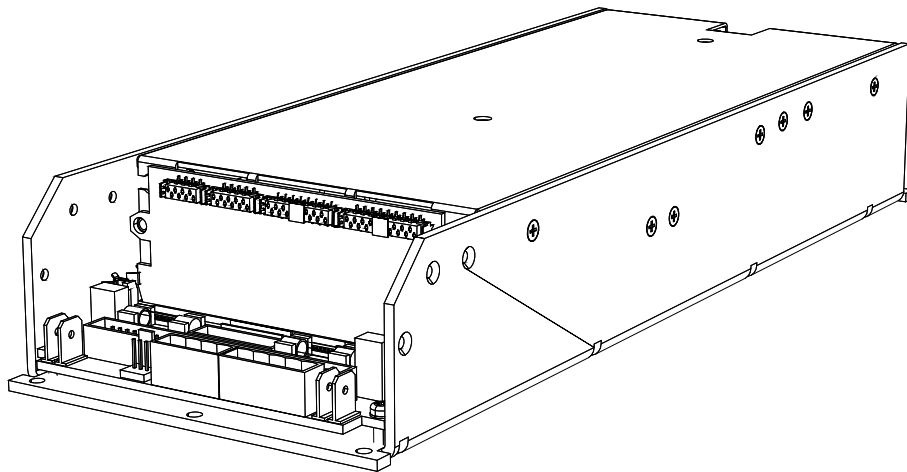


IpaMod



USER GUIDE

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Data are subject to change without notice.
For latest update please refer to the
online version available on www.powersoft-audio.com.

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Important safety instructions

This amplifier module is intended to be installed inside other devices and must be checked in the final product.


EXPLANATIONS OF GRAPHICAL SYMBOLS


 The triangle with the lightning bolt is used to alert the user to the risk of electric shock.

 The triangle with the exclamation point is used to alert the user to important operating or maintenance instructions.

 The CE-mark indicates the compliance with the low voltage and electromagnetic compatibility.


 Symbol for earth/ground connection.


 Symbol for conformity with Directive 2002/96/EC and Directive 2003/108/EC of the European Parliament on waste electrical and electronic equipment (WEEE).

 Symbol for electrostatic discharge sensitive devices.



1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this equipment near water.
6. Do not block any ventilation openings. Install in accordance with Powersoft's instructions.
7. Do not install near any heat sources such as radiators, heat registers, stover or other apparatus that produce heat.
8. Do not defeat the safety purpose of the polarized or grounding-type plug.
9. Only use attachments/accessories specified by Powersoft.
10. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.







 **WARNING: TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT ATTEMPT TO OPEN ANY PART OF THE UNIT. NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.**

 **DO NOT EXPOSE THIS EQUIPMENT TO RAIN OR MOISTURE, DRIPPING OR SPLASHING LIQUIDS. OBJECTS FILLED WITH LIQUIDS, SUCH AS VASES, SHOULD NOT BE PLACED ON THIS APPARATUS.**

Importantes instructions de sécurité


Ce module d'amplification est destiné à être installé à l'intérieur d'autres dispositifs et doit donc être contrôlé sur le produit fini.


EXPLICATION DES SYMBOLES GRAPHIQUES

-  La triangle avec le symbol du foudre est employée pour alerter l'utilisateur au risque de décharge électrique.
-  Le triangle avec un point d'exclamation est employée pour alerter l'utilisateur d'instruction importantes pour lors opérations de maintenance.
-  Le marquage CE indique la conformité à la directive de basse tension et la compatibilité électromagnétique.
-  Symbole pour la connexion à la terre.
-  Symbole pour la conformité al la Directive 2002/96/EC et la Directive 2003/108/EC du Parlement Européen sur les équipements électriques et électroniques (WEEE).
-  Symbole pour les appareils sensibles aux décharges électrostatiques.



1. Lisez ces instructions.
2. Gardez ces instructions.
3. Tenez compte de toutes les mises en garde.
4. Suivez toutes les instructions.
5. N'utilisez pas cet amplificateur à proximité de l'eau.
6. Assurez-vous d'une bonne ventilation de l'appareil. Installez en accord avec les instructions préconisées par Powersoft.
7. N'installez pas l'appareil à proximité de sources de chaleur ou d'autres appareils produisant de la chaleur.
8. Respectez le dispositif de mise à la terre de la prise secteur.
9. Utilisez uniquement les accroches et accessoires spécifiés par Powersoft.
10. Confiez toute réparation à un technicien qualifié. L'intervention d'un technicien est nécessaire dans les cas suivants : le cordon d'alimentation ou la prise secteur sont endommagés, des corps étrangers ou du liquide se sont introduits dans l'appareil, l'appareil a été exposé à la pluie ou à l'humidité, l'appareil montre des signes de dysfonctionnement ou est tombé.







 **MISE EN GARDE : AFIN DE RÉDUIRE LES RISQUES DE CHOC ÉLECTRIQUE, N'ESSAYEZ PAS D'OUVRIR L'UNITÉ, MEME EN PARTIE. AUCUNE PIÈCE A L'INTERIEUR NE PEUT ETRE CHANGÉE PAR L'UTILISATEUR. LAISSEZ L'ENTRETIEN A UN PERSONNEL QUALIFIÉ.**

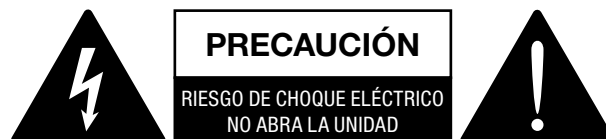
 **NE PAS EXPOSER CET APPAREIL A LA PLUIE OU A L'HUMIDITÉ, AUX GOUTTES OU AUX ÉCLABOUSSURES. LES OBJETS REMPLIS DE LIQUIDE, TELS QUE LES VASES, NE DOIVENT PAS ETRE PLACÉS SUR CET APPAREIL.**

Instrucciones de seguridad importantes


Este módulo amplificador está diseñado para ser instalado dentro de otros dispositivos y debe verificarse en el producto final.


EXPLICACIÓN DE LOS SÍMBOLOS GRÁFICOS

-  El triángulo con el símbolo de rayo eléctrico es usado para alertar al usuario de el riesgo de un choque eléctrico.
-  El triángulo con el signo de admiración es usado para alertar al usuario de instrucciones importantes de operación o mantenimiento.
-  La marca CE indica el cumplimiento de la directiva de bajo voltaje y de compatibilidad electromagnética.
-  Símbolo de la conexión a tierra.
-  Símbolo de conformidad con la Directiva 2002/96/EC y Directiva 2003/108/EC del Parlamento Europeo sobre los aparatos eléctricos y electrónicos (WEEE).
-  Símbolo para los dispositivos sensibles a descargas electrostáticas.



1. Lea estas instrucciones.
2. Guarde estas instrucciones.
3. Preste atención a todas las advertencias.
4. Siga todas las instrucciones.
5. No use este aparato cerca del agua.
6. No bloquee las aberturas de ventilación. Realice la instalación de acuerdo con las indicaciones de Powersoft.
7. No instale cerca ninguna fuente de calor como, por ejemplo, radiadores, rejillas de calefacción, hornos u otros aparatos que produzcan calor.
8. No elimine el diseño de seguridad del enchufe, ya sea del tipo polarizado o con conexión a tierra.
9. Use exclusivamente los dispositivos/accesorios indicados por Powersoft.
10. El servicio técnico debe realizarlo siempre personal cualificado. Se requerirá servicio de asistencia técnica cuando el aparato sufra algún tipo de daño como, por ejemplo, que el cable de alimentación o el enchufe estén dañados, que se haya derramado líquido o hayan caído objetos dentro del aparato, que éste se haya expuesto a la lluvia o humedad, que no funcione normalmente o que se haya caído.


 **PRECAUCIÓN: PARA REDUCIR EL RIESGO DE DESCARGA ELÉCTRICA, NO DESMONTE LA TAPA (NI EL PANEL TRASERO). NO HAY PIEZAS REPARABLES POR EL USUARIO EN EL INTERIOR. LLÉVELO A REPARAR A PERSONAL DE SERVICIO CUALIFICADO.**


 **NO EXPONGA ESTE UNIDAD A LA LLUVIA O LA HUMEDAD, GOTE O SALPICADURAS. NO COLOQUE OBJETOS LLENOS DE LÍQUIDOS, TALES COMO VASIJAS, SOBRE EL APARATO.**


Importanti istruzioni di sicurezza


Questo modulo amplificatore è destinato ad essere installato dentro altri dispositivi e deve quindi essere controllato nel prodotto finito.


SPIEGAZIONE DEI SIMBOLI GRAFICI


 Il triangolo con il lampo è utilizzato per avvisare l'utente del rischio di scossa elettrica.

 Il triangolo con il punto esclamativo è utilizzato per avvisare l'utente di importanti istruzioni d'uso e manutenzione.

 The CE-mark indicates the compliance with the low voltage and electromagnetic compatibility.

 Simbolo della connessione di terra.

 Simbolo di conformità alla Direttiva 2002/96/CE e alla Direttiva 2003/108/CE del Parlamento Europeo sulle apparecchiature elettriche ed elettroniche (RAEE).


 Simbolo per le apparecchiature sensibili alle scariche elettrostatiche




L'elettricità viene usata per svolgere molte funzioni utili, ma può anche causare danni personali o agli oggetti se applicata in modo improprio. Questo prodotto è stato progettato e realizzato con la massima attenzione alla sicurezza. Tuttavia, UN USO IMPROPRIO PUÒ PRODURRE SCOSSE ELETTRICHE E/O INCENDI. Per evitare potenziali pericoli, osservare le seguenti istruzioni durante l'installazione, l'utilizzo e la pulizia del prodotto. Per garantire la sicurezza e prolungare la vita utile del monitor LCD, leggere attentamente le seguenti precauzioni prima di usare il prodotto.

Importanti istruzioni di sicurezza

1. Leggere queste istruzioni.
2. Conservare le istruzioni.
3. Tenere conto di tutti gli avvisi.
4. Seguire tutte le istruzioni.
5. Non usare l'apparecchio in prossimità di acqua.
6. Non ostruire le prese di ventilazione. Installare secondo le indicazioni del produttore.
7. Non installare vicino a fonti di calore quali radiatori, bocchette dell'aria calda, stufe o altri apparecchi (compresi gli amplificatori) che producono calore.
8. Non compromettere la sicurezza delle spine polarizzate o con messa a terra.
9. Usare solo accessori specificati dal produttore.
10. Ricorrere a personale qualificato per qualsiasi intervento. Tali interventi sono necessari in caso di guasti dell'apparecchio quali danneggiamento del cavo di alimentazione o della spina, versamento di liquidi o caduta di oggetti nell'apparecchio, esposizione a pioggia o umidità o se l'apparecchio non funziona normalmente o è caduto.

 **ATTENZIONE: PER RIDURRE IL RISCHIO DI SCOSSE ELETTRICHE, NON TENTARE DI APRIRE ALCUNA PARTE DELL'UNITÀ. NON CI SONO PARTI INTERNE AD USO DELL'UTENTE. RIVOLGERSI A PERSONALE QUALIFICATO PER L'ASSISTENZA.**

 **NON ESPORRE QUESTO APPARECCHIO ALLA PIOGGIA, UMIDITÀ O SOSTANZE LIQUIDE. OGGETTI PIENI DI LIQUIDI, COME VASI, NON DEVONO ESSERE COLLOCATI SU QUESTO APPARATO.**

Regulatory information

FCC COMPLIANCE NOTICE

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

CAUTION: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- ▶ Reorient or relocate the receiving antenna.
- ▶ Increase the separation between the equipment and receiver.
- ▶ Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- ▶ Consult the dealer or an experienced radio/TV technician for help.

WEEE DIRECTIVE

If the time arises to throw away your product, please recycle all the components possible.



This symbol indicates that when the end-user wishes to discard this product, it must be sent to separate collection facilities for recovery and recycling. By separating this product from other household-type waste, the volume of waste sent to incinerators or land-fills will be reduced and natural resources will thus be conserved.

The Waste Electrical and Electronic Equipment Directive (WEEE Directive) aims to minimise the impact of electrical and electronic goods on the environment. Powersoft S.p.A. comply with the Directive 2002/96/EC and 2003/108/EC of the European Parliament on waste electrical and electronic equipment (WEEE) in order to reduce the amount of WEEE that is being disposed of in land-fill site. All of our products are marked with the WEEE symbol; this indicates that this product must NOT be disposed of with other waste. Instead it is the user's responsibility to dispose of their waste electrical and electronic equipment by handing it over to an approved reprocessor, or by returning it to Powersoft S.p.A. for reprocessing. For more information about where you can send your waste equipment for recycling, please contact Powersoft S.p.a. or one of your local distributors.

EC DECLARATION OF CONFORMITY

Manufacturer:
Powersoft S.p.A.
via E. Conti 5
50018 Scandicci (Fi)
Italy



We declare that under our sole responsibility the products:

Model Name: IpalMod

Intended use: Professional Audio Amplifier Module

Are in conformity with the provisions of the following EC Directives, including all amendments, and with national legislation implementing these directives:

- ▶ 2006/95/EC Low Voltage Directive
- ▶ 2004/108/EC Electromagnetic Compatibility Directive
- ▶ 2002/95/CE RoHS Directive

The following armonized standards are applied:

- ▷ EN 55103-1
- ▷ EN 55014-1
- ▷ EN 55022
- ▷ EN 61000-3-2
- ▷ EN 61000-3-3
- ▷ EN 61000-3-11
- ▷ EN 61000-3-12
- ▷ EN 55103-2
- ▷ EN 61000-4-2
- ▷ EN 61000-4-3
- ▷ EN 61000-4-4
- ▷ EN 61000-4-5
- ▷ EN 61000-4-6
- ▷ EN 61000-4-11
- ▷ EN 60065

Scandicci,
March 2002



Luca Lastrucci
Managing Director

For compliance questions only: compliance@powersoft.it

Electrostatic Discharge (ESD)

Electrostatic discharge (ESD) is one of the most significant factors leading to damage and failure of a wide variety of electronic components.

Poor handling can cause internal damage, which is invisible. This internal damage can then cause electrical failure or reliability problems.

 It is recommended that all workstations where Electrostatic Discharge Sensitive devices (ESDS) and assemblies are handled outside of full static protection packaging (i.e. within static control areas) should be provided with some form of ground conductive or dissipative flooring.

7:1.Welcome

Congratulations on your purchase of the Powersoft IpalMod module.

We know you are eager to use the IpalMod module, but please take a moment to read this user's manual and safety instructions. In case you have any questions, please do not hesitate to contact your dealer or Powersoft.

The IpalMod is a one channel amplifier modules specifically designed to drive high efficiency low-impedance loudspeakers: it integrates the Powersoft's patented Differential Pressure Control technology that optimizes sonic performances of the amplifier/transducer/cabinet/environment system and is specifically designed to fully exploit the potential of the IPAL compatible transducers.

The IpalMod shows amazing figures in terms of both output voltage ($180 V_{\text{peak}}$) and current capabilities ($110 A_{\text{peak}}$), being able to drive even the most demanding applications of selfpowered subwoofers and can be equipped with any Powersoft or third-party DSP solution.

The new design of the power supply equipped with PFC, reduces power consumption while enhancing reliability and consistency in all operating conditions.

7:2.Unpacking & checking for shipping damage

Your Powersoft product has been completely tested and inspected before leaving the factory. Carefully inspect the shipping package before opening it, and then immediately inspect your new product. If you find any damage notify the shipping company immediately.

7:3.Disposal of the packing material

The transport and protective packing has been selected from materials which are environmentally friendly for disposal and can normally be recycled.

Rather than just throwing these materials away, please ensure they are offered for recycling.

7:4.Differential Pressure Control

The Differential Pressure Control – DPC – is the core technology of the Integrated Powered Adaptive Loudspeaker system, also known as IPAL.



DPC makes IPAL systems efficient and reactive to the environment condition, overcoming the physical limitation of traditional sound reinforcement systems.

The differential pressure measurement, senses the difference of pressure between the front and the rear sides of the radiating diaphragm and uses this information to alter the behavior of the transducer, according to the real boundary conditions. Thanks to this innovative approach to full boundary conditions feedback processing, the IPAL system dramatically improves the electroacoustic efficiency in terms of high SPL and sonic performance of the sound reinforcement system.

The IPAL system combines a high-efficient transducer with a high-power switching mode amplifier that embed a fast and effective ZeroLatency™ DSP. The DSP performs the double operation of both managing the loudspeaker processing and taking care of the differential pressure control signal. IPAL establish a global feedback between the electrical and the acoustic domains.

Thanks to the rich graphic user interface – GUI – it is possible to weight and customize the feedback between the electrical and the acoustic domains. Two operating modes are available: Virtual Transducer and Pressure modes.

7:4.1.Virtual Transducer mode

The Virtual Transducer mode is based on the principle of virtual loudspeaker emulation: once defined the desired reference loudspeaker model (speaker designers can synthesize any desired driver using the GUI to set the Thiele-Small parameters) the IPAL achieves a very predictable and stable electromechanical structure. The actual loudspeaker will behave as the emulated virtual transducer, regardless to aging, power compression and parameters drift, thanks to the closed feedback loop that adaptively aligns the performance of the system to the desired ones.

7:4.2.Pressure mode

The Pressure mode relies on the DPC making it possible to match a specific target pressure response. Being the SPL output of any acoustic signal derived from the relationship between the pressure and the acoustical impedance, it's straightforward to use a direct measurement of such a pressure signal to make the system track a reference target pressure model. Benefits in terms of predictability of the system response and reduction of sensitivity from disturbing effects could be substantially appreciated.

Thermal constrains

This device must be correctly heatsinked for proper and reliable operation.

The built-in fans and an appropriate external passive heat sink guarantee by design thermal efficiency and reliability.

Proper heatsink planarity is strongly suggested to allow thermal transfer from the module's bottom plate to the heatsink; a thermal compound may be used, but it is not strictly necessary.

In order to ensure proper ventilation of the module, reasonable spacing of at least 100 mm must be left between the frame of the unit and any side component or surface of the enclosure.

The module has been designed to fit into a loudspeaker cabinet: please refer to [FIGURE 1](#) for proper module placing.

IN [FIGURE 1](#) HEATSINK FINS ARE SET HORIZONTALLY (WRONG!) ONLY FOR DESCRIPTIVE PURPOSE.

All configuration showed in [FIGURE 1](#) are viable for proper module placing and cooling. We suggest to position the module vertically with respect the ground in order to take advantage of the chimney effect for ventilation and heat dissipation.

In [FIGURE 1.a](#) the module and the loudspeakers share the same room into the cabinet. This is the default placement solution: it allows good ventilation because of woofer diaphragm movement and high air volume; be aware of magnetic field interaction: place the module far enough from loudspeakers magnet in order to prevent fans blockage.

[FIGURE 1.b](#) shows the more efficient cooling configuration, even if it is less effective against dust and moisture that can get into the module. By allowing external air flow, it is possible to reduce the fins width on the heatsink by maintaining good cooling performances.

8:1.Heatsink performance

Here we suggest a rule of thumb to calculate the thermal resistance of the heatsink.

The absolute thermal resistance of the heatsink is the temperature difference (kelvin or celsius) across it structure when a unit of heat energy flows through it in unit time (watt). For seek of simplicity, a heatsink with low thermal resistance offers high heat dissipation, as well as a low electric resistance allows high current flow through a conductive wire.

In order to define the maximum allowed thermal resistance for the heatsink let assume the following:

- ▶ e as the amp module efficiency
- ▶ cf as the crest factor of the audio signal
- ▶ W_{max} as the peak power delivered by the module
- ▶ T_{amb} as the highest ambient temperature
- ▶ T_{mod} as the highest operating temperature

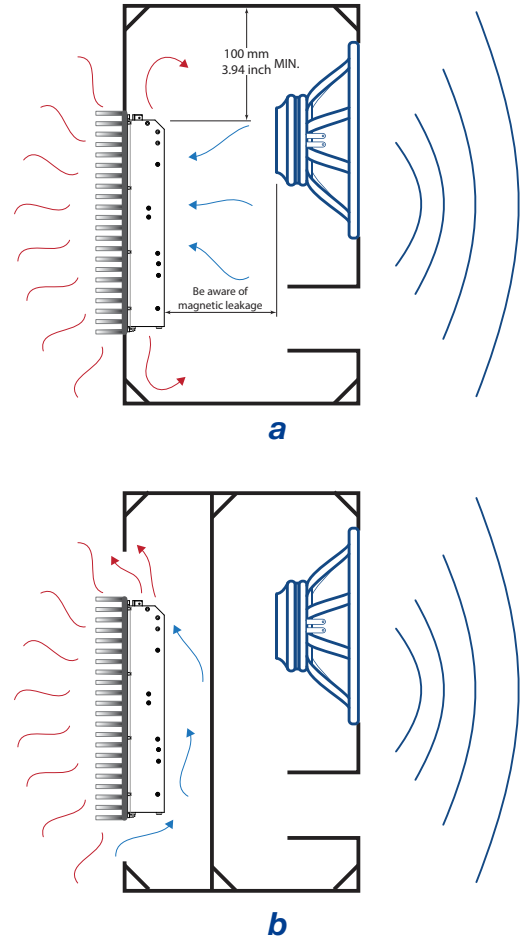


FIGURE 1: Cooling solutions (for descriptive purpose the heatsink fins are set in wrong direction);
 a) Module and loudspeaker into the same chamber;
 b) Module in a separate vented chamber.

The thermal resistance of the heatsink derives from the following formula:

$$R_{th} = \frac{T_{mod} - T_{amb}}{\text{Dissipated power}}$$

The maximum dissipated power can be calculated as:

$$\text{Dissipated power} = \frac{W_{max} (1 - e)}{cf}$$

For example, stating an efficiency of 80%, 6 dB crest factor and 3400 W peak power, the dissipated heat is:

$$\frac{3400 (1 - 0.8)}{4} = 170 \text{ W}$$

Considering that thermal protection of the module (T_{mod}) is set at 75°C (167°F) on the bottom aluminium plate and stating an ambient temperature of 45 °C (113°F), the previous example gives:

$$\frac{75 - 45}{170} = 0.14^{\circ}\text{C/W}$$

meaning that the temperature of the bottom plate is always lower than 75°C if the heatsink has a thermal resistance better than 0.14°C/W (or 0.14 K/W) with ambient temperature up to 45 °C.

8:2.Suggested heatsink

Powersoft provides an IpalMod compatible aluminium alloy heatsink, specifically designed to house the amp module, an input/output interface and the AC mains connection

(for further information, please refer to the DigiMod IK user guide, available on Powersoft website).

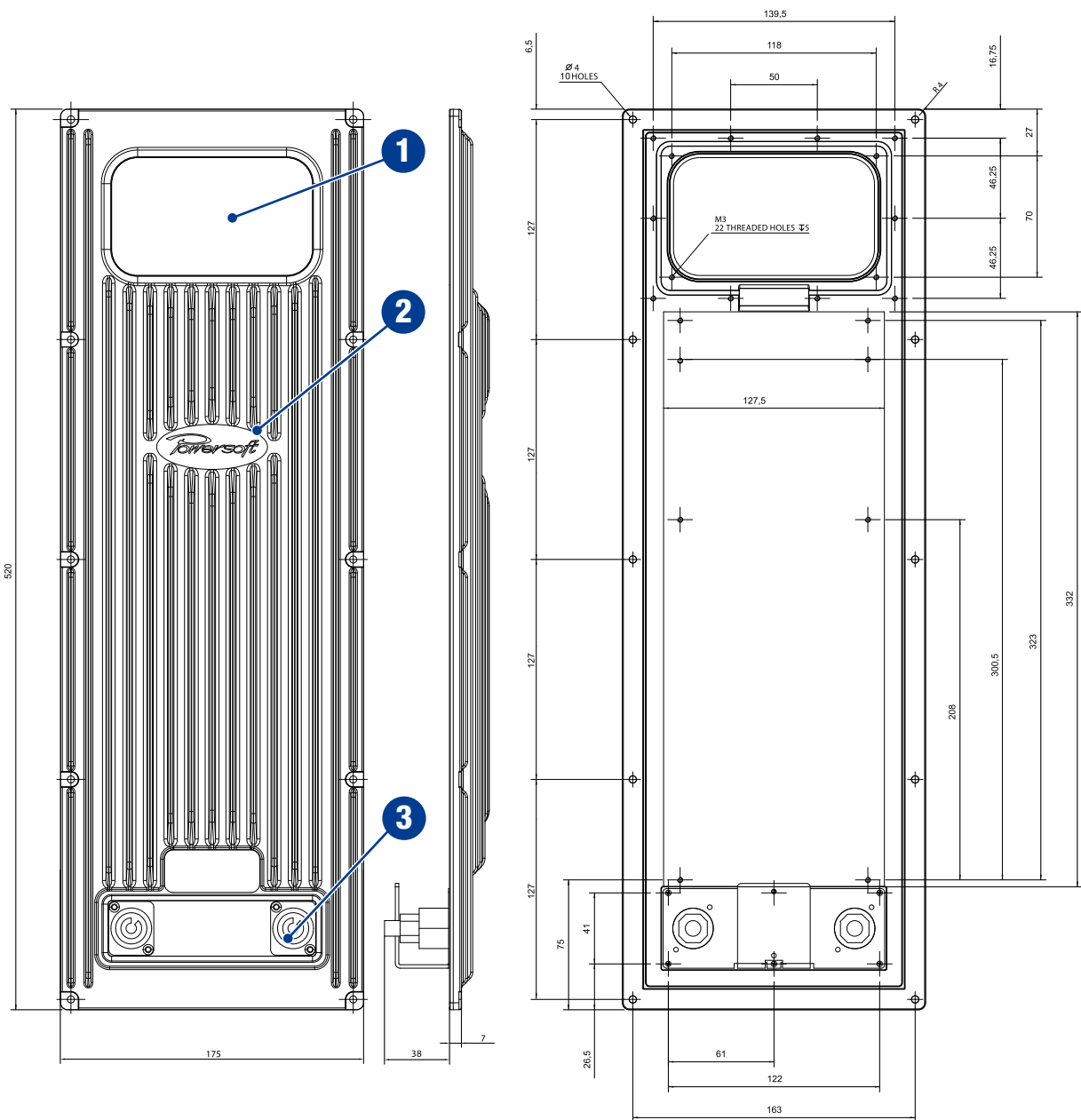



FIGURE 2: Aluminium alloy heatsink with I/O interface bay: 1. I/O interface bay (not compatible with IPAL DPC programming interface); 2. Heatsink; 3. AC mains interface.

Electromagnetic Compatibility (EMC)

9:1.AC MAIN filter

 In order to improve the electromagnetic compatibility an EMC filter must be inserted before the AC MAINS plugs on the power supply. Powersoft suggests the Schaffner FN2030-10-06 model.

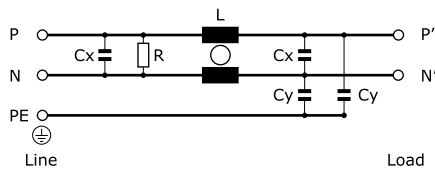



FIGURE 3: Typical electrical schematic of the EMI Filter.

9:2.Earth connection

 This device must be powered exclusively by earth connected mains sockets in electrical networks compliant to the IEC 364 or similar rules. Is absolutely necessary to verify this fundamental requirement of safety and, in case of doubt, require an accurate check by a qualified personal.

Is absolutely necessary to ground this device using the proper earth connection on the metal frame of the chassis; use M4 nut and bolt with proper split washer – grover washer – to secure the earth terminal lug.

9:3.Cabling

Wiring between the amp module and the load may lead to radio frequency noise. The following guide lines should be observed:

- ▶ reduced cabling length is advisable;
- ▶ keep cable pairs as close as possible to each other in order to minimize the antenna effect;
- ▶ design the cabling path far from RF noise source;
- ▶ set the cabling for RF noise rejection: shielded or twisted cables are advisable configuration (ref. FIGURE 5);
- ▶ use electromagnetic compatible connectors.

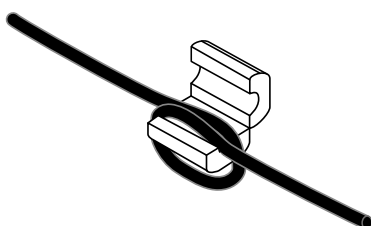


FIGURE 4: Ferrite core installation on I/O wirings.

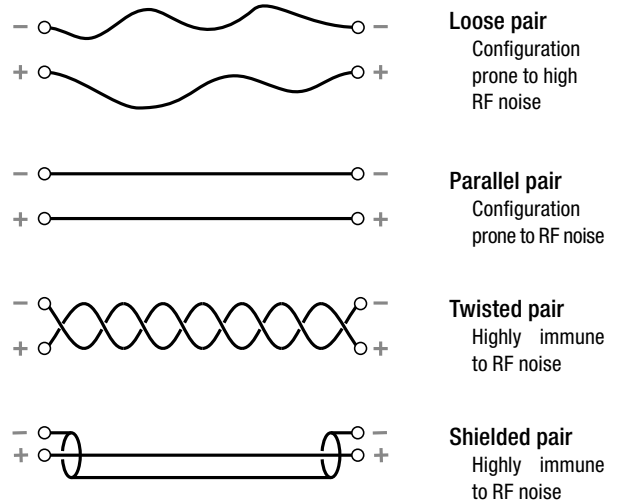


FIGURE 5: Cabling configuration.

9:4.Ferrite cores

Reject RF noise from input and output cabling by installing ferrite shields. Powersoft suggests the Kitagawa RFC-H13 ferrite core.

Wrap the cable around one side of each ferrite so that it pass through each ferrite twice (ref. FIGURE 4). Install the ferrite shield as close as possible to where the cable plug into the amplifier. Placing the ferrite elsewhere on the cable noticeably reduces its effectiveness.

9:5.Chassis shielding

If not already present on the product, a full body metal chassis or a shielding cage will provide best shielding of RF emission. In order to achieve the highest shielding, minimize the amount and size of holes or opening in the chassis.

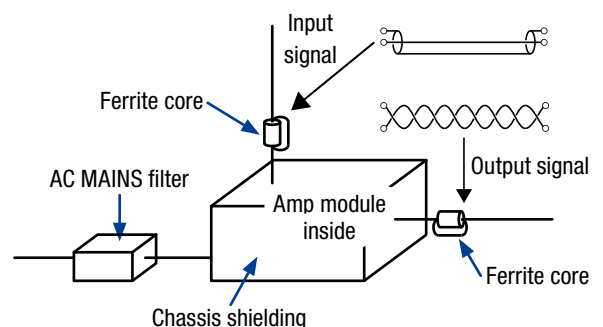


FIGURE 6: Tools and best practice for improving the electromagnetic compatibility.

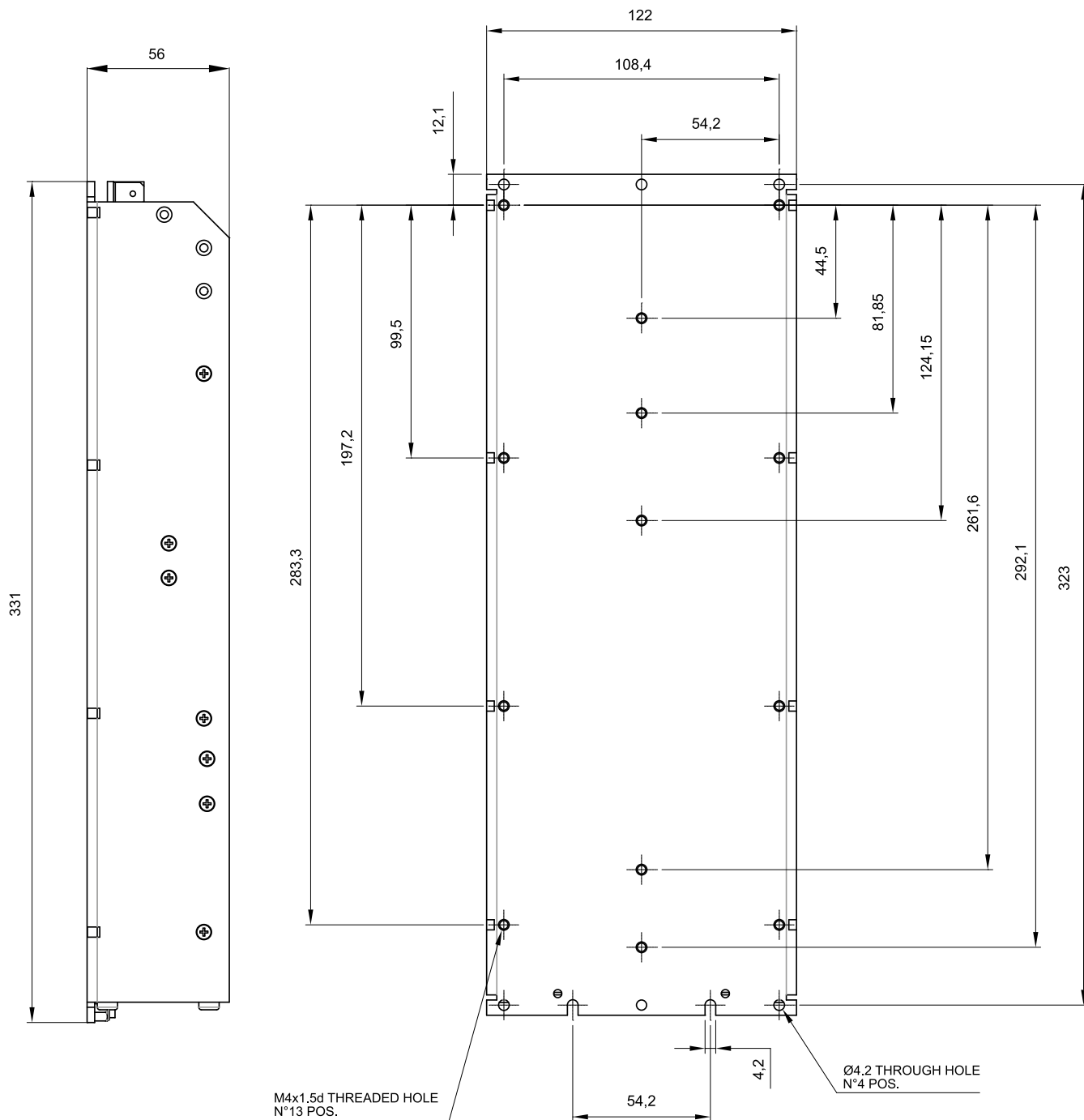


FIGURE 7: IpalMod: side and back plate (all dimensions in millimeters).

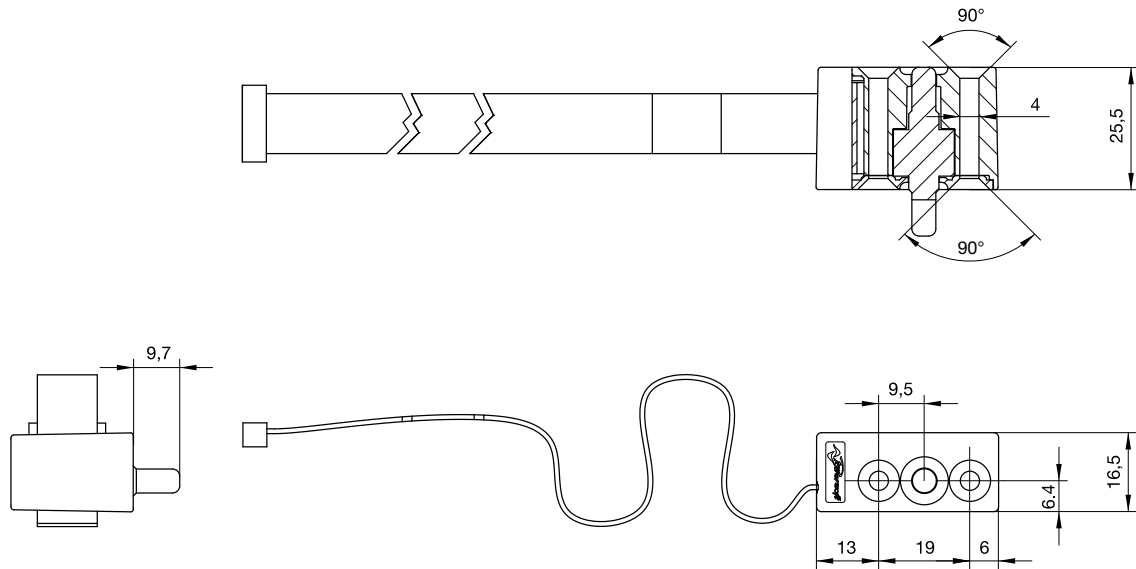


FIGURE 8: Pressure sensor (all dimensions in millimeters)

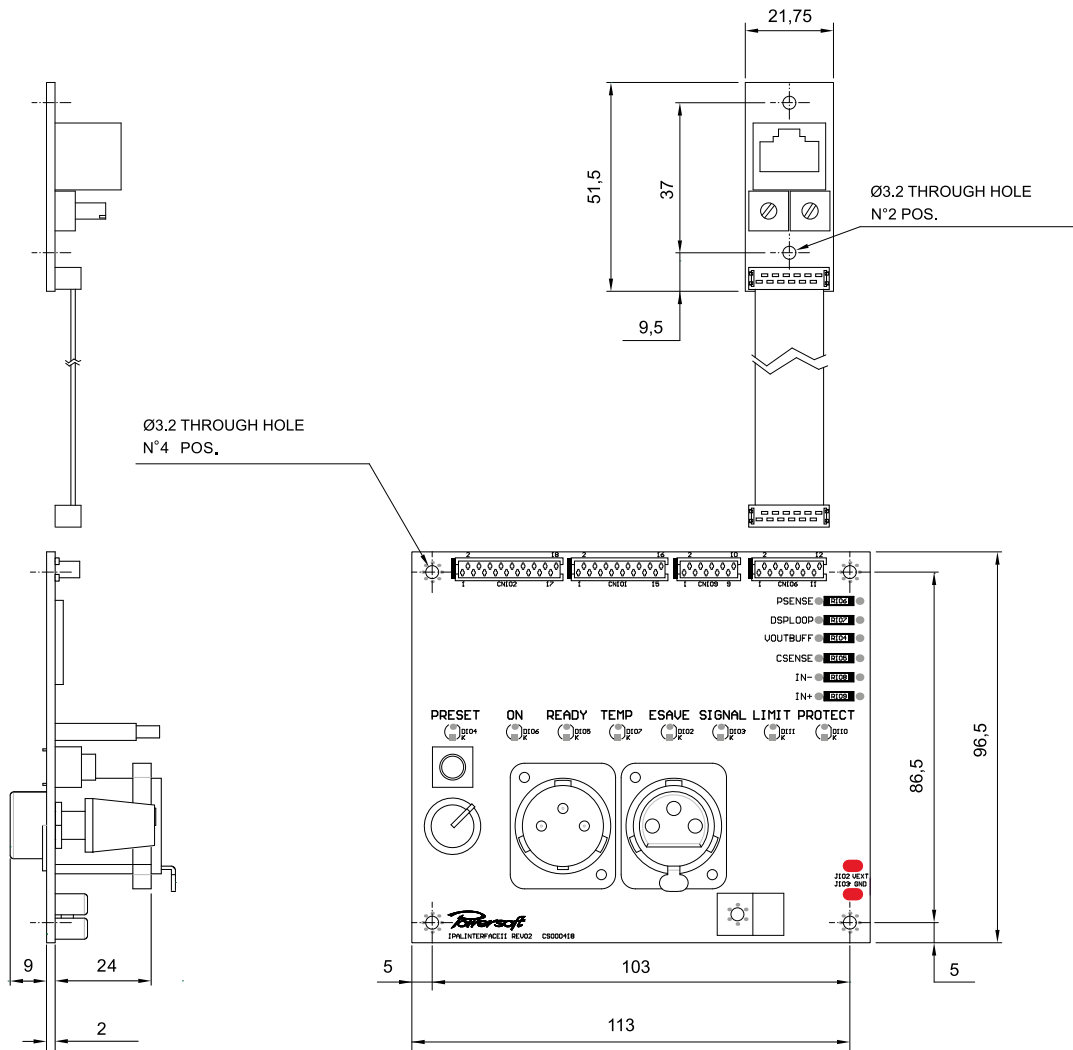


FIGURE 9: DPC interface board (all dimension in millimeters).

Connections

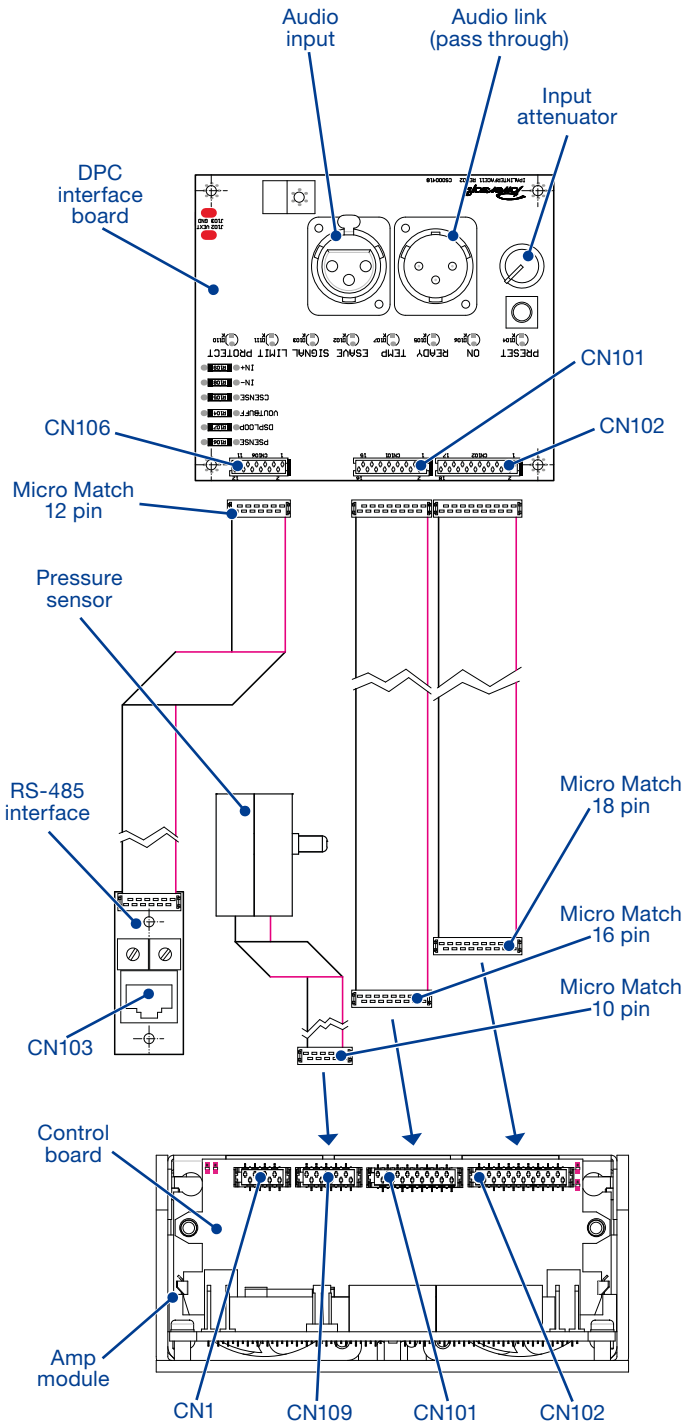


FIGURE 10: DPC interface to control board connections.

11:1. Interface board: bill of connectors

CODE	FUNCTION	TYPE
CN107	Audio link (pass through) balanced	XLR-M
CN108	Audio input balanced	XLR-F

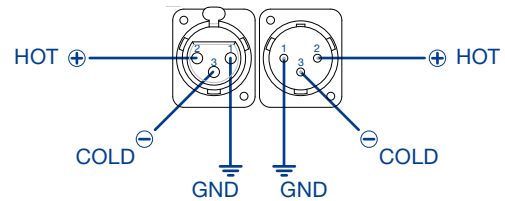


FIGURE 11: XLR pinout.

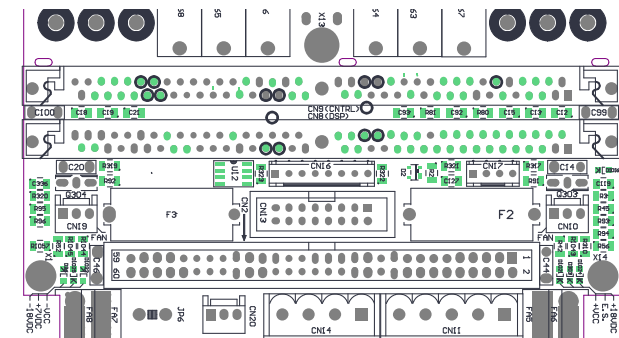
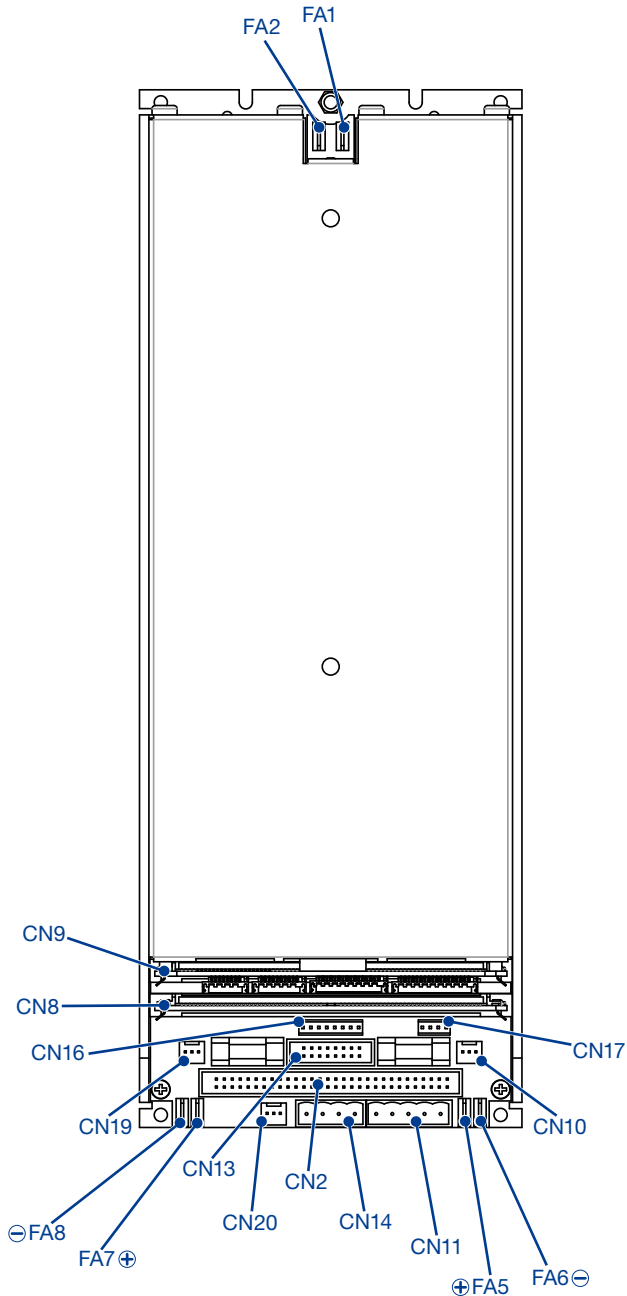
11:2. RS-485 interface

CODE	FUNCTION	TYPE
CN103	RS-485	RJ45
SW101	ID selector: units	rotative knob
SW101	ID selector: tens	rotative knob

11:3. Control board: bill of connectors

CODE	FUNCTION	TYPE
CN1	Reserved	8 pin Micro Match Socket
CN109	Pressure sensor	10 pin Micro Match Socket
CN101	Interface board 1	16 pin Micro Match Socket
CN102	Interface board 2	18 pin Micro Match Socket

Caution: do not connect any cable to the reserved CN1 connector on the IpalMod connection board: doing so can result in permanent module damage.



11:4.Amp module: bill of connectors

CODE	FUNCTION	TYPE
CN2	Power bus (reserved)	IDC 60 Pin Male Header
CN8	DSP/ext. circuit board	72-pin SIMM socket
CN9	Control board	72-pin SIMM socket
CN10	Built-in fan	Molex 22-27-2031
CN11	Input connector	MSTBVA 2,5/ 5-G-5,08
CN13	Test Connector (reserved)	IDC 20 Pin Male Header
CN14	Auxiliary	MSTBVA 2,5/ 4-G-5,08
CN16	System monitor	Pin Header Strip 2.54 mm
CN17	Bypass	Pin Header Strip 2.54 mm
CN19	Built-in fan	Molex 22-27-2031
CN20	Auxiliary fan	Molex 22-27-2031
CN8	DSP/ext. circuit board	72-pin SIMM socket
FA1 FA2	AC MAINS	2x Faston 6.3x0.8mm
FA5 FA7	Output Positive connector	2x Faston 6.3x0.8mm
FA6 FA8	Output Negative connector	2x Faston 6.3x0.8mm

11:4.1.CN11 pinout

Pin#	Name	IN	OUT	Description
1	GND	●		signal ground
2	HOT ⊕	●		bal/unbal input ⊕
3	COLD ⊖	●		balanced input ⊖
4	BY11		●	bypass unbalanced line out*
5	BY21	●		bypass unbalanced line in*

* Intended for external volume potentiometer: remove jumper in pins 3 and 4 of CN17 to insert external linear potentiometer, R = 1 kΩ to 2,7 kΩ (ref. [FIGURE 13](#)).

11:4.2.CN17 pinout

Pin#	Name	IN	OUT	Description
1	BY11		●	DSP/ext. circuit board
2	BY21	●		DSP/ext. circuit board
3	BY21		●	bypass
4	BY31	●		bypass

11:4.3.CN14 pinout

Pin#	Name	Description
1	GND	reference ground
2	MUTE	Mute command
3	Aux -12	-12 V _{DC} OUT
4	Aux +12	+12 V _{DC} OUT

* Intended for external volume potentiometer: remove jumper in pins 3 and 4 of CN17 to insert external linear potentiometer, R = 1 kΩ to 2,7 kΩ.

11:4.4.CN16 pinout

Pin#	Name	Description
1	Earect	input clipping
2	Protect	active protection
3	Temp	over temperature
4	Mute	signal mute
5	Aux +12	+12 V _{DC} OUT
6	GND	reference ground
7	NC	not connected
8	NC	not connected

11:4.5.CN10, CN19, CN20 pinout**

Pin#	Tension	Description
1	-24 V _{DC} OUT	Fan ⊖
2	+24 V _{DC} OUT	Fan ⊕
3	-24 V _{DC} OUT	Fan ⊖

** Maximum available current: 350 mA.

11:4.6.CN2 pinout

Pin#	Name	Description
1-2-3-4 5-6-7-8 9-10	+V _{CC}	+V _{CC} rail bus OUT
11-12-13	NC	not connected
14-15-16 17-18-19 20-21-22	-V _{CC}	-V _{CC} rail bus OUT
23-24	+18V _{DC}	+18V _{DC}
25-26	-18V _{DC}	-18V _{DC}
27-28	+7V _{DC}	+7V _{DC}
29	FAN	temperature controlled fan command
30	NC	not connected
31	MUTE	Mute command
32-33 34-35 36	NC	not connected
37	ESAVE	Energy save in idle mode
38		
39-40-41 42-43-44 45-46-47 48	-V _{CC}	-V _{CC} rail bus OUT
49-50	NC	not connected
51-52-53 54-55-55 56-57-58 59-60	-V _{CC}	-V _{CC} rail bus OUT

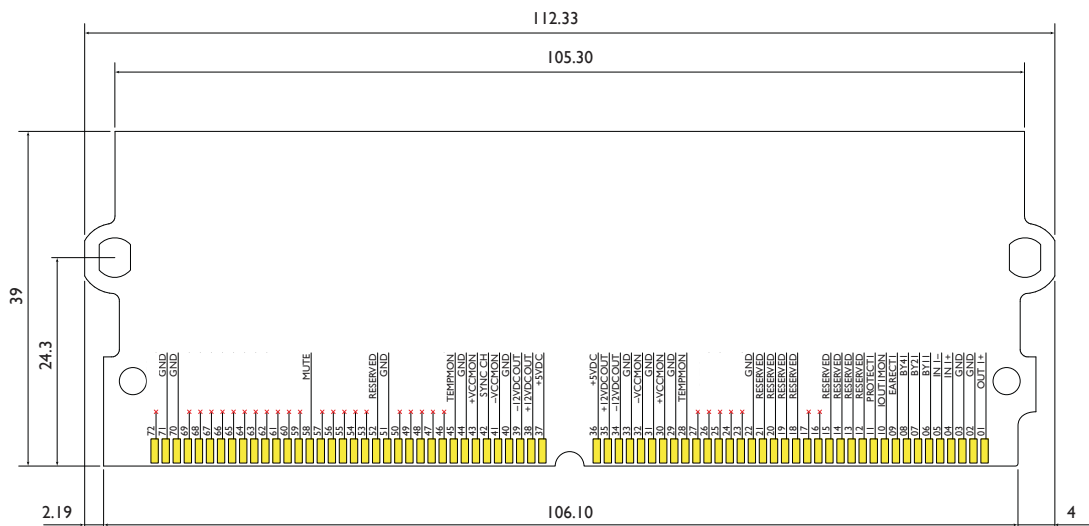
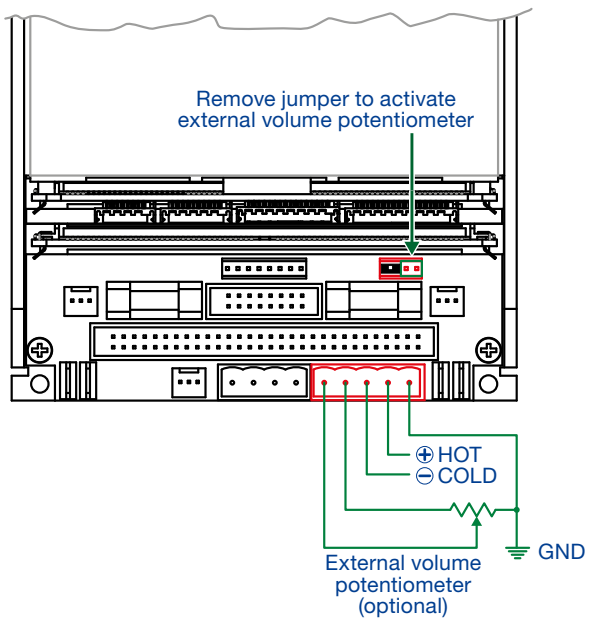
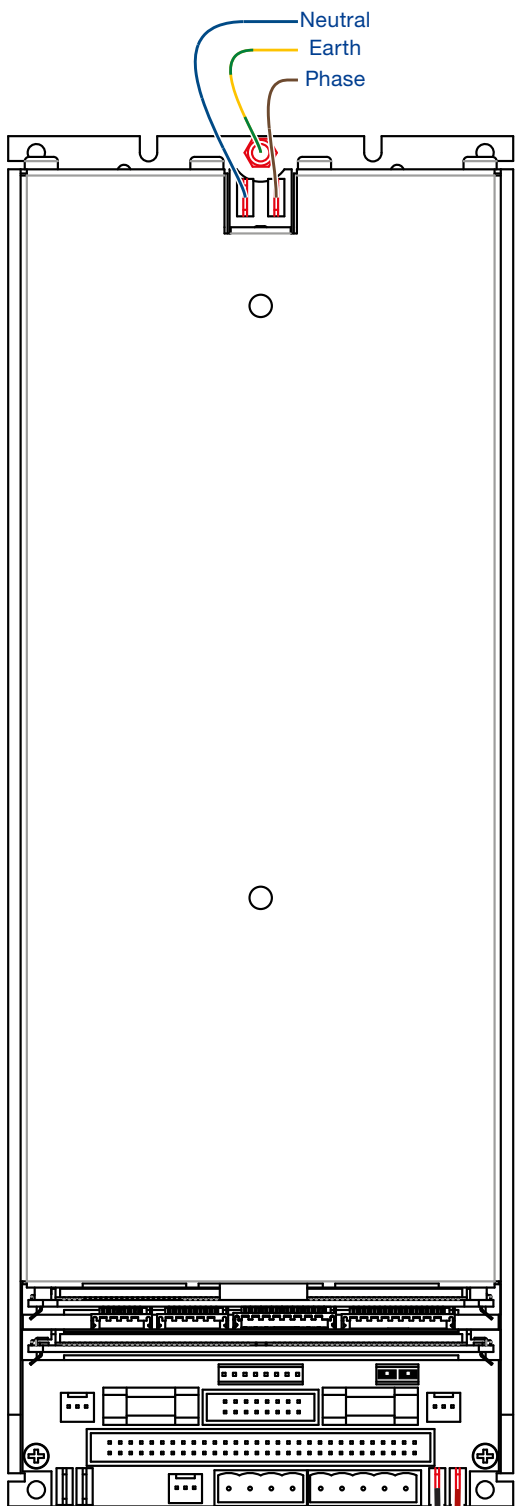
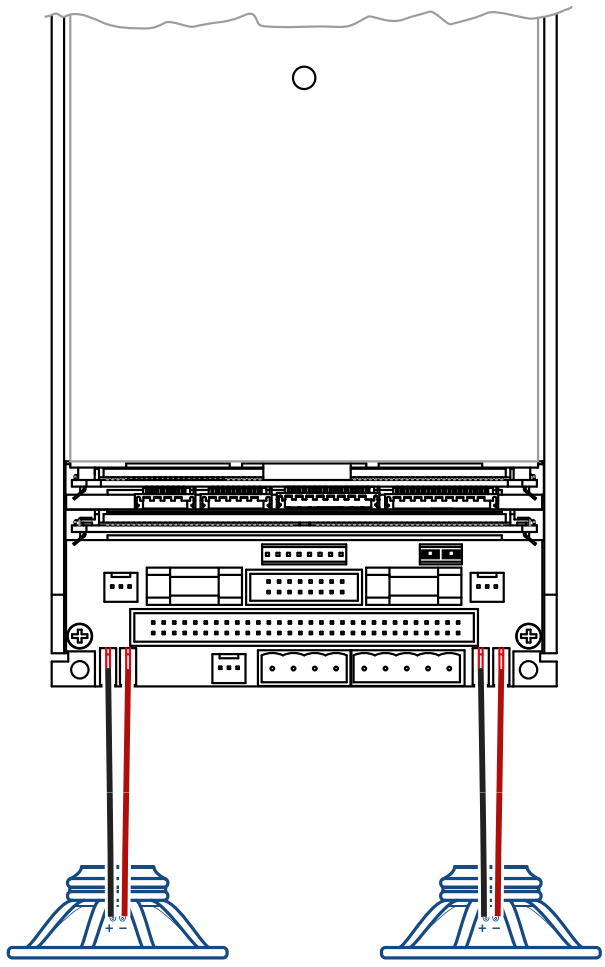


FIGURE 12: CN8: 72-pin SIMM board pinout (dimensions in millimeters).



Single transducer mode



Dual transducers mode

FIGURE 13: IpaMod: mains and audio connections.

11.5. IpaMod without DPC interface board

The IpaMod amplifier module can operate standalone, i.e. without the optional DPC interface board.

In order for the IpaMod to function without a connected interface board, the CN102 Micro Match connector on the control board must be patched:

short circuit pins number 8 and 17 on CN102.

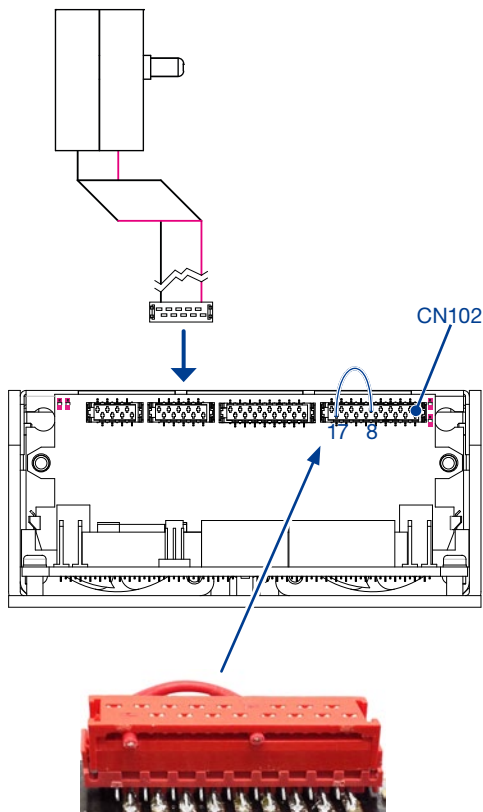


FIGURE 14: CN102 patch.

The patch disables the reading of the attenuator knob on the missing interface board, in order to set no attenuation to the signal.

11.6. Installing an optional DSP SIMM board

The IpaMod amplifier module can host an optional DSP board such as the Powersoft DSP-D and DSP-4 interfaces, as well as any other custom interface. Refer to [FIGURE 12](#) for proper SIMM board dimensions and connectivity.

In order to route the signal path to the optional DSP board on the CN8 connector remove the jumpers from CN17 as shown in [FIGURE 15](#).

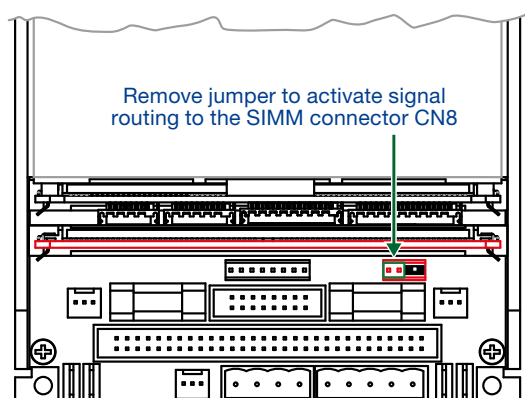


FIGURE 15: Jumper settings for optional DSP board.

Note about Powersoft DSP-D/DSP-C boards. Since the Powersoft DSP-D and DSP-C boards implement an input volume potentiometer on the interface panel, remove both jumpers from the CN17 connector (ref. [FIGURE 16](#)).

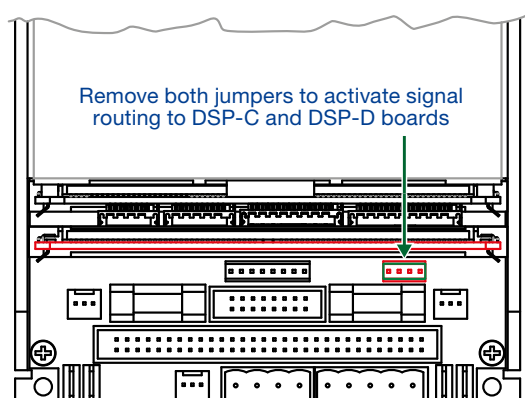
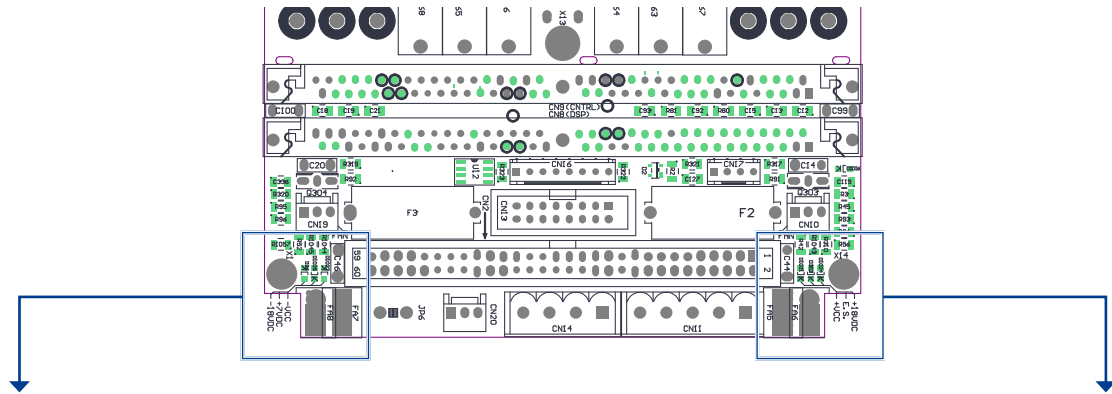


FIGURE 16: Jumper settings for DSP-C and DSP-D boards.

LED chart

12:1.Main PCB LED chart



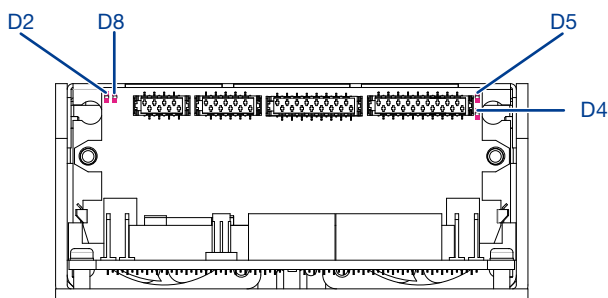
Left-hand LEDs:

Color	Code	Signal	Lighting
● GREEN	D26	-18V _{DC}	SOLID ON
● GREEN	D1025	+7V _{DC}	SOLID ON
● GREEN	D1022	-V _{CC}	SOLID ON

Right-hand LEDs:

Color	Code	Signal	Lighting
● GREEN	D1021	+V _{CC}	SOLID ON
—	—	D303	NC
● GREEN	D1024	+18V _{DC}	SOLID ON

12:3.SIMM board LED chart



Color	Code	Signal	Lighting
● GREEN	D2	+5V _{DC}	SOLID ON
● RED	D4	signal clip	ON
● GREEN	D5	ready	SOLID ON
● RED	D8	protection active	ON

12:2.Interface board LED chart

For a comprehensive description on system status refer to

Color	Label	Signal	Lighting
● RED	RED	PROTECT	Signal protection active SOLID ON
			No pressure sensor connected BLINKING
● RED	RED	LIMIT	Limiter active SOLID ON
● GREEN	GREEN	SIGNAL	Input signal present SOLID ON
● GREEN	GREEN	E.SAVE	Energy save mode active SOLID ON
● YELLOW	YELLOW	TEMP	Thermal protection active SOLID ON
● GREEN	GREEN	READY	No faults, system fully operating SOLID ON
● GREEN	GREEN	ON	System on SOLID ON

Pressure sensor

In order to guarantee high system performance, the proper placement of the pressure sensor on the loudspeaker cabinet and the correct connection of the transducer to the IpaMod are paramount.

WARNING!

Inadequate or wrong positioning of the pressure sensor can easily damage the amp module and the loudspeaker permanently.

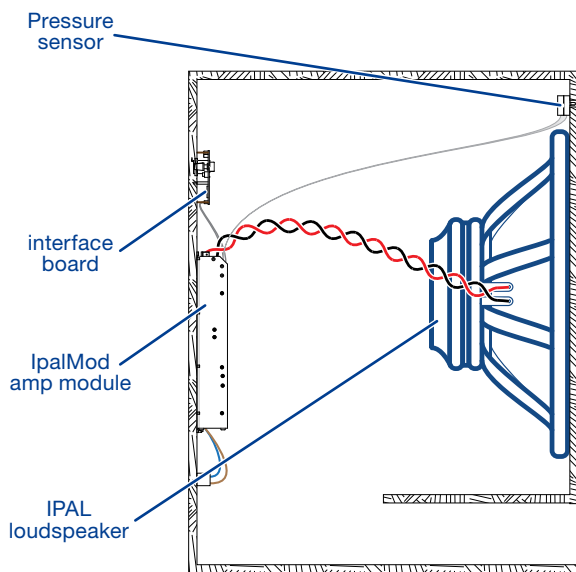
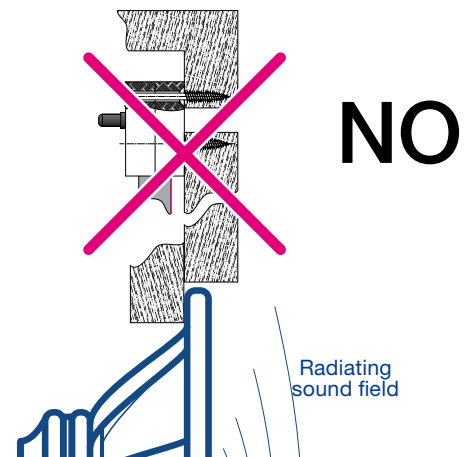
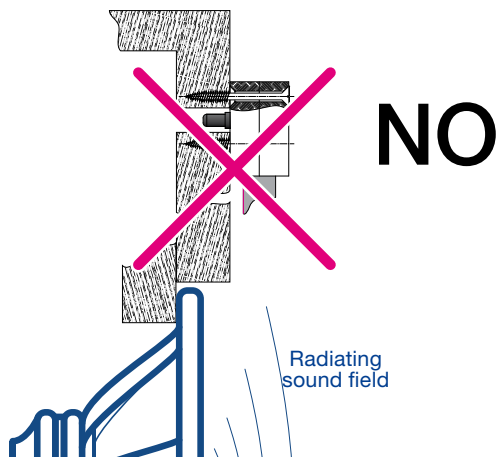
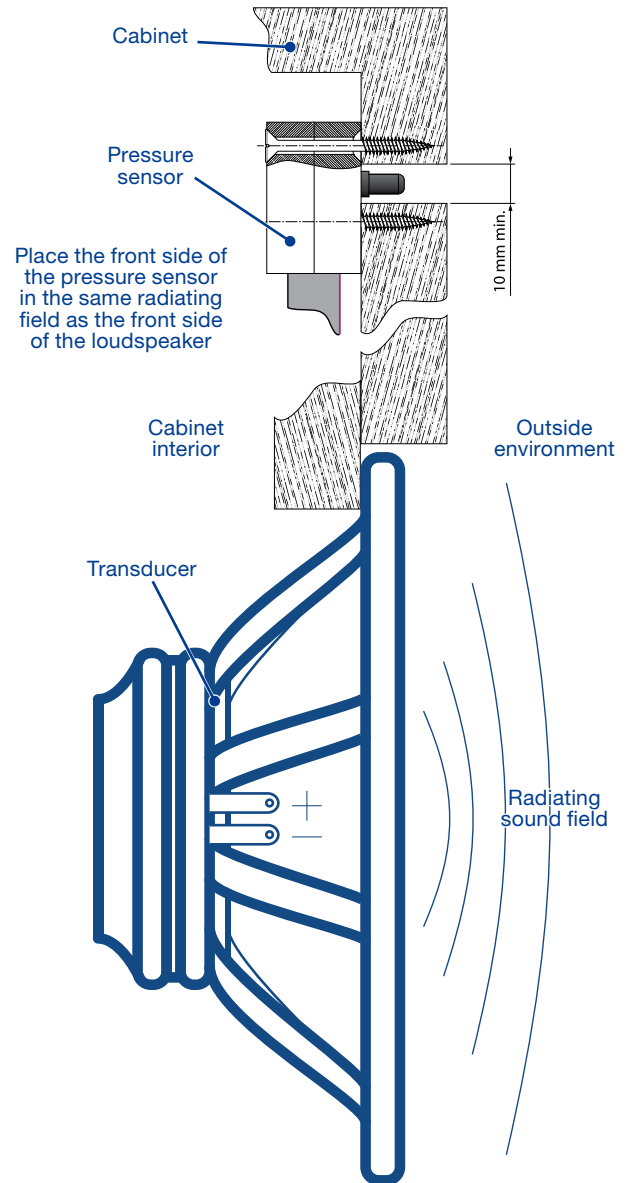


FIGURE 17: IPAL system.

The pressure sensor must be mounted on the front side of the loudspeaker cabinet so that the protruding black cylinder points in the same direction as the loudspeaker radiating surface.

Note about loudspeaker polarity: respect signal polarity: if needed, reverse the input signal polarity via software.



Power Control Manager

The DPC technology represents the most effective tool available for the acoustic designer to achieve unprecedented results in terms of control over the transducer displacement and system performance in low frequencies.

Thanks to the differential pressure control, the behavior of subwoofer and low frequency applications can be modeled in order to modify the systems response, increase sound pressure level capabilities and enhance the overall efficiency.

A DPC system is composed by:

- ▶ a Class-D amp module;
- ▶ a differential pressure sensor;
- ▶ a low-latency DSP board;
- ▶ a low impedance transducer.

The DPC system performs a real time feedback between the actual acoustic emission of the loudspeaker and the instantaneous displacement of the transducer.

By knowing the pressure field generated by the loudspeaker, the Zero Latency DSP controls the transducer displacement and adaptively modify the system emission. The system is capable to overcome transducers non-linearities, offering a complete control over sonic performance.

14:1. Connect and discover the system

The behavior of a DPC system can be configured and customized via a RS-485 connection by means of the Powersoft's Power Control Manager software. You can download the software from the Powersoft website:

<http://www.powersoft-audio.com/docman/632-power-control-manager/file>

In order to implement a RS-485 port on a personal computer Powersoft recommend the use of the SPECTRA USB 2.0 to RS-485 converter (browse the SPECTRA website www.spectra.ch for further information). A DB9 to RJ45 adapter is needed as well (ref. [FIGURE 19](#)).



FIGURE 18: SPECTRA #112887 USB to RS-485 converter.

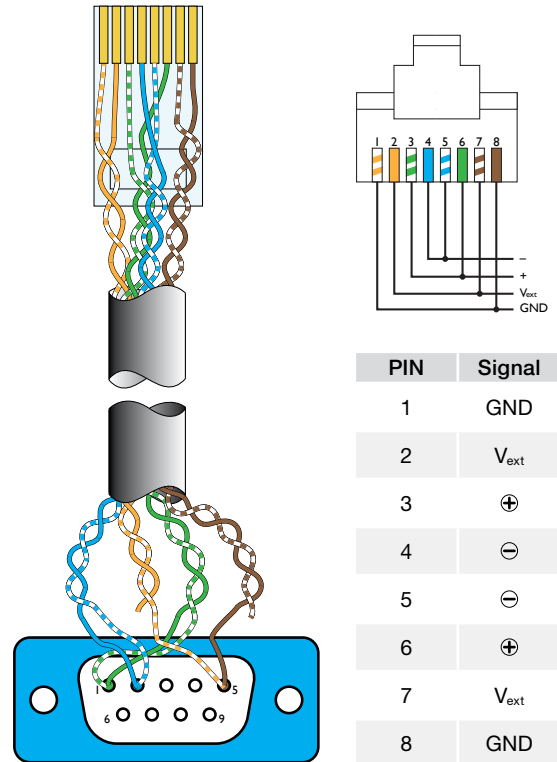


FIGURE 19: DB9-to-RJ45 adapter cable and RJ45 pinout.

Install the driver for operating the USB-to-RS485 converter and install the Power Control Manager.

Properly plug the system as shown in [FIGURE 20](#).

Once installed, the Power Control Manager shows a blank window: the first step is to discover all connected devices. This can be done automatically or manually.

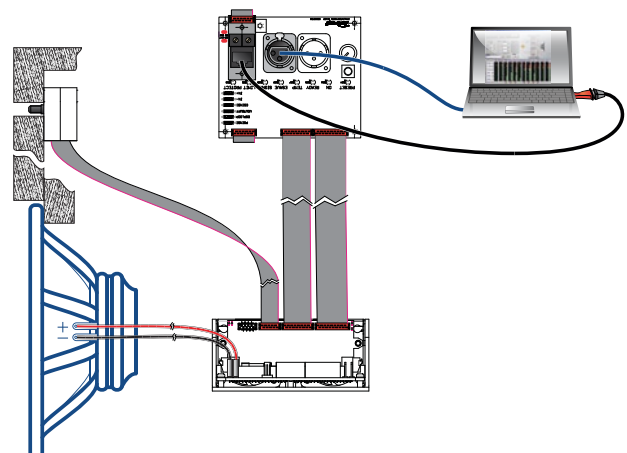
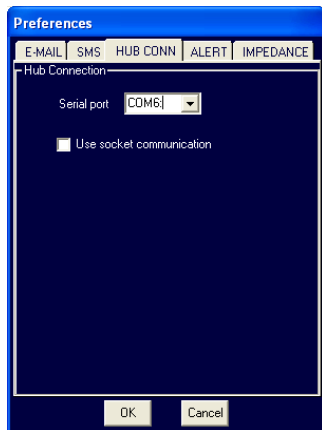


FIGURE 20: Wiring diagram.

14:1.1. Automatic discovery

1. Connect the amp module to the computer via the RS485 connection on the interface board.
2. Set a unique ID number on the interface board by means of the two rotary knobs: allowed values range from 01 to 99; 00 is reserved.
3. Turn the amplifier module on.
4. Verify the name assigned to the RS485 communication port on your PC operating system (this can be done through Microsoft Windows® Device Manager): the name should be something like COM5, COM6 or so on, depending on the number of the system built-in COM ports.
5. Start the Power Control Manager and select System > Preferences on the main menu.
6. Select the “HUB CONN” tab and make sure that the serial port number corresponds to the USB-to-RS485 converter.
7. Close the preferences window by clicking on OK.
8. In the Power Control Manager window, click on the Find Amplifier button in the lower left hand corner. All connected amp modules will be detected and automatically shown on the amp list in the Status section.



14:1.2. Manual discovery

1. Connect the amp module to the computer via the RS485 connection on the interface board.
2. Follow step 2 to 6 described in [Chapter 14:1.1](#).
3. Select Items > Add Amplifier on the main menu.
4. In the “New Amplifier” dialog window enter a name for the amplifier and select the model.
5. Enter the ID number of the interface board.
6. Click on “Ok”: the added amp will appear on the amp list.

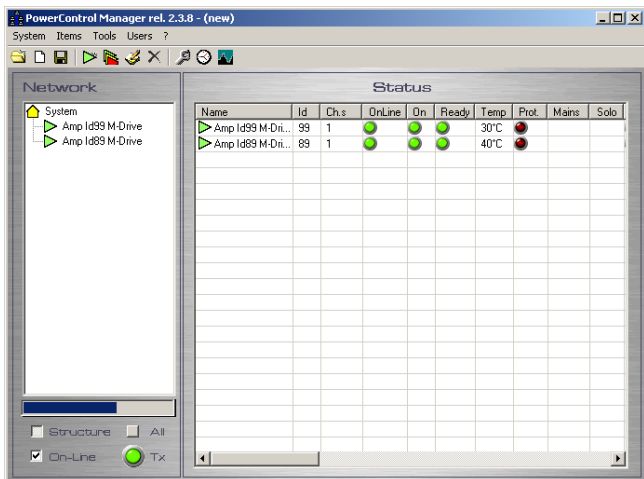
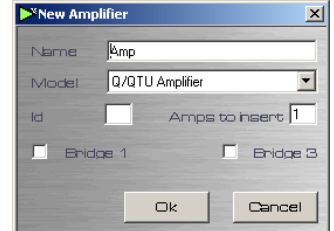


FIGURE 21: Power Control Manager: finding connected amplifiers.

Setting the Differential Pressure Control

By clicking on the name of an amplifier module in the amp list, you enter the settings interface of that module. All settings are accessible on the top section of the window; the bottom section shows meters and status leds.

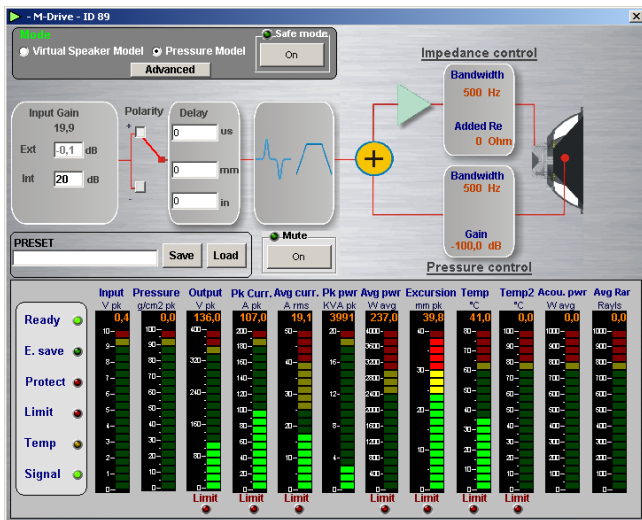


FIGURE 22: Power Control Manager: module settings.

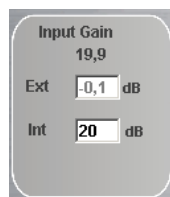
15:1. Global settings

Global settings affect the behavior of the system regardless of the operating mode (Virtual Speaker model / Pressure Model).

15:1.1. Input Gain

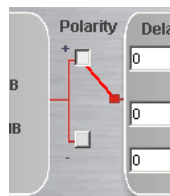
Set the maximum volume of the input signal. The attenuator knob on the interface board modifies the signal volume in series with the internal settings.

- ▶ The number just below the label “Input gain” shows the sum Int + Ext in decibels.
- ▶ Ext shows the attenuation (negative dBs) achieved by means of the attenuation knob.
- ▶ Int allows to define the internal signal volume in dB.



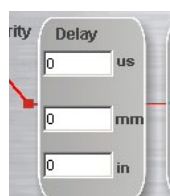
15:1.2. Polarity

The input signal can be phase reversed by clicking on the polarity boxes.



15:1.3. Delay

The input signal can be delayed by user definable amounts via the delay processing block. Parameters can be accessed and set from the main window.



Delay values can be entered in the time domain (us) or as physical linear distances (in mm or in inches).

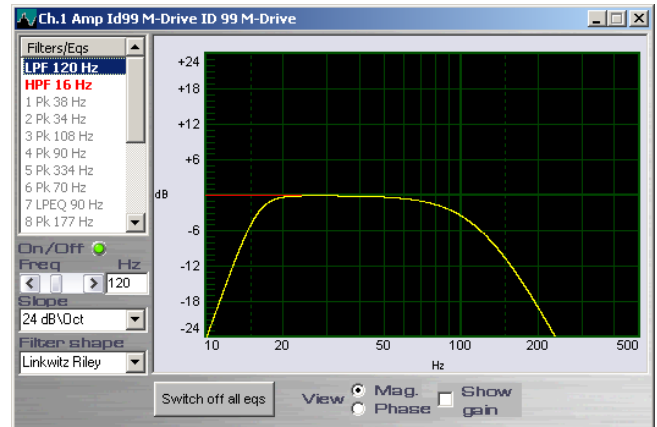
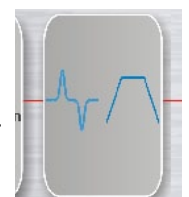


FIGURE 23: Parametric equalizer.

15:1.4. Parametric equalizer

A fully parametric equalizer processing block is available to fine tune the system's sound. By double clicking on the equalizer processing block, a new window opens (ref. FIGURE 23).



A list of parameter presets of commonly used equalization schemes is available on the left hand menu. Double clicking on the filter name selects it and adds it to the processing chain. Each individual selected filter can however be turned on or off by clicking on the “on/off ” green LED button at the bottom of the filter list.

The slider controls beneath the preset filters list allow real time variations of filter parameters such as the filter's central frequency, gain, Q and type. A log scale diagram of each filter's effect is presented on the right hand side of the eq window.

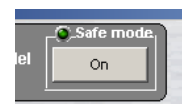
The red line represents the selected filter frequency shaping.

The yellow line represents the cumulative effect of all the filters on the entire input signal.

15:1.4.1. Safe Mode and Mute

Some settings may bring to system instability and critical operating condition. The Safe Mode button provides a protection against critical settings: when activated, this function will not allow the output power to exceed a set limit.

The Mute button is provided as well to mute audio playback.



15:2. Operating modes

The DPC technology can be exploited in two operating modes which differ in signal processing path and application scenarios.



15:2.1. Pressure Model Mode

The amplifier's output signal is modified in real time as a result of the combination of the input audio signal and the feedback loop.

The alteration is applied to the input stage so to minimize the difference between the desired output and that measured and reported by interpolating two the feedback loops.

15:2.1.1. Pressure control (pressure feedback loop)

This loop brings the pressure level measured at the radiating sound field, back to the input stage. This is achieved by feeding the pressure sensor measurement through a first order low pass filter (LPF) and a linear amplifier.

The parameters that can be set by the user for this feedback loop therefore are:

- ▶ the loop gain, expressed in dB and limited by the system's stability, defining the strength of the feedback effect;
- ▶ the LPF bandwidth, defining the range of frequency at which this feedback loop is active.

It is important to set the loop gain carefully, as too high a value will bring the system to instability. This results in a loud "ship's horn" sound which can potentially damage the system if not silenced after a short time. This can be done by lowering the feedback loop gain until the sound stops.

The entire pressure feedback loop can be bypassed by entering a loop gain value of -100 dB and an Re value of 0 (see below for Re): with these value the loop's effect will be disabled.

15:2.1.2. Impedance control (current feedback loop)

This loop brings back a voltage signal proportional to the current present at the output stage to the system's input. The signal taken from the output is first filtered by a first order low pass filter. Following this step, the current/voltage translation is carried out by a virtual resistor named " Re ".

The importance of this series resistor relies in the difference between traditional transducers and IPAL compatible speakers. IPAL speakers have an extremely low impedance. This means

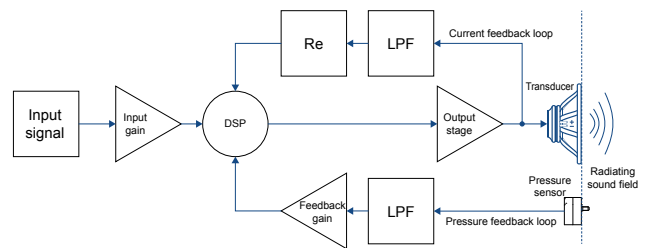


FIGURE 24: Pressure model feedback loop.

that they manifest a violent, extremely high Q resonant peak which can result in an unnatural sound reproduction. By adding a virtual series resistor Re , the entire system's resonant peak will be slightly flattened and widened in a way that mimics a traditional speaker's lower Q resonance.

This resistor will however not affect the power transfer from input to output as this is not a "real" physical resistor subject to ohmic heating.

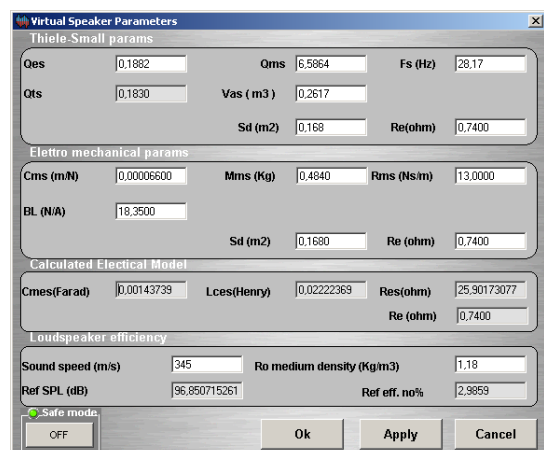
The parameters the user can set for this feedback loop therefore are:

- ▶ the "added Re " value, defining the additional series resistor inserted to simulate a traditional speaker behavior. This is usually a small number, which aims to return the apparent loudspeaker resistance to a traditional 2-4 Ohm value;
- ▶ the LPF bandwidth, defining the range of frequency at which this feedback loop is active.

15:2.2. Virtual Speaker Mode

The virtual speaker mode allows the user to enter a set of Thiele Small parameters that describe a transducer: this can be either a physically existing loudspeaker the user would like to emulate, or a non-existing, ideal transducer. The DSP uses these parameters to drive the amp module so that the entire system performs exactly as if the cabinet houses the wanted transducer.

The system automatically adapts its internal processing using information from the pressure sensor to virtually reproduce the behavior of the user defined transducer. The way this is achieved is practically user-transparent, meaning that the user can "interact" with the system only by changing the virtual speaker's parameters and not the system's internal loop parameters.



15:3.Thiele/Small parameters

The Thiele/Small parameters are electromechanical parameters that define the performance of a loudspeaker driver. T/S parameters are provided by driver manufacturers.

In order to setup the system, you are asked to enter the following T/S parameters:

- ▶ **Fs**: loudspeaker resonant frequency in free air (Hz);
- ▶ **Qes**: electrical loudspeaker damping at resonance (unitless);
- ▶ **Qms**: mechanical loudspeaker damping at resonance (unitless);
- ▶ **Vas**: volume of air with the same acoustic compliance of the driver suspension in free air (cubic meters or liters);
- ▶ **Re**: electrical resistance of voice coil (Ω);
- ▶ **Sd**: effective projected surface area of the driver diaphragm (square meters).
- ▶ **Cms**: suspension compliance (m/N)
- ▶ **Mms**: effective moving mass combining cone, coil, all moving parts and the acoustic load by the air in contact with the loudspeaker cone (kg);
- ▶ **Rms**: suspension and all moving parts losses or damping (mechanical ohm);
- ▶ **Bl**: force factor, i.e. strength of the magnetic field times the length of the wire forming the voice coil (T·m or N/A).

Furthermore, the system takes into account the following data:

- ▶ **Sound speed**: speed of sound (meter/second)
- ▶ **Ro medium density**: air's medium density (kg/m³)

15:3.1.Calculated parameters

The Power Control Manager derives the following data:

- ▶ **Qts**: total loudspeaker damping at resonance combining electric and mechanical effect (unitless):

$$Qts = \frac{Qms \cdot Qes}{Qms + Qes}$$

- ▶ **Cmes**: electrical capacitive equivalent of the moving mass Mm (farad)*;
- ▶ **Lces**: electrical inductive equivalent of the suspension compliance Cm (henry);
- ▶ **Ref eff. no**: loudspeaker free air standard reference efficiency (unitless);

$$no = \frac{Ro}{2\pi c} \frac{(Bl)^2}{Re} \left(\frac{Sd}{Mms} \right)^2$$

- ▶ **Ref eff. no%**: same as **Ref eff. no** in percentage;
- ▶ **Ref SPL**: reference sound pressure level (dB):

$$Ref SPL = 112 + 10 \log(no).$$

15:4.Advanced parameters

Advanced parameters are common to both Virtual speaker and Pressure model modes. Before accessing the Advanced parameters window by clicking on the Advanced button, a dialog box asking a password appears.

The Advanced parameters default password is **filippo**

This extra step is necessary to ensure that system parameters are not changed by mistake as incorrectly set values can permanently damage the system.

As an added precaution, when the user tries to assign a parameter value outside the range of acceptable values, the text box is highlighted in red and the parameter automatically set below the safety threshold.

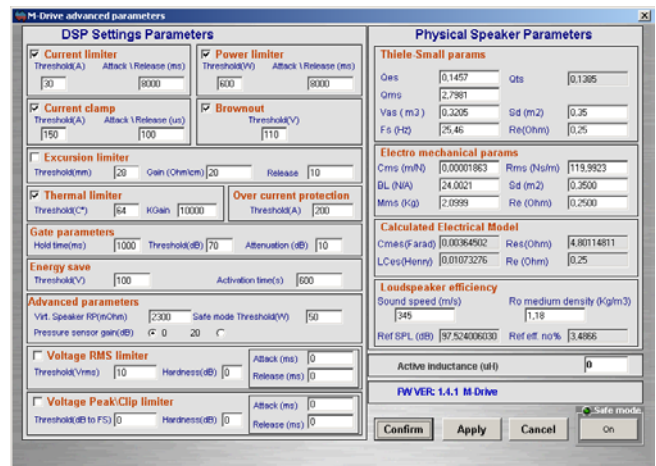


FIGURE 25: Advanced parameters.

15:4.1.DSP setting parameters

The Zero Latency DSP implements a number of limiters that can be activated and customized by the user:

Current limiter

Set a threshold limit and the attack/release time for the average (rms) output current.

Current clamp

The Current Clamp is a faster acting current limiter. Current Clamp is meant to limit spikes of current, effectively protecting the output stage and the connected loudspeaker from dangerous high peak current: this is different respect the short circuit protection that works by sensing decreasing rails values.

The current threshold value does not indicate the maximum output current, but the current level at which the limiter will start sensing spikes of current. Output current level can exceeds the clamp threshold considerably due to the internal limiter design.

Brownout

Brownout is an even faster acting output peak power limiter, and works on a different principle than all other limiters.

This protection system quickly reduces the amplifier gain when the rails voltage decrease quickly due to an excessive power draw from the load. Threshold voltage value is the value beneath which the rail voltage must drop for the limiter to begin acting. A threshold voltage value of 0 V, for example, disables the limiter.

Power Limiter

Ensures that the real part of the average output power does not exceeds the limits set by the user.

Overcurrent protection

The overcurrent protection acts similar to the current clamp but faster. You can just set the threshold.

Excursion Limiter

The excursion limiter keeps the loudspeaker cone displacement within a user defined range. The threshold cone excursion is set in mm. The excursion limiter works through a current loop, dynamically changing the value of a resistance proportionally to the displacement of the cone with respect to its resting position.

It is important to note that this position is estimated; its accuracy depends on the precision of the connected speaker physical parameters entered in the Physical Speaker Parameters section in the advanced parameters window (see below).

The Gain (ohm/cm) parameter sets the displacement/resistance conversion factor, so as to regulate the intensity of the limiting effect. For a given cone displacement, a higher gain value yields a more severe limiting action. The release time determines the time needed for the limiter to release the cone.

Please note that the maximum cone excursion set in this window only determines the cone displacement value that activates the effect of the limiter; it does not represent the maximum excursion the cone will display. The limiter's internal design allows for a certain margin between maximum displacement threshold value and effective cone displacement, the latter being potentially higher.

Thermal Limiter

The thermal limiter reduces the rail voltage by an amount proportional to the difference between the threshold temperature and the measured output stage temperature in order to lower the module's temperature.

Lowering the rails voltage reduces output power which in turn decreases ohmic heating of the output stage. The scaling factor that governs the rails reduction as a function of this temperature difference is called KGain; it can be entered by the user, although the default value (1000) is already an empirical optimum. For a given temperature difference, a higher KGain factor yields a more severe rails voltage reduction.

Gate

The system is equipped with a gate output block intended to improve the overall signal-to-noise ratio. The gate reduces the output gain for small signals interpreted as noise.

The hold time indicates how long the gain reduction occurs after the output signal falls below the threshold. The attenuation parameter indicates the amount by which the output gain is decreased with respect to no attenuation. Note that the system gain changes slowly and not abruptly so the effect is unnoticeable.

Energy Save

In order to reduce power consumption when the amp is not receiving any viable input signal, the IPAL system enters an energy save operation mode. Lower energy consumption is obtained lowering the rails voltage to the value entered in the voltage threshold. The energy save mode is activated only after no signal input is detected for more than the use set activation time.

Advanced Parameters: Virtual Speaker RP (mohm)

The Virtual Speaker RP is a scaling factor used by the pressure sensor. This depends on the specific pressure sensor in use and must therefore be changed only if the sensor is changed.

Advanced Parameters: Safe Mode Threshold

The Safe Mode provides a protection against critical settings that may bring the system to instability or even to damages.

When Safe Mode is active, the output power is limited by the value entered as Safe Mode Threshold.

Special care should be used while setting this value: it must not be greater than the maximum power handling capabilities of any part of the system.

Voltage RMS Limiter

Set a threshold limit and the attack/release time for the average (rms) output voltage.

Voltage peak/Clip Limiter

Set a threshold limit and the attack/release time for the peak output voltage.

Physical Speaker Parameters

Parameters in this section refer to the transducer and are the same described in [Chapter 15:3.Thiele/Small parameters](#). Please note, however, that the parameters entered in this window refer to the real loudspeaker whereas those entered in the Virtual speaker mode may refer a virtual transducer.

15:5. More about DPC

For more information about the IPAL and DPC technologies, please refer to: Blasizzo, Desii, Di Cola, Lastrucci, *Practical applications of a Closed Feedback Loop Transducer system Equipped with Differential Pressure Control*, presented at the 131st AES Convention New York, New York, October 20-23, 2011.

15:6.Metering

The bottom section of the Power Control Manager interface contains a copy of the LED located on the interface panel (ref. [Chapter 12:2.Interface board LED chart](#)) and some meters that provide a feedback on system performance.

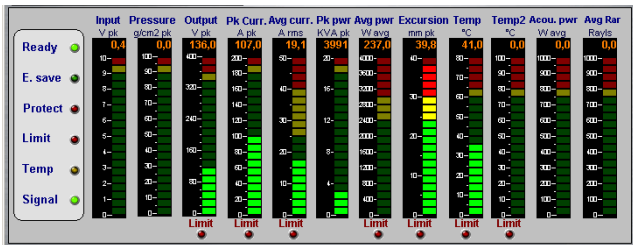


FIGURE 26: Power Control Manager: metering.

15:6.1.LEDs

Ready – When this LED is on the amp is ready and in proper functioning conditions. When this LED is off the amp is non functional due to a power fault. This can be either:

- ▶ internal: if there is an internal power failure;
- ▶ external: if the amp’s load current draw has exceeded the maximum acceptable values set by the current protection limiters.

E.Save – When this LED is on the amp has entered the energy save mode, after having detected no input signal for a selected timespan. The amp’s power consumption is minimized by decreasing rails voltage.

Protect – This LED lights when short circuit protection has acted to prevent amplifier damage. This was caused by the output current trying to increase above the value set by the user in the overcurrent protection section. No output is possible when this LED is on. The amplifier checks every 2 seconds if the short circuit condition is still in place. If not, the limiting action is interrupted, the LED is turned off and output is possible again.

Limit – This LED is on every time any limiting action is undertaken by any system limiter.

Temp – When this LED is on, the temperature of the module’s final stage has gone over the user set limit.

Signal – This LED is on when a signal is detected at the input.

15:6.2.Meter strips

Input (V_{pk}) – Input peak voltage measured before input gain/attenuation processing: the meter therefore represents the signal level entering the system before any processing is performed.

Pressure (g/cm^2_{pk}) – Peak pressure level as measured by the pressure sensor.

Output (V_{pk}) – Output voltage peak level. The Limit red LED underneath the meter strip lights when the measured output voltage is being clipped to the system’s maximum possible voltage level.

Pk Curr. (A_{pk}) – Peak output current. The Limit red LED underneath the meter strip lights when the measured output peak current rises above the limit set in the current clamp threshold.

Avg curr. (A_{rms}) – Root mean square current value. The Limit red LED underneath the meter strip lights when the measured output average current exceeds the limit set in the current limiter threshold.

Pk pwr (kVA_{pk}) – Peak output power.

Avg pwr (W_{avg}) – Average output power. The Limit red LED underneath the meter strip lights when the measured average power rises above the limit set in the power limiter threshold section.

Excursion (mm_{pk}) – Peak estimated cone excursion with respect to the central resting position. The Limit red LED underneath the meter strip lights when the estimated cone excursion goes beyond the limit set in the excursion limiter threshold section.

Temp ($^{\circ}C$) – Output stage temperature. The Limit red LED underneath the meter strip lights when the measured temperature rises above the limit set in the thermal limiter threshold section.

Temp2 ($^{\circ}C$) – Transducer temperature (external probe needed).

Acou. pwr (W_{avg}) – Estimated average acoustic power.

Avg Rar (Rayls) – Estimated average acoustic impedance.

Hardware protections

The architecture of Powersoft's amplifiers encompass several protection mechanisms triggered by harmful signal and temperature. Protection systems and triggers are independently implemented in the power supply section (power supply protection) and the amplifier section (amplifier protections); most of the protection threshold values can be set through the Power Control Manager (ref. [Chapter 15:4. Advanced parameters](#)).

15:7.Power supply protections

Power supply protections aim to isolate a faulty section in electrical power system from the rest of the device in order to prevent the propagation of the fault and limit device damages.

15:7.1.Primary AC mains overcurrent protection

AC main overcurrent are filtered by two 10 A time-lag fuses (also known as time-delay or low blow-fuse). The purpose of the time lag fuses is to allow the supply in electricity for a short time before the fuses actually blow. If the time-lag fuses blow out, the amplifier switch off; replace the fuses with proper 10 A time-lag fuses in order to restore the full functionality of the amplifier.

15:7.2.Primary AC mains overvoltage protection

AC mains overvoltage threshold is set to $295 V_{rms}$. If the AC mains voltage exceeds $295 V_{rms}$ the power supply stop working; the device does not turn completely off but falls in a "sleeping" mode: the power supply turns on again when the AC mains voltage drops under $290 V_{rms}$.

AC mains overvoltage are well tolerated by the power supply: no damages can be caused to the system even in case of severe overvoltage up to $400 V_{peak}$.

15:7.3.Primary thermal protection

The temperature is detected at power supply and triggers the heat dissipated by the device: if the temperature rises exceeding components tolerances, the primary hardware thermal protection starts lowering the rails voltage in order to lower the heat wasted and keep the overall efficiency high.

The process is driven by the DSP section of the Control Board and is auto-adaptive, aiming to maintain the system up even in heavy thermal condition.

15:8.Amplifier protections

The amplifier section protections are managed by the DSP section on the Control Board and can be customized by means of the Power Control Manager software.

15:8.1.Auxiliary power protections

Auxiliary plugs are protected against short circuit: a poliswitch opens the auxiliary circuits when the current drawn exceeds 1 A.

Support and warranty

17:1.Service

There are no user-serviceable parts in your amplifier. Refer servicing to qualified technical personnel. In addition to having an in-house service department, Powersoft supports a network of authorized service centers. If your amplifier needs repair contact your Powersoft dealer (or distributor). You can also contact the Powersoft Technical Service department to obtain the location of the nearest authorized service center.

17:2.Warranty

POWERSOFT guarantees its manufactured products to be free from defective components and factory workmanship for a period of 12 (twelve) months, starting from the date printed in the invoice of purchase.

All warranty repairs and retrofits must be performed at Powersoft facilities or at an Authorized Service Center at no cost for the purchaser. Warranty exclusion: Powersoft's warranty does not cover product malfunctioning or failure caused by: misuse, abuse, repair work or alterations performed by non-authorized personnel, incorrect connections, exposure to harsh weather conditions, mechanical damages (including shipping accidents), and normal wear and tear.

Powersoft will perform warranty services provided that the product is not damaged during transportation.

17:2.1.Return of Goods

Goods can be returned to Powersoft only after they have been granted a Return Merchandise Authorization – RMA – number to be attached to the external packaging. Powersoft (or its Authorized Service Center) has the right to refuse any returned good without a RMA number.

17:2.2.Repair or replacement

Powersoft reserves the right to repair or replace any defective goods covered by product warranty at its sole discretion and as it deems best.

17:2.3.Cost and responsibility of transport

The purchaser (or end user/customer) is solely responsible for all transportation costs and risks associated with sending warranty covered goods to Powersoft or its Authorized Service Center. Powersoft will assume full responsibility and cover all costs incurred to send the goods back to the purchaser (or end user/customer).

17:3.Assistance

Even though most product malfunctioning can be solved at your premises through Powersoft Customer Care or your direct knowledge, occasionally, due the nature of the failure, it might be necessary to return defective products to Powersoft for repair. In the latter case, before shipping, you are kindly asked to follow step by step the procedure described below:

- ▶ Obtain the “Defect Report Form” by contacting our Customer Care Department via email: service@powersoft.it or download the “Defect Report Form”.
- ▶ Fill out one “Defect Report form” for each returned item (the form is an editable tab guided document) and save as your name, amp model and serial number (for example: distributorname-MDRIVE-17345.doc) providing all required information except the RMA code/s and send it to service@powersoft.it for Powersoft approval.
- ▶ In case of defect reports approved by the Powersoft Customer Service Representative you will receive an RMA authorization code (one RMA code for each returning device). Upon receiving the RMA code you must package the unit and attach the RMA code outside the pack, protected in a waterproof transparent envelope so it is clearly visible.

All returning items must be shipped to the following address:

Powersoft S.p.A.
Via Enrico Conti, 13-15
50018 Scandicci (FI) Italy

In case of shipment from countries NOT belonging to the European Community make sure you have also followed the instructions described in the document available for download at the TEMPORARY EXPORTATION / IMPORTATION PROCEDURE link at <http://www.powersoft-audio.com/en/support/service>.

Thank you for your understanding and cooperation and continued support as we work to improve our partnership.

Specifications

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AC Mains Supply	
Power supply	Universal regulated, switch mode, with PFC
Nominal power requirement	AC 100 V - 240 V, 50/60Hz
Operating range	80 - 278 Vrms
Power consumption	
IDLE (energy save)	21 W
Average	400 VA
Efficiency @ 1/4 max power	81%
Inrush current	34.5 A _{peak} (7 A _{peak} after 5 s)
Audio	
Number of output channels	1
Gain	32 dB
Dynamic Range (A-Weighted @ 8 Ω)	65 dB
Output Noise (A-Weighted @ 8 Ω)	-44 dB
Frequency Response (-3 dB, 1 W @ 4 Ω)	10 Hz - 620 Hz
THD+N (from 0.1 W to Full Power)	< 0.6% (typical < 0.4%)
DIM (from 0.1 W to Full Power)	< 1.6% (typical < 0.8%)

Output Stage	
Maximum output power	8500W @ 1Ω
Maximum unclipped output voltage	180 V _{peak}
Maximum output current	110 A _{peak}

Virtual Speaker® mode	
Thiele-Small parameters	Qes - Qms - Vas - Sd - Fs - Re
Electromechanical model parameters	Qes - Qms - Vas - Sd - Fs - Re

Differential Pressure Control® mode	
Impedance control parameters	Bandwidth, added Re
Pressure control parameters	Bandwidth, slope, gain

DSP	
Equalizer	Raised-cosine, custom FIR, parametric IIR: peaking, hi/lo-shelving, all-pass, band-pass, band-stop, hi/lo-pass
Crossover	linear phase (FIR), hybrid (FIR-IIR), Butterworth, Linkwitz-Riley, Bessel: 6 dB/oct to 48 dB/oct (IIR)
Limiters	TruePower™, RMS voltage, RMS current, Peak limiter, Excursion limiter, Current clamp, Brownout limiter, thermal
Metering	Input & output voltage, pressure, peak & average current, peak & average power, excursion, temperature

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