

User's Guide

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Introduction

USB-121 is a USB device with eight solid state relay outputs and eight digital inputs which allows computer controlled switching of external devices and digital signals acquisition.

When connected to a PC, USB-121 appears as a virtual serial COM port and supports simple ASCII protocol to enable easy custom application development.

The outputs of USB-121 are designed with solid state technology, which means they do not have any moving parts like electromechanical relays do. The three main advantages of using SSR over electromechanical relay are unlimited relay life, faster switching time and bounce-free operation.

The USB-121 is a bus-powered USB device

Features

- Connect to PC through USB port
- Appears as a virtual serial COM port allowing easy communication through any programming language
- Compatible with any serial terminal program
- 2 x 16 positions pluggable terminal header with screw terminal
- Fully isolated I/O
- Unlimited relay life
- Bounce-free outputs
- Current limited inputs
- USB powered

I/O Connector

The USB-121 device ships with two detachable terminal block for digital signals. Each individual terminal accepts a wire gauge between 16 AWG and 28 AWG.

Table 1 describes the signals available on the I/O connectors.

Table 1: Signal descriptions

Signal name	Direction	Description
P0<0..7>A/B	Output	Solid state relay output
P1<0..7>+/-	Input	Optically isolated digital input P1<0..7>+ corresponds to the positive input terminal P1<0..7>- corresponds to the negative input terminal

Inputs

The USB-121 provides eight channels of isolated digital inputs. These inputs consist of an optocoupler, a current limiting circuit and a reverse voltage protection diode.

Each channel has its own positive and negative terminal. The input range on each channel is -60 VDC to +60 VDC.

Each USB-121 input detects a wide range of DC signals, from TTL logic levels to DC voltage levels up to +60 VDC.

Applying a DC voltage of at least 3 V across two input terminals registers logic high. Applying no voltage or a voltage difference of 1V or less registers logic low. DC voltage between 1V and 3 V may not register a consistent value.

Figure 1 shows signal connections for a power supply and a load connected to an isolated input.

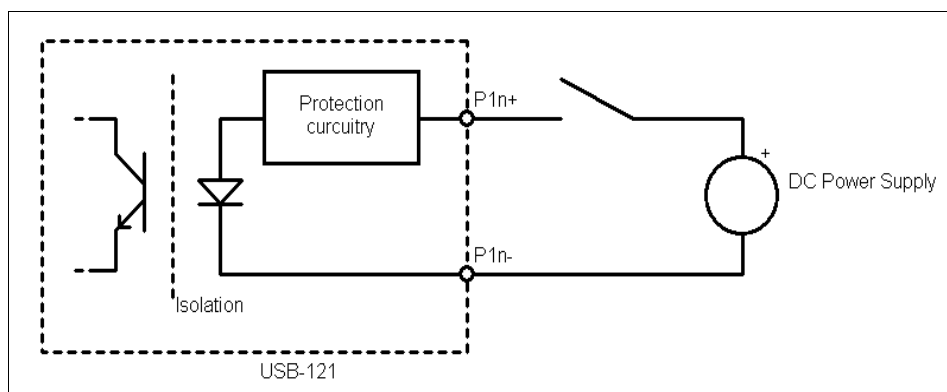


Figure 1: Connecting a switch to the isolated input

Outputs

The USB-121 provides eight channels of optically isolated solid state relay outputs rated at 400 mA @ 60 VDC/30 Vrms.

AC or DC load may be connected using outputs as switches to apply external power to loads.

The default power-on state of the solid state relays is open. By default, the solid state relays remain open when USB-121 device is powered off.

Connect the load to one of the leads of the power source. Connect either the P0nA or the P0nB terminal to the load and the other terminal to the other lead of the DC or AC power source. Figure 2 shows a possible configuration.

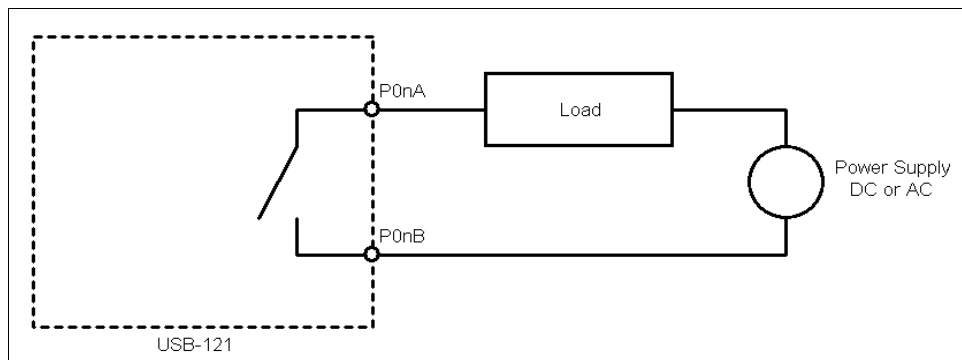


Figure 2: Connecting a load to the USB-121

Communication protocol

The USB-121 CDC class will create a virtual com port, that means that everything happens like if you were talking to a device connected to a legacy serial port on your pc.

USB-121 supports simple ASCII commands to write outputs and read inputs status.

This simple ASCII protocol offers following advantages:

- Allows use of standard serial terminal programs like Hyper Terminal
- All commands follow same format
- Each command has a response which gives confirmation that the command has been executed.

Tables below list all the supported commands with examples.

(In the following tables <CR> is Carriage Return and <LF> is Line feed).

P0 input port command

Read inputs	
Command R0<n><CR>	Response Read P0.<n> input status <CR><LF> <s> <CR><LF>
	Parameters <n> Input number (0...7) <s> 0=input is low 1=input is high
Example R07	Response 1 P0.7 input is high

P1 output port command

Set/Reset single output	
Command W1<n><v><CR>	Response Set P1.<n> output to <v> value <CR><LF> OK <CR><LF>
	Parameters <n> Output number (0...7) <v> 0=contact open 1=contact close
Example W131 W100	Response OK P1.3 output is closed OK P1.0 output is opened

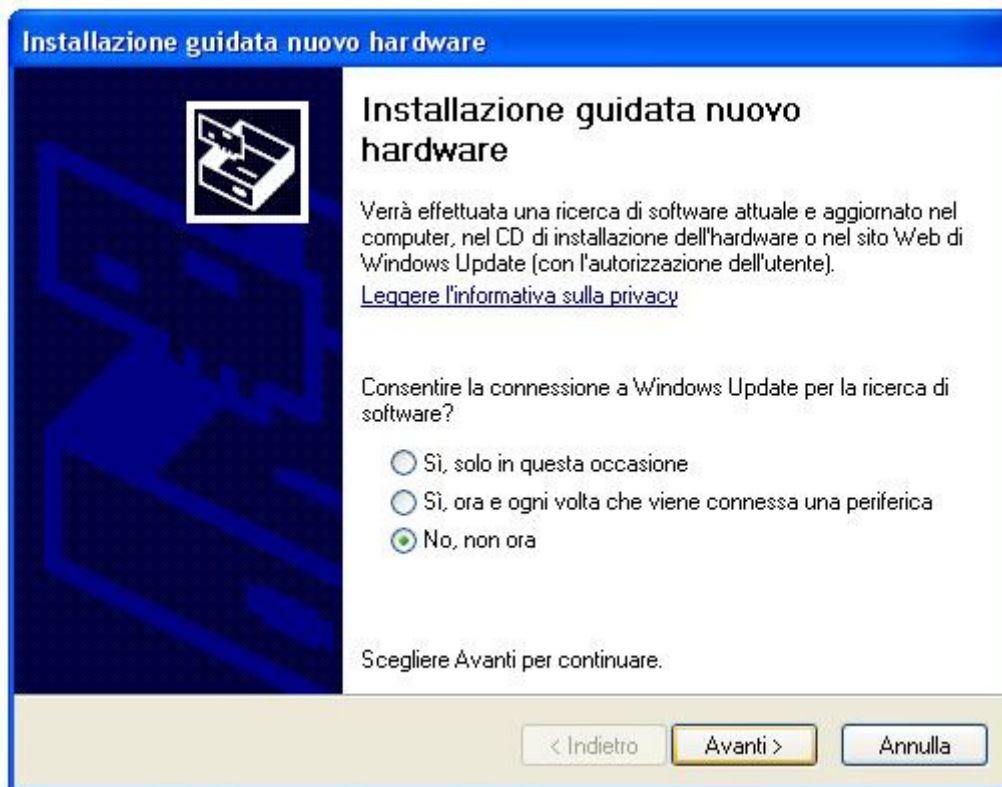
Read outputs	
Command R1<n><CR>	Response Read P1.<n> output status <CR><LF> <s> <CR><LF>
	Parameters <n> Output number (0...7) <s> 0=contact open 1=contact close
Example R12	Response 1 P1.2 output is closed

Installing driver

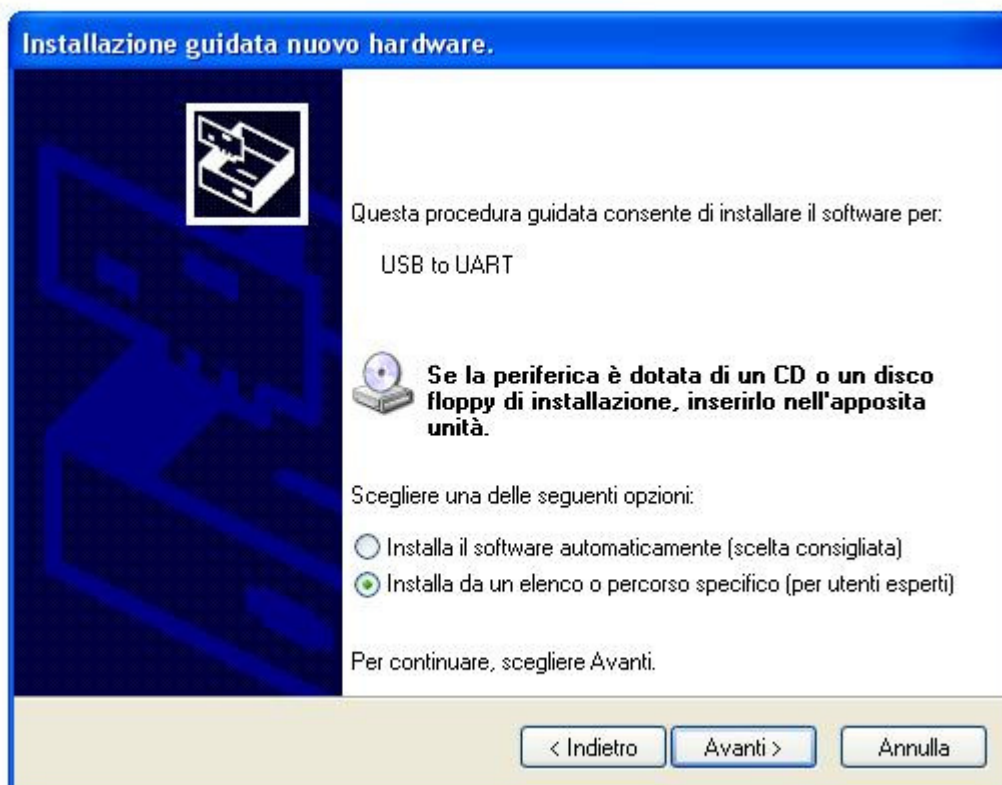
When you first connect the USB-121 to your computer, you may be prompted for a driver, or a windows information file, so the system knows wich driver to use.

Follow the instructions to install the driver (screenshots images are included for Windows XP operating systems).

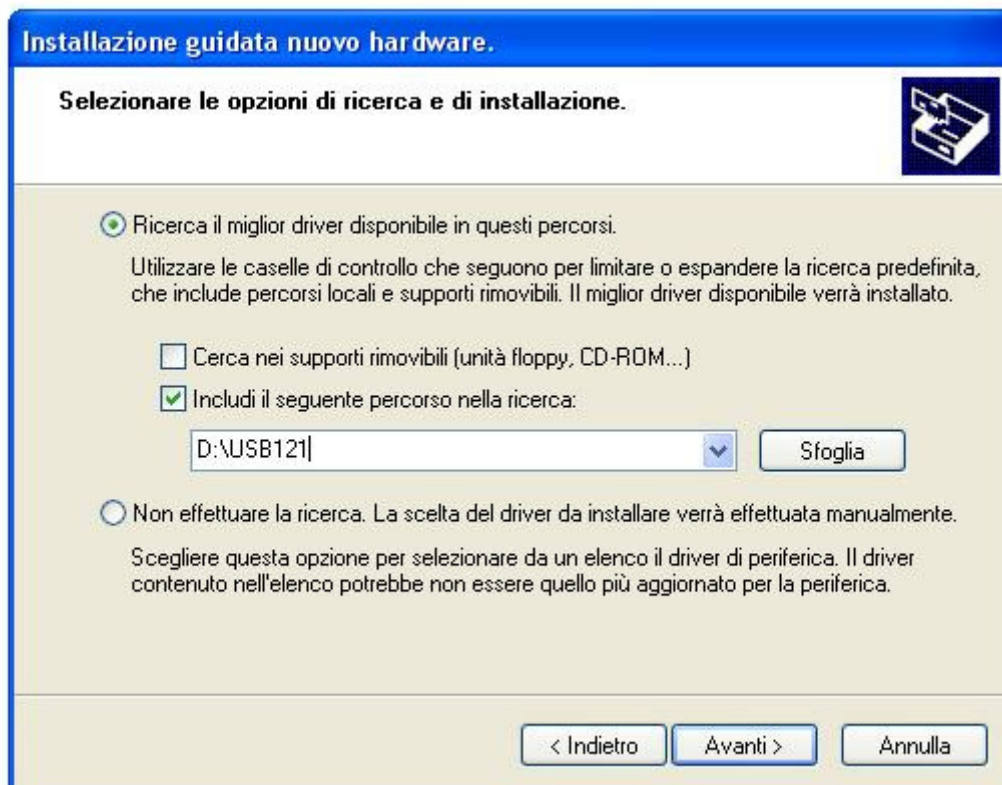
After you've plugged in your device you should be prompted with the Windows **Found New Hardware Wizard**.



Select 'No, not this time', then click 'Next'.



Select '**Install from a list or specific location**', then '**Next**'.



Insert the installation disk provided with the USB-121, and choose the appropriate directory where the driver is located. Click '**Next**' to continue.

If you receive a warning click '**Continue Anyway**'.

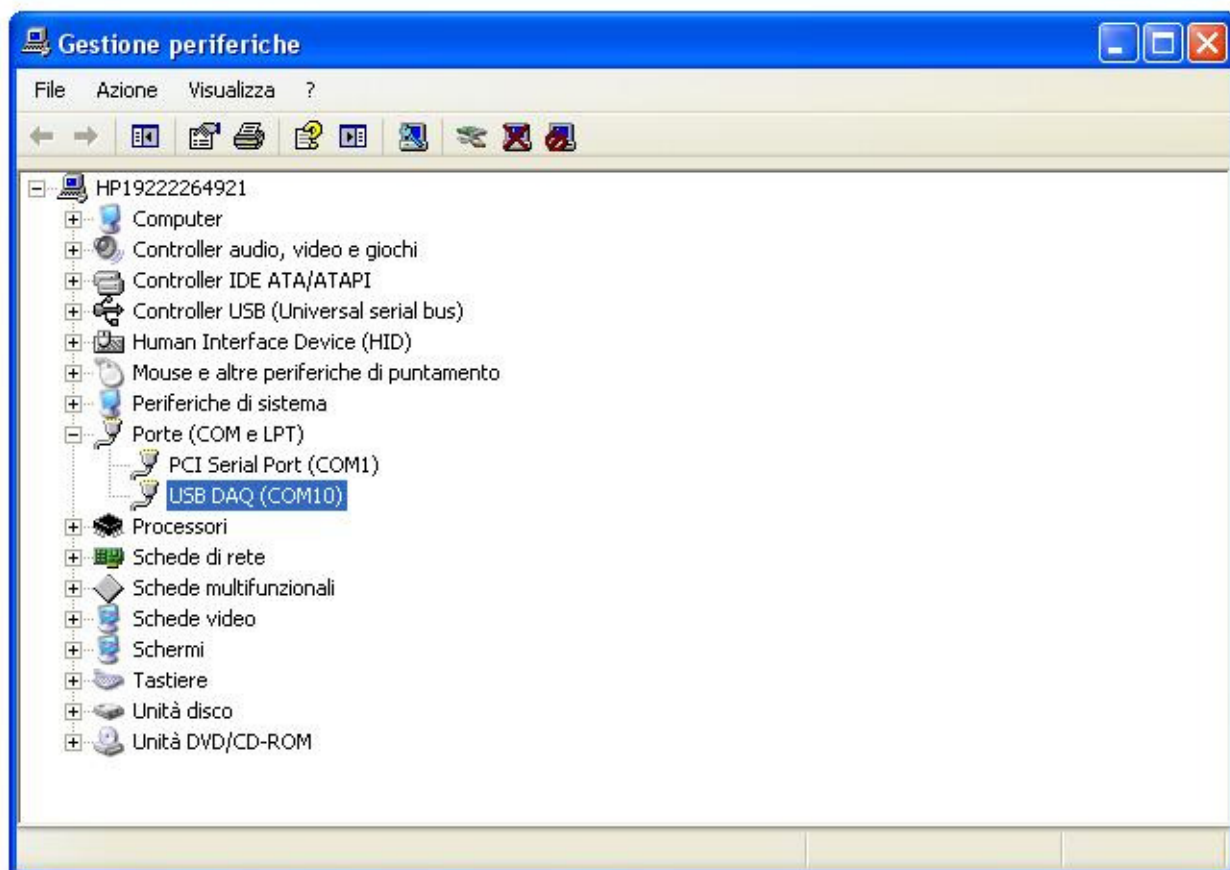


Click '**Finish**' to complete the driver installation.

COM Port

After installing the drivers, and plugging in the USB-121 module to a spare USB port, you will want to know which COM port it has been assigned to. This will vary from system to system depending on how many COM ports you currently have installed.

To find out where it is, right click on your '**My Computer**' desktop icon and select the '**Device Manager**' tab. Now scroll down and open the '**Ports (COM & LPT)**' tab. You should see the USB-121 serial port listed (COM10 in the example below).



Specifications

The following specifications are typical at 25 °C.

Isolated inputs

Number of input channels 8, ch-ch isolated
 Input voltage range -60 VDC to 60 VDC

Level	Min	Max
Input low voltage	-60 VDC	1 VDC
Input high voltage	3 VDC	60 VDC

Input current 3 mA/ch max

Solid state relay outputs

Number of output channels 8, ch-ch isolated
 Relay type Normally open solid state

	relay
Switching voltage	60 VDC/30 Vrms max
Switching current ¹	400 mA/ch max
On resistance	2 Ω
Off-state leakage current	1 μ A

¹ Load current derates linearly from 400mA @ 25°C to 300mA @ 60°C

Bus interface

USB specification	USB 2.0 full speed
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Power requirements

USB input voltage	4.5 to 5.5 VDC
USB input current	100 mA max

Physical characteristics

Dimensions without connector	101.60 x 51.56 x 28.70 mm
Dimensions with connector	119.60 x 51.56 x 28.70 mm
I/O connectors	USB receptable type B, 2x 16 positions plug header with screw terminal
Screw terminal wire size	16-26 AWG

Environmental

The USB-121 device is intended for indoor use only.

Operating temperature	0 to 55 °C
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