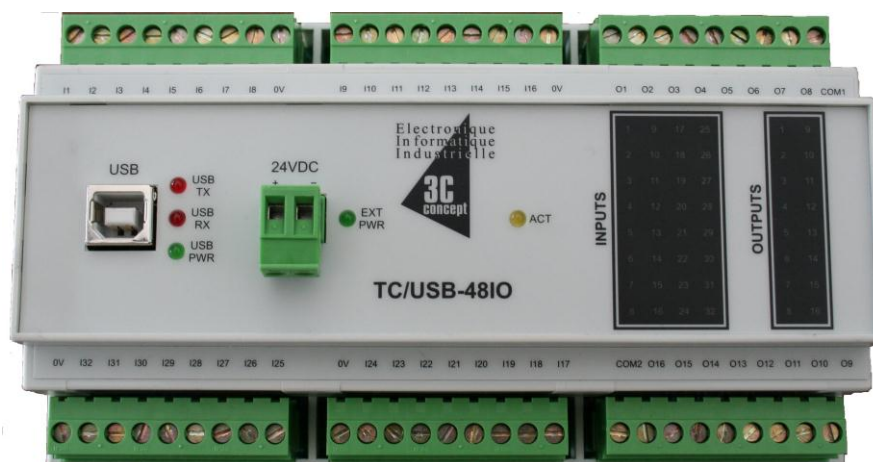


USER MANUAL

DIGITAL I/O MODULE FOR USB

32 INPUTS + 16 RELAY OUTPUTS

TC/USB-48IO



Electronique
Informatique
Industrielle



Document rev : 06
Board rev.: 00

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INDEX

KEY FEATURES4

SPECIFICATIONS4

ELECTRICAL SPECIFICATIONS5

MODULE OVERVIEW.....6

I/O WIRING7

RELAY CONTACT PROTECTION CIRCUIT FOR INDUCTIVE LOADS.....7

WINDOWS XP DRIVER INSTALLATION8

WINDOWS 2000 DRIVER INSTALLATION.....12

TROUBLESHOOTING16

DEMONSTRATION PROGRAM17

USING DLL TCUSB48IO.DLL19

FAQ23

Key Features

The TC/USB-48IO is a low-cost, easy to install, high-power digital I/O module for Universal Serial Bus (USB) with 32 digital inputs and 16 relay outputs (NO).

A selectable watchdog can reset all outputs after 2 seconds without activity.

TC/USB-48IO can be used with DIN rail mounting or wall mounting (with 3 hooks reversion)

All connections use pluggable screw terminal connectors. All I/O are isolated from controller and USB link is also isolated (dual isolation).

Specifications

- 32 isolated digital inputs 12 to 24 Vdc (10 mA Maxi).
- 8 bits pulses counter on all inputs
- Low-pass input filter on inputs (100 Hz)
- 16 relay outputs (48V/0.5A Maxi)
- Operating time for outputs : 6ms
- Build-in watchdog
- Isolation : between USB and Inputs-Outputs :1500Vrms
- 35mm DIN rail mount (or wall mount)
- Dimensions : (L)160* (W)90*(H)70
- External power supply requirement : 24Vdc (not provide)
- Power consumption 9.5 W maxi , 0.6W in standby on 24Vdc.

Electrical specifications

Power :

Nom	Description	Min	Typ	Max	Unités
Vcc	External power supply	10	24	28	volts
Iusb	USB consumption		50		mA
Pmax	External power consumption (@ 24V)	0.6		9.5	W

24V Digital inputs:

Nom	Description	Min	Typ	Max	Unités
Rin	Load resistor	2500	4400	5000	ohms
Vmax	Max voltage on inputs	-30	24	30	volts
Ie	Input current for active input	3	5	15	mA
Voh	Input voltage for active input	10		30	volts
Vol	Input voltage for inactive input		0	2	volts

Relay outputs :

Nom	Description	Min	Typ	Max	Unités
Vmax	Max voltage			60	volts
Ismx	Max current		500		mA
Ron	ON Resistance			0.1	ohms

Operating :

Nom	Description	Min	Typ	Max	Unités
Tre	Input response time		1	10	msec
Trs	Output response time		6	12	msec
Nbcy	Relay endurance (*)		100000		Cycles
Twdg	Watchdog refresh time		2		Sec

* On resistive loads 24VDC

USB specifications :

Maxi peripherals = 127

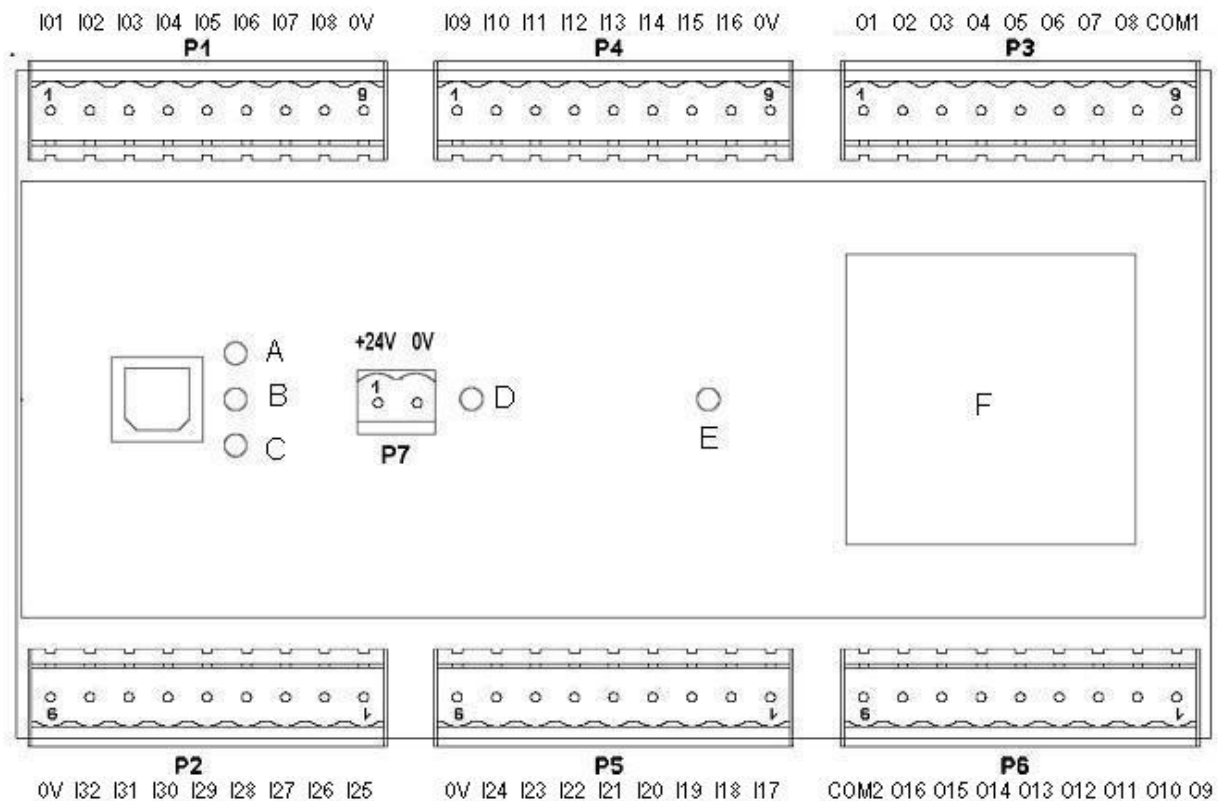
Maxi cable length = 5 m

USB hubs can be used

Increase length with extender (example extremeUSB(R) www.icron.com)

Industrial USB Hub (4 or 7 ports) seer hubport on www.digi.com

Module overview



Power connector : P7 (10-28V/10W)

Inputs connectors : P1, P2, P4, P5 (I01 to I32, all 0V connected together)

Outputs connectors : P3, P6 (O1 to O16, COM1 and COM2 are separated)

Leds description :

Led A : USB_TX : Red Led USB activity (sending data to PC)

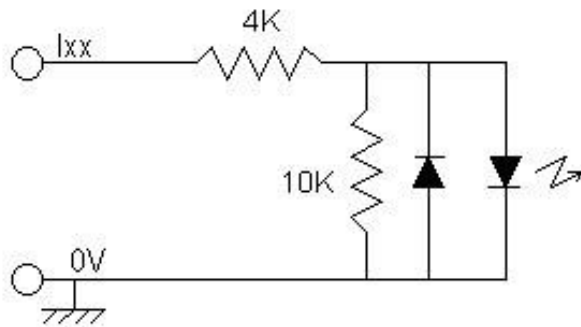
Led B : USB_RX : Red Led USB activity (receiving data from PC)

Led C : USB_PWR : Green Led, USB power supply

Led D : EXT_PWR : Green Led, External power supply

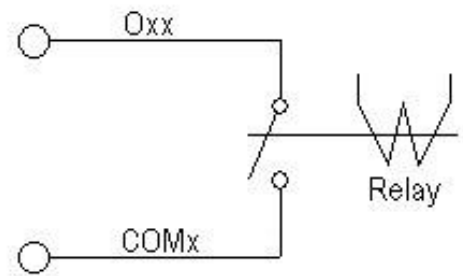
Led E : ACT : Yellow Led, flashing on normal activity

Led Matrix F : Red Leds for I/O status



Inputs

0V is common to all inputs
(I1 to I32)

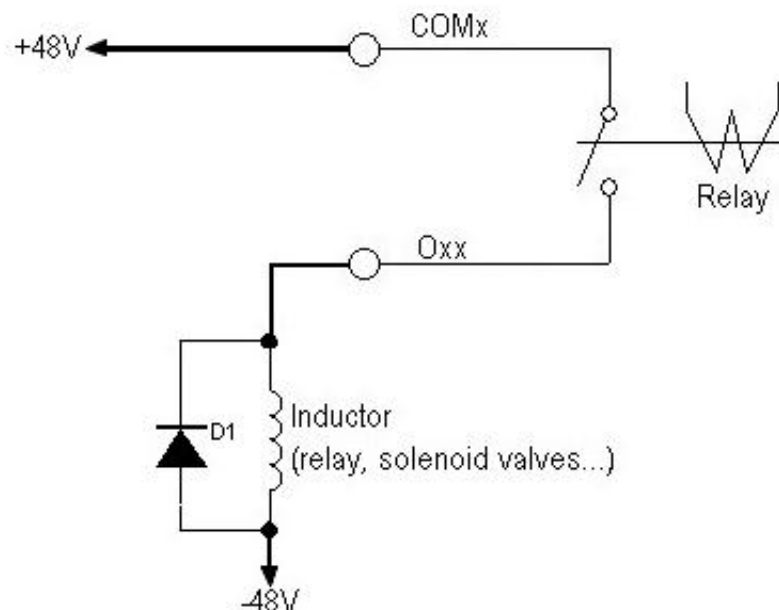


Outputs

Relay common are wired together for each
terminal block : COM1 (P3) , COM2 (P6).
COM1 is not connect to COM2

Relay contact protection circuit for inductive loads

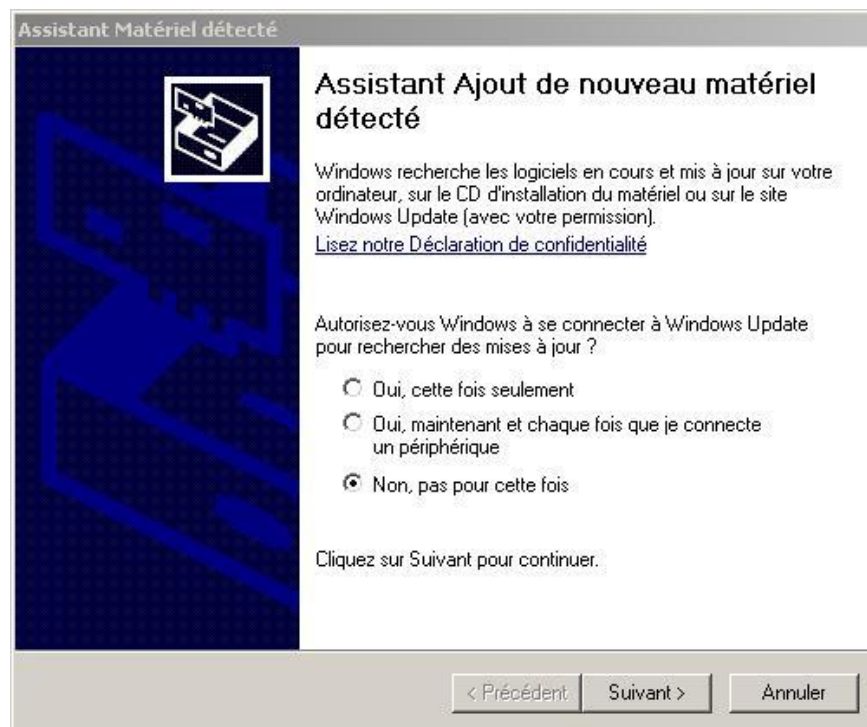
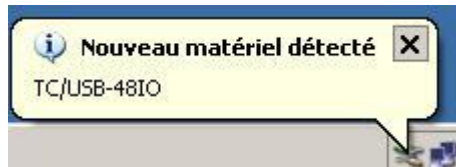
When you connect an inductive load to a relay, energy stored in the inductive load can induce a large voltage surge when you switch the relay. This voltage can severely damage the relay contacts. To limit the voltage surge across the inductive load in a DC circuit, install a kickback diode across the inductive load. For AC loads, install a metal oxide varistor (MOV) or RC network.



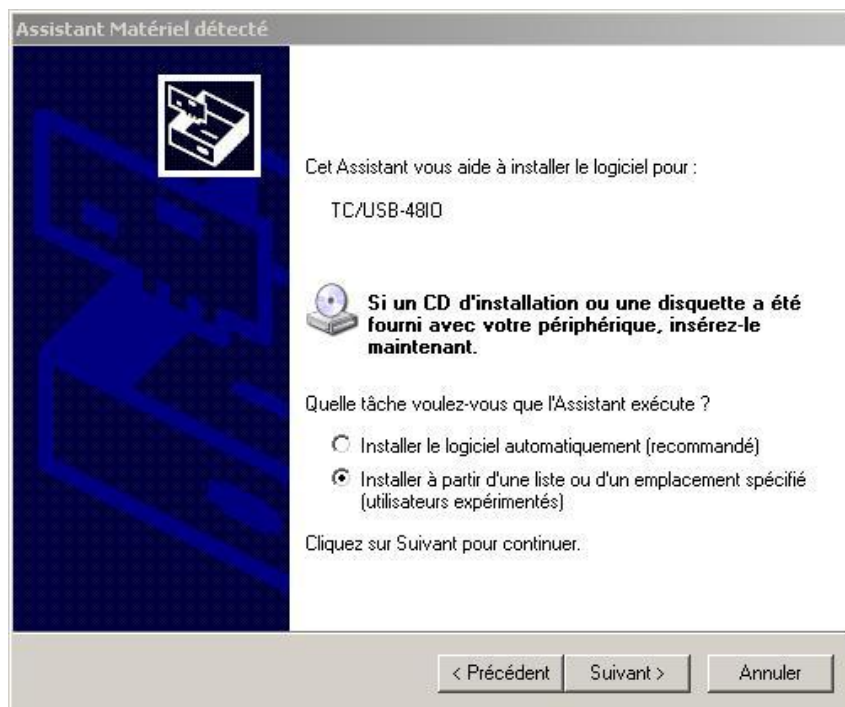
Windows XP Driver installation

CD-ROM include drivers, demonstration program, DLL (Dynamic Link Library) and definition files to include in your project.

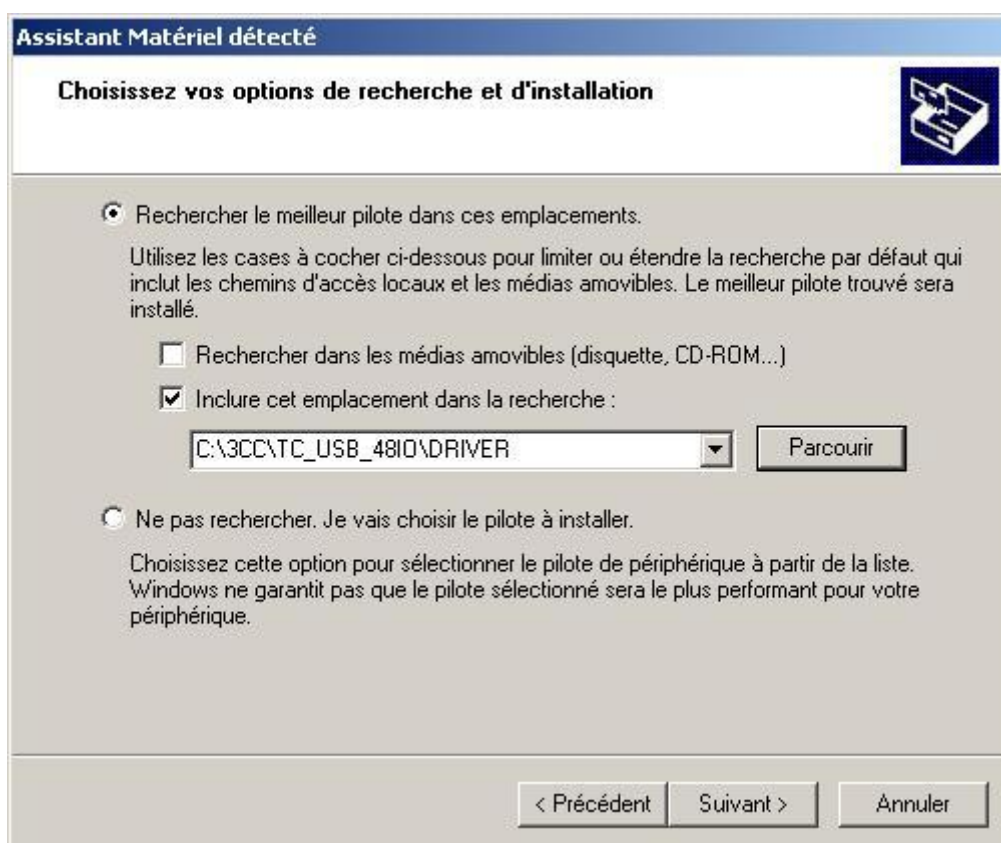
- Plug TC/USB-48IO to PC, Windows will detect a new peripheral :



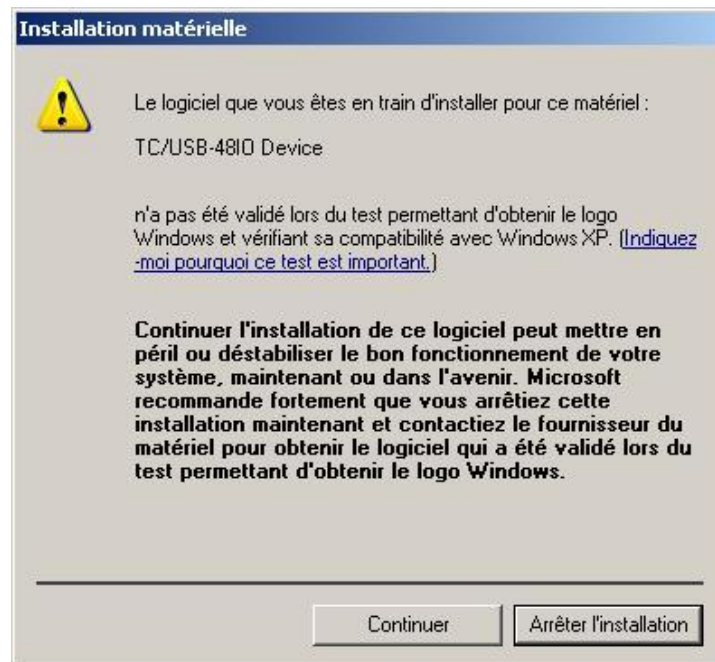
- Windows ask for connection to Windows Update, answer “No, not this time”
- Select “Install from a list or specific location” , and click “Next”



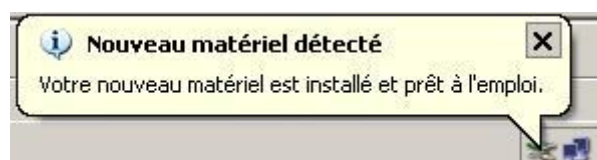
- In the next windows, click on Browse button and select directory ***TCUSB48IO\Win32\Drivers*** on your CDROM, click on “Next”.



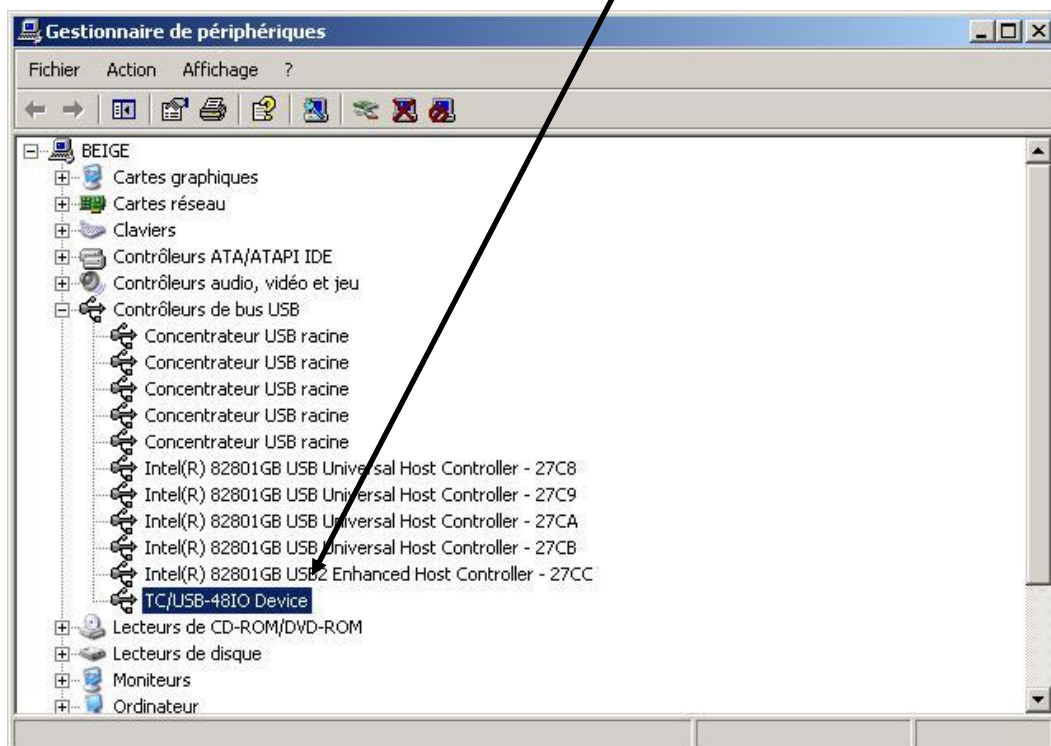
If Windows XP is configured to warn when unsigned (non-WHQL certified) drivers are about to be installed, the following screen will be displayed unless installing a Microsoft WHQL certified driver. Click on "Continue Anyway" to continue with the installation. If Windows XP is configured to ignore file signature warnings, no message will appear.



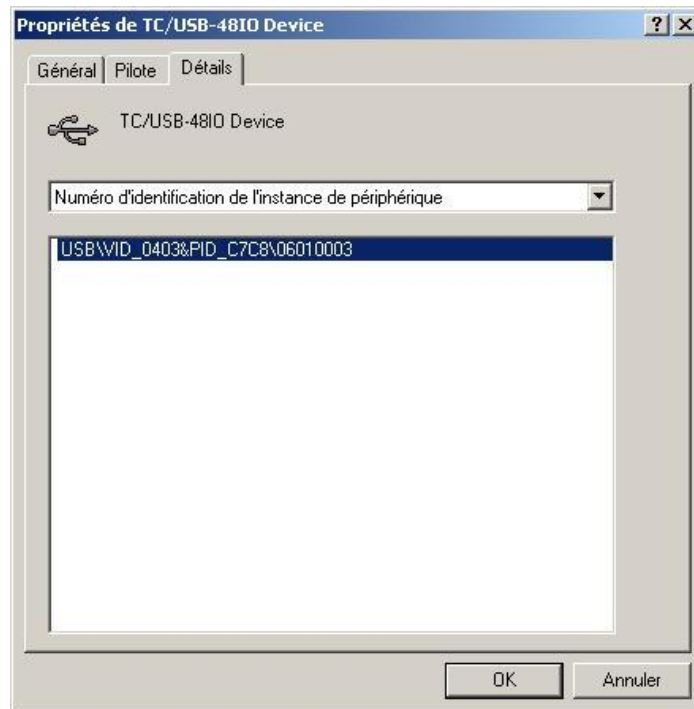
When installation is successful, the following screen is displayed :



You can check installation : Open the Device Manager (located in "Control Panel\System" then select the "Hardware" tab and click "Device Manger") and select "View > Devices by Connection", the device appears as TC/USB-48IO device.



You can display serial number with the property tab/details :



Now , you can use :

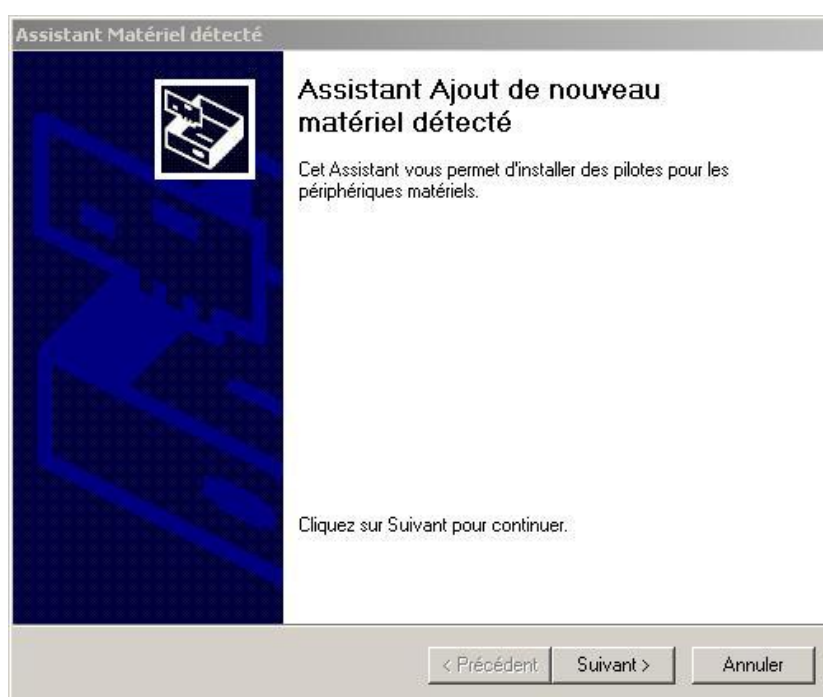
TCUSB48IO\Win32\Programme de demonstration\DemoTCUSB48IO.EXE

program on CD-ROM to check your product

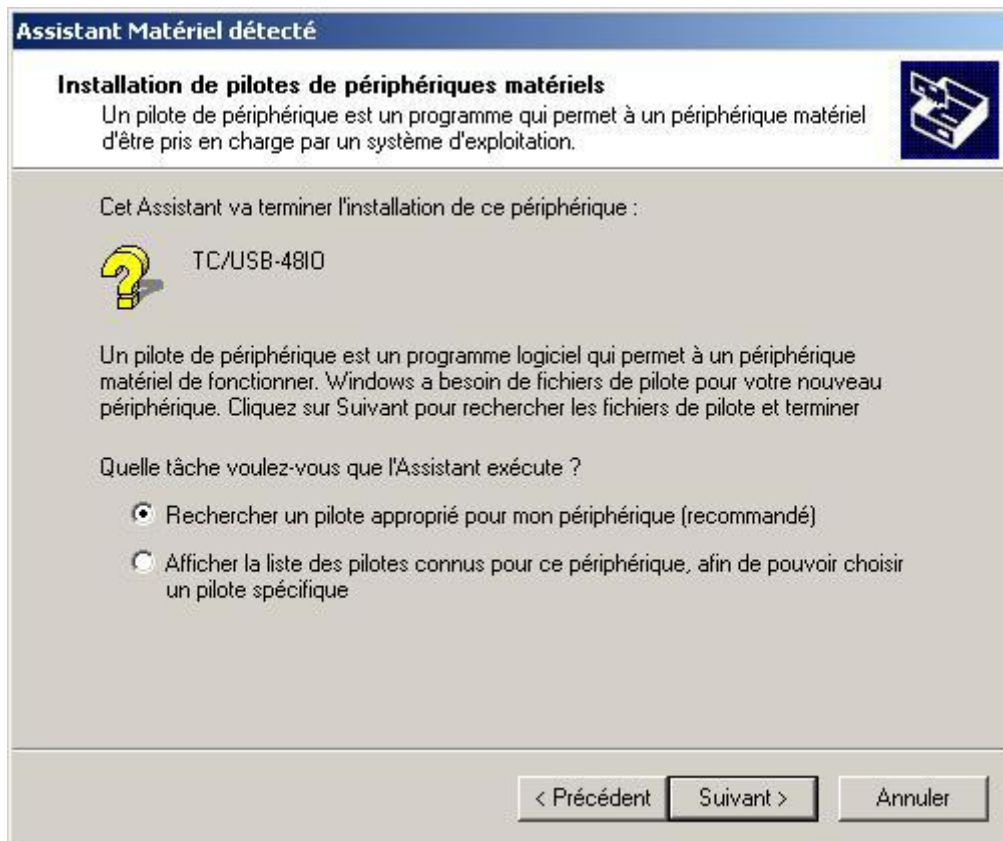
Windows 2000 Driver installation

CD-ROM include drivers, demonstration program, DLL (Dynamic Link Library) and definition files to include in your project.

- Plug TC/USB-48IO to PC, Windows will detect a new peripheral :



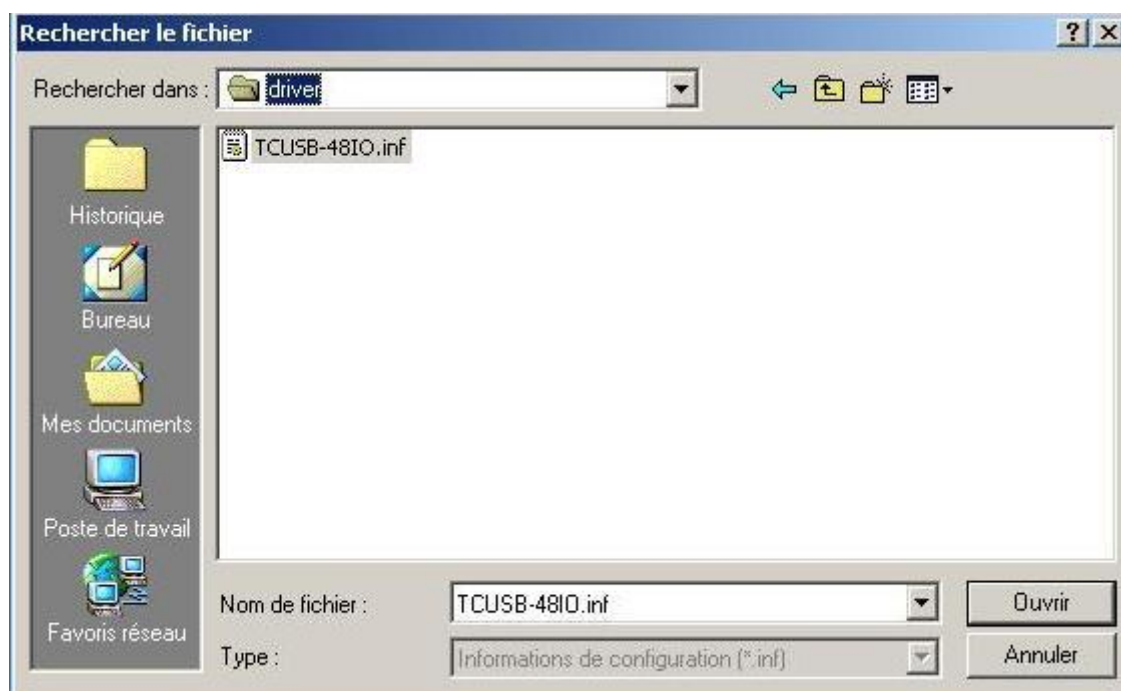
- Click "Next" to proceed with the installation



- Select "Search for a suitable driver for my device (recommended)" as shown below and then click « Next »



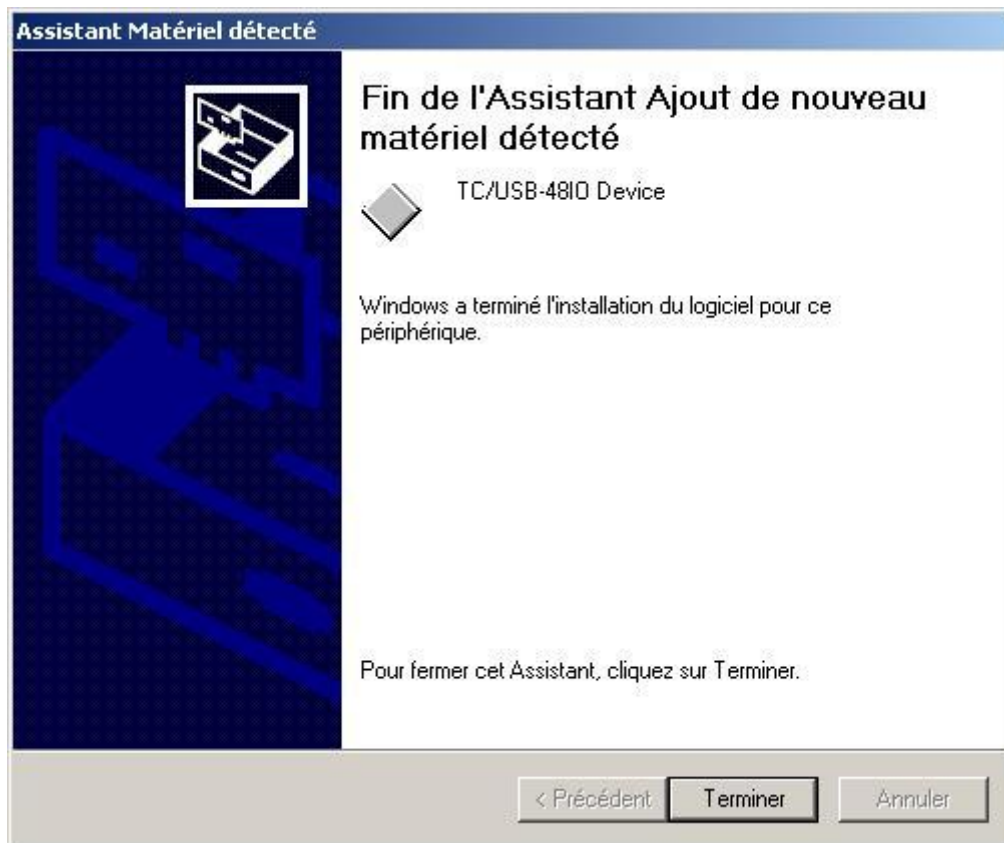
- Check the box next to "Specify a location" and uncheck all others as shown below.
- Click "Browse" to display an open file dialog box



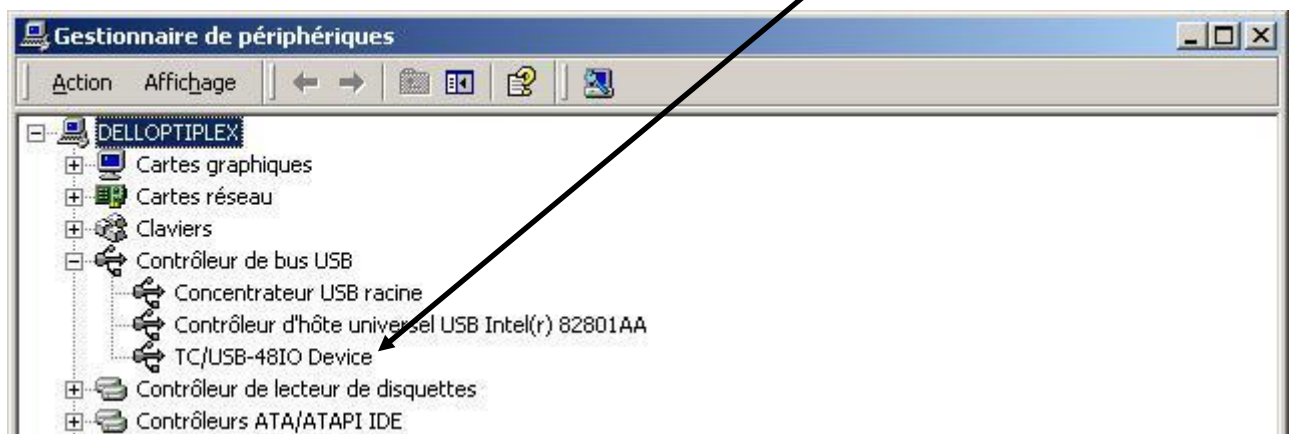
- Locate the folder containing the drivers on CDROM (**TCUSB48IO\Win32\Drivers**) and click "Open", then click "OK". The PC autoselect the correct INF file. Once Windows has found the required driver .INF file, click "Next" to proceed



- Windows should then display a message indicating that the installation was successful. Click "Finish" to complete the installation of the device :



You can check installation : Open the Device Manager (located in "Control Panel\System" then select the "Hardware" tab and click "Device Manager") and select "View > Devices by Connection", the device appears as TC/USB-48IO device.



Now , you can use :

TCUSB48IO\Win32\Programme de demonstration\DemoTCUSB48IO.EXE

program on CD-ROM to check your product

- yellow exclaim mark on Control panel :

The yellow exclaim mark means the there is no driver loaded for the device, or that the driver is corrupted or unsuitable, Select the "General" tab and click the "Reinstall Driver" button,

- Cancel Installation :

If installation is not complete, try to restart PC without TC/USB-48IO and plug again the module.

You can also try a new peripheral detection or change USB port.

- How to remove driver :

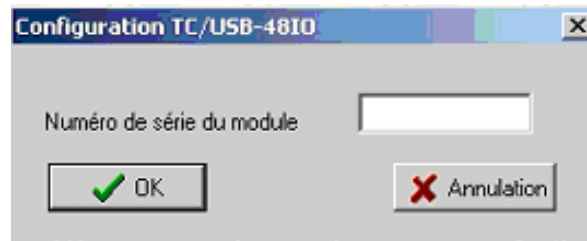
To uninstall the module's driver, execute the batch file "Uninstall Driver TCUSB48IO.bat" on the cd-rom shipped with it.

Before, you have to copy "**Uninstall Driver TCUSB48IO.bat**" et "**CDMUninstaller.exe**" from CD-ROM to HDD, in order to allow the creation of a log file for the uninstallation process.

Demonstration program

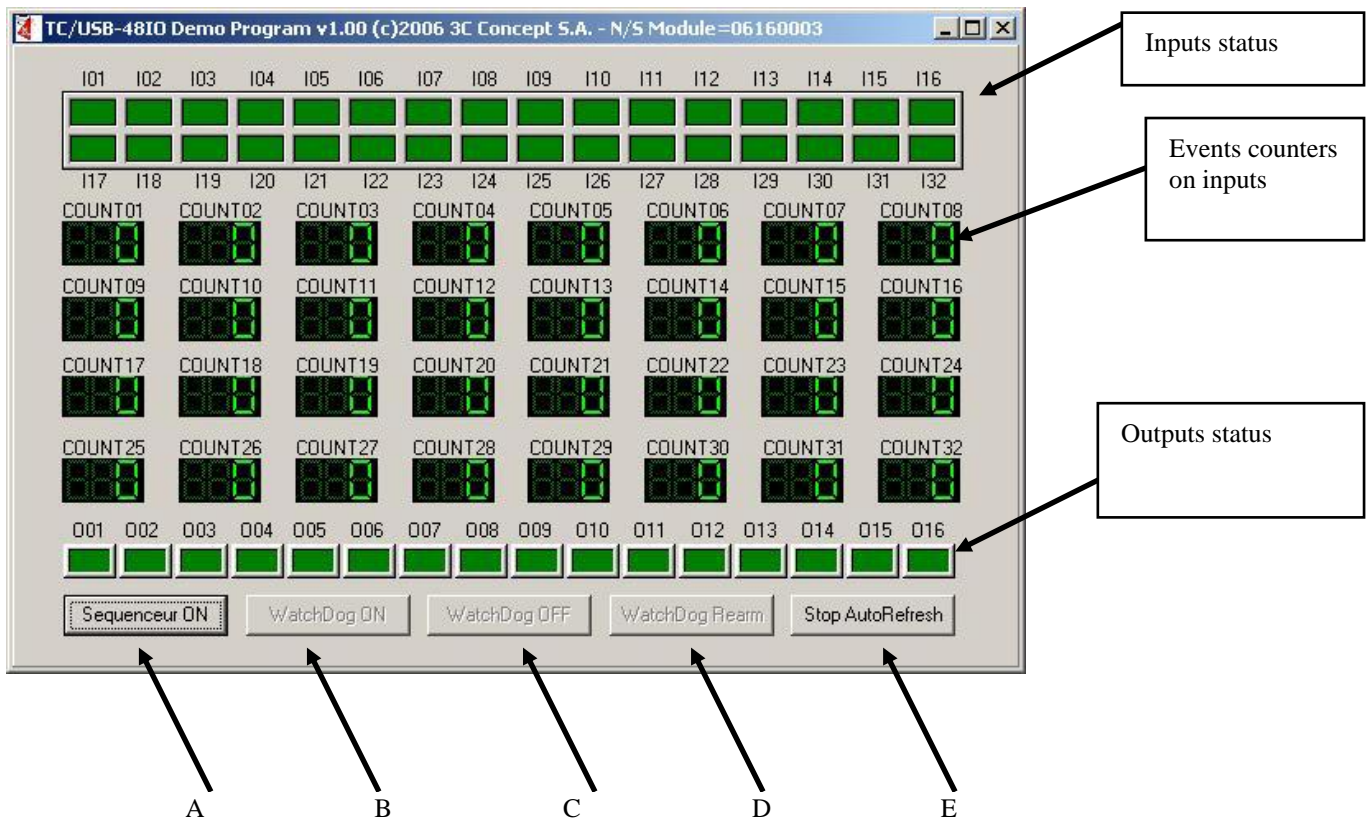
Demonstration program is located on CD-ROM in directory :

TCUSB48IO\Win32\programme de demonstration\DemoTCUSB48IO.exe



When running, program asks for TC/USB-48IO serial number. If you use only one module, you can click on OK without number. Software will locate the number automatically. Else, you can find serial number on a label placed at the back of the product.

Nota : Apply power supply (24V) on TC/USB-48IO before running



All outputs can be changed with a click on the according green lamp.

Button A : “ Sequencer ON/OFF “ : Start/Stop sequential output activation

Button B: “WatchDogOn” : Activate watchdog

Button C: “ WatchdogOff” : Stop watchdog

Button D: “ WatchDogRearm” : Manual watchdog reactivation (every 2s at least)

Button E : “StopAutoRefresh” : Stop Autorefresh for manual activation

Using DLL TCUSB48IO.dll

The Windows Dynamic Link Library (DLL) contains functions and provides a common Applications Program Interface (API) to board. The library functions allow the boards to be easily applied to many different applications, and also provides an easy way of accessing the board features. The 32-bit DLL can be used by any language that supports the Windows calling convention.

PASCAL compiler (DELPHI):

Use TCUSB48IO.INC file and TCUSB48IO.DLL

C compiler ::

Use TCUSB48IO.H and TCUSB48IO.DLL

Basic compiler:

Use TCUSB48IO.BAS and TCUSB48IO.DLL

C#:

Use TCUSB48IO.CS and TCUSB48IO.DLL

Shared object under Linux:

Look at directory Linux on CDROM. A text file explain driver utilisation.
(TCUSB48IO\Linux\librairie\libTCUSB48IO)

ⓘ Attention : All functions below works on a memory image updated by TCUSB48IO_Refresh. This function MUST be used before calling input functions AND after calling output functions. Do not call TCUSB48IO_Refresh after each function because of time transfer on USB.

Functions description :

TCUSB48IO_OpenN(Nmodule, NumSerie)

Parameter : Nmodule: signed integer 32 bits.

Numserie : Pointer on Non-signed Dword 32 bits set with serial number.

Return : Signed integer with error code (see error code list below) or serial number.

Driver initialisation, set serial number to module number (1 to 8) and reset outputs. If serial number is set to 0, the first detected module is used and serial is return instead of error code.

Must be use before any other function TCUSB48IO_xxx.

Close session with TCUSB48IO_Close before exiting you software.

TCUSB48IO_Open(Nmodule, NumSerie)

Parameter : Nmodule: signed integer 32 bits..

Numserie : Pointer on null-terminated string set with serial number.

Return : Signed integer with error code (see error code list below) or serial number.

Driver initialisation, set serial number to module number (1 to 8) and reset outputs. If serial number is set to 0, the first detected module is used and serial is return instead of error code.

Must be use before any other function TCUSB48IO_xxx.

Close session with TCUSB48IO_Close before exiting you software.

FOR COMPATIBILITY ONLY : use TCUSB48IO_OpenN

TCUSB48IO_Close(NModule)

Parameter : Nmodule: signed integer 32 bits

Return : 32 bits signed integer with error code (see error code list below)

Close session, reset outputs and close driver.

TCUSB48IO_Refresh(NModule)

Parameter : Nmodule: signed integer 32 bits

Return : 32 bits signed integer with error code (see error code list below)

Update memory data (inputs, outputs, counters) for selected module. This function must be used before calling input functions and after calling output functions.

TCUSB48IO_Input(Nmodule , Data) (1)

Parameter : Nmodule: signed integer 32 bits

Data : Pointer on unsigned Dword (32 bits)

Return : 32 bits signed integer with error code (see error code list below)

Copy all inputs status in Data variable.

TCUSB48IO_Output(Nmodule, Data) (1)

Parameter : Nmodule: signed integer 32 bits
Data : unsigned Word 16 bits

Return : 32 bits signed integer with error code (see error code list below)

Set outputs status with Data variable contents (16 bits). Bit 0 for S1 to Bit 15 for S16.

TCUSB48IO_BitInput(Nmodule , Entree) (1)

Parameter : Nmodule: signed integer 32 bits
Entree : signed integer 32 bits

Return : 32 bits signed integer with input status (0 or 1)

Read input (1 to 32) status on specified module.

TCUSB48IO_BitOutput(NModule,Sortie,etat) (1)

Parameter : Nmodule: signed integer 32 bits
Sortie : signed integer 32 bits
etat : signed integer 32 bits

Return : 32 bits signed integer with error code (see error code list below)

Set output (1 to 16) with specified state (0 or 1)

TCUSB48IO_BitReadBack(NModule,Sortie) (1)

Parameter : Nmodule: signed integer 32 bits
Sortie : signed integer 32 bits

Return : 32 bits signed integer with output status (0 or 1)

Output (1 to 16) read back.

TCUSB48IO_Counter(NModule,Entree,Data) (1)

Parameter : Nmodule: signed integer 32 bits
Entree : signed integer 32 bits
Data : Pointer on unsigned byte (8 bits)

Return : 32 bits signed integer with error code (see error code list below)

Read counter attached at input "Entree". Value is set in Data location.

TCUSB48IO_WdgRun(Nmodule)

Parameter : Nmodule: signed integer 32 bits
Return : None

Watchdog activation on specified module.

TCUSB48IO_WdgStop(Nmodule)

Parameter : Nmodule: signed integer 32 bits

Return : None

Watchdog stop on specified module.

TCUSB48IO_WdgRearm(NModule)

Parameter : Nmodule: signed integer 32 bits

Return : None

Watchdog rearm on specified module.

TCUSB48IO_ResetPort(NModule)

Parameter : Nmodule: signed integer 32 bits

Return : None

Restart USB port. After communication loss, this command try to restore connection.

TCUSB48IO_CyclePort(NModule)

Parameter : Nmodule: signed integer 32 bits

Return : None

After serious communication loss, this command try to restore connection. This is like to unconnected / reconnect module.

(1) See note about TCUSB48IO_Refresh

Error codes :

Error	Description
0	OK
1	Bad serial number
2	Bad module number (1 to 8)
3	No TC/USB-48IO found
4	Non-initialised module
5	Writing error
6	Reading error
7	Close error

TCUSB48IO_Open problem

Use TCUSB48IO_OpenN with integer value instead of string data.

Else, TCUSB48IO_Open must be use with zero terminated string. Set serial number in the string with zero after the last character and send pointer on this string to TCUSB48IO_Open function.

All seem to be right, but nothing change on outputs or input status

Don't forget to call TCUSB48IO_Refresh before calling input functions and after output functions,

USB installation is OK but demo program don't work

Please check external power supply (EXT POWER Led) and activity led. If all this is OK try to unplug module, restart computer and connect again.

After changing USB port, Windows ask me to install software again

This is normal on some releases of Windows XP (driver is attached to a specific port)