LEM

PROFESSIONAL SOUND

CYCLOP

ACTIVE LOUDSPEAKER SYSTEM

LUCKY

ACTIVE SAT SYSTEM

SERVICE MANUAL

2nd Edition

GENERALMUSIC

code 270274

Index

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 1/8W 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.

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		CYCLOP SAT	CYCLOP SUB
LOUDSPEAKER SPECIFICATIONS			
COMPONENTS	*High*	Niobium horn tweeter	
	Low	8" mid-woofer	15" woofer
POWER HANDLING (EIA RS-426A)	*W continuous* *W peak*	150 300	300 600
IMPEDANCE	*Ohms*	8	
PASSIVE CROSSOVER	*Hz*	5000 @ 6dB/oct.	
CONNECTIONS		1 x SPEAKON	
CONSTRUCTION		Chipboard with black scratch-resistant paint - Protection metal grid	
DIMENSIONS	*mm (WxHxD)*	274x430x242	546x476x630
WEIGHT	*kg*	7	39
AMPLIFIER SPECIFICATIONS			
EIA OUTPUT POWER (1kHz, max THD 1%)	*W*	2 x 150	300
INPUT SENSITIVITY	*dB (V)*	+4dB (1.23V)	
INPUT IMPEDANCE	*kohms*	30 (balanced) - 15 (unbalanced)	
ACTIVE CROSSOVER	*Hz*		180 @ 24dB/oct.
DISTORSION	*%*	<0.02 (THD+Noise)	
CONTROLS		Power output volume (SAT) - Shield ON/OFF	
CONNECTIONS		2 x JACK + 2 x XLR-F (signal input) - 2 x SPEAKON (power output)	
POWER SUPPLY		See label on the unit	
SYSTEM SPECIFICATIONS			
SENSITIVITY (SPL 1W/1m)	*dB*	94	
MAX SPL continuous	*dB*	116	
MAX SPL peak	*dB*	121	
FREQUENCY RESPONSE	*Hz (-10dB)*	40 - 20k	
DISPERSION (OxV)	°	90 x 60	

TEST PROCEDURES & ADJUSTMENTS

These procedure are relative to all system amplifiers inside the Sub woofer cabinet.

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 supply capacitors. If your measurement on any of the caps is greater than 10Vdc, connect a 100Ω 30W 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 amplified speaker.
- **Do not check the amplifier with the speakers connected use the appropriate load resistors only.**
- **BE CAREFUL increasing the Variac you must not exceed the nominal mains voltage plus its tolerance (see specifications) any upper voltage can be cause of damage.**

Remarks

- The internal LOW speaker is connected to two amplifiers working in bridge configuration.
- The MID-HIGH speakers (POWER OUTPUT sockets) are connected to two separate amplifiers.

Visual Check

- Check the speakers for any damaging (cone-breaking, interruption or further).
- 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
- Oscilloscope
- Digital Multimeter
- Temperature Meter
- 4Ω 150W, 8Ω 300W, 100Ω 30W resistors
- Variac (0÷250Vac)

TECHNICAL SPECIFICATIONS

Power Requirements:	(230Vac±10% 50Hz)	690VA
or	(115Vac±10% 50/60Hz)	690VA
Max Low Out Power*:	(8Ω)	300W
Max High Out Power*:	(8Ω)	150W
Low Limited Out*:	(8Ω)	140Vpp
High Limited Out*:	(8Ω)	76Vpp
Frequency Response	(LOW amplifier+speaker)	25Hz÷180Hz
	(MID-HIGH amp+speaker)	180Hz÷20kHz

Frequency X-Over	(Low/Mid-High)	180Hz
Line In Sensitivity:	(+4dB)	$1.229V_{RMS}$
Input Impedance:	(balanced)	30KΩ
	(unbalanced)	15KΩ
Voltage Gain:	(average)	30±1dB
IMD:	(SMPTE 60Hz/7KHz 4:1)	<0.1%
THD:	(THD+N)	<0.1%
S/N Ratio:	(unweighted)	>100dB

* Note: measured with the IHF standard method and just before the limiters became operative.

Setup

- Connect the Variac between the mains and the amplifier and set it at zero voltage.
- Disconnect all the Speakers.
- Turn full clockwise all the VOLUME potentiometers.
- Connect the audio generator to each channel input and set it to 100Hz $775mV_{RMS}$ (0dBm) sinusoidal signal.
- Connect the oscilloscope probe to the LOW OUT, clip to - and tip to + before RL2, set it to 20V/div. 2mS/div.
- The load resistor is disconnected.
- The procedures that follow must be executed subsequently in the order specified.

Supply Check

- Verify with the Multimeter the insulation between the heatsink and all transistor collectors (TR49,47,48,50,32,51,28,17,29,12,5,13).
- Verify with the Multimeter the PTC resistor value, it must be between 50Ω and 200Ω.
- Remove the transformer secondary fuses, set the Variac to the nominal mains voltage, check with the Multimeter the AC supply voltages:

  F1-F2=70±2Vac.
- Re-set the Variac at zero voltage, turn off the amplifier and put the fuses back on its holders.
- Set up the Variac slowly monitoring the oscilloscope screen, it should display the input signal amplified with distortion but without any DC voltage; starts from half of nominal mains voltage it should display the sinusoidal signal amplified without distortions, if a distortion occur or the protection trips check the amplifier as suggested in the ADVICES section; if a protection trips without any reason, also check the two MID-HIGH amplifiers connecting the oscilloscope probe to the respective output before the relay (tip at + clip at -).
- During the previous check the fan must run at its lower speed (15Vdc) till the input signal reaches about -3dBm.
- When the Variac ac voltage reaches the nominal voltage verify the DC supplies as follow:

  TR49 collector pin 2 (+Vcc) =+49±2Vdc
  TR51 collector pin 2 (-Vcc) =-49±2Vdc
  IC2 pin 2 =+17±1Vdc
  IC1 pin 3 =-17±1Vdc
- If one or more voltages don't correspond, check the rectifiers, capacitors and transformers disconnecting them from circuitry, refer to schematics.

LOW Amplifier Check

- Increase the input signal, the channel output signal must be symmetrical without visible distortion and oscillation as shown in *Fig.1* (note: the figure is representative don't refer to its level). If there is a distortion read the section ADVICES.
- During the test when the amplifier output reaches about 30Vp the fan turns at its maximum speed (24Vdc).
- When the input signal reaches about +6dBm ($1.55V_{RMS}$) the amplifier output reaches its maximum output at about 90Vp (70Vp with load attached), increasing the input at +10dB the output signal must remain at the same level.
- Connect the 8Ω 300W load on the output and repeat the check.
- **BIAS ADJUSTMENT:**

  Set the generator level at zero, connect the Multimeter across the R5 resistor, then adjust VR2 trimmer to read 2±0.5mVdc.

  Verify the same voltage across R52.

  Connect the Multimeter across the R141 resistor, then adjust VR4 trimmer to read 2±0.5mVdc.

  Verify the same voltage across R142.

MID-HIGH Amplifiers Check and Level Adjustment

- Set the generator to 1KHz $775mV_{RMS}$ (0dBm) sinusoidal signal.
- Move the oscilloscope probe tip on LEFT/RIGHT OUTPUT, clip to - and tip to + before RL1, set them to 10V/div. 200μS/div.
- The channel output signal must be symmetrical without visible distortion and oscillation as shown in *Fig.2*. If there is a distortion read the section ADVICES.
- Adjust VR3/VR4 for Left/Right channels, the trimmers are located on INPUTS BOARD, to obtain an output level of 22Vp.
- During the test when the amplifier output reaches about 15Vp the fan turns at its maximum speed (24Vdc).
- When the input signal reaches about +5dB ($1.38V_{RMS}$) the amplifier output reaches its maximum at about 44Vp (38Vp with load attached), increasing the input at +10dB the output signal must remain at the same level.
- Connect the 4Ω 150W load on each output and repeat the check without re-adjust VR3 and VR4.
- **BIAS ADJUSTMENT (LEFT/RIGHT):**

  Set the generator level at zero, connect the Multimeter across the R4 resistor, then adjust VR1 trimmer to read 2±0.5mVdc.

  Verify the same voltage across R22.

  Set the generator level at zero, connect the Multimeter across the R113 resistor, then adjust VR3 trimmer to read 2±0.5mVdc.

  Verify the same voltage across R94.
- **BANDWIDTH CHECK:**

  As a reference we report the x-over curve (Fig.3) obtained with the generator level at -10dB ($0,245V_{RMS}$), check it if necessary.
- **TEMPERATURE PROTECTION CHECK:**

  Placing a welder tip close to a PTC (R13 and R14) the fan must turn to the maximum speed and the relais disconnect the loads.

Advices

- 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 rail.

  If the positive cycle appears distorted, you can assume that the problem is in the circuitry of the negative low rail. Refer to the schematics.
- If you have determinate that the problem is a short on a supply 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.

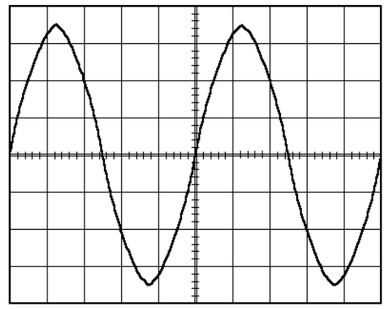
  If all the transistors are OK, unsolder and lift one leg of each diode and check them.

  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.

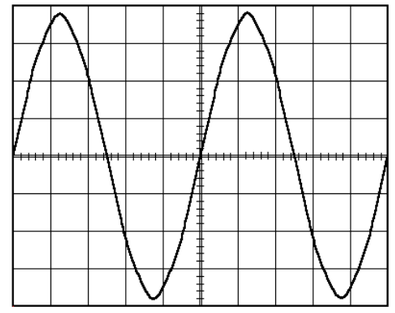
Figures

FIG 1



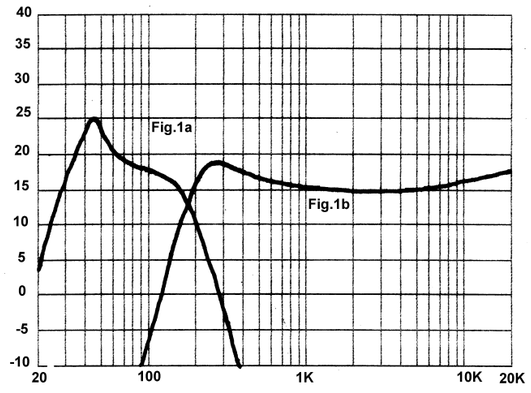
TRACE setting.
TIMEBASE. 2mS/div.
AMPLITUDE 20V/div

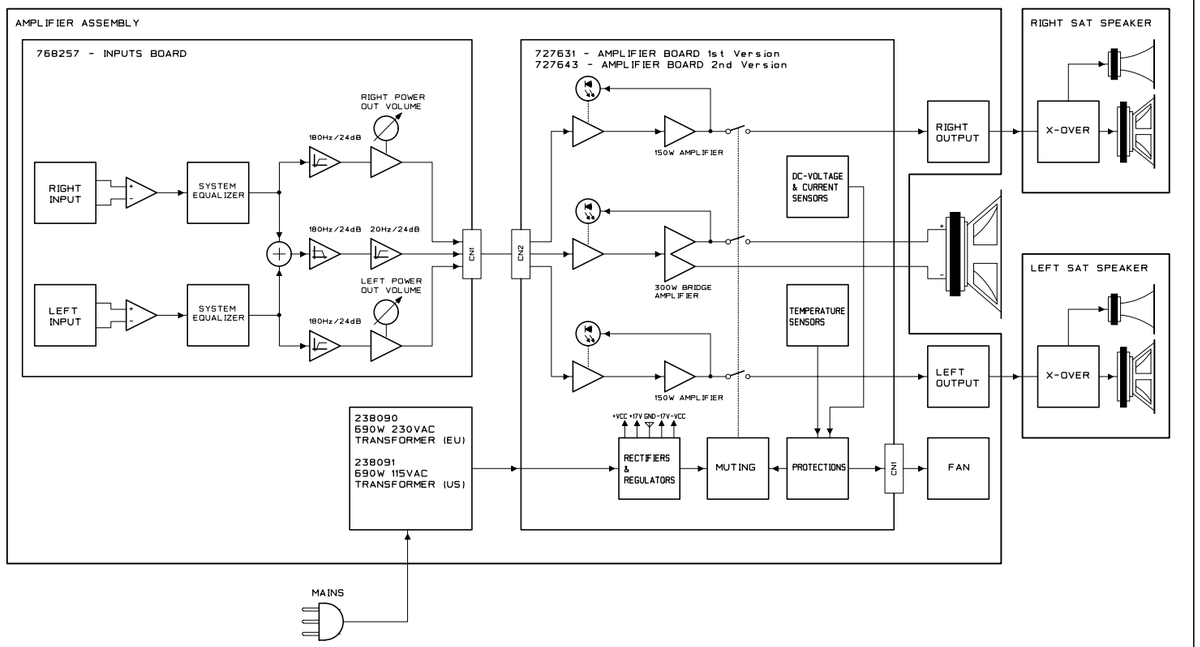
FIG 2



TRACE setting.
TIMEBASE. 200uS/div.
AMPLITUDE 10V/div

FIG. 3





DRW G.BOCCATO	DWG# 550712	PCB#	GENERALMUSIC S.p.A. ITALY
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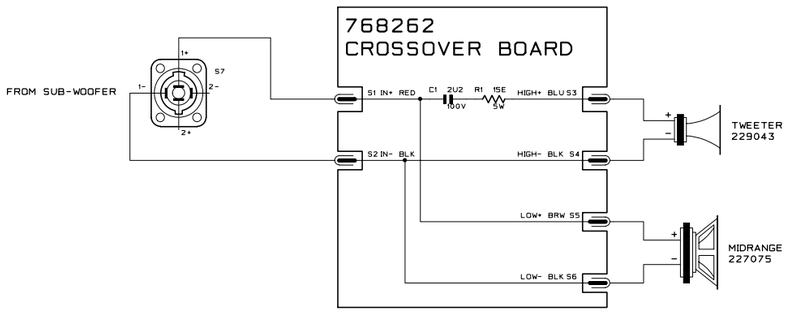

DRW G.BOCCATO	DWG# 550713	PCB# 313075	GENERALMUSIC S.p.A. ITALY
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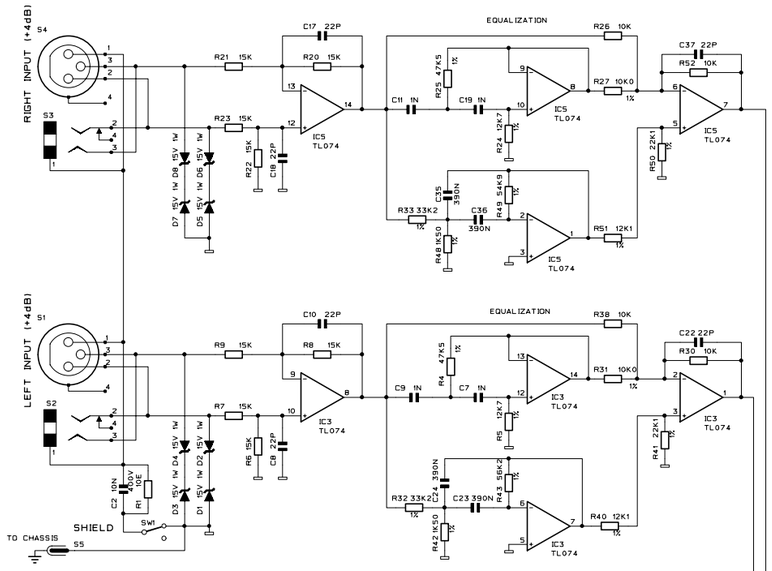
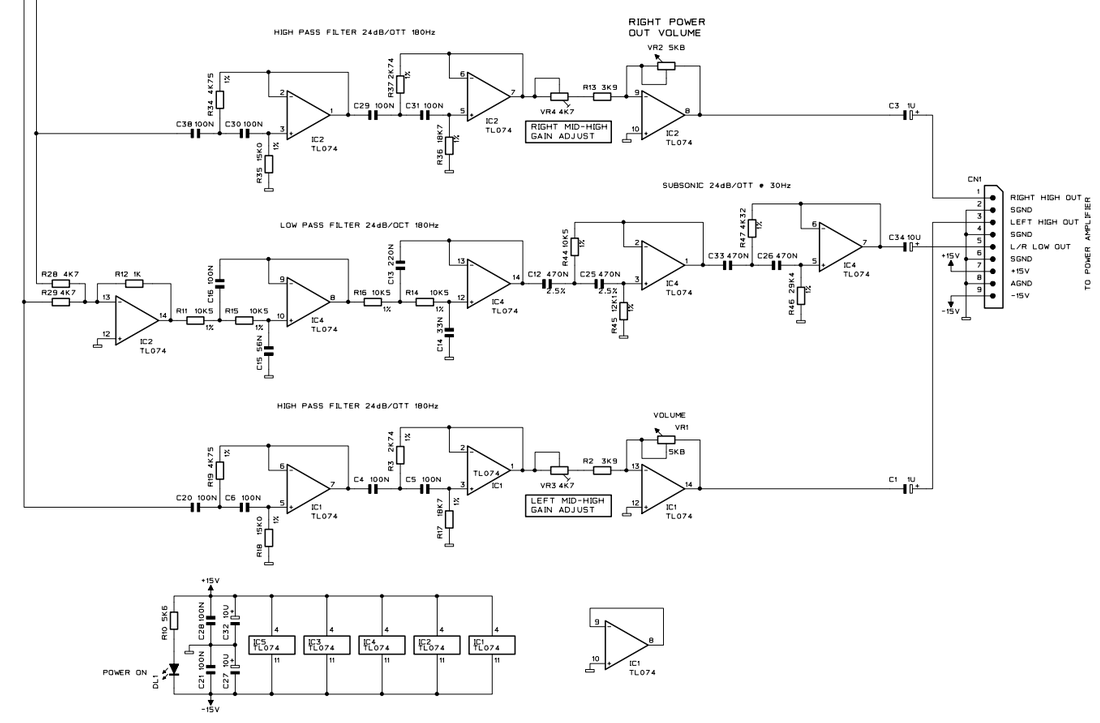


768257 - INPUT BOARD



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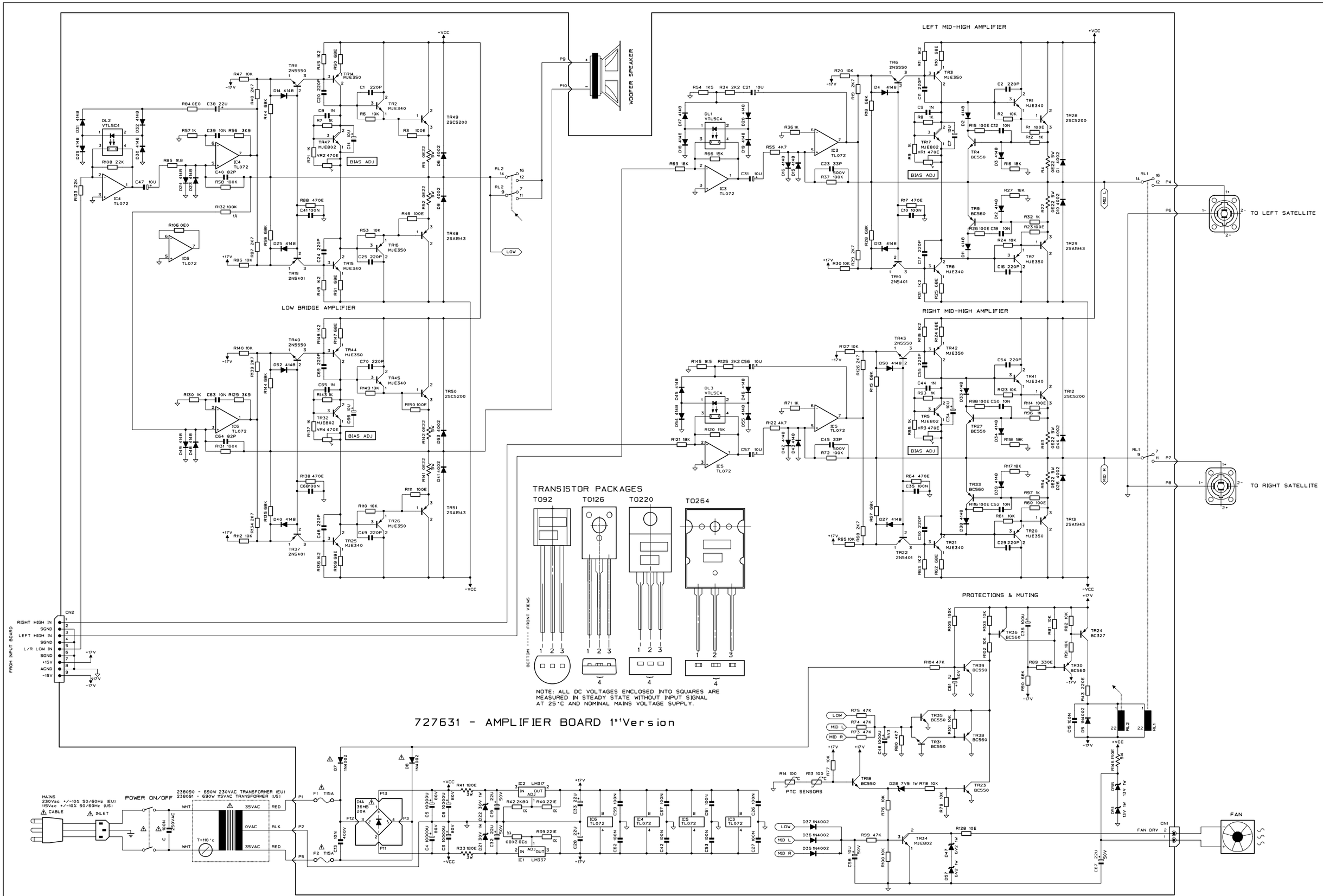
APP. G.BOCCATO	REV: B		



DRW G.RICCI	DWG# 550699	PCB# 313080	GENERALMUSIC S.p.A. ITALY
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APP. G.BOCCATO	REV: B	AMPLIFIER BOARD 1st Version	

LF AMPLIFIER

MF AMPLIFIER

HF AMPLIFIER

15" WOOFER SPEAKER

TO LEFT SATELLITE

TO RIGHT SATELLITE

FAN

INPUTS & SUPPLIES FROM INPUT BOARD CN1

CN2
1 R HIGH OUT
2 SGND
3 L HIGH OUT
4 SGND
5 LR LOW OUT
6 SGND
7 +17V
8 AGND
9 -17V

MAINS
230Vac +/-10% 50/60Hz (EU)
115Vac +/-10% 50/60Hz (US)
CABLE
INLET

POWER ON/OFF

238090 - 690W 230VAC TRANSFORMER (EU)
238091 - 690W 115VAC TRANSFORMER (US)
35VAC RED
0VAC BLK
35VAC RED
T=110 °c

PTC SENSORS

PCB# 313112

TRANSISTOR PACKAGES

T092 T0126 T0220 T0264

BOTTOM ----- FRONT VIEWS

727643 - AMPLIFIER BOARD (2nd Version)

NOTE: ALL DC VOLTAGES ENCLOSED INTO SQUARES ARE MEASURED IN STEADY STATE WITHOUT INPUT SIGNAL AT 25°C AND NOMINAL MAINS VOLTAGE SUPPLY.

DRW G.RICCI	DWG# 550711	PCB# 313112	GENERALMUSIC S.p.A. ITALY
CKD G.BOCCATO	DATE 11/04/2002	SCHEMATIC DIAGRAM	
APP. N.ZAVATTA	REV: A	AMPLIFIER BOARD 2nd Version	

Spare Part List

Code		Description
Accessories		
277378		Cyclop Owner's Manual (Italian-English)
277383		Lucky Owner's Manual (Italian-English)
130297		Mains Cable (EU)
130283		Mains Cable (US)
Cyclop Sat		
778150		Speakers Cables Assembly
667745		Speaker Net
229043		**12ohm Piezoelectric Horn Tweeter**
227075		**8" Midrange Speaker**
210217		Black Sealer (specify mt)
180699		Cyclop Sat Adhesive Label
180673		"Lem" Adhesive Label
180587		Model Data & Code Adhesive Label
150298		100x2.5mm Nylon Cable Tie
120482		4mm Black Shakeproof Washer
120411		WL3.5x20tt Black Screw
120364		WL3.5x12tt Black Screw
120281		WL3x15tt Black Screw
180808		"SOLTON BY LEM" Adhesive Label (Lucky)
768262		**Crossover Board (Pcb#313075)**
210215	*	Adhesive Rubber Foam 10x1.9mm (Specify mt)
120857	*	6.3mm Vertical Male Faston for Pcb
060275	*	15E 5W 10% Wire Resistor
020700	*	2u2 100V 10% MKT Polyester Capacitor
727638		**Input Panel Assembly (Cyclop)**
727639		**Input Panel Assembly (Lucky)**
778165	*	Cables Assembly
141200	**	Speakon Socket (NL4MP Neutrik)
667751	*	Input Panel (Cyclop)
667753	*	Input Panel (Lucky)
120581	*	M3 Black Self-Locking Nut
120451	*	3.2x7x0.5 Black Washer
120030	*	M3x12tsp Black Screw
717084		**Speaker Box Assembly**
430090	*	Cyclop Sat Wooden Speaker Box
347396	*	Belt Handle
347263	*	Flange Support
340270	*	25x12mm Rubber Foot
120359	*	WL5x30ts Black Screw
120351	*	WL4x25ts Black Screw
120341	*	WL4x20tt Black Screw
Cyclop Sub		
		Cabinet Assembly
667744		Speaker Net
659027		White Pot Knob
227074		**15" Woofer Speaker**
210274		Speaker Filler (400gr/m² 100x50x4cm)
210272		Speaker Filler (400gr/m² 30x50x4cm)
210217		Black Sealer (specify mt)
180673		"Lem" Adhesive Label
180587		Model Data & Code Adhesive Label
120483		5mm Black Shakeproof Washer
120461		5.3x10x1 Black Washer
120414		WL3.5x35tt Black Screw
120341		WL4x20tt Black Screw
120124		M5x30tc Black Screw
717083		**Speaker Box Assembly**
430089	*	CYCLOP SUB Wooden Speaker Box
340969	*	37x15mm Rubber Foot
323070	*	9.5x3.8mm Bumpon Rubber
190236	*	50x22mm Caster
177328	*	220x160mm Metal Handle
177325	*	Suspension Flange
120664	*	M6 4-tips Lock Nut
120662	*	M5 4-tips Lock Nut
120483	*	5mm Black Shakeproof Washer
120461	*	5.3x10x1 Black Washer
120417	*	WL4X35tt Black Screw
120411	*	WL3.5x20tt Black Screw
120124	*	M5x30tc Black Screw
120111	*	M6x25tsp Black Screw
Amplifier Assembly		
737129		**Amplifier Assembly (EU) (Cyclop)**
737130		**Amplifier Assembly (US) (Cyclop)**
737137		**Amplifier Assembly (EU) (Lucky)**
737138		**Amplifier Assembly (US) (Lucky)**
841280	*	Single 15cm AWG18 White Faston/Faston Wire
841272	*	12.5cm Yel/Grn Faston/Faston Wire
841182	*	9 Wires 25cm Crimp Terminal Cable
841006	*	10cm Yel/Grn Faston/Faston AWG18 Wire
768257	*	**Inputs Board (Pcb#313097)**
160178	**	Copper Jumper
141187	**	Hor Female XLR Socket (NC3FAH Neutrik)
140930	**	9 Contacts Hor Male Connector
140220	**	Jack Slim Horizontal S-F Socket APJ678 Adimpex
120857	**	6.3mm Vertical Male Faston for Pcb
110267	**	1sw 2pos Horizontal Slider Switch
100084	**	TL074 Quad J-Fet Operational Amplifier
080743	**	3mm Wide Diffused Green Led
080293	**	15V 1W 5% Zener Diode
074570	**	5KB RK16 Hor Rotary Potentiometer K15C31
070163	**	4K7 20% Vertical Linear Trimmer
052050	**	15K 1/8w 5% Resistor
052048	**	10K 1/8w 5% Resistor
052045	**	5K6 1/8w 5% Resistor
052044	**	4K7 1/8w 5% Resistor
052043	**	3K9 1/8w 5% Resistor
052036	**	1K 1/8w 5% Resistor
050131	**	10E 1/4W 5% Resistor
042695	**	56K2 1/4W 1% Metalized Film Resistor
042686	**	54K9 1/4W 1% Metalized Film Resistor
042685	**	47K5 1/4W 1% Metalized Film Resistor
042665	**	33K2 1/4W 1% Metalized Film Resistor
042659	**	29K4 1/4W 1% Metalized Film Resistor
042643	**	22K1 1/4W 1% Metalized Film Resistor
042633	**	18K7 1/4W 1% Metalized Film Resistor
042625	**	15K0 1/4W 1% Metalized Film Resistor
042615	**	12K1 1/4W 1% Metalized Film Resistor
042614	**	12K7 1/4W 1% Metalized Film Resistor
042606	**	10K5 1/4W 1% Metalized Film Resistor
042605	**	10K0 1/4W 1% Metalized Film Resistor
042564	**	4K75 1/4W 1% Metalized Film Resistor
042557	**	4K32 1/4W 1% Metalized Film Resistor
042535	**	2K74 1/4W 1% Metalized Film Resistor
042505	**	1K50 1/4W 1% Metalized Film Resistor
030245	**	10u 50V 20% Vert Electrolytic Capacitor
030005	**	1u 50V 20% Vert Electrolytic Capacitor
021032	**	470n 63V 10% MKT Polyester Capacitor
021031	**	390n 63V 10% MKT Polyester Capacitor
021028	**	220n 63V 10% MKT Polyester Capacitor
021024	**	100n 63V 10% MKT Polyester Capacitor
021023	**	82n 63V 10% MKT Polyester Capacitor
021018	**	33n 63V 10% MKT Polyester Capacitor
021000	**	1n 63V 10% MKT Polyester Capacitor
020250	**	10n 400V 10% MKT Polyester Capacitor
010595	**	100n 50V -20+80% Ceramic Cap. Multilayer
010271	**	22p 50V 10% CL2 Ceramic Capacitor
727632	*	**Fan Assembly**
140919	**	Molex 5264 Contact Housing
140870	**	Molex 5263 Female Contact
110359	**	24Vdc 80x25mm Fan
727631	*	**Amplifier Board (Pcb#313096) (1st Version)**
727643	*	**Amplifier Board (Pcb#313112) (2nd Version)**
778163	**	Cables Assembly
141200	***	Speakon Socket (NL4MP Neutrik)
340079	**	TO220 Mica Washer
340078	**	TO220 Insulated Bush
170960	**	TO220 Heatsink
160178	**	Copper Jumper
140930	**	9 Contacts Hor Male Connector
140917	**	2 Contacts Vert Male Connector
120582	**	M3 Black Nut
120521	**	3mm Black Spring Washer
120451	**	3.2x7x0.5 Black Washer
120005	**	M3x10tc Screw
110307	**	Relay 24V / 2 Switch 5A 250Vac
100067	**	LM337T TO220 1.2-37V 1.5A Adjustable Regulator
100066	**	LM317T TO220 1.2-37V 1.5A Adjustable Regulator
100061	**	TL072 Dual J-Fet Operational Amplifier
090920	**	MJE802 TO126 Npn Darl Transistor
090917	**	MJE350 TO126 Pnp Transistor
090916	**	MJE340 TO126 Npn Transistor
090201	**	2N5401 TO92 Pnp Transistor
090200	**	2N5550 TO92 Npn Transistor
090194	**	BC560C TO92 LN Pnp Transistor
090183	**	BC550C TO92 LN Npn Transistor
090153	**	BC327 TO92 Pnp Transistor
080901	**	VTL5C4 Analog Optoisolator
080342	**	30V 1W 5% Zener Diode
080282	**	13V 1W 5% Zener Diode
080245	**	7V5 1W 5% Zener Diode
080156	**	1N4002 1A 100V Rectifier Diode
080103	**	1N4148 100mA 75V Signal Diode
070106	**	470E 20% Horizontal Linear Trimmer
052062	**	150K 1/8w 5% Resistor
052060	**	100K 1/8w 5% Resistor
052058	**	68K 1/8w 5% Resistor
052056	**	47K 1/8w 5% Resistor
052054	**	33K 1/8w 5% Resistor
052052	**	22K 1/8w 5% Resistor
052051	**	18K 1/8w 5% Resistor
052050	**	15K 1/8w 5% Resistor
052049	**	12K 1/8w 5% Resistor
052048	**	10K 1/8w 5% Resistor
052047	**	8K2 1/8w 5% Resistor
052044	**	4K7 1/8w 5% Resistor
052043	**	3K9 1/8w 5% Resistor
052041	**	2K7 1/8w 5% Resistor
052040	**	2K2 1/8w 5% Resistor
052039	**	1K8 1/8w 5% Resistor
052038	**	1K5 1/8w 5% Resistor
052036	**	1K 1/8w 5% Resistor
052035	**	820E 1/8w 5% Resistor
052033	**	560E 1/8w 5% Resistor
052032	**	470E 1/8w 5% Resistor
052030	**	330E 1/8w 5% Resistor
052024	**	100E 1/8w 5% Resistor
050291	**	220E 1/4W 5% Resistor
050251	**	100E 1/4W 5% Resistor
050231	**	68E 1/4W 5% Resistor
050131	**	10E 1/4W 5% Resistor
042725	**	100K 1/4W 1% Metalized Film Resistor
042605	**	10K0 1/4W 1% Metalized Film Resistor
042534	**	2K80 1/4W 1% Metalized Film Resistor
042535	**	2K74 1/4W 1% Metalized Film Resistor
042405	**	221E 1/4W 1% Metalized Film Resistor
030884	**	10000U 80V 20% Snap-In Electrolytic Capacitor
030715	**	1000u 6v3 20% Vert Electrolytic Capacitor
030485	**	100u 25V 20% Vert Electrolytic Capacitor
030324	**	22u 50V 20% Vert Electrolytic Capacitor
030245	**	10u 50V 20% Vert Electrolytic Capacitor
030005	**	1u 50V 20% Vert Electrolytic Capacitor
021012	**	10n 63V 10% MKT Polyester Capacitor
020250	**	10n 400V 10% MKT Polyester Capacitor
010595	**	100n 50V -20+80% Ceramic Cap. Multilayer
010462	**	1n 50V 10% CL2 Ceramic Capacitor
010387	**	220p 50V 10% CL2 Ceramic Capacitor
010333	**	82p 50V 10% CL2 Ceramic Capacitor
010293	**	33p 50V 10% CL2 Ceramic Capacitor
347060	**	Nylon Cable Tie with 3mm Eye
340751	**	TO126 Mica Washer
340186	**	Adhesive Cable Fixing
340154	**	TO3P/TO218 Mica Washer
340078	**	TO220 Insulated Bush
210216	**	Adhesive Rubber Foam 20x5mm (Specify mt)
210215	**	Adhesive Rubber Foam 10x1.9mm (Specify mt)
177773	**	Cyclop Amp Right Support
177769	**	Amp Heatsink (1st Version)
177790	**	Amp Heatsink (2nd Version)
177768	**	Cyclop Amp Left Support
150298	**	100x2.5mm Nylon Cable Tie
120584	**	M4 Black Nut
120522	**	4mm Black Spring Washer
120521	**	3mm Black Spring Washer
120453	**	4.2x9x0.8 Black Washer
120451	**	3.2x7x0.5 Black Washer
120257	**	B2.9x9.5tc Black Screw
120063	**	M4x20tc Black Screw
120005	**	M3x10tc Screw
110119	**	Fuse Clip 10A max (EU) (US)
090920	**	MJE802 TO126 Npn Darl Transistor
090919	**	MJE15031 TO220 Pnp Transistor (2nd Version)
090918	**	MJE15030 TO220 Npn Transistor (2nd Version)
SKK090013	**	2SC5200 TO264 Npn Transistor
SKK090014	**	2SA1943 TO264 Pnp Transistor
080821	**	Ptc 100° PTH9L04BD222TS2F330 Murata
080607	**	KBPC2502 25A 200V Rectifier Diode Bridge
060408	**	180E 5W 5% Wire Resistor (1st Version)
060351	**	82E 5W 5% Wire Resistor (2nd Version)
060051	**	0E22 5W 5% Wire Resistor
667741	*	Panel (Cyclop)
667752	*	Panel (Lucky)
238090	*	**Transformer 230Vac (EU)**
238091	*	**Transformer 115Vac (US)**
180707	*	GND Symbol Adhesive Label
180808	*	"SOLTON BY LEM" Adhesive Label (Lucky)
150314	*	6.3mm Faston Insulator
150298	*	100x2.5mm Nylon Cable Tie
120841	*	6.3mm Female Brassed Faston
120587	*	M6 Black Nut
120584	*	M4 Black Nut
120582	*	M3 Black Nut
120541	*	16x9x1.6 Washer for Jack
120523	*	6mm Black Spring Washer
120522	*	4mm Black Spring Washer
120521	*	3mm Black Spring Washer
120472	*	6.4x24x2 Black Washer
120453	*	4.2x9x0.8 Black Washer
120256	*	B2.9x9.5tsp Black Screw
120131	*	M6x80te Black Screw
120063	*	M4x20tc Black Screw
120025	*	M3x10tsp Black Screw
110614	*	Mains Socket
110360	*	Fan Grid 80mm
110291	*	16A 250Vac Bipolar Power Switch
110038	*	T15A Fuse 6.3x32mm (US)
020491	*	100nF 10% 250Vac Polyester Capacitor

Note:

- All dimensions are in mm unless otherwise specified.
- The screw description is defined as follows:
  type of screw + diameter + X + length + type of head
  where type of screw is one of these:
  M = Metric thread
  B = Self-tapping screw for metal
  WL = Self-tapping screw for wood
  and type of head is one of these:
  tc = cylinder Phillips head
  ts = flared Phillips head
  tt = rounded Phillips head
  te = hexagonal nut head
  tsp = flat flared Phillips head
  tce = cylinder Allen hexagonal head
- The washer description is defined as follow:
  hole diameter + X + external diameter + X + thick
- 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.