

USER MANUAL

R.04

MODELS: **CA-2000**
 CA-4000
 CA-8000



<http://www.apogee-sound.com>

INSTRUCTION MANUAL FOR MODELS CA-2000 / CA-4000 / CA-8000

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1. IMPORTANT NOTE

Congratulations! You have chosen an expertly designed and manufactured professional power amplifier. CA-Series amplifiers from Apogee Sound offer superb sonic reproduction, exceptional reliability and rugged construction normally found only in amplifiers costing much, much more. The CA-Series amps are well suited to a wide range of applications; they're equally at home when used in fixed installations or travelling under the harshest touring conditions.

In order to obtain maximum functionality, it is important to carefully read this manual before connecting and using the amplifier. If any repair or maintenance task should ever be needed, please contact Apogee Sound International. We want to be sure that your product is serviced by authorized professionals, so it will continue to meet the highest standards of quality.

1.1 Precautions

CA Series amplifiers are capable of considerable AC power consumption (see table below). We recommend AC power cable of at least #14 AWG for short runs and at least #12 AWG for longer runs. Any circuit breakers that are located 'upstream' of the amplifier should be at least 20A at 115 VAC or 15A at 230VAC (data for one amplifier).

MODEL	POWER CONSUMPTION
CA-2000	830VA
CA-4000	1790VA
CA-8000	3115VA



The amplifier should always be used with a three-wire power cable and a suitable connection to ground (earth) made through the AC power cord. Failure to connect the ground, or a faulty ground connection could result in serious injury or death !



Whenever making connections or disconnections to the amplifier's inputs and/or outputs, it is important to first switch the amplifier to the 'OFF' position and to disconnect the AC power line.



Do not touch or manipulate the loudspeaker output terminals when the amplifier is switched on; there can be voltages present of more than 400Vpp which can be hazardous or lethal.

As a general rule, the area where the amplifier is set up should be dry and free from excessive moisture or dust.

2. INTRODUCTION

With the CA-Series of amplifiers, Apogee has applied an innovative new concept to the world of professional audio, that of the use of Switching Field Effect Transistors (patent # 89011155/4). The integration of these devices for audio applications represents a definitive step forward, eclipsing the performance of conventional amplifiers. The advantages are:

- a) Significantly less heat production due to lower internal resistance than bipolar transistors. The lower internal resistance also translates to a more powerful and solid bass response (note: conventional FETs have an internal resistance that is four to seven times higher than switching FETs).
- b) Superb sonic transparency, especially in the upper frequencies, due to the extremely high speed of the MOSFET devices. This fact also reduces TIM (Transient Intermodulation Distortion) to very low levels.
- c) SOA Contour Following Protection

The SOA is the Safe Operating Area of the FET output devices. A good protection system must keep the currents and voltages within the transistors well within the safe operating area, or reliability will be seriously compromised. However, determining the SOA is a complex function, as it varies with the operating temperature. For example, at 80°C it is considerably narrower than at 25°C (a typical start-up temperature). Some manufacturers use protection schemes that are conservative, compromising the performance of the components; you get fair protection, but the performance remains mediocre. Others prefer to leave "dark" areas between the safe operating area and the activation of protection, which is very risky.

By contrast, Apogee CA amplifiers use a unique SOA Contour Following System. This guarantees total protection of the amplifier at any output power, load, or operating temperature, as the intelligent electronic circuitry permanently watches for changes in the safety area, adapting itself to any situation.

- d) The Best Damping Factor of any Amplifier in its Class.

In the CA-Series, the typical output relays have been substituted with an electronic CROWBAR system. This device shunts-to-ground the output signal in the case of voltages that could damage the loudspeakers. By contrast, a relay introduces a mechanical contact in the path of the audio signal to the loudspeakers. This mechanical contact results in an important reduction of the amplifier's damping factor. Over time, the relay contacts are prone to wear, further reducing the amplifier's damping and general performance. Although the use of premium quality relays may minimize the problems, eliminating them altogether increases the damping factor as well as the long term reliability.

3. INSTALLATION

3.1 Location, Assembly, Ventilation

- The CA-2000, 4000 and 8000 amplifiers are 2 RU high (3.5") x 19" wide rack modules. It is important to recognize that the amplifiers are a heat source and should not be placed next to other equipment that is susceptible to heat, nor should the amplifiers themselves be exposed to high temperatures from other nearby equipment.
- The ventilation path should always be kept free to allow fresh air to enter the forced ventilation tunnel. The amplifier takes fresh air in through the front panel, filtered by a removable foam air filter, and brings it directly to the power modules, power transformer and power capacitors. The hot air is then exhausted through the rear panel. The forced air cooling system avoids heat accumulation inside the unit and thus increases the lifespan of the electronic components. The foam air intake filter is located on the front panel for ease of service. It should be free from dust build-up at all times. When the air filter becomes noticeably dirty, it should be removed and cleaned. The foam may be cleaned with compressed air or by rinsing under warm water. If rinsing, make sure to dry the foam before re-installing. Replacement foam filters are available from Apogee Sound International at a nominal charge.

3.2 Options

- An optional set of front handles is available for a nominal cost. The handles easily fasten to the front rack ears with screws supplied with the set. Handles are recommended if the amplifier will be removed or replaced in a rack enclosure on a regular basis.
- A optional set of rear rack ears is also available at a nominal cost. The rear rack ears are designed to attach to rack-mount rails positioned in the rear of the rack or road case (not supplied). They are strongly recommended if the amplifier will be used in a road case for touring. As an added benefit, the use of both front and rear rack ears will stiffen the road case, thereby increasing its durability and useful lifespan.

3.3 AC Power Connection (Mains)

The CA-Series amplifiers are fed with alternate currents of either 115VAC, or, 230VAC, 50/60Hz, depending on the country. The label on the rear of the unit indicates the voltage that it has been configured for. The amplifier may be internally reconfigured by an authorized service technician (See Figure 1).

The AC power cables should not be located near the cables carrying the audio signal, as this could induce hum into the system.

To protect the amplifier, there are five internal fuses; two situated in each power module and the fifth in the primary transformer supply. If a fuse blows, it should be replaced by one of identical characteristics. Should it blow again, please consult our Technical Service Department. **NEVER REPLACE THE FUSE WITH ANOTHER ONE OF A HIGHER VALUE!**



CAUTION: Fuse replacement requires that the lid of the amplifier be removed, exposing the user to potentially hazardous voltages inside the amplifier. All work must be performed by a qualified technician.

FUSE VALUES:	CA-2000	CA-4000	CA-8000
POWER MODULE (5x20mm)	T8A	T12A	T12A
AC MAIN FUSE 115VAC (6x32mm)	T6.3A	T16A	
AC MAIN FUSE 230VAC (6x32mm)	T6.3A	T10A	
AC MAIN FUSE 115/230VAC (10x38mm)			T16A
AUXILIARY SUPPLY (5x20mm)			T250mA

3.4 Signal input connections

The signal input connectors are of XLR type, electronically balanced. The pin assignment is as follows:

HOT (positive signal)	>	Pin 2
COLD (inverted signal)	>	Pin 3
GROUND	>	Pin 1

(note: when driving the amplifier from an unbalanced source, connect pin 3 to pin 1)

The "STK OUTPUT" (stacking output) connectors are in parallel with the inputs, and are normally used to supply the same input signal to a second amplifier. They can also be used as inputs in place of the XLR connectors. The stacking output connectors are of the 1/4" phone jack type, with a pin assignment as follows:

HOT (positive signal)	>	Tip
COLD (inverted signal)	>	Ring
GROUND	>	Sleeve (body)

The amplifier's input impedance is 22K Ω (balanced) with a nominal input sensitivity of 0dBV (1 volt) for CA-2000 and 4000 models and 3dBV (1,41V) for CA-8000. The 22K impedance makes it possible to drive a group of amplifiers in parallel without loss of audio quality.

3.5 Auxiliary Ground Lug

All CA-Series amplifiers are equipped with a signal ground lug. This lug is NOT intended as the primary AC power ground, which instead should be connected to the building ground by means of the power cord (see 3.3, Power Connection).

The ground lug is electrically tied to the chassis and can be useful as a means of reducing the chassis ground impedance, thereby eliminating ground loops between devices when setting up a sound system. One common practice is to tie together all the ground lugs of *all* devices that share a rack or housing, then to make one point of connection between the ground wire and the signal ground. There are other methods that can be effectively utilized, depending on the type of AC power distribution and other factors. Please consult our Technical Department for more information. In all cases, we recommend the use of heavy gauge wire (#14 AWG or larger) when auxiliary ground connections are utilized.

3.6 High-pass filter

This filter cuts off frequency components below 50 Hz. When powering small and medium format speakers, it is useful as an aid to reduce excessive cone excursion. Also, when the amplifier is powering 70v or 100v constant voltage systems, it can be used to reduce the likelihood of saturating the step-up and step-down transformers by removing excessive low frequency content. The filter may be switched ON and OFF from the rear panel, and it affects both channels equally. Technically, the filter is an 18dB/octave Butterworth with a corner frequency of 50 Hz.

High-pass filters are also useful when playing back vinyl records because the phono cartridges are very sensitive to feedback and acoustic coupling at low frequencies. NOTE: CA Series amplifiers are delivered with the high-pass filter switched to OFF.

3.7 Anticlip Limiter Circuit

The CA-Series amplifiers employ ANTICLIP limiters as part of an active protection system designed to help increase the lifespan of the loudspeakers. The ANTICLIP circuitry constantly analyses harmonic distortion at the amplifier's output and automatically reduces the input level in order to not exceed a predetermined distortion index. CA amplifiers are delivered with the ANTICLIP system set to a threshold of 1% THD (Total Harmonic Distortion) which we refer to as 'hard limiting'. However, this value can be switched to a 'soft limiter' that permits a maximum of 5% THD. Each channel may be set to either soft or hard limiting, independently.

This switchable protection feature offers the advantage of letting the system user or installer decide which setting is most useful for the particular application. Contact the factory for information regarding how to change this threshold.



CAUTION: Changes to the ANTICLIP settings require that the lid of the amplifier be removed, potentially exposing the user to hazardous voltages inside the amplifier. Therefore, all configuration work must be performed by a qualified service technician.

3.8 Output Connections for Stereo Operation

The OUTPUT section on the rear panel uses CE approved binding posts for connection to the loudspeakers. These binding posts are able to accept solid or stranded wire directly, or, ¼" crimp-style spade lugs. We strongly recommend the use of ¼" spade lugs as an alternate to connecting the speaker wires directly to the terminals. The use of spade lugs, when properly crimped and installed, will insure a low impedance, trouble free connection, for maximum sonic quality and safety.

When the amplifier is used in the two channel STEREO mode, each loudspeaker is connected to its respective channel output. The RED terminal is the HOT terminal and the BLACK terminal is the 'COLD' or ground terminal. When a positive voltage is applied to pin 2 of the input connector, a positive voltage will appear on the RED terminal of the speaker output connector and a negative voltage will appear on the BLACK terminal.

3.9 Output Connections for Bridged Operation

When the amplifier is used in the BRIDGE mode, it essentially becomes a single channel mono amplifier and the loudspeaker is then connected to the two RED terminals. When a positive voltage is applied to pin 2 of the input connector, a positive voltage will appear on the RED terminal marked plus (+) of the speaker output connector and a negative voltage will appear on the RED terminal marked minus (-).

To operate the amplifier in the BRIDGED mono mode, simply set the "STEREO / BRIDGE" switch to "BRIDGE". The input signal is taken from the INPUT connector on CHANNEL A only. Please note that ONLY THE CHANNEL A INPUT ATTENUATOR (level control) WILL BE FUNCTIONAL WHEN THE AMPLIFIER IS IN THE BRIDGED MODE. The output appears on the two RED speaker output terminals.

In all cases, the connection cable that joins the amplifier and the loudspeakers should be heavy gauge, high quality wire, kept as short as possible. We advise using a wire gauge of at least #14 AWG for lengths under 50'. For longer runs (over 50') the wire gauge should be increased to #12 AWG or larger. Ideally, multi-stranded, oxygen free copper cable is recommended for best results.

4. OPERATION AND USAGE

4.1 Start up

Pushing the POWER SWITCH illuminates the LED Power Indicator and activates the startup sequence. Initially, both red CLIP LEDs will illuminate during start-up, while the amplifier performs a diagnostic check and stabilizes all internal voltages. After approximately 10 seconds, the CLIP LEDs will turn off indicating that the amplifier is now ready for use.

In a typical audio system, it is important to start up the equipment in the following sequence to avoid transient 'pop's and 'clicks' that could damage your speakers: sound sources, mixer, equalizers, speaker processors or controllers, and finally power amplifiers. To turn them off, the sequence should be performed in an inverse pattern, i.e.: power amplifiers, speaker processors or controllers, equalisers, mixer, sound sources.

4.2 Input attenuators

The input attenuators are high quality rotary potentiometers, located on the rear panel to avoid tampering or inadvertent adjustments. The attenuators are calibrated in dB with '0 dB' representing maximum level (fully clockwise), and infinity representing full attenuation (fully counter clockwise).

4.3 Indicators

The CA-Series amplifiers are equipped with a simple but efficient combined indicator system.

The 'CLIP' indicator functions as both a CLIP indicator and a PROTECTION indicator. When functioning as a PROTECTION indicator, the LED may illuminate for any of the following reasons:

1. When the amplifier is first switched on, indicating that the startup sequence is initialised. The indicator will go out when the amplifier is ready for use.
2. If the amplifier output has been short circuited.
3. If DC or very low frequencies are present on the output that could damage the loudspeakers.

In any case, should the CLIP indicator remain lit, it is a sign of malfunctioning and the amplifier should be scheduled for service.

When the CLIP indicator is functioning as a CLIP indicator it will illuminate when the output level to the loudspeakers reaches -1.5dB below the actual clip point. Clipping is simply the inability of the amplifier to deliver any more output power because it has reached its design constraints, and/or because the AC mains voltage is substandard (sagging).

The CA-Series CLIP indicator system takes into account the variations in the AC mains voltage, always giving a true indication even if the AC voltage varies. When working at high levels with pop and rock musical styles, it is normal for the CLIP indicators to illuminate briefly at the rhythm of the low frequencies. Occasional clipping is not particularly harmful to low frequency loudspeakers, but can rapidly destroy mid frequency and high frequency drivers. Heavy clipping should always be avoided. When an amplifier clips, it produces a waveform that approximates a square wave. When clipping, the amplifier is 'telling' the loudspeaker cone or diaphragm to move outward in an infinitely short period of time and to remain there in stasis (no movement) for the duty cycle of the wavelength. Then, the amplifier 'tells' the loudspeaker to move rearward, again in an infinitely short period of time, and remain *there* until the next cycle occurs. Whenever a speaker cone or diaphragm is NOT moving, all of the electrical energy applied to it is converted directly to heat instead of sound, resulting in a high likelihood of damage to the loudspeaker.

TEMP (thermal protection indicator).

This indicator illuminates to warn that the tunnel cooling temperature has risen above 90 degrees centigrade. If this occurs, the amplifier will be temporarily shut down by the thermal monitor circuit in order to protect it from damage. The amplifier will start up automatically when the temperature descends to 75 degrees centigrade. The cause of thermally induced shutdown is typically a blocked air intake or exhaust port. One example: when used outdoors, amplifier racks are often covered with plastic to protect them from the rain. If the plastic is not removed or kept clear of the intake and exhaust ports when the amplifier is in use, it can lead to rapid overheating and thermal shutdown.

SIGNAL (signal presence indicator)

This indicator illuminates when signal is present at the amplifier input(s). It functions independently of the setting of the attenuator (level) controls. Illumination begins when the input signal exceeds -40dB.

5. CLEANING

The control panel and chassis must not be cleaned with any solvent, abrasive or petroleum derived substance or it may be damaged. When cleaning is required, use a soft cloth, slightly dampened with water and a neutral liquid soap. Be careful that no liquid gets into the amplifier. Never use sharp objects that could scratch the control panel.

Should liquid get into the amplifier, send the unit to the nearest Apogee Technical Service Center for inspection and repair.

6. DIAGRAMS, TABLES and FIGURES

6.1 Technical Specifications

	CA-2000	CA-4000	CA-8000
POWER 20-20kHz 1% THD			
4Ω Stereo	275 WRMS	635 WRMS	940 WRMS
8Ω Stereo	180 WRMS	395 WRMS	550 WRMS
8Ω Bridged	550 WRMS	1270 WRMS	1881 WRMS
POWER 1kHz 0.1% THD			
4Ω Stereo	250 WRMS	590 WRMS	880 WRMS
8Ω Stereo	165 WRMS	370 WRMS	518 WRMS
8Ω Bridged	500 WRMS	1180 WRMS	1750 WRMS
Peak Power 2Ω/1kHz	0,98Kw	2Kw	2.95Kw
Frequency response (-1dB)	7Hz-50kHz	7Hz-50kHz	6Hz-90kHz
High pass filter (-3dB)	50Hz	50Hz	50Hz
Butt./ 18dB/oct.			
THD + Noise @ 1kHz Full Pwr.	<0.03%	<0.03%	<0.07%
Imd. Dist. 50Hz & 7kHz, 4:1	<0.05%	<0.08%	<0.08%
TIM 100	<0.01%	<0.01%	<0.01%
S + N/N 20Hz-20kHz @ 1W/4Ω	>85dB	>80dB	>85dB
Damping factor 1kHz @ 8Ω	>300	>300	>300
Slew Rate	± 60V/μs	± 75V/μs	± 80V/μs
Channel crosstalk @ 1kHz	>70dB	>75dB	>70dB
Input connector	XLR3 balanced	XLR3 balanced	XLR3 balanced
Input CMRR/ref. Max. PWR)	>60dB @ 1kHz	>60dB @ 1kHz	>60dB @ 1kHz
Input Sensitivity / Impedance	0dBV/> 22kΩ	0dBV/> 22kΩ	3dBV/> 22kΩ
Signal present indicator	-40dB	-40dB	-40dB
Output connectors	Binding Posts	Binding Posts	Binding Posts
Clip indicators	-1.5dB before clip	-1.5dB before clip	-1.5dB before clip
Anticlip limiter	1% & 5% (aprox.)	1% & 5% (aprox.)	1% & 5% (aprox.)
Power consumption (max. Out)	830VA	1790VA	3115VA
Dimensions	Panel		
	Depth		
	482.6x88 mm	482.6x88 mm	482.6x88 mm
	437,5 mm	437,5 mm	480 mm
Weight	15kg	20kg	22.5kg

6.2 Figures

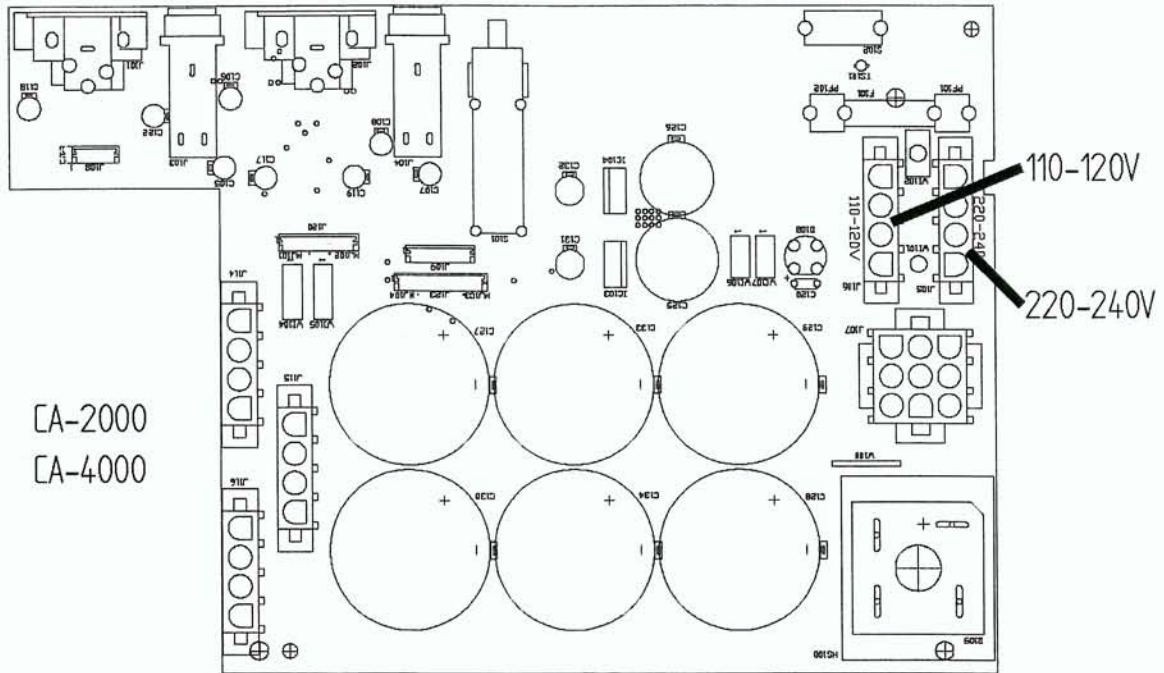
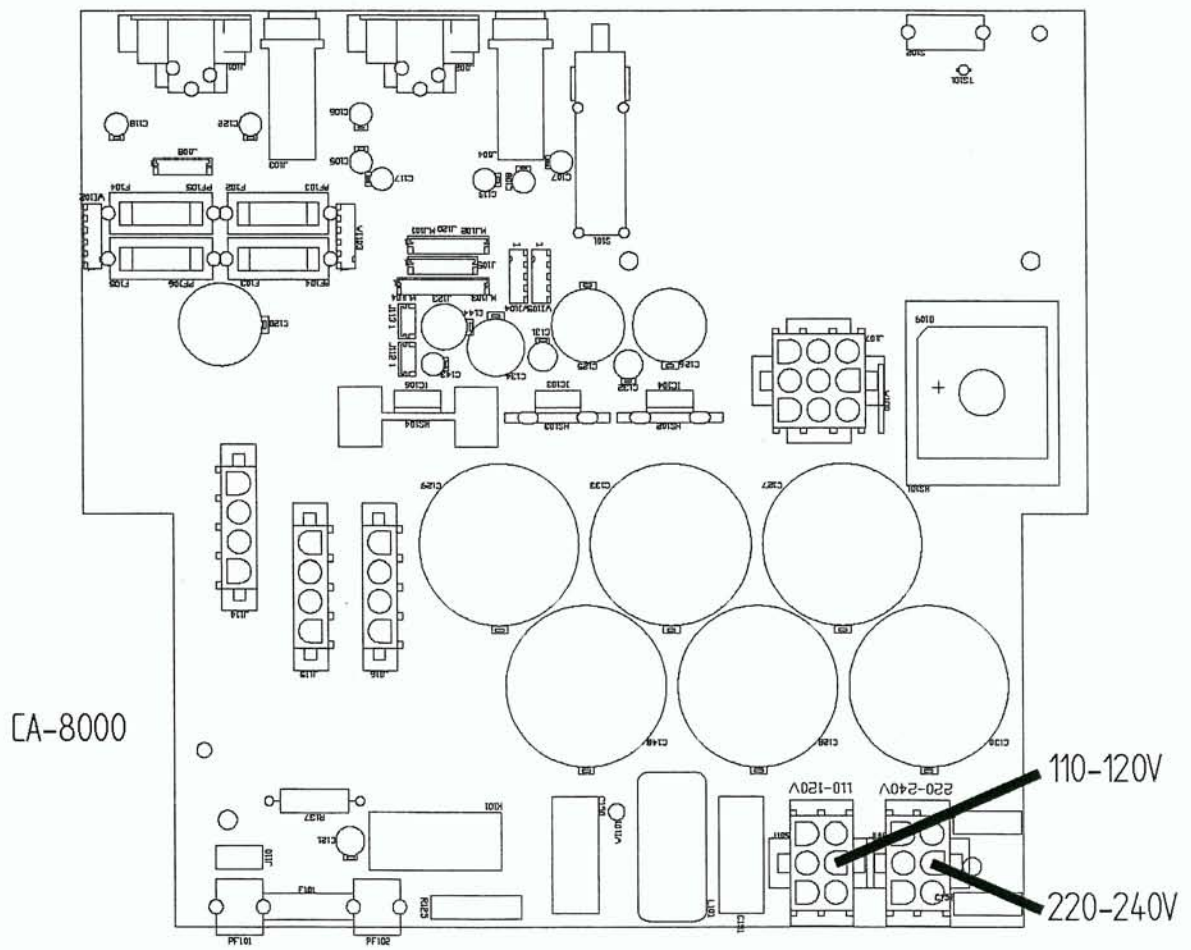


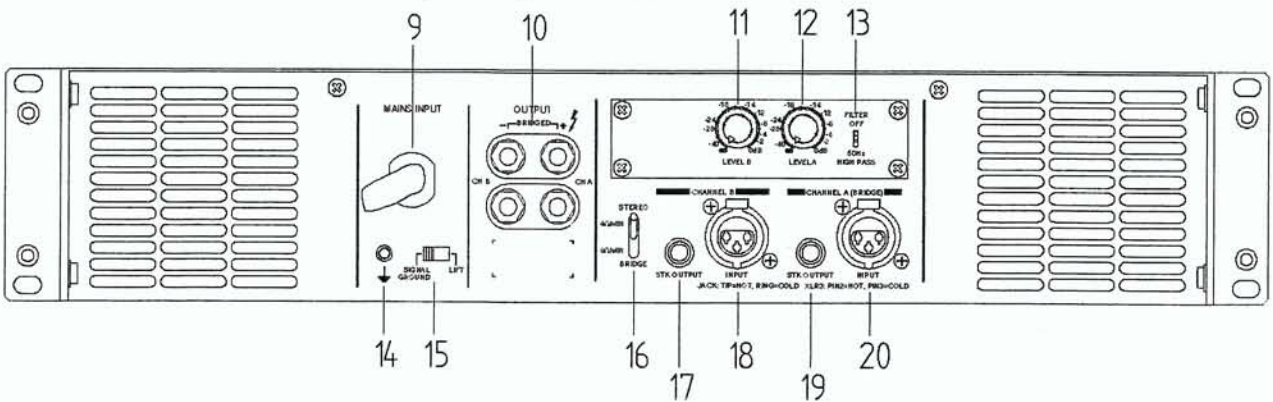
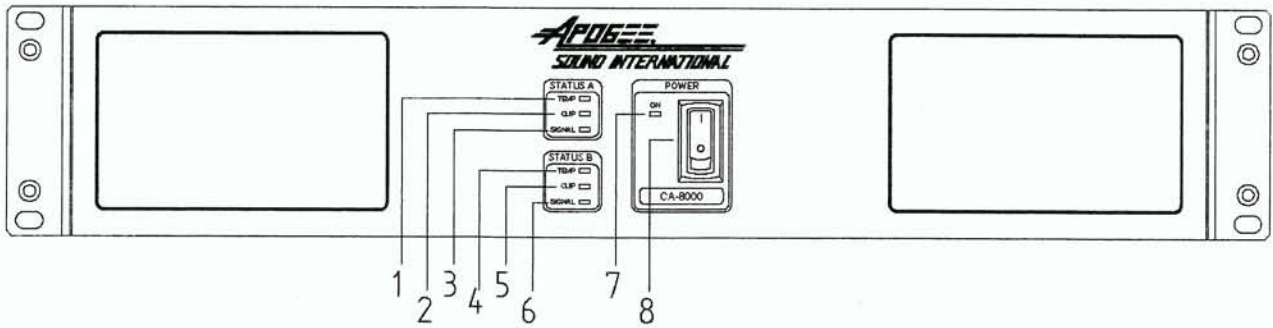
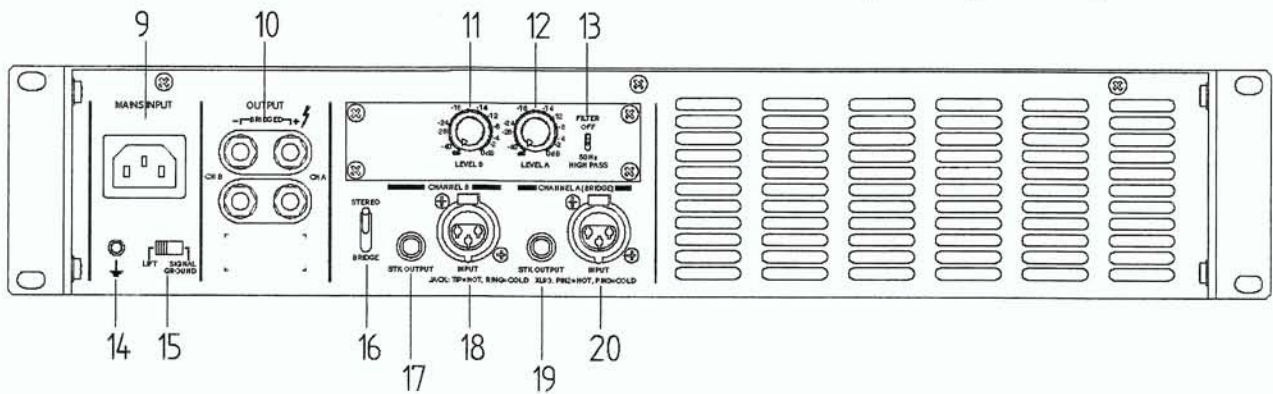
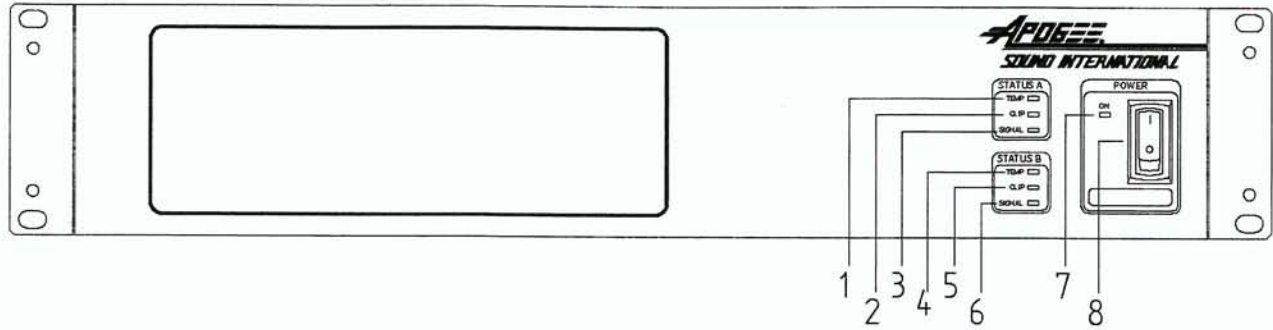
Fig. 1



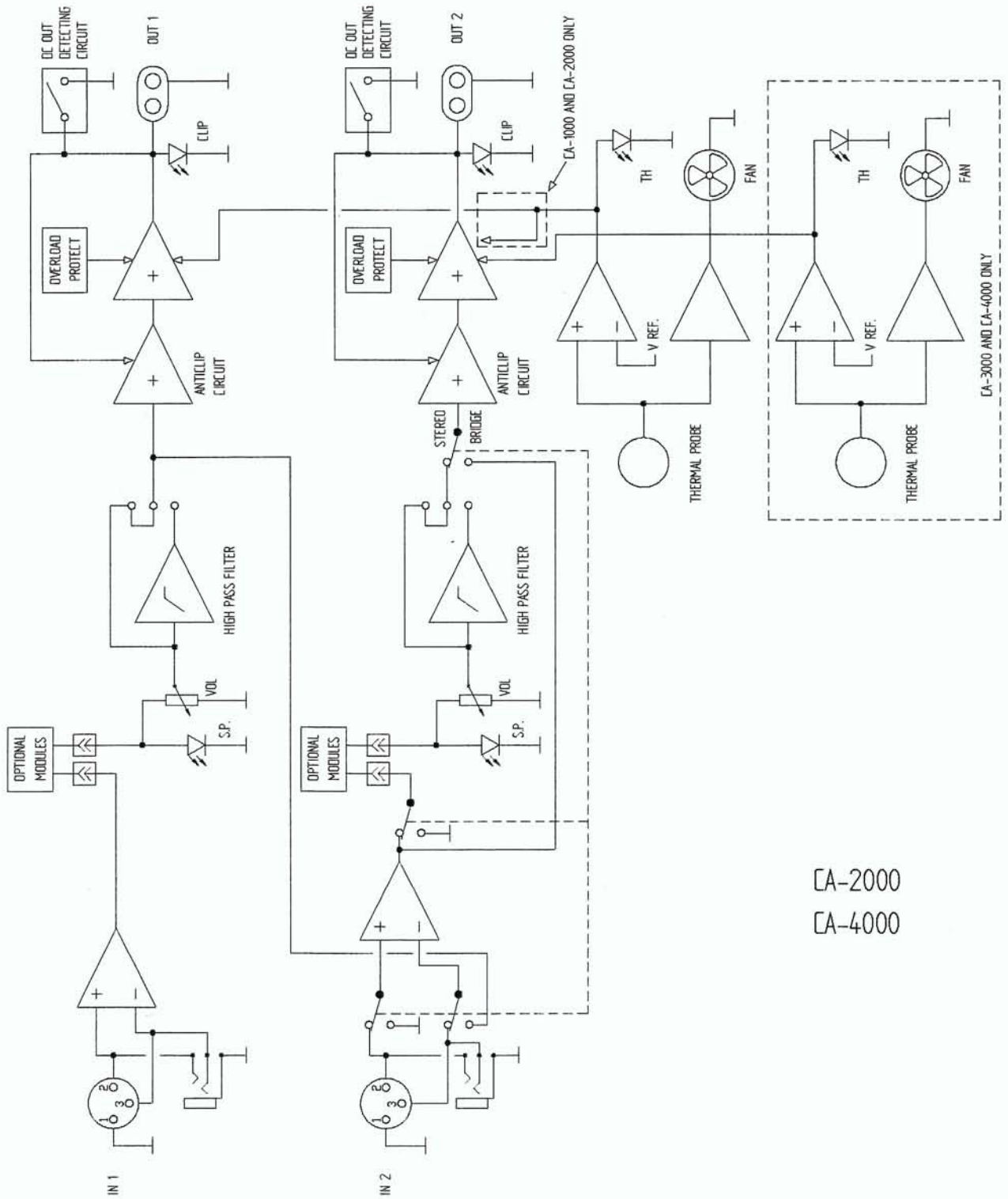
6.3 Function List

1. Thermal Protection Indicator / CHANNEL A (TEMP)
2. Combined Clip and Protection indicator / CHANNEL A (CLIP)
3. Signal present indicator / CHANNEL A (SIGNAL)
4. Thermal Protection Indicator / CHANNEL B (TEMP)
5. Combined Clip and Protection Indicator / CHANNEL B (CLIP)
6. Signal present Indicator / CHANNEL B (SIGNAL)
7. Power Indicator
8. Power Switch
9. AC Power Inlet
10. Speaker Output, 5-way Binding Posts
11. Input Level Attenuator / CHANNEL B
12. Input Level Attenuator / CHANNEL A
13. High Pass Filter Switch (50 Hz)
14. Ground (Earth) Terminal
15. Ground Lift Switch (disconnects signal ground from chassis connection)
16. Stereo / Bridge Selection Switch
17. Stacking Output CHANNEL B (1/4" Phone connector, tip/ring/sleeve in parallel with XLR Input)
18. Input Connector, XLR type, balanced / CHANNEL B
19. Stacking Output CHANNEL A (1/4" Phone connector, tip/ring/sleeve in parallel with XLR Input)
20. Input Connector, XLR type, balanced / CHANNEL A

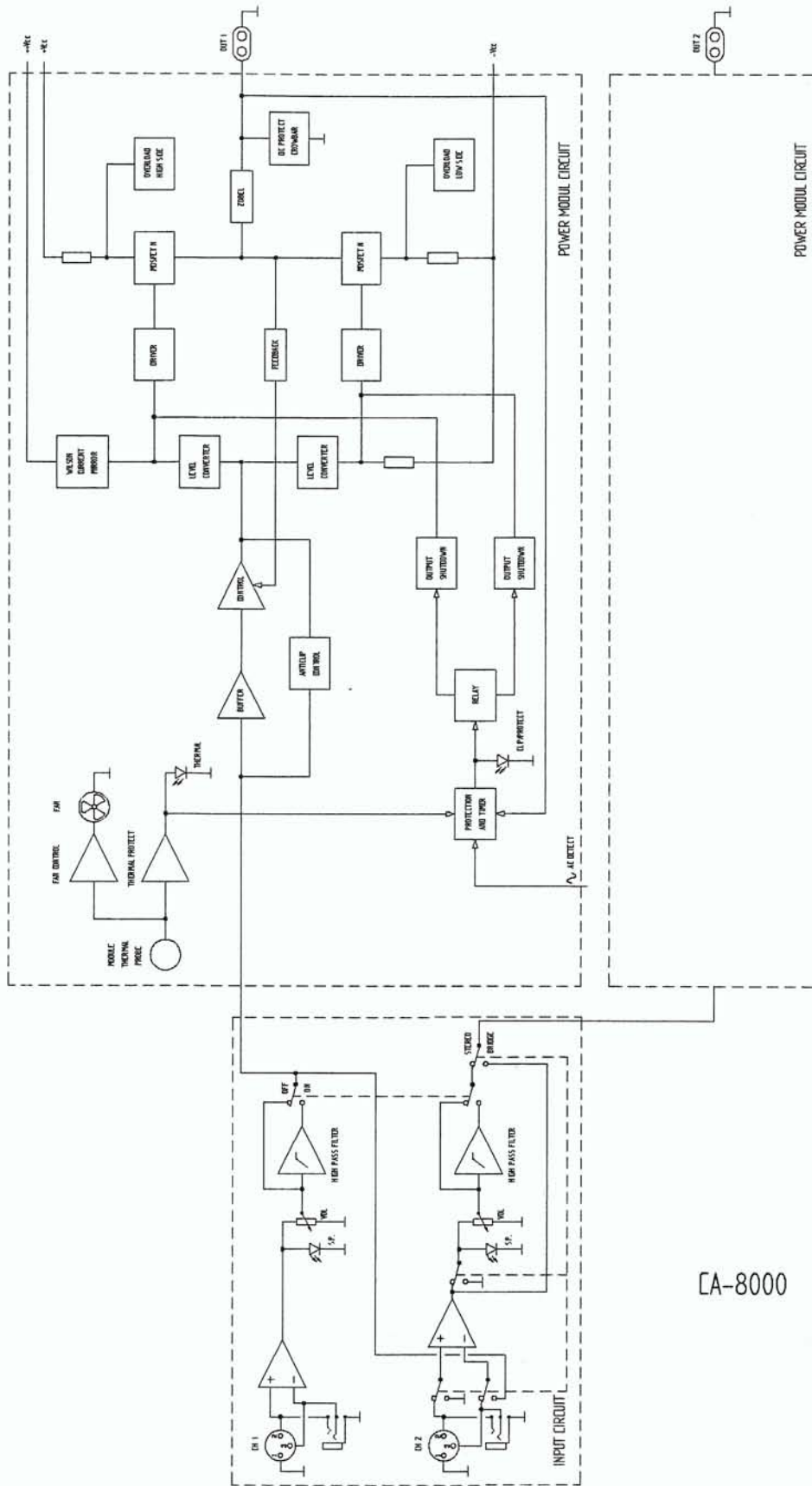
6.3 Function Diagram



6.5 Block Diagrams



CA-2000
CA-4000



CA-8000