E-PAC power amplifier controller manufactured by d&b audiotechnik AG.

– **E-PAC Z2500 all versions**

All production versions of type E-PAC starting from version Z2500.000.01 are included, provided they correspond to the original technical version and have not been subject to any later design or electromechanical modifications.

We herewith declare that said products are in conformity with the provisions of the following EC directives including all applicable amendments:

– **73/23 Low Voltage**
– **89/336 Electromagnetic Compatibility**

The following standards have been applied:

– **DIN EN 60065:1993**
– **DIN EN 55103-1:1996, classes E1 to E4**
– **DIN EN 55103-2:1996, classes E1 to E4**

d&b audiotechnik AG of Backnang accepts responsibility for this declaration.

d&b audiotechnik

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E-PAC User Manual (4.0E)

Insert this page into an envelope or fax machine and send it to:

d&b audiotechnik AG
Eugen-Adolff-Straße 134
D-71522 Backnang
Germany

Fax +49-7191-95 00 00

My address:

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Please send me the following information:

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I think the manual is informative yes, very ☐ ☐ ☐ ☐ no

I think the manual is well laid out ☐ ☐ ☐ ☐

Suggestions for improvement or remarks on manual and products:

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