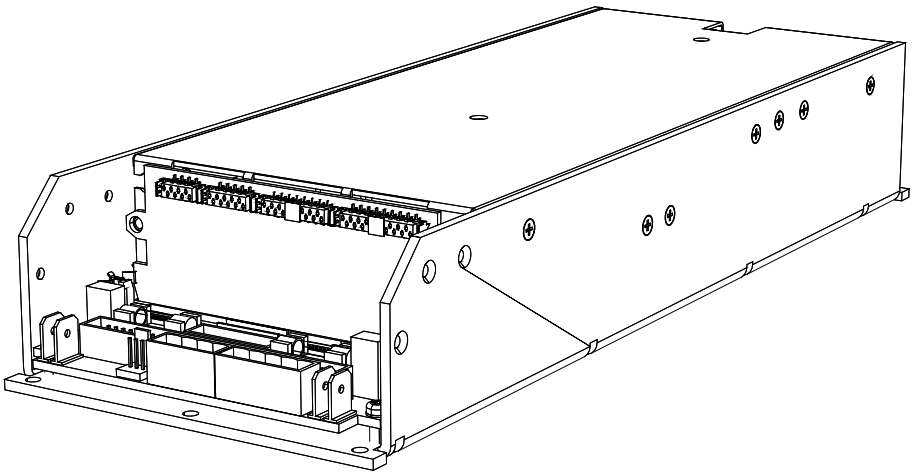
IpalMod



USER GUIDE

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DO000129.05 R0

Keep this manual
for future reference

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For latest update please refer to the
online version available on www.powersoft-audio.com.

IpalMod | User Guide

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Important safety instructions

1

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

3

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 UNITAD A LA LLUVIA O LA HUMEDAD, GOTEO O SALPICADURAS. NO COLOQUE OBJETOS LLENOS DE LÍQUIDOS, TALES COMO VASIJAS, SOBRE EL APARATO.

Importanti istruzioni di sicurezza

4

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 connessine 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

5

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 finance the cost of treatment and recovery of 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 Powesoft S.p.A. for reprocessing. For more information about where you can send your waste equipment for recycling, please contact Powesoft 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

CE

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)

6

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_{peak}) and current capabilities (110 A_{peak}), being able to drive even the most demanding applications of self powered 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® DIFFERENTIAL PRESSURE CONTROL PATENTED

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 behaviour 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

8

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 dafault 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.

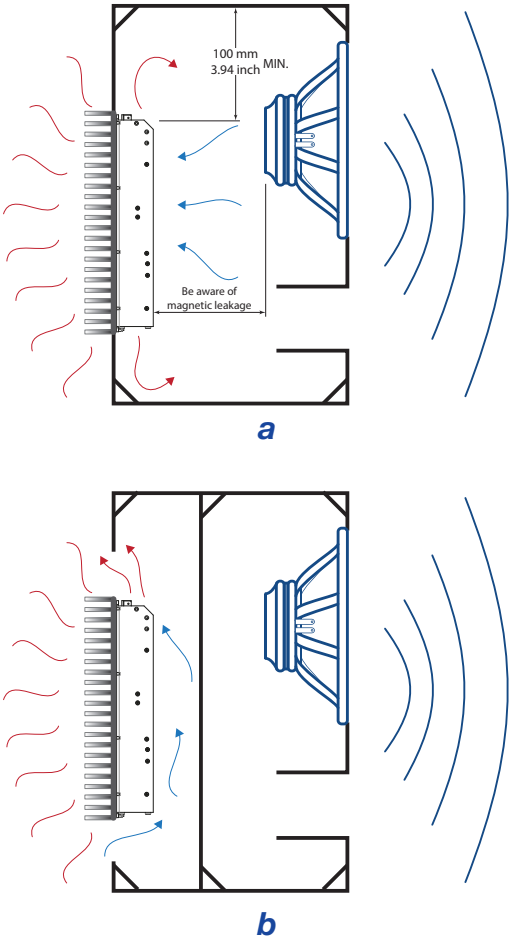


FIGURE 1: Cooling solutions (for descriptive purpose the heatsink fins are set in wrong direction);
a) Module and loudspeaker into the same chamber;
b) Module in a separate vented chamber.

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

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

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

The maximum dissipated power can be calculated as:

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

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

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

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:

$$\frac{75 - 45}{170} = 0.14°C/W$$

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).

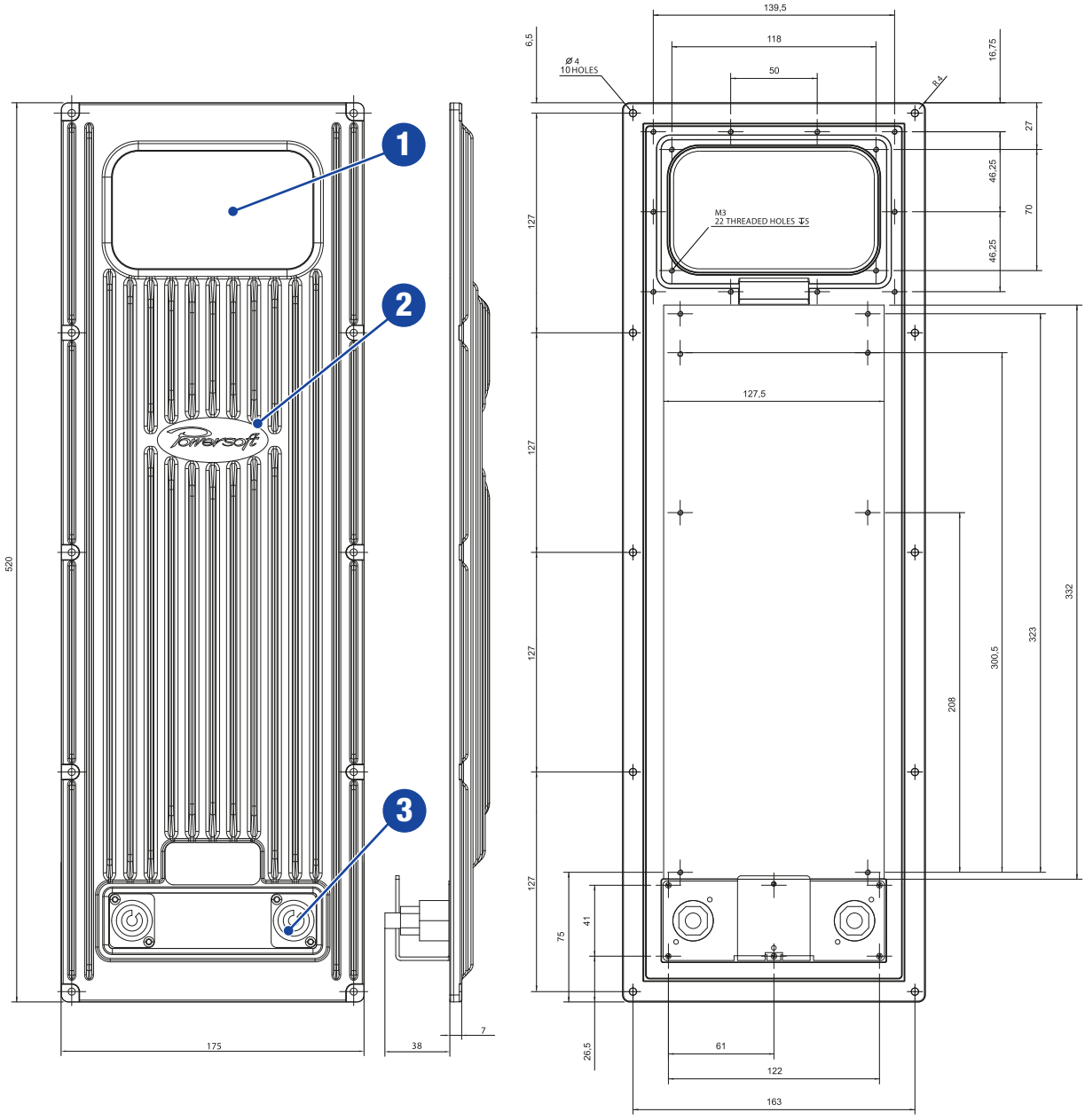


FIGURE 2: Aluminium alloy heatsink with I/O interface bay: 1. I/O interface bay (not compatible with IPAL DPC programming interface); 2. Heatsink; 3. AC mains interface.

Electromagnetic Compatibility (EMC)

9

9:1.AC MAINS 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:

Schaffner FN2030-10-06 model.

9:2.Cabling

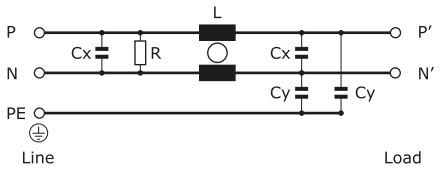


FIGURE 3: Typical electrical schematic of the EMI Filter.

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 4);
- place ferrites as close to the module as possible

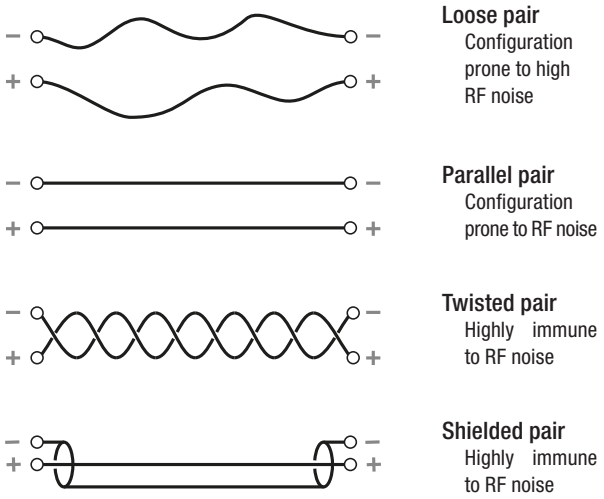


FIGURE 5: Cabling configuration.

9:3.Ferrite cores

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

Wrap both cables around one side of each ferrite so that it pass through each ferrite twice (ref. FIGURE 3). Install the ferrite shield as close as possible to where the cable plugs into the amplifier. Placing the ferrite elsewhere on the cable noticeably reduces its effectiveness.

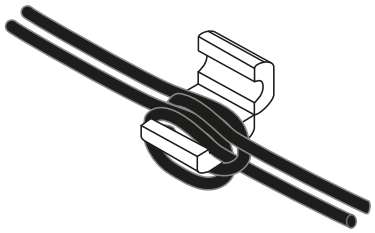


FIGURE 4: Ferrite core installation on I/O wirings.

9:4.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.

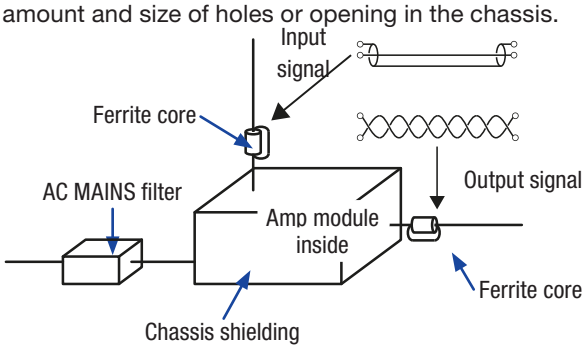


FIGURE 6: Tools and best practice for improving the electromagnetic compatibility.

9:5.Mains Fuse

Replace the fuses with the same type and rating: time delay fuse of 10A rating (2x Littelfuse series 215).

9:6.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.

Mechanical drawings

10

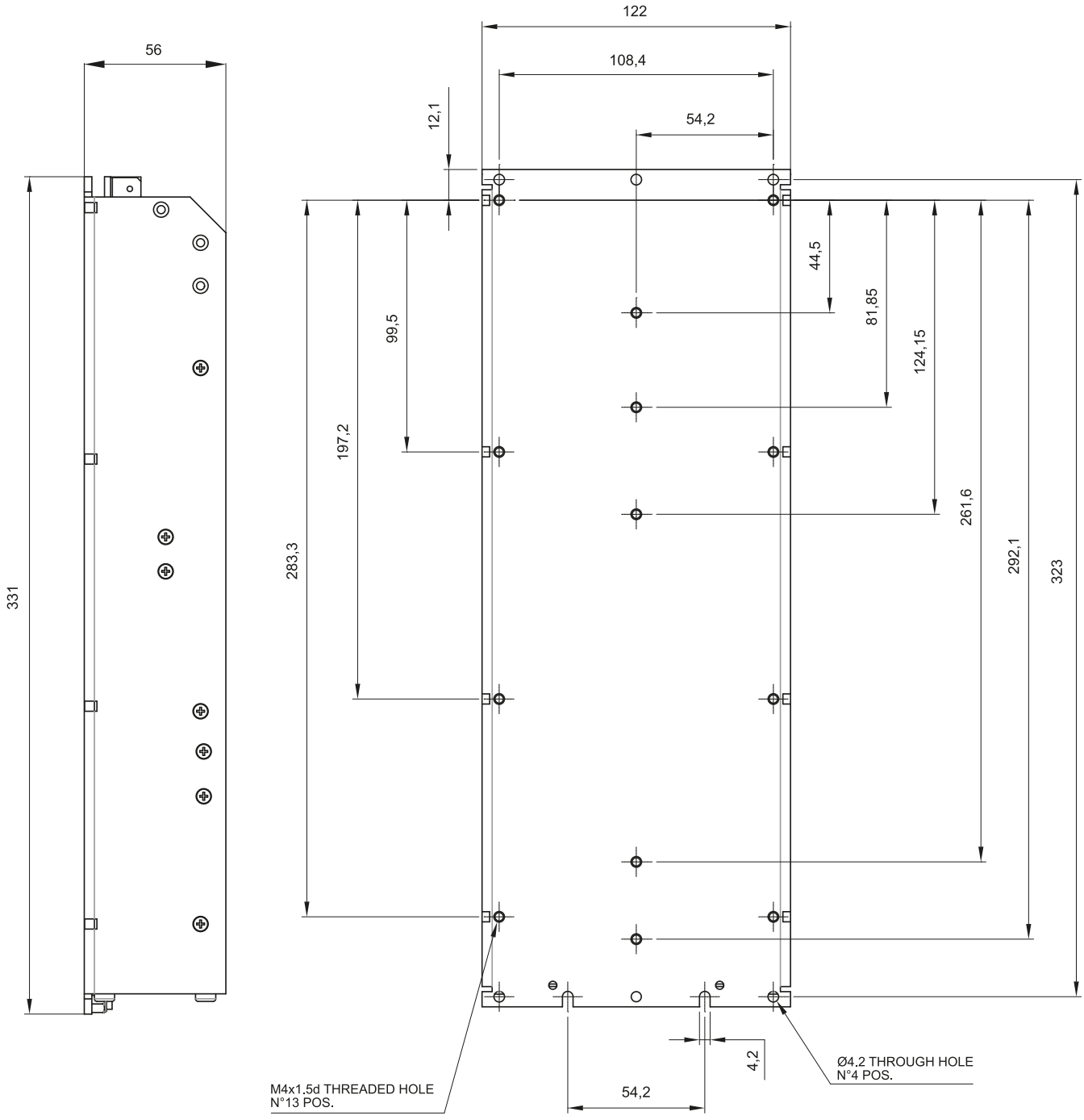


FIGURE 7: IpalMod: side and back plate (all dimensions in millimeters).

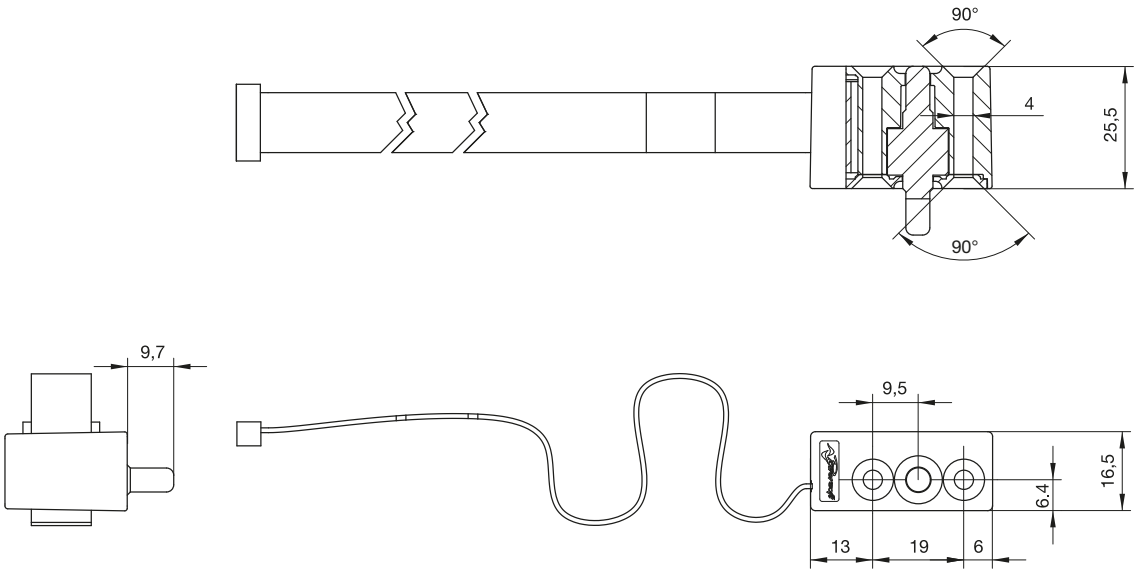


FIGURE 8: Pressure sensor (all dimensions in millimeters)

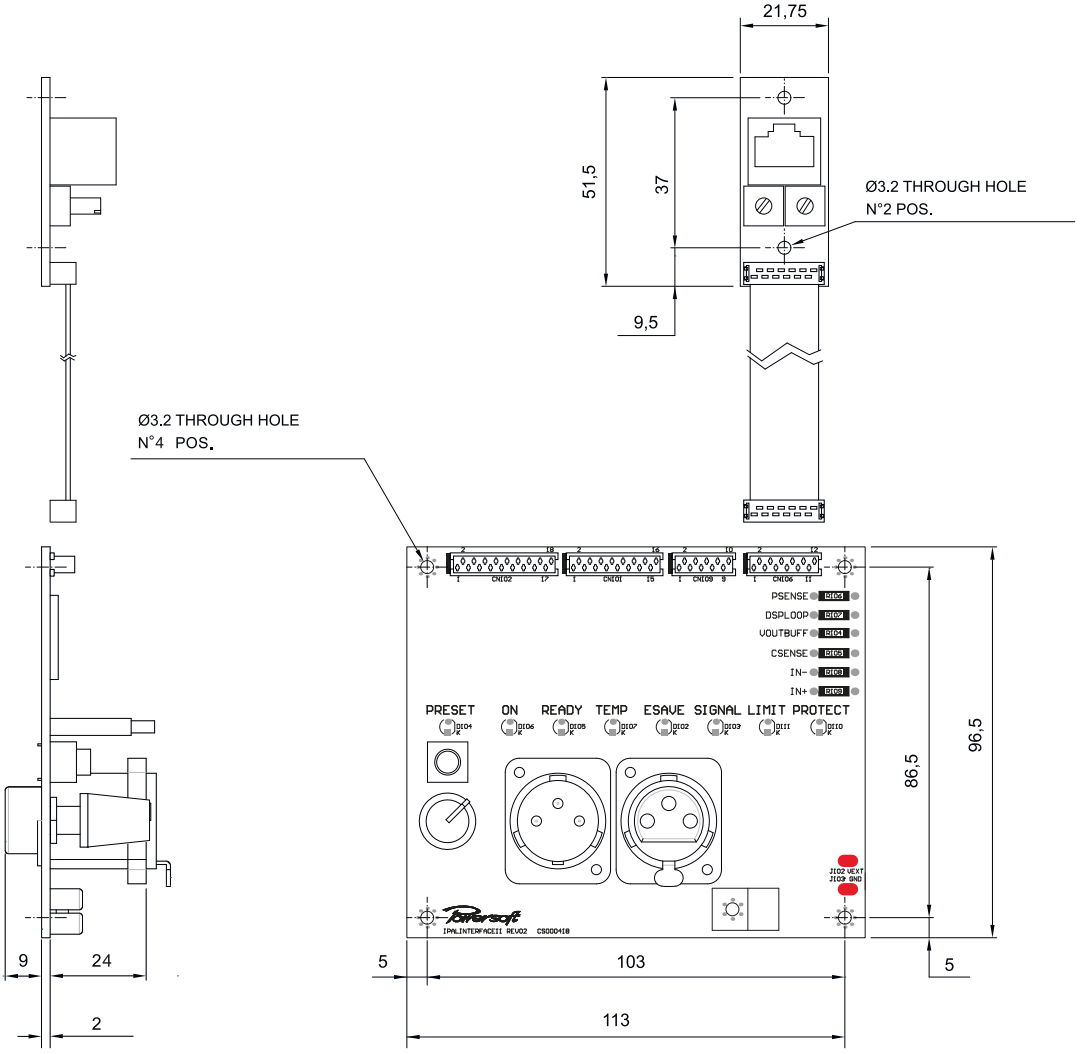


FIGURE 9: DPC interface board (all dimension in millimiters).

Connections

11

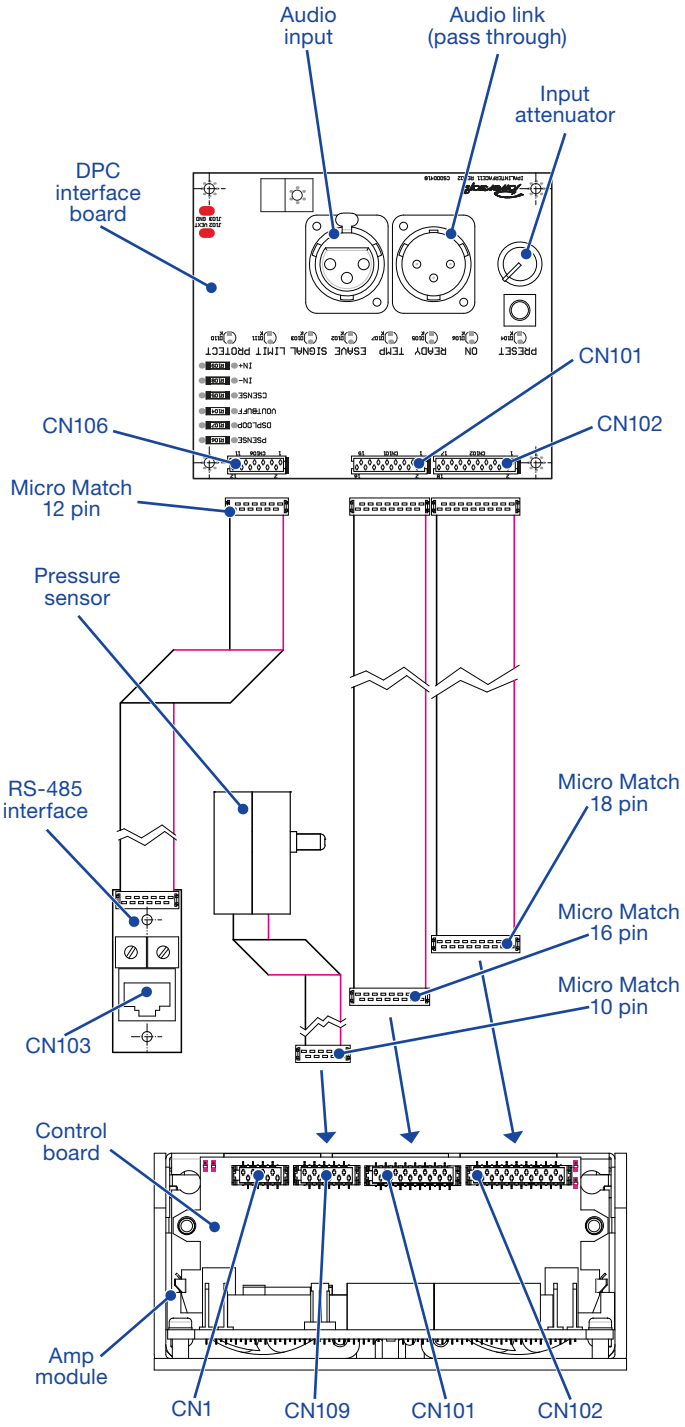


FIGURE 10: DPC interface to control board connections.

11:1.Interface board: bill of connectors

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

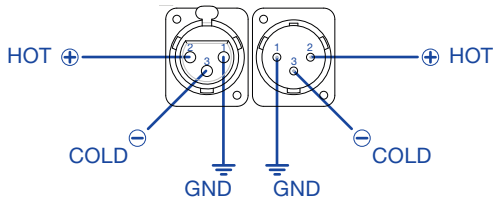


FIGURE 11: XLR pinout.

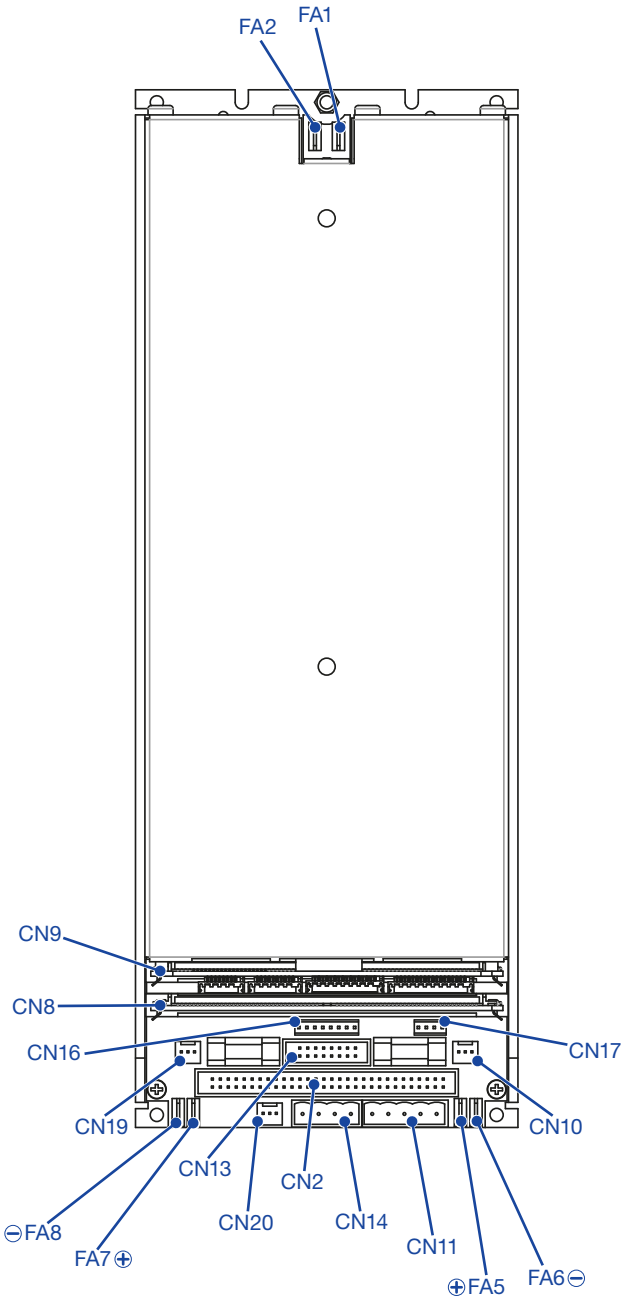
11:2.RS-485 interface

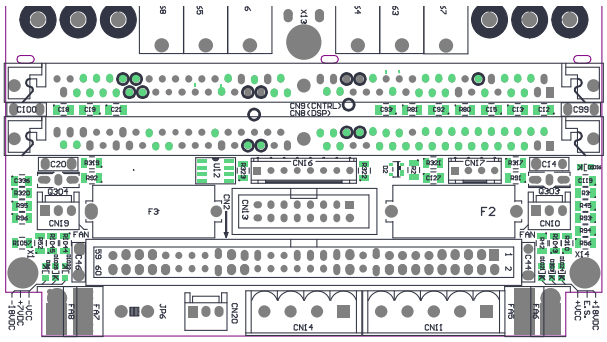
CODE	FUNCTION	TYPE
CN103	RS-485	RJ45
SW101	ID selector: units	rotative knob
SW101	ID selector: tens	rotative knob

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 24-43-44 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

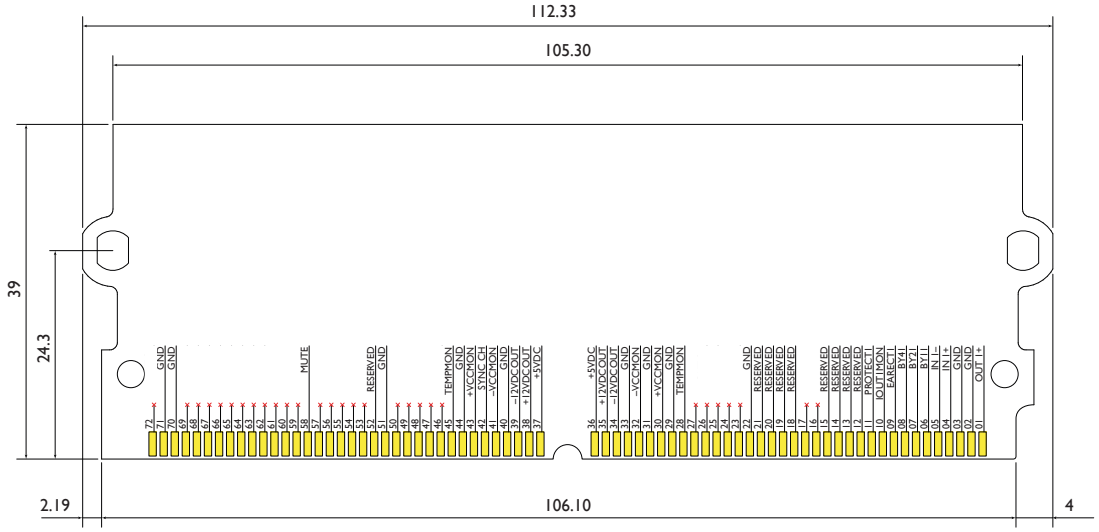


FIGURE 12: CN8: 72-pin SIMM board pinout (dimensions in millimiters).

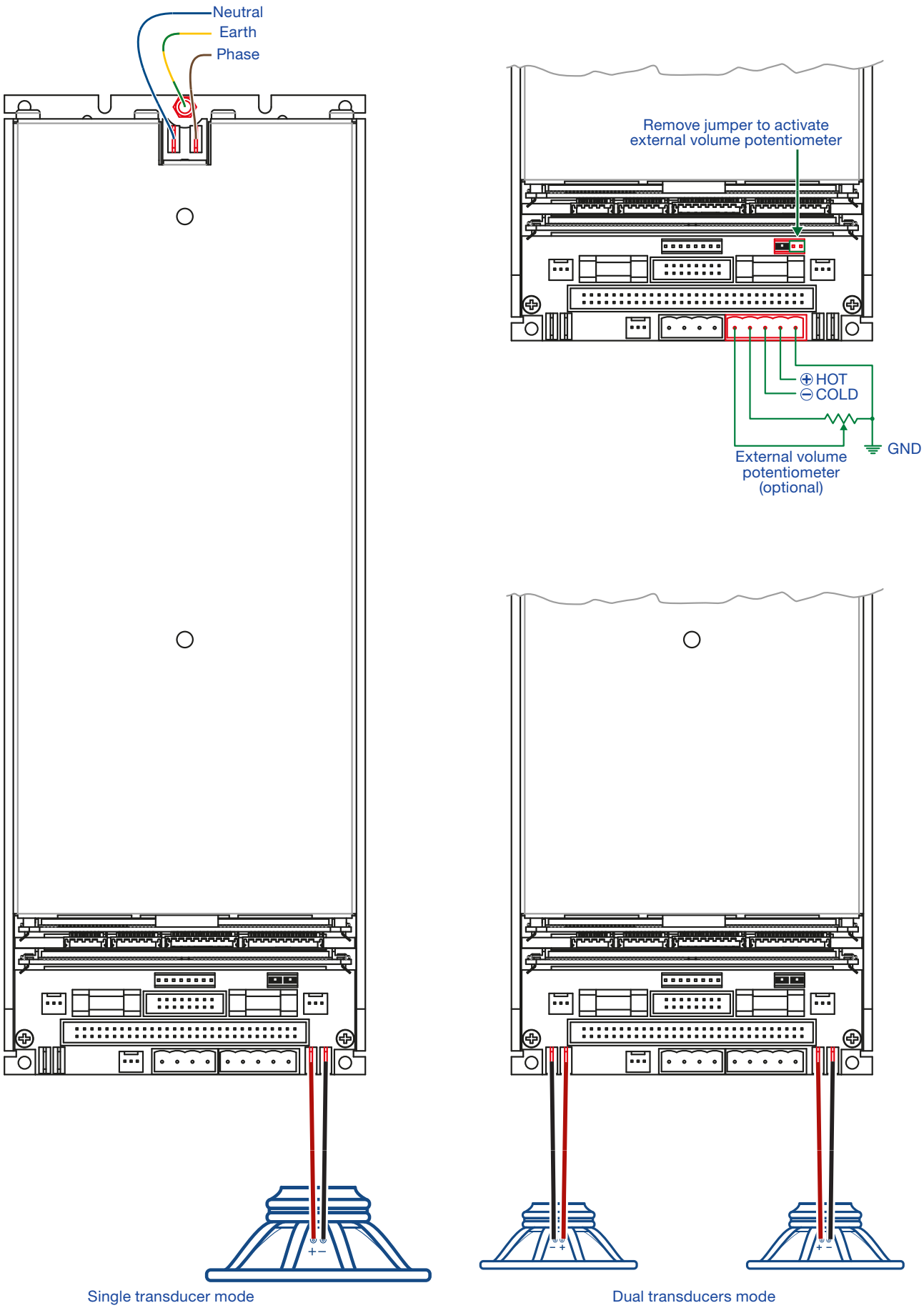


FIGURE 13: IpalMod: mains and audio connections.

11:5.Installing an optional DSP SIMM board

The IpalMod 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.

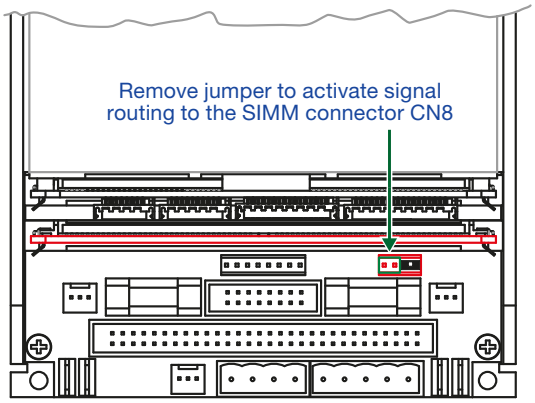


FIGURE 14: Jumper settings for optional DSP board.

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).

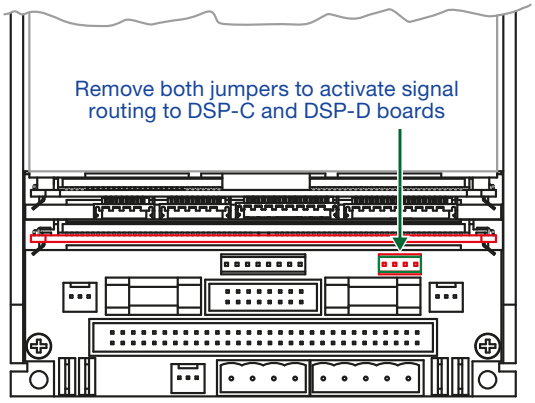


FIGURE 15: Jumper settings for DSP-C and DSP-D boards.

LED chart

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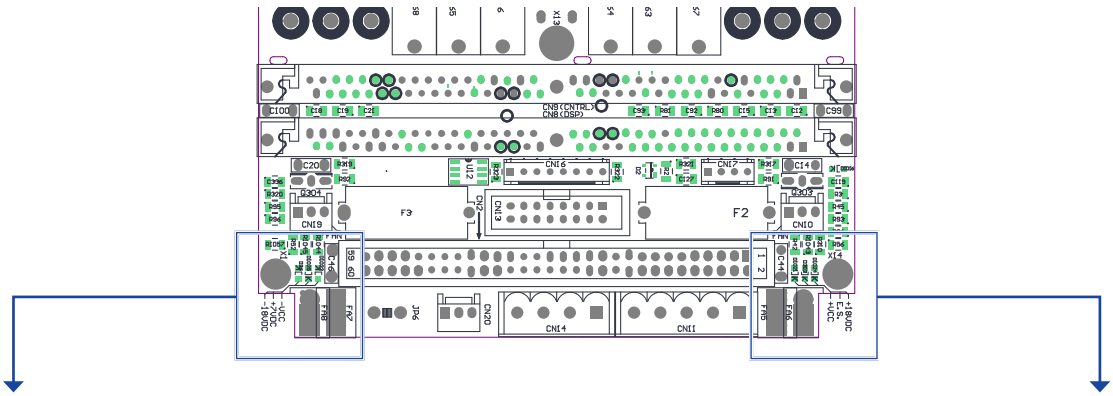
12:1.Main PCB LED chart



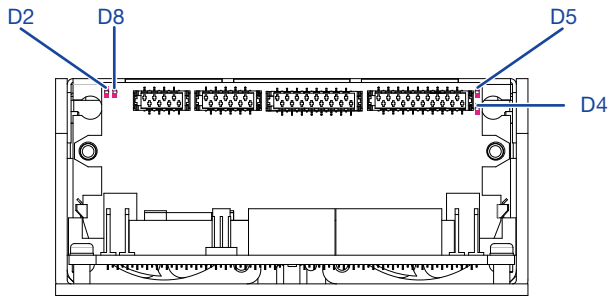
Left-hand LEDs:

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

Pressure sensor

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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 IpalMod are paramount.

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

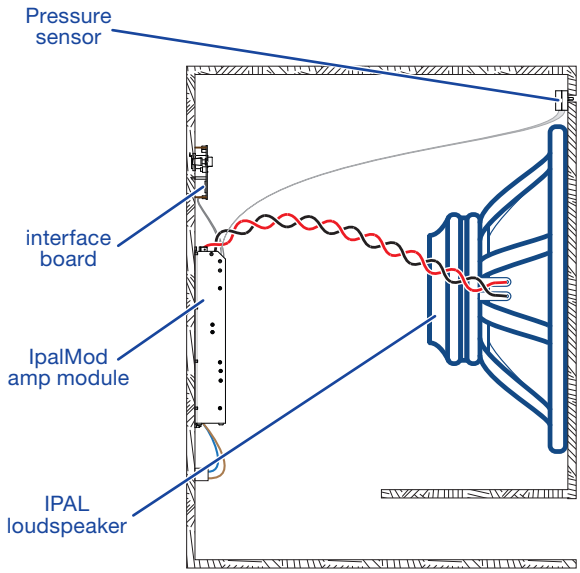
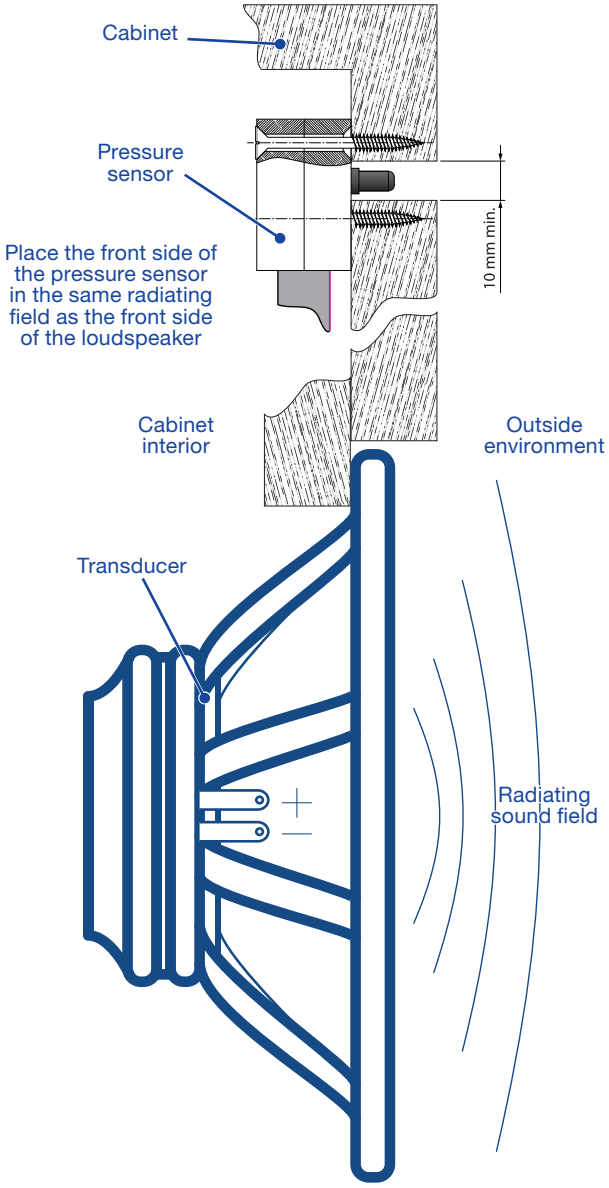
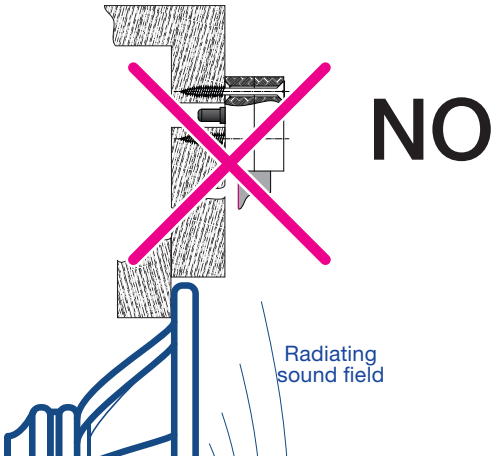
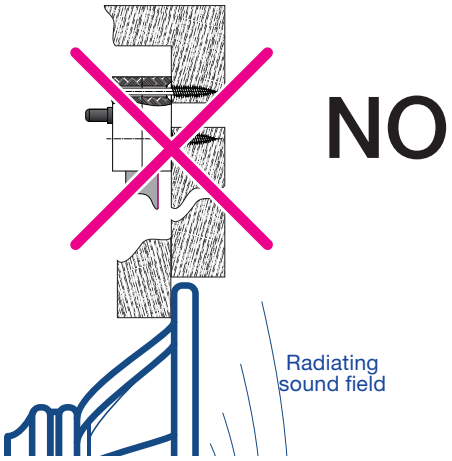


FIGURE 16: IPAL system.

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.







Initialization

14

14:1.DPC Programming System

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:

- Class-D amp module;
- differential pressure sensor;
- Zero-latency DSP board;
- 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 overcomes transducers non linearities, offering a complete control over sonic performance. In addition, DSP provides the needed algorithms for a complete loudspeaker tuning.

Using ProManager Plus™ is possible creating a custom model based on Zero Latency DSP (included on IpalMod) or based on an additional Powersoft DSP-4. Once you have created and exported the custom Armonía Plugin, the loudspeaker equipped with IpalMod can be recognized and managed via ArmoníaPlus™ software.

14:2.initialization framework

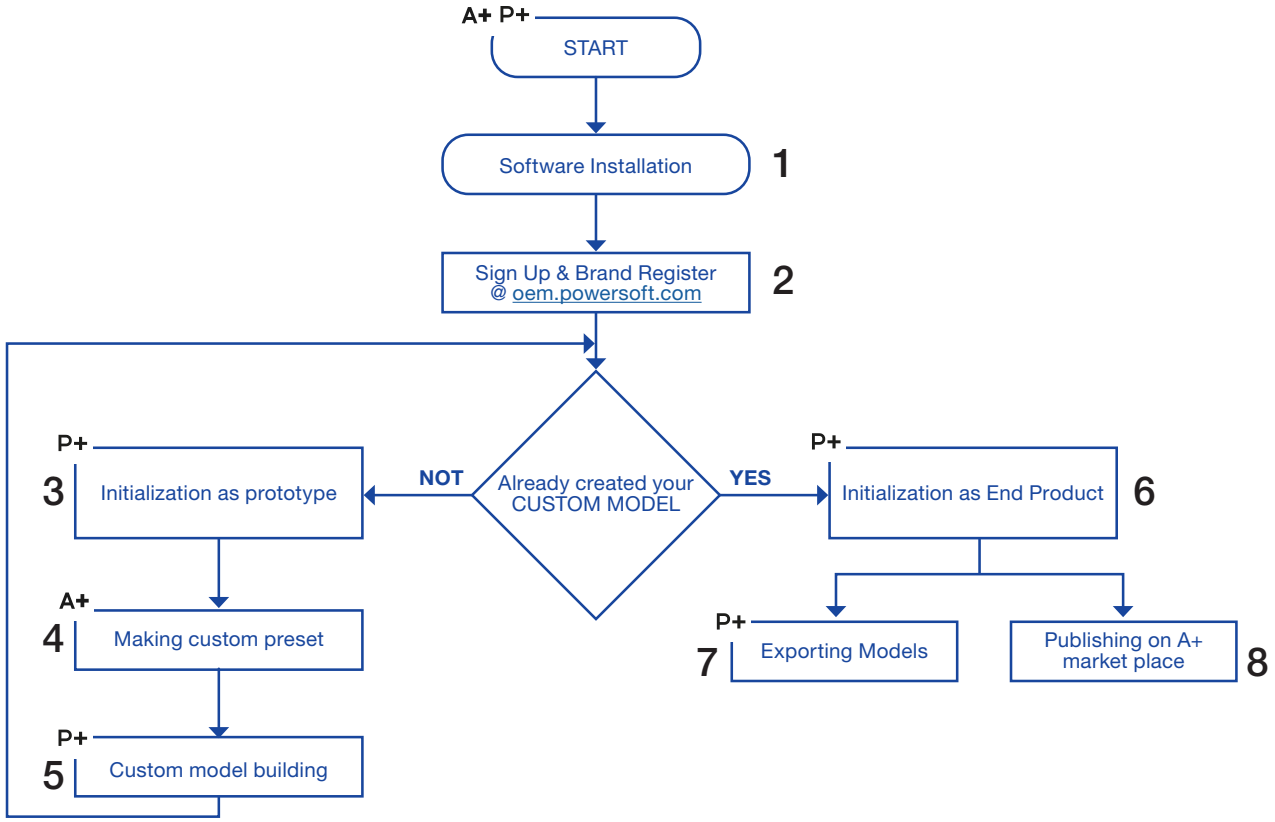
14:2.1.Initialization workflow

In order to initialize the DSP on board and external Powersoft DSP, the ProManager Plus™ proposes two approaches: Powersoft init or Custom init. The former initializes your DSP with default settings, while the latter initializes the DSP with your custom processing and it will allow ArmoníaPlus™ to identify your system as proprietary. As shown on the workflow, before directly proceeding with a custom initialization of the DSP, you are required to create a valid custom model for your product in which the presets – previously created for the Powersoft model with ArmoníaPlus™ – will be included.

This process of initialization will allow the DSP to take care of the processing and the level of the input signal according to the known

characteristics of the Powersoft amplifier module to which the DSP is associated to.

Furthermore, this process will also identify your DSP as part of a Powersoft system, which will permit you to discover the device when online in ArmoníaPlus™. The latter is a fundamental requirement in order to create your original processing and your proprietary DSP presets designed for your whole finished system.



14:2.2.Software installation

A+ Download and install ArmoníaPlus

P+ Download and install ProManager Plus

1. Install ArmoníaPlus™ before the ProManager Plus in order to gain complete access to the default presets bank

ArmoníaPlus™ is the software for setting and monitoring your system.

ArmoníaPlus™ allows you both on-line ans off-line system setup, tuning and real-time management and monitoring of all vital functions from a remote PC via a single intuitive graphical user interface.

Download ArmoníaPlus™ from the Powersoft Website www.powersoft.com

2. Install the ProManager Plus™.

3. Launch ProManager Plus™.

Do not run ProManager™ and ArmoníaPlus™ at the same time

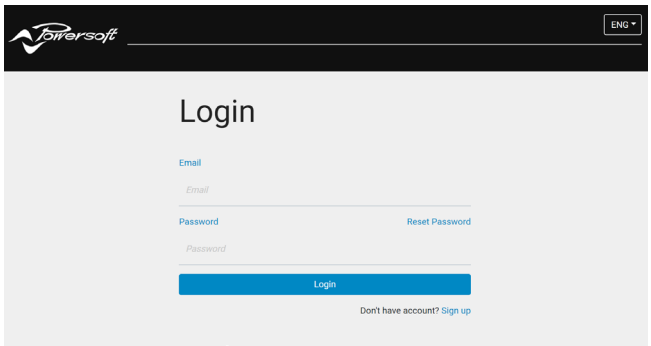
Take care to switch off ArmoníaPlus™ when you want to initialize your IpalMod with the ProManager Plus™.
Since both softwares try to access the DSP on board of the IpalMod, the system will become instable impeding any configuration.

14:2.3.Sign Up

P+ Sign Up & Brand Register

1.1. Acces the the OEM Manufacturer webpage for registration at:

oem.powersoft.com



before registering your brand you must register your account in Powersoft database.

2. Click on Sign up

3. Fill in all the cells with the required information

4. Accept the privacy policy

5. Click on Sign up

6. Confirm your registration opening the welcome email at the specified address.

NB - you must indicate your brand in the Powersoft generic account registration form, but it is not for ProManager.

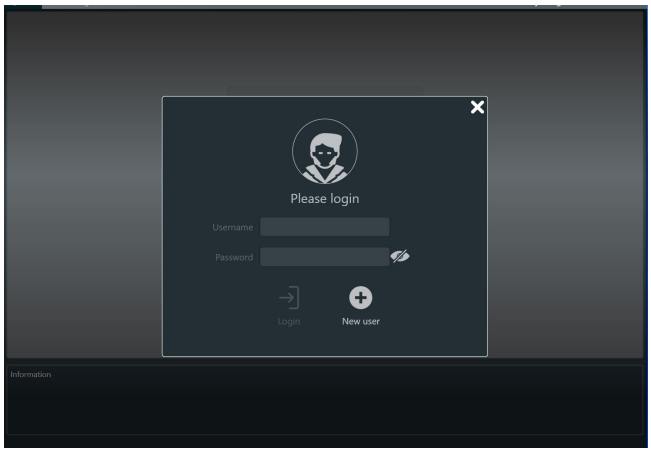
14:2.4.Brand Register

P+ Sign Up & Brand Register

1. Ensure that your internet browser is closed.

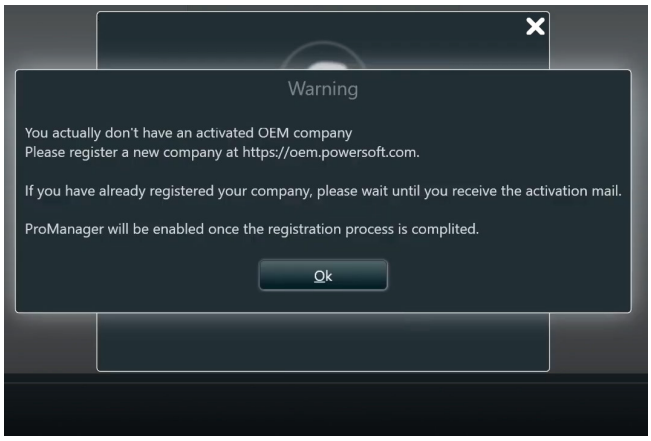
2. Open ProManager Plus

3. Have a Log-in with credentials just registered on Powersoft identity database.



4. Since you still have not your own brand registered on ProManager data base, a pop-up will appear with instruction for registration.

5. Click OK, the web page will open, you find the form for registering your own brand.

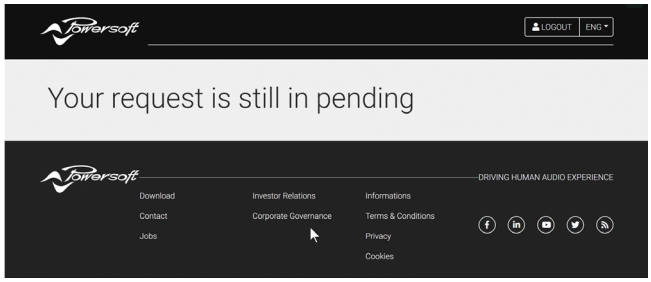


6. Fill in all the cells with the required information

7. Click on Sign up

8. Powersoft staff must be enable your request, so it will be in pending until confirmation (normally within 24h), you will receive a email confirmation.

9. Now, your own brand is associated to your Powersoft identity account, have a log-in again for using ProManager Plus



IpalMod DSP initialization

15

15:1.Required tools

Windows XP/7/8/10

Programming Cable
DB9 / RJ45

USB Serial Adapter VCP

A+ Armonía Plus

P+ ProManager Plus

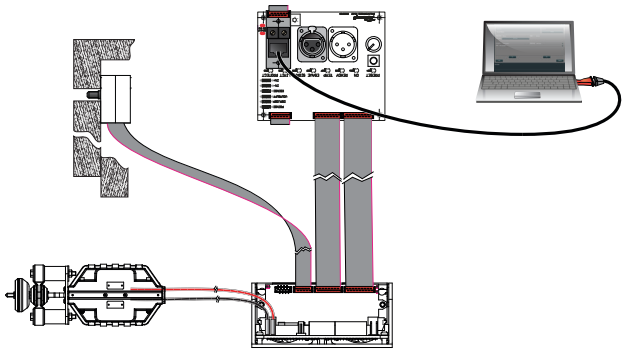
jrsoftware (latest release)

14:2.5.Connection

1. Connect the amp module to the computer via the RS485 connection on the interface board.

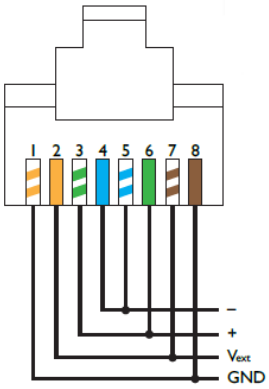
2. Set a unique ID number on the interface board by means of the two rotary knobs: allowed values range from 01 to 99; 00 is reserved.

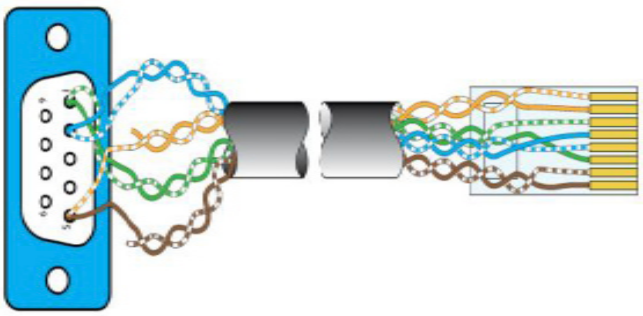
3. Turn the amplifier module on.



15:2.Programming Cable and Adapter

PIN	SIGNAL
1	GND
2	V_{ext}
3	+
4	-
5	-
6	+
7	V_{ext}
8	GND



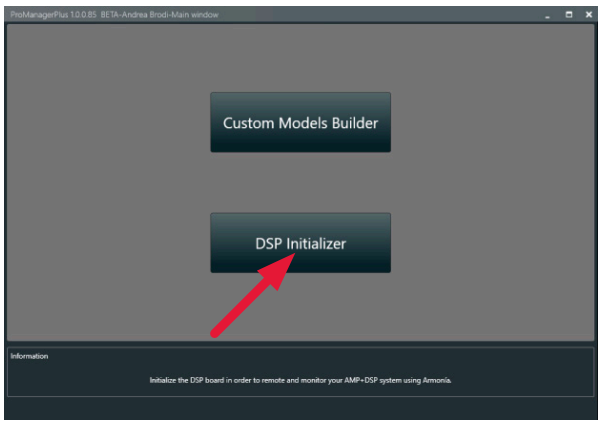


In order to implement a RS-485 port on a personal computer Powersoft recommend the use of the SPECTRA USB 2.0 to RS-485 converter. A DB9 to RJ45 adapter is needed as well.

15:3.Initialization as Prototype

1. Open ProManager Plus™

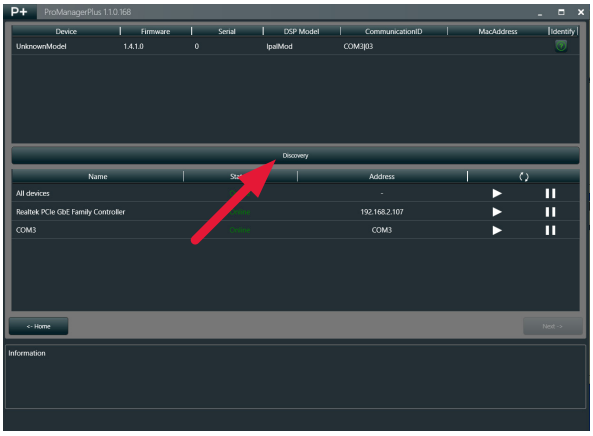
2. Click on the DSP Initializer button



3. Select the correct serial port by pressing Play

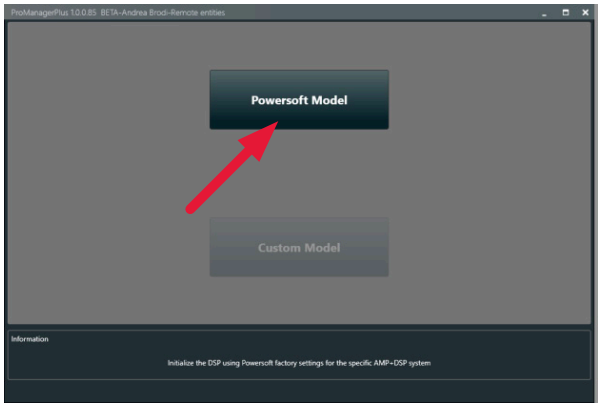
4. Press Discovery

5. Select the on-line system (Unknown model) and click on Next



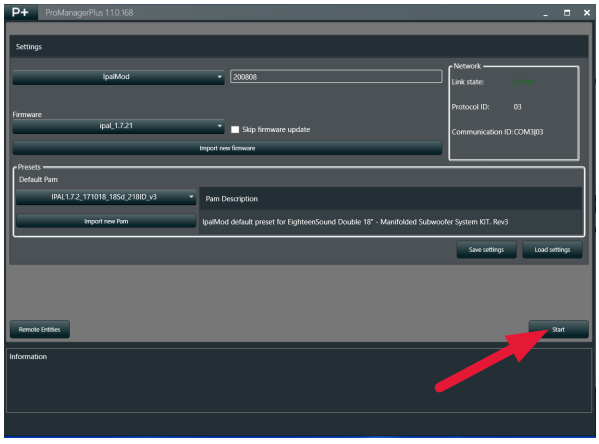
6. Click on Powersoft model

Custom Model button is disabled until you will make at least one custom model based on IpalMod.



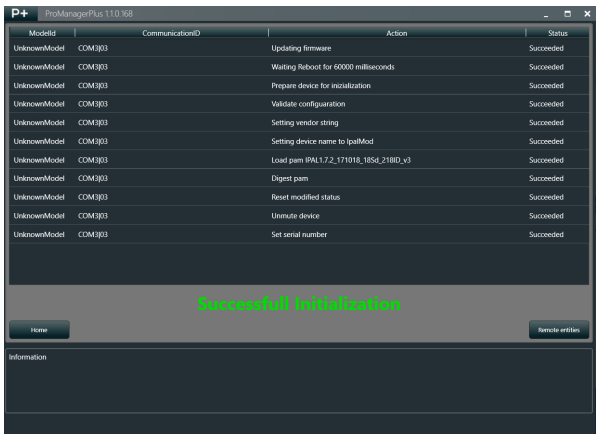
7. Fill in the cells with the required info

8. Select what kind of preset you want to store on your IpalMod; you find the Pam Description for each selected file then click on Start



9. Wait until DSP is successfully initilized

10. Close ProManager Plus™, only when the DSP has been correctly initialized.



A+ Create your custom presets with ArmoníaPlus

15:4.Making Custom Preset

At this stage you should have already initialized your DSP board as a Powersoft model. This includes also some default presets' schemes designed by Powersoft, which are intended to represent a good starting point for your evaluation of the amplifier, for a proper tuning of your speaker and for desired signal processing that you want to apply on your finished product. The final steps of this chapter will also guide through the process of exporting the presets that you have designed as .pam files. The exportation of these presets is an essential action if you desire to create a custom model for ArmoníaPlus™. In fact, you will be asked to import them on following steps.

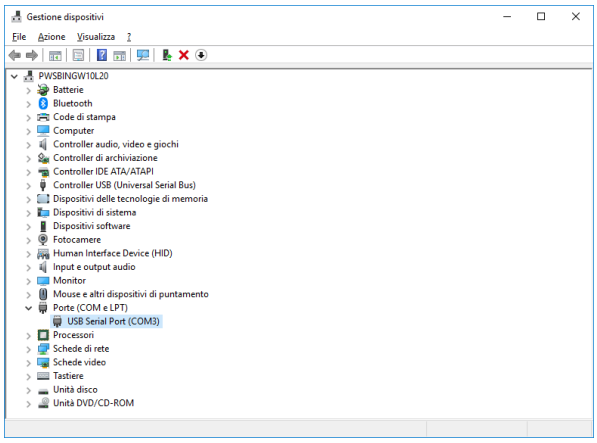
15:4.1.Automatic Discovery

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.

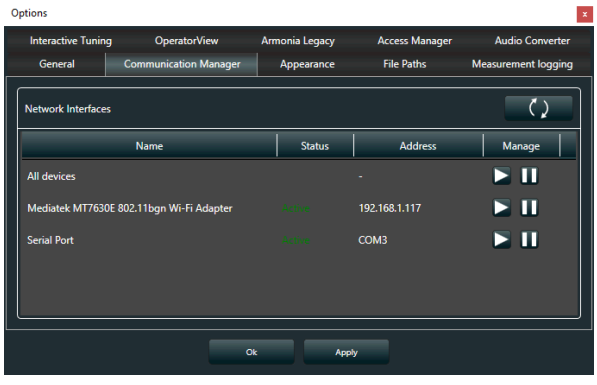
4. Verify the name assigned to the RS485 communication port on your PC operating system (this can be done through Microsoft Windows® Device Manager): the name should be something like COM5, COM6 or so on, depending on the number of the system built-in COM ports.



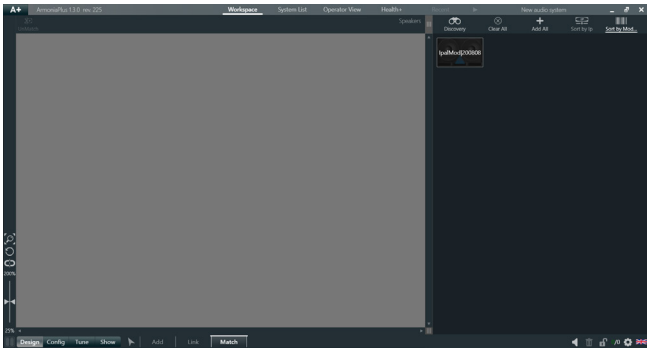
5. Open ArmoníaPlus, press the cogwheel in the lower right-hand corner select the tab "Communication Manager" on the option menu.

6. Make sure that the shown serial port number corresponds to the USB-to-RS485 converter and press Play for activating it, then press Apply.

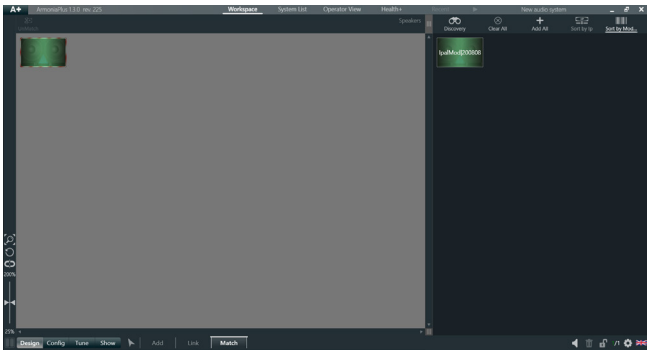
7. Close the Option menu by clicking on OK.



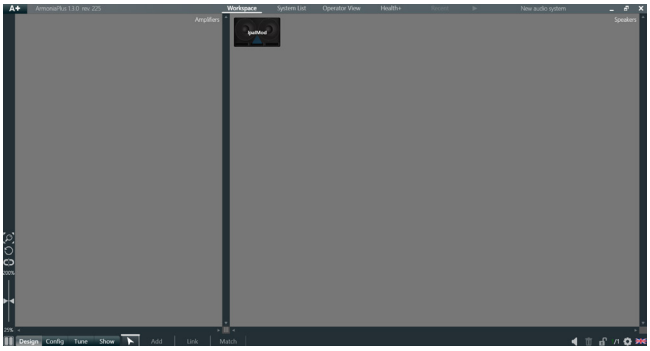
8. In the ArmoníaPlus™, go in the Match view and click on Discovery button . All connected amp modules will be detected and automatically shown on the amp list in the Status section.



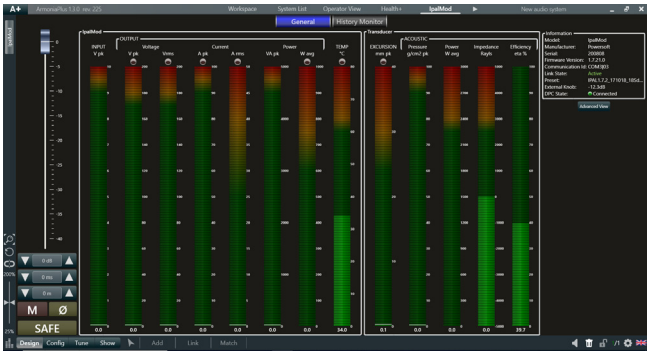
9. Drag the discovered model onto the workspace and wait it becomes green (device is on-line)



10. Go in the Select view , double click on the model



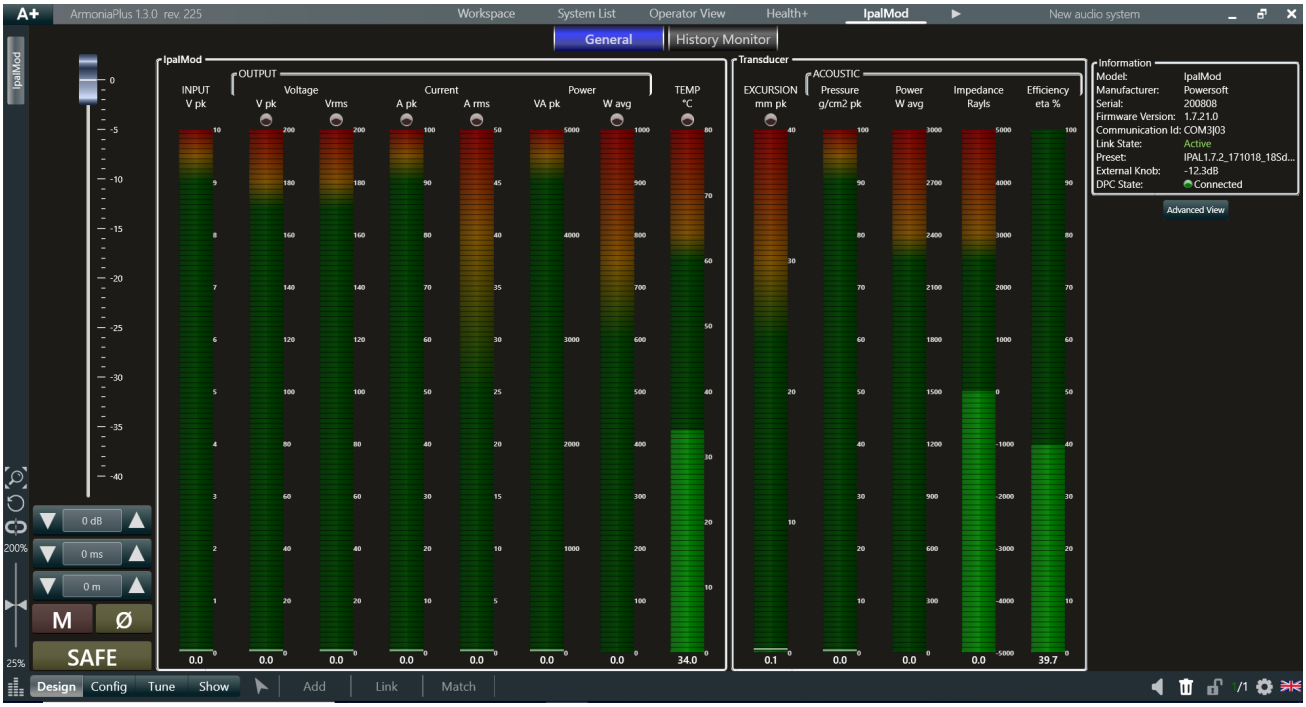
11. IpalMod as should appear at first opening



IpalMod DSP has two access levels based on kind of user:
1) Monitor view – for end user
2) Advanced view – for manufacturer

15:4.2.Monitor View

By clicking on the amplifier module from ArmoníaPlus' Workspace, at first opening you enter the Monitor view of the module, designed for the end user. In fact, all accessible settings do not permit to change internal DSP processing except delay, mute state and reverse polarity. The gain fader behaves as an attenuator; the max level is provided than the gain amount set inside the DSP.



Clicking on Advanced view , is possible entering deep inside in DSP processing, of course this is permitted only for a manufacturer with a pre-registered IpalMod license, Advanced view button does not show in case of missed license. When you pass in Advanced view first time after the initialization as Powersoft Model, no password will be requested.

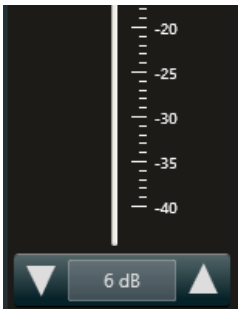
15:4.3.Advanced View

The advanced view provides a set of algorithms for tuning loudspeaker, including the DPC and impedance control, by clicking on Monitor view push button is possible to switch back to Monitor view mode.

15:4.3.1.Global Settings

15:4.3.2.Input gain

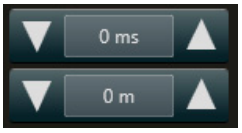
Set the maximum volume of the input signal. The attenuator knob on the interface board modifies the signal volume in series with the internal settings, it is possible disabling the external gain in the internal settings. In the Monitor view, input gain behaves as attenuator with a max value set than the gain value. So, end user has the possibility just to attenuate the signal.



15:4.3.3.Delay

The input signal can be delayed by user definable amounts via the delay processing block. Parameters can be accessed

and set both from Advanced view and Monitor view. Delay values can be entered in the time domain (us) or as physical linear distances (in mm or in inches).



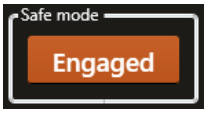
15:4.3.4.Polarity

The input signal can be phase reversed by clicking on this button. Polarity button is available for the end user in the monitor view.

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

15:4.3.5.Safe mode and Mute

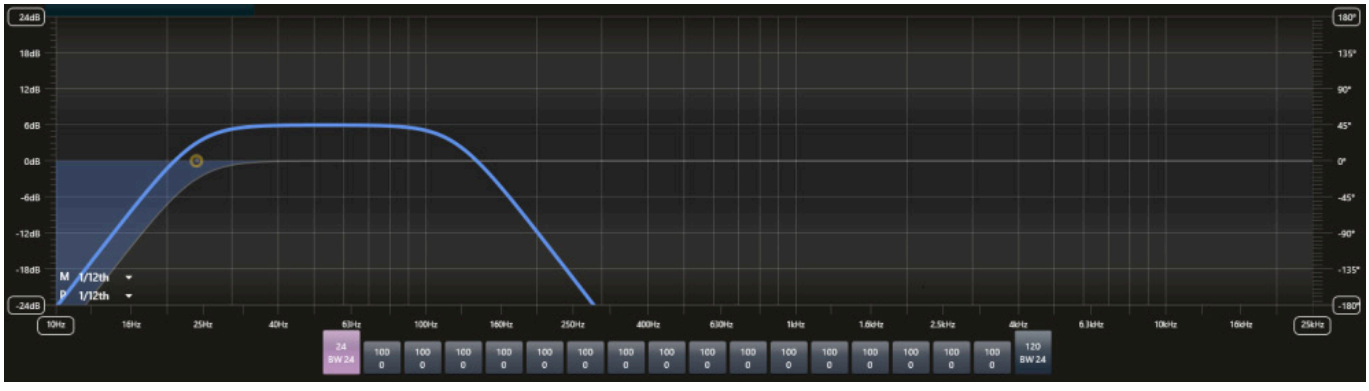
Some settings may bring to system instability and critical operating condition. The Safe Mode button provides a protection against critical settings: when activated, this function will not allow the output power to exceed a set limit (about 20W set on Power Limiter).



15:4.3.6.Parametric equalizer

A fully parametric equalizer processing blocks are available to fine tune the system's sound.

Each individual selected filter can however be enabled switching on the on/off switch. A list of parameter presets of commonly used equalization schemes is available under Type combo box. For each kind of equalization, you can set Frequency, Q, Gain (when available) using the sliding box. A log scale diagram of each filter's effect is presented, the slider on filters allows real time variations of filter parameters such as the filter's central frequency, gain, Q.

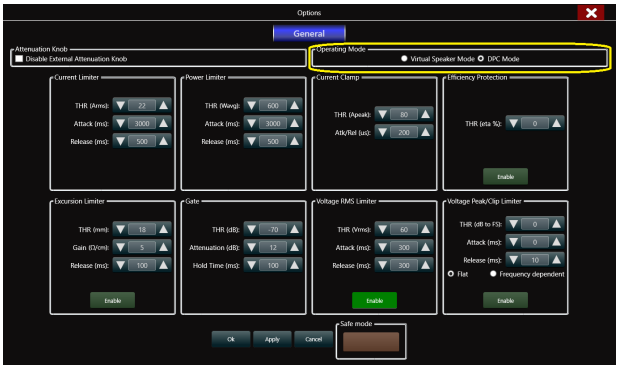


Options and Operating Modes

The DPC technology can be exploited in two operating modes which differ in signal processing path and application scenarios. They are the Pressure Model Mode and the Virtual Speaker Mode. They are selectable by clicking on the cogwheels push button and entering into the Options menu, than chosing the desired option.

15:4.4.Internal parameters

Click on the cogwheels button to access the Internal parameters window.



15:4.4.1.Pressure Control (pressure feedback loop)

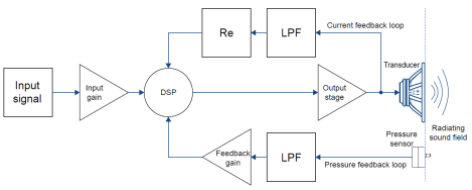
This loop brings the pressure level measured at the radiating sound field, back to the input stage. This is achieved by feeding the pressure sensor measurement through a first order low pass filter (LPF) and a linear amplifier. The parameters that can be set by the user for this feedback-loop therefore 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 top frequency of the band at which this feedback loop is active;
- The HPF bandwidth, defining the bottom frequency of the band at which this feedback loop is active.

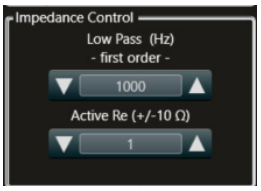
It is important to set the loop gain carefully, as too high a value will bring the system to instability. This results in a loud "ship's horn" sound which can potentially damage the system if not silenced after a short time. This can be done by lowering the feedback loop gain until the sound stops. The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

15:4.4.2.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 M-Force.



M-Force has an extremely low impedance. This means 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 mimic's 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:



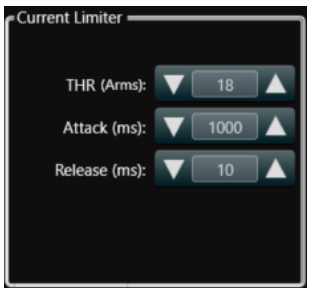
- The "added Re" value, defining the additional series resistor inserted to simulate a traditional speaker behavior. This is usually a small number, which aims to return the apparent loudspeaker resistance to a traditional 2-4 Ohm value;
- The LPF bandwidth, defining the range of frequency at which this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

15:4.4.3. Disable External Knob

By clicking on this box is possible disabling the external attenuation knob, this must be done in case of external processor like DSP-4 connected to IpalMod.

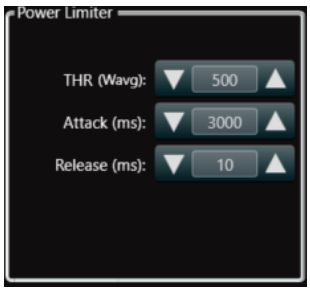
15:4.4.4. Current Limiter

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



15:4.4.5. Power Limiter

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



15:4.4.6. 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 exceed the clamp threshold considerably due to the internal limiter design.

15:4.4.7. Efficiency Protection

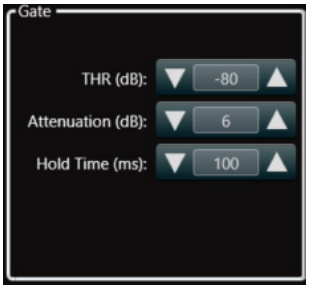
Set the minimum threshold limit of the measured efficiency that triggers the protections on the amp module. The pressure sensor continuously measures the acoustical output power developed by the diaphragm: when the acoustical output power falls under the expected output power, the efficiency of the system lower accordingly. This can be occasionally caused by a fault either in the amp module or in the transducer motor. Powersoft recommends to set the efficiency protection at least to 1/3 of the value of the reference loudspeaker efficiency (Ref eff. no%, see below). The value 0 (zero) switches off the efficiency protection. If the pressure sensor is not used, set the efficiency protection to 0 (zero).

15:4.4.8. 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.

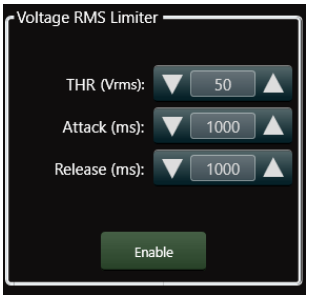
15:4.4.9.Gate

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 then output gain is decreased withn respect to no attenuation. Note that the system gain changes slowly and not abruptly so the effect is unnoticeable.



15:4.4.10.Voltage RMS Limiter

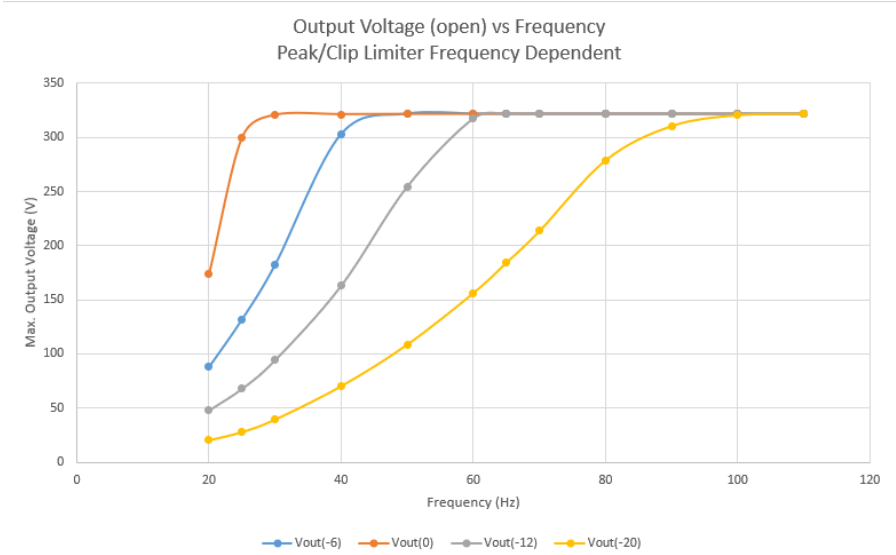
Set a threshold limit and the attack/release time for the average (rms) output voltage.



15:4.4.11.Voltage Peak/Clip Limiter

Set a threshold limit and the attack/release time for the peak output voltage. A clip limiter will be engaged.

Clip limiter can be set as flat (same clipping level per frequency) or frequency dependant (clipping level changing depending on the thershold set) see the graph for reference.



15:4.5.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.

15:4.6. 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:

ffFs: loudspeaker resonant frequency in free air (Hz);

ffQes: electrical loudspeaker damping at resonance (unitless);

ffQms: mechanical loudspeaker damping at resonance (unitless);

ffVas: volume of air with the same acoustic compliance of the driver suspension in free air (cubic meters or liters);

ffRe: electrical resistance of voice coil (Ω);

ffSd: effective projected surface area of the driver diaphragm (square meters).

ffCms: suspension compliance (m/N)

ffMms: effective moving mass combining cone, coil, all moving parts and the acoustic load by the air in contact with the loudspeaker cone (kg);

ffRms: suspension and all moving parts losses or damping (mechanical ohm);

ffBl: 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 folloging data:

ffSound speed: speed of sound (meter/second)

ffRo medium density: air's medium density (kg/m3)

15:4.7. Calculated Parameters

The Power Control Manager derives the following data:

ffQts: total loudspeaker damping at resonance combining electric and mechanical effect (unitless):

ffCmes: electrical capacitive equivalent of the moving mass Mm (farad)*;

ffLces: electrical inductive equivalent of the suspension compliance Cm (henry);

ffRef eff. no: loudspeaker free air standard reference efficiency (unitless);

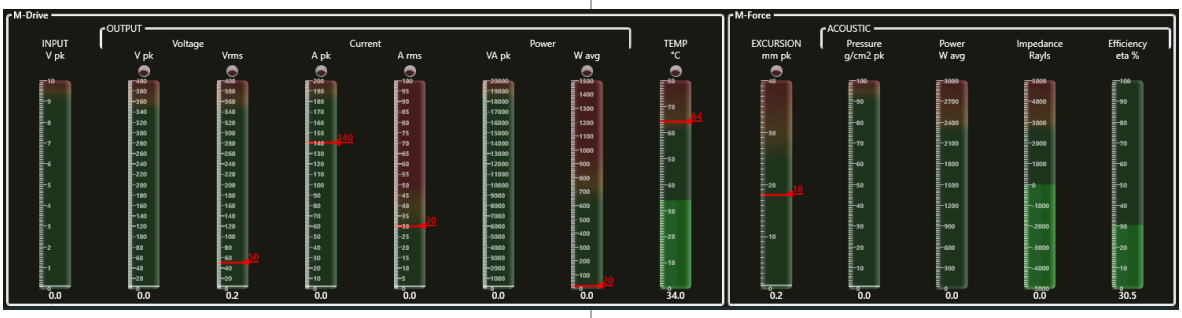
ffRef eff. no%: same as Ref eff. no in percentage;

ffRef SPL: reference sound pressure level (dB):

Ref SPL = 112 + 10 log(no).

15:4.8.Metering

Metering are divided in two parts, one regarding IpalMod amplifier and one regarding the M-Force and loudspeaker volume. Where is present, the red line indicates the threshold level in according with respective limiter.



15:4.8.1.IpalMod metering

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.

Output Voltage (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.

Output Voltage (V_{rms}) – Output voltage rms 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. Red line refers to Voltage RMS Limiter threshold.

Output Current (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. Red line refers to Current Clamp threshold.

Output Current (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. Red line refers to Current Limiter threshold.

Output Peak Power (VA_{pk}) – Peak output power.

Output Avarange Power (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. Red line refers to Power Limiter threshold, when Safe mode is engaged, threshold set to 20W.

15:4.8.2.M-Force metering

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. Red line refers to Excursion Limiter threshold.

Acoustic Pressure ($g/cm2_{pk}$) – Peak pressure level as measured by the pressure sensor.

Acoustic Power (W_{awg}) – Estimated average acoustic power.

Impedance (Rayls) – Estimated average acoustic impedance.

Acoustic Efficiency ($\%_{eta}$) – Estimated acoustic efficiency.

15:4.9.Locking

Normally the manufacturer take care for locking this view after he finished loudspeaker tuning, since DSP processing is part of his know-how. When you enter in the Advanced view first time, no password required, by pressing Lock button first time, a pop up, where you can set password, will appear; until you press Lock button, IpalMod and so pam files exported remain not locked by password.

Make attention: password is saved on board IpalMod and in the pam file when you export it, only pam files with a same password than IpalMod will open.

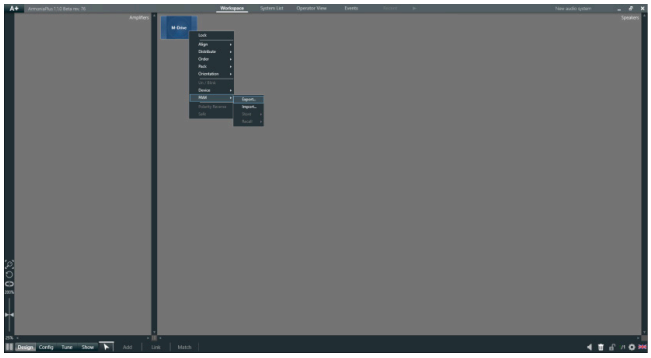
Each time you press Lock button you will pass to monitor view directly; if you want to pass again to advanced view you need to type the password for opening. Use monitor view button for closing the advanced view and return to Monitor view maintaining the IpalMod not locked by password, in this case if you want to pass again to advanced view, no password will be requested.

	IpalMod	Export Pam files
Not Locked IpalMod	IpalMod accepts all pam file from IpalMod not locked	Pam files compatible with all not locked IpalMod
Locked IpalMod	IpalMod accepts all pam file with the same locking password	Pam files compatible with IpalMod has same password
Change Password	Password changed only for IpalMod	Pam files previously exported from IpalMod with old password become not compatible.

15:5.Export Custom Presets

Once you reached the best performance in terms of DSP processing as you want, export your preset returning in the Select view.

1. Right click on the device
2. Select PAM > Export
3. Assign a name to your Preset and save



Custom Model Building

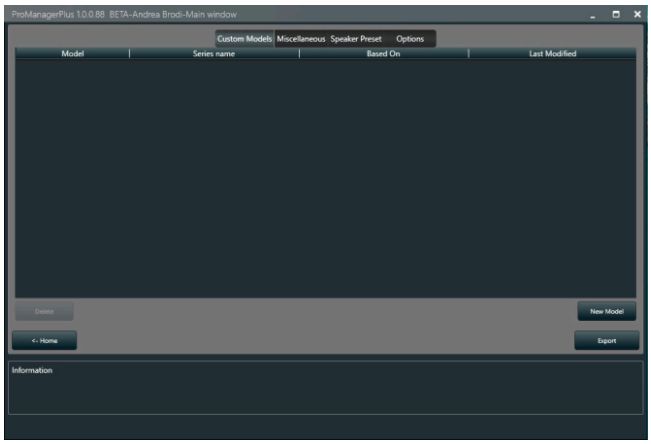
On this chapter we will give birth to the custom model, which represents your finished product (speaker, rack amp) that you aim to manage using ArmoníaPlus™. In fact, we will create a software plugin so that the ArmoníaPlus™ is able to accept and to recognise your custom model as it was defined.

16:1.DPC Custom Model Builder

1. Open ProManager Plus™
2. Click on the Custom Models Builder button

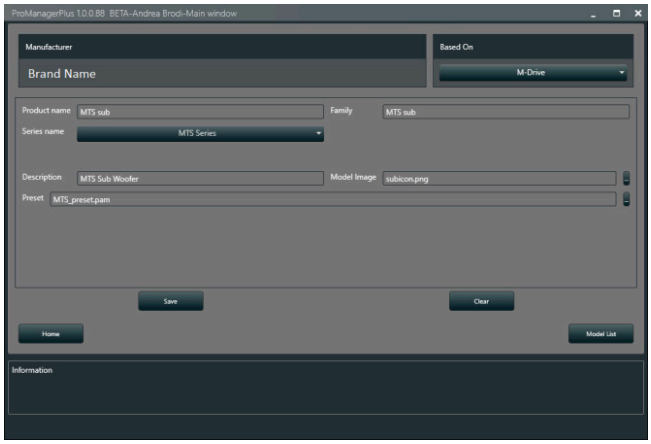
This is the model list, in this window are listed all custom model you will create.

3. Click on New Model on the bottom-right corner



4. Fill in the cells with the required informations:

- Based on: DSP in use
- Product name: your product name
- Family: your product version
- Series Name: your product serie
- Description: the description of your device that will appear in ArmoníaPlus
- Choose a suitable image for your system/model, suggested size: 350 max width, 250 max height
- Preset: Load the presets that you have previously exported from ArmoníaPlus™
- Click Save and confirm



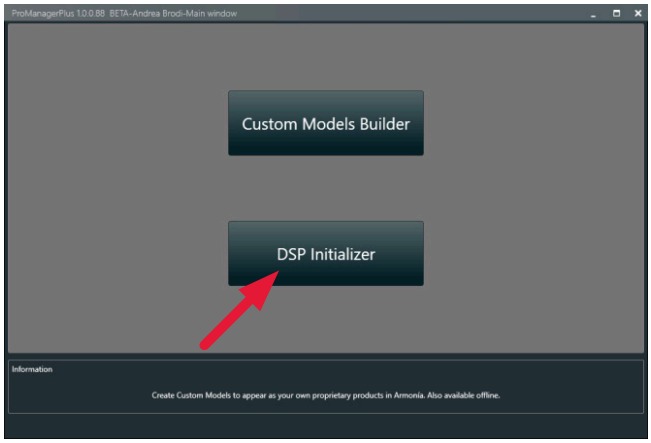
16:2.Initializazion as End Product

If you have come to this stage it means that you have created a software plug-in for ArmoníaPlus™ which contains all the parameters, names, descriptions and presets that characterize your finished product. Here we show how to straightforwardly initialise each of your products with custom settings. This may represent a good solution if, in ArmoníaPlus™, you want to immediately identify your proprietary product with the parameters that characterize it. Please note that the Custom Init button is disabled if no Custom model are yet available on your list.

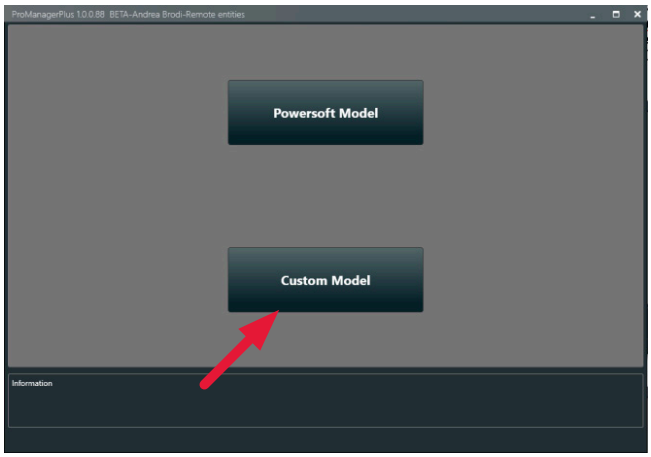
1. Open ProManager Plus™

2. Click on the DSP Initializer button

3. Discover the IpalMod using selected Com port as shown previously and press Next



4. Select Custom Model

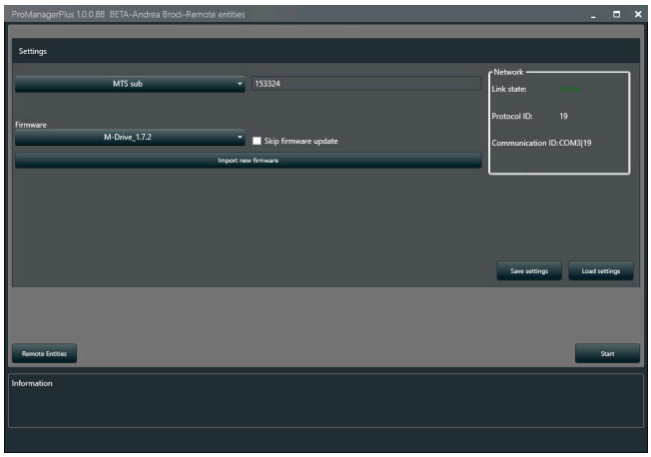


5. Select the model you have created during earlier stages

6. Specify the product serial assigned to your system/ model

7. Choose a firmware version to be stored on your DSP or tip the Skip firmware update check box

8. Press Start and wait until the DSP is successfully initialized. At the end of initialization, device will be ready to be recognized by Plugin previously installed.

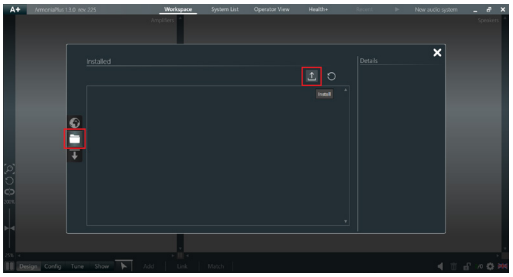


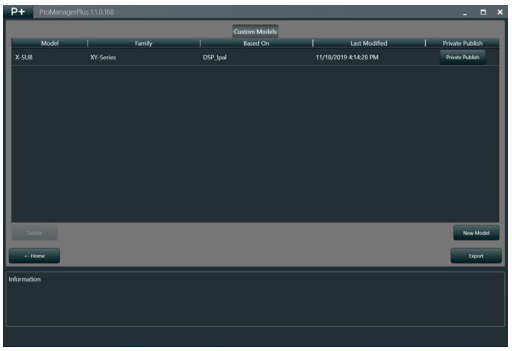
16:3.Exporting Models

1. Open ProManager Plus and go to Custom Model Builder.

2. Here you find all your custom model that correspond to your end products, is it possible to export all as ArmoníaPlus third party plug-in clicking on the button Export.

3. Save the Armoía package on your PC





4. Open ArmoníaPlus Plus and select MarketPlace under A+ menù

5. Select local folder and click on install, select the Armonía package just exported.

16:3.1.Publishing on A+ Market Place

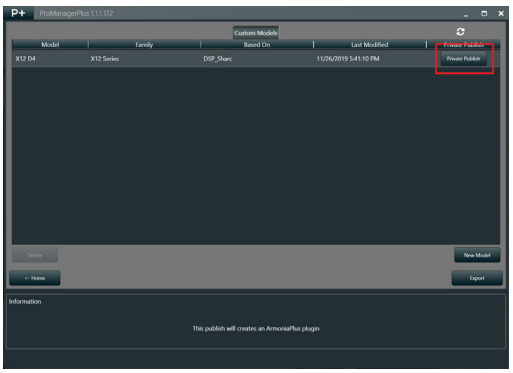
Publishing on A+ MarketPlace allows to publish one custom model at time and so managing single custom model

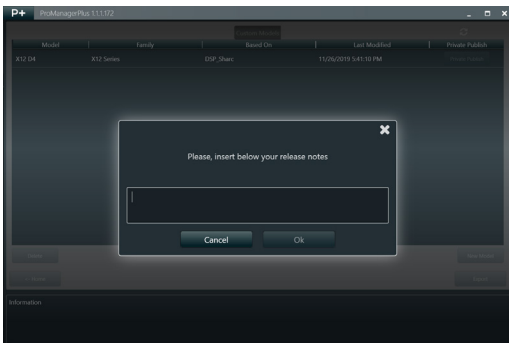
1. Open ArmoníaPlus ProManager Plus and go to Custom Model Builder section.

2. Click on Private Publish for custom model you want to publish on ArmoníaPlus Plus MarketPlace

3. Set the version and click ok.

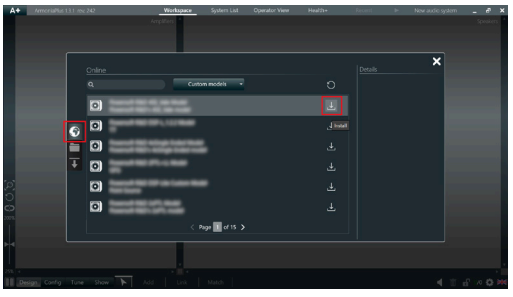
NB: the Plug-in published as Private is availabe on MarketPlace only for user registered to the custom model's brand.





4. Open ArmoníaPlus Plus and go to MarketPlace

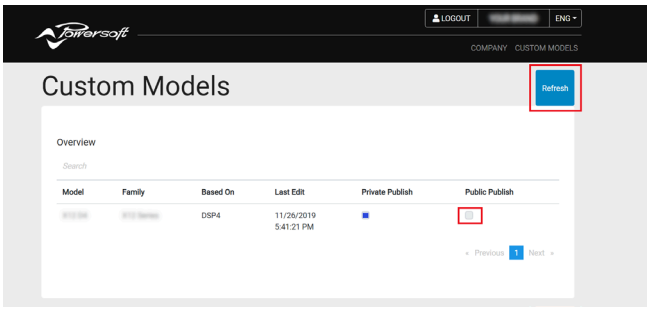
5. Select online folder and choose the custom model you want, then click on install.



It's possible passing plug-in in global publish, so available for each ArmoníaPlus user, via oem database.

6. Have a log-in on oem.powersoft.com, there are all custom models you have created and their publishing state, private and public.

7. Global publishing is available if custom model already published in private mode. Check the box "Public Publish" for releasing the plug-in that becomes available for all ArmoníaPlus user.



16:4.Add online Custom Model

From this step onwards, your product will appear and will be recognized in ArmoníaPlus™ as custom and the model will include all the proprietary processing and customization that you have applied using the ProManager™.

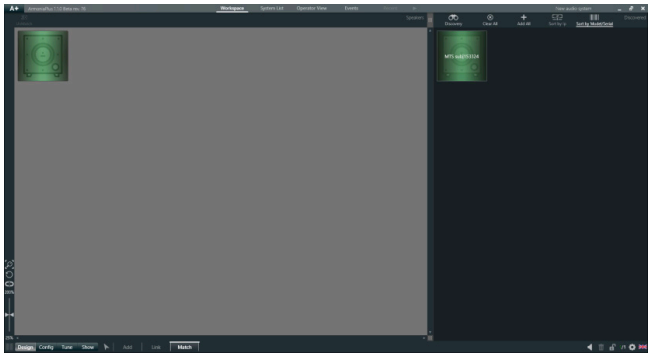
1. Open ArmoníaPlus™

2. Enable the serial virtual com port in the communication manager

3. Go in the Match view , click on Discovery and see your system branded as proprietary

4. Drag your custom model onto the workspace

5. You can now manage your system on Armonía



16:5.Add offline Custom Model

As soon as you installed plugin, you can manage the custom model not only with an online device but even adding a virtual powered speaker.

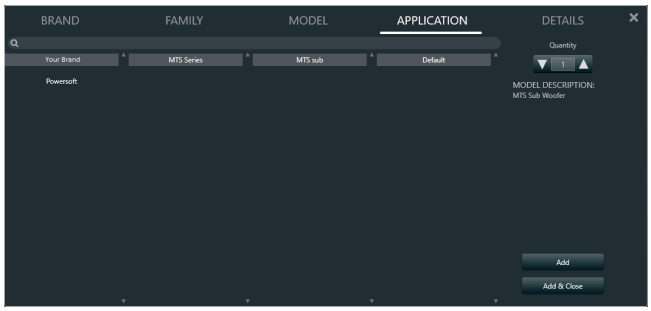
1. Go in the Add view

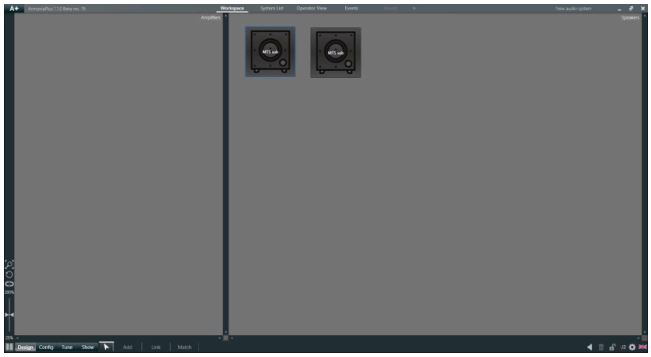
2. Click Powered Speaker

3. Choose your brand, family, model and kind of application.

4. Press Add & Close

5. Blue frame means virtual Power speaker.





DSP-4 Initialization

17

17:1.Required Tools

Windows XP/7/8/10

Programming Cable
DB9 / RJ45

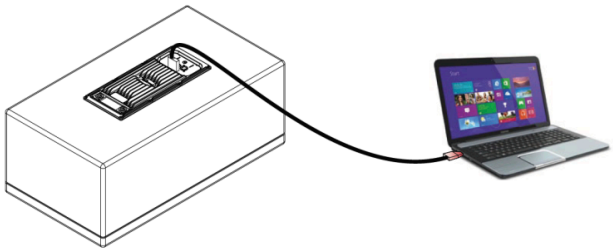
A+ Armonía Plus

P+ ProManager Plus

jrsoftware (latest release)

17:2.Connection

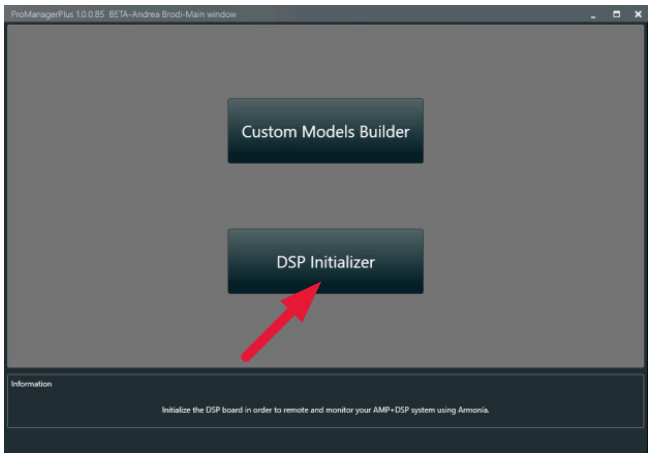
1. Connect DSP-4 to the computer via Ethernet cable.
2. Turn the amplifier module on.



P+ Initialization as Prototype

17:3.DSP-4 initialization as Powersoft model

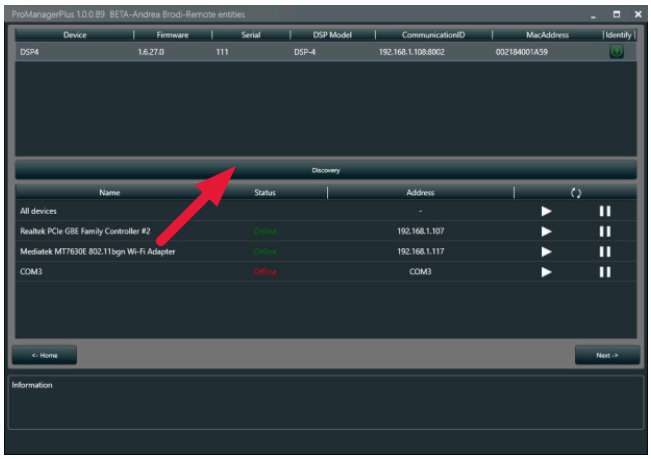
1. Open Armonía ProManager Plus™
2. Click on the DSP Initializer button



3. Select the Network Card where DSP-4 connected pressing Play

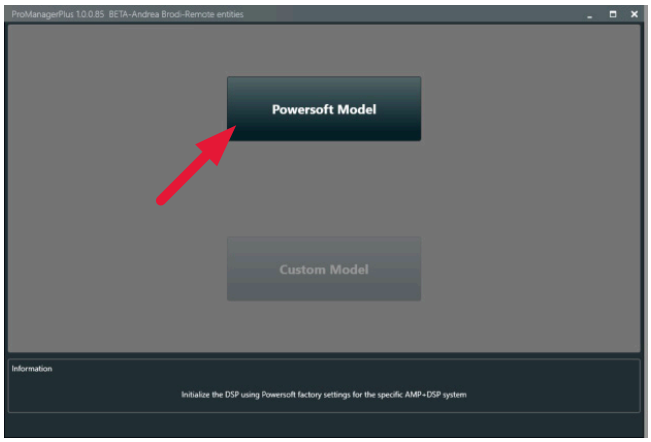
4. Press Discovery

5. Select the on-line system (Unknown model) and click on Next



6. Click on Powersoft model

Custom Model button is disabled until you will make at least one custom model based on DSP-4.



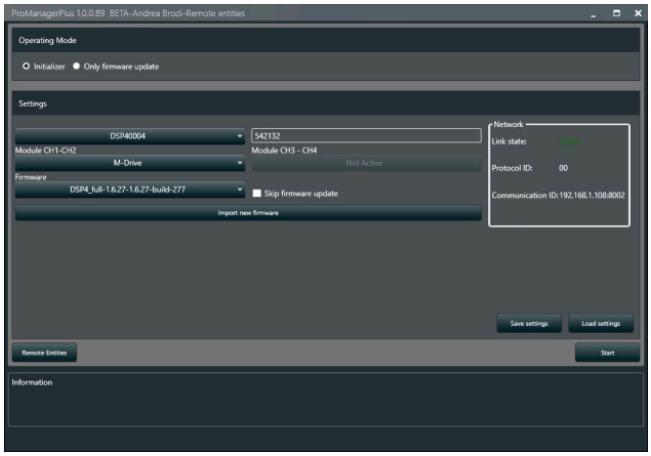
7. Select Initializer as operating mode

8. Fill in the cells with the required info selecting DSP40004 as DSP in couple with IpalMod.

9. Specify the product serial assigned to your system/ model

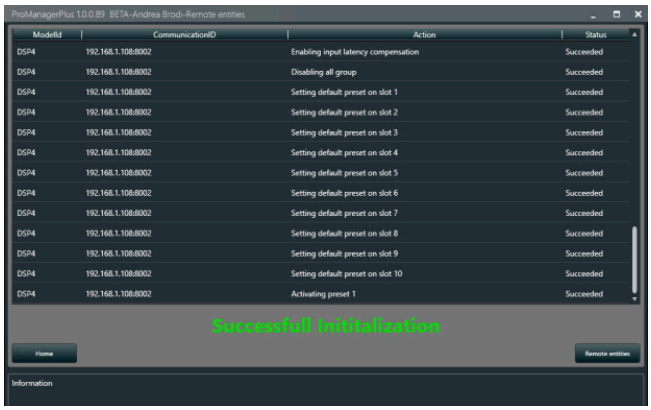
10. Choose a firmware version to be stored on your DSP or tip the Skip firmware update check box

11. Press Start and wait until the DSP is successfully initialized. At the end of initialization, device will be ready to be recognized by Plugin previously installed.



12. Wait until DSP is successfully initilized

13. Close ProManager Plus™, only when the DSP has been correctly initialized.



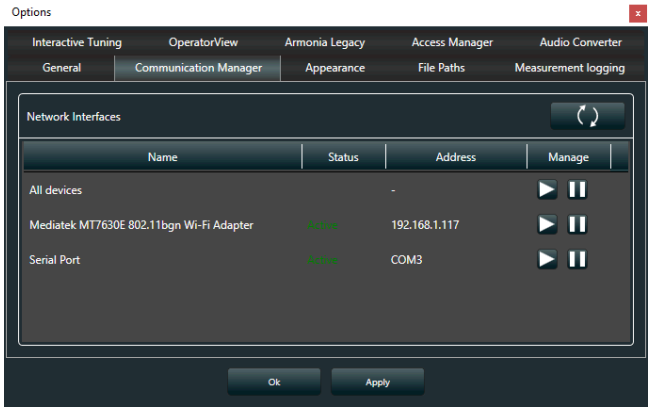
17:4.Programming DSP-4

At this stage you should have already initialized your DSP board as a Powersoft model. This includes also some default presets' schemes designed by Powersoft, which are intended to represent a good starting point for your evaluation of the amplifier, for a proper tuning of your speaker and for desired signal processing that you want to apply on your finished product. The final steps of this chapter will also guide through the process of exporting the presets that you have designed as .pam files. The exportation of these presets is an essential action if you desire to create a custom model for ArmoníaPlus™. In fact, you will be asked to import them on following steps.

1. Open ArmoníaPlus™, press the cogwheel in the lower right-hand corner select the tab "Communication Manager" on the option menu.

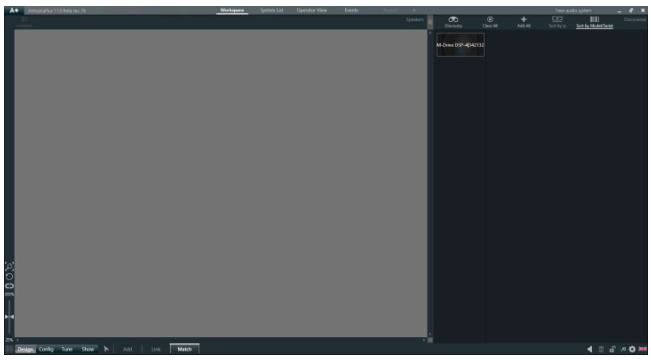
2. Select the Network Card where DSP-4 connected pressing Play, then press Apply.

3. Close the Option menu by clicking on OK.

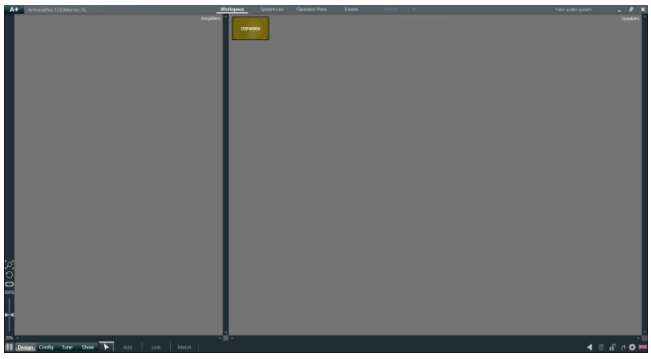


4. In the ArmoníaPlus™, go in the Match view and click on Discovery button. All connected amp modules will be detected and automatically shown on the amp list in the Status section.

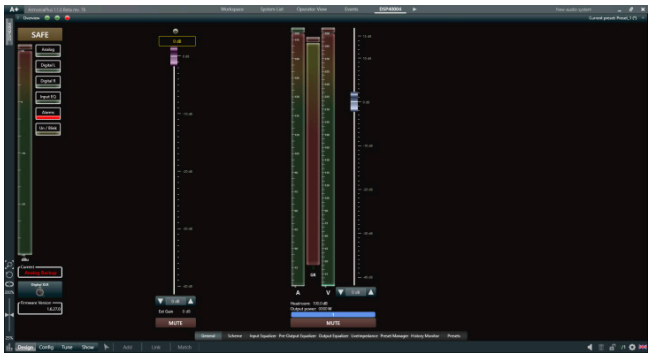
5. Drag the discovered model onto the workspace and wait it becomes green (device is on-line)



6. Go in the Select view

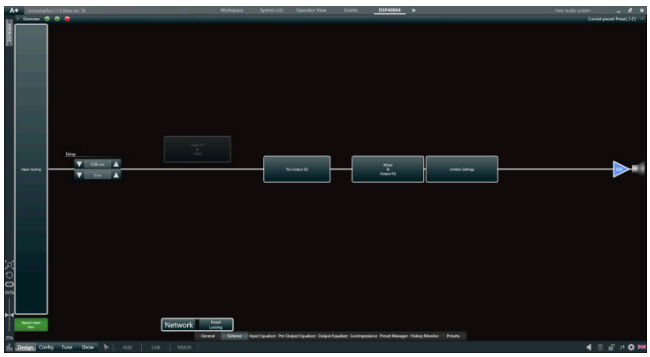


7. Double click on the model



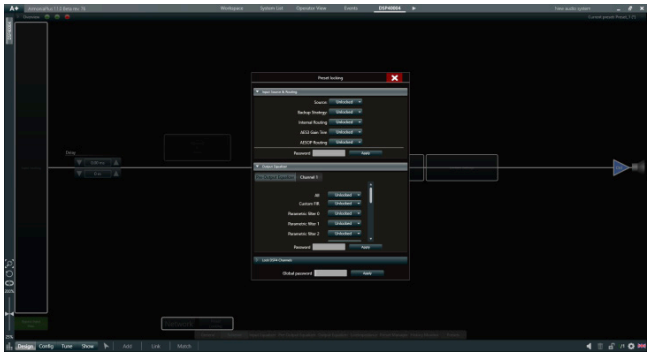
8. You now have a full overview of your Powersoft system: click on the Scheme tab

9. Double click on the functional blocks to edit the processing parameters



11. Once you are happy with the processing you can lock all params you want, clicking on Preset Locking

12. It is possible locking 3 different area using 3 different password or one global password for all.



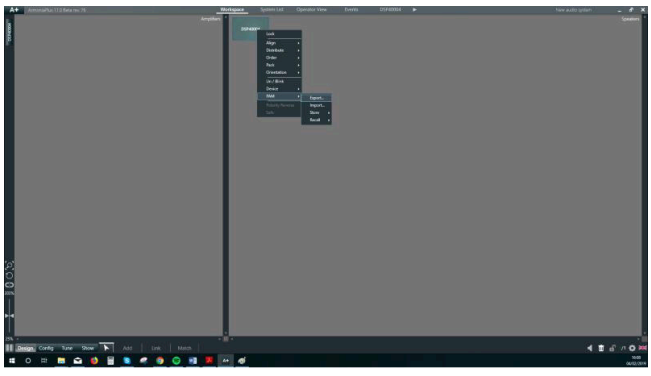
17:5.Export Custom Preset

Once you reached the best performance in terms of DSP processing as you want, export your preset returning in the Select view

1. Right click on the device

2. Select PAM > Export

3. Assign a name to your Preset and save



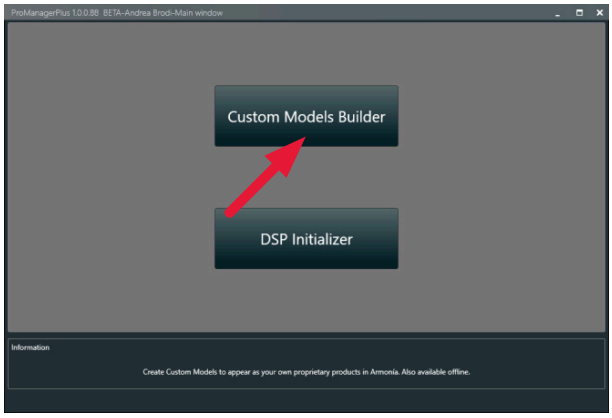
Creating Model Building (DSP-4)

On this chapter we will give birth to the custom model, which represents your finished product (speaker, rack amp) that you aim to manage using ArmoníaPlus™. In fact, we will create a software plugin so that the ArmoníaPlus™ is able to accept and to recognize your custom model as it was defined.

18:1.Custom model builder

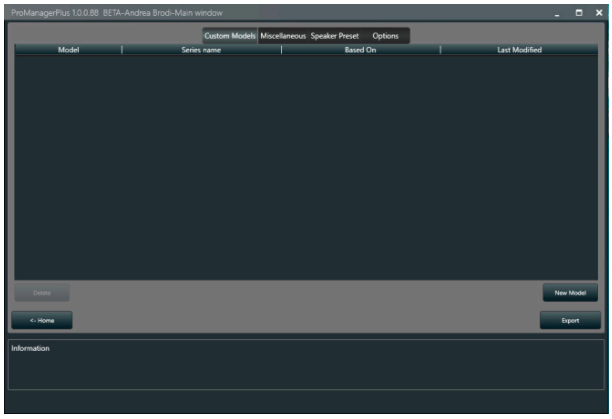
1. Open ProManager Plus™

2. Click on the Custom Models Builder button



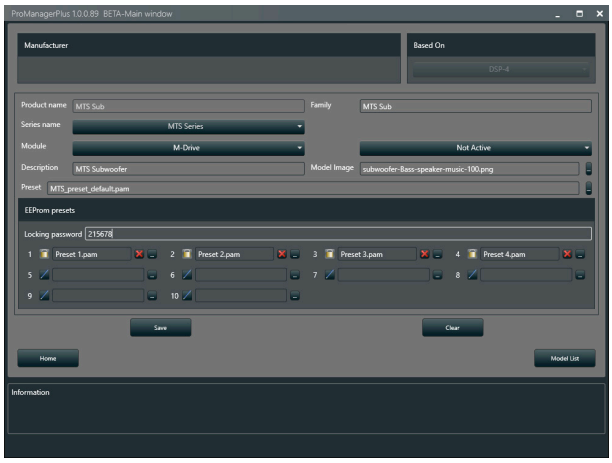
This is the model list, in this window are listed all custom model you will create.

3. Click on New Model on the bottom-right corner



4. Fill in the cells with the required information:

- Based on: DSP in use
- Product name: your product name
- Family: your product version
- Series Name: your product serie
- Module: Amp connected
- Description: the description of your device that will appear in ArmoníaPlus™
- Model image: Choose a suitable image for your system/model (suggested size 350 max width, 250 max height)
- Default Preset: Pam file exported from Powersoft model, is the one loaded in virtual Powered speaker
- Presets onboard: previously exported from Powersoft model.
- Slot locking: set as locked the slot you want by clicking on the padlock, remember to set a Locking password
- Click Save and confirm



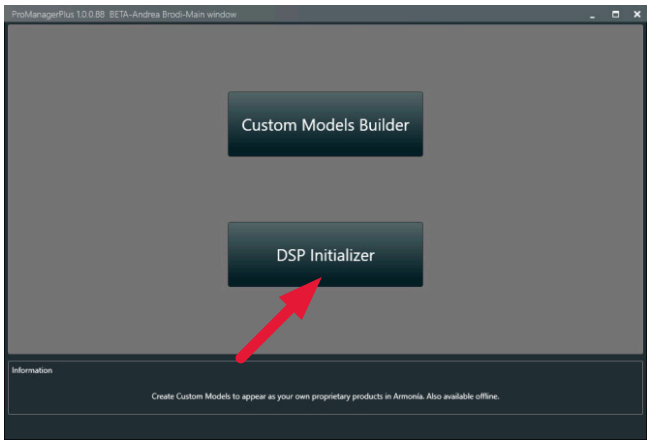
18:2.Initialize as End Product

On this chapter we will give birth to the custom model, which represents your finished product (speaker, rack amp) that you aim to manage using ArmoníaPlus™. In fact, we will create a software plugin so that the ArmoníaPlus™ is able to accept and to recognize your custom model as it was defined.

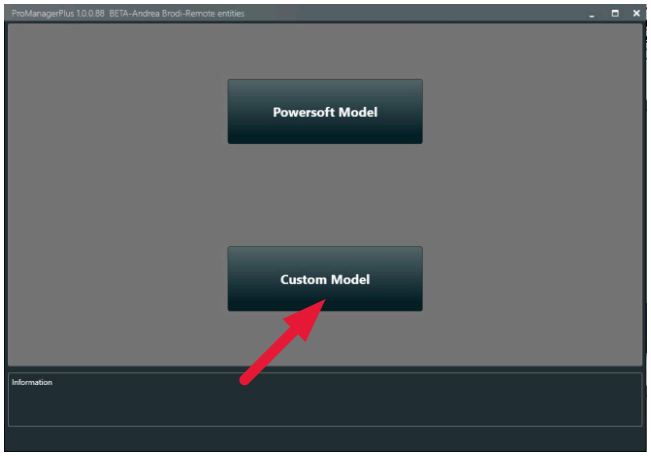
1. Open ProManager Plus™

2. Click on the DSP Initializer button

3. Discover the DSP-4 using selected Com port as shown previously and press Next



4. Select Custom Model

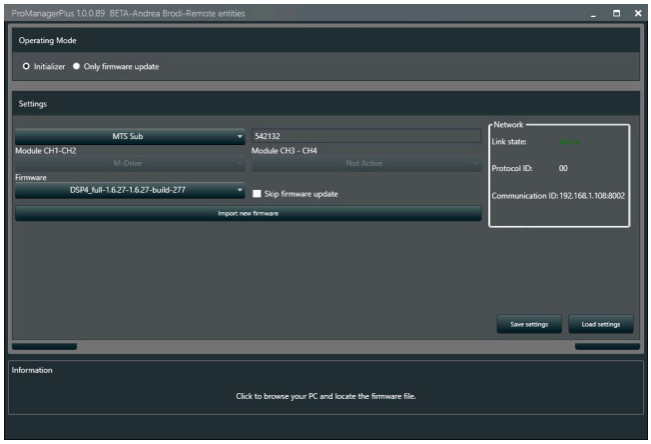


5. Select the model you have created during earlier stages

6. Specify the product serial assigned to your system/ model

7. Choose a firmware version to be stored on your DSP or tip the Skip firmware update check box

8. Press Start and wait until the DSP is successfully initialized. At the end of initialization, device will be ready to be recognized by Plugin previously installed.



18:5.Expoting Models & Publishing on ArmoníaPlus' MarketplaceAdd online Custom model

Refer to chapter 16.3.

18:3.Add online Custom model

From this step onwards, your product will appear and will be recognized in ArmoníaPlus™ as custom and the model will include all the proprietary processing and customization that you have applied using the ProManager Plus™.

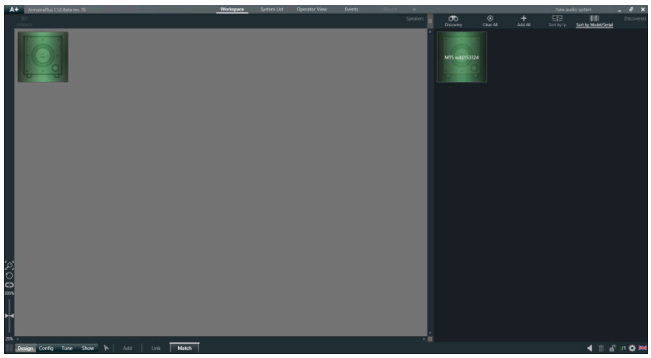
1. Open ArmoníaPlus™

2. Enable the serial virtual com port in the communication manager

3. Go in the Match view , click on Discovery and see your system branded as proprietary

4. Drag your custom model onto the workspace

5. You can now manage your system on Armonía



18:4.Add offline Custom model

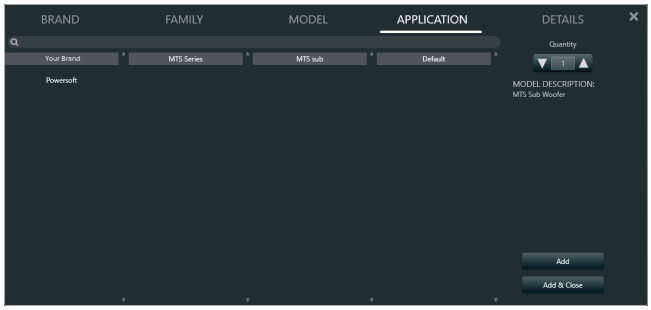
As soon as you installed plugin, you can manage the custom model not only with an online device but even adding a virtual powered speaker.

1. Go in the Add view

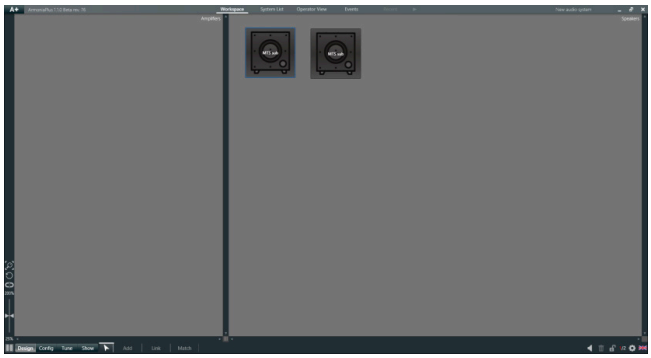
2. Click Powered Speaker

3. Choose your brand, family, model and kind of application.

4. Press Add & Close



5. Blue frame means virtual Power speaker.



Support and warranty

19

19:1.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.

19:2.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.

19:2.1.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.

19:2.2.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.

19:2.3.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).

19:3.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-IPALMOD-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 Cadolingi, 13
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 Apeak (7 Apeak 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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