*my*PCLab

INSTRUCTION MANUAL – V1.1x B

INTRODUCTION

*my*PCLab is a very compact Data Acquisition tool that connects to a PC via a USB port and monitors two universal input analog variables along with one digital input. From hobbyists to scientists, from simple technical tasks to complex engineering activities, *my*PCLab can be an invaluable tool for on-line monitoring and data logging in school, laboratory research, machine data recording and industrial understanding.

It comes with intuitive and easy-to-use Windows software which plots and records data, shows gauges, bargraphs and digital readouts. The USB port is accessed as a virtual serial port, which makes *my*PCLab compatible with SCADA software with Modbus RTU driver or with any program with ASCII serial communication.

Multiple units of *my*PCLab can be connected to the same computer, easily expanding the number of inputs. The *my*PCLab software can simultaneously communicate with multiple modules.

This manual describes software installation and connection of input signals to a *my*PCLab module. Instructions on using the software are available on its help system.

> ⚠ **Not compatible with Windows® 10.**

> ⚠ **READ THIS RECOMMENDATION TO AVOID DAMAGE TO YOUR COMPUTER.**
>
> *my*PCLab inputs are not electrically isolated from the USB port. Before connecting signals from sensors or transducers, make sure that they are not in contact with any source of electrical power (wires or conductive surfaces which may get energized). Input channels are not isolated from each other.

SPECIFICATIONS

Analog Input Signals: Configurable for channels 1 and 2. The input signals and measuring ranges are listed in the following table.

- **Thermocouples**: J, K, T, E, N, R, S and B types.

    Input Impedance >> 1 MΩ

- **Pt100**: Three wires connection, 625 μA bias current, α = 0.00385.

- **Linear Signals**: 0 to 50 mVdc: Input Impedance >> 1 MΩ

    0 to 10 Vdc: Input Impedance = 1 MΩ. Available only in channel 1.

    4 to 20 mAdc: Input Impedance: 22 Ω (+ 2,0 Vdc)

Input Type	Maximum Range
J Thermocouple	-130,0 to 940,0 °C (-202,0 to 1724,0 ºF)
K Thermocouple	-200,0 to 1370,0 °C (-328,0 to 2498,0 ºF)
T Thermocouple	-200,0 to 400,0 °C (-328,0 to 752,0 ºF)
E Thermocouple	-100,0 to 720,0 °C (-148,0 to 1328,0 ºF)
N Thermocouple	-200,0 to 1300,0 °C (-328,0 to 2372,0 ºF)
R Thermocouple	0,0 to 1760,0 °C (-32,0 to 3200,0 ºF)
S Thermocouple	0,0 to 1760,0 °C (-32,0 to 3200,0 ºF)
B Thermocouple	500,0 to 1800,0 °C (932,0 to 3272,0 ºF)
Pt100 RTD	-200,0 to 650,0 °C (-328,0 to 1202,0 ºF)
0 to 50 mVdc	Adjustable from -32767 to +32767
0 to 10 Vdc (Channel 1)	Adjustable from -32767 to +32767
4 to 20 mAdc	Adjustable from -32767 to +32767

*my*PCLab module sensors and signals

Digital Input: Logic voltage or dry contact signals.

"0" Logic Level: contact closed or voltage lower than 0.5 Vdc.

"1" Logic Level: contact opened or voltage from 2.0 V to 5,0 Vdc.

Digital input special features: Digital input can be configured for counting, timing or frequency measuring (pulses per time unit). Configurable: debounce time and scale factor.

Counting: It counts from 0 up to 4294967295. It is selectable to count on input rising edge, falling edge or both. Maximum input frequency: 1 kHz (square wave, no debounce).

Timing: It times up to 4294967295 miliseconds (more than 49 days). It is selectable to run timing when input in logic level "0" or when in "1". Accuracy: 0.5 % of the indicated time.

Frequency: It counts the number of pulses (rising edge, falling edge or both) in each base time, configurable from 1 to 65535 seconds (18 hours). Maximum input frequency: 500 Hz (square wave, no debounce). Maximum input frequency: 500 Hz (square wave, no debounce). Accuracy: 0.5 %.

Ambient Temperature Sensor: Internal thermistor.

Total Accuracy: Thermocouples R, S and B: 0.25% of the maximum range ± 3 °C (with maximum A/D resolution);

Other thermocouples: 0.25% of the maximum range ± 1 °C (with maximum A/D resolution);

Pt100, voltage and current: 0.20% of the maximum range (with maximum A/D resolution);

Ambient temperature channel: ± 1.5 °C (after 20 minutes connected to the USB port).

A/D Resolution: Configurable from 15 to 11 bits.

Input Sampling Rate: From 8 to 128 samples per second, depending on configured A/D resolution and number of enabled channels.

Computer Interface: USB V1. 1 Plug and Play, virtual serial port interface.

USB connection: Mini-B receptacle.

Power supply: From the USB bus. Typical current 30 mA.

Operating environment: 0 to 50°C, 10 to 90% relative humidity, non-condensing.

Electromagnetic Compatibility: EN 50081-2, EN 50082-2.

Built-in cold junction compensation for thermocouples and wire resistance for Pt100.

ABS case, dimensions: 70 x 60 x 18 mm. See figure.
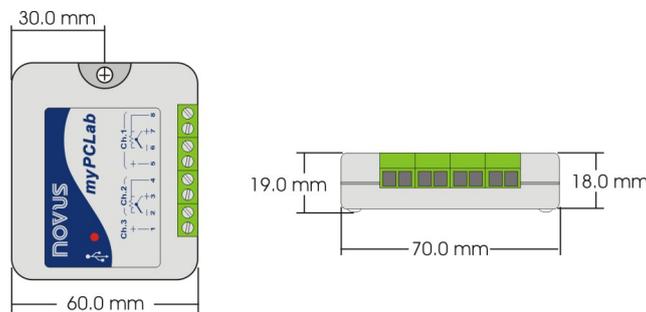
CONNECTIONS

This module operates only when connected to a PC USB bus, using the included type-A to mini-B cable. The following figure shows all possible input connections.
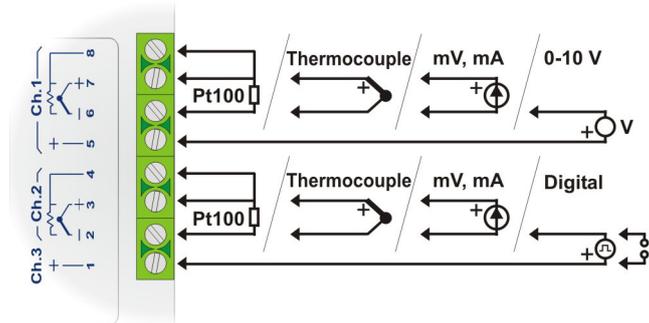
⚠ Signal wires connected to all inputs should be kept separated from power wires, and when possible installed inside of grounded electrical ducts.

Pt100 WIRING
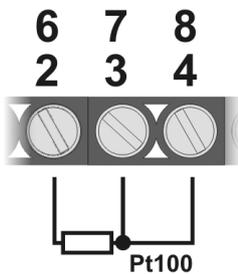
Connections of channel 1 are on terminals 6, 7 and 8. For channel 2 on terminals 2, 3 and 4. Connection with 3 wires from the sensor element to the module is necessary to cancel the cable resistance error in the measurement. The 3 wires must have the same length and gauge.

To connect a Pt100 with 2 wires, connect terminals 7 and 8 (channel 1) or 3 and 4 (channel 2).

THERMOCOUPLE WIRING
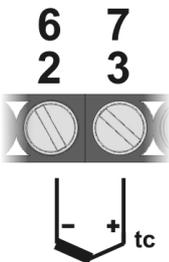
Connections of channel 1 are on terminals 6 and 7. For channel 2 on terminals 2 and 3. Observe indicated polarity.

Cables for thermocouple connection must have the same thermo-electrical characteristics of the thermocouple element (compensation or extension cable). Observe that both the thermocouple and the compensation cable must be connected with correct polarity.

If compensation cable is not used or is not connected with the correct polarity, large measurement errors will arise.

4-20 mA WIRING
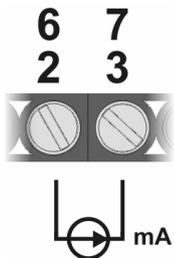
Connections of channel 1 are on terminals 6 and 7. For channel 2 on terminals 2 and 3. Observe indicated polarity.

0-50 mV WIRING
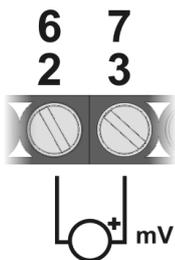
6 7
2 3

Connections of channel 1 are on terminals 6 and 7. For channel 2 on terminals 2 and 3. Observe indicated polarity.

0-10 V WIRING

5 6
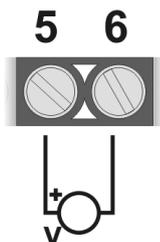
Linear voltage signals from 0 to 10 V can only be connected to channel 1, terminals 5 and 6. Observe indicated polarity.

DRY CONTACT DIGITAL INPUT WIRING

1 2
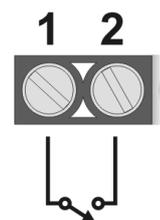
Digital signals are connected to channel 3, terminals 1 and 2.
The contact connected to digital input must not have any electrical voltage.

VOLTAGE DIGITAL INPUT WIRING

1 2
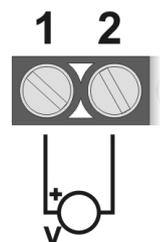
Digital signals are connected to channel 3, terminals 1 and 2. Observe indicated polarity.
Voltage levels applied to this channel must be within the specified limits. See "Specifications".

USB DRIVER INSTALLATION

The following installation steps may be slightly different depending on your PC configuration and Windows version. Follow the Wizard instructions and use the following steps and figures to select the correct installation options.

1. Insert the *myPCLab* CD in the CD-ROM drive.

2. Connect the module to a PC USB port. Windows® will detect the new hardware and after a few seconds the new hardware wizard will start.

3. The Found New Hardware Wizard will show-up and ask if you want to connect to Windows Update to get the driver. Select the "No, not this time" and select "Next".

4. Select "Install from a list or specific location (advanced)" and select "Next".

5. Select "Search for the best driver in these locations" and check option "Search removable media". Select "Next". If the installation files are not in a CD, select option "Include this location in the search" and type the path for the required files.

6. If a warning message regarding Windows® XP compatibility appears, select "Continue Anyway".

7. The *myPCLab* driver files will be copied to your computer and, when concluded, a window will show up informing that the wizard has finished installing the software. Select "Finish".

8. It is possible that the previous steps repeat a second time for the completion of installation.

After driver installation, proceed to the next chapter to install the *myPCLab* software that provides configuration, visualization, recording and data export.

In future connection of *myPCLab* modules, it is possible that Windows® prompt again for the USB driver installation. In this case, the same wizard will be presented. Follow the above steps, but select option "Install the software automatically (recommended)", since the driver files are already installed.

The following figures are examples of Windows XP® New Hardware Wizard. For Windows 2000® they look different, but the information is the same.
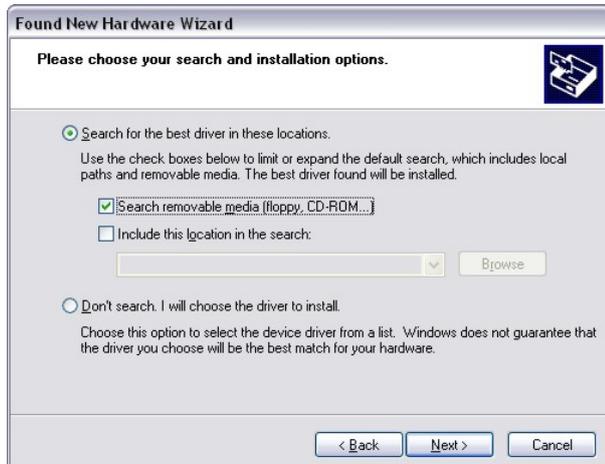
SOFTWARE INSTALLATION

The *my*PCLab software is a Windows program intended to:

- Configuration of *my*PCLab modules.
- Plot and record data, show gauges, bargraphs and digital readouts with data from multiple modules.
- Export acquired data in multiple file formats (xls, pdf, rtf, xml, html, dbf, txt, csv).

To install, execute file **myPCLabSetup.exe** from the installation CD, and follow the instructions to proceed with installation.

The *my*PCLab software has a complete help system, with all the necessary information for its use. Start the software and press F1 or select the Help menu to show the help content.

The *my*PCLab software can simultaneously communicate with multiple modules, making easy to expand the number of inputs of a measurement system.

SERIAL PORT (COM PORT) ASSIGNMENT

A few seconds after connection of a *my*PCLab, Windows operating system assigns a COM port number for communication. The assigned COM port number will not change in future connections to the same USB port. Users can easily identify and modify the assigned COM port in:

Control Panel / System / Hardware / Device Manager / Ports (COM & LPT)

Select the desired "myPCLab" device, click with the right mouse button and select "Properties". Select "Port Settings" and click on the "Advanced..." button. In "COM Port Number" list, select the serial port to be assigned. Some serial port can be marked as "in use". Only select one of these ports if you are sure it is not being used by any other peripheral in your computer.

In some cases, serial port can be marked as "in use" even when the associated device is not in the computer. In this case, it is safe to assign this port to *my*PCLab.

The following figures ilustrate the most important steps for this procedure.
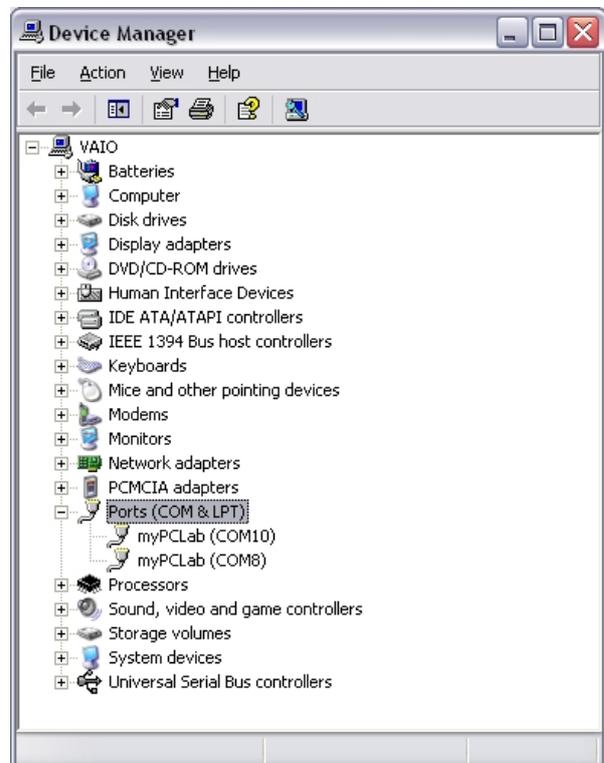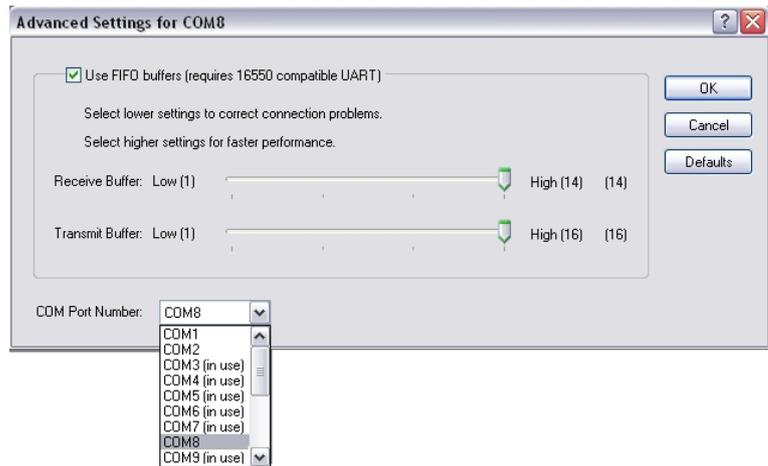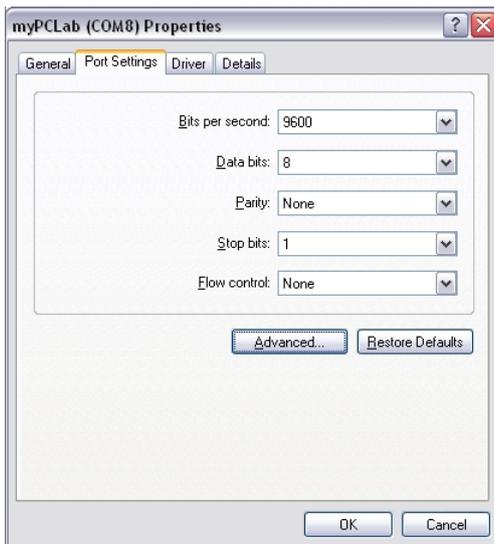
WARRANTY

Warranty conditions are available on our web site www.novusautomation.com/warranty.

APPENDIX 1 – SERIAL COMMUNICATION PROTOCOLS

Each *my*PCLab module installed in a PC is accessible as a distinct serial COM port. A module can communicate in one of two protocols: ASCII (delimited text) or Modbus RTU. Any program with serial communication capability using one of these protocols may be used to gather measurement data from the modules.

The used communication protocol depends on the "auto-send" module configuration. See the software help for information on how the change the "auto-send" configuration.

- Auto-send disabled: Communicates using Modbus RTU protocol. The module is a slave that responds to read requests issued by a Modbus master (for example a SCADA software).
- Auto-send enabled: Communicates using ASCII (delimited text) protocol. The module transmits continuously the values measured in its channels, in text format.

> The module can only be configured using the *my*PCLab software.
>
> The serial COM port assigned to a device will only be available a few seconds after connection of the *my*PCLab module to a USB port, since Windows operating systems needs to load the appropriate drivers. To check the COM port assigned to each module, use the *my*PCLab software or go to the Windows Control Panel in:
>
> Control Panel/System/Hardware/Device Manager/Ports (COM & LPT)

MODBUS RTU (AUTO-SEND MODE DISABLED)

*my*PCLab is a Modbus RTU slave that can answer to "Read Holding Register" requisitions, Modbus command number 3. The module doesn't have a specific Modbus address, since it's the only device in its serial port. It will answer to read request to any valid slave address.

When configuring the serial communication parameters of the Modbus master, set the COM port number assigned to the device. The USB port ignores all other serial communication parameters.

- **Communication Port**: Select the COM port number assigned to the *my*PCLab.
- **Baud rate**: any
- **Number of data bits**: any
- **Stop bits**: any
- **Parity**: any

The following table shows the Modbus registers available for reading. Three different address formats are presented. Use the address format according to your Modbus master.

Modbus Address (in 3 different formats)			Content
Protocol, 0 based	Protocol, 1 based	PLC	
3	4	40004	Channel 3 (digital input) current state
4	5	40005	Channel 1 value
5	6	40006	Channel 2 value
6	7	40007	Ambient temperature value
62	63	40063	Counting/Timing/Frequency value (high word)
63	64	40064	Counting/Timing/Frequency value (low word)

Holding Registers Table (reference 4X)

- Channel 3 (digital input) current state

  Value that represents the current state of the digital input. The values associated to levels '0' and '1' are defined in the module configuration.

- Channel 1 and 2 values

  Current value of the input channel, in engineering units. For values with decimal places, the decimal point separator will be omitted. Example: A channel with value 13.96 will be read as 1396.

  Measured values above or below its specified limits will be replaced by the corresponding overflow or underflow values, according to the module configuration.

  A disabled channel will return 0 (zero) as its measured value.

- Ambient Temperature Value

  Current measurement from the internal ambient temperature sensor, in degrees Celsius or Fahrenheit, according to module configuration. The decimal point separator is omitted. Example: 23.8°C is read as 238.

- Counting/Timing/Frequency value

  Together, they have the current counting, timing or frequency value, depending on the configuration. When directly read, this value is not multiplied by the scale factor.

⚠	Never send a Modbus write command to a module. Configuration or calibration registers may get corrupted and the module may get unusable.

ASCII – DELIMITED TEXT (AUT0-SEND MODE ENABLED)

When configured to the auto-send mode, the *my*PCLab module transmits to its USB port a line of text containing the current value of all measurement channels. A new line of text is transmitted after each measurement interval, according to the module configuration.

Any software with serial communication capabilities can receive these data. When configuring the serial communication parameters of the software, set the COM port number assigned to the device. The USB port ignores all other serial communication parameters.

- **Communication Port**: Select the COM port number assigned to the *my*PCLab.
- **Baud rate**: any
- **Number of data bits**: any
- **Stop bits**: any
- **Parity**: any

The simplest way to receive and display data is using a simple communication terminal software, like Windows® HyperTerminal. This software display on the screen all data received in the specified COM port. Other software like *Matlab*, *Simulink*, *HPVee*, *Testpoint*, can also be configured to receive and parse measured data.

When operating in the auto-send mode, a *my*PCLab don't expect to receive any information from the USB port. It transmits data continuously, with no control from the receiver. If during a transmission the module receives a Modbus RTU command, it will suspend the auto-send mode for 3 seconds and answer the Modbus request. After 3 seconds the auto-send mode will resume.

The line of text sent after each measurement interval has the following format:

#AAA;BBB;CCC;DDD;EEE;FFF\r\n

Where:

- "**#**" is the start of line delimiter.
- "**;**" is the separator of measurement values.
- "**AAA**" is the value of channel 3 (digital input).
- "**BBB**" is the value of channel 1.
- "**CCC**" is the value of channel 2.
- "**DDD**" is the value of the ambient temperature.
- "**EEE**" is the current counting, timing or frequency value, depending on the configuration (not multiplied by any scale factor).
- "**FFF**" is the time in milliseconds since the transmission of the first line.
- "**\r\n**" are ASCII values 13 (Carriage Return) and 10 (Line Feed), end of line delimiters (these characters are not visible).

Measurements containing values with decimal separators will be transmitted with the character '.' (ASCII 46). Examples:

    #100;258.1;-5.7;24.6;16772
    #0;4087;50.3;0;4900
    #-10;-10.9;-5000;19.4;338105