

**A1 Mainframe
F-Series, M2, M1220
User Manual**

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!

A1 Mainframe, F-series, M2, M1220 User Manual

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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.

d&b audiotechnik AG

Eugen-Adolff-Strasse 134, D-71522 Backnang

Telephone +49-7191-9669-0, Fax +49-7191-95 00 00

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 A1 mainframe

The mainframe complies with the electromagnetic compatibility requirements of EN 50082-1 - residential, business and commercial 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, MONO OUT).

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

WARNING!

The mainframe 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.

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

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.

WARNING!

WARNING!

CAUTION!

Only use loudspeakers in the F-Series and the M2 and M1220 monitors with the A1 mainframe fitted with the correct controller modules. The controller 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.

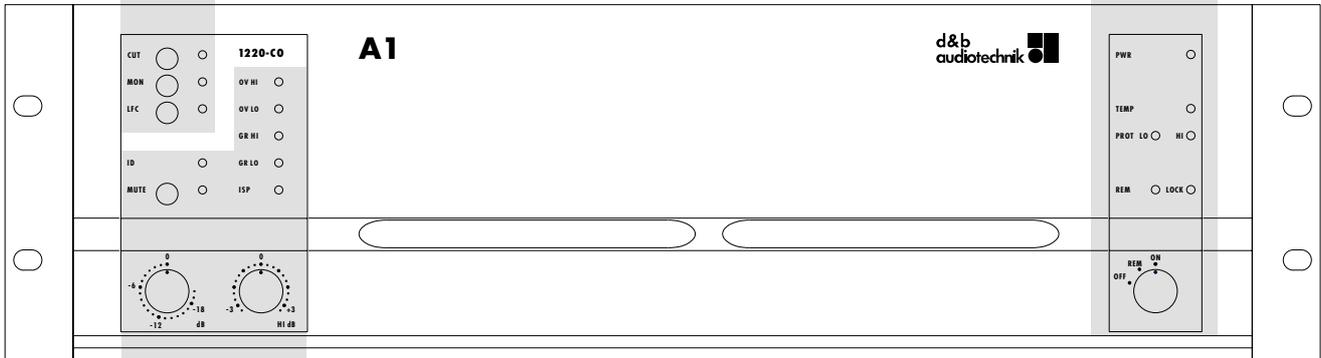
Loudspeakers produce a static magnetic field even if they are not connected or are not in use. Therefore make sure when erecting and transporting loudspeakers that they are nowhere near equipment and objects which may be impaired or damaged by an external magnetic field. Generally speaking, a distance 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.

Configuration switches

These switches depend on the type of loudspeaker. They are described individually for each system in the section "Loudspeakers".

Displays and controls of mainframe

These elements are described in the section "A1 mainframe".



Displays and controls of controller modules

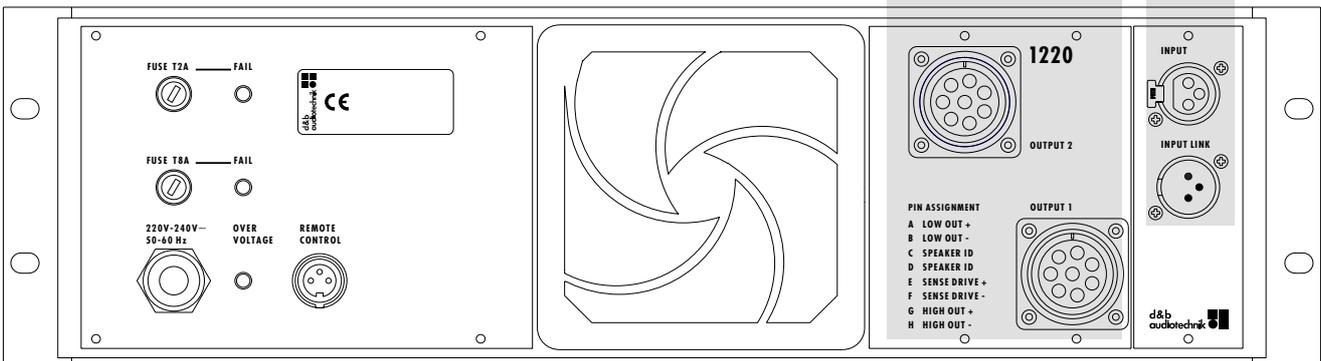
These elements are common to all modules. They are described in the section "Controller modules".

Input connectors

These elements are described in the section "A1 mainframe".

Output connectors

These elements are described individually for each system in the section "Loudspeakers".



A1 mainframe front and rear views

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1. Introduction

This user manual describes the facilities, functions and operation of d&b active controller loudspeaker systems and covers the operation of the A1 mainframe, controller modules and loudspeakers used in these systems.

d&b publishes additional application and technical information notes (TI). 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.

This user manual should provide the information you need in order to get the best performance out of the system. 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. d&b active systems design

There are two types of d&b active loudspeaker system - active subwoofers and full range, 2 way, active loudspeakers. Each type of active system is driven by an A1 mainframe fitted with a single, loudspeaker specific controller module.

The different loudspeaker controller modules house the signal processing electronics, connectors, controls & indicators appropriate to the different types of loudspeaker.

As well as the controller module, the A1 mainframe houses two separate power amplifiers - a 1200 W / 4 Ohm low frequency amplifier and a 350 W / 4 Ohm high frequency amplifier. In the case of the full range 1220 System, a single A1 fitted with a 1220 controller module can drive two 1220 cabinets. With the higher output full-range F2 System, each F2 cabinet needs to be driven by its own A1/F2 controller module combination.

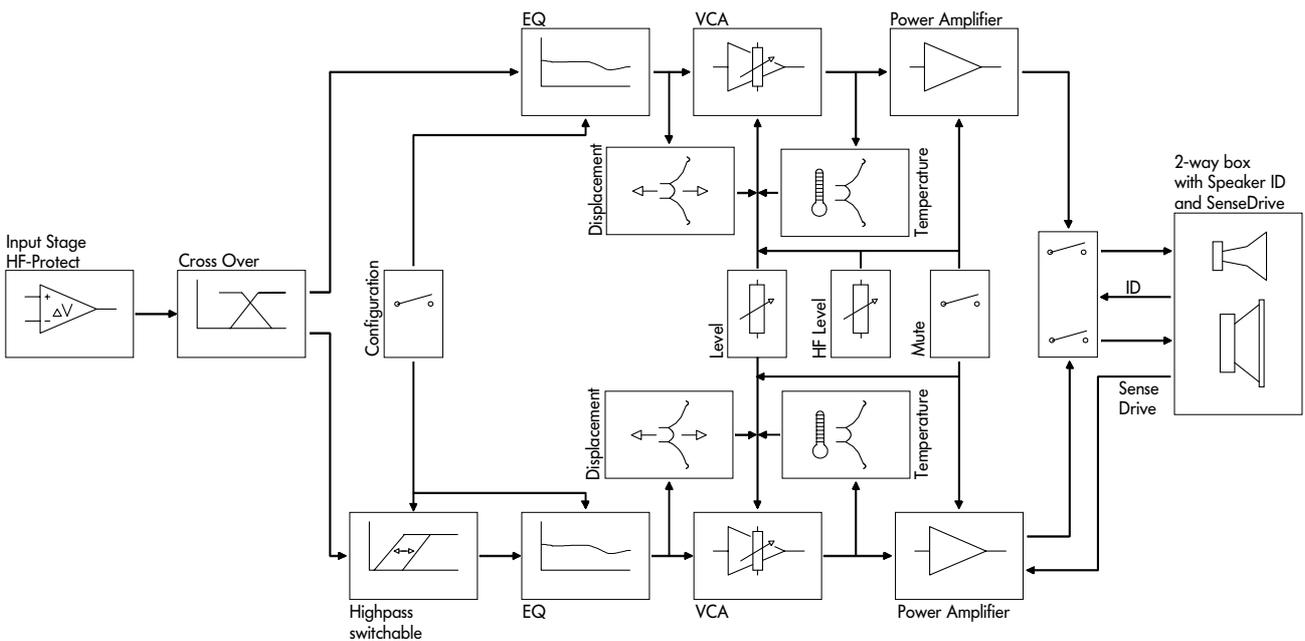
The full range systems can of course be supplemented with B1 or B2 subwoofers. Each active subwoofer cabinet is driven by its own A1/controller module combination - the mainframe HF amplifier being unused.

The modular nature of mainframe based systems allows later re-configuration. Simply changing the type of controller module fitted to a mainframe alters the mode of mainframe operation without the need for any internal changes to the mainframe itself.

The A1 mainframe incorporates an interface for remote control and monitoring of all controller module and mainframe functions.

Active full range systems may also be used with Series 02 subwoofers - e.g. the F2 System and C4-SUBs. Series 02 systems use the d&b 1200A mainframe.

1.3. Block diagram



Block diagram - full range active system

2. A1 mainframe

The A1 mainframe is housed in a 3 rack unit high, 353 mm (13.9") deep, 19" rack mount enclosure. The A1 is designed to accept a single d&b active system controller module and includes power supplies, separate LF and HF power amplifiers, protection circuits with their indicators and a remote control interface.

All mainframe facilities and functions and those of the controller modules can be remotely interrogated and altered via the d&b Remote Interface Bridge (RIB).

2.1. Features

2.1.1. A1 power amplifiers

The two power amplifiers fitted to the A1 can, respectively, deliver 700 W +200 W continuous sine wave power into an 8 ohm load - increasing to 1200 W + 350 W continuous sine wave power into a 4 ohms load. These output ratings are valid for at least 30 minutes of operation at an ambient temperature not exceeding 24° C.

Continuous sine wave power rating represents an extreme of operation not normally encountered when reproducing typical speech and music signals - both complex waveforms with average power levels usually well below their peak power level. Even when driving a d&b active system with highly compressed music (2:1 crest factor), the A1 will operate indefinitely - provided of course that the amplifier cooling system has sufficient cool airflow.

2.1.2. SenseDrive

The accuracy of a loudspeaker's signal reproduction, both level and transient response, is influenced by dynamic damping factor - the ratio of the load to source impedance.

Especially at low frequencies, the impedance of a loudspeaker will vary markedly with frequency. This impedance variation will significantly affect the system response. Whilst amplifier source impedance remains constant the impedance of the cables and connectors will largely depend upon the length and type of cable used - longer cables produce greater signal losses.

d&b SenseDrive compensates for the electrical properties of the loudspeaker cable. Two "sense" wires connect the signal from the LF driver back to the amplifier where it is compared and corrected to compensate for the cable losses. Signal reproduction is enhanced by delivering the correct signal to the loudspeaker terminals irrespective of the cable losses.

The SenseDrive technique is not used for driving the loudspeaker HF driver since external interference from sources such as adjacent lighting wiring could interfere with the operation of the Sense-Drive circuits. The relatively high impedance of HF drivers also tends to swamp any increase in load impedance due to longer speaker cables.

The A1 SenseDrive circuit is gain limited and whilst this imposes a ceiling on damping factor improvement, it guarantees stable operation with no cable length restriction using speaker multicores such as d&b MC8.

2.1.3. SpeakerID

A built-in SpeakerID circuit ensures that signal can only be connected to a loudspeaker if it matches the controller module fitted to the mainframe. When the SpeakerID circuit senses that the correct loudspeaker is connected to the mainframe output then the internal power amplifier outputs are fed to the mainframe speaker output connector(s) and the green ID LED on the controller module front panel illuminates.

With no cabinet connected, the ID LED remains unlit. If the wrong type of cabinet is connected the ID LED will flash and the power amplifier outputs are internally isolated from the mainframe speaker output connector(s).

SpeakerID not only prevents loudspeaker damage it also prevents hazardous voltages appearing on the exposed pins of the speaker output connector(s).

Where a mainframe, such as the 1220 System, has two speaker output connectors these are independently monitored and separately switched. However, to alert the user, connecting just one wrong cabinet will mute both output connectors.

2.1.4. Fan

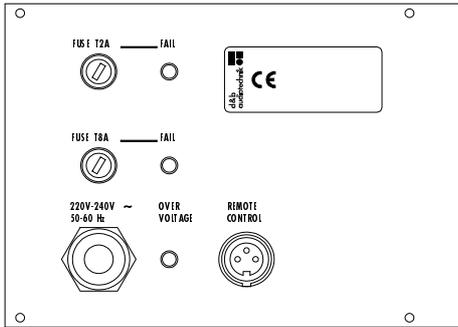
A fan draws in air through a filter behind the rear panel air intake. The fan speed is governed by the temperature of the output module heat sink and the momentary output level. This arrangement ensures a minimum of fan noise since the fan operates at minimum speed when power demand is low.

The level controlled fan allows greater cooling during louder passages, thereby allowing fan speed to be reduced still further during quiet passages preventing background noise interference.

We advise frequent cleaning of the fan filter to ensure good airflow through the unit. If the filter is visibly dirty, then it should be cleaned or replaced. Never operate the A1 without a filter. Dust deposits, especially combined with damp conditions, could cause the mainframe to malfunction.

When setting up the mainframe, do not block or cover the rear panel air intake or the vents on the front panel of the mainframe. See also section 2.4. (Mainframe installation).

IMPORTANT!



A1 mains input and fuses

2.1.5. Mains overvoltage protection

To protect against mains overvoltage damage the A1 is fitted with an efficient, self-resetting mains overvoltage protection circuit.

As soon as the mains supply voltage exceeds 265 V (115 V for the 100 V supply version) the overvoltage protection circuit responds and isolates the mainframe power supply from the mains supply leaving only a supervisory circuit active to monitor the mains supply voltage. The green POWER LED on the mainframe front panel goes out and the OVER VOLTAGE LED on the mainframe rear panel comes on.

Only if the mains voltage drops below 255 V (111 V) is the mainframe automatically reconnected to the mains supply and normal operation resumed. This 10 V difference in the protection circuit switching levels (switching hysteresis) prevents the mainframe from cycling on and off with a fluctuating mains supply voltage.

The protection circuit will operate with any mains overvoltage up to 400 V; allowing the A1 to survive connection across two phases of a three phase supply.

2.1.6. Mains inrush current limiter

The mains inrush current limiter ensures a slow "start-up" for the mainframe and allows several mainframes connected to the same mains supply circuit to be switched on together without temporarily overloading the supply circuit and causing a breaker to trip. The inrush current at switch on is limited to 5 A (230 V version).

Note that repeatedly and rapidly switching a mainframe on and off will overheat and stress the inrush current limiter circuit - a rear panel fuse protects the circuit from damage.

2.1.7. Fuses

Two 20 mm delay fuses are fitted on the mainframe rear panel - an 8 A fuse for the mainframe power supply and a 2 A fuse protecting the mains inrush current limiter. If either fuse should blow then the red LED (FAIL) indicator next to the respective fuseholder will light.

2.1.8. Remote control & monitoring

The A1 is fitted with a twin wire remote interface for various levels of remote control and system supervision of the mainframe and its controller module. The remote interface connection is opto-isolated and floating.

Basic Remote

The Basic Remote is the simplest way to implement a remote control system. A mainframe 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 of a mainframe also allows remote warning of a mainframe fault. Details of basic circuits for remote power control and fault display are published in d&b technical information bulletin TI 212.

Remote operation using the d&b Remote Interface Bridge (RIB)

The d&b RIB is housed in a 1 RU high, 19" rack mount enclosure. Combinations of 1 to 12 mainframes (A1 or P1200A) up to 500 m away can be directly connected to a RIB I/O port by a twin wire bi-directional serial link.

From the front panel of the RIB each mainframe can then be remotely powered on and off and its power and error status monitored. A group of mainframes can be switched directly by the RIB front panel MASTER ON/OFF switch or remotely via a connection to an opto-isolated 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

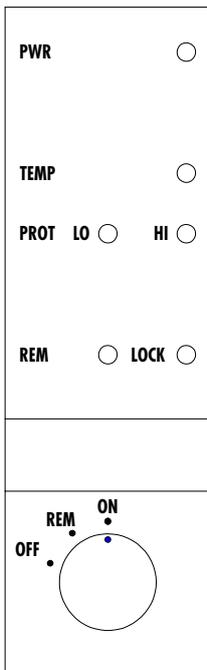
The RIB can be controlled by a computer (RS232, RS422 or MIDI interface) running suitable control software or by a MIDI control device. Under computer control, the following remote control and display options become available:

Remote control

- Power On/Off switching of mainframe
- Level control from +0 to -63.5 dB in 0.5 dB steps.
- MUTE switching
- Configuration switching e.g. CUT, MON, etc.

Remote status information

- Configuration switch status
- Mute switch status
- Level control setting
- Front panel indicator status (ISP, GR, OVL etc.)
- SPEAKER ID status
- Protect status (DC protect, short circuit protect, thermal protect)
- Heatsink temperature in °C
- Available headroom (pre-limiter)
- Gain reduction (due to limiter operation)



A1 front panel

2.2. A1 controls & indicators

PWR - Power (green)

- **On.** when the mainframe is connected to the mains supply, switched on and ready for use.
- **Off.** The mainframe is not connected to or powered from the mains supply. The mains overvoltage protection has triggered (see above) or the mainframe is not switched on.
- **Flashes** during the initial power-up cycle for about 2 seconds and also when the mains overvoltage protection circuit is triggered by an external fault (see also PROT below).

TEMP - Temperature (red)

- **Flashes.** The mainframe has switched off because the maximum permissible operating temperature has been exceeded. This occurs if the power amplifier heatsink temperature exceeds 83° C or if the mains power transformer temperature exceeds 120° C.

PROT - Protect (red)

As the two mainframe power amplifier channels operate independently there are separate PROT indicators for LO and HI channel.

- **On.** An internal fault has been detected on the mainframe channel concerned and that channel has been disconnected (e.g. DC voltage fault in the output stage).
- **On and the PWR LED also flashes.** An external fault has switched off the affected power amplifier channel. Typical faults producing this indication are shorted speaker cables or a load impedance which is too low for the amplifier to drive. Once the cause of the fault has been identified and removed, either muting and un-muting the controller module, or powering the mainframe off and on again, will reset the mainframe fault protection circuits and allow normal operation to resume.

REM - Remote (green)

- **On.** The mainframe is connected to the d&b RIB and ready for communication.

LOCK (yellow)

- **On.** The mainframe has been placed in a locked condition by a remote control system. This means that all the mainframe and controller module controls with the exception of the mains switch are inactive (locked out).
- **Off.** The A1 mainframe is set to local operation, i.e. may be operated using the front panel controls.

OFF/REM/ON (power switch)

- **OFF.** With the exception of the mains overvoltage protection circuit, the mainframe is isolated from the mains supply.
- **REM.** The mainframe is set to remote operation. If no remote control system is connected this setting is equivalent to the power switch OFF position.
- **ON.** The mainframe is switched on. In this switch position, the remote control system can monitor and display the operational status of the mainframe but cannot change any settings.

2.3. Connections

INPUT and INPUT LINK

The mainframe has a 3 pin XLR female input connector. Beneath and wired in parallel is a 3 pin male XLR connector to provide an input link - sometimes called a 'pass-through' connector - used to feed the input of the next device in the system signal chain.

Transformer balanced input (option)

To prevent system ground loops, the P1200A can be supplied with transformer balanced inputs. The transformers used are studio quality toroidal transformers able to handle signal levels up to +28 dBu without degrading the systems low frequency response.

The input balancing transformer gives electrical isolation between the source output (e.g. mixing console) and controller inputs and therefore prevents ground loops. A 22 kohms coupling resistor prevents electrostatic loading of the mainframe.

REMOTE CONTROL

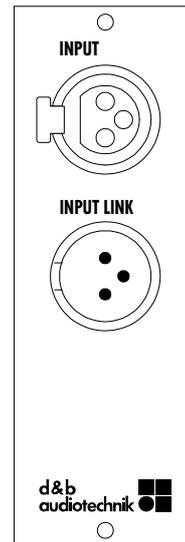
The A1 is fitted with a two-wire serial remote control interface. The 3 pin female DIN remote control connector is located on the left of the A1 rear panel. The connector is opto-coupled.

The remote functions are detailed in section 2.6. (Remote control & monitoring).

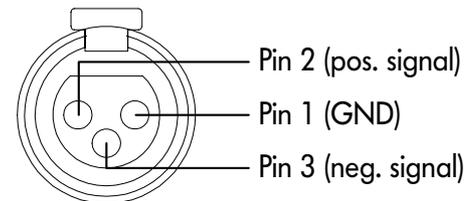
OUTPUT (loudspeaker outputs)

The speaker output(s) are also located on the mainframe rear panel. Both power amplifier outputs (LF & HF), SENSE DRIVE and SPEAKER ID connections all terminate on a single 8-pin CA-COM connector. The CA-COM is a particularly robust and reliable bayonet fit (locking) connector.

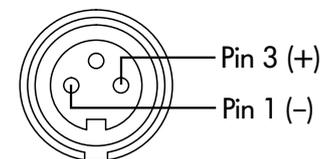
Different controller modules have different output connector pin assignments which are printed on the panel next to the connector(s). Each controller module speaker output panel is described in the later sections of this manual along with the different active loudspeakers and their controller modules.



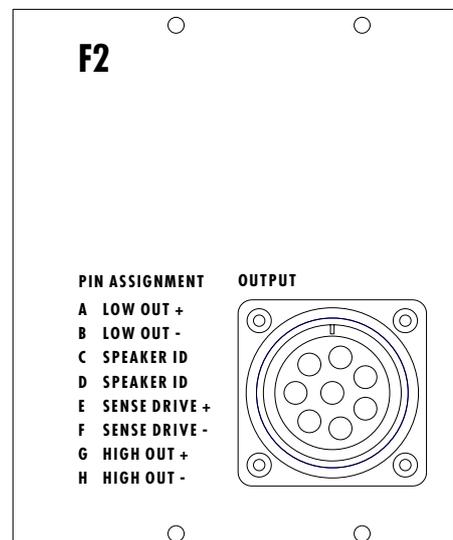
A1 input signal connectors



Pin assignments on P1200A signal inputs



Pin assignment for remote control



F2-CA loudspeaker output

2.4. Mainframe installation

P1200A mainframe enclosures are designed to fit a standard 19" equipment rack or cabinet.

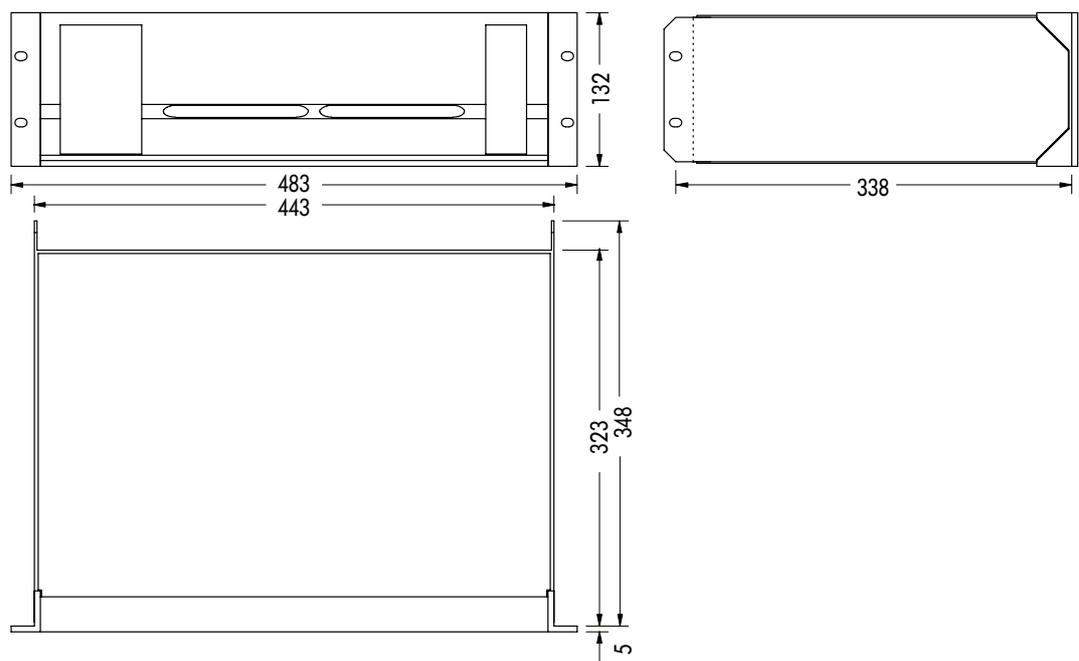
The front panel vent slot serves as a useful handle for lifting and moving mainframes in and out of racks. The front panel switches are flush-fitted and the level control(s) and mainframe power switch are recessed to protect them from accidental damage and unintentional adjustment.

When specifying a rack, be sure to allow extra depth (10 cm is usually sufficient) to accommodate the cables and connectors at the rear of the mainframe(s).

When mounting mainframes into a 19" rack cabinet, provide additional support using shelves fixed to the inner sides of the cabinet or the mounting holes provided on the mainframe rear-mounted rack ears - do not just rely on fixing and supporting mainframes by their front panels. This advice is particularly important if mainframes are being racked-up for touring use.

Since the P1200A power amplifiers can generate a lot of heat, please ensure, whatever the mounting or racking arrangement, that adequate cool airflow is provided to avoid a build-up of hot air inside the rack leading to overheating. The P1200A air intake is on the rear panel and the air outlets are set into the front panel.

To maintain good airflow through mainframes we recommend frequent cleaning of the fan filters. If mainframes are installed in cabinets so that direct access to the rear panel filters is not possible, we recommend using additional fan modules with front-mounted filters which can be easily replaced without opening the sealed cabinets. We will gladly advise on the choice of suitable fan modules.



A1 enclosure dimensions

2.5. 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 music signal or speech signal - the ratio of peak to sustainable RMS voltage of the signal.

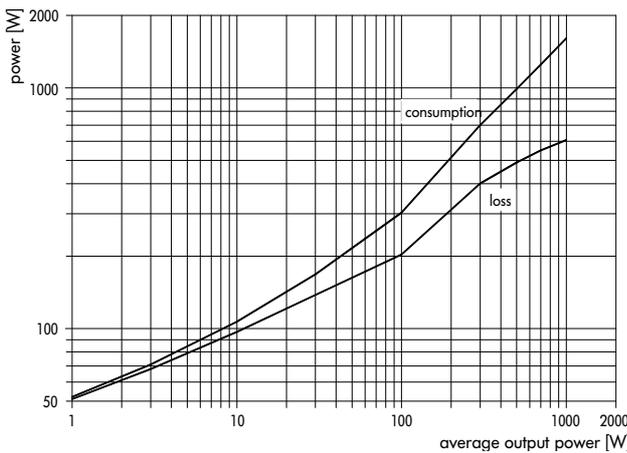
The table on the right gives power figures for various types of signal waveforms. The figures were measured on a A1 mainframe driving a 4 and 8 ohms load (LO and HI channel) to the clipping point of both mainframe power amplifiers.

Power input and thermal power loss as a function of average output power for sine wave and pink noise signal waveforms can also be derived from the two graphs shown below (Note that pink noise signal reaches the clipping point of the amplifiers at approx. 200 W average output power).

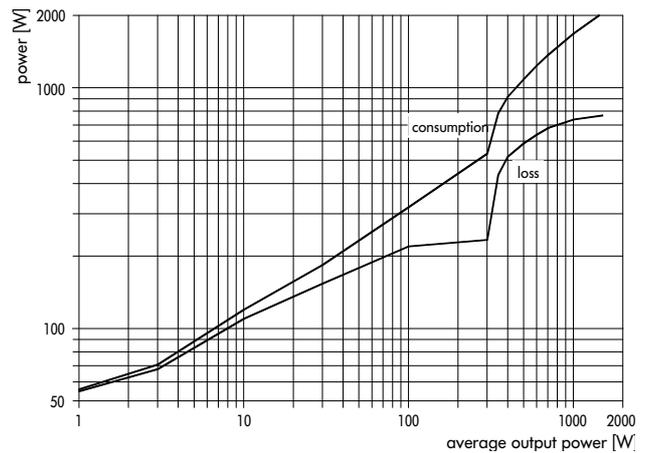
Signal waveform	CF	P _{out} [W]	P _{in} [W]	P _{loss} [W]
Square wave	1	2150	2900	750
Sine wave	1,4	1400	2130	730
Pink noise, compressed music	3,5	200	500	300
Music with medium dynamic range	5	100	300	200
Speech, music with wide dynamic range	8	40	200	160

- CF : Crest factor
- P_{out} : Maximum average output power (sum of both channels)
- P_{in} : Power input
- P_{loss} : Power loss

A1 Power balance



Average power consumption and loss of A1 as a factor of output power with pink noise signal (load impedance 4 / 8 ohms, both channels driven, sum of output power of both channels)



Average power consumption and loss of A1 as a factor of output power with sine wave signal (load impedance 4 / 8 ohms, both channels driven, sum of output power of both channels)

2.6. Technical specifications

Nominal output power	700 / 200 watts - 8 ohms
(THD+N < 0.1%, both channels driven).....	1200 / 350 watts - 4 ohms
Frequency response (-1 dB).....	20 Hz - 50 Hz
measured at rated output power, both channels driven	
Harmonic distortion (THD+N).....	< 0.05 % / 0.03 %
from 0.1 W to rated output power, 20 Hz - 20 kHz	
Intermodulation distortion (SMPTE).....	< 0.06 % / 0.02 %
from 0.1 W to rated output power	
Residual noise	> 112 dB / 114 dB
below rated output power, 22 Hz - 22 kHz, unweighted, RMS	
Damping factor at loudspeaker output.....	> 50 / 100
20 Hz - 20 kHz, 4 ohms load	
Crosstalk	< -55 dB

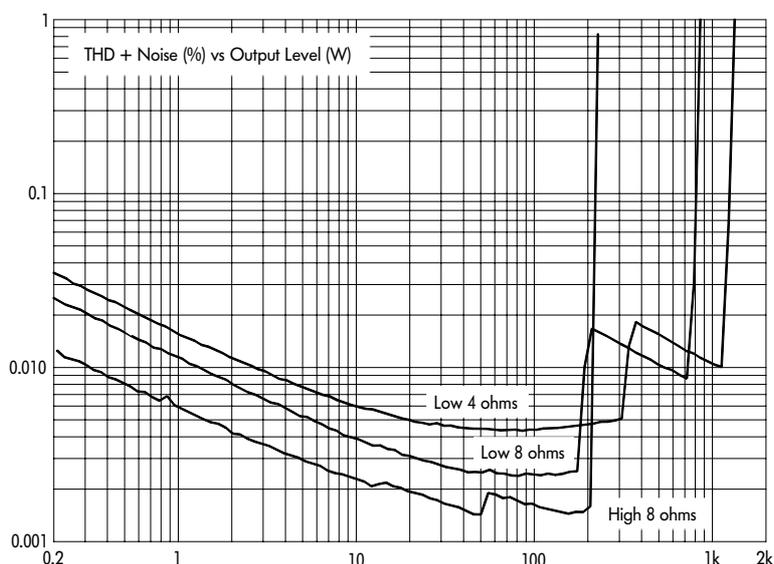
Protection circuits

Mains inrush current limiter.....	5 A
Switch-on delay.....	< 2 s
Overvoltage, DC output, overtemperature and short circuits	

INPUT	XLR 3-pin female
Input impedance.....	44 kohms
electronically or transformer balanced (optional)	
INPUT LINK	XLR 3-pin male
parallel to input	
C4-OUT (B2-CO only).....	XLR 3-pin. male
balanced, output load impedance.....	≥ 600 ohms
OUTPUT	8-pin CA-COM, male
Pin assignments depend on type of loudspeaker	

General

Height x width x depth.....	3 rack unit x 483 mm (19") x 353 mm (13.9")
Weight with module fitted.....	22 kg (48.5 lbs)
Mains voltage (min/nominal/max).....	195 / 230 / 265 V / 50 - 60 Hz
..... (additionally with 115/230 V version: 98 / 115 / 132 V / 50 - 60 Hz)	
..... (100 V version: 85 / 100 / 115 V / 50 - 60 Hz)	
Fuses.....	1 x 2 A Time Lag (T), 1 x 8 A Time Lag (T)
..... (115/230 V version: 2 x 8 A Time Lag (T))	
..... (100 V version: 1 x 5 A Time Lag (T), 1 x 16 A Time Lag (T))	



3. Controller modules

The different controller modules include all the signal processing electronics, front panel controls and indicators needed to control and operate a specific matching active loudspeaker system. Shown opposite is the 1220-CO used with the F1220 and M1220 loudspeakers. The actual controller circuitry, controls, indicators and rear panel connectors will of course vary depending upon the requirements of the loudspeaker design they are intended to drive

3.1. Features

Input circuit

A balanced and band-limited input circuit protects the system against out-of-band signals and radio frequency interference.

Equalisation

Equalisers in the controller module match the relative levels of the high and low drivers used in full range cabinets and ensure the linear frequency response of the loudspeaker system. Some controller modules are fitted with additional configuration switches to give the user a degree of control over the system frequency response.

Highpass filter

A highpass filter circuit fine tunes the bass-reflex loudspeaker enclosures used in these systems and also helps to maintain a linear low frequency response while protecting the loudspeakers from extreme sub bass signals.

Subwoofer crossover filters

The controller modules for the subwoofer systems incorporate a lowpass filter as an active crossover to a full range/TOP system. Conversely, the full range systems have a switchable highpass filter for use with an additional subwoofer system.

Thermal limiter

An internal control circuit simulates the loudspeaker voice coil temperatures under actual load conditions. The output of this circuit is used to protect drivers by reducing the signal level when critical temperature values are reached.

LF displacement limiter

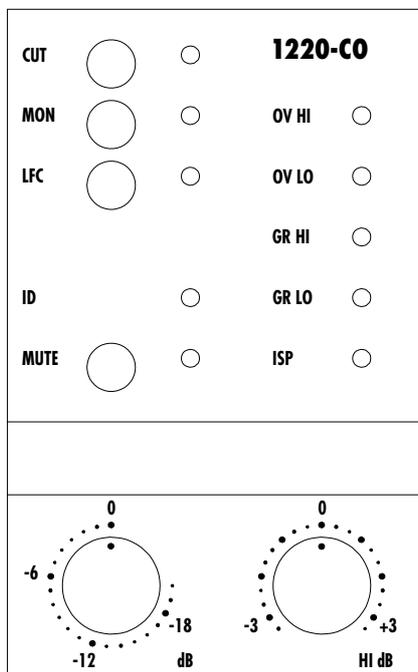
A second internal control circuit simulates the mechanical displacement of the LF driver cone and reduces the signal level before overexcursion damage can occur.

Clipping limiter

To maintain sound quality output stage clipping is kept within reasonable bounds by a limiter circuit. The limiter threshold alters to take account of the supply voltage to the mainframe power amplifiers. So if the mains supply voltage or the connected load impedance alter, then the limiter automatically tracks these changes to maintain the system sound quality.

2-way active crossover

The controller modules for the full range 1220 and F2 systems employ active crossover circuits to split the controller input signal into high & low signal paths to separately feed the high & low



1220 controller front view

drivers in the F1220 and F2 speaker cabinets. Each signal path, high & low, uses equalisers and limiters specifically adjusted to the electroacoustic requirements of the different speaker designs.

HF Level setting

As well as an overall level control, both active system controllers, 1220 and F2, provide a front panel HF level control to fine tune the balance between the cabinet high and low drivers at different listening distances. The 1220 HF level control has a +/- 3dB range while the F2 HF level control has a 0dB to - 6dB range.

3.2. Controls & indicators

This section describes the controls & indicators common to all A1 controller modules. Loudspeaker specific controls and indicators are explained in section 4 of this manual "Loudspeaker systems".

OV HI/LO - Overload (red)

- **On.** Illuminates when an overload occurs in the signal path (input signal too high)
- **On.** Illuminates when the controller limiters reduce gain by more than 12 dB (input signal too high).
- **On.** Illuminates when the amplifier gain is reduced because the output current is too high (e.g. perhaps due to a cable or connector short circuit).

GR HI/LO - Gain Reduction (yellow)

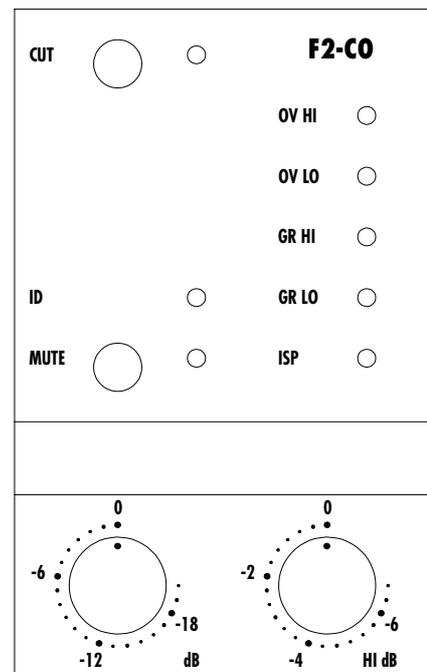
- **On.** Illuminates when the controller limiters for the channel indicated reduce gain by more than 3 dB.

ID - SPEAKER ID (green)

- **Off.** No speaker is connected to the output. Internally, the mainframe power amplifier outputs are isolated from the pins of the rear panel speaker output connector(s).
- **On.** One, or in the case of the 1220 system, two loudspeakers of the correct type are connected to the mainframe speaker output(s). The system is ready to operate.
- **Flashes.** Either one or two loudspeakers of the wrong type have been connected to the mainframe speaker output(s). The speaker outputs are disabled - internally isolated from the mainframe power amplifier outputs.

ISP - Input Signal Present (green)

- **ON.** 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.



Standard controls,
F2 controller module

MUTE (red)

This switch mutes the system output without having to alter any of the system level settings. The mute circuit acts by electronically disconnecting the mainframe power amplifier output. The red LED next to the MUTE switch illuminates to verify that the switch has been selected.

If cabinets used in an array are muted, the movement of the loudspeaker cones in those cabinets is no longer damped by the influence of the mainframe power amplifier output. The removal of damping to some drivers in an array makes them susceptible to excitation by the other loudspeakers in the array. 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 cabinets of an array it is therefore preferable to turn down or disconnect the input signal of the corresponding controllers instead of using the MUTE switch.

When the mainframe is connected to the d&b remote control system (d&b RIB and PC) it is possible to use the minimum input gain setting (-57.5 dB) instead of the MUTE function.

Level control

The detented level control adjusts the controller input sensitivity and has a 20 dB range, calibrated in 1 dB steps. The level control is normally set to 0 dB. On 1220 and F2 controllers, to the right of the level control is an HF level control which sets the relative level of the HF signal from about 1 kHz upwards.

4. Loudspeakers

d&b active systems consist of full range speaker cabinets fitted with separate high and low frequency drivers and actively driven by an A1 mainframe. A full range active system may be supplemented with additional active subwoofer systems.

All of the full range cabinets feature CD dispersion. CD stands for 'Constant Directivity' and indicates that the coverage angle of the loudspeaker is largely unaffected by frequency. A CD characteristic is essential for loudspeakers intended for use in multi-cabinet arrays.

A complete range of mounting brackets, flying frames, rigging accessories and a state-of-the-art flying system are available to allow d&b loudspeakers to be arrayed as quickly, safely and effectively as possible. Some of the rigging systems and fittings are loudspeaker-specific so for further details please refer to the brochures for each system and the d&b Rigging Accessories manual.

Constructed from marine plywood the loudspeaker cabinets have an impact-resistant paint finish and the drivers are physically protected by a rigid steel front grill covered by acoustically transparent foam.

IMPORTANT!

d&b active system loudspeakers may only be driven by the appropriate controller modules and A1 mainframes. Only by using the controller can maximum loudspeaker performance be achieved. Ignoring these basic requirements can adversely influence sound quality and risk damage to the loudspeakers. Without the correct thermal and LF displacement limiters in operation LF drivers are particularly susceptible to damage.

Please note that driving an active series loudspeaker cabinet without a suitable controller will void any warranty claim relating to loudspeaker failure.

d&b loudspeaker cabinets are equipped with threaded inserts, loudspeaker stand mounts, flying fittings, etc. The cabinets must only be used with original d&b accessories in strict accordance with the assembly instructions. Especially when flying loudspeakers, users must strictly observe the Safe Working Load (SWL) specified for each rigging component or rigging assembly used.

The d&b Rigging Accessories manual describes the correct assembly and use of the rigging components for d&b loudspeakers.

4.1. Connections

IMPORTANT!

All active system loudspeakers are fitted with an 8-pin CA-COM connector mounted on a metal panel, recessed to protect it from accidental damage - the panel also bears the cabinet serial number details.

The different active speaker systems use different connector pin assignments which are printed next to the speaker output connector on the controller module rear panel.

The d&b SpeakerID circuit used for the active systems prevents damage if the wrong speaker is inadvertently connected to an A1 mainframe.

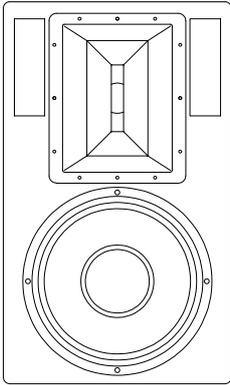
4.2. Data sheets for the loudspeakers

On the following pages you will find data sheets for the d&b loudspeakers which can be operated with the A1 mainframe. The data sheets contain information about the loudspeakers and operation with their respective A1 controller settings.

The following data sheets are a compilation of the individual data sheets for the d&b loudspeakers. Please note that the version number for the individual data sheets, shown as a footnote on the respective pages, can differ from the version number of this manual.

- **F1220**
- **F1222**
- **M1220**
- **M2**
- **F2**
- **B1-SUB**
- **B2-SUB**

F1220



The F1220 is a compact, actively driven, 2-way full-range loudspeaker which uses a 12" LF driver and 2" HF compression driver in an arrayable bass reflex cabinet. The HF driver is coupled to a 60° x 40° (h x v) constant directivity (CD) horn.

The F1220 cabinet is constructed from marine plywood coated with an impact resistant paint. Recessed handles are fitted along with a rigid steel grill and acoustically transparent foam front. A pair of countersunk M10 threaded inserts are provided on top and bottom to accept stand adapters and mounting frames. The top, bottom and rear panels of the cabinet also have flying tracks to accept rigging hardware.

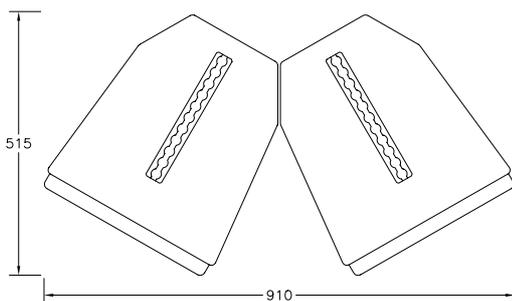
With a frequency response extending from 60 Hz to over 16 kHz, the F1220 can be used in many applications without the need for a separate subwoofer system. The relatively narrow dispersion angle and high SPL capability of the F1220 allow it to provide coverage to 20 m and beyond.

The F1220 is recommended for applications where high quality sound reinforcement, particularly of speech and vocals, is a critical requirement. The neutral reproduction, superb transient response and precise imaging of the 1220 system stems from the use of very low distortion drivers. The system is able to cleanly reproduce high level programs and, when used with active subwoofers, forms a formidable front-of-house system.

Angled rear side panels allow a pair of F1220 cabinets to be placed side-by-side to form a twin cabinet cluster with 120° horizontal coverage. F1220 cabinets can also be flown individually, or as a speaker cluster - the design of the flying fittings enabling the speakers to be rigged, aimed, and set at various angles without the need for additional stabilising guylines. The extensive range of fittings and rigging hardware for use with 1220 systems is detailed in the d&b Rigging Accessories Manual.

The stage monitor version of the F1220, the M1220, has a similar electro-acoustic performance and uses the same controller module, but has a cabinet shape more suited to its principal role as a stage monitor.

Two F1220 cabinets can be connected to a single A1 mainframe.



F1220 120° twin array

1220-CO - Controls & indicators

Standard setting

On the top left of the module front panel are three configuration switches. Yellow LEDs next to each switch illuminate when a switch is selected. With no configuration switches selected, the connected 1220 loudspeakers will operate as a main, front-of-house system without subwoofer support. A more balanced bass response is obtained when the cabinets are deployed as a twin cabinet cluster or operated in half space, placed on a stage or mounted on a wall.

CUT switch and indicator

With the CUT switch selected, the frequency and phase response of 1220 loudspeakers is modified for operation with d&b B1-SUB, B2-SUB or E18-SUB active subwoofer systems.

MON switch and indicator

With the MON switch selected, the controller module is configured to drive the M1220 stage monitor. The MON setting introduces a 1.5 dB lift between 500 Hz and 3 kHz. The CUT and LFC switches will still function whatever the setting of the MON switch. The MON switch should not be selected when driving F1220 cabinets.

LFC switch and indicator

LFC stands for "low frequency correction". With the LFC switch selected, bass level boost is applied to compensate for the LF loss encountered when cabinets are deployed in full space - flown or stand mounted. The LFC switch is automatically disabled when CUT is selected.

HI level control

The HI level control has a +/-3 dB range and cuts or boosts HF response above 1 kHz. For a linear frequency response, the HI level control should be set to its 0 dB position.

Recommended subwoofer level control settings

With the 1220-CO level control set to 0 dB, subwoofer level controls should be set to the following values:

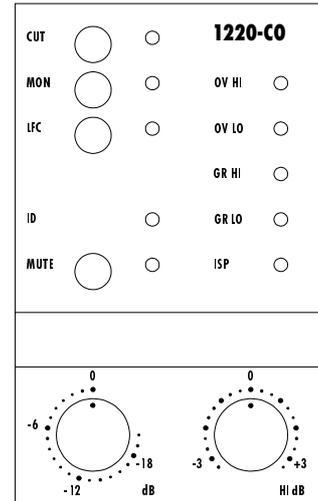
- B1-SUB: 0 dB
- B2-SUB: approx. -8 dB
- 1 x E18-SUB: +3 dB
- 2 x E18-SUB: -3 dB

Controller module rear panel

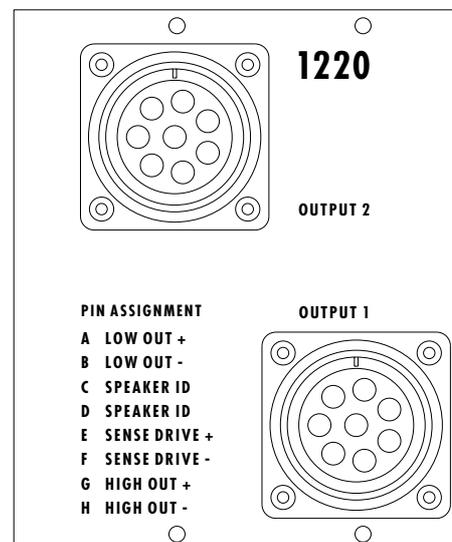
Two 8-pin, identically wired, CA-COM output sockets are fitted to the module rear panel. To avoid a potential shock hazard, if a single F1220 loudspeaker is connected, the pins on the unused socket are internally isolated from the mainframe power amplifier outputs.

Internal speaker wiring

When replacing the 12" driver, ensure that the red lead is connected to the black terminal on the driver, and vice versa. The HF driver is wired normally - red lead to the red terminal.



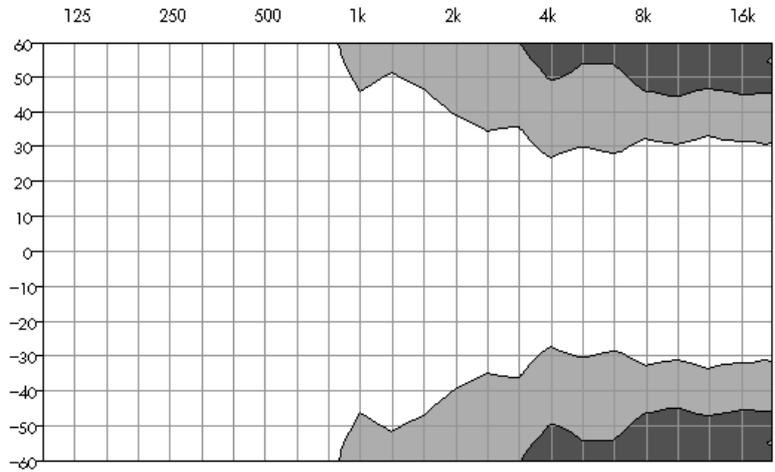
1220-CO controls & indicators



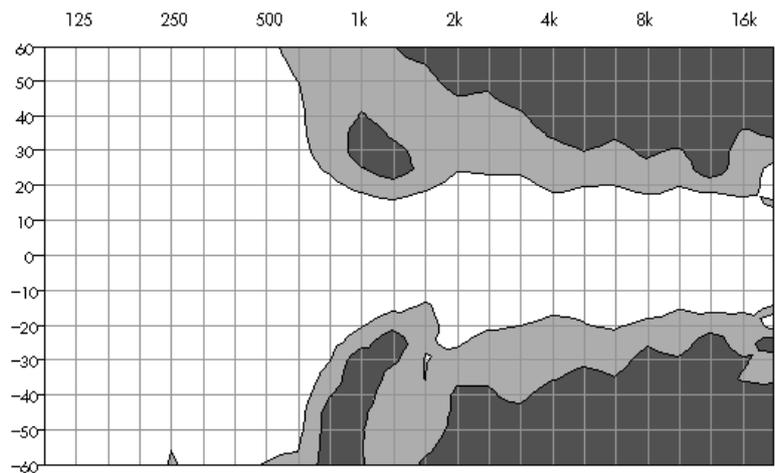
1220-CO rear panel

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 17 kHz down to 2 kHz.



horizontal



vertical

F1220 isobar diagram

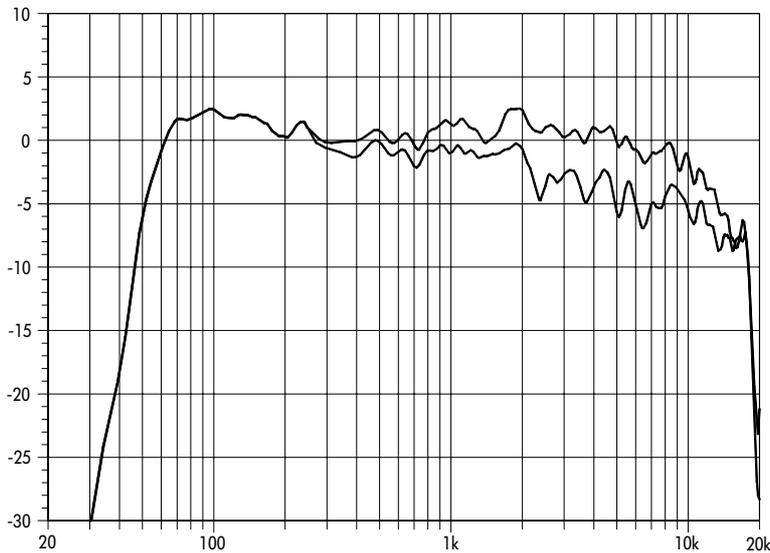
Technical specifications

F1220 System data

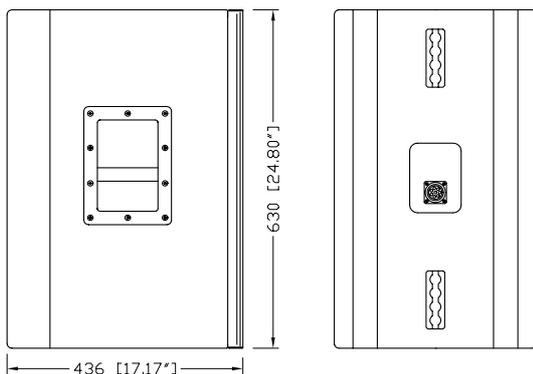
Frequency response F1220 (-5 dB) 60 Hz to 16 kHz
 Max. sound pressure (1 m) 134 dB
 (SPLmax peak, test signal pink noise with crest factor 4)
 Input level for max. sound pressure +15 dBu
 Input level for 100 dB-SPL / 1 m -13 dBu
 Polarity to controller INPUT (XLR pin 2: + / 3: -) LF: - / HF: +

F1220 loudspeaker

Nominal impedance (LOW / HIGH) 8 / 16 ohms
 Power handling capacity LOW (RMS / peak 10 ms) 300 / 1200 W
 Power handling capacity HIGH (RMS / peak 10 ms) 50 / 200 W
 Nominal dispersion angle (hor. x vert.) 60° x 40°
 Connection 8-pin CA-COM, female
 Pin assignments printed on the controller module rear panel
 Weight 37 kg (81.5 lb)



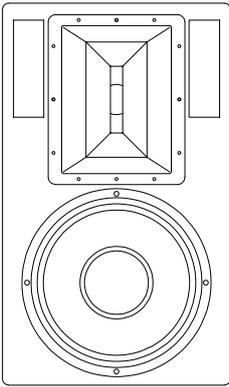
F1220 frequency response (on and 30° off the horizontal axis)



F1220 cabinet dimensions in mm [inch]



F1222



The F1222 is a compact, actively driven, 2-way full-range loudspeaker which uses a 12" LF driver and 2" HF compression driver in an arrayable bass reflex cabinet. The HF driver is coupled to a 60° x 40° (h x v) constant directivity (CD) horn. As an option the F1222 loudspeaker can be equipped with a 90° x 40° horn.

The F1222 cabinet is constructed from marine plywood coated with an impact resistant paint. Recessed handles are fitted along with a rigid steel grill and acoustically transparent foam front. A pair of countersunk M10 threaded inserts are provided on top and bottom to accept stand adapters and mounting frames. The top, bottom and rear panels of the cabinet also have flying tracks to accept rigging hardware.

With a frequency response extending from 60 Hz to over 16 kHz, the F1222 can be used in many applications without the need for a separate subwoofer system. The relatively narrow dispersion angle and high SPL capability of the F1222 allow it to provide coverage to 20 m and beyond.

The F1222 is recommended for applications where high quality sound reinforcement, particularly of speech and vocals, is a critical requirement. The neutral reproduction, superb transient response and precise imaging of the 1222 system stems from the use of very low distortion drivers. The system is able to cleanly reproduce high level programs and, when used with active subwoofers, forms a formidable front-of-house system.

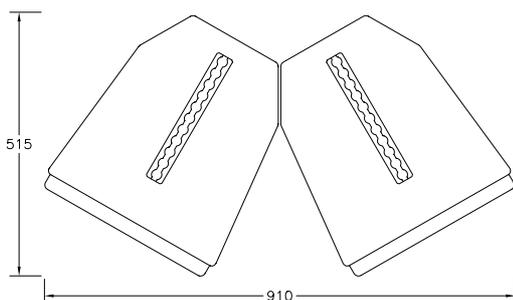
Angled rear side panels allow a pair of F1222 cabinets to be placed side-by-side to form a twin cabinet cluster with 120° horizontal coverage. F1222 cabinets can also be flown individually, or as a speaker cluster - the design of the flying fittings enabling the speakers to be rigged, aimed, and set at various angles without the need for additional stabilising guylines. The extensive range of fittings and rigging hardware for use with 1222 systems is detailed in the d&b Rigging Accessories Manual.

Two F1222 cabinets can be connected to a single A1 mainframe.

Compatibility to 1220 systems

The F1222 loudspeaker uses a different 12" low frequency driver than the F1220. Both systems have identical power handling capacity and acoustical quality. For sound reasons the F1222 loudspeaker should not be driven with a 1220 controller.

1220 and 1222 systems operated with their respective controllers are acoustically compatible. With a switch at its front the 1222 controller module can be set to drive 1220 loudspeakers.



F1222 120° twin array

1222 controller module switches

Standard setting

With no configuration switches selected, the connected 1222 loudspeakers will operate as a main, front-of-house system without subwoofer support.

CUT switch and indicator

With the CUT switch selected, the frequency and phase response of 1222 loudspeakers is modified for operation with d&b B1-SUB, B2-SUB or E18-SUB active subwoofer systems.

HFC switch and indicator

HFC stands for "high frequency correction". With the HFC switch selected, the frequency range above 10 kHz is lifted.

1220 switch and indicator

The 1220 switch configures the controller module to drive F1220 loudspeakers. This setting is identical to the basic setting of the 1220 controller module.

HI level control

The HI level control has a +/-3 dB range and cuts or boosts HF response above 1 kHz. For a linear frequency response, the HI level control should be set to its 0 dB position.

Recommended subwoofer level control settings

With the 1222-CO level control set to 0 dB, subwoofer level controls should be set to the following values:

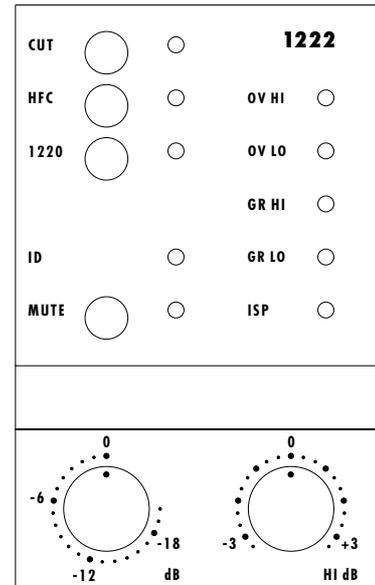
- B1-SUB: 0 dB
- B2-SUB: approx. -8 dB
- 1 x E18-SUB: +3 dB
- 2 x E18-SUB: -3 dB

Controller module rear panel

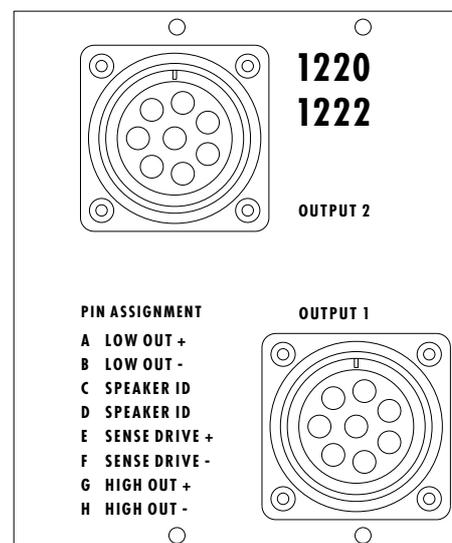
Two 8-pin, identically wired, CA-COM output sockets are fitted to the module rear panel. To avoid a potential shock hazard, if a single F1222 loudspeaker is connected, the pins on the unused socket are internally isolated from the mainframe power amplifier outputs.

Internal speaker wiring

When replacing the 12" driver, ensure that the red lead is connected to the black terminal on the driver, and vice versa. The HF driver is wired normally - red lead to the red terminal.



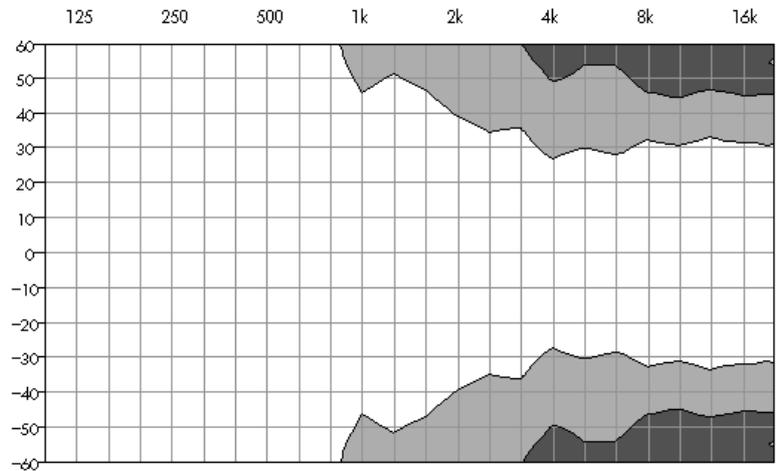
Controls on 1222 controller module



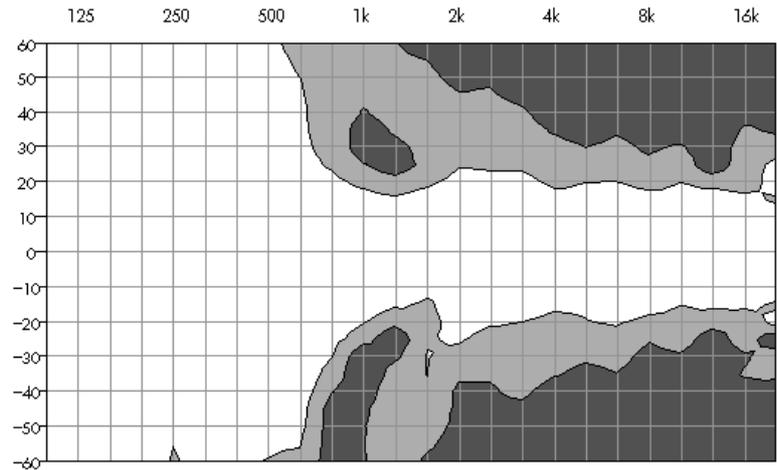
1222 controller rear panel

Dispersion characteristics

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



horizontal



vertical

F1222 (60°x40°) isobar diagrams

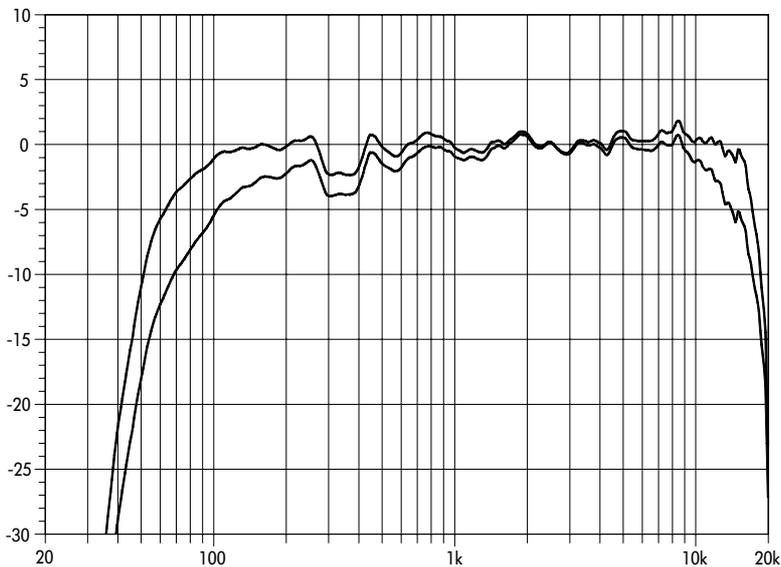
Technical specifications

F1222 System data

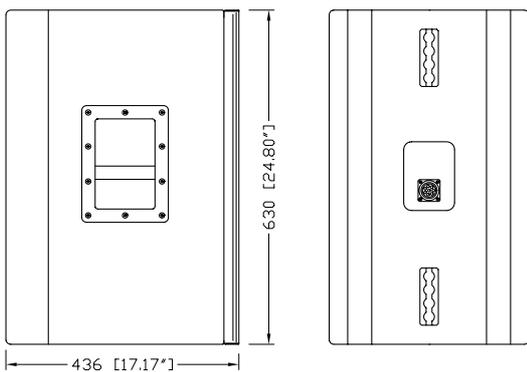
Frequency response (-5 dB) 60 Hz to 16 kHz
 Max. sound pressure (1 m) 134 dB
 (SPLmax peak, test signal pink noise with crest factor 4)
 Input level for max. sound pressure +18 dBu
 Input level for 100 dB-SPL / 1 m -13 dBu
 Polarity to controller INPUT (XLR pin 2: + / 3: -) LF: - / HF: +

F1222 loudspeaker

Nominal impedance (LOW / HIGH) 8 / 16 ohms
 Power handling capacity LOW (RMS / peak 10 ms) 300 / 1200 W
 Power handling capacity HIGH (RMS / peak 10 ms) 50 / 200 W
 Nominal dispersion angle (hor. x vert.) 60° x 40°
 Connection 8-pin CA-COM, female
 Pin assignments printed on the controller module rear panel
 Weight 35 kg (78 lb)

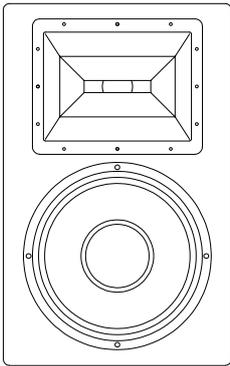


F1222 frequency response, standard, CUT and HFC switch settings



F1222 cabinet dimensions in mm [inch]

M1220



The M1220 is a compact, actively driven, 2-way stage monitor which uses a 12" LF driver and 2" HF compression driver in an arrayable bass reflex cabinet. The HF driver is coupled to a 40° x 60°(h x v) constant directivity (CD) horn.

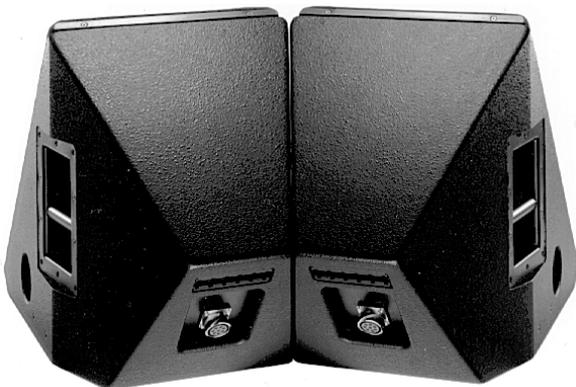
Constructed from marine plywood coated with an impact resistant paint, the M1220 cabinet is fitted with recessed handles and a rigid steel grill with an acoustically transparent foam front. Flying tracks to accept rigging hardware are also fitted to the base and rear panel of the cabinet.

The frequency response of the M1220 extends from 70 Hz to over 16 kHz, and the use of low distortion drivers ensures neutral reproduction, superb transient response and precise imaging.

A pair of M1220 cabinets side-by-side, with angled side panels together, forms an 80° horizontal coverage stage monitor array. M1220 cabinets can also be used as flown delays or as a centre cluster - when flown, because of the position of the flying tracks, the cabinets are suspended upside down. An extensive range of fittings and rigging hardware is detailed in the d&b Rigging Accessories Manual.

The front-of-house version of the M1220, the F1220, has a similar electro-acoustic performance, uses the same controller module, but has an arrayable cabinet shape more suited to its role as a main system cabinet. When the M1220 is used, the MON switch on the controller module is selected.

Two M1220 cabinets can be connected to a single A1 mainframe.



M1220 twin cabinet array

1220-CO Controls and indicators

Standard setting

On the top left of the module front panel are three configuration switches. Yellow LEDs next to each switch illuminate when a switch is selected. With no configuration switches selected, the connected 1220 loudspeakers will operate as a main, front-of-house system without subwoofer support. When using a mixture of F1220 and M1220 cabinets front-of-house, the greatest compatibility in the mid to treble range is obtained with no configuration switches selected. A more balanced bass response is obtained when the cabinets are deployed as a twin cabinet cluster or operated in half space, placed on a stage or mounted on a wall.

CUT switch and indicator

With the CUT switch selected, the frequency and phase response of 1220 loudspeakers is modified for operation with d&b B1-SUB, B2-SUB or E18-SUB active subwoofer systems.

MON switch and indicator

With the MON switch selected, the controller module is configured to drive the M1220 stage monitor. The MON setting introduces a 1.5 dB lift between 500 Hz and 3 kHz. The CUT and LFC switches function whatever the setting of the MON switch. The MON switch should not be selected when driving the F1220.

LFC switch and indicator

LFC stands for "low frequency correction". With the LFC switch selected, bass level boost is applied to compensate for the LF loss encountered when cabinets are deployed in full space e.g. flown. The LFC switch is automatically disabled when CUT is selected.

HI level control

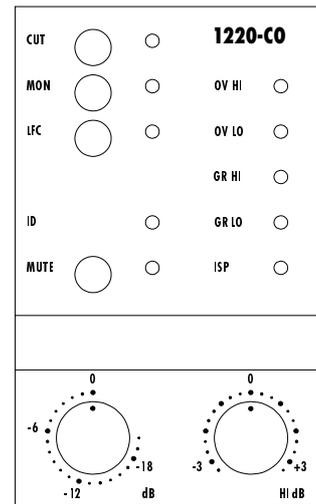
The HI level control has a +/-3 dB range and cuts or boosts HF response above 1 kHz. For a linear frequency response, the HI level control should be set to the 0 dB position.

Controller module rear panel

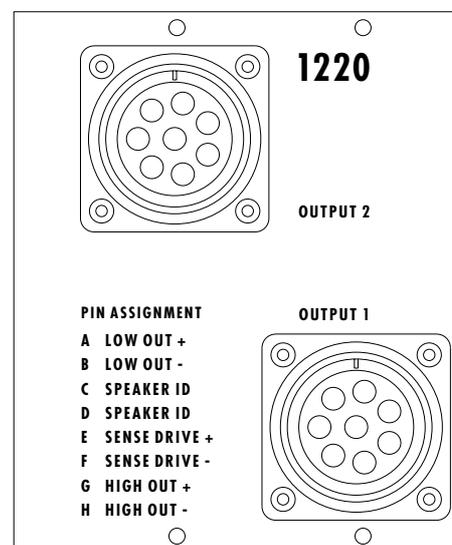
Two 8-pin, identically wired, CA-COM output sockets are fitted to the module rear panel. To avoid a potential shock hazard, if a single 1220 loudspeaker is connected, the pins on the unused socket are internally isolated from the mainframe power amplifier outputs.

Internal speaker wiring

When replacing the 12" driver, ensure that the red lead is connected to the black terminal on the driver, and vice versa. The HF driver is wired normally - red lead to the red terminal.



1220-CO controls & indicators



1220-CO rear panel

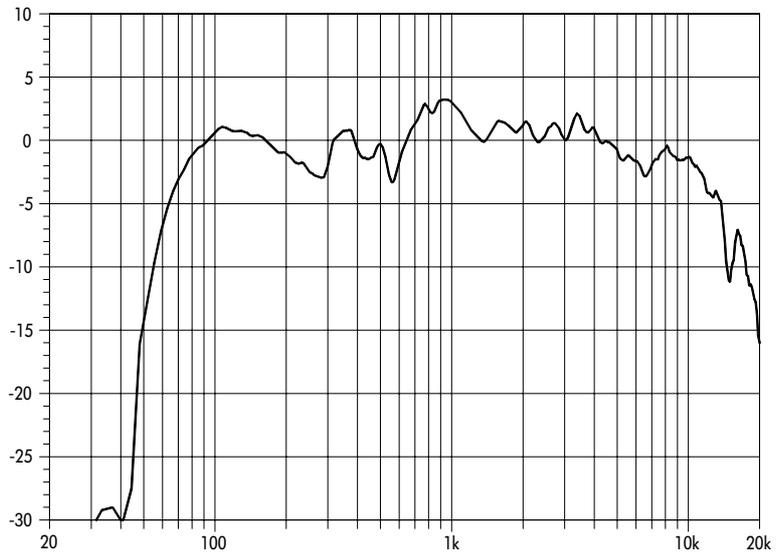
Technical specifications

M1220 System data

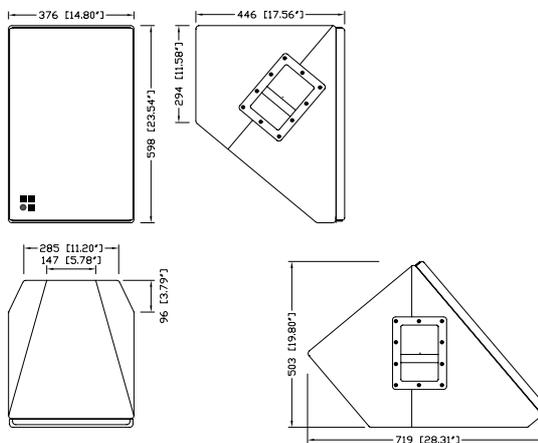
Frequency response M1220 (-5 dB, free field)70 Hz to 16 kHz
 Frequency response M1220 (-5 dB, floor coupling)60 Hz to 16 kHz
 Max. sound pressure (1 m) 134 dB
 (SPLmax peak, test signal pink noise with crest factor 4)
 Input level for max. sound pressure +15 dBu
 Input level for 100 dB-SPL / 1 m -13 dBu
 Polarity to controller INPUT (XLR pin 2: + / 3: -) LF: - / HF: +

M1220 stage monitor

Nominal impedance (LOW/HIGH)..... 8 / 16 ohms
 Power handling capacity LOW (RMS / peak 10 ms).....300 / 1200 W
 Power handling capacity HIGH (RMS / peak 10 ms).....50 / 200 W
 Nominal dispersion angle (hor. x vert.).....40° x 60°
 Connection 8-pin CA-COM, female
Pin assignments printed on the controller module rear panel
 Weight 34 kg (75 lb)

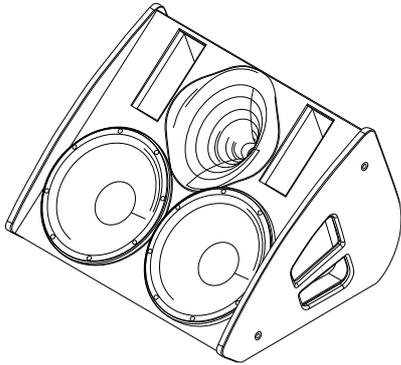


M1220 stage monitor frequency response, controller set to MON. (Free-field frequency response, standard setting, similar to F1220)



M1220 cabinet dimensions in mm [inch]

M2



The M2 is a high performance 2-way active monitor system using two 12" LF drivers in an airflow-optimised bass-reflex cabinet. It contains a 1.4" HF driver using a compact but extremely strong neodymium magnet assembly, mounted on a low distortion horn optimized for monitor applications. The design allows the use of a low height cabinet while achieving a constant directivity from an unusual 600 Hz upwards with a nominal dispersion of 45° (h) x 60° (v). Together with the cabinets baffle angle of 40° (to floor), this dispersion offers a realistic artist listening area starting directly above the cabinet and ranging for quite a distance upstage.

The M2 is driven actively using the A1 mainframe with M2 controller module. Two M2 cabinets can be driven from one A1 mainframe.

The M2 cabinet is constructed from marine plywood and has an impact resistant paint finish. The cabinet is protected by a rigid metal grill backed with an acoustically transparent foam. Two fittings which accept Ball-lock shackle pins are located on both sides of the cabinet allowing quick and flexible rigging. Fitted on the rear panel are two CA-COM connectors allowing linking of paired cabinets.

The M2, as a 2-way high performance monitor producing a remarkable peak sound pressure level of 143 dB – the most powerful d&b system so far, provides a constant directivity which raises the feedback level significantly and gives very direct voice reproduction. The M2 bestows its full dynamics across the entire frequency range without compromising the solo voices or instruments, which always stay clearly and audibly in front of the mix.

For applications which require deep bass, the LF response can be extended by using additional active subwoofer system C7-SUB.



M2 stage monitor

M2-CO Controls and indicators

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. M2 is now configured for use with d&b C7-SUB active subwoofer.

LFC level control

The detented **L**ow **F**requency **C**oupling control adjusts the systems lo- and lo-mid response to different operating environments of the M2 system.

The **FLOOR** position is the standard setting for a single M2, used as floor monitor.

Turning the control to the **PAIR** position, the lo- and lower mid frequency range is more and more reduced (Corner frequency about 600Hz). The maximum left position fully compensates the different coupling behaviour of the low and high frequencies when two cabinets are used in a paired monitor application.

Turning towards **FREE** increases the systems low end for operation without floor coupling (e.g. flown).

Indicators

These indicators give a three stage indication of the M2 Controller signal levels.

- **ISP (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.
- **GR (Gain Reduction, yellow)** illuminates when the controller limiter reduces gain by more than 3 dB.
- **OV (Overload red)** illuminates when the controller limiter reduces gain by more than 12 dB or 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).

The limiter indicators show the stage of the HF and LF channels independently.

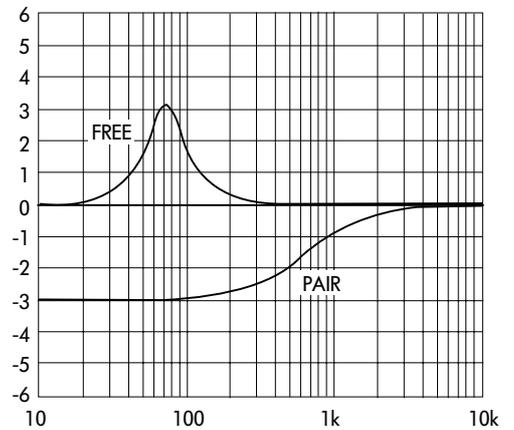
Level Control

The detented level control adjusts the controller input sensitivity. It has a 20 dB range (-14 dB ... +6 dB) calibrated in 1 dB steps. The controls are normally set to 0 dB.

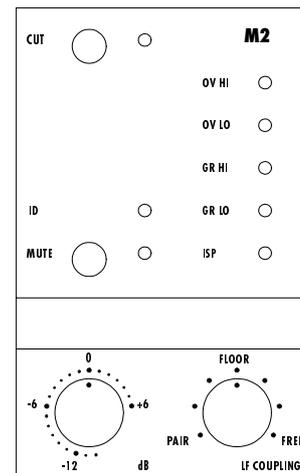
Connector

The M2 controller incorporates one CA-COM 8 pin output for driving one or two (linked) M2 loudspeakers. Different from the F-series controller, the M2 controller uses female connectors for protection against contact.

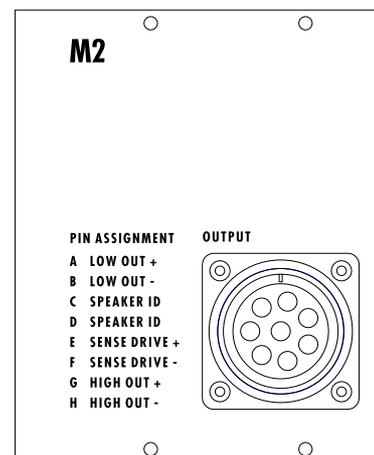
The M2 cabinet incorporates two CA-COM (male/female) connectors for easy linking of two cabinets.



Frequency response LFC-Funktion (min. and max.)



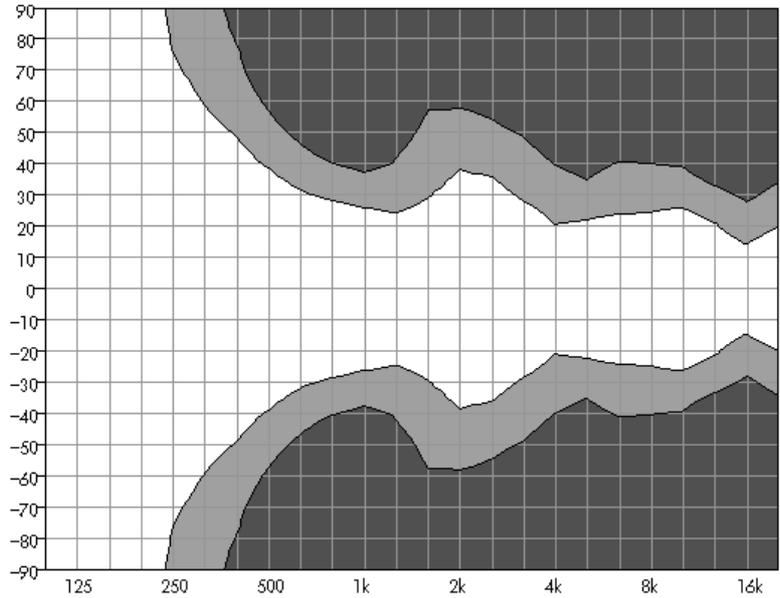
Controls and indicators M2 Controller Modul



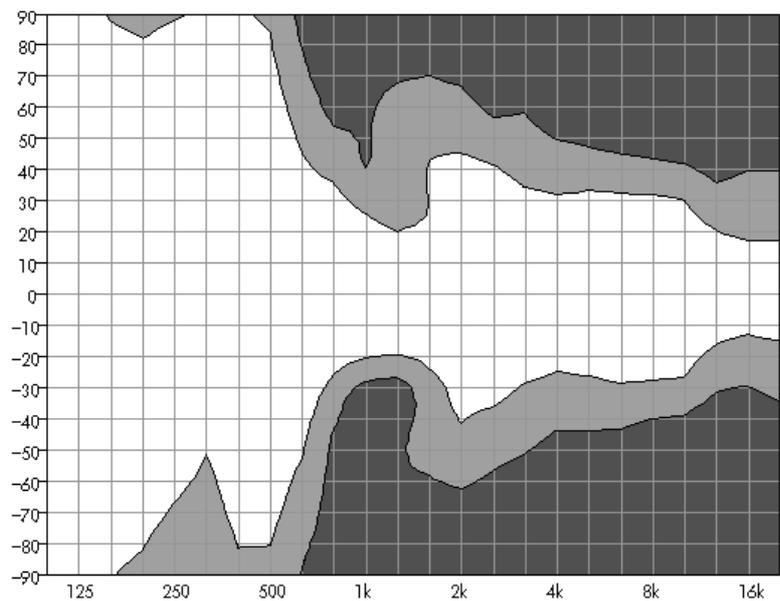
M2 Controller, CA-COM connector plate

Dispersion characteristics

The diagram below shows dispersion angle v. frequency plotted using lines of equal sound pressure (isobars) at -6 dB and -12 dB. The nominal 45° horizontal dispersion angle is maintained from 800 Hz to 10 kHz.



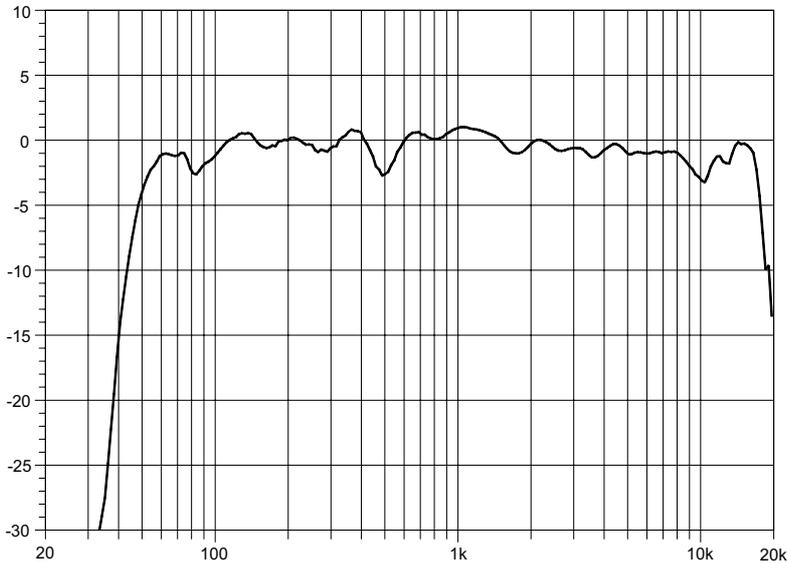
M2 isobar diagram horizontal



M2 isobar diagram vertical

Frequency response

The graph below shows the frequency response of the M2 system in floor monitor position, measured in a height of 1.7m (listening pos. in monitor operation) on axis:



M2 frequency response, monitor operation

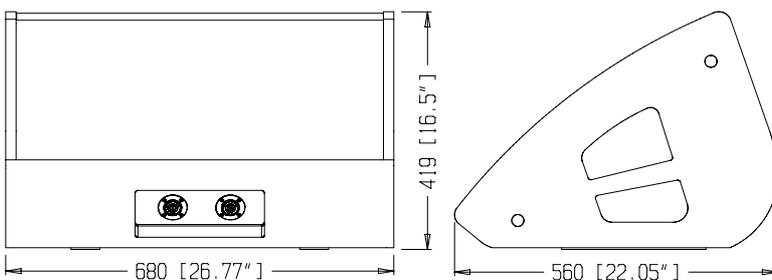
Technical specifications

M2 system data

Frequency response (-5 dB, free field)	56 Hz - 17 kHz
Frequency response (-5 dB, floor coupling).....	50 Hz - 17 kHz
Max. sound pressure level (1 m, free field)	143 dB
(SPLmax peak, pink noise test signal with crest factor of 4)	
Input level (SPLmax).....	+18 dBu
Input level (100 dB-SPL / 1 m)	-26 dBu
Polarity to controller INPUT (XLR pin 2: + / 3: -).....	LF: - / HF: -

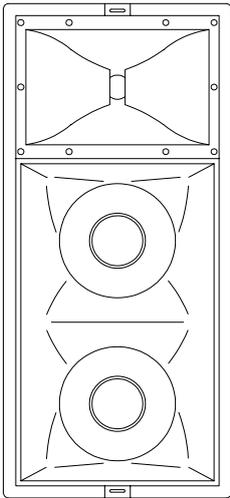
M2 loudspeaker

Nominal impedance LOW/HIGH	4 / 8 ohms
Power handling capacity LOW (RMS / peak 10 ms).....	500 / 2000 W
Power handling capacity HIGH (RMS / peak 10 ms)	50 / 200 W
Nominal dispersion angle (h x v)	45° x 60°
Connections	2 x 8-pin CA-COM
Weight	38 kg (83 lb)



M2 cabinet dimensions in mm [inch]

F2



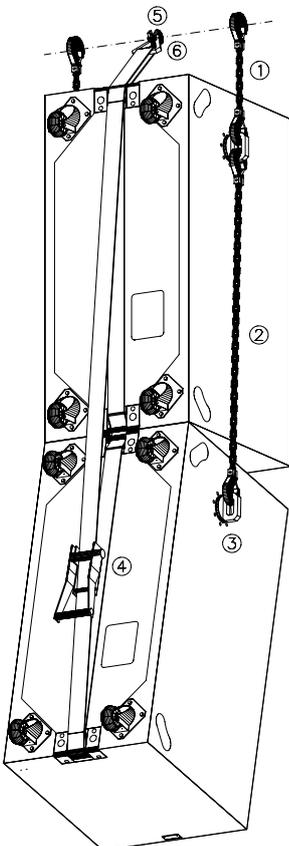
The F2 is an actively driven, 2-way full-range loudspeaker which uses a pair of 12" LF/mid range drivers and a 2" HF compression driver in a horn loaded cabinet. The HF driver is coupled to a 60° x 40° (h x v) constant directivity (CD) horn.

The F2 cabinet is constructed from marine plywood coated with an impact resistant paint. Fitted to the cabinet sides are recessed handles and rigging stud plates. On the front is a rigid steel grill with an acoustically transparent foam cover. Catches to secure an optional protective transport cover are also fitted to the top and bottom front edges of the cabinet. Heavy duty wheels are fitted on the back panel along with ratchet strap guides and countersunk M10 threaded inserts for attaching safeties and additional rigging.

With a frequency response extending from 80 Hz to over 16 kHz, the F2 system can be used on its own for speech and vocal reinforcement. Adding active subwoofers, B2-SUB or C4-SUBs, extends the capability of the F2 system to high level music reinforcement.

The relatively narrow dispersion and concentrated directivity of the F2 is a result of using horn loaded 12" drivers to cover the mid range. Directivity is well maintained towards the low end of the cabinet's response - 90° at 600 Hz and 60° from 800 Hz upwards. The high SPL capability of the F2 design makes it suitable for use in large venues to cover distances to 30 m and beyond.

The C4/F2/B1 Flying System, described in the d&b Rigging Accessories Manual, allows the safe and speedy construction of flown arrays of C4, F2 and B1 loudspeakers.



F2/B1 rigging

F2-CO Controller module - Controls & indicators

Standard setting

A single configuration switch (CUT) is located on the top left of the module front panel. A yellow LED next to the switch illuminates when it is selected. With the configuration switch not selected, the F2 system is configured for speech and vocal reproduction without subwoofer support.

CUT switch and indicator

With the CUT switch selected, the frequency and phase response of F2 loudspeakers is modified for operation with d&b B1-SUB, B2-SUB, C4-SUB or E18-SUB active subwoofer systems.

HI level control

The HI level control has a 0 to -6 dB range and cuts the HF response above 1 kHz. For distances beyond 20 m, the control should be set to its 0 dB position. For close coverage, below 20 m, a better balance is obtained with the control set to -3dB.

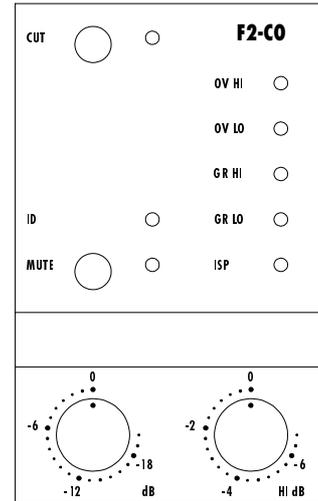
Recommended subwoofer level control settings

With the F2-CO level control set to 0 dB, subwoofer level controls should be set to the following values:

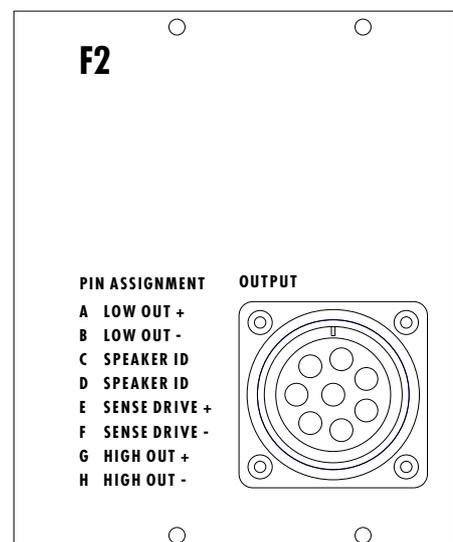
- B2-SUB: -3 dB
- 2 x C4-SUB: 0 dB
- 2 x E18-SUB: +2 dB
- 2 x B1-SUB: -1 dB
- B1-SUB: 0 dB, F2-CO at -5 dB

Controller module rear panel

A single 8-pin CA-COM output socket is fitted to the module rear panel.



F2-CO controls



F2-CO rear panel

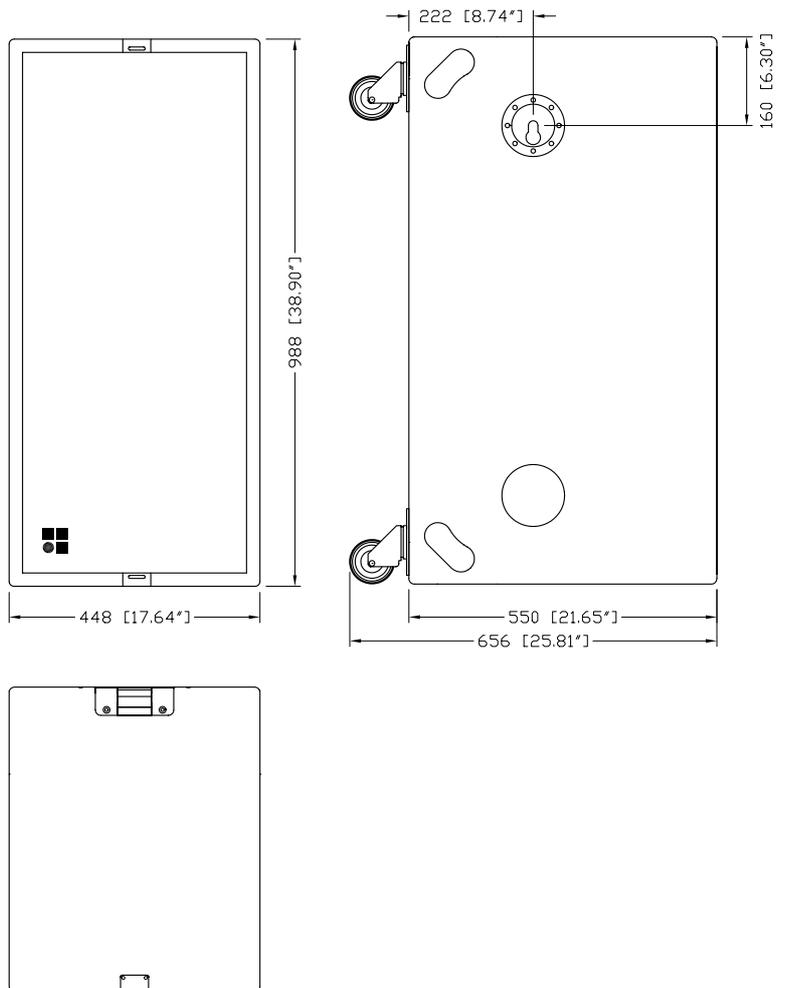
Technical specifications

F2 System data

Frequency response (-5 dB) 80 Hz to 16 kHz
Max. sound pressure (1 m) 136 dB
(SPLmax peak, test signal pink noise with crest factor 4)
Input level for max. sound pressure +11 dBu
Input level for 100 dB-SPL / 1 m -22 dBu
Polarity to controller INPUT (XLR pin 2: + / 3 -) LF: - / HF: +

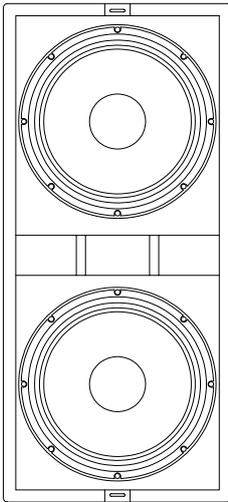
F2 loudspeaker

Nominal impedance (LOW / HIGH) 4 / 16 ohms
Power handling capacity LOW (RMS / peak 10 ms) 500 / 2000 W
Power handling capacity HIGH (RMS / peak 10 ms) 50 / 200 W
Nominal dispersion angle (hor. x vert.) 60° x 40°
Connection 8-pin CA-COM, female
..... Pin assignments printed on the controller module rear panel
Weight 77 kg (170 lb)



F2 cabinet dimensions in mm [inch]

B1-SUB

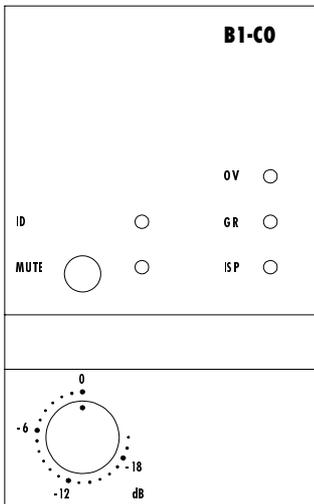


The B1-SUB is an actively driven subwoofer which uses a pair of 15" LF drivers mounted in a bass reflex cabinet.

The cabinet is constructed from marine plywood coated with an impact resistant paint. Fitted to the cabinet sides are recessed handles and rigging stud plates. On the front is a rigid steel grill with an acoustically transparent foam cover. Catches to secure an optional protective transport cover are also fitted to the top and bottom front edges of the cabinet. Heavy duty wheels are fitted on the back panel along with ratchet strap guides and countersunk four M10 threaded inserts for attaching safeties and additional rigging.

The frequency response of the B1-SUB extends from 32 Hz to 110 Hz. The B1 generates a warm, low bass - ideal for use with the 1220 system.

The B1-SUB can also be used as an F2 system subwoofer. For a well balanced sound at full output, two B1-SUBs to each F2 should be used. The dimensions, shape and the fittings used on the B1-SUB cabinet match those of the F2 cabinet making it particularly easy to deploy a mixed F2/B1 system - stacked or flown.



B1-CO controls

B1-CO - Controls & indicators

Since the B1-CO controller module is not fitted with any special controls or configuration switches, its standard controls are covered in the general controller module description in Section 3.2 of the A1 user manual. Please also refer to the descriptions of the 1220 and F2 systems for recommended subwoofer level settings.

Controller module rear panel

A single 8-pin CA-COM output socket is fitted to the module rear panel.

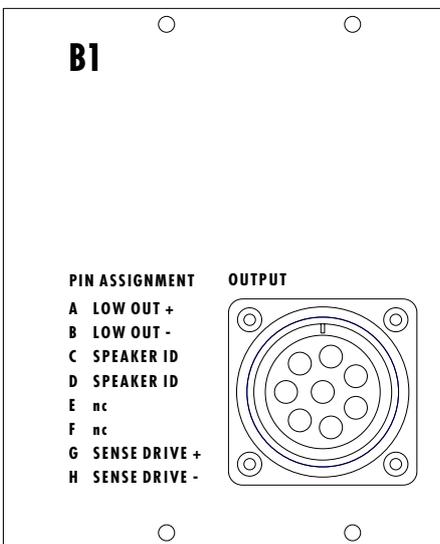
Technical specifications

B1-SUB system data

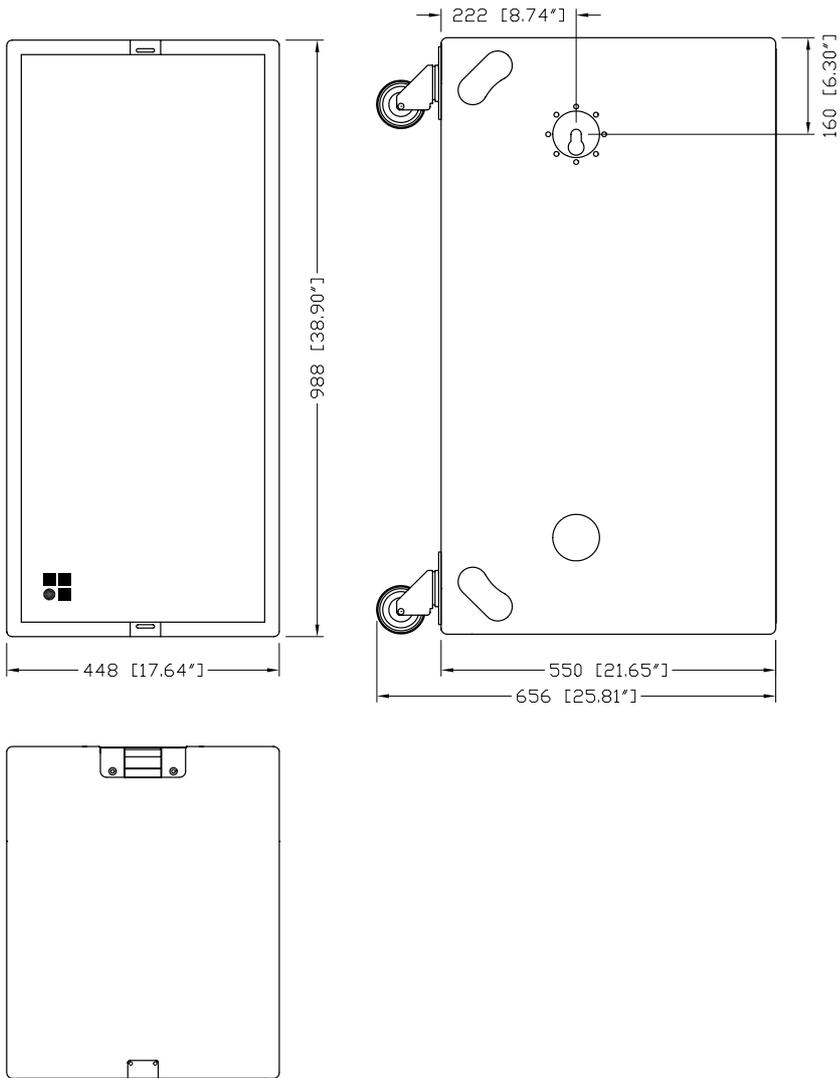
Frequency response (-5 dB).....	32 Hz to 110 Hz
Maximum sound pressure (1 m, full space).....	131 dB
(SPLmax peak, test signal pink noise with crest factor 4)	
Input level for max. sound pressure.....	+16 dBu
Input level for 100 dB-SPL / 1 m.....	-12 dBu
Polarity to controller INPUT (XLR pin 2: + / 3 -).....	LF: +

B1-SUB subwoofer

Nominal impedance	4 ohms
Power handling capacity (RMS / peak 10 ms).....	600 / 2400 W
Connection.....	8-pin CA-COM, female
.....Pin assignments printed on the controller module rear panel	
Weight	63 kg (139 lb)

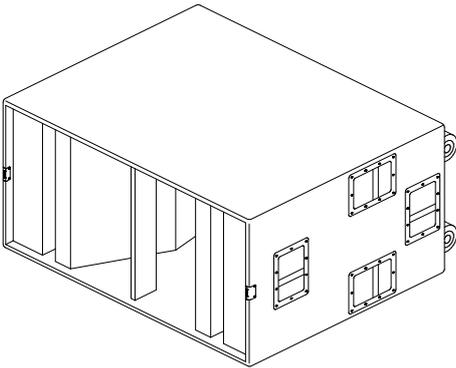


B1-CO rear panel



B1-SUB cabinet dimensions in mm [inch]

B2-SUB



The B2-SUB is an actively driven subwoofer which uses a pair of 18" LF drivers mounted in a bandpass horn cabinet.

The cabinet is constructed from marine plywood coated with an impact resistant paint. Fitted each side of the cabinet sides are four recessed handles and, on the rear panel, four heavy duty wheels. On the front is a rigid steel grill with a replaceable acoustically transparent foam cover. Catches to secure an optional protective transport cover are also fitted to the top and bottom front edges of the cabinet.

The width and height of the B2-SUB front panel is identical to that of two side-by-side C4 cabinets making it particularly easy to stack an array of B2-SUBs and C4 cabinets. The B2-SUB can be operated standing vertically or placed on its side horizontally.

The frequency response of the B2-SUB extends from 37 Hz to 125 Hz (-5 dB) with a peak sound pressure level of 139 dB-SPL. The B2 system is therefore ideal for use with the F2 system to provide high SPL coverage in large venues.

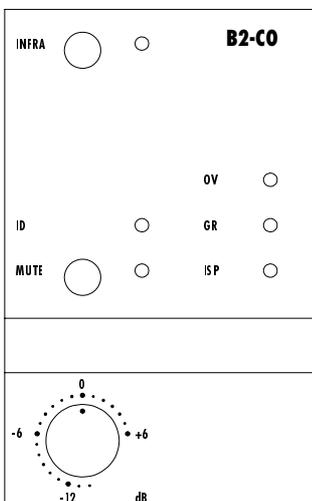
B2-CO - Controls & indicators

INFRA switch and indicator

A single configuration switch (INFRA) is located on the top left of the module front panel. A yellow LED next to the switch illuminates when it is selected. Selecting the INFRA switch restricts the B2 frequency response to a narrow, 32 Hz to 68 Hz range (-5 dB). This transforms a B2 system into an infrabass system for use with the C4 system. B2-SUBs can also be used as an infrabass system when C4-SUBs are used along with C6 or F2 cabinets.

Controller module rear panel

A single 8-pin CA-COM output socket is fitted to the module rear panel. An additional balanced XLR output marked C4-OUT is also provided on the module rear panel. The C4-OUT signal can be used to drive C4-SUB controller inputs when a B2 system is used as an infrabass system for C4-SUBs. In the event of a power or mainframe failure, a bypass relay in the B2-CO controller module will connect the pins of the C4-OUT socket directly to those of the module INPUT socket allowing the continued operation of the C4-SUB and TOP systems.



B2-CO controls

Using the C4-OUT socket to drive C4-SUBs

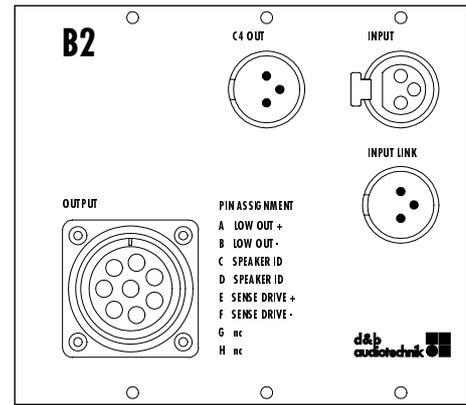
Although the C4-SUB operates very effectively down to 50 Hz (-5 dB), in some applications the ability to reproduce frequencies below this cut-off frequency can be an advantage. Using the B2 subwoofer, not only provides the desired LF extension, but also improves the low frequency headroom of the combined system.

Selecting the INFRA switch on the B2 controller module front panel configures the B2 system to operate around 50 Hz covering a one octave band from 32 Hz to 68 Hz (-5 dB). Used in INFRA mode, a B2 system, with just a single cabinet, delivers enough low-end bass to match the output of four C4-SUB cabinets. When C4-SUBs and B2-SUBs are operated together in an identical acoustic environment and their controllers set to the same level, the low frequency limit of the combined system is 37 Hz (-5 dB).

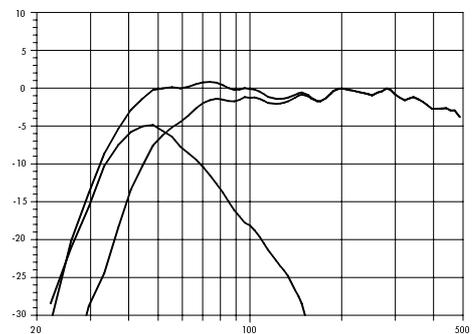
With fewer than four C4-SUBs per B2 cabinet, the headroom of the C4 system can be increased by altering the crossover point between the two bass systems simply by driving the C4-SUB systems from the C4-OUTPUT provided on the rear panel of the B2-CO controller.

The B2-CO controller C4-OUT socket provides a specially tailored signal with a relatively narrow-band level reduction around 50 Hz - the rest of the audio band remains unaffected. It therefore does not matter whether the mid/high cabinets (C4-TOPs or C6) are driven directly or via the C4-OUT - the signal they produce is the same in each case.

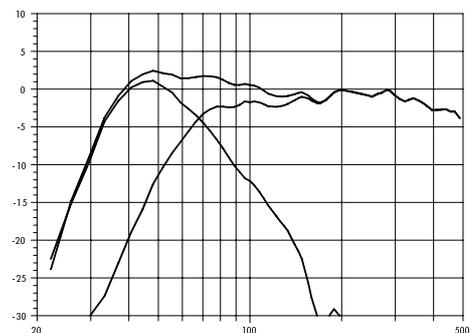
Used with a B2 system and driven from the C4-OUT socket, the low frequency limit of the C4-SUBs is raised to around 60 Hz. This raised crossover frequency is not acoustically critical, and is in fact beneficial, since the band below 60 Hz is more than adequately handled by the B2 system. If most of the C4-SUBs are flown, then due to the loss of ground coupling, the effective (acoustic) LF output of the system is reduced. Despite that, the increased LF headroom using the C4-OUT connection still gives a worthwhile improvement to the LF performance of the combined system.



B2-CO rear panel



C4 and B2-SUBs, 4:1 ratio



C4 system driven from C4-OUT and B2-SUB, 2:1 ratio (acoustic)

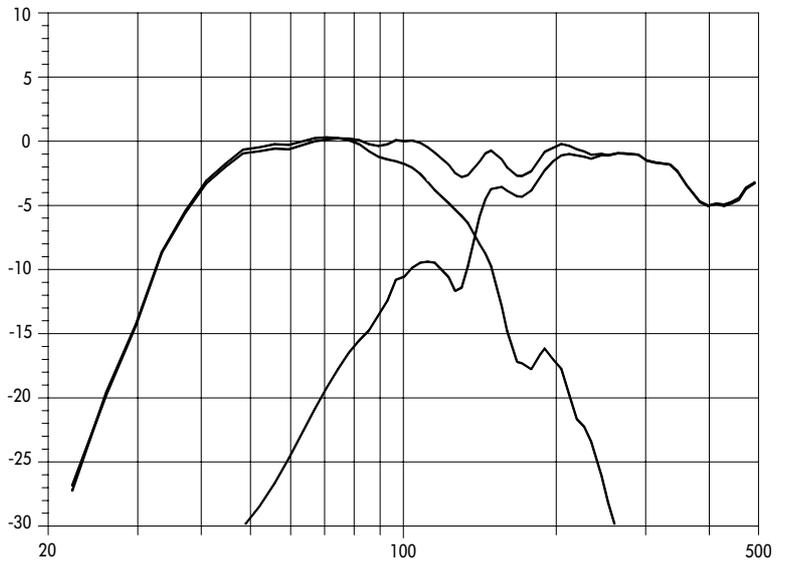
Technical specifications

B2-SUB system data (standard/INFRA)

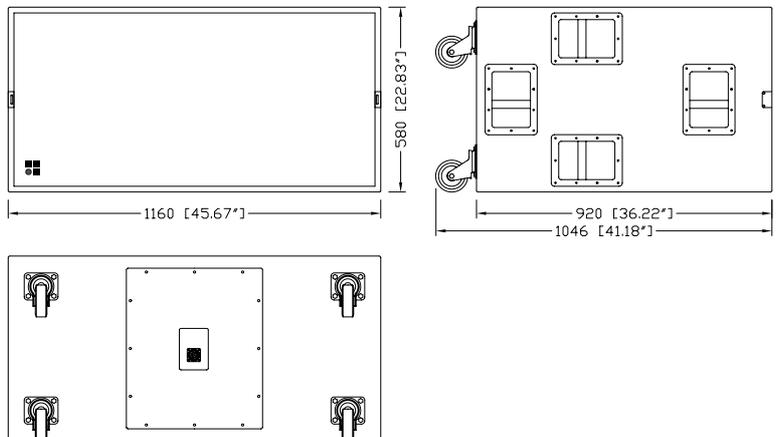
Frequency response (-5 dB)..... 37 Hz to 125 Hz / 32 Hz to. 68 Hz
 Max. sound pressure (1 m, full space)..... 139 dB / 136 dB
 (SPLmax peak, test signal pink noise with crest factor 4)
 Input level for max. sound pressure..... +16 dBu / +14 dBu
 Input level for 100 dB-SPL / 1 m..... -20 dBu / -19 dBu
 Polarity to controller INPUT (XLR pin 2: + / 3: -)..... LF: +

B2-SUB subwoofer

Nominal impedance..... 4 ohms
 Power handling capacity (RMS / peak 10 ms)..... 600 / 2400 W
 Connection..... 8-pin CA-COM, female
 Pin assignments printed on the controller module rear panel
 Weight..... 102 kg (225 lb)



B2-SUB/ F2 frequency response



B2-SUB cabinet dimensions in mm [inch]

5. System operation

5.1. 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 the loudspeaker cabinets relative to each other and also to how they are angled and aimed towards the audience.

5.1.1. Vertical coverage

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.

Speaker stands, mounting brackets and rigging fittings can be used to vary the height and angle of cabinets used on their own or as part of a speaker array. F1220 cabinets can either be flown or fitted with a swivel frame and placed on a stand. F2 cabinets can be rigged and flown.

The lower the loudspeaker height, then the greater the sound level difference between the audience area at the front of the stage and the audience area at the extreme range of the loudspeaker coverage. To minimise the sound level difference between the stage and the back of the room and ensure a more even level distribution the loudspeakers need to be placed as high as possible - within reason.

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

5.1.2. Arraying mid/high cabinets

With more than one loudspeaker source in a room, comb filter effects can create coverage problems. An unavoidable problem with multiple sound sources, comb filtering creates a regularly spaced, uneven frequency response across a coverage area due to constructive and destructive interference between the sources. The actual character of the comb filtering which occurs is related to the physical spacing of the sound sources. Minimising this effect requires some experimentation - altering the distance between the cabinets to try and minimise path length differences between the loudspeakers and the listeners can help. Sometimes even small alterations to loudspeaker positions can have a dramatic effect on particularly prominent combing frequencies. Fortunately, in real situations, the masking effects of room reflections, room absorption, and absorption due to the presence of an audience, all help to conceal combing related coverage problems.

A related problem due to interference effects can occur when closely arraying loudspeaker cabinets. Arrays need to be constructed so that the coverage patterns of the individual loudspeakers combine with minimal overlap. This problem has less to do with path di-

stances (the distances between the sources in the array are so small that any combing effect would only occur at relatively high frequencies) than with how closely defined and controlled the driver dispersion patterns are. Once more, the design of the active systems cabinets, in particular the use of CD horns, largely eliminates these problems and simplifies the creation of effective loudspeaker arrays - placing F1220 cabinets with their rear side panels butted together guarantees minimal dispersion pattern overlap and hence minimal interference.

A final configuration trick, 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, is to vertically stack the cabinets rather than horizontally array them - this helps minimise audible interference and gives more vertical directivity.

5.1.3. Stacking subwoofers

Regardless of the type and operating principles of the subwoofer systems, the basic relationships of coverage and array directivity at bass frequencies apply.

- Vertical subwoofer arrays have better bass 'throw'. The increased vertical directivity of such arrays dissipates less energy in the vertical plane.
- Wide subwoofer arrays, with their greater horizontal directivity, are more effective when trying to achieve a more even level distribution in the horizontal plane, e.g. between the centre and sides of a coverage area. The typical bass emphasis on the central axis between two front stacks can be reduced by outwardly rotating the two subwoofer arrays - the broader the array, the more even the coverage.

If a large number of subwoofers are available, then an L-shape configuration can combine the best properties of the two variants.

The arrangement of subwoofers in flying arrays (F2/B1/C4 systems) is often determined by the position of the TOP cabinets, i.e. the coverage requirements of the array. However, it is important to ensure that the subwoofer systems are also arranged in groups (blocks, rows or columns) in order to benefit from the coupling effects described above.

5.2. Wiring

We recommend the use of good quality cables with a minimum 1.5 mm² conductor size - 2.5 mm² is preferable.

d&b can supply MC8 CA-COM terminated cables (8 x 2.5 mm²) in various lengths. Especially for long cable runs, we recommend using d&b MC1220 cable. The coaxial construction of MC1220 minimises crosstalk and external signal interference.

d&b SenseDrive can compensate for cable losses provided the sum of the required voltage at the loudspeaker terminals and the voltage loss in the cable does not exceed the maximum available voltage the power amplifier can deliver. Therefore, the length of cable run between mainframe and loudspeaker should be kept as short as possible, particularly when the full output capability of the system is needed.

If in an installation very long cable runs are unavoidable, a conductor size greater than 2.5 mm² may be needed to reduce power loss and to achieve an acceptable damping factor - the ratio of the load impedance to the cable impedance being a critical factor. If the size of the individual conductors in a cable is insufficient, then it may help to 'double-up' the conductors to achieve an acceptable thickness of copper.

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

$$\text{maximum (single) length of cable} = 3 \times \text{load impedance } [\Omega] \times \text{cross-section } [\text{mm}^2]$$

5.3. Level setting for mixed systems

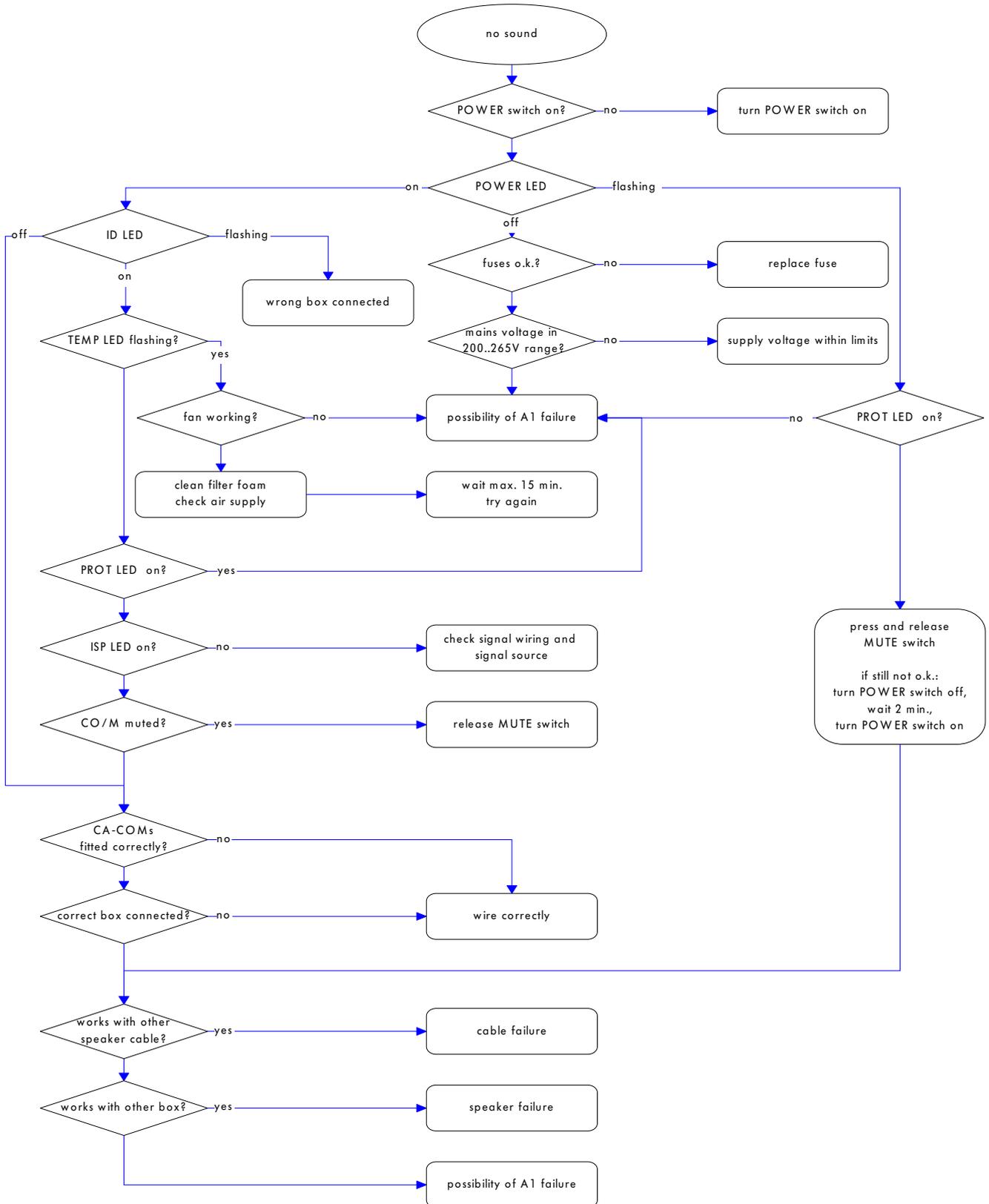
A mixed system is one which uses a mixture of full range cabinets and subwoofers. If equal numbers of full range cabinets and subwoofers are used then the correct balance and crossover frequency between the full range and subwoofer systems is assured provided the recommended controller module level settings are used. These recommended settings, using various d&b subwoofer systems, are given in the sections of this manual describing the F1220 and F2 loudspeakers. Altering the ratio of full range to subwoofer cabinets in a mixed system will need to be corrected by adjusting the controller module level controls.

Extreme differences of level settings between full range and subwoofer systems should be avoided. Differences of more than approx. 3 dB will adversely affect the crossover frequency between the systems and produce a deterioration in overall sound quality. If - to achieve a better balance - a severe correction is necessary, it's 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 tailored to the acoustic environment without unduly 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 given in the technical specification for each loudspeaker give the input signal level expressed as a dBu value needed to produce a 100 dB (SPL) sound pressure level measured at one metre.

Example: the 1220 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 1220 loudspeakers used together, the 1220-CO level control needs to be set 3 dB lower than that of the E3-CO.

6. Troubleshooting

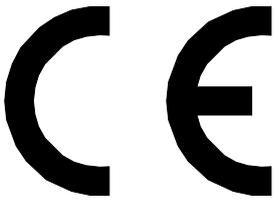


7. Publications list

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 208 A1 Controller Module Exchange	D5208.E.
TI 212 A1/P1200A Simple Remote Control Circuits	D5212.E.
TI 302 MC1220 cable, wiring with F-systems	D5302.INT.
TI 303 MC1220 cable, wiring with B1-SUB	D5303.INT.
TI 304 SOCAPEX - CA-COM adapter wiring	D5304.INT.
TI 323 C4-System configurations	D5323.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.E.
Complete Publications list	D9300.E.

8. EU declaration of conformity (CE symbol)



EU conformity of loudspeakers

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

Type	Typ No.
– F1220	Z0051/Z0052
– F1222	Z0055
– M1220	Z0054
– M2	Z0061
– F2	Z0021
– B1-SUB	Z0041
– B2-SUB	Z0056

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 hereby confirm that said products conform to the protection requirements stipulated in Directive 90/336/EEC of the Council of the European Communities for harmonisation of the statutory regulations of the Member States governing Electromagnetic Compatibility.

The products also meet the provisions of the Law concerning the Electromagnetic Compatibility of Electrical Appliances (EMCA) of 9 November 1992 as well as the First Amending Statute of the Law concerning the Electromagnetic Compatibility of Electrical Appliances (1stEMCARev) of 30 August 1995.

The following relevant, harmonised standards were taken as a basis for the assessment of electromagnetic compatibility:

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 mainframes

This declaration applies to the A1 mainframe manufactured by d&b audiotechnik AG consisting of the amplifier unit including the installed controller module.

Type	Type No.
– A1	Z0070, version .10 and higher
– Controller modules	Z0080 - Z0085, all

All production versions of type A1 are included, provided they correspond to the original technical version and have not been subject to any later design or electromechanical modifications.

We hereby confirm that said products conform to the protection requirements stipulated in Directive 90/336/EEC of the Council of the European Communities for harmonisation of the statutory regulations of the Member States governing electromagnetic compatibility.

The products also meet the provisions of the Law concerning the Electromagnetic Compatibility of Electrical Appliances (EMCA) of 9 November 1992 as well as the First Amending Statute of the Law concerning the Electromagnetic Compatibility of Electrical Appliances (1stEMCARev) of 30 August 1995.

The following relevant, harmonised standards were taken as a basis for the assessment of electromagnetic compatibility:

DIN EN 55022:05-1995 (Class B)

DIN EN 60555-2:06-1987

DIN EN 50082-1:03-1993

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



A1 User Manual (4.0 E)

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:

Please send me the following information:

Title

Number

I think the manual is informative

yes, very no

I think the manual is well laid out

Suggestions for improvements or comments on the manual and products:
