GAE Controller BF1

Der GAE BF1 ist ein speziell für den Betrieb hochwertiger Lautsprechersysteme entwickelter Controller. Er verbindet die Funktionen einer genau abgestimmten Schutzschaltung, einer ggf. optimal angepaßten Frequenzweiche für aktiven 2-Weg-Betrieb mit der Möglichkeit von klangkorrigierenden Maßnahmen.

Der GAE BF1 bietet folgende Funktionen:
- Stereo-Crossover
- Equalizer
- Limiter (Peak und RMS)

Durch die Preset-Karte kann der BF1 optimal auf jedes Fullrange- oder 2-Wege-System eingestellt werden. Folgende Parameter werden durch den Presetkarteneinschub beeinflußt:

- 2 Bandpaßfilter in Frequenz, Güte und Absenkung
- 1 Bandpaßfilter in Frequenz, Güte und Absenkung, schaltbar und regelbar (MID-EQ)
- 1 Hochpaßfilter 2.Ordnung zur unteren Bandbegrenzung des Low-Bereichs in Frequenz und Güte
- 1 optionales Hochpaßfilter dazu (BASSBOOST)
- 1 Tiefpaßfilter 2.-4.Ordnung zur oberen Bandbegrenzung des Low-Bereichs in Frequenz und Güte
- 1 Hochpaßfilter 2.Ordnung zur unteren Bandbegrenzung des High-Bereichs in Frequenz und Güte
- 1 optionales Hochpaßfilter dazu (BASSBOOST)
- 1 weiteres optionales Hochpaßfilter dazu (2-WAY)
- 1 Tiefpaßfilter 2.Ordnung zur oberen Bandbegrenzung des High-Bereichs in Frequenz und Güte
- Einsatzpunkte (Threshold) für Limiter-Funktionen in allen Wegen

The GAE BF1 is a specially designed, high quality loudspeaker, system controller. It combines the functions of an exactly tuned protection circuit, an ideally tuned cross-over for 2-way active operation with the possibility for sound correction measures.

The GAE BF1 offers the following functions:
- Stereo-Crossover
- Equaliser
- Limiter (Peak and RMS)

All electrical components are hand selected and finely graded for tolerance and guarantee excellent technical data. By means of the preset card the BF-1 can be finely tuned to every conceivable configuration of full-range and 2-way systems. The following parameters are influenced by the preset settings:

- 2 Band-pass-filter in Frequency, Q-factor and cut
- 1 Band-pass-filter in Frequency, Q-factor and cut, switchable and adjustable (MID-EQ)
- 1 High-pass-filter 2nd Order for setting the lower cut-off of the Low range in frequency and Q-factor
- 1 optional High-pass-filter (BASSBOOST)
- 1 Low-pass-filter 2nd - 4th Order for setting the upper cut-off of the Low range in frequency and Q-factor
- 1 High-pass-filter 2nd Order for setting the lower cut-off of the High range in frequency and Q-factor
- 1 optional High-pass-filter (BASSBOOST)
- 1 further optional High-pass-filter (2-WAY)
- 1 Low-pass-filter 2nd Order for setting the upper cut-off of the High range in frequency and Q-factor
- Cut-off (Threshold) for Limiter-Function in each way

Dimensions (H x W x D)	1U / 19“ / 252mm
Weight	4 kg
Power supply	230-240V, 115-120V / 50-60Hz, 15VA
Input configuration	electronically balanced, input impedance 20 kΩ
Maximum input level	+ 20dBu
Output configuration	electronically balanced, output impedance ≤ 20Ω
Maximum output level	+ 20dBu in 600Ω (≡10Vrms)
THD + N	≤ 0.01%
Signal / Noise ratio	≥ 96dBV ≡ 93.78dBu (A-weighted)
Dynamic range	≥ 114dBV (A-weighted)
Channel cross-talk	≥ 80dB @ 1kHz

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OPERATION MANUAL

GAE-Controller BF1

Table of contents

Important

Be sure to read the following before connecting and operating this device for the first time:

- This unit contains no user-serviceable parts.
- There are no operating controls inside the unit. It is not necessary to open the unit for operation.
- Refer all repair and maintenance to authorised GAE service personnel.
- Tampering with the internal circuitry will void any guarantee claims.
- Be sure to allow for sufficient cooling during operation especially when rack mounting this unit above other heat producing units (amplifiers etc.).
- The mains fuse may only be replaced with the specified type M0.1A (M= medium slow break) for 230V units. (M0.2A for 115 - 120V USA-units)
- Ensure that the unit is protected from heat and humidity.
- Make sure that the power source voltage specified on the rear panel of the unit matches your local AC mains supply.
  (220-240V/50-60Hz European-units, 115-120V/50-60Hz USA-units)
- Only use good quality cable material when connecting this unit. This applies to both signal and sense cables.
- Be aware that high voltages can occur in the sense cables.
- Read the operating manual carefully.

Reference to EC statement of conformity

This document confirms that the product **GAE Soundcontroller BF1** bearing the CE label meets all requirements in the EMC directive 89/336/EEC laid down by the Member States Counsel for adjustment of legal requirements, further more the product complies to the rules and regulations referring to the electomagnetic compatibility of devices from 30. August 1995.

This product bearing the CE label complies with the following harmonised or national standards:

DIN EN 55011; DIN EN 55022; DIN EN 55013; DIN EN 60555; DIN EN 50014; DIN EN 50081-1/2

The authorised declaration and compatibility certification lies with the manufacturer and can be viewed on request. Responsible as manufacturer is the company:

opal audio vertrieb GmbH, Engerstraße 47, 33824 Werther, Germany
Tel.: ++ 49 - 5203 - 236/237 Fax 238

The awarding of the CE label confirms the compliance with legal directives issued for the manufacture and marketing of electronic and electrical devices. As such the CE label is not a „seal of quality“ but rather proof that the device bearing the label is conform with the electromagnetic compatibility standards laid down in the above named testing regulations.

WARNING

High volume levels can lead to irreversible hearing damage.

In cases where hearing becomes painful it is possible that damage is incurred within the whole nervous system.

Modern sound systems are designed to reproduce high volume levels and as such can be considered a danger to human hearing when incorrectly operated.

Short description of operating controls

1. MONOBASS

On (button ❶ front, depressed, LED on):
The bass signal is available at both LOW-OUT-Outputs of the Controller in the form of a MONO sum.

2. BASSBOOST

On (button ❷ front, depressed, LED on):
The bass signal is additionally amplified. Frequency and Amplitude are dependant on the preset card ❻ being used. In Full-range operation (2-WAY Off) this amplification is also given to the HIGH-OUT-outputs of the Controller.

3. 2-WAY

On (button ❸ front, depressed, LED on):
With the switch in this position the Controller functions as a 2-way stereo cross-over.
Cross-over frequency, filter characteristic and Q-factor are dependant on the preset card being used.

Off (button ❸ front, not depressed, LED off):
A full-range signal is available at the HIGH-OUT-outputs. The frequency range of this signal is dependant on the preset card ❻ used. The BASSBOOST-function is fully effective in this mode.
The signal at the LOW-OUT-outputs is identical to the signal produced in 2-Way operation.
WARNING! When connecting additional active subbass-systems a phase difference may be expected between LOW- and HIGH-OUT. This is due to the low-pass filter in the LOW-OUT-output.

4. MID-EQ

On (button ❹ front, depressed, LED on):
The EQ-VALUE control ❺ can be used to cut the mid-frequency range by up to -6dB. Frequency and Q-factor of this control are dependant on the preset card ❻ being used.

5. MODULAR

On (Switch ❷ back, in the up position):
The bypass relays in the unit bypasses the Inputs to the Outputs in the case of a power failure in the controller. A GAE Modular system can then continue to run in full-range operation without the controller.

Off:
The bypass relays in the unit breaks the signal path between Inputs and the Outputs in the case of power failure to the unit. This prevents a full-range signal overloading and damaging the HF systems in a GAE 2-way system.

6. PHASE REVERSE

On (Switch ❶ back, in the up position):
The bass signal at the LOW-OUT Outputs of the controller is phase inverted.
The use of this feature is dependant on the system being driven by the controller and/or employing a special set-up. In normal use GAE systems with active separation between Mid-high and Bass systems require the following setting:

Direct radiating systems (all vented systems)	PHASE NORMAL
Bandpass systems (all ATUE models)	PHASE REVERSE

General function description

The GAE BF1 is a specially designed, high quality loudspeaker, system controller. It combines the functions of an exactly tuned protection circuit, an ideally tuned cross-over for 2-way active operation with the possibility for sound correction measures. Together with GAE-Loudspeaker systems and the appropriate preset card the GAE BF-1 provides a finely tuned sound reproduction system. To receive the best possible tonal and power related performance from your GAE system it is advisable to use only power amplifiers recommended by ourselves or your GAE distribution outlet.

The GAE BF1 offers the following functions:

- Stereo-Crossover
- Equaliser
- Limiter (Peak and RMS)

All electrical components are hand selected and finely graded for tolerance and guarantee excellent technical data. By means of the preset card the BF-1 can be finely tuned to every conceivable configuration of full-range and 2-way systems. The following parameters are influenced by the preset settings:

- 2 Band-pass-filter in Frequency, Q-factor and cut
- 1 Band-pass-filter in Frequency, Q-factor and cut, switchable and adjustable (MID-EQ)
- 1 High-pass-filter 2nd Order for setting the lower cut-off of the Low range in frequency and Q-factor
- 1 optional High-pass-filter (BASSBOOST)
- 1 Low-pass-filter 2nd - 4th Order for setting the upper cut-off of the Low range in frequency and Q-factor
- 1 High-pass-filter 2nd Order for setting the lower cut-off of the High range in frequency and Q-factor
- 1 optional High-pass-filter (BASSBOOST)
- 1 further optional High-pass-filter (2-WAY)
- 1 Low-pass-filter 2nd Order for setting the upper cut-off of the High range in frequency and Q-factor
- Cut-off (Threshold) for Limiter-Function in each way

INPUT:

One balanced XLR-input for each channel can be found on the back panel of the GAE BF1. High quality input amplifiers ensure a minimum of distortion and a maximum of signal to noise ratio.
The four Sense-Inputs (LOW and HIGH for each channel) are of extremely high impedance and can be directly attached (parallel) to the speaker outputs of the appropriate power amplifier.

It is important to note that very high voltages can occur across the output terminals of power amplifiers. For this reason be sure to disconnect power to the amplifier prior to connecting or disconnecting cables! Please refer to „Hints on connection“

OUTPUT:

Four outputs for connection of the BF1 with the inputs of power amplifiers can be found on the back panel of this device. The outputs are electronically balanced and are of low impedance. At least 6...10 power amplifiers (depending on input impedance) can be connected to each channel and frequency area without problem.

Please refer to „Hints on connection“! Pole reversal, incorrect signal direction and faulty cable material can cause serious damage to all connected equipment and loudspeakers!

BYPASS-RELAYS:

Integrated bypass-relays in the BF1 suppress power-up noises to already powered-up amplifiers. The switch labelled „modular“ on the rear panel of this device can determine one of two functions for these relays:

When working with a Full-range-System, for example the GAE-Modular-System, this is driven with a signal covering the full frequency range. With the function switch in position Modular and in the event of a power failure to or a malfunction in the BF1 all inputs and their corresponding outputs (and also the active bass outputs) become bridged. This allows the user to continue working with the system without a time consuming re-cabling action. **However**, in this case the EQ and Limiter functions are now out of operation and extra attention must be given to the applied volume levels in order to prevent possible damage to the loudspeaker components!

When working with a 2-way system, and in the case outlined above, a mid-high system connected to the high output of the BF1 would receive a full range signal which could result in the impairment of the components in the system. With the switch in the non MODULAR position and in the case of a power failure or a malfunctioning of the BF1 the signal path is broken by the relays and the outputs are muted.

Before connection and operation of the BF1 be sure to place the function switch MODULAR in the for the application required position!

Full range > MODULAR
2-Way-System > non MODULAR

PHASE REVERSE:

If this function switch is placed in the direction of phase reverse the output signal at the LOW-OUT output will be phase inverted. This function can be necessary depending on the design and the filtering of the bass system to be driven.

The following switch position applies in general to all GAE systems:

Direct radiator (all vented systems)	PHASE NORMAL
Bandpass (all ATUE 15x)	PHASE REVERSE

Exceptions to the above rule can arise from the disadvantageous positioning of the single units in a system or under problematical room conditions. The switch in the opposite position to that normally required can sometimes enable a better overall result or low frequency reproduction.

In difficult acoustical situations an acceptable tonal result cannot be achieved simply by reversing the phasing of a signal. In such cases a detailed analysis of the situation in question is absolutely necessary.

Control and Display elements

CONTROL ELEMENTS ❶❷❸❹❺

Four switches and their relevant status indicators can be found on the front panel of the BF1 controller. **MONOBASS❶**, **BASSBOOST❷**, **2-WAY❸** and **MID-EQ❹**.

In **MONOBASS❶**-operation a composite bass signal (Mono-Bass) is made available to both outputs LOW-OUT A and LOW-OUT B. The HIGH-OUT outputs are not affected and continue to operate in full stereo mode. This operations mode can be quite useful for example in smaller sized venues when, due to the size of the room, a differentiated stereo set -up is not possible. This operations mode can also be of advantage in rooms with long reverberation times enabling a more precise bass reproduction. When using a full range system this mode allows a single mono bass system to be incorporated as a support to the bass. In this case, however, a phase difference between HIGH-Out and LOW-Out can be expected due to the low pass filter in the LOW-OUT output. The positioning of an extra mono bass system, for example in the middle of the stage, is recommended in such a case. Depending on the acoustical situation the PHASE-REVERSE-function should be tried. (See also page 6)

With the **BASSBOOST❷** function it is possible to lend more penetration to a bass signal at low volume operation of the system. Full range systems which, due to their small enclosure volumes, do not have a powerful bass reproduction can, by applying this function, experience an a well-rounded performance. Events driven at high volume and/or where the system is driven to its full limits should be equipped with a well dimensioned bass system and this switch should be kept in the OFF position.

The **2-WAY** switch❸ divides the LOW-OUT and HIGH-OUT output signals into two fully separated frequency ranges. The cross-over frequency and the Q-factor of this function are determined by the pre-set card in use. The 2-way operation mode must be activated when operating an active 2-way system with separate bass and mid/high systems. The full range mode (2-WAY OFF) allows the connection of full range loudspeaker systems to the HIGH-Out outputs of the controller. In this case the LOW-OUT outputs present the same bass signal as they would in 2-Way operation.
ATTENTION! In this case of additional sub bass extension, a phase difference between HIGH-Out and LOW-Out can be expected due to the low pass filter in the LOW-OUT output. The positioning of an extra mono bass system, for example in the middle of the stage, is recommended in such a case. Depending on the acoustical situation the PHASE-REVERSE-function should be tried. (See also page 6)

Pressing the **MID-EQ** switch❹ activates the **MID-VALUE** control❺. With this control the frequency response at approx. 1,5kHz (depending on pre-set) can be reduced by up to 6dB, enabling the sound of the system to be matched to the acoustical room properties. The use of this equaliser function has been proved in the reproduction of recorded source material (Discos etc.). The use of this control function at live events is, in view of speech intelligibility and dynamic in the mid-range area, not recommended.

LIMIT LEDs ❼❽

The two LIMIT LEDs on the front panel of the BF1 indicate the operation and response of the limit function. Each of the four outputs of the BF1 is equipped with its own limiter system. Each of these systems consists of various limiters with varying threshold, attack and release values. The output voltage of the system-incorporated power amplifiers are controlled by the SENSE cables. The limiters regulate the output signal of the controller should the predetermined values be exceeded thus protecting the loudspeakers in the system from overloading and possible destruction. When the LEDs light green, a moderate limiting is operational which limits inaudibly the dynamic of the signal. A frequent or continued lighting of the green LED is the normal working condition. When the LEDs light red, a distinct limiting to the outputs is active. An occasional red lighting is acceptable however, a continuous red lighting of the LEDs is to be avoided as audible tonal forfeits and a considerable loss of dynamics can be expected from the continual overloading. In this situation although protected by the limiter, the loudspeaker components experience a considerable loading which can significantly shorten their lifespan.

POWER-LED ❾ and FUSE ❿

The POWER-LED and the power fuse (M0.1A, M= medium fuse) can be found on the front panel of the BF1 Controller. The POWER-LED indicates the operational status of the unit. It is necessary to check the power fuse should the POWER-LED fail to light when the mains is connected. **Important! Always disconnect from power supply before removing fuse**. The fuse holder can be removed by turning in an anti-clockwise direction using a coin or an appropriate screwdriver. Only replacement fuses of the same type should be used. All further repair and service work should be left to authorised personnel.

PRESET ❻

The BF-1-Preset should be inserted into the slot on the front panel of the unit with the grip hollow on the under side and then secured with the knurled screws**. The Preset sits very tightly in place due to the large number of contacts. Due to this a strong but gentle hand is required when changing the Preset.** Never use unnecessary force to insert or remove a Preset. Careful handling by connection will ensure that no damage to the contact pins on the inside of the device can occur. The Preset is not designed for continual substitution.

Lack of Preset or, in the case of incorrect connection of an inserted Preset, causes a less-intense lighting of the POWER-LED. Also the BYPASS-RELAYS remain in selected protection mode until the Preset has been correctly connected. (See under „BYPASS-RELAYS“)

A matched Preset card is available for all combinations of GAE-Loudspeaker systems. Be sure that the correct Preset is used for the corresponding system set-up! This ensures that your GAE system works safely and efficiently. The pre-adjusted parameters have been optimally tuned during many field-tests and have proved themselves in innumerable successful applications.

Preset cards for non-GAE system applications can be developed. Please ask your local GAE representative for information.

Technical Specifications

Dimensions (H x W x D)	1U / 19“ / 252mm
Weight	4 kg
Power supply	230-240V, 115-120V / 50-60Hz, 15VA
Input configuration	electronically balanced, input impedance 20 kOhm
Maximum input level	+ 20dBu
Output configuration	electronically balanced, output impedance ≤ 20 Ohm
Maximum output level	+ 20dBu in 600 Ohm (≡10Vrms)
THD + N	≤ 0.01%
Signal / Noise ratio	≥ 96dBV ≡ 93.78dBu (A-weighted)
Dynamic range	≥ 114dBV (A-weighted)
Channel cross-talk	≥ 80dB @ 1kHz

0dBV ≡ 1V
0dBu ≡ 0.775V ≡ -2.214dBV

APPENDIX A (Control elements)

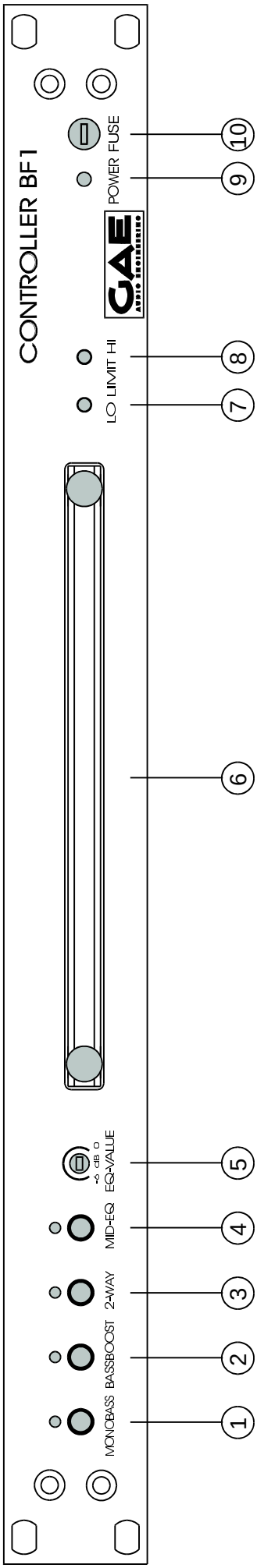


Fig. A: Frontpanel

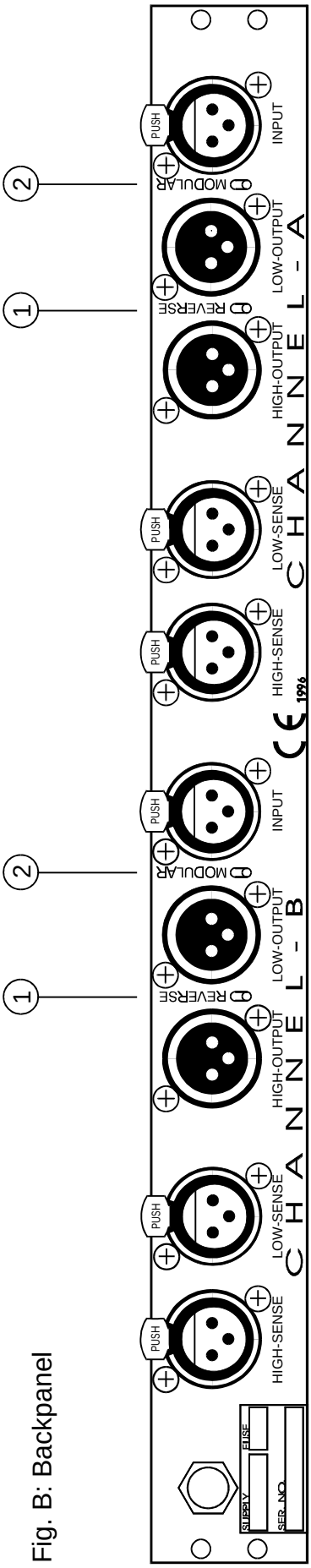
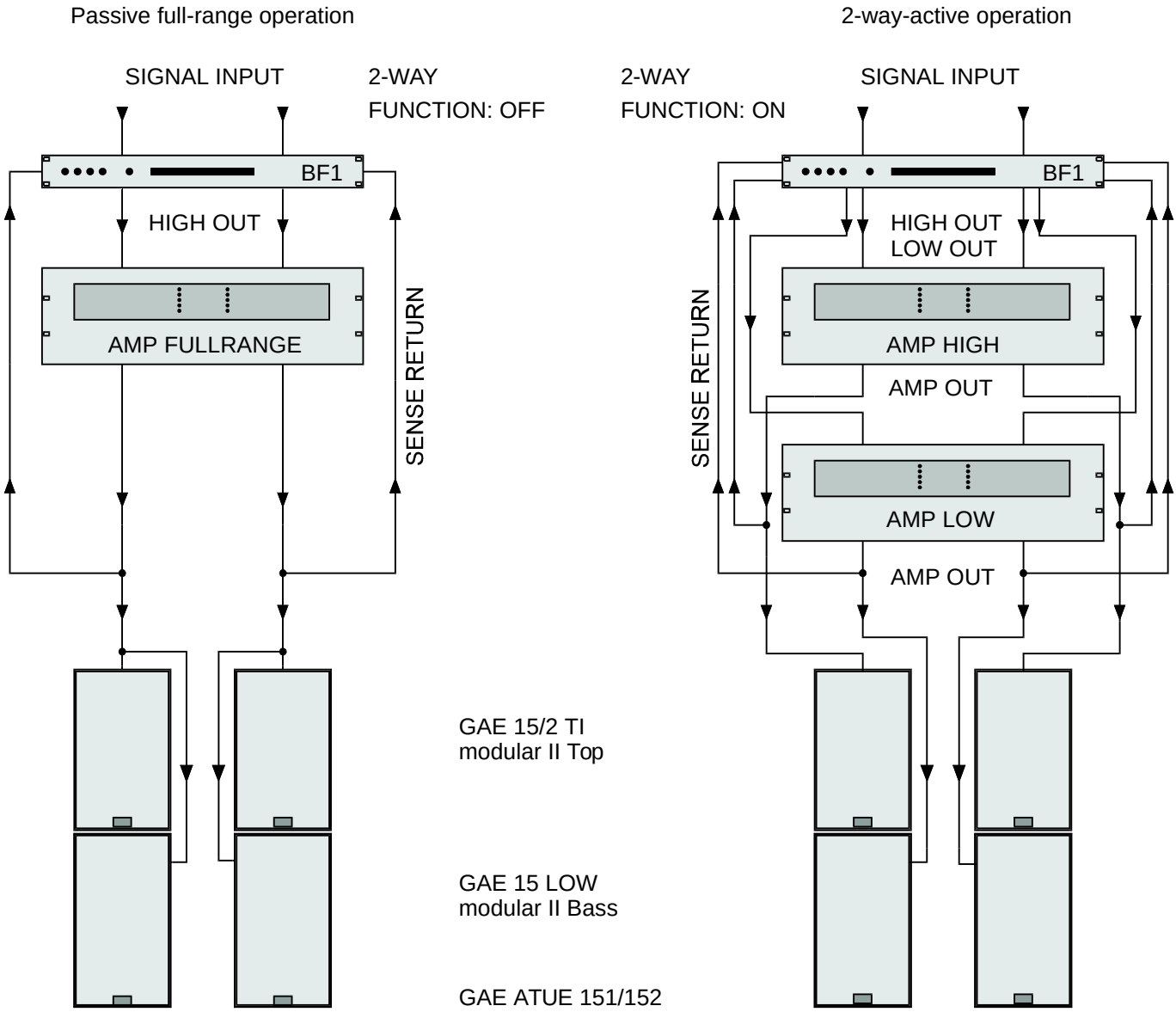


Fig. B: Backpanel

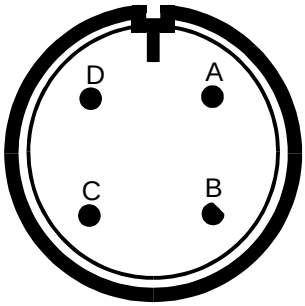
APPENDIX B (Hints on connection)

Connection-Diagram GAE modular (II) / BF1



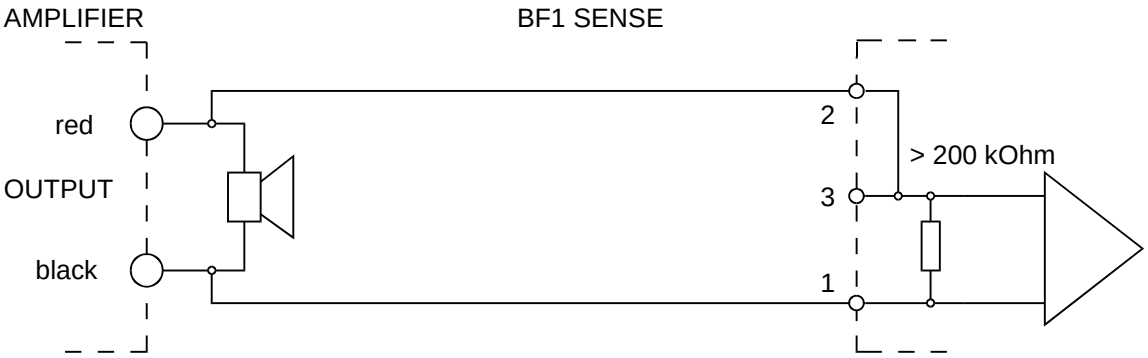
CACOM connector

Wiring diagram for CACOM connector CA02(06)COM-E18-10-P(S)B



A	Masse/Ground	green/yellow
B	Masse/Ground	blue
C	Signal/Live	black
D	Signal/Live	brown

CONFIGURATION SENSE-INPUT GAE BF1



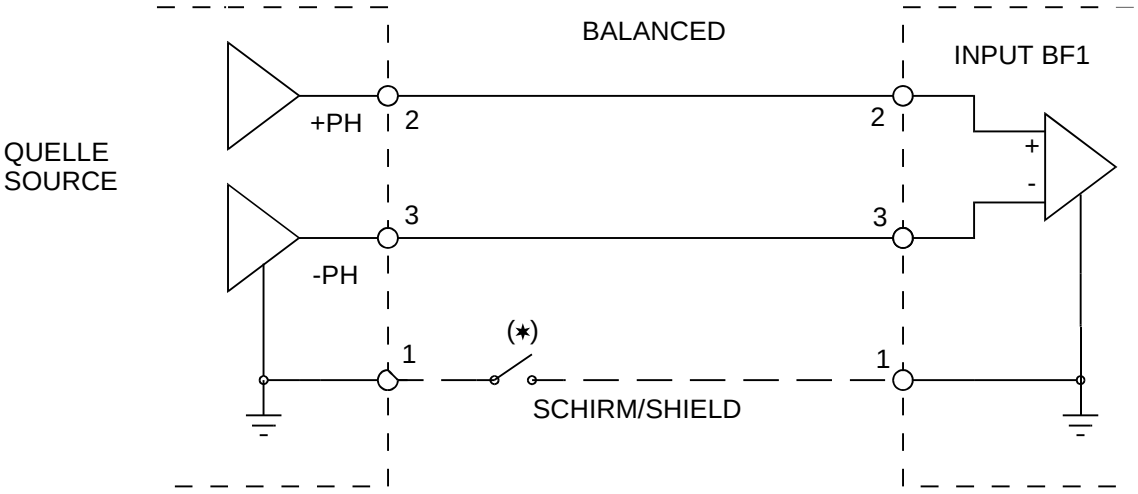
The Sense-input is balanced and without ground. This also allows its parallel connection to the loudspeaker terminals of bridged power amplifiers. The XLR-pins 2 and 3 of the Sense-Input are internally bridged. The input resistance is > 200 kOhm.

We recommend: Sense cable gauge 0.5 ... 0.75mm².

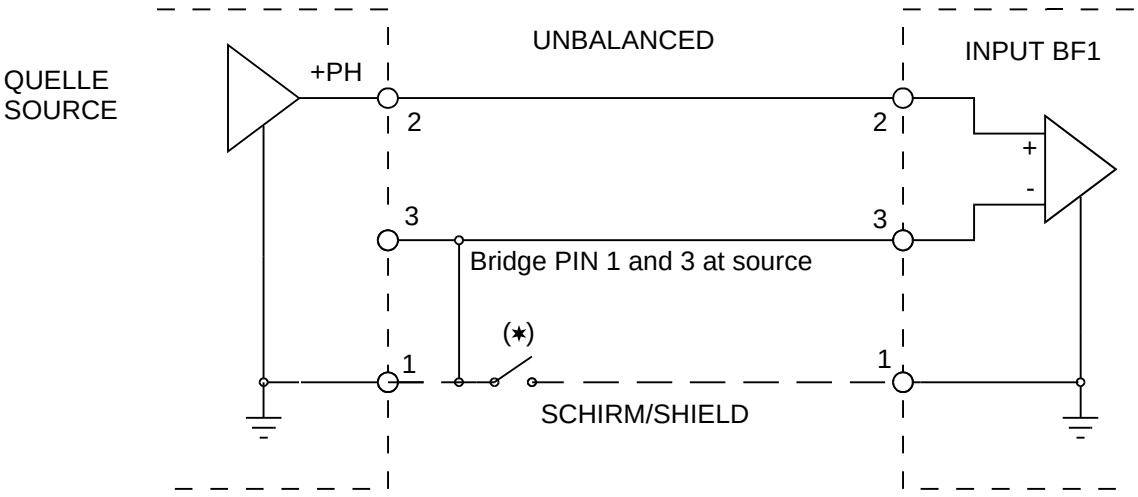
CONNECTION HINTS GAE CONTROLLER BF1 -INPUT-

Use only 2 core, shielded LF-cable !

1) BALANCED IN / Impedance = 20 kOhm



2) UNBALANCED IN

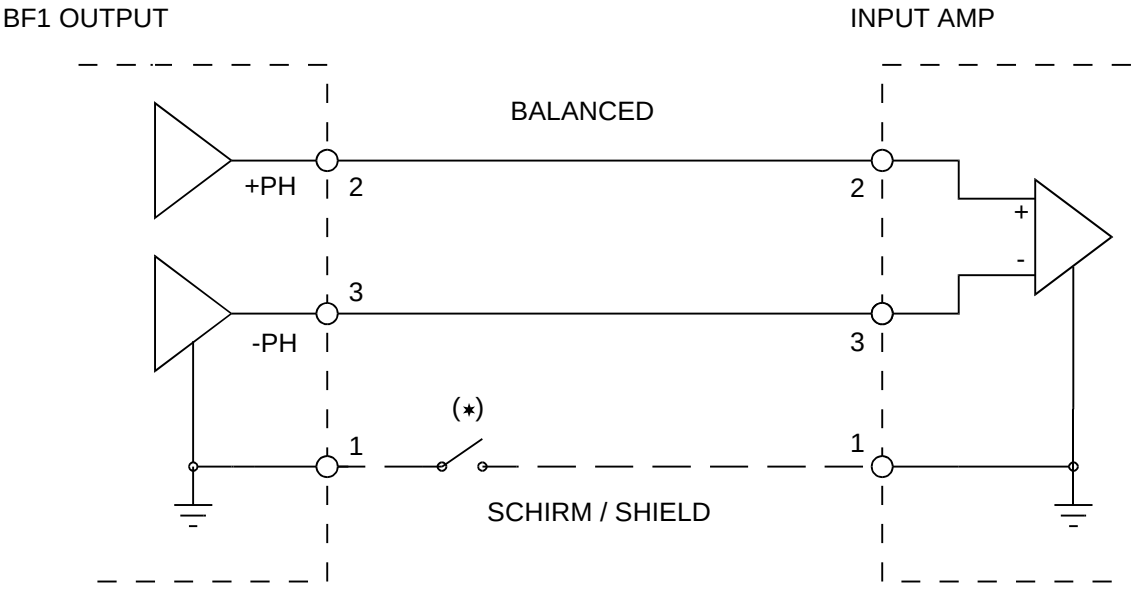


(✱) Eventually necessary for the cancelation of ground loops.

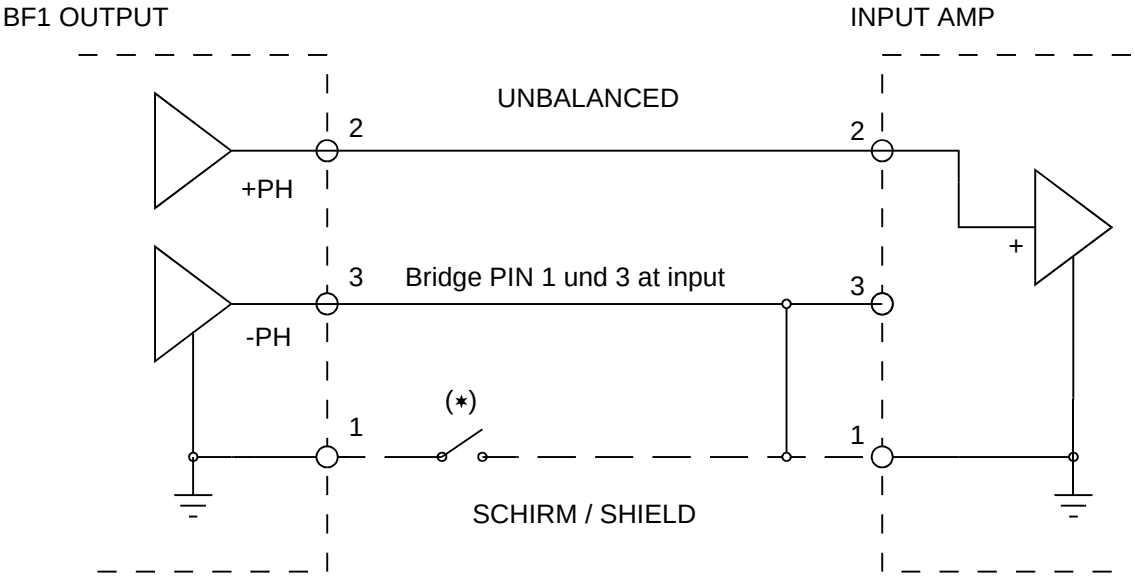
CONNECTION HINTS CONTROLLER GAE BF1 -OUTPUT-

Use only 2 core, shielded LF-cable !

3) BALANCED OUT / IMPEDANCE < 20 Ohm



4) UNBALANCED OUT



(*) Eventually necessary for the cancelation of ground loops.

IN THE CASE OF CONNECTIONS, THE ELECTRONICALLY BALANCED OUTPUT OF THE BF1 SHOULD BE TREATED AS A TRANSFORMER OUTPUT.