



User's Manual

Version 4.0
Released: 23.03.2006



**Important Information,
Please Read Before Use!**

KLING & FREITAG GmbH
Junkersstrasse 14
D-30179 Hannover
PHONE 0 (049) 511- 969 97-0
FAX 0 (049) 511- 67 37 94
www.kling-freitag.de



Thank you for your decision to buy a KLING & FREITAG product. To guarantee a trouble-free operating of the equipment and to enable the KLING & FREITAG C2 Controller to achieve its full potential, please read the operating instructions carefully before use.

With the purchase of the C2 Controller, you have acquired a device with the highest possible quality and performance capabilities.

As the owner of this system, you now have a versatile and highly professional tool which, when operated properly, is a true pleasure to use.

Symbols in User's Manual



This symbol indicates the possibility of life-threatening danger and a health risk for persons. Not following these instructions may result in serious health problems including potentially fatal injuries.



This symbol indicates a possibly dangerous situation. Not following these instructions may cause minor injuries or cause property damage.



This symbol gives instructions for the proper use of the described products. Not following these instructions may cause damage to the equipment or other property.

Symbols in User's Manual

User's Manual System Controller C2 Version 4.0, 23.03.2006

© by André Figula, Kling & Freitag GmbH, 2003 - 2006; all rights reserved.

All specifications in this manual are based on information available at the time of publishing for the features and safety guidelines of the described products.

Technical specifications, measurements, weights and properties are not guaranteed.

The manufacturer reserves the right to make product alterations within legal provisions as well as changes to improve product quality.

All persons who use the speaker system must have this guide and all further information for safe operations available to them during assembly, disassembly, and use.

We appreciate any input with suggestions and improvements for this manual. Please send this to us at the following address:

info@kling-freitag.de or to:

KLING & FREITAG GMBH Junkersstr.14 D-30179 Hannover

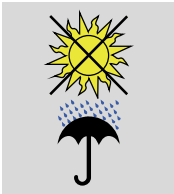
Phone +49 (0) 511 - 96 99 70, Fax +49 (0) 511 - 67 37 94

Contents

Chapter	Page
1. General Safety Instructions	5
2. Product Description	7
3. Connectors, Functions, Controls and Displays	9
3.1 Front	9
3.1.1 Diagram of switchable Filter Functions	11
3.2 Rear	11
4. C2 Remote Control	13
4.1 Example for Remote Control and Display	14
5. System Plug-In Cards	14
5.1 Notes for the System Plug-in Cards Line 212-6 and Line 212-9	14
5.2 Changing the System Plug-In Cards	15
6. Single Cable System	17
7. Operation with the Subwoofers K&F ACCESS B5 / B10	18
8. Recommendations for Configuration	18
8.1 Operating several Speakers per C2 Channel	18
8.2 The correct Balance between Bass and Top Speakers	19
8.2.1 SW 112 / SW 115D / SW 115E / SW 118E	19
8.2.2 SW 215E / SW 215D / ACCESS B5 / ACCESS B10	21
8.3 Combination of Bass System ACCESS B10 with C10 Controller	23
9. Wiring	24
9.1 Connecting the Speakon connectors to the terminal	24
9.2 Avoiding Ground Loops	25
9.2.1 What is a Ground Loop?	25
9.2.2 Avoiding Ground Loops	25
10. Configurations and Wiring Diagrams	26
10.1 Full Range Mode (without additional Subwoofer)	26
10.2 Full Range Systems & Subwoofers in 2-Way Active Mode	27
10.3 Combination with Subwoofer ACCESS B10 via Controller C10	28
10.4 Alternative Wiring without Frontal Connectors	29
11. Operating the Controller	30
12. Technical Specifications	31
13. Block Diagram	32
14. Regulations for Disposal	33
14.1 Germany:	33
14.2 EU, Norway, Island, and Liechtenstein (not Germany):	33
14.3 Other countries	33

1. General Safety Instructions

	CAUTION Risk of electric shock! Do not open the units!	
Warning: To avoid electric shock hazard, do not expose this appliance to rain or moisture. The enclosures may only be opened by qualified personnel!		



Do not install devices in any of the following places:

- where the units are permanently exposed to direct sunlight.
- near any heat sources and open fire. Do not put candles etc. on top of the unit.
- where the airflow for cooling is blocked.
- where it is exposed to high moisture.
- where it is exposed to strong vibrations and dust.



Power Supply

Before connecting the AC power cable of the controller, please check if the available voltage is compatible with the operating voltage as indicated on the unit. If this is not the case, then the unit needs to be adapted by the manufacturer or an authorized service centre. If the unit is not compatible with the available voltage, it should never be connected! This could irreparably ruin the controller.

Make sure that the power outlet supplies a ground connector, which must be connected to the unit via the PE conductor of the power cord!

All equipment, which is connected together using signal cables and has a connection to protective earth, must be connected to a common PE conductor. If not, there is a risk of an electric shock or the destruction of the connected equipment.

The power plug must always be used to disconnect from the power supply. Furthermore, the power plug must be easily accessible for use at all times.

Protection of electrical cables

Power cords should be laid in such a way that they are protected against footstep damages, tensile strain and against being trapped.

Transportation

When transporting the equipment, make sure that it is protected from vibrations.

Cleaning

The equipment should only be cleaned with a damp cloth when it is not plugged in.

Pauses in use

The power cord should be disconnected from the power source during longer pauses in use.

Intrusion of objects or liquids

No objects or liquids should intrude or leak into the equipment.

Maintenance and technical service

The user should not perform any maintenance work on the equipment other than that which is described in this manual. Repairs should be executed by a qualified service technician only.

In the following cases, the unit should be serviced by an authorized technician only if:

- the power cord or the mains connectors have been damaged.
- objects or liquids have gotten into it.
- it was exposed to rain.
- it doesn't appear to be functioning properly.
- it has fallen down or the enclosure is damaged.

Unwanted interference

RF interference on the power cord or on the line signal cables may lead to unwanted sound interference.



2. Product Description

The C2 Controller optimises the performance and operating safety of K&F speaker systems.

It can be equipped with a specific system plug-in card for the top speaker and a separate system plug-in card for the subwoofer.

The C2 Controller can be operated with all K&F loudspeakers for which a system plug-in card is obtainable:

The following system plug-in cards are available for the C2 Controller:

Top speakers:

- CA 106
- CA 1201
- CA 1215-6
- CA 1215-9
- CA 1515-6
- CA 1515-9
- Line 212-6
- Line 212-9

Subwoofer:

- SW(i) 112
- SW 115D-XO / SWi 115D
- SW(i) 115E / SW 215E
- SW(i) 118E
- SW 215D
- ACCESS B5
- ACCESS B10

All system plug-in cards for tops and subwoofers can be combined. The C2 Controller thus facilitates an optimum combination between all these K&F bass systems and all K&F full-range systems listed above.

Range of functions:

The C2 offers a 2-way stereo-crossover for separating the signal that is to be transmitted into frequencies for mid-high systems (= top speaker or full-range system) and frequencies for connected subwoofer systems (= sub or bass). It aligns the delay times and phase of the various full-range systems with those of the subwoofer systems.

The inclusion of carefully balanced filters (EQs) on the respective system plug-in cards enables the C2 Controller to optimise the feedback stability and frequency response of the loudspeakers.

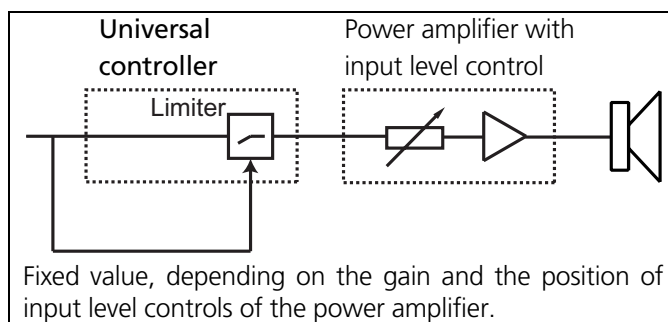
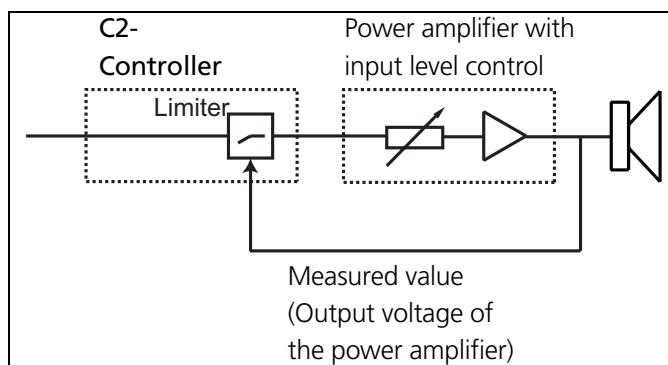
Why optimise the frequency response of passive high-end loudspeakers?

- a) The passive Kling & Freitag full-range systems are characterized not only by their excellent sound but also by their high degree of efficiency. Compact speaker systems with a high efficiency level have a natural low frequency attenuation. This is desirable for the following reasons:
 - In many situations, such as speech or acoustic applications, powerful bass is of less importance than efficiency.
 - In applications requiring a better reproduction of low frequencies the inclusion of a bass system is normally inevitable. As the C2 Controller boosts the bass frequencies of the top speakers in full-range mode, it is possible in many cases to do without additional bass systems.
- b) In full-range mode without C2 Controller mid-high systems also receive the low frequencies of a signal source, which they are not capable of transmitting. The systems are thus subjected to an unnecessary load. The C2 Controller filters out these frequencies by means of subsonic filters, thus reducing the risk of mechanical overload even at high performance levels.

In addition the C2 Controller offers the following functions:

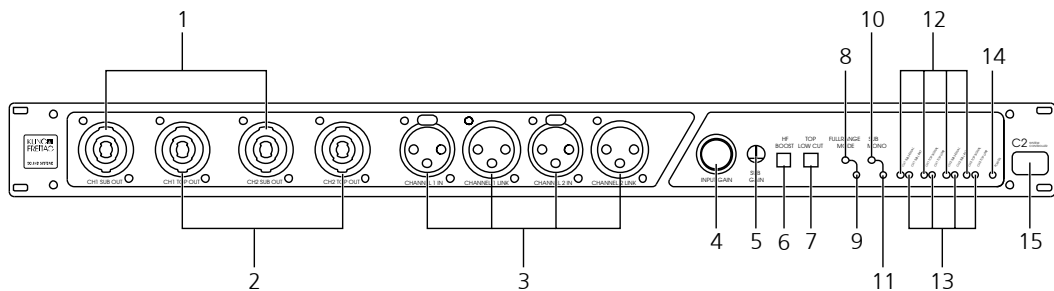
- optional bass boosting in full-range mode (top speakers without additional sub-woofers)
- top low cut switch, e.g. for...
 - ... optimising the frequency response of arrayed speakers (cluster)
 - ... optimising the frequency response in monitor mode
 - ... impact noise reduction
- high-boost to compensate for high frequency attenuation when the top speakers are aligned to cover large distances.
- Sub-mono, combining a stereo bass signal into one mono signal. Attenuation of the individual stereo channels by 6dB so that the bass speakers are not subjected to an increased load by the combined signal sum.
- Optimisation of the operating safety of speakers and power amplifiers through special peak and RMS limiters with sense technology:

With other (universal) controllers, the gain of the selected power amplifiers must be known. The limiter on the C2 Controller, on the other hand, uses a special control circuit to determine the actual output voltage of the power amplifiers. The limiter then reduces the input level only when the power amplifier actually provides more power than the speakers can handle. The amplifier's gain and the position of the input level control for the power amplifiers are insignificant for the limiter function of the C2 Controller.



3. Connectors, Functions, Controls and Displays

3.1 Front



1. **CH 1 SUB OUT, and CH 2 SUB OUT**
 Speakon connectors, pin assignment: (1+ / 1-)
 Channel 1 = CH 1, channel 2 = CH 2
 These outputs direct the amplified signals from the power amplifiers to the sub-woofers.
2. **CH 1 TOP OUT and CH2 TOP OUT**
 Speakon connectors, pin assignment: (1+ / 1-)
 Channel 1 = CH 1, channel 2 = CH 2
 These outputs direct the amplified signals from the power amplifiers to the mid-high systems.
3. **CHANNEL 1 IN / CHANNEL 1 LINK and CHANNEL 2 IN / CHANNEL 2 LINK, XLR**
 connectors, pin assignment: 1 ground / 2 + / 3 -
 Channel 1 = CHANNEL 1, channel 2 = CHANNEL 2
 IN (XLR female): electronically balanced line inputs for channels 1 and 2.
 These connectors are used to connect line signals, e.g. from a mixer output.
 LINK (XLR male): outputs for linking a line level signal, which is connected to the corresponding 'IN' connector, e.g. in order to direct the signal to further controllers or power amplifiers.
 The 'IN' and 'LINK' connectors are wired together in parallel.
 Further parallel-wired input connectors are situated at the rear of the controller and are labelled CH 1 INPUT and CH 2 INPUT.
4. **INPUT GAIN, level control**
 The INPUT GAIN control is used to set the input level of the C2 Controller. The input level can be increased by 6 dB and reduced by 40 dB. In order to avoid overloading the input section of the amplifier or the mixer output circuit, this control should normally be set at 0 dB.
 Turning down the input level controls may not always prevent distortions in the input section of the power amplifier, especially if this section has a relatively low headroom. To prevent signal interruptions or damages to the speakers, turn the level controls of the power amplifier to the maximum position, if possible and adjust the signal level on the mixing console or the controller.
5. **SUB GAIN, level control (also see as of chapter 8, page 18)**
 During operation with additional bass systems it is very important that the relative volume levels of the top speakers and the bass systems are correctly balanced. The SUB GAIN control is used to adjust these volume levels. Always use the controller to set the relative volume levels of the tops and bass systems, with the power amplifier turned up as high as possible. **Detailed advice on how the level adjustment should be set to suit various loudspeaker combinations can be found as of chapter 8, page 18.**

6. **HF BOOST**, switch (see also diagram in section 3.1.1)
Long-distance function for the top speakers. High frequencies are attenuated heavily by the air when travelling over long distances. In order to compensate for such high frequency attenuation in long-distance applications this push-button switch should be pressed. If it is not, then a linear frequency response for near-field conditions will result.
7. **TOP LOW CUT**, switch (see also diagram in section 3.1.1)
Attenuation of low frequencies in the mid-high system in order to ...
 - ... compensate increased acoustic pressure in the low-mid range due to the speaker's positioning. When using arrayed loudspeakers (cluster), improved performance is achieved when the Top Low Cut push-button switch is pressed. In this mode the increase in acoustic pressure in the low-mid area due to the cluster array is counteracted, producing a practically linear frequency response.
 - ... align frequency response in monitor mode.
 - ... reduce pop-noises in speech applications.
8. **FULL RANGE MODE**, switch (see also diagram in section 3.1.1)
Countersunk switch for selecting the modes:
 - a) 'FULL RANGE MODE' (switch pressed)
The entire frequency spectrum, with the exception of the inaudible infra-bass, is handled by the tops, with the frequency response optimised and the bass frequencies boosted.
 - b) '2-WAY ACTIVE MODE' (switch not pressed)
Mode for operation with additional subwoofers. Operation via 2-way stereo crossover for separating the signal into frequencies for the mid-high systems and frequencies for the connected subwoofer systems. By activating additional filters the group delay and phase response of the low and mid-high systems are aligned. This facilitates an optimum acoustic coupling of all K&F bass systems to all K&F full-range systems.
9. **FULL RANGE MODE**, display
LED illuminated in 'FULLRANGE' mode, switch (8.) pressed.
If this LED does not come on, then the '2-WAY ACTIVE MODE' is selected.
10. **SUB MONO**, switch
Countersunk switch for selecting the modes: 'SUB MONO' / 'SUB STEREO'. In 'SUB MONO' mode the bass signal is reduced to a mono signal. The amplified mono signal for the loudspeakers can be extracted from both SUB OUT output sockets (1. & 3.). The signal from the individual stereo channels is reduced by 6 dB so that the bass speakers are not subjected to an increased load by the combined signal sum.
11. **SUB MONO**, display
This LED is illuminated in 'SUB MONO' mode (switch pressed).
If this LED does not come on, then the 'SUB STEREO-MODE' is selected.
12. **SIGNAL LEDs**, display
These LEDs are illuminated when power amplifiers are connected and their output signals are received by the C2 Controller.
In exceptional cases, the Sense LEDs may still light up even when the power amplifiers are turned off or disconnected. This situation can be attributed to the "microphone effect" of the speakers. If the speaker's cones are moved (i.e. from air movement of other sound sources), the speakers produce voltage which may cause the LEDs to light up.

13. **LIMIT LEDs**, display

These LEDs are illuminated as soon as the output level of the relevant channel comes under the influence of the limiters on the controller. A gently engaging RMS limiter and a fast peak limiter limit the output of the power amplifiers virtually inaudibly to the maximum permitted level. If the red limiter LEDs light up frequently the volume should be reduced accordingly. If necessary, further loudspeakers should be added.

14. **POWER**, display

This LED illuminates as soon as the unit is connected to the mains supply.

15. **LABELLING AREA**

An interchangeable label provides information regarding the configuration of the filter cards in use.

3.1.1 Diagram of switchable Filter Functions

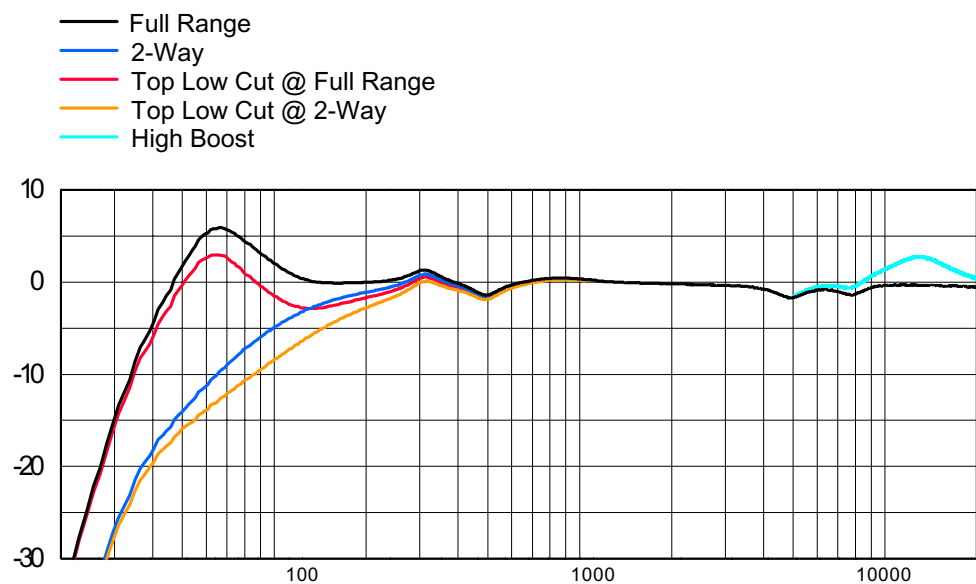
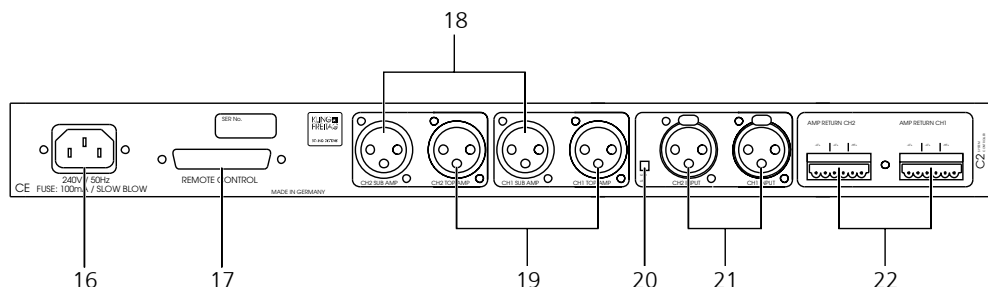


Diagram of the filter settings FULL RANGE, TOP LOW CUT, HF BOOST. Differences between the various models arise due to individual filter cards.

3.2 Rear



16. **AC Mains Socket**, IEC power socket 230V 50-60Hz / 115V 50-60Hz. Connect this socket using the mains cable supplied to a mains outlet. Pay attention to the stated mains voltage. Connection to an incorrect mains voltage can result in irreparable damage!

17. **REMOTE CONTROL**, mini D-Sub socket (for details see chapter 4, as of page 13) Connection for remote call-up of: 'Signal Present', 'Limit', 'Power On' and remote control of all output levels. A detailed description can be found in chapter 4.

18. CH 1 SUB AMP and CH 2 SUB AMP

XLR connector, pin assignment: 1 ground / 2 + / 3 -

Channel 1 = CH1, channel 2 = CH2

Electronically balanced line signal outputs. These outputs deliver the line signal processed by the controller to the subwoofers. Connect these sockets to the inputs of the power amplifiers for the subwoofers.

19. CH 1 TOP AMP and CH 2 TOP AMP

XLR connector, pin assignment: 1 ground / 2 + / 3 -

Channel 1 = CH1, channel 2 = CH2

Electronically balanced line signal outputs. These outputs deliver the line signal processed by the controller to the mid-high systems. Connect these sockets to the inputs of the power amplifiers for the mid-high systems.

20. GND LIFT, switch

For avoiding ground loops. Separates the signal ground from the power supply earth. The Ground Lift switch serves to avoid ground loops. When the Ground Lift switch is set at LIFT, Pin 1 of the INPUT connector is not connected to the signal source. A connection always exists between the input connector (XLR female) and the link connector (XLR male).

21. CH 1 INPUT and CH 2 INPUT

XLR female connectors, pin assignment: 1 ground / 2 + / 3 - .

Channel 1 = CH1, channel 2 = CH2

Additional electronically balanced line signal inputs. These input connectors are wired in parallel to the connectors CHANNEL 1 IN / CHANNEL 1 LINK and CHANNEL 2 IN / CHANNEL 2 LINK on the front of the unit.

22. AMP RETURN CH 1 and CH 2 (input impedance 220 kOhm)

Connector for Phoenix plugs MSTB 2,5/6-ST5, 08 / Ord.No: 17 57 05 1 VO

These connectors are for connecting the amplified output signals from the power amplifiers (loudspeaker signal).

The amplified signal from the bass power amps must be distributed to four pins (2 x LF+ und 2 x LF-), as the permitted current load capacity might otherwise be exceeded! The two inputs have no significance for stereo operation!

The amplified output signals connected here are directed to the relevant Speakon loudspeaker connectors at the front of the unit. LF to SUB OUT / HF to TOP OUT. These signals are required by the limiters (sense signal).

Please ensure that all is connected correctly. These inputs are electronically balanced.

When using 'SP' speakers nothing may be connected to these connectors as these speakers have built-in limiters.

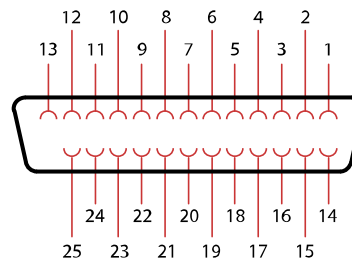
There are some makes of power amplifiers which have a DC voltage to earth potential from the positive and negative pins of the speaker outputs. In such cases the connection must be made via capacitors. More details can be found in the manuals of the power amps in question. The input impedance of the C2 Controller is 220 kOhm.

4. C2 Remote Control

The Sub-D connector at the rear of the C2 Controller offers the facility of remote control of the functions listed below and / or the calling-up of status information.

The Sub-D connector is not intended for connection to a computer. The contacts provide only analogue control and status signals.

25-pin Sub-D pin assignment:



Pin	Label	Input	Output	For
1	GND			
2	Top Signal Channel 1		X	for display, e.g. LED
3	Top Limit Channel 1		X	for display, e.g. LED
4	GND			
5	Top Signal Channel 2		X	for display, e.g. LED
6	Top Limit Channel 2		X	for display, e.g. LED
7	Minus 8,75V			level boost (control voltage source)
8	GND			
9	GND			
10	GND			
11	GND			
12	GND			
13	GND			
14	GND			
15	Sub Signal Channel 1		X	for display, e.g. LED
16	Sub Limit Channel 1		X	for display, e.g. LED
17	GND			
18	Sub Signal Channel 2		X	for display, e.g. LED
19	Sub Limit Channel 2		X	for display, e.g. LED
20	Plus 8,75V			level attenuation (control voltage source)
21	Sub Level Channel 1	X		potentiometer (control voltage)
22	Top Level Channel 1	X		potentiometer (control voltage)
23	Sub Level Channel 2	X		potentiometer (control voltage)
24	Top Level Channel 2	X		potentiometer (control voltage)
25	Master Level	X		potentiometer (control voltage)

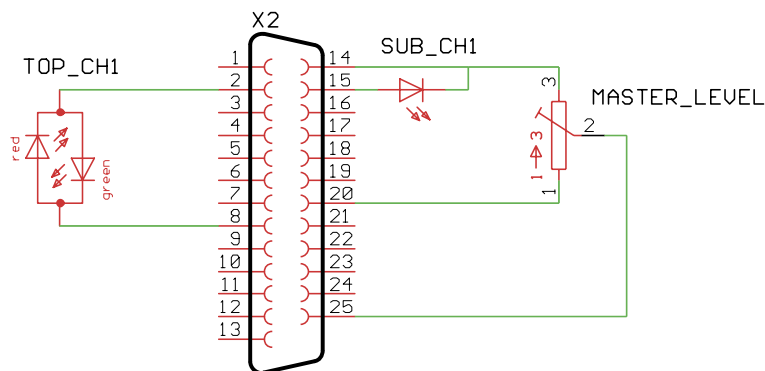
Voltage at LED outputs (via 1k2 resistor)

- inactive (no signal and no limiting) = +12V
- active (signal and limiting) = -12V

Inputs for potentiometers / control voltage

- Positive voltage (+8.75 V from pin 20) reduces the relevant output signal by 9dB per volt. With a 10k potentiometer between GND and pin 20 and the slider contact on the control input of a level channel (sub, top or master) a control range of 0 - 80dB can be achieved.
- Negative voltage (pin 7) boosts the signal by 9dB per volt. The boosting of the signal should be approached with the utmost care. An excessive signal can destroy power amplifier and speakers.

4.1 Example for Remote Control and Display



1. Bi-coloured LED between pin 2 (top signal channel 1) and GND
 - Colour 1 indicates that the C2 Controller is ready for operation
 - Colour 2 indicates that the 'top signal' is present at channel 1
2. LED between pin 15 (sub signal channel 1) and GND
 - LED indicates that the 'sub signal' is present at channel 1
3. Potentiometer (10k) at pin 20 (control voltage source for signal attenuation), pin 25 (master volume) and GND
 - The master volume can be adjusted within a control range of 0 - 80 dB.

5. System Plug-In Cards

5.1 Notes for the System Plug-in Cards Line 212-6 and Line 212-9

During the development of the Line Series particular care was taken so that the parallel operation of Line 212-6 and Line 212-9 can be guaranteed.

Thus it is also possible to operate the Line 212-9 using a Line 212-6 card.

Should you however wish to cover only shorter distances and operate the Line 212-9 alone, we would recommend for best results the use of a Line 212-9 card.

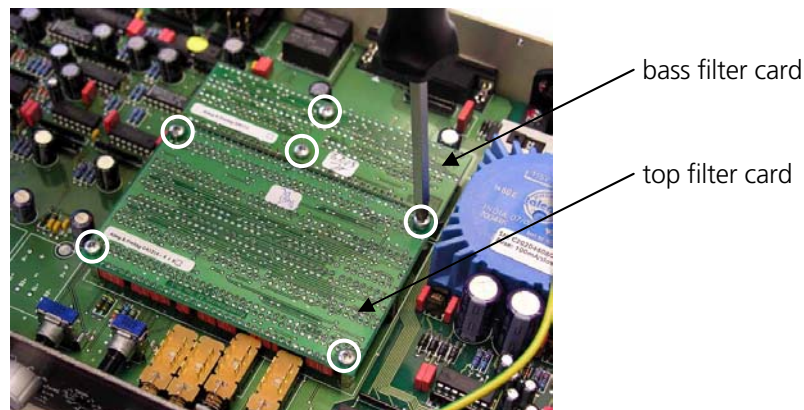
If you are using the Line 212-9 alone with a '-6' card we recommend that you reduce the frequency around 16 kHz Q2 by 2 dB.

5.2 Changing the System Plug-In Cards

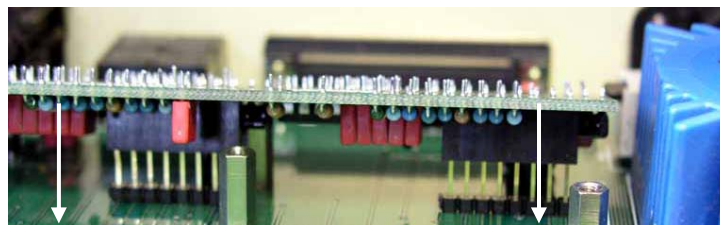


Tool: Cross-tip screwdriver, size PH 1

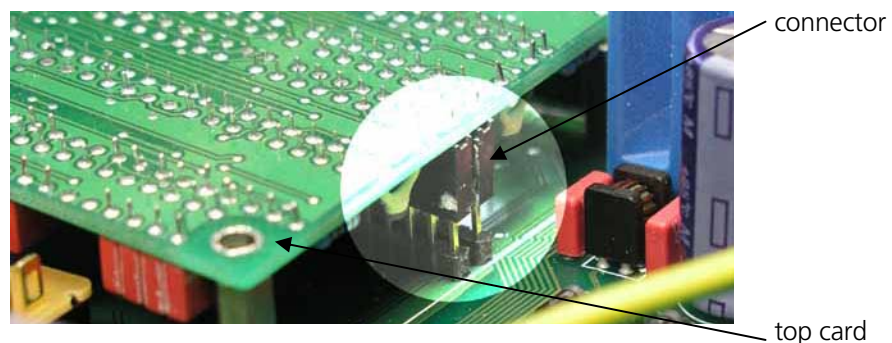
- Remove the mains plug!
- Remove the cover from the top of the housing using a Phillips screwdriver to remove the 7 cover screws (three screws at the back and two on each side).
- Remove the screws securing the cards. The card for the bass system is the small one and is secured with two screws. The large card for the tops is secured with 4 screws.



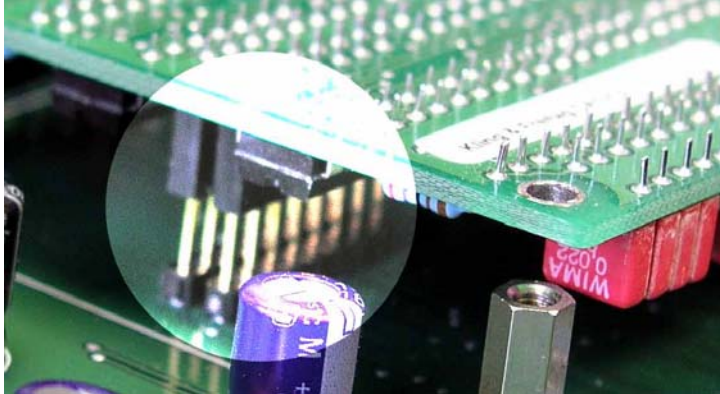
- Extract the installed card from the controller by carefully pulling it vertically upwards. Keep it in a safe place where it is not exposed to moisture or mechanical damage.
- We advise that the bass card be inserted first. Ensure that the pins fit exactly into the connector. Insert the card initially only so far, so as to make sure that the pins fit correctly into the openings of the connector. Then press the PCB firmly home, taking care not to bend the pins.



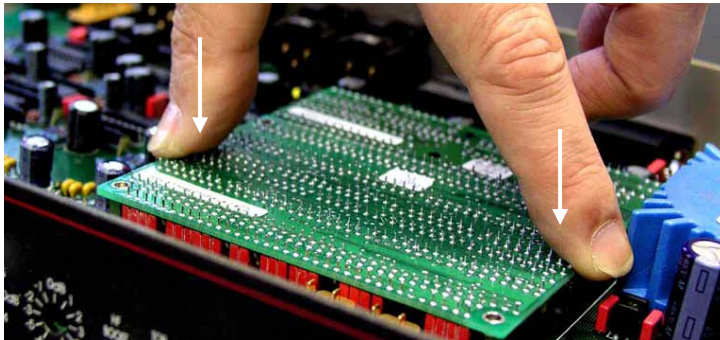
- Now insert the card for the top speakers. Here too extreme care should be taken: Start with the right-hand side. This is the side on which the end of the PCB is flush with the black connector. First fit this side carefully onto the pins. Do not yet press the PCB firmly into place.



- Now fit the connector on the left-hand side onto the pins.



Then press the filter card board firmly onto the pins.



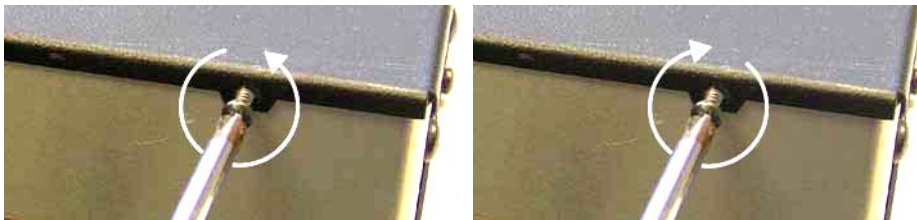
Screw the filter cards on tightly again!

Finally screw the cover of the housing back on. In order to protect the thread of the securing screws from damage, please proceed as follows:

Set the screws in position and applying only light pressure turn them anti-clockwise until you hear a click and the screw jumps forward a little. You have found the beginning of the thread. Now tighten the screws as normal in a clockwise direction.

1.)

2.)



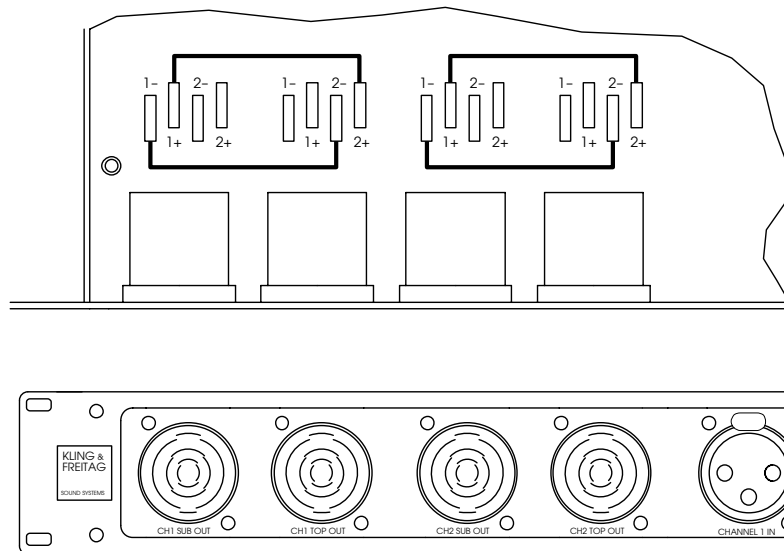
6. Single Cable System

If you wish to operate the C2 Controller with a 'single cable system' (connecting pins 1+/1- for tops and 2+/2- for the bass systems), a modification inside the housing is necessary.

The single cable system does not function with the models ACCESS B5 / B10. The reason for this is that these bass systems have two chassis, each with its own connecting pins for the input connectors. This means one chassis with 1+/1-, the other with 2+/2-. Thus all available pins are already in use. For more information on this subject see the next chapter.

To convert to a single cable system please proceed as follows:

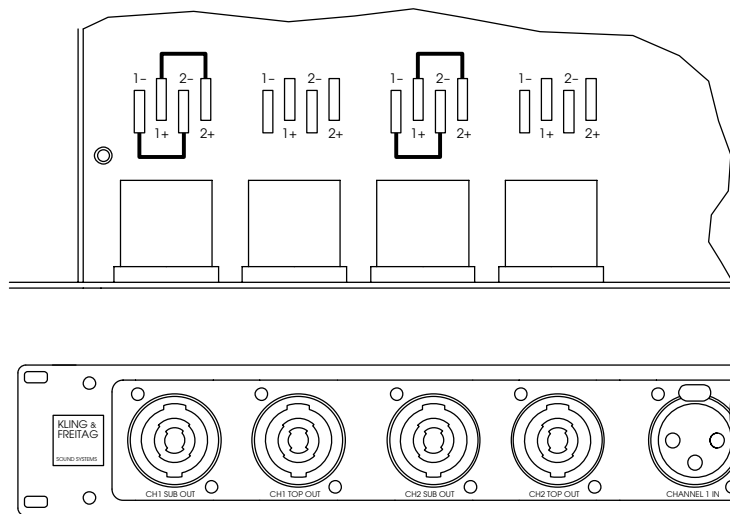
- Disconnect the mains plug!
- Remove the cover from the top of the housing using a Phillips screwdriver (size PH 1) to remove the 7 cover screws (three screws at the back and two on each side).
- Attach the jumper wires (available from Kling & Freitag) to the connections behind the Speakon connectors. See illustration below.
- Finally screw the cover of the housing back on. In order to protect the thread of the securing screws from damage, proceed as described in chapter 5.2 .



7. Operation with the Subwoofers K&F ACCESS B5 / B10

The subwoofer systems ACCESS B5 and B10 each have two loudspeaker chassis, each of which has its own connection pins to the input connectors. Therefore the jumper wires must be installed in the C2 Controller before use. The following measures should be taken inside the open housing of the C2:

- Disconnect the mains plug!
- Remove the cover from the top of the housing using a Phillips screwdriver to remove the 7 cover screws (three screws at the back and two on each side).
- Attach the jumper wires shipped with the B5 / B10 filter card to the connectors behind the Speakon connectors. See illustration below.
- Finally screw the cover of the housing back on. In order to protect the thread of the securing screws from damage, proceed as described in chapter 5.2 .



8. Recommendations for Configuration

8.1 Operating several Speakers per C2 Channel

The maximum number of speakers which can be operated at one time using the C2 Controller is limited by the minimum output impedance of the power amplifiers.

We recommend not more than 2 x 8 Ω loudspeakers per C2 Controller channel.

When operating in stereo this means: a maximum of 4 x 8 Ω top speakers and a maximum of 4 x 8 Ω bass speakers.

Should you wish to include more speakers on one channel, please observe the minimum output impedance of the power amplifier and make sure the power amplifier has sufficient headroom.

No further adjustments need to be made to the C2 Controller when operating with several speakers connected to a single controller. There is no need to adjust the limiters. They receive the necessary information via the voltage applied (not via the current).



8.2 The correct Balance between Bass and Top Speakers

When setting up the system it is very important to ensure that the volume levels of the tops and bass systems are correctly balanced.

The sound level of arrayed bass speakers increases by max. +6dB when doubling the number of speakers (+3dB efficiency plus 3dB by doubling the power amplifier level). The loudness of the tops increases in a different manner because of the directivity.

A bass speaker which is on the floor can be a few decibels louder than a flown bass system because of the floor reflections.

The SUB GAIN control on the C2 Controller facilitates the correct setting of this balance according to configuration and application.

The following tables are intended to show the basic principles of setting this balance in various configurations.

The data given apply to bass systems placed on the floor and are valid on the condition that all systems are driven by identical power amps with the signals set at the same level (we recommend maximum level).

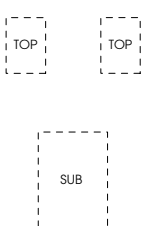
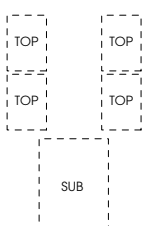






When using power amps with vastly different gain characteristics it can become necessary to adjust the balance between top and bass system using the volume controls of the power amplifier. We recommend however that this be done only when the level adjustment on the C2 Controller proves insufficient. When using this method it cannot be ruled out that the input circuit of the power amp is subjected to overload.

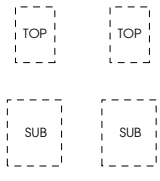
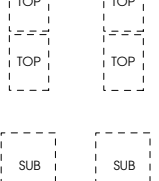
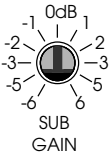
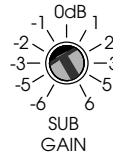
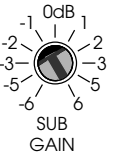




Depending upon room acoustics the correct setting may well differ in practice from that given here. For this reason the sound engineer should always carry out a fine adjustment using the SUB GAIN control.

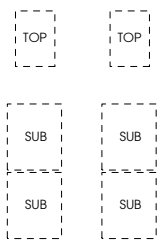
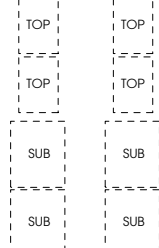


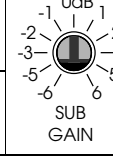





8.2.1 SW 112 / SW 115D / SW 115E / SW 118E

Prerequisite:

- identical power amps for tops and bass systems with each power amp set at the same volume.
- bass systems placed on the floor

1 x subwoofer with 2 top speakers			1 x subwoofer with 4 top speakers		
	2 x CA 106	2 x CA 1201 2 x CA 1215 2 x CA 1515 2 x Line 212		4 x CA 106	4 x CA 1201 4 x CA 1215 4 x CA 1515 4 x Line 212
1 x SW 112 1 x SW 115D / SW 115E 1 x SW 118E	 +6 dB SUB GAIN	Only recommended for applications with low bass level required	1 x SW 112 1 x SW 115D / SW 115E 1 x SW 118E	 +6 dB SUB GAIN	Only recommended for applications with low bass level required
 SUB MONO Sub Mono switch pressed / LED on	 TOP LOW CUT Top Low Cut switch not pressed	 SUB MONO Sub Mono switch pressed / LED on	 TOP LOW CUT Top Low Cut switch pressed		

2 x subwoofers (stereo) with 2 top speakers			2 subwoofers (stereo) with 4 top speakers		
	2 x CA 106	2 x CA 1201		4 x CA 106	4 x CA 1201
		2 x CA 1215			4 x CA 1215
		2 x CA 1515			4 x CA 1515
		2 x Line 212			4 x Line 212
2 x SW 112 2 x SW 115D / SW 115E 2 x SW 118E	0 dB  SUB GAIN	+6 dB  SUB GAIN	2 x SW 112 2 x SW 115D / SW 115E 2 x SW 118E	+6 dB  SUB GAIN	Only recommended for applications with low bass level required
 SUB MONO Sub Mono switch not pressed / LED off		 SUB MONO Sub Mono switch not pressed / LED off			
 TOP LOW CUT Top Low Cut switch not pressed		 TOP LOW CUT Top Low Cut switch pressed			

4 subwoofers (stereo) with 2 top speakers			4 subwoofers (stereo) with 4 top speakers		
	2 x CA 106	2 x CA 1201		4 x CA 106	4 x CA 1201
		2 x CA 1215			4 x CA 1215
		2 x CA 1515			4 x CA 1515
		2 x Line 212			4 x Line 212
4 x SW 112 4 x SW 115D / SW 115E 4 x SW 118E	-6 dB  SUB GAIN	0 dB  SUB GAIN	4 x SW 112 4 x SW 115D / SW 115E 4 x SW 118E	0 dB  SUB GAIN	+6 dB  SUB GAIN
 SUB MONO Sub Mono switch not pressed / LED off		 SUB MONO Sub Mono switch not pressed / LED off			
 TOP LOW CUT Top Low Cut switch not pressed		 TOP LOW CUT Top Low Cut switch pressed			

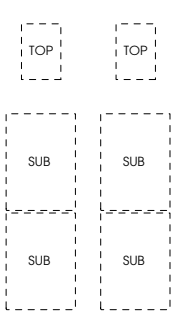
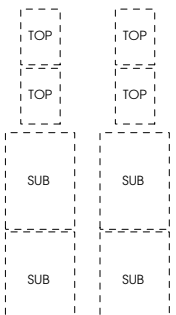






8.2.2 SW 215E / SW 215D / ACCESS B5 / ACCESS B10

Prerequisite:

- identical power amps for tops and bass systems with each power amp set at the same volume.
- bass systems placed on the floor

1 subwoofer with 2 top speakers				1 subwoofer with 4 top speakers			
	2 x CA 106	2 x CA 1201		4 x CA 106	4 x CA 1201		
		2 x CA 1215			4 x CA 1215		
		2 x CA 1515			4 x CA 1515		
		2 x Line 212			4 x Line 212		
1 x SW 215D	0 dB 	+6 dB 	1 x SW 215D	+6 dB 	Only recommended for applications with low bass level required		
1 x SW 215E			1 x SW 215E				
1 x ACCESS B5			1 x ACCESS B5				
1 x ACCESS B10			1 x ACCESS B10				
Sub Mono switch pressed / LED on	Top Low Cut switch not pressed		Sub Mono switch pressed / LED on	Top Low Cut switch pressed			

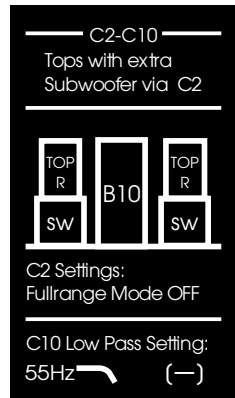
2 subwoofers (stereo) with 2 top speakers				2 subwoofers (stereo) with 4 top speakers			
	2 x CA 106	2 x CA 1201		4 x CA 106	4 x CA 1201		
		2 x CA 1215			4 x CA 1215		
		2 x CA 1515			4 x CA 1515		
		2 x Line 212			4 x Line 212		
2 x SW 215D	-6 dB 	0 dB 	2 x SW 215D	0 dB 	+6 dB 		
2 x SW 215E			2 x SW 215E				
2 x ACCESS B5			2 x ACCESS B5				
2 x ACCESS B10			2 x ACCESS B10				
Sub Mono switch not pressed / LED off	Top Low Cut switch not pressed		Sub Mono switch not pressed / LED off	Top Low Cut switch pressed			

4 subwoofers (stereo) with 2 top speakers			4 subwoofers (stereo) with 4 top speakers		
	2 x CA 106	2 x CA 1201		4 x CA 106	4 x CA 1201
		2 x CA 1215			4 x CA 1215
		2 x CA 1515			4 x CA 1515
		2 x Line 212			4 x Line 212
4 x SW 215D	not recom- mended	-6 dB	4 x SW 215D	not recom- mended	0 dB
4 x SW 215E			4 x SW 215E		
4 x ACCESS B5			4 x ACCESS B5		
4 x ACCESS B10			4 x ACCESS B10		
 Sub Mono switch not pressed / LED off	 Top Low Cut switch not pressed	 Sub Mono switch not pressed / LED off	 Top Low Cut switch pressed		

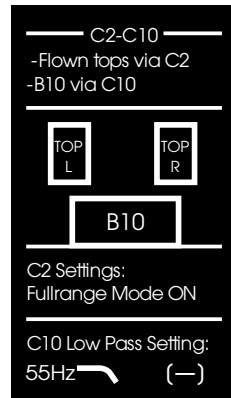
8.3 Combination of Bass System ACCESS B10 with C10 Controller

The bass system ACCESS B10 is an optimal bass supplement when driven via the Controller ACCESS C10.

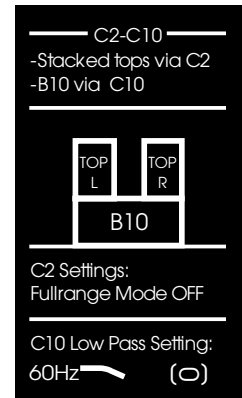
The C10 Controller has configuration switches for various configurations and applications. Its special electronics release the B10's last reserves of power in the sub-low range. Compared to operation of the B10 with a C2 Controller (also possible), use with the C10 Controller ensures an additional improvement in bass performance.



K&F full range systems with K&F bass systems are to be driven via the C2 Controller. The B10 is operated via the C10 Controller as additional bass system: Set the C2 Controller to Full Range Mode 'OFF'. Generally, the configuration switch for the C10 Controller should be set at 55 Hz.



If flown K&F full range systems are to be operated via the C2 Controller with a B10 as supplementary bass system via the C10 Controller, then the option for the C2 Full Range Mode 'ON' should be selected. The configuration switch on the C10 Controller should be set at 55 Hz.



If top speakers which are operated via the C2 Controller are stacked onto the B10, and the B10 is operated via the C10 Controller, then the C2 Controller should be set to Full Range Mode 'OFF'. The configuration switch on the C10 Controller should be set to 60 Hz.

9. Wiring

Make sure that all units are switched off and all controls are turned down before connecting your C2 Controller.

- We recommend the use of high-quality speaker cables provided by KLING & FREITAG.
- For connections from the mixing console to the power amplifier inputs, please use 2-pin shielded microphone cable with high-quality connectors.
- Avoid ground loops (see chapter 9.2)
- Please pay attention to the respective pin diagrams in this manual!
- Make sure that the +/- polarity of the speakers at the amplifier is correct. When simultaneously using power amplifiers from different manufacturers, be sure to use the correct specific pin configuration. It may be necessary to modify the pin configuration on the power amplifiers or on the connectors leading to them.
- Upon completing the wiring, ensure that the connected speaker channels are working in phase. To do so, use i.e. a phase checker. A phase error can also be recognized when the connected channels are used simultaneously. During simultaneous use the bass frequencies become notably quieter or the mid-frequencies such as voices cannot be located.
- To avoid loss of power, the cables should have a minimum wire gauge of 2.5 mm² - more for longer cabled distances. A minimum wire gauge can be easily calculated with the following formula:

$$\text{Minimum Wire Gauge (mm}^2\text{)} = \frac{\text{Required Cable Length (m)}}{2 \times \text{Speaker Impedance } (\Omega)}$$

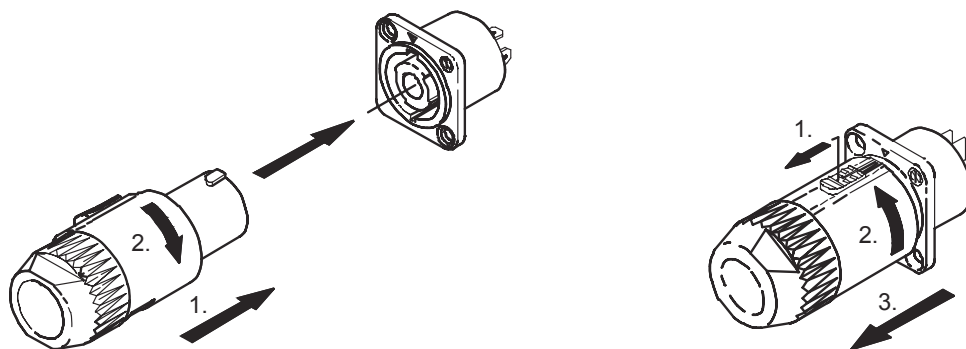
If several loudspeakers are connected, the signal can be linked through from one loudspeaker to the next. Please make sure that the total impedance of the loudspeakers $R(\Omega)$ is not lower than the minimal impedance indicated on the power amplifier.

$$1/R_1 + 1/R_2 + 1/R_3 + \dots = 1/R_{\text{total}}$$



Important

9.1 Connecting the Speakon connectors to the terminal



9.2 Avoiding Ground Loops

9.2.1 What is a Ground Loop?

Every component of a P.A. or Hi-Fi System has its own internal 0V reference (ground). This point is often connected to the protective earth connector (PE / Ground). If two or more units are connected to one another with a line level audio cable, there may be a ground connection through the ground of the power supply cable (yellow-green) as well as through the shielding of the audio cable. The voltage difference between these two ground points causes audible interference to come from the speaker.

9.2.2 Avoiding Ground Loops

If there is a loud humming or buzzing after the speaker system has been connected, then check that an unwanted "ground loop" has not been built into the system. The C2 Controller as well as some power amplifiers facilitate a ground lift switch. Set the ground lift switch of the C2 Controller to the 'Lift' position first. If the humming is still audible, then set the ground lift switches of the amplifiers to the 'Lift' position one after the other. If the noise is still audible, check if

1. the noise is caused by a ground loop before the power amplifiers or controllers (e.g. mixing console, effects or equalizers).
2. the system or parts of the system are connected to an "unclean" power supply - meaning one which is also running large motors or lighting systems. An "unclean" supply voltage, electrostatic and electromagnetic fields can cause interference.

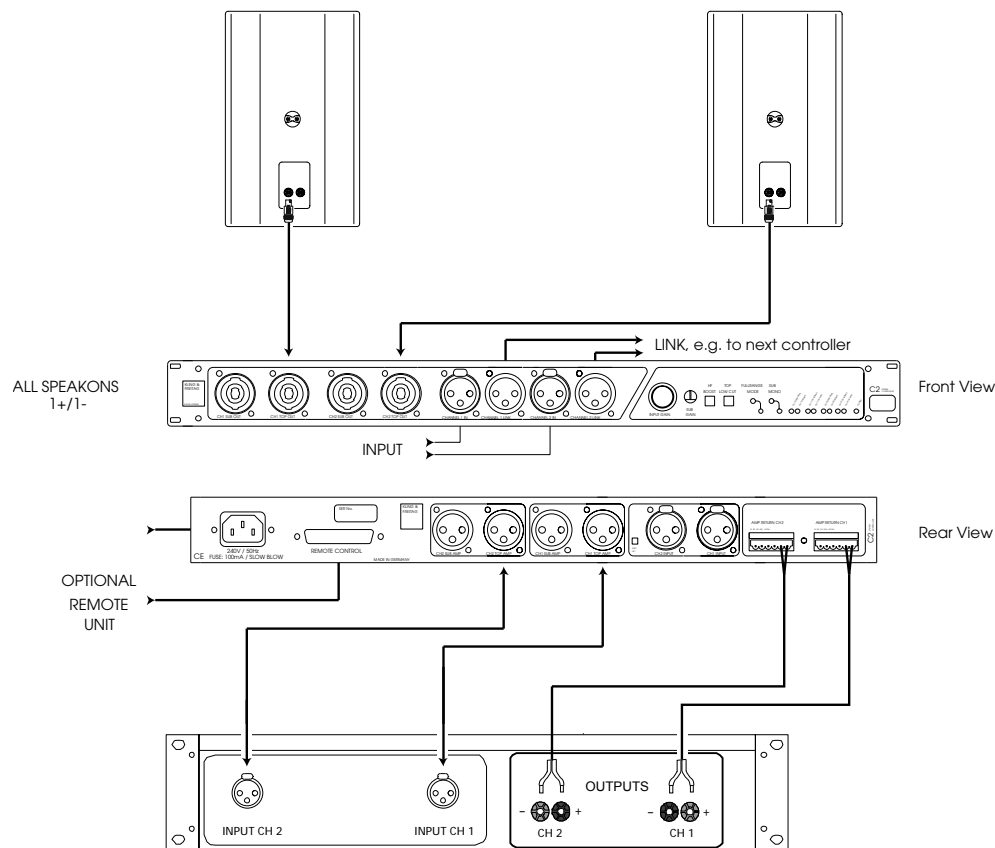


Please observe the following basic rules:

- **Never!!! try to avoid a ground loop by disconnecting or taping the protective earth contact at the mains connector! Extremely dangerous!**
- If possible, only use high-quality audio appliances with balanced signal outputs and with power cables with PE connectors.
- Use high-quality cables with good shielding.
- The point of ground for all connected components should merge at one central point. The power connections should lead out in a radial manner from one point and not be linked from one unit to the next.
- When installing appliances that create strong electrostatic or electromagnetic fields (large transformers, switch-mode power supplies), maintain some distance from other audio appliances. In extreme cases, the only solution is to create a completely independent 'audio ground'; in other cases, it is sufficient to connect a filter in front of the audio equipment.

10. Configurations and Wiring Diagrams

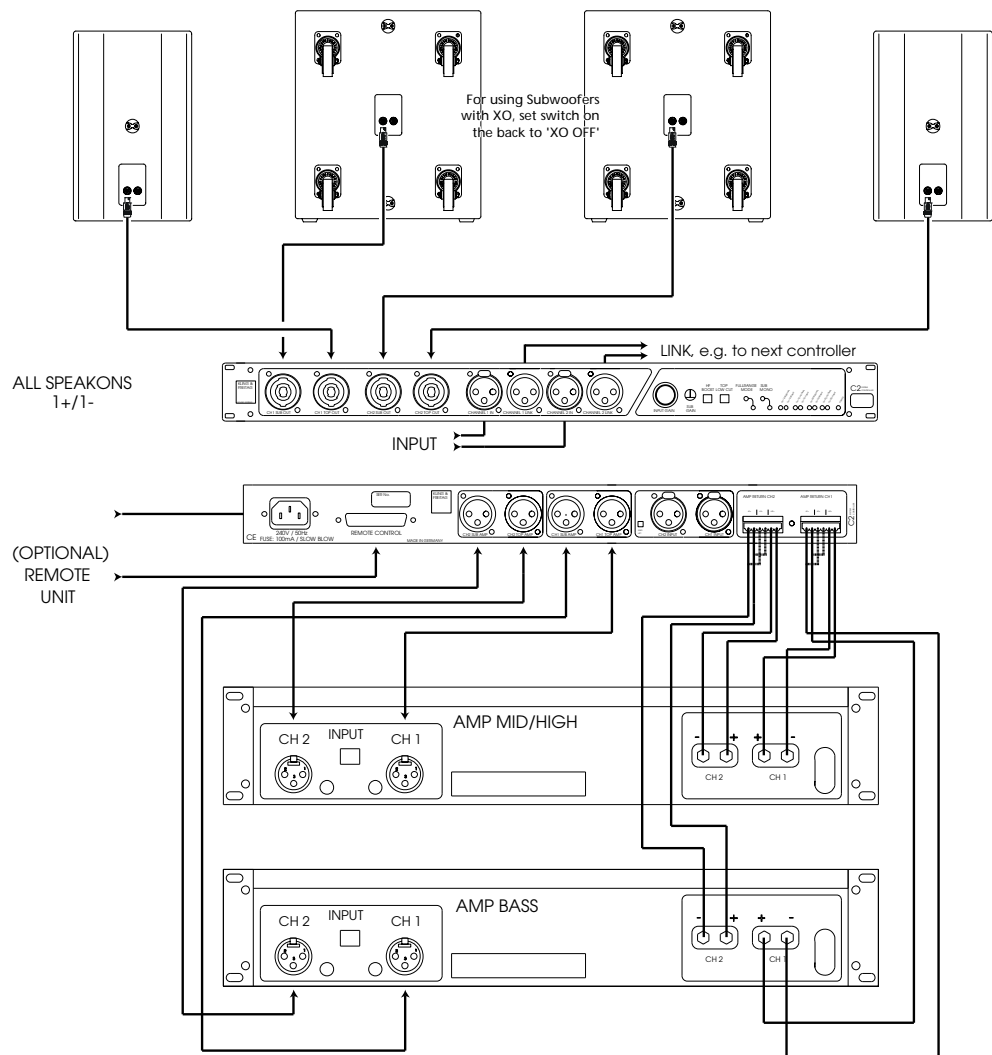
10.1 Full Range Mode (without additional Subwoofer)



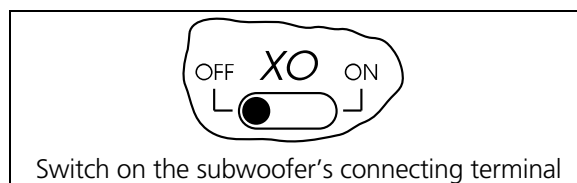
The countersunk switch 'Full-Range Mode' on the C2 Controller should be pressed and the LED assigned to it should light up. The full-range switch accentuates the bass frequencies of the mid-high systems, giving a more balanced sound to music programmes.

If you are using the mid-high systems in a cluster (speakers in close proximity) or as a stage monitor, press the 'Top Low Cut' switch on the C2 Controller.

10.2 Full Range Systems & Subwoofers in 2-Way Active Mode



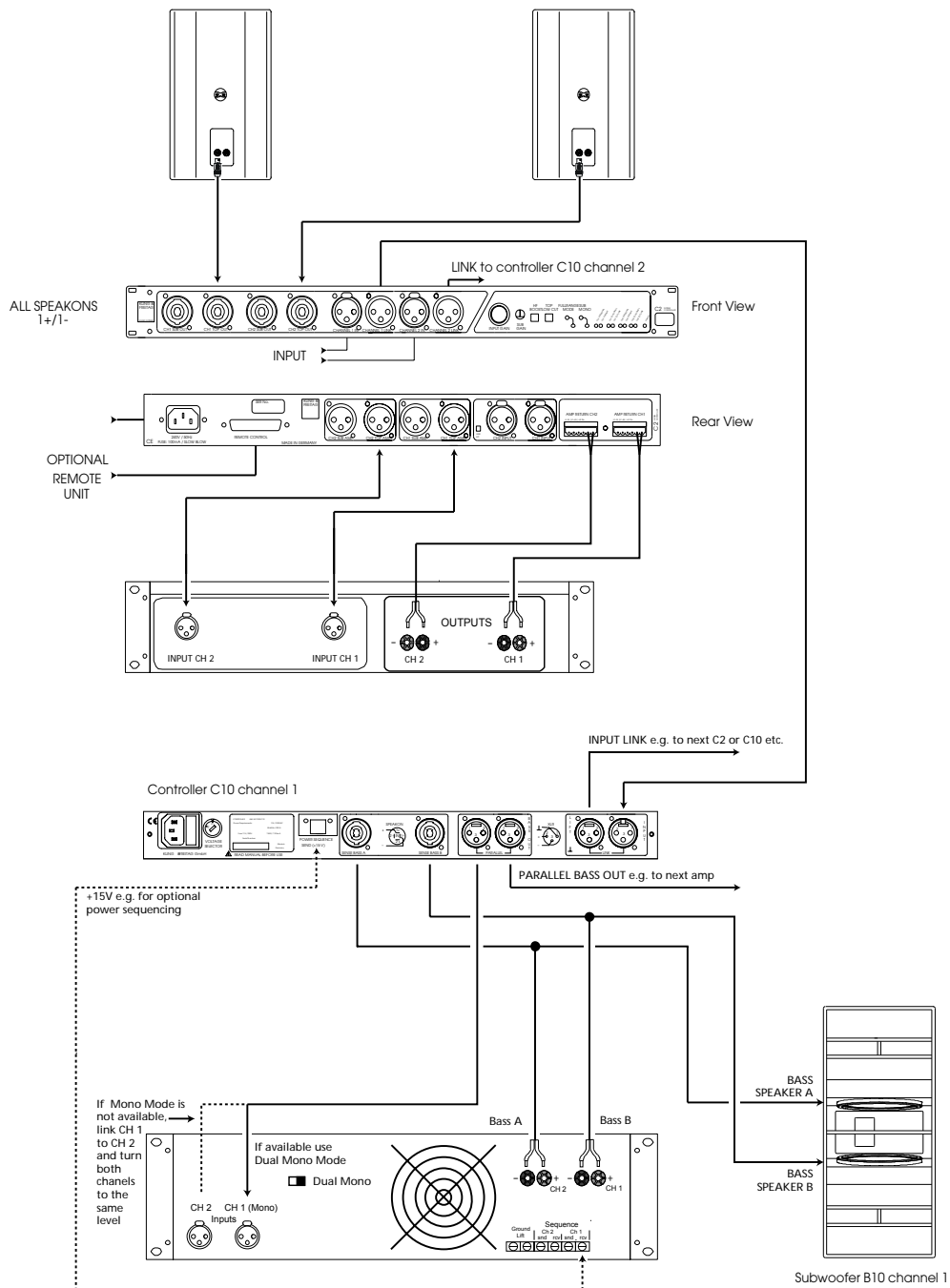
The switch "XO" on the connecting terminal of the subwoofer must be at "OFF" for this mode of operation:



The countersunk switch 'Full-Range Mode' on the C2 Controller should not be pressed and the LED assigned to it should not light up.

When using the mid-high systems in a cluster (speakers in close proximity), activate the "Top Low Cut" switch on the C2 Controller.

10.3 Combination with Subwoofer ACCESS B10 via Controller C10

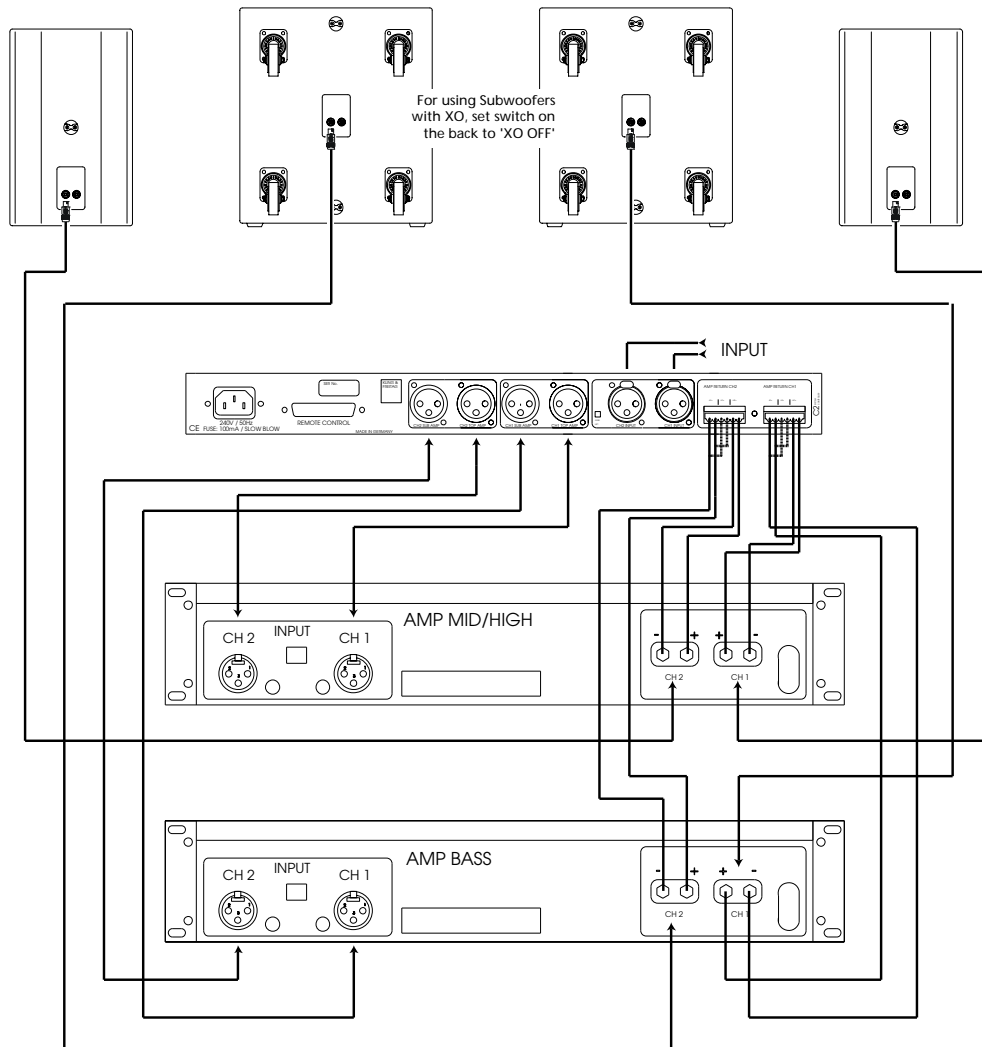


10.4 Alternative Wiring without Frontal Connectors

It sometimes makes sense, e.g. in the case of permanent installation, to avoid connections at the front of the controller. Frontal connections can be unpleasing to the eye, or perhaps doors on built-in racks can no longer be closed. For this reason it is possible to connect the C2 Controller solely at the rear.

Particular care should be taken that the sense connectors are wired parallel to the corresponding power amp outputs.

The following diagram shows the correct alternative wiring



11. Operating the Controller

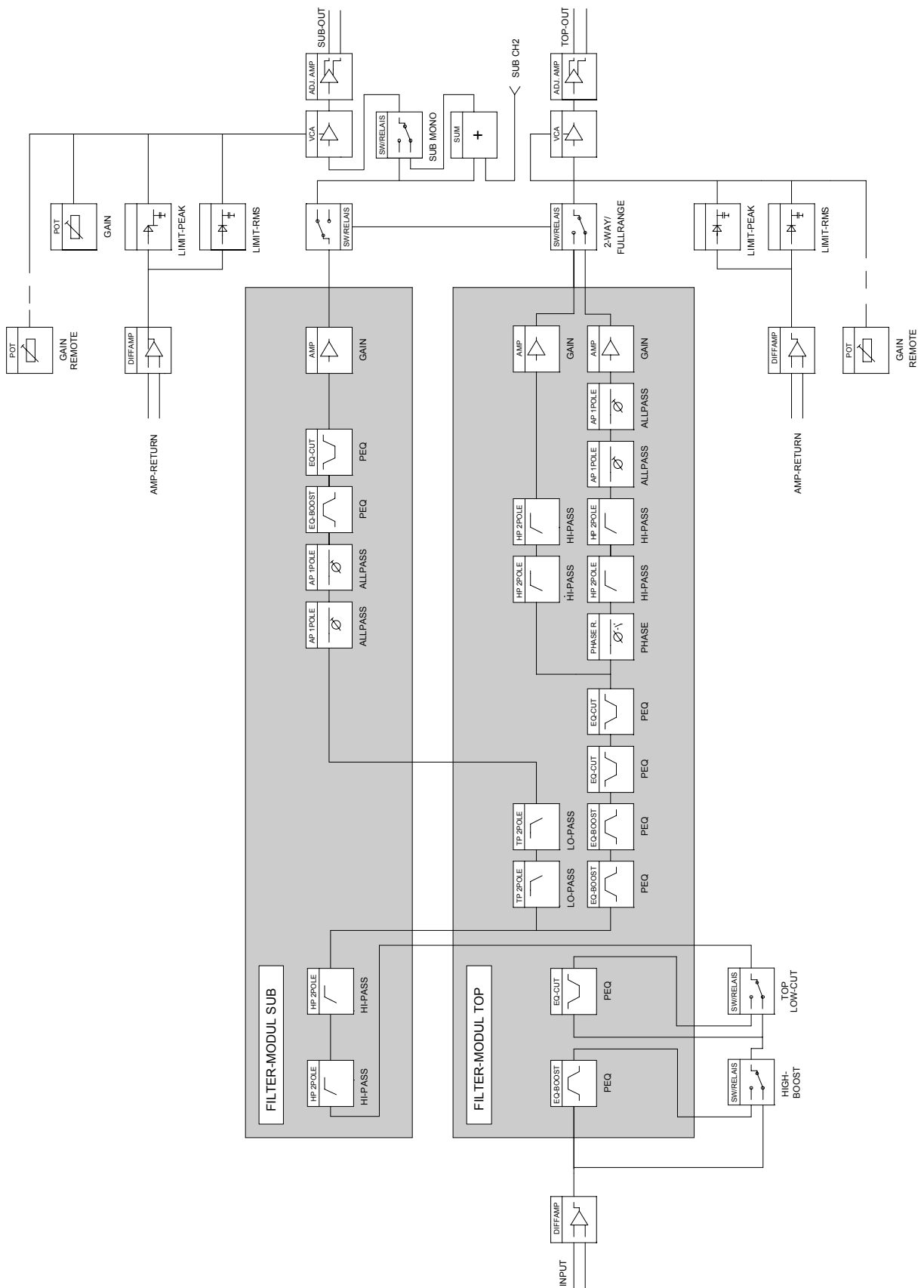
- Make sure to observe the installation instructions and safety notes shown in the loudspeaker manuals and in the user's manual for loudspeakers and assembly equipment.
- Switch off all equipment and turn down all level controls.
- Wire the speaker systems according to the wiring diagrams as shown above.
- Now switch on the peripheral equipment first (mixing console, effects etc.), followed by the C2 Controller and the power amplifiers. Always use the before mentioned switching order. Otherwise switching noises may damage the system.
- If there is interference, turn off all appliances in the reverse order and check all cable connections (see chapter 9.2).
- Next, turn on the C2 Controller and the other peripheral equipment and make sure there is no interference.
- Now put a low level signal into the system and check for the correct function of the system. In doing so, all amplifier input controls need to be turned off again. Now turn on the level control for the first top speaker channel and check that the correct signal is coming out of the speaker.
- The Sense LED for the top speaker (i.e. CH 1 TOP signal) of the K&F C2 Controller will light up green at a level of at ca. -40dB. The other channels of the system are checked in the same way. If the wrong LED lights up or a wrong (i.e., in 2-way active mode, low signal from a mid-high speaker) or distorted signal occurs, then there is a mistake in the wiring.
- The system should now be ready to operate.
- Turning down the input level controls may not always prevent distortions in the input section of the power amplifier, especially if this section has a relatively low headroom. A clipping signal may not be displayed by the clipping indicator then! To prevent signal interruptions caused by protection circuits or damages to the speakers, turn the level controls of the power amplifier to the maximum position, if possible. The output level of the mixing console or the controller should be set to a level that doesn't overload the power amplifiers.
- When turning off the system, the input controls for the power amplifiers should be turned down first followed by the power switches of the amplifiers. After that, the other appliances can be turned off.
- The crossovers of the top speakers are equipped with protection circuits for the high frequency driver and the crossover itself. These circuits cut off the signal current when highly overloaded. If the high speaker turns off, reduce the volume. After a few seconds, it will turn back on automatically.



12. Technical Specifications

Input	Nominal + 6 dB +20 dBu
	20k Ω
	XLR connectors
Outputs	+6 dB nominal (+1.55 V) electr. balanced XLR connectors Sub D for remote control
Output impedance	270 Ω
Input Gain	Variable, - 40 dB to +6 dB
Sub Gain	Variable, - 6 dB to +6 dB
Sense	Phoenix MSTB 2.5 / 6 – ST – 5.08, electronically balanced input impedance: 220 k Ω
Limiter ratio	> 10:1
Common mode rejection @15 kHz	> 40 dB
Signal to noise @ +6 dBm	98 dB
THD (THD+N) @ +6 dBm	< 0.03%
LED displays	Limit Signal Sub Mono Full Range Mode Power
Switchable functions	
Front	HF Boost Top Low Cut Full Range / 2-way Sub mono / sub stereo
Rear	Ground lift
Supply voltage	AC 230 V, 50 (230 V version)
alternative	AC 155 V, 60 Hz (115 V version)
Power consumption	10 VA
Fuse	230 V version: 100 mA T 115 V version: 200 mA T
Power connector	IEC power socket

13. Block Diagram



14. Regulations for Disposal

14.1 Germany:

It is not allowed to dispose of used electrical equipment as domestic waste.

But please do not dispose of them at official collecting points for recycling either!

All Kling & Freitag products are plain business-to-business (B2B) products. Disposal of Kling & Freitag products labelled with a waste bin sign have thus to be disposed of by Kling & Freitag alone. Please call Kling & Freitag at the number stated below if you have a Kling & Freitag product to be disposed. We will offer you a straightforward and professional disposal not affecting costs.

If there is no dustbin sign on one of your Kling & Freitag products, because they have been sold before March 2006 then by law the owner is in charge of the disposal. For these we will be happy to assist and offer you proper ways of disposal.

Telephone number to call about the disposal of used Kling & Freitag products: +49 (511)-96 99 7-0

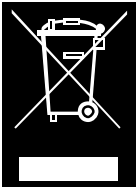
Explanation:

With the ElektroG (law relating to electrical and electronic equipment and appliances) we have complied with the EU-directive on waste electrical and electronic equipment (WEEE, 2002/96/EC)

The Kling & Freitag AG has thus labelled all products mentioned in the WEEE from 03/24/2006 onwards with a sign with a crossed out waste bin and a white bar below. This sign indicates that the disposal into the domestic waste is prohibited and that the product has been put into circulation at the 03/24/2006 earliest.

The Kling & Freitag GmbH has been legally registered as a manufacturer with the registration office EAR. Our WEEE Registration-Nr. is: DE64110372

For the German Registration office EAR we have accredited that our products are sole B2B products.



14.2 EU, Norway, Island, and Liechtenstein (not Germany):

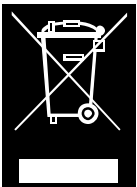
It is not allowed to dispose of used electrical equipment as domestic waste.

The Kling & Freitag AG has thus labelled all products coming from EU-Member countries as well as Norway, Island and Liechtenstein (except Germany) mentioned in the WEEE from 08/13/2005 onwards with a sign with a crossed out waste bin and a white bar below. This sign indicates that the disposal into the domestic waste is prohibited and that the product has been put into circulation at the 08/13/2005 earliest.

Unfortunately the European directive WEEE has been complied with implementing different national provisions of law throughout all member countries, which makes it impossible for us to offer consistent solutions for the disposal throughout Europe.

Responsible for complying with these provisions of law is the local distributor (importer) of each country.

For proper disposition of used products in accordance with these local provisions in the mentioned countries of the European Union (except Germany) please ask your local dealer or the local authorities.



14.3 Other countries

For proper disposition of used products in accordance with local provisions in other countries please ask your local dealer or the local authorities.