P500 PROFESSIONAL POWER AMPLIFIER

SERVICE MANUAL

Schematic Diagrams

CODE : 277319

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Notice

Service must be carried out by qualified personnel only. Any tampering carried out by unqualified personnel during the guarantee period will forfeit the right to guarantee.
For a correct operation of the instrument, after having switched off, be careful to wait at least 3 seconds before switching on again.
To improve the device's specifications, the schematic diagrams may be subject to change without prior notice.

Schematic Notes

⚠ All components marked by this symbol have special safety characteristics, when replacing any of these components use only manufacturer's specified parts.
The (μ) micro symbol of capacitance value is substituted by U. The (Ω) omega symbol of resistance value is substituted by E.
The electrolytic capacitors are 25Vdc rated voltage unless otherwise specified. All resistors are 1/4W unless otherwise specified.

- Soldering point.
- Male connector.
- Female connector.
- M/F faston connector.
- Test point.
- Supply voltage.
- Logic supply ground.
- Analog supply ground.
- Signal ground.
- Chassis ground.
- Flag joined with one or more flags with the same signal name inscribed.

ATTENTION
Observe precautions when handling electrostatic sensitive devices

TECHNICAL SPECIFICATIONS

Dimensions:	(WxHxD)	483x88x325mm (2U)
Weight:		13Kg
Power Requirements:	(230Vac±10% 50Hz)	500VA
Output Power:	(4Ω stereo/parallel)	2x 300Watts
	(8Ω stereo/parallel)	2x 200Watts
	(8Ω bridge)	600Watts
	(16Ω bridge)	400Watts
Max. Undistorted Out:	(4Ω stereo/parallel)	98Vpp
	(8Ω stereo/parallel)	113Vpp
	(8Ω bridge)	194Vpp
Input Sensitivity:	(constant sensitivity)	0.775Vrms (0dB)
	(constant gain)	1.75Vrms (+7dB)
Input Impedance:	(balanced)	30KΩ
	(unbalanced)	15KΩ
Voltage Gain:	(constant sensitivity)	33±0.5dB
	(constant gain)	26±0.5dB
Slew Rate:		25V/µS
Damping Factor:	(4Ω stereo/parallel)	>400
	(8Ω stereo/parallel)	>800
Frequency Response	(-0.2dB)	20Hz÷20KHz
at Full Power:	(-3dB)	10Hz÷60KHz
IMD:	(SMPTE 60Hz/7KHz 4:1)	<0.1%
THD:	(THD+N)	<0.1%
S/N Ratio:	(unweighted)	>95dB
Crosstalk:	(1KHz)	>60dB

TEST PROCEDURES & ADJUSTMENTS

Precaution

- To prevent short circuit during any test, **the oscilloscope must be EARTH insulated**, this occurs because some test require to connect its probe to the amplifier output, non-compliance may cause damages to oscilloscope inputs circuitry.
- Before removing or installing any modules and connectors, **disconnect the amplifier from AC MAINS** and measure the DC supply voltages across each of the power suppliy capacitors. If your measurement on any of the caps is greater than 10Vdc, connect a 100Ω 20W resistor across the applicable caps to discharge them for your safety. Remember to remove the discharge resistor immediately after discharging caps. **Do not power up the amplifier with the discharge resistor connected**.
- Read these notes entirely before proceeding to any operation. These notes are not comprehensive of all damages that possibly occur, but includes some specifically advices, checks and adjustments relative to this amplifier.

Remarks

- The power supply utilizes a dual bipolar DC rail configuration with low and high voltages; one positive and one negative low rail (+/-Vcc1) and one positive and one negative high rail (+/-Vcc2).

Visual Check

- Use compressed air to clear dust in the amplifier chassis.
- Before proceed to supply the amplifier check visually the internal assembly, if appears an evident damage find the most possible reasons that cause it.
- Check the wiring cables for possible interruptions or shorts.
- If the damage has burnt a printed circuit board don't try to repair it, replace with a new one.

Test Instruments

- Audio Generator
- Dual Trace Oscilloscope
- Digital Multimeter
- 2Ω 1000W, 4Ω 500W, 100Ω 20W resistors
- Variac (0÷250Vac)
- Temperature Meter

Setup

- Connect the Variac between the mains and the amplifier and set it at zero voltage.
- Set the amplifier in STEREO MODE and turn full clockwise the LEVEL potentiometers.
- Connect the audio generator to the channel inputs and set it to 1KHz 775mV$_{RMS}$ (0dB) sinusoidal signal.
- Insert the temperature meter through the IC3 interstice located at centre of heatsink.
- The procedures that follow must be executed subsequently in the order specified.

Supply Check

- Remove the transformer secondary fuses (located on SUPPLY & PROTECTIONS board), set the Variac to the nominal mains voltage, check with the Multimeter the AC supply voltages:
  F1-F2=52±2Vac F3-F4=90±3Vac.
- Re-set the Variac at zero voltage, turn off the amplifier and put the fuses back on its holders.
- Connect the oscilloscope probes CH1/2 to the channel outputs, before RL1 and RL2, set both to 20V/div. 200µS/div.
- Set up the Variac slowly monitoring the Outputs with the oscilloscope CH1/2 connected, it should display the sinusoidal input signal amplified with no distortions, if a distortion occur check the POWER AMPLIFIER boards as suggested in the ADVICES section.
- If the protection trips, turn off the amplifier, wait some minutes and disconnect the supplies from the outputs modules (CN2, CN3 on POWER AMPLIFIER boards), continue to check the supplies.
- **CAUTION: Before re-connecting the output modules to the supplies, you must have the capacitors discharged for your safety: connect a 100Ω 20W resistor across the caps and remove the resistor just after they are discharged.**
- Finally verify the DC supplies on SUPPLIES & PROTECTIONS Board:

T8 (+Vcc2)	=+61±2Vdc
T5 (+Vcc1)	=+35±1.5Vdc
T6 (-Vcc1)	=-35±1.5Vdc
T7 (-Vcc2)	=-61±2Vdc
CN2 pin1	=+23±1Vdc
CN3 pin3-4-5	=+15±1Vdc
CN3 pin8-9-10	=-15±1Vdc

- If one or more voltages don't correspond, check the rectifiers, capacitors and transformers disconnecting them from circuitry, refer to schematics.

Channels Check

- The channel A is facing the front and channel B the rear of the chassis.
- These procedures are intended for one channel at a time, repeat these operation for the other channel.
- Verify, with the Multimeter, the insulation between the heatsink and the transistors collectors.
- **SETUP:**
  Connect the CH1 scope GND clip to CN3 pin 1 (GND terminal).
  Connect the CH1 probe tip to CN3 pin 2 (AMP output).
  Connect the CH2 probe tip to D20 cathode.
  Set the LEVEL potentiometers full clockwise.
  The load resistor is disconnected.
- **INITIAL TEST:**
  Increase slowly the Variac. The channel output signals must be symmetrical respect the GND without visible distortion and oscillation as shown in *Fig.1 Trace A*. If there is a distortion read the section ADVICES and proceed to check the other channel.
  Verify that, when the heatsink temperature is less than 50°c, the cooling fan voltage must be between 10 and 14Vdc.
- **HIGH RAIL CHECK:**
  When the output signal (Positive half-wave) is less than 30Vp the voltage on D20 cathode must remain constant at 36V, when the output signal exceeds 30Vp the voltage must follow the output signal with 6V offset (see *Fig.1 Trace B*), to check the negative high rail connect the probe to D30 anode (see *Fig.1 Trace C*).
  Connect the 4Ω 500W load on the output and repeat the INITIAL and HIGH RAIL checks.
  Check the signal clipping, it must occur at 48±2Vpp (see *Fig.2 Trace A,B,C*).

Fig. 1

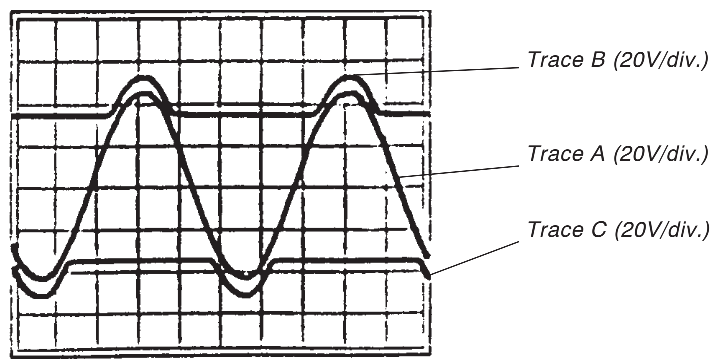
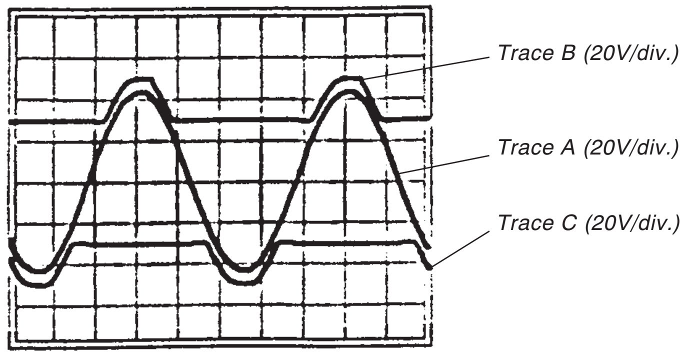


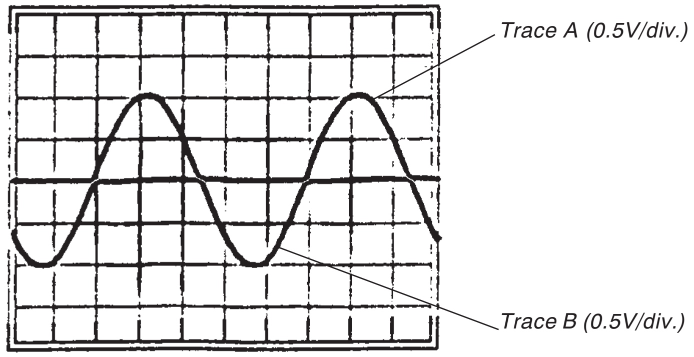
Fig. 2



Verify the voltages across the diodes D19 and D26; they must be 14.8 ±0.5Vdc.

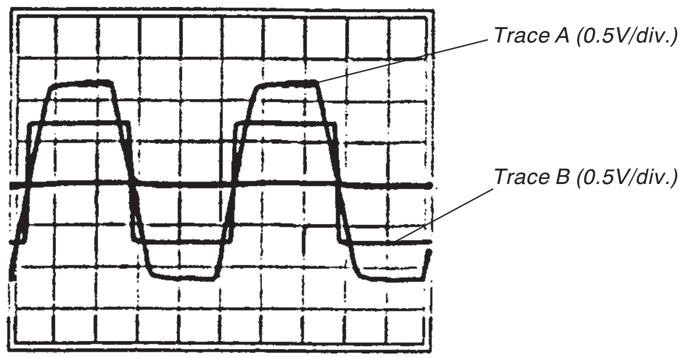
- **SIGNAL/CLIP SENSOR CHECK:**
  Set the LEVEL pot to minimum, set the scope timebase at 1V/div. 200µS/div., then increase the level and check the SIGNAL/CLIP led activity: it must turn on (green light) when the amplifier output is higher than 1Vp.
  Set the scope at 20V/div. and increase the level, check the led: it must change from green to red colour at the amplifier output signal clipping.
- **CURRENT AND SHORT CIRCUIT SENSOR CHECK:**
  Set the CH2 sensitivity to 0.5V/div., connect the scope CH1, GND clip at CN3 pin 2 (AMP output) and the probe tip at TR26 (PNP) emitter, connect the CH2 probe tip at TR17 (NPN) emitter.
  Set the generator to have approx. 1Vp on the emitters: their difference must be less than 0.2V on the peaks (see *Fig.3 Trace A & B*).

Fig. 3



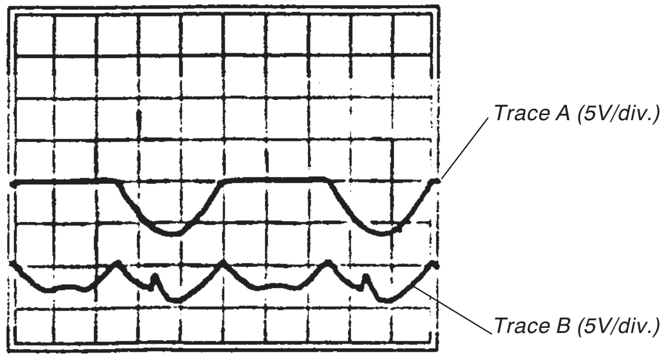
Connect a 2Ω 1000W load. Increase the input signal, the output current limiter must keep the emitter voltages (both half channel) at 1.25Vp approx. (see *Fig.4 Trace A*).
Temporarily short the amplifier output: the current limiter must keep the emitter voltages (both half channel) at 0.8±0.1Vp (see *Fig.4 Trace B*).

Fig. 4



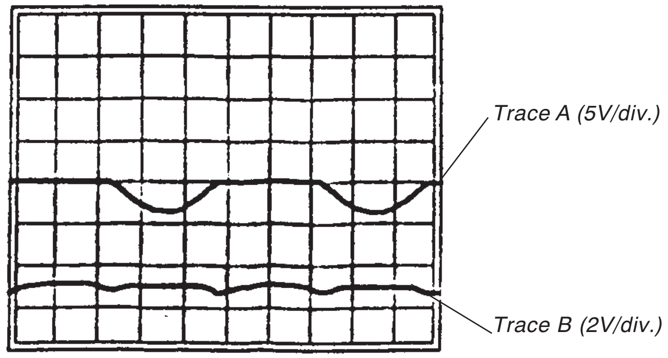
- **COOLING FAN & PROTECTION CHECK:**
  Short circuit pins 15 and 16 of OC1, the fan must run at max. speed (20÷23Vdc on its tips).
  Short circuit pins 13 and 14 of OC1, the PROTECT led must turn on immediately, the fan must run at max. speed. The PROTECT led of the other channel must also turn on after 2 Sec. and the relays must disconnect the output sockets.
  Remove the short circuit, after 3 Sec. both PROTECT leds must turn off and the relays must re-connect the output sockets.
  Temporarily short the emitter and the collector of TR1 the PROTECT led must turn on and the relays must disconnect the output sockets.
  Turn off the amplifier and wait a minute to let the supply caps discharge.
- **OFFSET SENSOR CHECK:**
  Set the Variac to zero voltage output, disconnect the amplifier load and the supply connection to the Power board (CN2,3,4), turn on the amplifier, connect temporarily (by means of a suitable conductor wire) CN3 pin 2 to +15Vdc (CN1 pin 5), the PROTECT led must turn on in 5 seconds approx.; the fan must run at maximum speed).
  Remove the connection, wait until the leds turn off and after some seconds repeat the check with -15Vdc (available on CN1 pin 4), the led PROTECT must turn on again.
- **SOA ADJUSTMENT:**
  Set the scope sensitivity at 5V/div. (both channels).
  Disconnect the fan and cut the pins A-B of J16.
  Connect the 4Ω 500W load and connect the CH2 probe tip at TR23 collector, check the waveform as shown in *Fig 5 Trace B*, *Trace A* show CH1 that is also connected at TR26 (PNP) emitter.

Fig. 5



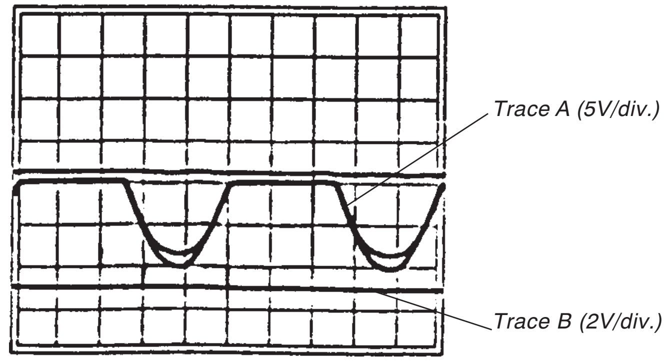
Set the scope CH2 sensitivity at 2V/div. and connect the probe tip at the testpoint TP3.
Set the load at 2Ω, wait until the temperature reaches 80°C; then change the load back to 4Ω.
Adjust the generator level to have the CH1 waveshape as shown in *Fig 6 Trace A*.
Turn the R47 trimmer to level the peaks of the CH2 waveshape as shown *Fig 6 Trace b*.

Fig. 6



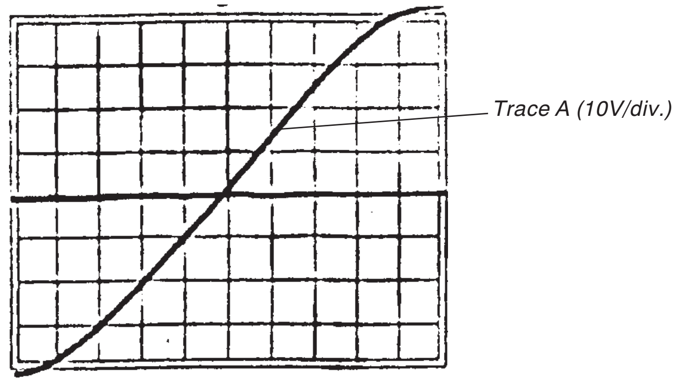
Solder the pins A-B of J16: the CH2 trace becomes continuous.
Increase the generator level for the max. displacement of the CH2 trace toward the centre of the screen *Fig 7 Trace b*.
Wait until the temperature reaches 88°C, then turn clockwise the R62 trimmer to activate the SOA control (that is displayed by CH1 trace when its peak voltage decrease *Fig 7 Trace A*), after some seconds, the channel goes in PROTECT mode.
Set the CH2 sensitivity at 5V/div. then, with its tip, check the voltage on D19 cathode: it must be 14V or more.
Activate the fan and check its supply voltage: it must be 20V or more (max. speed).

Fig. 7



- **BIAS ADJUSTMENT:**
  Remove the CH2 probe, connect CH1 GND clip to CN3 pin 1 (GND terminal) and its probe tip to CN3 pin 2 (AMP output) and set its sensitivity at 1V/div.
  Set the generator level at zero, connect the Multimeter across the emitters of TR17 and TR26, when the heatsink temperature reaches 55°C, turn off the cooling fan and adjust R55 trimmer to read 6±0.5mV.
  Adjust the generator level until the sinewave appears at full screen amplitude, No crossover distortion must be detectable: if necessary re-adjust R55. Re-connect the fan.
- **BANDWIDTH CHECK:**
  Sweep the generator frequency from 20Hz to 20KHz, the output level must have not detectable level changes.
- **SLEW RATE CHECK:**
  Set the scope sensitivity to 10V/div. 1µS/div. and set the generator to 1KHz square wave mode. Check the output square wave rising and falling edge slopes: both must be 10V/µS or more as shown in *Fig 8*.

Fig. 8



Inputs Board Check

- These procedures are intended for one channel at a time, repeat these operations for the other channel.
- **SETUP:**
  Connect the CH1 probe to amplifier input of the channel under test and set both at 500mV/div. 200mS/div.
  Connect the CH2 probe to amplifier output of the channel under test and set it at 10mV/div. 200mS/div.
  Set the audio generator at 1KHz sinus. $775mV_{RMS}$ (0dB).
  Set the LEVEL potentiometers full clockwise.
  The load resistor is disconnected.
- **CMRR ADJUSTMENT**
  Temporarily disconnect pin 3 from pin 1 and short the pin 2 (positive input) and pin 3 (negative input) of XLR input socket.
  Adjust the trimmer R10 (channel A) or R21 (channel B) to obtain the minimum output level.

➭ **GAIN ADJUSTMENT**
Re-set the input signal at pin 2 (positive input) and pin 3 (negative input) short with pin 1 (GND) of XLR input socket.
Set CH2 scope at 500mV/div. and connect it to the output of INPUTS board (CN3 pin9 for channel A or CN3 pin7 for channel B).
Set the input SENSITIVITY (SW1) at 1.75Vrms, adjust the trimmer R5 (channel. A) or R17 (channel B) to obtain the same amplitude of the scope signals.

➭ **AMPLIFIER GAIN CHECK**
Set CH2 scope at 20V/div. and connect it to the amplifier output of the channel under test. By means of the SENSITIVITY switch check the output levels: at 775mV position the output voltage must be 50±1.5Vp and at 1.75V position must be 22.5±0.5Vp.

➭ **AMPLIFIER BRIDGE MODE CHECK**
Set the amplifier in BRIDGE mode (input signal to channel A), connect the CH2 probe to the bridge output: the output voltage must be 97±3Vp.

➭ **SIGNAL TO NOISE RATIO CHECK**
Disconnect the audio generator and short the input (pin 1,2,3 of XLR socket shorted) the output signal (noise) must be less 1mV.

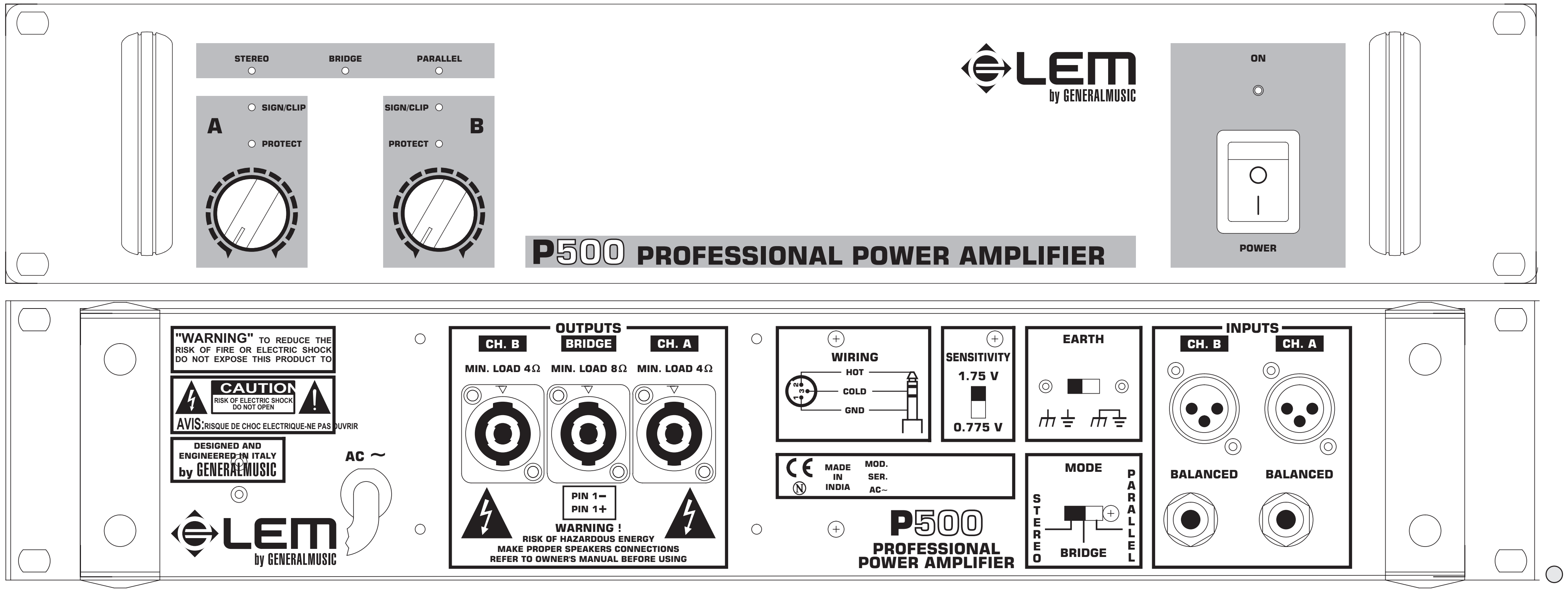
Advices

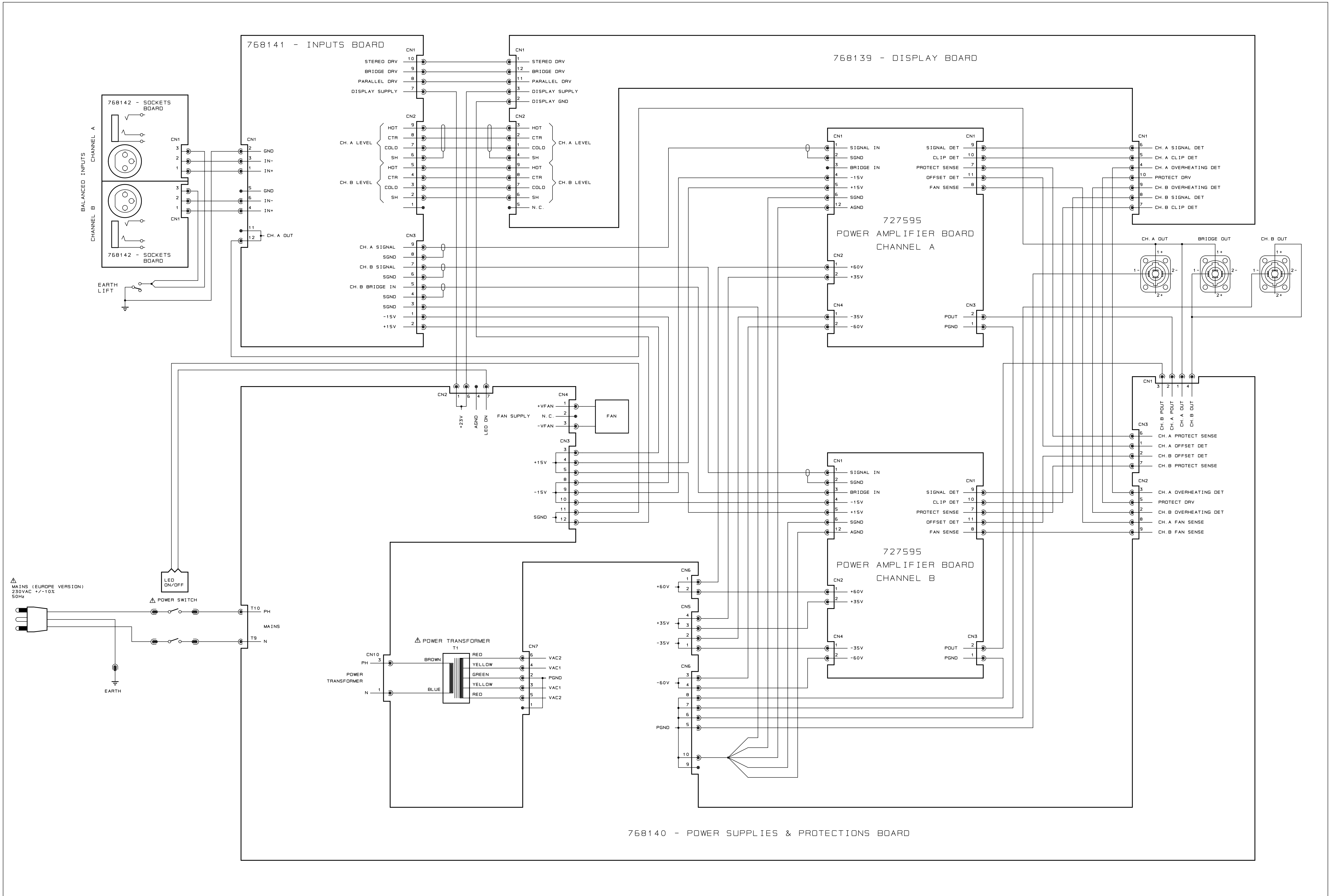
➭ Check the channels one at time to determine which is right (note: if you have a spare amplifier module that you know as right, use it).

➭ If you have determinate that the problem is a short on a rail, you must check the output transistors.
To determine which transistor devices are bad, use a soldering iron to lift one leg of each emitter pin and measure the emitter-collector resistance on each device. Unsolder and lift one leg of each base pin and check the base-collector resistance of each transistor and replace any that measure as a short.
If all the transistors are OK, unsolder and lift one leg of each diode and check them.
Check the circuit board for open foil traces.
Use the Multimeter as Ohm-meter to check the resistors, particularly the base and emitter resistors of damaged transistor.

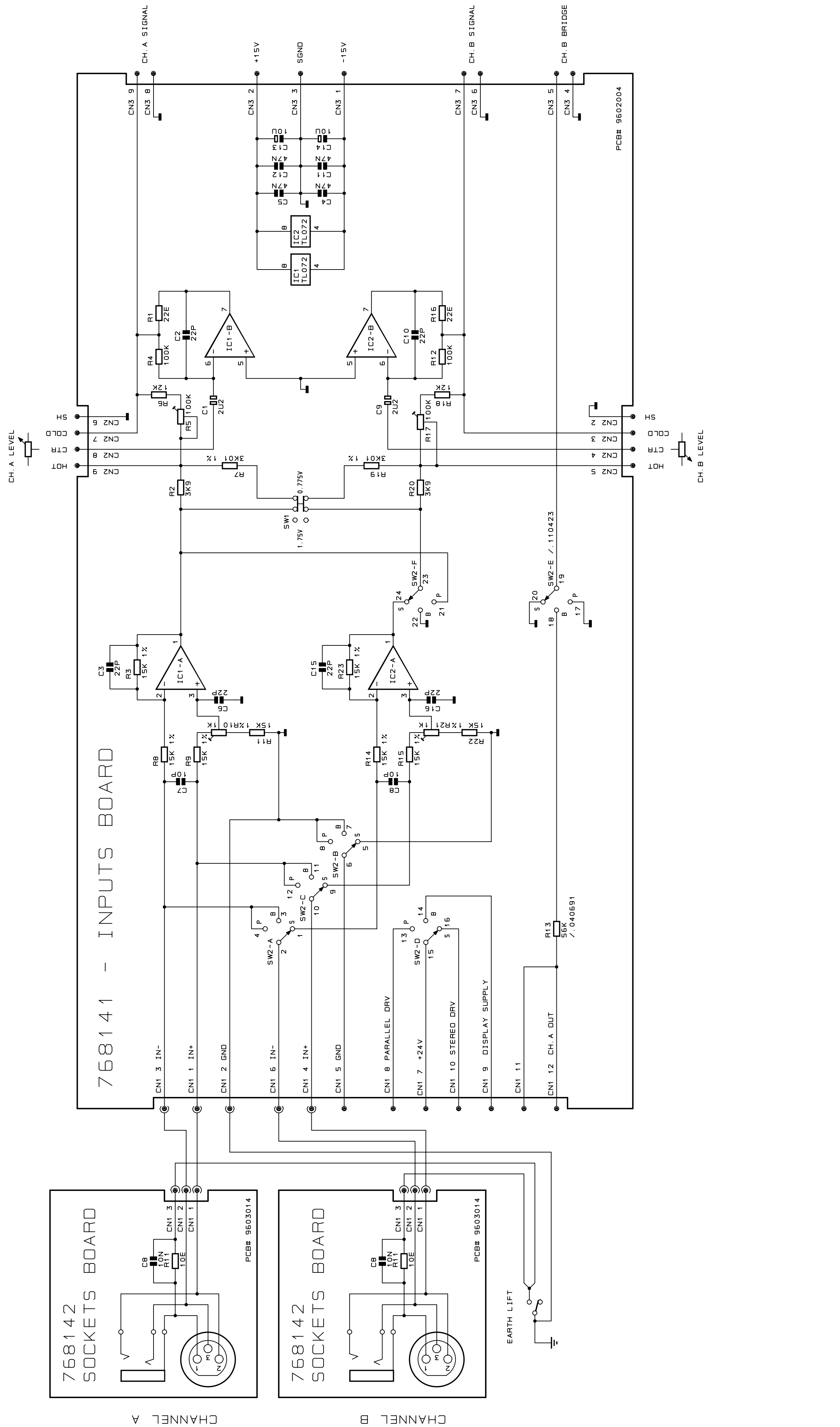
➭ If the input sinewave appears to be distorted during the negative cycle, you can assume that the problem is located somewhere in the circuitry of the positive low rail.
If the positive cycle appears distorted, you can assume that the problem is in the circuitry of the negative low rail.

➭ If the high rails appear distorted or are not modulating as shown in figure, then the problem probably exists somewhere in the circuitry of the respective (+ or -) defective high rail. Refer to the schematics.

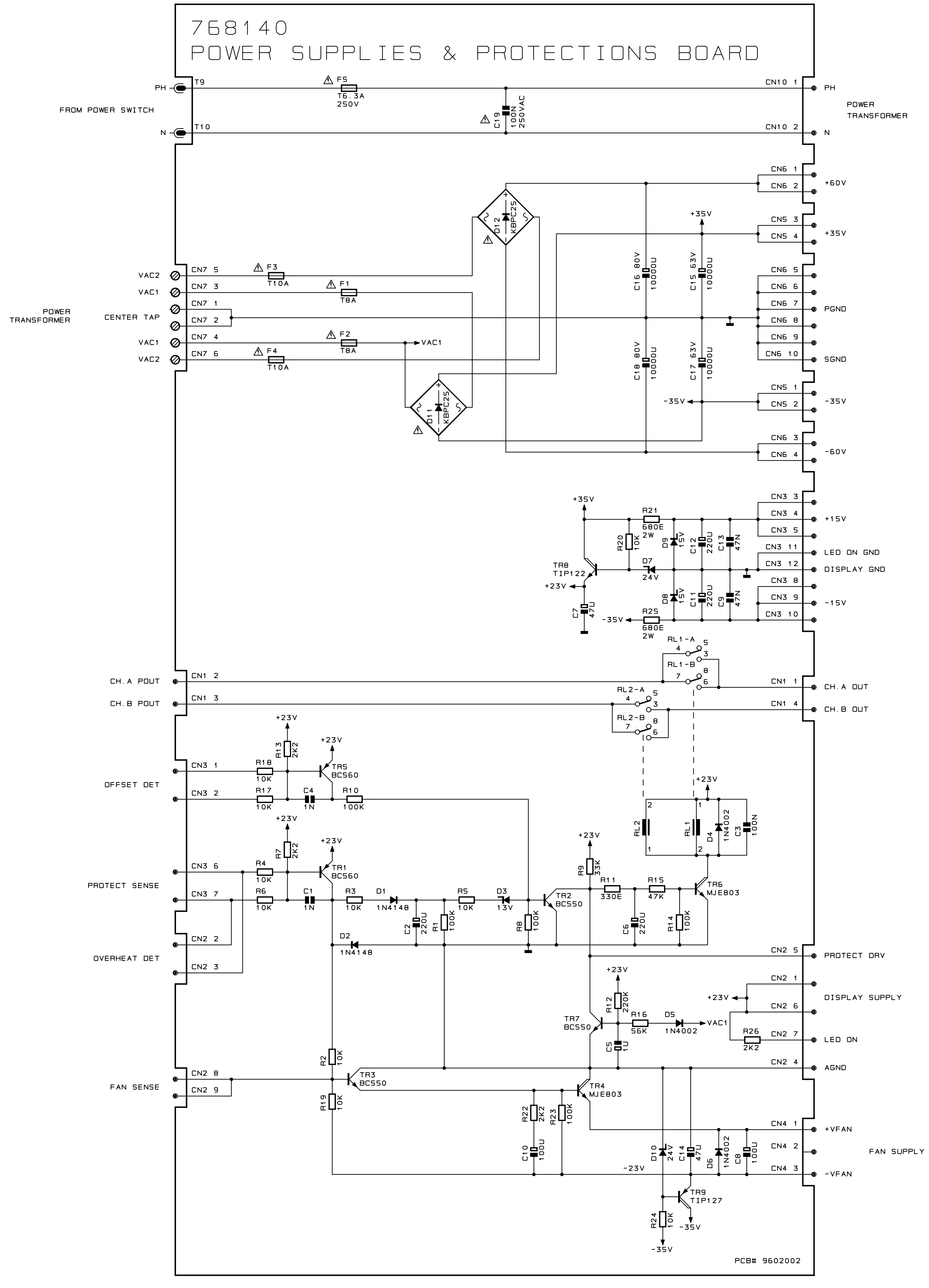




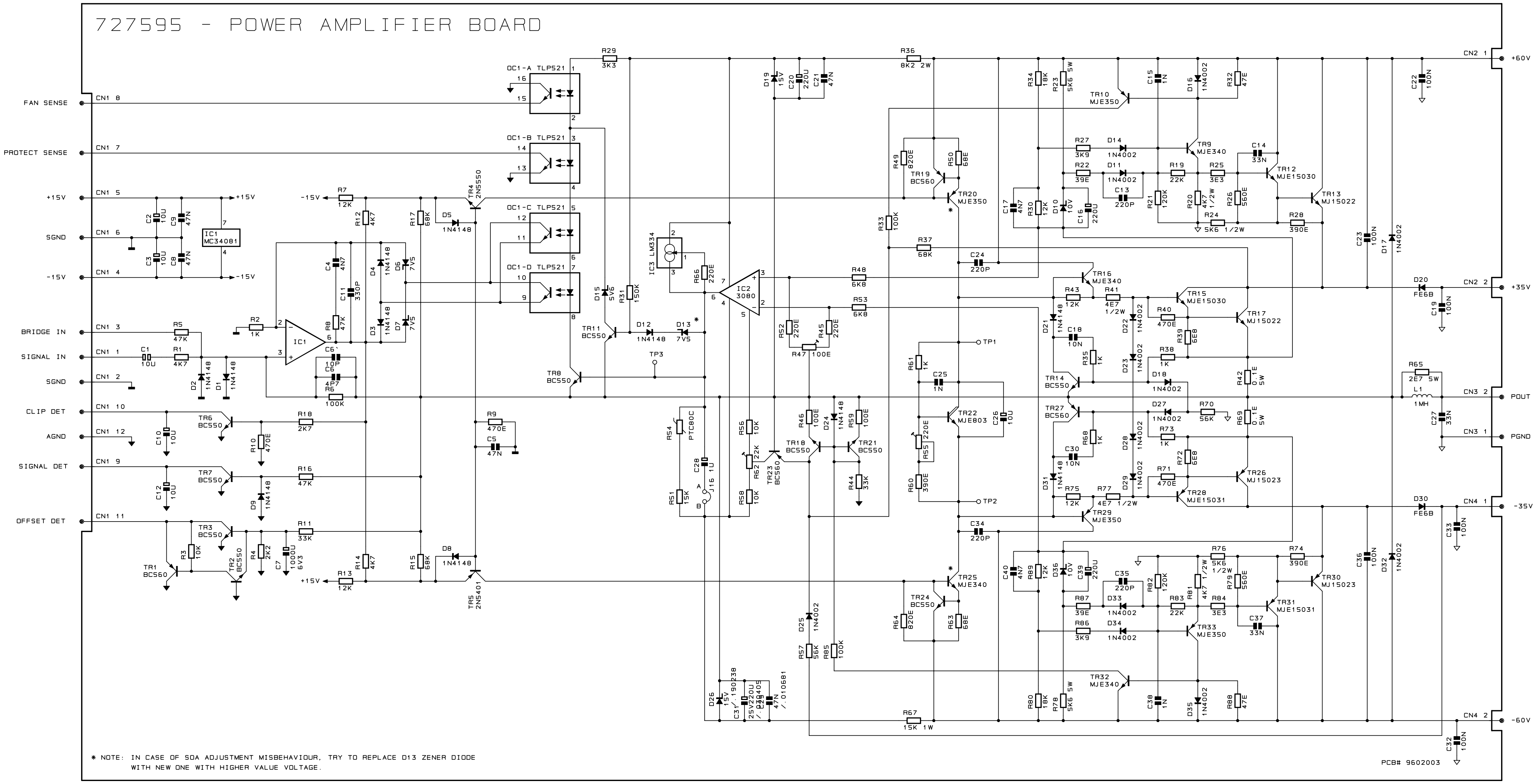
DRW M. PALANGHI	DWG# 550597	PCB#	GENERALMUSIC S.p.A. ITALY
CKD I. BATTELLI	DSK# 58PART: 1/1	SCHEMATIC DIAGRAM WIRING CONNECTIONS	ALL RIGHTS ARE RESERVED, NO COPIES OR REPRODUCE THIS DOCUMENT WITHOUT WRITTEN CONSENT BY GENERALMUSIC.
APP. C. ZUCCATTI	REV: 21/10/97		



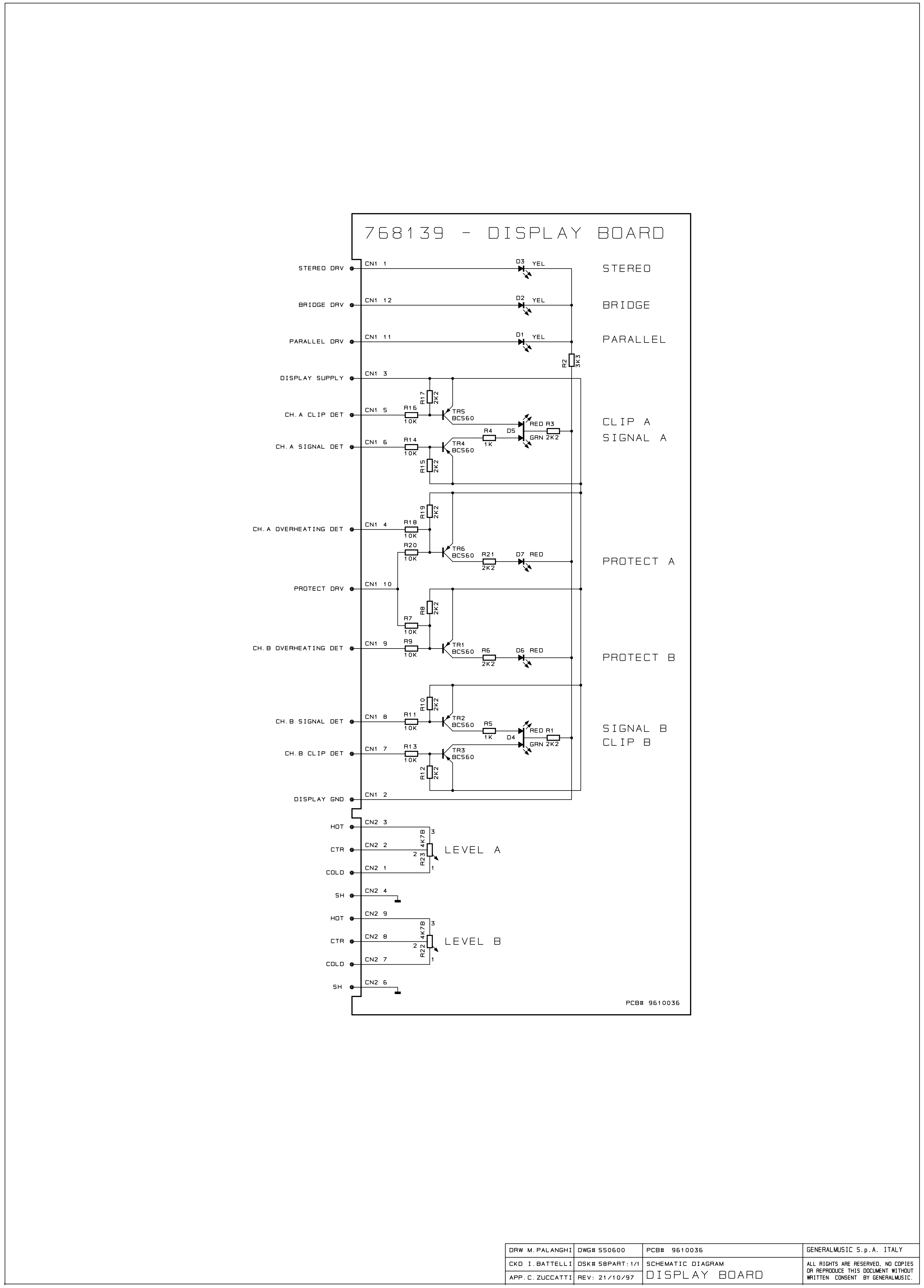
PCB# 9602004	SCHEMATIC DIAGRAM SOCKET & INPUT BOARDS
DWG# 550598	DSK#58PART:1/1
REV: 21/10/97	
DRW M.PALANGHI	CKD I.BATTELLI
APP C.ZUCCATTI	



DRW M.PALANGHI	DWG# 550601	PCB# 9602002	
CKD I.BATTELLI	DSK#58 PART:1/1	SCHEMATIC DIAGRAM POWER SUPPLIES & PROTECTIONS BOARD	
APP. C. ZUCCATTI	REV: 21/10/97		



DRW M.PALANGHI	DWG# 550599	PCB# 9602003	GENERALMUSIC S.p.A. ITALY
CKD I.BATTELLI	DSK#58 PART: 1/1	SCHEMATIC DIAGRAM POWER AMPLIFIER BOARD	
APP. C.ZUCCATTI	REV: 22/10/97		



Spare Part List

Code	Ref.	Description

Accessories

Code	Ref.	Description
277317		Owner's Manual P-Series

Assembly

Code	Ref.	Description
667644	MSSDCR01	Cover
667643	MSSDCQ01	Chassis
667642	MSSEBB01	Front Panel
667335	MEAYA104	Rear Spacer
657232	HRDKBH51	Level Knob
340048		Cord Lock
238083	FIN27341	Transformer 500W 230Vac
177542	MEATA102	Handle
141200	CONJK351	Speakon Socket
130285		Mains Cable (EU)
110294		Slider Switch (Earth Lift)
110291	SWTPR141	Power Switch
080607		KBPC25 25A 200V Rectifier Diode Bridge
778124	FIN27361	Cables Assembly

Inputs Assemblies

Code	Ref.	Description
768142	**FIN27305**	**Sockets Board (Pcb#9603014)**
140228	CONJK151	* Horizontal Jack Stereo Socket
	CONJK141	* XLR Female Socket
768141	**FIN27302**	**Inputs Board (Pcb#9602004)**
110293		* 2sw 2pos Slider Switch
110255		* 6sw 3pos Vertical Slider Switch
100061		* TL072 Dual J-Fet Operational Amplifier (replace BA4560 for service)
070245		* 100K 20% Vertical Linear Trimmer
070125		* 1K 20% Vertical Linear Trimmer
042625		* 15K0 1/4W 1% Metalized Film Resistor
042537		* 3K01 1/4w 1% Metalized Film Resistor
030085		* 2u2 50V 20% Vert Electrolytic Bipolar Capacitor

Display Assemblies

Code	Ref.	Description
768144	**FIN27306**	**Led On/Off Board (Pcb#9610036)**
768139	**FIN27304**	**Display Board (Pcb#9610036)**
090194		* BC560 TO92 LN Pnp Transistor
080742		* Led 3mm Wide Diffused Red-Grn
080710		* Led 3mm 60deg Diffused Yel
080705		* Led 3mm 60deg Diffused Red
074561	RESVRD01	* 4K7 Linear Rotary Potentiometer

Supplies & Protections Assembly

Code	Ref.	Description
768140	**FIN27303**	**Power Supplies & Protections Board (Pcb#9602002)**
110307		* Relay 24V / 2 Switch 5A 250V
110030		* T10A Fuse 5x20mm (EU)
110023		* T8A Fuse 5x20mm (EU)
110018		* T6.3A Fuse 5x20mm (EU)
090920		* MJE802 TO126 Npn Darl Transistor
090559		* TIP122 TO220 Npn Darlington Transistor
090558		* TIP127 TO220 Pnp Darlington Transistor
090194		* BC560 TO92 LN Pnp Transistor
090183		* BC550 TO92 LN Npn Transistor
080322		* 24V 1W 5% Zener Diode
080293		* 15V 1W 5% Zener Diode
080282		* 13V 1W 5% Zener Diode
080156		* 1N4002 1A 100V Rectifier Diode
080103		* 1N4148 100mA 75V Signal Diode
060475		* 680E 2W 10% Resistor
030891	CAPELJ81	* 10000u 63V -10+50% Vert Electrolytic Capacitor FS
030888		* 10000u 80v -10+50% V Electrolytic Capacitor FS
020493		* 100n 250Vac MKP EMI Capacitor "Siemens"

Power Channels Assembly

Code	Ref.	Description
727588	**FIN27311**	**Dual Power Amplifier Board (Pcb#9602003)**
727595		*** Power Amplifier Board (Pcb#9602003) with Heatsink**
768143		**** Power Amplifier Board (Pcb#9602003) without Heatsink**
230557		*** 1uh Horizontal Coil For Amplifier
100931		*** MC34081 Single J-Fet Operational Amplifier
100928		*** TLP521-4 Quad Optocoupler
100004		*** LM3080 Operational Transconductance Amp.
090917		*** MJE350 TO126 Pnp Transistor
090916		*** MJE340 TO126 Npn Transistor
090201		*** 2N5401 TO92 Pnp Transistor
090200		*** 2N5550 TO92 Npn Transistor
090194		*** BC560 TO92 LN Pnp Transistor
090183		*** BC550 TO92 LN Npn Transistor
080293		*** 15V 1W 5% Zener Diode
080261		*** 10V 1W 5% Zener Diode
080245		*** 7V5 1W 5% Zener Diode
080241		*** 5V6 1W 5% Zener Diode
080171		*** FE6B 6A 100V Fast Recovery Diode
080156		*** 1N4002 1A 100V Rectifier Diode
080103		*** 1N4148 100mA 75V Signal Diode
070207		*** 22K 20% Vertical Linear Trimmer
070084		*** 220E 20% Vertical Linear Trimmer
070065		*** 100E 20% Vertical Linear Trimmer
060620		*** 15K 1W 5% Resistor
060591		*** 8K2 2W 10% Resistor
060571		*** 5K6 2W 10% Resistor
060174		*** 2E7 5W 10% Wire Resistor
060033		*** 0E1 5W 5% Wire Resistor
030715		*** 1000u 6v3 20% Vert Electrolytic Capacitor
030247		*** 10u 25V 20% Vert Electrolytic Bipolar Capacitor
340752		** TO3 Mica Washer
340750		** TO126 Mica Washer
340079		** TO220 Mica Washer
340078		** TO220 Insulated Bush
140626		** TO3 Socket
100925	SMCIC831	** LM334 Adjustable Current Source TO92
090920	SMCTR981	** MJE802 TO126 Npn Darl Transistor
090919	SMCTRA01	** MJE15031 TO220 Pnp Transistor
090918	SMCTR991	** MJE15030 TO220 Npn Transistor
090917	SMCTRA11	** MJE350 TO126 Pnp Transistor
090916	SMCTR951	** MJE340 TO126 Npn Transistor
090910	SMCTR961	** MJ15023A TO3 Pnp Transistor
090907	SMCTR971	** MJ15022A TO3 Npn Transistor
080820	SMCTH111	** Ptc 80 PTH59F04BF222TS
110359	FANDC051	* Fan 24Vdc 80x25mm

Note:

Each spare part is single quantity unless otherwise specified.
Asterisk prefix explanation:

Omitted	= First level spare part.
One asterisk	= Second level, part of previous listed first level part.
Two asterisk	= Third level, part of previous listed second level part.
Three asterisk	= ....

Any request for not above mentioned part must encompass specific description including:
1) Model name,
2) Section name,
3) Module code,
4) Reference name,
5) Quantity number.