

OPERATING INSTRUCTIONS AND SYSTEM DESCRIPTION FOR THE

PA-01GX

ONE CHANNEL AMPLIFIER MODULE FOR EPMS SYSTEMS



VERSION 1.2
npi 2014

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About this Manual

This manual should help to setup and use the PA-01GX amplifier correctly and to perform reliable experiments.

If you are not familiar with the use of instruments amplification of small bio-electrical signals please read the manual completely. The experienced user should read at least chapter 3.

Important: Please read chapter 1 carefully! It contains general information about the safety regulations and how to handle highly sensitive electronic instruments.

Signs and conventions

In this manual all elements of the front panel are written in capital letters as they appear on the front panel.

System components that are shipped in the standard configuration are marked with ✓, optional components with ⇨.

Important information and special precautions are highlighted in gray.

1. Safety Regulations

VERY IMPORTANT: Instruments and components supplied by npi electronic are **NOT** intended for clinical use or medical purposes (e.g. for diagnosis or treatment of humans), or for any other life-supporting system. npi electronic disclaims any warranties for such purpose. Equipment supplied by npi electronic must be operated only by selected, trained and adequately instructed personnel. For details please consult the **GENERAL TERMS OF DELIVERY AND CONDITIONS OF BUSINESS** of npi electronic, D-71732 Tamm, Germany.

- 1) **GENERAL:** This system is designed for use in scientific laboratories and must be operated only by trained staff. General safety regulations for operating electrical devices should be followed.
- 2) **AC MAINS CONNECTION:** While working with the npi systems, always adhere to the appropriate safety measures for handling electronic devices. Before using any device please read manuals and instructions carefully.
The device is to be operated only at 115/230 Volt 60/50 Hz AC. Please check for appropriate line voltage before connecting any system to mains.
Always use a three-wire line cord and a mains power-plug with a protection contact connected to ground (protective earth).
Before opening the cabinet, unplug the instrument.
Unplug the instrument when replacing the fuse or changing line voltage. Replace fuse only with an appropriate specified type.
- 3) **STATIC ELECTRICITY:** Electronic equipment is sensitive to static discharges. Some devices such as sensor inputs are equipped with very sensitive FET amplifiers, which can be damaged by electrostatic charge and must therefore be handled with care. Electrostatic discharge can be avoided by touching a grounded metal surface when changing or adjusting sensors. **Always turn power off when adding or removing modules, connecting or disconnecting sensors, headstages or other components from the instrument or 19" cabinet.**
- 4) **TEMPERATURE DRIFT / WARM-UP TIME:** All analog electronic systems are sensitive to temperature changes. Therefore, all electronic instruments containing analog circuits should be used only in a warmed-up condition (i.e. after internal temperature has reached steady-state values). In most cases a warm-up period of 20-30 minutes is sufficient.
- 5) **HANDLING:** Please protect the device from moisture, heat, radiation and corrosive chemicals.

2. EPMS-07 Modular Plug-In System

2.1. General System Description / Operation

The npI EPMS-07 is a modular system for processing of bioelectrical signals in electrophysiology. The system is housed in a 19" rackmount cabinet (3U) has room for up to 7 plug-in units. The plug-in units are connected to power by a bus at the rear panel.

The plug-in units must be kept in position by four screws (M 2,5 x 10). The screws are important not only for mechanical stability but also for proper electrical connection to the system housing. Free area must be protected with covers.

2.2. EPMS-07 Housing

The following items are shipped with the EPMS-07 housing:

- ✓ EPMS-07 cabinet with built-in power supply
- ✓ Mains cord
- ✓ Fuse 2 A / 1 A, slow
- ✓ Front covers

In order to avoid induction of electromagnetic noise the power supply unit, the power switch and the fuse are located at the rear of the housing.

2.3. EPMS-E-07 Housing

The following items are shipped with the EPMS-E-07 housing:

- ✓ EPMS-E-07 cabinet
- ✓ External Power supply PWR-03D
- ✓ Power cord (PWR-03D to EPMS-E-07)
- ✓ Mains chord
- ✓ Fuse 1.6 A / 0.8 A, slow
- ✓ Front covers

The EPMS-E-07 housing is designed for low-noise operation, especially for extracellular and multi channel amplifiers with plugged in filters. It operates with an external power supply to minimize distortions of the signals caused by the power supply.

2.4. PWR-03D

The external power supply PWR-03D is capable of driving up to 3 EPMS-E housings. Each housing is connected by a 6-pole cable from the one of the three connectors on the front panel of the PWR-03D to the rear panel of the respective EPMS-E housing. (see Figure 1, Figure 3). A POWER LED indicates that the PWR-03D is powered on (see Figure 1). Power switch, voltage selector and fuse are located at the rear panel (see Figure 2).

Note: The chassis of the PWR-03D is connected to protective earth, and it provides protective earth to the EPMS-E housing if connected.



Figure 1: PWR-03D front panel view



Figure 2: PWR-03D rear panel view

Note: This power supply is intended to be used with npi EPMS-E systems only.

2.5. System Grounding

EPMS-07

The 19" cabinet is grounded by the power cable through the ground pin of the mains connector (= protective earth). In order to avoid ground loops the internal ground is isolated from the protective earth. The internal ground is used on the BNC connectors or GROUND plugs of the modules that are inserted into the EPMS-07 housing. The internal ground and mains ground (= protective earth) can be connected by a wire using the ground plugs on the rear panel of the instrument. It is not possible to predict whether measurements will be less or more noisy with the internal ground and mains ground connected. We recommend that you try both arrangements to determine the best configuration.



EPMS-E-07

The 19" cabinet is connected to the PROTECTIVE EARTH connector at the rear panel. The chassis is linked to protective earth only if the PWR-03D is connected. It can be connected also to the SYSTEM GROUND (SIGNAL GROUND) on the rear panel of the instrument (see Figure 3).

Important: Always adhere to the appropriate safety measures.

Figure 3: Rear panel connectors of the EPMS-E-07

2.6. Technical Data

19" rackmount cabinet, for up to 7 plug-in units

Dimensions: 3U high (1U=1 3/4" = 44.45 mm), 254 mm deep

EPMS-07

Power supply: 115/230 V AC, 60/50 Hz, fuse 2 A / 1 A slow, 45-60 W

EPMS-E-07

External power supply (for EPMS-E): 115/230 V AC, 60/50 Hz, fuse 1.6/0.8 A, slow

Dimensions of External power supply: (W x D x H) 225 mm x 210 mm x 85 mm

3. PA-01GX Amplifier Module

3.1. PA-01GX Components

The following items are shipped with the PA-01GX system:

- ✓ Amplifier module for the EPMS-07 system
- ✓ User manual

3.2. System Description

The PA-01GX amplifier is a plug-in unit for the npI EPMS-07 modular system. It is designed to amplify small bio-electrical signals. One output with two inputs is available, which can be used in AC or DC mode. The two inputs can be added or subtracted before amplification. DC offset can be compensated either by using the OFFSET control with two ranges, or by using the AC position of the input switches. Inputs and output are BNC connectors.

Input and output configurations are selectable. The PA-01GX can be connected internally to other modules of the EPMS-07 system, e.g. to one channel of an EXT-08, to a DPA-2F or to an INT-20M module. Both INPUT and OUTPUT signals can be linked internally to other EPMS modules. Two LEDs indicate when the linear region of the amplifier ($\pm 10V$) is exceeded.

The input impedance is $1 M\Omega$ (other impedances are available on request). The GAIN range is x1 to x5000 and can be set by a rotary switch.

3.4. Description of the Front Panel and Operation

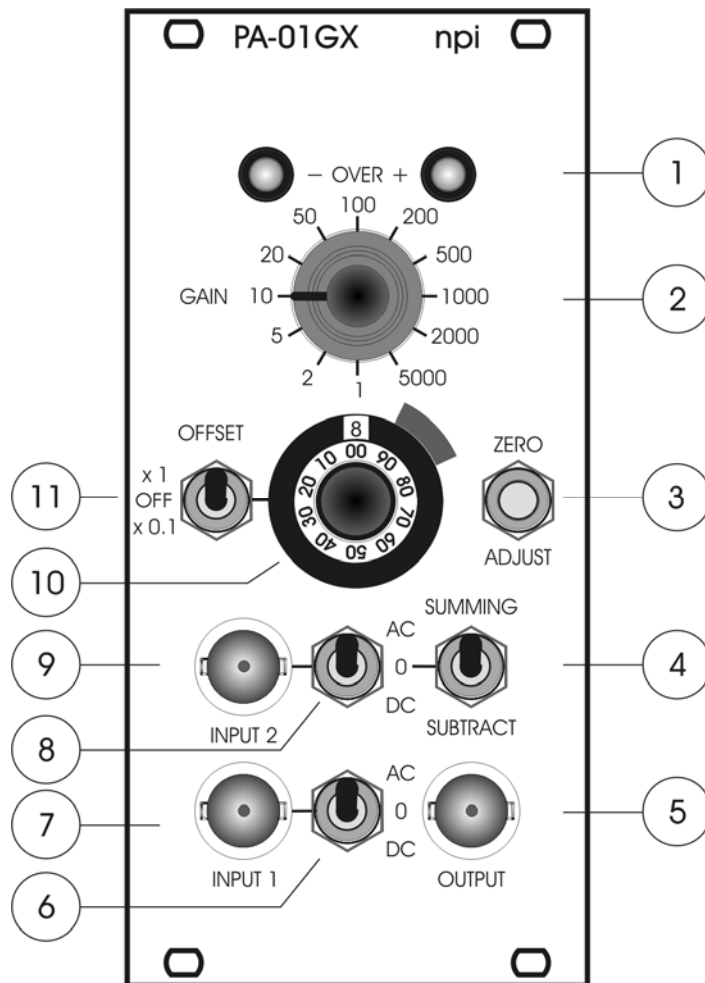


Figure 4: PA-01GX front panel view

In the following description of the front panel elements each element has a number that is related to that in Figure 4. The number is followed by the name (in uppercase letters) written on the front panel and the type of the element (in lowercase letters). Then, a short description of the element is given.

(1) OVER +/- LED



LED which indicate if the amplifier exceeds ± 10 V. The linear range of the amplifier is approx. ± 12 V.

(2) GAIN switch

Rotary switch to set the GAIN (amplification of the input signal).

(3) ZERO ADJUST trimpot

Trimpot for adjusting the OFFSET compensation. With the OFFSET range switch (# 11) in OFF position and the input coupling switches (#6, #8) in 0 position, the OUTPUT of the PA-01GX can be tuned to zero using this trimpot.

(4) SUMMING / SUBTRACT switch

Switch to define the operation of the PA-01GX. The switch is related to INPUT 2 (#9), i.e. in SUMMING position the signal at INPUT 2 is added to signal at INPUT 1 (#7) and in SUBTRACT position the signal at INPUT 2 is subtracted from to signal at INPUT 1.

(5) OUTPUT BNC connector

BNC connector providing the amplified signal.

(6) AC / 0 / DC switch (INPUT 1)

Switch to set the coupling of the signal at INPUT 1.

AC: the input signal is AC coupled with a corner frequency of 1 Hz

DC: the input signal is DC coupled

0: the input of the PA-01GX is grounded.

(7) INPUT 1 BNC connector

BNC connector to connect the input signal 1. Input impedance 1 M Ω (other impedances on request).

(8) AC / 0 / DC switch (INPUT 2)

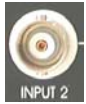
Switch to set the coupling of the signal at INPUT 2.

AC: the input signal is AC coupled with a corner frequency of 1 Hz

DC: the input signal is DC coupled

0: the input of the PA-01GX is grounded.

(9) INPUT 2 BNC connector



BNC connector to connect the input signal 2. Input impedance 1 M Ω (other impedance on request).

(10) OFFSET potentiometer



10-turn potentiometer for compensating for OFFSET of the OUTPUT in DC input coupling mode. The range is set by switch #11.

(11) OFFSET range switch



3-position switch for setting the range for OFFSET compensation (x0.1 or x1). In OFF position the compensation is turned OFF.

4. Literature

Boulton, A.A., Baker, G.B. & Vanderwolf, C.H. (eds.) (1990) *Neurophysiological Techniques, Basic Methods and Concepts*, Humana Press, Clifton, New Jersey.

Kettenmann, H. & Grantyn, R. (eds.) (1992). *Practical Electrophysiological Methods* Wiley-Liss, New York.

Ogden, D. (ed.) (1992) *Microelectrode Techniques - The Plymouth Workshop Handbook*, Second Edition, The Company of Biologists Ltd., Cambridge.

Windhorst, U. & Johansson, H. (eds.) (1999) *Modern Techniques in Neuroscience Research* Springer, Berlin, Heidelberg, New York.

5. Technical Data

Input range:	± 12 V
Input impedance:	1 M Ω
Input capacitance:	30 pF
AC coupling at input:	corner frequency of 1 Hz (if AC/0/DC switch is switched to AC)
Offset compensation:	± 1 V (x1) or ± 100 mV (x0.1)
Gain:	rotary-switch, 1-2-5-10-20-50-100-200-500-1000-2000-5000
Overload:	starting to light up at ± 10 V
Output:	impedance 50 Ω , max ± 12 V
Size:	front panel 12 HP (60.6 mm) x 3U (128,5 mm), 7" (175 mm) deep

EPMS-07 SYSTEM

Power Requirements: 115/230 V AC, 60/50 Hz, fuse 2 A / 1 A, slow, 45-60 W (depending on which modules are plugged in)

Dimensions: 19" rackmount cabinet, 3U high (1U = 1 3/4" = 44.45 mm)