DHD

Digital Broadcast Mixing Console

RM2200D

— Manual —

Users Manual and Configuration Reference

Latest Revision: November 9th, 2005

Contents

I. User Manual and Configuration Reference

About this Book

This document contains all information you need to set up and operate the RM2200D Broadcast Mixing Console. Read this document, if you:

- are installing and setting up a RM2200D system.
- need to configure a RM2200D for daily operation.
- are a user of the RM2200D.

You can find more information - including technical notes and updates to this manual - on the website of DHD at

www.dhd-audio.de.

1. Overview

1.1 Key Features

The RM2200D is a flexible and compact digital broadcast mixing system for small and mid-range applications. It is designed from the ground up to be a reliable tool for daily use in On Air studios, OB vans and pre production suites.

A RM2200D mixer consists of two main parts, which are coupled via an industry standard CAN-bus connection (see figure below). These parts are:

- *The DSP Frame.* This 3U rack unit includes all input and output modules, the DSP Audio Engine, the Control Engine and the power supply.
- *The Mixing Desk.* This is the user interface of the mixer with all faders, control knobs, push buttons and displays.

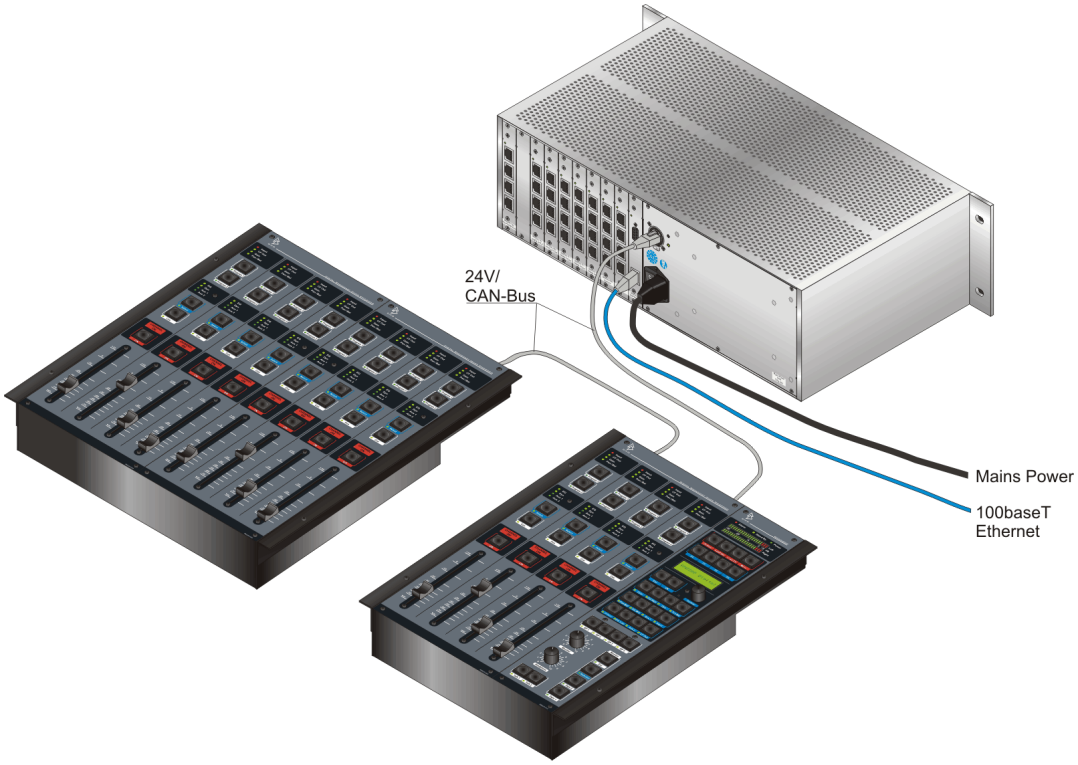


Figure I–1: Typical application of a RM2200D: DSP frame linked to a splitted mixing desk.

You can order the components of the RM2200D depending on your particular application. When fully configured, the system consists of:

- One Master Control module in the mixing desk.
- At least one and up to four fader modules in the mixing desk, each containing four faders. This gives you a maximum of 16 physical faders.
- One DSP frame which can contain up to 64 inputs and 64 outputs, both analog and digital.
- Two stereo main busses, two stereo Aux busses and four stereo clean feeds.
- Input processing for eight fader channels. For each channel, this includes three-band equaliser, compressor/expander and variable low- and high pass filters.

- GPIO and talkback facilities depending on the modules selected.

Tip: You can place the modules of the mixing desk both next to each other or apart, as long as the specifications for the CAN bus cabling are met. Depending on the application, this gives you many options to fit the RM2200D mechanically in your equipment setup.

The RM2200D uses a special real-time operation system running on dedicated micro controllers. There is no PC-based system inside the RM2200D and it works completely without any PC.

However, to set up and configure the system, you need to connect the RM2200D via Ethernet to a PC running the `RM2200D Software`. You can also use a serial connection in case no Ethernet is available. You use the software to setup the system for your particular application. This is called **Configuration Mode**.

Additionally, during daily operation the software can provide extended display functions for the mixer. This mode is called **Display Mode** and is always active when running the software.

1.2 Principle of Operation

Introduction

The RM2200D consists of two main parts: the *DSP Frame* and the *Mixing Desk*. Both are coupled with a CAN bus cable. The DSP frame is a 3U rack unit, it contains the power supply and all the hardware necessary for the actual audio processing. In contrast, the mixing desk only acts as "remote control" for the DSP frame - there is no audio transmitted on the CAN bus, only control and status information.

Additionally, you can connect a PC to the DSP frame using either a serial connection or the TCP/IP protocol over Ethernet. This PC runs the RM2200D software, a standard Windows application. You use this software both to configure the RM2200D and to display its state during normal operation. (See also "Operating the RM2200D" on page 13.)

The following picture shows the general structure of a RM2200D system. The DSP frame contains both the Audio and the Control Engine, all Control Modules are contained in the mixing desk.

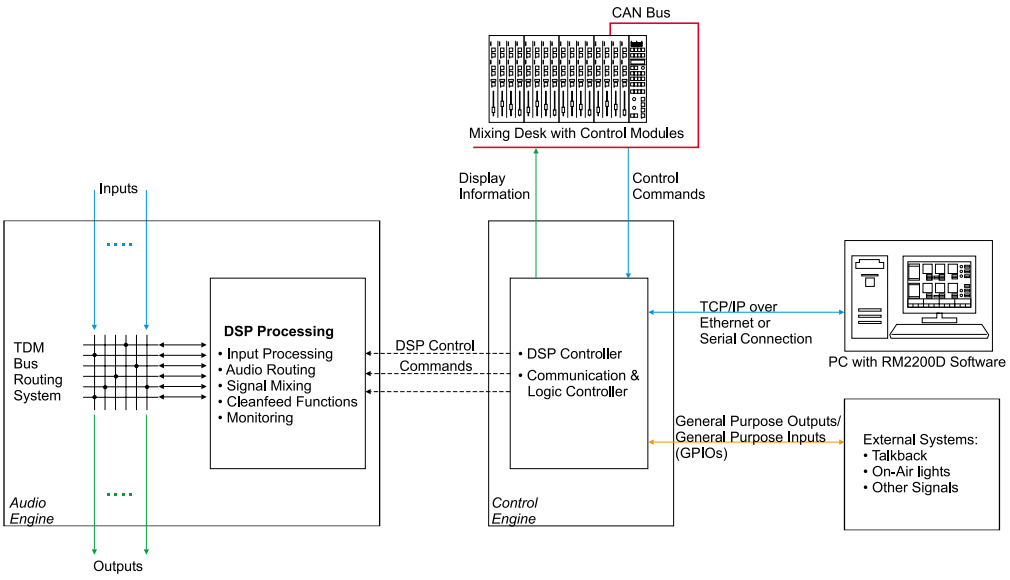


Figure I–2: General structure of the RM2200D.

Audio Engine

The Audio Engine of the RM2200D runs on a high-performance DSP system (SHARC from Analog Devices). This DSP is connected to all audio inputs and outputs of the RM2200D. All audio processing is done here; the hardware provides enough performance to handle all audio signals simultaneously.

The Audio Engine receives its commands from the Control Engine, whenever a fader is moved or a key is pressed on the mixing desk. Depending on the actual configuration, the Audio Engine changes the way it processes the audio signals.

Control Engine

The Control Engine handles all communication between the control modules in the mixing desk, the Audio Engine and external devices. Most of the time it reacts to events coming from the mixing desk. For example, if you move a fader on the mixing desk, this event is transmitted on the CAN bus into the Control Engine. In turn, the Control Engine changes the level of the audio signal which is currently assigned to the fader just moved. The other way round, the Control Engine sends level information to the level meters in the mixing desk and controls the different LEDs and the LC display in the Master Control Module of the mixing desk.

If you run the RM2200D software on a PC connected to the DSP frame, the Control Engine also communicates to this software. Is transmits the level and status information to the PC and reacts to configuration changes made in the software.

External Connections using GPIOs

The Control Engine communicates to external systems using **General Purpose Inputs (GPI)** and **General Purpose Outputs (GPO)**. GPIs and GPOs are used to interface external devices to the RM2200D. They are electrical contacts which are available on the RJ 45 sockets on certain modules. However, the technical specifications both for inputs and outputs differ from module to module. (See “Technical Specifications” on page 87.)

Caution: Before connecting any external devices to the GPIOs of the RM2200D, make sure you have read and understood the technical specifications of the GPIO connectors! Do not connect any equipment which can not operate within these specifications, otherwise you can damage both to the RM2200D and the external devices!

Examples for the use of GPIs and GPOs are:

- Fader start contacts of CD players, DAT decks or tape machines to the RM2200D.
- Light signalisation for On-Air, incoming telephone calls or other external events.
- Integration of external talkback systems.
- Connection of telephone hybrids or screener systems to the RM2200D.

Configuration Data

The RM2200D is a flexible system that can be adapted to many applications. There are several combinations of modules in the DSP frame possible as well as different requirements for the use of the RM2200D. Thus, the Control System needs to adapt to different situations. This is done by using a special set of data which contains the actual “structure” of the current setup. This data is called **Configuration Dataset** or just **Config** for short. It is stored within the DSP and Communications Module of the DSP frame and controls the way the RM2200D works. The Config is stored, even if the power supply of the DSP frame is cut. Only if you upload a new Config, the old one is replaced.

You create and change the Config within the RM2200D software, using its **Configuration Mode**. To activate a new Config, you need to upload it to the RM2200D DSP frame. After the transfer is finished, the new Config becomes active. (See also “About Configuration Data” on page 51.)

Every RM2200D is shipped from DHD with a standard Config preloaded. This Config is also on the CD shipped with the RM2200D. You can use it as a starting point for your own changes.

Input Pool, Fixed Faders and Selectors

The RM2200D contains an **Input Pool** for the audio inputs. This feature allows you to put several input signals together in a group. You can than use a **Pool Fader** to assign any of the signals from this pool to a particular fader. However, if one input from the pool is already assigned to a fader, you can not assign it to another fader. If you want to put an audio input into the Input Pool, you have to use the RM2200D software. Check the option for the desired input in the section `Frame I/O` of the configuration dialog. (See also “Frame I/O - Configuring the DSP Frame” on page 59.)

On the contrary, **Fixed Faders** are faders which have a permanently assigned input source that you can not change. This is for example useful for microphone channels that you want to assign to certain faders.

The RM2200D **Selector** works similar to the Input Pool. If you put an audio input into the Selector pool, you can choose it both for monitoring and as an alternative signal for clean feed output. (See also “Frame I/O - Configuring the DSP Frame” on page 59.)

Clean Feeds

A **Clean Feed** is used to generate a special audio signal. This signal is usually the output of the mixer, but *without* the signal the clean feed is assigned to. Clean feeds are mostly used when connecting telephone hybrids or other external lines to the RM2200D.

You can define up to four clean feed signals in the RM2200D software. They are permanently assigned to the selected input signals. However, you can also choose to send signals from the Selector pool as back signals, if necessary. You just have to check the option `Selector` in the section `Various` of the configuration dialog. (See also “Various - Configuring Level Meters and Clean Feeds” on page 80.)

Audio Sources and Logic Sources

When you are configuring the RM2200D, you need to know two important concepts which are used throughout this manual - **Audio Sources** and **Logic Sources**:

An *Audio Source* is any audio signal available within the RM2200D. These signals include:

- Input signals coming from devices connected to the RM2200D.

- Pre fader signals, program busses, Aux busses.
- Cue bus, monitor bus, monitor selector inputs and clean feeds.

If you are using the RM2200D software for configuration, you will often need to assign audio sources in certain parts of the software. You will find all available audio sources in the **Audio Sources window**. (See also “Audio Sources” on page 54.)

A *Logic Source* is a condition within the RM2200D which can be either active (“true”) or inactive (“false”). Depending on the configuration, logic sources are used to:

- Switch GPOs on or off, i.e. to remote control external devices.
- Switch LEDs on the mixing desk on or off.
- Input external logic signals via GPI contacts.
- Dim or mute monitor signals.
- Insert talkback signals into the program bus or other audio signals.

Logic sources include the following conditions:

- Fader start contacts.
- GPI inputs.
- Cue status for input signals. This condition becomes active if an input signal is assigned to a fader channel and this channel is in cue mode.
- All keys on the Master Control Module. If any one is pressed, its associated logic source becomes active.
- System events like On-Air logic 1 and On-Air logic 2, Alarm, Cue active and a few others. (On-Air logic 1 and 2 are for instance used to mute loudspeakers when microphone channels are opened.)

You only need to deal with logic sources when using the RM2200D software in Configuration Mode. When you need to select a logic source, the **Logic Sources window** will open and provide all available logic sources. The different logic sources are explained in more detail later in this manual. (See also “Logic Sources” on page 55.)

1.3 Structure of Audio Processing

The following picture shows the internal structure of the RM2200D audio processing in detail:

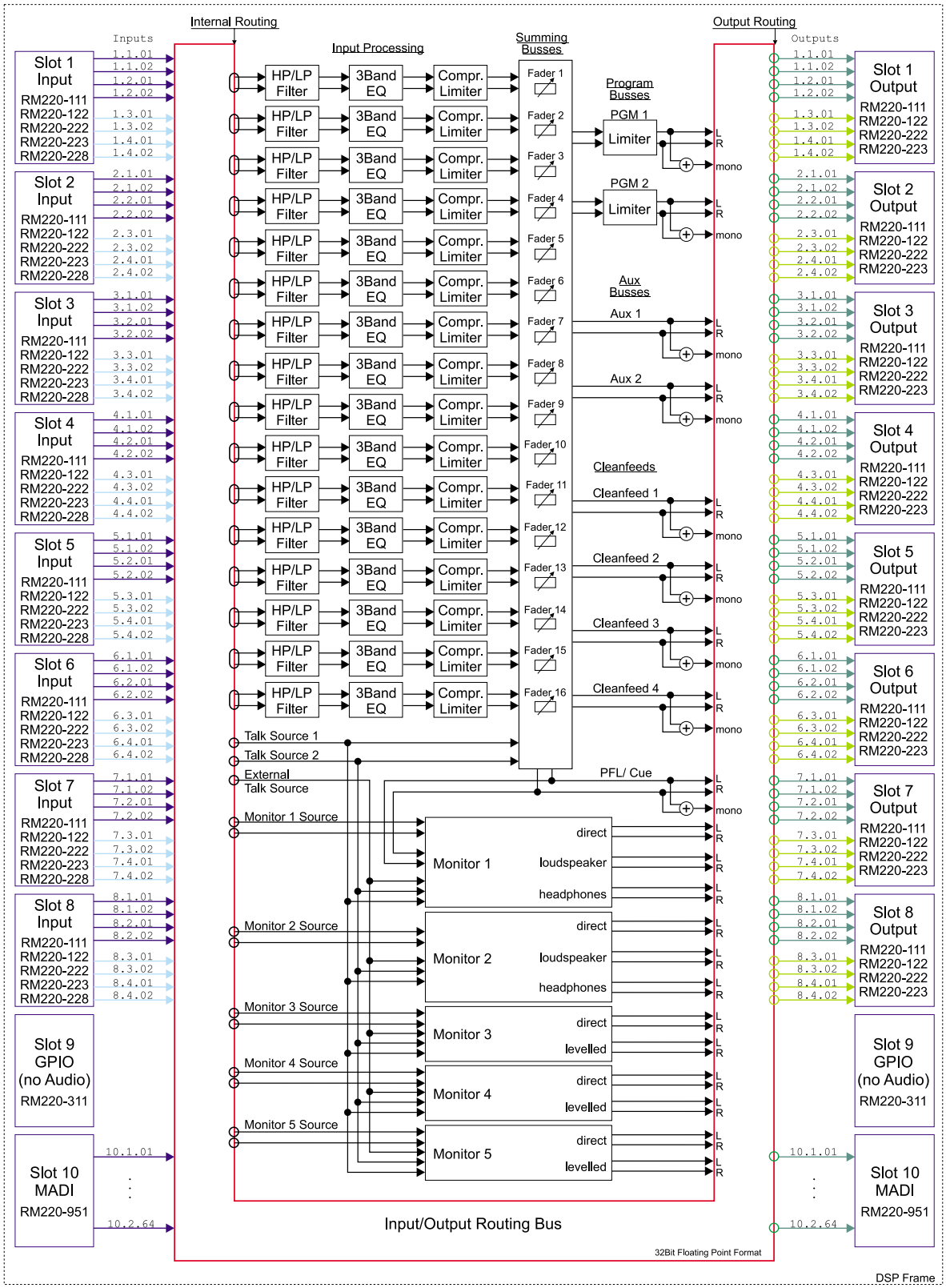


Figure I–3: Structure of the audio processing.

1.4 Available Modules

You can configure the hardware of the RM2200D depending on your application. Please note, that the minimum configuration for any RM2200D consists of the following:

- One DSP frame with power supply and DSP and Communication Controller module RM220-950.
- One Master Control module RM220-010.
- At least one fader module RM220-020.

There is a range of modules, adapter panels and mechanical mounting parts available. The following table gives you a short overview. You can find more detailed information later in this book. (See “Technical Specifications” on page 87.)

Part No.	Module Description	Features
RM220-061	DSP Frame 3U/19", 10 slots empty	passive DSP backplane, 10 slots for: • 8 audio/GPIO modules • 1 GPIO module (slot 9) • 1 DSP & Communication Controller • power supply included **Note:** *Redundant power supply is not possible or upgradeable!*
RM220-950	DSP & Communication Controller	• 100baseTX Ethernet on RJ45 • RS232 and CAN bus • DSP, 48kHz, 44.1kHz **Note:** *RM220-950 or RM220-951 necessary for each RM2200D on slot 10!*
RM220-951	DSP, MADI & Comm. Controller	• MADI 64ch.In/64ch.Out, SC connector • 100baseTX Ethernet on RJ45 • RS232 and CAN bus, DSP, 48kHz, 44.1kHz **Note:** *RM220-950 or RM220-951 necessary for each RM2200D on slot 10!* **Note:** *RS232 connector only available on RM220-061B!*

Part No.	Module Description	Features
RM220-122	Mic/Headphone/GPIO, 4 ch.	• 4 RJ45 Connectors • 4 el. balanced Mic/Line inputs with preamplifier, level 18dBu max. • phantom power 48V indiv. switchable • 2 stereo headphone outputs • 2 GPI, 4 GPO, 2 analog control in
RM220-111	Digital In/Out/GPIO, 8 ch.	• 4 RJ45 connectors • 4 AES3/EBU/SPDIF inputs • 4 AES3/EBU/SPDIF outputs • 4 async.input sample rate converters • 4 general purpose inputs, TTL • 4 general purpose outputs, open col.
RM220-222	Analog Line In/Out/GPIO, 4 ch.	• 4 RJ45 connectors • 4 line inputs, el. bal., 18dBu max. • 4 line outputs, el. bal., 18dBu max. • 4 general purpose inputs, TTL • 4 general purpose outputs, open col.
RM220-223	Analog Line In/Out/GPIO, 4 ch.	• 4 RJ45 connectors • 4 line inputs, el. bal., 24dBu max. • 4 line outputs, el. bal., 24dBu max. • 4 general purpose inputs, TTL • 4 general purpose outputs, open col.
RM220-228	Input Selector module (4 stereo input lines, 4 stereo monitor input lines)	• 2 stereo input selectors each with A,B,C,D stereo inputs • 16 line inputs, el. bal., 18dBu max. • 1 monitor selector and 1 fader selector, 4 RJ45 connectors • 1 RM220-228 supported by RM220-061

Part No.	Module Description	Features
RM220-311	GPIO Module	• 4 RJ45 connectors • 4 general purpose inputs, isolated, optocoupler +4..24V/ 4mA • 12 general purpose outputs, isolated, electro-mechanical relays, maximum current 1A, max. voltage 30V
RM220-010	Main Module	• 32 pushbuttons, 2 volume controls • 1 rotary optical encoder • LCD display • CAN bus • Stereo LED PPM • 80mm x 399mm, w/o installation frame
RM220-020	Fader Module	• 4 fader channels, each with 5 push buttons • 4 ALPS faders 100mm • CAN bus • 160mm x 399mm, w/o installation frame
RM220-020D	Fader Module with LED Displays	• 4 fader channels, each with 5 push buttons and one 4-character LED display • 4 ALPS faders 100mm • CAN bus • 160mm x 399mm, w/o installation frame
RM420-XLR-AA RJ45	XLR Adapter Panel 1U/19"	• for 8 RJ45 connections to 2 analog modules • 8 male XLR and 8 female XLR connectors stereo-paired • 4 SubD9 GPIO connectors at the rear • 8 RJ45 connectors at the rear • 8 CAT5 patch cables 1m included

Part No.	Module Description	Features
RM420-XLR-AD RJ45	XLR Adapter Panel 1U/19"	• for 8 RJ45 connections to 1 analog and 1 digital module • 8 male XLR and 8 female XLR connectors at the front • 4 SubD9 GPIO connectors at the rear • 8 RJ45 connectors at the rear • 8 CAT5 patch cables 1m included
RM420-XLR-DD RJ45	XLR Adapter Panel 1U/19"	• for 8 RJ45 connections to 2 digital modules • 8 male XLR and 8 female XLR connectors at the front • 4 SubD9 GPIO connectors at the rear • 8 RJ45 connectors at the rear • 8 CAT5 patch cables 1m included
RM420-XLR-AIN RJ45	XLR Adapter Panel 1U/19"	• for 4 RJ45 connections to 1 analog module RM220-228 • 16 female XLR connectors at front • 4 RJ45 connectors at the rear side • 4 CAT5 patch cables 1m included
RM220-Fxxx	Table Installation Frame	Mechanical parts for mounting the control modules. <xxx> gives the width in mm and can be 160, 240, 320, 400. For other sizes, table-installation frames need to be assembled. Please see website www.rm2200d.com, „Installations Drawings“ for combinations!

2. Operating the RM2200D

This chapter explains how to use the RM2200D mixing desk in everyday operation. The RM2200D can be used on its own, without the need to run any PC software simultaneously. However, it is recommended that you use the RM2200D software in Display Mode. This will give you more details about the current state of the system. It is also an alternative way to change the operation parameters of the RM2200D from the PC.

2.1 Module Layout and Control Elements

Fader Module Layout

The following picture shows a fader module of the RM2200D mixing desk, the table explains the function of the different parts:

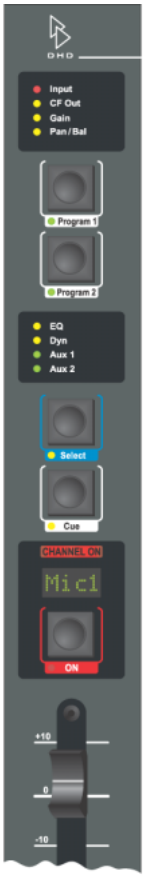


Figure I–4: The RM2200D fader module.

Control Element	Function
Input (LED)	This LED is green when the input carries a valid audio signal. For digital inputs, it is red when there is no synchronization.
CF out (LED)	This LED is yellow when the gain value of the clean feed out signal for the assigned input is not 0 dB and/or an alternative output signal is routed to the clean feeds back signal path. (See also “Using Clean Feed Channels” on page 37.)
Gain (LED)	This LED is yellow when the gain value for the input signal is not 0 dB.
Pan/Bal (LED)	This LED is yellow when the panorama/balance setting is not on neutral.
Program 1/Program 2 (keys and LEDs)	Press these keys to route the signal of the fader channel onto the two program busses. If the `Off-Air function` is active, both keys toggle each other. The keys can also be locked when the fader is open.(See also “Mod. Options - Configuring Module Options” on page 76.)
EQ (LED)	This LED is yellow when any equaliser or filter is active in the fader channel.
Dyn (LED)	This LED is yellow when any dynamics processing (limiter, compressor) is active in the fader channel.
Aux 1, Aux 2 (LED)	This LED is green, when an Aux signal is active in the fader channel. To switch it off, press the Select key, press the Aux 1 or Aux 2 key. Now turn the Control Knob to the left, until the display shows `-oo dB` and the LED goes off.
Select (key and LED)	Press this key, to put the fader channel in “Select Mode”. You can then change the parameters of the channel using the Master Control Module or the RM2200D software. Press it again when you are finished.
Cue (key and LED)	Press this key to cue the fader channel. The audio signal is routed to the monitor. You can configure Cue keys to toggle each other or to work independently, mixing all cue signals. You can also configure the way the Cue key works when pressed. (See also “Mod. Options - Configuring Module Options” on page 76.)
CHANNEL ON (Lamp)	This lamp lights when the audio signal in the fader channel is active.

Control Element	Function
Channel Display (alphanumeric, four characters)	This display shows the label of the currently selected input channel. There are only four characters displayed. If the input signal has a longer label,it will be displayed truncated. **Important Note:** Not all RM2200D fader modules provide the alphanumeric display. Only modules with the part number RM220-020D (note the "D") have a display.
ON (key and LED)	This key works together with the fader start contact. Both switch the audio signal and the logic signal for the fader start. For each input signal, you can configure the way they work together in the RM2200D software. Choose the tab `Frame I/O` in Configuration Mode and select the module which carries the input channel you want to modify. (See also "Frame I/O - Configuring the DSP Frame" on page 59.)

Reverse Function Select

The key concept in using the RM2200D is the Select key. Whenever you want to change something in a fader channel, you press this key to "set the function focus" on this particular fader channel. This is described in detail in the next section.

However, sometimes you want to switch a function (EQ, filter, dynamics etc.) just on or off. To make this easy, the RM2200D uses the Select key concept "the other way round." This is called **Reverse Function Select** and works like this:

1. Make sure there is no fader channel selected, all Select keys are inactive.
2. Now press and hold the desired function key on the Master Control Module. On all fader channels with this function activated the LED below the Select key will light up. All other fader channels will have this LED off. At the same time, the display shows `<function name> press Select`.
3. While still holding the function key, press the Select keys on the fader channels to switch the function on and off.
4. When you are finished, release the function key on the Master Control Module.

The Reverse Function Select feature works with the following functions: Filter, EQ High, EQ Mid, EQ Low, Dyn, Aux 1 and Aux 2.

Important Note: If a function is switched off for a selected fader channel, the display shows the letter `0` (for "Off" in front of any parameter value you are currently changing. You can change all parameters freely and their values will persist. However, they will only affect the fader channel when you switch the function on again.

Master Control Module Layout

The Master Control Module contains all the control elements you need to modify the operating parameters of he RM2200D. The basic philosophy when using it is simple:

1. If you want to change a parameter for a fader channel, first press the Select key on this channel.

2. On the Master Control Module, press the key with the desired function, for example the Input key.

3. The display shows the current selection, for example the currently selected input signal. You can now use the Control Knob to change this selection. The Control Knob is next to the LC display. As you change the value, the operation of the RM2200D changes "live". If you use the RM2200D software, you will also see the changes in Full Screen Display.

4. When you have changed one parameter, you can just press another function key to change another one. If all parameters are adjusted, press the Select key again to deactivate it, if necessary.

Note: Some of the function keys have more than just one primary function. To access them, just press the function key again. Alternatively, you can press the OK key to access the next function. A typical example is the setup of a limiter: Each press on the Dyn key takes you to the next parameter.

You can configure almost all keys on the Master Control Module as logic sources for control tasks. If you need to select a key from the Master Control Module, you find them under the node Master 1 buttons in the window Logic Sources. (See also "Logic Sources" on page 55.)

The following picture shows the top part of the RM2200D Master Control Module, the table explains the function of the different parts:

Figure I–5: Top part of the Master Control Module: status LEDs, level meters, setup keys, function keys and the LC display.

Control Element Label	Function
Alarm (LED)	This LED shows red, when there is a fault in the RM2200D. In normal operation, it should be off.
Stand By (LED)	This LED shows yellow, when the RM2200D is in Stand By Mode.You activate the Stand By Mode by holding the keys Pgm 1 and Esc together for five seconds. To wake the RM2200D up again, press the OK key for one second. Please note, that this feature needs to be enabled from the RM2200D software. (See “Console - Choosing Modules” on page 58.)
Power (LED)	This LED shows green, when the power supply from the DSP frame to the mixing desk works normally.
Level meters	These LED level meters display the current output level of the audio sources assigned to them in the RM2200D software. (See “Various - Configuring Level Meters and Clean Feeds” on page 80.)
Default	Press this key to load the Basic Setup. (See also “Using Setups” on page 25.)
Load Set	Press this key to select a User Setup for loading.
Load Ch	Press this key to load a Channel Setup for the selected fader channel.
Save	Press this key to save a User Setup or Channel Setup.

Control Element Label	Function
F1…F4	Function keys, mainly for monitor functions (input selection and level change). You can also use them as logic sources. Assign their function in the RM2200D software. (See “Func keys - Configuring Function Keys” on page 78.) If the key is configured as monitor input selector, press it and use the Control Knob to change the input signal for the monitor bus. If it is configured for level change, press it and use the Control Knob to change the level of the monitor bus. (See also “Monitoring Signals” on page 28.)
LC Display	This display shows the current state of any control operation on the Master Control Module.

The middle part of the Master Control Module contains all the function keys you use to change the parameters for a selected fader channel. It also contains the Control Knob which you use together with the LC display to change parameters or to select options and audio signals. All keys can be used as logic sources within the RM2200D software, too.

Note: Please note, that many keys can select more than one function only. To access these functions, just press the key again several times and watch the changing output on the display. The different functions are noted by numbered lists in the following table.

Tip: If possible, use the RM2200D software to view your changes in more detail on the PC monitor. This is especially useful when changing parameters for filters and dynamic processing.

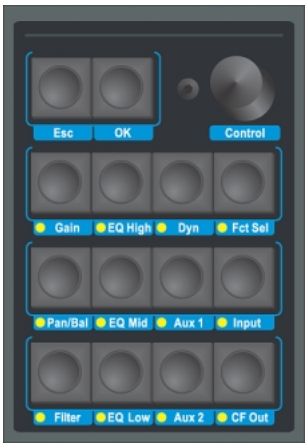


Figure I–6: Middle part of the Master Control Module: Control Knob and all function keys for changing parameters in fader channels.

Control Element Label	Function (Text on Display)
Esc	Use this key to cancel some operations and to put the RM2200D in Stand By Mode (together with the Pgm 1 key).
OK	For function keys with more than one function, press this key to access the next function. Also use it to wake up the RM2200D from Stand By Mode.
Control Knob	Use this rotary encoder together with the display and certain function keys to change parameters and to select options.
Gain	1. `Dig. Gain.` Use the Control Knob to change the digital gain of the selected fader channel between -20 dB to +20 dB. 2. `PhaseReverse.` Choose `ON` to reverse the phase of the selected fader channel. 3. Phantom Power.Only available for microphone channels. Use Control Knob to switch it `ON` or `OFF`.
Pan/Bal	1. `Panorama/Balance.` Use the Control Knob to change the balance/panorama value for the selected fader channel from `L 10` to `R 10`. The neutral position is `0`. 2. `Stereo Channel Summation.` Use the Control Knob to control the way the two stereo signals of the selected fader channel are treated. These options are available: • `Stereo.` Normal stereo operation. • `L->R L->L.` The left signal is routed to both channels. • `R->R R->L.` The right signal is routed to both channels. • `L->R R->L.` Left and right signal are exchanged. • `Mono.` Normal mono summation, the mono signal is routed to both channels. • `Mono -3db.` Mono summation, the mono signal is attenuated by -3 dB and is routed to both channels. • `Mono -6db.` Mono summation, the mono signal is attenuated by -6 dB and is routed to both channels.

Control Element Label	Function (Text on Display)
Filter	1. `FILTER <frequency>.` Use the Control Knob to adjust the filter frequency between 22 Hz and 20 kHz. 2. `FILTER <order>.` Use the Control Knob to select the order of the filter. To deactivate it, turn it far left until the display shows `BYPASS`. Turn it right to choose between `6dB/oct`, `12dB/oct`, `18dB/oct` and `24dB/oct`. 3. `FILTER HIPASS/LOWPASS.` Turn the Control Knob to select the desired filter curve.
EQ High	1. `EQ Gain.` Use the Control Knob to adjust the EQ gain between -15 dB and +15 dB. Select 0 dB to bypass the equaliser. In this case, the EQ LED in the selected fader channel goes off. 2. `EQFreq.` Use the Control Knob to adjust the EQ frequency between 1 kHz and 20 kHz.
EQ Mid	1. `EQ Gain.` Use the Control Knob to adjust the EQ gain between -15 dB and +15 dB. Select 0 dB to bypass the equaliser. In this case, the EQ LED in the selected fader channel goes off. 2. `EQFreq.` Use the Control Knob to adjust the EQ frequency between 22 Hz and 22 kHz. 3. `EQ Qual.` Use the Control Knob to adjust the EQ quality between 0.3 octaves and 3.0 octaves (in steps of 0.1 octaves).
EQ Low	1. `EQ Gain.` Use the Control Knob to adjust the EQ gain between -15 dB and +15 dB. Select 0 dB to bypass the equaliser. In this case, the EQ LED in the selected fader channel goes off. 2. `EQFreq.` Use the Control Knob to adjust the EQ frequency between 22 Hz and 1 kHz.

Control Element Label	Function (Text on Display)
Dyn	This key controls the dynamic processing (compressor and limiter) for the selected fader channel. Press it repeatedly (or use the OK key) to access all parameters. **Note:** If the dynamics processing is off, the display shows the letter `O` in front of the current parameter in the LC display . To switch the processing on or off, use the Reverse Function Select. (See also “Reverse Function Select” on page 15.) 1. `Threshold.` Use the Control Knob to adjust the compressor threshold between -50 dB and +10 dB. 2. `OutputGain.` Use the Control Knob to adjust the compressor output gain between 0 dB and +30 dB. 3. `Ratio.` Use the Control Knob to adjust the compressor ratio between 1.0:1 and 5.0:1 in steps of 0.1. 4. `Attack.` Use the Control Knob to adjust the compressor attack time between 0.2 ms and 50 ms. 5. `Release.` Use the Control Knob to adjust the compressor release time between 0.05 s and 10 s. 6. `LimThres.` Use the Control Knob to adjust the limiter threshold between -20 dB and +20 dB. 7. `LimRel.` Use the Control Knob to adjust the limiter release rate between 3 dB/s and 20 dB/s.

Control Element Label	Function (Text on Display)
Aux 1, Aux 2	These keys control the function of the Aux signals for the selected channel. Both Aux 1 and Aux 2 work equally. **Important Note:** If you want to change the output level of an *Aux bus signal*, use the Reverse Function Select: Make sure no Select key is active and press the Aux key. While holding it, use the Control Knob to adjust the output gain of the Aux signal. Release the key when you are finished. 1. `Aux Gain.` Use the Control Knob to adjust the Aux gain value between "off" (-oo dB) and +15 dB. Depending on the Aux characteristic the display shows one of the letters `A` (After fader), `P` (Pre fader) or `S`(Switched fader) in front of the gain value. 2. `<Aux characteristic>.` Use the Control Knob to change the way the Aux signal is generated. These values are possible: • `AFTER FADER(A).` The Aux signal is generated after the fader affects the audio level. • `PRE FADER(P).` The Aux signal is generated before ("pre") the fader affects the audio level. • `PRE SWITCH(S).` The Aux signal is generated pre-fader, as long as the fader is closed. If the fader is opened, it changes to after-fader. This is useful for conference/preparation applications.
Fct Sel	This key is used to select functions which you can not access directly from other keys. Currently it has no function, but future versions of the RM2200D firmware might use it.
Input	1. `<input name> select Input.` Use the Control Knob to select an input channel from the Input Pool and assign it to the selected fader channel. **Important Note:** You can only select input signals that are *not* already assigned to any other fader channel! 2. `Fix Fader.` Use the Control Knob to lock the selected input signal to the fader channel. Once locked, you can not change the input signal for the fader channel anymore. Choose the value `ON` to make the fader channel a fixed fader. Choose `OFF` to unlock it again.

Control Element Label	Function (Text on Display)
CF Out	Use this key to configure the back signal from the clean feed channel. **Important Note:** You can only use this function if a clean feed is configured for the selected fader channel. Otherwise the display shows `not available`. (See also “Various - Configuring Level Meters and Clean Feeds” on page 80.) 1. `CFOutGain.` Use the Control Knob to set the gain value for the clean feed back signal between -30 dB and +15 dB. 2. `<Selector signal name>.` Use the Control Knob to select an alternative audio source for the clean feed back signal. You can choose any signal which is in the Selector Pool. If you want the original clean feed signal for the selected fader channel, select the entry `CLEANFEED`. (Please note, that you must have configured a clean feed signal for this input signal.)

The bottom part of the Master Control Module contains keys and potentiometers for monitoring, to talkback keys and four keys for general use:

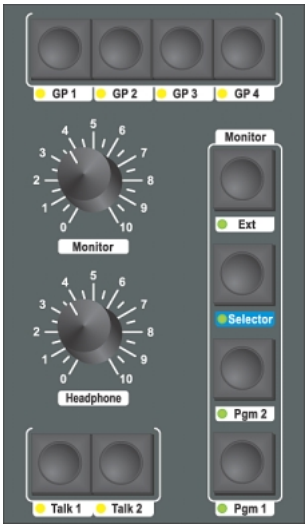


Figure I–7: Bottom part of the Master Control Module: general purpose keys, monitor keys, monitor potentiometer and talkback keys.

The two potentiometers affect the level of the monitor bus and the headphone output. The function of the keys is explained in the following table:

Control Element Label	Function
GP1…GP4	These are general purpose keys. You can use them as general logic sources, i.e. for signalization or talkback applications. The LED below each key can show the state of any logic signal (lamp source) within the RM2200D. (See “Func keys - Configuring Function Keys” on page 78.)
Talk 1 and Talk 2	Use these keys for talkback applications. However, you can use them as general purpose logic sources as well. You can assign the lamp source for the LEDs below the keys using the RM2200D software. (See “Func keys - Configuring Function Keys” on page 78.)
Monitor - Ext	This key puts the “external” monitor source on the monitor bus. Use the RM2200D software to assign a audio signal to this key. (See “Mod. Options - Configuring Module Options” on page 76.)
Monitor - Selector	Use this key together with the Control Knob to put any audio signal from the Selector Pool on the monitor bus. Rotate the Control Knob while holding this key. The display shows the currently selected audio input. Release the Selector key if you have selected the desired signal.
Monitor - Pgm 1 and Pgm 2	Press these keys to put the output of the program bus on the monitor bus.

Note: If you have assigned a default monitor source which has no associated key on the mixing desk, this will be selected when you press the currently active monitor key again, or after a reset of the DSP frame. (See also “Func keys - Configuring Function Keys” on page 78.)

2.2 Using the RM2200D Software in Display Mode

In everyday operation of the RM2200D, it is useful to run the RM2200D software in Display Mode on a PC next to the mixing desk. Doing so gives you these advantages:

- More detailed and flexible metering of audio signals.
- Display of the current date and time. Access to a programmable timer.
- Display of elapsed time since the last fader start for each fader.
- Graphical display of current settings for the selected channel. You can also change the settings of a selected audio channel directly from the screen.
- Easy access to channel and mixer setups.

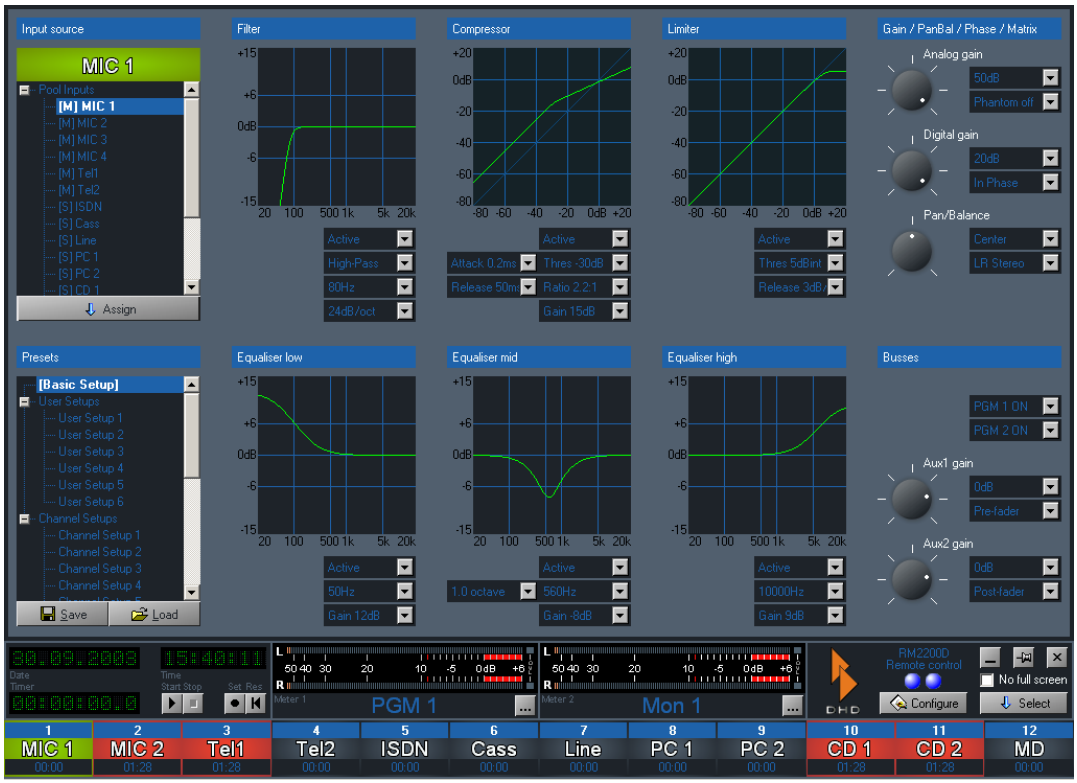


Figure I–8: Full Screen Display of the RM2200D software.

The function of the software is described in detail in the next chapter. (See “Using the RM2200D Software in Display Mode” on page 44.)

2.3 Using Setups

Overview

You can change many settings of the RM2200D from the mixing desk. These settings will even stay permanent when the system is powered off. However, sometimes you would like to *save* different settings for different situations. For example, you could use the RM2200D both as On-Air self-operating mixer and for production. Both applications have different requirements and each needs different settings . With the RM2200D, you can easily store your settings in **Setups**. A setup is basically a set of

parameters which is stored within the RM2200D hardware for later use. There are three different kinds of setups:

1. **Channel Setups.** A Channel Setup stores the parameter settings for *one audio channel*. In the display of the mixing desk they are labeled `CHSETUP <No.>`. You cane store up to 20 Channel Setups.

2. **User Setup.** A User Setup stores the current state of the *whole mixing desk including the current settings of all channels*. In the display of the mixing desk they are labeled `SETUP <No.>`. You can store up to six User Setups.

3. **Basic Setup.** This special setup is similar to a User Setup, it also stores the state of the whole system. However, you cannot save or change it from the mixing desk, but have to use the RM2200D software to do so. The *Basic Setup* is loaded after a reset of the DSP frame.

(See “Full Screen Display” on page 46.)

Important Note: Except for the Basic Setup, you can manage all your setups from the mixing desk, as described in the next section. However, you can also use the RM2200D software to store and load setups. You *have to use it* to store the Basic Setup.

Managing Setups from the Mixing Desk

To manage the setups of the RM2200D you use the four red buttons on top of the Master Control Module as well as the Control Knob and the keys Esc and OK below the LC display. (See the following figure.)

Figure I–9: Level meters, Setup keys, Function keys, LC Display, ESC-, OK key and Control Knob (from top to bottom).

Note: You can also use the RM2200D software to save and load all setups. Please note, that in this case you need to press the Select key in any fader channel on the mixing desk to gain access to the dialog section `Presets` in Full Screen mode. (See “Full Screen Display” on page 46.)

Saving and Loading the Basic Setup

To load the Basic Setup, press and hold the Default key for a few seconds. The display shows `Loading` and the Basic Setup is loaded. To save the Basic Setup, use the RM2200D software. (See “Full Screen Display” on page 46.)

Saving a User Setup

To save a User Setup, do the following:

1. Adjust all fader channels and other settings at will. When you have finished your adjustments, make sure no Select keys are active.
2. Press the red Save key. The display shows `SAVE SETUP <no.>`.
3. Turn the Control Knob until the display shows the number you want to save your setup under. Press the OK key to confirm your selection. The setup is saved immediately. To cancel the operation, press the Save key again.

Loading a User Setup

To load a User Setup, do the following:

1. Press the red Load key. The display shows `LOAD SETUP <no.>`.
2. Turn the Control Knob until the display shows the number of the setup you want to load. Press the OK key to confirm your selection. The new setup is loaded immediately. To cancel the operation, press the Load Set key again.

Saving a Channel Setup

To save a Channel Setup, do the following:

1. Press the Select key on the desired fader channel. Adjust all settings at will using the Master Control Module.
2. While the Select key is still active, press the red Save key. The display shows `SAVE CHSETUP <no.>`.
3. Turn the Control Knob until the display shows the desired number to save your setup under. Press the OK key to confirm your selection. The new setup is saved immediately. To cancel the operation, press the Select key again to deactivate it.
4. Press the active Select key again to deactivate it.

Loading a Channel Setup

To load a Channel Setup, do the following:

1. Press the Select key on the desired fader channel.
2. Press the red Load Ch key. The display shows `LOAD CHSETUP <no.>`.
3. Turn the Control Knob until the display shows the number of the setup you want to load. Press the OK key to confirm your selection. To cancel the operation, press the Select key again to deactivate it.
4. Press the active Select key again to deactivate it.

Important Note: You can only load a channel setup into a fader channel if this is allowed for the input it has been assigned. You can allow or deny this for any input signal in the section `Frame I/O` of the configuration dialog. (See also “Frame I/O - Configuring the DSP Frame” on page 59.)

2.4 Using Level Meters

The RM2200D has three level meters: one stereo (“hardware”) LED meter in the mixing desk and two software meters within the RM2200D software. The meter in the mixing desk is called **internal meter** , the two others are called **external meters.** Use the RM2200D software to configure both. (See “Various - Configuring Level Meters and Clean Feeds” on page 80.)

Use the RM2200D software to assign default sources to all meters. For the external (software) meters you can change their sources anytime on the PC. The internal meter always shows the level of the selected inputs. However, if you want the internal meter to display the level of the CUE bus whenever any CUE button is active, you can do so: Just check the option `Internal meter shows CUE` in the section `Various` of the configuration dialog to enable this function.

2.5 Monitoring Signals

The RM2200D provides five monitor busses, which work independently from each other. You can route any monitor bus to an output socket using the RM2200D software. Just configure the desired output on the appropriate module and select a monitor signal as audio source. (See “Mod. Options - Configuring Module Options” on page 76.)

If you want to meter any monitor signal, use the RM2200D software to do so. Just klick the button ... next to a meter and select the desired monitor signal from the Audio Sources window.

Important Note: You can monitor any input signal which has the option `Add to selector pool` set in the configuration dialog of its module. If this option is inactive, you will not be able to monitor this input! (See “Mod. Options - Configuring Module Options” on page 76.)

Any monitor bus can use any available signal. However, you can monitor the signals from the RM220-228 Analog In Selector Module *only on Monitor 1*!

Using Monitor 1

Compared to the four other monitor busses, Monitor 1 bus is special: It is the main monitor bus and its control keys and volume potentiometers are directly accessible on the mixing desk. The keys are on the bottom of the Master Control Module in the section labeled `Monitor`. The two potentiometers next to it control the volume of the audio signals `Mon 1 loudspeaker` (potentiometer `Monitor`) and `Mon 1 headphones` (potentiometer `Headphone`).

To configure and use the Monitor 1 bus, do the following:

1. Use the configuration software to assign the `Monitor 1` signal to any available output. Use the dialog `Frame I/O` to do this. (See “Frame I/O - Configuring the DSP Frame” on page 59.)

Tip: It is useful to have the signal of `Monitor 1` both on loudspeakers and headphones. If you want to configure the RM2200D that way, assign the signals `Mon 1 loudspeakers R/L` to the loudspeaker output. The potentiometer `Monitor` will control the volume of this output. Additionally, assign the signals `Mon 1 headphones R/L` to the headphone output on the RM220-122 Microphone/Headphone module. The potentiometer `Headphones` will control the volume of this output.

2. Use the configuration software to set up all other monitor options in the dialog `Mod. options`. Upload the new Config to the DSP frame. (See “Mod. Options - Configuring Module Options” on page 76.)

3. Now you can use the keys in the `Monitor` section of the Master Control Module to select the input signal for the `Monitor 1` bus. To select any signal not directly available on a key, use the Selector key. Hold it and rotate the Control Knob to select the desired signal for monitoring.

Using Monitor 2…5

You can not access the monitor signals `Monitor 2` to `Monitor 5` using dedicated keys on the mixing desk. To use them, do the following:

1. Assign the desired monitor signal to output sockets on a module in the DSP frame. You can either assign the plain monitor signal or the same signal using an internal potentiometer to control its volume. The plain signal is labeled `Monitor 2…5 R/L` in the Audio Sources window, the volume controlled one is labeled `Monitor 2…5 levelled R/L`. (See also “Frame I/O - Configuring the DSP Frame” on page 59.)

2. Use the section `Func keys` in the configuration dialog of RM2200D software to assign the monitor function to the four function keys F1…F4 on the top part of the Master Control Module. You can configure each key either to select an input signal for a monitor bus or to change the level for a monitor signal. Upload the new Config to the DSP frame.

3. To change the input for a monitor bus, press the function key you have configured as input selector. The display shows the key just pressed (i.e. `F 1`) and its assigned monitor bus (i.e. `Selector 2`). It also shows the signal currently selected for monitoring. Rotate the Control Knob to select the desired signal. When finished, press the function key again.

4. To change the level for a monitor bus, press the function key you have configured as volume control. The display shows the key just presses (i.e. `F 2`) and its assigned monitor bus (i.e. `Level Sel 2`). It also shows the current output level in dB. Rotate the Control Knob to adjust the monitor volume, the display will change accordingly. When finished, press the function key again.

2.6 Selecting Input Signals

Any fader channel can carry any input signal which you have put into the RM2200D Input Pool. If an input signal is not in the Input Pool, you can not assign it to a fader channel freely. (See also “Frame I/O - Configuring the DSP Frame” on page 59.)

Important Note: If you are using the RM220-228 Analog In Selector Module, you can assign any audio input signal from this module *only to one fader channel at any one time*! As soon as one fader channel uses any one of the signals from this module, you can not assign its other input signals to other fader channels! Please keep this limitation in mind when designing your studio setup!

To change the input signal for a fader channel, just press the Select key in the desired channel. If you are using the RM2200D software and it is connected to the DSP frame, the software will change to Full Display Mode. Next, press the Input key on the Master Control Module and use the Control Knob to select the desired input. The display shows your current selection. Press the Select key again when finished. (See also “Input” on page 22.)

Note: If you want to lock your selection of if you can not change the input signal (the display shows `Fixed Fader`), you can use the secondary function of the Select key. Press it again, and you can access the **Fixed Fader** function. This function locks or unlocks the possibility to select another input signal for a fader channel. The display shows `Fixed Fader: On` when the fader channel is locked or `Fixed Fader: Off` when you can freely select an input. Use the Control Knob to change this setting.

Tip: If you change the input signal of fader channels often, you can configure the mixing desk to activate this function by default when you press the Select key. Use the section `Mod. options` of the configuration dialog in the RM2200D software to set the default function of the Select key either to `Gain`

or `Input select`. (See also “Mod. Options - Configuring Module Options” on page 76.)

2.7 Setting up Input Processing

With the RM2200D you can set up input processing for each input signal. You can use several different processings and change their parameter settings. To change any parameter for a fader channel, do the following:

1. Press the Select key. The LED below it will light up. If the RM2200D software and is connected to the DSP frame, the software will change to Full Display Mode.

2. Press the key for the parameter you would like to change. If necessary, press it again to access further functions assigned to the same key. Watch the display as it changes according to the function selected. (See also “Master Control Module Layout” on page 16.)

3. Use the Control Knob to adjust the desired parameter. Watch the display for the current value. If you are using the RM2200D software, its Full Screen Display will change accordingly.

4. When you are finished, pres another function key if necessary or press the Select key again to deactivate it.

Important Note: When you change the settings for any fader channel, you are actually changing the settings for *the input channel currently assigned to it.* Any input channel keeps its parameter settings, even if it is not currently assigned to any fader channel. Thus you can safely change the input signal of a fader channel without loosing the settings of the input channel you just removed from the fader channel. If you then assign this input channel to any other fader channel, it will still have the same parameter settings.

The different parameters you can change are described in the following table. It gives a compact overview about the processing functions available. You can find

more details earlier in this manual. (See “Master Control Module Layout” on page 16.)

Function key	Assigned function/Available function levels (press key again)
Gain	Digital Gain: • Digital Gain. • Phase Reverse On/Off. (See also “Gain” on page 19.)
Pan/Bal	Panorama, Balance, Stereo channel assignment, Mono summation: • Panorama/Balance. • Mapping of input stereo channels to Stereo/ Cross-Channel Stereo/Left channel only/Right channel only and mono summation. (See also “Pan/Bal” on page 19.)
Filter	Variable Low or High pass filter: • Filter Frequency. • Filter order/Bypass. • Filter characteristics (Low pass/High Pass). • Use Reverse Function Select to switch Bypass on or off. (See “Reverse Function Select” on page 15.) (See also “Filter” on page 20.)
EQ High and EQ Low	Equaliser for high and low frequencies: • Equaliser Gain. • Equaliser frequency. • Use Reverse Function Select to switch Bypass on or off. (See “Reverse Function Select” on page 15.) (See also “EQ High” on page 20.)
EQ Mid	Variable Equaliser for middle frequencies: • Equaliser Gain. • Equaliser Frequency. • Equaliser quality. • Use Reverse Function Select to switch Bypass on or off. (See “Reverse Function Select” on page 15.) (See also “EQ Mid” on page 20.)

Function key	Assigned function/Available function levels (press key again)
Dyn	Dynamics processing with compressor and limiter: • Threshold (Compressor). • Output Gain (Compressor). • Ratio (Compressor). • Attack Time. • Release Time. • Threshold (Limiter). • Release Speed (Limiter). • Use Reverse Function Select to switch Bypass on or off. (See “Reverse Function Select” on page 15.) (See also “Dyn” on page 21.)

2.8 Assigning Program Busses

To assign a fader channel to a program bus, just press the key Program 1 or Program 2 on top of the fader channel. If the fader channel was already routed to the program bus, it will be switched off, if not, it will be switched on. In any case, the LED below the keys will be lit, if the fader channel is currently assigned to a program bus.

If you are using the RM2200D software and a fader channel is selected, the Full Screen Display will reflect your changes in the section `Busses`. You can also use the software to change the settings from the PC.

Note: Please note that you can use the RM2200D software to change the way the two Program keys behave. You can lock any of them independently when the fader is open. You can also set them to toggle each other for Off-Air operation. In this case, switching one program bus on switches the other one off and vice versa. (See also “Mod. Options - Configuring Module Options” on page 76.)

2.9 Using Aux Busses

You can assign any input signal to two Aux bussses, Aux 1 and Aux2. For each Aux signal coming from a fader channel you can change the following settings.

- Aux signal gain from +15 dB to -60 dB/off.
- Aux signal on or off using Reverse Function Select.
- Aux signal mode: **Pre Fader**, **After Fader** and **Pre Fader Switched**. Pre Fader Switched works like this: The Aux signal is generated Pre Fader as long as the fader is closed. When you open it, the Aux signal is muted. This is useful for special conferencing applications.

Additionally, you can change the overall gain for each Aux bus independently.

Important Note: When you change the Aux settings for any fader channel, you are actually changing*Aux settings for the input channel currently assigned to it.*

Any input channel keeps its Aux settings, even if it is not currently assigned to any fader channel. Thus you can safely change the input signal of a fader channel without loosing the Aux settings of the input channel you just removed from the fader channel. *However, if you remove an input signal from a fader channel, its Aux signal is also removed from the Aux busses!* If you then assign this input channel to any other fader channel, it will have the preserved Aux settings and will be routed to the Aux busses again.

The following table explains how you set the different options for Aux signals. If you are using the RM2200D software and a fader channel is selected, the Full Screen Display will reflect your changes in the section `Busses`. You can also use the software to change the settings from the PC.

To change this...	Do this...
Assign a fader channel signal to an Aux bus / Remove a fader channel from an Aux bus.	Use Reverse Function Select for the desired fader channel: 1. Make sure all Select keys on all fader channels are inactive. 2. Press and hold the Aux 1 or Aux 2 key on the Master Control Module . The `Select` LED will lit up on all fader channels currently routed to the Aux bus. 3. Press the Select key in the desired fader channel to assign or remove this signal from the Aux bus. The two LEDs `Aux 1` and `Aux 2` show the current Aux bus assignment of each fader channel.
Change the Aux Gain value for a *fader channel Aux signal*.	1. Press the Select key on the desired fader channel. 2. Press the Aux 1 or Aux 2 key on the Master Control Module to select the desired Aux bus. 3. Use the Control Knob to change the Gain setting to the desired value. The display shows the currently selected value in dB and the current Aux signal mode. If you set the value below -60 dB, the display changes to `-oo` and the Aux signal is switched off. The `Aux` LED in the fader channel also goes off. 4. Press the Select key again to deactivate it.

To change this...	Do this...
Change the **Aux signal mode**.	1. Press the Select key on the desired fader channel. 2. Press the Aux 1 or Aux 2 key *twice* on the Master Control Module to select the secondary function of the desired Aux bus. The display will show the currently selected Aux signal mode. 3. Turn the Control Knob to select the desired mode: • *Pre Fader (Display shows "P" when changing the Aux gain).* The signal is routed to the Aux bus *before* the fader affects its volume. • *After Fader (Display shows "A" when changing the Aux gain.).* The signal is routed to the Aux bus *after* the fader affects its volume. The Aux volume changes according to the fader movement. • *Pre Switch (Display shows "S" when changing the Aux gain).* The signal is routed to the Aux bus *before* the fader, *as long as the fader is closed*. If you open the fader, the Aux signal is muted. 4. Press the Select key again to deactivate it.
Change the *overall Aux Gain value* for Aux 1 bus or Aux 2 bus.	1. Make sure all Select keys on all fader channels are inactive. 2. Press and hold the Aux 1 or Aux 2 key. The display shows the current gain value for the selected Aux bus. 3. Use the Control Knob to change the Aux bus gain between 0 dB an -60 dB. To switch the Aux bus off completely, set the value below -60 dB. The display will then show OFF. 4. Release the Aux 1 or Aux 2 key.

2.10 Using Talkback Functions

You can define up to three signals - `Talk 1`, `Talk 2` and `External talkback` - to act as talkback signals.These signals are inserted into certain signal paths when certain logic conditions are met. You use the RM2200D software to define which talkback source is inserted into which output signal on which conditions. (See “Talkback” on page 79.)

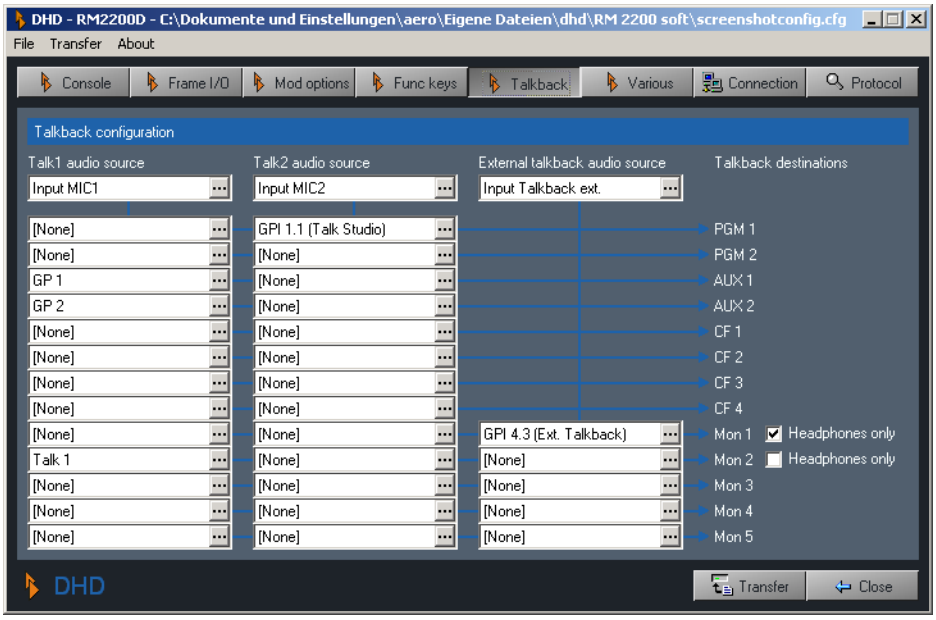


Figure I–10: The talkback configuration dialog of the RM2200D software.

To configure the talkback system, do the following:

1. Open the section `Talkback` in the configuration dialog of the RM2200D software.

2. In the top row of the talkback “matrix” assign the talkback input signals. Click the buttons ... to bring up the Audio Sources window and select the desired inputs there.

3. Now, select the output signal you want to affect with a certain talkback signal. You find the available output signals in the rightmost column `Destinations`. Go to the crosspoint between talkback signal and output signal.

4. At the crosspoint you find the logic source that will insert the talkback signal into the output signal when becoming active. Click the ... to bring up the Logic Sources window. Select the desired logic source from it.

5. If you want to insert the talkback signals into the *headphone monitor signals only*, check the boxes `Headphones only` next to the destinations `Mon1` and `Mon2`.

Note: Please note that the external talkback source can only be inserted into monitor busses, not into program busses, Aux busses or clean feed signals!

Tip: If you are connecting an external intercom system to the RM2200D, use its audio output as `External talkback audio source`. Connect the GPO of this system to a GPI of the RM2200D and use this GPI as logic source to route the external audio into the monitor busses of the RM2200D.

2.11 Using Clean Feed Channels

You can define up to four clean feed signals within the RM2200D. *These signals are always assigned to input signals.* All clean feed signals are available in the Audio Sources window both as stereo and mono signals. You configure all these options in the section `Various` of the configuration dialog in the RM2200D software. (See also “Various - Configuring Level Meters and Clean Feeds” on page 80.)

Additionally, you can select alternative back-signals instead of the “mix-minus” signals which are commonly sent to clean feed outputs. This is for instance useful when you want to send another signal instead of the program output to a telephone unit or outside line.

If you want to change the gain of the clean feed output or assign an alternative signal to it, do the following:

1. Press the Select key in the fader channel associated to a clean feed.
2. Press the key CF out on the Master Control Module. If a clean feed is assigned to this channel, the display shows `CFOutGain <Value>`. If no clean feed is defined for this channel, it shows `not available`.
3. Adjust the gain value for the clean feed output signal between +15 dB and -30 dB. Use the Control Knob to do so, the display shows the current value.
4. Press the key CF out again. You can now use the Control Knob to select an alternative output signal for the clean feed. The display shows your current choice.

Important Note: You can only select input signals as alternative output for clean feeds, if you have enabled them for this function. To do so, open the RM2200D software in Configuration Mode. Select the tab `Frame I/O` and find the desired input signal. Check the checkbox `Add to selector pool`. (See also “Frame I/O - Configuring the DSP Frame” on page 59.)

5. Press the Select key again to finish configuration.

Here is an example for a typical clean feed application: If you want to connect a telephone hybrid to the RM2200D, do the following:

1. Connect the output of the telephone unit to an input of the RM2200D. Connect the input of the unit to an output of the RM2200D.
2. Start the RM2200D software, connect to the DSP frame and enter the Configuration Mode. (See also “Using the RM2200D Software in Display Mode” on page 44.)

3. Select the tab `Frame I/O` and assign labels for the input and output of the telephone unit. (See also “Frame I/O - Configuring the DSP Frame” on page 59.)

4. Select the tab `Various` and define clean feed signals for the input signal from the telephone unit. (See also “Various - Configuring Level Meters and Clean Feeds” on page 80.)

5. Go back to the section `Frame I/O` and select the output socket which is connected to the input of the telephone unit. For the output routing, use the clean feed signal just created as audio source.

6. Now, the telephone unit should receive the proper clean feed signal from the RM2200D. If you want to send an alternative back signal to it, make sure you have activated the option `Allow selector` when defining the clean feed.

2.12 Off Air Operation

You can of course use the RM2200D for self-operated DJ shows, where the presenter operates the mixing desk herself. In such cases it is often required to use the RM2200D in **Off Air Mode**. A typical situation would be like this: You have an audio source (for instance playing music) running On Air but at the same time you want record a telephone call from a listener to a recording device.

To achieve this, you need to use the two program busses of the RM2200D simultaneously: Program bus 1 carries the On Air mix going out to the transmitter, program bus 2 is used to record your piece and is routed to the recording system. However, you have to make sure that all signals used for recording *do not interfere with the On Air signal!*. Therefore, you must assign any signal destined for Off Air recording to program bus 2 *only*.

Generally, you can use the keys Program 1 and Program 2 on top of each fader channel freely to assign this channel to any program bus. But this also means, that a fader channel can be assigned to both busses at once - which is exactly the situation you would like to prevent for Off Air operation. Therefore, the RM2200D provides a special operation mode. In this mode, the two program keys toggle each other in such a way, that any key press changes the program bus assignment alternating from program bus 1 to program bus 2. However, it is impossible to assign a fader channel to both program busses at the same time.

To activate this mode, put the RM2200D software into Configuration Mode and select the tab `Mod options`. Check the checkbox `Off-Air function (toggle PGM1/2)`. When you are finished, upload the Config to the DSP frame to activate it. (See also “Mod. Options - Configuring Module Options” on page 76.)

2.13 Connecting GPIs and GPOs

When you connect external devices to the RM2200D, you can not only exchange audio signals with them, but control signals too. Signals coming *from* external devices are connected to **General Purpose Inputs** (**GPIs** for short). Signals going out *to* external devices are connected to **General Purpose Outputs** (**GPOs** for short).

Caution: Before you are connecting any external signals to the RM2200D, make sure you have read and fully understand the technical specifications in this manual! (See “Technical Specifications” on page 87.)

Failing to do so can cause damage both to the RM2200D and any other equipment connected to it!

Here are two typical examples for using GPIOs: dimming the monitor signal using a GPI and switching on a red light when the RM2200D is On Air.

If you want an external signal to dim your monitor level, do the following:

1. Connect the external signal to one of the GPI contacts on one module in the DSP frame. Make sure you comply to the electrical specifications given later in this manual! (See “Technical Specifications” on page 87.)

2. Start the RM2200D software in Configuration Mode. Select the tab `Frame I/O`. (See “Frame I/O - Configuring the DSP Frame” on page 59.)

3. Find the connector you just used to connect the external signal to. Assign a descriptive label to the GPI used. If necessary, set up the input as inverted. This allows you to use both high- and low-active signals.

4. The input is now available as logic source. To use it to dim the monitor signal, go to the section `Mod options` and select it as `Monitor dim source`.

Tip: To check if a GPI (or other logic source) works properly, you can assign it as `lamp source` to any of the LEDs below the keys GP1...GP4. The LED should light up when the logic source becomes active.

If you want to switch on a red light when the microphone channels of the RM2200D are open, you can do the following:

1. Connect the red light electronics to one of the GPO contacts in the DSP frame. Make sure you comply to the electrical specifications given later in this manual! This is especially important if you need to drive an electrical load with the GPO and not just want to transmit a control signal! (See “Technical Specifications” on page 87.)

2. Start the RM2200D software in Configuration Mode. Select the tab `Frame I/O`. (See “Frame I/O - Configuring the DSP Frame” on page 59.)

3. Find the connector you just used to connect the external signal to. Assign a descriptive label to the GPO used. If necessary, set up the type of the output signal to either inverted, Pulse on or Pulse off. The first options inverts the signal state, the other two generate a pulse when the signal either becomes active (Pulse on) or inactive (Pulse off). Select the logic source which will drive this GPO. As a test, assign a key from the Master Control Module to it.

4. Upload the Config. Press the key you have just assigned as logic source. The read light should light up as long as the key is pressed.

5. Go back to the RM2200D software. Select the tab `Frame I/O` and find the microphone input signals. For each input, make sure the checkbox for the option `On-Air Logic 1` is checked. This makes the logic source `On-Air Logic 1` active anytime an input signal with this option set is on a fader channel and the fader is open.

6. Finally, select the logic source `On-Air Logic 1` to drive the GPO for the red light.

7. Upload the new Config. Now, if you open any microphone fader, the red light signalisation should become active.

2.14 Using CS Routing

CS Routing is a special control method that allows external devices to control routing within the RM2200D. That way, an external device can control which internal audio signal of the RM2200D is routed to a certain audio output. A typical application for CS Routing is the use of a DHD Router Control Panel RM420-018 or a Yellowtec Intellimix together with a RM2200D.

CS Routing uses the Channel Status Bits of the AES/EBU stream to send control data to the RM2200D. In turn, the DSP frame puts the requested audio signal on a predefined output. All signals available within the RM2200D can be routed to the output, actual details of this process depend on the configuration of the Router Panel or Intellimix.

However, this will only work if both the input and output of the AES/EBU signal share the same RJ45 socket on a RM220-111 Digital In/Out/GPIO module!

Important Note: To use CS Routing, you need to configure a RM220-111 Digital In/Out/GPIO module within the DSP frame. Also, it will *only work in conjunction with a DHD Router Control Panel RM420-018 or a Yellowtec Intellimix*.

To set up CS Routing, do the following:

1. Connect a DHD Router Control Panel RM420-018 or the Yellowtec Intellimix to a RM220-111 Digital In/Out/GPIO module. Make sure, that the control input and the output you want to use for routing *share the same RJ45 socket!* (See also “RM220-111 Digital In/Out/GPIO module, 8 channels” on page 95.)

2. Start the RM2200D software in Configuration Mode, connect to the DSP frame. Select the tab `Frame I/O` in the configuration dialog.

3. Find the RM220-111 Digital In/Out/GPIO module you connected the Router Panel or Intellimix to. Open its configuration dialog by double-clicking it.

4. Select the *digital output* the external device is connected to. Check the checkbox `CS Routing information` for this output.

5. Upload the new Config file to the DSP frame.

6. Now the Router Panel or Intellimix can send control information using the input associated to the output you just configured. The output will then carry the audio signal selected by the CS Routing commands.

3. Installing the RM2200D Software

Before you can use the RM2200D software, you need to install it on a PC connected to the DSP frame. This PC needs to run the Microsoft Windows XP operation system.

Important Note: The RM2200D software has been developed and tested on Windows XP *only*! Depending on the actual configuration of your PC you might be able to run it on other versions of Microsoft Windows as well. *However, if you try it, you do so entirely at your own risk! DHD does not recommend running the RM2200D software on any other versions of Windows!*

To install the software, use the setup program on the CD shipped with the RM2200D. If you insert the CD into the PC, the software will start automatically. If the setup program does not start automatically, you can run it by hand. Just open the CD within the Windows Explorer and navigate into the folder `Setup`. Double click the program named `Setup` and the software will start.

Now, follow the instructions on screen and the setup program will install all the necessary files on the harddisk of your PC. It will also create an alias for the RM2200D software in the `Start` menu of Windows. During the setup process, you will be asked for the installation directory and the place of the alias within the hierarchy of the `Start` menu. If you do not have any special requirements, just accept the default values. After that, use the Windows `Start` menu to run the RM2200D software. If you use it for the first time, you need to connect to a DSP frame, using the tab `Connection` in the Configuration Mode of the software. After that, they software will try to re-connect to the selected DSP frame any time you start it again. (See also “Connection - Configuring the Network Identity” on page 82.)

Normally, this is all you need to know for everyday use of the software. However, sometimes you need to navigate the directory structure of it, especially when dealing with configuration files, firmware updates or logfiles. In these cases you should know about the following directories in the RM2200D software folder:

- `Configurations.` Use this directory to store configuration files of the RM2200D software. When created first by the installer, it will contain a file called `DEFAULT.cfg`. This file contains a default configuration you can use a starting point for your own customized configuration. (See also “About Configuration Data” on page 51.)
- `Firmware.` This directory contains the firmware files for the DSP frame. When created first by the installer, it will contain the firmware version shipped with the DSP frame. Normally, you do not need to change the firmware in the DSP frame. However, if you download a new firmware revision from the DHD website, store it here. This allows you to “downgrade” to an older version, if necessary. (See also “Managing the Firmware” on page 52.)
- `Logfiles.` This directory is used by the RM2200D software to store the logfiles it writes during its operation. You only need to access these files when told so by DHD support staff. (See also “Protocol - Monitoring the CAN-Bus and Sending Commands” on page 86.)

If necessary, you can also start the RM2200D software from the command line. This feature is mostly used with customized startup scripts, for example if you want a PC

next to the mixing desk to start the RM2200D software automatically. You can use the following command line parameters:

Parameter	Function	Example
`FixLeft`	Place the left edge of the application window horizontally. The value describes the offset in pixels. If the window extends beyond the screen to the right, it is clipped.	`FixLeft=200` places the applications window 200 pixels from the left edge of the monitor.
`FixWidth`	Set the total width of the application window in pixels. If the value is smaller than the actual width the window is clipped.	`FixWidth=1024` changes the width of the application window from the current screen width to 1024 pixels.
`Monitor`	*For systems with multiple monitors only:* Set the number of the monitor to display the application on.	`Monitor=2` places the application window on the second monitor of the system.

Important Note: When you start the RM2200D software using command line parameters, sometimes things might not work as you expect. This is especially the case when you first set up customized scripts and test different parameters.

Please note, that you can not damage the software by using the wrong parameters – it just won't work as expected.

Also, do not use the parameter `Monitor` *unless your PC system provides indeed two or more monitors!*

Here are a few tips for working with command line parameters:

- You can use all parameters together, if necessary.
- If the application window "disappears" from the screen, you are very likely to use the wrong parameters. The window is drawn "off screen" and you can not use it with the mouse any more. In such a case, use the key combination Alt+F4 to quit the program and change the parameters.
- If you set up the software to work on a multiple monitor systems, the application window sometimes appears on the wrong monitor. In such a case, change the parameter `Monitor` to a different value until you get the desired result. However, if your combination of PC hardware, graphics card and graphics driver does not work properly with the RM2200D software, ask your local DHD dealer for technical support.
- Do not "clone" startup scripts from one PC system to another without proper testing! Never assume that two systems are exactly the same. Instead, test every script if it runs properly on the system you have just set up.

4. Using the RM2200D Software in Display Mode

4.1 Overview

You use the RM2200D software to both configure the system according to your application and to monitor its operation. Thus it works in two main modes: *Configuration Mode* and *Display Mode*.

You use the*Configuration Mode* to set up a new RM2200D system or to change a configuration already in use. (See also “RM2200D Software Configuration Reference” on page 50.)

In *Display Mode*, the RM2200D software displays additional information about the current state of the system. This information is either not available at the mixing desk itself or is rendered more concise on the PC monitor. During normal operation of the RM2200D, the software uses the **Small Screen Display** for status information. (See “Small Screen Display” on page 44.)

Full Screen Display only becomes active when you select a fader channel to change its parameters. (See “Full Screen Display” on page 46.)

Note: Once it is set up, you can use the RM2200D without any PC and software. But if you would like to monitor the operation of the system in more detail, it is recommended you use the RM2200D software in Display Mode.

To use the software, you need to run it on a PC with Windows XP. This PC needs a network connection to the RM2200D.

Important Note: Before you can use the RM2200D software to configure and monitor a DSP frame, you need to connect to it. Use the dialog `Connection` in Configuration Mode to connect to the RM2200D. (See also “Connection - Configuring the Network Identity” on page 82.) Please note, that both the PC and the RM2200D must be able to exchange UDP messages on Port 2201. In some networks this is not possible due to router and firewall setups. If this is the case, please talk to the network administrator.

4.2 Small Screen Display

During normal operation, the RM2200D software draws this display at the bottom of your PC monitor, as shown in the following picture.

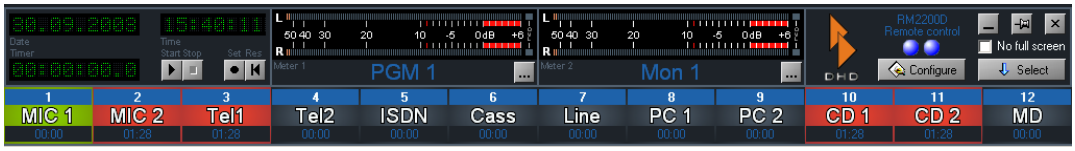


Figure I–11: Small screen display of the RM2200D software.

The bottom row of the display shows the **channel status indicators** for each channel on the mixing desk. The number on top of each indicator and the label tell you, which channel on the mixing desk is displayed.

The timer below the label shows the elapsed time since the last fader start event. The channel status indicators can have different colors showing different states. These colors are shown in the following table, the highest priority is on top:

Color of channel status indicator	Meaning
Yellow	Channel is in Cue Mode.
Green	Channel is in Select Mode.
Red	Channel is active, fader is open.
Off (Black)	Channel is off, fader is closed.

If a condition with a higher priority occurs, it overwrites the current display of the channel status indicator.

In the top row the following information is displayed:

- `Date` and `Time` show the current date and time. The actual values are read from the PCs clock. It is recommended to synchronize this clock to a reference clock or a time server.
- `Timer` is a stopwatch. It can count up or down and is controlled by fader start events. To set the timer, click the button `Set`. The icons on the buttons will then change to arrows which you can use to set the desired count down time. Count down will start when you click the button `Start` or open a fader. To stop the timer, click the button `Stop` or close the fader. To reset the timer, use the button `Reset`.
- `Meter 1 and 2` are two independent level meters. You can use them to display the levels of any signal on the audio bus of the RM2200D. The signals include available inputs, summing and Aux busses, clean feeds and monitor busses. To change the input signal, click the button ... next to the desired meter and choose another source from the Audio Sources window.

In the top right corner of the window are some more interface elements, listed from left to right:

- If you click on the `DHD logo`, your web browser will open the homepage of DHD.
- The button `Configure` switches the software to Configuration Mode, the button `Select` closes a Full Screen Display, if one is open.
- The two LEDs labelled `RM2200D Remote Control` show the status of the network connection similar to a network adapter or switch: The left LED should be always on, if the network link is available, the right one flickers according to the network traffic.
- The checkbox `No full screen` prevents the Full Screen Display from opening, if it is checked.
- The three small icons in the top right corner do the following: The leftmost minimizes the RM2200D software into the Windows task bar, the middle one keeps the Small Screen Display always on top of all other windows, if the pin icon is “plugged in”. The rightmost (the cross) closes the RM2200D software with a confirmation dialog.

The display changes from Small Screen Mode to Full Screen Mode, if:

- You press the `Select` key of any fader channel on the mixing desk.
- You click one of the channel status indicators at the bottom row of the Small Screen Display, thus selecting it from the software. On the mixing desk, the `Select` LED on the selected fader channel will light up.

In Full Screen Display Mode, it shows the properties of the channel currently selected on the mixing desk. The currently selected channel status indicator changes its color to *green*. If you press another `Select` key on the mixing desk or click another channel status indicator in the software, the display changes according to the state of the selected channel. Full Screen Display changes back to Small Screen Display when:

- You press the currently active `Select` key on the mixing desk, thus deactivating it.
- You click the currently active channel status indicator again.
- You click the button `Select` (top right of the Small Screen Display). This hides the currently active Full Screen Display.

If the checkbox `No fullscreen` is checked, the software does not open the Full Screen Display, even if you select a channel.

4.3 Full Screen Display

The RM2200D software changes to Full Screen Display, as soon as you press a `Select` key in one of fader channels on the mixing desk or click on one of the channel status indicators in the RM2200D software. The Full Screen Display is shown in the following picture:

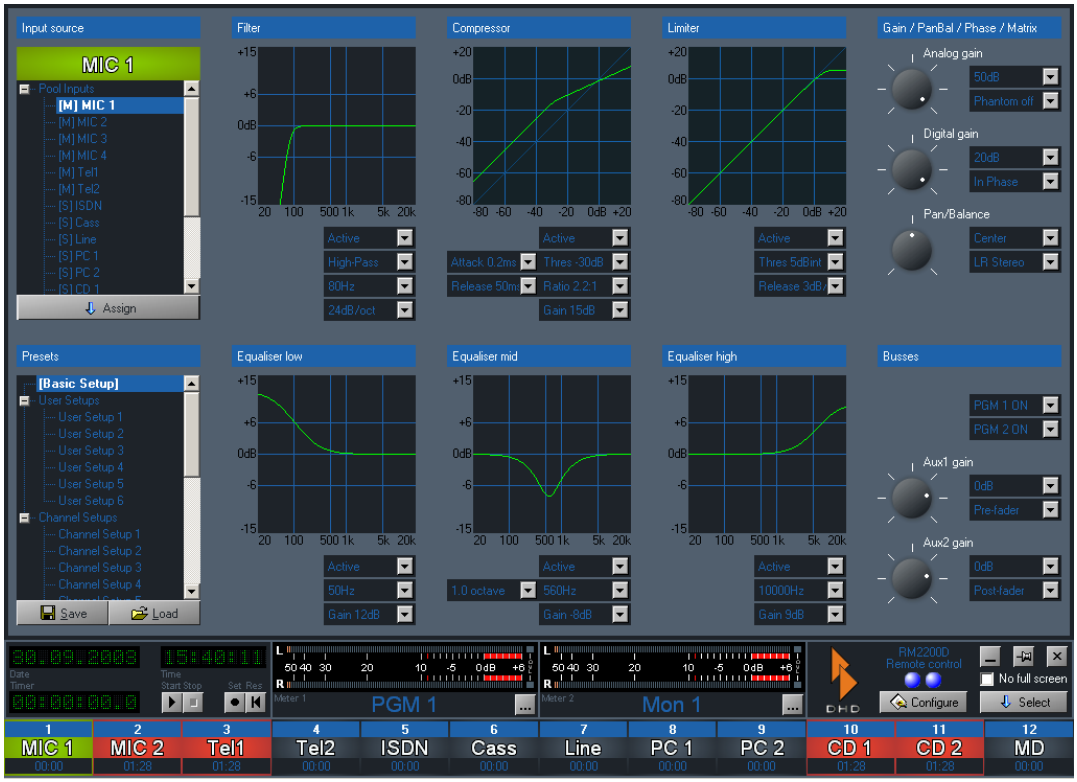


Figure I–12: Full Screen Display for channel “Mic 1”.

It works like this: If you change some settings on the mixing desk, the monitor display in the RM2200D software will reflect this change in real time. The other way round, you can use the interface elements RM2200D software to change the settings in the mixer “live”. Thus, the control elements of the selected channel on the mixing desk and the software work in parallel.

Important Note: The Full Screen Display is not activated, when the checkbox `No full screen` is checked!

The state of the selected channel is displayed in several panes. If you change any value in these panes, the new values are transmitted “live” to the RM2200D. The following list gives you an overview of the values you can change in Full Screen Display:

- Input Source: Here you select which audio signal is assigned as input to the selected fader channel. To change the current selection, select the new input in the signal list and click the button Assign. The labels for the name of the selected input will change accordingly. Please note, that in the signal list “[M]” denotes a mono input, “[S]” a stereo input.
- Presets: This section allows you to save the current state of the selected channel to a setup. You can also load an existing setup into the selected channel. You can use both User and Channel Setups to store the information. Select the desired setup in the list and click the button Load or Save. Please note, that the setups are stored within the RM2200D, not on the PC! (See also “Using Setups” on page 25.)

- Filter: Here you can change the settings for the variable high pass or low pass filter:

Parameter	Range
Frequency	22Hz … 20000Hz
Characteristics curve	high pass or low pass
Filter grade	6, 12, 18 or 24 dB/octave

- `Compressor:` Here you can change the settings for the compressor:

Parameter	Range
Threshold	-50dB … +10dB
Ratio	1.0:1 … 5.0:1
Gain	0dB … 30dB
Attack time	0.2ms … 50ms
Release speed	3dB/sec … 20dB/sec

- `Limiter:` Here you can change the settings for the limiter:

Parameter	Range
Treshold	-20dB intern … +20dB intern
Release time	50ms … 10s

- Gain/PanBal/Phase/Matrix: Here you can change the settings for analog and digital gain, switch phantom power for microphone inputs on or off and reverse the phase of the input signals. For mono inputs you can set the panorama, for stereo inputs the balance. For stereo inputs you can define how the two input channels (left and right) are treated. You can change the following settings using the pop-up menus and rotary knobs (click the knob and drag with the mouse to rotate):

Parameter	Range
Analog gain (RM220-122 only)	0dB … 50dB
48V phantom power (only RM220-122)	on or off
Digital gain	-20dB … +20dB
Phase reverse	on or off
Panorama (mono input only)	
Balance (stereo input only)	

You can use the following channel mappings when dealing with stereo inputs:

Displayed Value	Channel mapping
LR stereo	left to left and right to right
LL mono	left to left and left to right
RR mono	right to left and right to right
RL reverse stereo	right to left and left to right
Mono 0dB	left + right, summation with 0db
Mono -3dB	left + right, summation with -3dB
Mono -6dB	left + right, summation with -6dB

- Equaliser low, Equaliser mid, Equaliser high: These are three independent equalisers; you can set up any of them seperately. You can select from three characteristics: shelving low, shelving high and full parametric band:

EQ type	Parameter	Range
Shelving low (EQ low)	Frequency	22Hz ... 1000Hz
	Gain	-15dB ... +15dB
Parametric bell (EQ mid)	Frequency	22Hz ... 20000Hz
	Gain	-15dB ... +15dB
	Bandwith	0.3 ... 3.0 octaves
Shelving high (EQ high)	Frequency	1000Hz ... 20000Hz
	Gain	-15dB ... +15dB

- Busses:In this section you can assign the signal of the selected channel to either Program Bus 1 (PGM 1 ON) or Program Bus 2 (PGM 2 ON) or to both. Use the top two pop-up menus for this selection.

  To change the Aux settings for the selected channels, use the two rotary knobs to set the gain. Use the pop-up menus next to them to set the Aux type:

Parameter	Range
Aux 1 gain	off, -60dB ... +15dB
Aux 1 type	Pre Fader, After Fader, Pre Fader Switch (Pre Fader while fader is closed; off when fader is opened.)
Aux 2 gain	off, -60dB ... +15dB
Aux 2 type	Pre Fader, After Fader, Pre Fader Switch (Pre Fader while fader is closed; off when fader is opened.)

5. RM2200D Software Configuration Reference

5.1 Overview

You use the *Configuration Mode* of the RM2200D software for the initial setup of new systems and maintenance tasks on running systems.

You activate the Configuration Mode by clicking on the button `Configure` which is located bottom right next to the orange DHD logo. The configuration dialog with various options appears. You can close this dialog box either by clicking the Windows close box in the top right corner window or by using the button `Close` in the bottom right corner of the dialog. (See the following screenshot.)

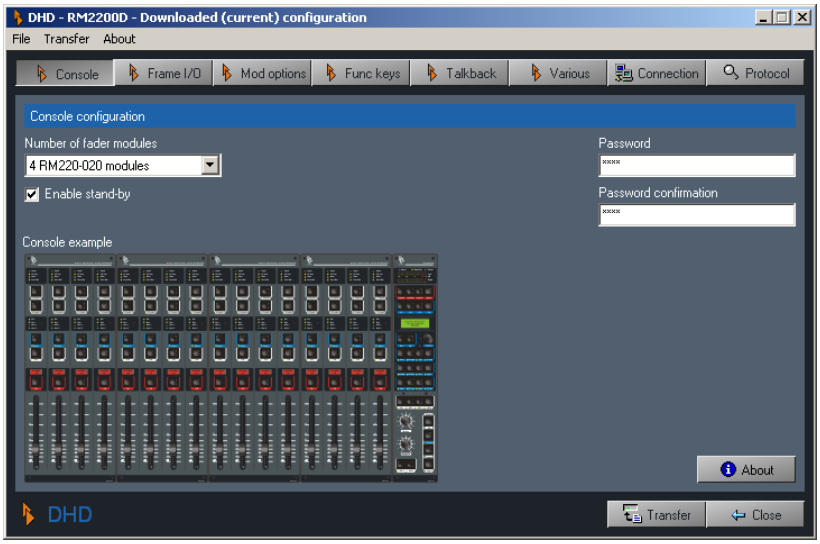


Figure I–13: The software in Configuration Mode, showing the dialog “Console”.

Tip: You can protect access to the Configuration Mode of the RM2200D software using a password. You can change this password in the dialog Console when the RM2200D software is in Configuration Mode.

If you are asked for a password, but you have no password set yet, just enter the string standard password „default“.

The configuration dialog contains several tabs which activate subpanes for the different options. The subpanes are:

- `Console.` Here you select the number of modules for the mixing desk. You can also set the password to protect access to the configuration dialog. (See “Console - Choosing Modules” on page 58.)
- `Frame I/O.` Use this dialog to select the modules for the DSP frame and to set up the properties of these modules. (See “Frame I/O - Configuring the DSP Frame” on page 59.)
- `Mod. options.` You can use the settings in this dialog to change the way the fader modules and the Master Control Module of the mixing desk work. (See “Mod. Options - Configuring Module Options” on page 76.)

- `Func. keys.` Here you set up how the push button keys on the mixing desk work. (See “Func keys - Configuring Function Keys” on page 78.)
- `Talkback.` In this dialog you configure the talkback system of the RM2200D. (See “Talkback” on page 79.)
- `Various.` Use this dialog to select the audio sources for the internal level meters in the Master Control Module and for the graphical meters in the RM2200D software. You can also setup the clean feed options here. (See “Various - Configuring Level Meters and Clean Feeds” on page 80.)
- `Connection.` Use this dialog to connect to a RM2200D system. If necessary, you can also change the IP address of the device here. (See “Connection - Configuring the Network Identity” on page 82.)
- `Protocol.` Use this dialog to monitor the activity on the CAN bus and transmit single commands from the software. Besides, you can control the way the system log works from here. (See “Protocol - Monitoring the CAN-Bus and Sending Commands” on page 86.)

Connecting to the RM2200D and Transferring Data

If you connect to the RM2200D for the first time, use the dialog `Connection` to do so. After that, the software keeps the connection alive. Even if you quit the software and restart it later, it will keep the information and try to connect to the last known RM2200D. You can monitor the state of the connection with the two LED icons on the right side of the Small Screen Display. (See also “Connection - Configuring the Network Identity” on page 82.)

Important Note: If you can not connect to the RM2200D, check cables and network configuration. Also make sure, you are not running any other DHD software on your computer simultaneously. If you do so, you could experience problems receiving data from the RM2200D.

About Configuration Data

The RM2200D software uses special data structures to store the changes you make to the configuration. These data structures are called **Configuration Dataset** or **Config** for short. Usually, a Config is stored within the communications controller of the RM2200D. Using the RM2200D software, you can download it from there, edit it and finally upload your changes back to the DSP frame.

Every RM2200D is shipped from DHD with a standard Config preloaded. This Config is also on the CD included with the RM2200D. You can use it as a starting point for your own changes.

Important Note: Please note, that you need to upload a changed Config back to the RM2200D for the changes to take effect. There is no “Auto-update” function.

You can also use the commands in the `File` to create a new Config, to save the current Config to disk or to open a saved Config file. It is good practice to keep backups of your Config files and give them descriptive names.

To transfer a Config, you can either click the button `Transfer` at the bottom of the configuration dialog or use the command `Up-/Download configuration` from the menu `Transfer`. The following dialog appears:

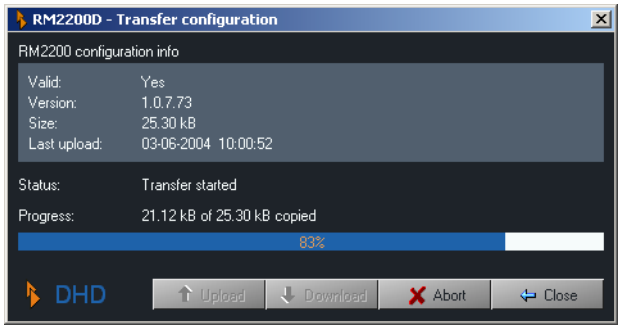


Figure I–14: Dialog for transferring configuration data. Transfer in progress.

In the upper half of the dialog you can read detailed information about the current Config. In the lower half you can start the up- or download and monitor the progress of the data transfer. Once the transfer has finished, use the `Close` button to dismiss the dialog.

Caution: If you are editing a new Config or changing an existing one, make sure you save your current edits to disk before attempting any transfer operations. Currently the software does not double-check for unsaved data and under certain conditions it may discard unsaved edits. A future version of the software will fix this issue.

Managing the Firmware

The “operation system” of the RM2200D runs in the RM220-950 controller module. This special software is called **Firmware** and stays resident in the flash memory of the controller, even when the RM2200D is switched off. Usually, you do not need to worry about the firmware, it just works in the background. However, DHD may release a new firmware version from time to time. This new version may fix bugs or implement new functions.

Important Note: If your RM2200D system runs fine even with an older firmware version, *do not change it without need!* Only update if the new version fixes some bugs which affect you or if told so by DHD support.

Also keep in mind, that the version of the firmware and the version of the RM2200D software are closely related. A certain firmware version may require a certain version of the software and vice versa. *If you use mismatching versions, you may run into problems!* Before changing your setup, be sure to check the RM2200D website for details at:

www.rm2200d.com

To update the firmware, choose the tab `Frame I/O` and click the button `Firmware`. The following dialog opens:

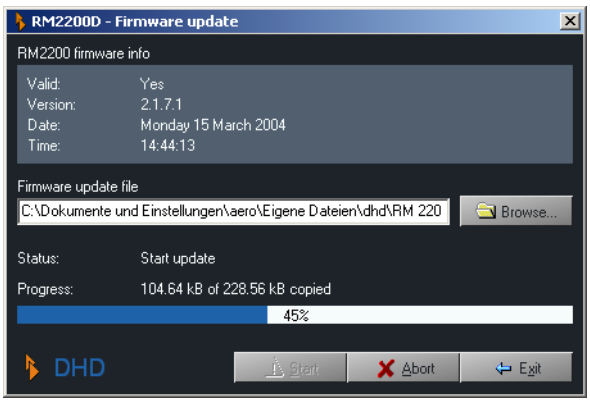


Figure I–15: Firmware update dialog, update transfer in progress.

In the upper half of it you can read detailled information about the firmware version currently running in the RM2200D. To update the firmware, use the button `Browse...` to locate the updater file. Next, click the button `Start` to start the upload . This process will take some seconds, the progress bar will show the current status. When the upload completed successfully, you need to reset the DSP frame to activate the new firmware. A confirmation dialog appears. Click the button `Yes` there and the DSP frame will reset itself.

Caution: Do not reset the DSP frame while the RM2200D is used or even On Air! Although you can not damage the system, a reset loads the Basic Setup 0 as defined in the Full Screen Display. This setup can be different from the current state of the RM2200D and therefore affect the audio output of the system in unpredictable ways. (See “Full Screen Display” on page 46.)

Audio Sources

Audio sources are all signals that are available within in RM2200D. When you configure the system, you often need to assign audio sources to certain things - as sources for output connectors, as talkback signals, clean feed sources etc. In all these cases, you use the Audio Sources window to select the desired signal.

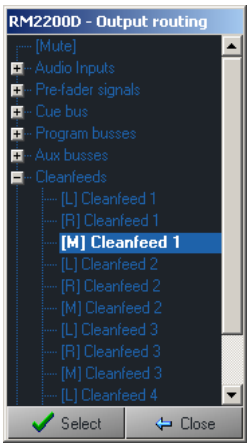


Figure I–16: Audio Sources window , section “Cleanfeeds” expanded.

The Audio Sources window is divided in several sections. The signals have names, they are either fixed or (in the case of input signals) you can change them in the dialog `Frame I/O` of the RM2200D software.

The available audio sources are divided into the following sections. Stereo signals are split in left (“L”) and right channel (“R”). Mono signals - like microphone inputs - are labeled “M”:

Section	Signals included
Mute	This is the “No Signal” signal. If you select it as audio source, the signal will just be silence.
Audio Inputs	These are all input signals connected to the DSP frame. The signals show the labels they were assigned in the dialog `Frame I/O`. However, the inputs of the RM220-228 Analog Input Selector module are *not available.* (See also “RM220-228 Analog In Selector Module” on page 71.)
Pre-fader signals	For each fader in the mixing desk, you can access the signal of its currently assigned input channel. This channel is taken *before* the fader affects the signal level! Please note, that the signal will change instantly, if you assign another input signal to the fader channel!
Cue bus	This is the signal currently on the cue bus. It is available both in mono and stereo.

Section	Signals included
Program busses	The two program bus signals are available here, both in mono and stereo.
Aux busses	The two Aux bus signals are available here, both in mono and stereo.
Cleanfeeds	The four clean feed signals are available here, both in mono and stereo.
Monitors	This category contains the signals of all five monitor busses. The signals are available in stereo. If the label is just `Monitor <No.>`, the signal is not level controlled. The other attributes have these meanings (not all of them are available on all monitor signals): • *Levelled.* The signal is volume controlled, mostly using the keys F1…F4 on the mixing desk together with the Control Knob. • *Headphone.* The level of this signal is controlled with the potentiometer `Headphone` on the mixing desk. • *Loudspeaker.* The level of this signal is controlled with the potentiometer `Loudspeaker` on the mixing desk.
Monitor selector inputs	These are the four monitoring inputs of the RM220-228 Analog In Selector Module. They are available *within the monitoring system only* and only if the module is contained within the DSP frame. (See also “RM220-228 Analog In Selector Module” on page 71.)

Logic Sources

Logic sources control many of the functions within the RM2200D. A logic source is a condition which is either active (“true”) or inactive (“false”). If you need to assign a

logic source to a certain function, you need to select it from the Logic Sources window.

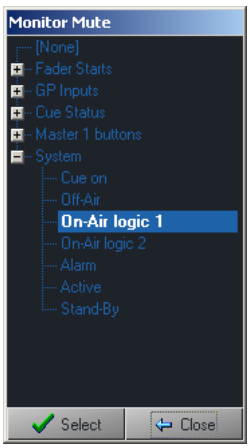


Figure I–17: Logic Sources window, section "System" expanded.

The Logic Sources window is divided into these sections:

Section	Logic sources included
None	This logic source is always inactive. If you select it to control a function, it will never change.
Fader Starts	Each input signal has a logic source "Fader Start" assigned to it. This condition becomes active, if the input signal is currently assigned to a fader channel *and* the fader is open. The labels of the logic sources correspond to the labels set in the dialog `Frame I/O`.
GPI Inputs	This category contains all GPI signals available in the system. The labels of the logic sources correspond to the labels set in the dialog `Frame I/O`.
Cue Status	Each input signal has a logic source "Cue Status" assigned to it. This condition becomes active, if the input signal is currently assigned to a fader channel *and* the Cue key is active on this fader channel. The labels of the logic sources correspond to the labels set in the dialog `Frame I/O`.

Section	Logic sources included
Master 1 buttons	This category contains all keys available on the Master Control Module. Any of this logic sources becomes active, if the corresponding key is pressed on the Master Control Module.
System	These logic source are controlled from the RM2200D itself. They are: • *Cue on.* At least one Cue key is currently active. • *Off-Air.* Both `On-Air logic 1` and `On-Air logic 2` are inactive. • *On-Air Logic 1*. At least one of the input signals linked to `On-Air logic 1` is open. • *On-Air Logic 2*. At least one of the input signals linked to `On-Air logic 2` is open. • *Alarm.* The RM2200D has detected an alarm condition. The `Alarm` LED on top of the Master Control Module is also on. • *Active.* The RM2200D is not in Stand By Mode. The `Stand By` LED on top of the Master Control Module is off. • *Stand-By.* The RM2200D is in Stand By mode. The `Stand By` LED on top of the Master Control Module is on.

5.2 Console - Choosing Modules

Use this dialog to select the number of fader modules for the mixing desk. Use the pop-up menu `Number of fader modules` to choose between one (4 faders) and four fader modules (16 faders). The console display in the configuration dialog changes appropriately.

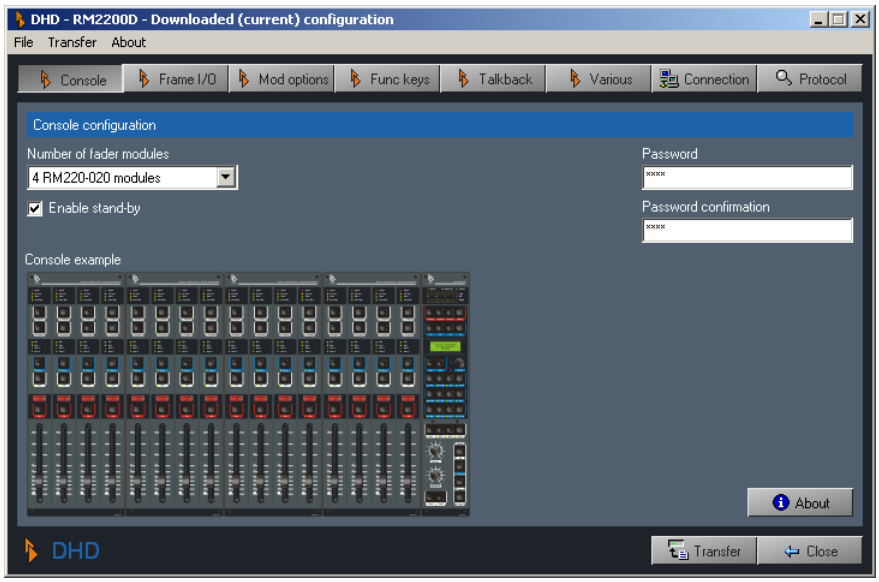


Figure I–18: Configuration dialog “Console” with four fader modules.

Important Note: It is possible to configure more mixer modules than actually available in the mixing desk. This will do no damage, but you are not able to access the ressources assigned to the non-existing fader module from the mixing desk.

If you check the checkbox `Enable stand-by`, you can put the RM2200D into Stand By Mode from the mixing desk. To activate Stand By Mode, press and hold the keys “Pgm 1” and “ESC” together for five seconds. To reactivate the system, press the key “OK” for one second.

To protect access to the Configuration Mode of the RM2200D software, you can enter a password. Type it into the input box `Password`; type it again into the input box `Password confirmation`. If these two passwords do not match, the button `Close` is disabled.

Important Note: When you entered a password, the Configuration Mode of the software is not protected until you quit and restart the RM2200D software. Also, once you entered your password to access the Configuration Mode, it will stay unprotected until you quit and restart the program.

Note: If you want to clear a set password, delete both password input fields.

If you are asked for a password, but you have no password set yet, just enter the string standard password „default“.

5.3 Frame I/O - Configuring the DSP Frame

Use this dialog to configure the modules in the DSP frame, to update the firmware and to reset the DSP frame.

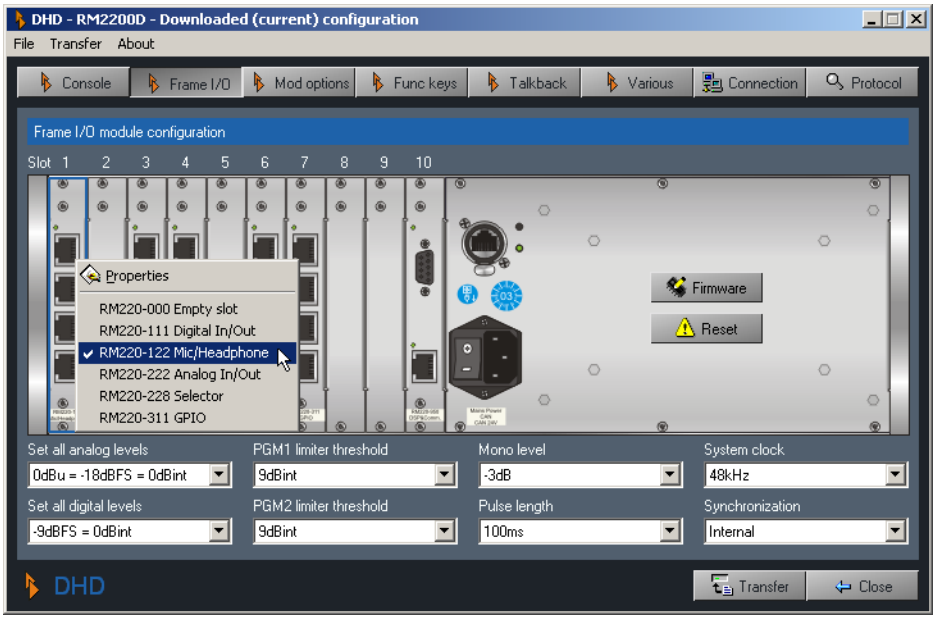


Figure I–19: Configuration dialog “Frame I/O” with module selection menu.

To assign a module to a slot, right-click on the slot and choose the desired module from the context menu. To change the settings of a certain module, double-click on it. This will open the appropriate configuration dialog for the choosen module.

Tip: If you let the mouse pointer rest over any module in the DSP frame, it will display its number as a tool tip.

To update the firmware, click the button `Firmware`. Choose the file with the new firmware and upload it to the DSP frame. (See also “Managing the Firmware” on page 52.)

To reset the DSP frame, click the button `Reset`. A confirmation dialog appears. If you click yes there, the DSP frame resets itself.

Caution: Do not reset the DSP frame while the RM2200D is used or even On Air! Although you can not damage the system, a reset loads the Basic Setup 0 as defined in the Full Screen Display. This setup can be different from the current state of the RM2200D and therefore affect the audio output of the mixer in unpredictable ways. (See “Full Screen Display” on page 46.)

Below the picture of the DSP frame there are two rows with pop-up menus, which control the following options:

- `Set all analog levels.` Here you adjust the value of all analog levels with respect to the internal “0 dB” reference level.

- `Set all digital levels.` Here you adjust the value of all digital levels with respect to the internal “0 dB” reference level.
- `PGM1 limiter threshold.` Adjust the threshold for the limiter of the “PGM1” signal from -20 dBint to +20 dBint. To turn the limiter off, choose option “Off”.
- `PGM2 limiter threshold.` Adjust the threshold for the limiter of the “PGM2” signal from -20 dBint to +20 dBint. To turn the limiter off, choose option “Off”.
- `Mono level.` Use this pop-up menu to control how all internal mono summing functions work. This affects mono signal generation for monitoring and mono busses. You can select values from 0 dB to -6 dB in 1 dB steps.
- Pulse length. This setting controls the length of the GPO pulse outputs. The pulse length can vary between 50 ms and 500 ms.
- System clock. Select the frequency of the internal system clock here: either 44.1 kHz or 48 kHz.
- Synchronisation. Select the source the RM2200D should synchronize to. Use Internal for the internal clock source or any available digital input.

RM220-111 Digital In/Out/GPIO Module

Features

Digital In/Out/GPIO module, 8 channels (4 stereo), 4 RJ45 connectors. The module provides:

- 4 AES3/EBU/SPDIF inputs.
- 4 AES3/EBU/SPDIF outputs.
- 4 async. input sample rate converters.
- 4 general purpose inputs, TTL.
- 4 general purpose outputs, open collector.

(See also “RM220-111 Digital In/Out/GPIO module, 8 channels” on page 95.)

Configuring Digital Audio Inputs

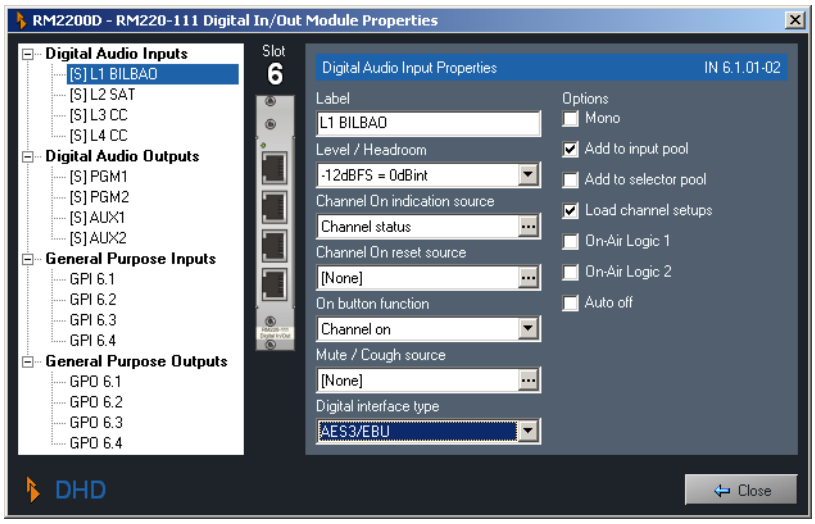


Figure I–20: Configuration dialog for the RM220-111 Digital In/Out/GPIO module.

- `Label.` Enter a descriptive name for the input here. This name will appear in all other parts of the software to identify this input.
- `Level/Headroom.` Adjust the headroom for this input between -12 dBu and +18 dBu. This value overrides the global setting in the dialog `Console`. (See also “Console - Choosing Modules” on page 58.)
- `Channel On indication source.` Select here, which logic source lights the “Channel On” indicator on top of the fader. Default value is `Channel Status`, displaying the current status of the fader. If you want to change it, click the button ... and select any other logic source from the Logic Sources window.
- `Channel On reset source.` Select here, which logic source switches the channel off when activated.
- `On button function.` Use this option to control the function of the “ON” button on top of the fader. These values are available:
  1. `Channel on.` Audio is switched on if both the button “ON” is active and the fader is open.

2. `On start.` Audio is switched on, when the button “ON” is activated, regardless if the fader is open or not.
3. `Fader start on/off.` Audio is switched on as soon as the fader is opened. The “ON” button switches only the fader start signal on and off.

- `Mute/Cough Source.` Select here, which logic source mutes the input. Click the button ... to select any other logic source from the Logic Sources window.
- `Digital interface type.` Set this option according to the digital device you want to connect to this input. Available options are `AES3/EBU` and `S/PDIF`.
- `Mono.` Check this box when using mono signals as inputs. If this option is active, the display of the audio inputs in the left tree display contains two mono inputs instead of one stereo input. Mono inputs have a label “[M]” in front of the entry, stereo inputs are labeled“[S]”. Also, the two popup menus for output routing change to one for each channel.
- `Add to input pool.` If you check this box, the input is available as fader input in the Input Pool of the RM2200D. (See also “Input Pool, Fixed Faders and Selectors” on page 6.)
- `Add to selector pool.` If you check this box, the input is available as a monitor input in the Selector Pool. (See also “Input Pool, Fixed Faders and Selectors” on page 6.)
- `Load channel setup.` If you check this box, you allow the user to load channel setups into this channel. (See also “Using Setups” on page 25.)
- `On-Air Logic 1.` If you check this box, opening the fader will activate the logic source `On-Air logic 1`. You can use this for example to switch on the red light in the control room.
- `On-Air Logic 2.` If you check this box, opening the fader will activate the logic source `On-Air logic 2`. You can use this for example to switch on the red light in the studio.
- `Auto off.` If you check this box, closing the fader will switch off the Channel On state when the fader is closed.

Configuring Digital Audio Outputs

- `Label.` Enter a descriptive name for the input here. This name will appear in all other parts of the software to identify this input.
- `Level/Headroom.` Adjust the headroom for this output between -12 dBu and +18 dBu. This value overrides the global setting in the dialog `Console`. (See also “Console - Choosing Modules” on page 58.)
- `Output routing audio source L.` Select here, which internal audio signal is routed to the *left channel* of this output port. To change this setting, click the button ... and choose the desired audio signal from the Audio Sources window. (Left channel signals are labeled “[L]”, right channel signals are labeled “[R]”).
- `Output routing audio source R.` Select here, which internal audio signal is routed to the *right channel* of this output port. To change this setting, click the button ... and choose the desired audio signal from the Audio Sources window.
- `Mono.` Check this box when using this output for mono signals. If this option is active, the display of the audio outputs in the left tree display contains two mono outputs instead of one stereo output. Mono outputs have a label “[M]” in

front of the entry, stereo outputs are labeled “[S]”. Also, the two popup menus for output routing change to one for each channel.

- `On-Air Logic 1.` If you check this box, the output signal will be muted when the logic source `On-Air logic 1` becomes active. You can use this for example to mute loudspeakers when microphones are opened.
- `On-Air Logic 2.` If you check this box, the output signal will be muted when the logic source `On-Air logic 2` becomes active. You can use this for example to mute loudspeakers when microphones are opened.
- CS Routing information. If you check this box, you enable a special feature called CS Routing to work with this channel.

Important Note: You can enable CS Routing *only* if a properly configured Router Control Panel RM420-018 or a Yellowtec Intellimix is connected to this output. Also, the input assigned to the output must be connected to the RM420-018 or the Intellimix *using the same RJ45 connector on a RM220-111 Digital In/Out/ GPIO module.*

These two devices can control which internal audio signals of the RM2200D are routed to the outputs of the RM2200D, which in turn are connected to their inputs. They use the Channel Status Bits of the AES/EBU data stream to tell the RM2200D on the *input channel*, which signal it should put onto the *output channel*. To achieve that, in the AES/EBU data stream, the ASCII fields *Source* and *Destination* of the Channel Status Data are used for transferring the corresponding address. Please note, that CS Routing only works for AES/EBU inputs and outputs sharing *the same RJ 45 socket*!

Configuring General Purpose Inputs

- `Label.` Enter a descriptive name for this GPI here. This name will appear in all other parts of the software to identify this input.
- `Level.` Select the option `Normal` to activate the GPI with a positive voltage. Choose option `Inverted`, if you want the GPI to activate when the input voltage is near zero.

Configuring General Purpose Outputs

- `Label.` Enter a descriptive name for this GPO here. This name will appear in all other parts of the software to identify this output.
- `Type.` Select the kind of output the GPO gives when activated. These options are available:
  1. `Normal.` The GPO carries a positive voltage when activated.
  2. `Inverted.` The GPO carries a voltage near zero when activated.
  3. `Pulse on.` The GPO gives a pulse when activated.
  4. `Pulse off.` The GPO gives a pulse when deactivated. (See also “Frame I/O - Configuring the DSP Frame” on page 59.)
- `Output routing logic source.` Use this setting to assign an internal logic source to the choosen GPO. Click the button ... to select any other logic source from the Logic Sources window.

RM220-122 Mic/Headphone/GPIO Module

Features

Analog Microphone In/Headphone Out/GPIO module, 4 channels (2 stereo), 4 RJ45 connectors. The module provides:

- 4 line inputs, electrically balanced, max. input level 18 dBu.
- 48 V phantom power, can be switched seperately for each microphone input.
- 2 stereo headphone outputs.
- 2 general purpose inputs, TTL with internal pull-up resistor.
- 2 analog control inputs (ACI).
- 4 general purpose outputs, open collector.

(See also “RM220-122 Mic/Headphone/GPIO Module, 4 channels” on page 97.)

Configuring Analog Audio Inputs

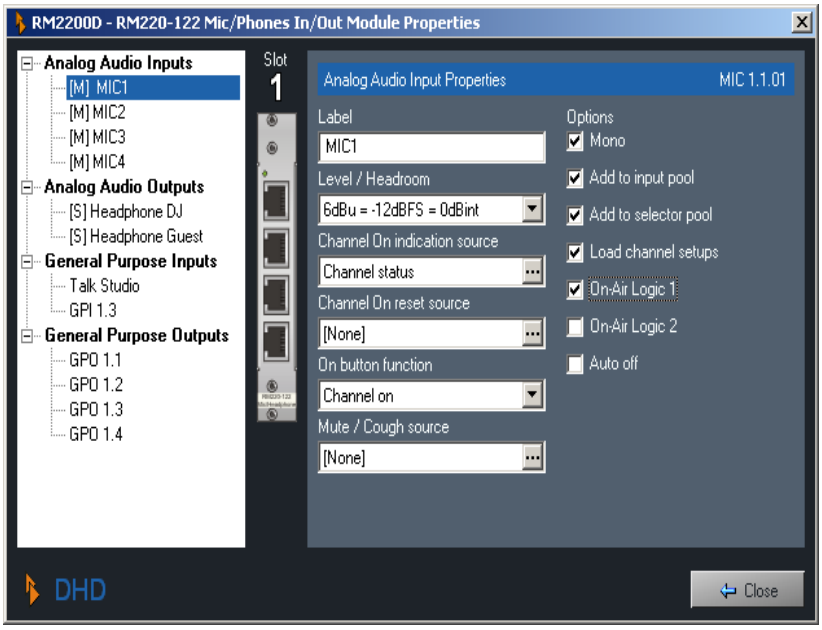


Figure I–21: Configuration dialog of the RM220-122 Mic/Headphone/GPIO module.

- `Label.` Enter a descriptive name for the input here. This name will appear in all other parts of the software to identify this input.
- `Level/Headroom.` Adjust the headroom for this input between -12 dBu and + 18dBu. This value overrides the global setting in the dialog `Console`. (See also “Console - Choosing Modules” on page 58.)
- `Channel On indication source.` Select here, which logic source lights the “Channel On” indicator on top of the fader. Default value is `Channel Status`, displaying the current status of the fader. If you want to change it, click the button ... and select any other logic source from the Logic Sources window.
- `Channel On reset source.` Select here, which logic source switches the channel off when activated.
- `On button function.` Use this option to control the function of the “ON” button on top of the fader. These values are available:

1. `Channel on.` Audio is switched on if both the button “ON” is active and the fader is open.
2. `On start.` Audio is switched on, when the button “ON” is activated, regardless if the fader is open or not.
3. `Fader start on/off.` Audio is switched on as soon as the fader is opened. The “ON” button switches only the fader start signal on and off.

- `Mute/Cough Source.` Select here, which logic source mutes the input. Click the button ... to select any other logic source from the Logic Sources window.
- `Mono.` Check this box when using mono signals as inputs. If this option is active, the display of the audio inputs in the left tree display contains two mono inputs instead of one stereo input. Mono inputs have a label “[M]” in front of the entry, stereo inputs are labeled“[S]”.
- `Add to input pool.` If you check this box, the input is available as fader input in the Input Pool of the RM2200D. (See also “Input Pool, Fixed Faders and Selectors” on page 6.)
- `Add to selector pool.` If you check this box, the input is available as a monitor input in the Selector Pool. (See also “Input Pool, Fixed Faders and Selectors” on page 6.)
- `Load channel setup.` If you check this box, you allow the user to load channel setups into this channel. (See also “Using Setups” on page 25.)
- `On-Air Logic 1.` If you check this box, opening the fader will activate the logic source `On-Air logic 1`. You can use this for example to switch on the red light in the control room.
- `On-Air Logic 2.` If you check this box, opening the fader will activate the logic source `On-Air logic 2`. You can use this for example to switch on the red light in the studio.
- `Auto off.` If you check this box, closing the fader will switch off the Channel On state when the fader is closed.

Configuring Analog Audio Outputs

- `Label.` Enter a descriptive name for the input here. This name will appear in all other parts of the software to identify this input.
- `Level/Headroom.` Adjust the headroom for this output between -12 dBu and +18 dBu. This value overrides the global setting in the dialog `Console`. (See also “Console - Choosing Modules” on page 58.)
- `Output routing audio source L.` Select here, which internal audio signal is routed to the *left channel* of this output port. To change this setting, click the button ... and choose the desired audio signal from the Audio Sources window. (Left channel signals are labeled “[L]”, right channel signals are labeled “[R]”).
- `Output routing audio source R.` Select here, which internal audio signal is routed to the *right channel* of this output port. To change this setting, click the button ... and choose the desired audio signal from the Audio Sources window.
- `Mono.` Check this box when using this output for mono signals. If this option is active, the display of the audio outputs in the left tree display contains two mono outputs instead of one stereo output. Mono outputs have a label “[M]” in front of the entry, stereo outputs are labeled “[S]”. Also, the two popup menus for output routing change to one for each channel.

- `On-Air Logic 1.` If you check this box, the output signal will be muted when the logic source `On-Air logic 1` becomes active. You can use this for example to mute loudspeakers when microphones are opened.
- `On-Air Logic 2.` If you check this box, the output signal will be muted when the logic source `On-Air logic 2` becomes active. You can use this for example to mute loudspeakers when microphones are opened.

Configuring General Purpose Inputs

- `Label.` Enter a descriptive name for this GPI here. This name will appear in all other parts of the software to identify this input.
- `Level.` Select the option `Normal` to activate the GPI with a positive voltage. Choose option `Inverted`, if you want the GPI to activate when the input voltage is near zero.

Configuring General Purpose Outputs

- `Label.` Enter a descriptive name for this GPO here. This name will appear in all other parts of the software to identify this output.
- `Type.` Select the kind of output the GPO gives when activated. These options are available:
  1. `Normal.` The GPO carries a positive voltage when activated.
  2. `Inverted.` The GPO carries a voltage near zero when activated.
  3. `Pulse on.` The GPO gives a pulse when activated.
  4. `Pulse off.` The GPO gives a pulse when deactivated.
- `Output routing logic source.` Use this setting to assign an internal logic source to the choosen GPO. Click the button ... to select any other logic source from the Logic Sources window.

RM220-222 Analog In/Out/GPIO Module

Features

Analog In/Out/GPIO module, 4channels (2 stereo), 4 RJ45 connectors. The module provides:

- 4 line inputs, electrically balanced, max. input level 18 dBu.
- 4 line outputs, electrically balanced, max. output level 18 dBu.
- 4 general purpose inputs, TTL.
- 4 general purpose outputs, open collector.

(See also “RM220-222 Analog In/Out/GPIO Module, 4 channels” on page 99.)

Configuring Analog Audio Inputs

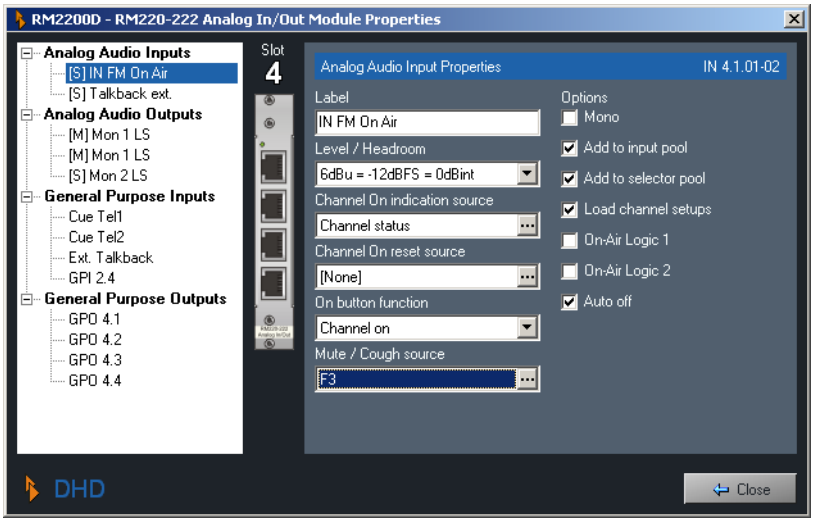


Figure I–22: Configuration dialog of the RM20-222 Analog In/Out/GPIO module.

- `Label.` Enter a descriptive name for the input here. This name will appear in all other parts of the software to identify this input.
- `Level/Headroom.` Adjust the headroom for this input between -12 dBu and +18 dBu. This value overrides the global setting in the dialog `Console`. (See also “Console - Choosing Modules” on page 58.)
- `Channel On indication source.` Select here, which logic source lights the “Channel On” indicator on top of the fader. Default value is `Channel Status`, displaying the current status of the fader. If you want to change it, click the button ... and select any other logic source from the Logic Sources window.
- `Channel On reset source.` Select here, which logic source switches the channel off when activated.
- `On button function.` Use this option to control the function of the “ON” button on top of the fader. These values are available:
  1. `Channel on.` Audio is switched on if both the button “ON” is active and the fader is open.
  2. `On start.` Audio is switched on, when the button “ON” is activated, regardless if the fader is open or not.

3. `Fader start on/off.` Audio is switched on as soon as the fader is opened. The "ON" button switches only the fader start signal on and off.

- `Mute/Cough Source.` Select here, which logic source mutes the input. Click the button ... to select any other logic source from the Logic Sources window.
- `Mono.` Check this box when using mono signals as inputs. If this option is active, the display of the audio inputs in the left tree display contains two mono inputs instead of one stereo input. Mono inputs have a label "[M]" in front of the entry, stereo inputs are labeled "[S]".
- `Add to input pool.` If you check this box, the input is available as fader input in the Input Pool of the RM2200D. (See also "Input Pool, Fixed Faders and Selectors" on page 6.)
- `Add to selector pool.` If you check this box, the input is available as a monitor input in the Selector Pool. (See also "Input Pool, Fixed Faders and Selectors" on page 6.)
- `Load channel setup.` If you check this box, you allow the user to load channel setups into this channel. (See also "Using Setups" on page 25.)
- `On-Air Logic 1.` If you check this box, opening the fader will activate the logic source `On-Air logic 1`. You can use this for example to switch on the red light in the control room.
- `On-Air Logic 2.` If you check this box, opening the fader will activate the logic source `On-Air logic 2`. You can use this for example to switch on the red light in the studio.
- `Auto off.` If you check this box, closing the fader will switch off the Channel On state when the fader is closed.

Configuring Analog Audio Outputs

- `Label.` Enter a descriptive name for the input here. This name will appear in all other parts of the software to identify this input.
- `Level/Headroom.` Adjust the headroom for this output between -12 dBu and +18 dBu. This value overrides the global setting in the dialog `Console`. (See also "Console - Choosing Modules" on page 58.)
- `Output routing audio source L.` Select here, which internal audio signal is routed to the *left channel* of this output port. To change this setting, click the button ... and choose the desired audio signal from the Audio Sources window. (Left channel signals are labeled "[L]", right channel signals are labeled "[R]").
- `Output routing audio source R.` Select here, which internal audio signal is routed to the *right channel* of this output port. To change this setting, click the button ... and choose the desired audio signal from the Audio Sources window.
- `Mono.` Check this box when using this output for mono signals. If this option is active, the display of the audio outputs in the left tree display contains two mono outputs instead of one stereo output. Mono outputs have a label "[M]" in front of the entry, stereo outputs are labeled "[S]". Also, the two popup menus for output routing change to one for each channel.
- `On-Air Logic 1.` If you check this box, the output signal will be muted when the logic source `On-Air logic 1` becomes active. You can use this for example to mute loudspeakers when microphones are opened.

- `On-Air Logic 2.` If you check this box, the output signal will be muted when the logic source `On-Air logic 2` becomes active. You can use this for example to mute loudspeakers when microphones are opened.

Configuring General Purpose Inputs

- `Label.` Enter a descriptive name for this GPI here. This name will appear in all other parts of the software to identify this input.
- `Level.` Select the option `Normal` to activate the GPI with a positive voltage. Choose option `Inverted`, if you want the GPI to activate when the input voltage is near zero.

Configuring General Purpose Outputs

- `Label.` Enter a descriptive name for this GPO here. This name will appear in all other parts of the software to identify this output.
- `Type.` Select the kind of output the GPO gives when activated. These options are available:
  1. `Normal.` The GPO carries a positive voltage when activated.
  2. `Inverted.` The GPO carries a voltage near zero when activated.
  3. `Pulse on.` The GPO gives a pulse when activated.
  4. `Pulse off.` The GPO gives a pulse when deactivated.
- `Output routing logic source.` Use this setting to assign an internal logic source to the choosen GPO. Click the button ... to select any other logic source from the Logic Sources window.

RM220-223 Analog Line In/Out/GPIO Module

Features

Analog Line In/Out/GPIO module, 4channels (2 stereo), 4 RJ45 connectors. The module provides:

- 4 line inputs, electrically balanced, max. input level 24 dBu.
- 4 line outputs, electrically balanced, max. output level 24 dBu.
- 4 general purpose inputs, TTL.
- 4 general purpose outputs, open collector.

(See also “RM220-223 Analog In/Out/GPIO Module, 4 channels” on page 102.)

Configuring Analog Audio Inputs

(See also “Configuring Analog Audio Inputs” on page 67.)

Configuring Analog Audio Outputs

(See also “Configuring Analog Audio Outputs” on page 68.)

Configuring General Purpose Inputs

(See also “Configuring General Purpose Inputs” on page 69.)

Configuring General Purpose Outputs

(See also “Configuring General Purpose Outputs” on page 69.)

RM220-228 Analog In Selector Module

This is a special module. It contains 4 stereo line inputs which can be routed to fader channels using the Input Pool. Additionally, it contains 4 stereo line inputs which can be used for monitoring *only*.

Important Note: Both the fader inputs and the monitor inputs work like a "classic" A,B,C,D input selector. You can only use *one* input signal as fader input at any time. Similar, you can only use *one* monitor input as source for the RM2200D monitoring system. *You can not use the monitor inputs as signal sources for fader channels!*

Please note also, that you can only use *one* module RM420-228 in a RM2200D. This gives youe one selector on one fader and one selector in the monitoring section!

Please consider these restrictions when designing your studio setup!

(See also "RM220-228 Analog In Selector Module (stereo)" on page 105.)

The module provides:

- 1 stereo input selector with A,B,C,D stereo inputs to route signals into fader channels.
- 1 stereo input selector with A,B,C,D stereo inputs to route signals into the monitoring system.
- 16 line inputs, electrically balanced, max. input level 18 dBu.
- 4 RJ45 connectors

Configuring Analog Audio Inputs

- `Label.` Enter a descriptive name for the input here. This name will appear in all other parts of the software to identify this input.
- `Level/Headroom.` Adjust the headroom for this input between -12 dBu and +18 dBu. This value overrides the global setting in the dialog `Console`.
- `Channel On indication source.` Select here, which logic source lights the "Channel On" indicator on top of the fader. Default value is `Channel Status`, displaying the current status of the fader. If you want to change it, click the button ... and select any other logic source from the Logic Sources window.
- `Channel On reset source.` Select here, which logic source switches the channel off when activated.
- `On button function.` Use this option to control the function of the "ON" button on top of the fader. These values are available:
  1. `Channel on.` Audio is switched on if both the button "ON" is active and the fader is open.
  2. `On start.` Audio is switched on, when the button "ON" is activated, regardless if the fader is open or not.
  3. `Fader start on/off.` Audio is switched on as soon as the fader is opened. The "ON" button switches only the fader start signal on and off.

- `Mute/Cough Source.` Select here, which logic source mutes the input. Click the button ... to select any other logic source from the Logic Sources window.
- `Mono.` Check this box when using a mono signal as input. *Please note, that the left channel is used as input, the right channel is not used.* If this option is active, the display of the audio inputs in the left tree display contains a mono input instead of a stereo input. Mono inputs have a label "[M]" in front of the entry, stereo inputs are labeled "[S]".
- `Add to input pool.` If you check this box, the input is available as fader input in the Input Pool of the RM2200D. (See also "Input Pool, Fixed Faders and Selectors" on page 6.)
- `Load channel setup.` If you check this box, you allow the user to load channel setups into this channel. (See also "Using Setups" on page 25.)
- `On-Air Logic 1.` If you check this box, opening the fader will activate the logic source `On-Air logic 1`. You can use this for example to switch on the red light in the control room.
- `On-Air Logic 2.` If you check this box, opening the fader will activate the logic source `On-Air logic 2`. You can use this for example to switch on the red light in the studio.
- `Auto off.` If you check this box, closing the fader will switch off the Channel On state when the fader is closed.

Configuring Monitor Input Properties

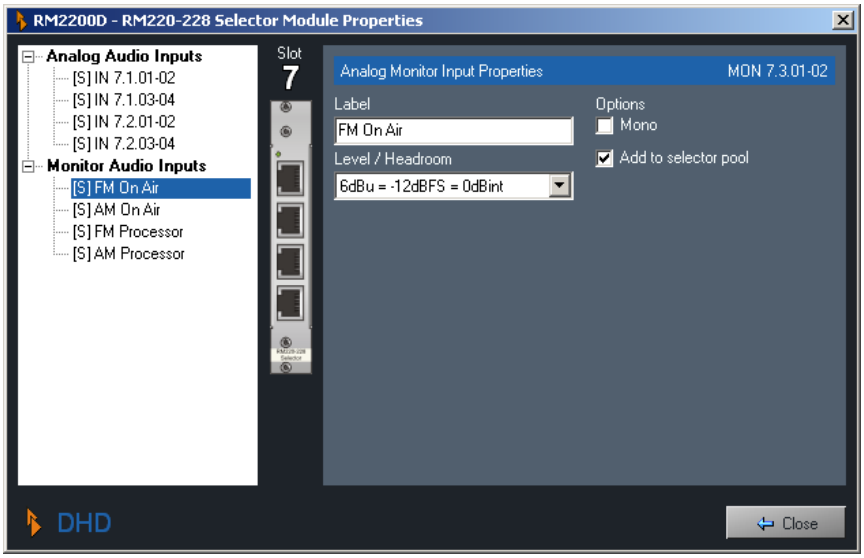


Figure I–23: Configuration dialog of the RM220-228 Analog In Selector Module.

- `Label.` Enter a descriptive name for the input here. This name will appear in all other parts of the software to identify this input.
- `Level/Headroom.` Adjust the headroom for this input between -12 dBu and +18 dBu. This value overrides the global setting in the dialog `Console`. (See also "Console - Choosing Modules" on page 58.)
- `Mono.` Check this box when using a mono signal as input. *Please note, that the left channel is used as input, the right channel is not used.* If this option is active, the display of the audio inputs in the left tree display contains a mono input instead of a stereo input. Mono inputs have a label "[M]" in front of the entry, stereo inputs are labeled "[S]".

- `Add to selector pool.` If you check this box, the input is available as a monitor input in the Selector Pool. (See also “Input Pool, Fixed Faders and Selectors” on page 6.)

RM220-311 GPIO Module

This module allows you to add more GPIO ports to your RM2200D system. This is necessary if your setup needs more GPIOs than there are available on the audio modules. Also, the ports on this module can handle more robust loads then the ones on the audio modules. The module provides:

- 4 general purpose inputs, insulated with opto-coupler, switchable pull-up resistor.
- 12 general purpose outputs, insulated, electro-mechanical relays, max. current 1A, max. voltage 30V.

(See also “RM220-311 GPIO Module” on page 107.)

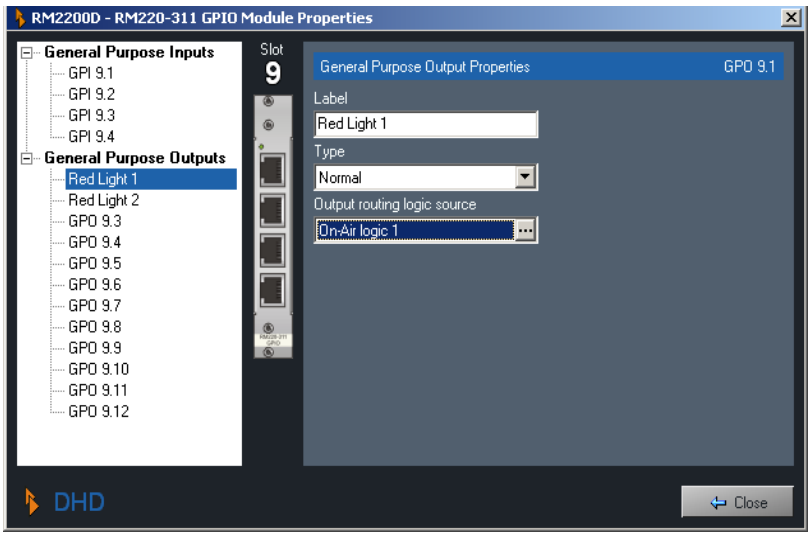


Figure I–24: Configuration dialog for the RM220-311 GPIO module.

Configuring General Purpose Inputs

- `Label.` Enter a descriptive name for this GPI here. This name will appear in all other parts of the software to identify this input.
- `Level.` Select the option `Normal` to activate the GPI with a positive voltage. Choose option `Inverted`, if you want the GPI to activate when the input voltage is near zero.
- `Pull-up.` The GPI ports can use a Pull-up resistor . Select option `On` to use this resistor. You need this if you want to onnect just a switch to this GPI. Choose option `Off` to deactivate the resistor.

Configuring General Purpose Outputs

- `Label.` Enter a descriptive name for this GPO here. This name will appear in all other parts of the software to identify this output.
- `Type.` Select the kind of output the GPO gives when activated. These options are available:
  1. `Normal.` The GPO carries a positive voltage when activated.
  2. `Inverted.` The GPO carries a voltage near zero when activated.
  3. `Pulse on.` The GPO gives a pulse when activated.
  4. `Pulse off.` The GPO gives a pulse when deactivated.

- `Output routing logic source.` Use this setting to assign an internal logic source to the choosen GPO. Click the button ... to select any other logic source from the Logic Sources window.

5.4 Mod. Options - Configuring Module Options

Use this configuration dialog to adjust the way the modules on the mixing desk work.

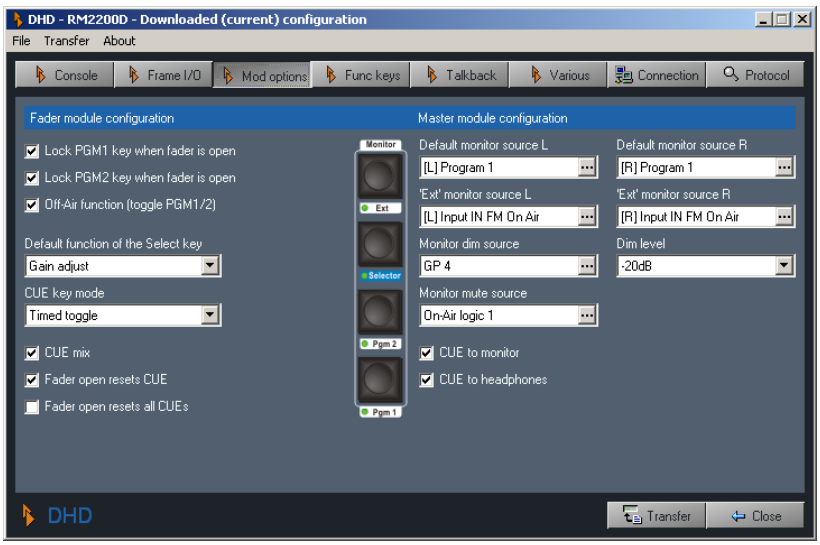


Figure I–25: Configuration dialog for module options.

Fader Module Configuration

These options affect the function of all fader modules in the mixing desk.

- `Lock PGM 1 key when fader is open.` If you check this checkbox, you can not remove a fader channel routing from the “PGM 1” bus using the PGM 1 key, as long as the fader channel is open. You should activate this option if PGM 1 is the On Air summing bus.
- `Lock PGM 2 key when fader is open.` If you check this checkbox, you can not remove a fader channel routing from the “PGM 2” bus using the PGM 2 key, as long as the fader channel is open.
- `Off Air function (toggle PGM 1/2).` If you check this checkbox, the two routing keys PGM 1 and PGM 2 are toggling each other. If you press one of them, the other gets released. This is useful for Off Air recording purposes. (See also “Off Air Operation” on page 38.)
- `Default function of the Select key.` Use this pop up menu to select which function is active when the Select key is pressed in a fader channel. You can choose between `Gain adjust` and `Input selection`.
- `CUE key mode.` Use this option to configure the behaviour of the CUE keys. These options are available:
  1. `Toggle.` The key latches when pressed. It stays on until pressed again.
  2. `Timed Toggle.` The key latches when pressed shortly, it releases when pressed again. When pressed longer, it stays on until it is released again.
  3. `Momentary.` The key stays on until it is released again.
- `CUE mix.` If you check this checkbox, you can cue several channels at the same time. All CUE/PFL signals are mixed on the CUE bus. If you uncheck this

option, only one fader channel at the time can be cued. If you press another CUE key, it will release the currently active one.

- `Fader open resets CUE.` If you check this checkbox, opening a fader will release the CUE key of *the same fader only*.
- `Fader open resets all CUEs.` If you check this checkbox, opening *any* fader will release *all* currently active CUE keys.

Master Module Configuration

In this part of the dialog you can configure general settings for monitoring and CUE functions.

- `Default monitor source L.` Use this option to select the default signal for monitoring (left channel). This signal is routed to the monitor after the RM2200D is reset and also in case no other monitor source is active. When you press any of the four monitor keys on the Master Control Module, you select its input and the associated key LED lights up. When you press it again, the key LED goes off and the default monitor signal comes back. Use the button ... to bring up the Audio Sources window to select any other audio signal.
- `Default monitor source R.` Use this option to select the default signal for monitoring (right channel). Use the button ... to bring up the Audio Sources window to select any other audio signal.
- `'Ext' monitor source L.` Use this option to assign any available signal (left channel) on the audio bus to the Ext monitor key in the mixing desk. If you press this key, this signal is routed to the monitor. Use the button ... to bring up the Audio Sources window to select any other audio signal.
- `'Ext' monitor source R.` Use this option to assign any available signal (right channel) on the audio bus to the Ext monitor key in the mixing desk. If you press this key, this signal is routed to the monitor. Use the button ... to bring up the Audio Sources window to select any other audio signal.
- Monitor dim source. Use this option to select which logic source is used to dim the monitor signal. You could use this, for example, to control the monitor dimming via a GPI from an external intercom system.
- `Dim level.` Use this pop up menu so select the attenuation for dimming the monitor. You can choose levels between 0 dB and -30 dB.
- `Monitor mute source.` Use this option to select which logic source is used to mute the monitor signal.
- CUE to monitor. If you check this checkbox, the CUE / PFL bus is routed to the monitor 1 loudspeakers when at least one CUE button is active.
- `CUE to headphones.` If you check this checkbox, the CUE / PFL bus is routed to the monitor 1 headphones when at least one CUE button is active.

5.5 Func keys - Configuring Function Keys

Use this configuration dialog to set up the function for the function keys F1 to F4, the general purpose keys GP1 to GP4 and the keys Talk1 and Talk2 on the Master Control module.

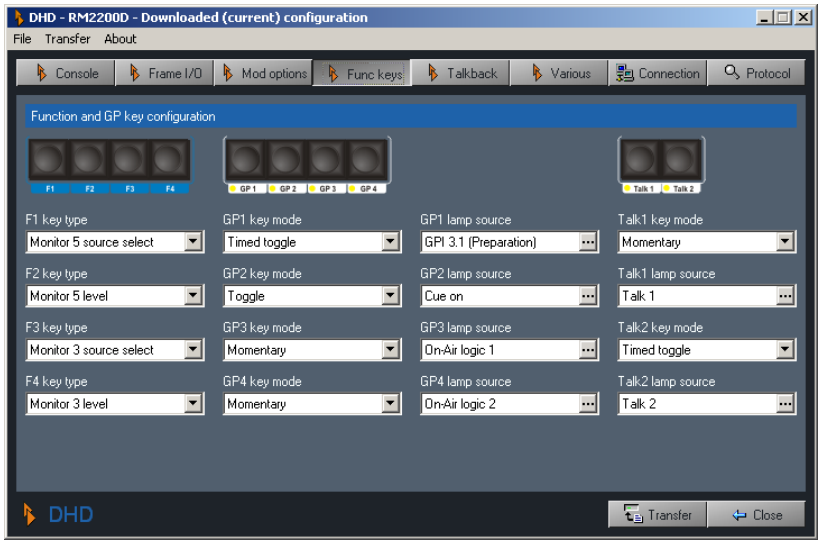


Figure I–26: Configuration dialog for function keys.

F1 … F4 Function keys

These keys allow you to change both the input signal and the input level for any of the five monitor busses. To use a function key for changing the input signal, select the option `Monitor <No.> source select` from the pop up menu. (<No.> denotes the number of the monitor bus.). To change the level of a monitor signal, assign the functon `Monitor <No.> level` to the function key.

After uploading the configuration, you just have to press the selected key on the mixing desk. The LCD changes to display the selected function and the current value. You can now use the rotary encoder to select the desired input or to change the monitor level. When you are finished, press the function key again to end the operation.

General Purpose Keys GP1 … GP4 and Talk 1, Talk 2 keys

These keys generate values for the logic sources GP1…GP4. These logic sources become true, when the associated key is pressed. Besides, each key has a **Lamp source**. This is a logic source which switches the LED below the key on and off. You can configure the following options for each key:

- `Key mode.` Use this pop up menu to configure the behaviour of the key. These options are available:
  1. `Toggle.` The key latches when pressed. It stays on until pressed again.
  2. `Timed Toggle.` The key latches when pressed shortly, it releases when pressed again. When pressed longer, it stays on until it is released again.

3. `Momentary.` The key stays on as long as it is pressed.

- `Lamp source.` Use the button ... to select any available logic source from the Logic Sources window. If this logic source becomes active, the LED lights up.

Tip: Use the Lamp Source feature to check if logic signals are working properly. This is especially useful if you need to connect to outboard equipment using GPIOs and there are communication problems on the GPIO ports. Just select the logic source in question as Lamp Source and check if it works.

Keys Talk 1 and Talk 2

These two keys work exactly like the General Purpose keys, except that they are located at the bottom of the mixing desk. Their configuration options are identical.

5.6 Talkback

The RM2200D includes a talkback matrix, which you can configure in this dialog . It works like this:

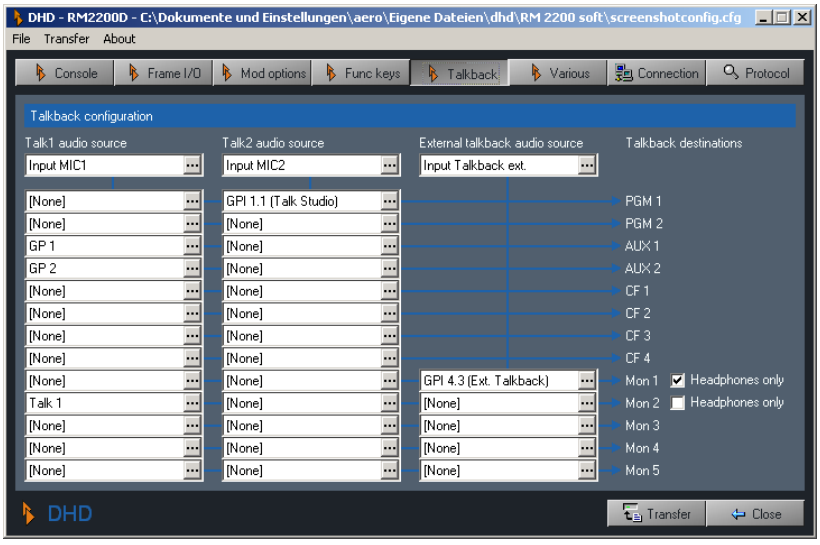


Figure I–27: Configuration dialog for the talkback matrix.

In the top row of the dialog there are three audio sources: `Talk1 audio source`, `Talk2 audio source` and `External talkback source`. Using the buttons ..., you can open the Audio Sources window and select any available audio signal as input.

Tip: Use the audio source `External talkback source` when connecting the RM2200D to an external intercom system. As you can see in the figure, this audio source can only talk back into monitor busses.

Below the first row there are logic conditions. They work like a crossbar: If the condition on a switching point becomes true, the audio signal from the first row is routed to the Talkback destination to the right. You just have to select the appropriate logic source for the desired talkback path.

For the destinations `Monitor 1` and `Monitor 2` you can choose to route the talkback signal only to the assigned headphones. Just activate the checkboxes `Headphones only` to use this function.

5.7 Various - Configuring Level Meters and Clean Feeds

Use this dialog to configure the clean feed system and the audio meters, both internally (in the mixing desk) and externally (in the RM2200D software on a PC).

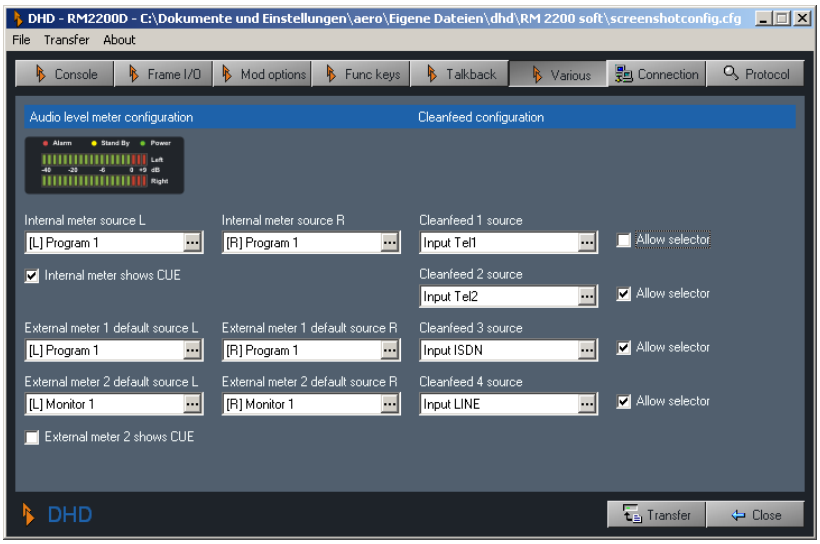


Figure I–28: Configuration dialog for audio metering and clean feed configuration.

Audio Level Meter Configuration

- `Internal meter source L.` Select the audio source (left channel) for the internal LED ppm meter in the Master Control module. Click on the button ... to select any available signal from the Audio Sources window. (Typically you would select the On Air summing bus here.)
- `Internal meter source R.` Select the audio source (right channel) for the internal LED ppm meter in the Master Control module. Click on the button ... to select any available signal from the Audio Sources window. (Typically you would select the On Air summing bus here.)
- `External meter default source 1.` Select the audio source (stereo) for the external LED ppm meter in the RM2200D software. Click on the button ... to select any available signal from the Audio Sources window.
- `External meter default source 2.` Select the audio source (stereo) for the external LED ppm meter in the RM2200D software. Click on the button ... to select any available signal from the Audio Sources window.

Tip: If the software is running in Display Mode, you can change the input of an external meter any time by clicking on the button ... next to the meter. The Audio Sources window opens and you can and select another signal.

- `External meter 2 shows CUE.` Check this checkbox if you want the CUE bus to be metered on the external meter 2. This happens only if at least one CUE key in any fader channel is activ.

Clean Feed configuration

Please note, that the clean feeds in the RM2200D are always associated to input signals! You can define up to four clean feed signals here. They are internally generated stereo busses and also as mono signal available in the output routing. You can also access them in the Audio Sources window.

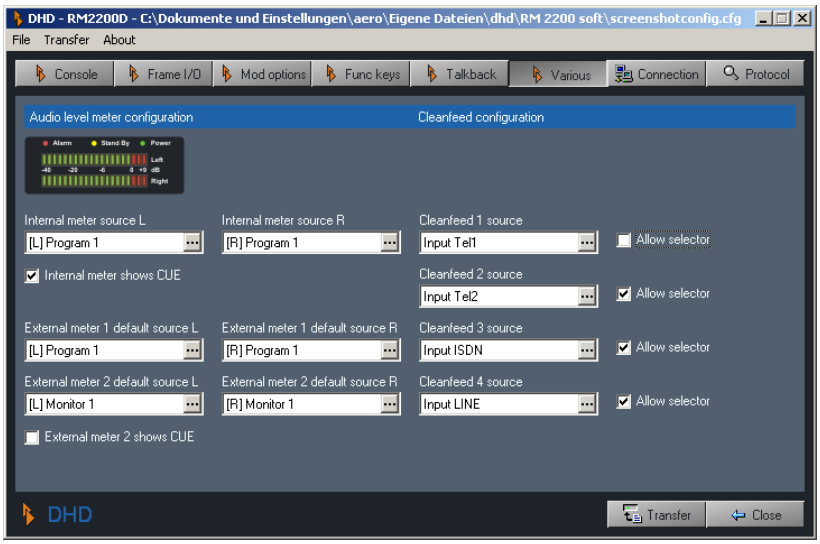


Figure I–29: Configuration dialog for audio metering and clean feed configuration.

Use the four pop up menus `Cleanfeed <No.> source` to assigned input signals to the clean feeds. If necessary, you can route an alternative backsignal to any clean feed if . To enable this feature, check the checkbox `Allow selector` to the right from the clean feed pop up menu. If you want to change the clean feed signal from the desk, for example to feed an alternative signal back to a codec or telephone unit, do the following:

1. Press the Select key in the fader channel associated to a clean feed.

2. Press the key CF out on the Master Control module. You can now adjust the gain value for the clean feed output signal. Use the Control Knob to do so, the display shows the current value.

3. Press the key Select again. You can now use the Control Knob to select an alternative output signal for the clean feed. The display shows your current choice.

4. Press the Select key again to finish configuration.

5.8 Connection - Configuring the Network Identity

This dialog allows you to connect to a RM2200D DSP frame and to change its IP address if necessary. Please read the following paragraph carefully, especially if you need to troubleshoot a network connection to a RM2200D!

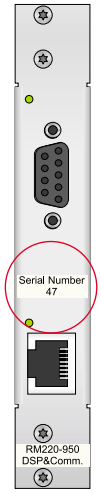


Figure I–30: Serial number on the slot panel of the RM220-950 DSP and Communications Controller

Each RM2200D has a unique serial number. It is printed onto the slot panel of the DSP and Communications Controller RM220-950. You can regognize this module by its two sockets - one 9-pin Sub-D and one RJ45 Twisted Pair socket. The serial number represents the last 3 bytes of the controllers Ethernet MAC address. These three bytes are reserved for the use of DHD and unique for each DSP frame. Before trying to connect to a RM2200D, you need to enter its serial number into the field `Serial number`. If you change this number, you see the label `MAC address` next to this field change appropriately.

Important Note: Make sure you are entering the serial number correctly! If you make any error, all attempts to connect to the DSP frame will fail!

In general, there are two ways to connect your PC to the RM2200D DSP frame - via a serial cable or via Ethernet and TCP/IP. Usually you would connect to the RM2200D using the Ethernet connection, but sometimes you need to resort to using the serial cable.

Note: It is recommended you use the serial connection to the DSP frame only in case the Ethernet connection is not working. Using a serial cable is considerably slower than Ethernet and you need to place the PC next to the DSP frame. However, if there is no Ethernet available or you need to connect a laptop PC to the DSP frame, using the serial connection might be easier. Also, if the IP address has been misconfigured, you might only be able to fix this by using the serial connection.

Connecting via the Serial Port

To connect to the DSP frame via the serial port, do the following:

1. Connect a serial cable to both the PC and the DSP frame. Make sure you choose the right serial port on the PC. Also make sure, that no other application uses this serial port.

2. Choose the entry `Serial via RS232` from the pop up menu `Connection type`.

3. From the pop up menu `Serial port` choose the serial port you are using on your PC.

4. Click the button `Connect`. If the connection was successful, the button `Transfer` in the lower right of the configuration dialog should become enabled.

5. Now, click the button `Transfer`. The configuration transfer dialog opens. Download the current configuration. After a few seconds the channel status indicators should change to display the current state of the RM2200D. Also, the software meters should start working, if there is a signal on their inputs.

Note: If you have trouble connecting using the serial port, check the following:

- Are you using the correct serial number of the DSP frame?
- Are you using the correct serial port on your computer ?
- Is no other application using this serial port?
- If you still can not connect to the DSP frame, check the cabling and exit the RM2200D software. After that, switch the DSP frame off, wait a few seconds and switch it on again. Start the RM2200D software and try to connect again.

Important Note: If necessary, you can use USB-RS232-converters to provide the serial port. However, because of the great variety of these devices, DHD can not recommend a type. It is possible that such converters do not work at all or do not work with the performance expected. If your PC is not equipped with a serial port (e.g. laptops), you should prefer a slot-in card with a serial port to an USB adapter.

Connecting via TCP/IP

The DSP frame has its own IP address. The RM2200D software talks to the firmware in the DSP frame using this address, the data is transported via the TCP/IP protocol. Normally, the RM2200D software determines the IP address of the DSP frame automatically, if you have entered the correct serial number for the DSP frame.

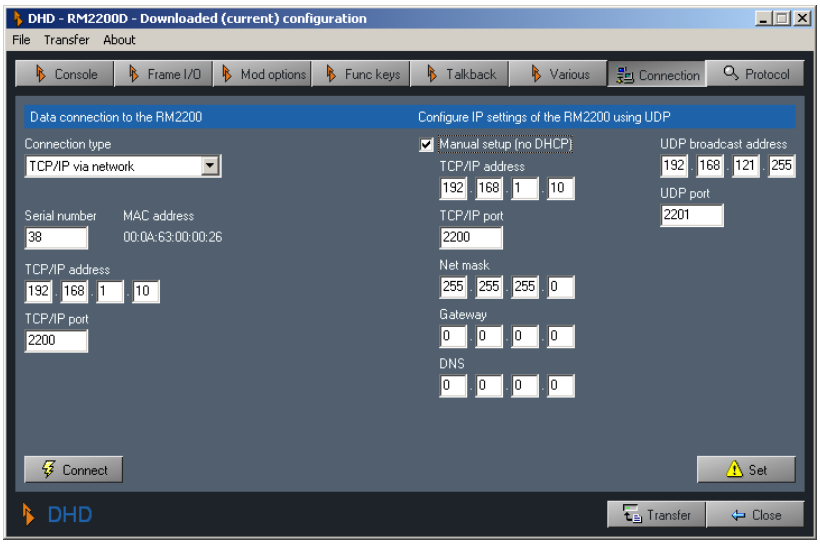


Figure I–31: Configuration dialog for the network identity of the RM2200D.

Important Note: For the automatic address detection to work it is necessary that UDP packets can travel freely between the PC running the RM2200D software and the DSP frame. If this is not possible, you may have problems connecting to the DSP frame, especially if it is using DHCP to get its IP address. If you suspect this kind of problem, please talk to your network administrator.

If you have entered the correct serial number and the UDP address detection works, you just have to click the `Connect` button to connect to the DSP frame. If the connection was established, after a few seconds the channel status indicators should change to display the current state of the RM2200D. Also, the button `Transfer` in the lower right of the configuration dialog should become enabled.

Note: If you quit the RM2200D software while a connection to the DSP frame is active, it will try to reconnect when started again. If this fails for any reason, use the dialog `Connection` to reconnect manually to the DSP frame.

Changing the IP address of the DSP frame

Normally, the firmware in th DSP frame will get its IP address from a DHCP server in the network, if there is one available.

Important Note: Make sure, the DSP frame is connected to the Ethernet *before* powering it on. If this is not the case and you are plugging in the Ethernet cable after powering on, the firmware can not contact the DHCP server and get a valid IP address. As a result, you might not be able to connect to the DSP frame from the RM2200D software.

If a DHCP server is available, make sure the Ethernet cable is connected properly and the link LED next to the RJ45 socket is on. Now, switch off the DSP frame, wait a few seconds and switch it on again. The firmware should now get a valid IP address from the DHCP server.

Tip: If the firmware of the DSP frame looks for a DHCP server but can‘t find one, it might keep an invalid IP address. As a result you can not connect to it from the RM2200D software. This can also happen, if you transfer a RM2200D from one network segment to another. In these cases you need to change the IP address manually, either using a serial connection or the UDP method described next. If you don not know which values to enter, talk to your network administrator.

To change the IP address of the DSP frame, do the following:

1. Make sure you entered the correct serial number for the DSP frame.
2. Select the desired connection from the pop up menu `Connection Type`.

Important Note: If you are using the option `TCP/IP via network`, make sure no routers or firewalls are blocking UDP traffic between the RM2200D software and the DSP frame!

3. Check the checkbox `Manual setup (no DHCP)`. Below it the input fields for the TCP/IP parameters are displayed.
4. Enter the new IP address for the DSP frame, change the subnet mask accordingly. The value for the `TCP/IP port` must be 2200. *Do not change the values for* `Gateway` *and* `DNS`*!*
5. When using the Ethernet connection, set the field `UDP broadcast address` to the correct value. Usually this is the subnet address with the value “255” at the end. (For example, if your network is “192.168.3.x”, the UDP broadcast address is “192.168.3.255”.)
6. Make sure the value for `UDP broadcast port` is set to “2201”.
7. If all values are entered correctly, click the button `Set`. If the IP address of the DSP frame has changed successfully, the field `TCP/IP address` will show the new value after a few seconds.

5.9 Protocol - Monitoring the CAN-Bus and Sending Commands

Use this dialog to monitor the commands on the CAN bus, to send CAN bus commands manually and to change which information is written to the log files.

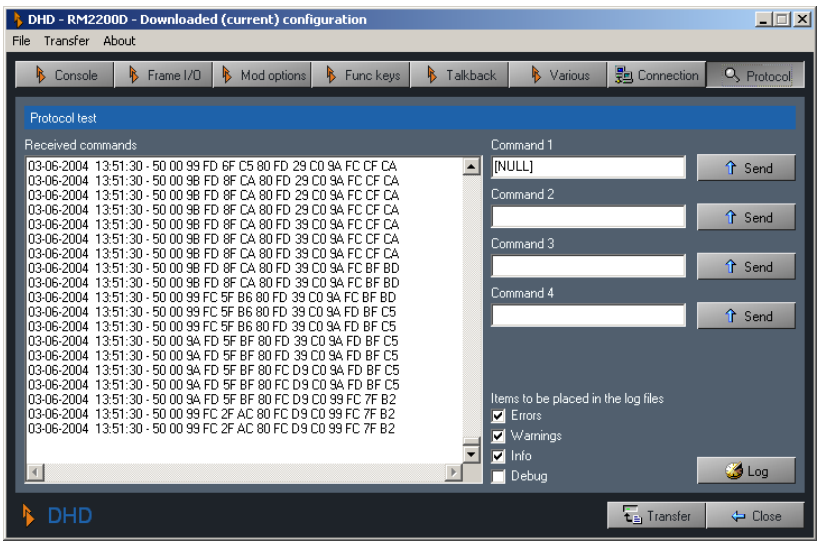


Figure I–32: Configuration dialog “Protocol”.

In the display area `Received commands` you can watch the commands transmitted on the CAN bus. You can use the four panes labeled `Command` to send commands directly onto the CAN bus.

The four checkboxes below the label `Items to be placed in the log files` control which information is written to the logfiles of the RM2200D software. These logfiles are in the subfolder `Logfiles` of the folder `Rm2200d`.

If you click the button `Log` you bring up a logging window for the current session.

Caution: Be careful when using the `Protocol` dialog . While there is nothing wrong with watching the commands on the CAN bus, you can do damage with the other options. If you deactivate logging options it can make troubleshooting more difficult. If you put the wrong commands on the CAN bus you can disturb the proper operation of the RM2200D. *Do not use this function unless told so by an authorized dealer or DHD support staff!*

6. Technical Specifications

This chapter contains detailed technical information about the DSP frame modules.

6.1 General Conditions

Environment	
Operating temperature	+5 ... +35 °Celsius
relative humidity	20 ... 85%, non condensing

6.2 RM220-111 Digital In/Out/GPIO module, 8 channels

Digital reference level	0 dBFS = full scale modulation
Frequency range for measurement	20 Hz ... 20 kHz

Digital Inputs

Supported standards	AES3/EBU, S/PDIF (software configurable)
Internal sample rate converters (SRC)	yes
SRC input sampling frequency range	30 kHz ... 100 kHz
SRC passband ripple	< 0.02 dB
Input impedance	110 ohm (AES/EBU), 75 ohm (S/PDIF)
Dynamic range (24 bit mode)	>120 dB
THD+N (24 bit mode)	< -120 dB (-1 dBFS input level) / < 0.0001%
Max. input jitter	> 40 ns

Digital Outputs

Supported standards	AES3/EBU, S/PDIF
output impedance	110 ohm (AES/EBU), 75 ohm (S/PDIF)
Dynamic range	144 dB
Jitter (internal synchronisation source)	< 2 ns (peak)
Max. input jitter	> 40 ns

General Purpose Inputs / Outputs (GPI/GPO)

4GPIs: non-insulated TTL-Inputs with internal pull up resistor (10k ohms to 5 V)	Switch to ground or TTL level (low active), overvoltage protected
4 GPOs: open collector drivers, switches to ground (electronic relay, insulated)	max. 0.2 A / 24 V DC, not protected

6.3 RM220-122 Mic/Headphone/GPIO module, 4 channels

Caution: Do not connect any voltaged lines (for example Telephone, ISDN) to any output of the modules RM220-122, RM220-222 and RM220-223. External voltage will cause damages on internal circuits.

Analog reference voltage level	0 dBu = 0.775 V (RMS)
Digital reference level	0 dBFS = full scale modulation
Frequency range for measurements	20 Hz ... 20 kHz
Sampling frequency	44.1 kHz ... 48 kHz

A/D Converter

Max. input level	18 dBu (electrically balanced)
Frequency response deviation	< 0.5 dB
Gain	0 ... 70 dB
Input sensitivity	-66 dBu
Input impedance	>= 8k ohm
Converter technology	24 bit, (64 x oversampling Sigma-Delta)
Dynamic range	typical 106 dB (A-weighted)
THD+N	< -80 dB (-1 dBFS, 0 dB analog gain) / < 0.01%
Common mode rejection	> 60 dB
Crosstalk	< -90 dB

D/A Converter

Max. output level (headphones, single ended)	15 dBu (unbalanced)
Frequency response deviation	< 0.3 dB
Output impedance	typical 17 ohm
Load impedance	>= 80 ohm (outputs short circuit protected)
Converter technology	24 bit, (128 x oversampling Sigma-Delta)
Dynamic range	typical 108 dB (A-weighted)
THD+N	< -82 dB (-1 dBFS) / < 0.008%
Crosstalk	< -90 dB

General Purpose Inputs / Outputs (GPI/GPO)

2 non-insulated analog control inputs (ACI) to connect external potentiometers for level control. (Connect 10k ohms linear potentiometer between wiper and GND (left detend), leave open right detend of potentiometer.)	Potentiometer 10k ohm to GND or 0 ... 3.3V control voltage, overvoltage protected
2 GPIs: non-insulated TTL-Inputs with internal pull up resistor (10k ohms to 5 V)	switch contact to GND or TTL level (low active), overvoltage protected
4 GPOs: electronic relay, insulated	max. 0.2 A / 30 V DC / 25 V AC

6.4 RM220-222 Analog In/Out/GPIO module, 4 channels

Caution: Do not connect any voltaged lines (for example Telephone, ISDN) to any output of the modules RM220-122, RM220-222 and RM220-223. External voltage will cause damages on internal circuits.

Analog reference voltage level	0 dBu = 0.775 V (RMS)
Digital reference level	0 dBFS = full scale modulation
Frequency range for measurements	20 Hz ... 20 kHz
Sampling frequency	44.1 kHz ... 48 kHz

A/D Converter

Max. input level	18 dBu (electrically balanced)
Frequency response deviation	< 0.1 dB
Input impedance	>= 10k ohm
Converter technology	24 bit, (64 x oversampling Sigma-Delta)
Dynamic range	typical 106 dB (A-weighted)
THD+N	< -92 dB (-1 dBFS) / < 0.0025%
Common mode rejection	> 40 dB
Crosstalk	< -90 dB

D/A Converter

Max. output level	18 dBu (electrically balanced)
Frequency response deviation	< 0.2 dB
Output impedance	typical 25 ohm
Converter technology	24 bit, (128 x oversampling Sigma-Delta)
Dynamic range	typical 108 dB (A-weighted)
THD+N	< -82 dB (-1 dBFS) /0.008%
Common mode rejection (output impedance)	> 60 dB
Common mode rejection (output voltage)	> 40 dB
Crosstalk	< -90 dB

General Purpose Inputs / Outputs (GPI/GPO)

4 GPIs: non-insulated TTL-Inputs with internal pull up resistor (10k ohms to 5 V)	switch to ground or TTL level (low active), overvoltage protected
4 GPOs: open collector drivers, switches to ground (electronic relay, insulated)	max. 0.2 A / 24 V DC, not protected

6.5 RM220-223 Analog In/Out/GPIO module, 4 channels

Caution: Do not connect any voltaged lines (for example Telephone, ISDN) to any output of the modules RM220-122, RM220-222 and RM220-223. External voltage will cause damages on internal circuits.

Analog reference voltage level	0 dBu = 0.775 V (RMS)
Digital reference level	0 dBFS = full scale modulation
Frequency range for measurements	20 Hz ... 20 kHz
Sampling frequency	44.1 kHz ... 48 kHz

A/D Converter

Max. input level	24 dBu (electrically balanced)
Frequency response deviation	< 0.1 dB

Input impedance	>= 10k ohm
Converter technology	24 bit, (128 x oversampling Sigma-Delta)
Dynamic range	typical 112 dB (A-weighted)
THD+N	< -92 dB (-1 dBFS) / < 0.0025%
Common mode rejection	> 40 dB
Crosstalk	< -90 dB

D/A Converter

Max. output level	24 dBu (electrically balanced)
Frequency response deviation	< 0.2 dB
Output impedance	typical 25 ohm
Converter technology	24 bit, (128 x oversampling Sigma-Delta)
Dynamic range	typical 113 dB (A-weighted)
THD+N	< -85 dB (-1 dBFS) /0.008%
Common mode rejection (output impedance)	> 60 dB
Common mode rejection (output voltage)	> 40 dB
Crosstalk	< -90 dB

General Purpose Inputs / Outputs (GPI/GPO)

4 GPIs: non-insulated TTL-Inputs with internal pull up resistor (10k ohms to 5 V)	switch to ground or TTL level (low active), overvoltage protected
4 GPOs: open collector drivers, switches to ground (electronic relay, insulated)	max. 0.2 A / 24 V DC, not protected

7. Pin Assignments and Wiring Diagrams

This chapter contains all the reference information you need to install and operate the RM2200D.

Caution: Please make sure you understand all information in this chapter *before* installing the RM2200D. Failing to do so can cause damage both to the RM2200D and any other equipment connected to it!

7.1 RM220-061 DSP Frame 3U/19“

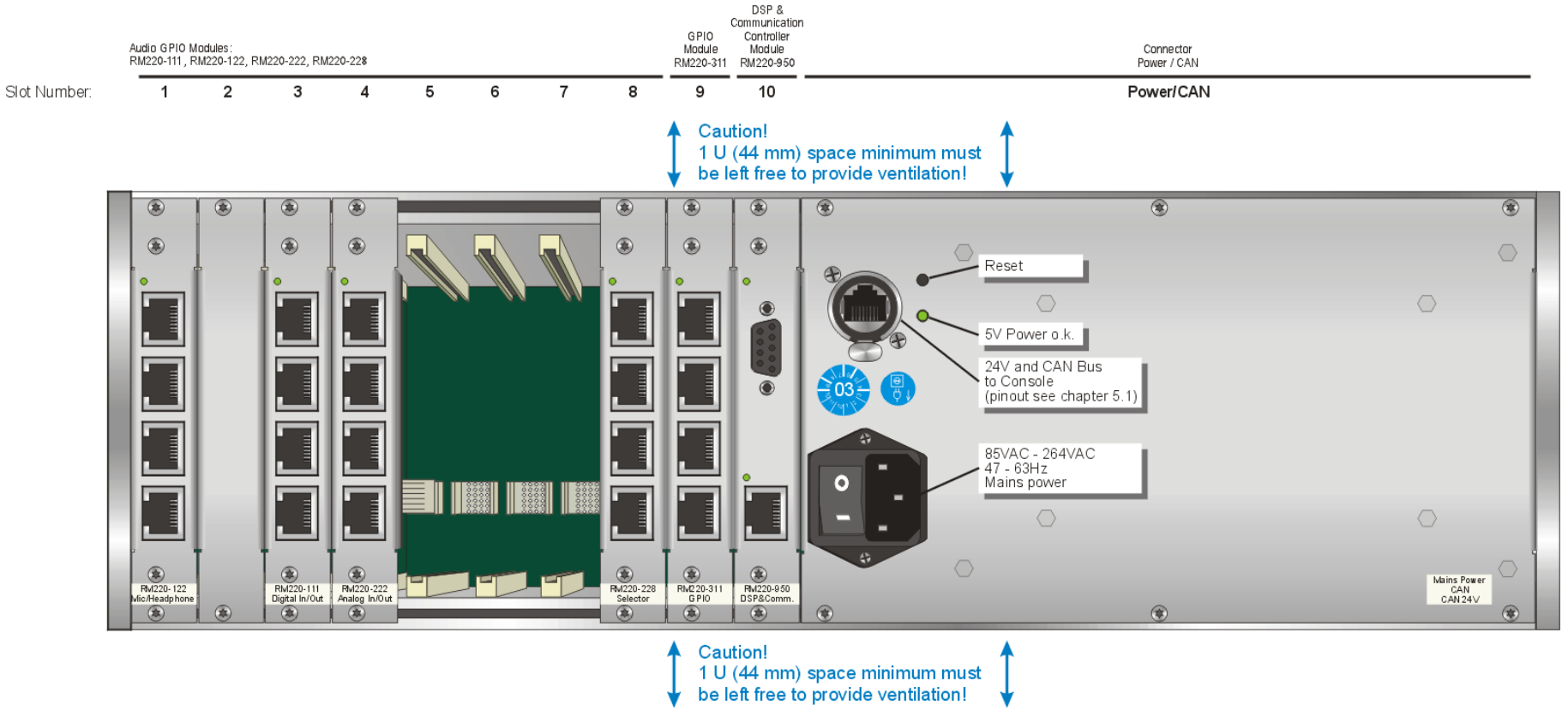


Figure I–33: RM220-061 DSP Frame 3U/19“. Please leave free 1 U space above and below the DSP frame to provide ventilation!

7.2 RM220-111 Digital In/Out/GPIO module, 8 channels

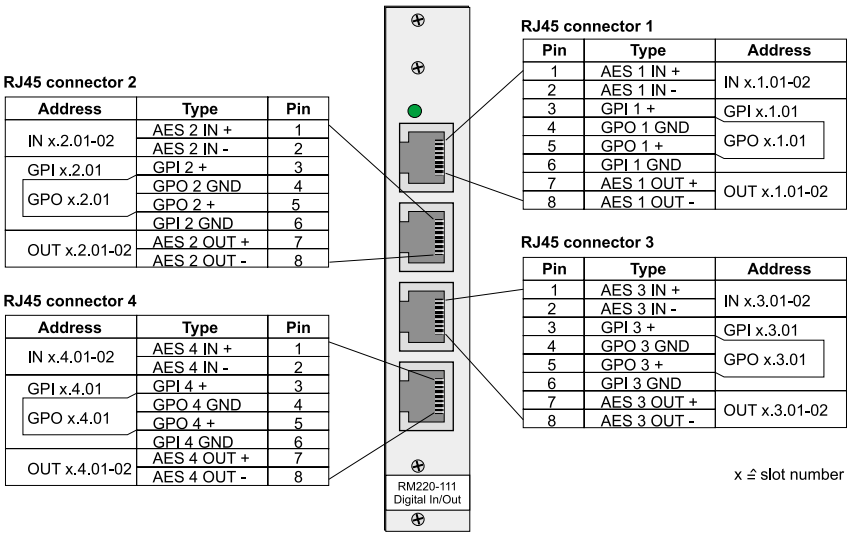


Figure I–34: RM220-111 Digital In/Out/GPIO module, Connector Chart.

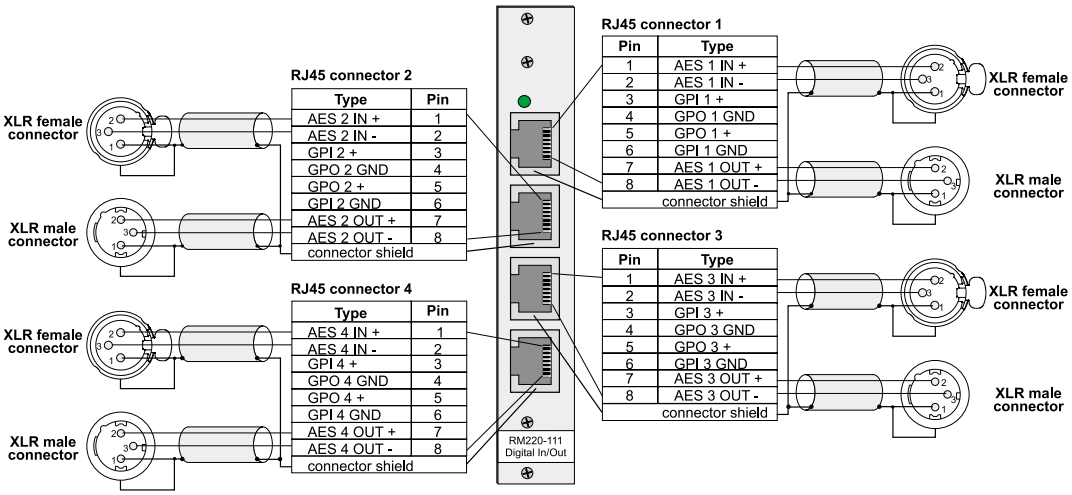


Figure I–35: RM220-111 Digital In/Out/GPIO module, Wiring Example 1.

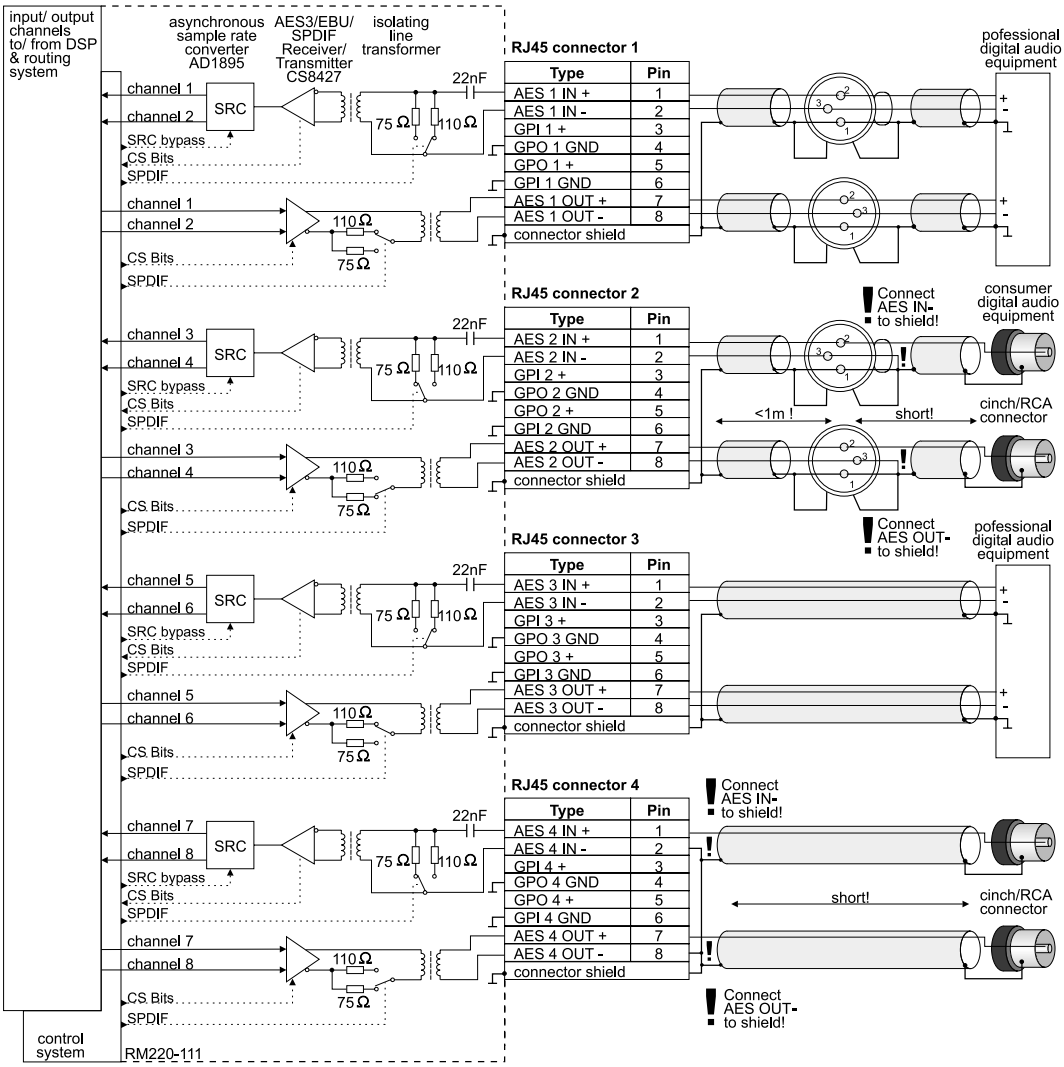


Figure I–36: RM220-111 Digital In/Out/GPIO module, Wiring Example 2.

7.3 RM220-122 Mic/Headphone/GPIO Module, 4 channels

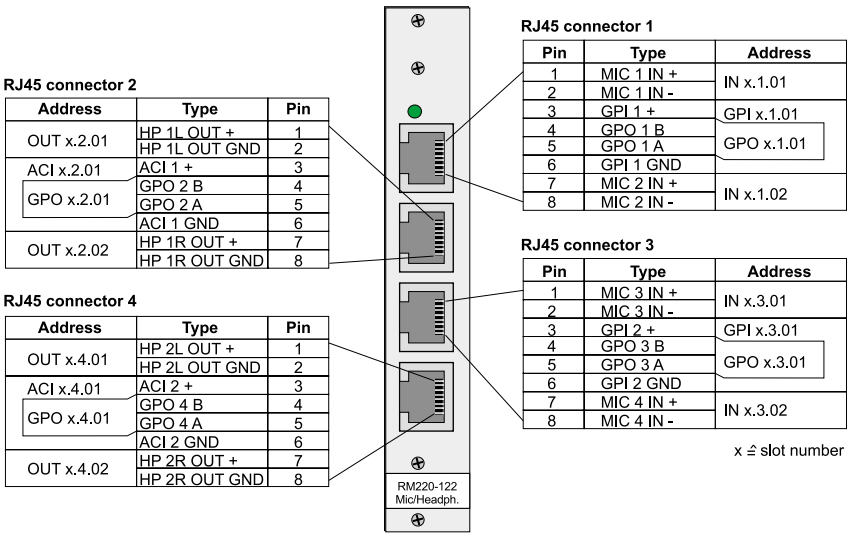


Figure I–37: RM220-122 Mic/Headphone/GPIO module, Connector Chart.

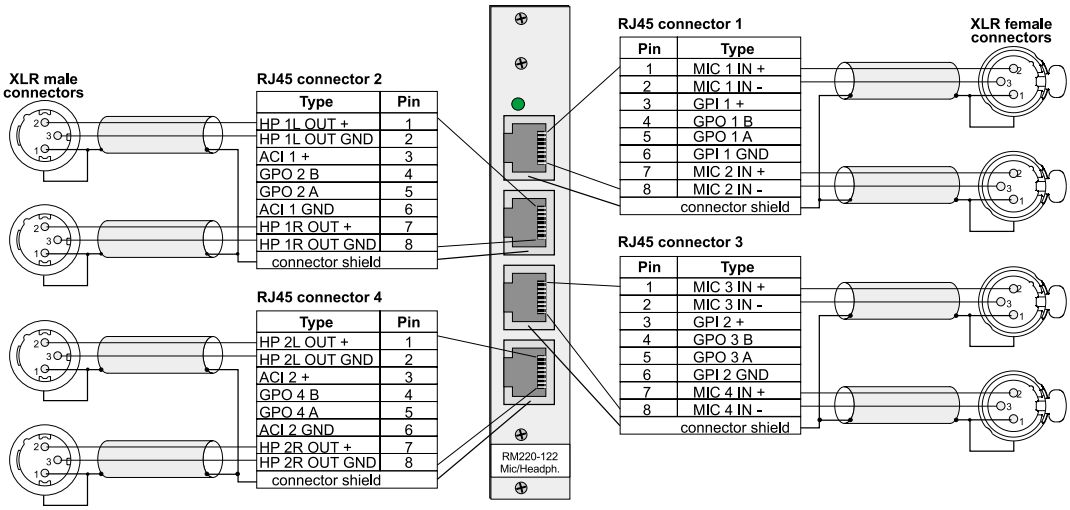


Figure I–38: RM220-122 Mic/Headphone/GPIO module, Wiring Example 1.

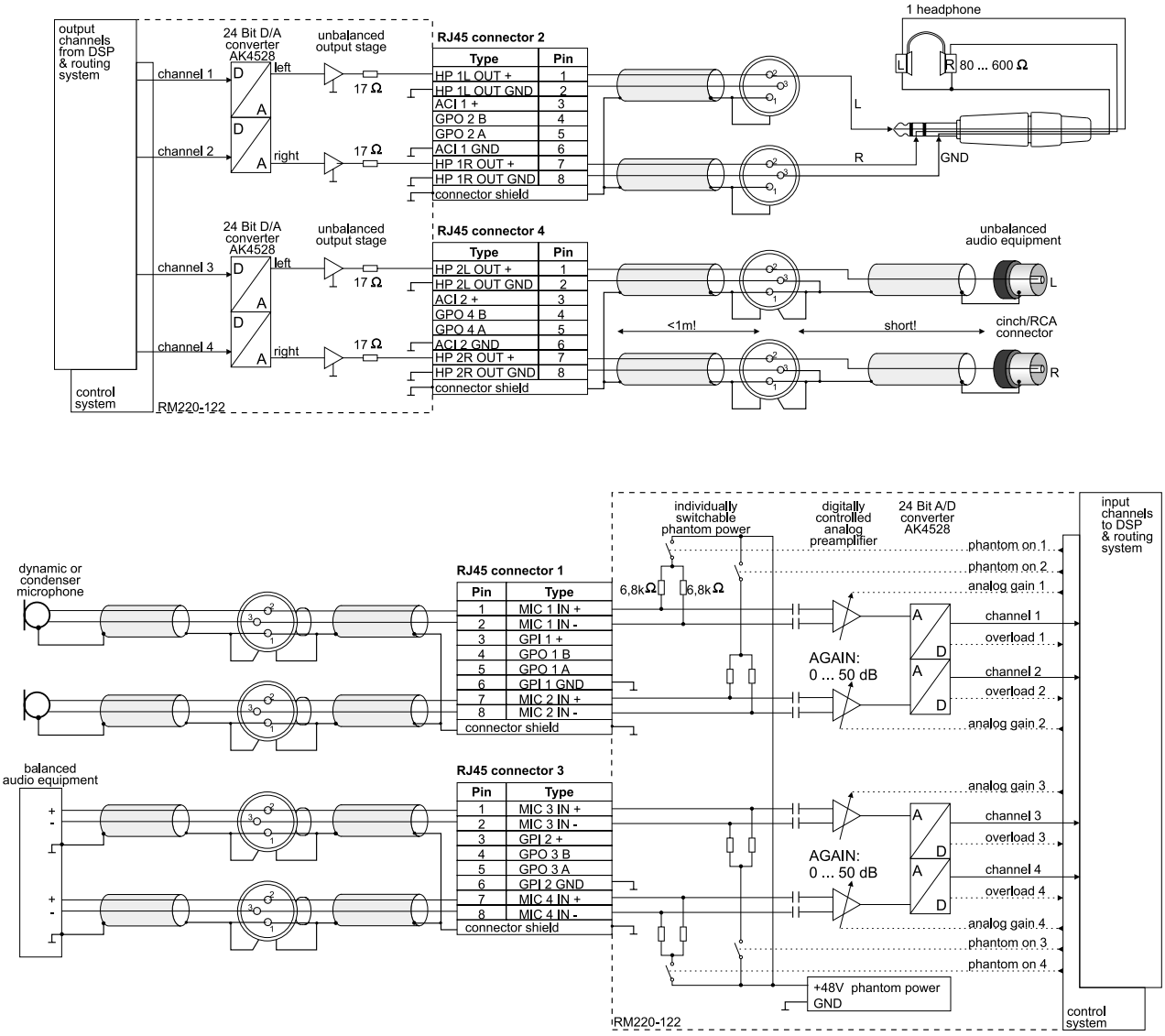


Figure I–39: RM220-122 Mic/Headphone/GPIO module, Wiring Example 2.

7.4 RM220-222 Analog In/Out/GPIO Module, 4 channels

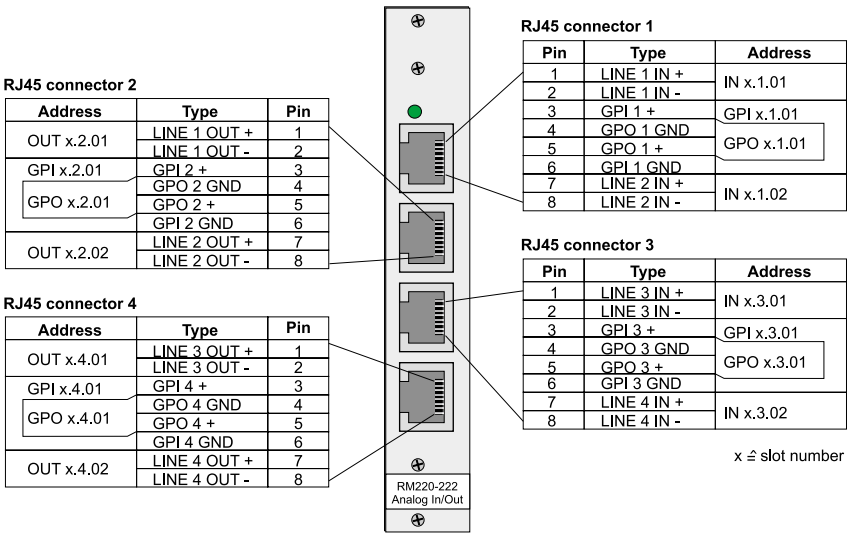


Figure I–40: RM220-222 Analog In/Out/GPIO module, Connector Chart.

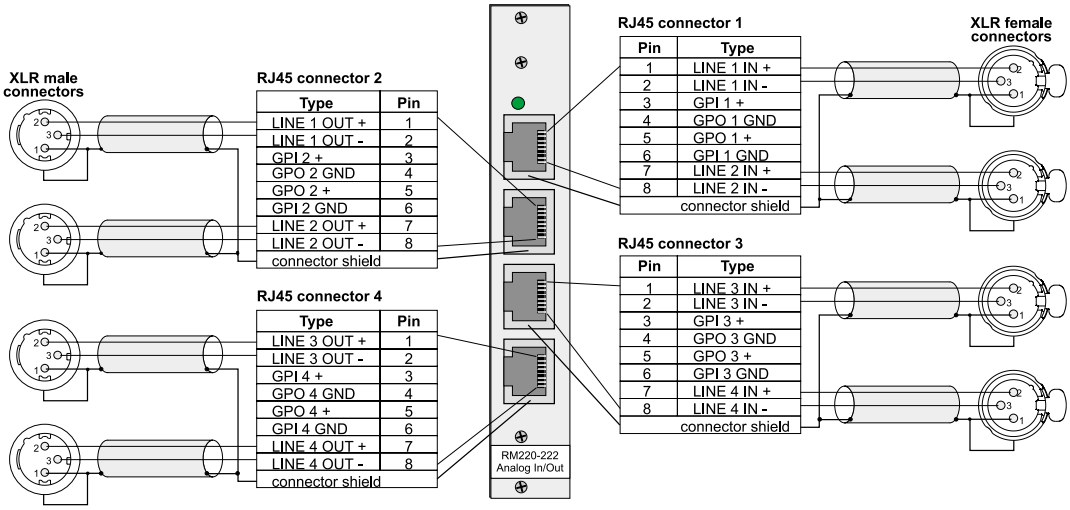


Figure I–41: RM220-222 Analog In/Out/GPIO module, Wiring Example 1.

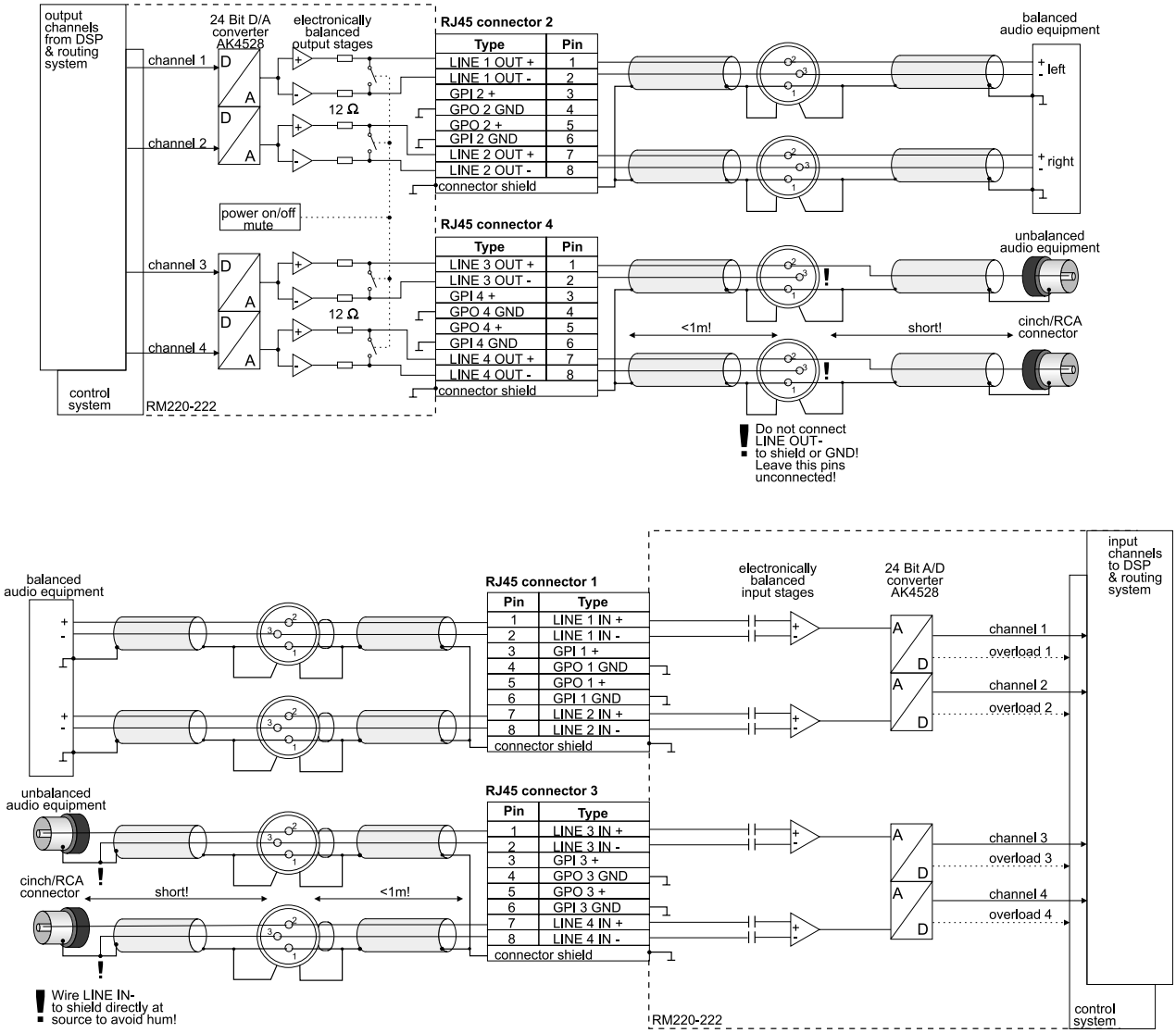


Figure I–42: RM220-222 Analog In/Out/GPIO module, Wiring Example 2.

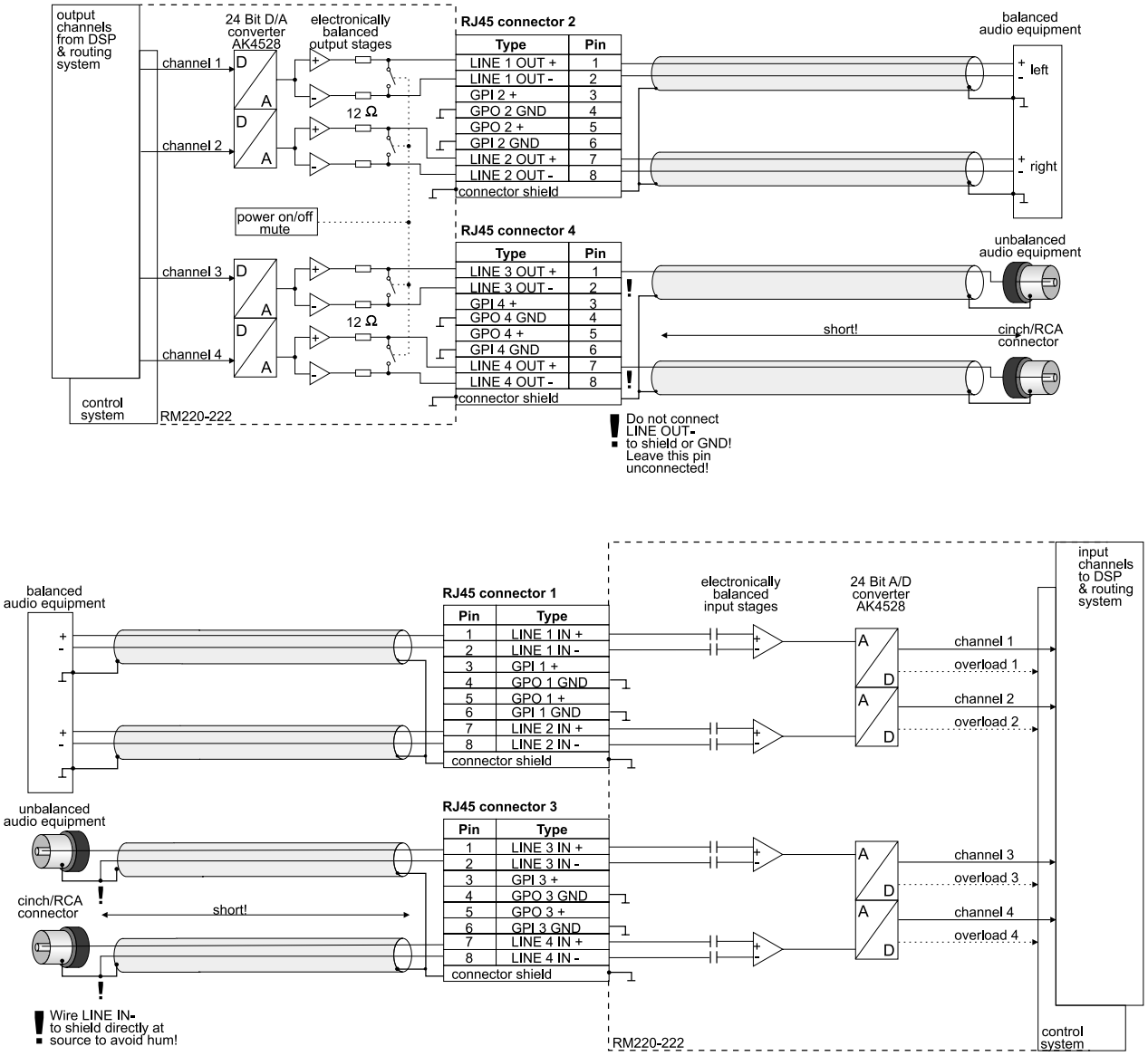


Figure I–43: RM220-222 Analog In/Out/GPIO module, Wiring Example 3.

7.5 RM220-223 Analog In/Out/GPIO Module, 4 channels

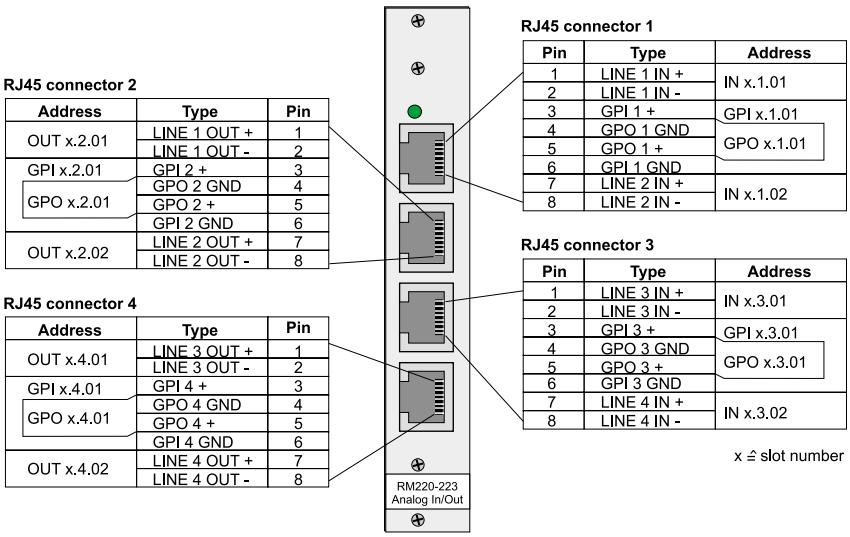


Figure I–44: M220-223 Analog In/Out/GPIO module, Connector Chart.

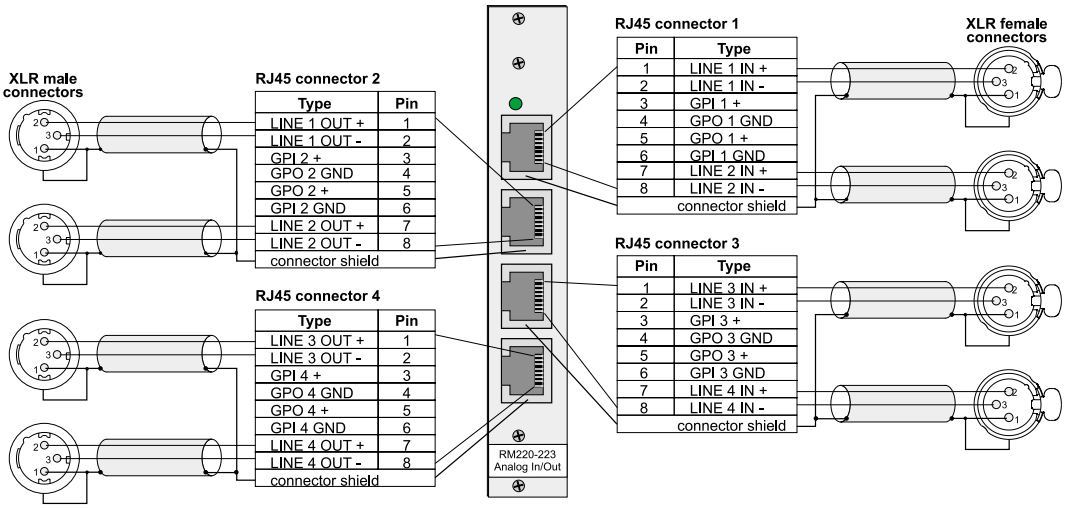


Figure I–45: RM220-223 Analog In/Out/GPIO module, Wiring Example 1.

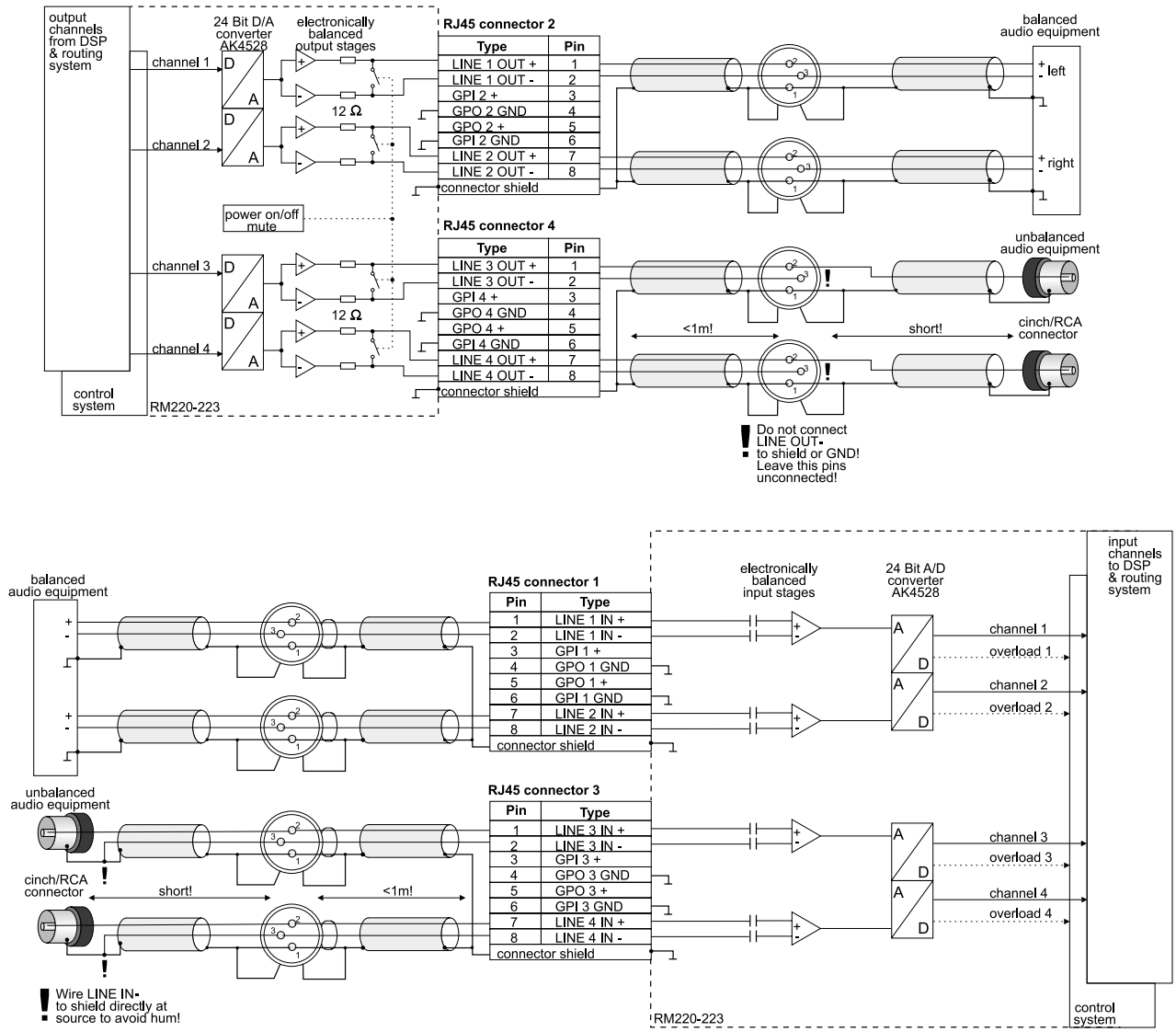


Figure I–46: RM220-223 Analog In/Out/GPIO module, Wiring Example 2.

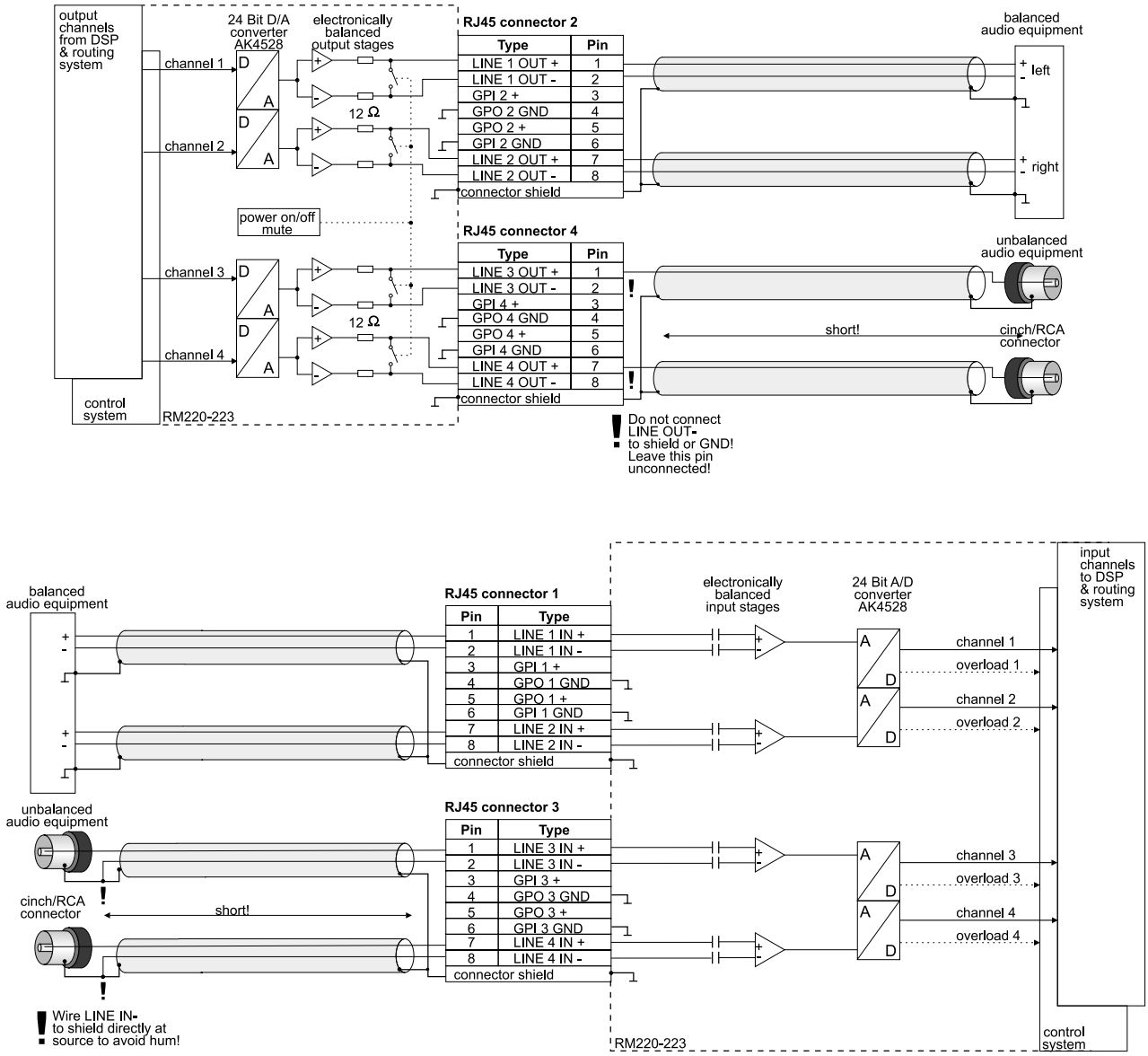


Figure I–47: RM220-223 Analog In/Out/GPIO module, Wiring Example 3.

7.6 RM220-228 Analog In Selector Module (stereo)

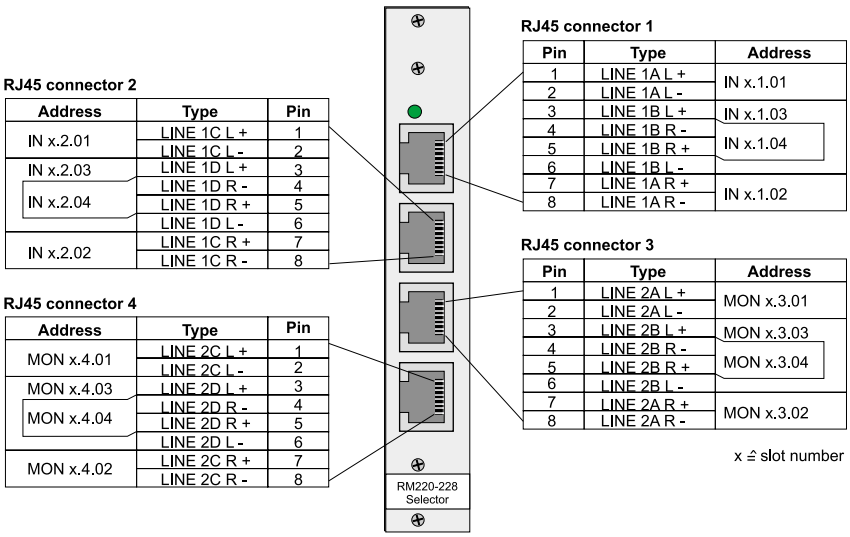


Figure I–48: RM220-228 Analog In Selector module, Connector Chart.

Important Note: Only one module RM220-228 is usable in the RM2200D with one selector on one fader and one selector in the monitoring section!

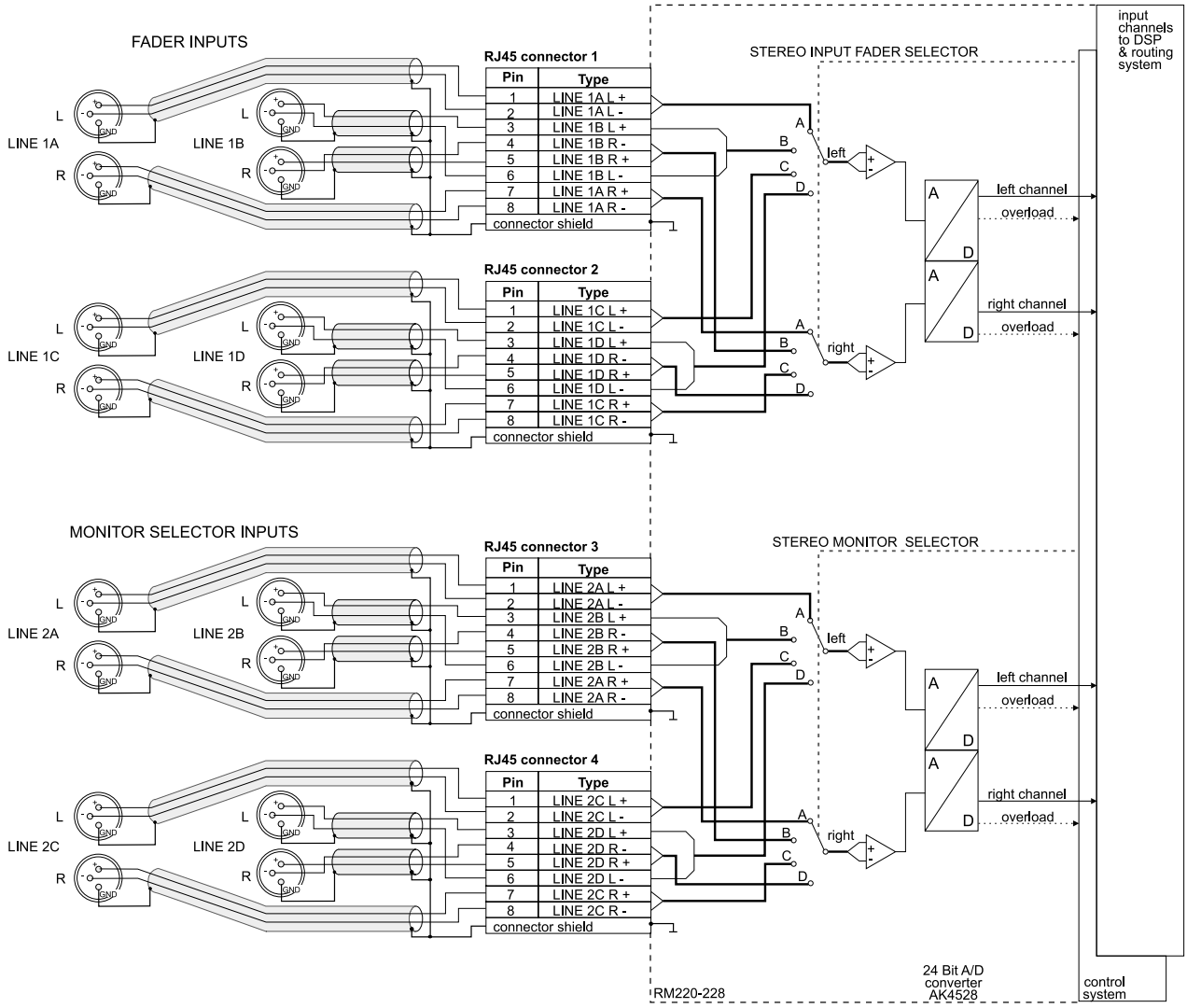


Figure I–49: RM220-228 Analog In Selector module, Wiring Example 1.

7.7 RM220-311 GPIO Module

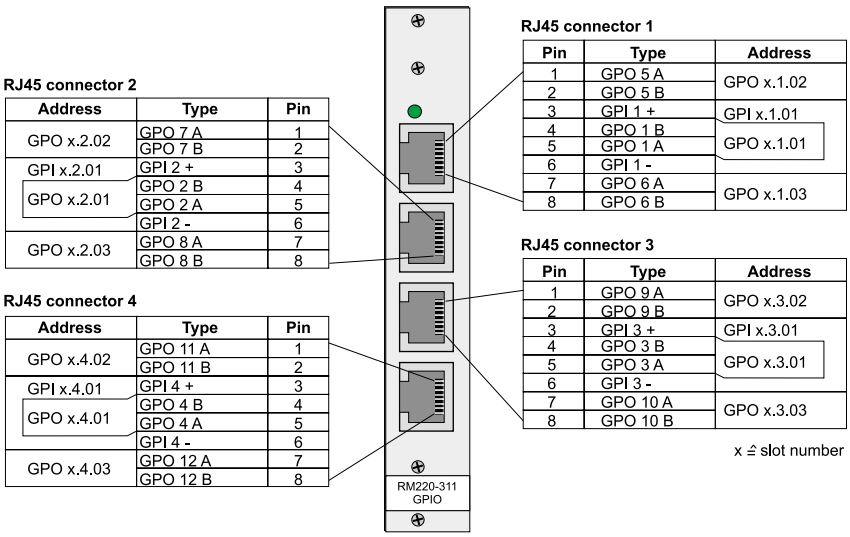


Figure I–50: RM220-311 GPIO module, Connector Chart.

7.8 RM220-951 DSP, MADI & Communication Controller

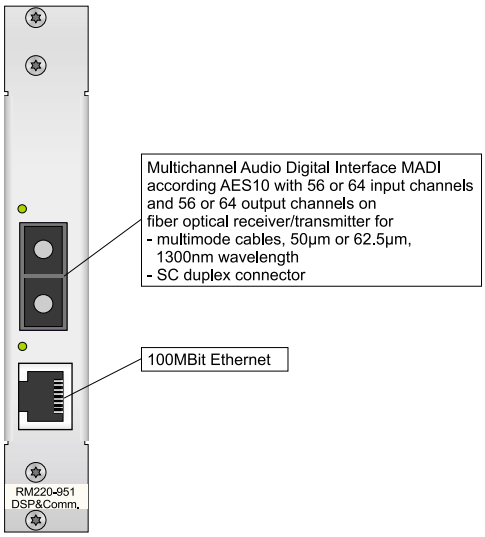


Figure I–51: RM220-951 DSP, MADI & Comm. Controller

Note: When using MADI the system has to be synchrinized to the incoming MADI data stream or to TTL wordclock reference clock, see on page 60 („Synchronisation ...“).

7.9 Color Codes for Network Cables

RM220-111 AES3/EBU In/ Out		RM220-222 Analog In/Out		RM220-122 Mic-Line In/ Headphone Out		RM220-311 GPIO		RM220-228 Analog In Selector module (stereo)	
RJ45.1 (top)		*RJ45.1 (top)*		*RJ45.1 (top)*		*RJ45.1 (top)*		*RJ45.1 (top)*	
1	AES 1 IN +	1	LINE 1 IN +	1	MIC 1 IN +	1	GPO 5 A	1	LINE 1A L +
2	AES 1 IN -	2	LINE 1 IN -	2	MIC 1 IN -	2	GPO 5 B	2	LINE 1A L -
3	GPI 1 +	3	GPI 1 +	3	GPI 1 +	3	GPI 1 +	3	LINE 1B L +
4	GPO 1 GND	4	GPO 1 GND	4	GPO 1 B	4	GPO 1 B	4	LINE 1B R -
5	GPO 1 +	5	GPO 1 +	5	GPO 1 A	5	GPO 1 A	5	LINE 1B R +
6	GPI 1 GND	6	GPI 1 GND	6	GPI 1 GND	6	GPI 1 -	6	LINE 1B L -
7	AES 1 OUT +	7	LINE 2 IN +	7	MIC 2 IN +	7	GPO 6 A	7	LINE 1A R +
8	AES 1 OUT -	8	LINE 2 IN -	8	MIC 2 IN -	8	GPO 6 B	8	LINE 1A R -
S	shield GND	S	shield GND	S	shield GND	S	shield GND	S	shield GND
RJ45.2		*RJ45.2*		*RJ45.2*		*RJ45.2*		*RJ45.2*	
1	AES 2 IN +	1	LINE 1 OUT +	1	HP 1L OUT +	1	GPO 7 A	1	LINE 1C L +
2	AES 2 IN -	2	LINE 1 OUT -	2	HP 1L OUT GND	2	GPO 7 B	2	LINE 1C L -
3	GPI 2 +	3	GPI 2 +	3	ACI 1 +	3	GPI 2 +	3	LINE 1D L +
4	GPO 2 GND	4	GPO 2 GND	4	GPO 2 B	4	GPO 2 B	4	LINE 1D R -
5	GPO 2 +	5	GPO 2 +	5	GPO 2 A	5	GPO 2 A	5	LINE 1D R +
6	GPI 2 GND	6	GPI 2 GND	6	ACI 1 GND	6	GPI 2 -	6	LINE 1D L -
7	AES 2 OUT +	7	LINE 2 OUT +	7	HP 1R OUT +	7	GPO 8 A	7	LINE 1C R +
8	AES 2 OUT -	8	LINE 2 OUT -	8	HP 1R OUT GND	8	GPO 8 B	8	LINE 1C R -
S	shield GND	S	shield GND	S	shield GND	S	shield GND	S	shield GND
RJ45.3		*RJ45.3*		*RJ45.3*		*RJ45.3*		*RJ45.3*	
1	AES 3 IN +	1	LINE 3 IN +	1	MIC 3 IN +	1	GPO 9 A	1	LINE 2A L +
2	AES 3 IN -	2	LINE 3 IN -	2	MIC 3 IN -	2	GPO 9 B	2	LINE 2A L -
3	GPI 3 +	3	GPI 3 +	3	GPI 2 +	3	GPI 3 +	3	LINE 2B L +
4	GPO 3 GND	4	GPO 3 GND	4	GPO 3 B	4	GPO 3 B	4	LINE 2B R -
5	GPO 3 +	5	GPO 3 +	5	GPO 3 A	5	GPO 3 A	5	LINE 2B R +
6	GPI 3 GND	6	GPI 3 GND	6	GPI 2 GND	6	GPI 3 -	6	LINE 2B L -
7	AES 3 OUT +	7	LINE 4 IN +	7	MIC 4 IN +	7	GPO 10 A	7	LINE 2A R +
8	AES 3 OUT -	8	LINE 4 IN -	8	MIC 4 IN -	8	GPO 10 B	8	LINE 2A R -
S	shield GND	S	shield GND	S	shield GND	S	shield GND	S	shield GND
RJ45.4 (bottom)		*RJ45.4 (bottom)*		*RJ45.4 (bottom)*		*RJ45.4 (bottom)*		*RJ45.4 (bottom)*	
1	AES 4 IN +	1	LINE 3 OUT +	1	HP 2L OUT +	1	GPO 11 A	1	LINE 2C L +
2	AES 4 IN -	2	LINE 3 OUT -	2	HP 2L OUT GND	2	GPO 11 B	2	LINE 2C L -
3	GPI 4 +	3	GPI 4 +	3	ACI 2 +	3	GPI 4 +	3	LINE 2D L +
4	GPO 4 GND	4	GPO 4 GND	4	GPO 4 B	4	GPO 4 B	4	LINE 2D R -

RM220-111 AES3/EBU In/ Out		RM220-222 Analog In/Out		RM220-122 Mic-Line In/ Headphone Out		RM220-311 GPIO		RM220-228 Analog In Selector module (stereo)	
5	GPO 4 +	5	GPO 4 +	5	GPO 4 A	5	GPO 4 A	5	LINE 2D R +
6	GPI 4 GND	6	GPI 4 GND	6	ACI 2 GND	6	GPI 4 -	6	LINE 2D L -
7	AES 4 OUT +	7	LINE 4 OUT +	7	HP 2R OUT +	7	GPO 12 A	7	LINE 2C R +
8	AES 4 OUT -	8	LINE 4 OUT -	8	HP 2R OUT GND	8	GPO 12 B	8	LINE 2C R -
S	shield GND	S	shield GND	S	shield GND	S	shield GND	S	shield GND

RM220-950 DSP & Communication Controller Ethernet / RS232		RM220-010, -020, -061 CAN Bus & 24V Console Power Supply	
Sub-D 9 (top)		RJ45 (bottom)	
1	int. n.c.	1	n.c. *)
2	RS232 TX Data	2	GND
3	RS232 RX Data	3	GND
4	int. wired to 6	4	+ 24V
5	RS232 GND	5	+ 24V
6	int. wired to 4	6	GND
7	int. wired to 8	7	CAN +
8	int. wired to 7	8	CAN -
9	int. n.c.	S	shield GND
S	shield GND		
RJ45 (bottom)			
1	Ethernet TX +		
2	Ethernet TX -		
3	Ethernet RX +		
4	int. term.		
5	int. term.		
6	Ethernet RX -		
7	int. term.		
8	int. term.		
S	shield GND		

*) not connected, +24V until december 2003

Network Cable Standard Colours			
		***common patch cables*(may vary between manufacturers!), recommendation according to EIA/TIA T568B**	**recommendation according to IEC708/ IEC189.2, EIA/TIA T568A**
RJ45			
1	cable pair 1a	white/orange	white/green
2	cable pair 1b	orange	green
3	cable pair 2a	white/green	white/orange
4	cable pair 3b	blue	blue
5	cable pair 3a	white/blue	white/blue
6	cable pair 2b	green	orange
7	cable pair 4a	white/brown	white/brown
8	cable pair 4b	brown	brown

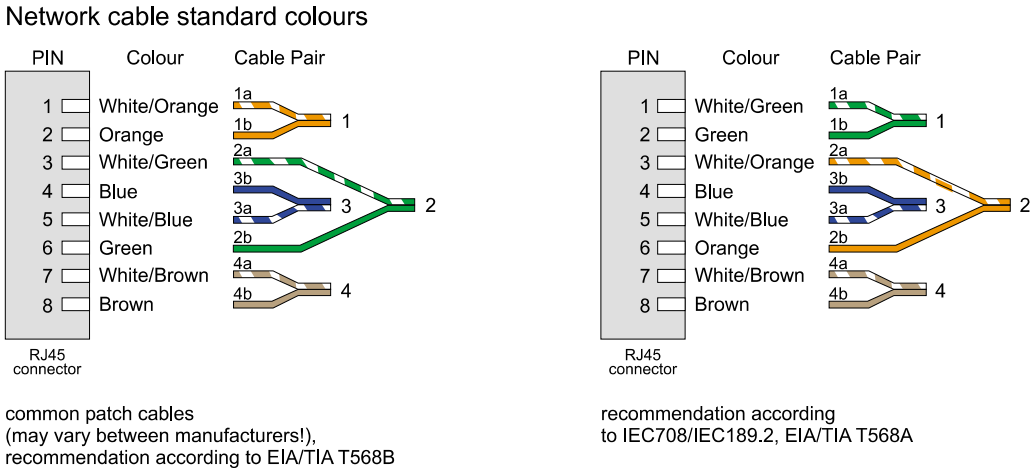


Figure I–52: Network cable standard colours for RJ 45 connectors.

8. Using GPIs (General Purpose Inputs)

8.1 RM220-111 Digital In/Out/GPIO module, 8 channels

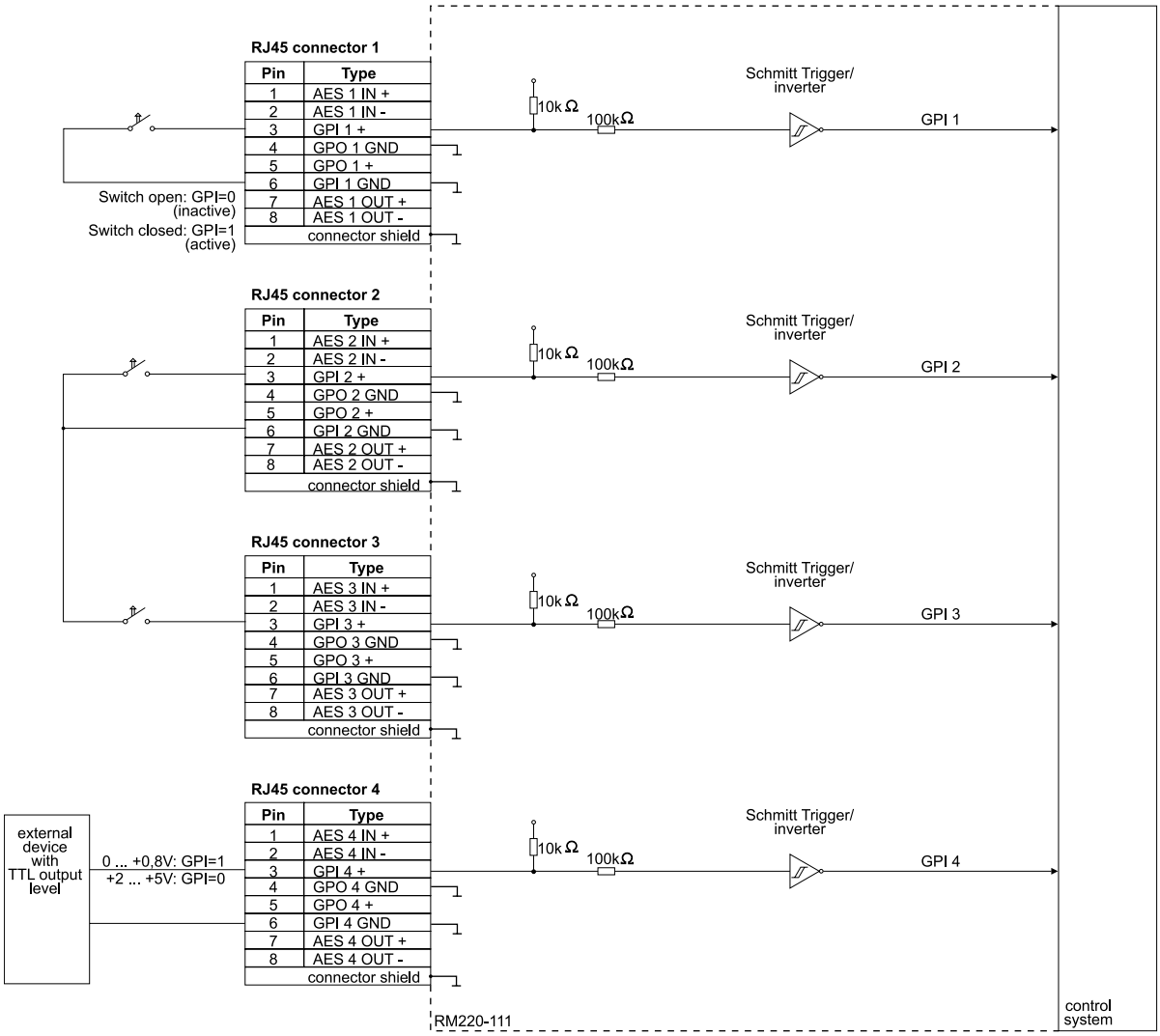


Figure I–53: RM220-111 Digital In/Out/GPIO module - Using GPIs, Wiring Example 1.

8.2 RM220-122 Mic/Headphone/GPIO Module, 4 channels

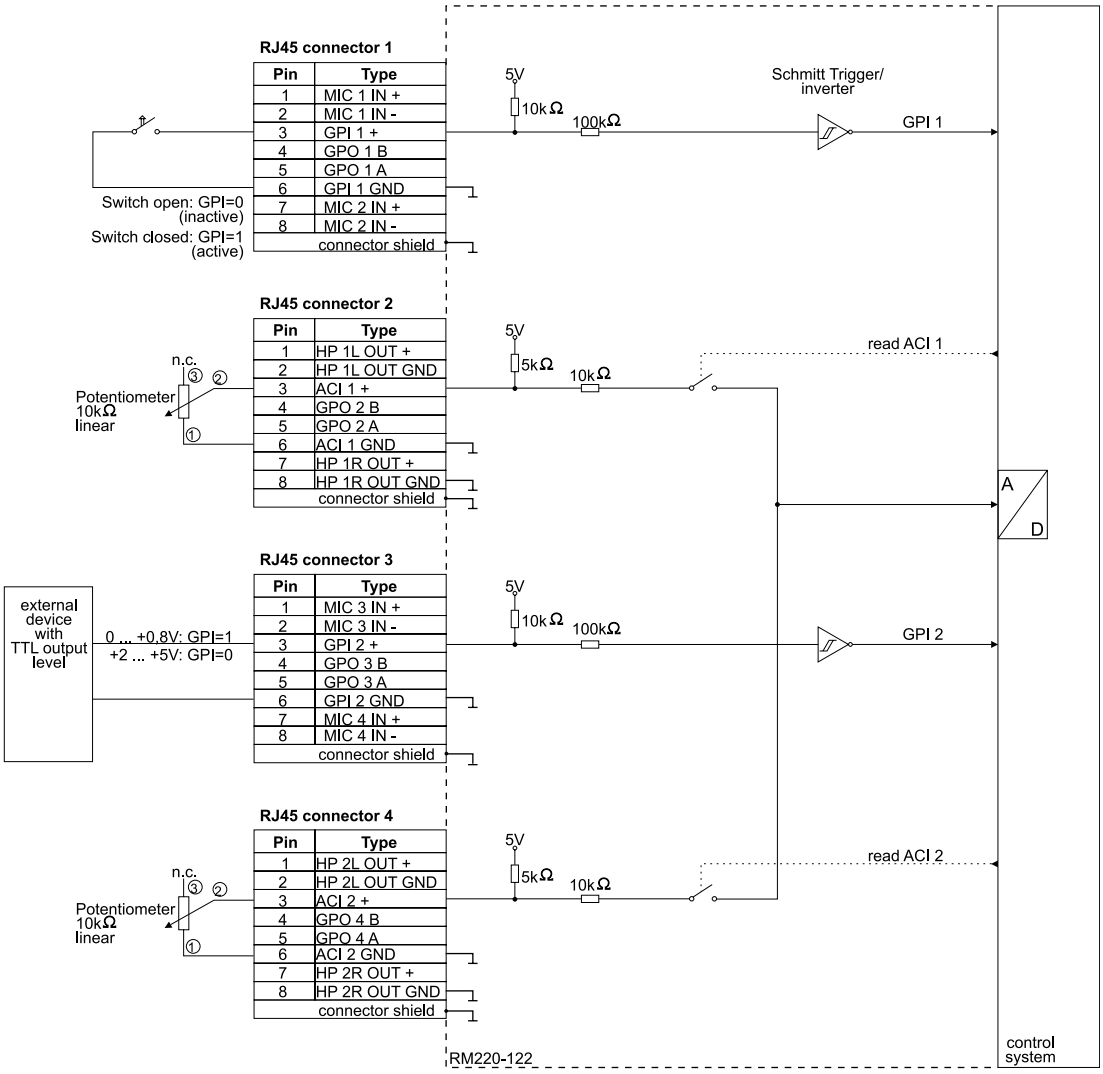


Figure I–54: RM220-122 Mic/Headphone/GPIO module - Using GPIs, Wiring Example 1.

8.3 RM220-222 Analog In/Out/GPIO module, 4 channels

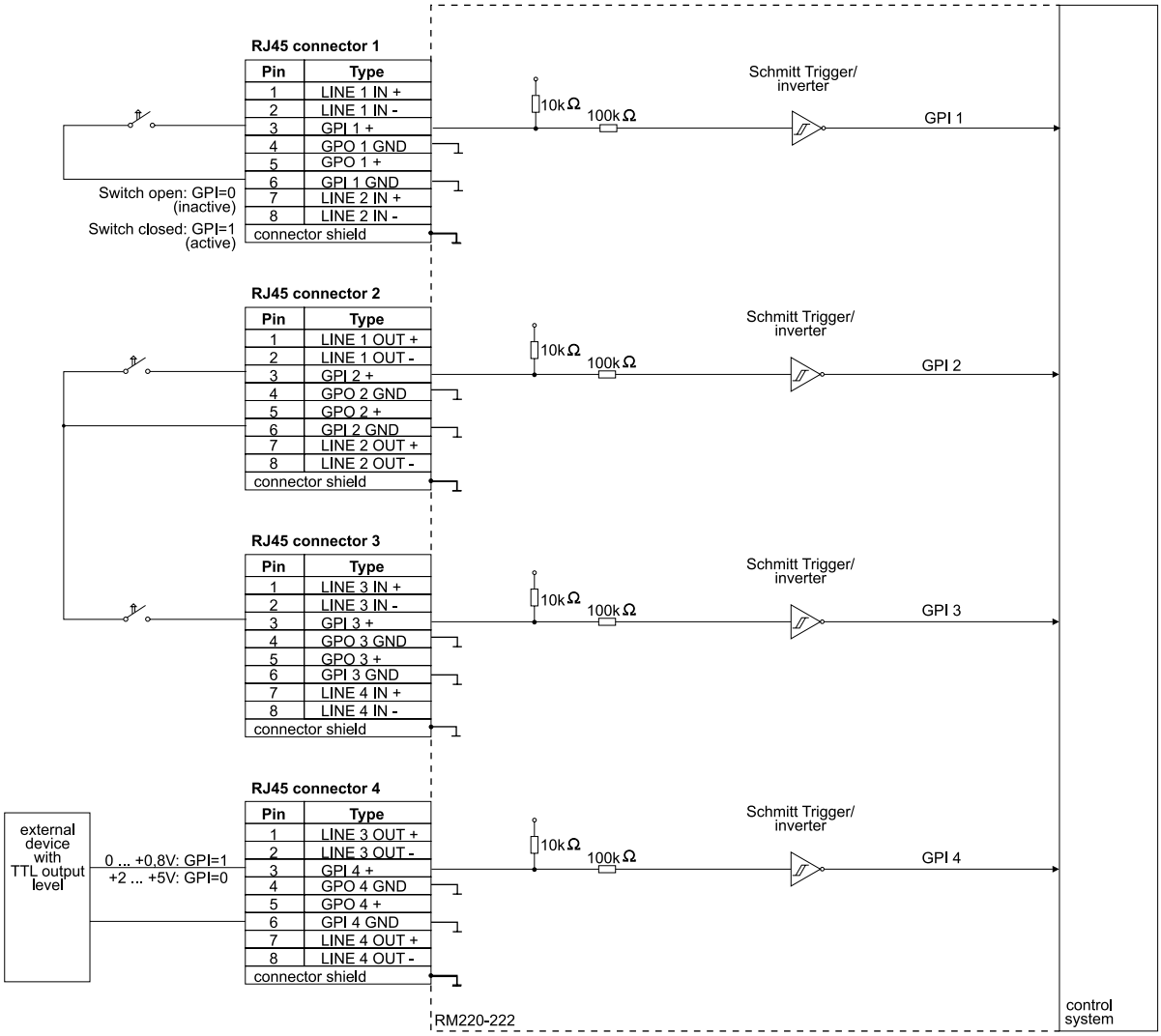


Figure I–55: RM220-222 Analog In/Out/GPIO module - Using GPIs, Wiring Example 1.

8.4 RM220-223 Analog In/Out/GPIO module, 4 channels

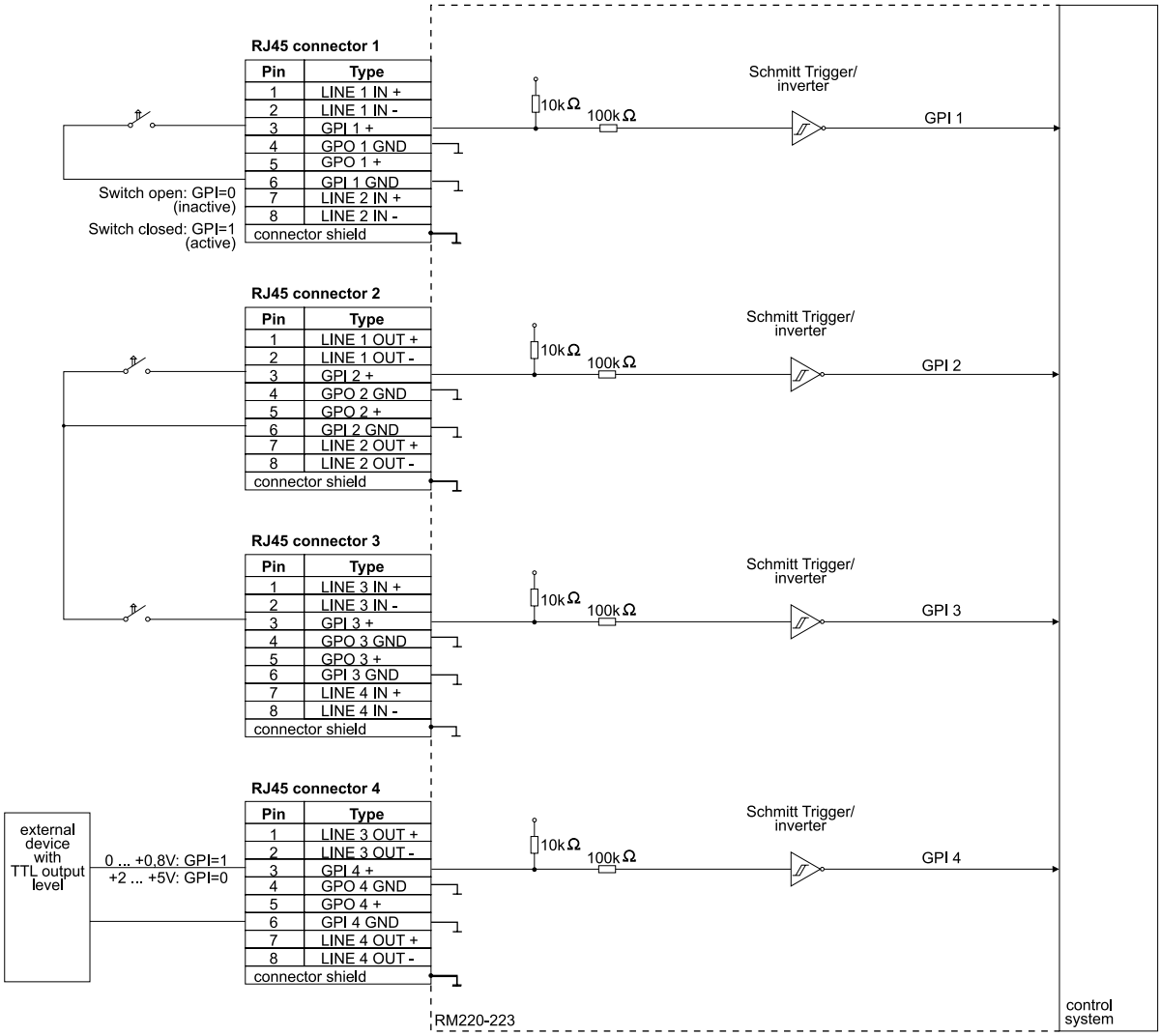


Figure I–56: RM220-223 Analog In/Out/GPIO module - Using GPIs, Wiring Example 1.

9. Using GPOs (General Purpose Outputs)

9.1 RM220-111 Digital In/Out/GPIO module, 8 channels

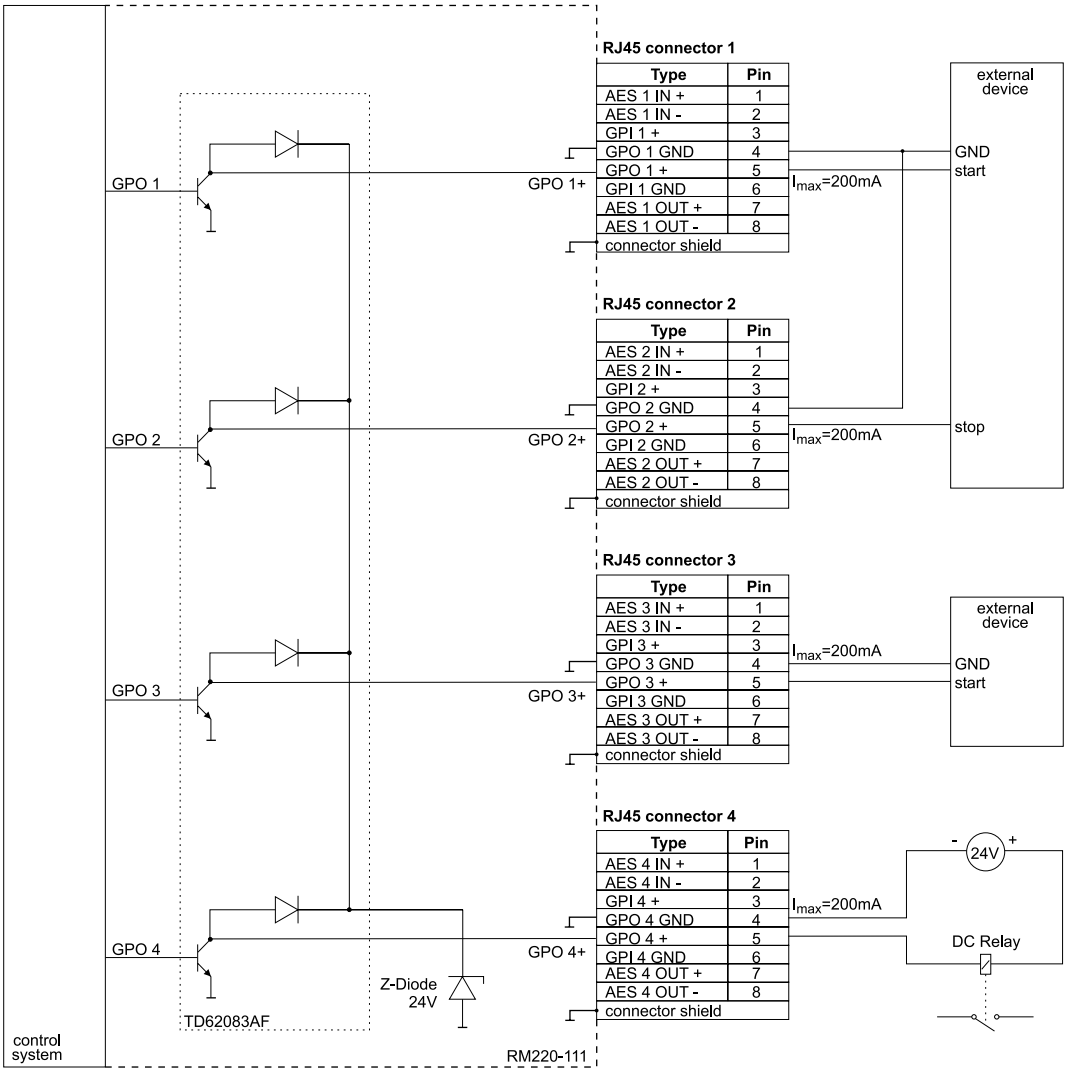


Figure I–57: RM220-111 Digital In/Out/GPIO module - Using GPOs, Wiring Example 1.

9.2 RM220-122 Mic/Headphone/GPIO module, 4 channels

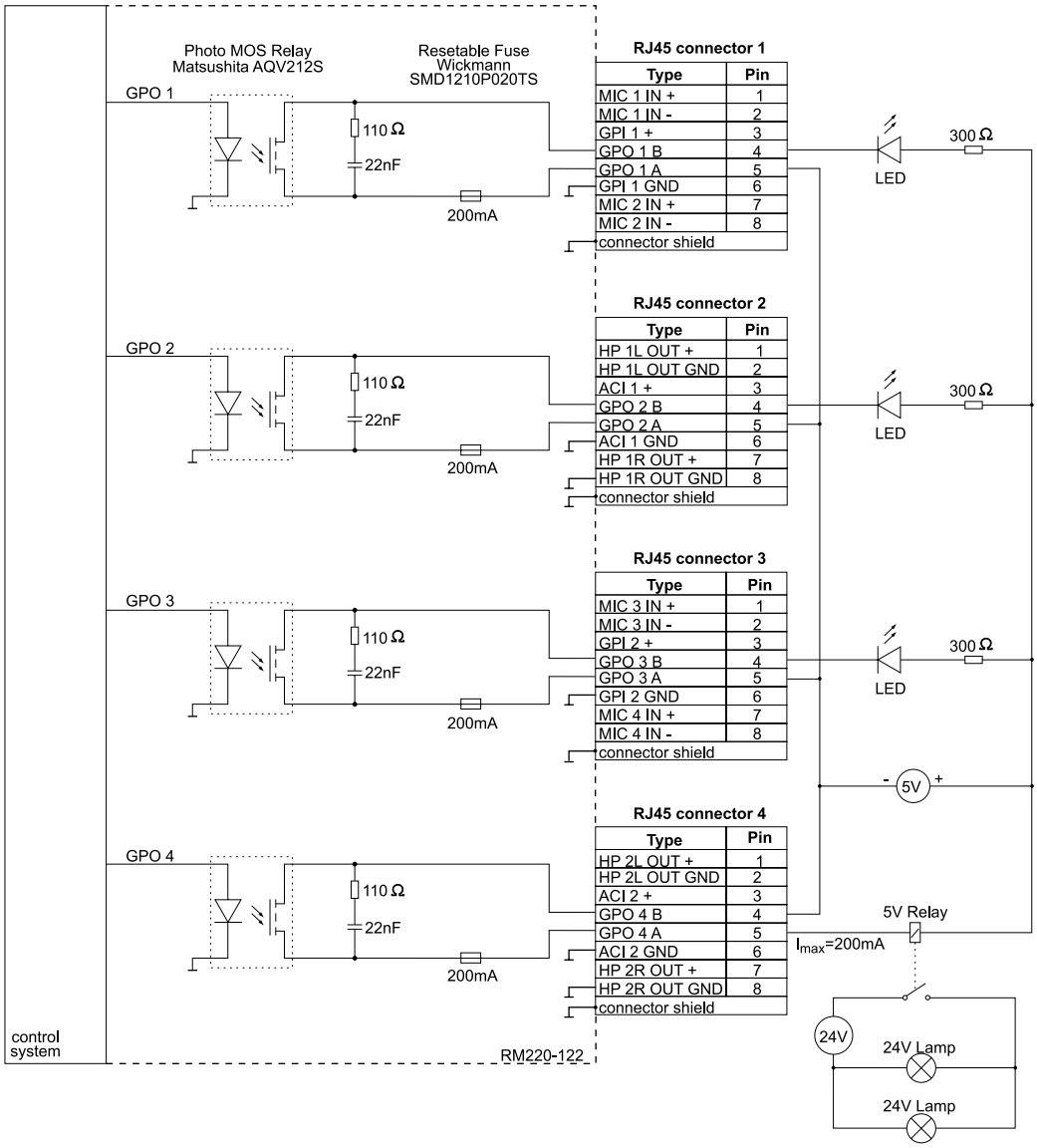


Figure I–58: RM220-122 Mic/Headphone/GPIO module - Using GPOs, Wiring Example 1.

9.3 RM220-222 Analog In/Out/GPIO module, 4 channels

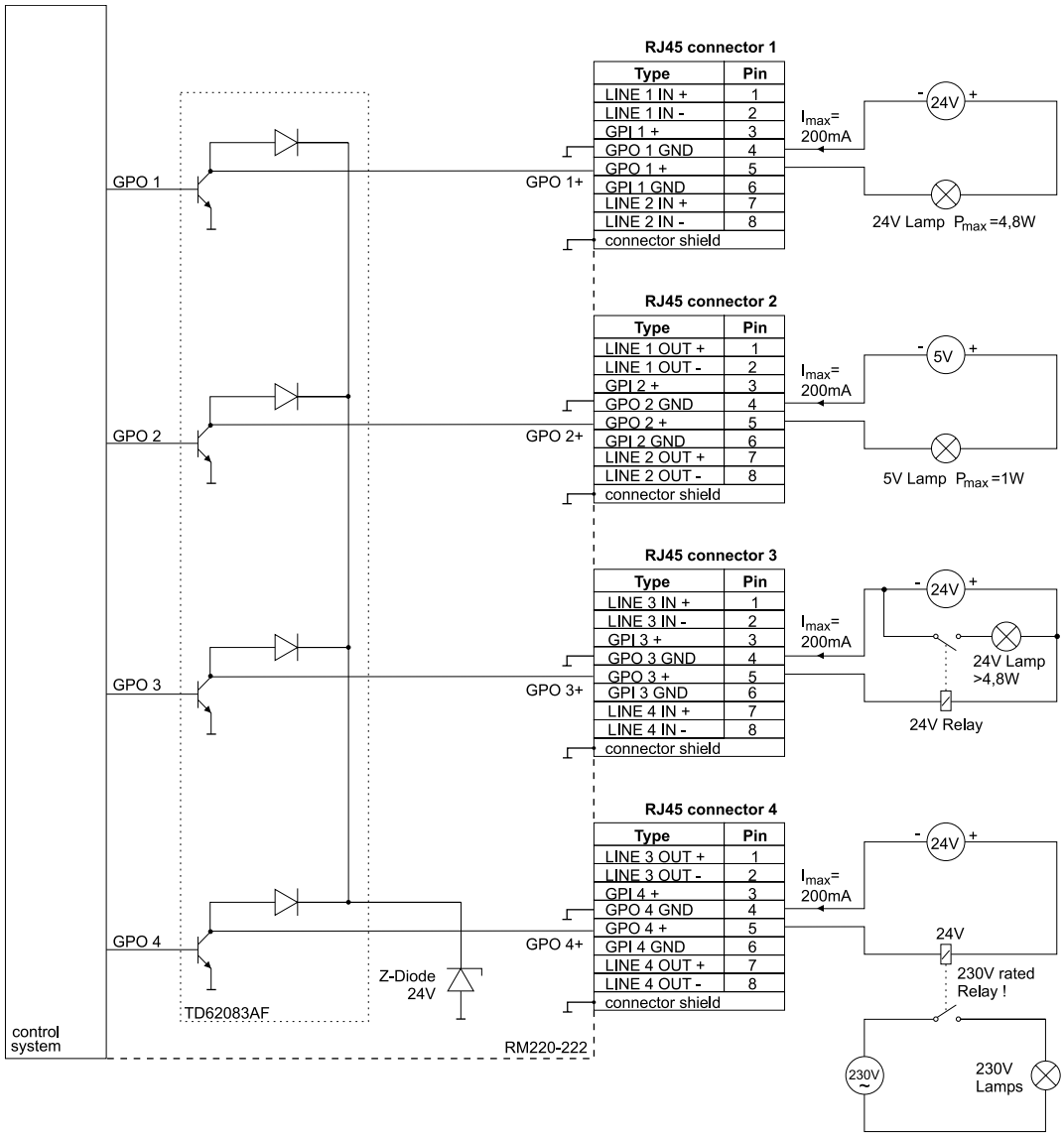


Figure I–59: RM220-222 Analog In/Out/GPIO module - Using GPOs, Wiring Example 1.

9.4 RM220-223 Analog In/Out/GPIO module, 4 channels

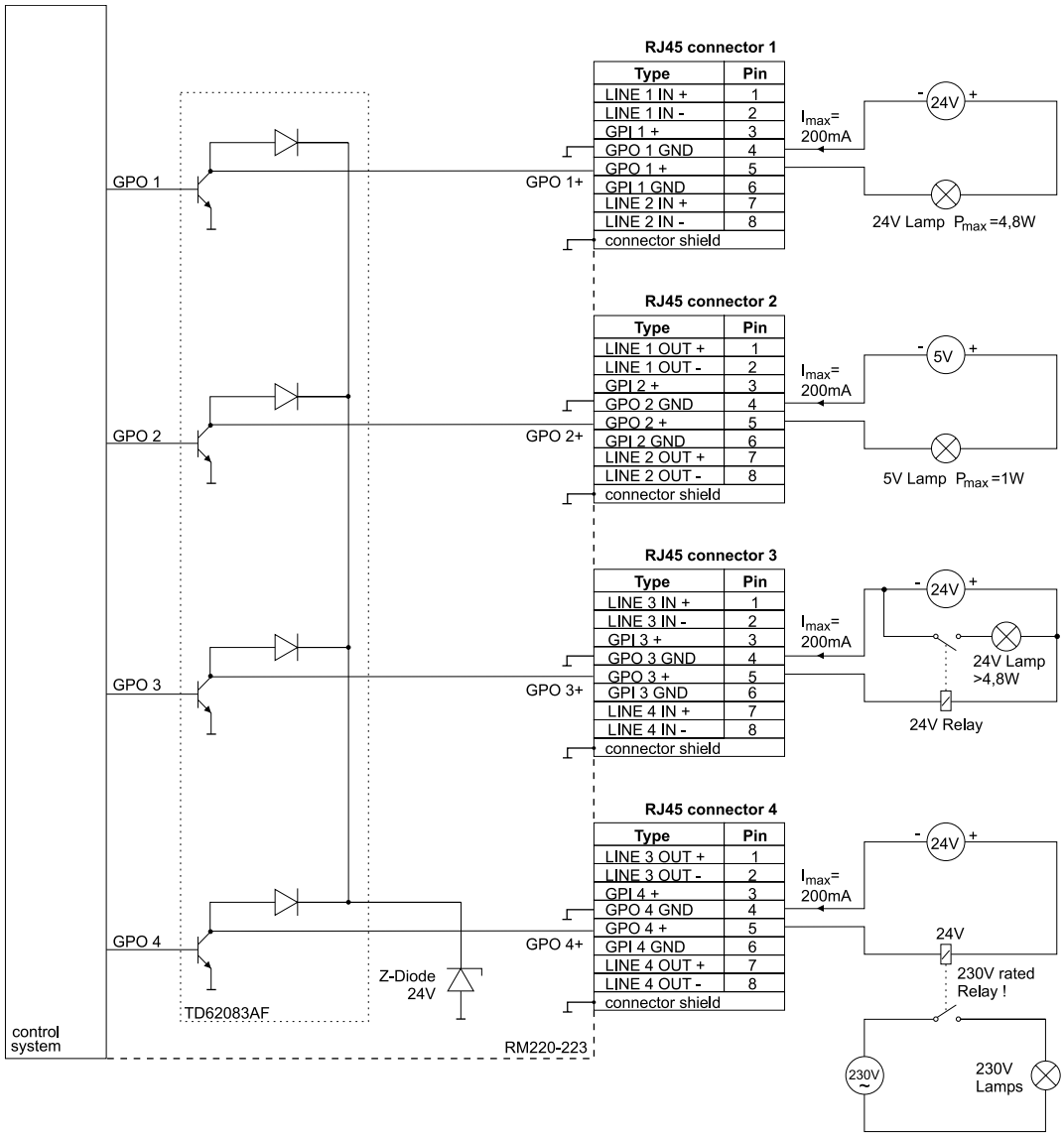
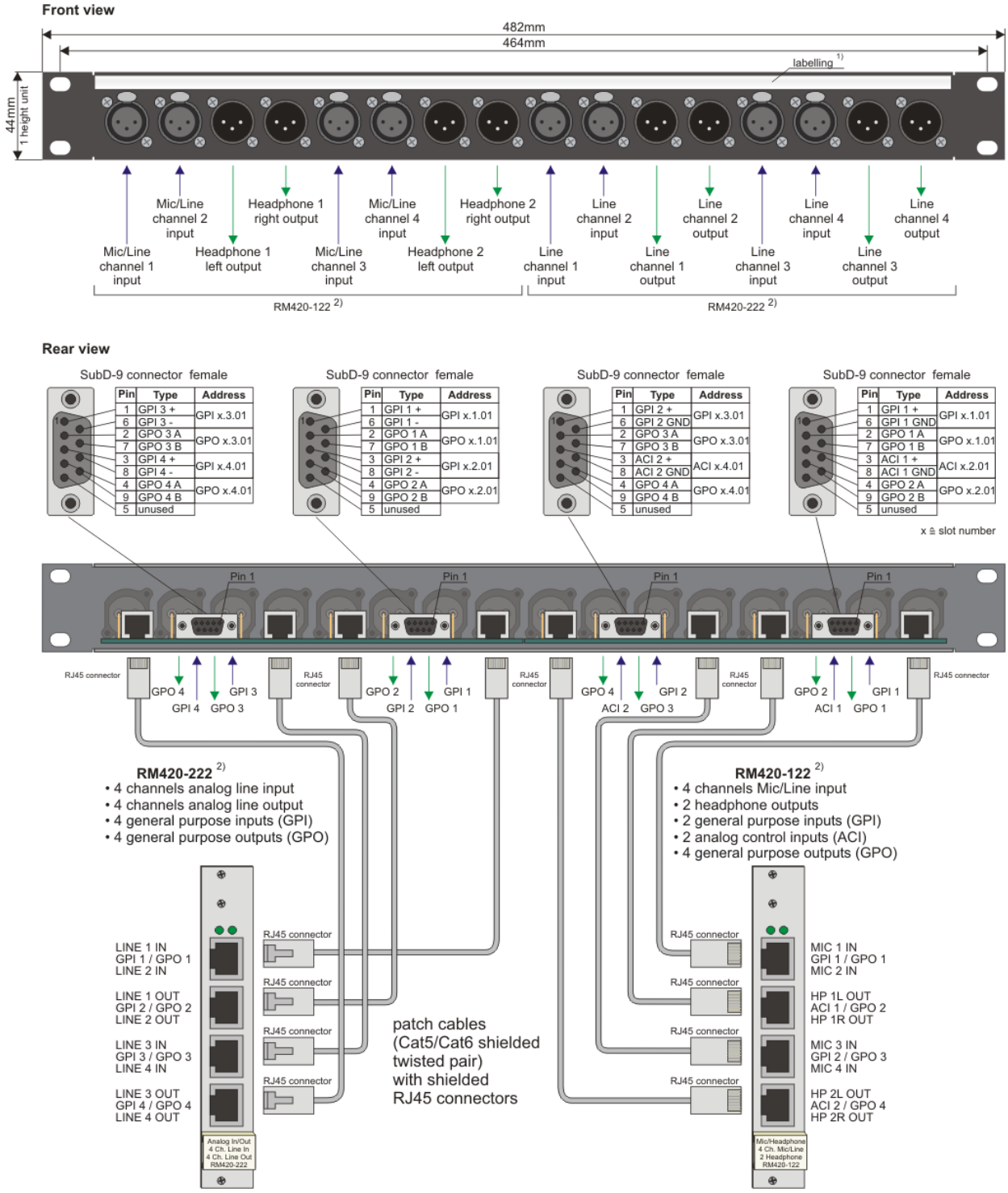


Figure I–60: RM220-223 Analog In/Out/GPIO module - Using GPOs, Wiring Example 1

10. XLR Adapter Panels

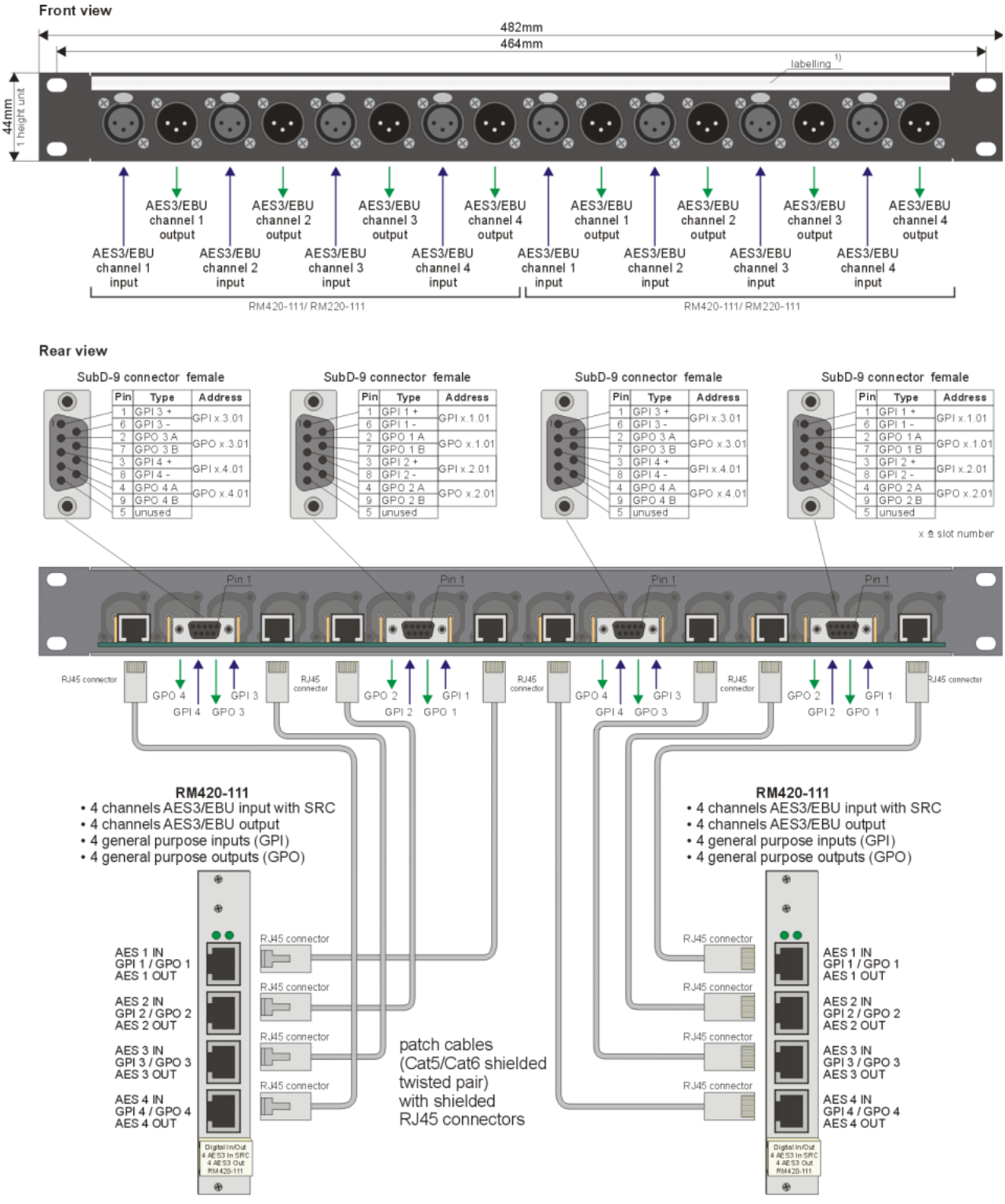
10.1 RM420-XLR-AA RJ45/XLR Adapter Panel 1U/19“



1) replaceable strip of paper underneath plastic cover
2) RM420-XLR-AA can be used with
   • 2 RM420-222/ RM220-222/ RM220-223 or
   • 2 RM420-122/ RM220-122 or
   • 1 RM420-222/ RM220-222/ RM220-223 and 1 RM420-122/ RM220-122

Figure I–61: RM420-XLR-AA RJ45/XLR Adapter Panel

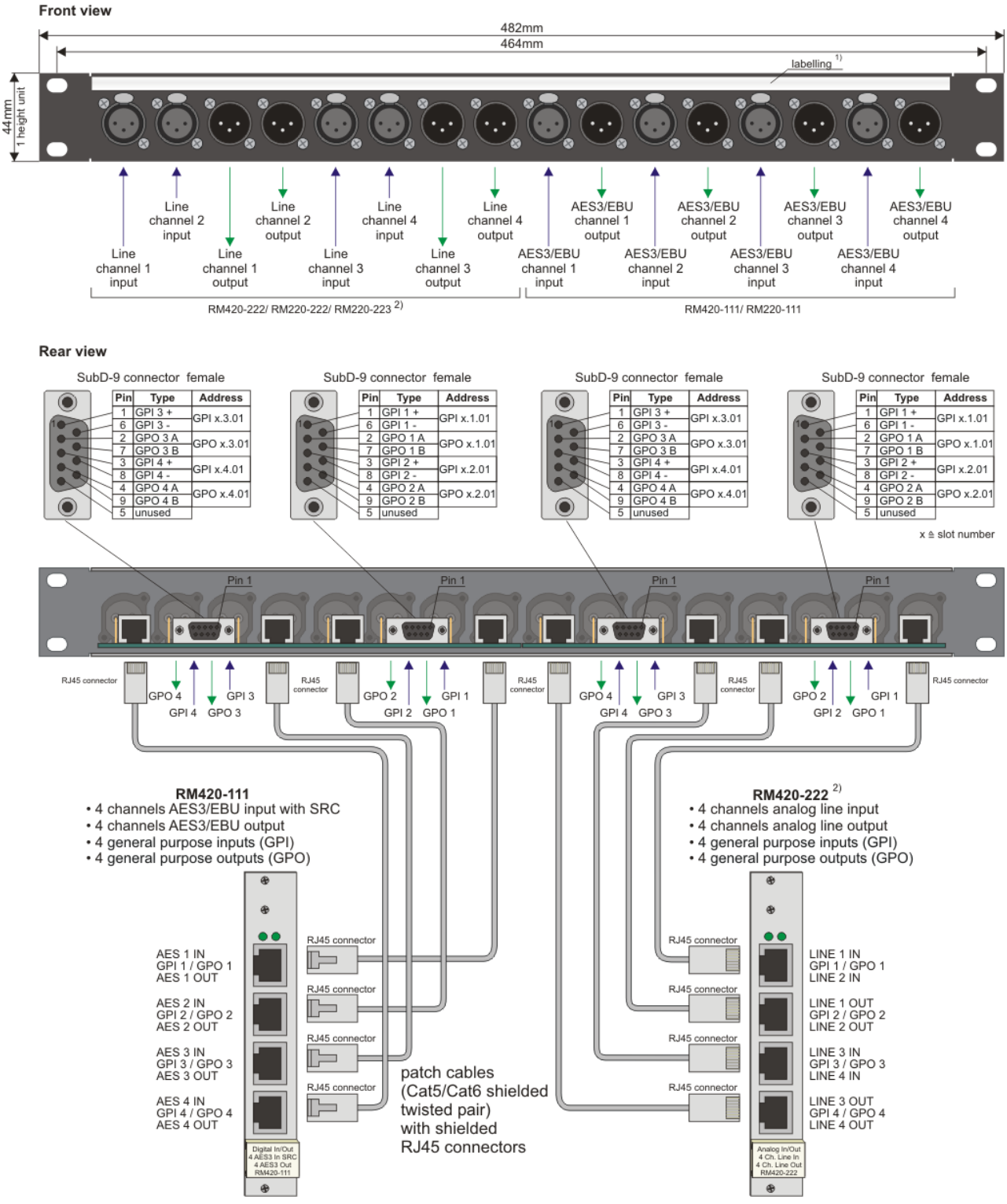
10.2 RM420-XLR-DD RJ45/XLR Adapter Panel 1U/19“



1) replaceable strip of paper underneath plastic cover

Figure I–62: RM420-XLR-DD RJ45/XLR Adapter Panel

10.3 RM420-XLR-AD RJ45/XLR Adapter Panel 1U/19“



1) replaceable strip of paper underneath plastic cover
2) or RM420-122/ RM220-122 (wiring see RM420-XLR-AA)

Figure I–63: RM420-XLR-AD RJ45/XLR Adapter Panel

11. Setting Address Jumpers for Fader Modules

Each fader module in the mixing desk has a **module address**. This address is essential for the communication between the mixing desk and the DSP frame. It is set using jumpers on the PCB of the fader module. Normally, module addresses are set in the factory and you do not need to worry about them. However, if you need to replace a fader module with a spare part, you need to set the correct address on the new module.

Important Note: Each fader module in a RM2200D mixing desk must have a unique address. If two modules are using the same address, they will work “in parallel”. Although this setup does not damage the RM2200D, it prevents the mixing desk from working properly.

You can change the module address from 1 to 4 using the jumpers inside the module. The following pictures show the location of the jumpers and how you have to set them for certain addresses.

11.1 RM220-020 Fader Module (without channel selection display)

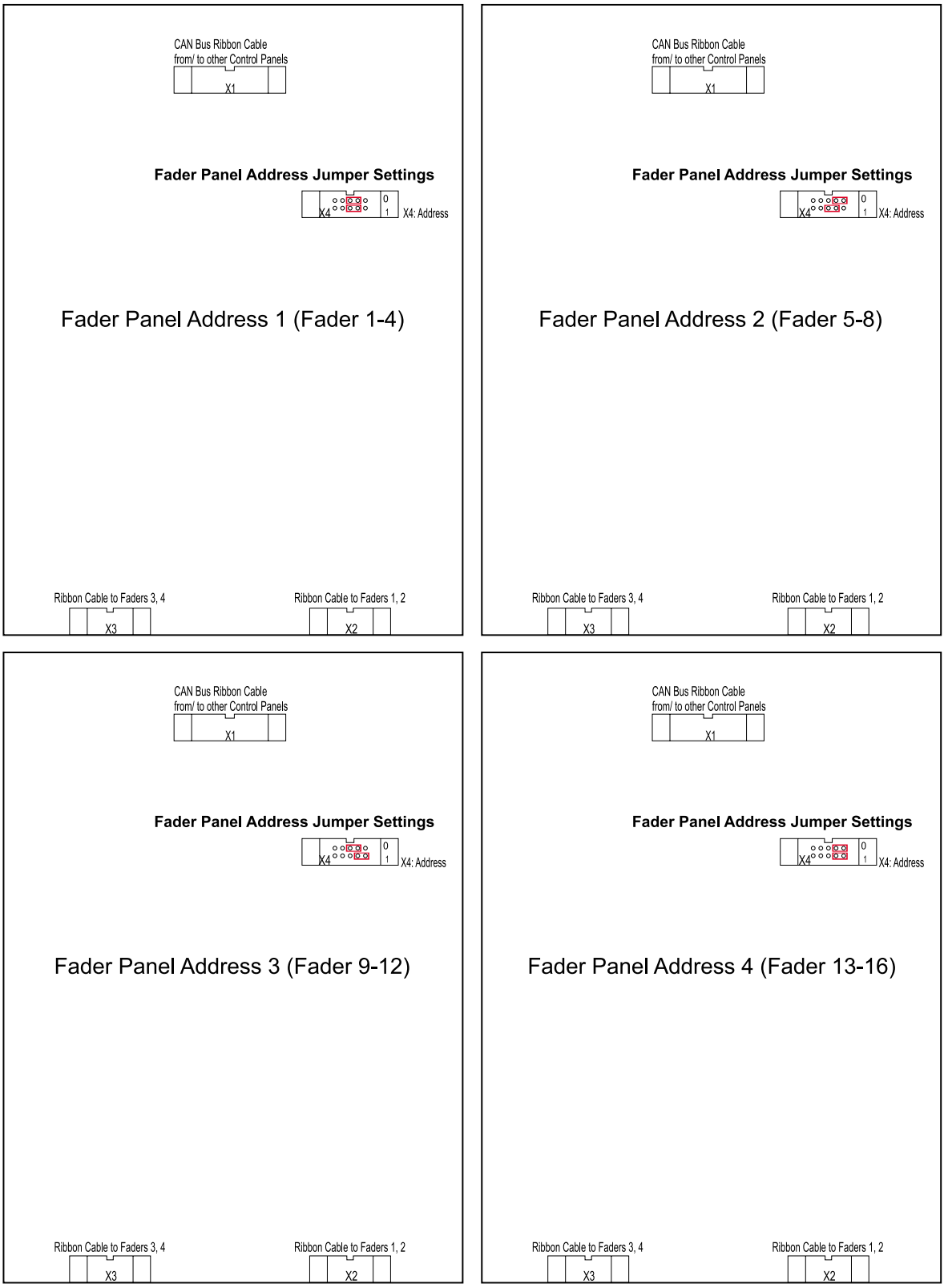
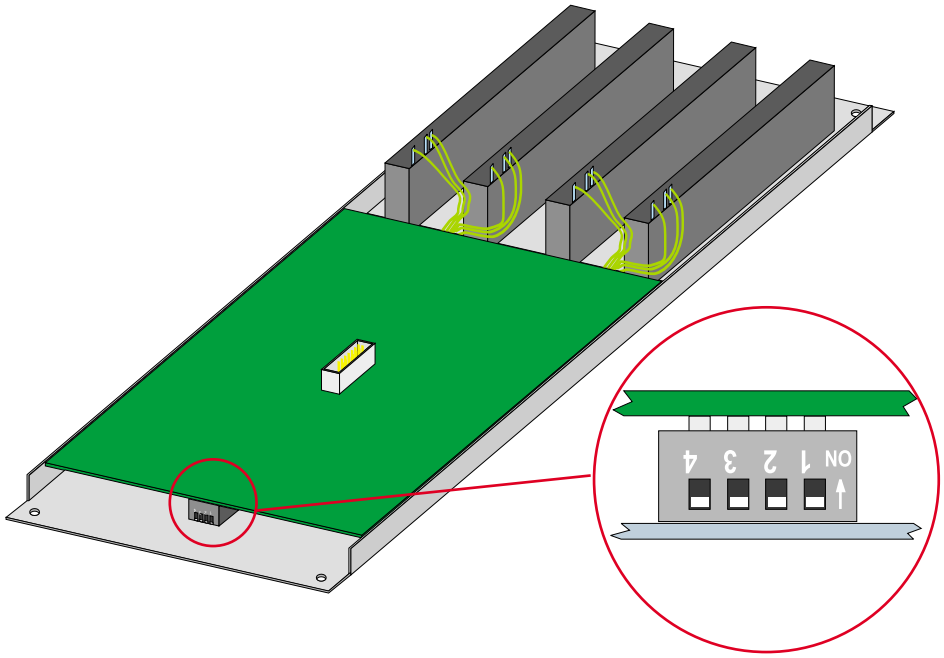
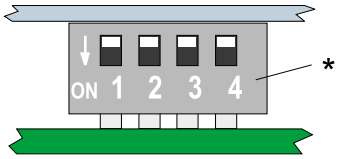


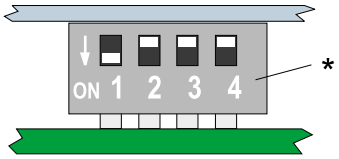
Figure I–64: Jumper settings for the fader module address (RM220-020, bottom view).

11.2 RM220-020D Fader Module (with channel selection display)

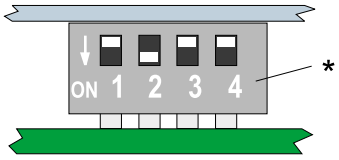




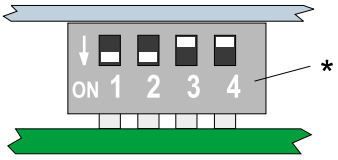
Fader Panel Address 1 (Fader 1-4)



Fader Panel Address 2 (Fader 5-8)



Fader Panel Address 3 (Fader 9-12)



Fader Panel Address 4 (Fader 13-16)

*) Switch 3 and 4 unused, does not matter!

Figure I–65: Jumper settings for the fader panel address (RM220-020D, bottom view).

Index

A

B

C

D

E

F

G

H

I

K

L

M

N

O

P

R

S

T

U

V

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