

Service Manual

Pediatric Audiometer PA5



Part number 80691102
Valid from serial 686712

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Technical Specifications

Standards:

Sound Pressure Level of the loudspeaker: ISO 389-7
Sound Pressure Level of the headphone: ISO 389

Medical CE-Mark:

The CE-mark indicates that Interacoustics A/S meets the requirements of Annex II of the Medical Device Directive 93/42/EEC.
Approval of the quality system is made by TÜV - identification no. 0123.

Power:

Batteries 3 x 1.5 AA or
3 x 1.2V NiMH

Frequencies:

500, 1000, 2000, 3000, 4000 Hz

Stimuli:

Warble Tone, NB, WN

Intensities:

distance 50 cm 20 - 30 ---- 80 dB HL in 10 dB steps, Warble Tone and WN
-10 dB in NB
distance 16 cm + 10 dB

Warble Frequency:

5 Hz, $\pm 5\%$

Sound Source:

Built in loudspeaker or headphone TDH39

Light Stimulation:

3 LED's arranged in a triangle, flashspeed 5 Hz

Tone and light stimulation:

Silent touch switches with automatic battery switch

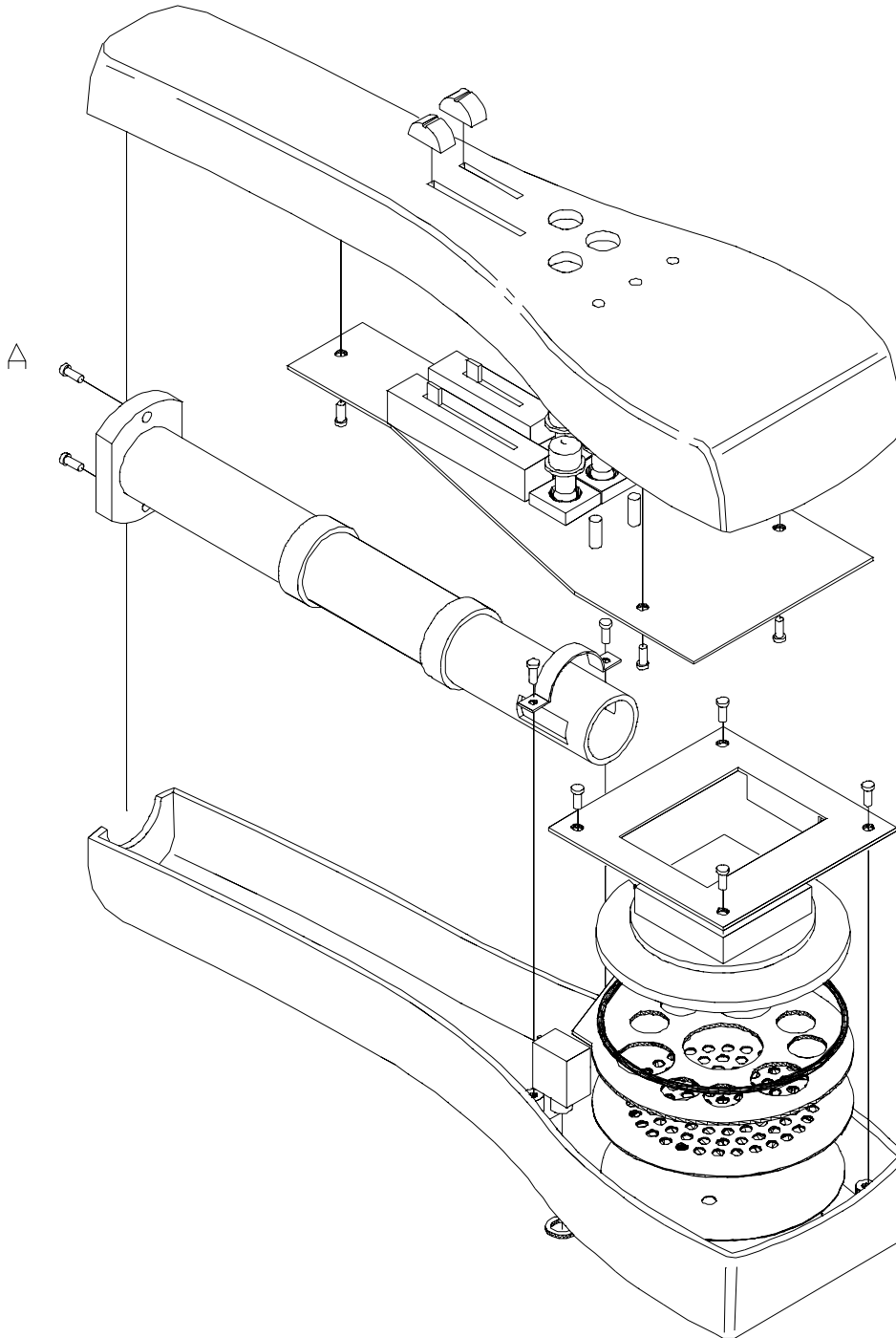
Dimensions:

L x W x H: approx. 25 x 7,5 x 5 cm
Weight: approx. 0,4 kg

Disassembly

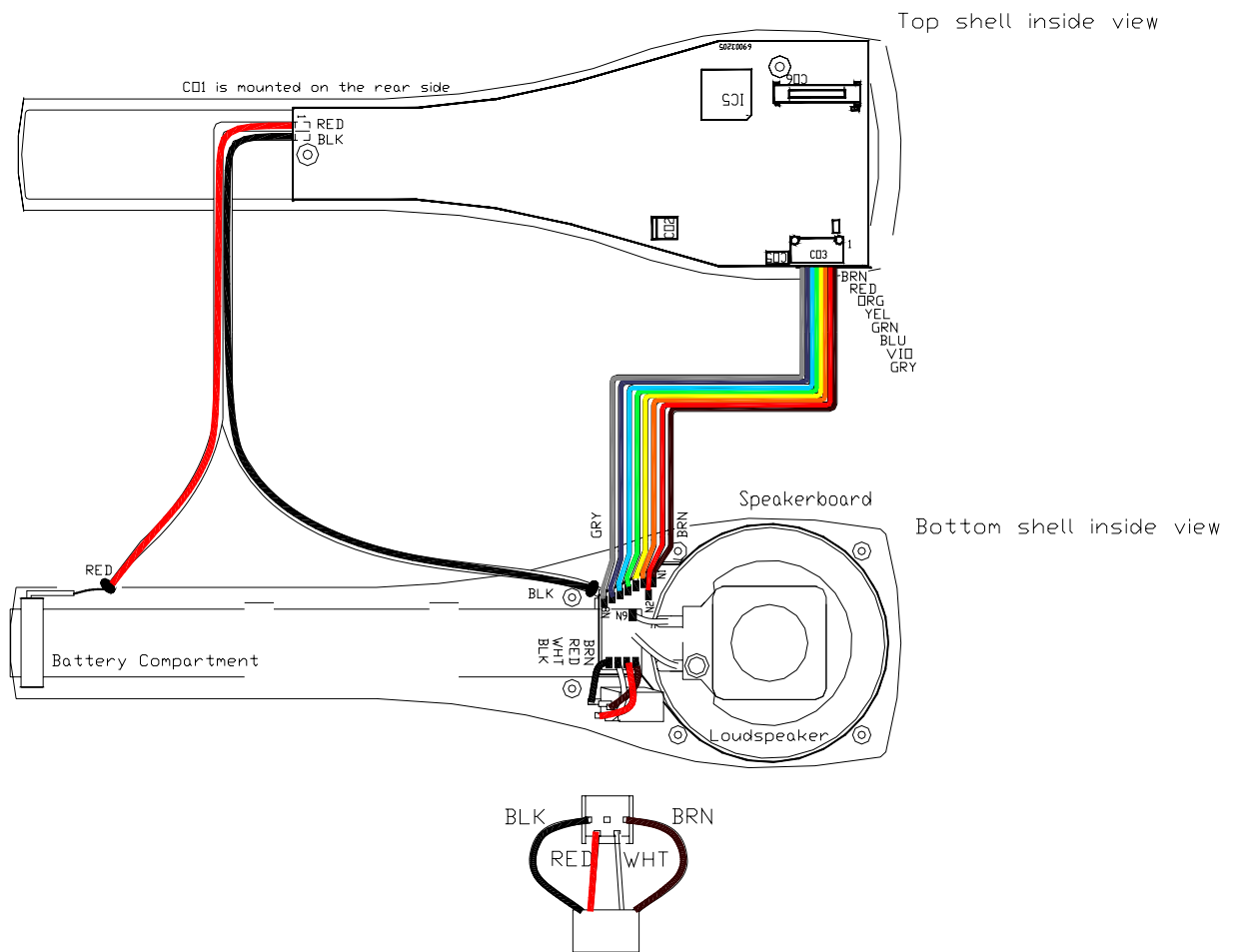
Open Cabinet - Mechanical Assembling

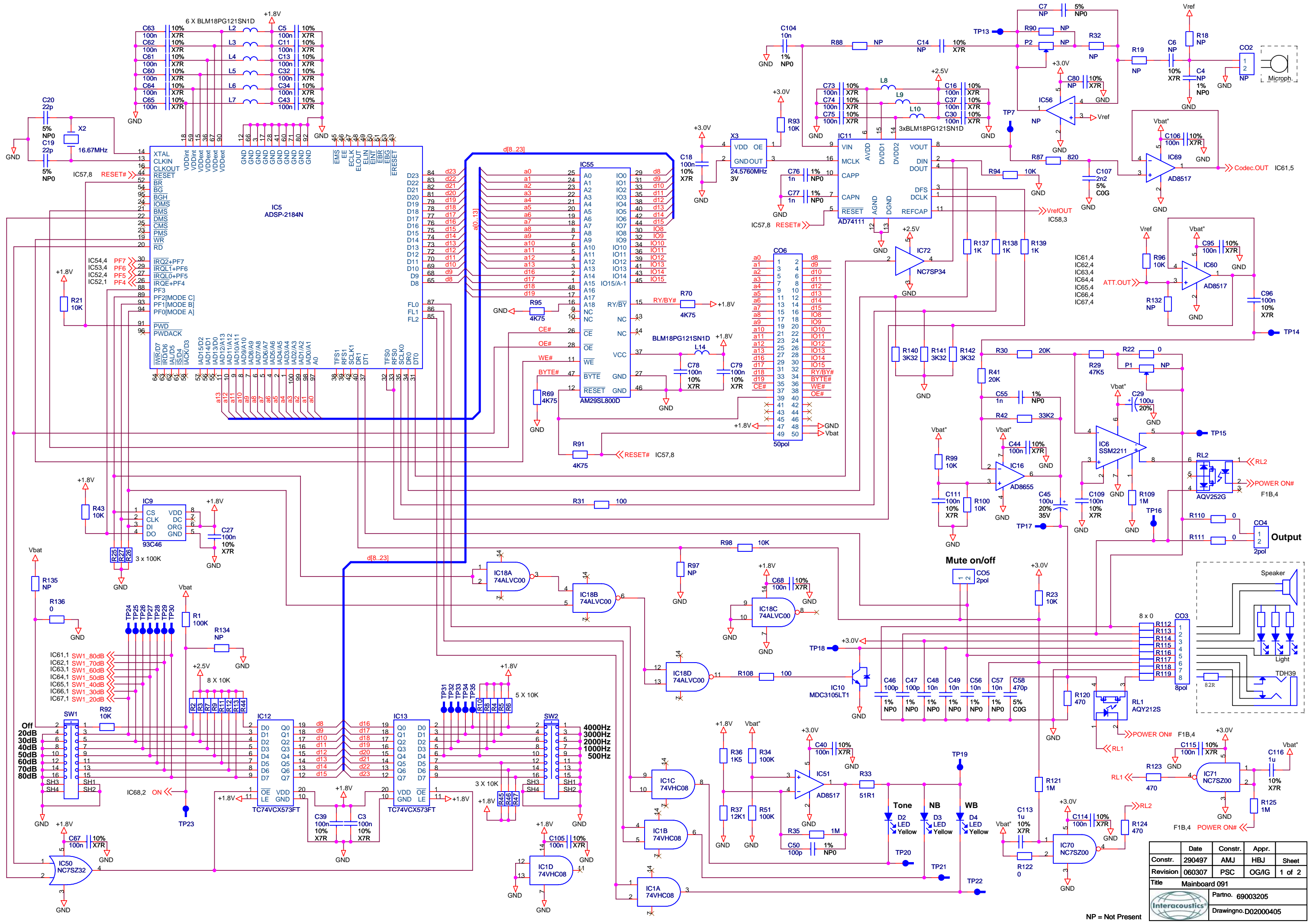
To open the instrument remove screw A from the top shell, tilt the top gently and beware of the hinges.



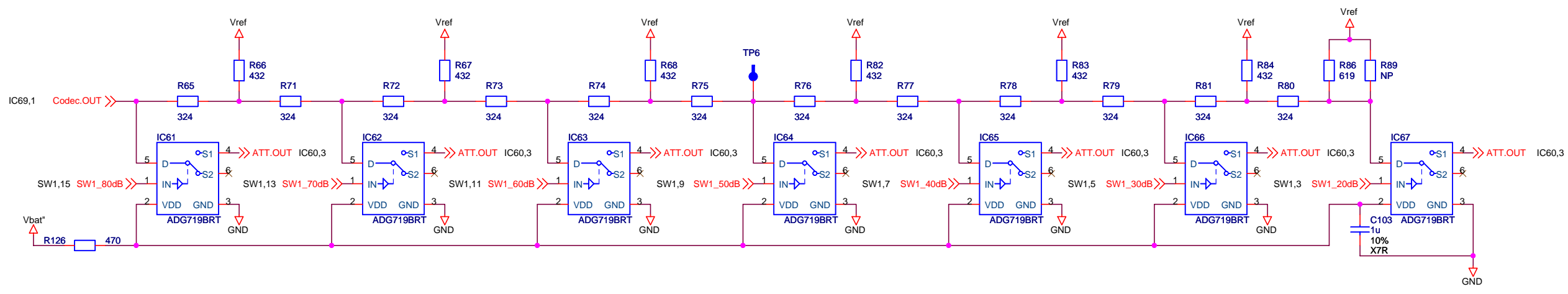
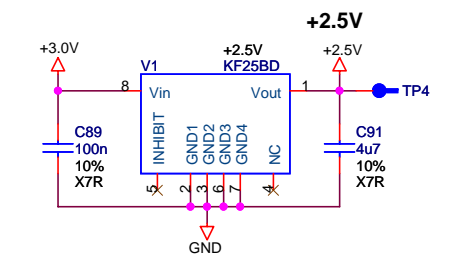
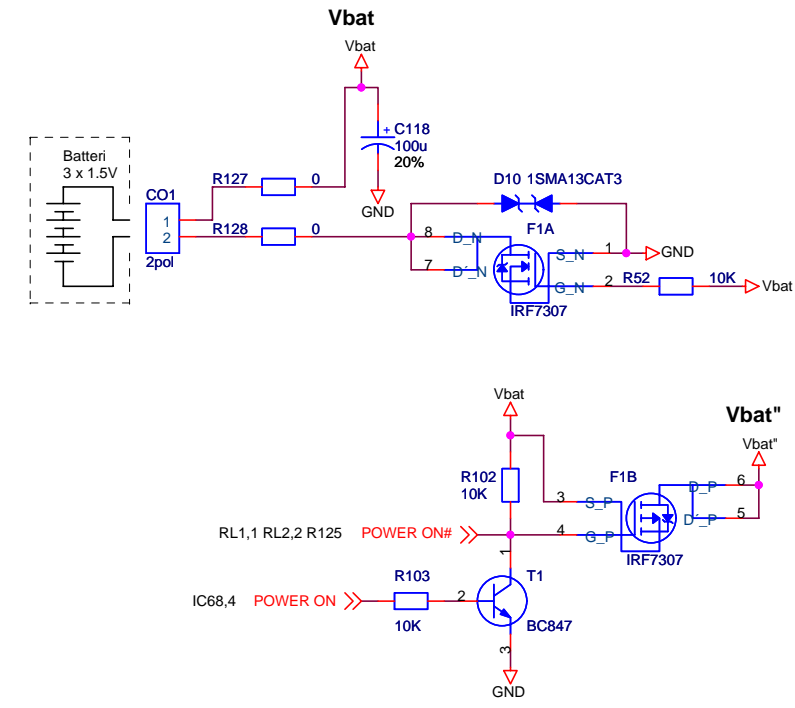
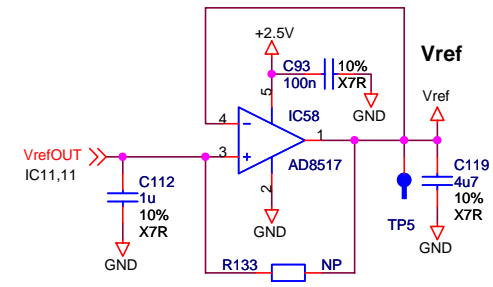
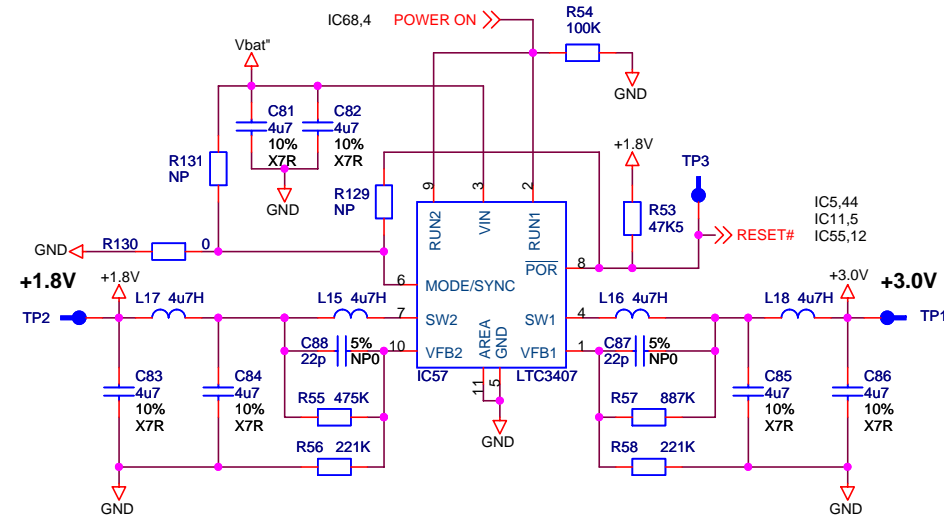
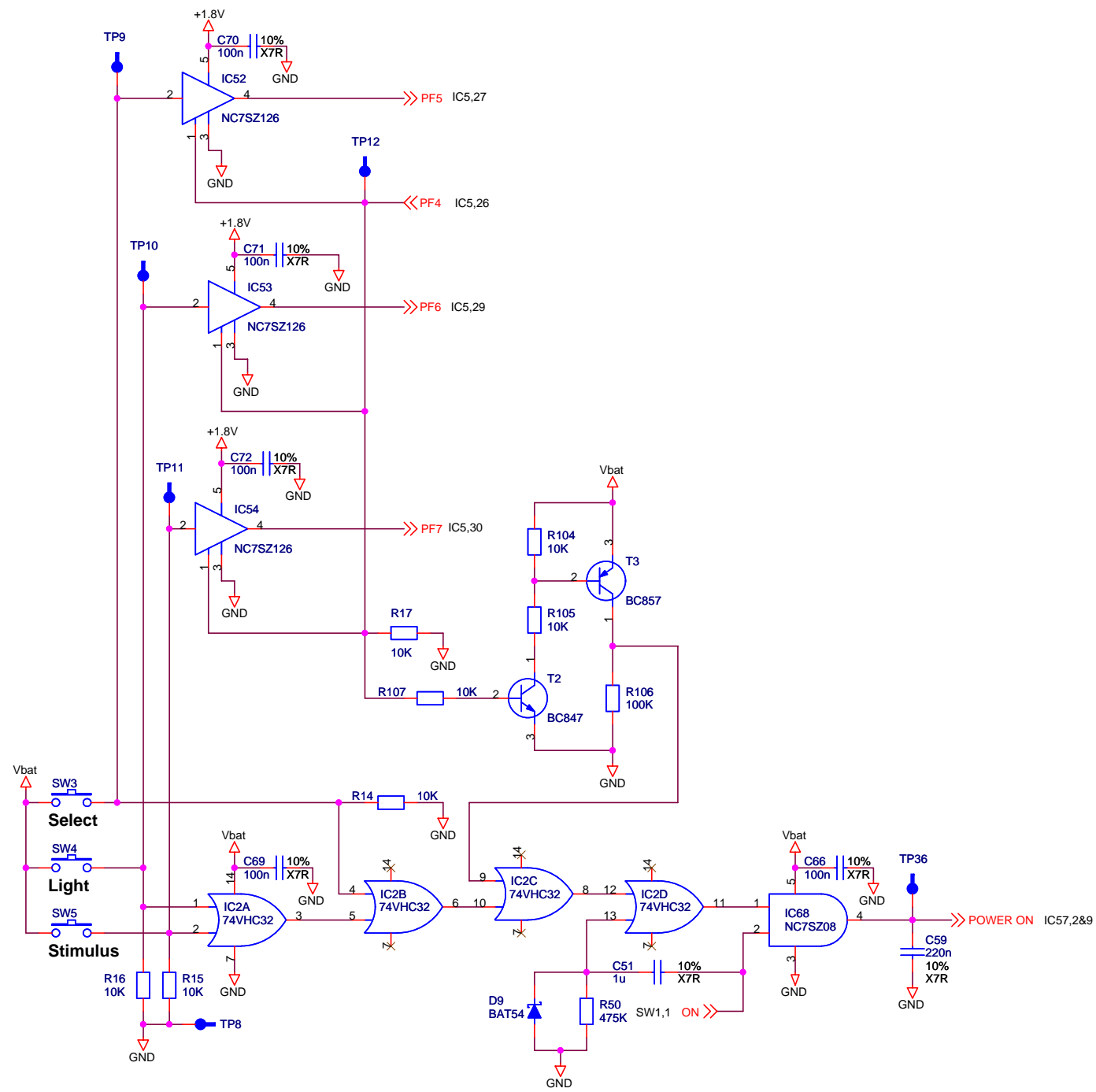
Electrical Assembling

Drawing I06005502





Constr.	Date	Constr.	Appr.	Sheet
290497		AMJ	HBJ	1 of 2
Revision	060307	PSC	OG/G	
Title	Mainboard 091			
		Partno. 69003205		
		Drawingno. D02000405		

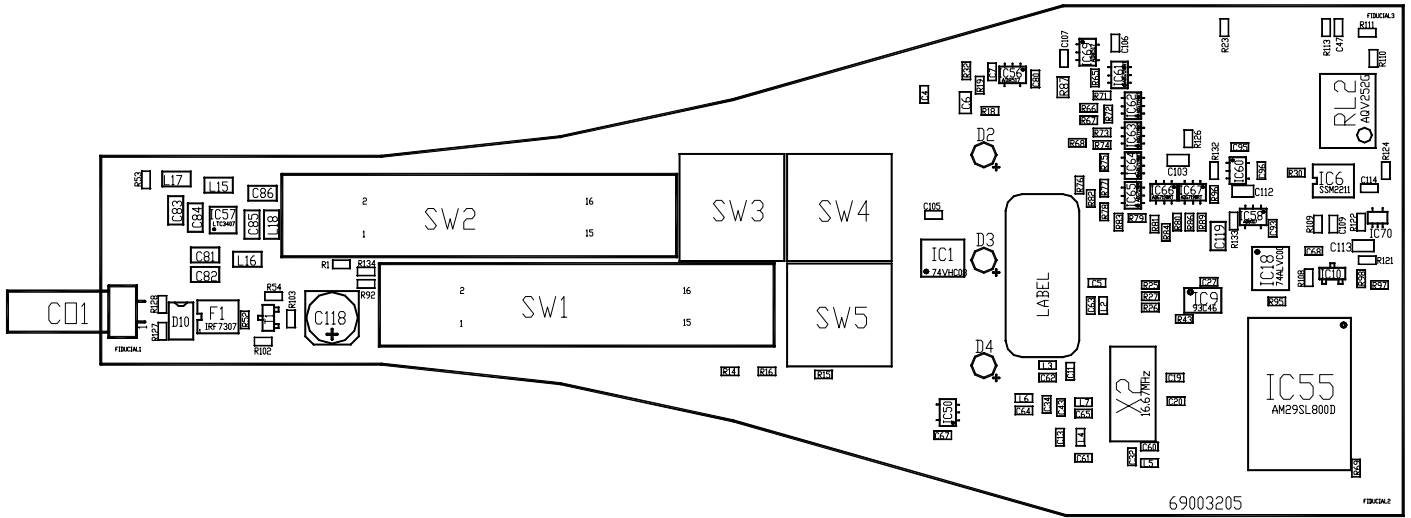



Date	Constr.	Appr.	Sheet
290497	AMJ	HB	2 of 2
060307	PSC	OG/IG	
Title Mainboard 091			
Partno. 69003205		Drawingno. D02000405	

NP = Not Present

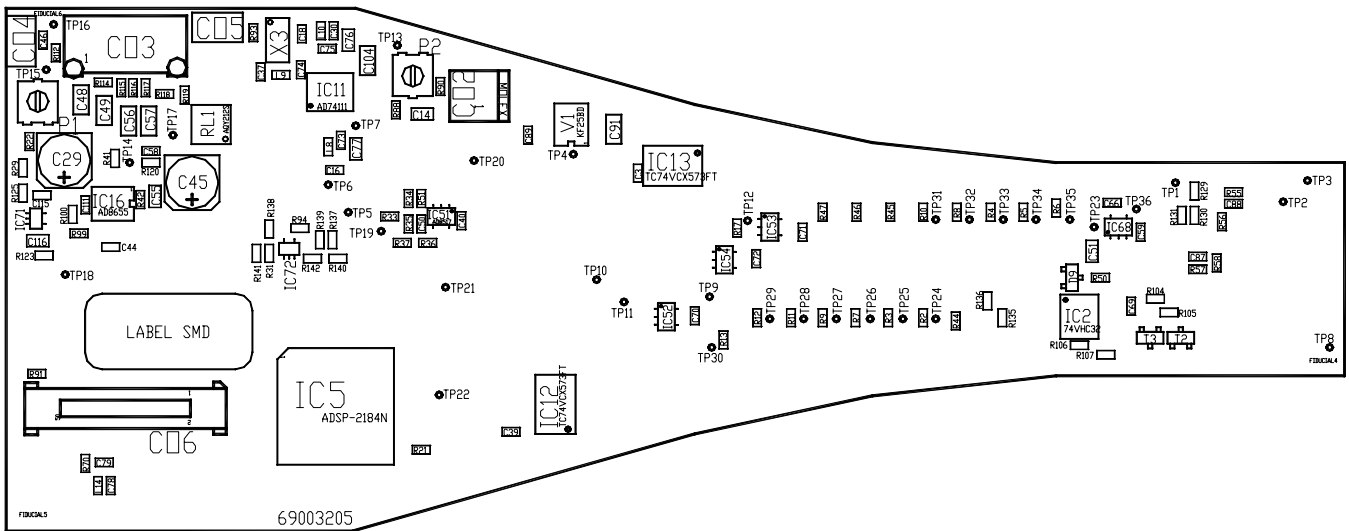
Component Index


Top side



	Date	Constr.	Appr.	
Constr.	280798	AMJ	HBJ	Sheet
Revision	130307	AMJ	OG/IG	1 of 1
Title Mainboard 091				
				Partno. 69003205
				Drawingno. D01000404

Bottom side



	Date	Constr.	Appr.	
Constr.	280798	AMJ	HBJ	Sheet
Revision	130307	AMJ	OG/IG	1 of 1
Title Mainboard 091				
				Partno. 69003205
				Drawingno. D01000504

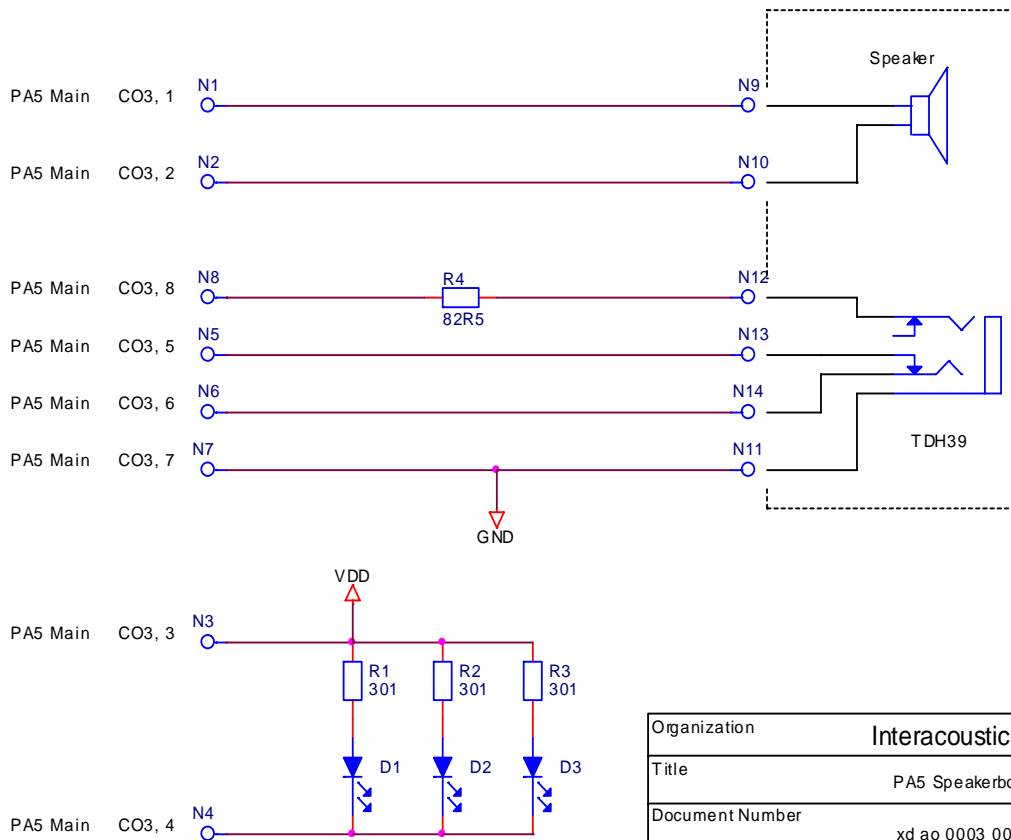
Component Part list

PCB 69003205 - PCA Assembled board PCA 510005506

Quantity	Part Reference	Part Number	Value	Tolerance
43	C3 C5 C11 C13 C16 C18 C27 C30 C32 C34 C37 C39 C40 C43 C44 C60 C61 C62 C63 C64 C65 C66 C67 C68 C69 C70 C71 C72 C73 C74 C75 C78 C79 C89 C93 C95 C96 C105 C106 C109 C111 C114 C115	61401102	100n	10%
4	C19 C20 C87 C88	61400501	22p	5%
3	C29 C45 C118	61003101	100u	20%
3	C46 C47 C50	61400201	100p	1%
5	C48 C49 C56 C57 C104	61401701	10n	1%
5	C51 C103 C112 C113 C116	61401601	1u	10%
3	C55 C76 C77	61401801	1n	1%
1	C58	61401501	470p	5%
1	C59	61405201	220n	10%
8	C81 C82 C83 C84 C85 C86 C91 C119	61410501	4u7	10%
1	C107	61446701	2n2	5%
1	CO1	75800401	2pol	
1	CO3	75801101	8pol	
2	CO4 CO5	75804501	2pol	
1	CO6	65005501	50pol	
3	D2 D3 D4	71700101	LED	
5	D6 D7 D8 J1 SP1	Dummy	LEDSYM	
1	D9	61707901	BAT54	
1	D10	61705101	1SMA13CAT3	
1	F1	64600701	IRF7307	
1	IC5	62047601	ADSP-2184N	
1	IC6	62001501	SSM2211	
1	IC9	62056401	93C46	
1	IC10	62002701	MDC3105LT1	
1	IC11	62047501	AD74111	
2	IC12 IC13	62047901	TC74VCX573FT	
1	IC16	62056701	AD8655	
1	IC18	62027101	74ALVC00	
1	IC1	62036501	74VHC08	
1	IC2	62036601	74VHC32	
1	IC50	62004701	NC7SZ32	
4	IC51 IC58 IC60 IC69	62047701	AD8517	
3	IC52 IC53 IC54	62043201	NC7SZ126	
1	IC55	62047801	AM29SL800D	
1	IC57	64307201	LTC3407	
7	IC61 IC62 IC63 IC64 IC65 IC66 IC67	62039501	ADG719BRT	
1	IC68	62004801	NC7SZ08	
2	IC70 IC71	62037801	NC7SZ00	
1	IC72	62037701	NC7SP34	
10	L2 L3 L4 L5 L6 L7 L8 L9 L10 L14	63704601	BLM18PG121SN1D	
4	L15 L16 L17 L18	63704101	4u7H	20%
8	R1 R25 R26 R27 R34 R51 R54 R106	60401701	100K	1%

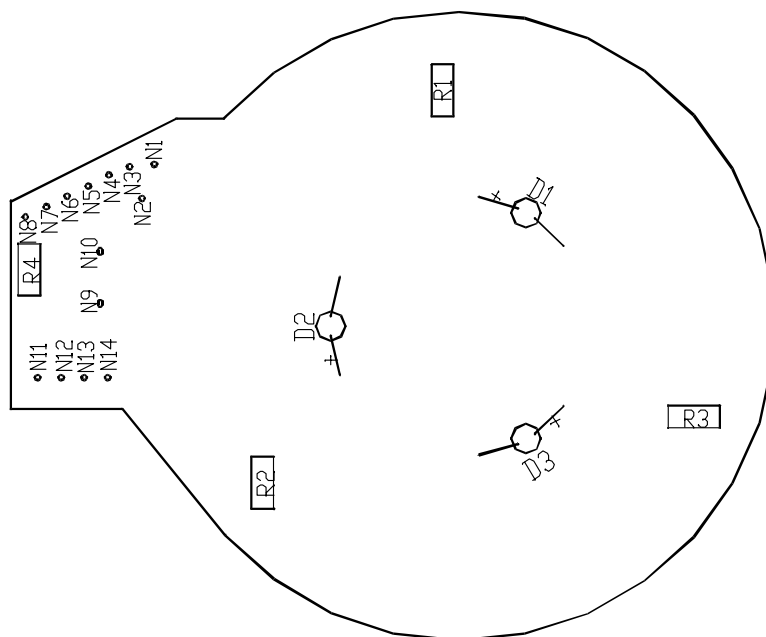
Quantity	Part Reference	Part Number	Value	Tolerance
36	R2 R3 R4 R5 R6 R7 R8 R9 R10 R11 R12 R13 R14 R15 R16 R17 R21 R23 R43 R44 R45 R46 R47 R52 R92 R93 R94 R96 R98 R99 R100 R102 R103 R104 R105 R107	60400201	10K	1%
16	R22 R110 R111 R112 R113 R114 R115 R116 R117 R118 R119 R122 R127 R128 R130 R136	60400102	0	1%
2	R29 R53	60402501	47K5	1%
2	R30 R41	60402001	20K	1%
2	R31 R108	60401201	100	1%
1	R33	60409801	51R1	1%
4	R35 R109 R121 R125	60400501	1M	1%
1	R36	60401901	1K5	1%
1	R37	60416901	12K1	1%
1	R42	60420401	33K2	1%
2	R50 R55	60408701	475K	1%
2	R56 R58	60408901	221K	1%
1	R57	60415801	887K	1%
12	R65 R71 R72 R73 R74 R75 R76 R77 R78 R79 R80 R81	60424101	324	1%
6	R66 R67 R68 R82 R83 R84	60424201	432	1%
4	R69 R70 R91 R95	60401101	4K75	1%
1	R86	60417101	619	1%
1	R87	60302801	820	5%
4	R120 R123 R124 R126	60406101	470	1%
3	R137 R138 R139	60403601	1K	1%
3	R140 R141 R142	60421701	3K32	1%
1	RL1	64501001	AQY212S	
1	RL2	64500901	AQV252G	
1	SW1	56004801	SW\8POL_OMSK	
1	SW2	56004701	SW\5POL_OMSK	
3	SW3- SW4- SW5-	36302901	xmkn0008	
3	SW3- SW4- SW5-	33502401	carbon Switch	
6	SW3- SW4- SW5-	35303601	screw	
2	T1 T2	64600402	BC847	
1	T3	64600101	BC857	
1	V1	64307601	KF25BD	
1	X2	63201501	16.67MHz	
1	X3	63204901	24.5760MHz	

Speaker board Diagram



Organization	Interacoustics A/S	
Title	PA5 Speakerboard	
Document Number	xd ao 0003 00004	
Sheet 1 of 1	Rev MBA	Page
Date	Wednesday, October 09, 2002	

Component Index and Values



PA5 SPEAKERBOARD

Calibration Procedure

General about calibration

Values used by calibration of the output levels for the applied transducers are generally found in international, national and/or in some cases internal product standards.

It is the responsibility of the person who makes the calibration, that the correct set of values is used here. The calibration charts for the test setup in question is used to ensure that the correct correction values are taken into account.

By the initial factory calibration, it is required that the standardized output levels are reached as close as possible and they should in general be within a reading of ± 1 dB for all type of signals.

By follow-up control of calibration, the allowed deviation of the output levels for the common signal types according to EN 60645 and ANSI S3.6-2004 are:

	EN 60645	ANSI S3.6-2004
Air conduction:	± 3 dB at 125 Hz to 4000 Hz	± 3 dB at 125 Hz to 5000 Hz
	± 5 dB at higher frequencies	± 5 dB at 6000 Hz and higher

Service, adjustment and repair

This instrument can be serviced, adjusted and repaired without losing the validity of the CE-marking provided the measuring equipment used is fulfilling the demands below, the adjustment procedures are followed and the personnel is having the necessary qualifications approved by Interacoustics.

Equipment for adjustment

In order to assure correct calibration of the audiometric equipment, it is important that the necessary measuring equipment is used and that it is reliable and stable.

Minimum requirements for measuring equipment:

- Measuring amplifier with input for condenser microphone or a sound level meter, fulfilling the demands of IEC 651 Type 1.
- Acoustical coupler, 6cc fulfilling the demands of IEC 303 and IEC 126.
- 1" pressure field condenser microphone for the above mentioned couplers, fulfilling the demands of IEC 1094-1.
- Furthermore it is recommended to have an acoustic calibrator for the control of the complete measuring chain.
- General purpose digital multimeter.
- General purpose oscilloscope

Hardware Calibration.

In order to make it possible for the loudspeaker to give maximum output, the gain in the output amplifier has to be adjusted.

1. Adjust P1 to maximum fully clock wise.

Check the current consumption.

In stand by mode: approx. 50uA
In on mode: approx. 160mA

Check low battery circuit.

$V_{batt} < 3.5 \text{ V} \pm 0,2\text{V}$ the LED turn off, but the instrument will still work by lower levels.
 $V_{batt} < 2.9 \text{ V} \pm 0,2\text{V}$ the instrument will shut down.

Check turn-off time interval.

The PA5 is shutting down in approx. 2 min when not used.

Continue the procedure with the software calibration.

Standards for Production and Calibration

Standards used:

For Sound Pressure Level of the loudspeaker: ISO 389-7.

For Sound Pressure Level of the headphone: ISO 389.

Values for Loudspeaker:

Frequency (Hz)	ISO 389-7 Tone (dB re. 20 μ Pa)	ISO 389-7 NB (dB re. 20 μ Pa)	White Noise in SPL
500	4,0	3,5	0 dB
1000	2,0	0,5	
2000	-1,5	-1,5	
3000	-6,0	-4,0	
4000	-6,5	-5,0	

Values for Headphone TDH39:

Frequency (Hz)	ISO 389 (dB re. 20 μ Pa)
500	11,5
1000	7,0
2000	9,0
3000	10,5
4000	9,5

Calibration Mode.

In order to switch to calibration mode, the following conditions must be fulfilled:

1. Set the attenuator to 20 dB.
2. Set the frequency to 4000 Hz
3. Keep <Light> and <Select> down for about 6 sec.

The Tone LED will now start flashing.

EEPROM pre-calibration.

In order to store default factory pre-calibration, the following conditions must be fulfilled:

1. Switch into calibration mode.
2. Keep <Light>, <Tone> and <Select> down for about 6 sec.

All LED's will then light up for a moment.

Software Calibration.

Loudspeaker Calibration.

Place the PA5 loudspeaker in a distance of 16 cm like in Fig. 1. , when using a Pressure field microphone, if using a free field microphone place the PA5 like in fig 2. In this distance the output level of the PA5 will be 10 dB more, than in a distance of 50 cm.

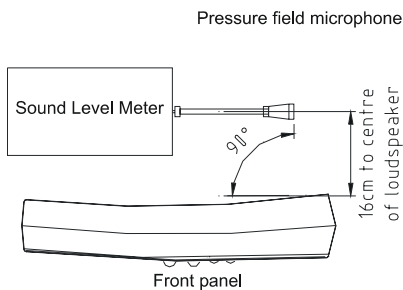


Fig.1

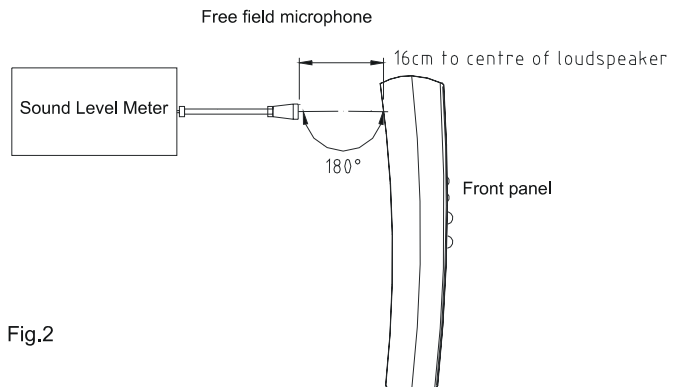


Fig.2

1. Set the attenuator to 80 dB.
2. Select the stimulus and frequency to be calibrated (Tone, Narrow Band noise or White noise).
3. Activating stepwise the <Stimulus> button will increase the level; the <Light> button will decrease the level.
The change in level is 1 dB per step.
4. Go to 2 until all the frequencies and stimuli have been calibrated.

Table of calibration values for the settings described above.

Frequency (Hz)	ISO 389-7 Tone (dB re. 20 μ Pa)	ISO 389-7 NB (dB re. 20 μ Pa)	*	White Noise in SPL
500	94,0	93,5	83,5	90 dB
1000	92,0	90,5	80,5	
2000	88,5	88,5	78,5	
3000	84,0	86,0	76,0	
4000	83,5	85,0	75,0	

* -10dB in NB

Headphones Calibration

Connect the headphones to the jack socket close to the loudspeaker. Place the headphones in a 6cc coupler with the 1" calibration microphone connected.

NOTICE! Only Tone can be calibrated.

1. Set the attenuator to 80 dB.
2. Select the frequency to be calibrated.
3. Activating stepwise the <Stimulus> button will increase the level; the <Light> button will decrease the level.
The change in level is 1,0dB per step.
4. Go to 2 until all the frequencies have been calibrated.

Table of calibration values for the settings described above.

Frequency (Hz)	ISO 389 (dB re. 20 μ Pa)
500	91,5
1000	87,0
2000	89,0
3000	90,5
4000	89,5

Final assembly

Mount the battery cover in the bottom of the PA5

Appendix U Update News

Following modifications are made for instruments from serial 686712:

New Main board PCB 69003205 PCA 51005506

Compatible to previous versions

Print layout redesigned

**Following modifications are made for instruments from serial 317827:
(No service manual update)**

Ferrites are replaced with 0R resistors due to intermittent measurement errors after introducing lead-free version of DSP.

**Following modifications are made for instruments from serial 186450
(No service manual update)**

Ferrite beads on wires for battery are modified to part number 73705301

Following modifications are made for instruments from serial 141619:

To avoid harmful effects if batteries are wrongly polarized, a Schottky diode SB560 is mounted in the lead direction.

The mounting is shown on sketch, see page 4

Mainboard 10 0006 00006

The added Schottky diode causes a voltage change; therefore R36 is modified to 1K82

Following modifications are made for instruments from serial 10:

New Mainboard pu 10 0006 00006

Compatible to previous versions

To improve print layout, components have been rotated 90 degrees.

Following modifications are made for instruments from serial 07 no. 97:

New Mainboard pu 10 0006 00005

Compatible to previous versions

To improve power-up procedure at low battery voltage, a new gate circuit is introduced.