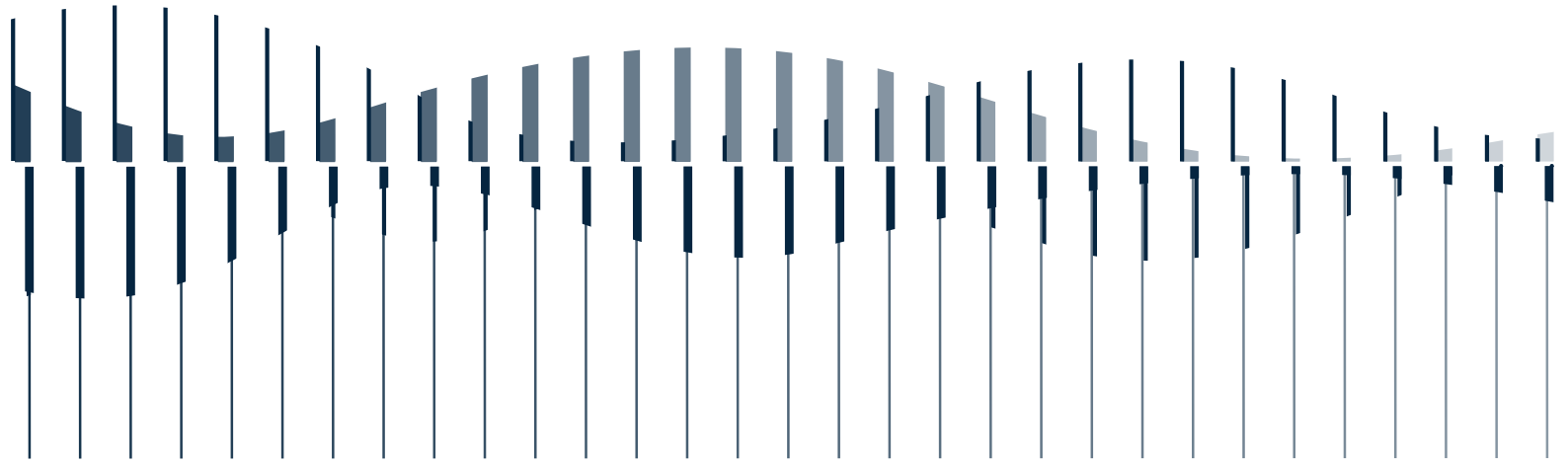
Instruction Manual

12AK Power Module



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GRAS

An Axiometrix Solutions Brand

Revision History

Revision	Date	Description
1	2005	First edition
2	2026-06-24	Addede section 4.5: Hum and Noise in your Measurement Setup. New GRAS logo, Small layout design changes.

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CONTENTS

1. Introduction and Description 4

1.1 Polarization Voltage 4

1.2 Preamplifier Voltage Supplies 4

1.3 Signal Conditioning 6

Frequency Response 6

Gain 6

1.4 SysCheck (System Check) 6

1.5 Power Supplies 6

1.6 Input/Output 6

2. External Features 7

2.1 Front Panel 7

2.2 Rear Panel 9

3. Internal Features 10

3.1 Battery Pack 10

3.2 User-servicable Switches 10

4. Operation 11

4.1 Batteries and External Power 11

4.2 Polarization Voltage and Preamplifier Supply Voltage 11

4.3 Filter and Gain Settings, and Direct Mode 11

4.4 SysCheck (System Check) 11

4.5 Hum and Noise in your Measurement Setup 12

Ground Loops: 12

Interference from other instruments, EMC Interference: 12

5. Service and Repair 12

6. Specifications 13

1. Introduction and Description

The GRAS Power Module Type 12AK (Fig. 1.1) is a single-channel power supply for preamplifiers used with condenser microphones. It is for general use in acoustic measurements as well as for intensity measurements; both in the laboratory and in the field.

It provides:

- a polarization voltage for a condenser microphone
- a voltage supply for powering a microphone preamplifier.
- a choice of signal conditioning.

A block diagram of its main components is shown in Fig. 1.2.

1.1 Polarization Voltage

The polarization voltage can be set to either 0 V or 200 V via an internal switch (see section 3.2). Use:

- 0 V for prepolarized microphones, and
- 200 V for externally-polarized microphones (default setting)

1.2 Preamplifier Voltage Supplies

The preamplifier voltage supply can be set to either 28 V DC or 120 V DC via an internal switch (see section 3.2). Use:

- 28 V for minimum power consumption (default setting), and
- 120 V for maximum dynamic range

Fig. 1.1 Power Module Type 12AK

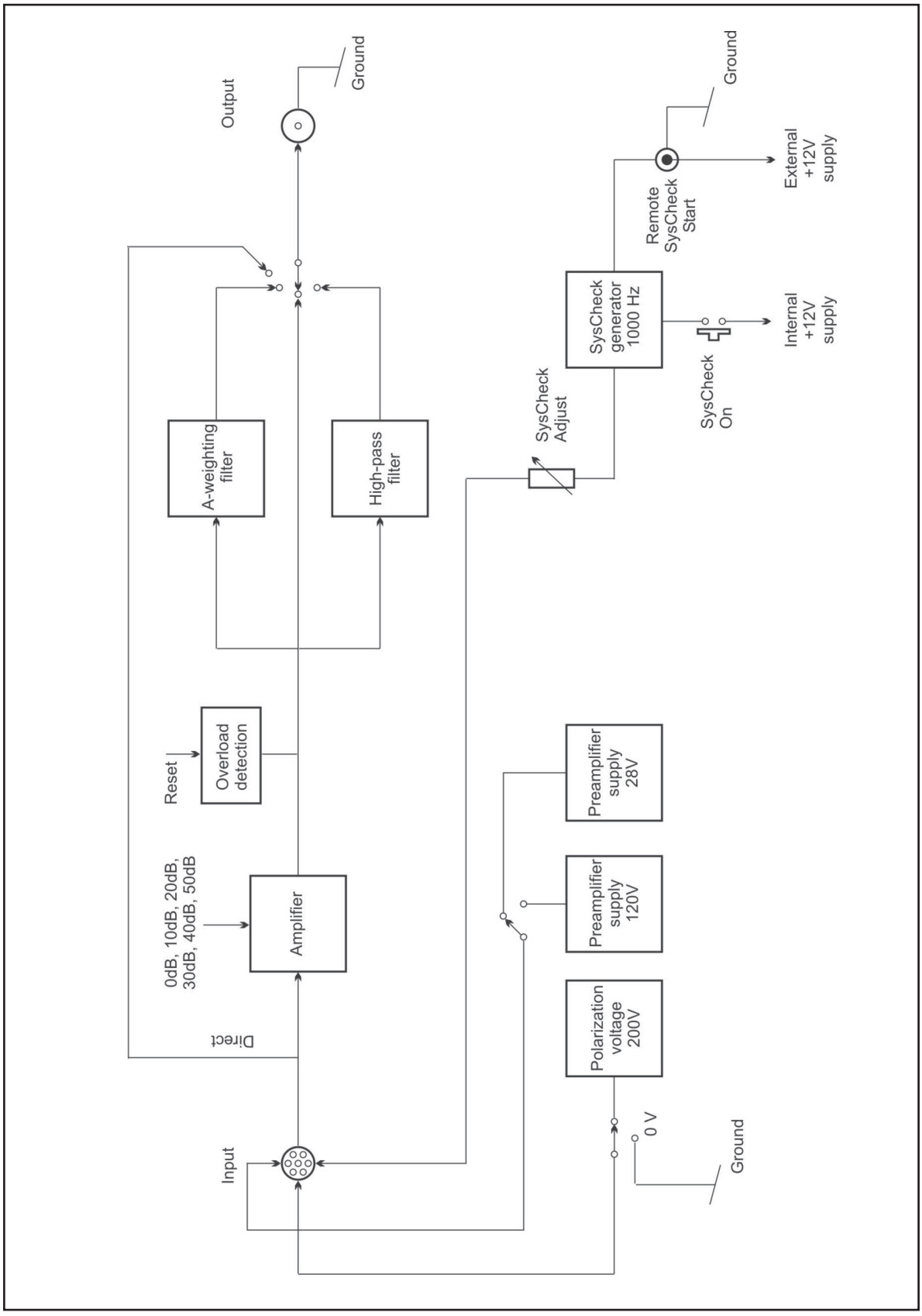

Fig. 1.2 Block diagram of the Type 12AK

1.3 Signal Conditioning

1.3.1 Frequency Response

The frequency response can be set to one of the following via a switch on the front panel (see section 2.1):

- Linear
- A-weighted
  via standard A-weighting filters fulfilling the requirements of IEC Standard 60651 “Sound Level Meters” Type 0.
- High-pass
  via a 3-pole Butterworth high-pass filter with a –1 dB cut off at a frequency of 20 Hz
- Direct-mode coupling
  the microphone signal from the preamplifier is coupled directly with the BNC output socket, thus by-passing all the above settings. Use this mode if extremely good phase response is required or for maximum upper limit of dynamic range.

1.3.2 Gain

The gain can be set to one of the following via a switch on the front panel (see section 2.1):

- 0 dB
- +10 dB
- +20 dB
- +30 dB
- +40 dB
- +50 dB

Note: Gain is disabled if Direct mode is selected.

1.4 SysCheck (System Check)

The Type 12AK has a built-in 1000 Hz SysCheck generator for verifying the stability of the complete measuring system including the microphone.

The signal level from the generator can be pre-adjusted before it is applied to the measurement set-up. A system check can be activated locally via a push button on the rear panel, or remotely via a Mini Jack socket also on the rear panel.

SysCheck (or similar technique) can be used with preamplifiers supporting this feature, e.g. the GRAS preamplifiers Type 26AJ and Type 26AL.

1.5 Power Supplies

The Type 12AK can run on internal batteries with a battery life of approximately 10 hours using GRAS preamplifiers, or from an external power supply of 12 - 18 V DC, e.g. the mains/line adapter included with the Type 12AK.

1.6 Input/Output

The Type 12AK has a 7-pin LEMO input for microphone preamplifier such as the GRAS Preamplifiers Types 26AM, 26AC and 26AK. Fig. 2.2 shows the wiring diagram of this input socket which is also compatible with a range of microphone preamplifiers from other suppliers such as Norsonic, L&D and Brüel & Kjær.

The output is available via a standard BNC socket for direct use with analyzers, voltmeters, oscilloscopes etc.

2. External Features

2.1 Front Panel

The front panel has the following features (see Fig. 2.1)

- Two LEDs: green “power OK”, red “Batt. Low”.
  If the power supply is correct, the green LED lights up. If the red LED lights up, either the batteries are low and should be changed (see section 3.1) or the external DC supply voltage is too low.
- **SysCh**eck **Adjust**ment potentiometer
  Use a small screwdriver to adjust the level of the SysCheck signal applied to pin 1 of the Preamplifier Input socket (Fig. 2.2). Signal adjustment ranges from 0 to 5.6 V RMS.
  (The SysCheck signal is applied when the **SysCheck Start** push-button on the rear panel is pressed - see Fig. 2.3).
- **Ovl** (oveload) **Reset**
  Press to reset (extinguish) the latched overload LED.
- **Overload** LEDs: both red
  Inst. lights instantaneously and only when there is an overload.
  Latch lights when there is an overload and remains lit (until reset via the **Ovl Reset** button).
- **Gain** switch
  Adjust the gain to suit requirements without overload (**Overload** LEDs light up). **Gain** settings are from 0 dB to +50 dB in 10 dB steps. Disabled if Direct mode is selected (see **Filter** below).

Fig. 2.1 Front panel of the Power Module Type 12AK

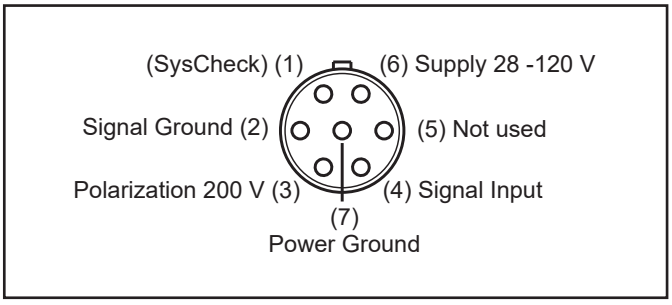

Fig. 2.2 7-pin LEMO female socket 1B (external view)

- **Filter** 4-position signal-conditioning switch;
  - **Lin.**
    routes the signal through the amplifier alone.
  - **AW**
    routes the signal through the amplifier and the A-weighting network.
  - **HP**
    routes the signal through the amplifier and the 20 Hz high-pass filter (e.g. to supress infra-sound).
  - **Dir.**
    selects the Direct mode and by-passes all **Gain** and **Filter** selections (see also section 1.3.1).
- Preamplifier **Input**
  7-pin LEMO input connector for microphone preamplifier. Wiring diagram shown in Fig. 2.2
- **Ouput**
  BNC socket for the output signal either via signal conditioning or directly from the microphone preamplifier.

2.2 Rear Panel

The rear panel has the following features (see Fig. 2.3)

- Power switch **I/0** (On/Off)
- Twist/release holder for 250 mA, 250 V low-impedance (<1.5 Ω) fuse.
- **Pol. Volt. 200 V**
  Test points for checking the 200 V polarization at source. Red +, Black ground. Independant of the selection of polarization voltage described in section 3.2.
- **SysCheck** push-button.
  Press and hold to activate the 1000 Hz SysCheck generator. The signal from the generator will be applied to pin 1 (see Fig. 2.2) of the Preamplifier Input socket.
- **Remote SysCheck Start.**
  Mini Jack input for remote SysCheck start. Apply a + DC voltage of 12 V to activate the SysCheck generator; centre pin +terminal.
- Input socket for an external power supply of **12 - 18 V DC**; centre pin +terminal. The use of an external power supply automatically disables power from the batteries.
- Locking screw
  Unscrew to remove baseplate and gain access to internal setting switches.

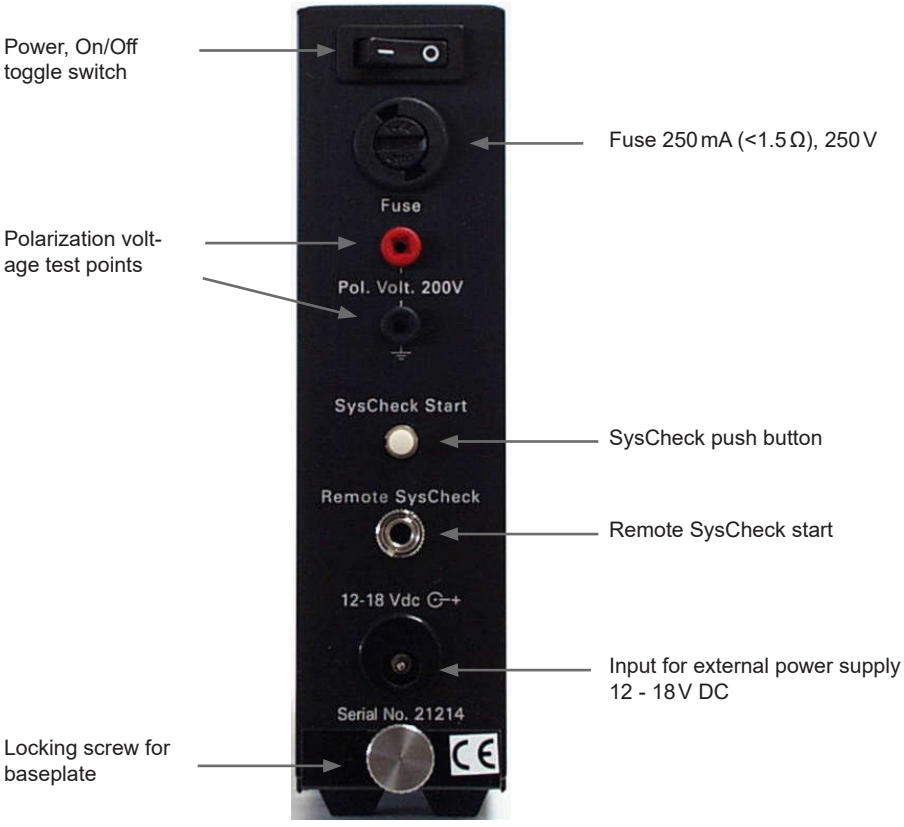

Fig. 2.3 Rear panel of the Power Module Type 12AK

3. Internal Features

Note: switch the Type 12AK off and disconnect it from any external power supply before removing the baseplate for any reason. Afterwards replace the baseplate.

The battery pack and user-servicable switches are contained within the cabinet of the Type 12AK. To gain access to these, first remove the knurled locking screw (see Fig. 2.3) and slide the baseplate off.

Fig. 3.1 Showing the battery pack of the Power Module Type 12AK

3.1 Battery Pack

Take out the battery tray (Fig. 3.1) and replace all the batteries (10 x LR6 (AA) standard alkaline cells), making sure that the polarity is as indicated on the battery tray.

3.2 User-servicable Switches

The (internal) user-servicable slide switches are shown in Fig. 3.2.

- **Preamplifier supply select** pair of switches:
  - **Polarization voltage** 2-position switch selects:
    0 V for prepolarized (electret) microphones
    or **200 V** for externally-polarized microphones
  - **Supply voltage** 2-position switch selects:
    120 V for maximum dynamic range
    or **28 V** for minimum power consumption

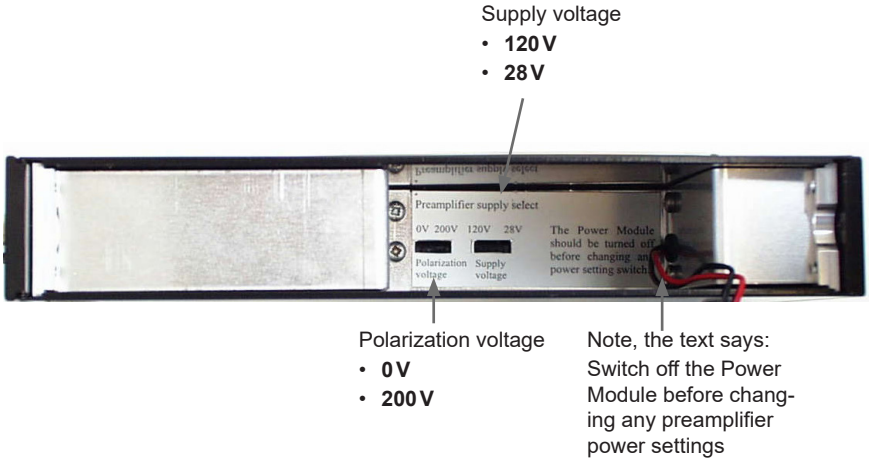

Fig. 3.2 Showing the internal switches of the Power Module Type 12AK

4. Operation

4.1 Batteries and External Power

The Type 12AK can be powered either by internal batteries (Fig. 3.1) or from an external power supply via the DC input on the rear panel (Fig. 2.3). If an external power supply is used, the batteries within the unit will be automatically disconnected. External power should be 12 - 18 V DC, typically from the mains/line adaptor included with the Type 12AK.

Whenever the Type 12AK is switched on, the green **Power On** LED on the front panel (Fig. 2.1) should always be lit to ensure correct operation. If red **Low Batt.** LED lights up, either the batteries are low and should be changed (see section 3.1) or the external DC supply voltage is too low.

4.2 Polarization Voltage and Preamplifier Supply Voltage

Polarization voltage can be switched from 200 V to 0 V (see section 3.2). Use 200 V for standard externally-polarized condenser microphones, and 0 V for prepolarized (electret) microphones.

Preamplifier supply voltage can be switched from 28 V or 120 V. Use 28 V for minimising power consumption, it is also sufficient for most applications but limits the dynamic range of the microphone preamplifiers used with the Type 12AK. Use 120 V to utilise the full dynamic range of the microphone preamplifier. In this case the dynamic range will be determined by the Type 12AK which should be switched to its Direct mode (section 3.2) or its Gain switched to 0 dB to avoid overload. Note: if a non GRAS preamplifier is used, check its supply-voltage specifications.

4.3 Filter and Gain Settings, and Direct Mode

The **Gain** switch can be used in conjunction with the first three positions of the **Filter** switch, viz. *(a)* **Lin.** (linear), *(b)* **AW** (A-weighting) or *(c)* **HP** (high-pass) filtering. The **Gain** switch is disabled if the **Filter** switch is set to **Dir** (direct mode).

In Direct mode, all amplification and filtering circuits are by-passed; the signal goes directly from LEMO input to BNC output.

Direct mode is preferable when very good phase response is required, e.g. when using the Type 12AK in intensity measurements , or for maximum upper limit of dynamic range. In this mode, the **Gain** switch on the front panel has no effect and the overload LEDs register nothing.

In all other modes the input signals can be amplified internally and passed through a selected filter. Use **Lin.** if no filtering is required. Use **AW** if A weighting is required by the measurement standard. Use **HP** if low frequencies (below 20 Hz) are to be suppressed, e.g. wind-induced noise.

4.4 SysCheck (System Check)

SysCheck (or similar technique) can be used with preamplifiers supporting this feature, e.g. the GRAS preamplifiers Type 26AJ and Type 26AL.

Use SysCheck to verify the stability of a complete measurement set-up. If the signal registered by the measuring equipment as a result of activating a SysCheck remains unchanged, then system stability (including the microphone) can be assumed.

4.5 Hum and Noise in your Measurement Setup

If you unexpectedly experience hum and noise in your measurement setup, this can be caused by ground loops or interference from other equipment, EMC interference.

Ground Loops:

Ground loops are primary caused by difference in electrical potential between the instrumentation in a measurement setup due to separate grounding points between the different instruments.

This can result in an unwanted current flow through the ground conductor, which will cause hum, buzz, and interference in the whole system, typically at lower frequencies around 50 – 60 Hz and their higher harmonics.

To avoid ground loops the different instruments in the measurement setup must be connected to the same power outlet or have the same ground connection.

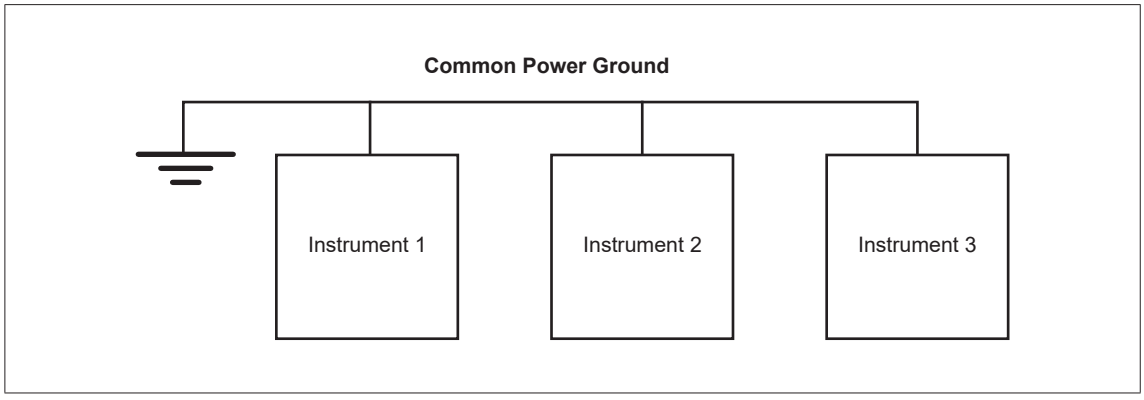

Fig. 4.1 *Correct Ground Connection*

Interference from other instruments, EMC Interference:

Other instruments might create a field which will interfere with the rest of the instruments in the measurement setup. This interference is normally caused by an electromagnetic interference. In most cases due to an electrical transformer and switching circuit, such as the one used in many Mains Power Supplies, such as GRAS AB0002, AB0003, AB0005 (12AL only) and AB0006, available for the GRAS Microphone Power Modules.

For switching circuit in power supply AB0005, the interference might be seen at the mains frequency and its higher harmonics as well as the switching frequencies.

Note: To avoid this interference, the instruments creating the electromagnetic interference must be isolated from the rest of the measurement setup. This can be done by moving these instruments away from the rest of the instrumentation and place signal cables as far away as possible from these instruments.

Note: Cables transporting high power might also interfere with low power signal cables. To avoid this, the High-Power cables must be separated from the signal cables and placed in a certain distance from each other.

5. Service and Repair

Repairs should be carried out only by qualified personal. The Power Module Type 12AK should not be dismantled with power on because of high-voltage circuits.

6. Specifications

Input/Output sockets:

Input:	7-pin LEMO 1B female
Output:	BNC coaxial

Gain:

0 to +50 dB in 10 dB steps, and direct-mode coupling

Output-voltages:

Preamplifier supply:	28 V or 120 V
Polarization voltage:	0 V or 200 V

Gain error:

<0.2 dB

Frequency response (Lin setting):

20 Hz - 20 kHz:	±0.2 dB
2 Hz - 200 kHz (gain ≤ +40 dB):	±1.0 dB
2 Hz - 100 kHz (gain = +50 dB):	±1.0 dB

Inherent noise:

(20 Hz - 20 kHz with input grounded)

A-weighted:	<2.8 µV
Lin:	<4 µV

(20 Hz - 20 kHz with GRAS preamplifier and 20 pF dummy microphone)

A-weighted:	<4 µV
Lin:	<5.6 µV

A-weighting filters:

Compliant with IEC 60651 Type 0 (see Fig. 6.1)

High-pass filter:

3-pole Butterworth, –1 dB at 20 Hz

Output impedance:

30 Ω

Power supply:

10 x LR6 (AA) standard alkaline cells, or

DC mains/line adapter supply: 12 V - 18 V

Power consumption:

With a G.R.A.S preamplifier using:-

120 V:	210 mA
28 V:	180 mA

Fuse:

250 mA (low impedance <1.5 Ω), 250 V

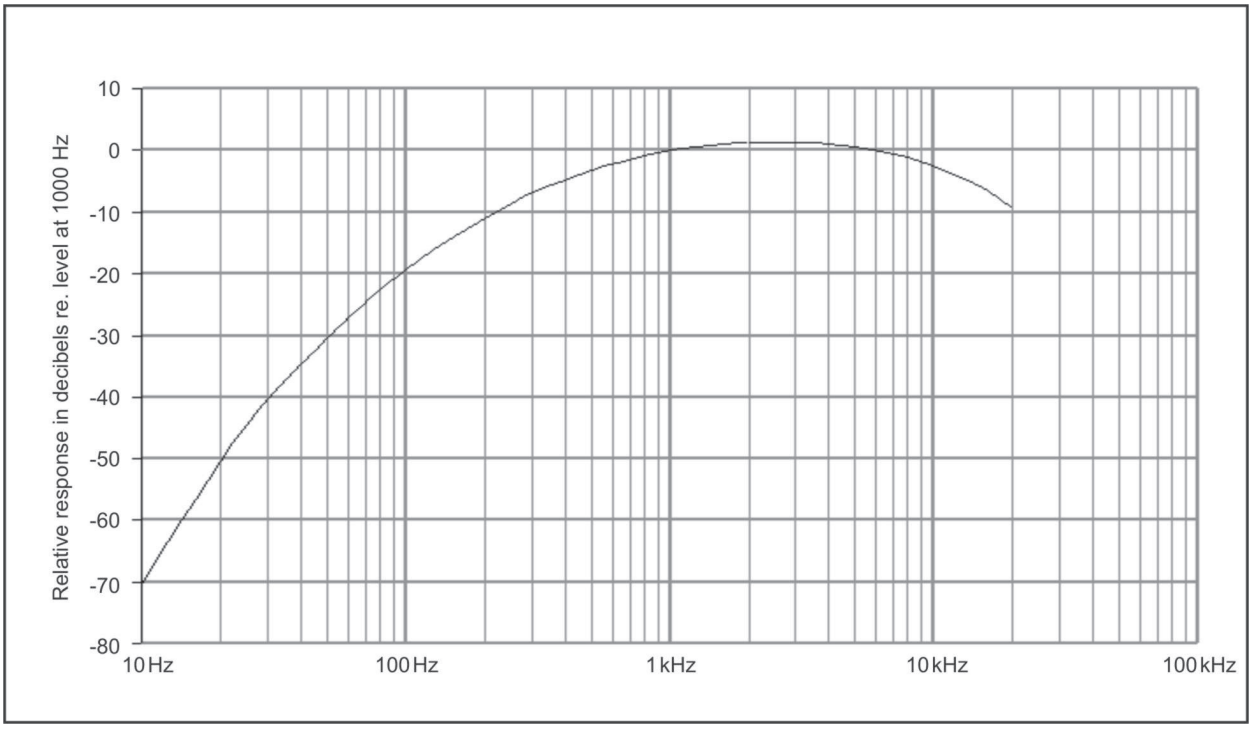

Fig. 6.1 Frequency resonse of A-weighting filter shown graphically

Battery life (valid for 23°C and alkaline cells) for:-

120 V supply:	≈9 hours
28 V supply:	≈11 hours

Operating temperature range:

-10 °C to +50 °C

Dimensions:

(1/12 of a standard 19-inch rack)

Height:	132.6 mm (5¼ in)
Width:	34.6 mm (1.3 in)
Depth:	196.0 mm (7.7 in)

Weight:

770 g (1.69 lbs)

Accessories included:

Mains/line adapter:

Europe:	AB0002
Or	
USA:	AB0003

Accessories available:

AK0040	19-inch Rack-mounting System

Manufactured to conform with:

CE marking directive: 93/68/EEC

WEEE directive: 2002/96/EC

RoHS directive: 2002/95/EC