HARVEY®

Operating Manual

HARVEY NxM Device

Version 1.0

DSPECIALISTS
Digitale Audio- und Messsysteme GmbH
Helmholtzstr. 2-9 L
D-10587 Berlin

www.harvey.audio

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Safety First!

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

This symbol is intended to alert the user that important literature concerning the operation and maintenance of this device 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 device to rain or moisture.

1. Read this operating manual carefully to avoid any problems.
2. Connect the device to a grounded AC outlet only; rating 100/240 V a.c., 50/60 Hz.
3. Before use, always make sure that the power cord is in good condition. Dispose and replace a damaged power cord immediately. Never detach the protective earthing conductor of the power cord.
4. Be sure to connect the device to a mains installation only, which is equipped with a overcurrent protective device.
5. The power switch is located on the rear panel of the device. The ON and OFF status are marked as “1” and “0”, respectively.
6. Install the device 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 cm (1") around the device to prevent overheating.
7. When exposing the device 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 device, 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.

1 Introduction

HARVEY is a family of freely programmable audio and media control devices that are ideal for conference rooms, theaters, museums, home theaters, educational institutions or multi-purpose halls, without being limited to these applications.

With a wide range of audio and control interfaces, HARVEY devices can connect to a wide range of devices and act as an intelligent control center for audio, lighting and media technology.

The integrated powerful digital signal processors (DSP) with their extensive software capabilities allow even for complex systems with a high number of channels a tailor-made and high-quality audio processing in real time with minimal signal delay of less than a millisecond.

To control HARVEY and the devices connected to it all common media controls of well-known manufacturers are suitable, such as Crestron, AMX, Cue and Apple, by using the integrated text protocol “H-Text”.

HARVEY devices also have the special ability to process and generate foreign protocols that can be programmed by you with almost no effort. In addition, they even allow data to be transferred between their serial interfaces (Ethernet, RS485, RS232), thus rendering additional converters superfluous.

Thanks to the integrated web server, graphical user terminals can be implemented quickly and easily for the end user.

All settings can be aggregated into scenarios, saved as a preset and recalled at the push of a button to quickly switch between different usage options of the installation.

The wall-mounted "HARVEY RC4" network-based remote control allows control of presets, audio levels and DMX lamps.

Both the HARVEY devices and the software have a modular structure. The programming of all HARVEY components is done conveniently via Windows computer with the freely accessible software "HARVEY Composer".

By programming with the HARVEY Composer software offline - even without connected devices - new installations and changes can be planned and prepared from any location. The programmed project is transferred to the hardware via an IP network and fine-tuned on the device online and in real time in the HARVEY Composer software.

Although the HARVEY devices and the software are designed to be intuitive to use, we recommend that you read this HARVEY Device Operating Manual and the HARVEY Composer Manual carefully to exploit all possibilities of the HARVEY family.

1.1 Features of the HARVEY Composer Software

HARVEY Composer is a Windows computer program that allows you to conveniently program HARVEY devices as an integrator of PA systems and conferencing systems.

The team behind the HARVEY Composer has set itself the goal of creating an intuitive and time-saving programming environment:

- ➔ HARVEY Composer is the central programming environment for all HARVEY device variants: The specific device properties resulting from their features are managed by the HARVEY Composer.
- ➔ Signal processing and control functions are organized as graphically displayed blocks in an audio and control plane.
- ➔ Function blocks are taken from a library area using the drag-and-drop principle and freely placed and connected on a worksheet.
- ➔ Equivalent connections between function blocks are grouped for a better overview. Nevertheless, details in the representation of individual connections are not lost.
- ➔ It is possible to work without a device connection (offline) - a resource display also always shows offline the current processor load for the preselected device variant.
- ➔ When the HARVEY Composer is connected to a HARVEY device (online), all parameter changes (volume, filter settings, etc.) are performed in real time.
- ➔ Device access can be protected against unauthorized access with a password.
- ➔ The connection to the HARVEY devices takes place via Ethernet network, without requiring special IT skills: All HARVEY devices that can be reached in the network are found via their changeable text designations and offered for selection.

1.2 Information about the HARVEY devices

The HARVEY product family is constantly expanding and currently consists of the following members:

- ➔ HARVEY NxM [Dante]: DSP audio and control matrix - flexible equipment with a selectable analogue input (N) and output channel count (M) with up to a sum of 32 channels and with / without Dante capability (64x64 channels) in one height unit.
- ➔ HARVEY mx.16 [Dante] [Cobranet]: Legacy DSP audio and control matrix - fixed 16x16 analog input / output channels with / without Dante or Cobranet capability in two height units.
- ➔ HARVEY RC4: Power over Ethernet (PoE) powered control module with buttons, one rotary knob and RGB signaling for wall, furniture or rack mounting.

See §6 of this manual for a list of the most typical HARVEY models available.

1.2.1 Flexible programming

All HARVEY devices have a comprehensive set of features that can handle most applications in audio and conferencing systems.

At the same time, there are no rigid processing structures:

- ➔ As a user, you specify the sequence in which the audio signals are to be processed and combined.
- ➔ The control functions range from freely definable state changes through buttons or switches connected to the HARVEY devices, via the possibility of converting interface formats (eg from Ethernet to RS232) to a freely configurable web interface for a time-saving creation of end-user terminals.

1.2.2 Powerful Audio signal processing

Thanks to their powerful 32/40 bit signal processors, the HARVEY audio and control matrices have enough processing power to process a large number of channels in real time:

- ➔ For example, a device processes more than 110 channels of 8-band equalizers or 240 seconds of single-block delays or 512 seconds of node delays of a mixing matrix with integrated nodal gain and delay.
- ➔ Depending on the device type, processing and signal conversion takes place with a very small signal delay of 0.75 milliseconds (analog input to output with HARVEY NxM). This delay, also called signal latency, is independent of the number of signal processing or control functions used.

  The following processing blocks add delay to an audio signal depending on its block parameters:

  - Filters (phase distortion of recursive filters)
  - Dynamic blocks (look-ahead time)
  - Delay and mixing matrix with delay (delay value)

- ➔ Signal processing works in floating-point format, so you do not have to worry about the quality of a signal going through multiple gain steps - lowering it by 60 dB, for example, and then catching up through amplification will not lead to quality degradation.

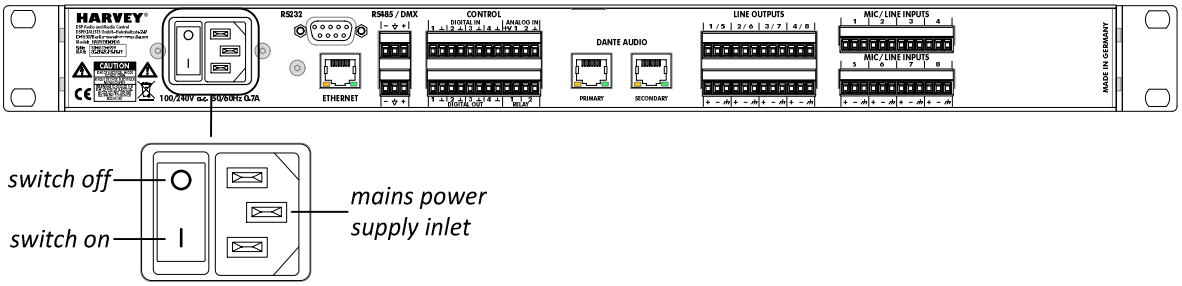
2 Unpacking

1. Please check the carton box for any kind of damage on reception. In case of a damaged carton, please contact your dealer before opening the carton.
2. Place the carton on the floor and remove the device.
3. Remove all accessories from the carton. You will find the accessories in the lateral compartment.
4. For the final use you mount the device in a conventional 19" rack.
5. Protect the device from heat, moisture and excessive dust. Consider the maximum ambient operating temperature of the device.
6. Connect the device as described in the following sections.

Included in delivery carton

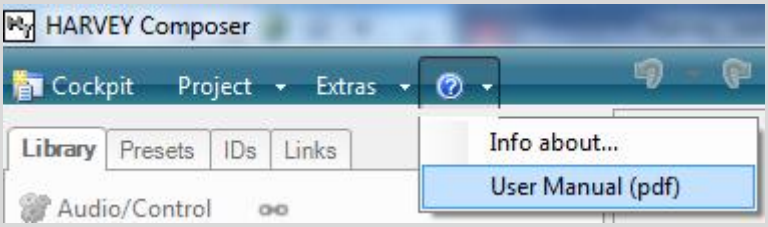
1	HARVEY® device
1	3-core power cord
N	12-pin terminal block; quantity depends on your HARVEY model
2	3-pin PHOENIX terminal block
1	RS485-/DMX end of line termination resistor 120 Ohm

3 Switching on the Device



1. Make sure that the device is switched off (press “0”) at the rear switch next to the power supply connection.
2. Connect the supplied power cord to the device´s power supply connection and your mains supply socket.
3. Switch on (press “1”) at the rear switch next to the power supply connection.
   - ➢ The device starts to boot.
   - ➢ The status light on the front side is yellow during boot.
   - ➢ The display on the front side is switched on and informs about the current boot status.
   - ➢ As soon as the normal operating status is reached, the main menu is displayed and the status light turns green.
4. Establish a network connection between your computer, on which the program HARVEY Composer is installed, and the device. Then start HARVEY Composer to program the HARVEY device. Consult the HARVEY Composer manual for further instructions.

Download the HARVEY Composer software from http://harvey.audio to your computer and install it. You will find the HARVEY Composer User Manual within HARVEY Composer:

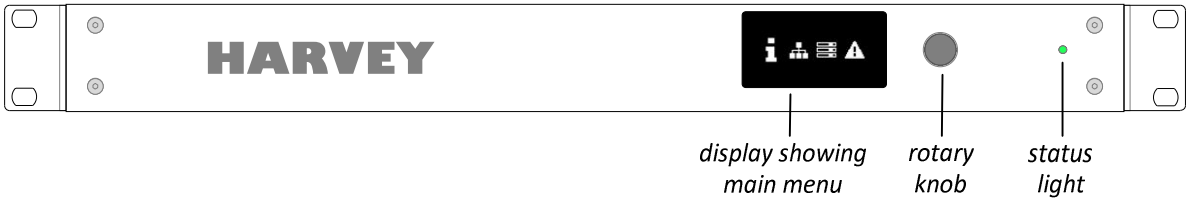


See §4 of this manual for further explanation of the front display, the status light and the menu settings.

See §5 of this manual for information regarding the interfaces on the rear side of the device and their technical specification.

4 Status and Settings on the Front Side

On the front of the device, you can make device settings and check the status of the device.



- The normal operating mode is indicated by a green status light (see §4.1)
- Turn the rotary knob left and right to navigate through the menus (see §4.2ff.).
- Push the rotary knob to select a menu entry.
- To leave menu entries, navigate to the cross on the right side of the menu's title and push the rotary knob. The main menu will be displayed again.

4.1 Status Light

Following table informs about the meanings of the status light on the front side of the device.

Color of Status Light	Status of Device
Green	Normal operating mode, power supplies ok
Yellow	Device is booting, power supplies ok
Red	Problem with power supply; contact your sales partner for further assistance.
Off	Device switched off, no mains power supply or a serious power supply problem; in the latter case contact your sales partner for further assistance.

4.2 Main Menu

The "Main Menu" is the default display and the starting point for information about the current device status. Submenus are used to make device and control network settings.

Main menu with menu entry “Device Status” highlighted.
See §4.2.1 for further information on the “Device Status” entries.
This entry is useful to get information about the device’s software.

Main menu with menu entry “Network Settings” highlighted.
See §4.2.2 for further information on the “Network Settings”.
This entry is useful to change the device´s network settings.

Main menu with menu entry “Device Connections” of Hypermatrix devices highlighted.
This entry informs about the current inter-device network connection status of Hypermatrix devices. See §4.2.3

Main menu with menu entry “Alarms” highlighted.
This entry informs about current errors of the device. See §4.2.4

There are further display states which are described in §4.2.5.

4.2.1 Device Status

Consult the “Device Status” menu entry when you want to get informed about the product model and software revisions installed on the device.

With the menu entry “Device Status” highlighted push the rotary knob to enter the entry.

The “Device Status” entry contains following information:

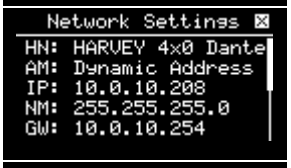
- PR Product model; example “HARVEY 4x0-DA”
- SW Revision text of software update packet which you are able to update via HARVEY Composer; example “2.1.6.0 r7579M”
- SP Revision text of the signal processor’s software; this software is included in the software update packet (see “SW”); the revision changes in dependency of the update packet; example “Rev: 7440”
- MS Base system’s software revision; this software is included during the factory manufacturing process; example “2.4.0.0 r6837”
- BL Bootloader software revision; this software is included during the factory manufacturing process; example “6544p1”

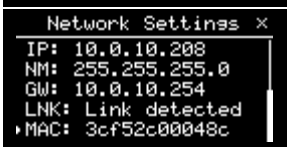
The “Device Status” is displayed in HARVEY Composer, too, after you connect to the device in question and navigate to the “Service Functions” of the Composer’s Cockpit.

4.2.2 Network Settings

The entry “Network Settings” enables you to change the network settings of the device’s network control interface (see §5.2 for further information on that interface).

With the menu entry “Network Settings” highlighted push the rotary knob to enter the entry.

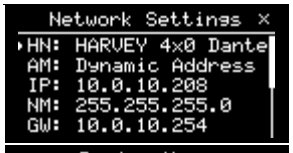




The “Network” entry contains following information. Some of those settings can be changed by pressing the rotary knob after you navigated to the entry by turning the knob. The location of the cursor is represented by an arrow in front of the entry. The position of the entry in the sub-menu is shown by a scroll bar on the right side.

HN	HARVEY device name: Select the entry by positioning the arrow in front of the entry and press the rotary knob. See §4.2.2.1.
AM	Address Mode: Changeable between “Dynamic Address” and “Manual Address”. See §4.2.2.2.
IP	IP address: Lets you change the address mode to “Manual Address” and set a new IP address. See §4.2.2.3.
NM	Network IP mask: Lets you change the address mode to “Manual Address” and set a new network IP mask.
GW	Network IP gateway: Lets you change the address mode to “Manual Address” and set a new network IP gateway.
LNK	This is a status display only. It shows “Link detected” if the HARVEY device has detected a physical Ethernet link, e.g. connected to an Ethernet switch. It shows “No Link!” if there is no physical Ethernet link – check cables and correct functioning Ethernet switch in this case.
MAC	This is a status display only. It informs about the MAC address of the HARVEY device which is additionally labelled on the rear side of the device under its serial number.

4.2.2.1 Device Name



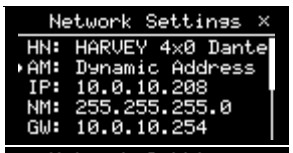
By entering the HARVEY device name entry…

…you will see the full name of the HARVEY device.
The Device Name can be changed within the HARVEY Composer’s Device Settings in the Cockpit.
Pressing the rotary knob leaves this entry.

The “Device Name” can be set within HARVEY Composer, after you connect to the device in question and navigate to the “Device Settings” of the Composer’s Cockpit.

4.2.2.2 Address Mode

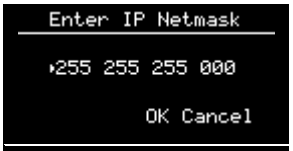
The “Address Mode” may be changed between dynamic IP and static IP.



By entering the Address Mode entry, which is set to “Dynamic Address” in our example, …

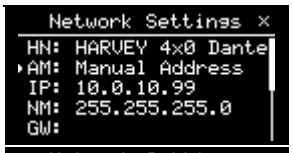
…you are asked if you want to change it to a static IP address (i.e. manual IP). Pressing the rotary knob on “YES” leads you thru the manual IP settings. Pressing the rotary knob on “CANCEL” leaves the configuration entry unchanged.

You enter an IP address by navigating to the corresponding IP octet. After pressing the rotary knob the field is highlighted and is changed by turning the rotary knob. By pressing again the rotary knob the value is entered and you may proceed to change the next IP octet.
Pressing the rotary knob on “YES” confirms the IP address and you get the next screen where the netmask can be set.
Press “CANCEL” to quit the whole manual IP address setting unchanged which leaves the setting to a “Dynamic Address”.

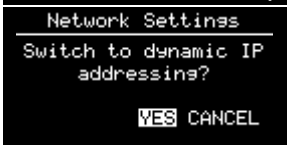


Enter the IP netmask. In normal cases this can be left unchanged to 255.255.255.0.

Enter the IP gateway. In normal cases this can be left unchanged to 0.0.0.0.



By entering the Address Mode entry, which is set to “Manual Address” in our example, …



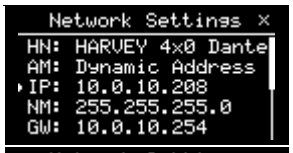
…you are asked if you want to change it to a dynamic IP address. Pressing the rotary knob on “YES” confirms this setting. Pressing the rotary knob on “CANCEL” leaves the configuration entry unchanged.

The dynamic IP addressing lets the device first to browse for a DHCP server on the network. Consult the settings of that DHCP server to administer the IP settings for the DHCP network clients.

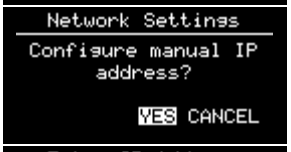
If there is no DHCP server on the network the HARVEY device will start its so called Auto IP procedure. As a result it will set itself IP settings with a free IP address out of the standardized Auto IP address range 169.254.0.1 through 169.254.255.254 with a subnet mask 255.255.0.0. The HARVEY device requires a network link to be able to check and set such an IP address.

The Address Mode may be changed with the help of HARVEY Composer’s Cockpit under the Device Settings, too.

4.2.2.3 IP Address

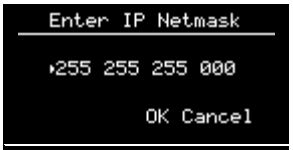


By entering the “IP Address” entry, when the device is set to “Dynamic Address” in our example, …



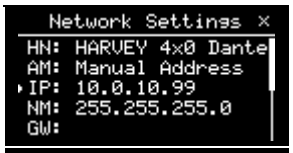
…you are asked first if you want to change it to a static IP address (i.e. manual IP). Pressing the rotary knob on “YES” leads you thru the manual IP settings. Pressing the rotary knob on “CANCEL” leaves the configuration entry unchanged.

You enter an IP address by navigating to the corresponding IP octet. After pressing the rotary knob the field is highlighted and is changed by turning the rotary knob. By pressing again the rotary knob the value is entered and you may proceed to change the next IP octet.
Pressing the rotary knob on “YES” confirms the IP address and you get the next screen where the netmask can be set.
Press “CANCEL” to quit the whole manual IP address setting unchanged which leaves the setting to a “Dynamic Address”.



Enter the IP netmask. In normal cases this can be left unchanged to 255.255.255.0.

Enter the IP gateway. In normal cases this can be left unchanged to 0.0.0.0.



By entering the “IP Address” entry, when the device is set to “Manual Address” in our example, …

You are directly asked to enter an IP address by navigating to the corresponding IP octet. After pressing the rotary knob the field is highlighted and is changed by turning the rotary knob. By pressing again the rotary knob the value is entered and you may proceed to change the next IP octet.
Pressing the rotary knob on “YES” confirms the IP address and you get back to the main menu.
Press “CANCEL” to quit the manual IP address setting unchanged and gets you back to the main screen.

4.2.3 Device Connections

The entry “Device Connections” is a status display in the context of Hypermatrix projects. See the HARVEY Composer Operating Manual for further information in Hypermatrix.

With the menu entry “Device Connections” highlighted push the rotary knob to enter the entry.

The example display aside shows a Hypermatrix group of four devices: The check marks in front of the three devices in the list show that the current device (the one you are looking at) is able to communicate with the other three Hypermatrix devices.

The example display aside shows a Hypermatrix group of four devices: The exclamation mark in front of the first device shows that the current device (the one you are looking at) is NOT able to communicate with that device.
In this case you have to check for a correct network cabling and power supply of that device.

4.2.4 Alarms

The “Alarms” sub-menu lists all current errors of the device.

With the menu entry “Alarms” highlighted push the rotary knob to enter the entry.

Normally there should be no alarms displayed in the list.

4.2.5 Other Display States

4.2.5.1 Boot Screens

After switching on the device shows the boot process until it shows the main menu.

4.2.5.2 Sound Off

Whenever the crossed speaker symbol appears in the right corner of the main menu, the device's sound is globally switched off.
If there is no speaker symbol displayed, the sound is globally switched on.

You can change the sound setting in HARVEY Composer. Either in the worksheet's status bar or in the Cockpit's Device Settings when connected to the device.

Be aware, that HARVEY Composer automatically switches off the sound, each time you upload a project to the device. Do not forget to switch it on manually.

4.2.5.3 Screensaver

After 1 minute without user input the display enables its screensaver and the display is switched off.

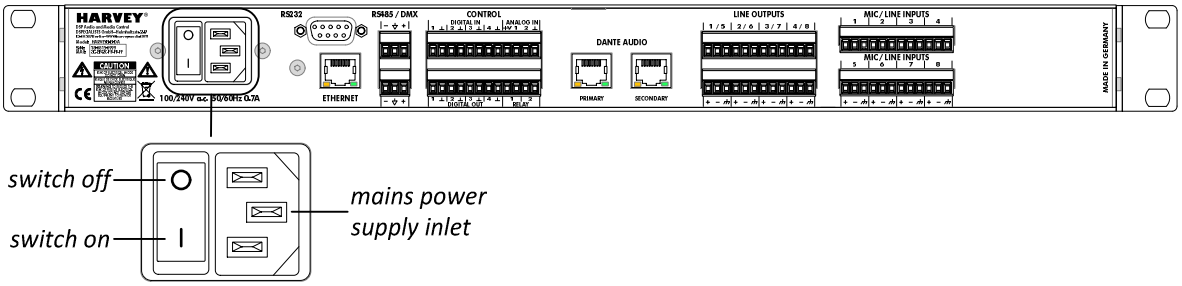
- By turning or pushing the rotary knob you are able to re-enable the display.

4.2.5.4 Project Loading

When transferring a project to the device with the help of HARVEY Composer the name of the project name is temporarily shown on the display.

5 Interfaces on the Rear Side

5.1 Mains Power Supply Inlet



Interface	Mains power supply inlet
Connector	3-pin appliance power inlet C14 IEC60320-1 with integrated mains switch
Ratings	100 / 240 V a.c. 50 / 60 Hz, rated current draw depends on device variant and is indicated below connector
Safety	No exchangeable fuse

ATTENTION

The device must be operated via the included three-core mains power cord connected to a socket-outlet with earthing connection.

ATTENTION

Before use, always make sure that the power cord is in good condition. Dispose and replace a damaged power cord immediately. Never detach the protective earthing conductor of the power cord.

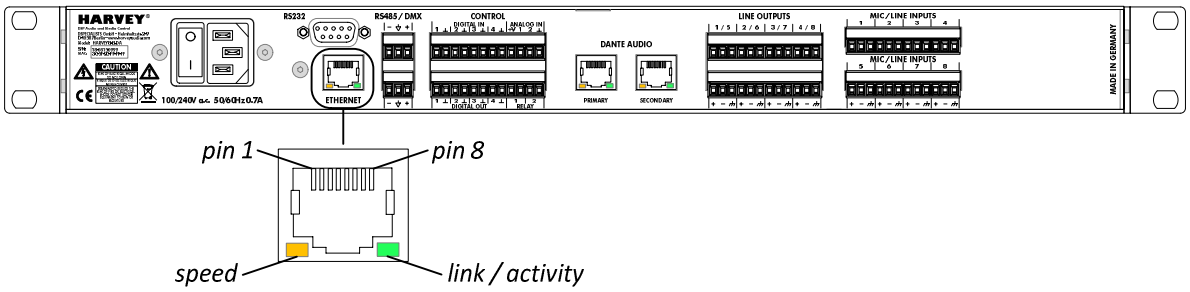
ATTENTION

Be sure to connect the device to a mains installation only, which is equipped with a overcurrent protective device

5.2 Network Control Interface

One network control interface is part of the standard HARVEY NxM equipment. It is used for different purposes:

- Connection and programming the device with the PC software HARVEY Composer
- HARVEY device interaction in a multi-HARVEY system (Hypermatrix)
- Media control integration



Interface	10/100 Mbps Ethernet, compliant with IEEE802.3/802.3u (100BaseTX) and ISO802-3/IEEE802.3 (10BaseT), auto-negotiation, automatic polarity detection and correction, auto-MDIX support
Connector	8 position 8 contact (8P8C) modular connector socket, shielded RJ45

Pinout

1	2	3	4	5	6	7	8
TD+	TD-	RD+	-nc-	-nc-	RD-	-nc-	-nc-

Connector shield connects to device enclosure.

LED Indicators

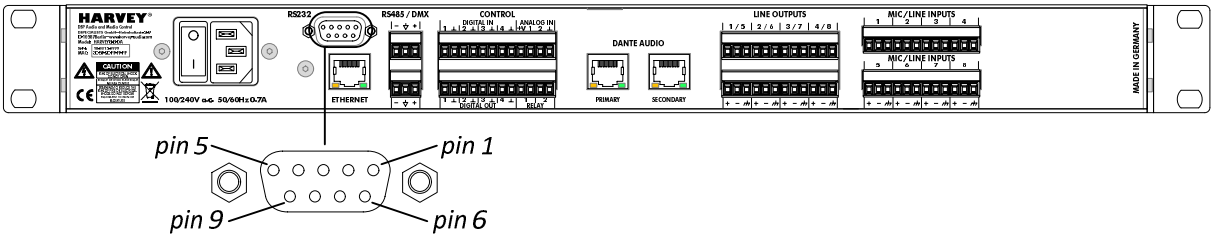
	Off	On	Flashing
Right green LED	no physical link	physical link w/o data activity	physical link with data activity
Left yellow LED	10 Mbps	100 Mbps	-not applicable-

Recommended Cable	Minimum CAT5 twisted pair cable with RJ45 connector according to pinout.

5.3 RS232 Control Interface

One RS232 interface is part of the standard HARVEY NxM equipment. It is used for:

- Media control integration



Interface	RS232, Data Communication Equipment (DCE)
Connector	D-SUB9/DE-9 socket with a pair of #4-4unc nuts for fixing a mating male connector

Pinout

1	2	3	4	5	6	7	8	9
-nc-	TxD	RxD	DTR	GND	DSR	CTS	RTS	-nc-
-na-	output	input	input	-na-	output	input	output	-na-

Pins #4 (DTR) and #6 (DSR) are connected internally.

Connector shield connects to device enclosure.

Protocol Capabilities	Baud rates: 9600, 19200, 38400, 57600, 115200, 230400, 460800 Data bits: 7, 8 Stop bits: 1, 2 Parity: none, odd, even Flow control: none, XON/XOFF, RTS/CTS

5.4 RS485 / DMX Control Interface

One RS485 / DMX interface is part of the standard HARVEY NxM equipment. It has a dual use function which is configured in HARVEY Composer: RS485 or DMX512-A.

As a RS485 interface it is used for:

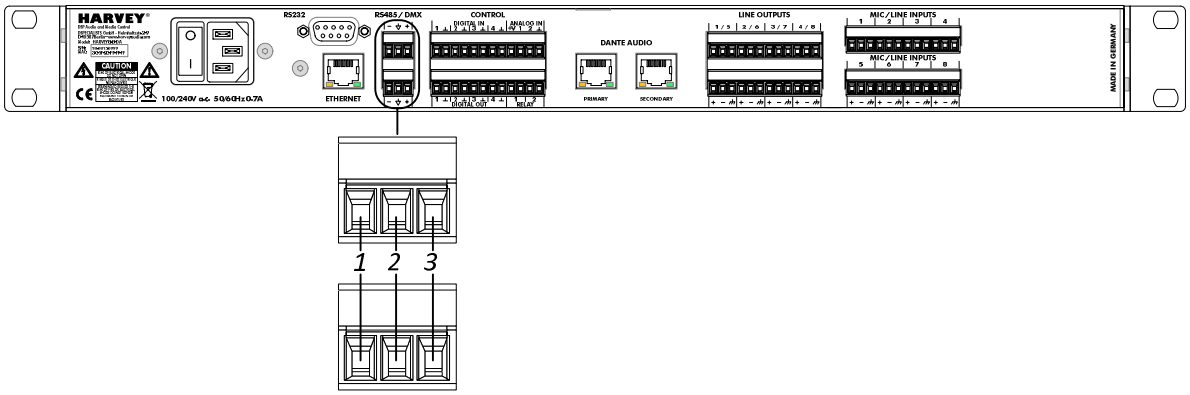
- Media control integration

As a DMX interface it is used as a:

- DMX universe controller, i.e. DMX512 output

or

- DMX device, i.e. DMX512 input



Interface	One RS485 half-duplex endpoint, differential mode of operation, galvanically isolated, two connectors for easy integration into cabling topology (bus, star, etc.)
Connector	Two 3-pole PHOENIX male terminal 3.81 mm pitch Mating connector (included in delivery): PHOENIX part#1803581
Pinout	1: DATA- 2: Shield GND 3: DATA+ DATA+/- and Shield GND are galvanically isolated (up to 1 kV_{rms}) from internal potentials.
RS485 Protocol Capabilities	Half-duplex bi-directional Baud rates: 9600, 19200, 38400, 57600, 115200, 230400, 460800 Data bits: 7, 8 Stop bits: 1, 2 Parity: none, odd, even Flow control: none, XON/XOFF, RTS/CTS
DMX Protocol	Compliant with DMX512 either sender or receiver configured by HARVEY Composer
Recommended Cable	100…120 Ohm impedance shielded twisted pair

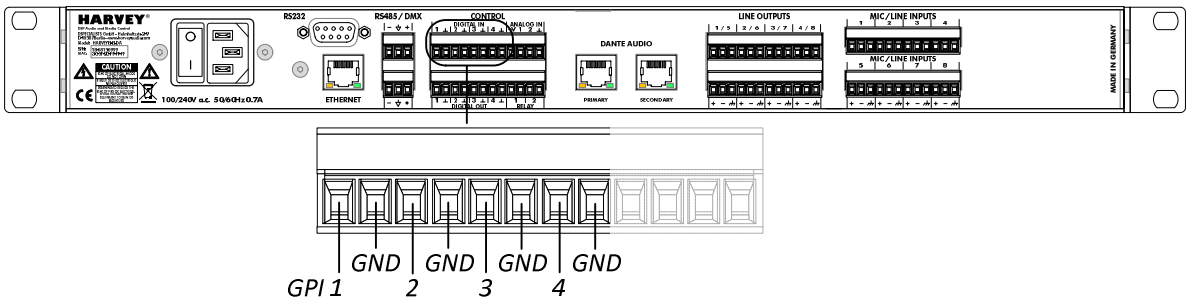
Connect the cable shield only to one end of the cable to avoid ground loops.

Terminate the data lines:
In a straight line topology terminate with a 120 Ohm resistor at each end of the line – i.e. at the first and last RS485/DMX device of a line.
In a star topology terminate at the star point device and at each end of the star.

5.5 Digital Input Control Interface (GPI)

Four digital control inputs are part of the standard HARVEY NxM equipment. These general purpose control inputs (GPI) are used for

- Preset calls
- Muting individual channels or channel groups
- Triggering serial command transmissions
- Other logic functions



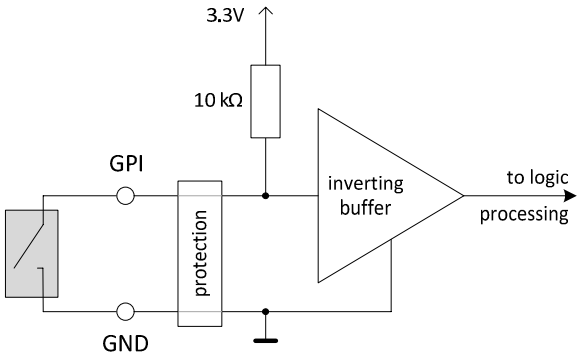
Interface	Four independent general purpose inputs (GPI) for logic control
Connector	8 pins of a 12-pole PHOENIX male terminal 3.81 mm pitch Mating connector (included in delivery): PHOENIX part#1803675
Pinout	see figure above
Capabilities	User may connect a tactile switch (dry contact), a voltage source or a variable resistor between GPI and GND see wiring diagrams on following page
Switch current (Option A)	I_{switch} = 300 µA @ R_{ext} = 0 Ω
Switching thresholds (Options B, C)	$R_{ext,th}$ = 10 kΩ (±10%) $U_{ext,th}$ = +1.6 V (±10%) – measured at GPI with reference to GND
Maximum operating limits (Option C)	U_{ext} = -5 V … +5 V (steady state, GPI with reference to GND)

GPI Wiring Options

Option A

External switch

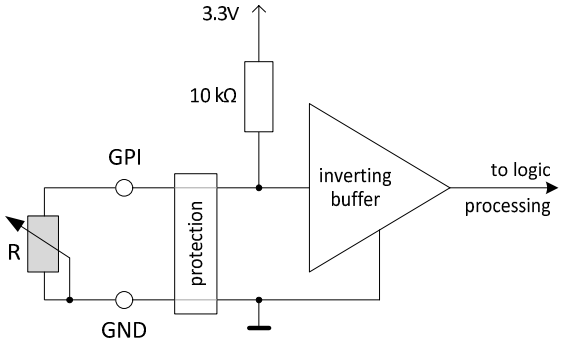
- switch closed : “1/TRUE“
- switch open : “0/FALSE“



Option B

External resistor

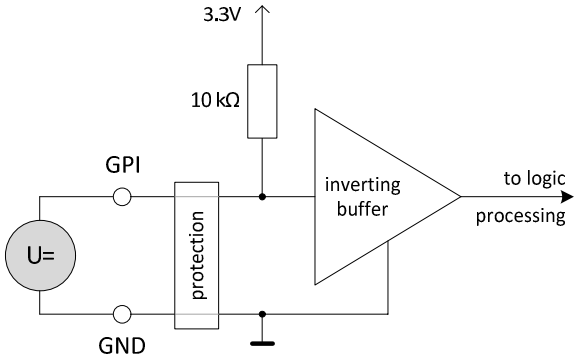
- R < 10 kΩ : “1/TRUE“
- R > 10 kΩ : “0/FALSE“



Option C

External voltage source

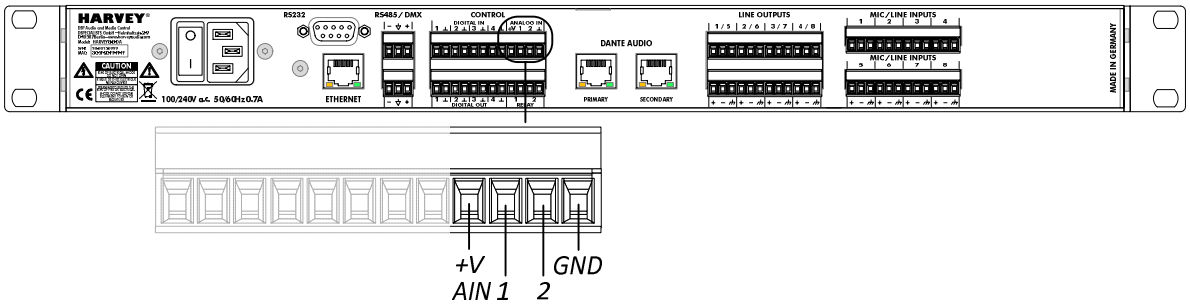
- (U=) < 1.6 V : “1/TRUE“
- (U=) > 1.6 V : “0/FALSE“



5.6 Analog Input Control Interface (AIN)

Two analog control inputs (AIN) are part of the standard HARVEY NxM equipment. These analog inputs are used for:

- Continuous control of gain faders



Interface	Two independent analog inputs (AIN) for continuous fader control, reference voltage output (+V) and reference ground (GND) present, internally calibrated with reference to actual +V
Connector	4 pins of a 12-pole PHOENIX male terminal 3.81 mm pitch Mating connector (included in delivery): PHOENIX part#1803675
Pinout	see figure above
Capabilities	User may connect a potentiometer or a voltage source see wiring diagrams on following page
Recommended potentiometer (Option A)	Linear type Nominal resistance R_{nom} = 1 kΩ … 100 kΩ

Relative resistance-to-gain correlation (Option A)

Relative to R_{nom} [%] *)	0	10	20	30	40	50	60	70	80	90	100
Gain [dB]	-∞	-89	-78	-67	-56	-45	-34	-23	-12	-1	+10

*) Relative to R_{nom} [%] is the resistance value seen by the input between terminals AIN and GND in relation to the resistance seen between terminals +V and GND.

Absolute voltage-to-gain correlation (Option B)

U_{AIN} [V]	0	0.47	0.94	1.41	1.88	2.35	2.82	3.29	3.76	4.23	4.7
Gain [dB]	-∞	-89	-78	-67	-56	-45	-34	-23	-12	-1	+10

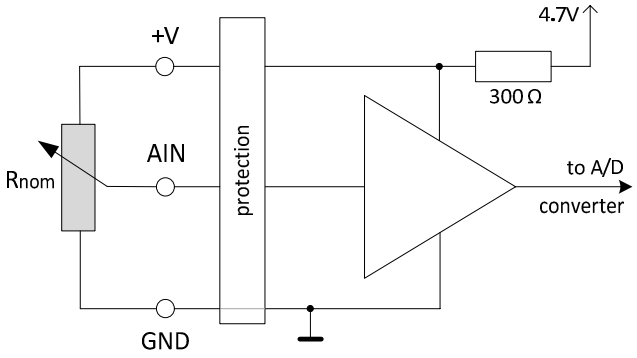
Table valid for unloaded +V.

Maximum operating limits (Option B)	U_{AIN} = -0.5 V … +5 V (steady state, AIN with reference to GND)

AIN Wiring Options

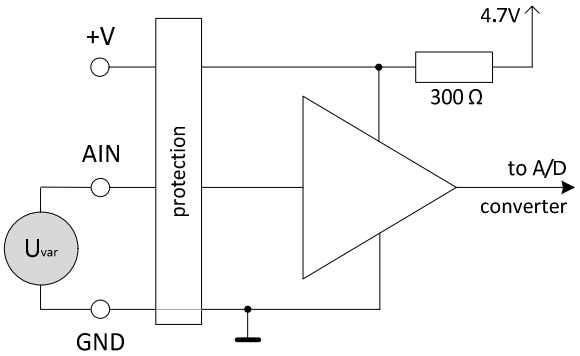
Option A

External potentiometer (variable resistor)



Option B

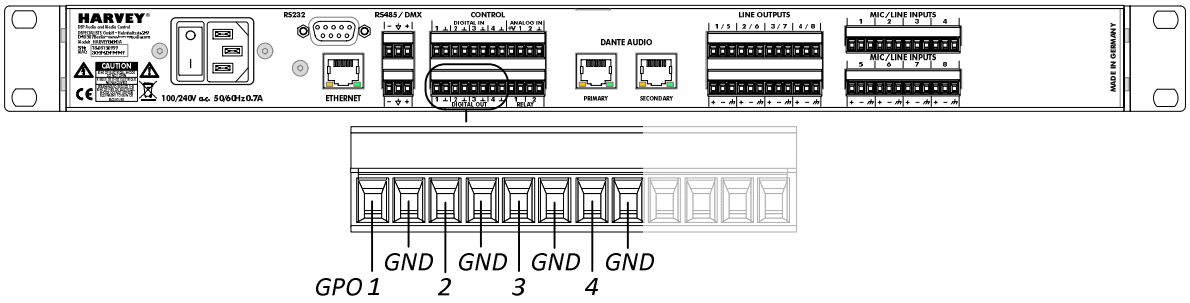
External voltage source (variable voltage)



5.7 Digital Output Control Interface (GPO)

Four digital control outputs are part of the standard HARVEY NxM equipment. These general purpose control outputs (GPO) are used for

- Directly driving external LED indicators
- Switching externally supplied loads (e.g. relays)



Interface	Four independent general purpose outputs (GPO) for directly driving external LED indicators or externally supplied loads (e.g. relays)
Connector	8 pins of a 12-pole PHOENIX male terminal 3.81 mm pitch Mating connector (included in delivery): PHOENIX part#1803675
Pinout	see figure above
Capabilities	see wiring diagrams on following page
Direct drive current capability (Option A)	$I_d = (4.8V – U_f)/100Ω$; U_f := LED forward voltage $I_{d,max}$ = 48 mA @ Uf = 0 V In case you need a lower LED current, externally integrate an appropriate resistor in series with the LED.
Operating limits for external supply (Option B)	U = +5 VDC … + 30 VDC Choose a power supply in accordance to the voltage range. I_{max} = 75 mA Choose a relay (or other load) in accordance to this limit.

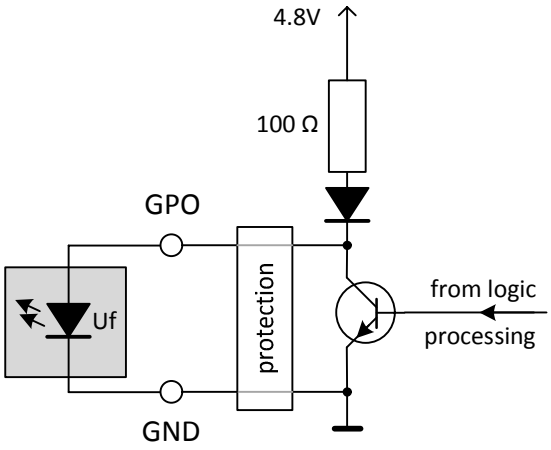
GPO Wiring Options

Option A

Directly driving external LED (or similar load)

- "1/TRUE" : LED off
- "0/FALSE" : LED on

➔ negative logic!

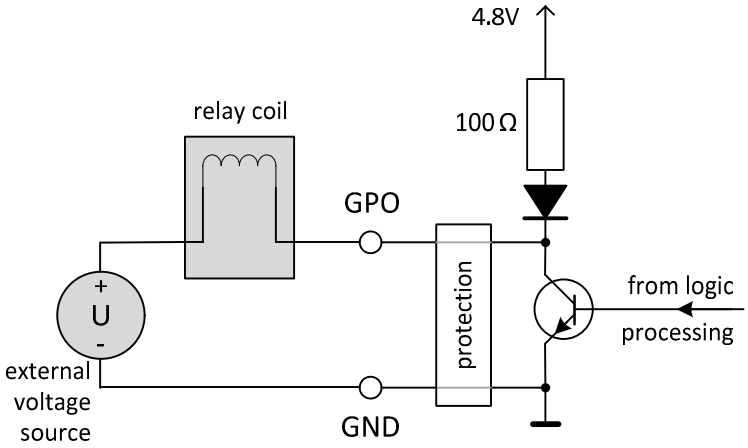


Option B

Driving externally supplied relay (or other load)

- "1/TRUE" : relay on
- "0/FALSE" : relay off

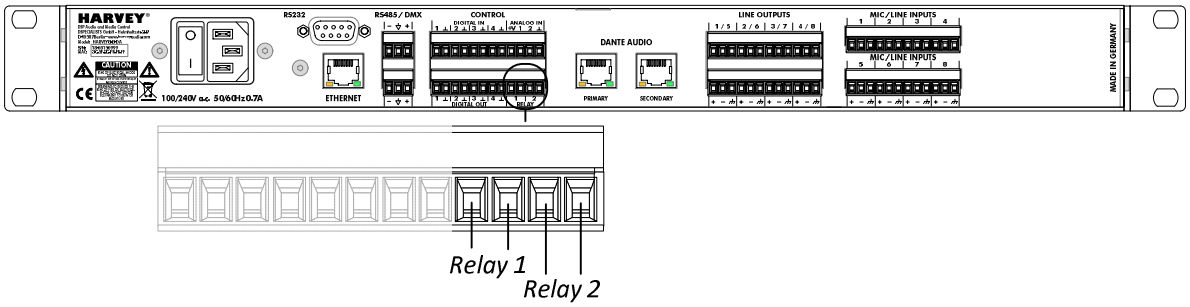
➔ positive logic!



5.8 Relay Contact Interface (GPO)

Two relay contact pairs are part of the standard HARVEY NxM equipment. These dry general purpose control outputs (GPO) are used for

- Switching externally supplied loads (e.g. relays)
- Galvanically isolated switching of other system components´ GPIs



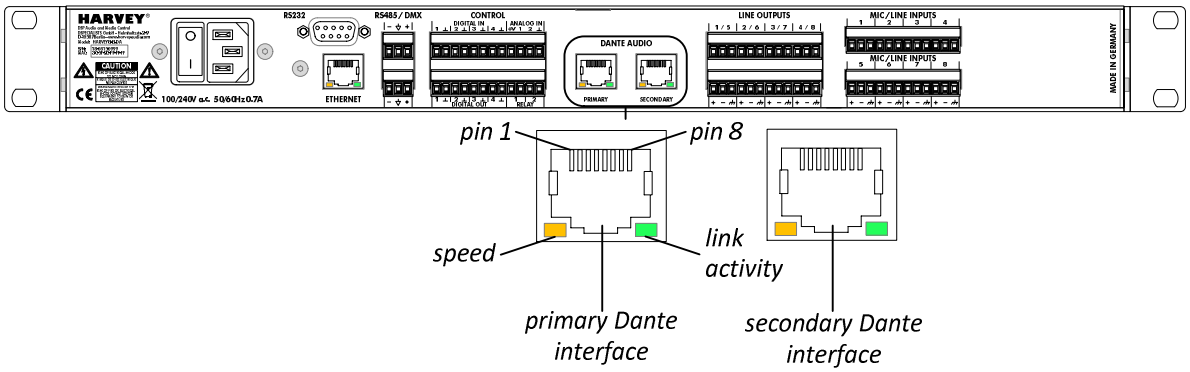
Interface	Two independent switch contact pairs (GPO)
Connector	4 pins of a 12-pole PHOENIX male terminal 3.81 mm pitch Mating connector (included in delivery): PHOENIX part#1803675
Pinout	see figure above
Capabilities	Both switches are “normally open” (NO) ▪ “1/TRUE“ : switch closed ▪ “0/FALSE“ : switch open
Rated load (resistive load)	DC: 1.0 A @ 30 VDC; 0.5 @ 60 VDC (60 VDC max.); 30 Wmax. AC: 1.0 A @ 30 VAC; 0.3 A @ 125 VAC (125 VAC max.); 37 VAmax.

5.9 Dante Network Audio Interface (Optional)

The Dante network audio interface is an optional HARVEY NxM component.

It is provided including following features:

- Endpoint for 64x64 audio channels; each 48 kHz/24 bit
- Primary and secondary interface available supporting Dante redundancy mode and switch mode



Interface	Audinate Dante® network audio, realised based on Audinate´s BK-II module (64x64), two ports 100/1000 Mbps Ethernet, compliant with IEEE802.3/802.3u (1000BaseT/100BaseTX), auto-negotiation, automatic polarity detection and correction, auto-MDIX support
Connector	Two 8 position 8 contact (8P8C) modular connector sockets, shielded RJ45

Pinout

1	2	3	4	5	6	7	8
D1+	D1-	D2+	D3+	D3-	D2-	D4+	D4-

Connector shield connects to device enclosure.

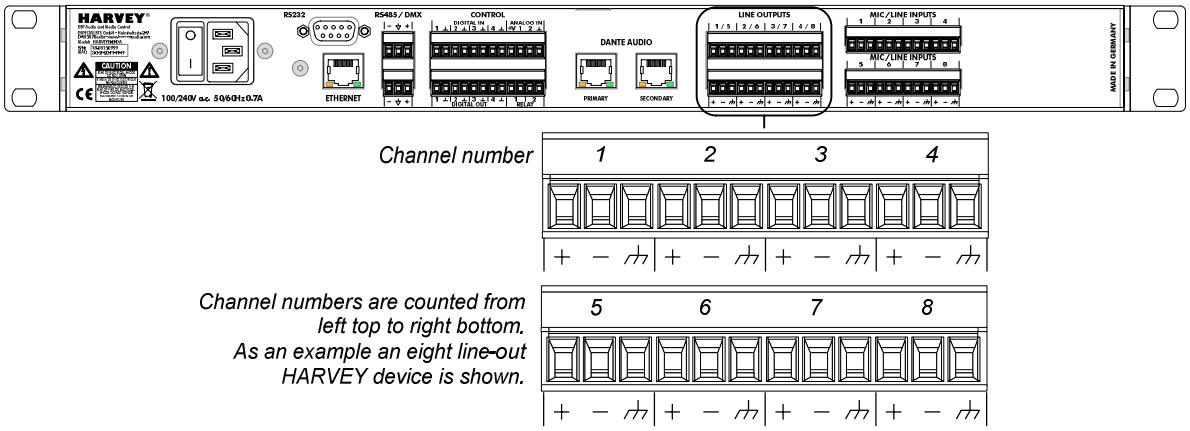
LED Indicators

	Off	On	Flashing
Right green LED	no physical link	physical link w/o data activity	physical link with data activity
Left yellow LED	100 Mbps	1000 Mbps	-not applicable-

Recommended Cable	Minimum CAT5 twisted pair cable with RJ45 connector according to pinout.

5.10 Analog Audio Line Output Interface

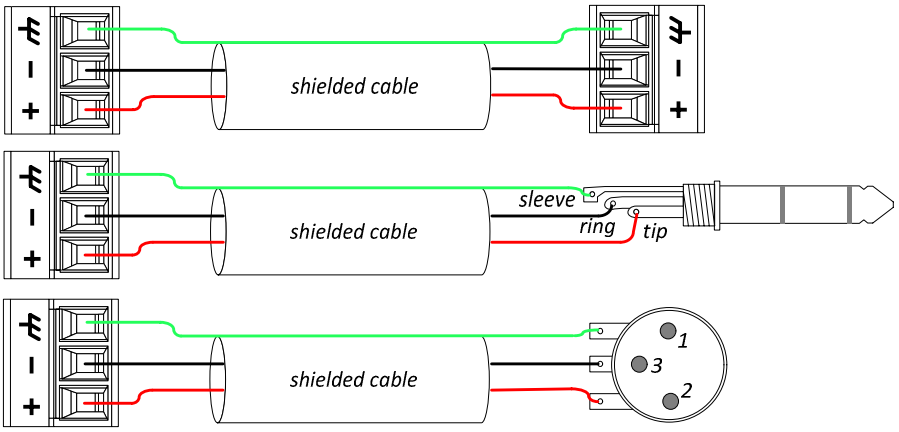
The quantity and physical position of the analog audio line output interface depends on the actual HARVEY NxM variant. HARVEY NxM devices may be equipped with multiples of eight line outputs up to 32 channels.



Interface	Analog audio line outputs, number of channels 8/16/24/32 dependent on device variant, balanced floating line level output, AC coupled, protected against overcurrent and overvoltage, based on THAT Corp. OutSmarts® balanced line driver
Connector for eight channels	2x 12-pole PHOENIX male terminal 3.81 mm pitch Mating connector (included in delivery): PHOENIX part#1803675
Pinout	**+ / -** balanced line outputs ⏚ shield, connected to chassis internally (AES-48)
Wiring	see wiring diagrams on following page
Gain settings	+15 dB, +9 dB, +6 dB, 0 dB
Output levels	+24 dBu, +18 dBu, +15 dBu, +9 dBu (unloaded, THD+N 1%) +22 dBu, +16 dBu, +13 dBu, +7 dBu (600 Ω load, THD+N < -100 dB)
Output impedance	70 Ω balanced 35 Ω unbalanced
Bandwidth	10 Hz … 22.5 kHz (-0.3 dB / -1.0 dB rel. 1 kHz)
Channel Crosstalk	< -104 dB @ +24 dBu level (worst case)
Dynamic range	> 110 dB @ 600 Ω load, all gain settings
THD+N	< -103 dB @ 16 dBu / 997 Hz, 600 Ω load, +9 dB gain setting
D-to-A converter	48 kHz / 24 bit, delta-sigma
D-to-A latency	125 µs

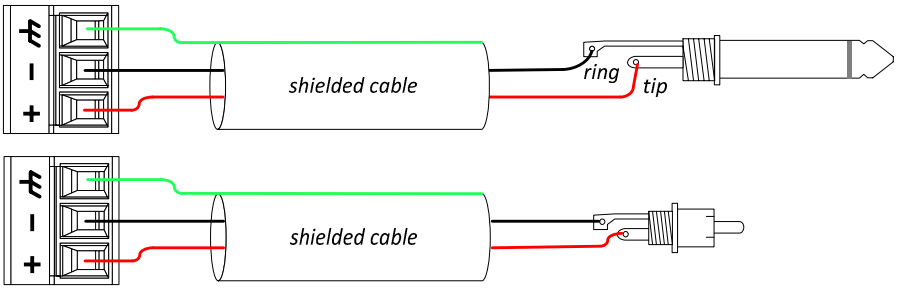
Recommended Line Output Wiring

Wiring to balanced inputs

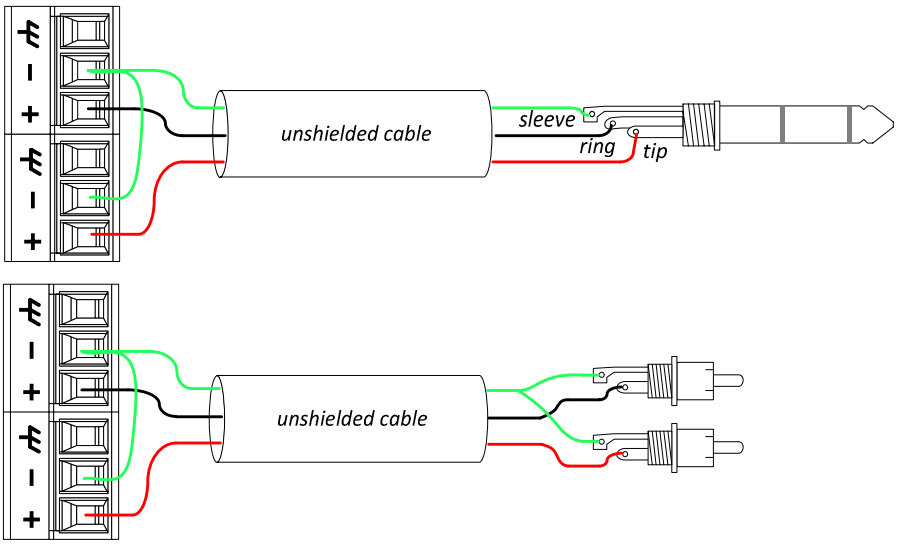


In case of large shield currents due to high common-mode / shield potential differences which may exist at a high distance between the sending and receiving device, disconnect the shield connection on the receiver´s end.

Wiring to unbalanced single channel (mono) inputs



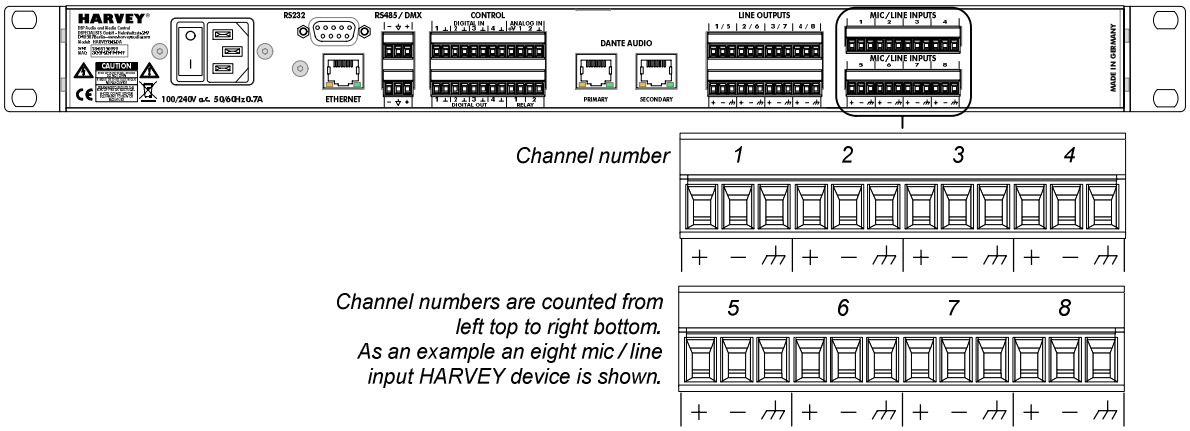
Wiring to unbalanced stereo inputs



Whenever possible avoid a connection to unbalanced signal level equipment because audio performance will be sacrificed.

5.11 Analog Audio Mic / Line Input Interface

The quantity and physical position of the analog audio line output interface depends on the actual HARVEY NxM variant. HARVEY NxM devices may be equipped with multiples of four mic / line inputs up to 28 channels.



Interface	Combined analog audio microphone and line inputs, number of channels 4/8/12/16/20/24/28 dependent on device variant, balanced floating line level input, P48 phantom voltage switchable, AC coupled, protected against overcurrent and overvoltage, based on THAT Corp. differential preamplifier
Connector for four channels	1x 12-pole PHOENIX male terminal 3.81 mm pitch Mating connector (included in delivery): PHOENIX part#1803675
Pinout	**+ / -** balanced line inputs ⏚ shield, connected to chassis internally (acc. AES-48)
Wiring	see wiring diagrams on second after next page
Preamp gain	Mic: 0…+60 dB, 3 dB steps Line: 0, +6, +9, +15 dB
Line Input levels	+24 dBu, +18 dBu, +15 dBu, +9 dBu (THD+N 1%) +22 dBu, +16 dBu, +13 dBu, +7 dBu (THD+N < -100 dB)
Input impedance	2 kΩ balanced 1 kΩ unbalanced
Phantom power (P48)	+48 VDC, 10 mA max., switchable for each input

ATTENTION

Be sure to exclusively enable phantom power for condenser microphones which are specified for a P48 supply. Other equipment could be harmed!

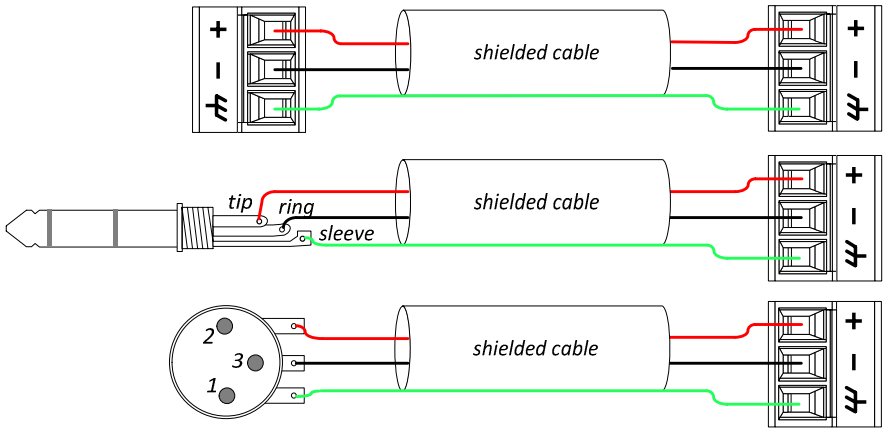
Table continues on following page…

…continuation of the previous page:

Mic EIN	-127.5 dBu @ 22 kHz bandwidth with 150 Ω source impedance
Bandwidth	10 Hz … 22.5 kHz (-0.3 dB / -1.0 dB rel. 1 kHz)
Channel Crosstalk	< -104 dB @ +24 dBu level (worst case)
Dynamic range	> 110 dB, all gain settings
THD+N	< -101 dB @ 997 Hz, 0 dB gain setting
A-to-D converter	48 kHz / 24 bit, delta-sigma
A-to-D latency	333 µs

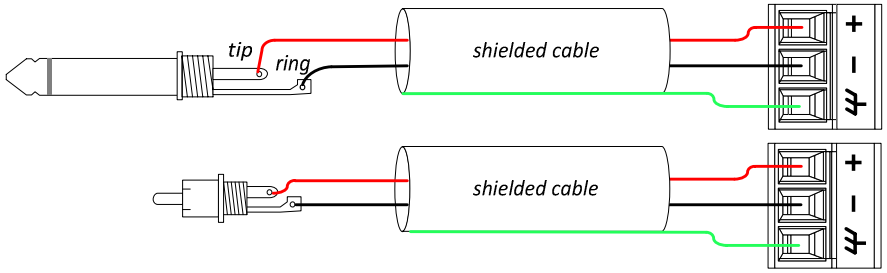
Recommended Line Input Wiring

Wiring from balanced outputs

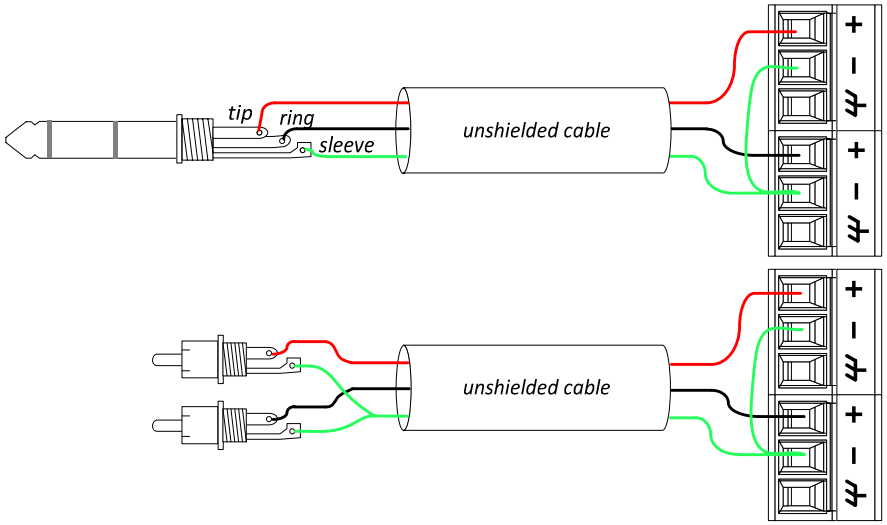


In case of large shield currents due to high common-mode / shield potential differences which may exist at a high distance between the sending and receiving device, disconnect the shield connection on the receiver´s end.

Wiring from unbalanced single channel (mono) outputs



Wiring from unbalanced stereo outputs



Whenever possible avoid a connection to unbalanced signal level equipment because audio performance will be sacrificed.

6 HARVEY Models

The most typical device variants of HARVEY NxM can be found in the following table:

HARVEY	***1 HU, 19" DSP audio matrix with…***
0x0-DA	64x64 Dante interface
4x0-DA	4 analog input channels, 64x64 Dante interface
8x0-DA	8 analog input channels, 64x64 Dante interface
16x0-DA	16 analog input channels, 64x64 Dante interface
0x8-DA	8 analog output channels, 64x64 Dante interface
8x8	8 analog input, 8 analog output channels
8x8-DA	8 analog input, 8 analog output channels, 64x64 Dante interface
8x8-DA-AES	8 analog input, 8 analog output channels, 64x64 Dante interface, AES-Interface
16x8	16 analog input, 8 analog output channels
16x8-DA	16 analog input, 8 analog output channels, 64x64 Dante interface
0x16-DA	16 analog output channels, 64x64 Dante interface
8x16	8 analog input, 16 analog output channels
8x16-DA	8 analog input, 16 analog output channels, 64x64 Dante interface
16x16	16 analog input, 16 analog output channels

HARVEY	***1 HU, 19" DSP audio matrix, Class-D Amp (max. 80W per unit) with..***
8x8-AMP4	8 analog input, 8 analog output channels, 4 channels class-D output

Please contact us, if you require other interface combinations. We will check whether we can make further variants possible.

6.1 HARVEY NxM versus HARVEY mx.16

The following table lists the commons and differences between the HARVEY NxM devices and the legacy HARVEY mx.16 unit.

Property	**HARVEY NxM [Dante]**	**HARVEY mx.16[Dante][Cobranet]**
Number of Analog Audio Channels	N analog inputs in steps of 4 M analog outputs in steps of 8 Up to a sum of 32 channels (N+M = 32)	16 analog inputs 16 analog outputs
Dante Option	64 input channels 64 output channels	16 input channels 16 output channels
CobraNet Option	Not available	16 input channels 16 output channels
Mic Inputs (Number und Gain)	Each analog input is mic capable (P48 and gain) Gain range: 0..60 dB in 3 dB steps	Only the first eight channels are mic capable (P48 and gain) Gain range: 0, 10..65 dB in 1 dB steps
Line Inputs (Gain-Steps)	Each analog input is line level capable. Gain steps: 0, 6, 9, 15 dB	Each analog input is line level capable. Gain steps: 0, 9, 15, 18 dB
Line Outputs (Gain Steps)	Each analog output is line level capable. Gain steps: 0, -6, -9, -15 dB	Each analog output is line level capable. Gain steps: 0, -9, -15, -18 dB
Switching Inputs (GPI)	Four switching inputs	Eight switching inputs
Switching Outputs (GPO)	Six switching outputs, of which - Four transistor outputs, each with two connection options: supplied internally, externally powered - two relay switches	Three switching outputs - no transistor outputs - three relay switches
Voltage Inputs	Two voltage inputs	Eight voltage inputs

7 HARVEY NxM Specifications

Signal Processing	
Sampling Rate	48 kHz
Raw Processing Capacity	450 MIPS / 2.7 GFLOPS
Delay Memory	240 seconds of block delay

Analog Audio Inputs	
Number of Inputs	Dependent on device variant: 0, 4, 8, 12, 16, 20, 24, 28
Connectors	3-pins on PHOENIX 3.81 mm pitch per input channel
Basic Specification	Balanced floating line / mic level inputs; AC coupled
Preamp gain	Mic: 0…+60 dB, 3 dB steps Line: 0, +6, +9, +15 dB
Line Input Levels	+24 dBu, +18 dBu, +15 dBu, +9 dBu (THD+N 1%) +22 dBu, +16 dBu, +13 dBu, +7 dBu (THD+N < -100 dB)
Phantom power (P48)	Switchable independent for each input; 48 V / 10 mA max.
Mic Equivalent Input Noise (EIN)	-127.5 dBu @ 22 kHz bandwidth with 150 Ohm source imped.

Analog Audio Outputs	
Number of Outputs	Dependent on device variant: 0, 8, 16, 24, 32
Connectors	3-pins on PHOENIX 3.81 mm pitch per input channel
Basic Specification	Balanced floating line level outputs; AC coupled
Gain Settings	+15 dB, +9 dB, +6 dB, 0 dB
Line Output Levels	+24 dBu, +18 dBu, +15 dBu, +9 dBu (unloaded, THD+N 1%) +22 dBu, +16 dBu, +13 dBu, +7 dBu (600 Ω load, THD+N < -100 dB)

Common Audio Quality Specs	
Dynamic Range	< -110 dB unweighted
THD+N (A/D/A)	< -100 dB @ 997 Hz, 0 dB gain settings
Channel Crosstalk	< -104 dB @ +24 dBu
Latency (A/D/A)	< 0.75 ms (analog inputs routed to analog outputs)

Common Interfaces (all models)	
Front User Interface	128x64 pixel OLED graphics display (black/white); rotary knob with integrated pushbutton; 3-color status light
Network Control Interface	RJ45 w/ two LEDs; 10/100 Mbps (100BaseTX/10BaseT), CAT5 or better recommended; media control and programming
RS232 Control Interface	D-SUB9 socket/female; baud rates 9,600 – 460,800; media control
RS485 / DMX Control Interface	Two 3-pin PHOENIX male terminals 3.81 mm pitch, baud rates 9,600 – 460,800; galvanically isolated; media control and DMX512 sender/receiver
Digital Input Control Interface (GPI)	Four inputs on 8 pins of PHOENIX male terminal 3.81 mm pitch; external switch, external resistor/potentiometer (threshold 10 kOhm), external voltage source (threshold 1.6 VDC)
Analog Input Control Interface (AIN)	Two inputs on 4 pins of PHOENIX male terminal 3.81 mm pitch; external potentiometer (nom. value 1 kOhm .. 100 kOhm), external voltage source (0..+4.7VDC)
Digital Output Control Interface (GPO)	Four outputs on 8 pins of PHOENIX male terminal 3.81 mm pitch; capable of directly driving external LEDs (or similar loads, 48 mA max.), indirectly driving externally supplied loads (e.g. relays, external voltage +5…+30 VDC, 75 mA max.)
Relay Contact Interface (GPO)	Two independent switch contact pairs on 4 pins of PHOENIX male terminal 3.81 mm pitch; each 1 A @ 30 VDC (30 Wmax); 1.0 A @ 30 VAC (37 VAmax)

Other Specs (all models)	
Mains power supply	3-pin C14 IEC60320-1 with integrated mains switch; 100 / 240 V a.c. 50 / 60 Hz, rated current draw depends on device variant; HARVEY 16x16: 1.2 A; HARVEY 4x0-DA: 0.7 A
Dimensions	1 U height; for integration in standard 19” rack; WDH: 482 mm x 193 mm x 43.8 mm (dimensions include 19” mounting brackets)
Ventilation	Max. recommended ambient operating temperature 30°C. Ensure that left and right device sides are unobstructed (25 mm minimum clearance on both sides).
Shipping weight	HARVEY 16x16: 3.1 kg; HARVEY 4x0-DA: 2.9 kg
Certifications	Safety EN62368-1, EMC EN55024, EN55032; RoHS II EN50581

Dante Audio Network Interface (Option "-DA")	
Number of Channels	64 input channels / 64 output channels
Connectors	Two RJ45 w/ two LEDs; 100/1000 Mbps; Dante primary and secondary interface (switched or redundant)
Channel Routing	Automatic by HARVEY Hypermatrix or manually with Audinate's Dante Controller

AES3 Audio Interface (Option "AES")	
Number of Channels	1x AES-RX (2 channels), 1x AES-TX (2 channels); more channels possible on request
Connectors	Two 3-pin PHOENIX 3.81 mm pitch; XLR possible on request
Data Sample Rate	Input sample rates 8 kHz … 192 kHz (sample rate converted to 48 kHz) Output sample rate 48 kHz (fixed)
Termination	110 Ohm; transformer isolated

Class-D Amplifier Output (Option "AMP4")	
Number of Channels	4x amplifier outputs; more channels possible on request (up to 12)
Connectors	Four 3-pin PHOENIX 5,00 mm pitch
Speaker impedance	≥ 2 Ohm
Output Power	Max. 80 Watt in total per unit; automatic power limit independent of load For equally driven channels power per channel:
THD+N	< 0.1%

Load	**1 ch.**	**2 ch.**	**3 ch.**	**4 ch.**
2 Ohm	1x 82 W	2x 41 W	3x 27 W	4x 20 W
4 Ohm	1x 63 W	2x 41 W	2x 27 W	4x 20 W
8 Ohm	1x 32 W	2x 32 W	2x 27 W	4x 20 W

CONTACT

DSPECIALISTS
Digitale Audio- und Messsysteme GmbH

Helmholtzstr. 2-9L

10587 Berlin

Germany

Phone +49 30 467 805-0
Fax +49 30 567 805-99

sales@dspecialists.de
www.dspecialists.de

www.harvey.audio