



PROFESSIONAL

## TECHNICAL INFORMATION BULLETIN

TITLE:

**PRX700 Troubleshooting Guide**

NUMBER: TB-060

Page: 1 of 17

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### **Purpose:**

This document is intended as a guideline on how to diagnose and perform the most common repairs of the PRX700 Series Amplifier modules. The information in this document is intended for use by qualified, factory authorized JBL technicians.

ESD must be considered when handling and repairing these modules. It is left to the service centers own discretion to ensure an ESD-safe environment when attempting to repair a module.

For assistance and questions during troubleshooting, please contact JBL Customer Service Support.

### **Indications:**

PRX700 Series products may exhibit issues in one of the following areas:

- 1) Mains Filter and Rectifier
- 2) Main SMPS
- 3) Amp Channels
- 4) Amp Control

### **Scope:**

There is no serial number range for these products. If a unit exhibits these conditions, it should be repaired at a component level.

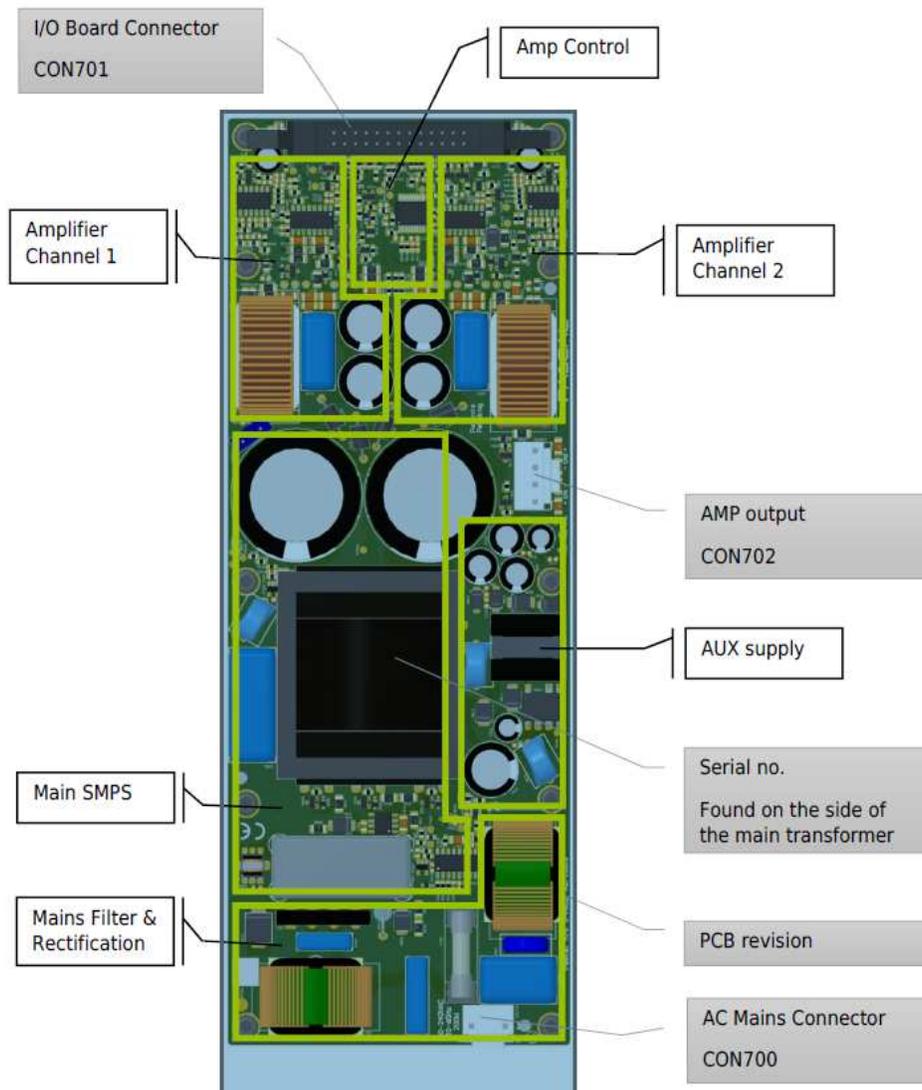
### **Warranty Implications:**

- This is not a product recall and the modification is only to be performed if the symptom is apparent.
- Any U.S. authorized service agency performing this procedure should file a warranty claim according to standard/normal procedure.

# PRX700 Troubleshooting Guide

## Tools and Supplies:

- Ohm Meter
- Soldering/Desoldering station
- Wire cutters
- Audio Precision (optional)
- 4Ω, 300W load power resistor per channel



**Module Overview**

# PRX700 Troubleshooting Guide

## Procedure

### 1.0 Mains Filter and Rectifier

Typical errors are related to handling or applying mains overvoltage to the module, both errors are usually very visible and found through visual inspection, identifying burned components.

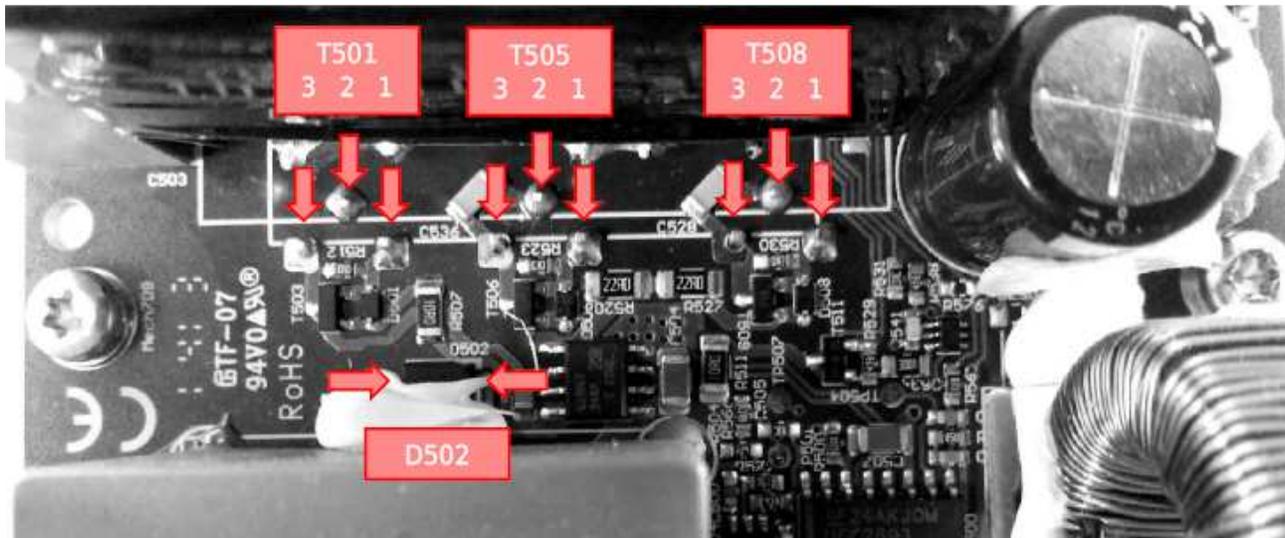
If the main fuse is found open, we recommend that the root cause is found before repairs and fuse replacement.

### 2.0 Main SMPS

If the MOSFETs in the SMPS are overheated, mounted incorrectly or similar, they could potentially fail.

If these fail, the S-PRO2 will not power up and the fuse will likely be open. The debugging can be done with an ohmmeter. Remember always to perform these measurements without power on the module. Follow these four steps to verify the SMPS's condition.

Measure steps	Step one	Step two	Step three	Step four
Measure	Pin 1 - Pin 2	Pin 1 - Pin 3	Pin 2 - Pin 3	Over D502



If any of these measurements are below 90kohms, the Main SMPS is defective.

# PRX700 Troubleshooting Guide

## 2.0 Main SMPS (continued)

For your reference, here are the components commonly used in this repair.

Reference Des.	Part number	Manufacturer	Description
T501, T505, T508	STP26NM60N	STMicroelectronics	MOSFET 600V 20A
IC500	UCC2893D	Texas Instruments	Active clamp current mode PWM controller
IC505	IRS21867S	IRF - International rectifier	High and low side driver
T503, T506, T509	FMMT718	Zetex	Silicon power transistor
R507, R511	RC1206FR-1310RL	Phycomp-Yageo	Resistor, 10R 1% 1206
F500	021506.3MXP	Littelfuse	Fuse, ceramic tube, 6.3A 250V

It's very important that the module is assembled correctly after it has been repaired.

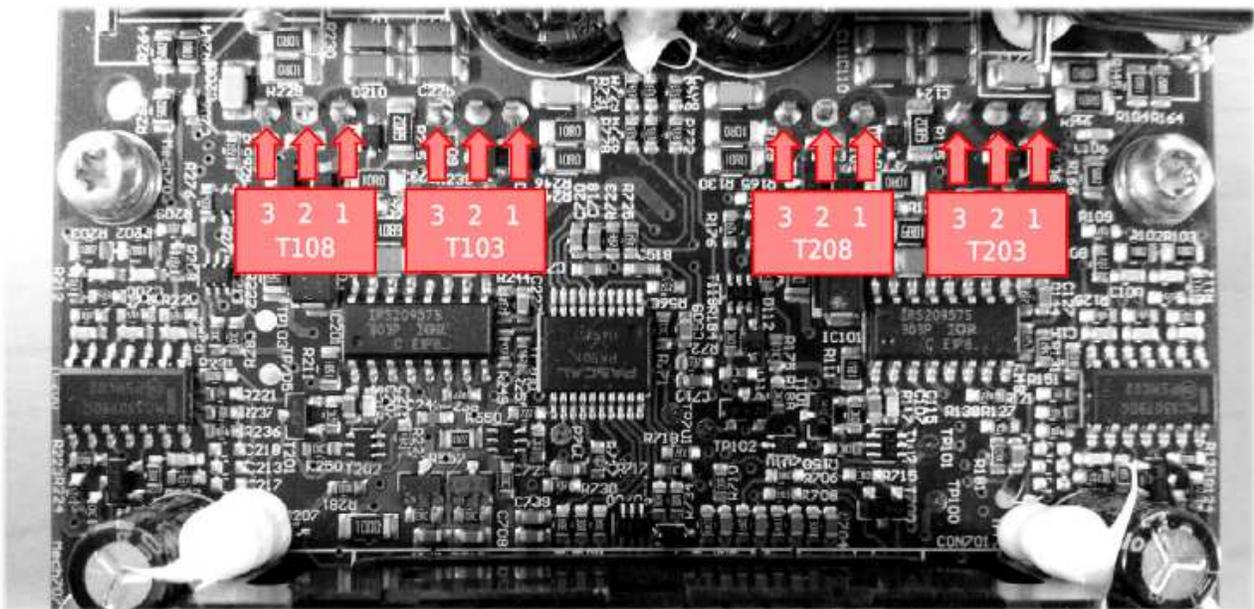
### 3.0 Amp Channels

If the MOSFETs in the Amp channels are overheated, mounted incorrectly or similar, they could potentially fail. If these fail, the S-PRO2 will power up, but stay in protection.

The troubleshooting can be performed with an ohmmeter. Remember always to perform these measurements without power on the module.

Follow these three steps for every amplifier MOSFET.

Measure steps	Step one	Step two	Step three
Measure between	Pin 1 - Pin 2	Pin 1 - Pin 3	Pin 2 - Pin 3



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### 3.0 Amp Channels (continued)

If any of your measurements are below 8kohms, the amplifier MOSFET is defective and needs to be replaced. It's important to always replace both amplifier MOSFET's in the failing channel, including the gate transistor for each amplifier MOSFET.

For your reference, here are the components commonly used in this repair.

Reference number	Part number	Manufacturer	Description
T103, T108, T203, T208	IRFB5615Pbf	IRF - International rectifier	Digital audio MOSFET
T104, T109, T204, T209	FMMT718	Zetex	Silicon power transistor

Always replace all components mentioned below for each failing channel.

Failing channel	Components to be replaced.
Channel 1	T103, T104, T108, T109
Channel 2	T203, T204, T208, T209

It's very important that the module is assembled correctly after it has been repaired.

### 4.0 Amp Control

#### 4.1) +3.3V

The amplifier will automatically go into protection mode due to different conditions. This can be very advantageous during troubleshooting, as it can help isolate faults to specific areas of the circuit.

Verify that the PASxx chip has DC supply.

Test Point	Reference Point	Min Value	Max Value	Note
TP701	GND (TP702)	3.2 Vdc	3.4 Vdc	

Possible faults:

1. Aux supply
2. 3V3 regulator
3. Shorted decoupling cap
4. Alien fragments or damage to PCB

Key components to check:

1. IC700, IC701
2. C716, C722

## PRX700 Troubleshooting Guide

### 4.0 Amp Control (continued)

#### 4.2) +7.5V Sense

Normal: The PAS chip is continuously verifying +7.5V precision.

Test Point	Reference Point	Min Value	Max Value	Note
CON701.17 -18	GND (TP702)	6.5 Vdc	8.5 Vdc	

Standby: When the module is in standby and loaded, it is possible for the +7.5V rail to drop further down.

Test Point	Reference Point	Min Value	Max Value	Note
CON701.17-18	GND (TP702)	4.6 Vdc	8.5 Vdc	In standby

Possible faults:

1. Aux supply
2. 3v3 regulator
3. Shorted decoupling cap
4. Alien fragments or damage to PCB

Key components to check:

1. IC503, IC701
2. D515
3. C527, C529, C539, C708, C721, C723

#### 4.3) Mute IN

It is possible to control mute of the amplifier channels via the IO board.

Mute Off Conditions

Test Point	Reference Point	Min Value	Max Value	Note
CON701.13	GND (TP702)	3.2 Vdc	3.4 Vdc	IO Board: Mute off

Mute On Conditions

Test Point	Reference Point	Min Value	Max Value	Note
CON701.13	GND (TP702)	-0.1 Vdc	0.1 Vdc	IO Board: Mute On

Possible faults:

1. ESD or overvoltage from IO damage
2. Shorted decoupling cap
3. Alien fragments or damage to PCB

Key components:

1. C712
2. D700
3. R711, R717

## PRX700 Troubleshooting Guide

### 4.0 Amp Control (continued)

#### 4.4) +/-15V On Off

It is possible to set the module into standby via the IO board. When using the standby feature, you activate or deactivate the +/-15V rails by the +/-15V\_on\_off pin, controlled by PAS02.

##### When Activated

Test Point	Reference Point	Min Value	Max Value	Note
IC700 Pin 11	GNDA (TP702)	3,4 Vdc	3,6 Vdc	IO Board: Standby off

##### When Deactivated

Test Point	Reference Point	Min Value	Max Value	Note
IC700 Pin 11	GNDA (TP702)	-0,1 Vdc	0,1 Vdc	IO Board: Standby On

Possible faults:

1. Defective PASxx Chip
2. Shorted Transistor
3. Broken resistor
4. Alien fragments or damage to PCB

Key components to check:

1. T514, T516A, T516B, T518

#### 4.5) Mute

It is possible to mute the amplifiers via the IO board.

##### Mute Activated

Test Point	Reference Point	Min Value	Max Value	Note
R171	R171	3,0 Vdc	3,3 Vdc	IO board: Mute ON

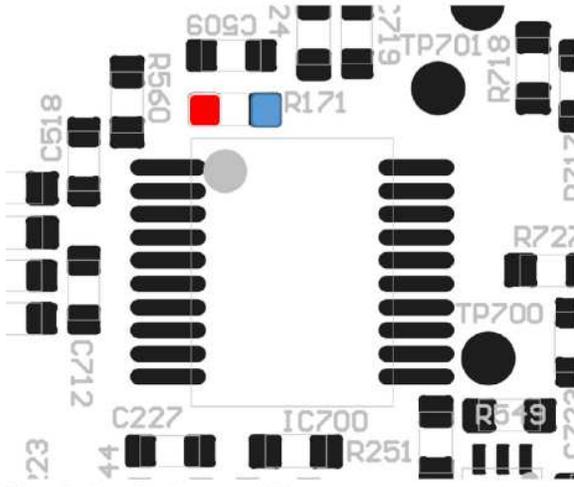
##### Mute Deactivated

Test Point	Reference Point	Min Value	Max Value	Note
R171	R171	-0,1 Vdc	0,1 Vdc	IO board: Mute Off

## PRX700 Troubleshooting Guide

### 4.0 Amp Control (continued)

Measure over R171, red probe nearest IC700 Pin 1 marked with red and black probe at the other end of R171, marked with blue.



#### Possible faults:

1. Defective PASxx chip
2. Broken Resistor
3. Shorted Transistor
4. Shorted Capacitor
5. Alien fragments or damage to PCB

#### Key components:

1. T102A, T202A, T700
2. IC700
3. C705

#### 4.6) SMPS ON

The SMPS (switch mode power supply) can be turned on and off by the SMPS\_on, pin 10 on IC710. If the +/-70 rails don't come up, a sense circuit can also pull down the SMSP\_on pin, that will cause the Main SMPS to shut down.

#### SMPS on

Test Point	Reference	Min Value	Max Value	Note
TP506	TP702	1,0 Vdc	1,2 Vdc	

#### SMPS Off

Test Point	Reference	Min Value	Max Value	Note
TP506	TP702	-0,1 Vdc	0,1 Vdc	

## PRX700 Troubleshooting Guide

### 4.0 Amp Control (continued)

Possible faults:

1. Main SMPS
2. Defective PASxx chip
3. Broken Resistor
4. Shorted Transistor
5. Shorted Capacitor
6. Alien fragments or damage to PCB

Key components:

1. IC502, IC700
2. OC501
3. T511, T512
4. C517, C522

#### 4.7) STBY In

It is possible to set the module in standby mode via the IO board.

Standby on

Test Point	Reference	Min Value	Max Value	Note
IC700 Pin 17	TP702	3,2 Vdc	3,4 Vdc	IO board: Standby on

Standby off

Test Point	Reference	Min Value	Max Value	Note
IC700 Pin 17	TP702	-0,1 Vdc	0,1 Vdc	IO board: Standby off

Possible faults:

1. Defective PASxx chip
2. Broken Resistor
3. Shorted Capacitor
4. Alien fragments or damage to PCB

Key components:

1. IC700
2. R714, R716
3. C709
4. D700

# PRX700 Troubleshooting Guide

## 4.0 Amp Control (continued)

### 4.8) DC

The DC detection is able to protect the amplifiers and the speakers connected, in two different ways. If the DC detected is external, the module will mute and unmute the output 3 times within a second. If there's still DC detected, the module shut down. If the DC detected is internal, the module will mute the amplifiers and shut down within 700ms.

DC protection on

Test Point	Reference	Min Value	Max Value	Note
IC700 Pin 13	TP702	-0,1 Vdc	0,1 Vdc	

DC protection off

Test Point	Reference	Min Value	Max Value	Note
IC700 Pin 13	TP702	3,2 Vdc	3,3 Vdc	

External or internal detected DC: These measurements are done without anything connected to the output. If it's external, you won't measure any DC on the outputs. If it's internal, you will.

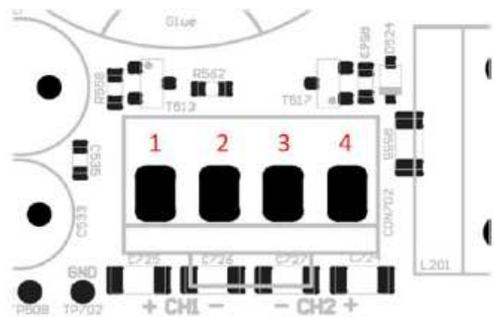
Test Point	Reference	Min Value	Max Value	Note
Con702 Pin 1	Con702 Pin 2	0 Vdc	0,1 Vdc	
Con702 Pin 4	Con702 Pin 3	0 Vdc	0,1 Vdc	

Possible faults:

1. Amplifiers output stage
2. External DC input
3. DC detect
4. PASxx chip
5. Alien fragments or damaged to PCB

Key components:

1. IC102, IC202, IC700
2. T103, T108

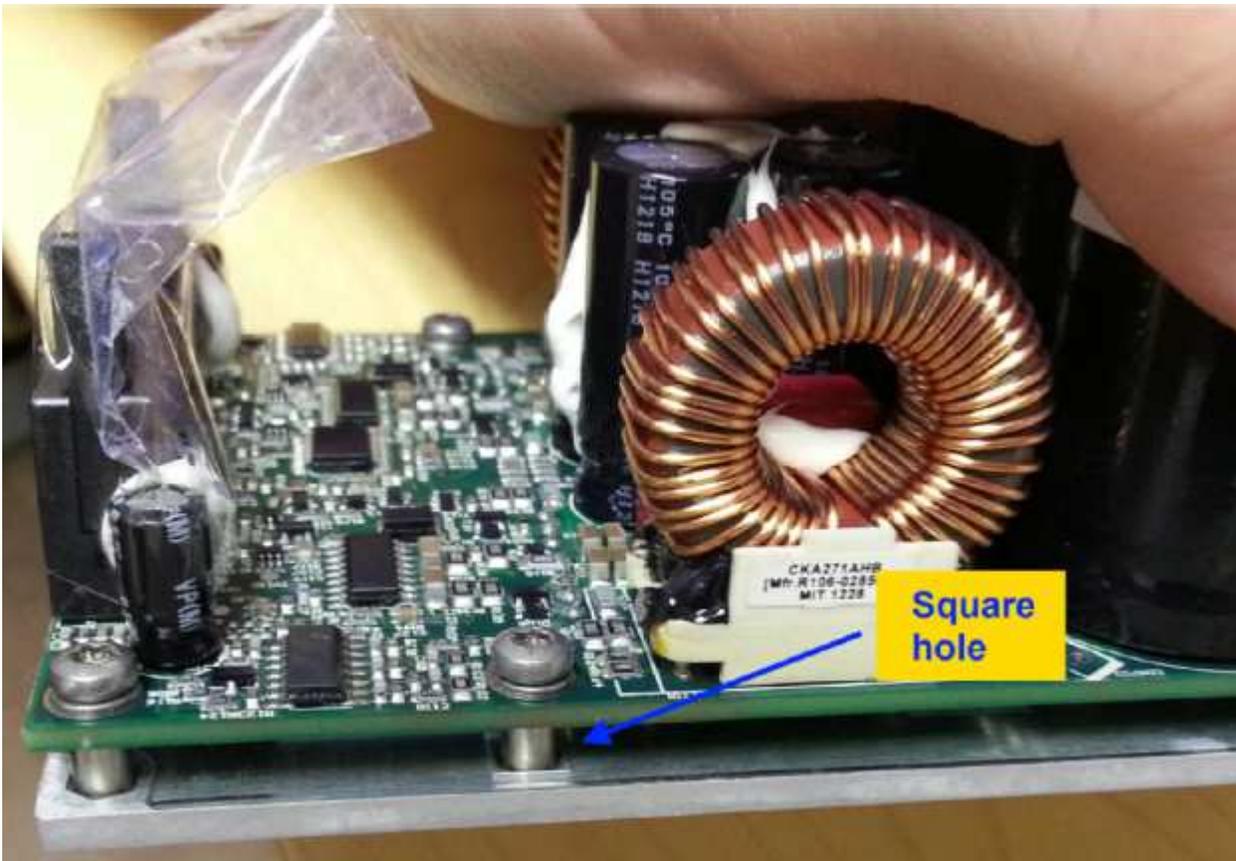


## PRX700 Troubleshooting Guide

### 5.0 Mechanical

#### 5.1) Isolation Foil

Glue the isolation foil MCA271HSISO1 onto the mechanical profile MCA271HSAMP. The glue used should have flammability rating UL94 V-0. Alternatively a double-sided adhesive can be used. During most repairs the isolation foil can be reused if there is no visual damage. The isolation foil has one square hole, this verifies correct assembly.



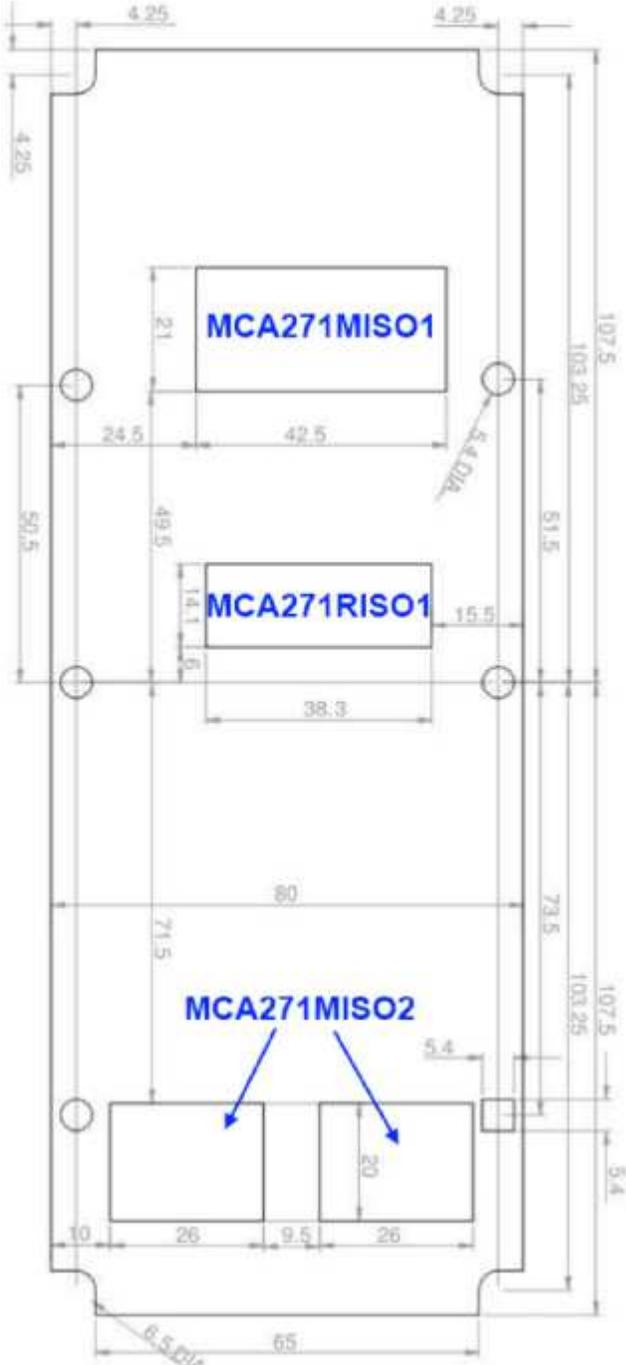
#### 5.2) Gap Pad

Place the following Gap-Pad onto the mechanical profile in the positions indicated below. Use the cutouts in the isolation foil for guidance.

MCA271MISO1	1 Pcs	Gap Pad for MOSFETs
MCA271RISO1	1 Pcs	Gap Pad for Rectifiers
MCA271MISO2	2 Pcs	Gap Pad for Output MOSFETs

The gap pad will always degrade during disassembly, always use new Gap Pad during assembly.

**PRX700 Troubleshooting Guide**  
**5.0 Mechanical (continued)**



# PRX700 Troubleshooting Guide

## 5.0 Mechanical (continued)

### 5.3) PCB and heatsink assembly

Assemble the PCB onto the mechanical profile MCA271HSAMP and tighten all 10 screws.

All screws should have D01133 M3 spring washers.

The screws must be assembled in the order outline below:

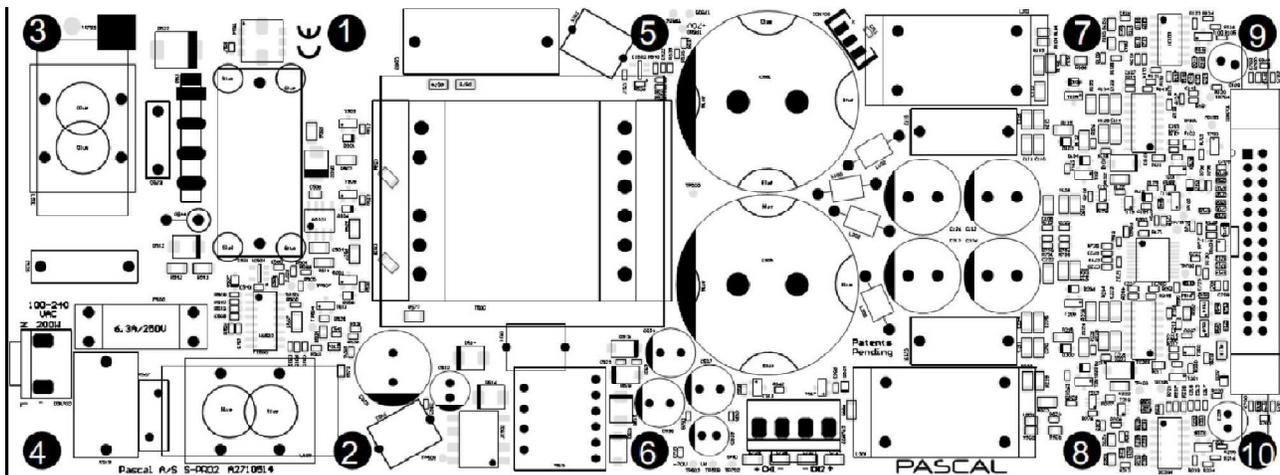
1 > 2 > 3 > 4 > 5 > 6 > 7 > 8 > 9 > 10.

### 5.4) Factory Reset

If the module has been disassembled, repaired or otherwise modified, make sure to follow the Factory Reset instructions in the chapter below.

### 5.5) PCB and heatsink disassembly

When disassembling the unit from the MCA271HSAMP, it is important to remove the screws in the following order:



### 5.6) BOM Mechanical

Ref Des	Part no.	Abb.	Manufacturer	Description
Iso 1	MCA271HSISO1B	CUS	Pascal	Isolation foil
Iso 2	MCA271MISO1B	CUS	Pascal	Gap pad MOS-FET SMPS 1mm
Iso 3	MCA271RISO1B	CUS	Pascal	Gap pad rectifier 1mm
Iso 4 - 5	MCA271MISO2B	CUS	Pascal	Gap pad MOS-FET AMP 1mm
Mech 1 - 10	1961030006071D0	DRTL	Duratool	Screw DIN 7985 M3x6, pan head, Torx
Mech 11 - 20	D01133	DRTL	Duratool	Spring washer M3
Mech 21	MCA271HSAMP	CUS	Pascal	S-PRO Alu surface 80x215x3 mm
PCBA	A27105XX	CUS	Pascal	Complete PCB Assembly

# PRX700 Troubleshooting Guide

## 6.0 Factory Reset Guide

### 6.1) Introduction

This procedure should always be performed if the module has been repaired, as this allows the module to make initial measurements of the both gain structure and thermal properties, both critical to optimal amplifier performance.

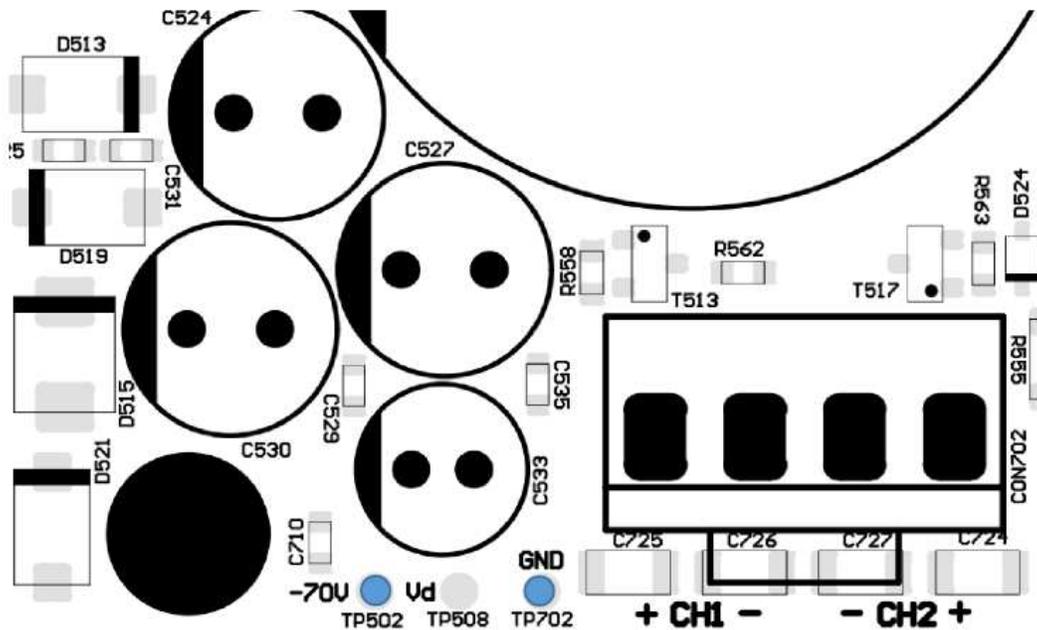
### 6.2) Prerequisites

Before the module is reset, it is very important that the module has room temperature (between 20°C and 30°C) and that amplifier internal rails are below +/-10V.

NOTICE: The reset is only available on modules featuring PAS02 chip.

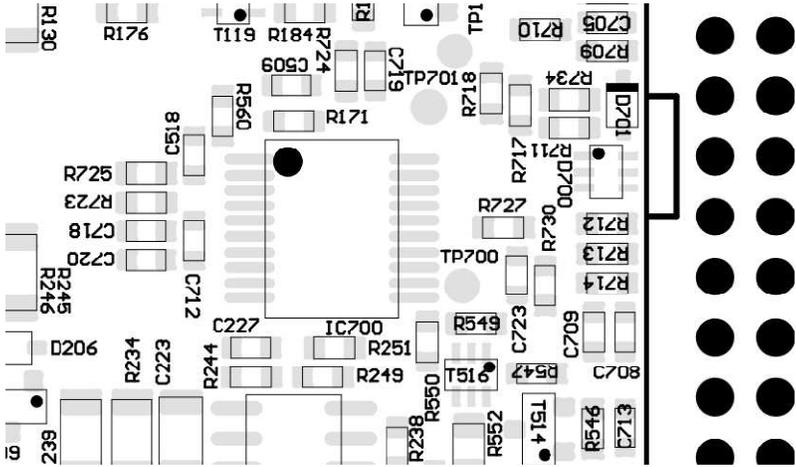
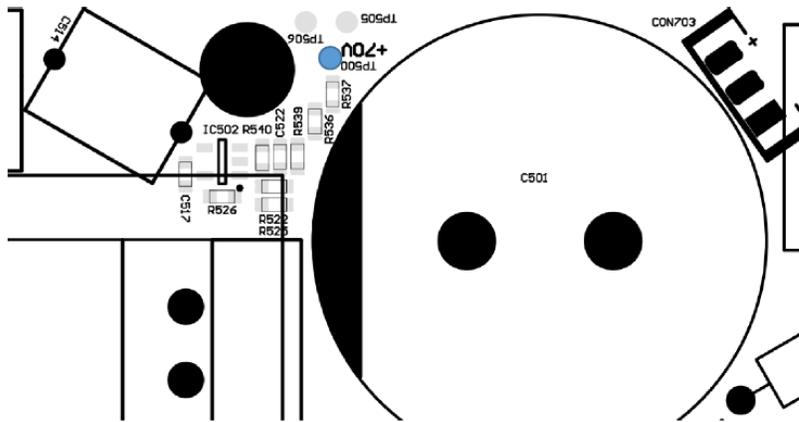
If in doubt:

1. Disconnect the module from AC and leave to cool for 60 minutes. This ensures that the temperature is well within required limits.
2. Measure the amplifier rails, to verify that +70V and -70V is below +/-10V before start-up. See figures below for Test Point locations. This should be verified without mains AC on.
3. Verify that the module has the PAS02 chip. Simply locate the chip as seen on the figures below, and verify that it contains the text "PAS02".



# PRX700 Troubleshooting Guide

## 6.0 Factory Reset Guide (continued)



### 6.3) Reset Guide

Follow the timing diagram below.

Make sure that the module starts with AC off, and that TP700 and TP701 is shorted.

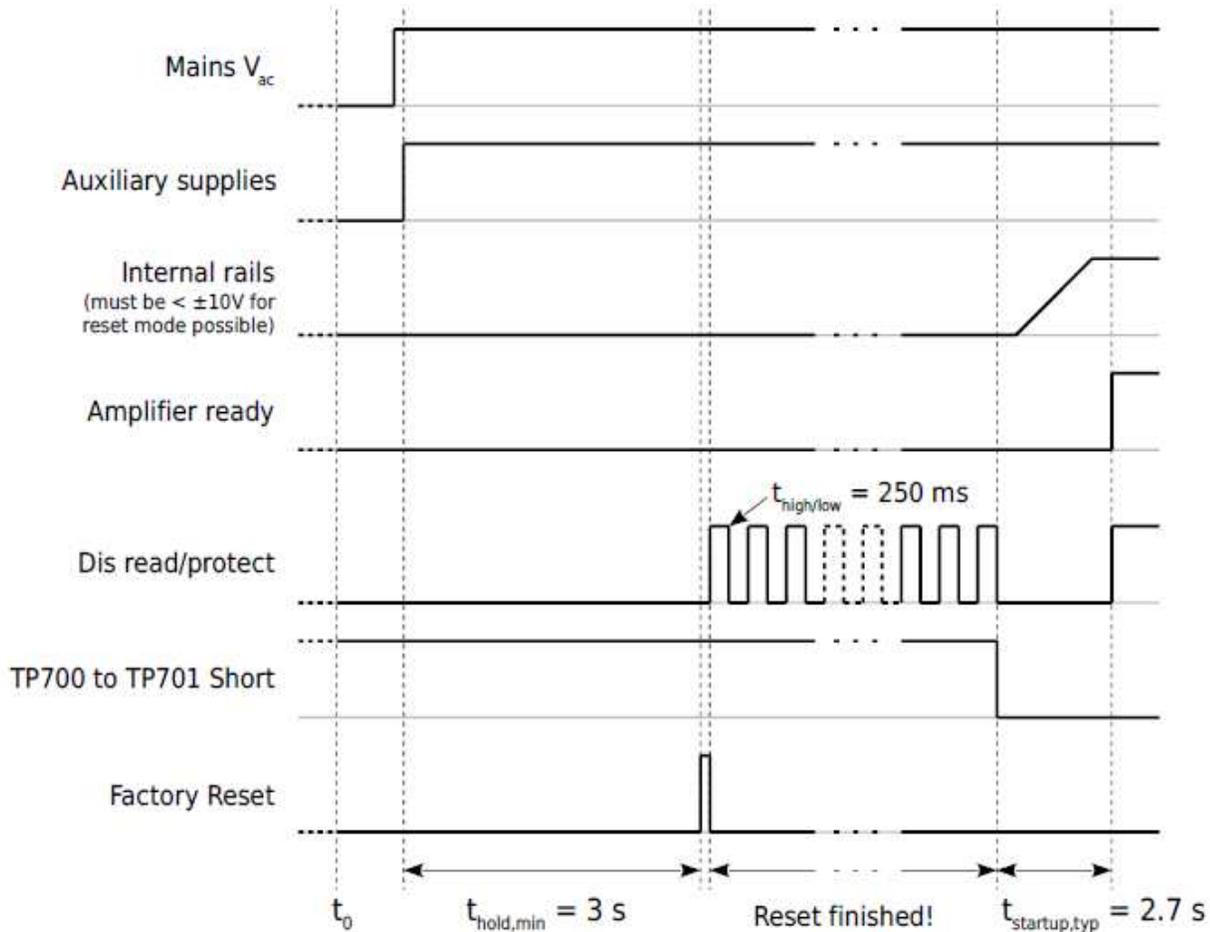
The reset is finished when Dis read/protect starts to switch between high and low. For reference, the analog IO board features an LED that starts flashing. If your DSP solution does not have an LED connected to this pin, we recommend monitoring this pin with a scope or similar. The dis read/protect pin can be found on pin11 on the IO connector CON701.

## PRX700 Troubleshooting Guide

### 6.0 Factory Reset Guide (continued)

#### Factory Reset Mode

S-PRO2 module temperature must be between 20-30°C when Factory Reset Mode is initiated!!



### 7.0 Burn In Test

When applicable, a BIT (Burn In Test) can be performed as an addition to normal verification. Typically we recommend a setup as described below, but other options might be preferred depending on the final application.

This test can be omitted in most service cases, but we recommend that this test is always performed if components requiring cooling have been changed or if any part of the thermal detection circuits has been changed.

## **PRX700 Troubleshooting Guide**

### **7.0 Burn In Test (continued)**

#### Typical Burn in Test

Duration: 2 Hrs

Load: 4 $\Omega$ , 300W load power resistor per channel.

Output Voltage: 15~17Vac

Input Signal: Pink Noise

Passive/Active Cooling: No

Notice that the module will go into thermal protection after a while under these conditions. This is normal behavior. The Burn In test helps to verify that the internal protection circuits are functional, by regulating the output power according to temperature.