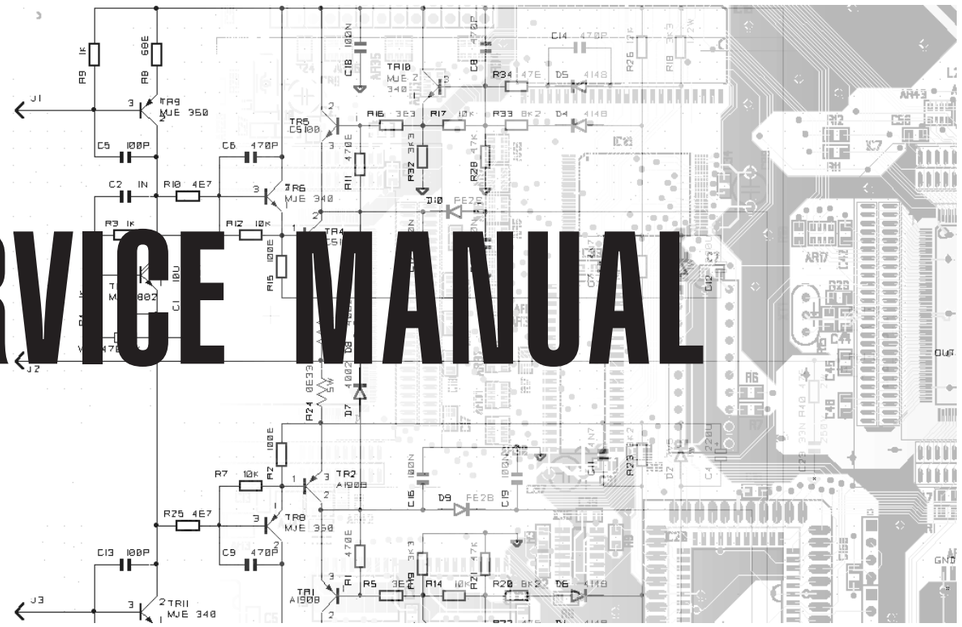
AMP 2.4

HEAVY DUTY POWER AMPLIFIER

SERVICE MANUAL



GENERALMUSIC®

CODE: 270232

Index

Warnings

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.
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 1/8Ω unless otherwise specified.
All switches shown in the "OFF" position. All DC voltages measured to ground with a voltmeter 20KOhm/V.

- ← Soldering point.
- • Male connector.
- ⊃ Female connector.
- ⊂⊃ M/F faston connector.
- ↑ Supply voltage.
- ⊡ Test point.
- ⟨⟩ Flag joined with one or more flags with the same signal name inscribed.
- ⊥ Logic supply ground.
- ⏚ Analog supply ground.
- ⏚ Chassis ground.
- ⊕ Earth ground.

ATTENTION

Observe precautions when handling electrostatic sensitive devices.

Address

GENERALMUSIC S.p.A. Sales Division: 47842 S.Giovanni in Marignano (RN) ITALY - Via delle Rose, 12 - tel. 0541/959511 - fax 0541/957404
GENERALMUSIC on the NET: http://www.generalmusic.com

TECHNICAL SPECIFICATIONS

Dimensions:	(WxHxD)	483x44x310mm (1U)
Weight:		8Kg
Power Requirements:	(230Vac±10% 50Hz)	300VA
Output Power:	(8Ω stereo/parallel)	2x 130Watts
Max. Undistorted Out:	(8Ω stereo/parallel)	92Vpp
Input Sensitivity:	(constant sensitivity)	0.775Vrms (0dB)
Input Impedance:	(balanced)	30KΩ
	(unbalanced)	15KΩ
Voltage Gain:	(constant sensitivity)	32±0.5dB
Slew Rate:		10V/µS
Damping Factor:	(8Ω stereo/parallel)	>400
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)	>70dB

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 10W 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).
- Some component references in the circuitry have the A letter suffix to identify the CH1 channel and the B letter for CH2 channel.

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
- 4Ω 500W, 8Ω 300W, 100Ω 10W resistors
- Variac (0÷250Vac)

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.
- The procedures that follow must be executed subsequently in the order specified.

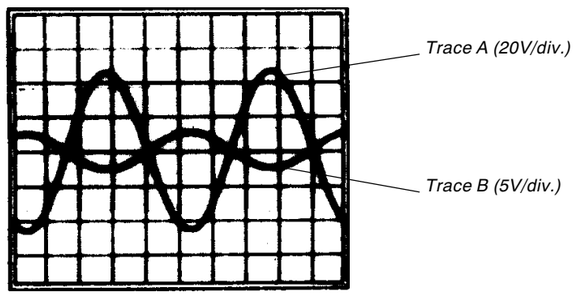
Supply Check

- 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:
  FUSE1-FUSE2=55±1.5Vac
  FUSE3-FUSE4=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, 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 (CN1, CN4 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 100ΩΩ10W resistor across the caps and remove the resistor just after they are discharged.**
- Finally verify the DC supplies on POWER SUPPLIES board:
  CN2-4 pin 3 (+Vcc2) =+61±2Vdc
  CN2-4 pin 4 (+Vcc1) =+36±1.5Vdc
  CN2-4 pin 2 (-Vcc1) =-36±1.5Vdc
  CN2-4 pin 1 (-Vcc2) =-61±2Vdc
  CN3 pin 5 =+15±1Vdc
  CN3 pin 3 =-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 CH1 channel is on the left and CH2 channel is on the right 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.
- Verify, with the Multimeter, the PTC resistor value (R133 connected across pin 8 an pin 9 of CN3), it must be between 50Ω and 200Ω.
- **SETUP:**
  Connect the ch1 scope GND clip to CN102 pin 1 (GND terminal).
  Connect the ch1 probe tip to CN102 pin 2 (AMP output).
  Connect the ch2 probe tip to D109 anode and set it sensitivity at 5V/div.
  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* (*Trace B* shown the amplifier 2nd stage input). If there is a distortion read the section ADVICES and proceed to check the other channel.

Fig. 1



- **BIAS ADJUSTMENT:**
  Set the generator level at zero, connect the Multimeter across the emitter and collector of TR108, then adjust R132 trimmer to read 2.5Vdc.
- **HIGH RAIL CHECK:**
  Connect the ch2 probe tip to D103 cathode and set it sensitivity at 20V/div.
  When the output signal (Positive half-wave) is less than 30Vp the voltage on D103 cathode must remain constant at 36V, when the output signal exceeds 30Vp the voltage must follow the output signal with 6V offset (see *Fig.2 Trace B*), to check the negative high rail connect the probe to D114 anode (see *Fig.2 Trace C*).
  Connect the 8Ω 300W load on the output and repeat the INITIAL and HIGH RAIL checks.
  Check the signal clipping, it must occur at 48±2Vpp (see *Fig.3 Trace A,B,C*).
- **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 LIMITER led

Fig. 2

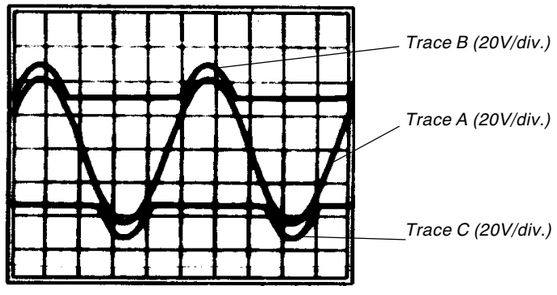
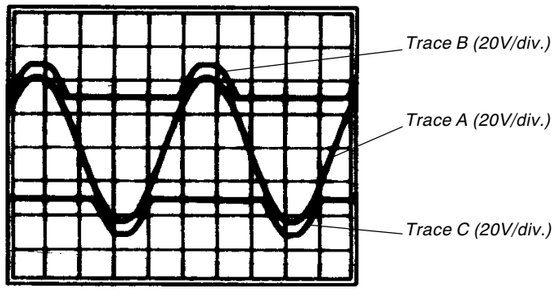


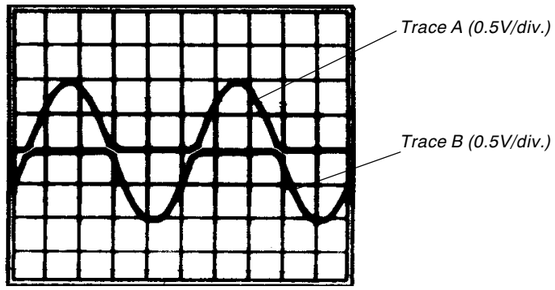
Fig. 3



activity: it must turn on (red light) at the amplifier output signal clipping.

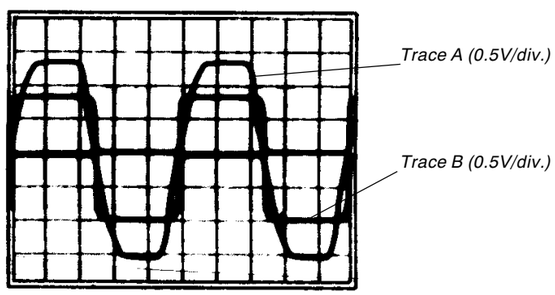
➪ **CURRENT AND SHORT CIRCUIT SENSOR CHECK:**
Set both the scope channels sensitivity to 0.5V/div., connect the scope ch1 GND clip at CN3 pin 2 (AMP output) and the probe tip at TR106 (NPN) emitter, connect the ch2 probe tip at TR113 (PNP) emitter.
Set the generator to have approx. 1Vp on the emitters: their difference must be less than 0.2V on the peaks (see *Fig.4 Trace A & B*).
Connect a 4Ω 500W load. Increase the input signal, the output current

Fig. 4



limiter must keep the emitter voltages, both half channel, at 1.5Vp approx. (see *Fig.5 Trace A*).
Temporarily short the amplifier output: the current limiter must keep the emitter voltages (both half channel) at 1 approx. (see *Fig.5 Trace B*).

Fig. 5



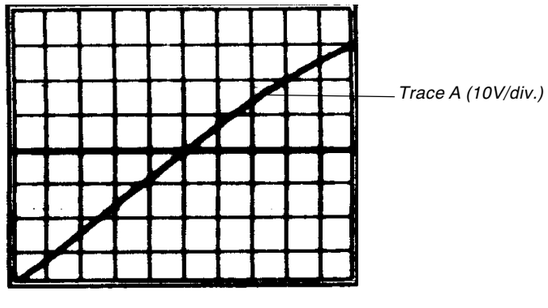
➪ **OFFSET SENSOR CHECK:**
Set the Variac to zero voltage output, disconnect the amplifier load and the supply connection from the Power Supply & I/O Board (CN2-4), turn on the amplifier, connect temporarily (by means of a suitable conductor wire) CN2 pin 2 to +15Vdc (CN3 pin 5), the PROTECT led must turn on in 5 seconds approx.
Remove the connection, wait until the leds turn off and after some seconds repeat the check with -15Vdc (available on CN3 pin 3), the led PROTECT must turn on again.

➪ **BIAS CHECK:**
Disconnect ch2 probe. Connect the ch1 scope GND clip to CN2 pin 1 (GND terminal) and its probe tip to CN2 pin 2 (AMP output). Adjust the generator level until the sinewave appears at full screen amplitude, no crossover distortion must be detectable: if necessary re-adjust R132.

➪ **BANDWIDTH CHECK:**
Set ch1 scope sensitivity at 20V/div., increase the generator level to have 80Vpp, 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 6*.

Fig. 6



Inputs & Protections 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 it 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.

➪ **AMPLIFIER GAIN CHECK**
Check the output levels: at 775mV position the output voltage must be 46±1.5Vp.

➪ **SIGNAL TO NOISE RATIO CHECK**
Disconnect the audio generator 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.

PHC768016 - POWER SUPPLY & I/O BOARD

PHC768018 DISPLAY BOARD

PHC768019 PHONES BOARD

PHC768017 - POWER AMPLIFIER BOARD CH1

PHC768017 - POWER AMPLIFIER BOARD CH2

CH1 IN

CH2 IN

PROTECT CH1

CLIP CH1

SIGNAL CH1

PROTECT CH2

CLIP CH2

SIGNAL CH2

LEVEL CH1

LEVEL CH2

POWER ON

PHONES

STEREO

PARALLEL

OFFSET DETECTOR CH1

OFFSET DETECTOR CH2

THERMAL PROTECTION CH1

THERMAL PROTECTION CH2

SIGNAL DETECTOR CH1

SIGNAL DETECTOR CH2

MUTING

PHONES SENSOR

BIAS ADJ

CH1 OUT

CH2 OUT

FLOATING

MAINS GROUND ON

230Vac 50/60Hz +/-10%

POWER

FUSES T3.15A 250VAC

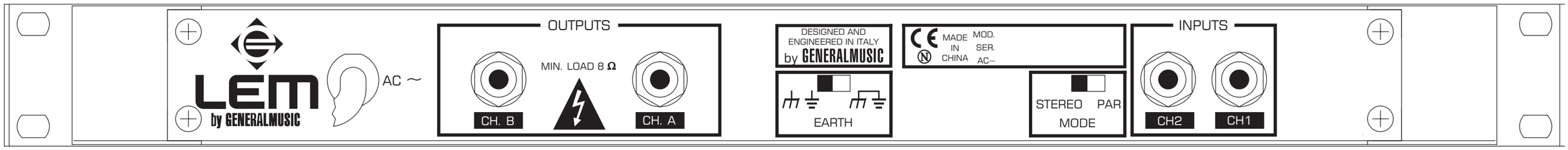
TRANSFORMER 300W 070-23118-800-0 PHC238003

PCB# 290-60241-000-0

PCB# 290-60240-000-0

PCB# 290-34340-100-0

DRW BOCCATO	DWG# 550625	PCB#	GENERALMUSIC S.p.A.
DEPT. AUDIO	DATE 05/05/99	DESCRIPTION	
PART# 1 OF 1	REV# A	AMP2.4 130WX2 POWER AMP.	



Spare Part List

Code	Ref.	Description
		Accessories
277328		Owner's Manual
		Assembly
PHC667004		Front Panel
PHC667003		Level Knob
PHC238003		**Transformer 300W**
PHC130294		Mains Cord (EU)
PHC110007		Power Switch
		Assembly
PHC768019		**Phones Board**
140207		Horizontal Female Jack Socket
PHC768133		**Display Board (Pcb# 290-60241)**
080742	*	Led 3mm Wide Diffused Red-Grn
080710	*	Led 3mm 60deg Diffused Yel
080705	*	Led 3mm 60deg Diffused Red
PHC074001	*	10K Rotary Potentiometer
PHC768016		**Power Supply & I/O Board (Pcb# 290-60240)**
230557	*	1uh Hor Coil For Amplifier
140228	*	Horizontal Jack Stereo Socket
110307	*	Relay 24V / 2 Switch 5A 250V
100051	*	4558 Dual Operational Amplifier
PHC090000	*	A1015GR TO92 Ln Pnp Transistor
PHC090001	*	C1815GR TO92 Ln Npn Transistor
080232	*	5V1 1W 5% Zener Diode
080156	*	1N4002 1A 100V Rectifier Diode
080103	*	1N4148 100mA 75V Signal Diode
070241	*	100K 20% Horizontal Linear Trimmer
070121	*	1K 20% Horizontal Linear Trimmer
060540	*	3K3 1W 5% Resistor
060481	*	820E 5W 10% Resistor
060214	*	4E7 5W 10% Wire Resistor
030085	*	2u2 50V 20% Vert Electrolytic Bipolar Capacitor
110020	*	T5A Fuse 5x20mm (EU)
110003	*	T3.15A Fuse 5x20mm (EU)
080605	*	KBL02(6) 4A 200V Rectifier Diode Bridge
080293	*	15V 1W 5% Zener Diode
060441	*	470E 5W 10% Resistor
030543	*	3300u 63V 20% Snap-In Electrolytic Capacitor
PHC727596	*	**Power Amplifier Board (Pcb# 9610042) With Heatsink**
100931	*	MC34081 Single J-Fet Operational Amplifier
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
080261	*	10V 1W 5% Zener Diode
080245	*	7V5 1W 5% Zener Diode
PHC080007	*	LT6A04 6A Fast Recovery Diode
080156	*	1N4002 1A 100V Rectifier Diode
080103	*	1N4148 100mA 75V Signal Diode
070084	*	220E 20% Vertical Linear Trimmer
070065	*	100E 20% Vertical Linear Trimmer
060075	*	0E33 5W 5% Wire Resistor
030247	*	10u 25V 20% Vert Electrolytic Bipolar Capacitor
340750	*	TO126 Mica Washer
340078	*	TO220 Insulated Bush
090920	*	MJE802 TO126 Npn Darl Transistor
090863	*	TIP36C TO218 Pnp Transistor
090862	*	TIP35C TO218 Npn Transistor
PHC080008	*	Ptc 90 PTH9L04BE222TS2F330

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.