

Manual 1.1



TIB 14S

Trigger Interface



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1. Introduction

Electrophysiological setups have to be increasingly flexible nowadays. More parameters than ever need to be acquired or altered simultaneously during data acquisition. Controlling bath perfusion or synchronizing other peripheral devices with data acquisition are standard routines in many laboratories today. The TIB 14S is fully supported by the HEKA software, enabling the simultaneous control of numerous devices, such as magnetic valves, shutters, stimulators, etc. within one software application. The open collector outputs can optionally carry three different voltages which, in contrast to other digital I/O boards, obligates the use of additional hardware to drive external devices.

The TIB 14S is a digital output trigger interface to be used with a fully computer controlled patch clamp amplifier EPC 9 or EPC 10 which have an AD/DA converter interface built-in or with a standalone interface ITC-16 or LIH 1600. For control of the TIB 14S from the TIDA software an additional PCI-DIO interface card is required. The TIB 14S provides your system with 14 TTL outputs and 14 open collector power outputs which will enable you to control several devices, directly from your software.

2. Controls and Functions

2.1 Front panel controls



BNC out: 14 BNC connectors numbered 0 to 13

Switches: A switch for each channel is available for manual control of the channel. Three positions are available: **on**, **off**, **manual**.

LED: Each channel has its own LED indicating the status of channel. Light on: TTL high, light off: TTL low.

2.2 Rear panel controls



FUSE: Contains a fuse of type T 800 mA L.

POWER: Power connector to connect to a 50 - 60 Hz power line.

Voltage selector: Allows selection between 110 V and 220 V.

Note: Before connecting the TIB 14S to the local power line, please make sure that the appropriate voltage is selected.

Digital In (ITC-16): Digital input connector to connect the TIB 14S to patch clamp amplifiers of the series EPC 9, EPC 10 and interfaces ITC-16, LIH 1600, LIH 8+8.

TRIGGER OUT: Trigger out connector to be connected to a valve bank or other peripheral devices.

Digital In (CIO-DIO): Digital input connector of type SUB-D.

3. Installation

3.1 Connection to EPC 9, EPC 10, LIH 8+8 and LIH 1600

The TIB 14S can be connected to the digital I/O connector of EPC 9, EPC 10, LIH 8+8, ITC-16, and LIH 1600 via the connector on the rear panel labelled **Digital In (ITC-16)**.

Digital In (ITC-16) connector :



PIN number	SIGNAL
1	
3	
5	
7	
9	
11	
13	
15	
17	
19	Ground
21	Ground
23	
25	DIGIT_0
27	DIGIT_1
29	DIGIT_2
31	DIGIT_3
33	DIGIT_4
35	DIGIT_5
37	DIGIT_6
39	DIGIT_7

PIN number	SIGNAL
2	
4	DIGIT_15
6	
8	
10	
12	
14	DIGIT_15
16	
18	
20	Ground
22	Ground
24	
26	DIGIT_8
28	DIGIT_9
30	DIGIT_10
32	DIGIT_11
34	DIGIT_12
36	DIGIT_13
38	
40	

Figure 3.1: Digital In Connector (ITC-16)

3.2 Connection to CIO-DIO or PCI-DIO 24H interface card

In case you are not using the TIB 14S in combination of a device mentioned above, you can be connected to a CIO-DIO or PCI-DIO24H interface card via the connector on the rear panel labelled **Digital In (CIO-DIO)**.

DIGITAL IN (CIO-DIO-24) connector :

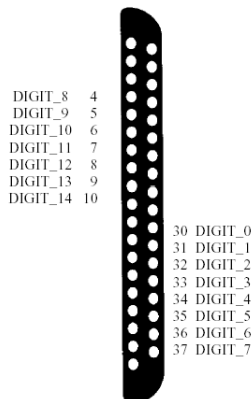
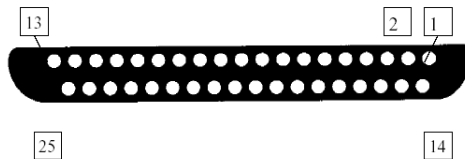


Figure 3.2: Digital In Connector (CIO-DIO)

3.3 Connection of Magnetic Valve

TRIGGER OUT connector (rear-panel):



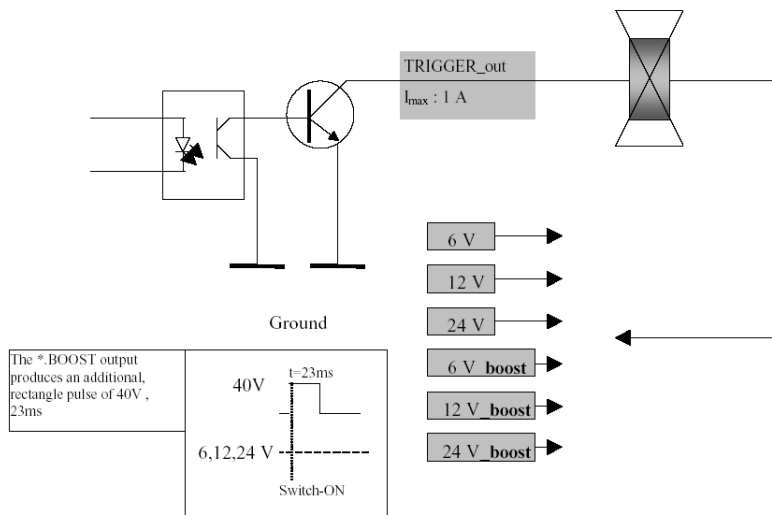
PIN number	SIGNAL
1	TRIGGER-0
2	TRIGGER-1
3	TRIGGER-2
4	TRIGGER-3
5	TRIGGER-4
6	TRIGGER-5
7	TRIGGER-6
8	TRIGGER-7
9	TRIGGER-8
10	TRIGGER-9
11	TRIGGER-10
12	TRIGGER-11

PIN number	SIGNAL
13	TRIGGER-12
14	TRIGGER-13
15	GND (ground)
16	6V
17	GND (ground)
18	12V
19	GND (ground)
20	24V
21	6V BOOST
22	12V BOOST
23	GND (ground)
24	24V BOOST
25	GND (ground)

Figure 3.3: Trigger Out Connector

The advantage of the open collector output is the possibility to connect magnetic valves with various voltages. The open collector output switches the ground line with a max. output current of 1A. The TTL output (+5V) switches the output with a max current of 20mA. The TTL output and the open-collector output are switched in parallel. Each trigger command is indicated by a LED and activates both, TTL output and a open collector output.

The opto coupled output avoids ground loops in the setup which often is the reason for artifacts and increasing noise level during the measurement. For switching a magnetic valve it is absolutely necessary to mount a protection diode. The protection diode (mounted anti-parallel, directly at the valve) avoids spikes during the measurement and protects the output transistor of the TIB14 interface.



3.4 Connection of Peripheral Devices

The BNC connectors at the front panel of the TIB 14S can be used to control peripheral devices.

4. Operation

4.1 Manual Operation

Each of the 14 digital outputs at the front panel is equipped with a manual switch.

Permanent On Put the switch in the **on** position to set the corresponding channel to a TTL high level.

Pulsed Mode, Transiently ON Press down the switch in the **manual** position to transiently set the corresponding channel to a TTL high level. The level remains high as long as you keep the switch in the **manual** position. If you release the switch the TTL level returns to low.

4.2 Software Support

Pulse software Trigger commands can be set by the PULSE software, either manually in the amplifier window or automatically through Macros or in a Pulse Generator Sequence. Using the Pulse Generator the triggers will be synchronized with the stimulation signals of PULSE.

PatchMaster software PATCHMASTER in addition, offers a more flexible use of the trigger outputs in the Pulse Generator and allows control of the trigger commands from the Protocol Editor. For more information about the software support please refer to the brochures and manuals of the corresponding software package.

4.3 Control of a Valve Bank

Magnetic valves can be driven either in **normal mode** by connecting the valve to the 6V, 12V or 24V pins or in **boost mode** by connecting to 6V_boost, 12V_boost or 24V_boost of the Trigger Out connector. For pin assignment and a scheme how to connect the valves please refer to figures 3.3 and 3.3.

The **boost mode** facilitates the opening of the magnetic valves.

***Note:** The maximal output current of the TIB 14S is limited to 1 A. Depending on the current requirement of the valves connected to the TIB 14S only one valve may be open at a time.*

5. Technical Specifications

5.1 Compatibility Chart

The following combinations of software and devices are supported:

Software	PATCHMASTER or PULSE		TIDA	
Patch Clamp Amplifier	EPC 7		EPC 7	
		EPC 9 or EPC 10		EPC 9 or EPC 10
Interface Board			CIO-DIO or PCI-DIO 24H	CIO-DIO or PCI-DIO 24H
	ITC-16 or LIH 1600		ITC-16 or LIH 1600	
Trigger Interface	TIB 14S			

5.2 Specifications

Digital Out Channels: TIB 14S offers up to 14 trigger outputs

Front panel connectors: 14 BNC connectors with TTL level outputs are available. The state of the trigger outputs is indicated by LED's.

Rear panel connectors:

- DIGITAL IN (ITC-16) connector to connect the EPC 9 or EPC 10 patch clamp amplifiers or the ITC-16 or LIH 1600 acquisition interfaces directly. For pin assignment please refer to figure 3.1 on page 5.
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- **DIGITAL IN (CIO-DIO)** connector to connect the CIO-DIO interface card. For pin assignment please refer to figure 3.2 on page 6.
- **TRIGGER OUT** open collector outputs to control up to 14 devices. The outputs are opto-coupled open collector driven. Three different power voltages are built-in: 6 V; 12 V; 24 V. In addition, there are three boosted power voltages available. The boost produces directly after switching on this channel an additional rectangle pulse of 40 V amplitude and 23 ms duration. Maximum current output is 1 A. For pin assignment please refer to figure 3.3 on page 7.

***Note:** Magnetic devices should be used with a protection diode.*

For a scheme how to connect a magnetic valve please refer to figure 3.3 on page 8.

Dimensions: (D x W x H) (25.0 x 48.3 x 9.0) cm (9.8 x 19.0 x 3.5) inch

Weight: 5.8 kg / 12.6 lbs

Power requirements: 115 V or 230 V, selectable at the rear maximum power consumption 55 W

Software control: via setting of digital out channels in PATCHMASTER, PULSE or TIDA. For details see the reference manual or the corresponding software package.