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This manual contains confidential information.

Any form of duplication is prohibited !



1 Safety and warranty

1.1 Safety

-Warning

Inside the PMS 5000 amplifier module, AC voltages up to 240 V may be present !

-Connection to the mains voltage

The PMS 5000 amplifier module chassis is connected to ground by the grounding conductor in the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle. When this ground connection is not present or interrupted, all accessible parts of the amplifier can cause an electrical shock.

-Fuses

To avoid fire hazard, only replace fuses by the same type and value.

-Maintenance

Do not perform internal maintenance or adjustments unless there is someone present, capable of rendering first aid and reanimation.

Try to perform all service works with mains power off. Remove mains connector to be sure that no internal voltages are present.

1.2 Warranty

SUMMARY

Stage Accompany warrants to the original commercial purchaser of each new Stage Accompany product, from the date of purchase by the original purchaser until the end of the warranty period, that the product is free of defects in materials or workmanship.

WARRANTY PERIOD

The warranty period on all Stage Accompany products is five years from the date of the first consumer purchase, with the exception of:

- all electrical products: three years from the date of the first consumer purchase;
- cone assemblies in the loudspeaker and diaphragms in the Compact Drivers: one year from the date of the first consumer purchase;



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- movable parts, such as castors, locks, handles, hinges, fans, etc: one year from the date of the first consumer purchase;
- computers and associated peripherals: six months from the date of the first consumer purchase.

HOW TO VALIDATE THE WARRANTY

To validate warranty, fill out the enclosed warranty card and return it to Stage Accompany within ten days of the purchase date. The purchaser must always keep the original bill of sale to establish the date of purchase.

ITEMS EXCLUDED FROM WARRANTY

Appeal on warranty will be voided in case :

- of defects caused by influence from the outside, accident, misuse, neglect or influence of water;
- the serial number on the warranty and/or product has been defaced, altered or removed;
- of damage due to shipment;
- of damage resulting from neglection of instructions listed in the user manual;
- of damage caused by incorrect, abnormal or abuse during delivery;
- the unit has been repaired (or shows signs of repair) by someone not authorised by Stage Accompany;
- if the warranty registration card has not been returned to Stage Accompany within 10 days of purchase;
- the original bill of sale can not be presented whenever warranty service is required;

WHAT WE WILL DO

Shipment of the product to a Stage Accompany dealer is at the risk and responsibility of the customer.

Stage Accompany will pay all labour and material expenses for all repairs covered by this warranty. Stage Accompany will not pay the cost of shipment to the Stage Accompany dealer or to the factory. However Stage Accompany will pay the return shipping charges if repairs are covered by the warranty.



2 Description of the Blue Box

The Blue Box is a microprocessor controlled, active loudspeaker system, consisting of:

- SA 4525 enclosure,
- SA 8525 high frequency driver,
- SA 2527 horn,
- SA 1503 low frequency driver and
- PMS 5000 amplifier module.

The system comprises the following features:

- **microprocessor control**

All the electronic functions are monitored and controlled by the microprocessor. External control is possible through SAnet.

- **full range**

The blue box contains 2 loudspeakers, covering the entire audio bandwidth. Extra tweeters or subwoofers are not needed.

- **high output**

The Blue Box is capable of delivering a sound pressure level of 120 dB continuous and 130 dB peak at 1 meter. Seperate power amplifiers are applied for each loudspeaker.

- **automatic leveller function**

A built in microprocessor controlled leveller keeps the average output within the safe operating area of the loudspeakers. No VCA's are involved!

- **balanced input**

The input is electronically balanced (switchable to unbalanced) for excellent hum and noise rejection and optimal performance. Phase is switchable to inverted.



3 Taking the Blue Box apart

The Blue Box can be taken apart in two ways.

- Access to the electronics can be obtained by removing the amplifier module
- The loudspeakers can be taken out

In both cases, be sure that the mains plug is removed from the receptacle.

The best way to dismount the amplifier module is shown in figure 1. Place the Blue Box on its wheels and open the flightcase. Remove the lid and place the blue box on its speaker panel. Be sure the surface is flat!

Remove the bolts that attache the actual Blue Box to its flightcase; one in every horizontally mounted handle.

Next remove the flightcase from the box just by pulling it off the Blue Box enclosure.

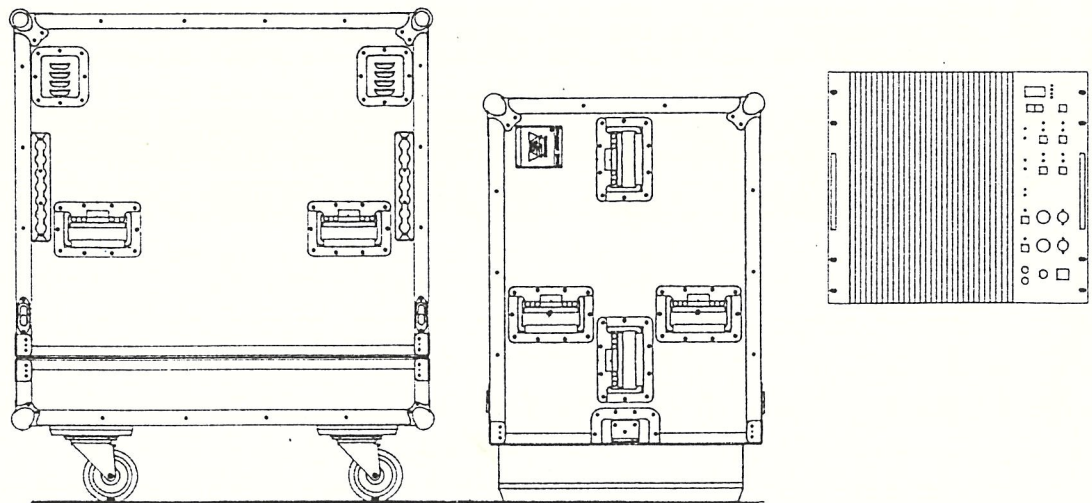


Fig 1 Removing the amplifier module

The module is attached to the chassis with 8 bolts, 4 on each side. Remove these bolts and use the handles of the module to lift the module approx. 20 cm out of the enclosure. Disconnect the loudspeaker connectors and the flat cable.

Now the module is free of connections and can be fully pulled out of the enclosure.



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To remove the loudspeakers (fig 2), place the Blue Box on its back. Remove the lid of the flightcase, remove the foam front (by pulling it off gently) and remove the mounting bolts of the speaker or driver you want to replace.

Now the loudspeaker can be pulled out. In case the speaker is jammed, use a lever (a screwdriver for example). Disconnect the wires from the loudspeakers terminals.

Do not use the Blue Box for sound reinforcement purposes if one of the loudspeakers is removed!

Before re-assembling, connect the red and yellow wires to the red terminal and the black and white wires to the black terminal.

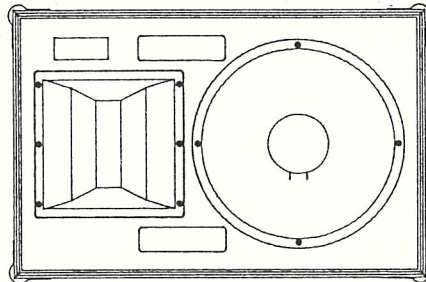


Fig. 2 Frontal view

5 Basic operation of the electronics

This chapter describes some of the key circuits of the PMS 5000. The complete circuit drawings can be found on page 16 to 29.

5.1 The analog board

The analog board contains the electronics for the input amplifier, a rumble filter, the crossover, the amplifier attenuators and the RMS/peak to DC converters.

The input amplifier is a straightforward opamp differential amplifier.

The amplifier provides for a 3 dB gain. Common mode rejection can be trimmed with TR1. See page 36 for the exact adjustment procedure. The input impedance is 30 k Ω over both input legs.

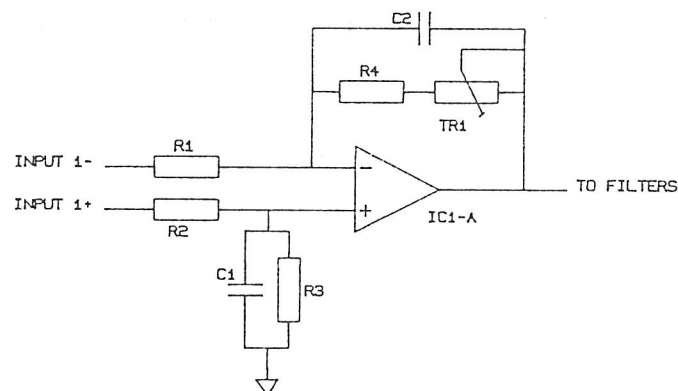


Fig 3 Input amplifier

The input is equipped with two relays. Rel1 reverses the input polarity while Rel2 switches to the unbalanced input configuration.

After debalancing the input, low frequency rumble is removed with a 24 dB/oct bessel filter at 23 Hz (IC2).

IC3 and IC4 split the input signal into high and low frequencies. The circuit around IC3 is a 24 dB/oct high pass Bessel filter and the circuit around IC4 a 24 dB/oct low pass Bessel filter.

The amplitude of each of the two signals are controlled by IC7 and IC8. These are digitally controlled attenuators (fig 4).

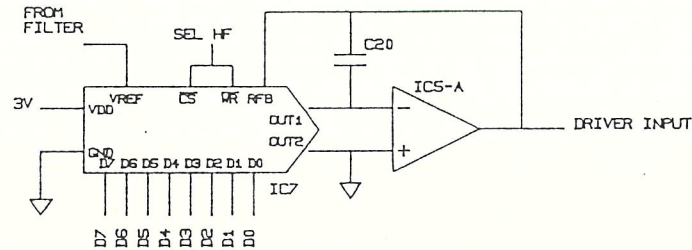


Fig 4 Digital attenuator

The digital code presented to D7..D0 determines the level of attenuation and given by the formula:

$$A = 20 * \log \frac{n}{256}$$

where n is the decimal value of the digital code.

The analog board also contains 6 electronic rectifiers. Four of these are peak to DC converters, the other two RMS to DC converters. The purpose of these rectifiers is to pass the amplitude information on the input and output voltages to the microprocessor. The basic configurations of the two converters are shown in fig. 5. In each converter the input signal is double-sided rectified. The peak rectifier (upper circuit) stores the information through a diode in a capacitor (instant attack, slow decay). The RMS rectifier (lower circuit) slowly charges and discharges a capacitor in the negative feedback loop of an opamp.

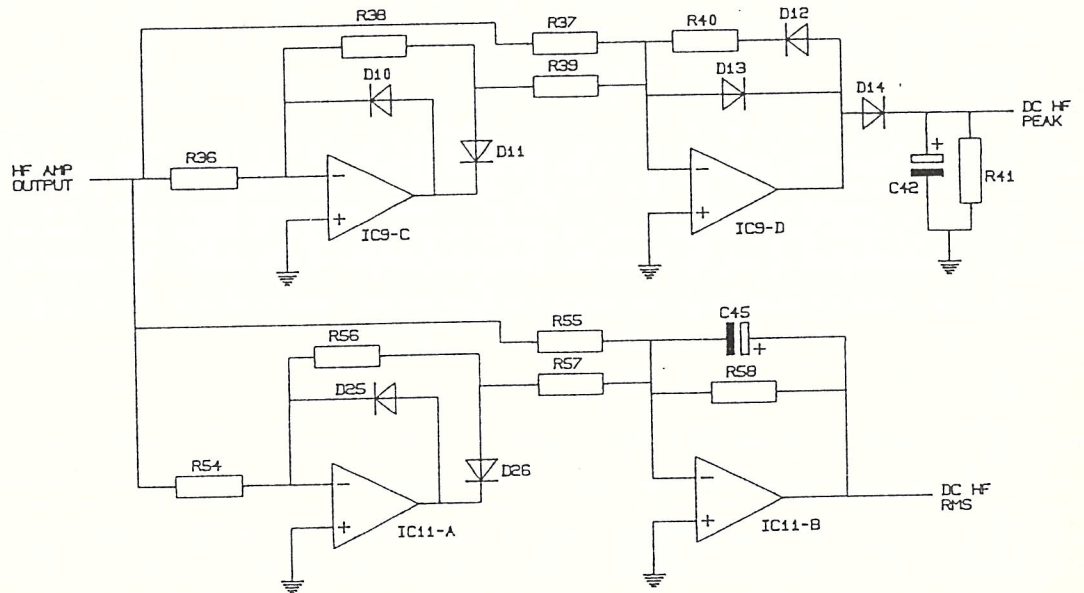


Fig 5 electronic rectifiers

5.2 The digital board

The digital board contains a microprocessor circuit, a multiplexer, an AD converter, the SAnet driver and interface electronics for displays and buttons.

The processor circuit (see page 20) contains an Intel 8344 uP, an address bus decoder (IC20), a 256K EPROM (IC21) and a 8K RAM (IC22). IC25 is a 'watchdog' that disables the write procedure for the RAM in case the power supply is running down.

The remaining part of the digital circuit is found at page 21.

The AD converter is built around IC15, IC16, IC17 and IC18. IC17-C and IC17-D are buffers for the temperature sensors. IC15 is an analog multiplexer which selects the source that has to be converted. Possible sources are:

- hot input voltage (dc in 1)
- cold input voltage (dc in 2)
- high frequency peak output level (dc hf peak)
- low frequency peak output level (dc lf peak)
- high frequency rms output level (dc hf rms)
- low frequency rms output level (dc lf rms)
- high frequency amplifier temperature (hf temp)
- low frequency amplifier temperature (lf temp)
- high frequency amplifier dc (dc high)
- low frequency amplifier dc (dc low)

T14 forms a current source together with R17 and ZD1. The collector current is ± 12 mA. This source provides drain current for the dual fet T1.

The input of the amplifier is connected to the gate of the left fet, the feedback network to the gate of the right one. In a steady situation both input and feedback voltages are 0V so both the gate-drain voltages are equal. The current of T14 will be equally divided over the two fets, so $I1 = I2 = 6$ mA.

I1 passes a current mirror composed with R8, D3 and T7.

I2 passes two current mirrors, one composed with D3, R9, and T6 and the other with T11 and T12.

In a steady situation $I1 = I2$ so all current pushed out of T7 is pulled into T12 and both the drive currents will be zero.

With a rising input voltage, I1 becomes larger than I2, and not all the current produced by T7 can be pulled into T12. The residual current will be pushed into the power amplifier as drive current.

With a negative input voltage, I2 is larger than I1 and drive current will be pulled out of the power amplifier.

DC stability is achieved by the circuit around IC1. To detect DC offset, the power amplifier's output signal is integrated and fed into the feedback loop.

5.4 The poweramp board

Fig. 7 shows the basic setup of the power amplifier.

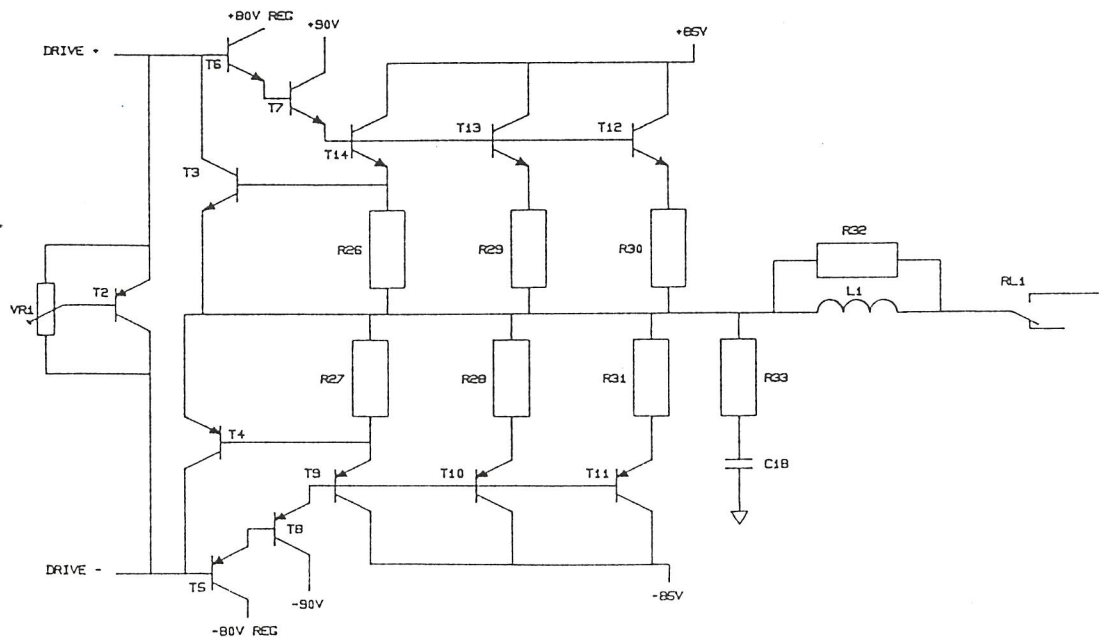


Fig 7 power amplifier

The driver circuit provides two signals, drive + and drive -. The positive drive current is boosted by T6 and T7 and fed to the NPN power transistors T12..T14. The negative drive current is boosted by T5 and T8 and fed to T9..T11.

T2 is set as a constant voltage source and provides the bias current for the amplifier.

Current limiting is handled by T3 and T4. When the current drawn from the amplifier rises, the voltage across R26 and R27 rises too. As soon as this voltage reaches a value of ± 0.65 V, T3 and T4 start to conduct and limit the drive current for the power stage. Current limiting is depending on the output voltage. At 0 V output the maximum current is ± 3 A rising to ± 12 A at 50 V.

5.5 The regulated power supply board

The regulated power supply provides 6 different low power voltages for both the preamplifiers, all relays and the digital circuit. First there are two 80 V voltages to feed the power amplifiers driver circuits.

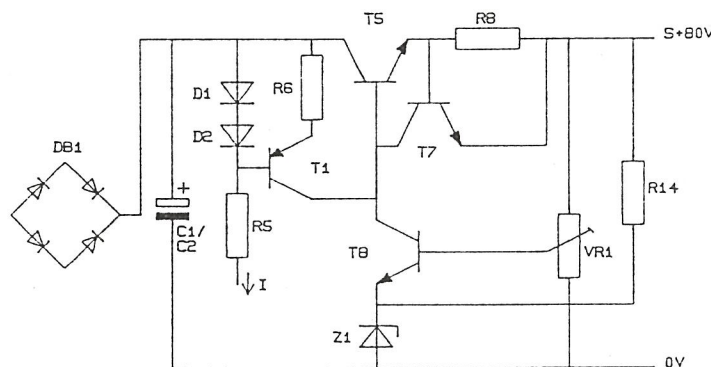


Fig 8 high voltage regulator

In this circuit (fig 8) T5 is the regulating transistor. Its base is fed by a current source built around T1, R6, D1 and D2. The base current is regulated by T8 which senses the output voltage through VR1. With VR1 the output voltage can be set. Current protection is arranged with T7. With increasing output current, the voltage drop across R8 increases and T7 starts deflecting T5's base current.

The negative 86 V supply is built in exactly the same way.

The 18 V supplies are straightforward, consisting of two integrated circuits.

The 5 V digital supply is extended with transistor T14, allowing larger currents. The unregulated voltage (10 V) is used as relay supply.



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5.6 The high power supply board

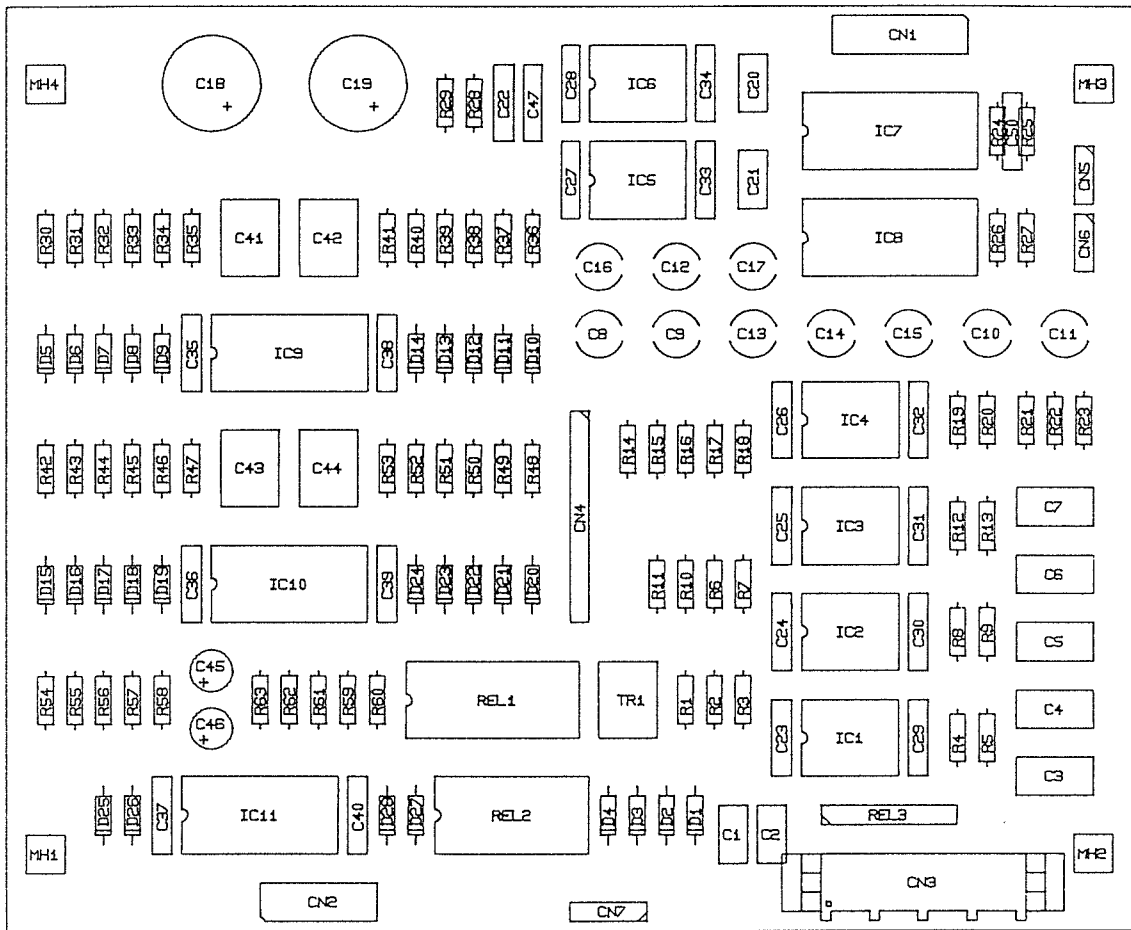
Both power amplifiers share a common power supply which delivers 4 different voltages: two high power 85 V voltages for the amplifiers power stage and two low power 90 V voltages for the driver transistors.

The high power voltages are rectified by a high power rectifier bridge which, for dissipation reasons, is mounted on the chassis. The energy is stored in two 22 mF / 100 V capacitors.

The low power voltages are on board rectified and the filter capacitors are placed on top of the high power voltages.

All capacitors are discharged by resistors when the power has been switched off.

The power supply board also contains a relay that connects the mains voltage to the primary windings of the transformer.



analog board