HK AUDIO®

CONCERT SOUND

DIGITAL FIELD CONTROLLER

MANUAL 2.1

English
Deutsch

Important Safety Instructions

Before connecting, read instructions

- Read all of these instructions!
- Read all of these instructions!
- Save these instructions for later use!
- Follow all warnings and instructions marked on the product!
- Do not use this product near water, i.e. bathtub, sink, swimming pool, wet basement, etc.
- Do not place this product on an unstable cart, stand or table. The product may fall, causing serious damage to the product or to persons!
- Slots and openings in the cabinet and the back or bottom are provided for ventilation; to ensure reliable operation of the product and to protect it from overheating, these openings must not be blocked or covered. This product should not be placed in a built-in installation unless proper ventilation is provided.
- This product should not be placed near a source of heat such as a stove, radiator, or another heat producing amplifier.
- Use only the supplied power supply or power cord. If you are not sure of the type of power available, consult your dealer or local power company.
- Do not allow anything to rest on the power cord. Do not locate this product where persons will walk on the cord.
- Never break off the ground pin on the power supply cord.
- Power supply cords should always be handled carefully. Periodically check cords for cuts or sign of stress, especially at the plug and the point where the cord exits the unit.
- The power supply cord should be unplugged when the unit is to be unused for long periods of time.
- If this product is to be mounted in an equipment rack, rear support should be provided.
- This product should be used only with a cart or stand that is recommended by HK AUDIO®.
- Never push objects of any kind into this product through cabinet slots as they may touch dangerous voltage points or short out parts that could result in risk of fire or electric shock. Never spill liquid of any kind on the product.
- Do not attempt to service this product yourself, as opening or removing covers may expose you to dangerous voltage points or other risks. Refer all servicing to qualified service personnel.
- Clean only with dry cloth.
- Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for the safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
- Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:
- When the power cord or plug is damaged or frayed.
- If liquid has been spilled into the product.
- If the product has been exposed to rain or water.
- If the product does not operate normally when the operating instructions are followed.
- If the product has been dropped or the cabinet has been damaged.
- If the product exhibits a distinct change in performance, indicating a need of service!
- Adjust only these controls that are covered by the operating instructions since improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to normal operation.
- Exposure to extremely high noise levels may cause a permanent hearing loss.
- Individuals vary considerably in susceptibility to noise induced hearig loss, but nearly everyone will lose some hearing if exposed to sufficiently intense noise for a sufficient time. The U.S. Government´s Occupational Safety and Health Administration (OSHA) has specified the following permissible noise level exposures:

Duration Per Day In Hours	Sound LeveldBA, Slow Response
8	90
6	92
4	95
3	97
2	100
1 1/2	102
1	105
1/2	110
1/4 or less	115

- According to OSHA, any exposure in excess of the above permissible limits could result in some hearing loss.
- Ear plug protectors in the ear canals or over the ears must be worn when operating this amplification system in order to prevent a permanent hearing loss if exposure is in excess of the limits as set forth above. To ensure against potentially dangerous exposure to high sound pressure levels, it is recommended that all persons exposed to equipment capable of producing high sound pressure levels such as this amplification system be protected by hearing protectors while this unit is in operation.
- Fuses: Replace with IEC 127 (5x 20 mms) type and rated fuse for best performance only.

TO PREVENT THE RISK OF FIRE AND SHOCK HAZARD, DO NOT EXPOSE THIS APPLIANCE TO MOISTURE OR RAIN. DO NOT OPEN CASE; NO USER SERVICE-ABLE PARTS INSIDE.
REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

Important Advice on Safety!

Please read before use and keep for later use!

- The unit has been built by HK AUDIO® in accordance with IEC 60065 and left the factory in safe working order. To maintain this condition and ensure non-risk operation, the user must follow the advice and warning comments found in the operating instructions. The unit conforms to Protection Class 1 (protectively earthed).
- HK AUDIO® ONLY GUARANTEE THE SAFETY, RELIABILITY AND EFFICIENCY OF THE UNIT IF:
- Assembly, extension, re-adjustment, modifications or repairs are carried out by HK AUDIO® or by persons authorized to do so.
- The electrical installation of the relevant area complies with the requirements of IEC (ANSI) specifications.
- The unit is used in accordance with the operating instructions.
- The unit is regularly checked and tested for electrical safety by a competent technician.

WARNING:
- If covers are opened or sections of casing are removed, except where this can be done manually, live parts can become exposed.
- If it is necessary to open the unit this must be insulated from all power sources. Please take this into account before carrying out adjustments, maintenance, repairs and before replacing parts.
- The appliance can only be insulated from all power sources if the mains connection is unplugged.
- Adjustment, maintenance and repairs carried out when the unit has been opened and is still live may only be performed by specialist personnel who are authorized by the manufacturer (in accordance with VBG 4) and who are aware of the associated hazards.
- Loudspeaker outputs which have the IEC 417/5036 symbol (Diagram 1, below) can carry voltages which are hazardous if they are made contact with. Before the unit is switched on, the loudspeaker should therefore only be connected using the lead recommended by the manufacturer.
- Where possible, all plugs on connection cables must be screwed or locked onto the casing.
- Replace fuses only with IEC127 type and specified ratings.
- It is not permitted to use repaired fuses or to short-circuit the fuse holder.
- Never interrupt the protective conductor connection.
- Surfaces which are equipped with the "HOT" mark (Diagram 2, below), rear panels or covers with cooling slits, cooling bodies and their covers, as well as tubes and their covers are purposely designed to dissipate high temperatures and should therefore not be touched.
- High loudspeaker levels can cause permanent hearing damage. You should therefore avoid the direct vicinity of loudspeakers operating at high levels.
  Wear hearing protection if continuously exposed to high levels.

MAINS CONNECTION:
- The unit is designed for continuous operation.
- The set operating voltage must match the local mains supply voltage.
- The unit is connected to the mains via the supplied power unit or power cable.
- Power unit: Never use a damaged connection lead. Any damage must be rectified by a competent technician.
- Avoid connection to the mains supply in distributor boxes together with several other power consumers.
- The plug socket for the power supply must be positioned near the unit and must be easily accessible.

PLACE OF INSTALLATION:
- The unit should stand only on a clean, horizontal working surface.
- The unit must not be exposed to vibrations during operation.
- Keep away from moisture and dust where possible.
- Do not place the unit near water, baths, wash basins, kitchen sinks, wet areas, swimming pools or damp rooms. Do not place objects containing liquid on the unit - vases, glasses, bottles etc.
- Ensure that the unit is well ventilated.
- Any ventilation openings must never be blocked or covered. The unit must be positioned at least 20 cm away from walls. The unit may only be fitted in a rack if adequate ventilation is ensured and if the manufacturer's installation instructions are followed.
- Keep away from direct sunlight and the immediate vicinity of heating elements and radiant heaters or similar devices.
- If the unit is suddenly moved from a cold to a warm location, condensation can form inside it. This must be taken into account particularly in the case of tube units. Before switching on, wait until the unit has reached room temperature.
- Accessories: Do not place the unit on an unsteady trolley, stand, tripod, base or table. If the unit falls down, it can cause personal injury and itself become damaged. Use the unit only with the trolley, rack stand, tripod or base recommended by the manufacturer or purchased together with the unit. When setting the unit up, all the manufacturer's instructions must be followed and the setup accessories recommended by the manufacturer must be used. Any combination of unit and stand must be moved carefully. A sudden stop, excessive use of force and uneven floors can cause the combination of unit and stand to tip over.
- Additional equipment: Never use additional equipment which has not been recommended by the manufacturer as this can cause accidents.
- To protect the unit during bad weather or when left unattended for prolonged periods, the mains plug should be disconnected. This prevents the unit being damaged by lightning and power surges in the AC mains supply.

Diagram 1

Diagram 2

Wichtige Sicherheitshinweise!

Bitte vor Gebrauch lesen und für späteren Gebrauch aufbewahren!

- Das Gerät wurde von HK AUDIO® gemäß IEC 60065 gebaut und hat das Werk in sicherheitstechnisch einwandfreiem Zustand verlassen. Um diesen Zustand zu erhalten und einen gefahrlosen Betrieb sicherzustellen, muss der Anwender die Hinweise und die Warnvermerke beachten, die in der Bedienungsanleitung enthalten sind. Das Gerät entspricht der Schutzklasse I (schutzgeerdet).
- DIE SICHERHEIT, ZUVERLÄSSIGKEIT UND LEISTUNG DES GERÄTES WIRD VON HK AUDIO® NUR DANN GEWÄHRLEISTET, WENN:
- Montage, Erweiterung, Neueinstellung, Änderungen oder Reparaturen von HK AUDIO® oder von dazu ermächtigten Personen ausgeführt werden.
- die elektrische Installation des betreffenden Raumes den Anforderungen von IEC (ANSI)-Festlegungen entspricht.
- das Gerät in Übereinstimmung mit der Gebrauchsanweisung verwendet wird.

WARNUNG:
- Wenn Abdeckungen geöffnet oder Gehäuseteile entfernt werden, außer wenn dies von Hand möglich ist, können Teile freigelegt werden, die Spannung führen.
- Wenn ein Öffnen des Gerätes erforderlich ist, muss das Gerät von allen Spannungsquellen getrennt sein. Berücksichtigen Sie dies vor dem Abgleich, vor einer Wartung, vor einer Instandsetzung und vor einem Austausch von Teilen.
- Ein Abgleich, eine Wartung oder eine Reparatur am geöffneten Gerät unter Spannung darf nur durch eine vom Hersteller autorisierte Fachkraft (nach VBG 4) geschehen, die mit den verbundenen Gefahren vertraut ist.
- Lautsprecher-Ausgänge, die mit dem IEC 417/5036-Zeichen (Abb.1, s.unten) versehen sind können berührungsgefährliche Spannungen führen. Deshalb vor dem Einschalten des Gerätes Verbindung nur mit dem vom Hersteller empfohlenen Anschlusskabel zum Lautsprecher herstellen.
- Alle Stecker an Verbindungskabeln müssen mit dem Gehäuse verschraubt oder verriegelt sein, sofern möglich.
- Es dürfen nur Sicherungen vom angegebenen Typ und der angegebenen Nennstromstärke als Ersatz verwendet werden.
- Eine Verwendung von geflickten Sicherungen oder Kurzschließen des Halters ist unzulässig.
- Niemals die Schutzleiterverbindung unterbrechen.
- Oberflächen, die mit dem "HOT"-Zeichen (Abb.2, s.unten) versehen sind, Rückwände oder Abdeckungen mit Kühlschlitzen, Kühlkörper und deren Abdeckungen, sowie Röhren und deren Abdeckungen können im Betrieb erhöhte Temperaturen annehmen und sollten deshalb nicht berührt werden.
- Hohe Lautstärkepegel können dauernde Gehörschäden verursachen. Vermeiden Sie deshalb die direkte Nähe von Lautsprechern, die mit hohen Pegeln betrieben werden. Verwenden Sie einen Gehörschutz bei dauernder Einwirkung hoher Pegel.

NETZANSCHLUSS:
- Das Gerät ist für Dauerbetrieb ausgelegt.
- Die eingestellte Betriebsspannung muss mit der örtlichen Netzspannung übereinstimmen.
- Der Anschluss an das Stromnetz erfolgt mit dem mitgelieferten Netzteil oder Netzkabel.
- Netzteil: Eine beschädigte Anschlussleitung kann nicht ersetzt werden. Das Netzteil darf nicht mehr betrieben werden.
- Vermeiden Sie einen Anschluss an das Stromnetz in Verteilerdosen zusammen mit vielen anderen Stromverbrauchern.
- Die Steckdose für die Stromversorgung muss nahe am Gerät angebracht und leicht zugänglich sein.

AUFSTELLUNGSORT:
- Das Gerät sollte nur auf einer sauberen, waagerechten Arbeitsfläche stehen.
- Das Gerät darf während des Betriebs keinen Erschütterungen ausgesetzt sein.
- Feuchtigkeit und Staub sind nach Möglichkeit fernzuhalten.
- Das Gerät darf nicht in der Nähe von Wasser, Badewanne, Waschbecken, Küchenspüle, Nassraum, Swimmingpool oder feuchten Räumen betrieben werden. Keine mit Flüssigkeit gefüllten Gegenstände -Vase, Gläser, Flaschen etc. auf das Gerät stellen.
- Sorgen Sie für ausreichende Belüftung der Geräte.
- Eventuelle Ventilationsöffnungen dürfen niemals blockiert oder abgedeckt werden. Das Gerät muß mindestens 20 cm von Wänden entfernt aufgestellt werden. Das Gerät darf nur dann in ein Rack eingebaut werden, wenn für ausreichende Ventilation gesorgt ist und die Einbauanweisungen des Herstellers eingehalten werden.
- Vermeiden Sie direkte Sonneneinstrahlung sowie die unmittelbare Nähe von Heizkörpern und Heizstrahlern oder ähnlicher Geräte.
- Wenn das Gerät plötzlich von einem kalten an einen warmen Ort gebracht wird, kann sich im Geräteinnern Kondensfeuchtigkeit bilden. Dies ist insbesondere bei Röhrengeräten zu beachten. Vor dem Einschalten solange warten bis das Gerät Raumtemperatur angenommen hat.
- Zubehör: Das Gerät nicht auf einen instabilen Wagen, Ständer, Dreifuß, Untersatz oder Tisch stellen. Wenn das Gerät herunterfällt, kann es Personenschäden verursachen und selbst beschädigt werden.
  Verwenden Sie das Gerät nur mit einem vom Hersteller empfohlenen oder zusammen mit dem Gerät verkauften Wagen, Rack, Ständer, Dreifuß oder Untersatz. Bei der Aufstellung des Gerätes müssen die Anweisungen des Herstellers befolgt und muss das vom Hersteller empfohlene Aufstellzubehör verwendet werden. Eine Kombination aus Gerät und Gestell muss vorsichtigt bewegt werden. Plötzliches Anhalten, übermäßige Kraftanwendung und ungleichmäßige Böden können das Umkippen der Kombination aus Gerät und Gestell bewirken.
- Zusatzvorrichtungen: Verwenden Sie niemals Zusatzvorrichtungen, die nicht vom Hersteller empfohlen wurden, weil dadurch Unfälle verursacht werden können
- Zum Schutz des Gerätes bei Gewitter oder wenn es längere Zeit nicht beaufsichtigt oder benutzt wird, sollte der Netzstecker gezogen werden. Dies verhindert Schäden am Gerät aufgrund von Blitzschlag und Spannungsstößen im Wechselstromnetz.

Abb.1

Abb.2

Content

Index of Figures:

1 THE COHEDRA™ CONTROLLER CONCEPT

The performance of a conventional controller is confined to providing:
- crossover functions
- equalization
- time alignment
- limiting functions protecting against power amp and speaker overloading

Current digital controllers compute frequency equalization using IIR filters, which are however unable to equalize phases. At present, some line arrays use purely mechanical time alignment for high frequency drivers, but not for midrange woofers.
An example of filtering using an IIR controller or analog EQ follows:

When equalizing frequency response as shown in the example above, the 100 Hz frequency suffers a delay of 13.1 ms in comparison to the first overtone at 200 Hz! (see Figure 2). If this frequency is rendered by an 18" woofer, delay time increases again before the signal reaches the ear! This means the fundamental and its overtone are no longer in sync, causing dynamic distortion that degrades the sonic image's natural homogeneous sound.

To ensure natural response, the speaker system must be processed with phase and time alignment as well as real phase equalization.

The functions of the HK AUDIO® Digital Field Controller (DFC) go far beyond those of a standard controller:

1.1 FREQUENCY AND PHASE EQUALIZATION USING FIR FILTER TECHNOLOGY

FIR filter technology lets you equalize a sound systems' phase and frequency response of (loudspeakers and power amp!) separately. Unlike IIR filters, FIR filters do not consist of a specific number of separately computed filter elements. Instead, they contain a complete sampled copy of the function required for equalization.
The entire filter is recomputed every time a filter setting is modified.
The DFC's controller concept is geared specifically to avoid unsatisfactory group time results of conventional digital controllers using IIR filter technology such as shown in the above example.

1.2 3-WAY VIRTUAL CROSSOVER

The crossover splits the input signal into three frequency bands. The selected filter equalizes the entire sound system's frequency and phase response. This includes all components following the DFC in the signal chain such as amps, passive crossovers, and speakers.

1.3 THE DFC LIMITER IN COMBINATION WITH THE VX 2400

RMS/ Peak Limiter and Thermo Limiter
The DFC is equipped with temperature and RMS limiters for all three frequency bands. These forward-looking features anticipate the amount of power routed to the amp's outputs. In the event of impending electrical, mechanical or thermal overload, they cut output power to allowable levels for the connected speaker systems.

Overshoot Limiter
The VX 2400 power amp can produce intermittent peak output levels ranging up to 2,000 W per channel. For this reason, the overshoot limiter also takes the duration of an impending overload into account alongside its amplitude. This ensures that the DFC limiters exert little or no influence on the amplitude and duration of brief percussive impulses with high amplitude but very brief durations. This, in turn, clearly extends the sound system's useful dynamic range. Beyond that, the rendered audio signal retains its natural characteristics despite the use of limiters.

1.4 SPECIFIC SPEAKER FILTERS

The DFC features an extendible database archiving functions for equalization, phase correction, and limiting different HK AUDIO® speakers and sound reinforcement systems in combination with the VX 2400 power amp (see the chapter entitled Controllers and Controller Software).

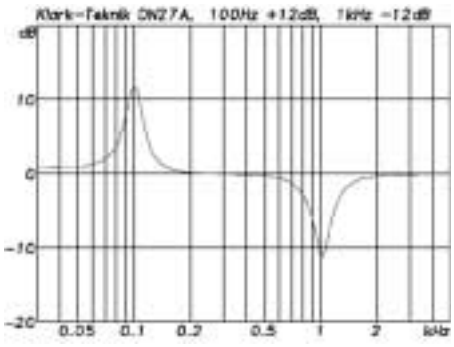


Figure 1: Equalization at 100 Hz and 1 kHz

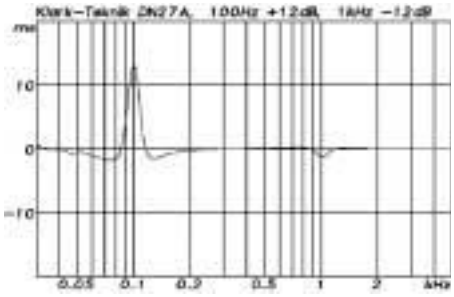


Figure 2: Resultant group time of IIR filter processing

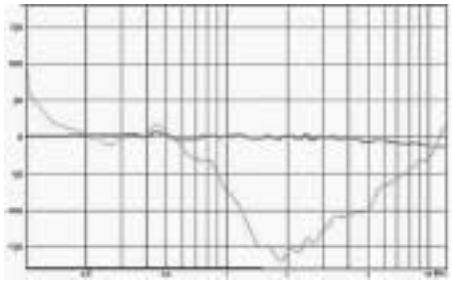


Figure 3: Phase characteristic with and without phase equalization

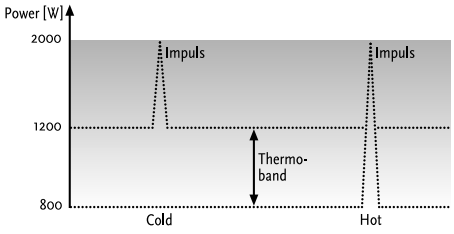


Figure 4: The Overshoot Limiter's mode of operation

Figure 1: DFC front view

1 Digital Field Controller (DFC)

Courtesy of its virtual crossover, the Digital Field Controller lets you operate COHEDRA™™ and all other biamped sound reinforcement systems of the HK AUDIO® Concert Sound Series as you would active three-way sound reinforcement systems.

This is possible because the DFC splits the input signal into three frequency bands – the low, middle and high ranges. It then equalizes, limits, and performs similar functions separately for each frequency band. After processing the incoming signal, the DFC blends the middle and high frequency bands to create a composite signal, thereby delivering the midrange/high frequency signal required to drive biamped systems.

This means that even though one power amp channel drives a mid/high unit via a passive crossover and using a single speaker cable, you can set levels and delay times separately for the cabinet's midrange woofers and high frequency drivers, as well as use virtual functions to invert phases and mute signals.

The Digital Field Controller designed for use in the Amp Rack. It implements in digital format all the functions required to control HK AUDIO® sound reinforcement systems composed of speakers and the VX 2400 amp. The DFC features FIR filters enabling comprehensive frequency and phase response correction. Used in combination with the specially developed PC control software and Remote Interface, you have a logical and amazingly convenient control system readily available. It handles intuitively, enabling you to master even the most daunting sound reinforcement challenges with ease. Its hallmark features include specially developed filter sets preprogrammed to EQ varying system and stacking configurations of HK AUDIO® Concert Sound systems in combination with VX 2400 power amps. The DFC features the following functionality:

- PA Remote Management
- System Equalization
- Phase Correction
- Peak / RMS, Temperature and Overshoot Limiter
- EQ
- Delay.

The DFC is equipped with an analog input and a digital AES/EBU input for patching in signals. The DFC's analog input is electronically balanced. Input impedance is 15 k-ohms. Input sensitivity is 0 dBV (equals 1 V RMS); the maximum permissible input level is 24 dBV. An electronic filter serves to protect the device against HF interference.

FIR filter technology
FIR filter technology lets you correct the phase and equalize the frequency response of HK AUDIO® sound systems independently. Unlike IIR filters, FIR filters do not consist of a specific number of separately computed filter elements. Instead, they contain a complete sampled copy of the function required for equalization. The entire filter is recomputed every time a filter setting is modified.

The DFC features an extendible database archiving functions for equalization, phase correction, and power handling capacity specifications of different HK AUDIO® speakers and sound reinforcement systems. You can load new filters programmed for specific cabinets and speaker configurations into the DFC's memory using HK AUDIO® Controller PC software (see chapter 2.15).

Frequency and phase equalization
The crossover splits the input signal into three frequency bands. The selected filter equalizes the entire sound system's frequency and phase response. This includes all components following the DFC in the signal chain - amps, passive crossovers, speaker chassis, and speaker housings.

Limiters
The DFC is equipped with temperature and RMS limiters for all three frequency bands. They feature forward-looking algorithms that anticipate the amount of power routed to the amp's outputs. In the event of impending electrical, mechanical or thermal overload, they cut the output to allowable levels for the connected speaker systems.

Figure 2: Rear view of the DFC

The VX 2400 power amp can produce intermittent peak output levels up to 2,000 W per channel. For this reason, the overshoot limiter also takes the duration of an impending overload into account alongside its amplitude. This ensures that the DFC limiters exert little or no influence on the amplitude and duration of brief percussive impulses with high amplitude but very short durations. This, in turn, clearly extends the sound system's useful dynamic range. Beyond that, the rendered audio signal retains its natural characteristics despite the use of limiters.

Note that the DFC's overshoot limiter only works when the VX 2400 power amp's limiter is switched off. It limits the VX 2400's output to 1200 W per channel.

1.1 CONNECTIONS

230 V / 50 - 60 Hz mains power supply. The DFC's mains plug is a three-pole non-heating equipment connector with a ground contact. Do not connect the device using anything other than a three-pole connector with a ground contact. The mains outlet must also be equipped with a ground contact. Never use damaged cables, plugs, or sockets.

Analog audio input FULLRANGE In
Connect signal sources with an analog output to this three-pin female XLR socket.
Pin assignments are:
pin 1 = ground, pin 2 = signal (+), pin 3 = signal (-).

Digital signal port DIGITAL In / DIGITAL Out
Connect signal sources with a digital AES/EBU output to this three-pin female XLR socket. The input signal can be patched through via the parallel circuit's three-pin male XLR port.
Pin assignments are:
pin 1 = ground, pins 2 and 3 = signal.

Analog audio output LF Out
This port carries the low frequency output signal in 3-way or 2-way configurations. It is a male three-pin XLR port.
Pin assignments are:
pin 1 = ground, pin 2 = signal (+), pin 3 = signal (-).

Analog audio output MF Out
This port carries the midrange signal in 3-way configurations. It is a male three-pin XLR port.
Pin assignments are:
pin 1 = ground, pin 2 = signal (+), pin 3 = signal (-).
This port is disabled when HK AUDIO® systems are biamped!

Analog audio output HF Out
This port carries the high range signal in 3-way configurations, the mid-/high range signal in 2-way configurations, and the fullrange signal in passive configurations (e.g. when using Solo filter sets for the HK AUDIO® fullrange cabinets VT 112 II F or VT 115 X). It is a male three-pin XLR port.
Pin assignments are:
pin 1 = ground, pin 2 = signal (+), pin 3 = signal (-).

Midi In / Midi Out connector for remote monitoring and control
Located on the front panel of the DFC, this port serves to transmit remote control and monitoring data via a looped circuit. Midi In is a three-pin female XLR port, Midi Out a three-pin female XLR port.
Pin assignments are:
pin 1 = ground, pin 2 = signal (+), pin 3 = power circuit.

REMOTE control connector
This port serves to control the HK AUDIO® PB 4 Patchbay and to provide power to the COHEDRA™ PB 5 Patchbay.

1.2 Display and Control Features

Limiter LEDs (red)
- Available for each frequency band (HF, MF, LF)
- LED lights up when the Peak Limiter activates in response to an overload.
- LED also lights up when the temperature limiter of the given frequency band is active even if it is not receiving an incoming signal.

Input Level LEDs (8 LEDs: green/yellow/red)
Green: Input level within a range of -24 to 0 dBV
Yellow: Input level within a range of +6 to +12 dBV
Red: Input level higher than +18 dBV

LCD display
- 2 x 16 characters
- In normal operating mode, it indicates the controller number and selected filter.
- When a menu is accessed, it shows the options and editable parameters.

Menu button
- Accesses and exits the main menu.
- Selects individual values in windows offering several variable values.

Enter button
- Accesses windows for editing main menu parameters.
- Confirms entries and edited values.

+ and - buttons
- Navigate to the next or previous option.
- Edit parameters in the editing window.

Reset button
- Reboots the DFC so that all settings are maintained.
- For further reset functions, see the section Reset Functions.

Ground switch
On: Grounds the signal to the DFC chassis.
Lift: Severs the connection between the signal and the DFC's ground. This can eliminate humming caused by ground loops.

1.3 Basic Settings

Loading stored settings
To load previously programmed and stored DFC settings, press the Menu button to go to the main menu and press the + and - buttons to select the Load Setup window (press - twice). Access the appropriate editing window by pressing the Enter button and press the + and - buttons to select a stored DFC setting from memory slots 1 to 10. Press Enter to load it to the DFC and return to the main menu.

Changing the controller number
The controller number is factory-set to Controller no 1, which is also the default after a hot reset. HK AUDIO® DFC PC Software can be used to assign numbers to DFCs automatically in the sequence in which they are looped, or the controller number can be set manually on the DFC.

To do this, press Menu to access the main menu and the + and - buttons to select the window for the option Controller No. (press + eight times). Press Enter to access the editing window and use the + and - buttons to select a controller number from 1 to 32 for this DFC. Confirm your selection and return to the main menu by pressing Enter.

Selecting the filter for connected speaker(s)
Press the Menu button to go to the main menu and the + and - buttons to select the window for the option Speaker Type (press – seven times). Press Enter to access the Speaker Change editing window and use the + and - buttons to select one of the DFC's dedicated speaker filters. Confirm your selection and return to the main menu by pressing Enter.

Selecting the audio input
Press the Menu button to go to the main menu and the + and - buttons to select the window for the option Audio Input (press – four times). Press Enter to access the editing window and use the + and - buttons to select from among the one analog and three digital options.

Selecting Analog configures the DFC to accept an analog signal. AES/EBU format is in stereo, so you have three channels to choose from for patching in digital signals. Digital Left routes the left channel of the digital signal to the DFC, Digital Right sends the right channel. When you select Digital L+R, the digital left and right channels are blended internally to create a composite signal. Confirm the selected option and return to the main menu by pressing Enter.

Selecting a Controller/Rack Mode
This function is only available in combination with the PB4, which is used exclusively for HK AUDIO® R-Series configurations.

Setting master levels
Press the Menu button to go to the main menu. Volume is the first option offered in the main menu, so the window for this option appears immediately in the DFC display. Press Enter to access the Master Volume editing window and use the + and - buttons to adjust the DFC's master level in 0.5 dB steps within a range of -40 dB to dB +6.
Confirm the adjusted level and return to the main menu by pressing Enter.

Setting low frequency levels
Press the Menu button to go to the main menu and the + and - buttons to select the window for the option LoGain (press + once). Press Enter to access the Volume Low editing window and use the + and - buttons to select the DFC's low frequency output level in 0.5 dB steps within a range of -40 dB to +6 dB. Settings lower than -40 dB mute the DFC's low frequency output signal. Confirm the adjusted level and return to the main menu by pressing Enter.

Setting midrange frequency levels
Press the Menu button to go to the main menu and the + and - buttons to select the window for the option MiGain (press + twice). Press Enter to access the Volume Mid editing window and use the + and - buttons to select the DFC's midrange frequency output level in 0.5 dB steps within a range of -40 dB to +6 dB. Settings lower than -40 dB mute the DFC's low frequency output signal. Confirm the adjusted level and return to the main menu by pressing Enter.

Setting high frequency levels
Press the Menu button to go to the main menu and the + and - buttons to select the window for the option HiGain (press + three times). Press Enter to access the Volume High editing window and use the + and - buttons to select the DFC's high frequency output level in 0.5 dB steps within a range of -40 dB to +6 dB. Settings lower than -40 dB mute the DFC's high frequency output signal. Confirm the adjusted level and return to the main menu by pressing Enter.

1.4 Setting Delay Times

Selecting the delay display mode
The DFC can indicate delay settings in milliseconds (ms) or meters (m). To select the desired delay display mode, press the Menu button to go to the main menu and the + and - buttons to go to the window for the option Delay Base (press - eight times). Press Enter to access the Delay Display editing window and use the + and - buttons to select ms (delay indicated in milliseconds) or m (delay indicated in meters). Confirm the selected mode and return to the main menu by pressing Enter.

The DFC offers both master and frequency band delays. The master delay aligns delay lines to the main sound reinforcement system. Frequency band delays align speakers within a system, for example when subwoofers are stacked on the ground and tops are flown overhead. This is called time alignment.

Note: When biamping HK AUDIO® systems, always ensure midrange and high frequency delay times are identical, otherwise the different delays in the passive high/midrange unit will cause phase problems.

Setting master delay time
Press the Menu button to go to the main menu and the + and - buttons to select the window for the option Delay (press + four times). Press Enter to access the Master Delay editing window and use the + and - buttons to select the DFC's master delay within a range of 0 ms to 1999.39 ms (equals 679.81 meters). Confirm the selected delay time and return to the main menu by pressing Enter.

Setting low frequency delay time
Press the Menu button to go to the main menu and the + and - buttons to select the window for the option LoDel (press + five times). Press Enter to access the Low Delay editing window and use the + and - buttons to select the DFC's low frequency delay time within a range of 0 ms to 92.15 ms (equals 31.33 meters). Confirm the selected delay time and return to the main menu by pressing Enter.

Setting midrange frequency delay time
Press the Menu button to go to the main menu and the + and - buttons to select the window for the option MiDel (press + six times). Press Enter to access the Mid Delay editing window and use the + and - buttons to select the DFC's midrange frequency delay time within a range of 0 ms to 92.15 ms (equals 31.33 meters). Confirm the selected delay time and return to the main menu by pressing Enter.

Setting high frequency delay time
Press the Menu button to go to the main menu and the + and - buttons to select the window for the option HiDel (press + seven times). Press Enter to access the High Delay editing window and use the + and - buttons to select the DFC's midrange frequency delay time within a range of 0 ms to 92.15 ms (equals 31.33 meters). Confirm the selected delay time and return to the main menu by pressing Enter.

1.5 Adjusting the Equalizer

The DFC features an onboard equalizer offering 28 frequency bands. It lets you adjust the sound system to suit the acoustics of the given venue.
To set the equalizer, press the Menu button to go to the main menu and use the + and - buttons to go to the window for the option Equalizer Setup (press - five times). Press the Enter button to access the first of the two equalizer editing windows. In this window, the + and - buttons serve to switch the equalizer ON and OFF) when the cursor is set to the first cursor position and to adjust the equalizer's level via Volume when the cursor is set to the second position. Use the Menu button to reposition the cursor.

Press the Enter button when the first equalizer editing window is shown in the display to access the second equalizer editing window. In this window, you can select the frequency band when the cursor is set to the first cursor position and then boost it (by up to 15 dB) or cut it (down by 15 dB) when the cursor is set to the second position. Use the Menu button to reposition the cursor. Once you have adjusted the equalizer, press Enter to return to the main menu.

1.6 Storing Settings

To store the settings you have made on the DFC, press the Menu button to go to the main menu and use the + and - buttons to go to the window for the option Store Setup (press – once). Press Enter to access the editing window and use the + and - buttons to select one of the memory slots from 1 to 10. Press Enter to store the DFC settings in the selected memory slot and return to the main menu.

1.7 Disabling Buttons on the DFC

The DFC offers a key lock option that safeguards it against tampering and accidental activation of functions. To disable these buttons, press the Menu button to go to the main menu and use the + and - buttons to go to the window for the option Lock Keys (press – three times). First press Enter to access the editing window, then use the + button to select Yes, and confirm by pressing Enter. The following message appears in the window: Are you sure? Confirm by pressing the + button twice + (Yes).
A counter appears in the editing window. Use the + and - buttons to set it to the indicated value of 23. Press Enter to activate the DFC's key lock.

Enabling buttons on the DFC
When the key lock is active and you press the Menu button, a prompt appears telling you to press Enter to deactivate the key lock. After pressing Enter, the editing window of the option Lock Keys appears. First, use the - button to select No, then confirm via the Enter button.
The following message appears in the window: Are you sure? Confirm by pressing the + button twice + (Yes). A counter appears in the editing window. Use the + and - buttons to set it to the indicated value of 23. Press Enter to deactivate the DFC's key lock mechanism.

1.8 Reset, Hot Reset and Master Reset Functions

Reset
Pressing the Reset button once reboots the DFC. The process takes about 10 seconds. All adjustments made before the reset are retained.

Hot reset
A hot reset restores the DFC's factory settings. All your settings are deleted, but the filter database is retained. To initiate a hot reset, press and hold the Menu and Enter buttons simultaneously, then press the Reset button. The DFC initiates a hot reset when you release the Reset button. The following message appears in the display: Hot Reset!!!! – Release Keys!!!!. After a hot reset (which takes about 15 seconds) the Speaker Type option's Speaker Change editing window appears in the display.
As described in section 6.3, select a filter for the speakers that you want to address. Once you have done this, the DFC is ready to operate.

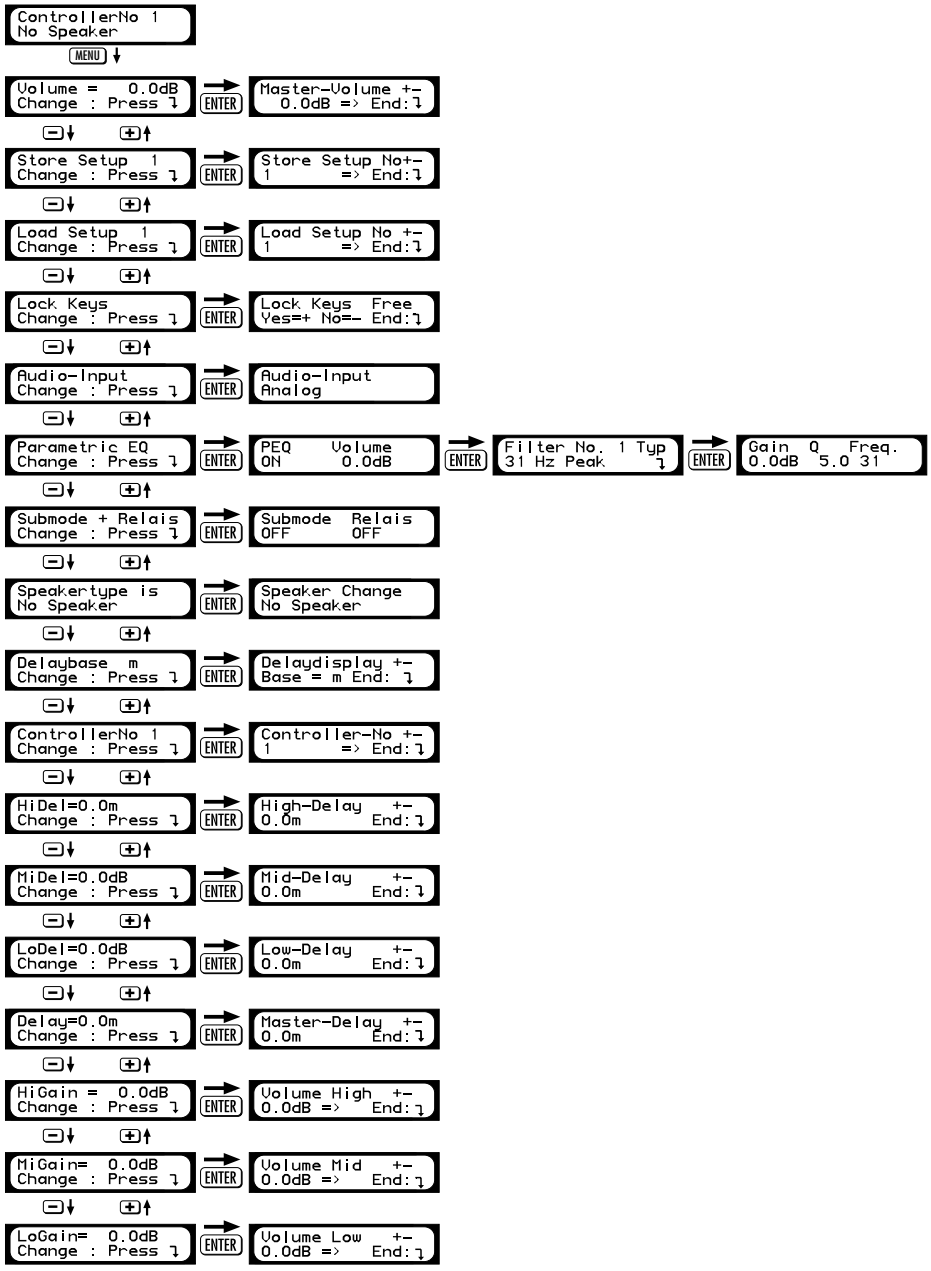
Master reset
A master reset restores the DFC's factory settings and deletes its filter database. Because new filters can only be uploaded to the DFC via a connected PC and the Audio Controller Software, the master reset option is only available when the DFC is connected to a PC via Midi loop and PC/Midi interface and the HK AUDIO® Audio Controller software has been launched.

The DFC will not operate without the speaker filters. For this reason, the master reset option is password-protected and may only be activated by HK AUDIO® service staff.

1.9 Remote Control and Remote Monitoring

The DFC's Midi port lets you control and monitor up to 32 DFCs remotely using a PC. The DFC connects to the PC via a special HK AUDIO® interface. To this end, all DFCs are connected in a loop starting at the dongle's Midi Out port (from the dongle's Midi Out to the first DFC's Midi In, from the first DFC's Midi Out to the second DFC's Midi In, and so forth until the final DFC's Midi Out is connected to the dongle's Midi In). The dongle connects to the PC via a serial interface (COM, RS 232). You can monitor the DFC's temperature and peak limiter status and view and edit all of the DFC's variable parameters using HK AUDIO® Audio Controller PC Software.
In addition, the HK AUDIO® DFC PC Software offers convenient options for handling several DFCs at the same time by grouping them, as well as for creating for even very complex sound reinforcement systems. This lets you switch configurations swiftly and easily (see also the chapter Audio Controller Software).

1.10 Overview of the DFC's Menu Functions



1.11 Technical Data

Analog Input
Input: 3-pin XLR female
Pin assign: 1 = ground, 2 = signal(+), 3 =signal(-)
Input impedance: 15 k-ohms
Input level (nominal / maximal): 0 dBV / + 24 dBV

Digital Input
Input: 3-pin XLR female
Pin assign: 1 = ground, 2 and 3 = Signal
Input impedance/sensitivity: 250 ohms / 200 mV
Data format / sampling rate: AES-EBU / 44.1 kHz

Analog output
Output: 3-pin XLR male
Pin assign: 1 = ground, 2 = signal (+), 3 = signal (-)
Output impedance: 47 ohms
Output level (maximal): + 10 dBV

Digital output
Output: 3-pin XLR male
Pin assign: 1 = ground, 2 and 3 = Signal
Output impedance: 110 ohms
Max. output level: 5 V
Data format / sampling rate: AES-EBU / 44.1 kHz

Mains
Mains voltage connector:
3-pole non-heating equipment connector
Mains voltage: 230 V to 253 V
Mains frequency: 50 – 60 Hz
Power consumption: 17 VA

Remotes / Midi
Midi In port: 3-pin XLR female
Pin assign: 1 = ground, 2 = (+), 3 = power circuit
Midi Out port: 3-pin XLR male
Pin assign: 1 = ground, 2 = (+), 3 = power circuit
Remote port: 9-pin D-Sub for connecting a PB4 or PB5

A/D–D/A Converter
THD, input voltage: -83 dB
Input analog: +21 dBV, 1 kHz
Output analog: +21 dBV
THD, frequency: -87 dB
Input analog: 0 dBV, 50 Hz to 20 kHz
Output analog: 0 dBV
Frequency response: 10 Hz to 20 kHz (± 2 dB)
Input analog: 0dBV
Output analog: 0 dBV)
Dynamic range: -128 dB (unweighted; 10 Hz to 20 kHz)
Output: analog, +10 dBV
A/D converter resolution: 24 bits
D/A converter resolution: 20 bits
Ambient temperature range: -10°C to +60°C

Weight: 3 kg (6.6 lbs)
Dimensions (B x H x T): 48.2 cm x 4.4 cm x 22.7 cm (19" x 1 7/8" x 9")

2 AUDIO CONTROLLER SOFTWARE VERSION 3.01

DFC Software Version 3.01 lets you control and monitor up to 32 HK AUDIO® Digital Field Controllers (DFCs) remotely using a PC (or notebook) and the HK AUDIO® PC interface. This makes it easy to handle even very large PAs and complex sound systems using very little equipment. And that goes for fixed as well as for mobile sound systems.

DFC Software 3.01 handles intuitively and offers many useful functions and application options, all of which are described in this manual. Please take the time to read it so that you can make the most of the possibilities afforded by the Digital Field Controller in combination with DFC Software 3.01.

System requirements
- 100 MHz Pentium processor (200 MHz recommended)
- 16 RAM MB, 32 MB recommended
- 1 MB free hard disk space for the application
- 100 MB free hard disk space for the filters and filter descriptions
- Mouse
- At least 800x 600 resolution, 16 bits color, 4 MB graphic RAM recommended
- Free serial interface (COM port) of USB interface with COM adapter
- Operating systems: Windows 95/98, NT 4.0, Win XP

2.1 INSTALLING SOFTWARE

Make sure an EPROM with an operating system version Feb 21, 2001 or higher is installed in the DFCs. The installed version appears in the display for a few seconds after you switch the DFC on. Older operating system versions do not support and implement all the functions offered by the DFC Software 3.01.
If you find that your DFCs run an older system, get in touch with HK AUDIO® directly at:
dfcupgrade@hkaudio.com
or fax +49 (0) to 6851 905215.

If you are running an older version of the DFC Software on your PC, delete it before installing DFC Software 3.01.

To install the software, insert the CD-ROM in the disk drive and copy the folder named DFC Software 3_01 to the PC. You can use the Windows Desktop or Windows Explorer to do this. Once you have copied the file, remove the CD-ROM from the disk drive and open the folder named DFC Software 3_01 on the PC.

Important note: Once you have done this, be sure to deactivate write protection for the files HK.Ini, BLK.Ini, and SUB.Ini (right-click File / Properties / disable Write-protected.) Not until write protection is deactivated will DFC Software 3.01 be ready to run!

2.2 DFC SOFTWARE FILES

DFC Software comprises the files Audio Controller 3_01, BLK.DEF, BLK.Ini, HK.Ini, and SUB.Ini, as well as the Speakers folder. It also offers the Audio Controller Demo file, which serves practice and demonstration purposes. When you open this file, all functions such as the Info window are operative without a connected Digital Field Controller.

Note: The demo version cannot be connected to DFCs or used to control them in real-time.

Audio Controller File 3_01
This is the DFC Software's application file. Double-click the icon using the left mouse button to launch the software.

BLK.DEF, BLK.Ini, HK.Ini, and SUB.Ini files
DFC Software settings are stored in these configuration files.
Before launching the DFC Software for the first time, be sure to deactivate write protection for the files HK.Ini, BLK.Ini, and SUB.Ini (right mouse click on File / Property / disable Write-protected); see section 2.1).

Speakers folder
This folder serves to store filter data (*.BLK files) and descriptions (*.HKI files) of each filter. DFC Software accesses this file when you want to download filters to the DFC, upload filters to a PC, or view the properties of a filter.

2.3 CONNECTING HARDWARE / THE PC INTERFACE

The PC interface establishes a data link between a PC and up to 32 DFCs. Its power is supplied by the included PSA 0812 power unit (12 ~, 200 mA), which plugs into the PSA 0812 POWER SUPPLY connector on the PC interface. The Power On LED lights up (red) to indicate incoming operating voltage.

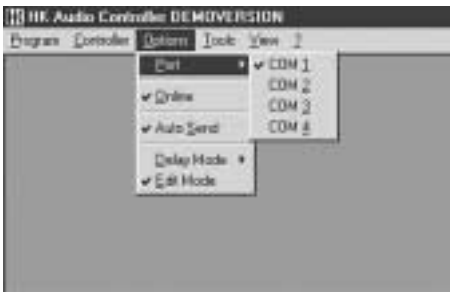


Figure 3: Selecting the serial interface

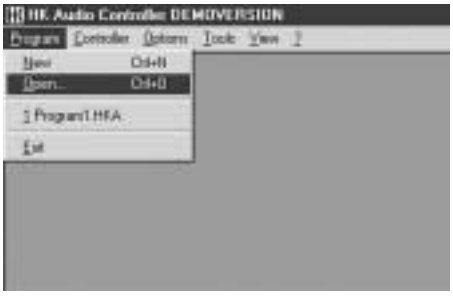


Figure 4: Loading stored programs

Figure 5: Loading and setting controller values

Connect the PC interface to the serial port of the PC (COM port) using the included serial connector cable (9-pin Sub-D male/female). If your computer lacks a COM interface, use a COM-port-to-USB-adapter. Please consult your computer to learn how to configure this connection.

DFCs are connected in a loop starting at the PC interface's Midi Out port (from the PC interface's Midi Out to the first DFC's Midi In, from the first DFC's Midi Out to the second DFC's Midi In and so forth until the final DFC's Midi Out is connected to the PC interface's Midi In). Use balanced microphone cables (XLR male / XLR female) to connect the components. The distance between the PC interface and the first DFC may range up to 300 meters. Every DFC amplifies the data signal before routing it out. The DFCs must be looped because they not only receive data, but also send acknowledging messages and data back to the PC.

Important note: The Midi In and Midi Out ports of the DFCs and the DFC interfaces do not comply with the MIDI standard and are incompatible with other devices!

2.4 Launching DFC Software

Launch the DFC Software by double-clicking the Audio Controller 3_01 icon using the left mouse button. If the PC and PC interface are connected properly, a window will pop up; it reads Please wait...Updating current configuration. Once this is done, the software is ready to run.
The user interface consists of the Menu bar containing the individual menus, the Status bar, the Peak Limiter window, and the Editing Panel.

Note: If there is a problem with the Midi loop or the loop has not been closed, a window pops up indicating the following message: Midi-Loop open!
No data transfer possible. Change to offline mode?
If you opt to switch to offline mode, the display reads: Warning! While working in offline mode the display shows wrong controller values. The reason for this is that the PC and DFCs are not connected. Check the Midi loop and re-launch the DFC Software.

If there is a problem with the serial link between the PC and PC interface or the wrong COM port has been entered to the DFC Software, the following window pops up: No dongle connected to the serial port. Only Edit Mode will be possible. If the cable is defective, replace it.

Selecting the serial interface
See figure 3. The option Port in the Options menu lets you define the correct PC serial interface for the PC interface (for example, COM 1). Once you have selected the correct interface, DFC Software ready to run. To load the current looped DFC configuration to the software, first activate the option Online in the Options menu (see section 2.5) by clicking it using the left mouse button, and then select the option Update current configuration in the Controller menu (see section 2.5).

Loading stored programs
See figure 4. To load DFC programs created and stored in previous sessions, select the option Open in the Program menu. A window pops up with a prompt asking you for the program name and possibly the program file. Select the desired program and click the Open button. The program is loaded to the DFC Software.

Note: Programs generated in an earlier DFC Software version (Version 2.1 or lower) cannot be loaded to DFC Software 3.01.

Creating new programs
See figure 5. To create new DFC programs, select the option New in the Program menu. A window pops up suggesting that you load the settings on the currently connected DFCs as the basis for the new program (Load Controller Values).

In this window, you also have the option of starting the new program with preset defaults (zero values) that are loaded to the DFCs when the DFC Software is launched (Set Default Values). The actual user panel appears once you have selected an option and confirmed it with OK.

2.5 MENU BAR

See figure 6. The Menu is located in the upper area of the screen and includes the Program, Controller, Group, Options, Tools, View, and Window menus, as well as the Info menu providing access to the DFC Software's individual functions.

Program menu
- The option New initiates a new DFC program.
- The Load option loads a stored program. When this option is selected, a window pops up with a prompt asking you for the program name and possibly the program folder.
- The option Save saves (to a clipboard) the program that you are currently working with. If you have not assigned a name to it, a window pops up prompting you to name the program.
- The option Save As saves an edited program. A window pops up prompting you to name the program.
- The option Delete closes the current program in the DFC Software. When this option is selected, a window pops up with a prompt asking you if you want to save the program before exiting it.
- The option Copy copies the current program into a clipboard.
- The option Insert inserts a program contained in the clipboard into a Program window.
- The option Exit closes the DFC Software. When this option is selected, a window pops up with a prompt asking you if you really want to quit the DFC Software. If programs have not been saved, a window pops up asking you if you want to save them.

Controller menu
See figure 7.
- The option Update current configuration loads the current DFC loop configuration into the DFC. This tells the application which DFC network you want to control and monitor. This function is executed automatically when the DFC Software is activated, if the PC and DFCs are connected properly and the correct serial interface has been selected.
- The option Load Controller Values to PC loads the DFC's current settings for level, delay, frequency response, and so forth into the DFC Software. When this option is selected, the following message appears: Warning! Loading controller values will overwrite program. Associations of controllers and groups will be lost. This function can be executed automatically when creating a new program using the option New in the Program menu, if the Online option in the Options menu is activated.

Group menu
See figure 8.
- The option Add creates a new DFC group that you can assign individual DFCs to.
- The option Delete deletes the selected group. An additional warning message does not appear when this option is selected.
- When activated, the option Lock precludes DFC group assignments from being changed. New groups may be added but DFCs cannot be assigned to these groups. Groups may also be deleted even if DFCs are assigned to them.

Options menu
See figure 9.
- The Online option switches back and forth between online and offline mode. When online mode is selected, a checkmark appears next to the option. In offline mode, the PC and DFCs are not connected, meaning that any adjustments you make do not affect the connected DFCs and the DFC status cannot be monitored. For this reason, the following message appears when offline mode is activated: Warning! While working in offline mode the display shows wrong controller values.
- When selected (a checkmark appears next to the option), the option Auto Send sends modifications immediately to the connected DFCs. If Auto Send is deactivated, you must first click the OK button in the given window every time you want to send new settings. This option can serve as an additional safeguard against accidental editing.
- The option Delay Mode accesses a submenu that lets you determine if delays are indicated in meters, milliseconds, or feet.
- The option Edit Mode activates its namesake. In edit mode, all 32 controller views are always displayed in the user interface's Editing Panel. This is where you can configure DFCs and create groups. You can also adjust DFC parameters such as level, delay and equalizer settings in edit mode. With the exception of selecting a filter for speakers, this lets you create programs without having DFCs connected.

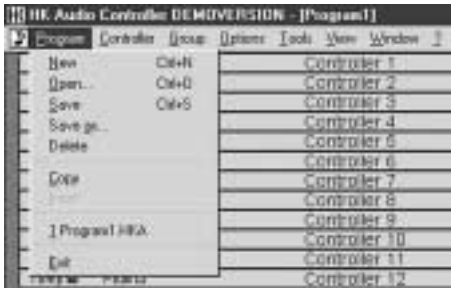


Figure 6: Program menu

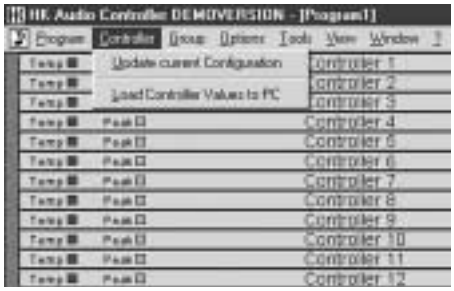


Figure 7: Controller menu

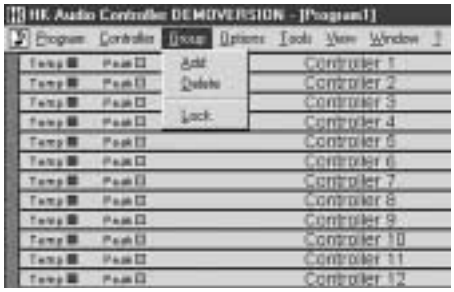


Figure 8: Group menu

Figure 9: Options menu

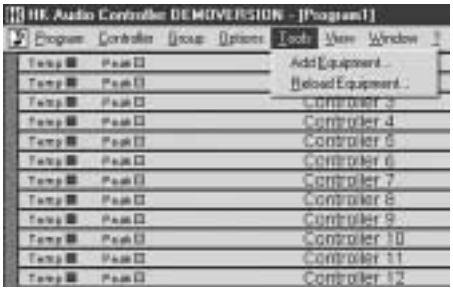


Figure 10: Tools menu

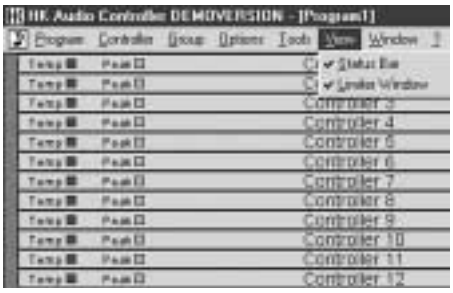


Figure 11: View menu

Figure 12: Window menu

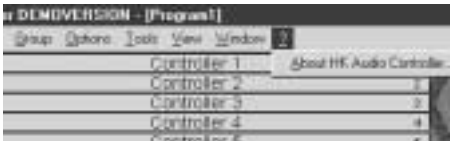


Figure 13: Help menu (?)

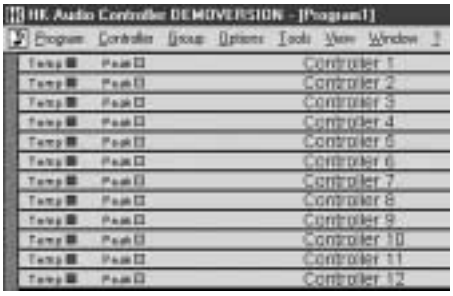


Figure 14: DFC Controller Software Editing Panel

Tools menu
See figure 10.
- The option Add Equipment loads new speaker filters to the connected DFCs (see section 2.15).
- The option Reload Equipment loads and stores speaker filters from the connected DFCs to the PC.

View menu
See figure 11.
Select the option Status Bar (a checkmark appears next to the option) if you want the Status bar to be displayed.
Select the option Limiter Window (a checkmark appears next to the option) if you want the Peak Limiter window to be displayed. Once activated, it remains on-screen even if you go to another program on the PC / laptop.

Window menu
See figure 12.
- The option Cascade cascades (arranges front to back in staggered formation) all program windows appearing on the screen.
- The option Tile arranges all program windows appearing on the screen side by side or stacks them one on top of the other.
- The option Arrange Icons displays all program windows appearing on the screen in the form of little symbols called icons. The program windows must first be reduced to the size of an icon by clicking the Minimize button.

The Window menu also lists the names of all currently opened programs. Access the desired program by clicking its name.

Info menu (?)
See figure 13.
The option About HK AUDIO® Controller displays information on the software, version and copyright.

Status bar
The Status bar is located at the lower edge of the screen. It principally indicates the progress of activated functions. When the program is not executing a function, the display reads Ready. If you activate one of the menus in the Menu bar by clicking it using the left mouse button and point the cursor to individual options, the Status bar shows a description of the given option's function (Help).

Controller Number and Limiter displays
See figure 14. The Editing Panel shows a graphical view of the individual controllers. In edit mode, the Editing Panel always displays all 32 potential Controller views. If you are not working in edit mode (and the connection between the PC and the DFCs is up and running), it shows only the controllers connected to the PC.

DFC Controller Software Editing Panel
See Figure 14.
Temperature and Peak Limiter indicators appear on the left side of the controller views. These are subdivided into the DFC's three output frequency bands (Bass, Mid, High). The upper area of each limiter box indicates the high frequency band, the center area the middle frequency band, and the bottom area the low frequency band. When deactivated, the Temperature Limiter indicator appears in blue and the Peak Limiter display in green for all frequency bands. When activated, the given frequency band indicator's color changes to red.

The respective controller number (1 to 32) appears on the right side of the Controller views. The name of the DFC assigned the given controller number appears roughly at the center. The factory default is Controller 1 to max. Controller 32. However, you may enter other names as you see fit; for reasons of clarity, you will find that this makes sense in practice (see section 2.6. Changing the Controller Name).

Peak Limiter window
See figure 15. The Peak Limiter window always shows the peak limiters for all 32 possible DFCs. When selected (a checkmark appears next to the option Limiter Window in the View menu), it remains visible in the foreground of the screen. This lets you continuously monitor the status of the DFCs' peak limiters even when working with other programs.

Like the Controller views, the Limiter view is divided into boxes for the low frequency band, middle frequency band, and high frequency band. In normal operating mode, the color of the Peak Limiter indicator is green. When DFC's peak limiter activates, the indicator for the given frequency band turns red.

The Peak Limiter window can only be activated (View menu > Limiter window) when the DFC Software is in online mode (a checkmark appears next to the Online option in the Options menu).

Figure 15: Peak Limiter window

2.6 ADJUSTING CONTROLLER PARAMETERS

See figure 16. Double-clicking a Controller view opens a window (Adjustment for Controller) that lets you set and edit controller parameters.

Changing the controller name
The controller name is factory set to Controller 1 to max. Controller 32. For reasons of clarity - particularly when working with complex sound reinforcement systems and several DFCs - we recommend that you assign meaningful names to the connected controllers (for example, something along the lines of Longthrow left, Delay right, Sublow, etc.).

Click Name to delete the given controller name and enter a new controller name.

Selecting the filter for connected speaker(s)
Click Speaker using the left mouse button to open a selection box listing all speaker filters offered for the selected DFC. Click the desired filter using the left mouse button to select it.

Viewing filter properties
Click the Info button in the Speaker panel to open a window showing the properties of the selected filter and associated speakers.
These properties include:
- filter name
- filter latency
- required speakers and power amps
- list of speakers with picture and details
- frequency response of the speakers when driven by the DFC

Click the Close button located at the upper right edge of the Info window to close it.

Note in the event that you trouble viewing properties:
In order to view a given filter's properties, this filter's Info file (*.HKI) must be stored in the DFC Software's Speaker folder. If the DFC Software is unable to locate this file, a window pops up indicating the following message: Speaker connection info for ... not available!

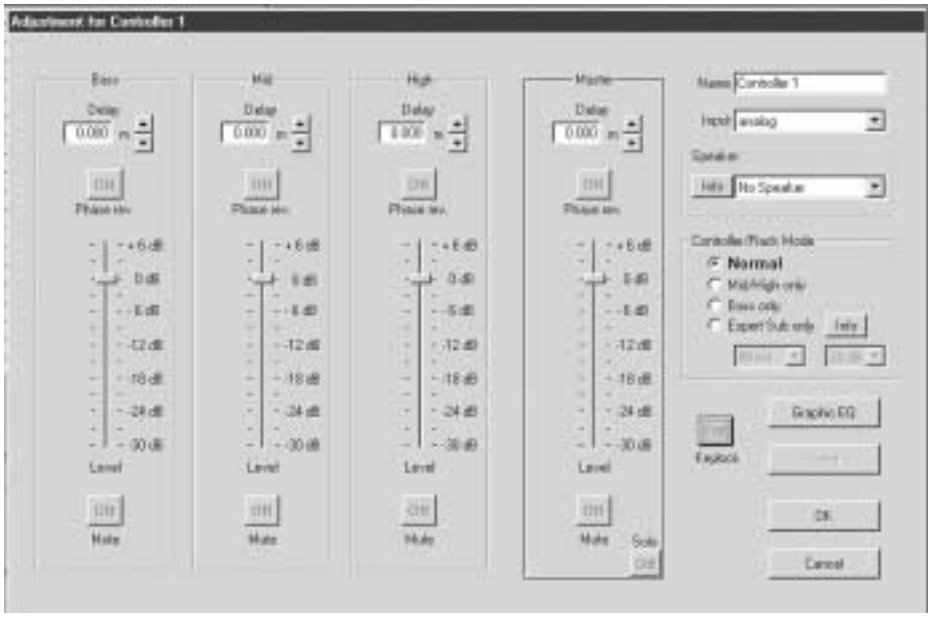


Figure 16a: Adjustment for Controller window

2.7 SELECTING THE AUDIO INPUT

The DFC accepts both analog and digital audio signals (sampling rate = 44.1 kHz), so you must select the desired input and/or channel for incoming audio signals. Click Input to open a box listing one analog and three digital options.

Select Analog to configure the given DFC to accept an analog audio signal. The digital circuit is stereo, so you have three channels that accept digital audio signals to choose from. Digital Left routes the left channel of the digital signal to the given DFC, Digital Right sends the right channel. When you select Digital L+R, the digital left and right channels are blended internally to create a composite signal.

Click the desired option using the left mouse button to select it.

2.8 SELECTING A CONTROLLER/RACK MODE

Controller/Rack Display Mode offers four options for operating the DFC in combination with the HK AUDIO® PB 4 Patchbay. Click the desired mode to select it.

Note: This function is only available when using the PB4 in combination with HK AUDIO® R-Series!

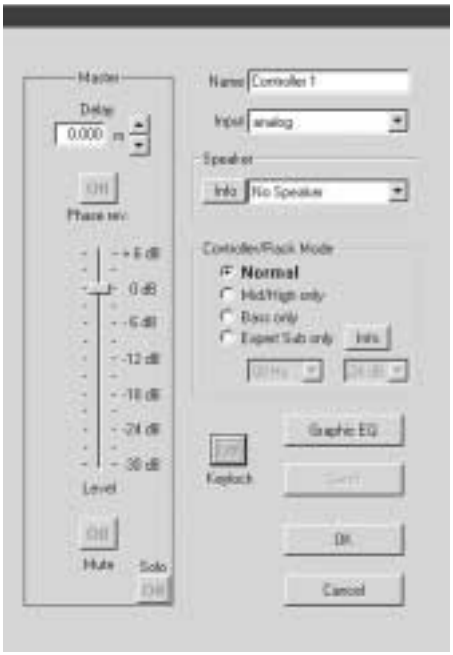


Figure 16 b: Master channel

Abbildung 16 c): Bass, Mid and High channel

2.9 Activating the Key Lock on the DFC

The key lock safeguards the DFC against tampering and accidental activation of functions. Activate it by clicking the Keylock button. The lettering of the Keylock On button turns red to indicate the key locking mechanism is activated. Deactivate the key lock by clicking the Keylock button again. The Keylock button reads Off and turns grey.

2.10 Adjusting Master Channel Strip Settings

The master channel strip (appropriately labeled Master) lets you adjust settings such as level, delay, and so forth for the entire DFC. These settings apply to all frequency bands of outgoing signals. (see Figure 16 a).

Master channel level
The virtual Level fader in the master channel strip determines the level of the entire DFC. To adjust the level, click the virtual fader's knob using the left mouse button, hold the button down, and drag the mouse up or down. Once you have dragged the virtual fader to the desired position, release the left mouse button.

Master channel delay
Click the Delay display in the master channel strip to set the delay for the entire DFC. Once you have clicked the display, you can delete the given delay setting and type in a new setting. The two buttons located next to the Delay display give you another option for setting delay time. Click one of them to step through delay times in predefined increments. Depending on the selected delay mode (as defined by the Delay Mode option in the Options menu), delay settings are indicated in milliseconds, meters or feet. The delay display appears in red to indicate delay settings other than zero.

Reversing the master channel's phase
Click the Phase rev. button in the master channel strip to reverse the phase of the entire DFC. When phase reversal is activated, the lettering on the Phase rev. button changes from Off to On and its color from grey to red. To deactivate phase reversal, click the Phase rev. button again.

Mute and solo
Click the Mute button in the master channel strip to mute the entire DFC. When mute is activated, the lettering on the Mute button changes from Off to On and its color from grey to red. To deactivate mute, click the Mute button again.

Click the Solo button in the master channel strip to mute all connected DFCs with the exception of the given DFC (Solo-In-Place function). When solo is activated, the lettering on the Solo button changes from Off to On and its color from grey to red.
To deactivate solo, click the Solo button again.

Note: If you attempt to close the Adjustment for Controller window while solo is activated, the following message appears: Attention!!! Solo still activated. You will not be able to close the window.

2.11 Adjusting the Bass, Mid and High Channels

See figure 16 b. The three channel strips Bass, Mid and High let you determine level, delay and other settings for the given frequency bands before routing signals from the DFC to connected speakers.
This lets you handle biamped systems as (virtual) active three-way systems.

Adjusting levels
The virtual fader Level in the Bass, Mid and High channel strips determines the level of each frequency band for the given DFC.
To adjust the level, click the virtual fader's knob using the left mouse button, hold the button down, and drag the mouse up or down. Once you have dragged the virtual fader to the desired position, release the left mouse button.

Adjusting delay time
You can set a delay time of up to 100 ms for each frequency band (Bass, Mid and High channel strips) of the given DFC via the Delay display in the respective channel strip. This serves to align clusters and compensate for discrepancies in response time caused by the given stacked configuration, for example, to align subwoofers stacked on the ground with tops flown overhead.

Important note: Ensure midrange and high frequency delay times are identical; otherwise you will encounter alignment problems within a single speaker cabinet. Once you have clicked the display, you can delete the given delay settings and type in new values.

The two buttons located next to the Delay display give you another option for setting delay time. Click one of them to step through delay times in predefined increments.

Depending on the selected delay mode (as defined by the Delay Mode option in the Options menu), delay settings are indicated in milliseconds, meters or feet. The delay display appears in red to indicate delay settings other than zero.

Reversing phase
Click the Phase rev. button in the Bass, Mid and High channel strips to reverse the phase of the entire DFC. When phase reversal is activated, the lettering on the Phase rev. button changes from Off to On and its color from grey to red. To deactivate phase reversal, click the Phase rev. button again.

Mute
Click the Mute button Bass, Mid and High channel strips to mute the respective frequency on the selected DFC. When mute is activated, the lettering on the Mute button changes from Off to On and its color from grey to red. To deactivate mute, click the Mute button again.

2.12 Graphic EQ

See figure 17. Click the Graphic EQ button in the Adjustment for Controller window to open another window offering a graphical view of a 28-band equalizer. Use it to adjust the frequency response of the speakers addressed by the DFC to suit the given venue's acoustics.

Adjusting frequencies
Use the graphic EQ's virtual faders to adjust the given DFC's frequency response. The control range for each frequency band is -18 dB to dB +12.
To adjust the graphic EQ, click the knob of the desired frequency band's virtual fader, hold the button down, and drag the mouse up or down. When you click the fader, its color changes to blue and the color of its knob to red. Once you have dragged the virtual fader to the desired position, release the mouse button.

You can also adjust frequency response settings using the computer keyboard's cursor keys as well as the Pos 1 and End key. The Q and P cursor keys serve to select a fader, the R and S cursor keys to move it. Pressing the Pos 1 key selects the fader for the frequency band at around 31.5 Hz and pressing the End key selects the fader for the 16-kHz frequency band.

Adjusting gain settings
Click one of the two buttons in the Gain display to adjust the graphic EQ for the given DFC.
This is done in 0.5 dB steps within a range of -12 dB to dB +12.

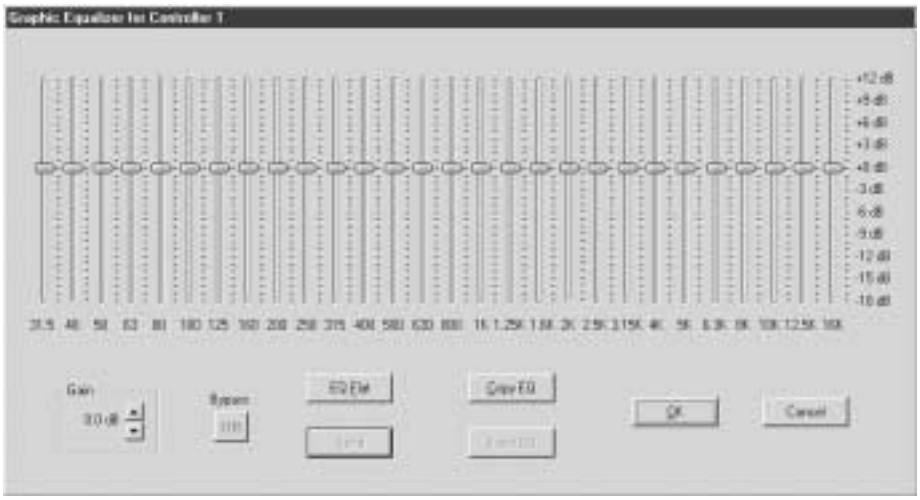


Figure 17: The 28-band Graphic EQ's control panel

Bypass and EQ Flat
Click the Bypass button to remove the graphic EQ from the signal path (for example, to make A/B comparisons of a processed / unprocessed audio signal). When activated, the lettering of the Bypass button changes from Off to On and its color from grey to red.

The EQ Flat button resets all of the graphic EQ's virtual faders as well as the gain settings to a value of 0 dB. When you click EQ Flat, a window appears asking you if you really want to reset the graphic EQ.

Copy EQ and Insert EQ
Copy EQ and Insert EQ make it very easy to load one graphic EQ setup to another graphic EQ.
To do this, click the Copy button of the graphic EQ whose settings you want to transfer. Then activate the graphic EQ to which want to copy the settings. This can be the EQ of another or DFC group.
The copied setup is loaded to this graphic EQ when you click the Insert button.

Copy EQ and Insert EQ comprise the graphic EQ frequency and gain settings.

Send in the Graphic EQ window
Click the Send button to send the graphic EQ settings to the given DFC and activate them there. This is not necessary if the option Auto Send in the Options menu has been activated, because then all edited settings are immediately sent to the DFCs. The Send button is shaded grey when the option Auto Send is activated because there is no need to click it.

Exit the graphic EQ via the OK (your settings are retained) or Cancel button (your settings are deleted).

Send in the Adjustment for Controller window
Click the Send button to send the settings adjusted in the Adjustment for Controller window to the given DFC and activate them there. This is not necessary if the option Auto Send in the Options menu has been activated, because then all edited settings are immediately sent to the DFCs.
The Send button is shaded grey when the option Auto Send is activated because there is no need to click it.

Exit the Adjustment for Controller window via the OK button (your settings are retained) or the Cancel button (your settings are deleted).

2.13 Forming Groups

The option of forming groups is very convenient, making it much easier to work with DFCs and the DFC Software, particularly when facing challenging sound reinforcement applications and using complex systems. To this end, individual DFCs are assigned to one group or several groups. All adjustments made to a given group affect all DFCs assigned to that group.

Assigning DFCs to specific groups
DFCs are usually assigned to a group when the group is initially created. To do this, select the option Add in the Group menu. The newly defined group appears in the Editing Panel at the right of the user interface's right. The group name is initially set to the factory default Group 1 to max. Group 32.

You must select a group before you can assign DFCs to it. Do this by clicking the Group button using the left mouse button. When selected, the color of the Group button changes to red. Then click the DFCs that you want to assign to the selected group using the right mouse button. The color of the selected DFCs changes to green. To revoke a DFC's group assignment, click it again using the right mouse button. Its color changes back to grey. When a group is selected (via a single click using the left mouse button), the color of the Group button changes to red and the color of the given DFCs to green. If a DFC assigned to a group is selected (via a single click using the left mouse button), its color changes to red and the color of its group to green.

Setting group parameters
Double-clicking a Group button opens a window (Group Settings window) that lets you set and edit group parameters.

Changing group names
The group name is initially factory-set to Group 1 to max. Group 32. For reasons of clarity, we recommend that you assign meaningful names to groups (for example, something along the lines of Longthrow all, Delay, Sublow, etc.).

Click Name to delete the given group name and enter a new group name. When two or several DFC are combined into a group, you can make the same adjustment for all DFCs within the group that you can for an individual controller, only that these settings apply to all controllers in the group (see section 2.10).

Specifically, these are:
- Master channel strip setting
- Master channel level
- Master channel delay
- Master channel phase reversal
- Mute and solo functions
- Bass, Mid and High channel settings
- Group level settings
- Group delay settings
- Group phase reversal
- Group mute
- Group Graphic EQ
- Group frequency adjustments
- Group gain settings
- EQ copy and EQ insert functions
- Send function

2.14 Working with Several Programs

The DFC Software lets you open several programs with different DFC settings in dedicated Program windows. You have several options for viewing these simultaneously on the user panel.

You can click the desired Program window to activate it and send its settings to the connected DFCs. This is a simple, swift, and convenient option for switching back and forth among the different configurations of even very complex sound reinforcement systems.

Creating several programs
You can create new programs, copy and edit stored programs, or simply open a stored program. To begin creating a new program, select the option New in the Program menu (see 2.5). Stored programs are loaded using the option Load in the Program menu as described in section 5.2.

The options Copy and Insert in the Program menu load one program's setup to another. To do this, select the option Copy in the program whose settings you want to copy. Then go to the program to which you want to copy the settings by clicking its window, or create a new program via the option New in the Program menu. In this program, select the Insert option in the Program menu. It loads the copied settings into the selected program.

Arranging Program windows
Once you have created, edited, or opened several programs in different windows, you can arrange these windows in a variety of ways on the user panel. To do this, use the options Cascade, Tile, and Arrange Icons in the Window menu

The option Cascade cascades (arranges front to back in staggered formation) the program windows.
The option Tile arranges programs side by side or stacks them one on top of the other in windows of the same size. The option Arrange Icons arranges all program windows in the desired order once they have been minimized to the size of icons.

Activating programs
Activate an open program by clicking its Program window. As soon as a program is activated, its settings are transmitted to the connected DFCs.

The Window menu offers another option for activating a program. In the bottom half of this window, you will find listed the names of all open programs. Activate the desired program by clicking its listed program name.

2.15 Loading New Filters into DFCs

At HK AUDIO®, we constantly strive to develop speaker filters for numerous application scenarios and configurations of HK AUDIO® speakers and power amps. You can get these on CD-ROM or download them from out website www.hkaudio.com. The DFC Software lets you load these new filters to the DFCs that you have at your disposal. Once loaded to a DFC, filters can also be activated directly at the DFC without using the DFC Software.

Vice versa, it is also possible to copy filters to a PC from the DFCs. This is a handy option when you want to load filters from one DFC to other DFCs.

Important note: In order to load filters to DFCs, they must be accessible in the DFC Software's Speakers folder. If, for example, you received them on CD-ROM, you must first copy them to this file. To load new filter sets to DFCs, select the option Add Equipment in the Tools menu. This opens a new window called Add Equipment.

Selecting filters for loading
See figure 18. In the Add Equipment window, you must first select in the Speakers folder the filters that you want to load to the DFC(s). The buttons used to do this are called Append, Insert, Remove, and Remove all. The Selection list shows the filter sets selected for uploading to the DFC.

Important note: All filters designated in the Selection list are loaded to the DFC even if these are already stored in the DFC. The newly loaded filters of the same name do not overwrite the filters stored in the DFC; instead, these names are listed twice!

Click the Append button to open a window listing all filters offered in the Speakers folder. Select one or several filters and confirm via the Open button. This appends the Selection list, adding the selected filters at its end.
You can also use the Insert button to do this. It inserts filters from the Speakers folder to a selected position in the Selection list. This comes in handy when you want to do things like insert a R-2x2 Stack mid2 filter between R-2x2 Stack mid1 and R-2x2 Stack mid3 filters listed in the Selection.

The Remove button deletes filters currently designated for loading in the Selection list. Click Remove all to delete all filters designated for loading in the Selection list.

Figure 18: The Add Equipment window

Figure 19: The Reload Equipment window

Important note: The BLK.DEF file contains all filter sets in the sequence recommended by HK AUDIO® and available at the time of the DFC Software 3.01 release. If you want to reload all of these filters to a DFC after a master reset, you have another option - alongside using the Append and Insert buttons - for creating a filter Selection list:

1. Open the file named BLK.DEF in an editor (for example, Windows Editor)
2. Store the opened BLK.DEF file under the name BLK.InI. This new file overwrites the existing BLK.InI file.

The Selection list now offers the filters contained in the BLK.DEF file.

Downloading filters to DFCs
Use the Selected Controller, Single Controller, or All Controllers buttons in the Add Equipment window to load filters designated for loading in the Selection list to the DFC(s).
The Selected Controller button sends the filters in the Selection list that is currently activated in the user interface's Editing Panel (marked red) to the DFC. The controller number of this DFC appears in the display at the right of the Selected Controller button.

The Single Controller button also sends the filters in the Selection list to an individual DFC. Select the desired DFC by entering its controller number to the display at the right of the Single Controller button.

The All Controllers button sends the filters in the Selection list to all connected DFCs.

Once filters have been transferred, close the Add Equipment window by clicking the Close button. The Selection list is retained.

Note: The BLK.InI file's write protection must be deactivated for the Selection list to be retained. Otherwise, an error message appears because the Selection list cannot be stored.

Uploading filters to a PC
To copy a filter from a DFC into the DFC Software's Speakers folder, first select the DFC from which you want to upload the filter to the PC.
Once you have selected the DFC (it is marked red), go to the Tools menu and select the option Reload Equipment, which opens the Reload Equipment window.

See figure 19. The Reload Equipment window offers a box called Speaker Type; select the filter that you want to upload to the PC from the filters contained in the DFC. Click the Reload Filter button to copy the filter to the PC. Once it has been uploaded, you can select and send another filter or quit the Reload Equipment window via the OK button.

Note: Though the Reload Equipment function sends files containing filter data (*.BLK), it does not send files containing filter descriptions (*.HKI). If the Speakers folder does not contain the file describing a given filter (*.HKI), you will not be able to view its properties.

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