



OPERATING INSTRUCTIONS

for the

PLUGSYS MODULE

RWT R-Wave Trigger Module for ECGA Electrocardiogram Amplifier

Type 689

(Version 1.1, Print date 3.11.02/T.Beha)

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1. Introduction, manufacturer's details

These Operating Instructions describe the function and the use of the R-Wave Trigger Module Type 689/1. They represent an essential part of the equipment and must be kept close to the equipment. All the information in these Instructions have been assembled after careful examination but it does not represent any warranty of product properties. Alterations in line with technical progress are reserved.

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Trademarks

PLUGSYS® is a registered trademark of HUGO SACHS ELEKTRONIK - HARVARD APPARATUS GmbH, March-Hugstetten, Germany.

2. Safety note



Important: This equipment must not be used on humans ! The equipment is not suitable for operation in hazardous areas and/or in a flammable atmosphere.

3. General description, applications

The R-Wave Trigger Module RWT Type 689/1 is an add-on module to the ECG Amplifier Type 689. It is used for triggering (starting) a stimulator or some other equipment from the R-wave of an ECG signal.

The ECG signal must be obtained by the ECGA module. The R-Wave Trigger Module is connected internally to the ECGA module and can only operate in conjunction with that module.

The RWT module, as well as the ECG amplifier, are plug-in modules of the PLUGSYS measuring system.

The R-wave Trigger Module can be used e.g. for synchronised stimulation of a heart. By triggering the DELAY module of a stimulator it is possible to delay the stimulation pulse relative to the R-wave and to position it in the vulnerable phase of the ECG in order to induce ventricular fibrillation. For that purpose the trigger output of the RWT has to be connected to the trigger input of the stimulator.

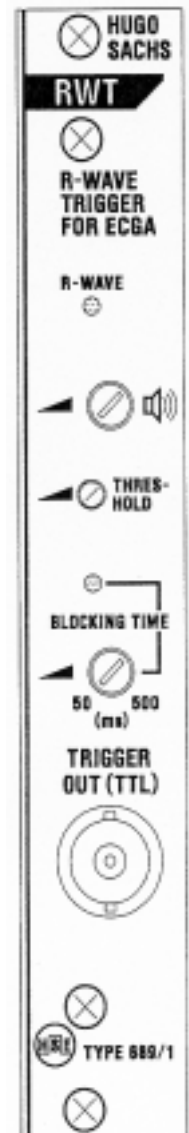
Every R-wave recognised by the RWT is indicated by flashing of an LED and an audible beep is heard at the same time. The loudness of the beep can be adjusted with the aid of a trimmer. Double triggering due to an enlarged T-wave is prevented by an adjustable threshold value („THRESHOLD“); in addition there is an adjustable „BLOCKING TIME“ during which the circuit is inactivated.

The trigger signal is available as a TTL voltage at a BNC socket on the front panel, and also internally on the PLUGSYS system bus for triggering.

In order to utilise the RWT module it has to be installed in a PLUGSYS housing Series 600 and linked to an ECG Amplifier Module.



R-wave triggering with positive TTL pulses.



4. Installing the module in a housing

(If the module has been supplied already installed you can omit Sections 4 and 5 and continue at Section 6. If you have received the module as an individual item you should continue reading here.)

Before the RWT module can be put into operation it must be installed in a suitable HSE PLUGSYS housing Series 600 (Jan 96: 601 to 607). If the module is supplied as part of a completely installed PLUGSYS measuring system, the work described below has already been carried out and the selected signal path have been entered in the bus diagram.

Before the module is installed in a housing it is necessary to establish the connections of the module to the bus lines by setting jumpers, as described in the next Section (Section 5).

Do not forget to enter the selected jumpers in the bus diagram (in the white Operating Instructions folder under Section 1).

Installation procedure for a new ECGA and RWT:

- * Pull out the mains plug on the housing.
- * Remove the blank panel at the intended slot position in the PLUGSYS system.
- * Prepare the ECGA module Type 689 according to Section 4 of the ECGA Operating Instructions (make connections and fit jumpers).
- * Prepare the RWT module Type 689/1 according to Section 4.1 of these Operating Instructions (fit jumpers).
- * Connect the ECGA module to the RWT module by the ribbon cable.
- * Insert the ECGA and RWT modules together, note the guide rails.

- * Push the ECGA module into the bus connector.
- * Screw on the front panels.
- * Connect the ECG cable to the ECGA module.
- * Connect the mains plug to the housing.
- * Switch on the housing.

Installation procedure for retrofitting the RWT module.

- * Pull out the mains plug on the housing.
- * Remove the blank panel on the right next to the ECGA module.
- * Remove the ECGA module.
- * Prepare the RWT module Type 689/1 according to Section 4.1 of these Operating Instructions (fit jumpers).
- * Connect the ECGA module to the RWT module by the ribbon cable.
- * Insert the ECGA and RWT modules together, note the guide rails.
- * Push the ECGA module into the bus connector.
- * Screw on the front panels.
- * Connect the ECG cable to the ECGA module.
- * Connect the BNC cable from the trigger output to the trigger input of the equipment being triggered.
- * Connect the mains plug to the housing.
- * Switch on the housing.

4.1 Internal settings, jumpers

Warning: When the RWT module is outside an enclosure it must be protected against electrostatic charges! The RWT module contains highly sensitive MOS components which can be damaged or destroyed by electrostatic discharges. If you remove the module from the enclosure, or if you perform any operation on the removed module, you have to ensure equilibration of potentials before you touch any part of the printed circuit. (Touching an earthed object, e.g. water tap, central heating radiator, earthed housing, PLUGSYS housing or similar).

Before you can install the RWT module in the PLUGSYS housing you have to fit a jumper on the circuit board to ensure that the output signal is linked to the intended or desired bus line. The equipment can be used in conjunction with the complete system only if the bus line is connected up correctly.

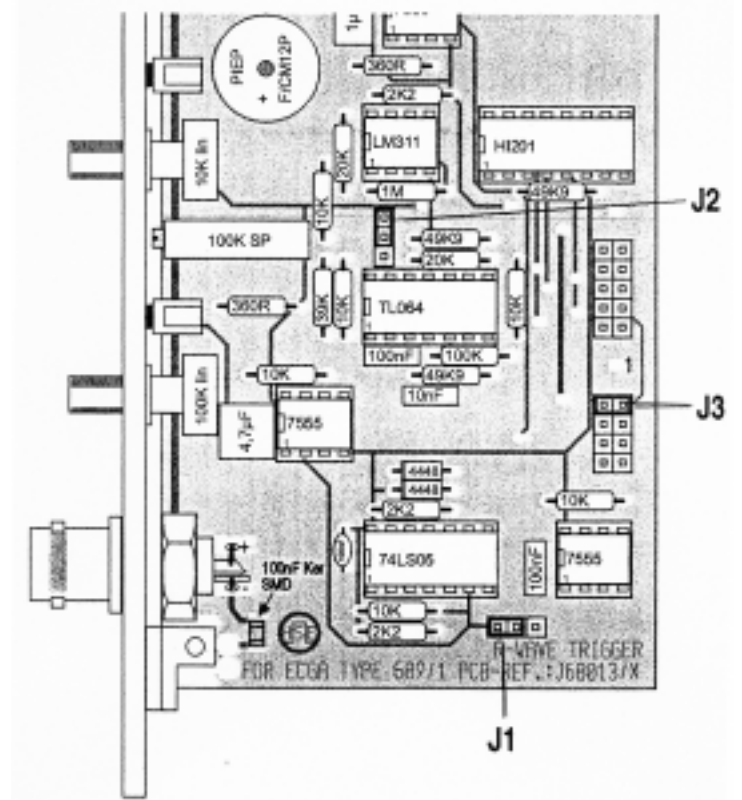
Do not forget to enter the selected assignment of the signals in the bus diagram of the PLUGSYS housing (the bus diagram in the Operating Instructions folder under Section 1).

If the module is supplied as part of a complete PLUGSYS measuring system the operation described below has already been carried out and the signal paths selected have been entered in the bus diagram.

Warning: When choosing the bus lines (trigger lines), note that you have to use a free line and must check this by referring to the bus diagram. If there are no relevant details in the diagram you can determine the assignment of the bus lines only by removing all modules and determining the signal paths selected there as explained in the individual Operating Instructions.

The locations of the jumpers can be found in the illustration below. The following jumpers have to be placed:

Inverting the trigger signal	J1
Changing the gain	J2
Trigger lines TRIG1 - TRIG4	J3



5. Starting up

After the ECG input cable has been connected to the input sockets of the ECGA you can switch on the housing and start the measurements.

An oscilloscope should be used for accurate adjustment of „THRESHOLD“ value and „BLOCKING TIME“.

The ECG signal is picked off at the BNC socket of the ECGA and connected to the oscilloscope. The trigger signal is connected to the second channel of the oscilloscope. Now adjust the „BLOCKING TIME“ to 50 msec by turning the control anticlockwise against the left stop. Then adjust the „THRESHOLD“ trimmer so that there is only a single pulse at the trigger output for each R-wave. See diagrams below.

R-waves Triggering with positive TTL pulses

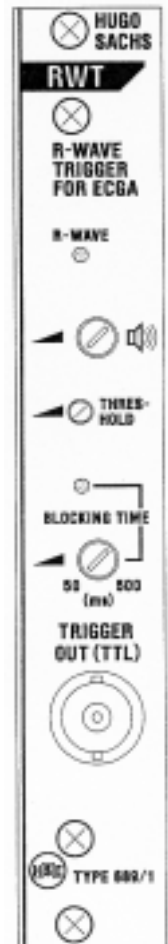


6. Input

The RWT module receives its input signal (ECG) through the internal ribbon cable from the ECG amplifier module.

7. Description of the controls

- (1) LED „R-WAVE“ flashes for each R-wave identified.
- (2) Trimmer for the loudness of the audible signal. There is a beep at each R-wave identified whose loudness can be adjusted here.
- (3) „THRESHOLD“ trimmer. This trimmer is used to adjust the threshold for identifying the R-wave. In order to check this function, the ECG signal and the trigger signal should be examined together on an oscilloscope. The „THRESHOLD“ trimmer has to be adjusted so that a trigger pulse is output only for an R-wave, and not for a T-wave. If a T-wave also produces a trigger pulse, the threshold has to be increased by clockwise rotation of the „THRESHOLD“ trimmer.
- (4) LED „BLOCKING TIME“. This LED indicates the duration of the blocking time. It is possible to select a blocking time between 50 and 500 msec after the R-wave during which the circuit is inactivated.
- (5) BNC socket TRIGGER OUT (TTL). Either positive or negative TTL pulses are output depending on the configuration of the internal jumper J1.



8. Errors, causes, remedies

Error: The R-wave LED is not flashing.

Cause: „THRESHOLD“ has been set too high or the gain on the ECGA module is too low.

Remedy: Increase „GAIN“ on the ECGA module so that the deflection on the bargraph is between 50 and 75%. Turn the „THRESHOLD“ trigger anticlockwise to reduce the threshold.

Error: The R-wave LED flashes twice.

Cause: „THRESHOLD“ has been set too low. The circuit triggers on the T-wave. „BLOCKING TIME“ has been set too short.

Remedy: Turn the „THRESHOLD“ trimmer clockwise in order to increase the threshold. Turn the „BLOCKING TIME“ trimmer clockwise to increase the blocking time. Do not set the blocking time too long, otherwise the module does not trigger on every R-wave.

Error: The controlled equipment is not triggered.

Cause: Cable not connected up correctly. Trigger pulses are inverted.

Remedy: Check the trigger input of the controlled equipment. Does it require a positive or a negative pulse? Check jumper J1 on the RWT module.

9. Maintenance and cleaning

The PLUGSYS modules do not really require any maintenance. The RWT module is supplied fully calibrated ready for use. Any operation on and modification of the electronic circuitry results in cancellation of the warranty and product liability by the manufacturer.

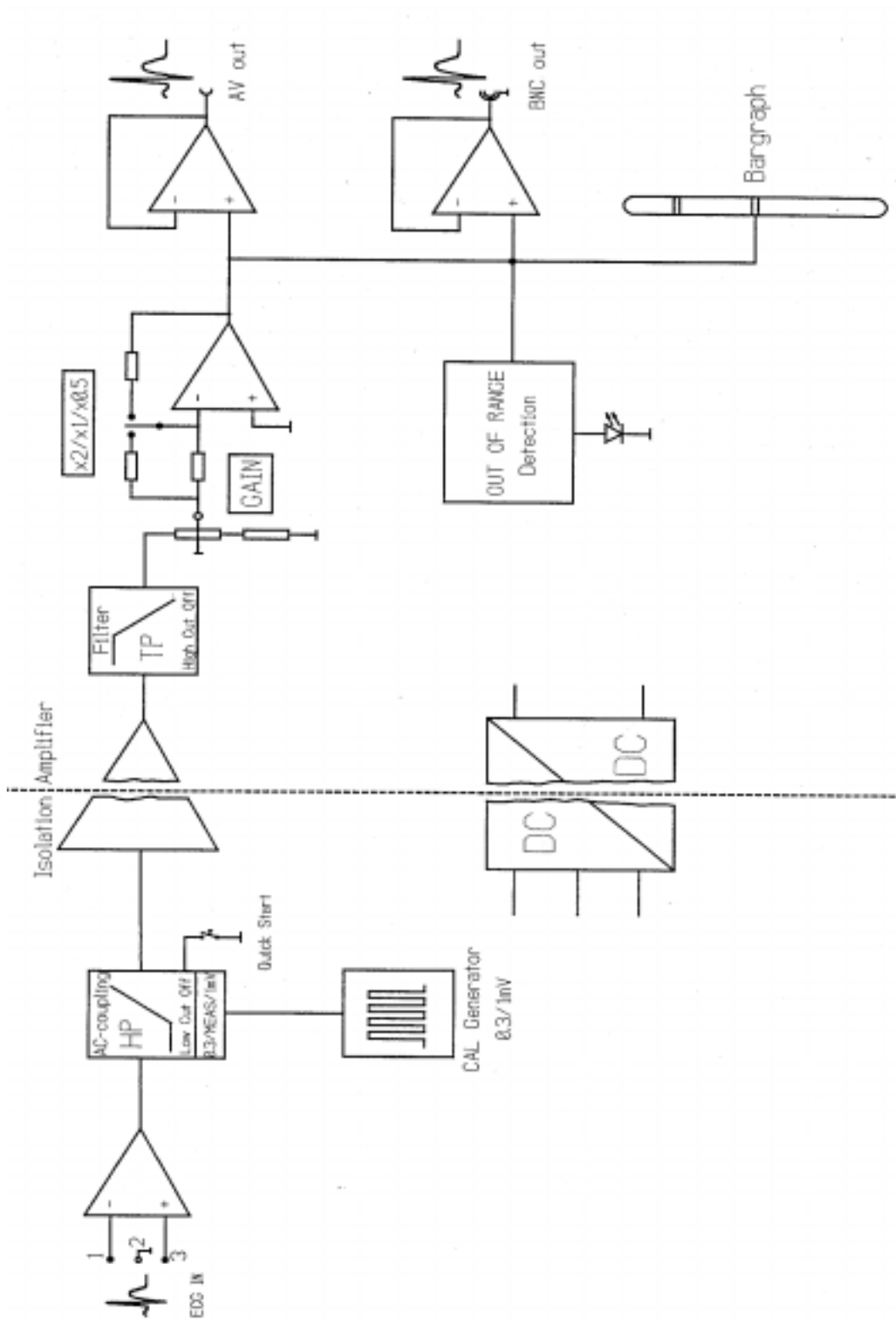
The front panel can be cleaned when necessary with a slightly moistened (not wet) cloth. Before cleaning, pull out the mains plug for safety !

Never allow any moisture to find its way inside the unit, especially the controls and the keys, as this leads to corrosion on the switching contacts resulting in incorrect operation. In addition the PLUGSYS housing should be protected against splash water and saline solutions which would cause damage to individual components and short-circuits.

10. Transport and storage

If you have to ship the PLUGSYS system (e.g. to the manufacturer for repair), you should pack it in a suitably large carton, with about 10 cm space all round the unit, in order to include sufficient padding material (e.g. expanded polystyrene, foam rubber blocks) to prevent transport damage. When shipping individual modules these should also be well packed and placed inside antistatic foil or bag.

11. Block diagram of RWT module



12. CE conformity

This product and accessories conform to the requirements of the Low-Voltage Guideline 73/23/EWG as well as the EMC Directive 89/336/EWG and are accordingly marked with the CE symbol. For conformity with the standard it is essential that the details in these Instructions are strictly observed during operation.

13. Technical data

Output: BNC socket „TRIGGER OUT“ on the front panel, open collector TTL signal with 2.2 kOhm pull-up resistance. Can be altered between positive and negative output pulses by on-board jumper.

R-wave indication: LED and audible signal to indicate the R-wave. The loudness of the beep can be adjusted by a trimmer.

THRESHOLD: The triggering threshold can be adjusted by a trimmer.

BLOCKING TIME: Adjustable blocking time from 50 to 500 msec. This time can be adjusted with the „BLOCKING TIME“ trimmer. An LED indicates how long the circuit remains inactivated.

Ambient conditions: Working temperature 10 to 40°C

Relative humidity: 20 to 80% without condensation

Storage temperature: -20 to 60°C

Supply: 5 V 70 mA, supplied via ECGA module

Mechanical data:

Dimensions: module for PLUGSYS housing
width 16E (40.4 mm)
height 3U (128.7 mm)
depth Eurocard (220 mm)

Weight: 200 g

Accessory: BNC output cable and Operating Instructions

14 Reply form

Please take a few minutes of your time in order to write to us on any difficulties in understanding these Operating Instructions or in the use of the PCLS bath. With your feedback you help to improve our products and the system documentation and make them more user-friendly.

Please tell us

☞ where you have found mistakes,

☞ where the arrangement was not clear and what you did not understand,

☞ and where you would like to see improvements.

Many thanks for *your kind assistance*.

Yours HUGO SACHS ELEKTRONIK-
HARVARD APPARATUS GmbH.

Your name _____

Organisation _____

Street _____

Town _____

Phone / Fax _____

e-mail _____

Please send this sheet or a copy to:

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