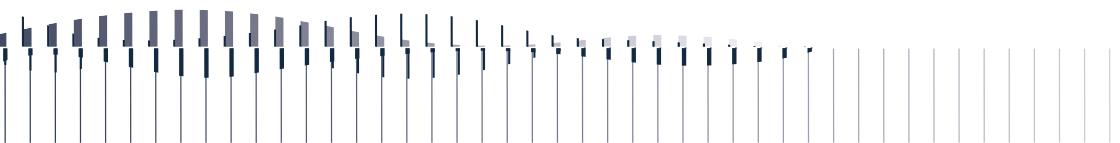


Instruction Manual

GRAS 12BA 1-Channel CCP Power Module with TEDS Support
GRAS 12BE 2-Channel CCP Power Module with TEDS Support
GRAS 12BB 4-Channel CCP Power Module with TEDS Support
GRAS 12BC 1-Channel LEMO Power Module with TEDS Support
GRAS 12BF 2-Channel LEMO Power Module with TEDS Support
GRAS 12BD 4-Channel LEMO Power Module with TEDS Support



12Bx Power Modules

Any feedback or questions concerning this document are welcome at
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Revision	Date	Description
1	22 January 2021	First Edition
2	19 January 2022	Additional power modules added (Second Edition)

Instruction Manual

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1 | Introduction

The GRAS 12Bx family of power modules provide traditional power for non-polarized transducers and preamplifiers (with LEMO connectors) or constant current power (CCP) polarized transducers and preamplifiers (with BNC connectors). Modules are available with one, two, or four channels. The configurations are:

- GRAS 12BA (1-Channel CCP Power Module)
- GRAS 12BC (1-Channel LEMO Power Module)
- GRAS 12BE (2-Channel CCP Power Module)
- GRAS 12BF (2-Channel LEMO Power Module)
- GRAS 12BB (4-Channel CCP Power Module)
- GRAS 12BD (4-Channel LEMO Power Module)

When used in conjunction with the GRAS Mic Power Module App or an Audio Precision APx analyzer instrument (available separately) and a connected personal computer (PC), the modules can provide access to Transducer Electronic Data Sheet (TEDS) data on TEDS-enabled microphones. Additionally, when a SysCheck2™ -enabled CCP microphone is used, you can remotely verify that the microphone is functioning within referenced parameters.

1.1 CCP Power Modules

The GRAS CCP Power Modules with TEDS Support (12BA, 12BB and 12BE) are SysCheck2-enabled USB-powered pass-through power modules that provide power to microphones without signal degradation, gain modification, or attenuation. Power is provided for CCP transducers and preamplifiers (also known as ICP® transducers and preamplifiers) through BNC connections. The 12BA supports a single CCP microphone preamplifier, the 12BE supports up to two and the 12BB supports up to four CCP microphone preamplifiers. If more than four microphones are required, multiple power modules can be used concurrently. Power is provided through the USB cable using a USB 2.0 or USB 3.0 port on the PC and a USB-C port on the power module.

Examples of GRAS products requiring a CCP supply are:

- 246AE ½" Free-field SysCheck2 Microphone Set.
- 46BD ½" CCP Pressure Microphone Set.
- 46AE ½" Free-field Microphone Set.
- 40PH Array Microphones.

1.2 Traditional Power Modules

The GRAS LEMO Power Modules (12BC, 12BD and 12BF) are DC-powered pass-through power modules that provide power to microphones without signal degradation, gain modification, or attenuation. Power is provided through the USB C port when connected to a port that can supply the minimum 1.5 A required by the module. AC mains power can also be supplied through the AUX PWR port if the minimum 1.5 A is not available through the USB-C port. When USB power is not sufficient and AUX PWR is not connected, the channel 1 LCD display will flash with two dash (--) characters.

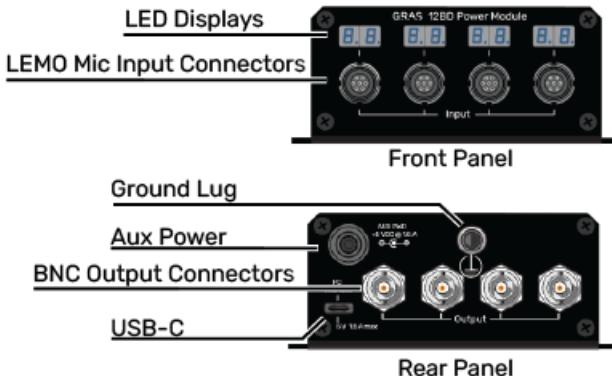
Examples of GRAS products with a LEMO connection are:

- 46BH ½" LEMO Pressure Microphone Set.
- 46AF ½" LEMO Free-Field Microphone Set.

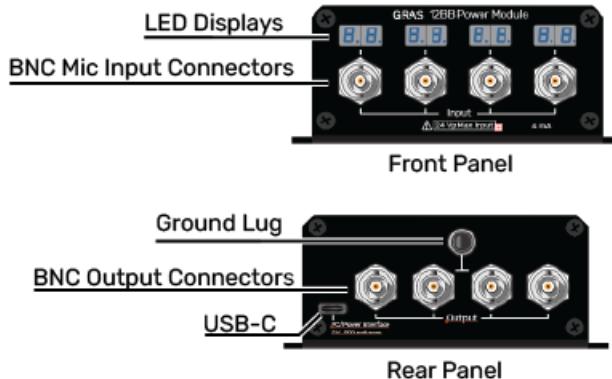
2 | External Features

Figure 1 – LEMO and CCP power module features

LEMO Power Module (4 Channel)



CCP Power Module (4-Channel)



LED Displays

There is an LED display for each microphone input on the module. There are up to four LED displays on the power module, depending on the model. Each LED display identifies a microphone input so an

appropriate microphone can be selected for TEDS data acquisition. Numbers are only displayed on the LED displays when using the GRAS Mic Power Module App or Audio Precision APx500 software.

Microphone Inputs

There are up to four microphone inputs on a power module, depending on the model. Power modules that use standard power come with LEMO connectors for the inputs. Power modules using CCP come with BNC connectors for the inputs. The corresponding output connectors are on the rear panels.

Power Module Outputs

There are up to four output connectors on a power module, depending on the model. BNC connectors are used for all outputs.

Ground Lug

For Operator Safety when using power modules equipped with 7-Pin LEMO Microphone input connectors, the ground terminal marked with the Protective Earth Terminal symbol  must be connected with a low-resistance ground strap to a suitable ground. See *Protective Earth Terminal* on page 36 for more information.

For CCP power modules, performance may be improved by connecting the ground lug of the power module and the APx analyzer or other measurement equipment using a low-resistance ground strap.

PC / Power Interface USB-C Port

The 12BA, 12BB and 12BE are powered through the USB-C port on the rear panel of the module when connected to a USB 2.0 or USB 3.0 port and draw a maximum of 500 mA. Since the modules do not affect gain or attenuation, there are no external switches or controls. The USB-C port also serves as the data connection to the PC when using with the GRAS Mic Power Module App or APx500 software. USB 2.0 and USB 3.0 connections are supported.

Aux Power

LEMO modules have an auxiliary power input on the back of the module that can be used when available USB ports are not able to provide the minimum of 1.5 A required for operation. When the module is connected to a USB port that does not supply at least 1.5 A, the LEDs for the first channel will flash “--” and the module will not provide power to connected microphones. CCP modules do not have an auxiliary power option.

Note: Use the external power adapter provided (part number 4540.1805) when AC mains power is required. The use of other power adapters is not recommended and may cause safety hazards.

Figure 2 – 12BB CCP 4-Channel Microphone Power Module



Mounting Tabs

Modules have four mounting tabs that can be used to anchor the module with user-supplied fasteners to prevent any undesirable movement. The module can be rack mounted using a rack cradle (not included) or mounted directly to a work surface.

2.1 CCP Preamplifier Support

For CCP preamplifiers, the 12BA, 12BB and 12BE provide:

- A constant current supply (4 mA) sourced at 24 V DC per channel.
- Access to TEDS data (when used with the Mic Power Module App or Audio Precision APx500 software).

2.2 Input/Output

Microphones providing the input signals are connected via BNC or LEMO connectors on the front panel of the power module. Output signals from the power module rear panel are connected via BNC connectors to the measurement system.

3 | Operation

GRAS 12BA-12BF Power Modules are USB-powered pass-through devices that provide power to measurement microphones and integrate with the APx family of Audio Precision analyzers. The power modules are available in one-, two- and four-channel configurations to power up to four microphones. If more than four microphones are required, multiple power modules can be used concurrently. Additionally, Transducer Electronic Data Sheet (TEDS) data can be read from TEDS-enabled microphones when connected to a system running APx500 software or when using the Mic Power Module App.

3.1 Channel Indicators and Assignment

Channel indicators are only enabled when using Audio Precision APx500 measurement software or the GRAS Mic Power Module App.

Each input connector on a power module has an LED channel indicator on the front panel above the measurement microphone connector. Channels are assigned dynamically when Audio Precision APx500 measurement software starts and recognizes an attached supported GRAS power module, or when the list command is used in the GRAS Mic Power Module App with a supported GRAS power module. Once assigned, the number is displayed on the LED channel indicator. Until a channel is assigned, the display will read "--". The microphone channels are used to identify attached measurement microphones to acquire TEDS data and set sensitivity values.

3.2 TEDS Support

The APx500 software and Mic Power Module App can read TEDS 0.9 and TEDS 1.0 data from TEDS-enabled microphones connected through supported GRAS power modules.

For R&D testing, the data is used as data-sheet values in calibration reports. For production testing in controlled production setups and environments, the TEDS data can be used in lieu of actual calibration values.

For best accuracy, it is recommended that microphone sensitivity be measured using an external acoustic source such as a pistonphone.

TEDS is described in detail in the IEEE 1451 family of standards.

3.3 SysCheck2 Support

The APx500 software and Mic Power Module App supports SysCheck2 functionality when combined with SysCheck2-enabled microphones, such as the GRAS 246AE $\frac{1}{2}$ " Free-field SysCheck2 Microphone Set and the GRAS 246AO $\frac{1}{2}$ " Pressure Standard SysCheck2 Microphone Set.

SysCheck2 is a GRAS-patented technology for verifying measurement chain integrity. When set up, this verification tool can perform remote health checks on microphones, channel gain and cable integrity. SysCheck2-enabled microphones can also provide on-demand environmental data (temperature, barometric pressure and humidity).

3.4 Input/Output Functions

The Microphone Power Module is a pass-through device that provides power to the microphone without signal degradation, gain modification, or attenuation. The microphone inputs are on the front of the device and the outputs to the analyzer are on the back of the device. A USB-C port on the back of the device connects to a PC for power and communication with APx500 measurement software or Mic Power Module App.

3.5 Connection and Configuration

3.5.1 To connect the GRAS Power Modules

The power module connects to a USB 2.0 or USB 3.0 port on the PC and a USB-C port on the back of the power module. For power modules that provide CCP, power is provided to the module through the USB cable; the module does not need to be plugged in to mains power. For power modules that provide Standard Power through a LEMO connection, the modules have an auxiliary power connector that can be plugged into mains power if the USB connection does not support the 1.5 A required by the power module. There are no external switches or controls on CCP or Standard Power (LEMO) Power Modules.

3.5.2 To configure the GRAS Power Module:

- 1) Connect the PC/Power Interface USB-C port to an available USB 2.0 or USB 3.0 port on the measurement PC.
- 2) Connect the measurement microphone to the BNC or LEMO input on the front panel of the power module.
- 3) Connect the measurement equipment to the corresponding BNC output on the rear panel of the power module.

Note: In some situations, noise performance can be improved by connecting the ground lugs of the power module to the ground lug of the attached analyzer using a short, low-resistance cable.

Once connected, microphone sensitivity can be acquired from a TEDS-enabled microphone or can be measured using an external acoustic source such as a pistonphone, and measurements can be made using the attached measurement equipment.

4 | Accessing TEDS Data

4.1 Setting up for TEDS Data

Channel assignment and TEDS data acquisition requires either the GRAS Mic Power Module App or Audio Precision's APx500 measurement software running on the connected PC. The GRAS Mic Power Module App and the APx500 measurement software can communicate with the microphone power module using a USB 2.0 interconnection through the module's USB-C connector. See the following sections of this document or the APx500 User's Manual and the embedded help within the APx500 software for information about channel assignment and TEDS data.

When used with the GRAS Mic Power Module App or an APx analyzer:

- Microphone input channels are assigned and channel numbers are displayed on the front panel LED displays above the measurement microphone BNC input connectors.
- TEDS data can be read from TEDS-enabled microphones.
- Input channels for microphones can be accessed from Signal Path Setup or through sequence steps in the APx500 software.

When multiple power modules are attached to a PC, the power module with the lowest serial number will have channel 1 assigned to the first channel and additional channels will be assigned incrementally across all attached power modules, with the power module with the highest serial number configured last. This process is run when the APx500 software is launched or each time a command is entered in the Mic Power Module App.

NOTE: To maintain channel assignments when using APx500 software to access TEDS data and set sensitivity levels, power modules should not be added or removed from a test setup without closing and then relaunching the APx500 software.

4.1.1 Acquiring TEDS Data Using the Mic Power Module App

The Mic Power Module App is a command-line program that runs in a Command Prompt window in Microsoft Windows 10 or later. The program can be used to view power module information and acquire TEDS data when connected to a TEDS-enabled microphone. The TEDS data is displayed in the command window and can be written to a CSV file. Power module information available includes serial number, product ID, available connectors, input assignments, and version information. You can see which connector has a TEDS-enabled microphone attached, and view the model, brand, and serial number.

PC System Requirements

The Mic Power Module App requires a PC running Microsoft Windows 10 (64-bit) or later and one or more available USB 2.0 or USB 3.0 ports.

Installing the Mic Power Module App

The installation file (MicPowerModuleAppSetup.exe) can be downloaded from the Audio Precision website (www.ap.com/download/gras-12bx-mic-power-module-app/).

To install the GRAS Mic Power Module App, download and then double-click on the install file to start the installation. Follow the instructions in the installation dialogs. The default installation directory is:

C:\Program Files\GRAS\Microphone Power Module

Once the installation is completed, to scan for connected power modules and assign connector IDs, open a Command Prompt window, navigate to the installation directory and type:

MicPowerModuleApp.exe list

Running the Software

Run the GRAS Mic Power Module App in a Command Prompt window from the installation directory by typing the app executable name (MicPowerModuleApp.exe) followed by a command name and options and arguments.

All commands are case-sensitive and most require an input (port) number to identify the port attached to the microphone. The port number is specified using one of the following syntax options:

```
--InputNumber portnumber  
-iportnumber
```

Note: When using the long option (--InputNumber) with commands, two hyphens are used as a prefix and a space is required between the option and the argument. When using the short option (-i) with commands, only one hyphen is used and there is no space between the option and the argument.

The following commands and options are available:

list

Syntax

```
list [-t | --help | --version]
```

Description

The list command scans for connected power modules, assigns connector ID numbers and shows connected power modules (Serial Number, Inputs, and assigned connector ID numbers). The assigned connector ID numbers are displayed on the LED display above each connector.

Options

-t

The -t option displays the make, model, serial number and connection ID of all TEDS microphones connected to the power module. This option is not required and does not take any arguments.

--help

The --help option displays help for the specified command that precedes it.

```
--version
```

The `--version` option displays the app version information.

Example

```
>MicPowerModuleApp.exe list
```

```
SN:00115, Bnc4X Inputs:[1,2,3,4]
```

teds

Syntax

```
teds -iportnumber | --InputNumber portnumber
[-o path\filename] | --help | --version]
```

Description

The `teds` command reads TEDS data from the microphone on the specified Mic Power Module port. The `-i` or `--InputNumber` option with the `portnumber` argument must be specified.

Example

```
>MicPowerModuleApp.exe teds -i1
Manufacturer ID|24
Manufacturer Name|GRAS Sound & Vibration
Model Number|46
Version Letter|1
Version Number|5
Serial Number|265867
Template ID|27
Sensitivity @ reference
condition|0.0492436116918724
Reference frequency (F ref)|249.847411747693
Polarization Voltage|Pre-polarized
Microphone Type|Free field
Microphone Size|1/2 inch
Equivalent microphone volume|4E-08
Polarity (Sign)|negative
Transducer Electrical Signal Type|Voltage Sensor
Mapping Method|Linear
AC or DC Coupling|DC
Calibration Date|09/12/2019
```

```
Calibration Initials|PV  
Calibration Period (Days)|360
```

Options

-i *portnumber* or --InputNumber *portnumber*

The **-i** option is used to identify the ID of the connector from which to read TEDS data. It is a required option. The ***portnumber*** argument is also required and must match the ID shown on one of the power module LCD displays. The ID can be specified with or without the leading zero.

-o *path/filename*

The **-o** option saves the TEDS data for the microphone on the specified connector to a CSV file and requires the path and filename arguments. This option is not required.

--help

The **--help** option displays help for the specified command that precedes it.

--version

The **--version** option displays the app version information.

var

```
var -i portnumber | --InputNumber portnumber  
{-l | -v fieldname} | --help | --version}
```

Description

The **var** command displays the value of the specified TEDS fields. The **-i** option and ***portnumber*** argument are required along with either the **-l** or **-v** option.

Options

-l

The **-l** option lists all TEDS field names that can be accessed. It does not list the values of the field names. This option is not required.

-i *portnumber* or --InputNumber *portnumber*

The **-i** option and ***portnumber*** argument are used to identify the ID of the connector from which to read TEDS data. It is a required option. The ***portnumber*** argument must match the ID shown on one of the power module LCD displays.

-v *fieldname*

The -v option selects a specific TEDS field name value to display. The *fieldname* argument is case sensitive but the full name of the TEDS field name is not required. If an argument matches more than one TEDS field, all matching fields are displayed with their values. This option is not required.

--help

The --help option displays help for the specified command that precedes it.

--version

The --version option displays the app version information.

Example

```
>MicPowerModuleApp.exe var -i 01 -v Sensitivity  
Sensitivity @ reference condition =  
0.0492436116918724
```

help**Syntax**

```
help [commandname ]
```

Description

The help command lists the available commands. When a command name is used as a parameter after the help command, help for that specific command is displayed.

Options

commandname

An option that displays a list of the parameters and arguments for the specified command. This option is not required.

Example

```
>MicPowerModuleApp.exe help list
```

version**Syntax**

```
version (no command options)
```

Description

The version command displays the module's firmware version. There are no options.

Example

```
>MicPowerModuleApp.exe version  
MicPowerModuleApp 2.0.0.2
```

4.1.2 Acquiring TEDS Data Using APx500 Software

To access the TEDS features of supported GRAS power modules as part of an APx analyzer system, you must connect the hardware before launching the APx500 software, or ID numbers will not be assigned. The system should be configured in the following order:

- 1) Connect the APx analyzer and the power module to the PC using USB cables.
- 2) Power on the APx analyzer.
- 3) Launch the APx500 measurement software.
- 4) Click the **TEDS/SysCheck** or **Calibrate from TEDS** button in Signal Path Setup to open the TEDS dialog and acquire TEDS data from a connected microphone. See the documentation included with APx500 measurement software for more information.

When the APx500 measurement software is launched, it discovers supported GRAS power modules and assigns an ID number to each connector. The numbers are displayed in the LED displays above each microphone connector. Assigned channel numbers are not persistent between APx software restarts, although power modules will be assigned the same channel numbers unless a power module with a lower serial number is added or removed between restarts. Microphones do not need to be connected to a power module when the APx500 software is launched for connector numbers to be assigned. Multiple power modules can be managed in this manner on a single PC. The microphone connector ID is used by the APx500 software to select a microphone when acquiring TEDS information.

Note: If the APx500 software is launched before power modules are connected to the PC, microphones will receive power but microphone connector IDs will not be configured or available for TEDS data acquisition. To configure microphone connector IDs, ensure that the USB cable from the power module is connected to the PC and relaunch the APx500 software.

APx500 software is not required for the power module to provide operational power to compatible microphone preamplifiers. However, the GRAS Mic Power Module App or APx500 software is required to access a microphone's TEDS data.

Installation and safety information for the APx analyzer instrument, the required APx500 measurement software (version 6.0.1 or later) and PC system requirements can be found in the *Installation and Specifications* booklet provided with the APx analyzer. Audio Precision documentation is available online at ap.com.

5 | Accessing SysCheck2

5.1 SysCheck2 commands using the Mic Power Module App

When using SysCheck2-enabled microphones, such as the GRAS 246AO or 246AE, with a GRAS power module or APx analyzer that has a TEDS-enabled Mic Power Supply, you can run SysCheck2 from a Windows command prompt and do the following:

- Display the environmental condition data stored in the microphone. (Pressure, Temperature, and Humidity)
- Take environmental readings with the Microphone. (Pressure, Temperature, Humidity)
- Update environmental condition data stored in the microphone.
- Turn on the red, green, and blue LEDs that are integrated into the microphone.

Accessing SysCheck2 functionality using the command-line interface is most useful when integrating SysCheck2 with third party tools. SysCheck2 can be run from a command window using the Mic Power Module App.

Note: Updating environmental condition data stored on the microphone using the command-line interface is not recommended when using APx500 software to access SysCheck2 functionality. See *Using SysCheck2 with APx500 Software* on page 26.

5.1.1 Running SysCheck2 commands

Run the GRAS Mic Power Module App in a Command Prompt window from the installation directory by typing the app executable name (`MicPowerModuleApp.exe`) followed by a SysCheck2 command name with any options and arguments.

All commands are case-sensitive and require an input number (port) to identify the port to which the microphone is connected. The input number can be specified using one of the following syntax options:

--InputNumber *portnumber*
-i*portnumber*

When using the long option (`--InputNumber`) with commands, two hyphens are used as a prefix and a space is required between the option and the argument. When using the short option (`-i`) with commands, only one hyphen is used and there is no space between the option and argument.

The following SysCheck2 commands and options are available:

readenv

Syntax

`readenv -iportnumber` or `--InputNumber portnumber`

Description

The `readenv` command reads the environmental conditions stored in the microphone on the port specified by the `portnumber` argument and returns the values for Temperature (°C), Pressure (millibars), and Humidity (%).

Options

`-iportnumber` | `--InputNumber portnumber`

The port number (1-99) of the connected microphone.

Example

```
>MicPowerModuleApp.exe readenv -i2
```

```
T=22.4, P=1.015, H=42
```

sinegen

Description

The `sinegen` command turns on or off the internal SysCheck2 sine generator. When the frequency (`-f`) option is used, it turns on the SysCheck2 sine generator at the specified frequency. When the frequency (`-f`) option is not used, it turns off the SysCheck2 sine generator. The internal sine generator is used in the SysCheck2 process but is of limited use in the command-line tool.

Syntax

```
sinegen -iportnumber | --InputNumber  
portnumber  
[-f{250|500|1000}]
```

Options

-iportnumber or **--InputNumber portnumber**

The port number (1-99) of the connected microphone.

-f

The frequency of the internal generated signal.

Example

```
>MicPowerModuleApp.exe sinegen -i2 -f 250
```

In this example, the internal sine generator in the microphone on port 2 generates a 250 Hz signal.

led

Syntax

```
led -iportnumber | --InputNumber portnumber  
[-rseconds] [-gseconds] [-bseconds]
```

Description

Turns on the LED(s) of the specified colors for the specified duration(s). At least one option must be supplied. When multiple options are used, the LEDs turn on in sequence for the specified durations. The options (-r, -g, -b) can be supplied in any order on the command line, but the lighting sequence is always red, green, and then blue. If no duration parameter is entered, all LEDs will be turned off.

Options

-iportnumber or **--InputNumber portnumber**

The port number (1-99) of the connected microphone.

-rseconds, -gseconds, -bseconds

The led color (r=red, g=green, b=blue) and the time in seconds (1-600) that the leds are lit.

Example

```
>MicPowerModuleApp.exe led -i2 -r20 -g15 -b10
```

In this example, the command turns on the red LED for 20 s, followed by the green LED for 15 s, followed by the blue LED for 10 s for the microphone on port 2.

RL

Description

Returns the current programmed reference level in volts when entered with only the `--InputNumber` option. When a reference voltage is included in the command, the reference level is set to the defined voltage value.

Syntax

```
RL -iportnumber or --InputNumber portnumber  
[level]
```

Example

```
>MicPowerModuleApp.exe RL -i2 92.84
```

In this example, the stored reference level for the microphone on port 2 is set to 92.84.

RT

Description

Returns the current programmed reference temperature in degrees C when entered with only the `--InputNumber` option. When a reference temperature is included in the command, the reference level is set to the defined temperature value in degrees C.

Syntax

```
RT -iportnumber | --InputNumber portnumber  
[temperature]
```

Options

-iportnumber or `--InputNumber portnumber`

The port number (1-99) of the connected microphone.

temperature

The temperature in degrees C.

Example

```
>MicPowerModuleApp.exe RT -i2 25
```

In this example, the stored reference temperature for port 2 is set to 25 °C

RP

Description

Returns the current programmed reference pressure in millibars when entered with only the --InputNumber option. When a reference pressure is included in the command, the reference level is set to the defined pressure value in millibars.

Syntax

```
RP -iportnumber | --InputNumber portnumber  
[pressure]
```

Options

-iportnumber or **--InputNumber portnumber**
The port number (1-99) of the connected microphone.

pressure

The pressure in millibars.

Example

```
>MicPowerModuleApp.exe RP -i2 1013
```

In this example, the stored reference pressure for the microphone on port 2 is changed to 1013 mbar.

RF

Description

Returns the current programmed reference frequency in Hertz when entered with only the --InputNumber parameter. When a reference frequency is included in the command, the frequency level is set to the specified frequency value in Hertz.

Syntax

```
RF iportnumber | --InputNumber portnumber  
[frequency]
```

Options

-iportnumber or **--InputNumber portnumber**
The port number (1-99) of the connected microphone.

frequency

The frequency in Hertz.

Example

```
>MicPowerModuleApp.exe RF -i2 250
```

In this example, the stored reference frequency for the microphone on port 2 is changed to 250 Hz.

5.2 Using SysCheck2 with APx500 Software

SysCheck2 functionality is available through APx500 software when a SysCheck2 microphone is connected to an Audio Precision APx analyzer, either through a TEDS-enabled analyzer input that provides microphone power or through a supported GRAS microphone power module. For more information, see the documentation provided with APx analyzers and APx500 measurement software (version 7.0 or later).

Installation and safety information for the APx analyzer instrument, the required APx500 measurement software and PC system requirements can be found in the Installation Instructions and Specifications booklet provided with the APx analyzer. Audio Precision documentation is available online at ap.com.

Appendix A | LEMO Microphone Power Supply Specifications

A.1 USB Interface

Interface		Type A Peripheral Interface
	Versions	USB C / USB 2.0 Compatible with USB 2.0, 3.0 and USB C ports
	Power	USB +5 V, 1.5 A max USB-C ports with Power Delivery Protocol, USB-A ports with fast charge (Battery Charger Protocol)

A.2 External Power

Aux Power Input		+ 5 V 1.5 A Max If both USB and Auxiliary power are connected, the power is sourced from the Auxiliary Power Supply
Aux Power Connector		5.5 mm x 2.1 mm barrel +5 V on center pin
External Power Supply		
	AC Input Voltage	100 to 240 VAC 50 to 60 Hz
	DC Output Voltage	+5 V @ 3.0 A

A.3 Microphone Channel

Input		
	Channels	12BC - 1 x 7 pin LEMO Input 12BF - 2 x 7 pin LEMO Input 12BD - 4 x 7 pin LEMO Input Input impedance determined by Analyzer attached to the outputs
	Polarization Voltage	200 VDC ± 2.0 V Polarization voltage is always supplied when unit is powered
	Pre-amp Voltage	± 15 VDC @ 60 mA max all channels combined Pre-amp voltage is always supplied when unit is powered
	Max Input Voltage	14 Vp Limited by ± 15 VDC pre-amp supply
Output		
	Channels	12BC - 1 x BNC Output 12BF - 2 x BNC Output 12BB - 4 x BNC Output
	Coupling	Passive 10 Hz AC coupling filter (with 100 kOhm analyzer input impedance) Signal is passed through with passive AC coupling filter
	Max Output Voltage	24 V Peak to Peak Limited by ± 15 VDC pre-amp power and microphone pre-amp output
	Residual Noise	< 2 μ Vrms Input shorted, 10 Hz to 20 kHz bandpass filter
	Flatness	10 Hz to 20 Hz - ± 0.06 dB 20 Hz to 200 kHz - ± 0.03 dB Analyzer input impedance 100 kOhms and greater, Source impedance 50 Ohms or less

A.4 General/Environmental

Temperature Range		
	Operating	0°C / 32°F to +45°C / 113°F
	Storage	-40°C / -40°F to +75°C / 167°F
Humidity		90% to +40°C /104°F (non-condensing)
Max Operating Altitude		2,000 m
EMC		IEC 61326-1:2005 / EN61326-1:2006 Complies with EC Council Directives (EMC) Directive 2004/108/EC and 93/68/EEC Emissions and immunity levels are influenced by the quality of interface and signal cables attached to the unit. Compliance was demonstrated using Audio Precision / GRAS cables.
Safety		
		UL 62368-1, Second Edition / CSA C22.2 No. 62368-1 Safety of Audio/Video, Information and Communication Technology Equipment, Second Edition
		EN 62368-1:2014, Safety of Audio/Video, Information and Communication Technology Equipment, Second Edition
		IEC 62368-1, Second Edition Safety of Audio/Video, Information and Communication Technology Equipment, Second Edition
Dimensions		
	Width	108 mm [4.25"] Includes built-in mounting ears
	Height	44.2 mm [1.74"] Includes builtin mounting ears
	Depth	178.3 mm [7.02"] Includes LEMO connectors on the front and BNC connectors on the rear
	Mounting hole pattern	100 mm (width) x 124.1 mm (depth) [3.94" x 5.28"]
	Mounting hole diameter	4.6 mm [0.18"]

Temperature Range	
Weight	12BC: 390 g / 13.8 oz 12BF: 425 g / 15.0 oz 12BD: 494 g / 17.4 oz

Appendix B | CCP Microphone Power Supply Specifications

B.1 USB Interface

Interface		Type A Peripheral Interface
	Versions	USB C / USB 2.0 Compatible with USB 2.0, 3.0 and USB C ports
	Power	USB +5 V, 500 mA max

B.2 Microphone Channel

Input		
	Channels	12BA - 1 x BNC Input 12BE - 2 x BNC Input 12BB - 4 x BNC Input Input impedance determined by Analyzer attached to the outputs
	Mic Power	Constant Current +24V @ 4mA per channel Mic power is always supplied when unit is powered
	Max Input Voltage	24 V Peak Limited by +24 V Mic Power

Microphone Channel table continued

Output		
	Channels	12BA - 1 x BNC Output 12BE - 2 x BNC Output 12BB - 4 x BNC Output
	Coupling	Passive 10 Hz AC coupling filter (with 100 Ohm analyzer input impedance) Signal is passed through with passive AC coupling filter
	Max Output Voltage	24 V Peak to Peak Limited by + 24 V CCP power and microphone output
	Residual Noise	< 2 µVrms Input shorted, 10 Hz to 20 kHz Bandwidth, BP filter
	Flatness	10 Hz to 20 Hz - ± 0.06 dB 20 Hz to 200 kHz - ± 0.03 dB Analyzer input impedance 100 kOhms and greater, Source impedance 50 Ohms or less

B.3 General/Environmental

Temperature Range		
	Operating	0°C / 32°F to +45°C / 113°F
	Storage	-40°C / -40°F to +75°C / 167°F
Humidity		90% to +40°C / 104°F (non-condensing)
Max Operating Altitude		2,000 m
EMC		IEC 61326-1:2005 / EN61326-1:2006 Complies with EC Council Directives (EMC) Directive 2004/108/EC and 93/68/EEC Emissions and immunity levels are influenced by the quality of interface and signal cables attached to the unit. Compliance was demonstrated using Audio Precision / GRAS cables.
Safety		
		UL 62368-1, Second Edition / CSA C22.2 No. 62368-1 Safety of Audio/Video, Information and Communication Technology Equipment, Second Edition
		EN 62368-1:2014, Safety of Audio/Video, Information and Communication Technology Equipment, Second Edition
		IEC 62368-1, Second Edition Safety of Audio/Video, Information and Communication Technology Equipment, Second Edition
Dimensions		
	Width	108 mm [4.25"] Includes built in mounting ears
	Height	44.2 mm [1.74"] Includes built in mounting ears
	Depth	193.8 mm [7.63"] Includes LEMO connectors on the front and BNC connectors on the rear
Weight		12BA: 397 g / 14 oz 12BB: 510 g / 18 oz 12BE: 435 g / 15.3 oz

Appendix C | Safety

C.1 Safety Information

Do **NOT** service or repair this equipment unless properly qualified. Servicing should be performed only by a qualified technician or an authorized GRAS distributor.

Do **NOT** substitute parts or make any modifications without the written approval of GRAS. Doing so may create safety hazards. Using this product in a manner not specified by GRAS can result in a safety hazard.

Do **NOT** exceed mains voltage ratings. This equipment is designed to operate only from a 50–60 Hz ac mains power source at 100–240 V ac nominal voltage. The mains supply voltage is not to exceed $\pm 10\%$ of nominal (90–264 V ac).

This product is for indoor use—Installation Category II, Measurement Category I, pollution degree 2.

To clean the enclosure of this product, use a soft cloth or brush to remove accumulated dust. A mild detergent may be used to remove remaining dirt or stains. Do not use strong or abrasive cleaners. Wipe all surfaces with a damp cloth.

C.1.1 Safety Symbols

The following symbols may be marked on the panels or covers of equipment or modules, and are used in this manual:



WARNING!—This symbol alerts you to a potentially hazardous condition, such as the presence of dangerous voltage that could pose a risk of electrical shock. Refer to the accompanying Warning Label or Tag, and exercise extreme caution.



ATTENTION!—This symbol alerts you to important operating considerations or a potential operating condition that could damage equipment. If you see this marked on equipment, refer to the Operator's Manual or User's Manual for precautionary instructions.



FUNCTIONAL EARTH TERMINAL—A terminal marked with this symbol is electrically connected to a reference point of a measuring circuit or output and is intended to be earthed for any functional purpose other than safety.



PROTECTIVE EARTH TERMINAL—A terminal marked with this symbol is bonded to conductive parts of the instrument and is intended to be connected to an external protective earthing system.

It is the equipment operator's responsibility to provide the cable and select the appropriate system safety ground. In order to comply with regulatory requirements, the cable must be 18 AWG or larger and be Green with a Yellow stripe.

It is the operator's responsibility to ensure and confirm that the connection point is suitable and provides a low resistance connection point to ground.

Overall resistance from the Protective Earth terminal to the selected ground point must be less than 0.1 Ohm.

Typical ground points can be grounded terminals or bare metal on associated earth-grounded (3-prong connected) equipment or other marked protective conductor terminals.

C.1.2 Disclaimer

GRAS cautions against using their products in a manner not specified by the manufacturer. To do otherwise may void any warranties, damage equipment, or pose a safety risk to personnel.

C.2 Consignes de sécurité

Ne procédez **PAS** à l'entretien ou à la réparation de cet équipement à moins d'être dûment qualifié(e) pour le faire. L'entretien devrait être effectué uniquement par un technicien qualifié ou un distributeur GRAS agréé.

Ne **PAS** remplacer de pièces ou effectuer de modifications sans l'approbation écrite d'GRAS. Si c'est le cas, il pourrait y avoir des risques pour la sécurité. Utiliser ce produit d'une manière non précisée par GRAS peut entraîner un risque pour la sécurité.

Ne **PAS** dépasser la tension de réseau nominale. Cet équipement est conçu pour fonctionner uniquement à partir d'une source d'alimentation réseau de 50–60 Hz CA, à une tension nominale de 100–240 V CA. La tension d'alimentation du réseau ne doit pas dépasser $\pm 10\%$ de la tension nominale (90–264 V CA).

Ce produit est destiné à une utilisation à l'intérieur-Catégorie d'installation II, Catégorie de mesure I, degré de pollution 2.

Pour nettoyer le boîtier de ce produit, utiliser un chiffon doux ou une brosse douce permettant d'éliminer la saleté accumulée. Un détergent doux peut être utilisé pour éliminer la saleté ou les taches. Ne pas utiliser de produits nettoyants forts ou abrasifs. Essuyer toutes les surfaces à l'aide d'un chiffon humide.

C.2.1 Symboles de sécurité

Les symboles suivants peuvent être présents sur les panneaux ou les couvercles de l'équipement ou des modules, et sont utilisés dans le présent manuel:



AVERTISSEMENT!—Ce symbole vous informe d'une situation potentiellement dangereuse, par exemple, la présence d'une tension dangereuse qui pourrait présenter un risque de choc électrique. Consultez l'autocollant ou l'étiquette d'avertissement qui l'accompagne, et faites preuve d'une grande prudence.



ATTENTION!—Ce symbole vous informe d'importantes considérations liées au fonctionnement ou d'une condition d'utilisation potentielle qui pourrait endommager l'équipement. Si vous voyez ce symbole sur l'équipement, consultez le manuel de l'opérateur ou le manuel de l'utilisateur pour connaître les instructions préventives.



BORNE DE TERRE FONCTIONNELLE— Les bornes identifiées à l'aide de ce symbole sont reliées électriquement à un point de référence d'un circuit ou d'une sortie de mesure et doivent être raccordées à la terre (mise à la terre) pour toute fonction utilitaire autre que la sécurité.



BORNE DE TERRE DE PROTECTION—Les bornes identifiées à l'aide de ce symbole sont liées à des pièces conductrices de l'instrument et elles doivent être raccordées à un système protecteur de mise à la terre externe.

C.2.2 Avis de non-responsabilité

GRAS déconseille fortement l'utilisation de ses produits d'une manière non spécifiée par le fabricant. Une telle utilisation pourrait annuler toute garantie, endommager l'équipement ou présenter un risque de sécurité pour le personnel.

C.3 Información de seguridad

NO proporcione servicio o reparación a este equipo a menos que esté debidamente calificado. El trabajo de servicio deberá ser efectuado solamente por un técnico calificado o un distribuidor autorizado de GRAS.

NO reemplace partes ni haga modificaciones sin la aprobación por escrito de GRAS. Hacerlo podría causar riesgos de seguridad. El uso de este producto en una manera no especificada por GRAS puede resultar en un riesgo de seguridad.

NO exceder las clasificaciones de la tensión de red eléctrica. Este equipo está diseñado para operar solamente de una fuente de suministro eléctrico de 50–60 Hz de corriente alterna a una tensión nominal de 100–240 VCA. La fuente de suministro de voltaje no debe exceder del ±10 % del nominal (90–264 VCA).

Este producto es para uso en interiores-Categoría de instalación II, Categoría de medición I, grado de contaminación 2.

Para limpiar la caja de este producto, utilice un trapo o cepillo suave para remover el polvo acumulado. Se puede utilizar un detergente neutro para remover la suciedad o manchas remanentes. No utilice limpiadores fuertes o abrasivos. Limpie todas las superficies con un trapo húmedo.

C.3.1 Símbolos de seguridad

Los siguientes símbolos podrían estar marcados en los paneles o cubiertas del equipo o los módulos, y se utilizan en este manual:



¡ADVERTENCIA!—Este símbolo le alerta sobre una condición potencialmente peligrosa, tal como la presencia de voltaje peligroso que pudiera representar un riesgo de descarga eléctrica. Consulte la etiqueta de advertencia adjunta y tenga mucha precaución.



¡ATENCIÓN!—Este símbolo le alerta de consideraciones operativas importantes o de una condición operativa potencial que pudiera dañar al equipo. Si usted ve este símbolo en el equipo, consulte el Manual del operador o el Manual del usuario para instrucciones de precaución.



TERMINAL DE TIERRA FUNCIONAL—Un terminal marcado con este símbolo está conectado eléctricamente a un punto de referencia de un circuito de medición o salida y se supone está conectado a tierra (aterrizado) para algún fin funcional diferente a la seguridad.



TERMINAL DE TIERRA DE PROTECCIÓN—Un terminal marcado con este símbolo está enlazado a partes conductores del instrumento y se supone que está conectado a un sistema externo de protección a tierra (aterrizada).

C.3.2 Exención de responsabilidad

GRAS advierte contra el uso de este producto de una manera no especificada por el fabricante. El hecho de no hacerlo de la manera indicada invalidaría las garantías, causaría daño al equipo, o representaría un riesgo de seguridad para el personal.

Appendix D | Warranty, Service and Repair

D.1 Warranty

GRAS products are made of components from our proven standard portfolio and are all manufactured of high-quality material and branded parts that were chosen and processed to ensure life-long stability and robustness. The warranty does not cover products that are damaged due to negligent use, an incorrect power supply, or an incorrect connection to the equipment.

The GRAS 12BA, 12BB and 12BE CCP Power Modules with TEDS Support are covered by a limited three year warranty provided by Audio Precision. Warranty terms and conditions can be found at <http://ap.com/services-calibration/warranty/>

D.2 Service and Repairs

All repairs are made at GRAS International Service Center located in Denmark. Our Service 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.

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

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