HARVEY®

Operating Manual

HARVEY Pro

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Important Safety Instructions

This symbol indicates the need for the user to read and understand the following instructions for a safe operation of the equipment.

1. Read these instructions. Keep these instructions.
2. Never remove screws from the enclosure to reduce the risk of electric shock. There are no user-serviceable parts inside. Refer all servicing to qualified service personnel only.
3. The device is intended exclusively for operation in a standard 19" rack or switch cabinet. For this purpose, mount the device at the rackmounts with four screws to the 19” rack or cabinet.
4. Only connect the unit to a grounded 3-pole AC outlet with rated 100-240 V ~ 50-60 Hz.
5. Be sure to connect the unit to a mains installation only, which is equipped with an overcurrent protective device rated at 20 A maximum.
6. Before use, always make sure that the mains power cord is in good condition. Never remove the protective earthing conductor of the power cord. Dispose and replace a damaged power cord immediately.
7. A maximum of 20 AC mains supplied external devices is allowed to be connected to the interfaces of the device.
8. The power switch is located on the rear panel of the unit. The ON and OFF positions are marked as “1” and “0”, respectively.
9. 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 too low temperatures.
10. Do not block the ventilation openings. Allow for a clearance of 2.5 cm (1") around the unit to prevent overheating.
11. 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.
12. Overexposure to high sound levels can result in hearing damage or loss. Be sure to wear ear protectors when exposed to such sound levels.
13. Consult the HARVEY Pro operating manual to use the device under the intended operating conditions.

FCC User Information

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this operating manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

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 audio 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 and HARVEY RC12 network-based remote controls allow 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 models: 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 model.
- ➔ 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 in the network can be connected to through configurable names.

1.2 Information about the HARVEY Devices

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

- ➔ HARVEY Pro: DSP audio and control matrix - flexible equipment with a selectable analogue audio input and output channel count with up to a sum of 32 channels, without / with Dante capability (additional 64 input and 64 output channels) and without / with digital AES capability (additional 2 input and 2 output channels) in one rack unit height.
- ➔ 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 four buttons, one rotary knob and RGB signaling for wall, furniture or rack mounting.
- ➔ HARVEY RC12: Power over Ethernet (PoE) powered control module with twelve buttons and RGB signalling for wall, furniture or rack mounting.

See section 6 of this manual for a list of the most typical HARVEY Pro 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 (e.g. 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 Pro). 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.

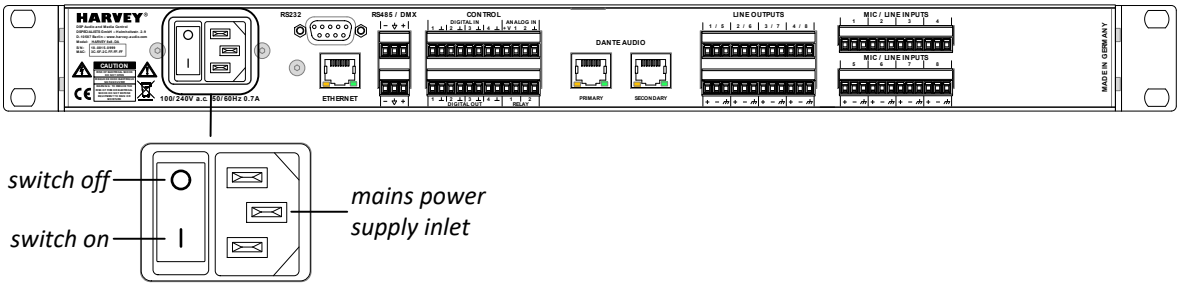
2 Unpacking

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

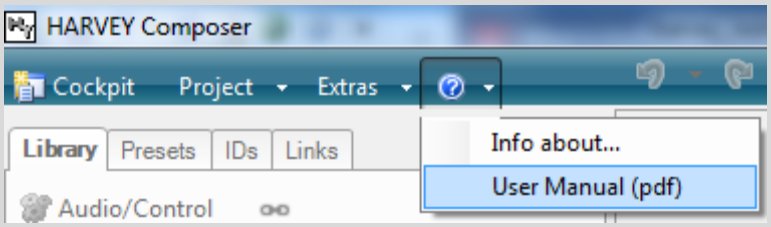
1	HARVEY® device
1	3-core power cord (depending on country)
N	12-positions terminal block; quantity depends on your HARVEY model
2	3-positions PHOENIX terminal block
1	RS485-/DMX end of line termination resistor 120 Ohm

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:

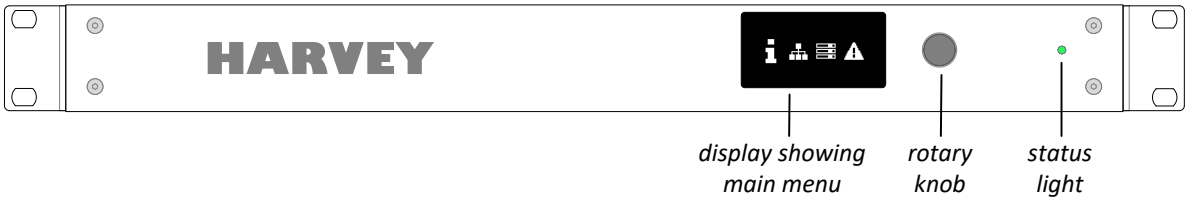


See section 4 of this manual for further explanation of the front display, the status light and the menu settings.

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

4 Status and Settings on the Front Panel

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 section 4.1)
- Turn the rotary knob left and right to navigate through the menus (see section 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.

Under normal conditions the power up sequence is as follows:

Off ○ → Yellow ● → Green ●

4.2 Main Menu

The "Main Menu" is the default display and the starting point for information about the current device status.

Main menu with menu entry “Device Status” highlighted.
See section 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 section 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 section 4.2.3

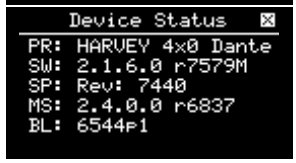
Main menu with menu entry “Alarms” highlighted.
This entry informs about current errors of the device.
See section 4.2.4

There are further display states which are described in section 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:

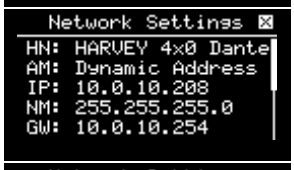
- PR Product model; example “HARVEY 4x0-DA”
- SW Revision text of software update packet which you are able to update via HARVEY Composer; example “2.1.6.0 r7579M”
- SP Revision text of the signal processor’s software; this software is included in the software update packet (see “SW”); the revision changes 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”

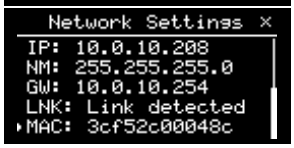
The “Device Status” is displayed in HARVEY Composer, too, after you connect to the device in question and navigate to the “Service Functions” of the Composer Cockpit.

4.2.2 Network Settings

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

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

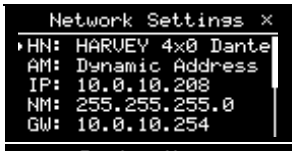




The “Network” entry contains following information. Some of those settings can be changed by pressing the rotary knob after you navigated to the entry by turning the knob. The location of the cursor is represented by an arrow in front of the entry. The position of the entry in the sub-menu is shown by 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 section 4.2.2.1.
AM	Address Mode: Changeable between “Dynamic Address” and “Manual Address”. See section 4.2.2.2.
IP	IP address: Lets you change the address mode to “Manual Address” and set a new IP address. See section 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 panel of the device below its serial number.

4.2.2.1 Device Name



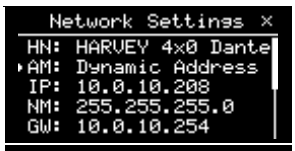
By entering the HARVEY device name entry…

…you will see the full name of the HARVEY device.
The Device Name can be changed within the HARVEY Composer 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 Cockpit.

4.2.2.2 Address Mode

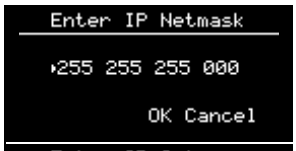
The “Addressing Mode” may be changed between dynamic IP and static IP.



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

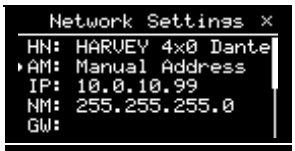
…you are asked if you want to change it to a static IP address (i.e. manual IP). Pressing the rotary knob on “YES” leads you thru the manual IP settings. Pressing the rotary knob on “CANCEL” leaves the configuration entry unchanged.

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. Normally this can be left unchanged to 0.0.0.0. Needs only be set if device is to communicate with devices in other networks than the local network.



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

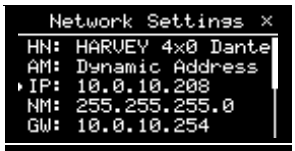
…you are asked if you want to change it to a dynamic IP address. Pressing the rotary knob on “YES” confirms this setting. Pressing the rotary knob on “CANCEL” leaves the configuration entry unchanged.

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 Cockpit under the Device Settings, too.

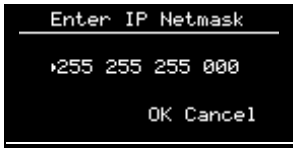
4.2.2.3 IP Address



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

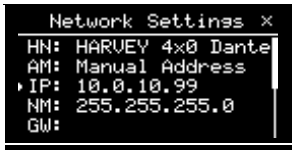
…you are asked first if you want to change it to a static IP address (i.e. manual IP). Pressing the rotary knob on “YES” leads you thru the manual IP settings. Pressing the rotary knob on “CANCEL” leaves the configuration entry unchanged.

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.

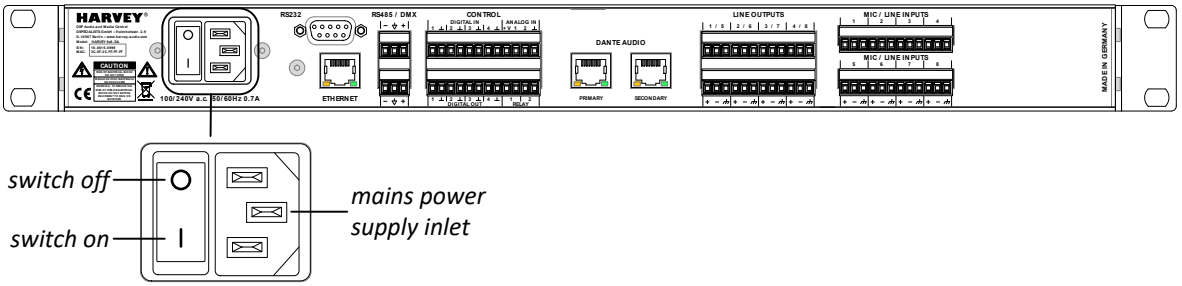
- By turning or pushing the rotary knob you are able to re-enable the display.

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 Panel

5.1 Mains Power Supply Inlet



Interface	Mains power supply inlet
Connector	3-positions appliance power inlet C14 IEC60320-1 with integrated mains switch
Ratings	100-240V a.c. 50-60 Hz, rated current draw depends on device model and is indicated on type plate
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.

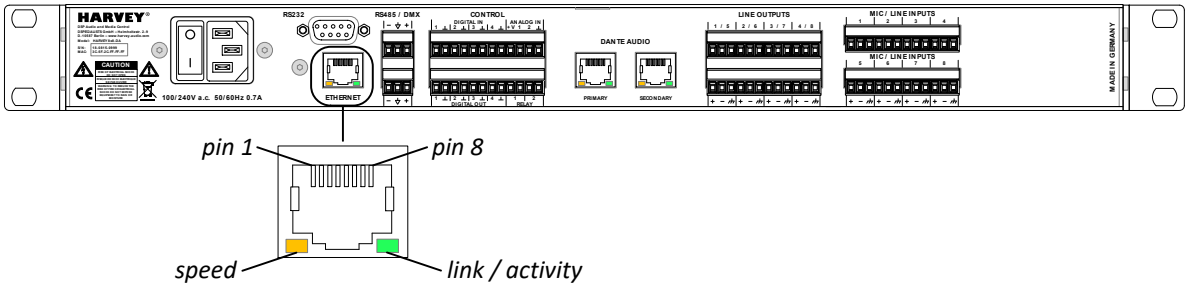
ATTENTION

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

5.2 Network Control Interface

One network control interface is part of the standard HARVEY Pro 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

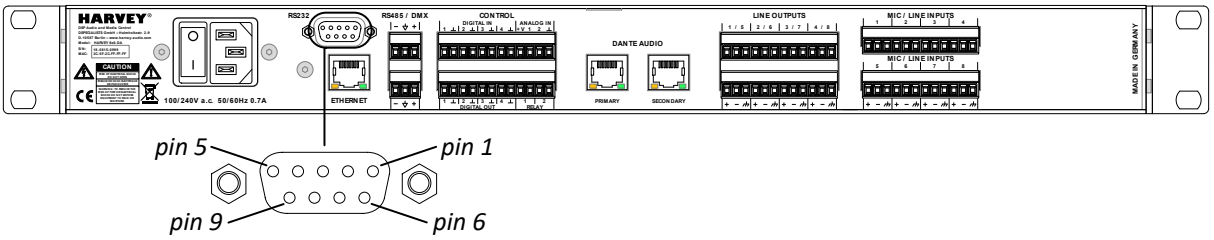
	Off	On	Flashing
Right green LED	no physical link	physical link w/o data activity	physical link with data activity
Left yellow LED	10 Mbps	100 Mbps	-not applicable-

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 Pro 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 Pro 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:

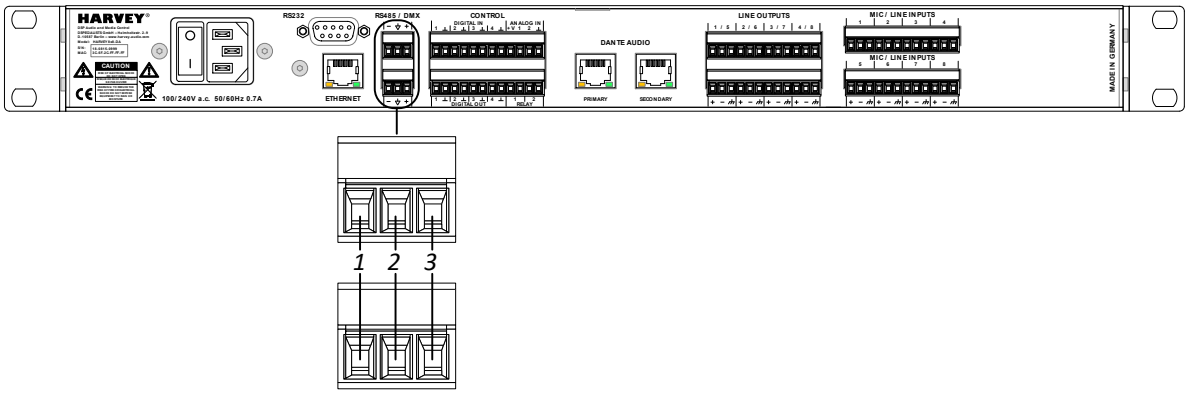
- Media control integration

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** | **2** | **3** DATA- | Shield GND | 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

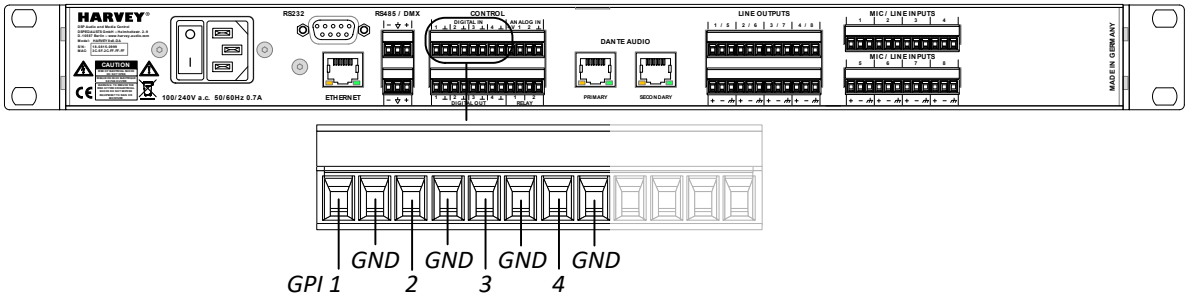
Connect the cable shield only to one end of the cable to avoid ground loops.

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 Pro 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



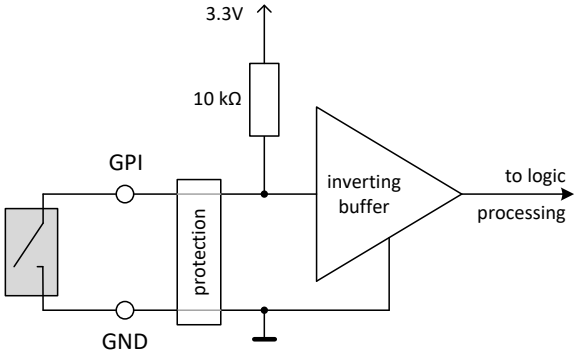
Interface	Four independent general purpose inputs (GPI) for logic control
Connector	8 pins of a 12-pole PHOENIX male terminal 3.81 mm pitch Mating connector (included in delivery): PHOENIX part#1803675
Pinout	see figure above
Capabilities	User may connect a tactile switch (dry contact), a voltage source 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

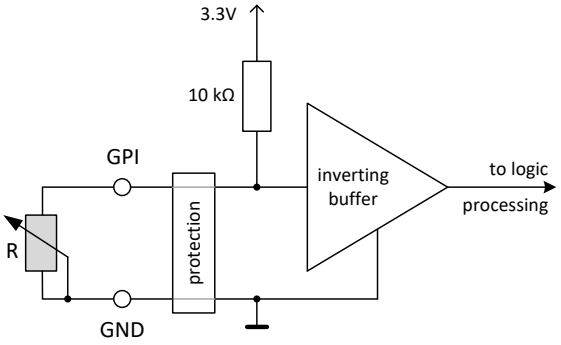
- switch closed : “1/TRUE“
- switch open : “0/FALSE“



Option B

External resistor

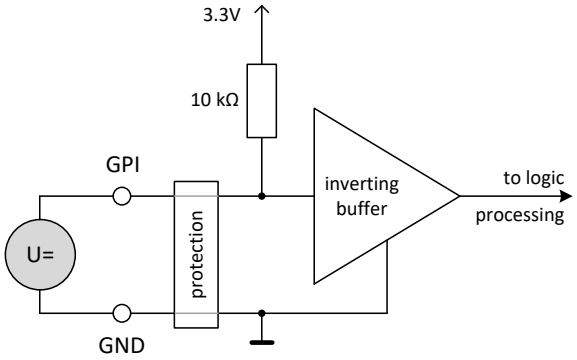
- R < 10 kΩ : “1/TRUE“
- R > 10 kΩ : “0/FALSE“



Option C

External voltage source

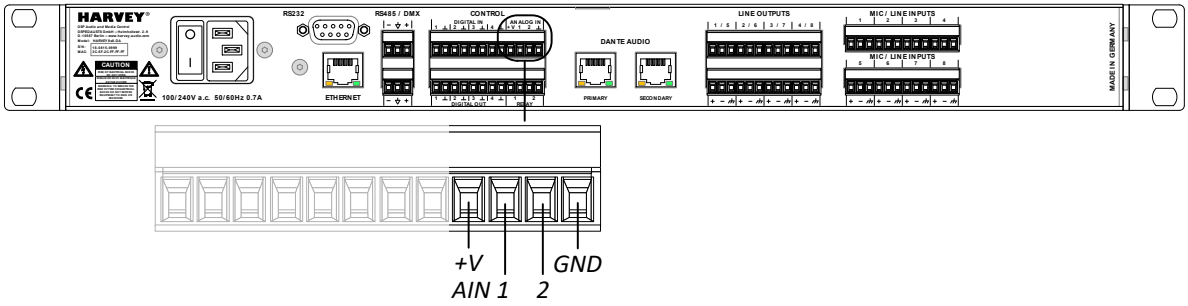
- (U=) < 1.6 V : “1/TRUE“
- (U=) > 1.6 V : “0/FALSE“



5.6 Analog Input Control Interface (AIN)

Two analog control inputs (AIN) are part of the standard HARVEY Pro 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

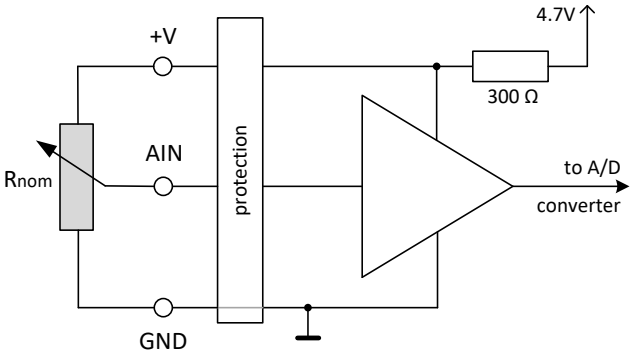
Table valid for unloaded +V.

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

AIN Wiring Options

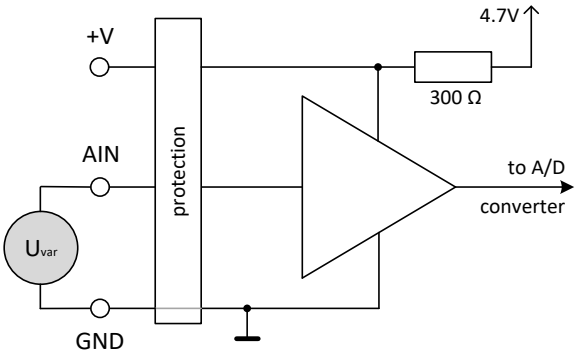
Option A

External potentiometer (variable resistor)



Option B

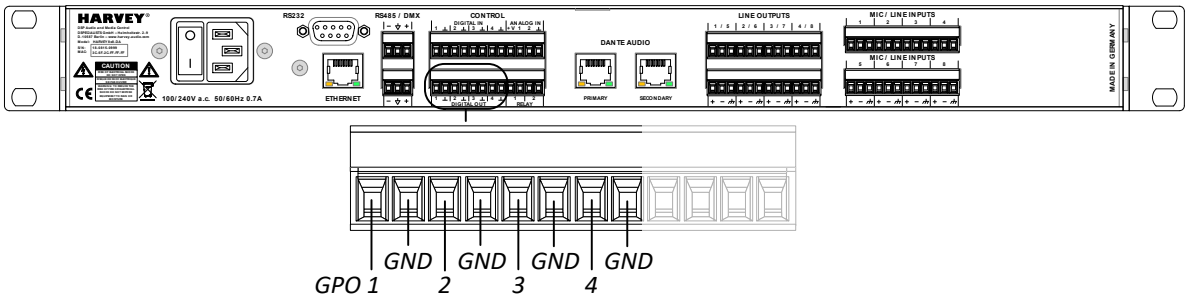
External voltage source (variable voltage)



5.7 Digital Output Control Interface (GPO)

Four digital control outputs are part of the standard HARVEY Pro 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 = (4.8 V – U_f) / 100 Ω ; 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.

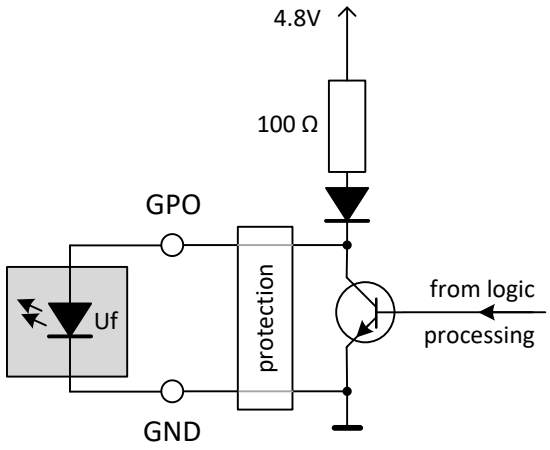
GPO Wiring Options

Option A

Directly driving external LED (or similar load)

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

➔ negative logic!

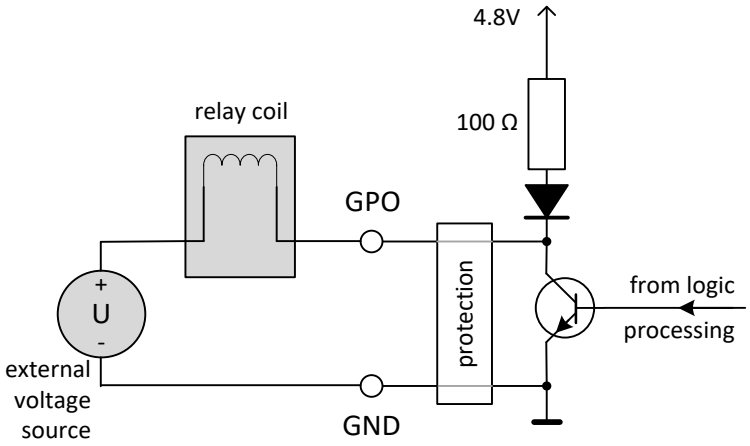


Option B

Driving externally supplied relay (or other load)

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

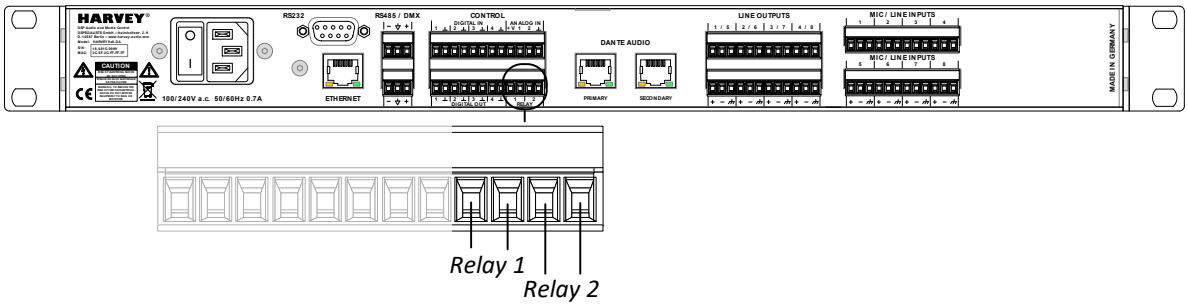
➔ positive logic!



5.8 Relay Contact Interface (GPO)

Two relay contact pairs are part of the standard HARVEY Pro 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



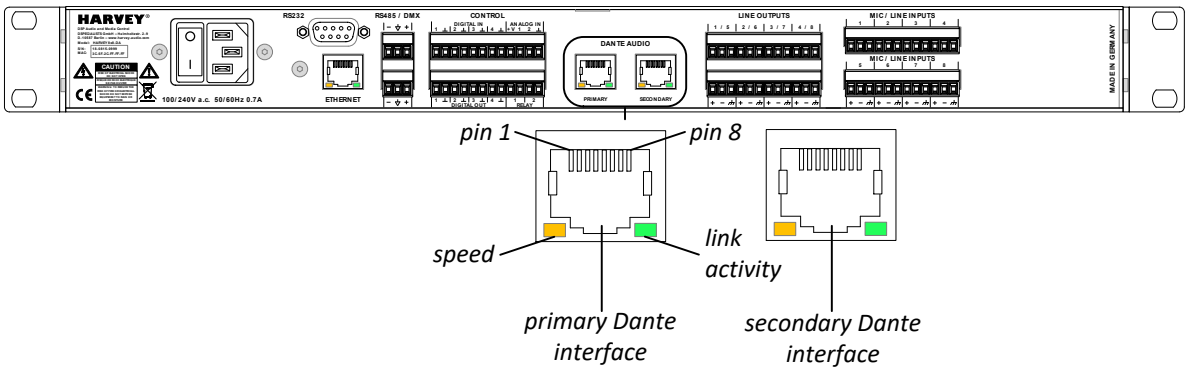
Interface	Two independent switch contact pairs (GPO)
Connector	4 pins of a 12-pole PHOENIX male terminal 3.81 mm pitch Mating connector (included in delivery): PHOENIX part#1803675
Pinout	see figure above
Capabilities	Both switches are “normally open” (NO) ▪ “1/TRUE“ : switch closed ▪ “0/FALSE“ : switch 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 Pro component.

It is provided including following features:

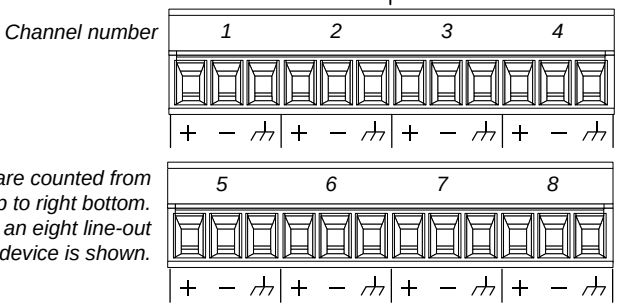
- Endpoint for 64x64 audio channels; each 48 kHz/24 bit
- Primary and secondary interface available supporting Dante redundancy mode and switch mode



Interface	Audinate Dante® network audio, realised based on Audinate´s Brooklyn 3 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	<table><tr><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th></tr><tr><td>D1+</td><td>D1-</td><td>D2+</td><td>D3+</td><td>D3-</td><td>D2-</td><td>D4+</td><td>D4-</td></tr></table> Connector shield connects to device enclosure.
LED Indicators	<table><tr><th></th><th>Off</th><th>On</th><th>Flashing</th></tr><tr><td>**Right green LED**</td><td>no physical link</td><td>physical link w/o data activity</td><td>physical link with data activity</td></tr><tr><td>**Left yellow LED**</td><td>100 Mbps</td><td>1000 Mbps</td><td>-not applicable-</td></tr></table>
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 Pro model. HARVEY Pro devices may be equipped with multiples of eight line outputs up to 32 channels.

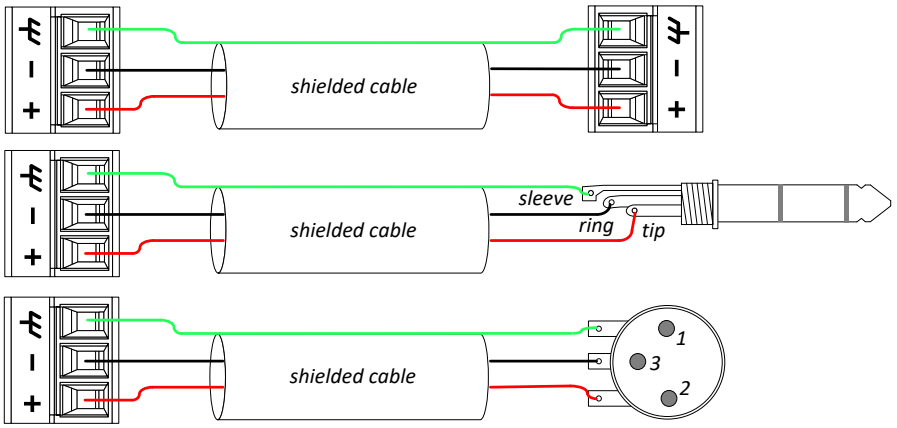


Channel numbers are counted from left top to right bottom. As an example an eight line-out HARVEY device is shown.

	Analog audio line outputs, number of channels 8/16/24/32 dependent on device model, 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) (rated minimum load: 600 Ω)
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

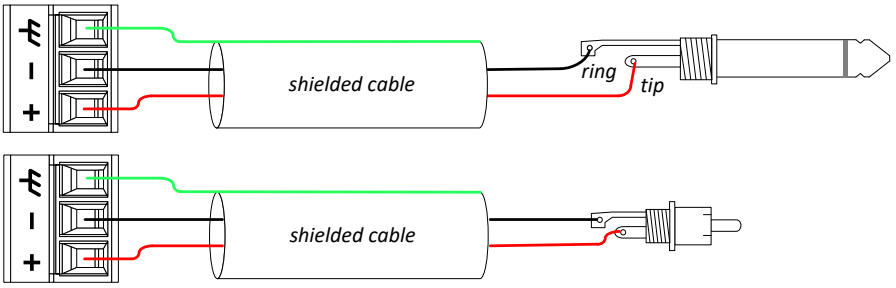
Recommended Line Output Wiring

Wiring to balanced inputs

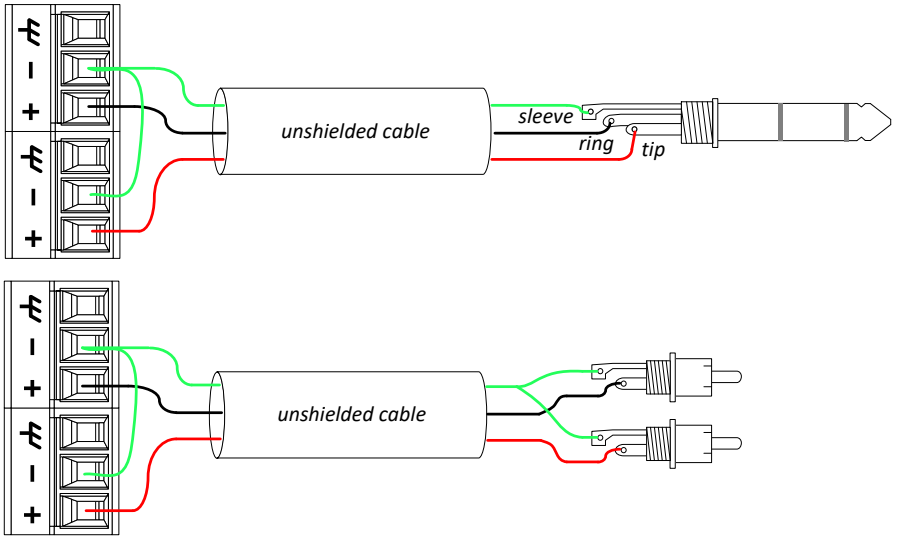


In case of large shield currents due to high common-mode / shield potential differences which may exist at a high distance between the sending and receiving device, disconnect the shield connection on the receiver´s end.

Wiring to unbalanced single channel (mono) inputs



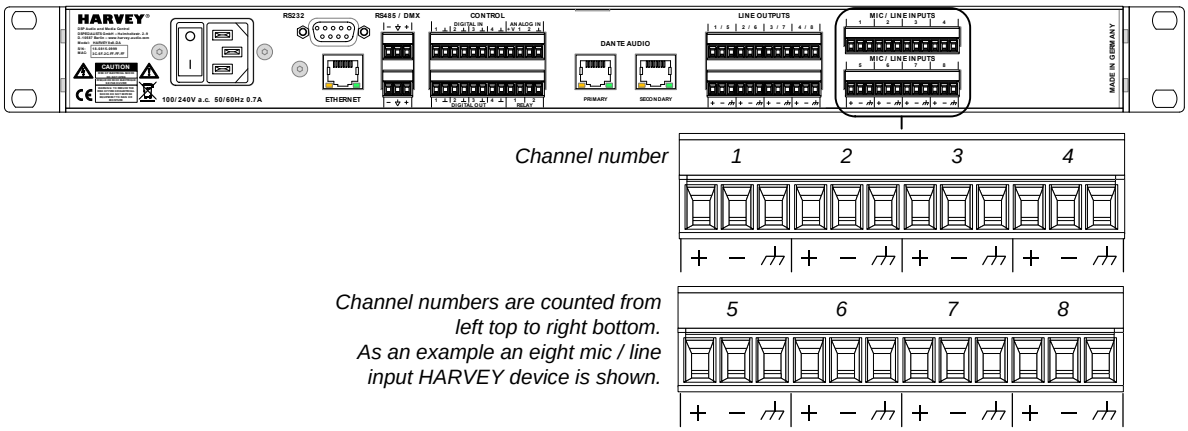
Wiring to unbalanced stereo inputs



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 Pro model. HARVEY Pro 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 model, 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. (IEC 61938), 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!

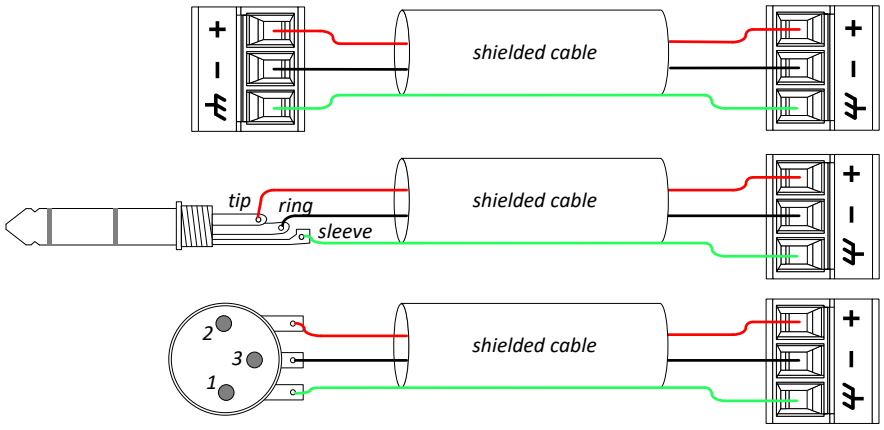
Table continues on following page…

…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

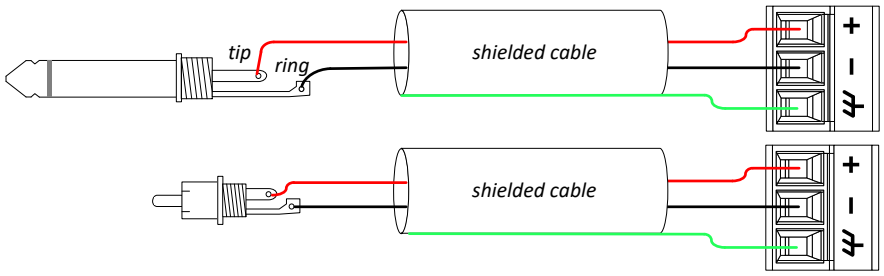
Recommended Line Input Wiring

Wiring from balanced outputs

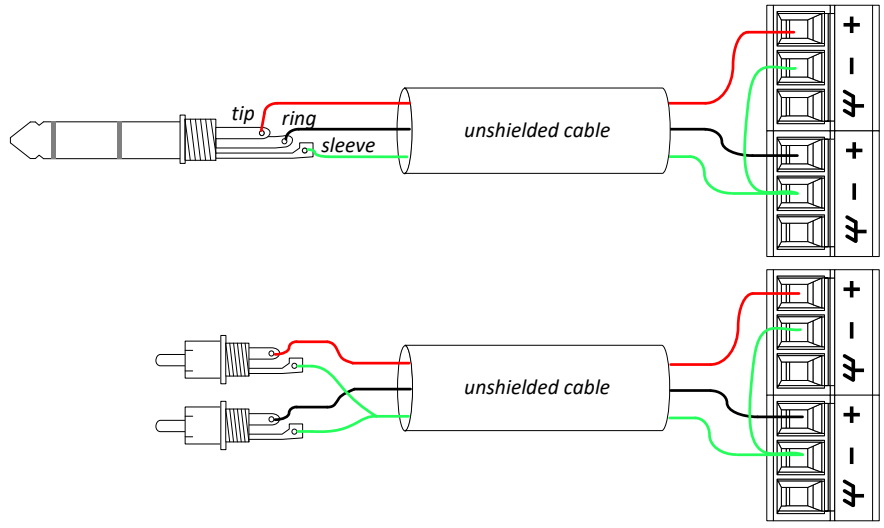


In case of large shield currents due to high common-mode / shield potential differences which may exist at a high distance between the sending and receiving device, disconnect the shield connection on the receiver´s end.

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.

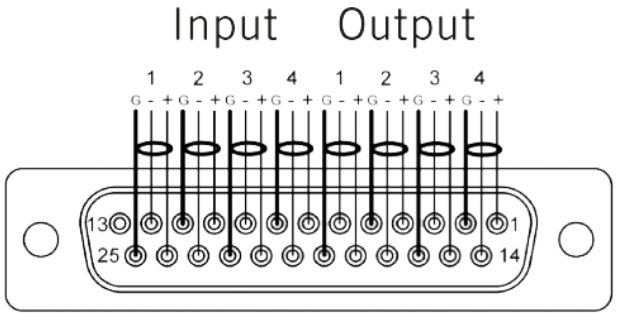
5.12 AES 2x2 Audio Interface

HARVEY Pro models with the “AES” identifier in the model name are equipped with an 2x2 channel AES3 interface card.

Interface	1 stereo pair of AES3 digital inputs and four 1 stereo pairs of AES3 digital outputs, i.e. 2 input and output channels that can be routed in the HARVEY audio processing.
Connector	2x 3-pole PHOENIX male terminal 3.81 mm pitch
RX Pinout	**+ / -** balanced digital input ⏚ shield, connected to chassis internally
TX Pinout	**+ / -** balanced digital output ⏚ shield, connected to chassis internally
Input sample rate	44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz, 176.4 kHz, 192 kHz (with sample rate conversion to HARVEY system rate of 48 kHz)
Output sample rate	48 kHz (HARVEY System clock)
Bit depth	24 bit
Impedance	100 Ω balanced

5.13 AES 8x8 Audio Interface

HARVEY Pro models with the “AES8” identifier in the model name are equipped with an 8x8 channel AES3 interface card.

Interface	4 stereo pairs of AES3 digital inputs and four 4 stereo pairs of AES3 digital outputs, i.e. 8 input and output channels that can be routed in the HARVEY audio processing.
Connector	D-SUB 25-pin AES/EBU with TASCAM pin-out format
Pinout	
Input sample rate	44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz, 176.4 kHz, 192 kHz (with sample rate conversion to HARVEY system rate of 48 kHz)
Output sample rate	48 kHz (HARVEY System clock)
Bit depth	24 bit
Impedance	100 Ω balanced

6 HARVEY Pro Models

The most typical device models of HARVEY Pro are listed in the following table:

Pro	1 HU, 19" DSP audio matrix with…
8x8	8 analog audio inputs, 8 analog audio outputs
8x8-DA	8 analog audio inputs, 8 analog audio outputs, 64 Dante digital audio inputs, 64 Dante digital audio outputs
8x8-DA-AES	8 analog audio inputs, 8 analog audio outputs, 64 Dante digital audio inputs, 64 Dante digital audio outputs, 1 AES digital audio input, 1 AES digital audio output (i.e. 2x2 channels)
12x8	12 analog audio inputs, 8 analog audio outputs
12x8-DA	12 analog audio inputs, 8 analog audio outputs, 64 Dante digital audio inputs, 64 Dante digital audio outputs
16x8	16 analog audio inputs, 8 analog audio outputs
16x8-DA	16 analog audio inputs, 8 analog audio outputs, 64 Dante digital audio inputs, 64 Dante digital audio outputs
8x16	8 analog audio inputs, 16 analog audio outputs
8x16-DA	8 analog audio inputs, 16 analog audio outputs, 64 Dante digital audio inputs, 64 Dante digital audio outputs
16x16	16 analog audio inputs, 16 analog audio outputs
8x24	8 analog audio inputs, 24 analog audio outputs
24x8	24 analog audio inputs, 8 analog audio outputs
0x8-DA	8 analog audio outputs, 64 Dante digital audio inputs, 64 Dante digital audio outputs
4x0-DA	4 analog audio inputs, 64 Dante digital audio inputs, 64 Dante digital audio outputs
8x8-DA-AMP4	8 analog audio inputs, 8 analog audio outputs, 64 Dante digital audio inputs, 64 Dante digital audio outputs 4 class-D amplifier outputs (max. 80 W per unit) *This model is only available with CE marking.*
8x8-DA-AES8	8 analog audio inputs, 8 analog audio outputs, 64 Dante digital audio inputs, 64 Dante digital audio outputs 8 digital AES3 inputs, 8 digital AES3 outputs *This model is only available with CE marking.*

Please contact us, if you require other interface combinations. The chances are high that we can make further models available.

6.1 HARVEY Pro versus HARVEY mx.16

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

Property	**HARVEY Pro NxM[-DA][-AES][-AMPn]**	**HARVEY mx.16[Dante][Cobranet]**
Number of Analog Audio Channels NxM	N analog audio inputs in steps of 4 M analog audio outputs in steps of 8 Up to a sum of 32 channels (N+M = 32)	16 analog inputs 16 analog outputs
Dante Option [-DA]	64 Dante digital inputs 64 Dante digital outputs	16 Dante digital inputs 16 Dante digital outputs
CobraNet Option	Not available	16 CobraNet digital input 16 CobraNet digital outputs
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 audio input is line level capable. Gain steps: 0, 6, 9, 15 dB	Each analog audio input is line level capable. Gain steps: 0, 9, 15, 18 dB
Line Outputs (Gain Steps)	Each analog audio output is line level capable. Gain steps: 0, -6, -9, -15 dB	Each analog audio 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
AES3 Option [-AES]	One AES Rx, One AES Tx (stereo) 2 digital AES3 compatible input channels 2 digital AES3 compatible output channels	Not available
8x AES3 Option [-AES8]	Four AES Rx, Four AES Tx (stereo) 8 digital AES3 compatible input channels 8 digital AES3 compatible output channels	Not available
Amp Option [-AMPn]	4/8/12 amplifier outputs	Not available

7 HARVEY Pro Specifications Summary

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 model: 0, 4, 8, 12, 16, 20, 24, 28
Connectors	3-positions 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. (IEC 61938)
Mic Equivalent Input Noise (EIN)	-127.5 dBu @ 22 kHz bandwidth with 150 Ohm source impedance

Analog Audio Outputs	
Number of Outputs	Dependent on device model: 0, 8, 16, 24, 32
Connectors	3-positions 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) (rated load: ≥ 600 Ω)

Common Analog Audio Quality Specs	
Bandwidth	10 Hz ... 22.5 kHz (-0.3 dB / -1.0 dB rel. 1 kHz)
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 audio inputs routed to analog audio outputs)

Common Interfaces (all models)	
Front User Interface	128x64 pixel OLED graphics display (black/white); rotary knob with integrated pushbutton; 3-color status LED 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 bps; media control
RS485 / DMX Control Interface	Two 3-positions PHOENIX male terminals 3.81 mm pitch, baud rates 9,600 – 460,800 bps; 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..+4.7 VDC)
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 W max.); 1.0 A @ 30 VAC (37 VA max.)

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

2 channel AES3 Audio Interface (Option “AES”)	
Number of Channels	1x AES3-RX (2 channels), 1x AES3-TX (2 channels);
Connectors	Two 3-positions PHOENIX 3.81 mm pitch; *XLR option on request*
Data Sampling Rate	Input 8 kHz … 192 kHz (sampling rate converted to 48 kHz) Output 48 kHz (fixed)
Termination	110 Ohm; transformer isolated

8 channel AES3 Audio Interface (Option "AES8")	
Number of Channels	4x AES3-RX (8 channels), 4x AES3-TX (8 channels);
Connectors	D-SUB 25-pin AES/EBU with TASCAM pin-out format
Data Sampling Rate	Input 8 kHz … 192 kHz (sampling rate converted to 48 kHz) Output 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-positions PHOENIX 5,0 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

General (all models)	
Mains power supply	3-positions C14 IEC60320-1 with integrated mains switch; 100-240 V ~ 50 / 60 Hz, see table on following page for power values
Ambient temperature	0 °C - 30 °C / 32 °F - 86 °F Ensure that left and right device sides are unobstructed (25 mm minimum clearance on both sides).
Cooling	Models with less than a sum of 24 analog audio input and output interfaces: Convection All other models: Fan, left to right
Humidity	10% to 90%, noncondensing
Shipping weight (examples)	HARVEY Pro 16x16: 3.1 kg; HARVEY Pro 4x0-DA: 2.9 kg
Dimensions	1 RU height; for integration in standard 19" rack; WDH: 482 mm x 193 mm x 43.8 mm (dimensions include 19" mounting brackets)
Regulatory compliance, certifications	Safety: CE, IEC/UL 62368-1:2014 (CB and NRTL listed mark) EMC: CE, EN 55032:2012 Class A, EN 55035:2017, EN 61000-3-2:2014, EN 61000-3-3:2013, FCC 47 CFR Part 15 Class A, ICES-3(A) RoHS: CE, EN 50581

Electrical power, thermal output (per model)

Pro	True power input requirement[1)]	BTU/h[2)]
8x8	22 W	66 BTU/h
8x8-DA	24 W	75 BTU/h
8x8-DA-AES	26 W	82 BTU/h
8x8-DA-AES8	28 W	88 BTU/h
12x8	27 W	81 BTU/h
12x8-DA	29 W	90 BTU/h
16x8	36 W	114 BTU/h
16x8-DA	39 W	121 BTU/h
8x16	35 W	106 BTU/h
8x16-DA	37 W	115 BTU/h
16x16	44 W	135 BTU/h
8x24	43 W	129 BTU/h
24x8	46 W	142 BTU/h
0x8-DA	15 W	46 BTU/h
4x0-DA	12 W	38 BTU/h
8x8-DA-AMP4	tbd	tbd

[1)] True power drawn by model under rated conditions,
i.e. 0 dBFS into 600 Ohm loads on all analog audio outputs,
P48 10 mA current supply of all analog audio inputs

[2)] True power drawn by model, external power of loads excluded,
1 W = 3.41 BTU/h

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