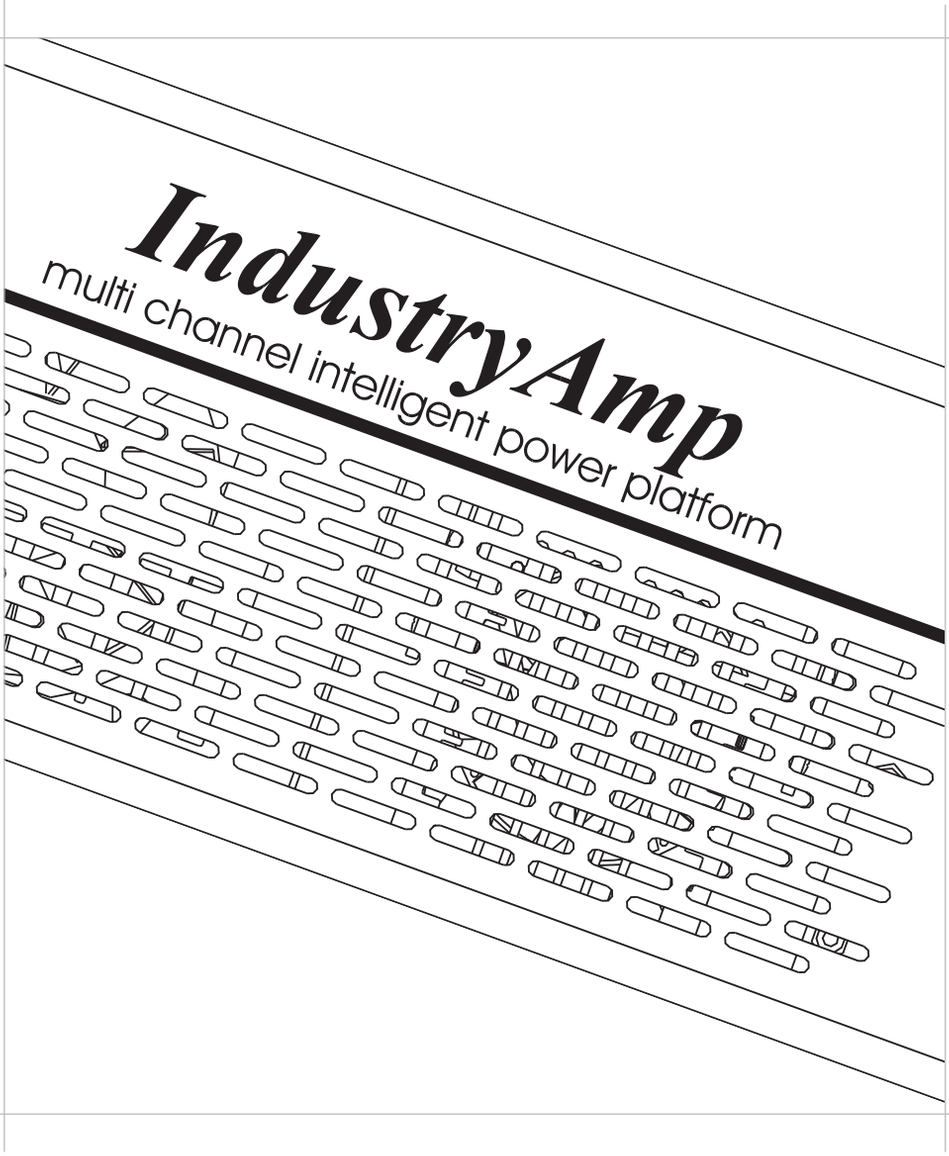
PB-400-CN

Datasheet

Applies to Part Number:

590403

IndustryAmp PB-400-CN*



AXYS® TUNNEL by HARMAN

*This unit has a CobraNet® interface installed

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1. Architectural and engineering specifications

The unit shall be constructed in a 3U 19" rack enclosure. It shall be a multi channel power amplifier with on-board DSP and RISC processor that is intended for use in distributed 70V/100V professional audio installations.

All signal processing functions, necessary to properly control and monitor each amplifier channel shall be implemented on-board in order to reduce the overhead costs related to external processors. The electronics shall consist of a 2 channel analogue audio input module, 8 digital inputs and 8 digital audio outputs via CobraNet®, a Digital Signal Processor with 10 inputs and 4 outputs, 4 class AB power amplifiers with protection circuitry and a high power switched-mode power supply with a very high peak power capability.

The analogue audio inputs shall be transformer balanced. All necessary signal processing shall be implemented in the digital domain by means of a 32 bits floating point DSP.

The DSP shall realize appropriate output channel gain, equalisation filters and delays. Besides the aforementioned, the DSP shall be able to realize EQ, pre-delay, volume and autogain, and compression as required. The DSP software and coefficients shall reside in non-volatile memory in order to facilitate adaptations and software updates. Audio AD and DA conversion shall be performed with high quality 24 bits converters.

The output section shall be equipped with high-grade toroidal transformers to provide both 70V and 100V outputs. All loudspeaker terminals shall be protected against voltage spikes by means of gas discharge devices. The 4 outputs shall be driven by full complementary class AB amplifiers equipped with rugged industrial power mosfet devices capable of handling large currents without risk of failure. There shall be a large phase margin within the feedback loop to keep the amplifiers stable under any load condition. Each amplifier shall be capable of delivering 250 W_{rms} into a 40 Ω load.

The device shall be controllable over RS-485 as well as over Ethernet. The RS-485 interface shall be implemented as a fully isolated full-duplex serial network interface. Access over Ethernet shall be realized by using the CobraNet® Serial Bridge protocol.

This control unit shall serve four main functions:

- Remote monitoring of parameters like status of the DSP, amplifiers and their loads, monitoring and control of the internal fan, external pilot tone detection, status of the optional ambient noise sensing microphone, thermal overload protection, ambient noise level, ambient temperature, control for the input section etc.
- Remote control of DSP parameters: volume, pre-delay, EQ, output sections, autogain configuration and surveillance related parameters.
- Updating DSP software and factory unit programming.
- Configuration of the CobraNet® node (Ethernet interface only).

The device shall provide failure relay contacts for monitoring purposes. The failure relay connections shall be configurable for either 'volt-free' or 'impedance-sensing' operation (to allow for a direct connection to impedance-sensing monitoring equipment).

The analogue audio signal shall be connected to a Phoenix type MC 1,5/ 3-ST-3,81 connector. The device shall be equipped with two RJ-45 sockets to allow connection to a fully redundant CobraNet® network. The RS-485 signal shall be connected to a Phoenix type MC 1,5/ 5-ST-3,81 connector. Each of the amplifier outputs shall be connected to Phoenix type GIC 2,5/ 3-ST-7,62 connectors. The unit shall be equipped with a Neutrik Powercon mains inlet connector.

The enclosure shall be constructed of steel finished with a nickel plating. All connectors, as well as the mains switch and fuse holder, shall be located on the rear of the enclosure. The front of the enclosure shall accommodate a bi-colour LED to indicate the status.

Dimensions are: 132 mm H x 483 mm W x 342 mm D. Weight 20.8 kg. The amplifier unit shall be the AXYS® model IndustryAmp PB-400-CN.

2. Specifications

Electrical:

Analogue Audio Inputs[1]	- Number of inputs	: 2
	- Nominal level	: 0 dBV (RMS, line input)
	- Maximum level	: +19 dBV (peak, line input)
	- Type	: dual line input, transformer balanced
	- Impedance (balanced)	: 6k8 Ω
	- Frequency range	: 30 to > 20k Hz (-3 dB, analogue in to amp out, 100 Ω load)
	- CMRR	: > 55 dB (1k Hz), > 60 dB (50 Hz)
Digital audio interface[2]	- Number of inputs	: 8
	- Number of outputs[3]	: 8
	- Format	: 48 kHz / 24, 20 or 16 bit
	- Type	: Dual 100 Mb/s CobraNet® Ethernet (IEEE 802.3u) connection
General	- Dynamic range[4]	: > 90 dB
	- THD + N	: < 0.06 % @ 1k Hz (50 V_{rms} in 50 Ω) < 0.4 % @ 50 to 10k Hz (50 V_{rms} in 50 Ω)
DSP module	- Type	: floating point 900 MFLOPS 32 bits
	- Memory[5]	: 128 Mb SDRAM + 10 Mb non volatile
	- AD - DA conversion	: 24 bits sigma-delta 128 x oversampling
	- Auxilliary processor	: single cycle RISC
	- Sample rate	: 48.0 kHz (default)
	- Latency	: 3.45 ms (analogue in to amp output)
	- Signal processing	: - input channel delay (10 x 1.3 seconds)[5] - main pre-delay (21.8 seconds)[5] - output channel delay (43.6 seconds per output)[5] - equalizer - volume - individual RMS and peak limiters on each output - ambient noise level dependent gain adaptation ('fail-safe') - four output filters + delay ringbuffers - individual output EQ, gain and polarity control - input configuration (10 inputs)
	- CobraNet® transmission routing	: - Slot 1 ANS mic - Slot 2 Analogue out 2 - Slot 3 Analogue out 3 - Slot 4 Analogue out 4 - Slot 5 Analogue in 1 - Slot 6 Analogue in 2 - Slot 7 Analogue in processed 1 (before input selection processing) - Slot 8 Analogue in processed 2 (before input selection processing)

Control & monitoring	- Interface[6]	: RS-485 or CobraNet® Serial Bridge protocol
	- RS-485 interface type	: serial full-duplex RS-485, autoswitching 115k2, 57k6, 38k4,19k2 baud, optically isolated
	- Maximum number of units[7]	: 126 units
	- Remote surveillance	: - general status (DSP running, signal present etc.) - amplifier monitoring and load monitoring schemes - pilot tone detection on analogue inputs (20k5 - 28k Hz, level > -22 dBV) - pilot tone detection on CobraNet® inputs (19k2 to 23k5 Hz, software configurable threshold) - monitoring of optional external ambient noise sensing microphone - frost protection - fan monitoring and control for internal fan - thermal overload protection
	- Failure	: - internal hardware bypass circuit for analogue audio inputs - failure relay (external connector, maskable conditions) SPDT 100 mA / 24 V - configurable for volt-free or impedance-sensing (10k / 20k Ω) operation (internal jumper) - failure status indicated at front by bi-colour LED
	- Load monitoring freq	: 22k Hz
	- Load monitoring level	: 8 V_{rms} (unloaded)
	- Load monitoring maximum impedance	:1600 Ω @ 22k Hz
Power amps	- Type	: Full complementary FET class AB
	- Power	: 4 x 250 W_{rms} (40 Ω)
	- Protection	: - DC failure - Short circuit
	- Output transformers	: Toroidal
	- Taps	: 70 V, 100 V
	- Minimum load	: 40 Ω (@ 100 V), 20 Ω (@ 70 V)
	- Loudspeaker terminal surge protection clamping	: 350 V @ 20 kA
Connectors[8]	- Analogue audio inputs	: Phoenix type MC 1,5/ 3-ST-3,81 (2 x)[9] p1 = Line 1 +, p2 = GND, p3 = Line 1 -
	- CobraNet® interface	: RJ-45 (2 x)[2]
	- RS-485 interface	: Phoenix type MC 1,5/ 5-ST-3,81 p1 = DGND, p2 = Y, p3 = Z, p4 = B, p5 = A
	- Ambient noise sensor	: Phoenix type MC 1,5/ 3-ST-3,81 p1 = In +, p2 = GND, p3 = In -
	- Ambient temperature sensor (NTC)	: Phoenix type MC 1,5/ 2-ST-3,81 p1 = In, p2 = GND
	- Failure relay	: Phoenix type MC 1,5/ 3-ST-3,81 p1 = Common (CO), p2 = Normally closed (NC), p3 = Normally open (NO)[10]
	- Loudspeakers	: Phoenix type GIC 2,5/ 3-ST-7,62 (4 x)[11] p1 = 0, p2 = 70 V, p3 = 100 V
	- Mains	: 3p male Neutric Powercon

PSU	- Type	: Switched-mode, power factor correction, standby supply
	- Rated mains voltage	: 100 V to 240 V, 50 or 60 Hz
	- Mains fuse(s)	: 1 x 8 A quick-blow/anti-surge 20 x 5 mm glass fuse (type F8A HBC)
	- Power consumption[12]	: - 54 W (idle) - 11 W standby (main power supply shut down) - 122 W load monitoring active (all outputs 50 Ω) - 1000 W (rated full load)
	- Power factor	: 0.50 (idle) / > 0.90 (full load)
	- Max mains inrush current	: 20 A short-time peak (@ 230 V)
	- Protection	: - thermal protection - output current limiting - under-voltage and over-voltage lock out
Fans	- Type	: large low-speed temperature-controlled fans
	- Number of fans	: 2
	- Airflow	: rear to front

General:

Temperature range (ambient)		: 0 to 40 °C (32 - 104 °F)
Dimensions (H x W x D)		: 132 x 483 x 342 mm (3U 19" rack enclosure)
Weight		: 20.8 kg (46 lbs)
Finish		: Nickel Plated
MTBF[13]		: 70000 hours
Standards	- EMC	: EN 55103-1:1996; E1, E2, E3 EN 55103-2:1996; E1, E2, E3
	- Safety	: IEC 60065:2001 (ed7) +A1:2005 +A2:2010
	- Mains harmonics	: EN 61000-3-2:2001
Certificates		: CE

Notes:

1. The device supports 2 analogue audio inputs and 8 digital CobraNet® inputs.
2. The device is equipped with 2 RJ-45 sockets for a redundant CobraNet® connection.
3. Various signals can be routed to the 8 CobraNet® transmit channels, see section 'DSP block diagram' for details.
4. A-weighed, 10 to 22k Hz analyzer bandwidth, open input, 50 Ω load.
5. Devices with early serial numbers are equipped with 64 Mb SDRAM, this halves the maximum available delay times.
6. The device can either be accessed over RS-485 or over Ethernet by using the CobraNet® Serial Bridge protocol. The interfaces cannot be used simultaneously.
7. Maximum number that can be connected to one subnet, multiple subnets can be controlled by one host PC. This also applies when accessing over the CobraNet® Serial Bridge.
8. All Phoenix type numbers refer to the required cable parts, a complete set of Phoenix connectors is supplied with the product.
9. For solid and stranded wires with conductor cross sections from 0.14 to 1.5 mm^2.
10. For volt-free operation CO is connected to NC if the device is powered and the status is OK (no masked failure).
11. For solid and stranded wires with conductor cross sections from 0.2 to 2.5 mm^2.
12. Typical values, valid for nominal operating temperature of the amplifier.
13. At ambient temperature of 20 °C.

3. PB-400-CN measurement plots

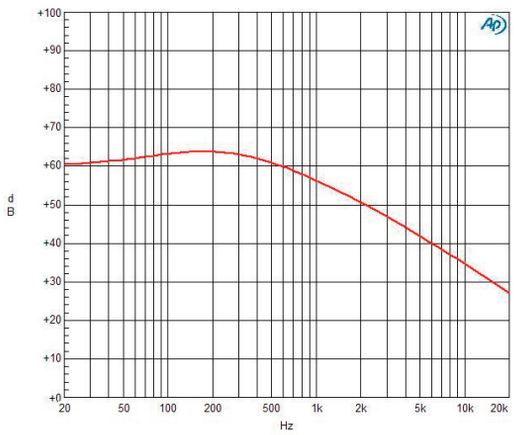


Fig 1 CMRR versus frequency.

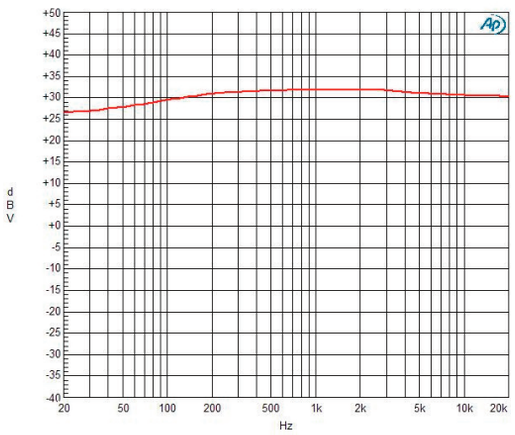


Fig 2 Magnitude vs frequency, 50 Ω loaded, 40 V_{rms} out @ 1k Hz.

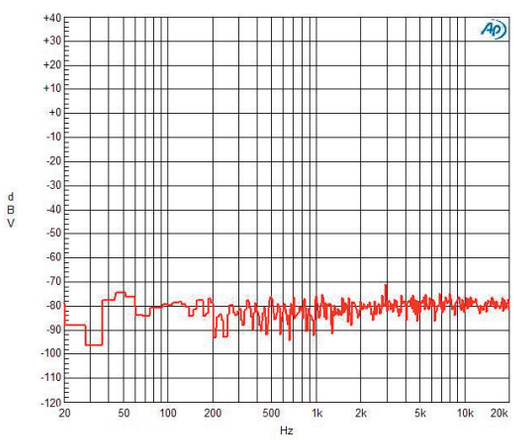


Fig 3 FFT of residual noise with input 1 active (shorted), 50 Ω load.

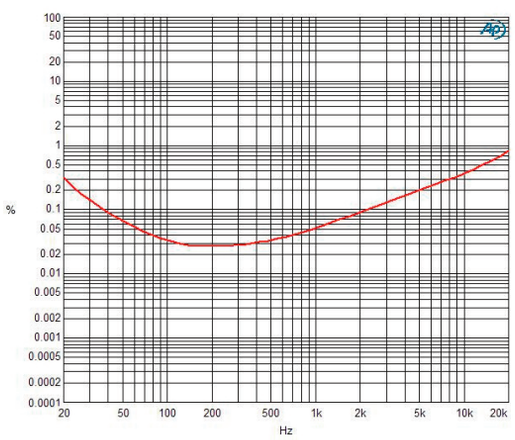


Fig 4 THD+N vs frequency, 50 Ω load, 50 V_{rms} output level (@ 1k Hz).

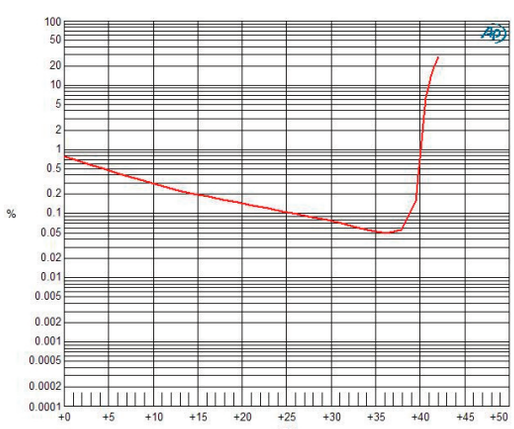


Fig 5 THD+N vs output level, 1k Hz, 50 Ω load, output limiters not active.

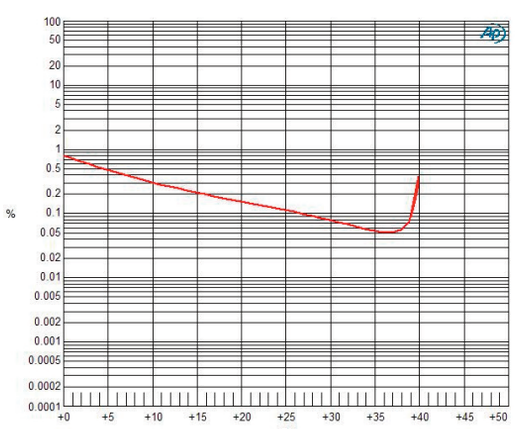
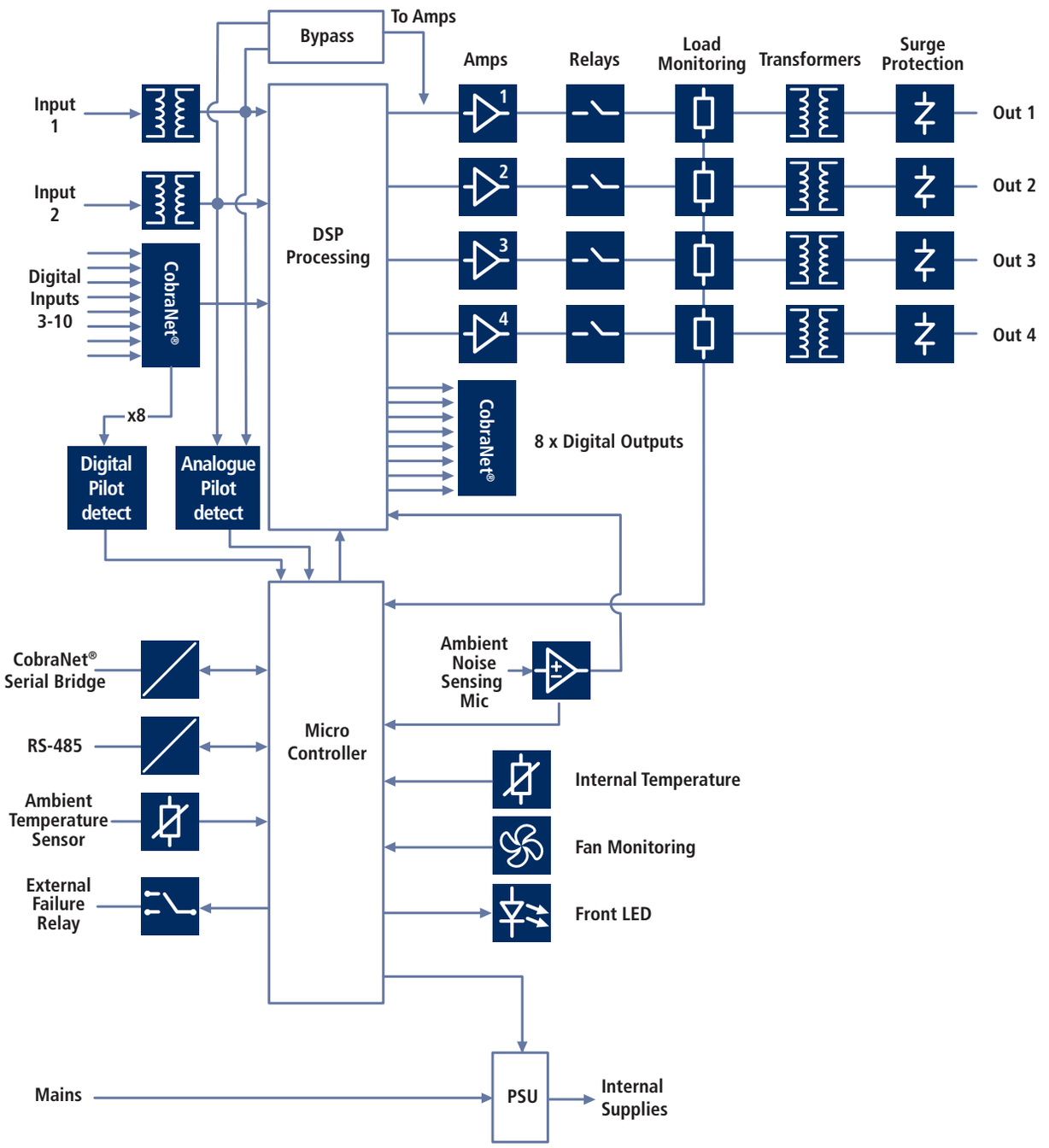


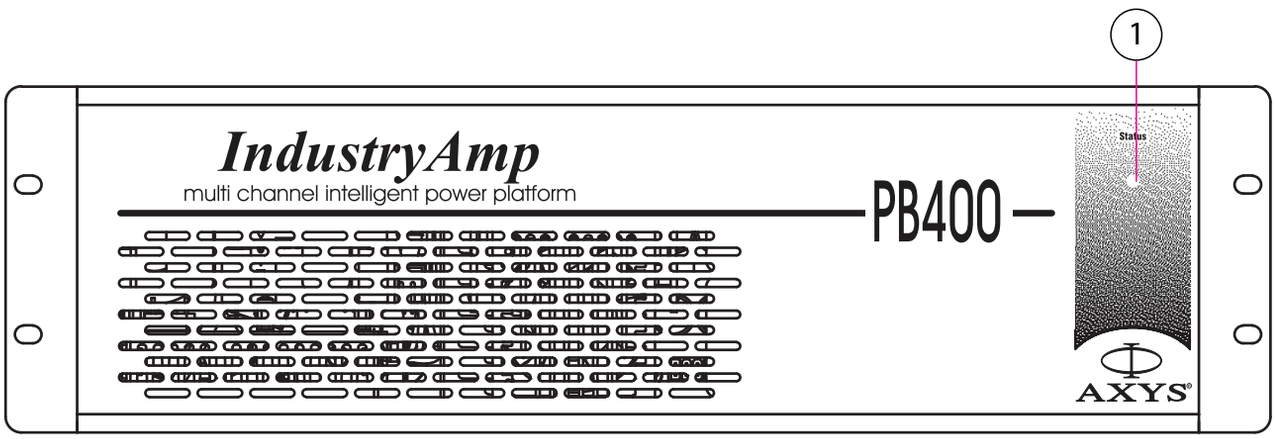
Fig 6 THD+N vs output level, 1k Hz, 50 Ω load, output limiters with default params.

4. **Functional Diagram** (part number 590403)

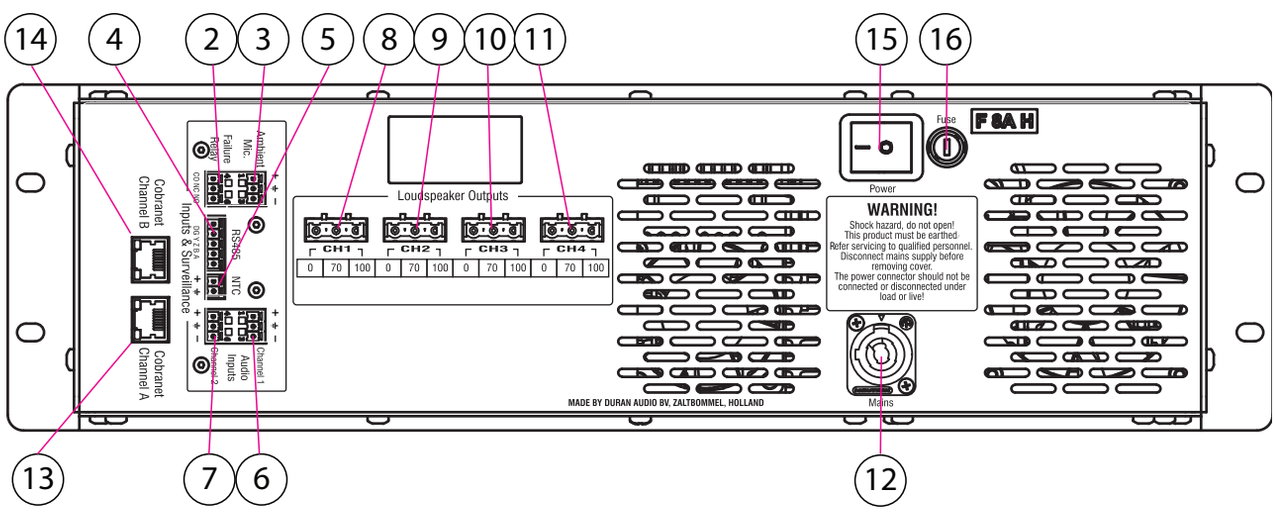


5. **Mechanical Details** (part number 590403)

Front Panel

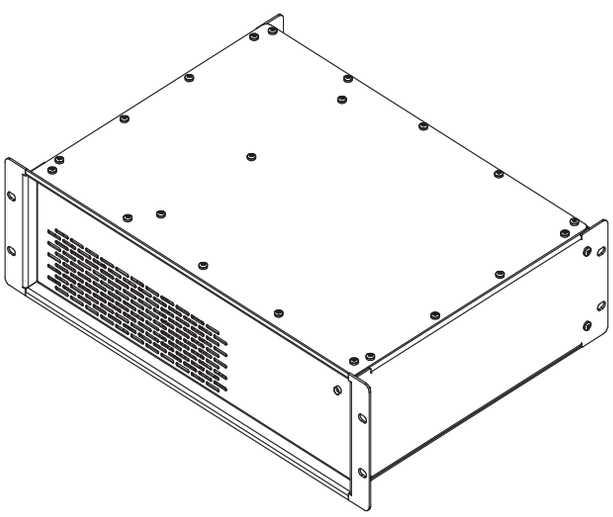


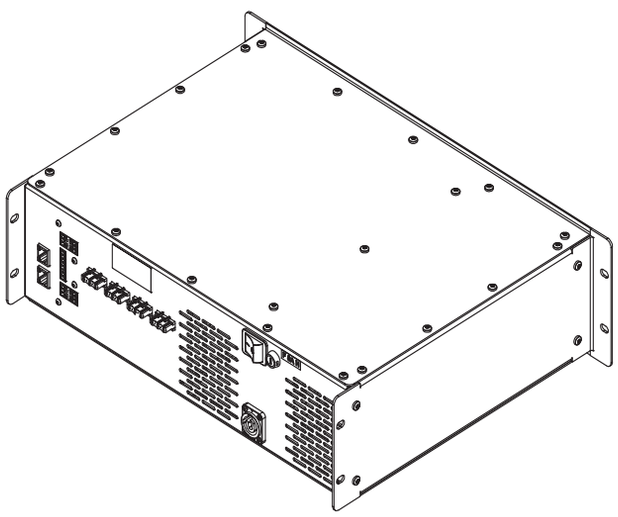
Rear Panel

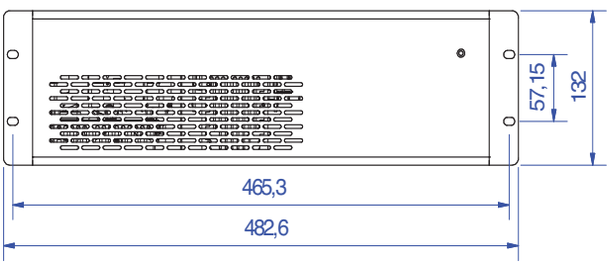


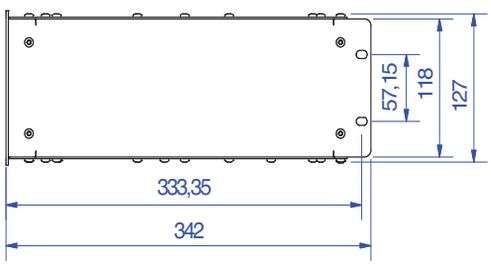
1. Status LED – bi-colour LED: normal (green), failure (red)
2. Failure relay connector
3. ANS microphone input
4. RS-485 network interface
5. Ambient temperature sensor connector
6. Analogue input 1
7. Analogue input 2
8. Output 1 (100 V / 70 V)
9. Output 2 (100 V / 70 V)
10. Output 3 (100 V / 70 V)
11. Output 4 (100 V / 70 V)
12. Mains power connector
13. CobraNet® Port A
14. CobraNet® Port B
15. Mains switch
16. Mains fuse

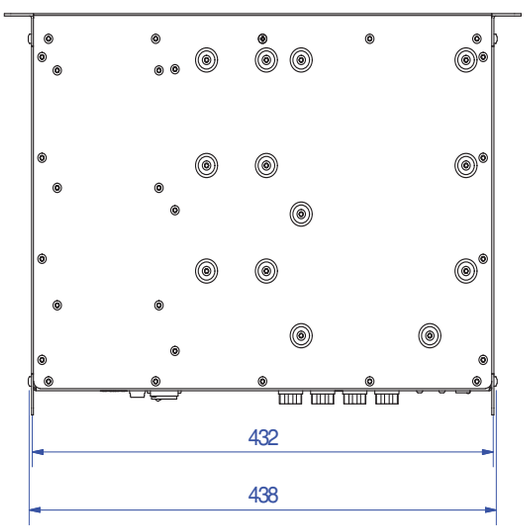
5. **Mechanical Details** (part number 590403)



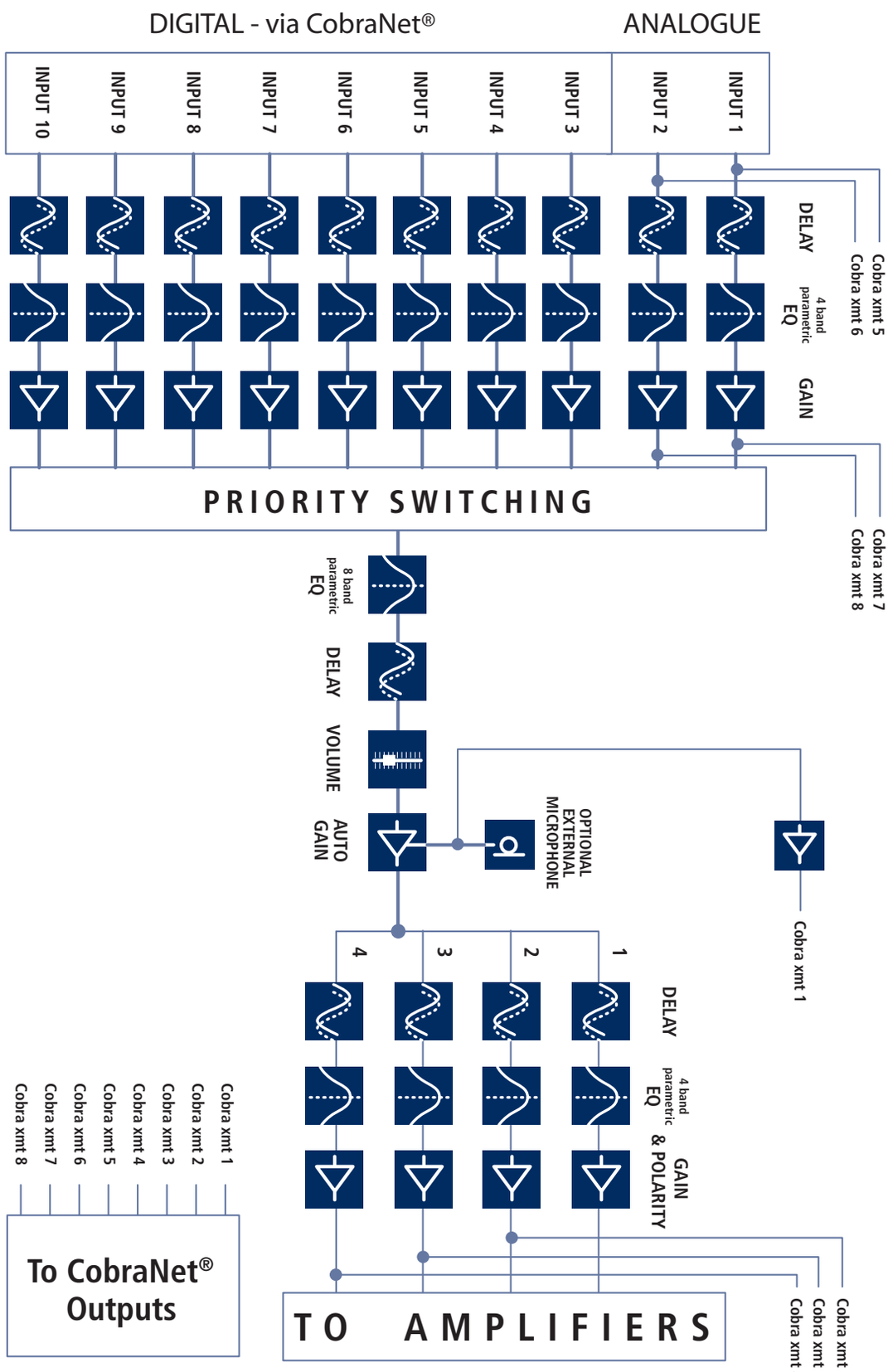








6. DSP Block Diagram



7. Optional Accessories

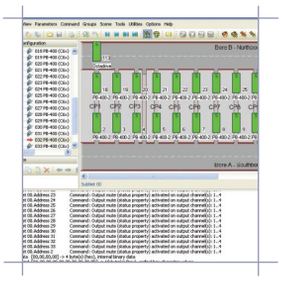
Ambient Noise Microphone
and Temperature Sensor
Order code: 97661101



USB-RS485 converter
Includes
Wincontrol and Drivers
Order code: 387802



WinControl Server
Order code: 386600





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