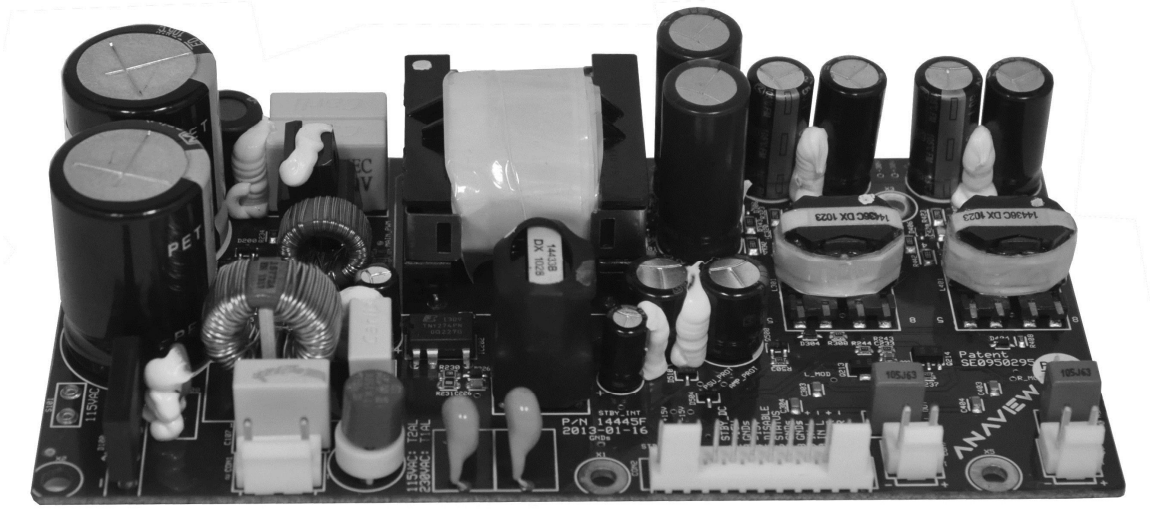
A MEMBER OF THE ETAL GROUP

PRODUCT DATA SHEET
AUDIO LINE COMBINATION
ALC0180-2300



SCOPE

These technical specifications describes the functionalities and features of the Anaview Audio Line Combination ALC0180-2300, an integrated audio solution combining high-end amplifier and power supply technology, capable of delivering 2x90W into 4Ω @1%THD, 2x50W into 8Ω @1%THD or 1x180W into 8Ω bridged. Instantaneous peak power 270W BTL 6Ω. Typical applications are audio receivers, powered speakers and residential audio systems.

Disclaimer

The data sheet contains specifications that may be subject to change without prior notice. Responsibility for verifying the performance, safety, reliability and compliance with legal standards of end products using this subassembly falls to the manufacturer of said end product.

ANAVIEW products are not authorized for use as critical components in life support devices or life support systems without the express written approval of the president of ETAL Group AB. As used herein:
1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform when properly used in accordance with instructions for use provided in the labelling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

GENERAL

Environmental conditions

Humidity	5 – 85% RH non condensing
Operating ambient temperature	0°C to +55°C
Normal operation ambient temperature	0°C to +45°C
Storage Temperature	-40°C to +85°C

Regulations and compliances

EMC	Emission	Conducted Emission FCC 15V, Sec. 107 Class ÒBÓ Radiated Emission FCC 15V, Sec. 109 Class ÒBÓ Conducted Emission EN 55022 (2010) Class ÒBÓ Telecom Conducted Emission EN 55022 (2010) Class ÒBÓ Radiated Emission EN 55022 (2010) Class ÒBÓ Power Line Harmonics EN 61000-3-2 (2006) + A1 (2009) + A2 (2009) Power Line Flicker EN 61000-3-3 (2008)	0.15 MHz ï 30 MHz 30 MHz ï 1 GHz 0.15 MHz ï 30 MHz 0.15 MHz ï 30 MHz 30 MHz ï 1 GHz
	Immunity	ESD Immunity IEC 61000-4-2 (2008) Radio Frequency Immunity IEC 61000-4-3 (2006) + A1 (2007) + A2 (2010) Electrical Fast Transient Immunity IEC 61000-4-4 (2004) + A1 (2010) Surge Immunity IEC 61000-4-5 (2005) RF Common Mode Immunity IEC 61000-4-6 (2008) Power Frequency Magnetic Field IEC 61000-4-8 (2009) Voltage Dips and Short Interruptions IEC 61000-4-11 (2004)	Criterion B Criterion A Criterion B Criterion B Criterion A Criterion A Criterion B and C
Safety	LVD	IEC 60065:2001 + A1:2005 + A2:2010 EN 60065:2002 + A1:2006 + A11:2008 + A2:2010 + A12:2011 UL 60065 7th Ed. Revised 2012-09-21 CAN/CSA C22.2 No. 60065-03, 1st Ed., 2006-04 + A1:2006 + A2:2012	
Power Loss	EuP Energy Star	Designed to enable system compliance with: 2005/32/EC ï 1275/2008: Standby/Off Mode Loss, Annex II Point 1 Energy Star ï Consumer Audio Products, Phase II	

Miscellaneous product specifications

Cooling	Convection cooling
Mounting of the unit	See Figure 1 Board outline, dimensions
IEC Protection Class	Class II - Double insulation
Efficiency	84% at 230Vac, 1KHz 2x50W into 8Ω
Idle power consumption	10W max at 230VAC, with Maximum load for Energy Star compliance
Standby mode power consumption	700mW typ. when remote shut down by DISABLE input.
Manufacturing according to workmanship standard	IPC-A-610, Revision D, February 2005

ELECTRICAL SPECIFICATIONS

Input specifications:

Mains input voltage (*1)	Nominal rating: ~ 115 / 230 VAC, 2.6A/2.2A Absolute min/max: ~ 90-132 / 180-264 VAC	
Mains input freq.	45-63 Hz	
DISABLE	Discrete input signal. Active high. Disable voltage: +8VDC (typ.) >3.5VDC (min) <15VDC (abs max) Max sourcing current needed : 200uA To Enable Amp: Leave pin unterminated or put to GND <1.0VDC (max)	
IN_L+/_L-	0 - 1.43Vrms max (*2)Balanced audio input, left channel	
IN_R+/_R-	0 - 1.43Vrms max (*2)Balanced audio input, right channel	
Input impedance (*3)	**<u>Single ended input signal</u>** IN_L+ (CON2:9) Signal IN_L- (CON2:10) Ground Input impedance = 10k5 IN_R+ (CON2:11) Signal IN_R- (CON2:12) Ground Input impedance = 3k7 Input signal ground must also be connected to GND (CON2:7,8) to avoid large potential difference between ALC0180-2300 and source, since ALC0180-2300 is floating (not connected to protective earth).	**<u>Balanced input signal</u>** IN_L+ (CON2:9) Signal+ IN_L- (CON2:10) Signal- GND (CON2:7,8) Signal Ground Input impedance L+ = 10k5 Input impedance L- = 2k3 IN_R+ (CON2:11) Signal+ IN_R- (CON2:12) Signal- GND (CON2:7,8) Signal Ground Input impedance R+ = 2k3 Input impedance R- = 10k5

(*1) Mains AC input voltage range selectable with jumper.
Minimum startup voltage is 90VAC / 180VAC

(*2) At 230VAC mains input voltage. Maximum signal input voltage is given by output power rating factor, as described in the *Output Specifications*.

(*3) Signal source output impedance must be symmetrical for IN+ and IN- on both channels or there will be a difference in gain between the channels and common mode rejection will be compromised. (see application notes for more information)

Output specifications:

Audio outputs (*1)(*2)	Max output voltage	Typ. cont. output power	Typ. output power FTC cond. (*3)	Max output power	Instantaneous peak output power	THD
OUT_L+/_L- OUT_R+/_R-	**SE mode**					
	0- 19Vrms	2x11.25W 4Ω	2x50W 4Ω	2x90W 4Ω 2x50W 8Ω	2x105W 4Ω 2x60W 8Ω	1%
	BTL mode					
	0- 38Vrms	22.5W 8Ω	100W 8Ω	180W 8Ω	220W 8Ω	1%

(*1) Mains input voltage 115/230VAC. Output power of RMS load current. Due to the non-regulated nature of the internal PSU, the output power depends on the mains input voltage. Hence the power rating follows the equation: % Power change = (% voltage change)^2

(*2) Both channels driven

(*3) 1 hour pre heating with 1/8 of specified load and subsequently 5 min. with specified load at 120/230Vac, 1kHz input, ambient temp. 25°C still air. Open frame. Board mounted vertically.

AUX outputs (*1)	Nom. voltage	Voltage fluctuation		I Max cont.	Comments
		Min	Max		
AUX output supply voltage V1 : (STBY_DC)	+7.4VDC	+6.9VDC	+14VDC	20mA	
AUX output supply voltage V2: (VA+)	+14VDC	+7.5VDC	+16.5VDC	300mA (*2)	Max capacitive load 330uF
AUX output supply voltage V3: (VA-)	-14VDC	-7.5VDC	-16.5VDC	300mA (*2)	Max capacitive load 330uF

(*1) The ALC0180-2300 AUX outputs are unregulated and vary with load and AC input voltage. The AUX output supply voltage V1 (STBY_DC) is 12VDC while the unit is running and approximately 7.4VDC when in standby mode.

(*2) Maximum continuous output current on VA+ and VA- is in sum 600mA. This allows for any load combination between the two outputs in total giving 600mA, i.e. at most 600mA on one and 0mA at the other.
This is not applicable for product revision G and earlier, where the individual load current may not exceed 300mA.

If these outputs are shorted a fuse (F200) blows and has to be replaced, see page 15.

Maximum load for Energy Star compliance

Compliance	Comment	STBY_DC	VA+/-	
Energy star	Maximum load (VA+ and VA- combined) to ensure <10W total idle consumption. Measured at 115/230VAC	20	250	mA

Protections and functions:

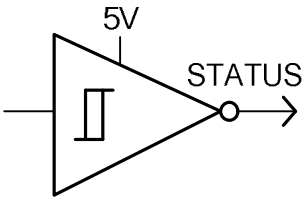
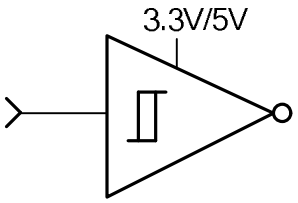
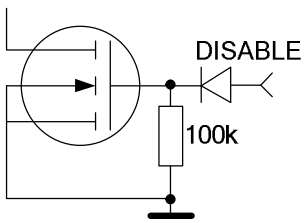
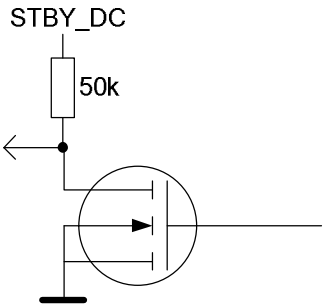
Mains input fuse	T1AL (time lag) at 230VAC (upper AC voltage range) T2AL (time lag) at 115VAC (lower AC voltage range)
Over temperature protection	Power shut down by over temperature. Threshold temperature : 100(min) - 105(typ) - 110(max)°C Sensor connected to drain tab of high side power FET The shutdown time is short, only parts of seconds to start with, but increases as the module heats up. This is because when the temperature difference between the MOSFETs and the PCB is large, the MOSFETs will cool down very fast after shutdown, but as the PCB gets warmer it will take longer. This protection mode will be heard as very short interrupts to the sound.
Over voltage protection	Amplifier shut down during over voltage on output voltage rails. This can happen if the mains voltage exceeds the maximum rated level or during railpumping (due to DC on inputs or when generating subsonic frequencies). Immediately when the voltage has decreased the amplifier will start again. This protection mode will be heard as very short interrupts to the sound.
Over current protection	Treshold current : 9A (0.5Ω load, 1kHz burst). There are two modes of over current protection. 1. Constant current mode. The output will behave as during voltage clipping i.e. the output voltage will be cut off on the top to maintain an allowed current. 2. If the over current mode persists during a longer period (several periods of music) it is assumed that there is an error and the amplifier will shut down for a while and then restart.
Protection output status	Status output: CON2 pin 6 "STATUS" Goes high during: 1. Over temperature shutdown 2. Over voltage shutdown Note that over current protection will not generate a STATUS flag.
Remote shut down to standby mode	Shut down input: CON2 pin 5 "DISABLE" Shut down by: Apply +8VDC (+3.5<V<+15VDC) on DISABLE input Normal operation : Leave pin floating or put to GND (V<+1.0VDC)
Anti rail pumping	Right audio input channel is internally inverted before amplification in order to consume power symmetrically from both power rails. This prevents rail pumping, since the bass of recordings is usually equally mixed into both channels. The output of the right channel is correspondingly internally inverted, such that this feature is transparent to the user. This is seen in fig. 2 When using one channel only it is still possible to generate full span of power at 20Hz into 4Ω at nominal mains voltage. The lower frequency that is being generated the more the rails will be pumped (DC being the extreme where even a few hundred millivolts can cause over voltage shutdown).

Audio specifications:

Unless otherwise specified, the outputs are loaded with 4Ω.

Offset voltage (open inputs)	5mV typical (40mV max)
Switching frequency (idle)	460kHz typical (435-475kHz min-max)
Switching residual	700mVpk typical
Recommended load	4Ω (SE mode) 8Ω (BTL mode)
Gain (f =1kHz)	22.45dB typical
Idle noise	20uV typical (A-weighted 20Hz < f < 20kHz)
Upper BW limit (-3dB)	>60kHz
Lower BW limit (-3dB)	0Hz (requires 100% identical use of both channels)
Output impedance (100Hz)	3mΩ typical
Residual noise vs freq	See figure 3
Crosstalk vs freq	See figure 4
THD vs PWR	See figures 6-9
THD vs freq	See figure 10
Freq response	See figure 11

Proposed interfaces:

Input/output	**ALC circuit**	**Proposed interface**
STATUS (output) Goes high during over voltage conditions due to rail pumping or during amplifier over temp conditions.		
DISABLE (input) Pull up to STBY_DC to set the module in standby mode (power supply and amplifiers disabled). Leave floating or pull down to ground to enable.		

CONNECTIONS

Mains connector	CON1 : 2 pin 0.312" (7.92mm) locking header (JST B2P3-VH (LF) (SN)) Suggested mating connector : JST VHR-3N or similar Crimp terminal: SVH-41T-P1.1 Pinning Pin1 : AC_N (Neutral) Pin2 : AC_L (Live)

Signal connector	CON2 : 12pin 0.100" (2.54mm) header (Molex 2227-2121) Suggested mating connector : Molex KK series 2695-12 or similar Crimp terminal: Molex KK series 2759 or 4809	
	Pinning:	Description:
	Pin 1 : STBY_DC	AUX output voltage V1. (Standby voltage)
	Pin 2 : VA+	AUX output voltage V2
	Pin 3 : GND	Secondary side ground.
	Pin 4 : VA-	AUX output voltage V3
	Pin 5 : DISABLE	Standby mode activation input.
	Pin 6 : STATUS	Status output signal.
	Pin 7 : GND	Secondary side ground.
	Pin 8 : GND	Secondary side ground.
	Pin 9 : IN_L+	Left audio channel positive input
	Pin 10 : IN_L-	Left audio channel negative input
	Pin 11 : IN_R+	Right audio channel positive input
	Pin 12 : IN_R-	Right audio channel negative input

Loudspeaker connectors	CON6 : 2pin 0.156" (3.96mm) header (JST B2P-VH (LF) (SN)) CON7 : 2pin 0.156" (3.96mm) header (JST B2P-VH (LF) (SN)) Suggested mating connector : JST VHR-2N or similar Crimp terminal: SVH-41T-P1.1	
	Pinning:	Description:
	CON6	
	Pin1 : OUT_R+	Right audio channel positive output
	Pin2 : OUT_R-	Right audio channel negative output
	CON7	
	Pin1 : OUT_L+	Left audio channel positive output
	Pin2 : OUT_L-	Left audio channel negative output

MECHANICAL OUTLINE

Size (l x w x h)	150x75x38mm, see Figure 1. Board outline, dimensions below. Max component height/lead length on PCB bottom side: 4.0 mm
Weight	220g
Mounting hole dia.	X1, X3, X5 (plated): 3.5mm X2, X4 (non-plated): 4.0mm **NOTE:** The non-plated holes X2 and X4 are located on the primary side of the PSU circuitry and must be <u>insulated</u> when utilized. This typically means that nylon spacers/screws must be used when mounting the unit in an end application. This is due to the design compromise of getting minimum product volume on the benefit of insufficient safety creepage/ clearance distance for these two holes.
IP figures, encapsulation IP XY (X=Solids, Y=Liquids)	Open frame
Coloring, design and branding	ALC0180-2300, black PCB

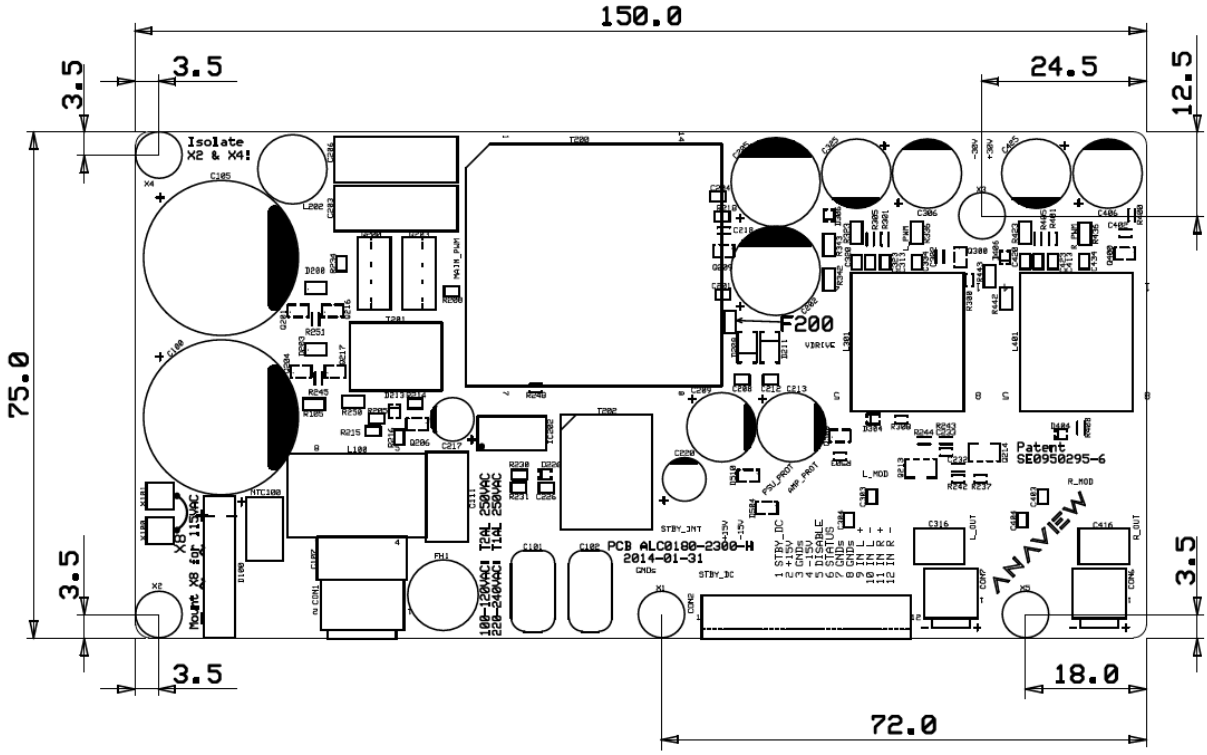


Figure 1. Board outline, dimensions and mounting holes.

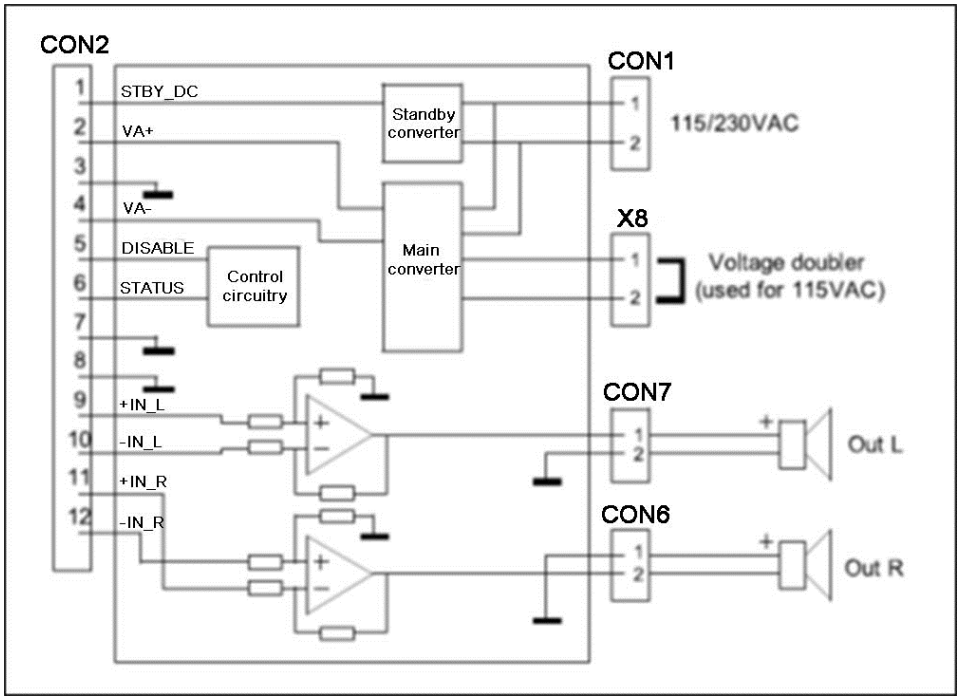


Figure 2. Connection diagram.

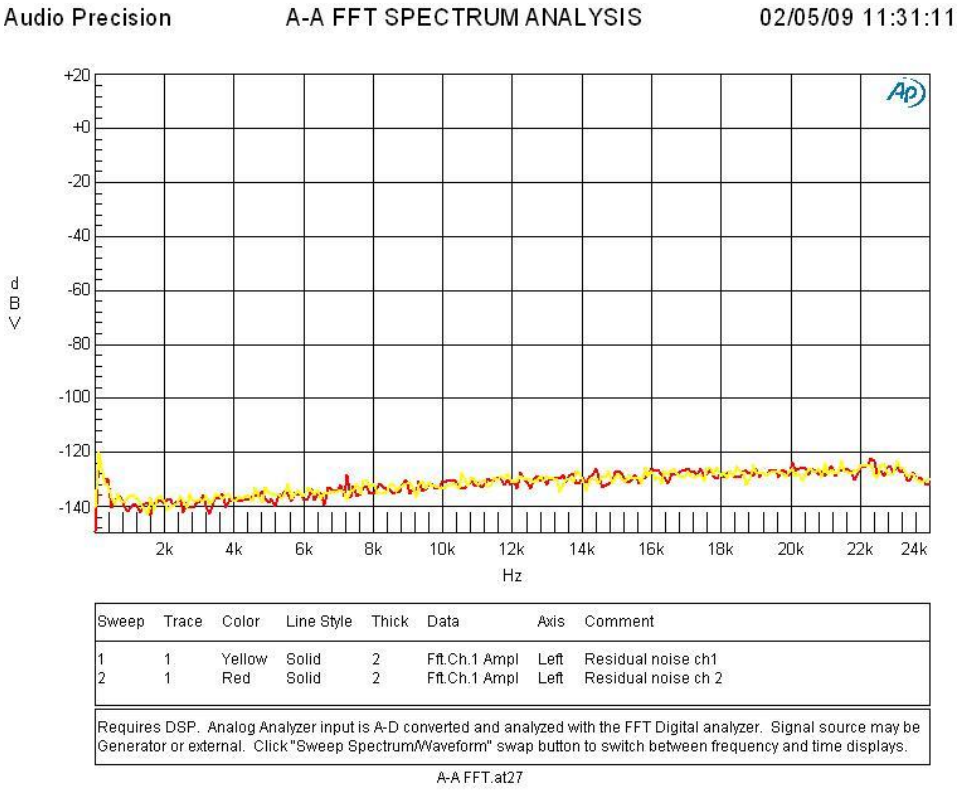


Figure 3. Residual Noise

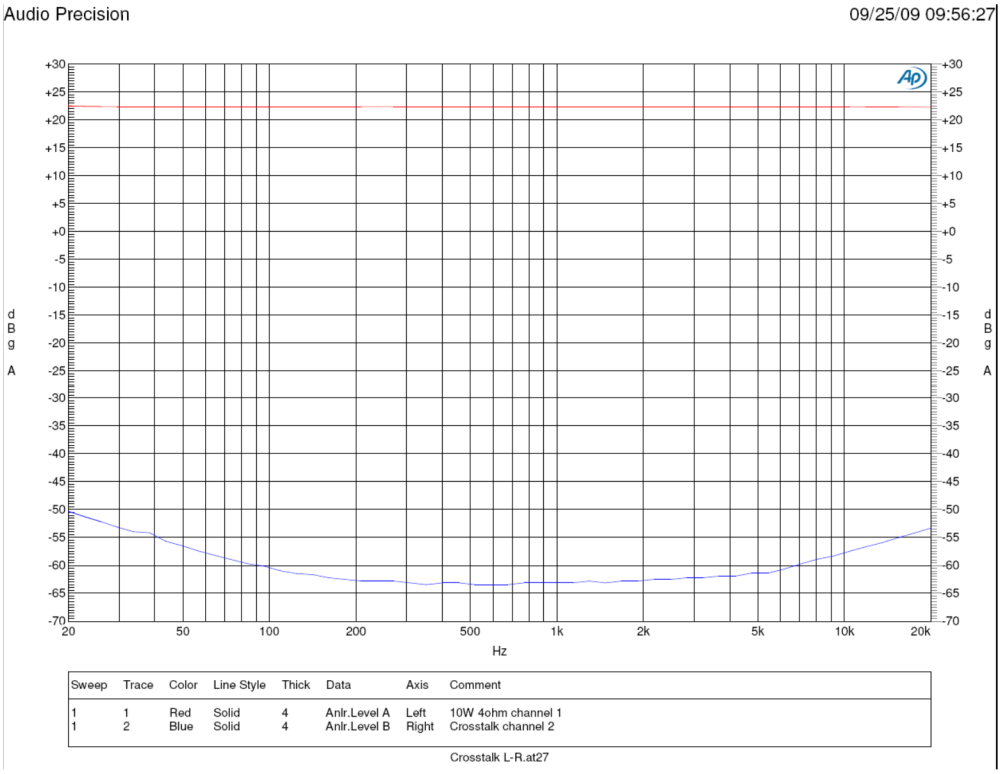


Figure 4. Crosstalk 10W 4Ω 230VAC

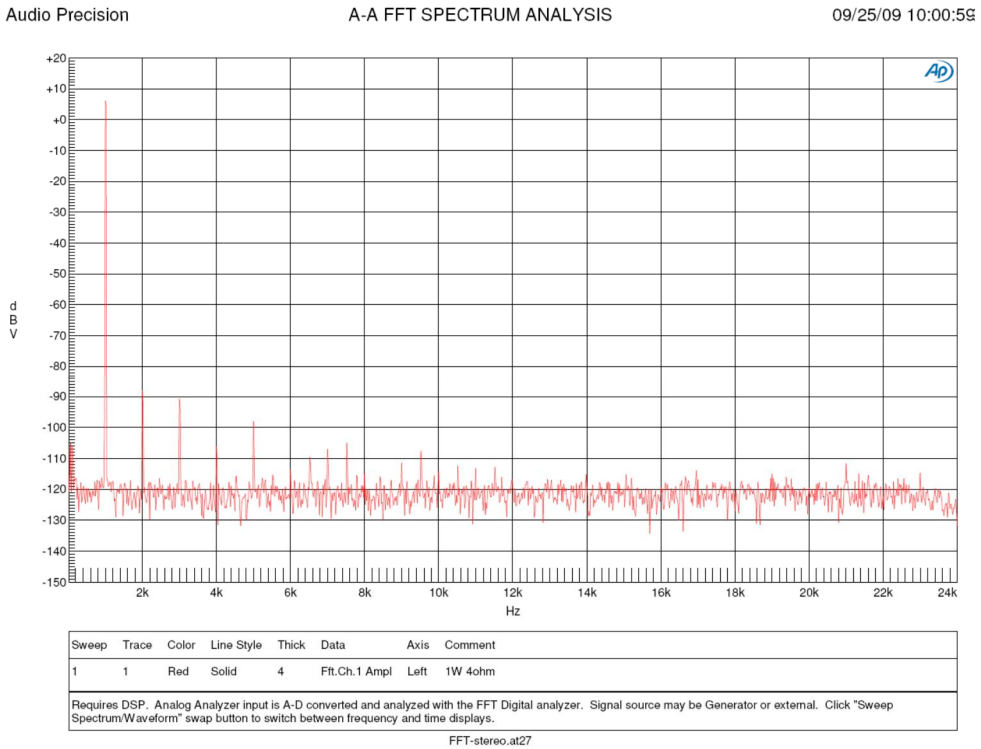


Figure 5. FFT 1W 4Ω 230VAC

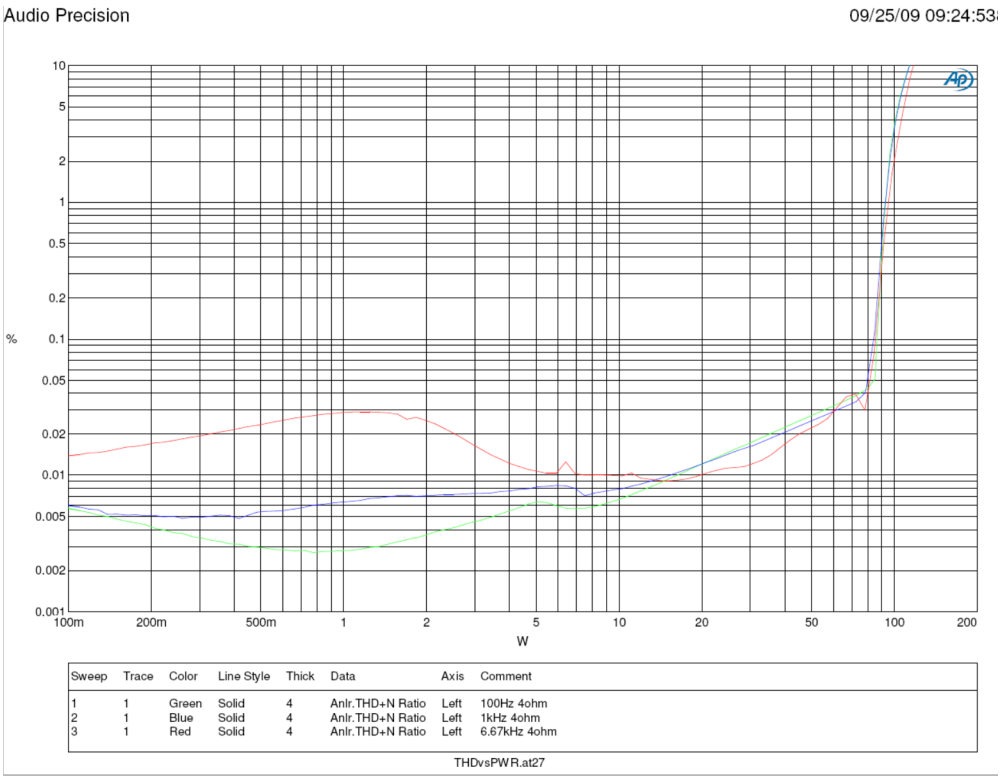


Figure 6. THD vs power, 4Ω 230VAC, one channel driven

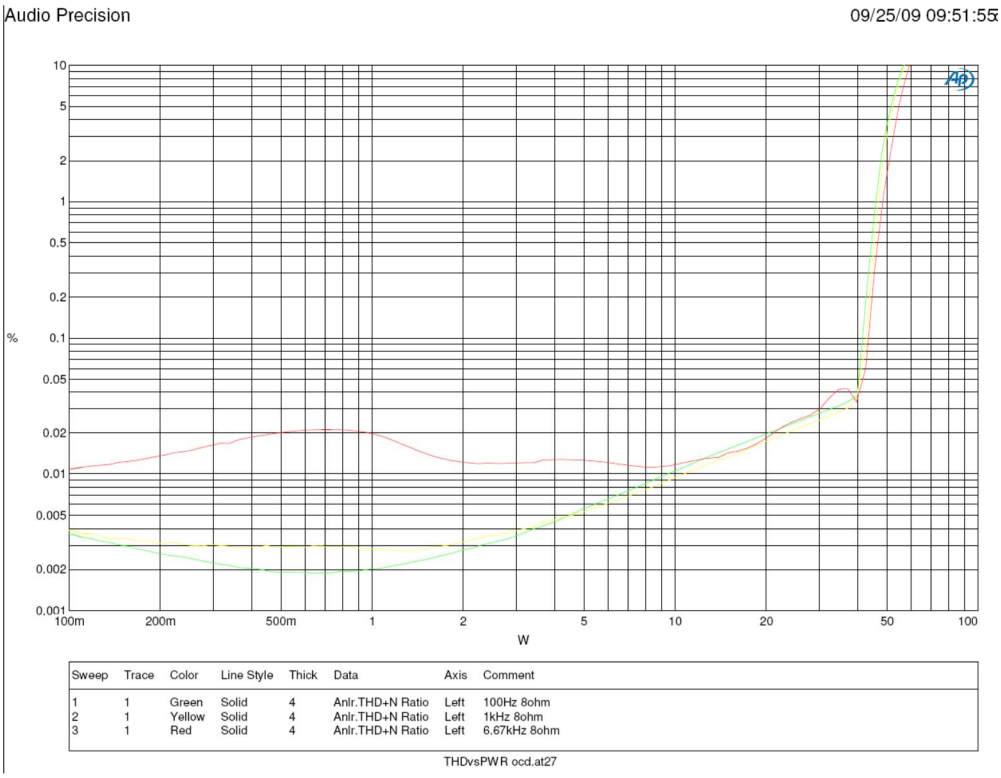


Figure 7. THD vs power, 8Ω 230VAC, one channel driven

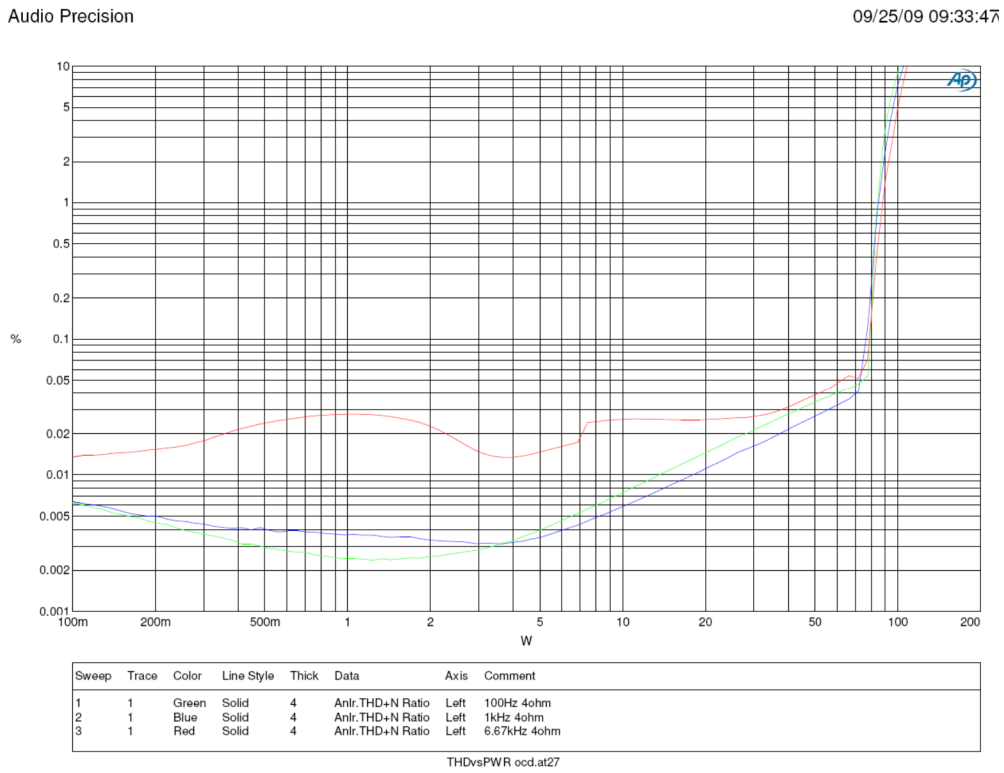


Figure 8. THD vs power, 4Ω 230VAC, both channels driven

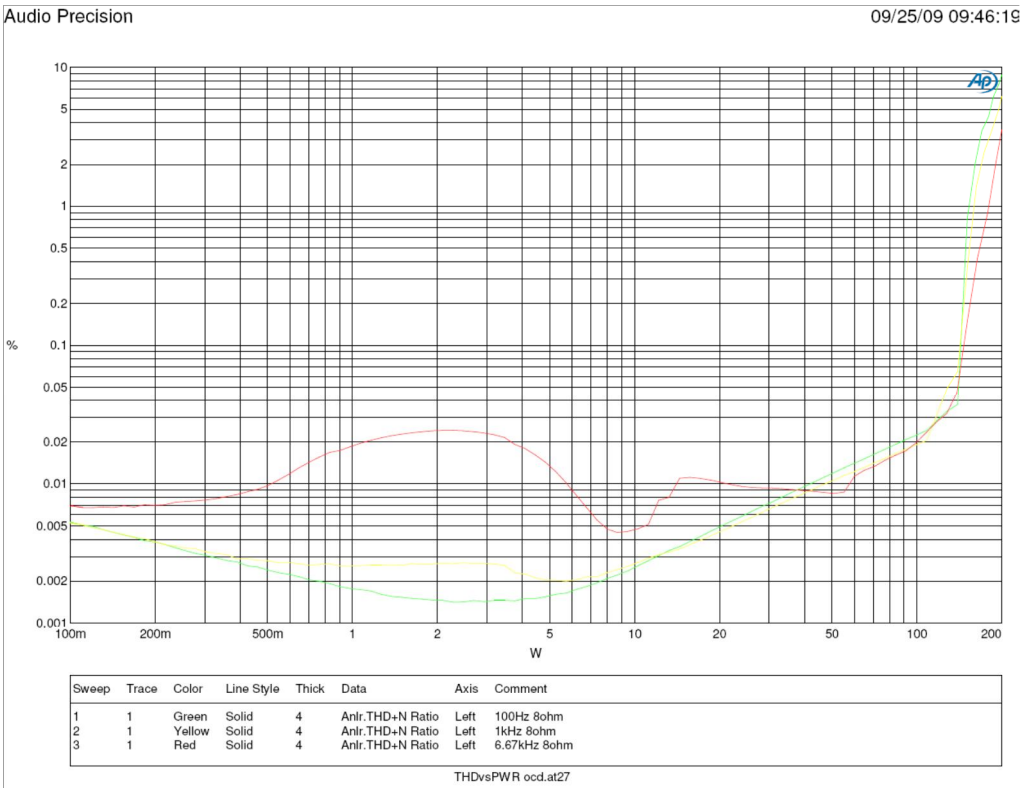


Figure 9. THD vs power, BTL mode 8Ω 230VAC

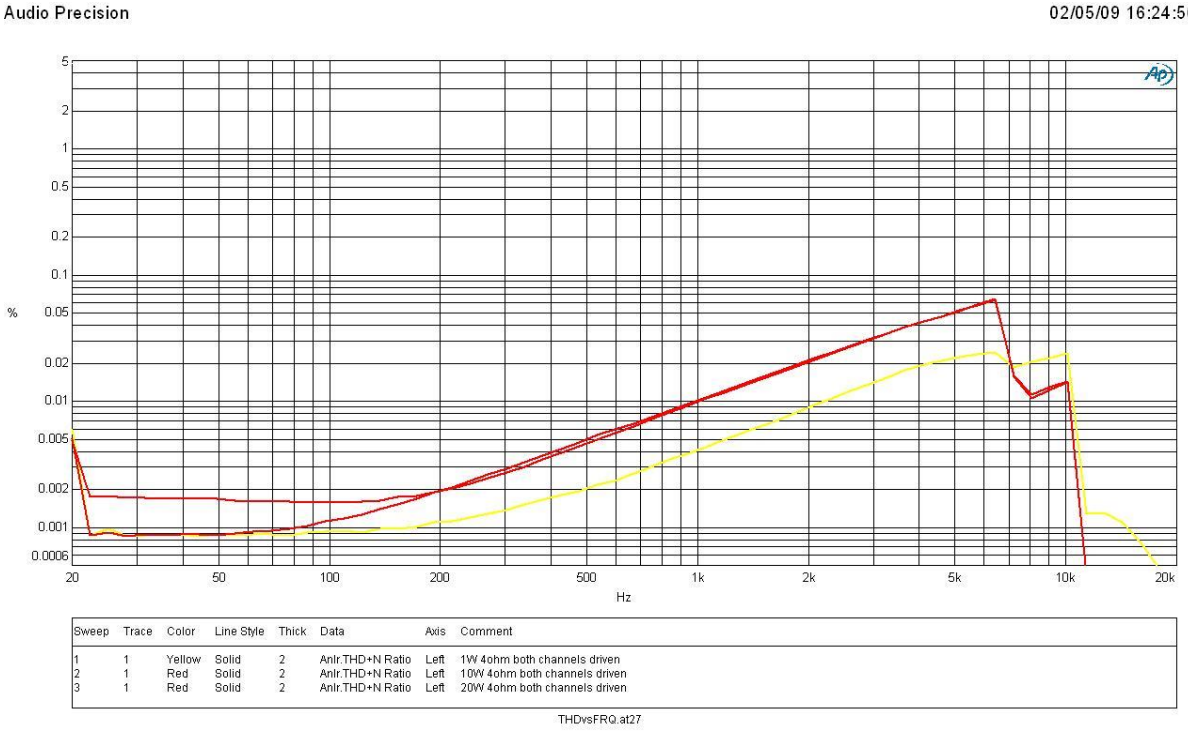


Figure 10. THD vs frequency, 4Ω 230VAC, both channels driven

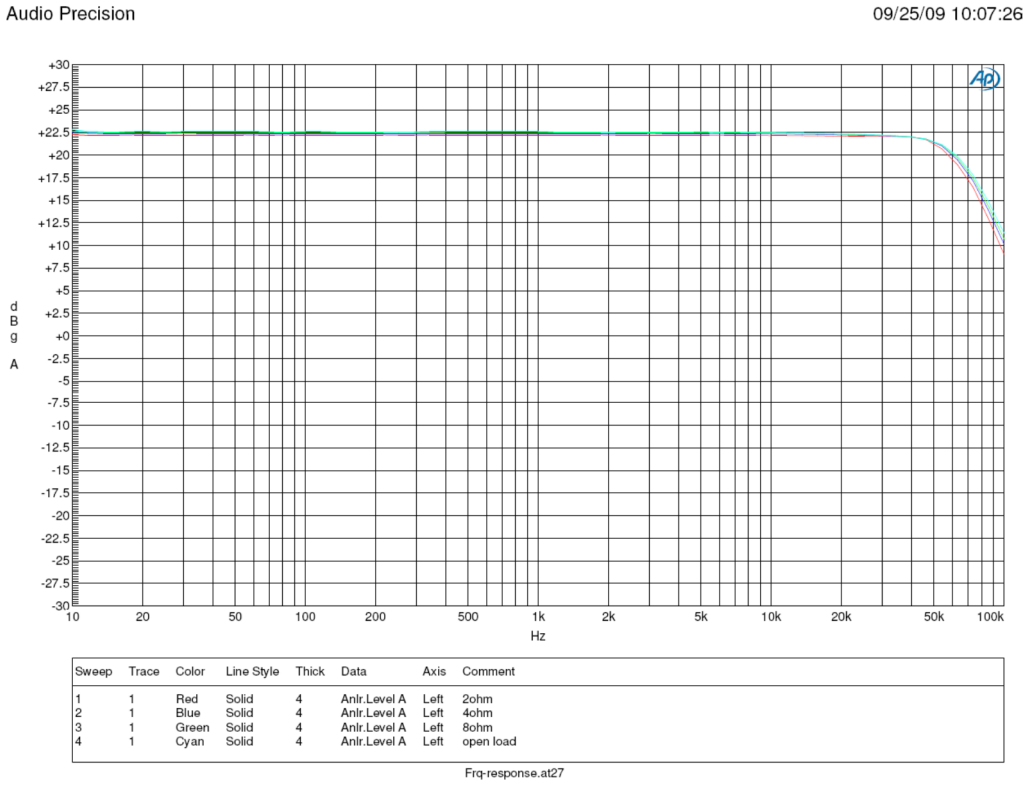
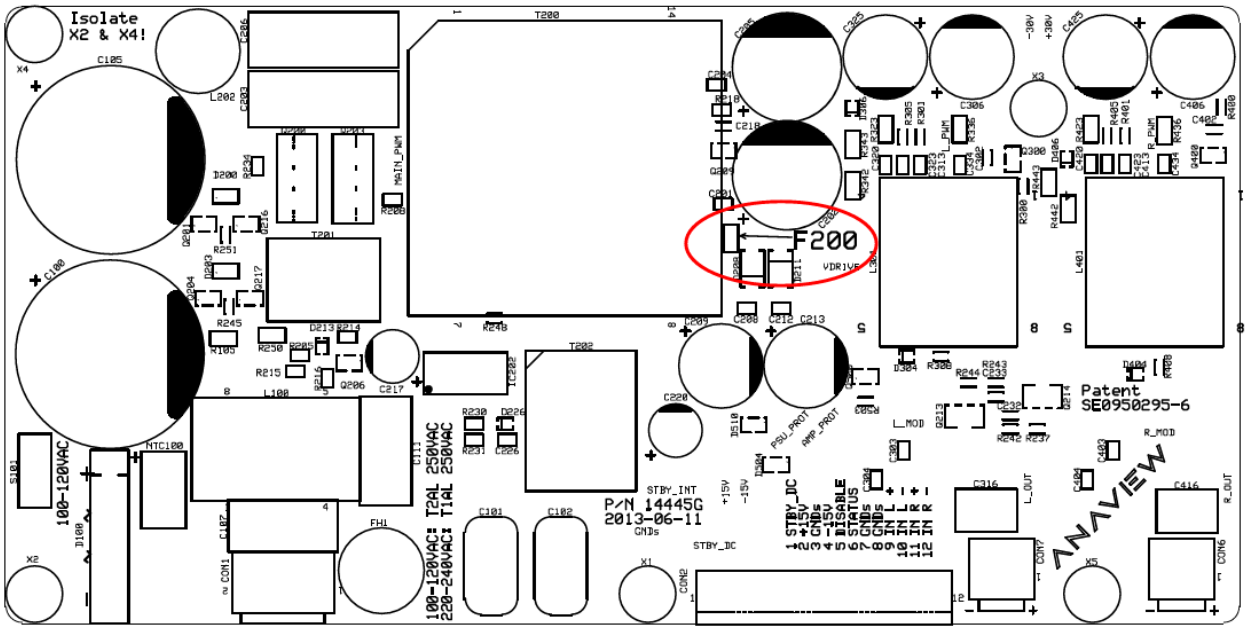


Figure 11. Frequency response.

INSTRUCTIONS

Replacing the VA+/- fuse

The auxiliary supplies VA+/- are protected by a surface mounted fuse. In case of overload this fuse will open and has to be replaced to get the supplies back.



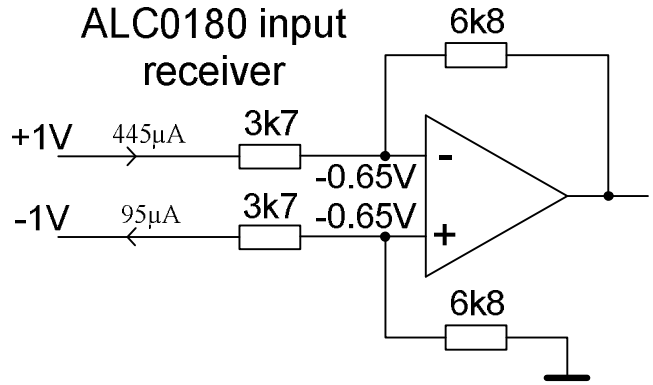
F200 is a 4A fuse from Littelfuse with article number 0440004.WR.

The maximum load on VA+/- can be seen in the table on page 5. The fuse value of 4A was choosen to tolerate the start-up charge energy of a capacitive load.

APPLICATION NOTES

Optimizing input stage CMRR

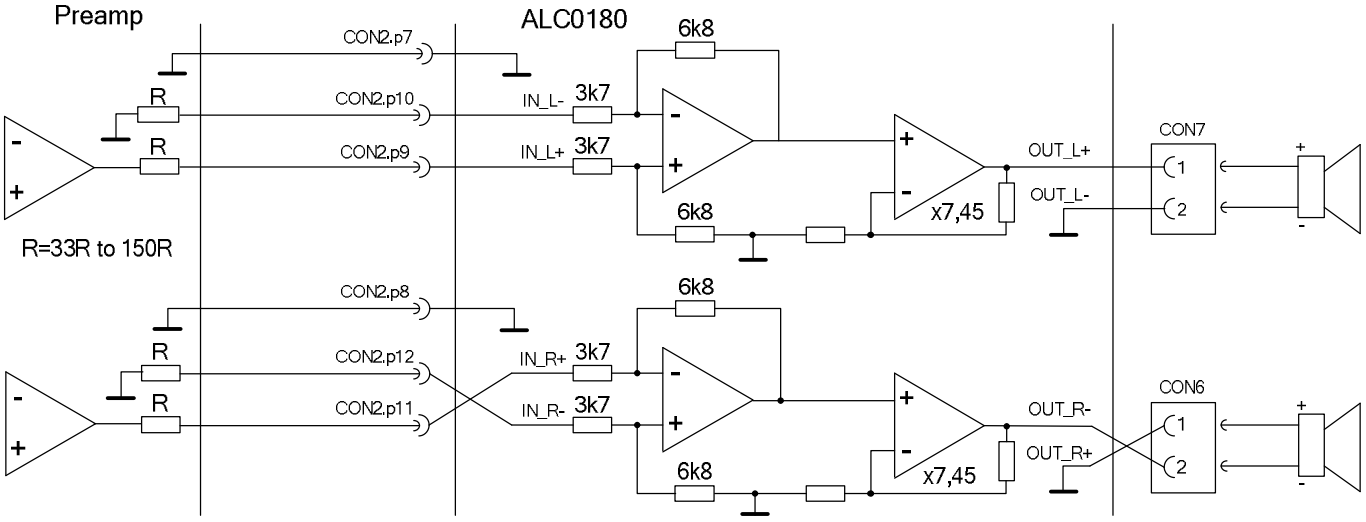
This is simplified drawing of the input of ALC0180. It is a typical circuit which is often used where the source impedance is well known and does not vary too much. Input currents are calculated when a balanced signal is applied. As can be seen the input impedance is not the same on both inputs and depending on which type of signal is applied (single ended or balanced) the input impedance changes.



This is however not a problem as long as a few precautions are made. Common mode rejection CMRR will be significantly improved by having the same source resistance on both the inputs.

Impedance balancing with single ended signal

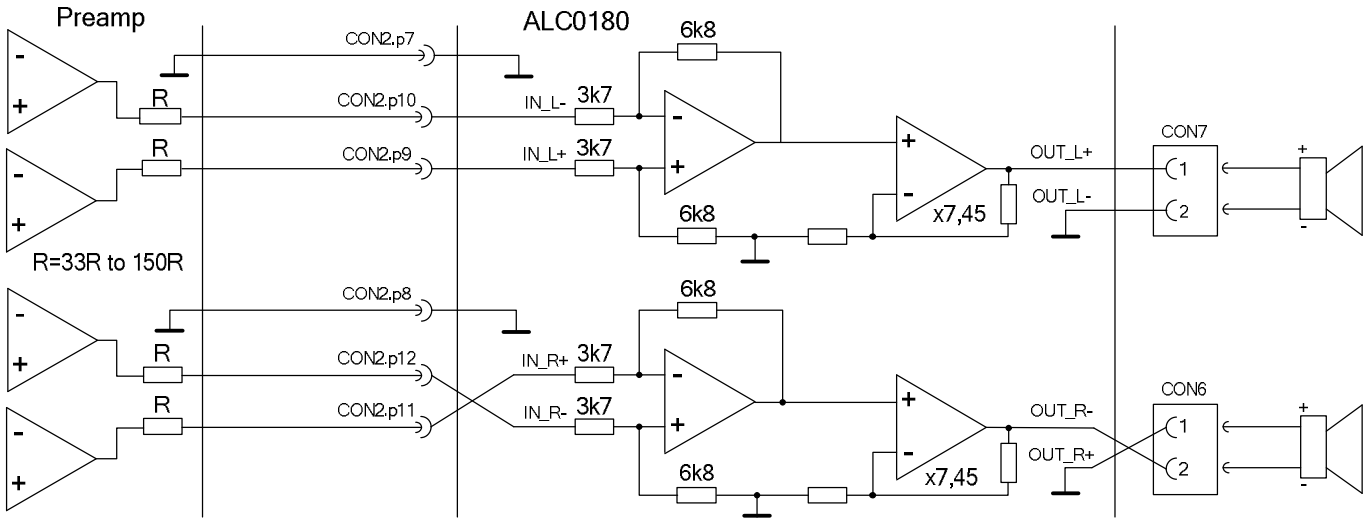
Below is shown a setup with an impedance balanced single ended source. This requires a balanced cable.



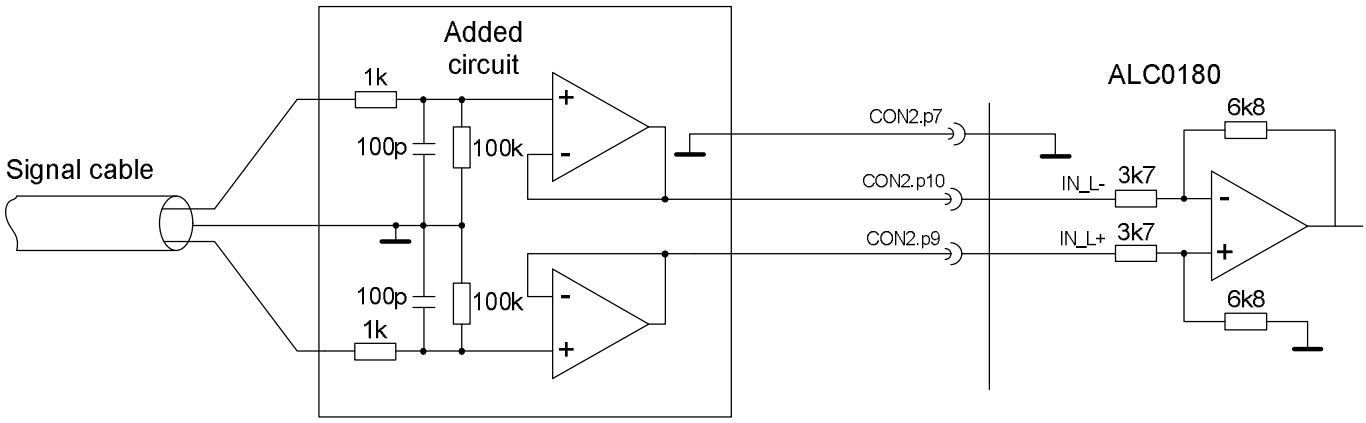
It is quite common to have a series resistance of 50ohm or more on the signal output so if the same resistance is placed in the opposite side of the signal of either sending or receiving side of the cable the CMRR rejection is intact.

Balanced input signal

If a balanced signal source is used the following setup applies.

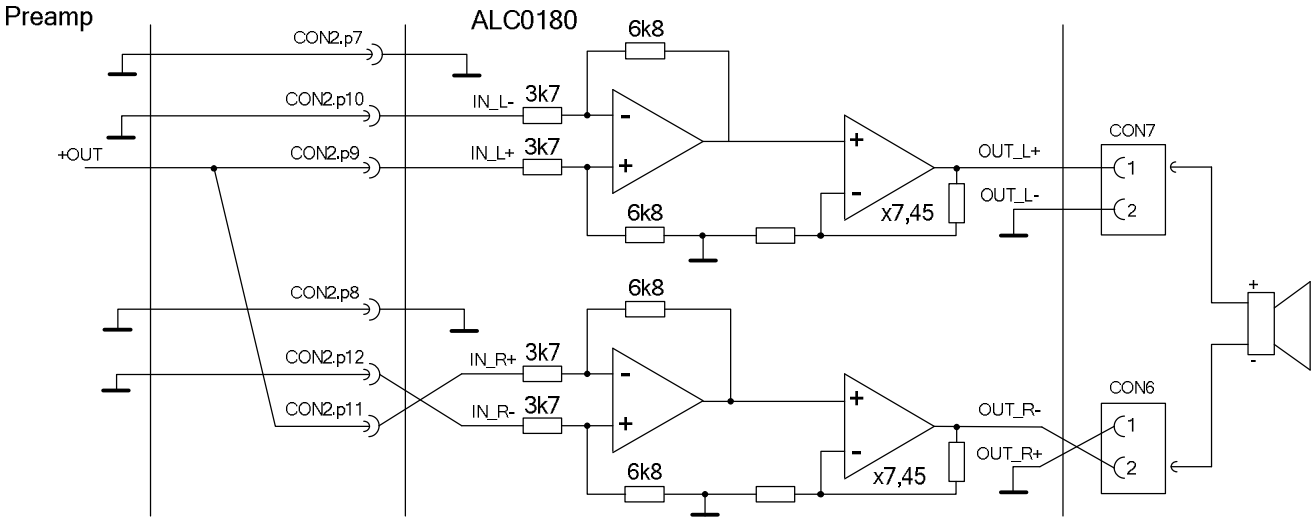


If long cables are used the cable impedance itself can contribute in a non insignificant way to the series impedance and since that impedance is not very well defined (symmetrically) it can be an advantage to increase both the diff mode and common mode input impedance. In such a case an additional circuit as below can be added before the AMS module.

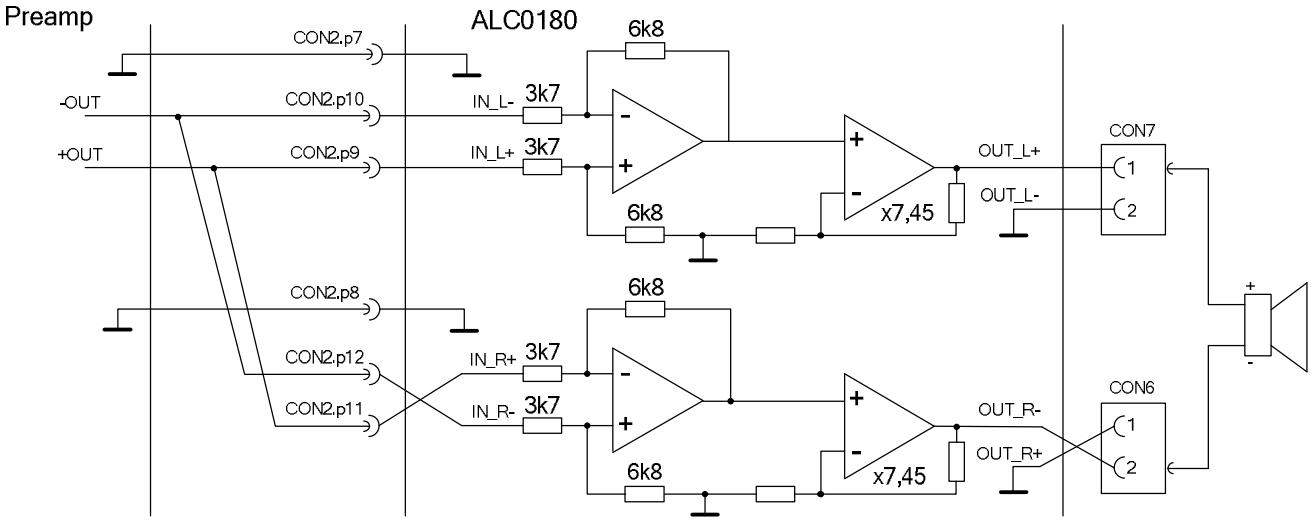


BTL setup

SE input signal



Balanced input signal



REVISION LOG

Rev.	Date	Item	Sign
F	2010-04-19	- Added note about increased current capability on VA+/- - Revised input fuse description, AMP gain and upper BW limit - Added CSA 60065, EuP and Energy Star to the compliance table	KS
G	2010-09-06	- Added nominal input AC current and AC symbols, page 1 - Updated max input level IN_L/R+/- from 1.39 to 1.43Vrms - Updated and added mounting holes information, page 6 - Added product weight, page 6	KS
H	2013-06-25	- Updated to Anaview standards - Added photo - Changed dimension drawing - Revised contact information	PB
I	2013-11-19	- Updated AC mains minimum startup voltage	MC
J	2014-02-13	- Added application notes on input stage - Added information about VA+/- fuse - Added proposed interfaces for inputs/outputs - Added information in protection and audio specifications sections. - Changed PCB color to black. - Updated specs for VA+/- - Added specs for Energy Star compliance - Added info about input impedance in INPUT SPECIFICATIONS - Updated EMC info	PB JN
K	2014-06-02	- Updated thresholds in protections sections - Updated pictures in interfaces section - Updated information about VA+/- fuse	PB
K1	2015-05-04	- Updated threshold for Disable - Updated mounting hole information	JN

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