HARVEY®

HARVEY mx.16

Operating Manual

Version 1.8

DSPECIALISTS
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http://www.dspecialists.com
http://www.harvey-audio.com

Safety Notes

This symbol is intended to alert the user that uninsulated voltage within the unit has sufficient magnitude to cause electric shock.

This symbol is intended to alert the user that important literature concerning the operation and maintenance of this unit has been included. Be sure to read this manual carefully.

CAUTION: Never remove screws from the enclosure to reduce the risk of electric shock. There are no user-serviceable parts inside. Refer all service to authorized personnel.

WARNING: To prevent fire or electric shock, do not expose the unit to rain or moisture.

1. Read this manual carefully to avoid any problems.

2. Connect the unit to a grounded AC outlet (rating: 90…250 V, 47…63 Hz) only.

3. Before use, always make sure that the power cord is in good condition. Dispose and replace damaged power cords immediately. Never detach the ground connection of the power cord.

4. The main fuses are located on the rear panel of the unit and are externally accessible. Be sure to replace fuses with items of the same type and specifications.

5. The power switch is located on the rear panel of the unit. The ON and OFF statuses are marked as “1” and “0”, respectively.

6. Install the unit in a cool, dry, and clean place with sufficient ventilation. Do not expose it to direct sunlight, heat sources, vibrations, dirt and dust, humidity, and low temperatures. When installing into a closet, allow for a clearance of 2.5 mm (1") around the unit to prevent overheating.

7. When exposing the unit to considerable temperature changes, be sure to allow for it to adjust to the new conditions. Such variations in temperature may cause condensation inside the unit, resulting in failure and the risk of electric shock.

8. Overexposure to high volumes can result in hearing damage or loss. Be sure to wear ear protectors when exposed to such volumes.

HARVEY®

Operating Manual
HARVEY mx.16 · HARVEY Composer

I. Introduction

I.1 Preface

The HARVEY mx.16 is a highly flexible audio and media-control matrix and a critical component of sound-reinforcement and conference systems.

Each hardware unit features 16 analog audio inputs and the same number of audio outputs plus a large number of control interfaces from various formats. In addition, you can add another 16 audio channels by implementing a Dante or CobraNet digital audio interface—for a total of 32 audio inputs and outputs.

You can connect the HARVEY to a wide range of devices thanks to the versatile interface options and use it as a control center for your audio, lighting, and media systems. The HARVEY mx.16 converts incoming and outgoing data as required between the various serial ports, thus rendering additional converters unnecessary. Many popular media controllers including Crestron, AMX, Cue, and iPad are suitable for operating the HARVEY mx.16 and the devices connected to it. This way, the HARVEY mx.16 is the perfect audio and media-control matrix for conference rooms, theaters, home theaters, schools, and multipurpose venues.

The 32-bit high-performance DSP implements numerous functions in the software domain. It ensures high-quality audio editing tailored to the application at hand even with complex configurations and high channel counts. Settings are stored and recalled by the press of a key, so you can quickly switch between various applications for your installation.

The Windows-compliant HARVEY Composer software allows for conveniently setting up the unit. The HARVEY system has a modular configuration and offers many function blocks for audio editing and control functions. Since you can perform the system setup offline (i.e. without the hardware connected) using HARVEY Composer, you can project and preconfigure new installations or installation changes when and wherever you like. You can later apply your new or changed project to the hardware and fine-tune the settings online and in real-time using your mouse and HARVEY Composer.

The proprietary HARVEY H-Net and H-Text protocols provide a dedicated HARVEY programming language that allows for remotely controlling all parameters of a HARVEY mx.16 unit using serial interfaces (e.g. Wi-Fi over TCP). Refer to the separate manual for information on how to use this feature and the programming language.

To achieve optimum results, read this manual carefully and thoroughly.

I.2 Items Included

The following items are supplied with your HARVEY mx.16 system:

1 × HARVEY mx.16 hardware unit

1 × 3-pin IEC power cord

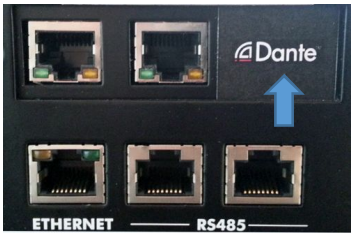
5 × 8-pin Phoenix terminal block

32 × 3-pin Phoenix terminal block

1 × RJ45 connector featuring a 120-ohm daisy-chain terminator

Optional Interface

If you ordered your HARVEY mx.16 including the optional digital interface, it has already been implemented before shipping. The ports are located above the Ethernet and RS-485 interfaces on the rear panel.



HARVEY mx.16 with optional Dante interface

➔ Make sure all items are present. If any items have been damaged in transit or are missing, contact your retailer.

I.3 Computer Minimum Requirements

HARVEY Composer runs on any computer that meets or exceeds the following requirements:

Operating system:	Windows XP SP3 (32-bit), Windows 7 (32-bit or 64-bit), or Windows 8 (32-bit or 64-bit)
	Microsoft .NET Framework 2.0 successfully installed (Windows XP)
CPU:	1.5 GHz or faster (multicore processor recommended)
RAM:	2 GB RAM (> 3 GB recommended for Windows 7 and Windows 8)
Video card:	1024 × 768 (higher resolution recommended)
Network port:	100-Mbps or 1000-Mbps Ethernet port

➔ You can download the latest HARVEY Composer version from http://www.harvey-audio.com.

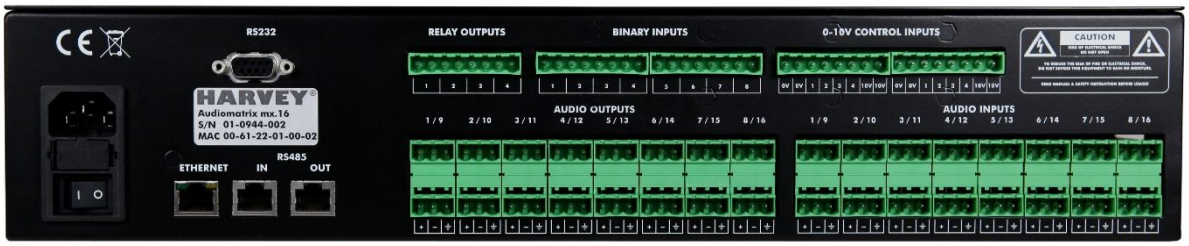
➔ For information on how to install the application and all required software components, refer to the “Software Setup” section in chapter III (page 15).

II. HARVEY mx.16

II.1 Front Panel

The user interface (i.e. the display and the controls), a headphones port, and a red alarm LED indicator are located on the front panel of the HARVEY mx.16.

II.2 Rear Panel



All physical inputs and outputs, interface ports, the power-cord socket, and the power switch are located on the rear panel of the HARVEY mx.16. The designs of all digital-audio and serial ports (CobraNet/Dante; Ethernet, RS-485, and RS-232) comply with the respective standards. All audio I/Os and control ports connect to your installation through the supplied Phoenix terminal blocks. For pinout, refer to chapter VII (“Appendix”, page 89).

II.3 Features

Audio ports:	8 analog audio inputs 1-8 (line or microphone inputs)
	8 analog audio inputs 9-16 (line inputs)
	16 analog audio outputs 1-16 (line outputs)
	16 digital audio inputs (optional implementation through Dante or CobraNet interface)
	16 digital audio outputs (optional implementation through Dante or CobraNet interface)
Control interfaces:	3 serial interfaces (Ethernet, RS-232, RS-485) with DMX support
	4 relay outputs 1-4 (output 1 hardwired to alarm indication)
	8 binary inputs 1-8 (optical inputs to DSP binary logic system)
	8 voltage-control inputs (0-10 V, external adjustment)
Monitoring:	Stereo headphones output for all audio links (local operation)
System software:	Upgradeable through Ethernet link using the HARVEY Composer software
Operation:	Local user interface (display, 4 buttons, 1 encoder)
	Project configuration using HARVEY Composer
DSP signal processing	32-bit floating-point DSP (2.4 GFLOPS, 800 MMACS)
	Audio-processing and media/interface-control system with fully modular configuration
	Static system latency (audio input to output): < 2 ms (77 samples @ 48 kHz)
	No latency compensation required.

II.4 Initial Operation

Connect the HARVEY mx.16 unit to the mains. For this purpose, connect the power-cord ends to the IEC socket on the rear panel and to a mains socket, respectively. Then press the power switch next to the IEC socket.

Always disconnect the unit from the mains before connecting or disconnecting any ports.

Always connect the unit to a suitable grounded AC outlet (rating: 95-250 VAC, 50/60 Hz).

II.4.1 System Boot

When switching on the HARVEY mx.16 using the power switch, the unit boots to the system software and performs a self-test. During boot time, which is about 30 seconds, the display will show the current boot status.

- ➔ When the HARVEY mx.16 is supplied with power, it will automatically load the system software.
- ➔ The HARVEY mx.16 display will read “Alarm” until boot-up has successfully completed.

After boot-up, the HARVEY mx.16 automatically loads the project stored to the device.

- ➔ When the HARVEY mx.16 is ready for operation, the display shows the “HARVEY mx.16 .click for menu.” message.

The unit continuously writes function-block parameters to a nonvolatile flash memory. At startup, the HARVEY mx.16 initially reads all parameters from the flash memory; afterwards, if you have set a default preset in the project, it will be loaded. Note that if the default preset does not include all project parameters, system operation might be based on invalid settings after reboot.

HARVEY mx.16 will automatically enable the Sound message if the audio had not been muted at last shutdown. (“Sound” is a global project message used for enabling or disabling all audio I/O links on the HARVEY mx.16.)

II.4.2 Alarm

In case of failure, the red ALARM indicator located on the front panel will light. At the same time, the relay on the Relay Output 1 will open. (During normal operation, the Relay Output 1 contact is closed at all times.)

Relay Output 1 signals critical errors (“Alarm) or in case of power outage. Therefore, it is not user-programmable; HARVEY Composer will list the Relay Outputs 2-4 only.

- ➔ The system logs all alarms occurring in operation. You can view and delete the log items on the user interface of the unit (see also page 14).
- ➔ Note that the Alarm message issued at boot time is uncritical and will therefore not be logged.

II.4.3 Sound

In the context of the HARVEY system, “sound” refers to the global audio-matrix status. Therefore, “Sound Off means that all audio links are muted.

- ➔ When project transmission is complete, the audio will be globally muted for safety reasons:

This way, inappropriate project configuration may not result in damage to external devices, for example, loudspeakers.
Sound is globally enabled or disabled using a status-bar switch in HARVEY Composer.

II.5 The User Interface

You can view and configure parameters on the HARVEY mx.16. In addition, you can use the user interface for setting up audio monitoring through the headphones output.

The interface consists of the display, four buttons, and one encoder.

When the unit is ready for operation, the display will show the ".click for menu." prompt.

➔ Press any button or operate the encoder for accessing the main menu.

II.5.1 The Main Menu

The main menu includes four submenus that you can access using the buttons: Status, Monitor, Settings, and Alarm.

➔ To access a menu item, press the corresponding button.

➔ To return to the main menu, press and hold the encoder for at least 1 second.

II.5.2 The Status Menu

The Status menu includes a number of pages that provide status information on the HARVEY mx.16 hardware unit. The first page shows the network name of the unit; the remaining pages provide information on the network configuration and the release numbers of the installed software modules.

➔ Using the encoder, you can scroll through the various pages.

➔ To exit the Status menu, press and hold the encoder for at least 1 second.

II.5.3 The Monitor Menu

In the Monitor menu, you select the audio signal for monitoring through the headphones output. All analog and digital audio I/Os of the HARVEY mx.16 unit are available for selection.

The selected audio signal is tapped right at the analog or digital audio I/O. The monitoring signal is always dual, i.e. you will hear either a stereo signal (left and right channels) or a summed mono signal, which is output to both headphones channels.

➔ Use the encoder for adjusting the headphones volume.

The volume-adjustment (or gain-adjustment) range is between –100 dB and +10 dB.

➔ Use button 1 for toggling between the <Dual> and <Mono> monitoring modes.

In <**Dual>** mode, you will hear a stereo signal through an odd-numbered channel on the left side and an even-numbered channel on the right side; in **<Mono>** mode, however, only one audio channel is output to both the left and right headphones channels.

➔ Use button 2 for toggling monitoring sources between In and Out.

Select <**In>** for monitoring input channels or **<Out>** or monitoring output channels.

➔ To precisely select channels for monitoring through the headphones, press and hold button 3 while making your selection using the encoder.

The channel numbers currently selected for monitoring are displayed above the buttons 3 and 4. **<A>** identifies the 16 analog I/O channels; **<D>** identifies the 16 digital I/O channels of a Dante or CobraNet interface. When the <Dual> mode is enabled, you select two adjacent channels (with the odd channel number on the left and the even channel number on the right) as a stereo-channel pair for monitoring.

➔ To exit the Monitor menu, press and hold the encoder for at least 1 second.

II.5.4 The Settings Menu

The Settings menu allows for setting up the network configuration on the HARVEY mx.16. In this mode, you configure the network name of the unit, manual or automatic IP-address assignment, and the IP address, the network mask, and the gateway address. Note that you can make all the settings using the HARVEY Composer software, too.

- ➔ Button 1 accesses a page where you can change the hardware name of the unit.
- ➔ Use button 2 for toggling between manual and automatic IP-address assignment.
- ➔ When in manual IP-addressing mode, pressing button 4 will get you to a menu where you can configure the network settings. When in that menu, press button 1 to access a page where you can enter the network mask <NMask>; button 2 to access the IP-address input page <IPAddr>; or button 4 to access the gateway-input page <GWay>.
- ➔ To exit the Settings menu, press and hold the encoder for at least 1 second.

To enter or change parameter settings:

- ➔ Using the buttons 1 (<-) and 2 (->), move the cursor to the desired position.
- ➔ Rotate the encoder to change the selected value step by step.
- ➔ To move the cursor to the next input position, press and release the encoder once.
- ➔ Press button 4 <OK> to confirm your changes, or press button 3 <Back> to cancel the operation.

II.5.5 The Alarm Menu

The Alarm menu allows for logging warning messages. You need to confirm and clear all warnings occurred. Clearing the warning and rebooting the HARVEY mx.16 should result in normal operation.

- ➔ If an error message is displayed, take note of the error code and contact our support.
- ➔ Press button 4 <Back> to exit the Alarm menu.

III. HARVEY Composer

III.1.1 Software Setup

Be sure to use the latest HARVEY Composer version.

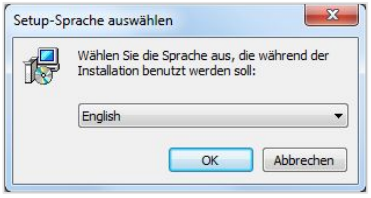
- ➔ You can download the latest HARVEY Composer version from http://www.harvey-audio.com.
- ➔ When using Windows XP, make sure that Microsoft .NET Framework 2.0 is installed.
- ➔ Windows 8: Select Control Panel > Programs > Turn Windows Features On or Off, then enable Microsoft .NET Framework 3.5.

Installation

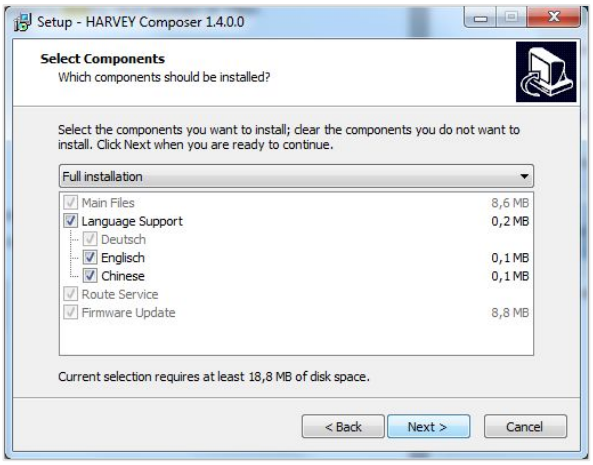
Launch the “harvey_composer-mx16-setup.exe” installation file.

Depending on your operating system, security alerts may be displayed. The purpose of those alerts is to protect the user from malicious software from the Internet; however, files you download from our website do not pose a risk, so you can safely confirm any alerts.

- ➔ Confirm any security alerts displayed by the operating system by clicking <Run Anyway> or <Yes>.
- ➔ Select the language to be used during installation.



- ➔ Click <Next> on the Welcome screen to proceed.
- ➔ Select the installation folder for the program, then click <Next> to confirm.
- ➔ Selecting the Full Install option is recommended. In this case, in the Select Components dialog, just click <Next> to select a full install.



- ➔ Provide any name for the Windows start-menu item, or accept the default (“HARVEY”). Confirm the operation by clicking <Next>.
- ➔ On the next page, select whether you want to create additional desktop and Quick Launch icons. Click <Next> to confirm your settings.
- ➔ The next page shows a summary of your installation settings. Click <Next> to launch the installation.
- ➔ During the installation process, a Windows Firewall message will be displayed whether you want to permit network access to Harvey mDNSResponder. You can safely allow for communication within Private networks, so click <Allow Access>.
- ➔ On the final page of the installation wizard, click <Finish> to complete the software installation.

III.1.2 Launching the Application

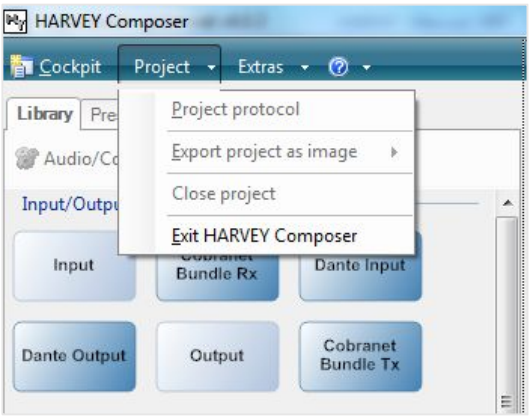
Launch HARVEY Composer by clicking the program icon:

This program icon exists in the Start > All Programs > HARVEY program group (or whichever name you have assigned during installation).

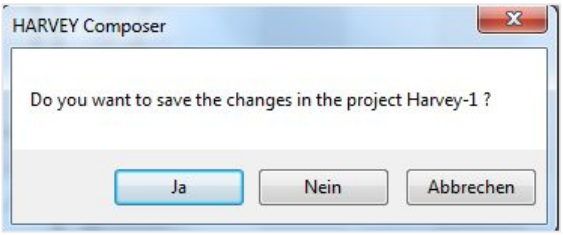
You can also launch HARVEY Composer from the Quick Launch bar or by double-clicking the appropriate desktop icon. In Windows 8, you can launch HARVEY Composer through the program icon in the tile view.

III.1.3 Exiting the Application

Select the Project > Exit HARVEY Composer item in the main window to <Exit HARVEY Composer>.

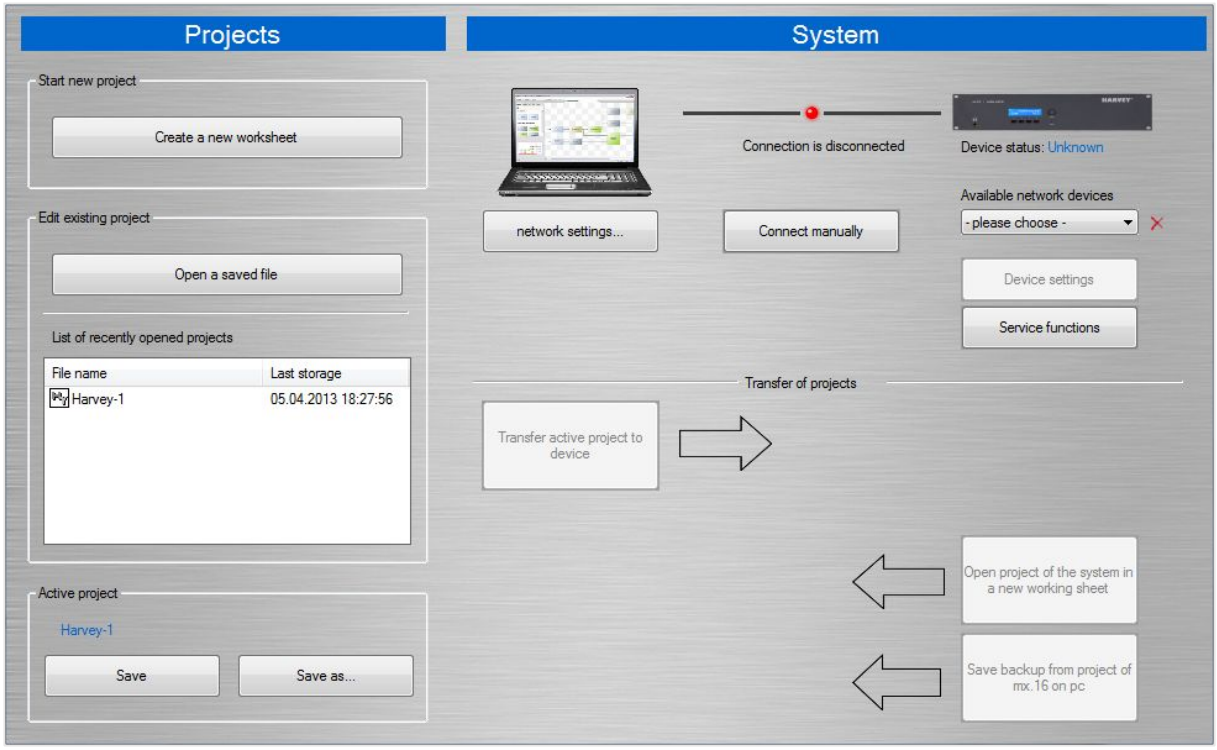


If there are unsaved changes in open projects, HARVEY Composer will prompt you to save them as necessary:



- ➔ Click <Yes> to store the project. Before the project is stored and the program closed, you have the option of entering comments into a separate window.
- ➔ If you want to exit the program without saving your changes, click <No>.
- ➔ If you rather do not want to exit the program at this time, click <Cancel>.

III.2 Cockpit



At program launch, HARVEY Composer will always show the “cockpit”. The cockpit is the control center of the software and is subdivided into two sections.

On the left-hand side, you see the <Project> section, which just allows for creating a new worksheet.

- ➔ Click the [Create New Worksheet] button to create a new project.
- ➔ Projects are created offline, meaning that you don’t need a live network connection from the computer to a HARVEY mx.16 unit now; you will need such a connection only when you want to transfer the finished project to a HARVEY mx.16 unit.

Existing projects are open in the next panel. The list shows all recently opened projects. The bottom panel shows the currently enabled project; to store the project, click the **[Save]** or **[Save As]** buttons as appropriate.

The **System** area on the right-hand side provides access to the network settings of your computer and allows for establishing connections to the HARVEY mx.16 units on your network. All HARVEY mx.16 units are automatically detected and listed in the **<Available Network Devices>** drop-down menu.

- ➔ To make a connection, select the desired HARVEY system, then click the <Connect> button. The red indicator will then turn yellow while the connection is being established; when the operation has been successfully completed, it will turn green and the “Connection is Established” message will be displayed.

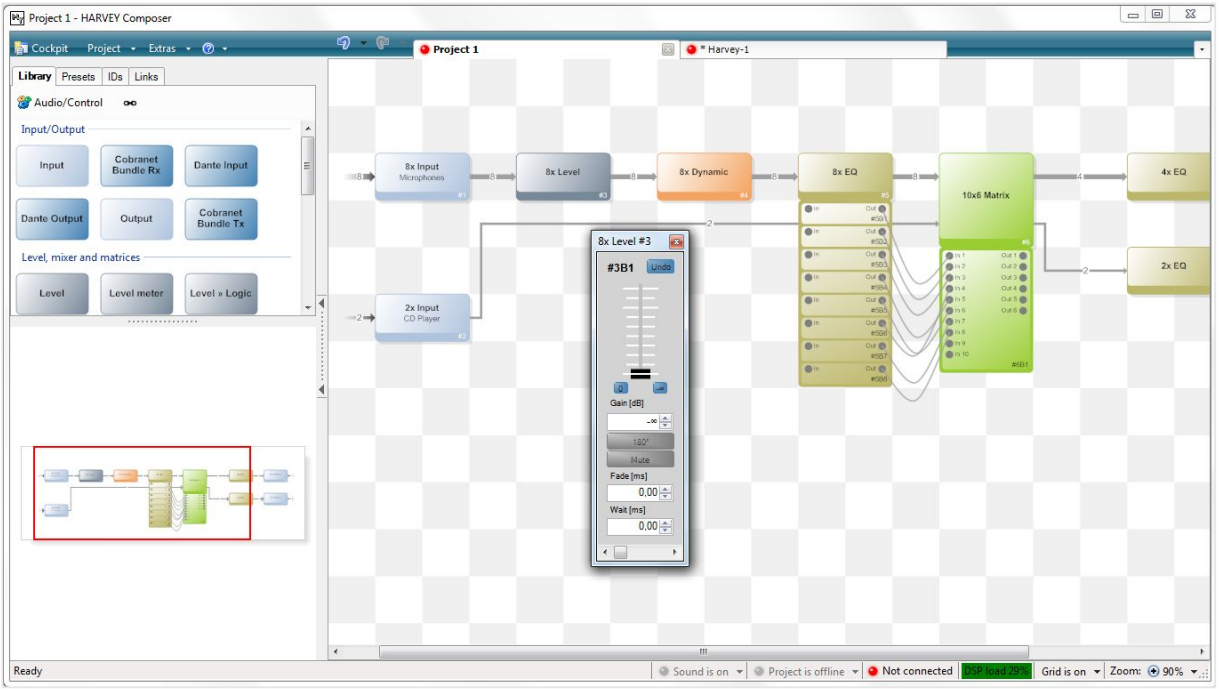
Clicking the **[Device Settings]** button allows for accessing details, managing the device name and the IP address, performing a hardware reboot, or muting the unit (“Sound Off”).

The **[Service Functions]** button provides access to functions used for updating the HARVEY mx.16 firmware and the HARVEY Composer software.

The lower right-hand window area includes the **Transfer of Projects** section. If HARVEY Composer is connected to a HARVEY mx.16 unit, you can transfer a finished project to the unit, download the project currently used on the HARVEY mx.16 to HARVEY Composer, or back up that project to your computer.

- ➔ To access the cockpit, use the menu bar of the HARVEY Composer main window.

III.3 Main Window



The HARVEY Composer user interface has a clear-cut layout based on the modular function blocks.

Menu Bar: The **<Cockpit>** item in the menu bar allows for accessing the cockpit. Using the **<Project>** item, you can export the current setup as an image in one of the following formats: .emf, .bmp, .jpg, or .png. In addition, this is where you exit the program. The **<Extras>** item provides access to the available language options (currently German, English, and Chinese) and to a number of user-specific options in HARVEY Composer. This is also where you set the **dBr reference level** of the project (default: 18 dBr = 0 dBFS).

➔ The <dBr> setting does not affect threshold or audio levels but is for presentation purposes only.

Worksheet: This window pane located on the right is where you create and configure your HARVEY mx.16 projects. Each project encompasses all parameters and settings of a single HARVEY mx.16 unit. All functions are displayed as function blocks on the worksheet. Double-click a block to edit it. You will also interconnect them using lines on the worksheet.

➔ Each project worksheet has a dedicated tab, so you can switch between projects by moving between tabs. This way, you can edit multiple projects separately.
➔ Use the mouse wheel for zooming into and out of the worksheet.

Sidebar: Located in the left-hand area of the main window, the sidebar holds the **library** containing the function blocks and provides access to the **Preset**, **IDs**, and **Links** menus. There is also the Bird's Eye View at the bottom of the sidebar.

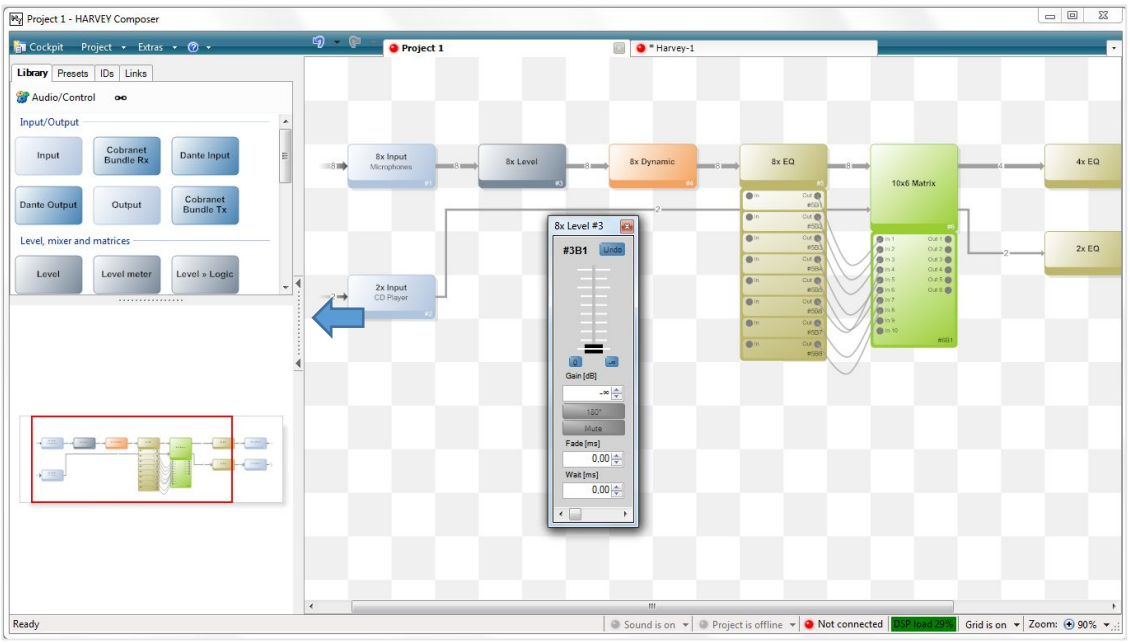
➔ The sidebar includes all tools required for setting up projects and also serves as a control center.

Status bar: At the bottom right corner of the worksheet, there is a **<Zoom In>** item. You can select between five zoom levels to adjust the worksheet view to your liking. Use the **<Grid>** button for enabling or disabling the Snap to Grid feature. With this feature enabled, all function blocks on the worksheet will snap to the grid positions, resulting in an ordered layout; if the grid has been disabled, you can freely move all blocks on the worksheet. The **<DSP Load>** indicator shows the current load of the HARVEY mx.16. This indicator functions in online and offline modes alike. In addition, the status bar shows whether you are currently editing your project online or offline, the HARVEY mx.16 unit your computer is connected to (if any), and whether **<Sound>** has been enabled.

➔ <Sound> Off: When this is displayed, all audio links from and to the HARVEY mx.16 are muted.
➔ When you transmit a project, <Sound> will automatically be set to Off, so you need to re-enable it manually afterwards.

III.4 Sidebar

The sidebar located in the left-hand main-window area holds a number of tabs including the following: **<Library>**, **<Presets>**, **<IDs>**, and **<Links>**.



Bird's Eye View: The Birds Eye view is located in the bottom left corner. It provides a full overview of your project. In this view, the area of the worksheet that is currently visible on the right-hand side is marked with a rectangular frame that can be shifted using the mouse.

➔ You can expand and collapse the sidebar using the icon with the box containing the two arrows on the right-hand border. To change the height of the Bird's Eye view, use the sidebar splitter.

III.5 Library

The **library** contains all function blocks. Use the drag & drop functionality to move function blocks to the worksheet. There are two function-block layers: Audio and Control.

Blocks in the **Audio** category include analog and digital audio inputs and outputs, matrices, mixers, meters, faders, filters, equalizers, dynamic processors, and more.

The **Control** category includes the analog, digital, and serial control interfaces, for example, binary inputs, relay outputs, voltage-control inputs, RS-232, RS-485, DMX, and Ethernet interfaces, and logic blocks.

Clicking the **[Audio/Control]** item toggles between the two layers <Audio> and <Control>.

➔ When doing so, the function blocks and links (connections) visible on the worksheet reflect the selected setting.

To increase clarity, function blocks and links arranged on the worksheet are visually combined to audio-processing and control-signal groups. All function blocks that cannot be linked to any other block on the current layer are displayed as transparent. Note that function blocks providing both audio and control connectivity switch layers as appropriate and always show the ports that can be used in the selected layer.

Clicking the chain icon in the sidebar enables or disables links on the worksheet. (For more information on the links, see page 29.)

III.6 The Offline and Online Modes

In HARVEY Composer, you will use the offline mode for creating new projects.

You can configure, arrange, link, and wire function blocks on the worksheet in offline mode only. When you have established a connection between HARVEY Composer and a HARVEY mx.16 unit and have transmitted projects to the unit, you cannot make any structural changes to them on the device anymore.

➔ You can make changes to the project structure **in offline mode only**.

The basic method of operation in HARVEY Composer is as follows:

First, you create the project offline by placing, wiring, and configuring all function blocks. You can save your parameter settings as presets (or snapshots) for later recall.

In the next step, you transmit the project to the HARVEY mx.16 unit and perform fine tuning of your parameters online.

➔ Note that you can change only parameter settings on the HARVEY mx.16 in **online mode**.

In online mode, HARVEY Composer hides the grid to indicate that you currently cannot perform any changes to the project configuration.

➔ When project transmission is complete, the audio will be globally muted for safety reasons:

This way, project misconfiguration may not result in damage to external devices, for example, loudspeakers.
The audio is globally enabled or disabled using a status-bar switch in HARVEY Composer.

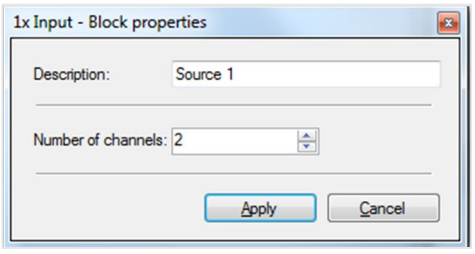
III.7 Creating Projects

To create a new project, first launch the cockpit in HARVEY Composer (see 17), then click the **[Create New Worksheet]** button.

Use your mouse for dragging all function blocks you need from the library onto the worksheet. When you drop function blocks with I/Os onto the worksheet, the Block Properties and Connection Editor dialogs will open automatically one by one.

III.7.1 Block Properties

In the <Block Properties> dialog, you configure a block ID and set the number of channels.



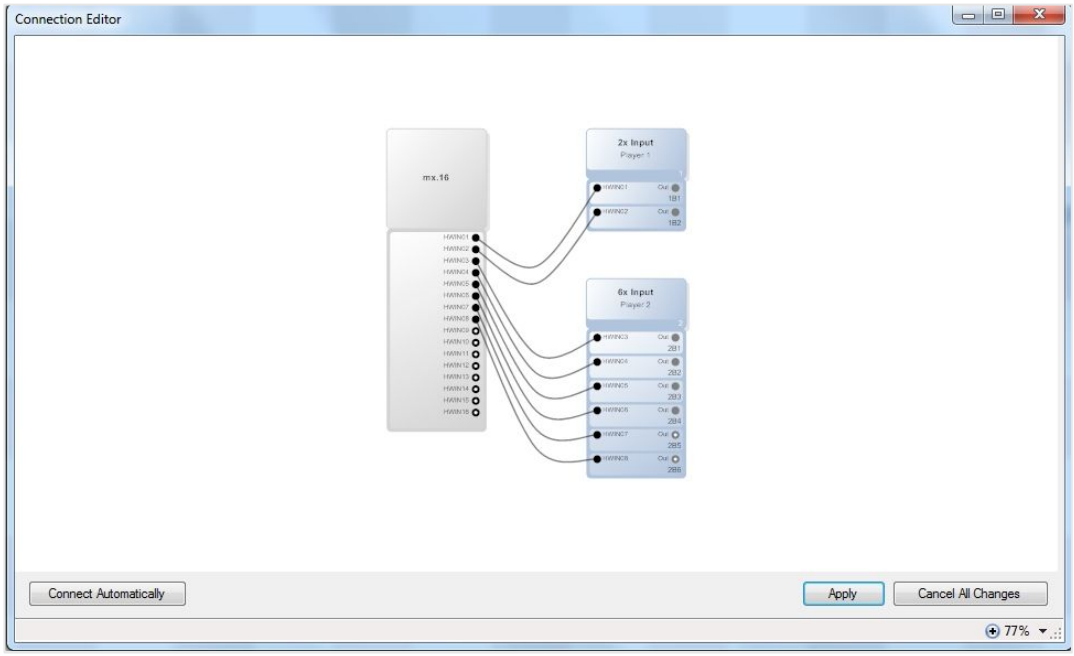
➔ To access the dialog, right-click any function block and select <Properties> from the pop-up menu.

➔ The Block Properties dialog also allows for increasing the channel count at a later time;

➔ to reduce the channel count, you need to manually delete one or more channels in the Channel List (see the “Channel List” section on page 24)

III.7.2 The Connection Editor

In the Connection Editor, you wire the ports of a function block to other function blocks or the ports of the HARVEY mx.16. The editor lists all physically existing inputs and outputs of the system and the block to connect it to.

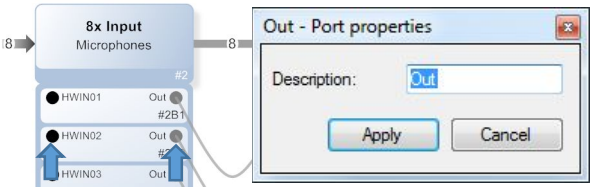


The I/O count depends on the type of function block and the number of available HARVEY mx.16 ports. You can click the **[Wire Automatically]** button to have the software auto-wire the ports. In this case, the ports available on the HARVEY mx.16 will be wired one by one. You can also perform the wiring manually: Move your mouse pointer over one of the black circles representing the ports on the HARVEY block, then drag to any port of the I/O block. Click the **[Apply]** button to confirm your changes and close the window.

➔ Use the mouse wheel to zoom in and out of the Connection Editor.

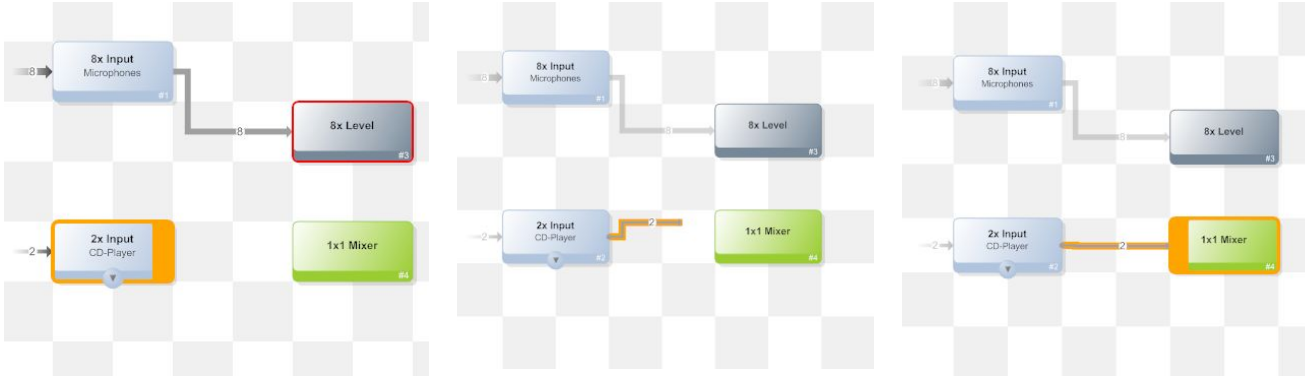
➔ If you want to launch the Connection Editor later, double-click the arrow on the left or the right side of a function block (next to the trunk).

III.7.3 Port Properties



➔ Double-clicking a port opens the **<Port Properties>** dialog where you can enter a new port name.

III.7.4 Wiring Function Blocks



After placing the function blocks on the worksheet, you can wire them to one another.

To do so, move the mouse pointer over the right border of a block until it changes its shape to an arrow. While pressing the left mouse button, drag a line from the source block to the target block, then release the mouse button. The link is marked by a line that adjusts automatically whenever you change the position of an icon or rearrange the icons. The number of links within the drawn trunk is adjusted automatically with regard to the number of channels.

- ➔ A small number on the trunk shows the links contained in it.
- ➔ To remove a trunk, click to select it, then press the <Del> key on your computer keyboard.

You can also insert a new function block right between two existing ones that are interconnected. To do so, drag the new block from the library and drop it onto the trunk between the blocks on the worksheet. The software adjusts the channel count of the new block as appropriate for the trunk. All function blocks that have already been placed on the worksheet will be shifted accordingly (provided the new function block can be placed in the selected position). A preview shows where the adjacent blocks will be moved and if and how audio links will be rearranged.

- ➔ ⃠ Note that when the mouse pointer is located over a position where you cannot drop function blocks, it will turn into a No icon; in this case, select a different location on the worksheet.

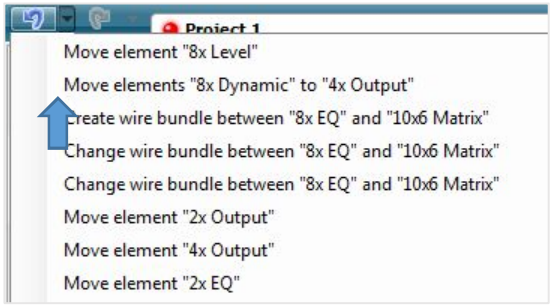
- ➔ There must always be a minimum space of one grid rectangle between any two blocks.

- ➔ At any time, you can rearrange one or more function blocks on the worksheet. To select multiple blocks at a time, either drag a select rectangle around them (lasso selection), or press and hold the <Ctrl> key while clicking each block you want to select.

- ➔ While block inputs accept only a single connection, you can wire one output to multiple inputs at the same time.

- ➔ You can make connections for single channels in the channel list of the respective function blocks.
  For more information, refer to the “Channel List” section on page 24.

III.7.5 Project Protocol

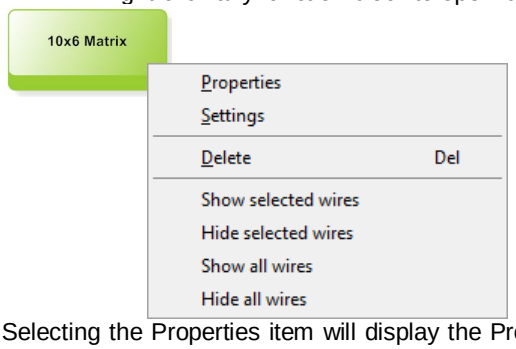


The project protocol is a history file that stores recent edits of a HARVEY Composer project.

- ➔ At the top of the main window, click the blue left arrow once to undo your last action; to redo undone actions, click the right arrow.
- ➔ To view all logged edits, click the triangle next to each arrow. In the list displayed, you can quickly select one specific action to undo or redo all edits stored up to that point in the edit history.
- ➔ Click the Extras > Options > Processing item to set the number of edits stored in the undo/redo history.
- ➔ You can set a maximum of 32 edit actions (default: 20).

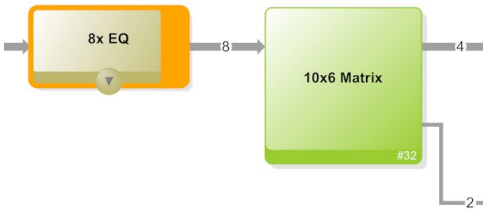
III.7.6 The Pop-Up Menu

- ➔ Right-click any function block to open its pop-up menu.

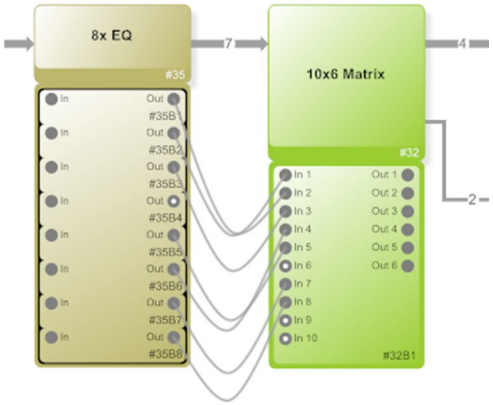


Selecting the Properties item will display the Properties window of the function block. This is where you can set the name, the number of inputs and outputs, and any other properties of the block. Clicking the Settings item allows for configuring the block parameters (see page 26). Selecting the Show/Hide Selected Wires item will show or hide the channel list (see page 24) of selected blocks; selecting the Show/Hide All Wires item will show or hide, respectively, the channel list of all blocks.

III.7.7 Channel List and Wires



Click the arrow at the bottom of the block to show or hide the channel list. The arrow is displayed only when the pointer is on the function block. Similarly, individual wires are visible only when the pointer is on a block.



The channel list allows for manually connecting individual block ports. Ports and wires are color-coded depending on the category that they belong to. Note that you can wire only ports of the same type or color. Gray wires represent audio links; blue wires gain-control signals; green wires binary-logic signals; and brown wires serial data.

➔ Clicking the [Audio/Control] item toggles the worksheet between the two layers. All function blocks that provide no functionality or ports in the selected layer are displayed as transparent; blocks providing functionality or ports in both of the two layers adjust their appearance to show connectivity options in the selected layer.

III.7.8 Deleting Channels

To reduce the channel count of a block, you can delete individual channels in the channel list:

➔ Right-click the channel that you want to delete, then select the **<Delete>** item from the pop-up menu. You can also select the channel, and then press the <Del> on your computer keyboard.

➔ To select multiple channels, select each channel you need while holding the <Ctrl> key. When you're finished, release the <Ctrl> key. All selected channels will now have a red border. Next, right-click any channel, then select the **<Delete>** item from the pop-up menu or press the <Del> on your computer keyboard.

➔ You can also select a contiguous range of channels (for example, channels 9-16). To do so, click the first channel, then press and hold the <Shift> key while clicking the last one.

III.7.9 Groups

With the majority of function-block types, you can group several channels for easier handling. Channels are grouped and ungrouped in the channel list. You configure and operate grouped channels using a channel-group interface. Grouped channels still have their individual input and output ports.

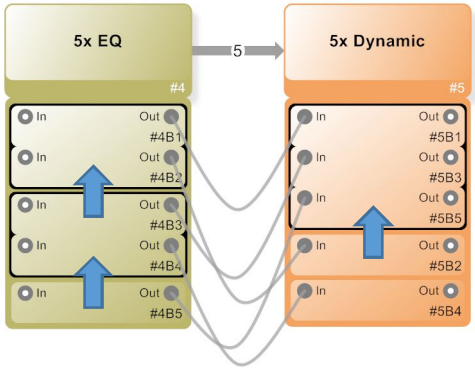
- ➔ The channel list changes to show all channels belonging to a group one after another inside a black frame.

- ➔ Note that grouping will result in rearranging the channels, so channels that have not been neighbors before will now be listed one after another but will keep their original channel ID and wires. When those channels are subsequently removed from the group, they will return to their original position in the list.

The following example shows two function blocks each with five channels, some of which are grouped:
Channels 1 and 2 and channels 3 and 4 of the EQ block have been grouped; similarly, channels 1, 3, and 5 of the Dynamic block have been grouped. Note that the channels of the Dynamic block have been reordered to provide an integrated view of the resulting group but keep their original channel IDs (#2B1, #2B3, #2B5) as well as their wires to the EQ block.

To create a new group or break an existing one, first select the channels from the channel list:

- ➔ While holding the <Ctrl> key on your keyboard, click each channel you want to add to or remove from the group. When you're finished, release the <Ctrl> key. All selected channels will now have a red border.

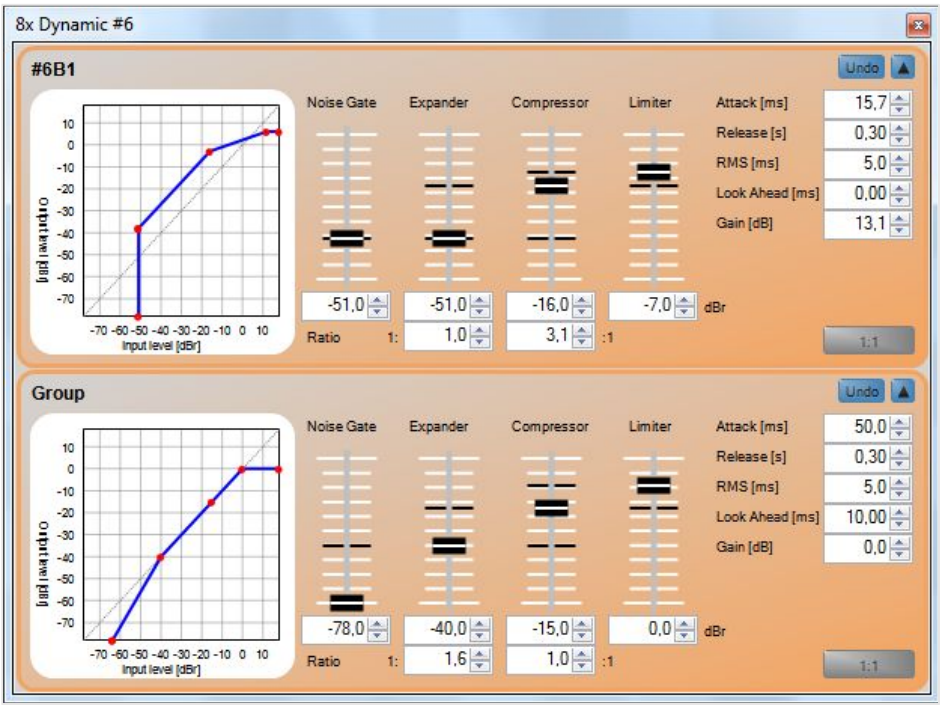


- ➔ Next, to create your group or add selected channels to an existing one, point to one of the selected channels. Right-click the selected channel and select **<Create Group>** from the pop-up menu.

- ➔ If you want to separate an entire group, point to one of the selected channels. Right-click the selected channel and select **<Release a Group>** from the pop-up menu.

- ➔ To remove one or more channels from the group, select the channels to be removed, then right-click and select **<Release From a Group>** from the pop-up menu.

- ➔ You can also select a contiguous range of channels (for example, channels 9-16). To do so, click the first channel, then press and hold the >Shift> key while clicking the last one.



III.7.10 Settings/Function-Block Parameters

To access the Block Settings dialog, double-click a function block. You can also open this dialog by right-clicking the block and selecting Settings from the pop-up menu.

The Block Settings provides a separate panel for adjusting each channel or group. When the project is online, i.e. your computer is connected to a HARVEY mx.16 unit, all changes made here will be immediately applied, so you can hear them at once.

➔ For details on function-block parameters, refer to the “Audio Function Blocks” chapter on page 31 and the “Control Function Blocks” on page 59, respectively.

III.7.11 Copying Settings Using the Clipboard

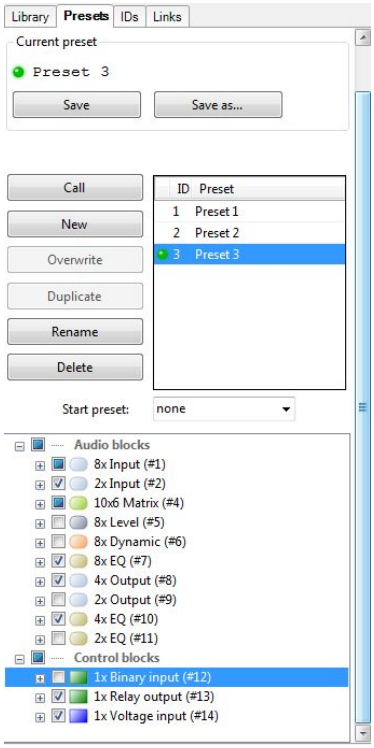
You can copy full parameter sets from a channel or group to another one using the clipboard. This way, you can quickly and conveniently apply equalizer curves or other complex parameter sets. To do so:

➔ Display the source function block’s channel list and point to the channel the parameters of which you want to copy. Right-click the source channel and select **<Copy Parameter>** from the pop-up menu. Alternatively, you can select the channel and press <Ctrl> + <C> on your computer keyboard.

➔ Point to the channel you want to apply the copied parameter set to. Right-click the target channel and select **<Paste Parameter>** from the pop-up menu. Alternatively, you can select the channel and press <Ctrl> + <V> on your computer keyboard.

III.7.12 Presets

In the Presets menu in the sidebar, you create new presets and recall and manage existing ones. A preset is a snapshot of a parameter set. For example, a preset can include the current parameter settings of all function blocks as well as a single parameter of just one function-block channel.



Each preset has a unique ID. You can recall presets from the Preset function block or using H-Net and H-Text messages. Note that when recalling a preset, settings contained in it will overwrite current parameter settings. Since a HARVEY mx.16 can always hold just one project at a time, presets are key to utilizing the full potential of the HARVEY system's flexibility.

All function blocks that are part of the current project are displayed in a tree near the window bottom. Clicking the [+] signs allows for showing or hiding additional tree levels, so you can select individual function-block channels and even their parameters.

To create a new preset, first select the parameters to be stored:

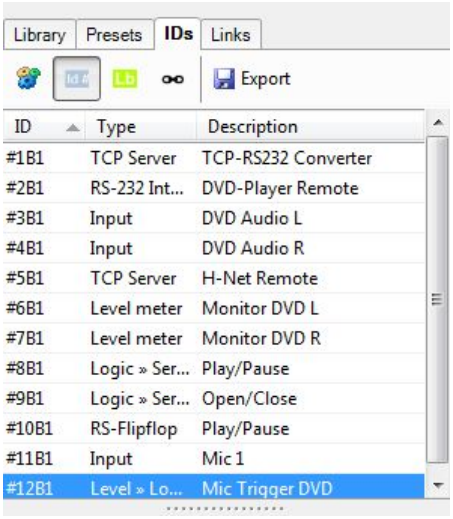
- ➔ Enable the checkboxes of all function blocks, individual channels, and parameters to be included in the preset.
- ➔ Click the [Save] or [Save As] buttons and name your project.

A list of existing presets will be displayed where you can click to select individual presets for recall, overwriting, duplicating, renaming, or deleting.

From the **<Start Preset>** drop-down menu, you can select a default preset that is automatically loaded to the HARVEY mx.16 at boot time. If you do not configure a default preset, all settings that were configured before the last shutdown will be recalled from flash memory.

- ➔ If you are going to configure various system setups, be sure to define a default preset first. This way, you avoid unpredictable and mixed parameter settings at boot time. (Also refer to the "System Boot" section on page 11.)

III.7.13 IDs



The IDs menu located on the sidebar lists all channel IDs.
Each function block and each channel contained in it has a unique ID within the project.
An ID is composed as follows:

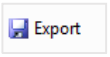
 # <function_block_ID> ***B*** *<channel ID>*
Example: **#3B2** (function block 3, channel 2)

The <ID> column lists all IDs in ascending order.
The <Type> column shows the type of function block.
To assign a custom label to a channel, double-click the corresponding item in the <Description> column and enter the label.

Clicking this button toggles between the <Audio> and <Control> layers on the worksheet.

Use these buttons to select whether the channel list of a function block shows the **ID** or the custom **Lab**el assigned in the <Description> column.

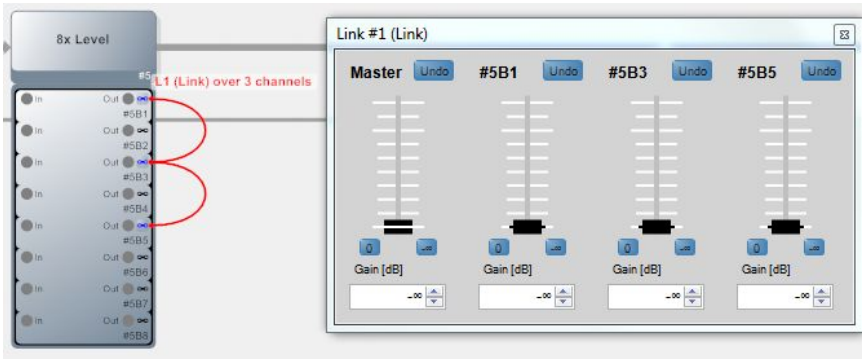
Using the chain icon , you can toggle between showing and hiding link groups on the worksheet. (For more information on link groups, see page 29.)



The export function allows for writing the entire channel list including the IDs, the function-block type, and the description to a CSV file.

III.7.14 Link Groups

The Link function provides for linking channels of Level function blocks. When level faders are linked, their current level offsets will be maintained, and you can control all of them using a single “master” fader. When you create a new link group, its master fader will default to –∞ dB, meaning that all channel faders are effectively set to –∞ dB. Setting the master fader to unity gain (0 dB) will restore the original offsets of the channel faders. The dB setting of the master fader will be added to the settings of all link-group members.



(Channel view with link function enabled) (Link Settings window)

➔ You can access the link functions from the **<Links>** menu in the sidebar.

➔ You can link even channels from multiple Level blocks.

To set up a new link group or to ungroup channels, first select the channels in a block’s channel list.

➔ While holding the <Ctrl> key on your keyboard, click each channel you want to add to or remove from the link group. When you’re finished, release the <Ctrl> key. All selected channels will now have a red border.

➔ Next, to create the link group, point to one of the selected channels. Right-click the selected channel and select **<Create New Link>** from the pop-up menu. In the Link Properties window, you can configure a name for the link group.

➔ If you want to ungroup all channels of a link group, right-click any member channel of the group and select **<Release Current Link>**.

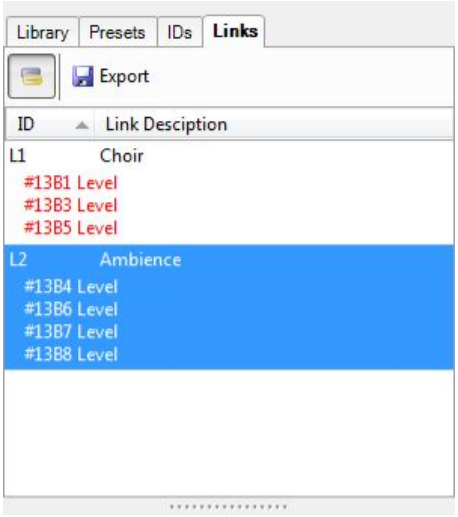
➔ To remove one or more channels from a link group, select the channels to be removed, then right-click and select **<Release From Current Link>** from the pop-up menu.

➔ You can also select a contiguous range of channels (for example, channels 2-5). To do so, click the first channel, then press and hold the <Shift> key while clicking the last one.

Link groups are managed in the **<Link Settings>** dialog.

➔ To access that dialog, right-click on the channel list and select **<Link Settings>**, or double-click on the channel ID in the Links menu in the sidebar. Alternatively, you can double-click any of the red connecting lines of a link next to the channel list to access the link settings.

The master fader is always located on the left-hand side of the Link Settings window. To the right of the master fader, you can see the channel faders of the link members, each displaying the original fader setting. The horizontal lines show the current level settings of each channel based on the offset master-fader setting. Link members are marked on their function blocks with red connecting lines, the link ID, and the assigned labels.



The Links menu in the sidebar lists all configured link groups with their respective names.

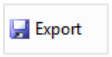
Each link group has a unique <ID> consisting of the letter “L” and an automatically assigned number.

The <Link Description> shows the assigned name.

- ➔ If the <Link> tab has been selected in the sidebar, the worksheet shows the linked channels. All components that do not belong to any link-group member are grayed out on the worksheet.

- ➔ The <Library> and <IDs> sidebar menus provide a chain button for toggling the view.

Using the <Show/Hide Blocks> button, you can set whether the relevant function blocks are listed below the link ID or not. Member channels from any blocks are listed with their channel ID.



The export function allows for writing the entire list including all details to a CSV file.

IV. Audio Function Blocks

Audio function blocks allow for processing audio in the HARVEY mx.16 DSP environment. For this purpose, the HARVEY mx.16 incorporates a powerful 32-bit floating-point DSP.

The audio latency between the input and output terminals is exactly 94 samples.
As the internal sample rate is 48 kHz, this equals a delay of 1.95833 ms.
Or a sound path of 66 cm (26").

The delay is the same for all channels regardless of the type and number of blocks to be processed in the channel or audio path. The A/D and D/A converters of all channels are in full sync with each other and perform the conversion process within a single sample period at exactly the same time. Therefore, no latency compensation is required.

Based on their settings, the following processing blocks add to the delay of an audio signal:

- Filter and EQ (phase distortion produced by recursive filters)
- Dynamic (lookahead time)
- Delay and delay-enabled mixing matrix (by the actual delay setting).

➔ A CobraNet interface implemented on the HARVEY mx.16 increases latency by another two samples (96 samples, 2 ms).
To this adds the buffer size configured on the CobraNet network (e.g. 1.33 ms).

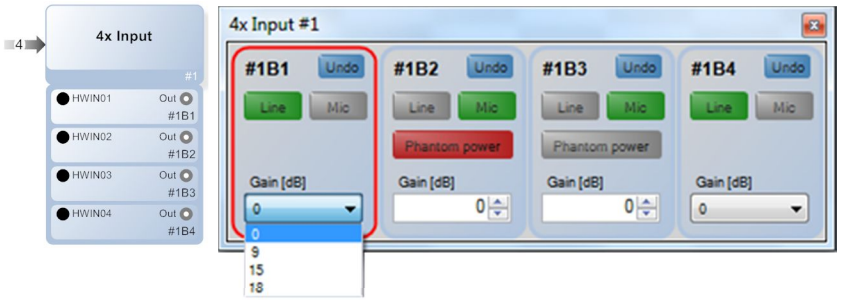
➔ Some audio function blocks offer additional control ports.
Control ports are listed in a table below each function block's description.

IV.1 Audio Function Blocks: Inputs and Outputs

This manual section describes all audio function blocks that provide input or output ports.

➔ Some function blocks will be available on the HARVEY system only when the CobraNet and/or Dante interfaces are implemented.

IV.1.1 Input (Audio Function Block: I/O)



The Input block converts audio incoming at the analog Audio Inputs 1-16 to the software DSP domain of the HARVEY mx.16 and provides all gain parameters. The function block includes one or more software-based input channels (up to 16), each of which is linked to one dedicated hardware input of the HARVEY mx.16. Note that you cannot connect the same hardware port to multiple software ports. This way, each project includes a maximum of 16 software-based audio inputs. These can be freely distributed to function blocks, so you can use 16 single-input blocks, four quadruple-input blocks, or any other combination. In addition, you can group multiple channels.

Clicking the **[Undo]** button will undo all changes made since the Settings window was opened.

Use the **[Line]** or **[Mic]** buttons for setting the sensitivity of the corresponding hardware input to line or microphone level. The selected operating mode is known by the green button.

In ***line mode***, you can select a gain setting from the **<Gain [dB]>** drop-down menu. Available settings include 0 dB, +9 dB, +15 dB, +18 dB.

In ***mic mode***, you can adjust the microphone gain between 0 and +65 dB in 1-dB steps. In addition, phantom power can be enabled or disabled using the corresponding button. When enabled, the **[Phantom Power]** button will turn red.

- ➔ Note that only hardware inputs 1-8 include microphone preamps—ports 9-16 handle line signals only.
- ➔ The Input block offers no additional control ports.

IV.1.2 Output (Audio Function Block: I/O)

The Output block converts software-based audio to analog audio, makes it available at the analog Audio Outputs 1-16 of the HARVEY mx.16 to the DSP level, and provides all gain parameters. This function block includes one or more software-based output channels (up to 16), each of which is linked to one dedicated hardware output of the HARVEY mx.16. Note that you cannot connect the same hardware port to multiple software ports. This way, each project includes a maximum of 16 software-based audio outputs. These can be freely distributed to function blocks, so you can use 16 single-output blocks, two 8-output blocks, or any other combination. In addition, you can group multiple channels.

➔ When setting up an Output block with multiple software outputs, HARVEY Composer automatically groups them. You can then control all outputs of a group together.
To configure separate settings, you can ungroup channels in the channel list. For details, refer to the "Groups" section on page xxx.

Clicking the **[Undo]** button will undo all changes made since the Settings window was opened.

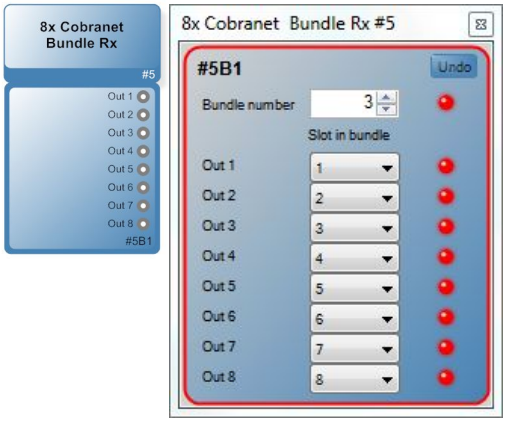
You can select the maximum output level from the **<Gain [dB]>** drop-down menu. Available settings include 0 dB, –9 dB, –15 dB, and –18 dB. When gain is set to 0 dB, the maximum output level is +21 dBu; the other settings result in maximum output levels of +12 dBu, +6 dBu, or +3 dBu, respectively.

Clicking the **[Mute]** button will mute the output. While mute is on, the button will be red.

➔ The Output block offers the following additional control ports:

Parameter	Control Port	Value Range
Mute	Logical Input	On/Off

IV.1.3 CobraNet Rx (Audio Function Block: I/O)



The CobraNet Rx function block converts audio incoming at the CobraNet interface to the software DSP domain of the HARVEY mx.16. Each CobraNet Rx block receives a full CobraNet bundle comprising 8 audio channels (or slots) and makes these audio channels available at its output ports for further processing. You can freely route the slots of a CobraNet bundle to the output ports of the function block.

- ➔ This feature is available only for HARVEY mx.16 units implementing the CobraNet interface.
- ➔ Note that you can use a maximum of 8 CobraNet Rx blocks in each project.
- ➔ Be sure not to use CobraNet and other Ethernet network protocols in the same environment!

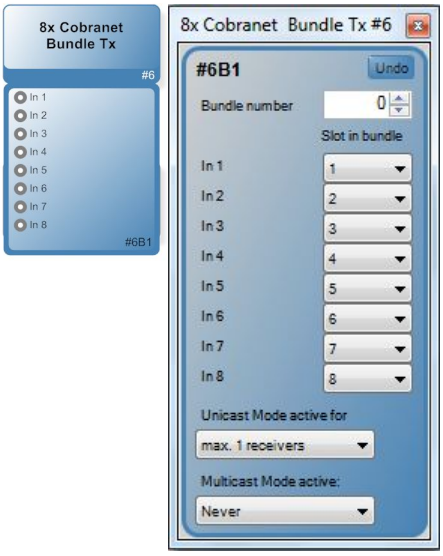
Clicking the **Undo** button will undo all changes made since the Settings window was opened.

Using the **<Bundle Number>** field, you can select the CobraNet bundle you want to use. During audio transmission, the indicator on the right of the input box will be green; if there are no incoming data, the indicator will be red.

You can assign each of the output ports (Out 1-8) of the function block with a CobraNet slot using the drop-downs in the **<Slot in Bundle>** column. Note that you cannot link a slot to multiple output ports. The indicator next to each output will light green at successful reception or red when there are no incoming data.

- ➔ The CobraNet Rx block offers no additional control ports.

IV.1.4 CobraNet Tx (Audio Function Block: I/O)



The CobraNet Tx function block routes audio from the DSP domain of the HARVEY mx.16 to a CobraNet network. A CobraNet Tx block provides 8 port inputs and outputs the audio as a full CobraNet bundle containing 8 slots (audio channels) at the CobraNet interface. You can freely route the 8 input ports to the 8 slots made available by the function block.

- ➔ This feature is available only for HARVEY mx.16 units implementing the CobraNet interface.
- ➔ Note that you can use a maximum of 4 CobraNet Tx blocks in each project.
- ➔ Be sure not to use CobraNet and other Ethernet network protocols in the same environment!

Clicking the [**Undo]** button will undo all changes made since the Settings window was opened.

Using the **<Bundle Number>** field, you can select a CobraNet bundle as a target for signal routing.

You can assign each of the input ports (In 1-8) of the function block with a CobraNet slot using the drop-downs in the **<Slot in Bundle>** column. Note that you cannot link a slot to multiple input ports.

In the **<Unicast Mode Active For>** drop-down menu, you can set the maximum number of CobraNet receivers (1-4) triggering bundle transmission in unicast mode.

In the **<Multicast Mode Active>** drop-down menu, you set the conditions that trigger bundle transmission to the CobraNet network in multicast mode (Never, From 1-4 Receivers, Always).

- ➔ The CobraNet Tx block offers no additional control ports.

IV.1.5 Dante Input/Output (Audio Function Blocks: I/O)

The Dante Input and Dante Output function blocks implement 16 I/O ports in the software domain of the HARVEY mx.16 that allow for exchanging audio with the Dante interface. Each function block includes one or more software-based input or output channels (up to 16), each of which is linked to one dedicated Dante port (1-16). Note that you can connect each of the 16 Dante I/Os to one software port or vice versa. This way, each project includes a maximum of 16 Dante inputs and Dante outputs. These can be freely distributed to function blocks, so you can use 16 Dante single-input blocks, 4 Dante quadruple-input blocks, or any other combination.

- ➔ This feature is available only for HARVEY mx.16 units implementing the Dante interface.
- ➔ You can operate a Dante network in combination with other Ethernet network protocols in the same environment.

The Dante Input and Dante Output function blocks provide no configuration options in HARVEY Composer.

- ➔ All settings are made using the Dante controller software by Audinate.
- ➔ The function blocks offer no additional control ports.

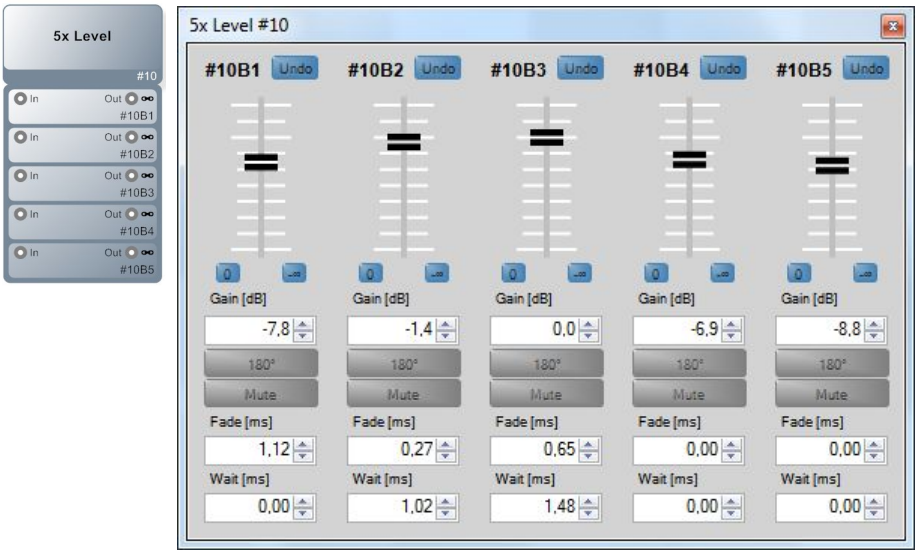
IV.2 Audio Function Blocks: Level, Mixer, and Matrices

This section describes components such as faders, meters, the logic mixer/matrix, and the auto mixer.

These components assist in routing and monitoring signals and allow for using logic operations and mixing audio.

➔ If there are not enough inputs or outputs, HARVEY Composer will notify you accordingly.

IV.2.1 Level (Audio Function Block: Level, Mixer, and Matrices)



The Level function block provides for gain adjustment, phase inversion, and muting of up to 16 audio channels. Each channel has its dedicated port output, meaning that there is no summing function.

- ➔ For summing channels, use a downstream Mixer/Matrix block.
- ➔ This function block allows for grouping channels and also supports the link function (see page 29).

Clicking the **[Undo]** button will undo all changes made since the Settings window was opened.

Using the **channel fader**, you can set the signal level from –99.9 dB to +10 dB in steps of 0.1 dB. The bottom-stop setting (–∞) is equivalent to muting the channel. Using the blue **0** and **–∞** buttons allows for configuring a level of 0.0 dB or –∞, respectively. You can view the current gain setting in the **<Gain [dB]>** field. To change the setting, click into the field and enter the desired value using your keyboard, or use the tiny arrow buttons.

Clicking the **[180°]** button inverts the polarity of the audio. While the function is enabled, the button will be green.

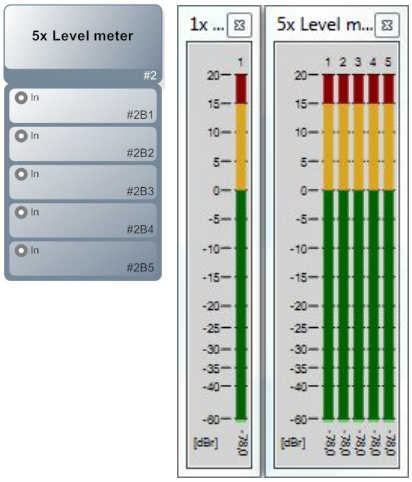
Clicking the **[Mute]** button will mute the port output. While mute is on, the button will be red.

Using the **Fade [ms]** control, you can set the level-fadeover time when changing presets. **Wait [ms]** determines the time to wait before the fadeover starts. You can set times between 0.00 and 15,000.00 ms in 0.01-ms steps.

- ➔ The Level block offers the following additional control ports:

Parameter	Control Port	Value Range
Mute	Logical Input	On/Off
Level	Level Input	Preset Range

IV.2.2 Level Meter (Audio Function Block: Level, Mixer, and Matrices)



The Level Meter function block provides for visual signal monitoring.
The number of input ports automatically adjusts as required.

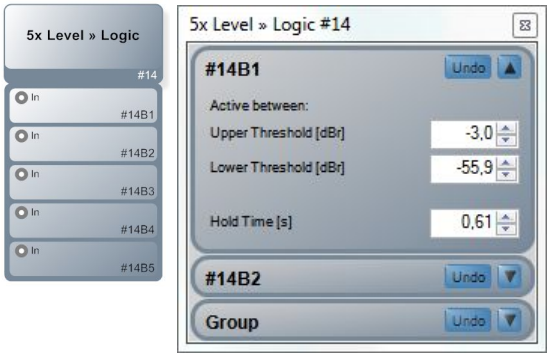
There are no configurable parameters.

The function block measures the incoming audio and shows the level on a dBr scale (relative project-reference level) in the Settings window of the block. The block has no port outputs.

- ➔ The <dBr> reference level configured in Extras > Options automatically affects the meters of all Level Meter function blocks.

- ➔ The Level Meter block offers no additional control ports.

IV.2.3 Level » Logic (Audio Function Block: Level, Mixer, and Matrices)



The Level » Logic function blog evaluates incoming audio and sets the logic output to 1/TRUE or 0/FALSE depending on the conditions defined for the input level. This function block provides a single port input on the audio layer and a single logic-port output on the control layer. The block is capable of handling multiple channels at the same time.
The number of input ports automatically adjusts as required.
However, you can also set it manually from the Settings window.

➔ The project-reference level configured in Extras > Options automatically affects the threshold settings in this function block. (Refer to page 18)

Clicking the **[Undo]** button will undo all changes made since the Settings window was opened. Using the **[^]** and **[v]** buttons, you can show or hide the parameters of a channel or channel group in the Settings window.

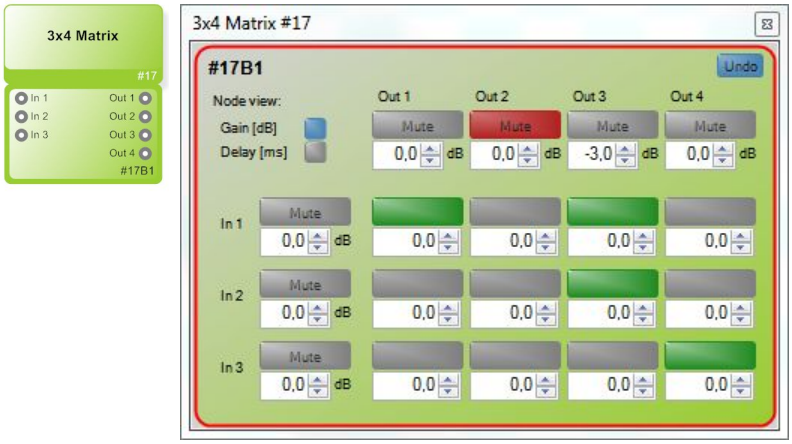
By configuring the **Upper Threshold [dBr]** and **Lower Threshold [dBr]** settings, you can define a level range, which the audio input has to fall into in order to set the logical output to 1/TRUE. Levels falling outside this range set the logical output to 0/FALSE. You can set any range between +∞ (maximum system level) and –∞ (no signal present). The numerical threshold levels of the range vary depending on the configured reference level.

The **Hold Time [s]** parameter allows for configuring a hold time that will be applied as soon as the incoming audio falls outside the configured range. You can set hold times between 0.25 and 10 seconds.

➔ The Level » Logic block offers the following additional control ports:

Parameter	Control Port	Value Range
Metered Audio Level (Condition)	Logical Output	On/Off

IV.2.4 Mixer/Matrix (Audio Function Block: Level, Mixer, and Matrices)



The Mixer/Matrix block provides two functions within the same block: It mixes incoming audio signals and makes the new output signal available at one of its output ports and also routes port inputs to any port outputs using a routing matrix. This way, when used in combination with an upstream Level block, you can create a simple downmix or make different mixes available at the various port outputs. The block can also be used as a simple patch bay. When implementing various system scenarios using presets, this function block becomes an advanced control center thanks to its flexibility. You can configure any combination of 1-16 inputs and outputs.
The number of input and output ports automatically adjusts as required. However, you can also set it manually from the Settings window.

➔ This function block offers ***3 block options*** through its Settings window. This way, all nodes allow for configuring adjustable gain or gain plus delay settings:

1: Simple mix matrix
2: Mix matrix with gain
3: Mix matrix with gain and delay

➔ To select or remove input channels or copy their parameters on the channel list, click the circular input-port icon.

Clicking the **[Undo]** button will undo all changes made since the Settings window was opened.

Clicking the **[Mute]** button will mute the input or output port. While mute is on, the button will be red.

Using the input fields located below the Mute button, you can set the **level** between –99.9 dB and +10 dB in steps of 0.1 dB for each **input and output**. The –∞ setting (below –99.9 dB) is equivalent to muting the channel.

The node buttons allow for **connecting** input ports and output ports. Enabled connections are shown as green buttons.

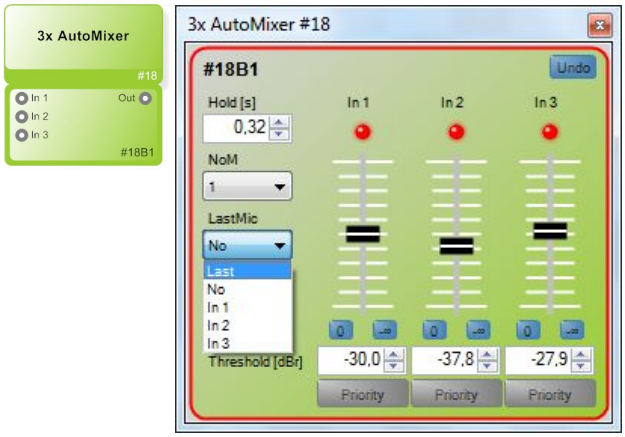
The **Mix Matrix with Gain** provides additional gain-input fields below the node buttons (–∞, –99.9 dB…+10 dB gain in 0.1-dB steps).

With the „**Mix Matrix with Gain and Delay**, you can additionally set signal delays for each connection from 0 to 1000 ms in 0.02-ms steps.

Also in the Mix Matrix with Gain and Delay, using the **<Gain [dB]>** and **<Delay [ms]>** options in the **<Node View>**, you can set which of the two parameters you can view and adjust in the input fields below the nodes.

➔ The Mixer/Matrix block offers no additional control ports.

IV.2.5 AutoMixer (Audio Function Block: Level, Mixer, and Matrices)



The AutoMixer is a function block specifically designed for microphone conferences. It is used for automatically downmixing multiple input signals to a single port output depending on the input levels. Each input channel includes an adjustable gate. The function block sums the signals from all open channels and sets the master output level automatically with regard to the channel count in order to prevent feedback. You can adjust the maximum number of channels that can be open at the same time. In addition, you can configure a priority channel; when that channel is open, all other channels are muted. Similarly, you can set one channel to remain open during pauses. The AutoMixer block can be configured with 1-16 channels. *The number of input ports automatically adjusts as required. However, you can also set it manually from the Settings window.*

- ➔ The project-reference level configured in Extras > Options automatically affects the threshold settings in this function block. (Refer to page 18)
- ➔ To select or remove input channels or copy their parameters on the channel list, click the circular input-port icon.

Clicking the **[Undo]** button will undo all changes made since the Settings window was opened.

Using the **channel fader**, you can set each channel's **gate threshold** in steps of 0.1 dB. You can also view and change the threshold in the input fields below the faders. This setting is relative to the configured dBr reference level of the project. Selecting –∞ disables the gates, meaning that the channel stays open at all times. Using the blue **[0]** and **[–∞]** buttons allows for configuring a level of 0 dBr or –∞, respectively. The **indicator** located above each fader is red when the gate is closed or green when the channel is open.

The hold time set in **<Hold [s]>** determines how long the gate will remain open when the level has fallen below the threshold. It can be set between 0.01 and 10 seconds.

The **<NoM>** ("number of microphones") drop-down menu sets the maximum number of channels that can be open at the same time. When enabling this function, the selection is based on the switching order (FIFO).

The **<Last Mic>** drop-down menu allows for setting a channel that will remain open even when all gates are closed.

Using the **[Priority]** button, you can set the priority channel (for example, the moderator's channel). When the priority channel is open, all other channels will be muted.

- ➔ The AutoMixer block offers the following additional control ports:

Parameter	Control Port	Value Range
Active (available per channel)	Logical Output	On/Off

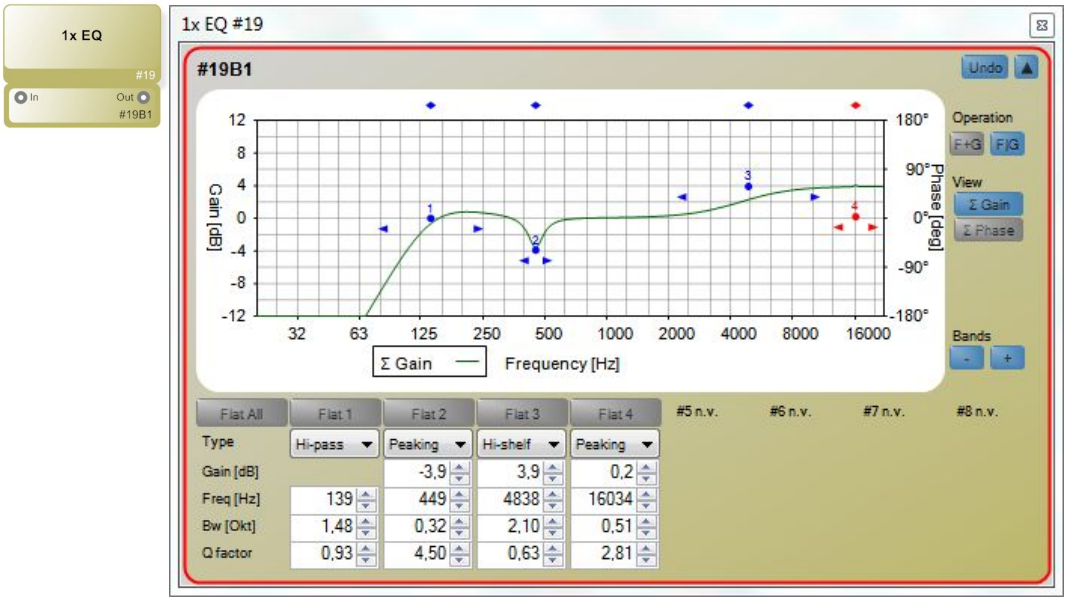
IV.3 Audio Function Blocks: Filter and EQ

This section describes all function blocks used for frequency or phase processing.

Depending on the filter type and setting, channel filters may produce frequency-depending phase distortion. (Frequency dependence results from the use of recursive filters.) This results in frequency-depending latencies typically in the range of the respective cutoff frequencies.

➔ Additional latency caused by filters is not automatically compensated; therefore, you may need to perform manual compensation using all-pass filters.

IV.3.1 1..8-Band EQ (Audio Function Block: Filter and EQ)



The EQ 1..8 function block offers up to 8 independent fully parametric filters per channel. Each block includes up to 16 channels and also handles channel groups. *The number of channels automatically adjusts as required. However, you can also set it manually from the Settings window.*

Clicking the **[Undo]** button will undo all changes made since the Settings window was opened.
Using the **[^]** and **[v]** buttons, you can show or hide the parameters of a channel or channel group in the Settings window.

The individual **bands** are adjusted either in the diagram using the mouse or by entering the corresponding values in the lower part of the window. Two graphical operating modes are available in the right-hand side of the window: In the **[F+G] Mode**, you can configure the frequency and gain settings by moving the EQ-band dot horizontally and/or vertically; In the **[F|G] Mode**, you can move the dot only vertically for adjusting the gain while the frequency setting is made using a diamond on top of the diagram. The bandwidth setting is visualized by two arrows located on each side of the dot. You can change it by selecting and dragging it using the mouse. The [Σ Gain] and [Σ Phase] buttons of the **View** panel on the right-hand side are used for changing what is visualized in the diagram: **[Σ Gain]** shows the resulting amplitude response, and **[Σ Phase]** shows the phase response of the sum. You can have both functions enabled at the same time. Using the **[–]** and **[+]** buttons in the **<Bands>** panel, you can increase or decrease the number of bands used one by one.

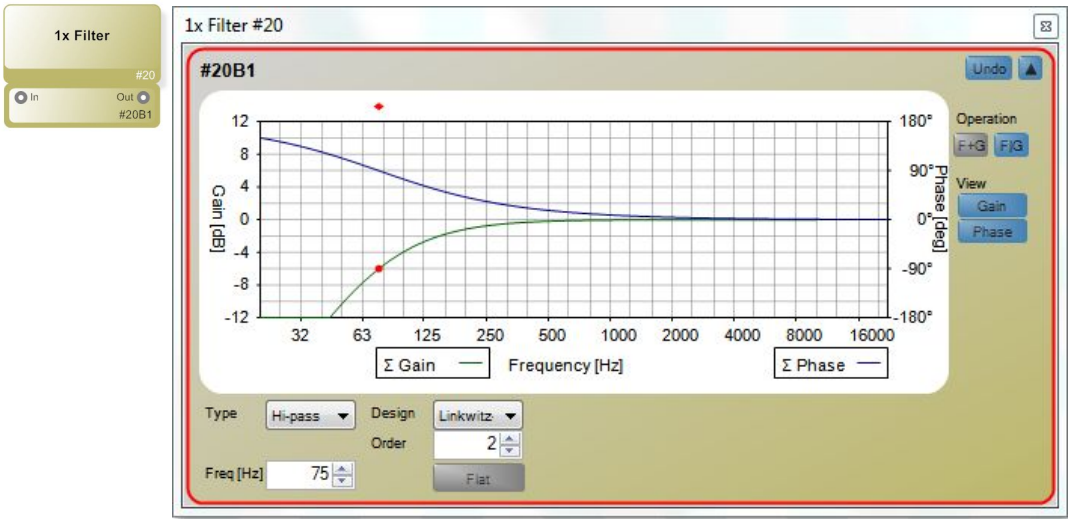
Clicking the **[Flat All]** button toggles the bypass function of the entire function block on and off. In addition, each band features a dedicated **[Flat <x>]** button to enable or disable it separately. When bypass is enabled, the button will be red.

The **<Type>** drop-down menu provides for selecting the filter type of each band. Available types include Peaking, Low-Pass, High-Pass, Notch, All-Pass, Low-Shelf, and High-Shelf. You can view and set the **Gain [dB]** and **Frequency [Hz]** parameters precisely. The value ranges are ±12 dB in 0.1-dB steps and 20-22,000 Hz in 1-Hz steps, respectively. **Bw [Oct]** and **Q Factor** show the filter quality as bandwidth (in octaves) and Q factor, respectively.

➔ The EQ 1..8 block offers the following additional control ports:

Parameter	Control Port	Value Range
Flat All	Logical Input	On/Off

IV.3.2 Filter (Audio Function Block: Filter and EQ)



The Filter function block provides a configurable hi-pass or low-pass filter and can be used as shelving filter, too. Each block includes up to 16 channels and also handles channel groups. *The number of channels automatically adjusts as required. However, you can also set it manually from the Settings window.*

Clicking the **[Undo]** button will undo all changes made since the Settings window was opened.
Using the **[^]** and **[v]** buttons, you can show or hide the parameters of a channel or channel group in the Settings window.

The **band** is adjusted either in the diagram using the mouse or by entering the corresponding values in the lower part of the window. Two graphical operating modes can be selected in the right-hand side of the window: In the **[F+G] Mode**, you can configure the frequency and gain settings by moving the band dot horizontally and/or vertically. In the **[F|G] Mode**, you can move the dot only vertically for adjusting the gain while the frequency setting is made using a diamond on top of the diagram. The bandwidth setting (in shelving mode) is visualized by two arrows located on each side of the dot. You can change it by selecting and dragging it using the mouse. The Gain and Phase buttons of the **View** panel on the right-hand side are used for changing what is visualized in the diagram: **Gain** shows the amplitude response and **Phase** the phase response of the filter. You can have both functions enabled at the same time.

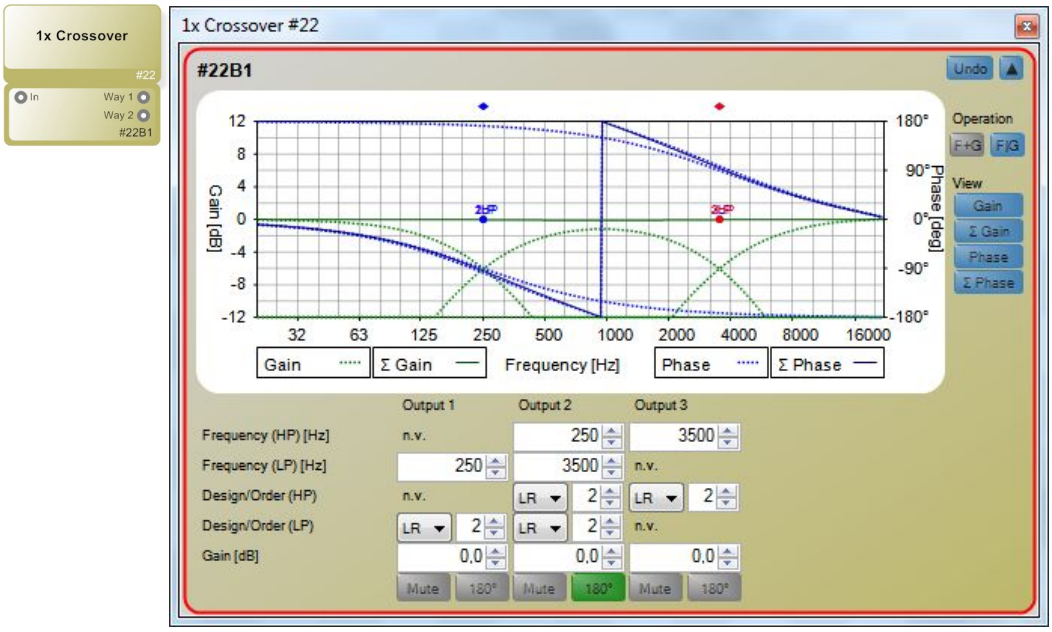
The **<Type>** drop-down menu provides for selecting the filter type. Available types include Low-Pass, High-Pass, Low-Shelf, and High-Shelf. The low-pass and high-pass filters are based on either the **Linkwitz-Riley** or the **Butterworth design**. Both designs provide various filter orders (Linkwitz-Riley: 2nd, 4th, 6th, or 8th order; Butterworth: 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, or 8th order). With the shelving bands, you can view and set the **Gain [dB]** and **Frequency [Hz]** parameters precisely. The value ranges are ±12 dB in 0.1-dB steps and 20-22,000 Hz in 1-Hz steps, respectively. **Bw [Oct]** and **Q Factor** show the quality as bandwidth (in octaves) and Q factor, respectively.

Clicking the **[Flat]** button toggles the bypass function of the entire function block on and off. When bypass is enabled, the button will be red.

➔ The Filter block offers the following additional control ports:

Parameter	Control Port	Value Range
Flat	Logical Input	On/Off

IV.3.3 Crossover (2..4) (Audio Function Block: Filter and EQ)



The Crossover function block splits the input signal into 2 to 4 output signals using a crossover network. The function provides high-pass and lower-pass filters plus gain for each band. The use of Linkwitz-Riley filters ensures the generation of output signals with smooth amplitude responses. Depending on the selected filter order, specific bands need to be phase-inverted by 180° to be in phase with adjacent bands: Therefore, be sure to enable the Phase button in the View panel for monitoring. Each block includes up to 16 channels and also handles channel groups. *The number of channels automatically adjusts as required. However, you can also set it manually from the Settings window.*

Clicking the **[Undo]** button will undo all changes made since the Settings window was opened.
Using the **[^]** and **[v]** buttons, you can show or hide the parameters of a channel or channel group in the Settings window.

The crossover-point bands are adjusted either in the diagram using the mouse or by entering the corresponding values in the lower part of the window. Two graphical operating modes can be selected in the right-hand side of the window: In the **[F+G] Mode**, you can configure the frequency and gain settings by moving the band dot horizontally and/or vertically. In the **[F|G] Mode**, you can move the dot only vertically for adjusting the gain while the frequency setting is made using a diamond on top of the diagram. The Gain, Σ Gain, Phase, and Σ Phase buttons of the **View** panel on the right-hand side are used for changing what is visualized in the diagram: **Gain** shows the amplitude response of the individual filter bands; **Σ Gain** the resulting amplitude response of the output bands; **Phase** the phase response of the individual filter bands; and **Σ Phase** the resulting phase response of the output bands. You can have all functions enabled at the same time.

You can view and set the frequencies of the crossover-filter bands precisely using the **Frequency (HP) [Hz]** and **Frequency (LP) [Hz]** parameters. The value range is 20-22,000 Hz in 1-Hz steps. Using the **Design/Order (HP)** and **Design/Order (LP)** settings, you can select the filter design and order: **LR** is a Linkwitz-Riley filter (2^{nd}, 4^{th}, 6^{th}, or 8^{th} order), and **Bw** is a Butterworth filter (1^{st}, 2^{nd}, 3^{rd}, 4^{th}, 5^{th}, 6^{th}, 7^{th}, or 8^{th} order). The output gain of the bands is set using the **Gain [dB]** parameter. The value range is ±12 dB in 0.1-dB steps.

Clicking the **[Mute]** button will mute the respective band. While mute is on, the button will be red.
Clicking the **[180°]** button inverts the polarity of the respective band. While the function is enabled, the button will be green.

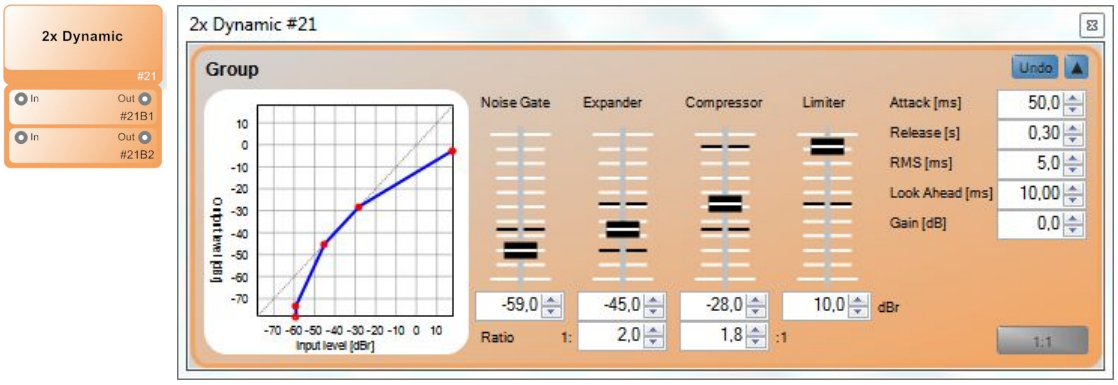
➔ The Crossover (2..4) block offers no additional control ports.

IV.4 Audio Function Blocks: Dynamic

This manual section describes audio function blocks that allow for processing the dynamics of the incoming audio.

➔ Note that Dynamic blocks add to the audio latency in the magnitude of the configured lookahead time.

IV.4.1 Dynamic (Audio Function Block: Dynamic)



The Dynamic function block combines four dynamic processors. They allow for configuring complex yet comprehensible dynamic processing of the audio signal. The four processors all use the time constants configured in the function block. By setting up the various thresholds purposefully, you can also use the processors separately. This way, you can apply individual dynamic processes with separate time constants by daisy-chaining multiple Dynamic blocks. Each block includes up to 16 channels and also handles channel groups. *The number of channels automatically adjusts as required.*

➔ The project-reference level configured in Extras > Options automatically affects the threshold settings in this function block. (Refer to page 18)

Clicking the **[Undo]** button will undo all changes made since the Settings window was opened.
Using the **[^]** and **[v]** buttons, you can show or hide the parameters of a channel or channel group in the Settings window.

Using the **fader**, you can set the **threshold** parameter of each dynamics module in steps of 0.1 dB. You can also view and change the threshold in the input fields below the faders. This setting is relative to the configured dBr reference level of the project. The **black marker** on a fader scale show the threshold of the downstream dynamics processors. The expander and compressor provide for adjusting the **ratios** to 1.0:1-20.0:1. The **diagram** visualizes the ratio between the input level and the output level (i.e. the resulting dynamics curve) as a blue line. Thresholds are marked by **red dots**.

The value of **<Attack [ms]>** is the attack time of all dynamics processors (0.1-100 ms).

The value of **<Release [ms]>** is the release time of all dynamics processors (0.01-3 s).

The value of **<RMS [ms]>** is the evaluation-time window. Large time windows ensure smoother dynamics processing while short ones respond faster to peaks (0.1-100 ms).

The value of **<Lookahead [ms]>** is the lookahead time, i.e. an additional delay for performing dynamics processing; however, note that the sidechain loop is still fed with the undelayed input signal. Thanks to this design, the dynamics processor can “look ahead” and thus get some time for triggering their action. The lookahead time can be set within a range of 0.00-1000 ms.

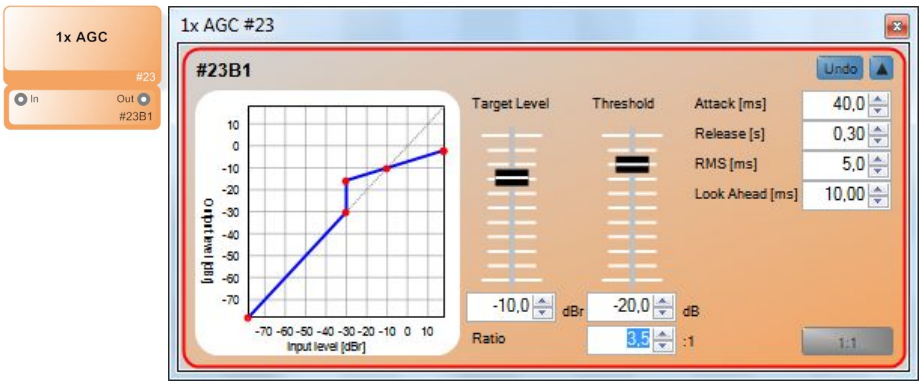
Using the **<Gain [dB]>** control, you can adjust the output level within a range of ±20 dB in 0,1-dB steps.

Clicking the **[1:1]** button toggles the bypass function of the entire function block on and off. When bypass is enabled, the button will be red.

➔ The Dynamic block offers the following additional control ports:

Parameter	Control Port	Value Range
1:1 (Bypass)	Logical Input	On/Off
Active	Logical Output	On/Off

IV.4.2 AGC (Audio Function Block: Dynamic)



The AGC (Auto Gain Control) function block provides for straightforward processing used for smoothing audio dynamics. When the input level falls below a defined <threshold>, gain will be increased. This upward compression depends on the configured ratio and the selected threshold. While the signal exceeds the <threshold>, the adjusted compression ratio will be applied; if the level falls below the threshold, the dynamics of the input signal will not be altered <The Target Level> parameter specifies the dBr reference level. While the signal falls below that level, gain increase will be applied; when the <target level> is exceeded, the audio will be downward-compressed applying of the configured ratio. Each block includes up to 16 channels and also handles channel groups. *The number of channels automatically adjusts as required.*

➔ The project-reference level configured in Extras > Options automatically affects the threshold settings in this function block. (Refer to page 18)

Clicking the **[Undo]** button will undo all changes made since the Settings window was opened.
Using the **[^]** and **[v]** buttons, you can show or hide the parameters of a channel or channel group in the Settings window.

Using the **Threshold** fader, you set in 0.1-dB steps the first threshold where upward compression starts. Gain depends on the **Ratio** setting that can be between 1.0:1-20.0:1. Using the **Target Level** fader, you set in 0.1-dB steps the second threshold where gain increase effectively ends and the downward compression starts. You can also view and change the Threshold and Target Level settings in the input fields below the faders. This setting is relative to the configured dBr reference level of the project. The **diagram** visualizes the ratio between the input level and the output level (i.e. the resulting dynamics curve) as a blue line. The thresholds are marked by **red dots**.

The value of **<Attack [ms]>** is the attack time of the dynamics processor (0.1-100 ms).

The value of **<Release [ms]>** is the release time of the dynamics processor (0.01-3 s).

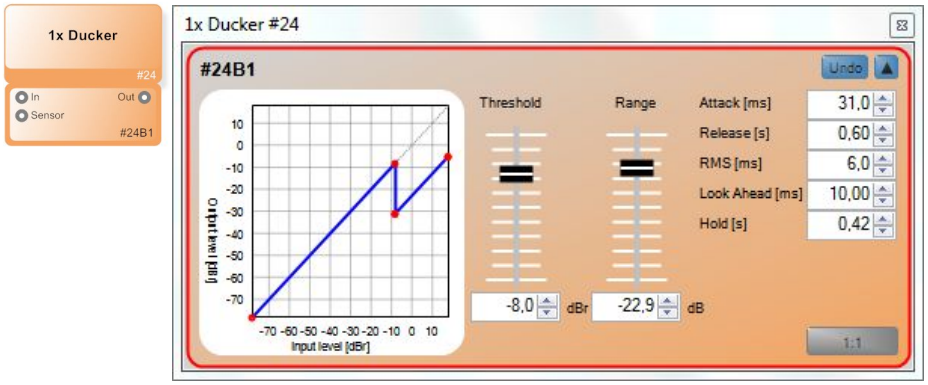
The value of **<RMS [ms]>** is the evaluation-time window. Large time windows ensure smoother dynamics processing while short ones respond faster to peaks (0.1-100 ms).

The value of **<Lookahead [ms]>** is the lookahead time, i.e. an additional delay for performing dynamics processing; however, note that the sidechain loop is still fed with the undelayed input signal. Thanks to this design, the dynamics processor can “look ahead” and thus get some time for triggering their action. The lookahead time can be set within a range of 0.00-1000 ms.

Clicking the **[1:1]** button toggles the bypass function of the entire function block on and off. When bypass is enabled, the button will be red.

➔ The AGC block offers no additional control ports.

IV.4.3 Ducker (Audio Function Block: Dynamic)



The Ducker function block implements the ducking effect known from radio. In addition to the audio input for the signal to be processed, each channel of this block also has a sensor input. When the level of the sensor input exceeds the <Threshold> setting, the level of the signal present at the audio input will be lowered. You can set the amount of level decrease using the <Range> fader and control it using configurable time constants. Each block includes up to 16 channels and also handles channel groups. *The number of channels automatically adjusts as required.*

➔ The reference level configured for the project automatically affects the threshold settings in this function block.

Clicking the **[Undo]** button will undo all changes made since the Settings window was opened.
Using the **[^]** and **[v]** buttons, you can show or hide the parameters of a channel or channel group in the Settings window.

Using the **Threshold** fader, you select in 0.1-dB steps the level where ducking starts. You can also view and change the threshold in the input fields below the fader. This setting is relative to the configured dBr reference level of the project. The **Range** fader allows for adjusting the amount of level decrease between –100 dB and 0 dB in 0.1-dB steps. You can also view and change the Range setting in the input fields below the faders. The **diagram** visualizes the ratio between the sensor-input level and decrease in output level as a blue line. Thresholds and post-ducking levels are marked by **red dots**.

The value of **<Attack [ms]>** is the ducking attack time (0.1-100 ms).

The value of **<Release [ms]>** is the ducking release time (0.01-3 s).

The value of **<RMS [ms]>** is the evaluation-time window. Large time windows ensure smoother dynamics processing while short ones respond faster to peaks (0.1-100 ms).

The value of **<Lookahead [ms]>** is the lookahead time, i.e. an additional delay for performing dynamics processing; The sidechain loop is, however, still fed with the undelayed input signal. Thanks to this design, the dynamics processor can “look ahead” and thus get some time for triggering their action. The lookahead time can be set within a range of 0.00-1000 ms.

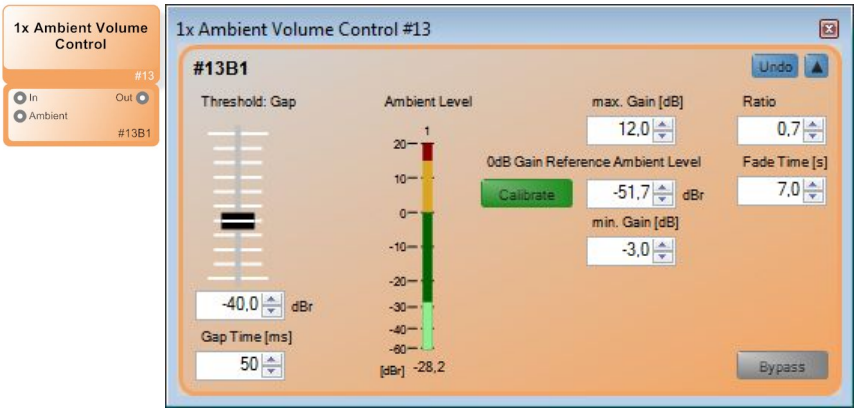
You can extend the ducking by setting a hold time using the **<Hold [ms]>** parameter. The value range is 0.00-10 s.

Clicking the **[1:1]** button toggles the bypass function of the entire function block on and off. When bypass is enabled, the button will be red.

➔ The Ducker block offers the following additional control ports:

Parameter	Control Port	Value Range
1:1 (Bypass)	Logical Input	On/Off
Active	Logical Output	On/Off

IV.4.4 AVC (Audio Function Block: Dynamic)



The AVC (Ambient Volume Control) function block allows for automatically adjusting the program volume (for example, of an announcement) with regard to ambient noise.
In addition to the audio input for the signal to be processed, each channel of this block also has a sensor input where you can connect e.g. a measurement microphone.
During a signal pause or "gap", when the level of the sensor input exceeds the set 0 dB Gain Reference Ambient Level, the level of the signal present at the audio input will be increased; when the level at the sensor input falls below that reference level, the program level will be reduced.

For gap detection in the program signal, you set a **<Threshold [dBr]>** (using the fader) and enter the **<Gap Time [ms]>**. This way, the system detects a gap whenever the program level falls below the threshold longer than the gap time.

The "**Ambient Level"** meter shows the ambient level detected during the last program pause.

Clicking the **[Calibrate]** button applies the detected ambient level as the 0 dB Gain Reference Ambient Level where the program level is neither increased nor reduced.

The **<Max. Gain [dB]>** setting determines the upper threshold that the program level can be increased to in relation to the reference level when the ambience level increases.

The **<Min. Gain [dB]>** setting determines the lower threshold that the program level can be reduced to in relation to the reference level when the ambience level decreases.

The **<Ratio>** parameter sets the ratio of the difference between the ambient and reference levels and the program-gain setting. For example, with a ratio setting of 0.5, when the ambient sound rose by 6 dB, the program level would be increased by just 3 dB.

Using the **<Fade Time [s]>** setting, you can configure how fast the program level adjusts to changed ambience levels.

Each block includes up to 16 channels and also handles channel groups. *The number of channels automatically adjusts as required.*

➔ The reference level configured for the project automatically affects the threshold settings in this function block and the dBr reference level.

Clicking the **[Undo]** button will undo all changes made since the Settings window was opened.
Using the **[^]** and **[v]** buttons, you can show or hide the parameters of a channel or channel group in the Settings window.

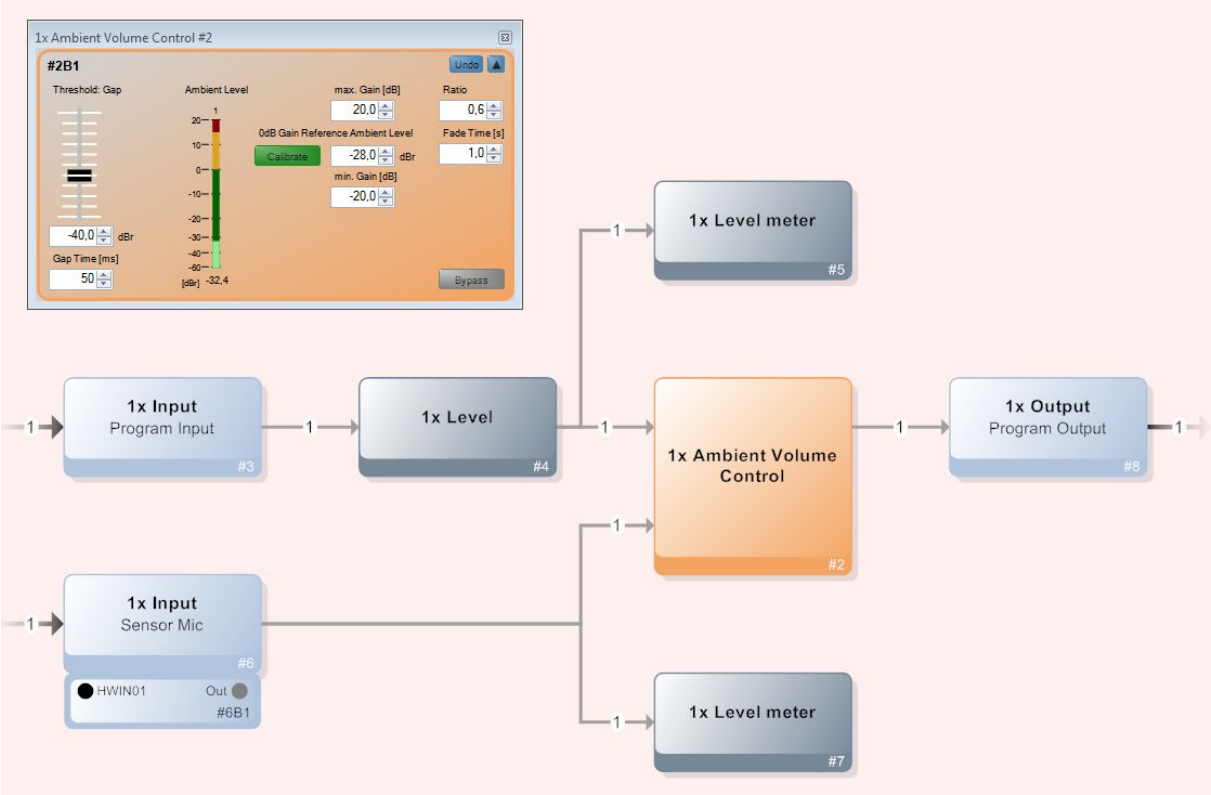
Clicking the **[Bypass]** button toggles the bypass function of the entire function block on and off. When bypass is enabled, the button will be red.

➔ The AVC block offers no additional control ports.

IV.4.4.1 A Guide to Using the AVC Block

To achieve perfect results when using the AVC function block, you need to configure the best possible settings with regard to the ambient conditions.

This guide provides a sample project to explain how to configure optimum settings for this function block. In this example, we assume that the project in question has been uploaded to a HARVEY mx.16 unit that has an online connection to a computer running HARVEY Composer.



The project includes the following function blocks:

- ➔ Audio input for the unprocessed announcement signal or program
- ➔ Audio input receiving this signal of a microphone that measures the ambience volume
- ➔ Fader used for adjusting the default volume of the announcement signal
- ➔ Two meters for monitoring the program and measurement-microphone levels
- ➔ AVC function block used for automatically adjusting the program level
- ➔ Audio output to send the program signal processed by the AVC to. The speaker system of the venue connects to this audio output.

- ➔ *Tip:*
  The HARVEY mx.16 allows for monitoring individual audio inputs and outputs using headphones. This feature might be useful in cases where you cannot perform parameter adjustments within earshot of the venue.

1. First, using the meters, make sure that the program and measurement-microphone signals have an appropriate level. You can make necessary changes using the Audio Input function blocks or the faders in the program-signal path. If you enable the bypass in the Settings dialog of the AVC function block, the system should reproduce an announcement signal at an appropriate level in the venue.

2. The first step is to configure the gap detection in the Settings dialog of the AVC block.
   a. To do so, an announcement must be replayed.
   b. A Threshold setting of about –40 dBr (at 18 dBr = 0 dBFS) and a Gap Time setting of 50 ms should make a good starting point.
   c. The Ambient Level meter should reflect pauses in the announcement (for example, between sentences). If the meter constantly moves even during the announcements, try reducing the threshold; if the meter shows no sufficient response, increase it. Configure the Gap Time as necessary in a similar fashion.

3. The next step is measuring and configuring the 0-dB reference level, i.e. the ambient level where the program level is neither increased nor reduced.
   a. Enable the bypass function of the AVC function block. Next, start playing the announcement. If necessary, repeat step 1 to make sure that the announcement is played at a volume appropriate for the current ambient volume in the venue. Then, disable the bypass function.
   b. Click the [Calibrate] button to apply the last measured ambience level as the 0-dB reference level.

4. Reasonable gain settings (Max./Min. Gain) depend on the actual conditions of the environment and the resulting variations in ambient volume in the venue:
    a. When calibrating the reference level (step 3), if the ambient volume was normal mode but situations where significantly lower levels occur are still possible, you might want to set the Min. Gain parameter to a value below 0 dB (e.g. –10 dB). However, if the ambient volume was indeed very low, you might want to consider a Min. Gain setting of 0 dB, thus making sure that the program volume will never be lowered.
    b. Set the Max. Gain parameter so that you get sufficient program amplification when the ambient volume increases.

5. Among other factors, the Ratio setting depends on the position of the measurement microphone: If the microphone is suspended at great height and thus rather far away from the ambient-sound sources on the ground, a Ratio setting of 1 or even greater is recommended; otherwise, select a setting of less than 1.
    a. For testing purposes, you may try to produce different ambient levels inside the venue.
    b. If you feel that AVC does not sufficiently raise the program level when the ambient volume increases, set the Ratio to a higher value. Afterwards, if AVC increases the program level too much, reduce the ratio again.

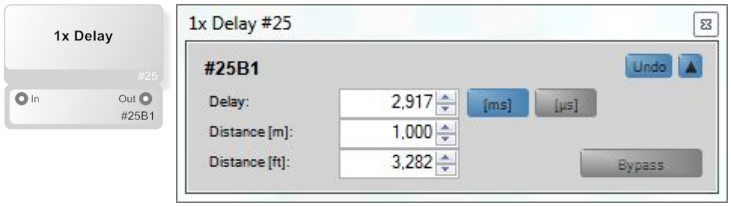
6. Select a high setting (such as 10 seconds) for the Fade Time parameter to prevent perceivable program-level corrections at short-time variations of the ambient volume; however, to achieve faster response, select a lower value.

IV.5 Audio Function Blocks: Function Blocks

This section describes function blocks that provide additional functions in the audio domain. These include:

- Delay
- a-b Differential Signal
- Signal Generator

IV.5.1 Delay (Audio Function Block: Function)



The Delay function block delays the input audio by a number of samples before outputting it. The main application is aligning the latencies of multiple sound sources. The delay time is set as a time or latency value rather than a number of samples. Each block includes up to 16 channels and also handles channel groups. *The number of channels automatically adjusts as required.*

- ➔ This function block offers ***block options*** through its Settings window. You can increase the step width of the delay by multiplying the sample rate within the block (upsampling). This way, you can switch the step width from the default setting of **20.83 µs** (48,000 Hz) to either **10.64 µs** (96,000 Hz) or even **5.21 µs** (192,000 Hz).

- ➔ When using the upsampling feature, note that the **maximum delay time** decreases from **1000 ms** to **500 ms** or **250 ms**, respectively.

- ➔ In addition, upsampling increases the DSP load, resulting in additional latency. The **Filter Length** in the blog properties allows for adjusting the processing time for upsampling filtering. Low filter settings speed up processing at the cost of higher processing load.

Clicking the **[Undo]** button will undo all changes made since the Settings window was opened.
Using the **[^]** and **[v]** buttons, you can show or hide the parameters of a channel or channel group in the Settings window.

The value of **<Delay [ms]>** is the delay between the input and the output. The maximum delay time and the step width depend on the settings configured in the block properties. Available step widths include 20.83 µs, 10.64 µs, and 5.21 µs, resulting in maximum delay times of 1000, 500, or 250 milliseconds, respectively. Using the **[ms]** and **[µs]** buttons, you can toggle the unit of time between milliseconds and microseconds.

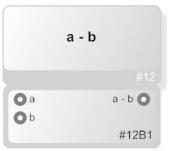
The setting of **<Distance [m]>** parameter determines the resulting sonic latency in meters between the input and the output. The maximum delay time and the step width depend on the settings configured in the block properties. Available step widths include 20.83 µs, 10.64 µs, and 5.21 µs, resulting in maximum propagation speeds of 343, 171.5, or 85.75 m/s, respectively.

The setting of **<Distance [ft]>** parameter determines the resulting sonic latency in feet between the input and the output. The maximum delay time and the step width depend on the settings configured in the block properties. Available step widths include 20.83 µs, 10.64 µs, and 5.21 µs, resulting in maximum propagation speeds of 1125.328, 562.664, or 281.332 ft/s, respectively.

Clicking the **<Bypass>** button toggles the delay on or off. When bypass is enabled, the button will be red.

- ➔ The Delay block offers no additional control ports.

IV.5.2 a – b Differential Signal (Audio Function Block: Function)

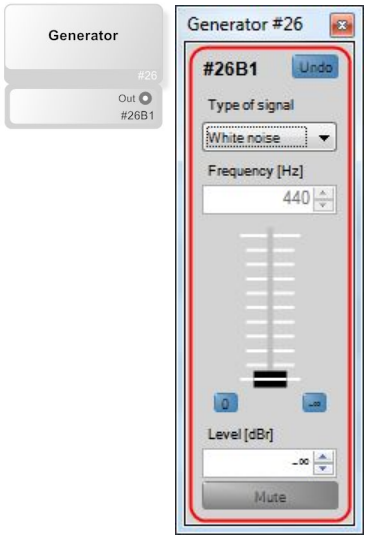


The a-b function block generates the differential signal of the two audio signals present at the a and b inputs and outputs. Using this block, you can create the differential signal (or “side signal”) from a L/R stereo source. Differential signals are often used as a basis for pseudo-stereo channels. Each block includes up to 16 channels. *The number of channels automatically adjusts as required.*

The a-b function block provides no configuration options in HARVEY Composer.

➔ The a-b block offers no additional control ports.

IV.5.3 Sine/Noise Generator (Audio Function Block: Function)



The Generator function block includes an audio-signal generator with adjustable output level.
Each block includes up to 16 channels and also handles channel groups. *The number of channels automatically adjusts as required.*

➔ The reference level configured for the project automatically affects the displayed generator level (dBr).

Clicking the **[Undo]** button will undo all changes made since the Settings window was opened.
Using the **[^]** and **[v]** buttons, you can show or hide the parameters of a channel or channel group in the Settings window.

You can set the type of the generated signal using the **<Signal Type>** drop-down menu. Available types include sine, pink noise, and white noise.

The **<Frequency [Hz]>** parameter is used for setting the sine frequency in 1-Hz steps within a range of 20-22,000 Hz.

Using the **fader**, you can adjust the generator output level in 0.1-dB steps. This setting is relative to the configured dBr reference level of the project. The bottom-stop setting (–∞) is equivalent to muting the channel. Using the blue **[0]** and **[–∞]** buttons allows for configuring a level of 0.0 dBr or –∞, respectively.
You can view the current level setting in the **<Level [dBr]>** field. To change the setting, click into the field and enter the desired value using your keyboard, or use the tiny arrow buttons.

Clicking the **[Mute]** button will mute the generator output. While mute is on, the button will be red.

➔ The Generator block offers the following additional control ports:

Parameter	Control Port	Value Range
Mute	Logical Input	On/Off

V. Control Function Blocks

The HARVEY mx.16 provides serial interfaces and physical I/Os for controlling media devices or externally operating HARVEY parameters. The HARVEY system not only processes audio signals but sends and receives control messages and uses these for controlling audio functions.

V.1 Control Function Blocks: Inputs and Outputs

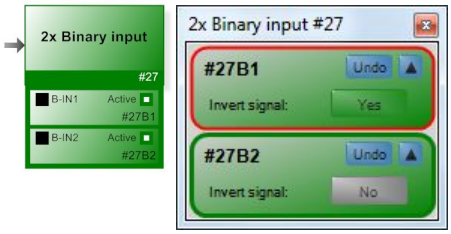
On the hardware side, the HARVEY mx.16 provides 8 binary inputs, 4 relay outputs, and 8 voltage-control inputs.

Binary Inputs 1-8 and Relay Outputs 1-4 use binary logic.

➔ Relay Output 1 is used for alarm purposes (critical errors, power failure).
Therefore, it is not user-programmable and is not displayed in HARVEY Composer.

The 0-10 V Control Inputs 1-8 evaluate voltage levels between 0-10 V. The DSP environment converts the detected voltage levels to level-control signals. This way, external devices such as faders or rotary controls can be used for controlling levels in Level blocks on the DSP domain.

V.1.1 Binary Input (Control Function Block: I/O)



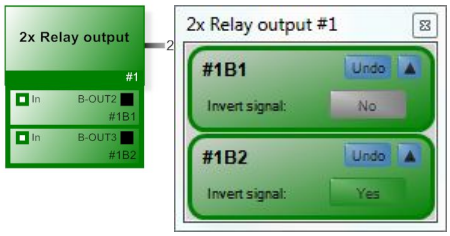
The Binary Input function block converts signals present at the Binary Input 1-8 of the HARVEY mx.16 to the software DSP domain. When the loop is open, the status becomes 0/FALSE; when the loop is closed, the status becomes 1/TRUE. The current status is output to the logic port. The function block includes one or more software-based inputs (up to 8), each of which is linked to one dedicated Binary Input on the HARVEY mx.16. Note that you cannot connect the same hardware port to multiple software ports. This way, each project includes a maximum of 8 software-based binary inputs. These can be freely distributed to function blocks, so you can use 8 single-input blocks, 4 dual-input blocks, or any other combination. In addition, you can group multiple channels.

Clicking the **[Undo]** button will undo all changes made since the Settings window was opened.
Using the **[^]** and **[v]** buttons, you can show or hide the parameters of a channel or channel group in the Settings window.

Clicking the **[Invert Signal]** button inverts the binary status at the output port, meaning that 0/FALSE becomes 1/TRUE and vice versa. When signal inversion is enabled, the button label becomes <Yes> and the button color green.

Parameter	Control Port	Value Range
Output	Logical Output	On/Off

V.1.2 Relay Output (Control Function Block: I/O)



The Relay Output block converts software-based logical statuses to analog signals and makes them available at the Relay Outputs 2-4 of the HARVEY mx.16. Relay Output 1 is hardwired to an alarm function and is not user-programmable. The function block includes one or more software-based relay outputs (up to 3), each of which is linked to one dedicated Relay Output on the HARVEY mx.16. Note that you cannot connect the same hardware port to multiple software ports. This way, each project includes a maximum of 3 software-based relay outputs. These can be freely distributed to function blocks, so you can use 3 single-output blocks or any other combination. In addition, you can group multiple channels.

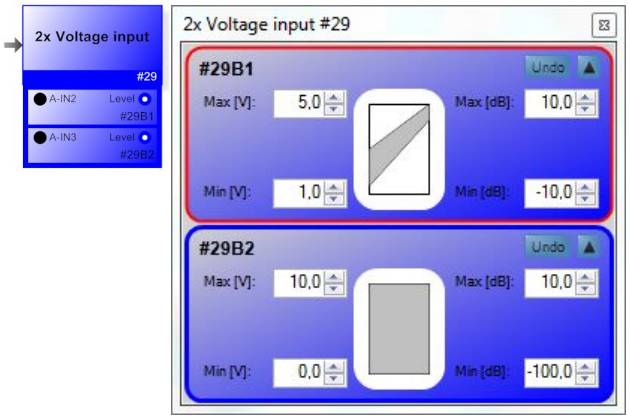
➔ Relay Output 1 (Alarm) is not user-programmable.

Clicking the **[Undo]** button will undo all changes made since the Settings window was opened.
Using the **[^]** and **[v]** buttons, you can show or hide the parameters of a channel or channel group in the Settings window.

Clicking the **[Invert Signal]** button inverts the logical status at the relay output, meaning that 0/FALSE becomes 1/TRUE and vice versa. When signal inversion is enabled, the button label becomes <Yes> and the button color green.

Parameter	Control Port	Value Range
Input	Logical Input	On/Off

V.1.3 Voltage Input (Control Function Block: I/O)



The Voltage Input function block converts voltage levels present at 0-10 V Control Input 1-8 of the HARVEY mx.16 to the software DSP domain. The level evaluation is user-scalable. The function block includes one or more software-based voltage inputs (up to 8), each of which is linked to one dedicated 0-10 V Control Input on the HARVEY mx.16. Note that you can connect each of the eight 0-10 V Control Inputs to one software port only. This way, each project includes a maximum of 8 software-based voltage inputs. These can be freely distributed to function blocks, so you can use 8 single-input blocks, 2 quadruple-input blocks, or any other combination.

Clicking the **[Undo]** button will undo all changes made since the Settings window was opened.
Using the **[^]** and **[v]** buttons, you can show or hide the parameters of a channel or channel group in the Settings window.

To convert applied voltages to control levels, you can set an input-voltage range and a control-level range. The **Min [V]** and **Max [V]** parameters determine the limits of the input voltage range. You can set these parameters between 0.0 V and 10.0 V in 0.1-V steps. The **Min [dB]** and **Max [dB]** parameters set the level range that is controlled by the incoming voltage levels. The resulting control level is available at the output port. You can use it, for example, for controlling a channel of a Level block by connecting it to the corresponding control input.

- ➔ The sample rate is 20 Hz.
- ➔ When changing levels, a 250-ms fadeover time is applied.

Parameter	Control Port	Value Range
Active	Level Output	Defined

V.2 Control Function Blocks: Serial Interfaces

The HARVEY mx.16 implements a total of four interface types for data transmission and control: RS-232, RS-485, Ethernet, and DMX.

The unit provides one physical RS-232 interface port (9-pin D-sub) as well as one physical RS-485 interface (RJ45).

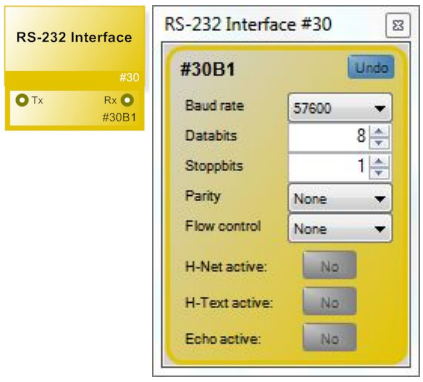
The DMX interface shares the physical RJ-45 port with the RS-485 interface, so you cannot use the RS-485 and DMX formats on the same HARVEY mx.16 unit at the same time.

As the Ethernet interface is port/IP-based, you can use a virtually unlimited number of function blocks thanks to the use of TCP.

A particularly interesting feature is the conversion between interface formats. For example, it allows for using RS-232 or RS-485 enabled units on an Ethernet network, which is normally not possible. In the same way, you can convert RS-232 signals to RS-485 or vice versa.

The Serial » Logic and Logic » Serial function blocks enhance the interface functionality in that they provide logical functions to serial interfaces in the HARVEY DSP domain or convert serial messages to logical statuses.

V.2.1 RS-232 Interface (Control Function Block: Serial Interfaces)



The settings of the RS-232 Interface function block are used for configuring the RS-232 interface port of the HARVEY mx.16. It provides one serial RX input and one TX output on the control layer. These ports allow for transmitting serial data packets, which can be used either for configuring logical statuses of control signals (using the Serial » Logic or Logic » Serial blocks) or for triggering the transmission of specific data packets based on logical statuses. In addition, you can interconnect serial interfaces on the control layer for use as an interface converter. Note that you can use just one RS-232 Interface block in each project.

Clicking the **[Undo]** button will undo all changes made since the Settings window was opened.

Use the **<Baudrate>** drop-down menu for adjusting the data rate of the RS-232 interface.

The **<Data Bits>** parameter sets the number of bits per data packet.

The **<Stop Bits>** parameter sets the number of stop bits per data packet.

Use the **<Parity>** drop-down menu for selecting whether parity checks will be applied. Settings include None, Even, and Odd.

Using the **<Flow Control>** drop-down menu, you can select the data flow control to be applied. Available settings include None, XON/XOFF, and RTS/CTS.

Use the **<H-Net Active>** button for selecting whether H-Net data will be processed or not. When enabled, the button turns blue.

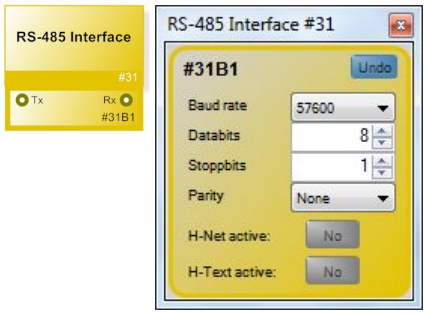
Use the **<H-Text Active>** button for selecting whether H-Text data will be processed or not. When enabled, the button turns blue.

➔ You can enable either H-Net or H-Text.

Use the **<Echo Active>** button for selecting whether H-Text data will be processed or not. When enabled, the button turns blue.

Parameter	Control Port	Value Range
RX Port	Serial Input	Data Packet
TX Port	Serial Output	Data Packet

V.2.2 RS-485 Interface (Control Function Block: Serial Interfaces)



The settings of the RS-485 Interface function block are used for configuring the RS-485 interface port of the HARVEY mx.16. It provides one serial RX input and one TX output on the control layer. These ports allow for transmitting serial data packets, which can be used either for configuring logical statuses of control signals (using the Serial » Logic or Logic » Serial blocks) or for triggering the transmission of specific data packets based on logical statuses. In addition, you can interconnect serial interfaces on the control layer for use as an interface converter. Note that you can use just one RS-485 Interface block in each project.

➔ The RS-485 hardware port of the HARVEY mx.16 can be used as either RS-485 or DMX port. Therefore, you cannot use the RS-485 Interface and DMX function blocks at the same time.

Clicking the **[Undo]** button will undo all changes made since the Settings window was opened.

Use the **<Baudrate>** drop-down menu for adjusting the data rate of the RS-485 interface.

The **<Data Bits>** parameter sets the number of bits per data packet.

The **<Stop Bits>** parameter sets the number of stop bits per data packet.

Use the **<Parity>** drop-down menu for selecting whether parity checks will be applied. Settings include None, Even, and Odd.

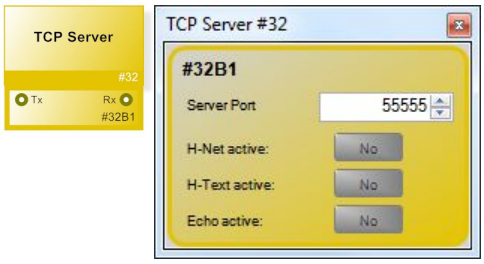
Use the **<H-Net Active>** button for selecting whether H-Net data will be processed or not. When enabled, the button turns blue.

Use the **<H-Text Active>** button for selecting whether H-Text data will be processed or not. When enabled, the button turns blue.

➔ You can enable either H-Net or H-Text.

Parameter	Control Port	Value Range
RX Port	Serial Input	Data Packet
TX Port	Serial Output	Data Packet

V.2.3 TCP Server (Control Function Block: Serial Interfaces)



The TCP Server function block activates HARVEY mx.16 as TCP server, so that external (Client) devices can control HARVEY mx.16 via an Ethernet network. The function block provides one serial RX input and one TX output on the control layer. These ports allow for transmitting serial data packets, which can be used either for configuring logical statuses of control signals (using the Serial » Logic or Logic » Serial blocks) or for triggering the transmission of specific data packets based on logical statuses. In addition, you can interconnect serial interfaces on the control layer for use as an interface converter. You can use any number of UDP Client function blocks.

Clicking the **Undo** button will undo all changes made since the Settings window was opened.

In the **Target Port** field, you can enter a value between 2000 and 59999 to set the port used for addressing the TCP server.

Use the **<H-Net Active>** button for selecting whether H-Net data will be processed or not. When enabled (Yes), the button turns blue.

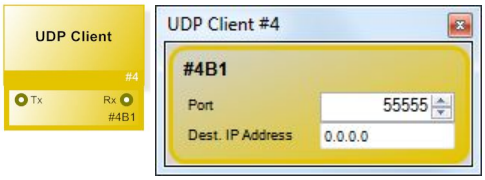
Use the **<H-Text Active>** button for selecting whether H-Text data will be processed or not. When enabled, the button turns blue.

➔ You can enable either H-Net or H-Text.

Use the **<Echo Active>** button for selecting whether H-Text data will be processed or not. When enabled, the button turns blue.

Parameter	Control Port	Value Range
RX Port	Serial Input	Data Packet
TX Port	Serial Output	Data Packet

V.2.4 UDP Client (Control Function Block: Serial Interfaces)



The UDP Client function block allows for controlling UDP-enabled external (server) devices on an Ethernet network using the HARVEY mx.16. The function block provides one serial RX input and one TX output on the control layer. These ports allow for transmitting serial data packets, which can be used either for configuring logical statuses of control signals (using the Serial » Logic or Logic » Serial blocks) or for triggering the transmission of specific data packets based on logical statuses. In addition, you can interconnect serial interfaces on the control layer for use as an interface converter. You can use any number of UDP Client function blocks.

Clicking the **Undo** button will undo all changes made since the Settings window was opened.

In the **Target Port** field, you can enter a value between 2000 and 59999 to set the port used for addressing the device to be controlled (i.e. the server).

Next, enter the IP address of the device to be controlled into the **Target IP Address** field.

Parameter	Control Port	Value Range
RX Port	Serial Input	Data Packet
TX Port	Serial Output	Data Packet

V.3 Control Function Blocks: Logic

The Negator and RS Flipflop function blocks add more functions for logical control.

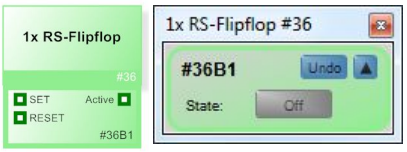
V.3.1 Negator (Control Function Block: Logical)

The Negator function block inverts the logical signal present at the input, meaning that it outputs the opposite status: 0/FALSE becomes 1/TRUE and vice versa. Each block includes up to 16 channels. *The number of channels automatically adjusts as required.*

The Negator function block provides no configuration options in HARVEY Composer.

Parameter	**Control Port**	**Value Range**
Input	Logical Input	On/Off
Output	Logical Output	On/Off (Inverted)

V.3.2 RS Flipflop (Control Function Block: Logical)



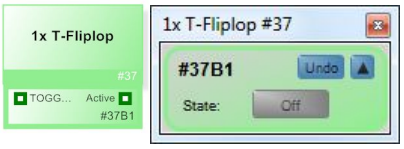
The RS Flipflop function block implements an RS flip-flop: Momentarily applying the 1/TRUE status to the SET input results in 1/TRUE as the stable output status while momentarily applying 1/TRUE to the RESET input resets the output status to 0/TRUE. If 1/TRUE is present at both inputs at the same time, a random output status will be set. The block includes up to 16 channels. *The number of channels automatically adjusts as required.*

Clicking the **[Undo]** button will undo all changes made since the Settings window was opened.
Using the **[^]** and **[v]** buttons, you can show or hide the parameters of a channel or channel group in the Settings window.

Using the **<State>** button, you can set the output of the RS Flipflop block to 1/TRUE for testing purposes. When enabled, the button turns green.

Parameter	Control Port	Value Range
Set	Logical Input	On/Off (Evaluation)
Reset	Logical Input	On/Off (Evaluation)
Output	Logical Output	On/Off (Evaluation)

V.3.3 T-Flipflop (Control Function Block: Logical)



The T-Flipflop function block implements a toggle flip-flop: Momentarily applying a signal to the toggle input inverts the output status.
The block includes up to 16 channels. *The number of channels automatically adjusts as required.*

Clicking the **Undo** button will undo all changes made since the Settings window was opened.
Using the **[^]** and **[v]** buttons, you can show or hide the parameters of a channel or channel group in the Settings window.

Using the **State** button, you can set the output of the T-Flipflop block to 1/TRUE for testing purposes. When enabled, the button turns green.

Parameter	**Control Port**	**Value Range**
Toggle	Logic Input	On/Off (Evaluation)
Output	Logic Output	On/Off (Evaluation)

V.4 Control Function Blocks: Function Blocks

The Preset function block described in this section allows for automated parameter recall when specific conditions are met. This way, using external switches, you can trigger specific operating statuses that implement different applications of an installation.

V.4.1 Preset (Control Function Block: Function Blocks)

When the Preset block receives 1/TRUE at its control input, it loads a preset configured for the current project. This way, the block allows for loading stored parameter sets. The block also has a control output which represents the active state of the selected preset. That state will also be signaled if the preset is being called via other mechanisms (e.g. H-Text). The block includes up to 16 channels. *The number of channels automatically adjusts as required.*

- ➔ You can use this function block for switching between several application scenarios or even for automatically changing parameters when specific statuses occur.
- ➔ Using the serial interfaces or binary inputs, you can enable various statuses and parameters on multiple HARVEY mx.16 units.
- ➔ In addition, messages can be triggered using H-Net and H-Text.

Clicking the **[Undo]** button will undo all changes made since the Settings window was opened.
Using the **[^]** and **[v]** buttons, you can show or hide the parameters of a channel or channel group in the Settings window.

Using the **<Preset ID>** drop-down menu, you select a preset that will be applied when 1/TRUE is present at the input.

Parameter	**Control Port**	**Value Range**
Input	Logical Input	On/Off (Evaluation)
Output	Logical Output	On/Off

V.5 Control Function Blocks: Serial

The function blocks described in this section allow for evaluating or triggering serial data packets.

V.5.1 Serial » Logic (Control Function Block: Serial)

When receiving a specific serial data packet, the Serial » Logic function block momentarily outputs the 1/TRUE status. To achieve a stable logical status, you need to insert a downstream RS-Flipflop function block. The Serial » Logic block includes a serial RX input for data-packet reception on the control layer. The block includes up to 16 channels. *The number of channels automatically adjusts as required.*

➔ Multiple channels share the same serial RX input.

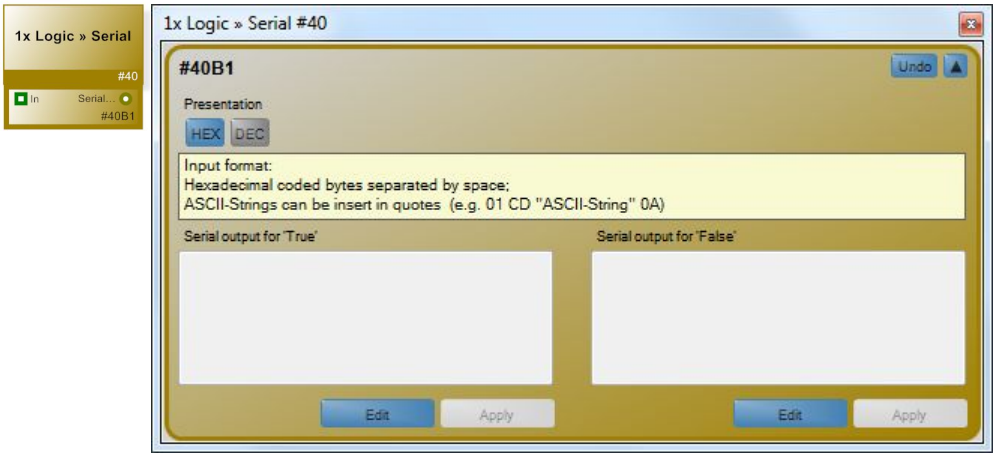
Clicking the **[Undo]** button will undo all changes made since the Settings window was opened.
Using the **[^]** and **[v]** buttons, you can show or hide the parameters of a channel in the Settings window.

The **[HEX]** and **[DEC]** buttons allow for toggling the data-packet byte view and input between hex and decimal. To enter ASCII strings, put them in quotes. For example: 01 CD "ASCII string" 0A.

You can view and enter the data packet that will trigger the new logical status at the control output in the **<Serial Input>** field. Use spaces as a delimiter when entering the encoded bytes. Clicking the **[Edit]** button below the input field enables the input mode. Click the input field and enter your characters using the mouse. When doing so, blue **[Apply]** and **[Cancel]** buttons will be displayed. Using these buttons, you can apply your changes or cancel the action; in both cases, you exit the input mode.

Parameter	Control Port	Value Range
RX	Serial Input	Data Packet
Output	Logical Output	On/Off (Evaluation)

V.5.2 Logic » Serial (Control Function Block: Serial)



The Logic » Serial function block evaluates the control-input status and sends a previously defined serial data packet when TRUE or FALSE are received. It provides one serial TX output on the control layer used for routing the triggered data packets to a serial interface. The block includes up to 16 channels. *The number of channels automatically adjusts as required.*

➔ Multiple channels share the same serial TX output.

Clicking the **[Undo]** button will undo all changes made since the Settings window was opened.
Using the **[^]** and **[v]** buttons, you can show or hide the parameters of a channel group in the Settings window.

The **[HEX]** and **[DEC]** buttons allow for toggling the data-packet byte view and input between hex and decimal. To enter ASCII strings, put them in quotes. For example: 01 CD "ASCII string" 0A.

The data packets for each signal state are entered into the **<Serial Output for 'True'>** and **<Serial Output for 'False'>** fields, respectively. Use spaces as a delimiter when entering the encoded bytes. Clicking the **[Edit]** button below the input fields enables the input mode. Click the input field and enter your characters using the mouse. When doing so, blue **[Apply]** and **[Cancel]** buttons will be displayed. Using these buttons, you can apply your changes or cancel the action; in both cases, you exit the input mode.

Parameter	Control Port	Value Range
Input	Logical Input	On/Off (Evaluation)
TX	Serial Output	Data Packet

V.6 Control Function Blocks: DMX

HARVEY mx.16 can be integrated into a DMX network using its RS-485 Interface. The required adapter cables to connect DMX XLR plugins to the HARVEY RJ-45 outlets may be obtained from your HARVEY Distributor.

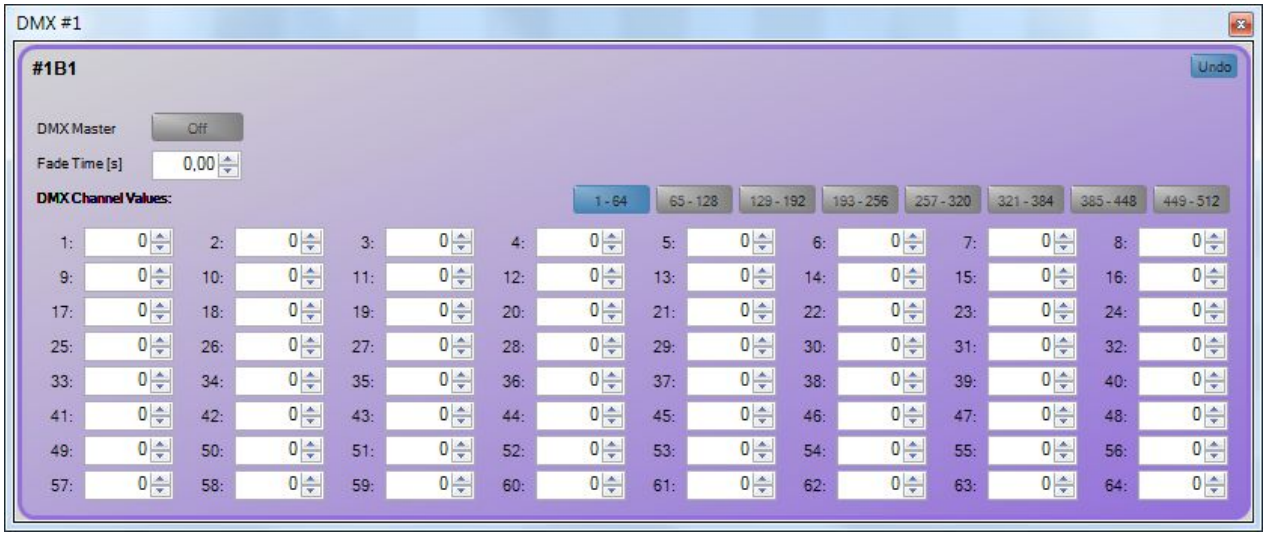
Using the DMX integration HARVEY mx.16 is able to control other DMX devices for example using preset calls to change between different lighting scenes. Fade times may be configured per preset or globally to achieve soft scene transitions.

HARVEY mx.16 may also be configured to act as DMX client to be controlled by another DMX controller. Several HARVEY parameters may be coupled to DMX values, such as level gain, mute or bypass parameters. In fact, any logic event may be triggered when a specific DMX channel value exceeds or falls below a configured threshold. Those may be used to call presets or go as far as sending messages over any of the control interfaces to control external devices.

As a result, any device which can be controlled by HARVEY mx.16 becomes implicitly DMX controllable.

The function blocks described in this section allow the specific configuration of the DMX integration.

V.6.1 DMX (Control Function Block: DMX)



The DMX function enables the RS-485 interface for the use with DMX digital control signals.

The RS-485 hardware port of the HARVEY mx.16 can be used as either RS-485 or DMX port. Therefore, you cannot use the RS-485 Interface and DMX function blocks at the same time. Also you can use only one DMX block in each project.

Only one controller may be active on a DMX bus. HARVEY must not be configured as DMX controller if another controller is active on the bus.

Clicking the **[Undo]** button in the Setting window will undo all changes made since the window was opened.

Using the **[∧]** and **[∨]** buttons, you can show or hide the parameters of a channel or channel group in the Settings window.

The **<DMX Master>** button activates HARVEY to be the DMX controller on the bus. When enabled, the button turns green. If disabled, HARVEY mx.16 is capable of receiving DMX channel values from another DMX controller.

The DMX block features 512 **<DMX Channel Values>** which appear in groups of 64 channels in the Settings window. The groups are only used to keep the interface small: No matter which group is selected in an open Settings window the block will always contain all 512 channel values.

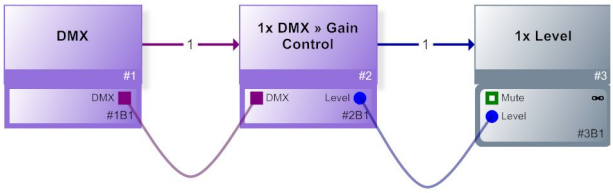
DMX Channel values may be stored in presets. The channels which are to be stored in a preset have to be selected within that preset's parameter tree (see Presets, III.7.12). The **<Fade Time>** parameter may be used to set up smooth fading of DMX values upon a preset call over the configured time. If the <Fade Time> parameter is being added to the preset as well it can be used to set specific fade times for each preset.

The DMX function block does not provide any ports on the worksheet. Controlling DMX values is only possible via HARVEY Composer, Presets or by control protocol (H-Text or H-Net) over one of the control interfaces.

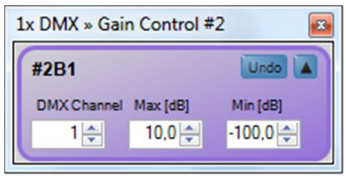
V.6.2 DMX » Gain Control (Control Function Block: DMX)

The DMX » Gain Control function block adapts DMX channel values to level gain parameters. It therefor allows to for Level blocks to be controlled by external DMX controllers.

The DMX » Gain Control block input must be connected with a DMX Source (DMX block, see V.6.1). The output must be connected to Level input of the Level block which is to be controlled.



Note: The adaption uses the same scaling as the Level block Setting window in Composer giving a fine-grained control over the region around 0 dB. As a result, common linear hardware DMX faders obtain a characteristic as is known from professional audio mixing consoles.



Clicking the **[Undo]** button in the Setting window will undo all changes made since the window was opened.

Using the **[∧]** and **[v]** buttons, you can show or hide the parameters of a channel or channel group in the Settings window.

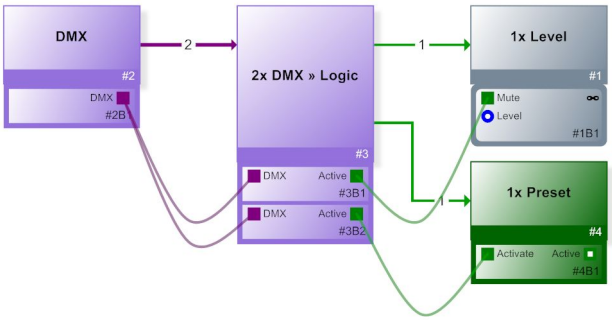
The **<DMX Channel>** field controls which DMX channel value is to be used for the gain control adaption. DMX Channel accepts values from 1 to 512.

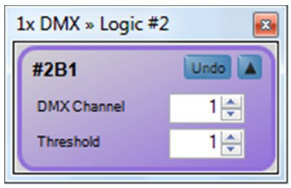
<Max [dB]> and **<Min [dB]>** may be used to limit the gain range which can be controlled via the configured DMX Channel.

V.6.3 DMX » Logic (Control Function Block: DMX)

The DMX » Logic function block sends 1/TRUE on a logic output whenever an associated DMX channel values reaches or exceeds a configured threshold or 0/FALSE when it falls below that threshold.

The block's DMX input must be connected with a DMX Source (DMX block, see V.6.1). The active output must be connected to a logic input of the function block to be controlled as shown in the following example:





Clicking the **[Undo]** button in the Setting window will undo all changes made since the window was opened.

Using the **[∧]** and **[v]** buttons, you can show or hide the parameters of a channel or channel group in the Settings window.

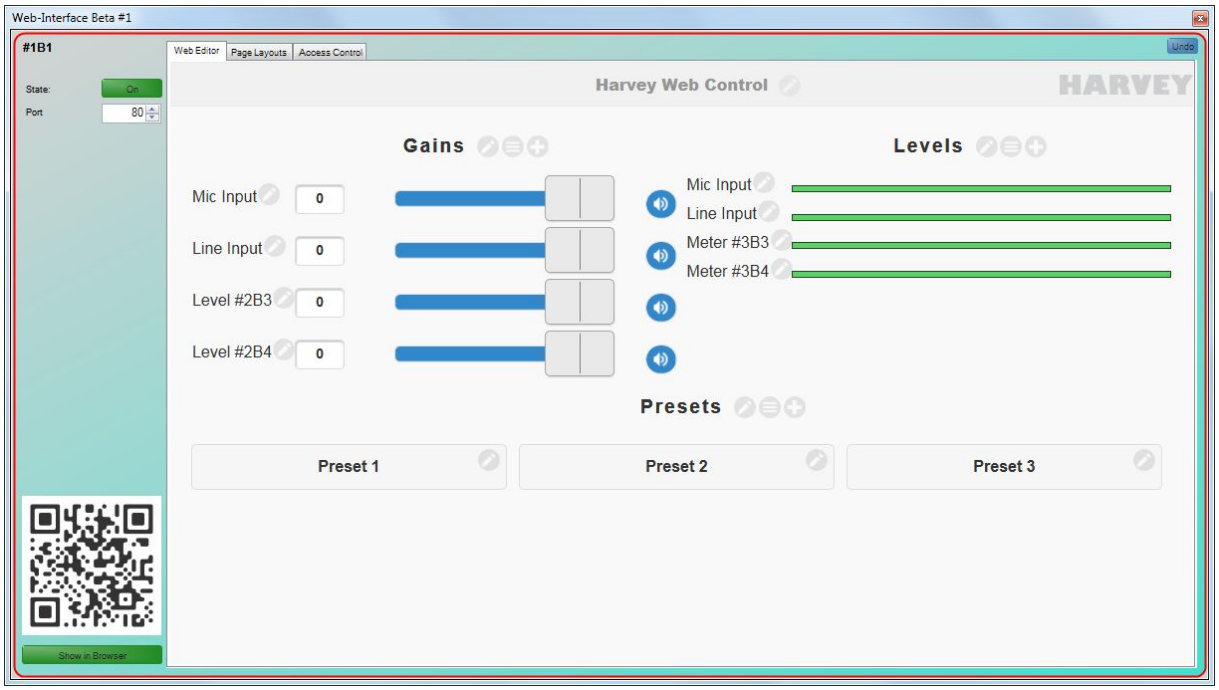
The **<DMX Channel>** field controls which DMX channel value is to be used for the gain control adaption. DMX Channel accepts values from 1 to 512.

The **<Threshold>** defines which value must be reached or exceeded for the Active output of the block to send TRUE. Thresholds may take values from 0 to 255.

V.7 Web-Interface Beta

Warning: The feature described in this section is in public beta test and should only carefully be considered for productive use.

HARVEY Composer allows generating and designing a web interface for the current project. That web interface can be used to control the HARVEY project from any web browser on a PC or mobile device.



Web Editor

The Web Editor tab in the settings window provides a what you see is what you get (WYSIWYG) editor to edit your custom web interface. Upon opening the window for the first time for a given project a web interface will be generated providing controls for all Level blocks, Level Meters and Presets in corresponding sections.

The arrangement and labels of the controls and sections can be edited by clicking on the icons which are located next to each control, e.g. the Pencil icon.

Page Layouts

The tab page “Page Layouts” provides a selection of available layout options for the sections within the web interface. The currently selected layout is highlighted with a green border.

Access Control

The access to the web interface may be restricted to a configurable set of devices. Allowed devices can be added to the MAC address list within the tab page “Access Control” either by manually entering the MAC addresses or by scanning the therein provided QR code using the device to be permitted.

If the MAC address list is empty, all devices will be allowed to access the web interface.

Editing the MAC access list may be done online which avoids the need to reload the entire project if single device are to be added or removed.

Offline Preview

The designed web interface may be previewed using a local web browser or any mobile device by scanning the QR code provided at the bottom-left of the settings window. This allows for testing the web interface on the target device without having a HARVEY mx.16 device at hand.

VI. Controlling and Integrating Media Systems

This section describes exemplary control scenarios in order to explain the integration of media systems. Be sure to read the following paragraphs to get an idea of the impressing control and conversion features your HARVEY system offers.

VI.1 Interface-Format Conversion

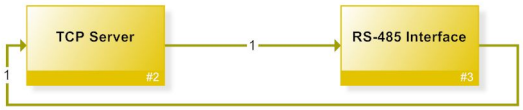
The data exchange between your HARVEY mx.16 and other devices is straightforward. The various serial interface options of the HARVEY mx.16 allows for networking devices for communication and control purposes. This is particularly true for the Ethernet interface used in combination with the TCP protocol.

➔ You can control several HARVEY mx.16 units and third-party devices connected to their serial interface ports using LAN and Wi-Fi links.

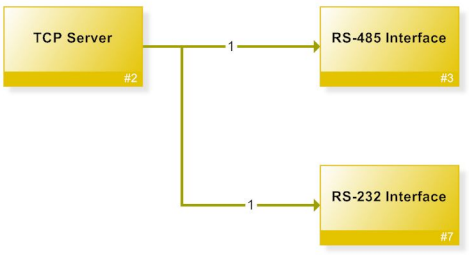
Interface-format conversion is very simple to implement using your HARVEY system.

➔ Simply connect the output and input ports of different interfaces

In this example data will be forwarded from an incoming TCP stream to the RS-485 interface. To achieve bidirectional data conversion you have to draw wires in both directions as shown in the following example:



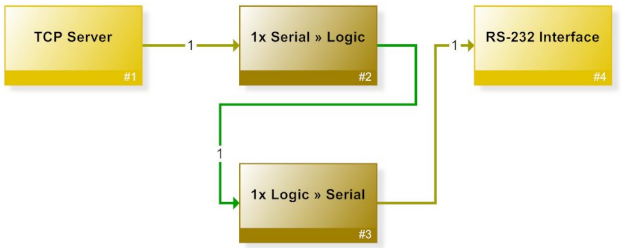
You may also connect multiple interfaces, e.g. to broadcast signals from one interface to all others:



VI.2 Integrating Proprietary Protocols

In this scenario, you want to operate a DVD player equipped with an RS-232 port from an iPad through a Wi-Fi link. Provided the Wi-Fi is on the same network, you can use the HARVEY mx.16 for receiving, translating, and forwarding control messages.

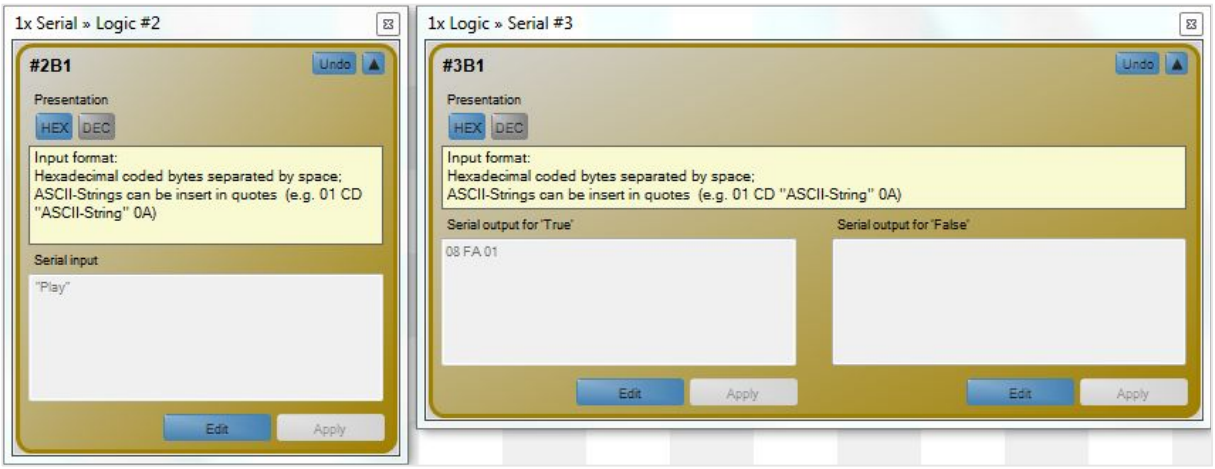
Using the interface-format conversion functionality of the HARVEY mx.16, converting Ethernet information into the RS-232 format is straightforward.



The problem is that the DVD player expects a play message that is different from the one transmitted by the iPad. However, you can configure a translation function using the Serial » Logic and Logic » Serial function blocks:

Insert the Serial » Logic and Logic » Serial blocks between the Ethernet and RS-232 blocks.

The condition entered into the Serial Input field of the Serial » Logic block is the ASCII string “Play”. This corresponds to the expected message sent by the iPad. If the condition is met, i.e. the “Play” string is received, the block changes the logical output to 1/TRUE. In doing so, it triggers the transmission of the data packet that has been defined for that status on the downstream Logic » Serial function block: On that block, a data package containing the “08 FA 01” string (which corresponds to the play message for the DVD player) was entered into the Serial Output for 'True' field. Next, the triggered data packet is transmitted to the RS-232 interface and from there sent to the DVD player. The player receives a play message in a format it understands and consequently starts playing.

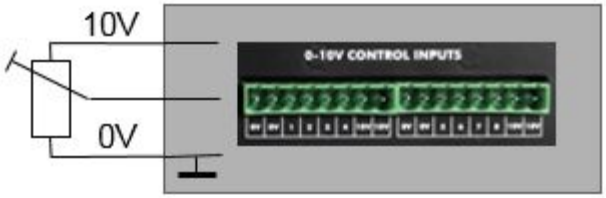


➔ See page 75 for details on the Serial » Logic and Logic » Serial function blocks.

Tip: Using specialized apps such as iCue by Cue a.s., you can create your own touch-enabled GUIs with objects and thus transmit user-defined control messages through TCP. This way, you can configure attractive user interfaces for applications of your HARVEY installation.

VI.3 External Faders

You can connect an external fader to one of the 0-10 Volt Control Inputs to control a fader channel in the Level function block.

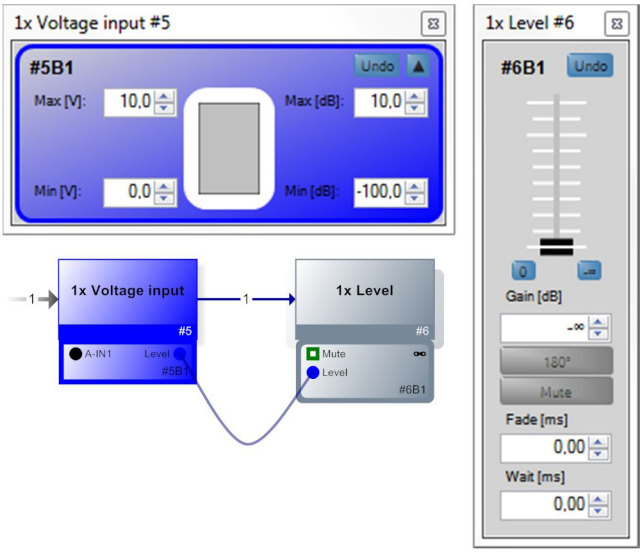


The Phoenix terminal blocks supply +10 V and 0 V (ground), so you just need an adjustable potentiometer with a center tap.

➔ Connect the fader ends to the 0-10 V supply of the HARVEY mx.16 and the fader's center tap to one of the 0-10 Volt Control Inputs 1-8.

Turn off the power of the equipment before making changes to the Phoenix terminals.

When using external faders, be sure to use the power source provided by the HARVEY mx.16.

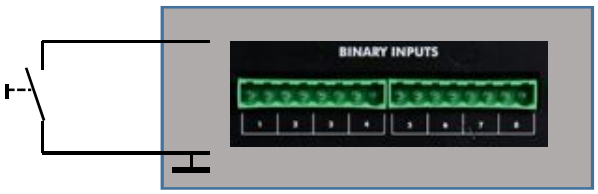


➔ To control a channel fader, connect the control output of the Voltage Input block to the control input of a channel of the Level block (see page 39).

➔ The Voltage Input block allows for evaluating and limiting the conversion (see page 62).

VI.4 External Pushbutton/Switch

You can connect external pushbuttons or switches to each of the Binary Inputs 1-8 and use them for triggering various functions (for example, switching presets or muting channels).



The Phoenix terminal blocks provide two terminals for each Binary Input to allow for setting up closed loops.

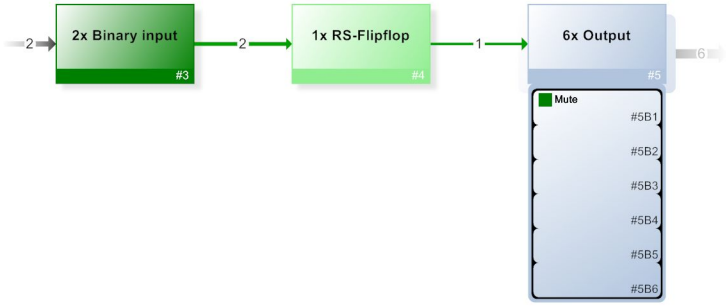
➔ Connect pushbuttons or switches to the two terminals of any Binary Input 1-8.

Turn off the power of the equipment before making changes to the Phoenix terminals. Be sure never to connect live wires to the Binary Inputs.

➔ Connect the Binary Inputs to any other block to trigger specific functions.

➔ Typically, a short switching pulse is sufficient for triggering a function.

In the first example above, you can use each of the four connected pushbuttons for triggering one specific preset.



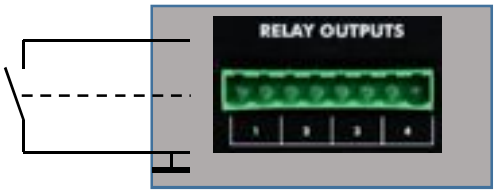
This allows for selecting between three different scenarios and a standby status.

➔ To constantly trigger statuses using pushbuttons, use RS Flipflop function blocks.

The second example allows for muting and unmuting six grouped outputs using pushbuttons. The first pushbutton enables the RS Flipflop hold state and constantly mutes the output group. The second pushbutton resets the flip-flop and unmutes the six outputs.

VI.5 Relay Outputs

You can control external devices and signalers using the Relay Outputs 1-4. Relay Output 1 is dedicated to indicate alarms and cannot be configured. At normal conditions, that output is closed.

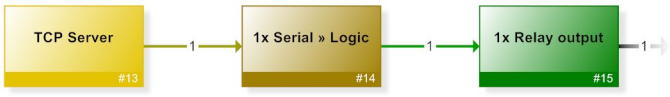


The Phoenix terminal blocks provide two terminals for each Relay Output.

➔ Connect the devices to be controlled to the two terminals of any Relay Output 1-4.

Turn off the power of the equipment before making changes to the Phoenix terminals.

Be sure never to connect live wires to the Relay Outputs.



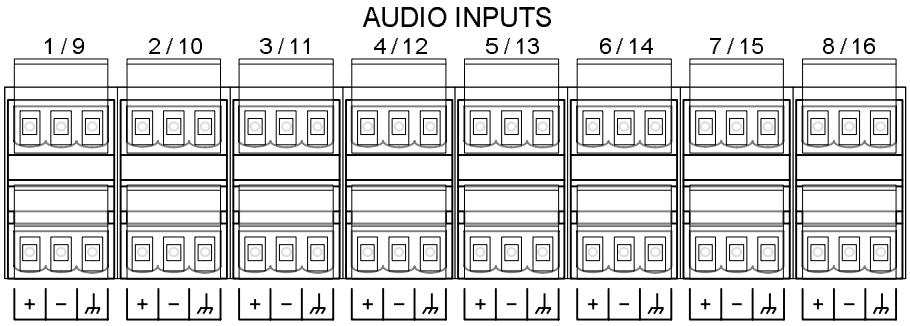
For example, you may use a TCP data packet sent through the Ethernet interface for triggering an action inside a wiring closet.

VII. Appendix

VII.1 Interfaces (Pinout, Electronic Specifications, Systems Integration)

This section provides information on the electrical and mechanical specifications of the interfaces of the device.

VII.1.1 Audio inputs



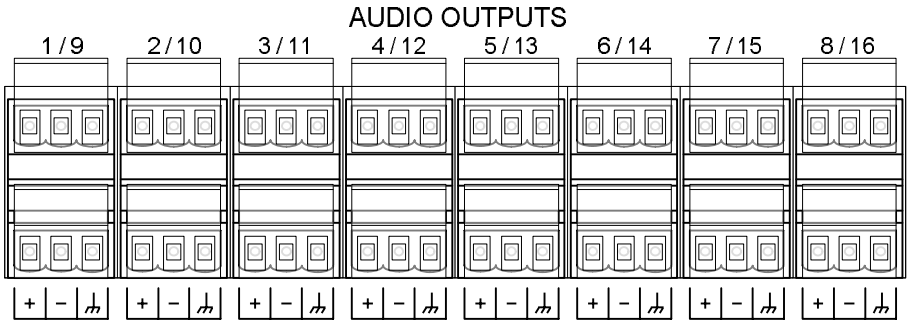
The back side of the device provides 16 analog audio inputs.The first 8 inputs are arranged in the upper terminal row. They can be configured as Line or as Mic inputs in the HARVEY Composer Software. The other 8 inputs are arranged as Line inputs in the lower row.

Microphone inputs	
Channels	1…8, alternatively configurable as Line input per HARVEY Composer
Connectors	Each channel: 3 pole PHOENIX screw terminal, 5,0 mm dimension, scope of delivery
Interface	analog, balanced
Assignment	+ / - = balanced audio input, AC coupled ⏚ = shield connection, internal with protective conductor connection of the device
Level, full scale, balanced	+8 dBu (0 dB Gain), -2 dBu….-57 dBu (+10 dB…+65 dB Gain) Gain is configurable by HARVEY Composer
Phantom power	+48 V, balanced over 2 x 6,8 kOhm to + / -, short circuit proof Phantom power can be switched on/off in HARVEY Composer

Line inputs	
Channels	1…16, 1…8 alternatively configurable as Mic inputs in HARVEY Composer
Connectors	Each channel: 3 pole PHOENIX screw terminal, 5,0 mm dimension, scope of delivery
Interface	analog, balanced
Assignment	+ / - = balanced audio input, AC coupled ⏚ = shield connection, internal with protective conductor connection of the device
Level, full scale, balanced	+21 dBu (0 dB Gain), +12 dBu (+9 dB), +6 dBu (+15 dB), +3 dBu (+18 dB) Gain can be configured in HARVEY Composer

➔ The balanced inputs are also suitable for the connection of unbalanced (signle-ended) signals. In this case the ground potential signal (GND) of the source should be connected to the "-". Furthermore it should be considered that a possibly existing cable shield should be connected only to one side (either to the HARVEY mx.16 side or to the source side), to avoid ground loops.

VII.1.2 Audio outputs

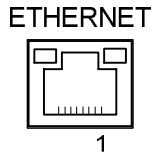


The back side of the device provides 16 analog audio outputs. The first 8 outputs are arranged in the upper terminal row, the other 8 outputs are arranged in the lower terminal row.

Line outputs	
Channels	1…16
Connectors	Each channel: 3 pole PHOENIX screw terminal, 5,0 mm dimension, scope of delivery
Interface	analog, balanced
Assignment	+ / - = balanced audio input, AC coupled ⏚ = shield connection, internal with protective conductor connection of the device
Level, Full scale, balanced	+21 dBu (0 dB Gain), +12 dBu (+9 dB), +6 dBu (+15 dB), +3 dBu (+18 dB) Gain can be configured in HARVEY Composer

➔ The balanced outputs are also suitable for the connection of unbalanced (signle-ended) signals. In this case the ground potential signal (GND) of the outgoing signal should be connected to the "-". Furthermore it should be considered that a possibly existing cable shield should be connected only to one side (either to the HARVEY mx.16 side or to the feeding side), to avoid ground loops.

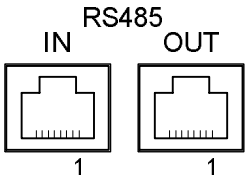
VII.1.3 Ethernet Network



The rear side of the device provides an Ethernet connection. On the one hand it allows communication with the HARVEY Composer configuration software, on the other hand it can be used for control functions.

Ethernet	
Connectors	RJ45, contact position 8P8C
Interface	10/100 Mbps, 10/100BaseT gem. IEEE802.3i/IEEE802.3u
Assignment	Pin-1: TXD+ (out), Pin-2: TXD- (out), Pin-3: RXD+ (in), Pin-6: RXD- (in) all other pins unused
LED indication	Left: data activity Right: Link
Functions	• Configuration with HARVEY Composer • Media control via HARVEY protocols (→ H-Text, H-Net) • Media control via an external protocol (→ Logic-to-Serial, Serial-to-Logic)

VII.1.4 RS485 (DMX)

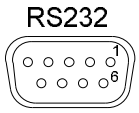


The rear side of the device provides 2 RS485 connections in one single RS485 interface. Both connections are equal and allow for a Daisy Chain cabling . The interface can be used for control functions.

The DMX mode of the interface, that allows for light control, can be activated by configuration with the HARVEY Composer software.

RS485	
Connectors	RJ45, contact position 8P8C
Interface	RS485/half duplex or alternatively DMX, per HARVEY Composer configurable galvanically isolated
Assignment	Pin-3 and Pin-6: DATA+ (in/out), Pin-4 and Pin-5: DATA- (in/out), Pin-7 and Pin-8: ISO-GND (from device isolated ground reference of the data signals) all other pins unused
RS485 Settings	Baud rate: 9600, 19200, 38400, 57600, 115200, 230400, 460800 bps Data bits: 7, 8 Stop bits: 1, 2 Parity: none, odd, even
Functions	RS485 Mode: • Media control with HARVEY protocols (→ H-Text, H-Net) • Media control with external protocols (→ Logic-to-Serial, Serial-to-Logic) Alternatively: • DMX512

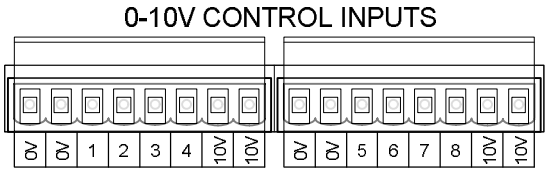
VII.1.5 RS-232



The rear side of the device provides a RS-232 interface.The interface allows for control functions.

RS232	
Connectors	D-SUB9, female
Interface	RS232, DCE (data circuit-terminating equipment)
Assignment	Pin-2: TXD (out), Pin-3: RXD (in), Pin-7: CTS (in), Pin-8: RTS (out), Pin-5: GND all other pins unused
RS232 Settings	Baud rates: 9600, 19200, 38400, 57600, 115200, 230400, 460800 bps Data bits: 7, 8 Stop bits: 1, 2 Parity: none, odd, even Flow control: none, XON/XOFF, RTS/CTS
Functions	• Media control with HARVEY protocols (→ H-Text, H-Net) • Media control with external protocols (→ Logic-to-Serial, Serial-to-Logic)

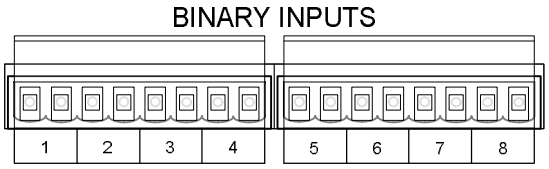
VII.1.6 0-10 V Control Inputs



The rear side of the device provides 8 0 – 10 V control inputs for controlling faders of HARVEY mx.16. You may connect either external control voltages or resistance potentiometers. In addition to the signal inputs the interface provides reference voltage of 0 V (min) and 10 V (max).

0-10V Control inputs	
Connectors	2 x 8-pol. PHOENIX screw terminal, dimension 5,0 mm, scope of delivery
Interface	8 x analog control input
Coupling	DC
Voltage input	Each input 1..8 with reference to „0V“: 0…+10 VDC
Input impedance	1 MOhm
Capacity 10V/0V	max. 50 mA (total)

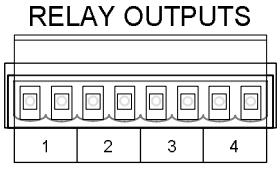
VII.1.7 Binary Inputs



The rear side of the device provides 8 binary inputs that allow for controlling logical states in the HARVEY mx.16 (e.g. Mute, Preset). The inputs are safely activated by connecting the appropriate contact pairs.

Binary inputs	
Connectors	2 x 8-pol. PHOENIX screw terminal, dimension 5,0 mm, scope of delivery
Interface	8 x binary inputs
Switchover threshold	R < 1 kOhm: input activated R > 2 kOhm: input deactivated
Power (R = 0 Ohm)	10 mA

VII.1.8 Relay Outputs



Three of the four contact outputs (no. 2 – 4) may be arbitrarily used (e.g. Serial-To-Logic, preset status).

The first relay output is a floating alarm contact that indicates if HARVEY mx.16 has a serious problem.

Relay Outputs	
Connector	1 x 8-pol. PHOENIX screw terminal,dimension 5,0 mm, scope of delivery
Interface	4 x potential-free relay ports (1 : Alarm, 2-4: User-assignable)
Max. Switching voltage	30 V
Max. Switching current	1 A
Logic	1:Alarm: closed during normal operation; in case of fault open 2-4: On: closed; off: open

VII.1.9 Specifications

Audio inputs:	8 analog mic/line inputs
	8 analog line inputs
	24-bit Sigma-Delta A/D converters
	Phantom power (+48 V) per mic input (separately enabled)
Audio outputs:	16 analog outputs
	24-bit Sigma-Delta D/A converters
CobraNet:	For audio networking (16 in, 16 out)
Ethernet:	10/100 BaseT, RJ-45, link-activity indicator
RS-485:	2 × RJ-45 (460 Kbps max.)
RS-232:	1 × 9-pin D-sub female (460 Kbps max.)
Binary inputs:	8 opto inputs, ground-connection enabled
Relay outputs:	Output 1: Alarm indicator
	Outputs 2-4 freely configurable
Voltage inputs:	8 (voltage range: 0-10 V; sample rate: 20 Hz)
A/D + D/A dynamic range:	>110 dBFS (A)
THD+N A/D + D/A:	< 0.005%
Input level (max.):	+21 dBu, +12 dBu, +6 dBu, +3 dBu (configurable)
Output level (max.):	+21 dBu, +12 dBu, +6 dBu, +3 dBu (configurable)
Power supply:	IEC socket, 95-250 VAC, 50/60 Hz
Dimensions (W × H × D):	2U/483 mm × 88 mm × 382 mm
Weight:	7 kg