GRAS 12AU 1-Channel Universal Power Module With Signal Conditioning And Power Amplifier Instruction Manual

GRAS Sound & Vibration

Instruction Manual

12AU 1-Channel Power Module
with Signal Conditioning and Power Amplifier

Contents

12AU 1-Channel Universal Power Module With Signal Conditioning And Power Amplifier

Revision History
Any feedback or questions about this document are welcome at gras@grasacoustics.com.

Revision	Date	Description
1	7 November 2012	Tentative version
2	14 December 2012	First publication
3	18 December 2012	Minor corrections to General Description
4	29 November 2016	Correction to page 10, amplifier input impedance
5	22 June 2017	Specs. for power amplifier output voltage swing changed to ±13.5 V
6	28 October 2021	USB cable connection warning added p. 21

General Description

The GRAS 12AU Power Module is a supply and conditioning amplifier for simultaneously powering a preamplifier for a condenser microphone and an amplifier for a loudspeaker or any other sound source using a loudspeaker/earphone/coupler. By design, it avoids system-generated noise, e.g. from ground loops. In a measurement set-up, the 12AU controls both the paths of the signal sent out to the loudspeaker and the resulting acoustic signal picked up by the microphone. In both cases, its set-up for handling these signals independently

comes under external control.
The 12AU is remote controlled entirely via its USB interface, and, for this purpose, is delivered with a control program for Microsoft Windows ® . Settings on the 12AU can be controlled by the control software's graphical user interface and easily confirmed by the LEDs on the front panel. See "Using the Graphical User Interface" on page 23 for instructions. It is also possible to operate the 12AU typing commands in its View Log window, see "Operating the 12AU Using Commands" on page 28.
It is optimized for computerized production line testing. Up to six 12AUs can be connected to and operated from the same PC.

Features

- Single channel conditioning amplifier for microphone preamplifier and speaker amplifier with measurement of current output
- Controls the paths of the outgoing and received signals at the same time
- Very low inherent noise
- The speaker input and the analogue outputs are floating with respect to common ground to avoid system-generated noise
- Measurement of loudspeaker impedance without disturbing the speaker
- Fulfils EMC requirements according to EU regulations
- Full remote control via USB interface
- LEMO input with 200 V polarization voltage for externally polarized microphone
- CCP input for prepolarized microphone
- Gain settings for noise and overload control:
  – Microphone conditioner: 0 to 50 dB in 10 dB steps
  – Speaker amplifier: –20 dB to +10 dB in 10 dB steps
  – Current output: 0 dB and +20 dB
- Filters:
  – Microphone amplifier: 1 Hz or 20 Hz
  – Speaker amplifier: DC or AC coupling (10 Hz)
- Comprehensive status and overload indication
- Rack mountable in 19" rack.

Microphone Conditioner

Input and output

The 12AU has two microphone inputs, a LEMO input for externally polarized microphones and a CCP input for prepolarized microphones.
The LEMO input has a 7-pin LEMO 1B socket for a microphone preamplifier such as the G.R.A.S. Preamplifiers 26AM, 26AC, and 26AK. Fig. 1 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 input impedance is 100 kΩ.

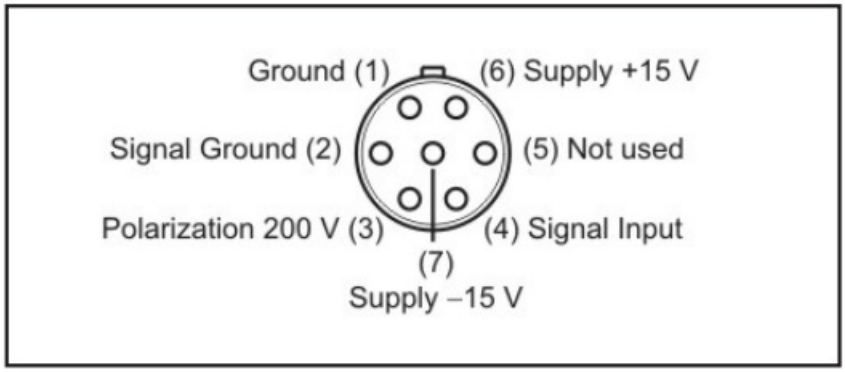


Fig. 1. *7-pin LEMO female socket 1B (external view).*

The CCP input has a standard BNC socket.
The Microphone Output is a standard BNC socket for direct use with analyzers, voltmeters, oscilloscopes etc.
The output is floating (2 kΩ//100 nF to common ground).
The output impedance is 100 Ω.

Input for Externally Polarized Microphone or Pre-polarized Microphone (CCP)

The 12AU has a 7 pin LEMO socket for a microphone with a LEMO type preamplifier and a BNC socket for a CCP microphone set.
The polarization voltage can be set to 200 V or 0 V, a green LED on the front indicates the currently selected polarization voltage.
The preamplifier voltage supply is ±15 V DC. The CCP supply is 4 mA.

Bandwidth, Filters and Noise

The bandwidth of the Microphone Conditioner is from 1 Hz to 100 kHz (–3 dB). A 20 Hz (Butterworth 3. order) high-pass filter can be selected remotely. A front-panel LED lights up when the filter is switched on.
The noise floor relative to input, with the input shorted, is (≥20 dB gain) <1.5 µVrms (20 Hz – 20 kHz). With the input loaded with a 20 pF dummy microphone, the noise is less than 5 µVrms (20 Hz – 20 kHz).

Gain

The gain can be set to one of the following: 0 dB, +10 dB, +20 dB, +30 dB, +40 dB or +50 dB (± 0.2 dB). One of a series of front-panel LEDs lights up to indicate the current gain setting.

Overload Detection

If either of the conditioning amplifier stages goes into overload, this is indicated by a red LED. Gain and filter settings can be optimized to improve headroom/reduce overloads.

Speaker Amplifier

The speaker amplifier has a bandwidth (-3 dB) from DC to 80 kHz (DC coupled) and from 10 Hz – 80 kHz (AC coupled). AC or DC coupling is set remotely.
Phase shift (input to output) is ≤ ±1° (DC to 20 kHz). The maximum output voltage is ±13.5 V, the maximum output current ±1.4 A. The current output (voltage/current ratio) can be set to 1 V/1 A or 10 V/1 A (remote controlled).

Input and output

The input connector is a standard BNC socket, floating with 10 kΩ//100 nF to common ground.
The input impedance is 10 kΩ.
The speaker amplifier has two outputs, a voltage output and a current output. The voltage output connector is a 2 pin LEMO (pin 1 is output, pin 2 is return). The current output connector (remote controlled) is a BNC socket, floating with 2 kΩ//100 nF to common ground.

Gain

The gain can be set in steps of 10 dB (±0.2 dB), from –20 dB to +10dB. One of a series of front panel LEDs lights up to indicate the current gain setting.
Overload
Voltage and current overload detection are indicated by separate LEDs on the front panel (remote controlled reading and reset).

Monitor Section

The signals that are fed to and taken out of the 12AU can be monitored via the monitor BNC output socket. Front panel LEDS indicate the actual selection: Mic Out, Amp In., Amp Out, Current Out.

Power Supply

The 12AU can be powered from a mains/line supply of either 115 V AC or 230 V AC , selected with a switch on the rear panel.

Physical Interface

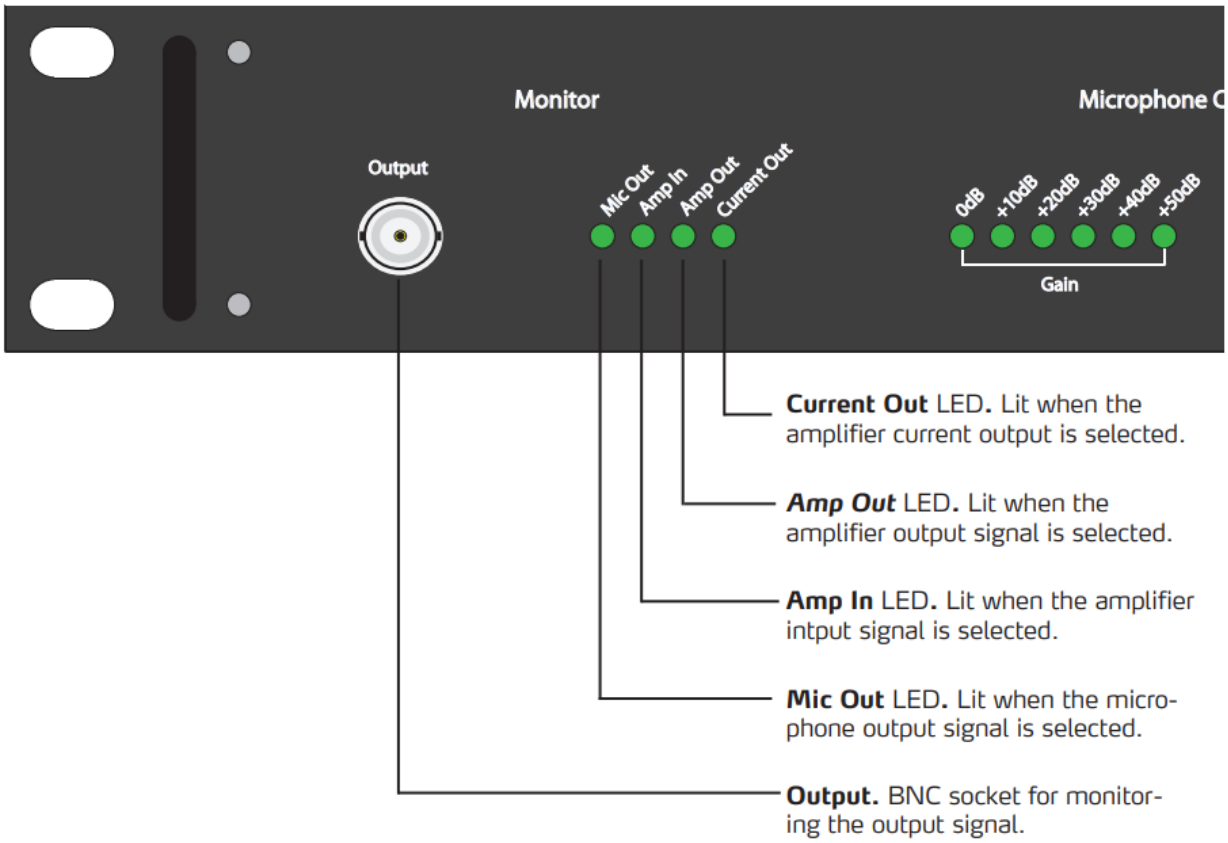
Front Panel

The 12 AU is designed for mounting in a 19” rack.

When the 12AU is switched on, the default settings will be applied. All LEDs are lit for a few seconds to show that the 12AU is working properly. After approximately 10 seconds, it switches to operational mode.
Selections are made via the USB connection on the rear panel using the accompanying control software.

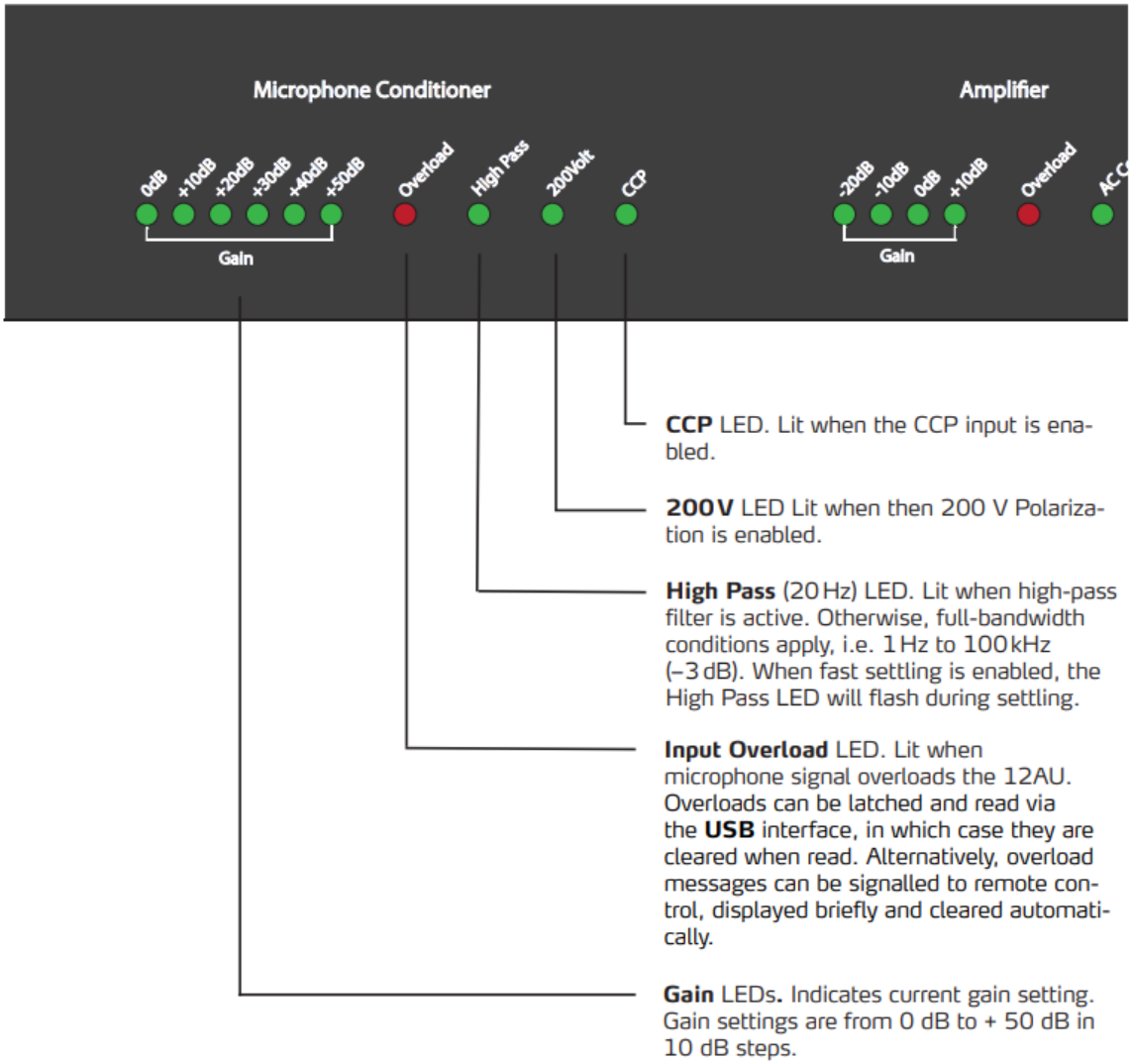
The Monitor Section

The Monitor function of the 12AU makes it possible to monitor the input and output signals via separate sockets, one on the front and another on the back.



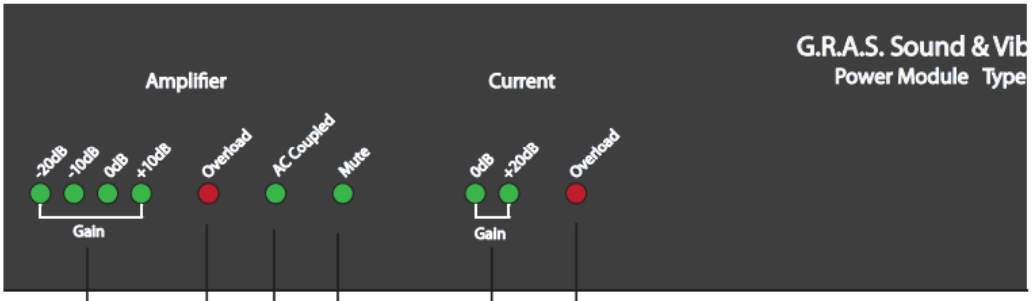
Microphone Conditioner Section

These LEDs indicate the current preamplifier-input status which is controlled via the USB interface connection on the rear panel.



Amplifier Section

These LEDs indicate the status of the amplifier which is controlled via the USB interface connection on the rear panel. The amplifier can be set to voltage or current amplification, with separate gain and overload settings for each mode.



Current overload LED. Lit when current output goes into overload. Overloads can be latched and read via the **USB** interface, in which case they are cleared when read. Alternatively, overload messages can be signalled to remote control, displayed briefly and cleared automatically.

Current Gain LED. The LED indicates the actual current gain setting, 0 dB or +20 dB.

Mute LED. Lit when output is muted.

AC-Coupled Lit when output is AC-coupled. When not lit the output is DC-coupled.

Overload LED. Overloads can be latched and read via the **USB** interface, in which case they are cleared when read. Alternatively, overload messages can be signalled to remote control, displayed briefly and cleared automatically.

Gain LEDs. Indicates the actual gain setting. Gain settings are from –20 dB to + 10 dB in 10 dB steps.

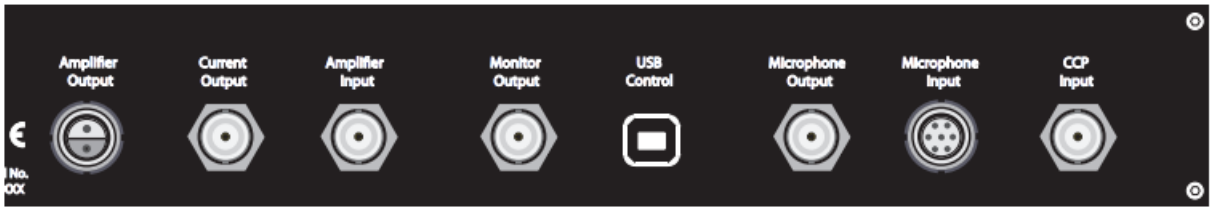
Rear Panel

Mains Input and Voltage Setting

Voltage Setting Switch for either 115 VAC or 230 VAC.

Mains Input and Fuse Holder. Input socket for either 115 VAC or 230 VAC mains supply. Fuse holder for 1 A slow fuse.

Monitor and Amplifier Sockets



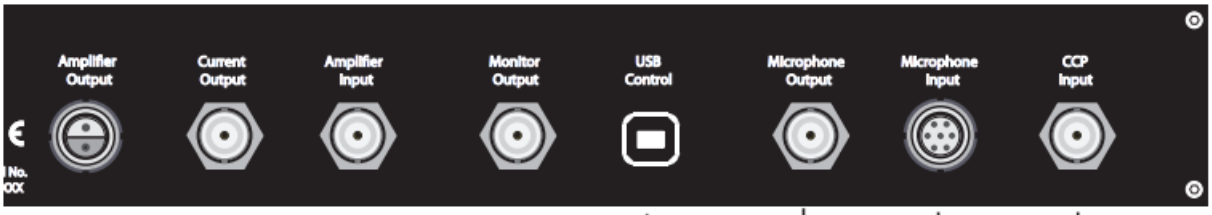
Monitor Output. BNC output socket for monitoring the currently selected signal. Output impedance is 100 Ω. Also repeated on the front panel.

Amplifier Input. BNC input socket for signal to the speaker amplifier, for example from a signal generator. Input impedance is 10 kΩ.

Current Output. BNC output socket for a voltage signal proportional to the current through the output circuit of the speaker amplifier.

Amplifier Output. 2-pin LEMO connector for a loudspeaker with an impedance of 2 Ω or more.

USB and Microphone Sockets



USB Control. USB socket for connection to a USB computer port.

Microphone Output. BNC output socket for the microphone signal.

Microphone Input. 7-pin LEMO input connector for microphone preamplifier. The wiring diagram is shown in Fig. 1.

CCP Input. BNC Input connector for Constant Current Powered transducers.

The 12AU Behavior and Protocol Specification

Interface and Protocol Specification

Compatibility

The 12AU protocol specification complies with the 12AP specification version 1.2, where applicable.
(The Floating command is omitted).

USB Interface

There is no flow control/handshaking; therefore commands must be sent one by one, waiting for the response.
The input buffer is 64 bytes, in case of overflow a response: “Buffer overflow” will be submitted.
This will not happen under normal conditions.

12AU Startup Sequence

After power on or restart, the 12AU immediately initializes the settings of 12AU to current default settings and turns on all LEDs.
If connected to PC, the OVL leds will be turned off when then USB connection is established, typically after 4 seconds from power on.
Appoximate after 8 seconds the IRQ and overload system is enabled, the LED will reflect the setting and a Reset<crlf> is submitted.

Behavior

A watchdog is enabled. It will restart 12AU if the processor stops working – this will send the string Reset<crlf> to the host. In this case the host knows that the fault has occurred and will be able to reinitialise 12AU.

Commands

Note: <LF> in input will be ignored, and commands are in uppercase.

List of Commands and Responses

Microphone Conditioner

CCP	
CCP Y<cr>	CCP input enabled.
CCP N<cr>	CCP input disabled.
Gain	
G0<cr>	set the conditioning amplifier gain to 0 dB.
G10<cr>	set the conditioning amplifier gain to 10 dB.
G20<cr>	set the conditioning amplifier gain to 20 dB.
G30<cr>	set the conditioning amplifier gain to 30 dB.
G40<cr>	set the conditioning amplifier gain to 40 dB.

G50<cr>	set the conditioning amplifier gain to 50 dB.
Polarization Voltage	
P200<cr>	set polarization voltage to 200 V.
P0<cr>	set polarization voltage to 0 V.
High Pass Filtering	
HP1<cr>	set the conditioning amplifier high pass filter to 1 Hz.
HP20<cr>	set the conditioning amplifier high pass filter to 20 Hz.
HP20L<cr>	set the conditioning amplifier high pass filter to 20 Hz with gain applied late in the ch ain.
Overload Handling	
LATCH<cr>	set the conditioning amplifier to latch overloads. Overloads are latched, and cleared when read. No overload messages will be sent.
OVLTM M<cr>	set the conditioning amplifier hold time for overload to minimum.
OVLTM #<cr>	set the conditioning amplifier hold time for overload to # sec. (1s. default).
OVLLED Y<cr>	set the conditioning amplifier to display overload. (default).
OVLLED N<cr>	set the conditioning amplifier to not display overload. (not recommended).
Speaker Amplifier	
SG-20<cr>	set the speaker amplifier gain to –20 dB.
SG-10<cr>	set the speaker amplifier gain to –10 dB.
SG0<cr>	set the speaker amplifier gain to 0 dB.
SG10<cr>	set the speaker amplifier gain to 10 dB.
SMUTE Y<cr>	mute speaker amplifier.
SMUTE N<cr>	enables speaker amplifier.
SHP0<cr>	DC couples speaker amplifier.
SHP10<cr>	AC couples speaker amplifier HP 10 Hz.
Overload Latching	
SLATCH<cr>	set the speaker amplifier to latch overloads overload’s are latched, and cleared when read. No overload messages will be sent.
Gain	
CG0<cr>	set the speaker amplifier gain to 0 dB.
CG20<cr>	set the speaker amplifier gain to 20 dB.
Current Overload Latching	

CLATCH<cr>	set the speaker amplifier to latch current overloads. Overload's are latched, and cleared when read. No overload messages will be sent.
Fast Settling	
FastSettling #<cr>	Set the period of fast settling to [#] sec. Enabling fast settling after change of setup in # sec. (Inserts HP50Hz for [#] sec.)
FastSettle<cr>	Enables fast settling in the predefined period, the period is defined with the comman d FastSettling #

Monitoring	
Monitor Conditioning<cr>	sets monitor to Conditioning Amplifier Output.
Monitor Speaker in<cr>	sets monitor to Speaker Amplifier Input.
Monitor Speaker out <cr>	sets monitor to Speaker Amplifier Output.
Monitor Current<cr>	sets monitor to Current Amplifier Output.
MLATCH<cr>	set the Speaker Amplifier to latch current overloads. Overload's are latched, and cleared when read. No overload messag es will be sent.
The Monitor Conditioning amplifier does not sent overload messages.	
Special Commands	
MSG<cr>	set the Conditioning amplifier to submit an overload message when it s overload status changes, returns actual overload status: OVL_on < crlf> or OVL_ off<crlf>, overload is not latched.
OVL<cr>	reads overload status, and returns OVL_on <crlf> or OVL_off <crlf>. Latched overloads will be reset by reading the status.
SMSG<cr>	set the speaker amplifier to submit an overload message when its vol tages overload status changes, returns actual overload status: SOVL _on <crlf> or SOVL_off <crlf>, overload is not latched.
SOVL<cr>	reads overload status, and returns SOVL_on <crlf> or SOVL_off <crlf >. Latched overloads will be reset by reading the status.
CMSG<cr>	set the Speaker amplifier to submit an overload message when its cu rrent overload status changes, returns actual overload status: COVL _on <crlf> or COVL_off <crlf>, overload is not latched.
COVL<cr>	reads overload status, and returns COVL_on <crlf> or COVL_off <crlf >. Latched overloads will be reset by reading the status.
MMSG<cr>	set the Monitor rear output to submit an overload message when its o verload status changes, returns actual overload status: MOVL_on <c rlf> or MOVL_ off <crlf>, overload is not latched.
MOVL<cr>	reads overload status, and returns MOVL_on <crlf> or MOVL_off <crl f>. Latched overloads will be reset by reading the status.
INFO<cr>	is equivalent to sending the commands TYPE, SERIAL and FIRMWA RE.
TYPE<cr>	returns: G.R.A.S. Type 12AU <crlf>.

SERIAL<cr>	returns: Serial no.: xxxxx <crlf>.
FIRMWARE<cr>	returns: Firmware ver. 1.1 <crlf>.
G<cr>	returns: conditioning Gain: 50dB, 40dB, 30dB, 20dB, 10dB or 0dB.
SG<cr>	returns: speaker Gain: -20dB, -10dB, 0dB or 10dB.
SMUTE<cr>	returns: Speaker enabled or Speaker muted.
CG<cr>	returns: current Gain: 0dB or 20dB.
HP<cr>	returns: Conditioning filter: 0.7Hz, 20Hz or 20Hz late gain.
SHP<cr>	returns: Speaker filter: 0Hz or 10Hz.
Monitor<cr>	returns: selected monitor: Conditioning, Speaker in, Speaker out or Current.
Name<cr>	returns: User selected name of the unit.
Name “text”	saves the text in 12AU as a user selected name of the unit, the USB connection is disabled during this and 12AU restarts when ready.
Pol<cr>	returns: Polarization voltage: 0V or 200V.
CCP<cr>	returns: CCP status: enabled or disabled.
FastSettling<cr>	returns: FastSetling time: #.# S.
OVLTM<cr>	returns: Overload hold time: #.# S.
T<cr>	returns: speaker amplifier temperature in deg C°.
Special Responses	
Reset<crlf>	submitted when 12AU is powered on.
OVL_on<crlf>	submitted when OVL is received or in message mode when conditioning amplifier overload status changes. It reflects the overload status.
OVL_off<crlf>	see OVL_on<crlf>.
SOVL_on<crlf>	submitted when SOVL is acquired or in message mode when speaker voltages overload status changes. It reflects the overload status.
SOVL_off<crlf>	see SOVL_on<crlf>.
COVL_on<crlf>	submitted when COVL is acquired or in message mode when speaker amplifier current overload status changes. It reflects the overload status.
COVL_off<crlf>	see COVL_on<crlf>.
MOVL_on<crlf>	submitted when MOVL is acquired or in message mode when Monitor rear output overload status changes. It reflects the overload status.
MOVL_off<crlf>	see MOVL_on<crlf>.

Overload Response in Latch Mode

For each of the overload detectors, an internal overload status flag is reflecting the actual overload condition. The overload status flag will be set when an overload occurs.

In latch mode, the status flag and the LED will be set by an occurrence of overload. It can only be reset after the

overload condition has been removed and the overload status is read by sending the OVL<cr> command (SOVL, COVL or MOVL respectively).
Note: The command: OVLLED N<cr> will disable the conditioning amplifier's overload LED, the behavior in all other ways is unchanged.
Note: the Monitor rear output has no overload LED indication, it can only be read via the USB interface.
Overload Response in Message Mode
When an overload detector is in message mode, the respective overload LED will follow the overload status flag, unless it is disabled by the command: OVLLED N<cr>.
The Overload LED will light under overload condition; it will turn off approximately one second after the condition has been removed. For the conditioning amplifier, the time can be shortened by the command: OLVTM M<cr>.
When the overload state changes, the message sent will be:
OVL_on<crlf> or OVL_off<crlf> or
SOVL_on<crlf> or SOVL_off<crlf> or
COVL_on<crlf> or COVL_off<crlf> or
MOVL_on<crlf> or MOVL_off<crlf>.
If an overload occurs while a command is sent to the 12AU, the overload status will not be read and no response sent back until the command has been processed.
Restart and Default

Restart<cr>	Restarts 12AU.
Factory_default<cr>	Loads factory default values,
Load_default<cr>	Loads current default values
Save_default<cr>	Saves current setup values as default, the USB connection is disabl ed during this and 12AU restarts when ready.

Default Settings
The conditioning amplifier powers up in default mode, which can be user defined. The factory defined default mode is:

- Conditioning amplifier gain 0 db
- Conditioning amplifier polarization 200 V
- Conditioning amplifier high pass filter 1Hz
- Displays overload
- Overload hold time 1 sec.
- Overload mode is Message mode
- Speaker amplifier gain –20 dB
- Speaker enabled.
- Speaker amplifier high pass filter 10 Hz
- Current output gain 0 dB
- CCP input disabled
- FastSettling disabled
- Monitor set for Conditioning amplifier

Installing the USB-driver and Control Software

The 12AU is operated remotely via its USB interface. Before connecting the 12AU to your computer, you need to install the USB driver and the control software for the 12AU.
Important: Do not connect the 12AU to the PC before installing the device driver.
If you already have done so, you need to update the driver from the Device Manager with the one found on the

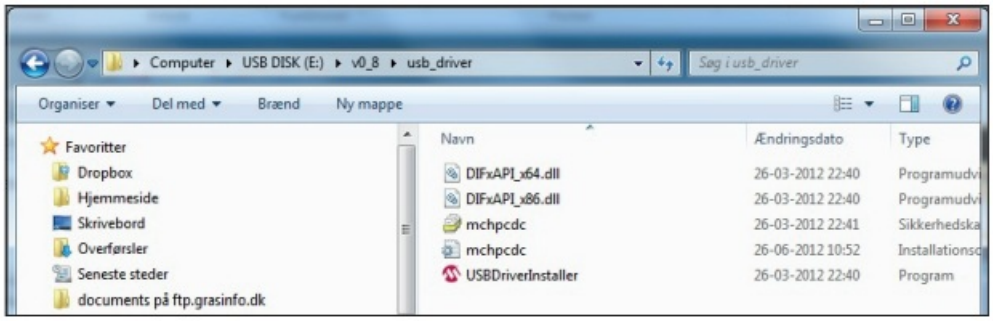
USB stick in the directory usb_driver! Refer to “Updating the USB driver” on page 30 for information on how to do this.

Installing the USB Driver

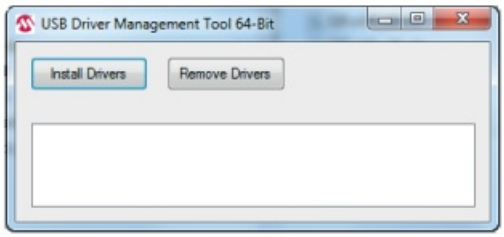
Prior to connecting the 12AU, you must install the dedicated USB device driver on the PC that you will use to operate the 12AU.

Important. The installation requires that you are logged in as administrator on the PC.

1. Insert the 12AU USB stick delivered with the 12AU in your PC.
2. In Windows Pathfinder, open the 12AU Installation USB.
3. Open the usb_driver directory containing the USB driverinstaller.



4. Click on the USBDriverinstaller Icon.



5. Click on the Install Drivers button and wait for confirmation.

If you have already connected the 12AU, the installation will fail and you need to remove the Windows USB driver manually by updating the USB driver using the Windows Device Manager.

For instructions on how to do this, see “Updating the USB driver” on page 30.

Installing the Control Software

Introduction

The control software for the 12AU is installed from the installation USB. Windows XP, Windows Vista, or Windows 7 is required.

Screen resolution must be set to 1024 x 768 or higher.

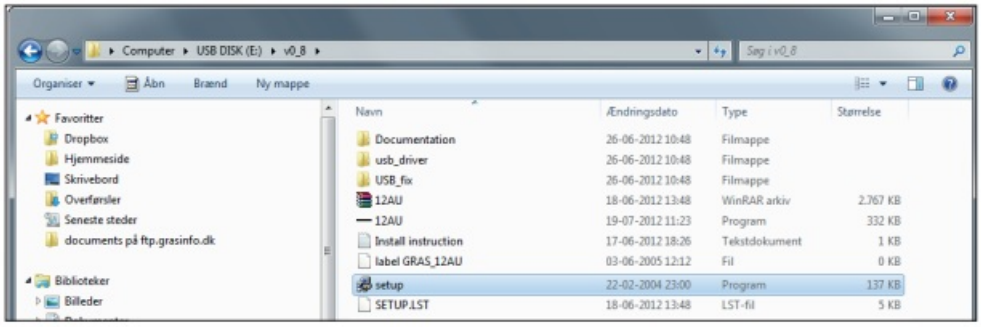
Important. The installation requires that you are logged in as administrator on the PC.

Requirements

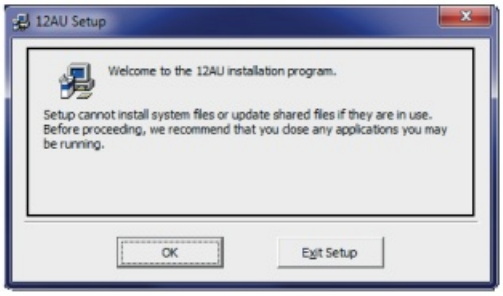
- Operating system: Windows XP, Windows Vista, or Windows 7.
- Screen resolution 1024 x 768 or higher.
- A mouse or other suitable pointing device.
- USB port.

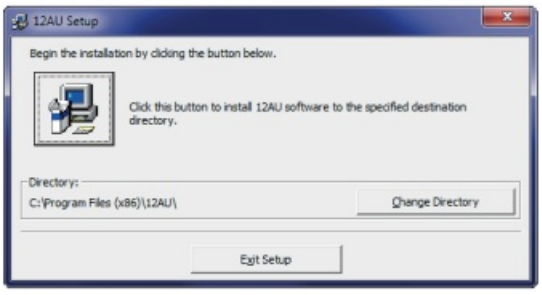
Installation

1. Insert the Control software USB stick for 12AU in your computer.

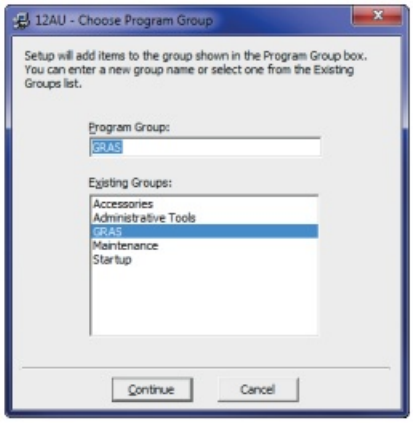


2. Run setup from the root of the installation disk.





1. Click OK (left) , then click the Installation button (right).



When the installation is complete, the control software will be selectable in the program list as 12AU. Once installed, you can drag and drop a shortcut icon from the Windows program list to your desktop.
If the control software does not appear in your program list, you can find it in the folder in which it has been installed. In the example above, that folder is GRAS.
You can operate the 12AU using its graphical interface and a mouse. How to do this is described in “Using the Graphical User Interface” on page 23. Alternatively, you can enter commands in the View Log window. How to do this is described in “Operating the 12AU Using Commands” on page 28.

Preparing the 12AU for Measurements

Cables and Connections

Important! 12AU must be turned off before connecting or disconnecting the USB cable.
Important! Before connecting the 12AU to your PC, you should install the USB driver. Refer to “Installing the USB Driver” on page 18 for instructions.
A typical set-up for testing the loudspeaker of a telephone is shown in Fig. 3 below.

- The signal for the measurement is generated by a signal generator and fed via a BNC cable to the power amplifier.
- The output of the amplifier is taken out as a voltage signal (2-pin LEMO) or a current signal (BNC) and fed to the test object.

- The microphone in the coupler can be an externally polarized microphone (connected with 7-pin LEMO), or a prepolarized microphone connected with a BNC cable.
- The signal picked up by the microphone is fed to the analyzer via a BNC cable.
- For comparison, these signals can be monitored separately during the measurement.
  Connection is via BNC and the monitoring is software-controlled.

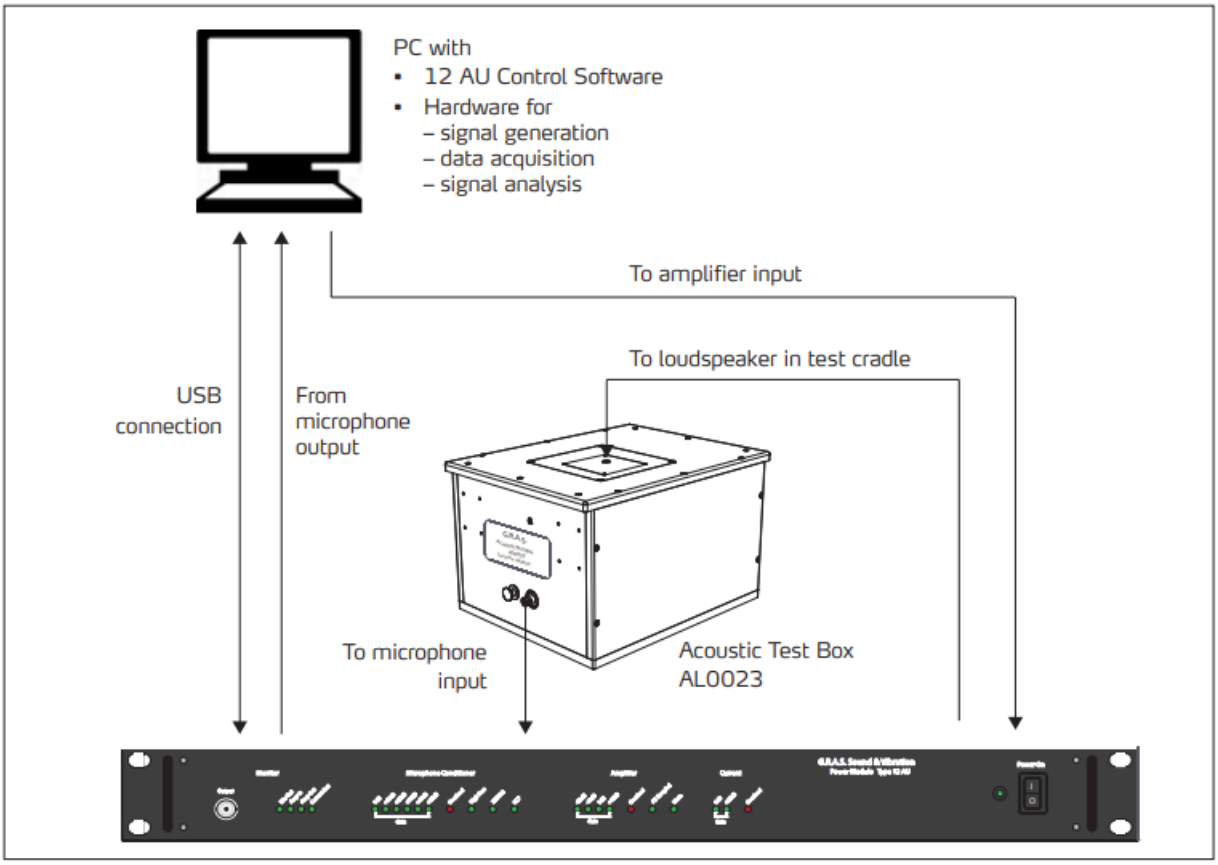


Fig. 3. A set-up for production test a loudspeaker withthe Acoustic Test Box AL0023

Multi-channel Measurements

The 12AU is designed especially for production line testing.
Multiple 12AUs can be set up for simultaneous monitoring of separate production lines, using the same PC as the common control center.
Physically, all 12AUs are connected as shown in Fig. 3 on page 21, but all connected to the same PC via USB.
You can launch a separate instance of the control software for each 12AU connected to the PC.
The control software will automatically look for a 12AU and lock to its serial number.
Each 12AU can be given a name/assigned an identification, making it easy to separate it from other 12AUs controlled from the same PC. For information about how to do this, see “Save Settings as Default in 12AU” on page 27.
Important. Before connecting the 12AU to your PC, you must install the USB driver. Refer to “Installing the USB Driver” on page 18 for instructions.

Operating the 12AU via its PC Application

This section describes how to operate the 12AU using its graphical user interface. Alternatively, you can use commands. How to do this is described in “Operating the 12AU Using Commands” on page 28.

Using the Graphical User Interface

To launch the 12AU control software, select it from the Windows program list.

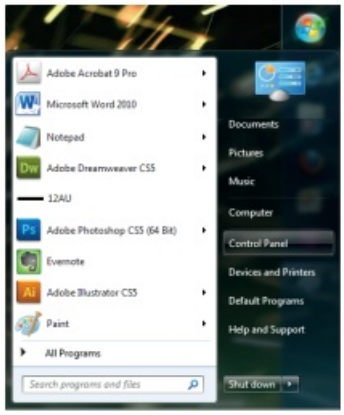


Fig. 4. The 12AU in the Windows program list.

When the control software is launched, the user interface shown in Fig. 5 is displayed.

Fig. 5. The 12AU User Interface

The 12AUs graphical user interface resembles the front panel. You can operate the 12AU using the pull down menus and by clicking the LEDs representing the settings of the sections of the 12AU.

Selecting Settings

1. Change a setting by clicking the LED symbol below the setting in question. The LEDs will turn green or get dimmed to confirm your choice.

All the settings shown on the user interface can be chosen in this way. For example, you can select 200 V polarization voltage by clicking on the corresponding LED.

The application will store the settings for each 12AU in the Windows registration data base, and will start as when it was closed.

The Setup Menu

The Setup menu lets you select how Overload and Settling time are handled.

Fig. 6. The 12AU's overload handling modes

- Latched polling 1s
- Latched polling 5s
- Latched, click LEDs to read and reset
- Messaged
- Messaged, latched, click LED to reset

Fig. 7. The 12AU's fast settling modes

- Disabled

- 0.5 sec
- 1 sec
- 3 sec

The Tools Menu
In the Tools menu, you can

- Activate the View log window in which you can monitor the communication between the control application and the 12AU. See “View Log” on page 25.
- View amplifier temperature, See “View Temperature” on page 25.
- Enlarge the graphical user interface. See “Enlarge the Graphical User Interface” on page 25.
- Select Enable advanced, allowing you to
  – assign a name to 12 AU, See “Assign a Name” on page 26.
  – save actual settings as default setup in 12AU. See page 27.
  – choose to operate the 12AU using commands. See page 28.
  These functions are described in detail on the following pages.

*Fig. 8. The **Tools** menu*

View Log
Selecting the View log option lets you monitor the communication to and from the 12AU. In Fig. 9 an example of this is shown, The example shows how the default setup used by 12AU upon power up is displayed.

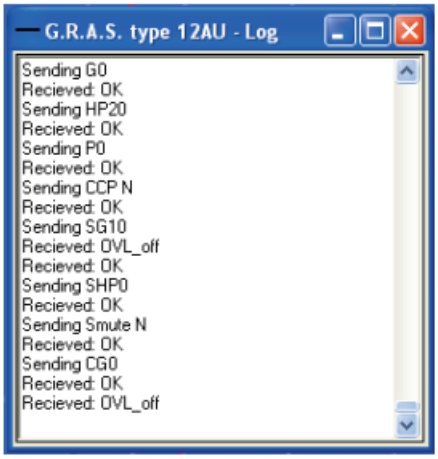


***Fig. 9.** The 12AU log, here showing the default settings after power up.*

View Temperature
In the Tools menu, you can enable monitoring of the amplifier temperature (View amplifier temperature). The actual temperature is shown in the status bar, see Fig. 10.

***Fig. 10.** 12AU with **View amplifier temperature** enabled*

Enlarge the Graphical User Interface
In the Tools menu, you can select to Enlarge the graphical user interface. The result is shown in Fig. 11.

*Fig. 11. 12AU with **Enlarge** enabled*

Enable Advanced
Selecting the Enable advanced option activates a number of functions that otherwise are hidden and therefore inaccessible.

- You can give the 12AU a name. This is useful if you will be operating more than one 12AU from the same PC.
- You can Save setup as default in 12AU. This is used to store the actual settings in the 12AU.
- You can choose to operate the 12AU in command mode. See “Operating the 12AU Using Commands” on page 28 for further information.

To enable advanced:

1. Select Enable Advanced, The Advanced password pop up window will appear.

*Fig. 12. The **Advanced password** pop up window*

   To access this function, you need to enter the password gRas in the Advanced password pop up window. This password is hard-coded into the firmware and cannot be changed. You must type it exactly as shown here.
2. Type gRas and press Enter. The name field shown in the status bar appears, see Fig. 13

Assign a Name
When you have entered the password, you can give the 12AU a name in the name field shown in the status bar, see Fig. 13.

Fig. 13. The 12AU interface with the name field in the status bar enabled

1. Type a name, press Enter.

The 12AU will disconnect and reestablish the connection to the PC application. After a few seconds, its new name will be shown in the status bar as shown in Fig. 14

Fig. 14. *The 12AU interface, with a name in the status bar*

As long as the Enable advanced function is enabled, the name can be changed (and the other advanced functions are accessible). If you want to disable advanced at this point:

Disable Advanced

1. Click on the Tools menu as shown in Fig. 15

Fig. 15. *12AU ready for disabling of* ***Enable advanced***

2. Click on Enable advanced to remove the disable Enable advanced option.

Fig. 16. *The 12AU interface with name in the status bar.* ***Enable dvanced*** *is disabled and the name cannot be edited.*

To edit the name or access the other Enable advanced functions, you need to proceed as described in “Enable Advanced” on page 26.

Save Settings as Default in 12AU

It is possible to store the actual settings as default setup in the 12AU. This feature makes it possible for the 12AU to start up in a user defined setting independently of the control software and the communications link to the PC.

Fig. 17. *When* ***Enable advanced*** *is chosen, you can save the setup as default in 12AU.*

1. In the Tools menu, select Enable advanced as described on page 26.
2. Enter the password gRas as described on page 26.
3. Select the settings you want by clicking the appropriate LEDs.
4. Select Save setup as default in 12AU.

   Now the 12AU will restart and reconnect to the PC.

The Help Menu

The Help menu shows the actual version of the control software, see Fig. 18

*Fig. 18. 12AUs **Help** menu*

Operating the 12AU Using Commands

This section describes how you can operate the 12AU using commands comprising ASCII characters.
They are entered and responses viewed in the G.R.A.S Type 12AU log window found in the Tools menu as shown in Fig. 19.

*Fig. 19. The **G.R.A.S Type 12AU log** window is accessed from the **Tools** menu. Here you can enter commands and view responses. When command mode is used, the graphical user interface disappears from the screen.*

Entering Command Mode

To operate the 12AU in command mode, you must first Enable advanced in the Tools menu and then enter the password as described on page 26. Proceed as follows:

1. Click on the Tools menu.
2. Select Enable advanced.
3. Type the password in the Advanced password window
4. Select View log to display the Type 12AU Log window
5. In the Tools menu of the GRAS Type 12AU log window, select Command mode.

   The graphical user interface disappears and you can now operate the 12AU using commands.

Typing Commands

1. Type each command and strike the <Enter> key (symbolized by <cr>). Wait for the response.

A typical command will look like this: HP1<cr>. This command will set the high-pass filter to 1 Hz.
For a full list of commands, refer to “List of Commands and Responses” on page 12.
Note: When pressing Enter the line up to the cursor will be sent to 12AU.

Dealing with Overload in a Production Setup

Overload Caused by Handling

In a setup with product testing in an automated production line, overload due to handling between measurements may occur.

Minimizing Overload

You can minimize overload by following these guidelines:

- Keep the gain as low as possible.

- Select a microphone with the highest possible high-pass cut-off frequency. This will give the shortest settling time after handling.
- If possible, use the HP20L filter. This produces a little more noise than the HP20 filter but improves the headroom before filtering and thereby reduces the overload.
  The HP20L filter setting applies most of the gain at the output amplifier, e.g. 30 dB will be achieved with 10 dB at the input and 20 dB at the output. (Normally, the most gain will be applied at the input amplifier to achieve best signal to noise ratio).

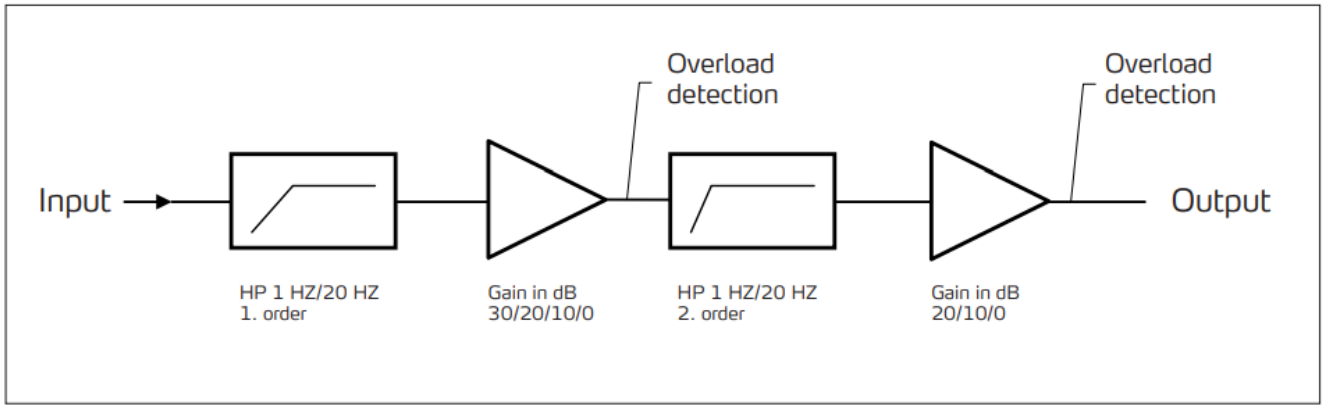


Fig. 20. *Block diagram of conditioning amplifier.*

- If overload is unavoidable, the overload indication hold time can be reduced to a minimum with the command: OVLTM M<cr>.
- If you are certain that the overload does not harm your measurement, you can disable the displaying of the overload on the front panel with the command: OVLLED N<cr>.
  This will not change the behavior of overload handling on the USB interface.

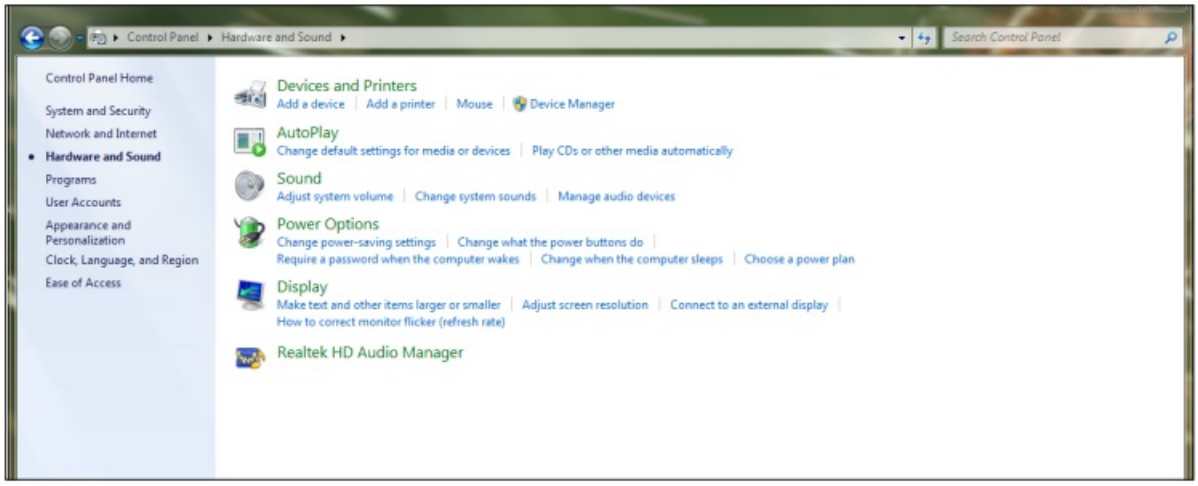
Appendix

Updating the USB driver

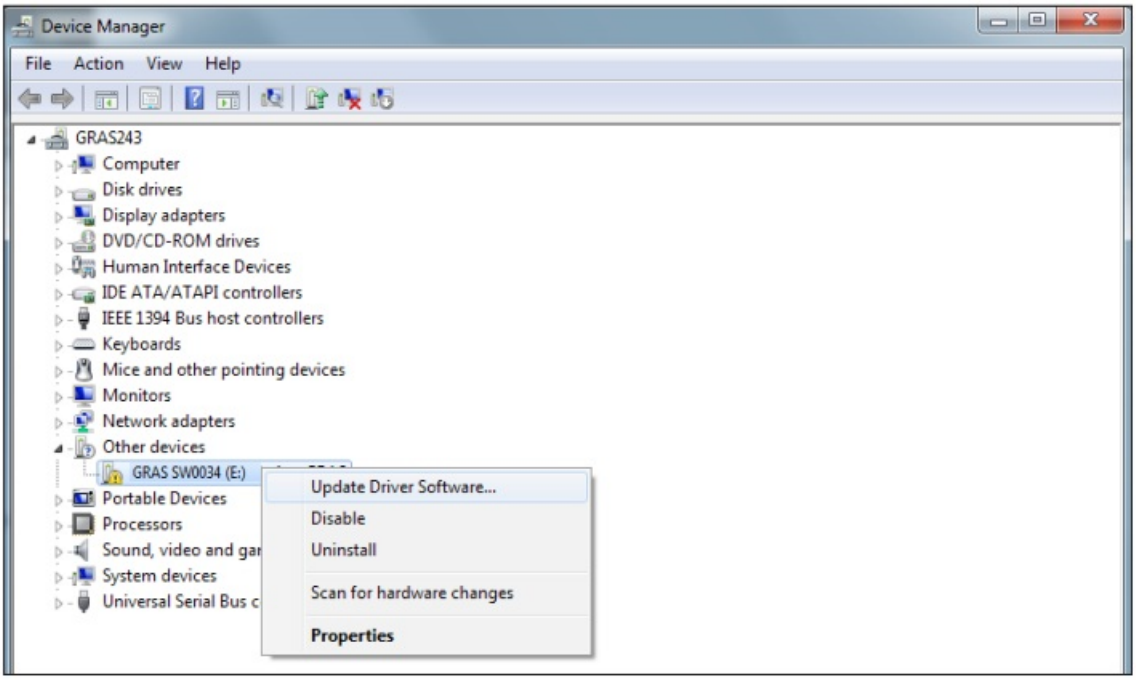
The 12AU uses a dedicated USB driver, it will not work with Windows' own default USB driver.
If you connect the 12AU to tour PC before installing the USB driver, the installation software cannot install the driver.
To circumvent this problem, you need to update the driver using the Windows Device Manager from the Windows Control Panel.

1. Open the Control Panel in the Windows Start menu

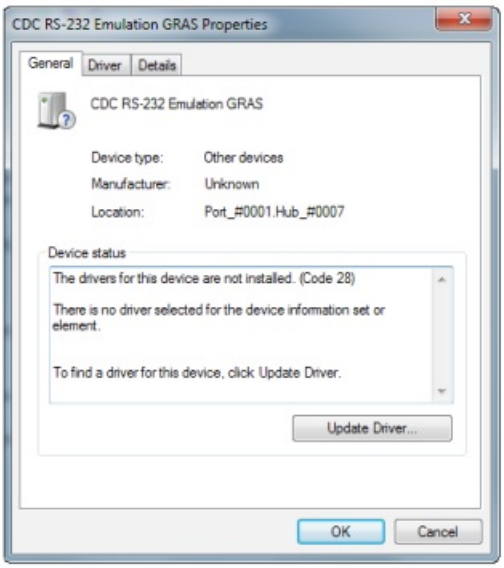
2. Select Hardware and Sound.



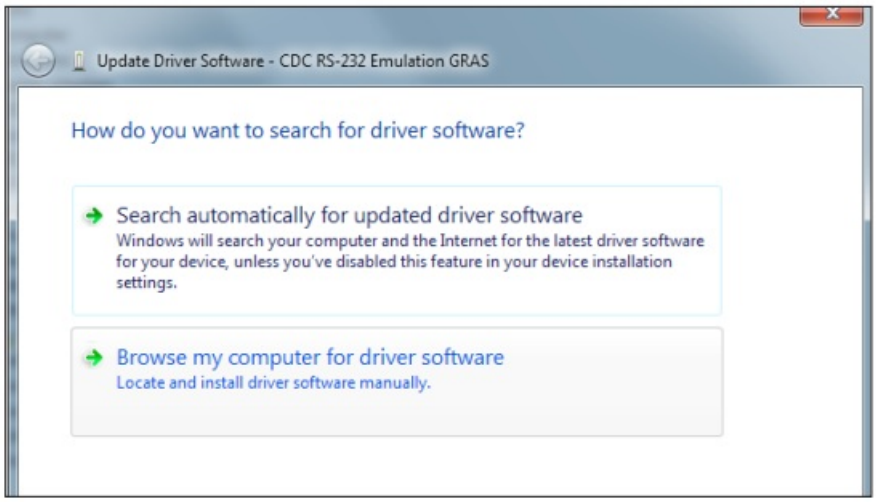
3. Select Device Manager. The 12AU will be listed under Other Devices.

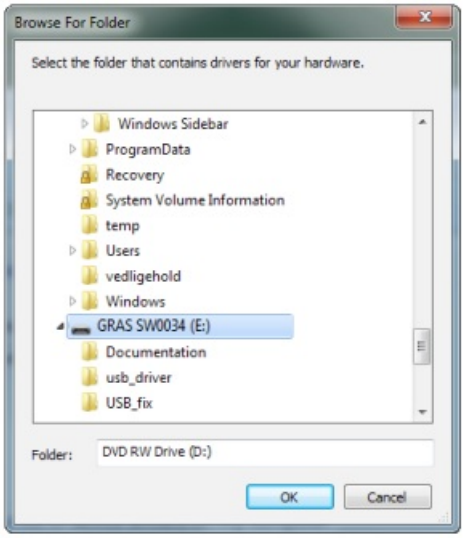


4. Right-click CDC RS-232 Emulation GRAS and select Properties.
5. Select the tab General and click the Update Driver button.

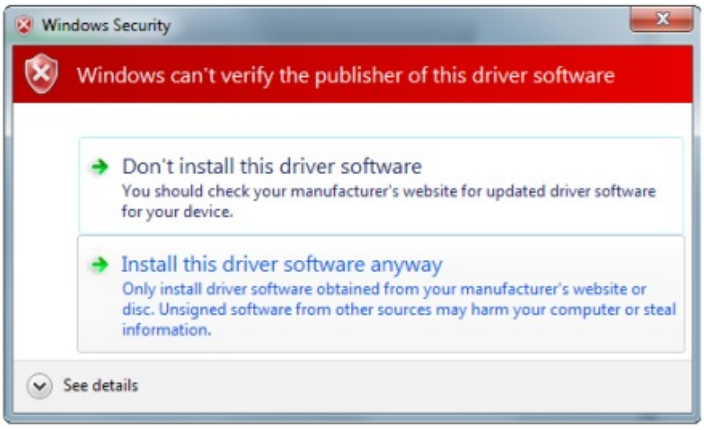


6. Click Browse my computer for driver software to access the 12AU installation USB.

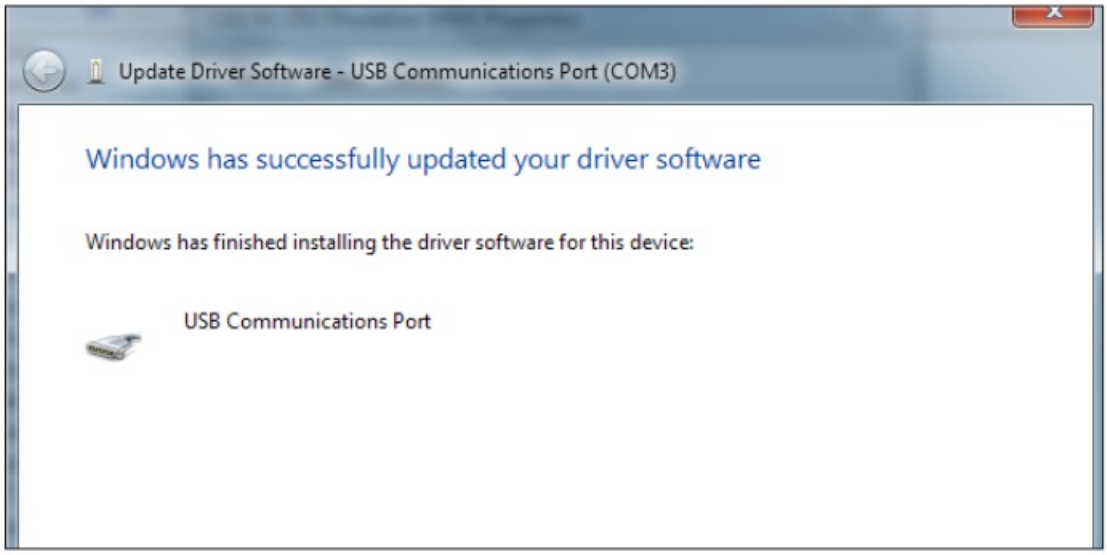




7. Select usb_driver on the Installation USB.
8. Ignore the authenticity warning.



The USB driver will now be updated with the Microtech USB driver required by the 12AU.



The installation is complete when confirmed by Windows.

Technical Specifications

All outputs except speaker amp. output have fixed 100 kHz (3 dB) low pass filters to minimize the need for anti-aliasing filtering in the following analyzing equipment.
There is no phase shift between microphone input and output due to prepolarized or external polarized microphones. It is designed with no relays in the signal path.

Microphone section

Input for externally polarized microphone	7 pin LEMO 19 series
Input impedance	100 krΩ
LEMO preamplifier supply	±15 V
Input for prepolarized microphone	BNC
CCP preamplifier supply	4 mA
Polarization voltage	200 V/O V
Output	BNC floating (2 ki2//100 nF to power ground)
Output impedance	100 Ω
Gain	0 – 50 dB in 10 de steps (±0.2 dB) (remote controll ed)
Bandwidth (-3 dB)	1 Hz – 100 kHz
Noise floor (relative to input) Input shorted (≥20 de gain) Input loaded with 20 pF dummy mic.	<1.5 pVrms (20 Hz – 20 kHz) <5 pVrms (20 Hz – 20 kHz)
High pass filter (remote controlled) 1.order Butterworth 3. order	1 Hz 20 Hz
Overload detection	LED indicators (remote controlled)

Speaker-amplifier section

Amplifier Input connector	BNC floating (10Ω k//100 nF to power ground)
Input impedance	10Ω
Amplifier output connector	2 pin Lemo (pin 1 is output. pin 2 is return)
Current output connector (remote controlled)	BNC floating (2Ω k//100 nF to power ground)
Gain (remote controlled)	-20 db to +10 dB in 10 dB steps (±10.2 dB)
Bandwidth (-3d13) (remote controlled AC or DC coupling)	DC coupled: DC to 80 kHz AC coupled: 10 Hz – 80 kHz
Phase shift (input to output)	≤ ±1° (DC to 20 kHz)
Max output voltage	±13.5 V
Max output current	±1.4 A

Voltage and current overload detection	LED indicator (remote controlled reading and reset)
Current output (voltage/current ratio)	1 V /1 A or 10 V/1 A

Monitor Output Section

Output connector	BNC (both front and back)
Output impedance	100 Ω
The monitor socket on the front is for quick check – its performance is (slightly) below that of the similar socket on the rear.	
Power	
Power Supply	115 or 230 VAC

Warranty and Service

Warranty
All GRAS products are made of high-quality materials that will ensure life-long stability and robustness. The 12AU is delivered with a two-year warranty.
The warranty does not cover products that are damaged due to negligent use, an incorrect power supply, or an incorrect connection to the equipment.
Service and Repairs
All repairs are made at GRAS International Support Center located in Denmark. Our Support Center is equipped with the newest test equipment and staffed with dedicated and highly skilled engineers. Upon request, we make cost estimates based on fixed repair categories. If a product covered by warranty is sent for service, it is repaired free of charge, unless the damage is the result of negligent use or other violations of the warranty. All repairs are delivered with a service report, as well as an updated calibration chart.

Manufactured to conform with:
CE marking directive:

CE

93/68/EEC

WEEE directive:

2002/96/EC

RoHS directive:

2002/95/EC

G.R.A.S. Sound & Vibration continually strives to improve the quality of our products for our customers; therefore, the
specifications and accessories are subject to change.

LI0083 – Revision 28 October 2021

Documents / Resources

	GRAS 12AU 1-Channel Universal Power Module With Signal Conditioning And Power Amplifier [pdf] Instruction Manual 12AU 1-Channel Universal Power Module With Signal Conditioning And Power Amplifier, 12AU 1-Channel, Universal Power Module With Signal Conditioning And Power Amplifier, Power Module With Signal Conditioning And Power Amplifier, With Signal Conditioning And Power Amplifier, Conditioning And Power Amplifier, And Power Amplifier, Power Amplifier

References

- GRAS Sound and Vibration