

Operating Electronics
for Spectral Sensors
and Linear Image Arrays

**Remote-Controlling of Interface-
Electronics and Spectrometer-Systems**

Technical Note

Version 1. 3

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1 Introduction

For the remote control of device performance, digital inputs and/or the trigger input are integrated into the interface electronics as well as the spectrometer systems. When receiving a certain signal at one of these ports, a predefined event is actuated.

The tec5 electronics offers two different ways of remote controlling:

- ♦ Remote controlling via digital inputs
The first option is remote controlling by means of the digital inputs. This is managed by software and provides the possibility not only to do sample-measurements, but also e.g. dark-current or calibration measurements. However, a delay of up to some ms between receiving the signal and the start of the measurement has to be taken into account; the delay depends on the processor load.
- ♦ External triggering
The second option is the use of the hardware-trigger, which has the advantage to actuate the event in real-time without any delay.
When using a system, the trigger-signals are transmitted to the electronic via the 9-pin DSUB connector. This connector is located on the back-panel of the system with USB-electronics; for PCI-electronics it is located next to the 40-pin connector on the PCI-board. For electronics please refer to the related documentation which can be found on the provided Info CD.

2 Remote Controlling by Means of Digital Inputs

Two digital inputs are available for this type of remote controlling, which is especially useful for applications which do not require real-time measurements. An advantage is that the software is ready with its entire functional range, independently from the remote control. Thus, measurements can also be initiated manually. To do so TTL signals (+5V) are used. The digital input is grounded when the release button is not pushed, this is taken care of by the internal circuitry, realized by means of a 10 k Ω resistor. The actual status is always defined. In the following the wiring diagrams for digital remote controlling based on one or two digital inputs, are shown.

One Digital Input

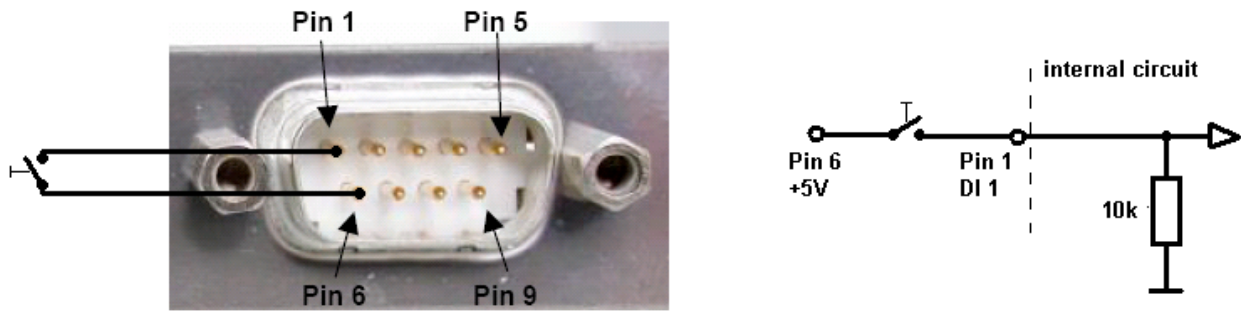


Figure 1: Remote control with one digital input

By applying a +5V signal (TTL-signal) to the digital input (DI1) at pin 1, the measurement is initiated. A simple way to realize this is to connect pin 1 (DI19) and pin 6 (+5V-Out) by a pushbutton.

Two Digital Inputs

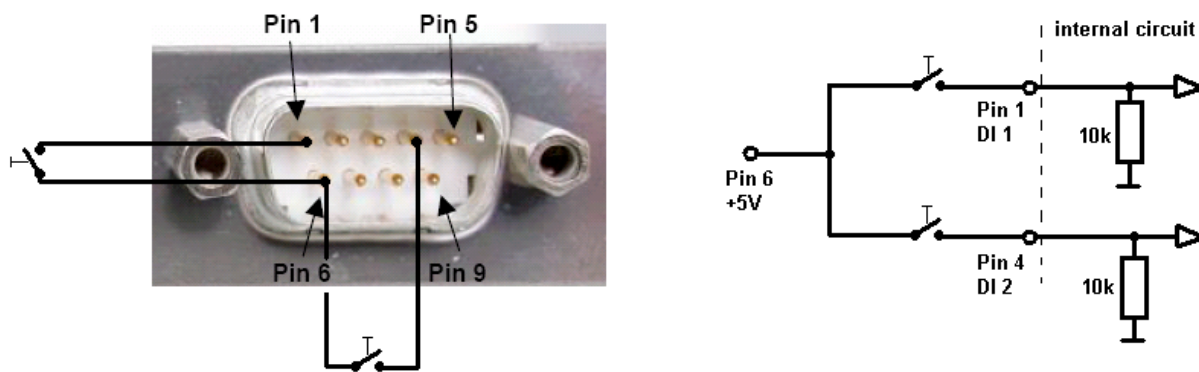


Figure 2: Remote control with two digital inputs

In principle remote controlling with two digital inputs is an upgrade of remote controlling with one digital input. Pin 4 (DI2) is already grounded by means of an internal $10\text{k}\Omega$ resistor. By applying +5V to pin 4 (DI2), or connecting pin 4 (DI2) and pin 6 (+5V-Out) by a push button, a measurement is started. In that way e.g. the trigger event at DI1 can initiate a dark-current measurement and the trigger event at DI2 can initiate a sample measurement. The allocation of the respective functions to the digital inputs is done via the software (please refer to chapter 4.3.12 "Remote Control" of the MultiSpec Pro manual).

3 Hardware Triggering

By means of the hardware-trigger, the measurements can be performed closely linked timewise to the trigger-signal. It is especially suitable for measurements requiring accurate timing. For PCI electronics the jitter (time delay between the trigger event and the data scan) is virtual 0, for USB electronics it averages to $100 \pm 50\mu\text{s}$. However, without changing the operating mode, this type of triggering can only be initiated by applying a real signal, not by software.

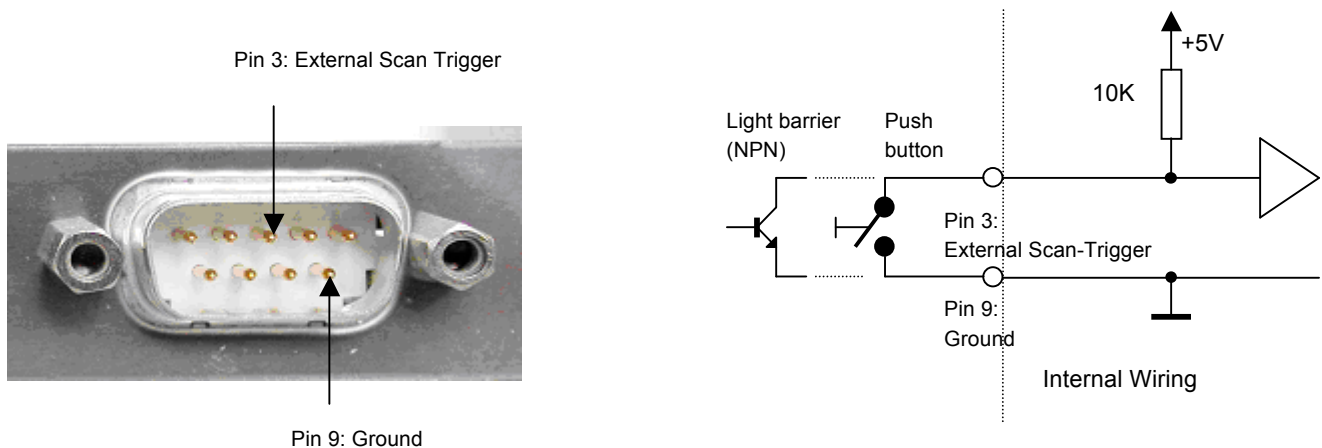


Figure 3: Hardware trigger signal connection at 9 pin Digital I/O connector

In case of a hardware trigger, the input “external scan trigger” has to be an “High” signal (+5V = logic high) or the input has to be disconnected (+5V level is realized by an internal pull-up-resistor). For triggering a measurement, a negative slope is needed (Change to Ground = Change to logic low).

For testing purposes a push button can be connected, alternatively a light barrier with an open-collector-npn output or an pulse generator between pin3 (Ext. Trig.) and pin9 (GND) in addition to the external trigger. Furthermore the hardware must be prepared for the external triggering by the command “Get Spectra”. All further procedures are working exclusively within the hardware in real-time and are autonomous from the processor load. For this purpose, various operating modes are available, which are described in the Technical Note “Overview - Sensor Operating Modes”. The selection of the operating mode also decides whether the triggering is started exclusively at an negative slope (one time per trigger pulse / operating mode xxx_Pulse_xxx) or at each slope (operating mode xxx_Slope_xxx).

Attention !

During the external triggering the electronic is responsive to each activated trigger slope as soon as the measuring cycle is initiated by the computer. At very short integration times, a chatter of the switch can cause an additional accidentally measuring cycle.

A re-triggering of a measuring cycle is stopped by the electronics. That means between the acceptance of the trigger pulse and the initialization of a new measurement every further trigger pulse is inhibited. If

the trigger frequency is higher as the performance of the computer allows, this effect can cause a loss of measured data.

In the figure shown below, a trigger signal is applied as soon as the sample to be measured interrupts the light gate. Now the sample is in the correct position and a measurement is initiated by remote control. Especially in case the products have varying distances between each other, it is a good possibility to ensure that 100% of the samples are measured.

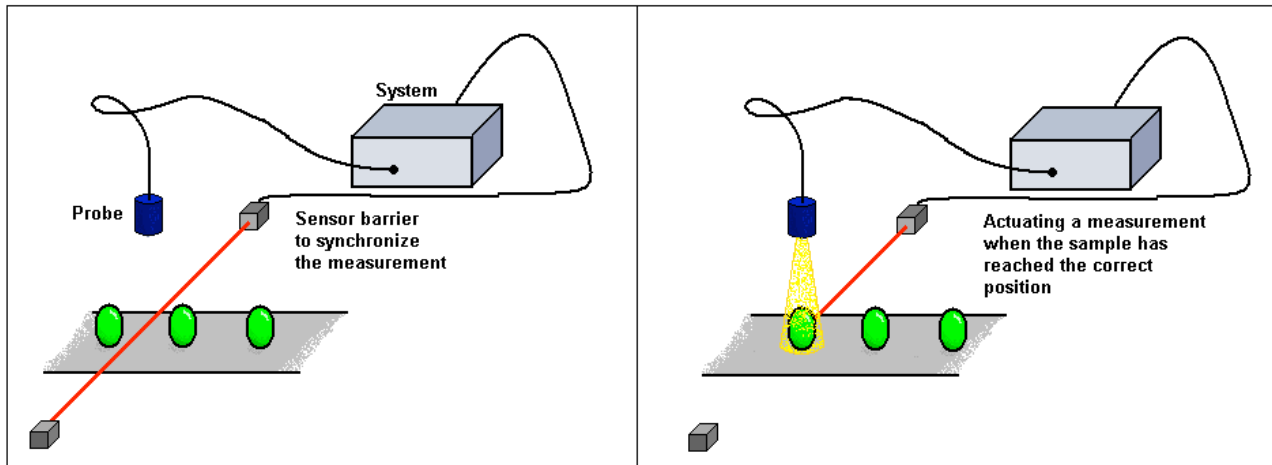
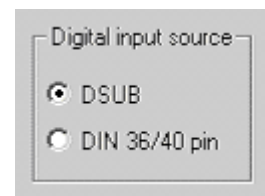


Figure 4: Synchronizing the measurements by means of a sensor barrier

For testing purposes of the external triggering, a frequency synthesizer can be connected with pin 3 (Ext_Trig) and pin 9 (GND). By means of the command "Get Spectra", the hardware is prepared for the external triggering. All further activities are solely controlled by the hardware in real-time and are independent of the processor work load. For this purpose different triggered sensor operating modes are available, which are described in detail in the technical note „Overview – Sensor Operating Modes“.

4 Note

The digital input source has to be set from „DIN 36/40 pin“ to „DSUB“ in case of triggering a system using the software MultiSpec Pro. This menu item can be found under "Operating Electronics /Options Setup". The DIN 36/40 pin connector can be used alternatively to the DSUB for triggering PCI electronics, however this connector is not accessible for the outside.



5 Expanded Options by the Use of Additional Hardware

!!Works only with the MultiSpec Pro processe software!!

5.1 I/O Boards

The software MultiSpec Pro supports different I/O Boards and allows thereby the dataexchange and the remote control of a system.

The software support for the additional I/O boards must be installed with the MultiSpec Pro software. For further information, please see chapter “3.4 Installation of MultSpec Pro” of the MultiSpec Pro User Manual.

Further information can also be found in the MultiSpec Pro User Manual chapter “6.1 I/O Boards”.

5.2 PROFIBUS DP

Furthermore, the MultSpec Pro software supports Profibus DP-Slave for communication with a master system and allows thereby the dataexchange and the system remote.

The software support must be installed with the MultiSpec Pro software. For further information, please see chapter “3.4 Installation of MultSpec Pro” of the MultiSpec Pro User Manual.

Further information can also be found in the MultiSpec Pro User Manual chapter “6.2 PROFIBUS DP”.

5.3 OPC DA Client

To allow the communication with software application and control devices of other manufacturer, the Multispec Pro software supports the standard software specification OPC (OLE for **P**rocess **C**ontrol).

I/O-Data can be exchanged with OPC servers (for example Wago, Beckhoff, Phoenix Contact, etc.) easily.

Further information can also be found in the MultiSpec Pro User Manual chapter “6.3 OPC DA Client”.