

OPERATING INSTRUCTIONS AND SYSTEM DESCRIPTION FOR THE

TMR-02M

TIMER MODULE FOR EPMS SYSTEMS



VERSION 1.5

npi 2015

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1. Safety Regulations

VERY IMPORTANT: Instruments and components supplied by npí 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. npí electronic disclaims any warranties for such purpose. Equipment supplied by npí 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 npí electronic, D-71732 Tamm, Germany.

- 1) **GENERAL:** This system is designed for use in scientific laboratories and must be operated by trained staff only. General safety regulations for operating electrical devices should be followed.
- 2) **AC MAINS CONNECTION:** While working with the npí 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 (inserted)
- ✓ Front covers

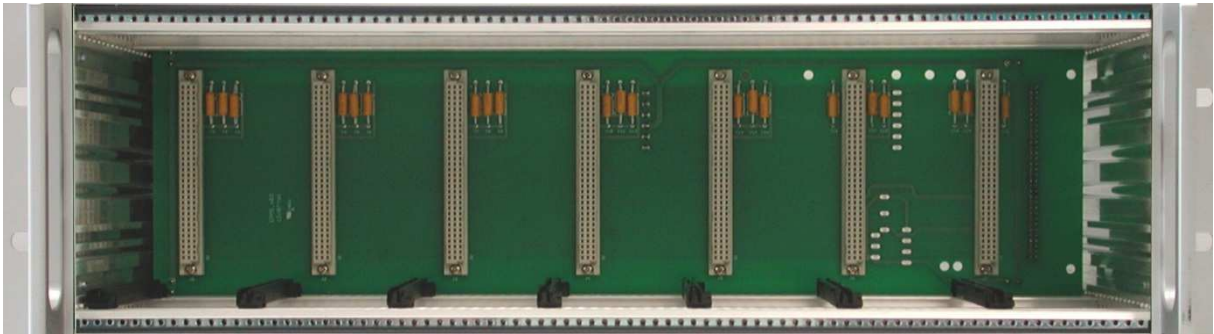


Figure 1: Left: front view of empty EPMS-07 housing.

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 (see Figure 2, right).

2.3. EPMS-H-07 Housing

In addition to the standard power supply of the EPMS-07, the EPMS-H-07 has a built-in high voltage power supply. This is necessary for all MVCS / MVCC modules, the HVA-100, HV-TR150 and HVC-03M modules. The output voltage depends on the modules in use.

2.4. 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 (inserted)
- ✓ 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.

2.5. EPMS-03

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

- ✓ EPMS-07 cabinet with built-in power supply
- ✓ Mains cord
- ✓ Fuse 034 A / 0,2 A, slow (inserted)
- ✓ Front covers



Figure 2: Left: front view of EPMS-03 housing. Right: rear panel detail of EPMS-03 and EPMS-07 housing.

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 (see Figure 2, right).

2.6. 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 one of three connectors on the front panel of the PWR-03D to the rear panel of the respective EPMS-E housing. (see Figure 3, Figure 4). A POWER LED indicates that the PWR-03D is powered on (see Figure 3, left). Power switch, voltage selector and fuse are located at the rear panel (see Figure 3, right).

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

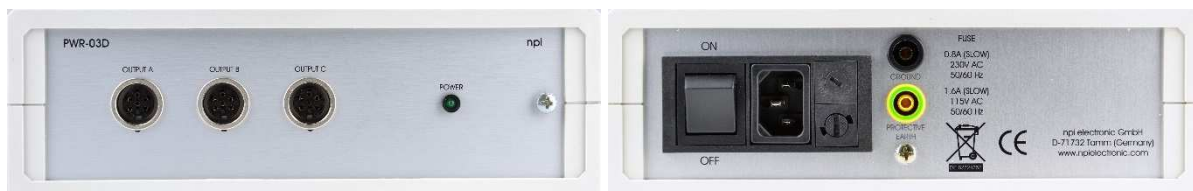


Figure 3: Left: PWR-03D front panel view Right: PWR-03D rear panel view.

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

2.7. System Grounding

EPMS-07/EPMS-03

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 CHASSIS connector at the rear panel. It can be connected to the SYSTEM GROUND (SIGNAL GROUND) on the rear panel of the instrument (see Figure 4).

The chassis can be linked to PROTECTIVE EARTH by connecting it to the PWR-03D with the supplied 6-pole cable **and** by interconnecting the GROUND and PROTECTIVE EARTH connectors on the rear panel of the PWR-03D (see Figure 3). Best performance is generally achieved without connection of the chassis to protective earth.

Important: Always adhere to the appropriate safety measures.

Figure 4: Rear panel connectors of the EPMS-E-07

2.8. Technical Data

EPMS-07, EPMS-E-07 and EPMS-H-07

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 and EPMS-H-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 (PWR-03D) 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

EPMS-03

Power supply: 115/230 Volts AC, 60/50 Hz, fuse 0.4 A / 0.2 A slow

Maximum current supply: 500 mA

Dimensions: 3U high (1U=1 3/4" = 44.45 mm), 254 mm deep, 265 mm wide

3. TMR-02M Timer Module

3.1. TMR-02M Components

The following items are shipped with the TMR-02M system:

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

3.2. System Description

The TMR-02M was designed as an easy-to-use device for generating square pulses of fixed amplitude (TTL, +5 V) and variable length.

The TMR-02M has two digital switches to set PULSE duration and DELAY time. The TMR-02M can be used continuously or for a selectable number of cycles. A switch allows manual start (and stop while cycling), but the unit can also be operated using an external TRIGGER. The TRIGGER output is used to control external devices, e.g. an oscilloscope.

3.3. Description of the Front Panel

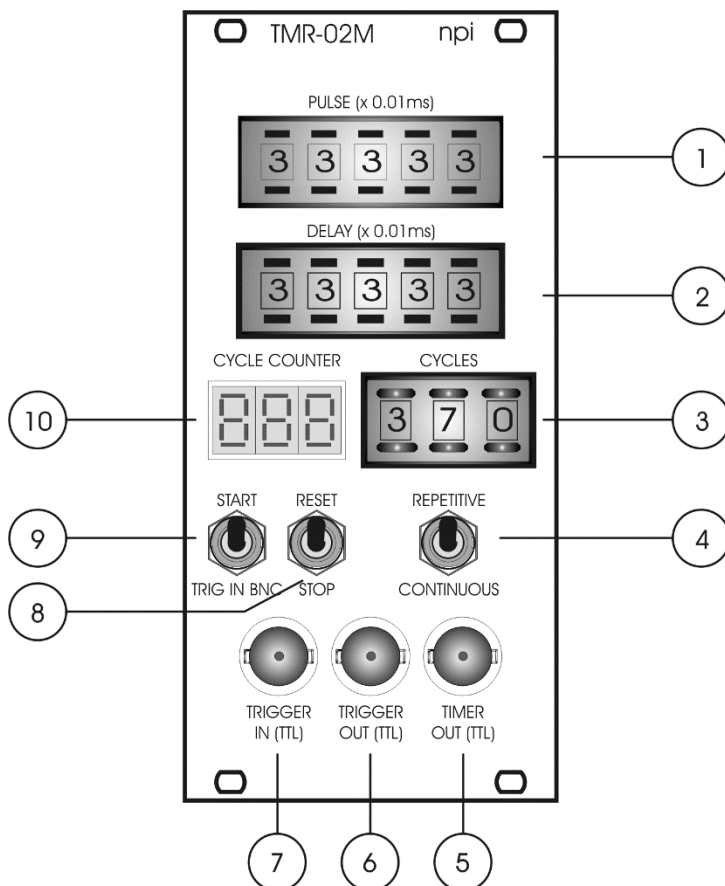


Figure 5: TMR-02M front panel view

(1) PULSE (x 0.01 ms) switch

5-digit thumb wheel switch to set the duration of the PULSE, minimum pulse width 10 μ s, maximum pulse width 999.99 ms.

(2) DELAY (x 0.01 ms) switch

5-digit thumb wheel switch to set a delay time, minimum delay time 10 μ s, maximum delay time 999.99 ms.. The delay time is the time from the rising edge of the trigger TTL signal to the beginning of the rising edge of the PULSE (see also Figure 6).

Note: If both thumb wheel switches are set to 00000, a short pulse with 1 μ s duration will be generated!

(3) CYCLES switch

Switch for setting the number of desired cycles (1 to 999).

Note: At the start of each train of cycles a RESET is executed, i.e. the TMR will be reset immediately after a start signal comes, either via manual switch or via TTL signal. For instance, if you preset 10 cycles and you press start or a TTL pulse is applied, the timer is reset to zero, 10 cycles will be executed and the TMR stops still showing "10" at the display. Upon the next start signal (via switch or TTL) the timer is reset again and 10 cycles will be executed.

Note: If the thumb wheel switch is set to 000 and switch #4 is set to REPETITIVE, 1 cycle will be generated!

(4) REPETITIVE / CONTINUOUS switch

Switch for setting the operation mode of the TMR-02M.

REPETITIVE: The timer cycles repetitively pulses: The number cycles is of set by CYCLES switch #3.

CONTINUOUS: The timer cycles pulses continuously as long as the RESET / STOP switch is pressed.

(5) TIMER OUT (TTL) connector

BNC connector providing the timed TTL signal (see also #1 and #2, Figure 5). The TTL at this connector is HI (+5 V) for the duration of the pulse.

(6) TRIGGER OUT (TTL) connector

BNC connector providing a TRIGGER signal for triggering an external device, e.g. an oscilloscope at the beginning of each cycle. The signal amplitude (TTL, +5 V), the signal length is 1 μ s.

(7) TRIGGER IN (TTL) connector

BNC connector for connecting an external TRIGGER device, minimum length: 10 μ s.

(8) RESET / STOP switch

Switch for stopping the timer.

RESET: the timer is stopped and the CYCLE COUNTER is set to zero.

STOP: the timer is stopped and the CYCLE COUNTER shows the number of cycles which had been carried out. If started again with switch #9 the CYCLE COUNTER continues to count.

Note: At the start of each train of cycles a RESET is executed, i.e. the TMR will be reset immediately after a start signal comes, either via manual switch or via TTL signal. For instance, if you preset 10 cycles and you press start or a TTL pulse is applied, the timer is reset to zero, 10 cycles will be executed and the TMR stops still showing "10" at the display. Upon the next start signal (via switch or TTL) the timer is reset again and 10 cycles will be executed.

(9) START / TRIG IN BNC switch

Switch for setting the kind of starting.

START: The timer is started by pressing the switch to this position.

TRIG IN BNC: The timer is started by a TTL HI signal applied to the TRIG IN BNC.

Note: To prevent unwanted cycle starts the START function of the switch has a built-in de-bouncing circuit. As a result the minimum time between two manually switched START events is ca. 2 s.

(10) CYCLE COUNTER LED

LED indicating the number of cycles which had been carried out since the first start. In CONTINUOUS mode the LED counts continuously.

4. Operation

The TMR-02M module can be started either manually by pushing START (#9, Figure 5) or by a TTL HI signal (rising edge) at TRIGGER IN (TTL) (#7, Figure 5). This signal must be at least 10 μ s.

The time course of the signals at input and outputs is illustrated in Figure 6.

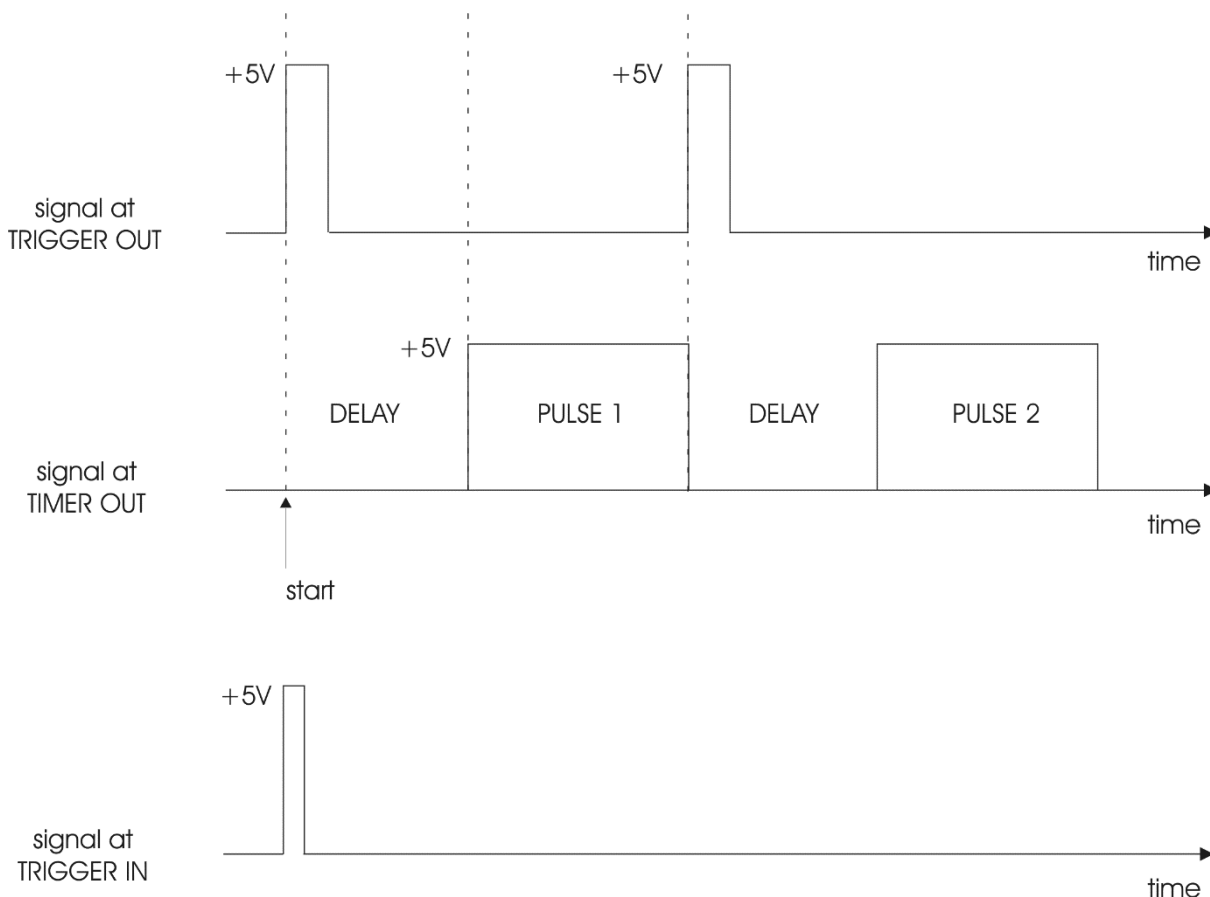


Figure 6: scheme of operation

At the beginning of the DELAY time a TTL signal (+5 V, 1 μ s) is generated at TRIGGER OUT. This TTL signal can be used to trigger an oscilloscope. After the DELAY, the PULSE starts immediately. After the end of the PULSE the second cycle begins and so on, i.e. the time-lag between the pulses is determined by the DELAY (x 0.01 ms) switch (#2, Figure 5).

5. Technical Data

TMR-02M

PULSE (x 0.01 ms) switch:	5 digits thumb wheel, 0.01 to 999.99 ms, digital
DELAY (x 0.01 ms) switch:	5 digits thumb wheel, 0.01 to 999.99 ms, digital
CYCLES switch:	3 digits thumb wheel, 1 to 999
TIMER OUT:	BNC connector, TTL signal
TRIGGER OUT:	BNC connector, TTL signal, 1 μ s
TRIGGER IN:	BNC connector, TTL signal, 10 μ s minimum
Size:	front panel: 12 HP (60.6 mm) x 3U (128,5 mm), 7" (175 mm) deep