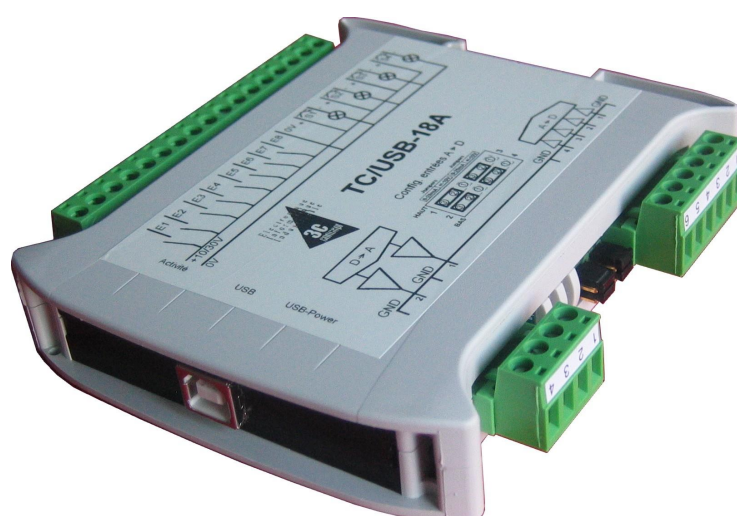


USER MANUAL
USB MODULE
8 INPUTS + 4 OUTPUTS + 4 A/D + 2 D/A
TC/USB-18A



Document rev. : 09
Module rev.: 01

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The TC/USB-18A module provides a powerful way to add digital and analog I/O to a computer

This module add to your computer 8 opto-isolated digital inputs, 4 opto-isolated digital outputs, 4 analog inputs and 2 analog outputs.

Powered by USB bus, this module give to you a cost effective large variety of inputs/outputs.

A watchdog timer is incorporated as a failsafe feature if a particular sequence is not executed every 2 seconds in order to disable all outputs.

Specifications

- 8 opto-isolated digital inputs, 12 to 24 Vdc 10 mA Max with events counter on each input (8 bits counter)
- Lowpass filter 100 Hz on digital inputs
- 4 opto-isolated digital outputs (transistors 48V 30mA max)
- 4 analog inputs 12 bits^{*1} ($\pm 10V$ ou 0/4-20mA jumpers selected)
- 2 analog outputs 12 bits ($\pm 10V$ / 5mA max)
- Watchdog timer
- USB to I/O isolation : 750Vrms
- USB 2.0 Compatible (12 Mbits/s)
- USB powered (500 mA max)
- DIN 35mm mounting
- Dimensions : (L) 100 x (l) 23 x (H) 120

*Note *1 : 11 bits used in 0/4-20mA mode*

Electrical specifications

Power:

Nom	Description	Min	Typ	Max	Unités
Iusb	USB current consumption	100		500	mA

10-30V Inputs:

Nom	Description	Min	Typ	Max	Unités
Rin	Load impedance		4700		ohms
Vmax	Maximal voltage	-30		30	volts
Ie	Input current for logic level 1	3	5	15	mA
Vih	Input voltage for logic level 1	10		30	volts
Vil	Input voltage for logic level 0		0	2	volts

Opto-coupler outputs:

Nom	Description	Min	Typ	Max	Unités
Vmax	Maximal voltage			48	volts
Ismx	Maximal current			30	mA

Analog inputs $\pm 10V$:

Nom	Description	Min	Typ	Max	Unités
Rin	Input impedance		10K		ohms
Vmax	Maximal voltage	-30		30	volts
	Calibration precision		0.5		%

Analog inputs 0-4/20mA:

Nom	Description	Min	Typ	Max	Unités
Rin	Input impedance		100		ohms
Vmax	Maximal voltage	-10		10	volts
	Calibration precision		0.5		%

Analog outputs:

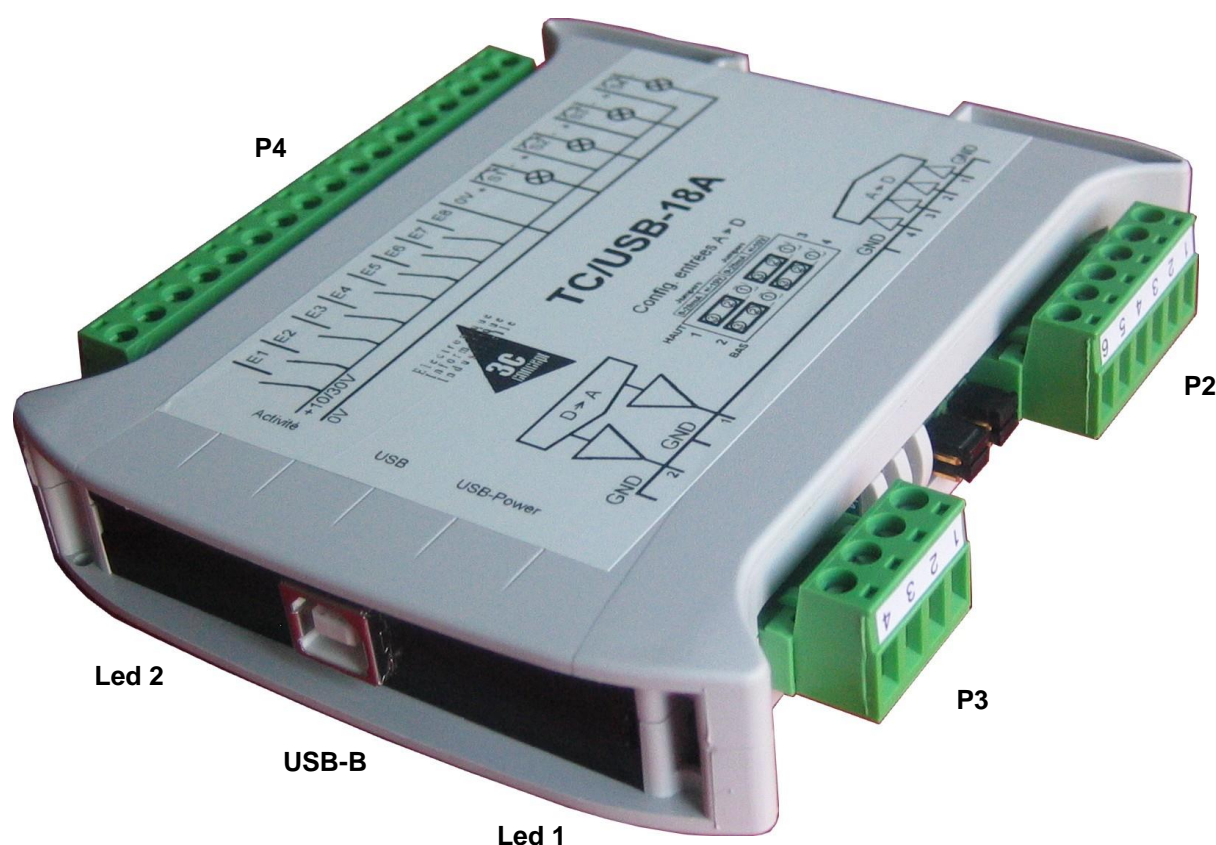
Nom	Description	Min	Typ	Max	Unités
Vmax	Maximal voltage	-10		10	volts
Ismx	Maximum current			5	mA
Rout	Output resistance		20		ohms
	Calibration precision		0.5		%

Dynamic characteristics:

Nom	Description	Min	Typ	Max	Unités
Tre	Digital Inputs response time		1	10	msec
Trso	Output response time (Transistors)		100	300	µsec
Trea	Analog inputs response time		2		msec
Trsa	Analog outputs response time		2		msec
Twdg	Watchdog timebase		2		sec
Fmax	Encoder inputs max. frequency		1000		Hz

USB Specifications:

- Peripherals max = 127
- Maximal length between peripherals = 5 m
- Possibility to use USB Hub
- Possibility to use extenders (ex. extremeUSB(R) www.icron.com)
- Industrial Hub (4 or 7 ports) see hubport on www.digi.com



Leds description :

Led 1 : Power supply present,(on USB)

Led 2 : Flash for normal activity

P4 : Connector 17 ways - 8 digital inputs / 4 Digital outputs

Pin	Signal
1	E1 / EZ*
2	E2 / EA*
3	E3 / EB*
4	E4
5	E5
6	E6
7	E7
8	E8
9	0V
10	OPTO S1+
11	OPTO S1-
12	OPTO S2+
13	OPTO S2-
14	OPTO S3+
15	OPTO S3-
16	OPTO S4+
17	OPTO S4-

*Inputs E1,E2,E3 are shared with encoder inputs EZ, EA, EB.

ⓘ Attention : Polarized outputs respect wiring guide.

P3 : Connector 4 ways - 2 Analog outputs

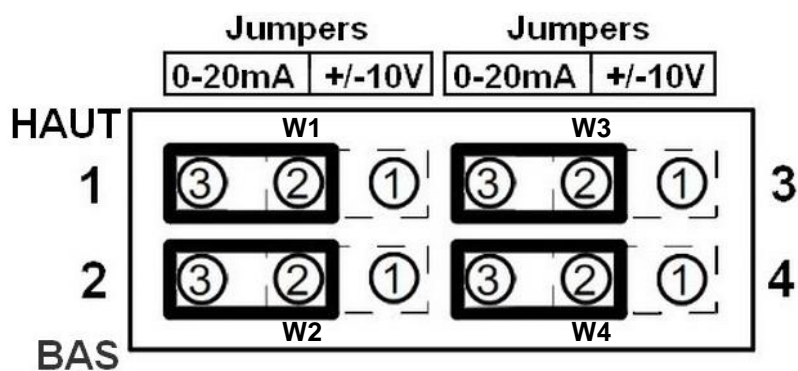
Pin	Signal
1	ANA S1
2	0V
3	ANA S2
4	0V

P2 : Connector 6 ways - 4 Analog inputs

Pin	Signal
1	0V
2	ANA E1
3	ANA E2
4	ANA E3
5	ANA E4
6	0V

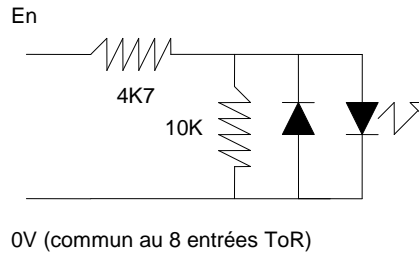
Analog inputs configuration:

4 jumpers near P2 connector select inputs mode: $\pm 10V$ (jumpers between 1 and 2) or 0-4/20mA (jumpers between 2 and 3).

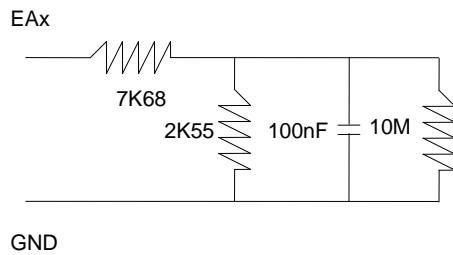


Input	Jumper	1-2 location	2-3 location
1	W1	$\pm 10V$	0-4/20mA
2	W2	$\pm 10V$	0-4/20mA
3	W3	$\pm 10V$	0-4/20mA
4	W4	$\pm 10V$	0-4/20mA

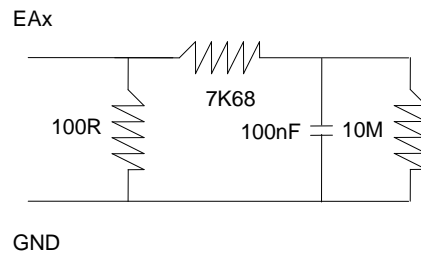
Logical inputs :



Analog inputs :

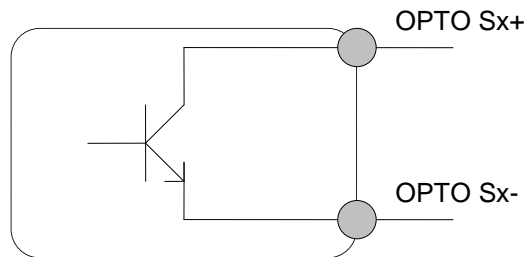


Entrée analogique avec cavalier en 1-2 ($\pm 10V$)
 $\pm 10V$ mode (jumper between 1-2)



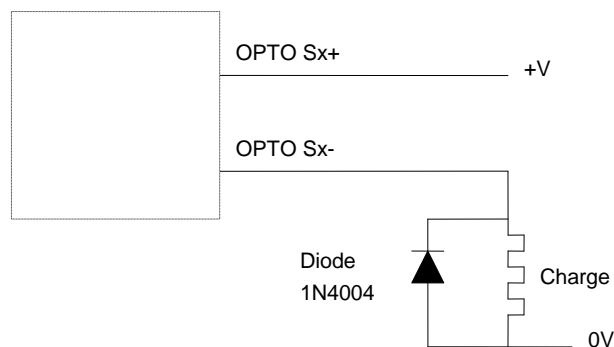
Entrée analogique avec cavalier en 2-3 (0-4/20mA)
 0-4/20mA mode (jumper between 2-3)

Opto-couplers outputs :



Output protection:

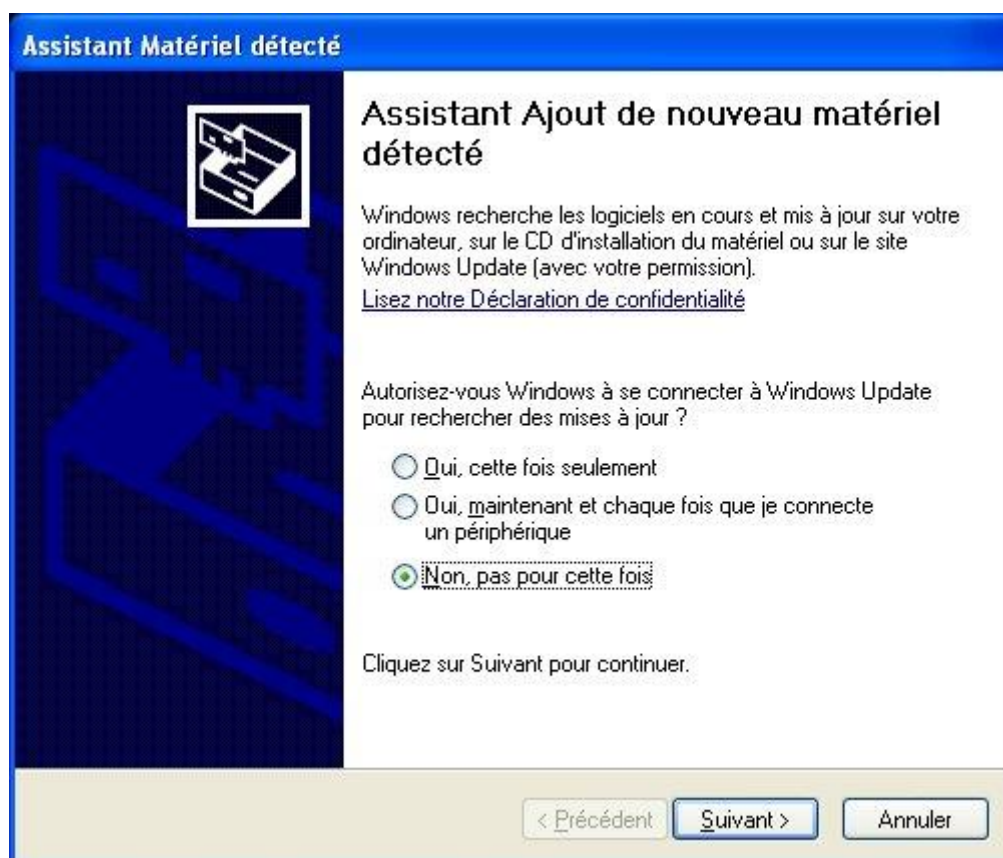
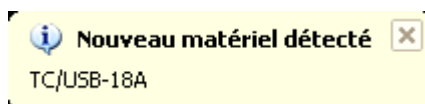
With inductive loads (relay, solenoid ...) a free wheel diode must be placed:



Driver installation under Windows XP

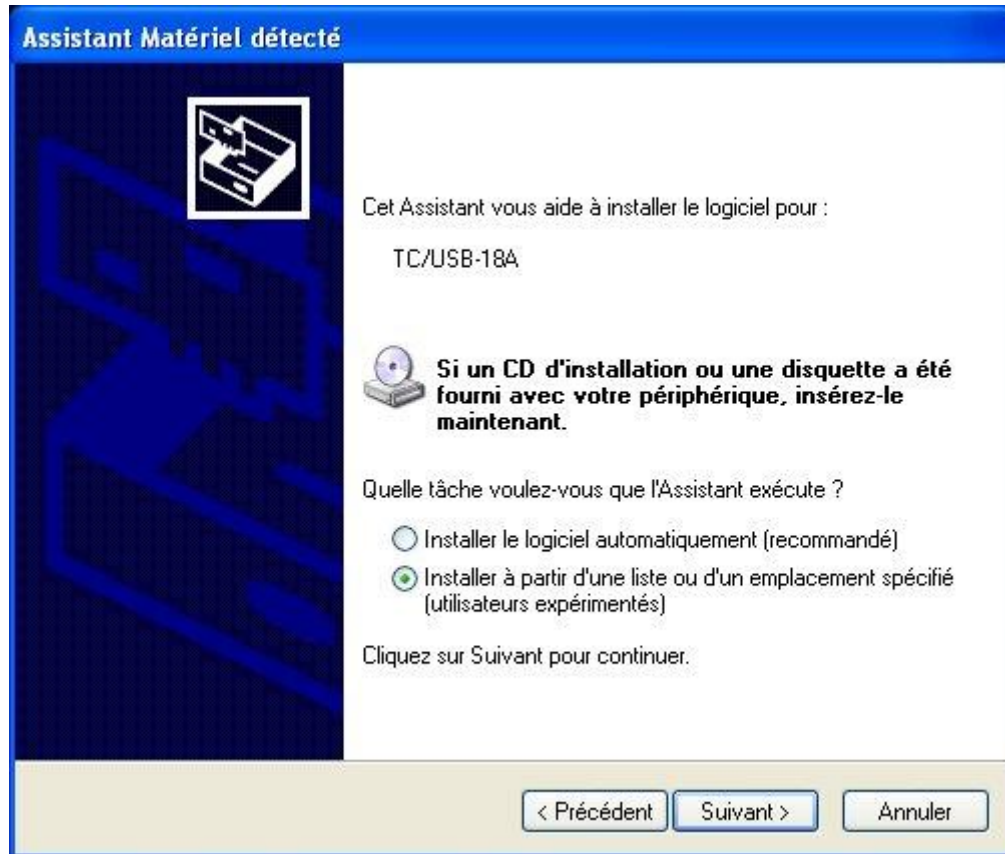
On CD-ROM you can find demonstration program, DLL and include files to create your own programs.

- Connect module to PC, Windows must detect it and show a message box :



- Windows want to connect to Windows Update, answer « not this time »

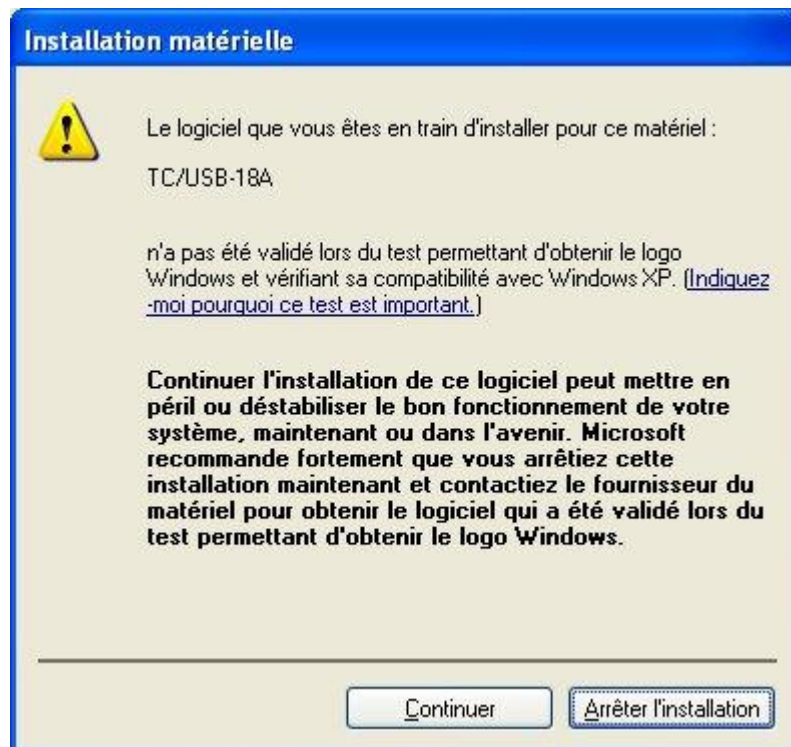
- Next select « install from a list.. »



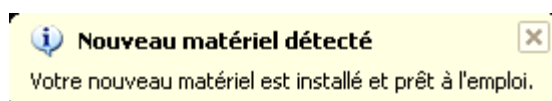
- In this window click on « Include this location » and browse to directory **TCUSB18A\WIN\INSTALL** on CDROM



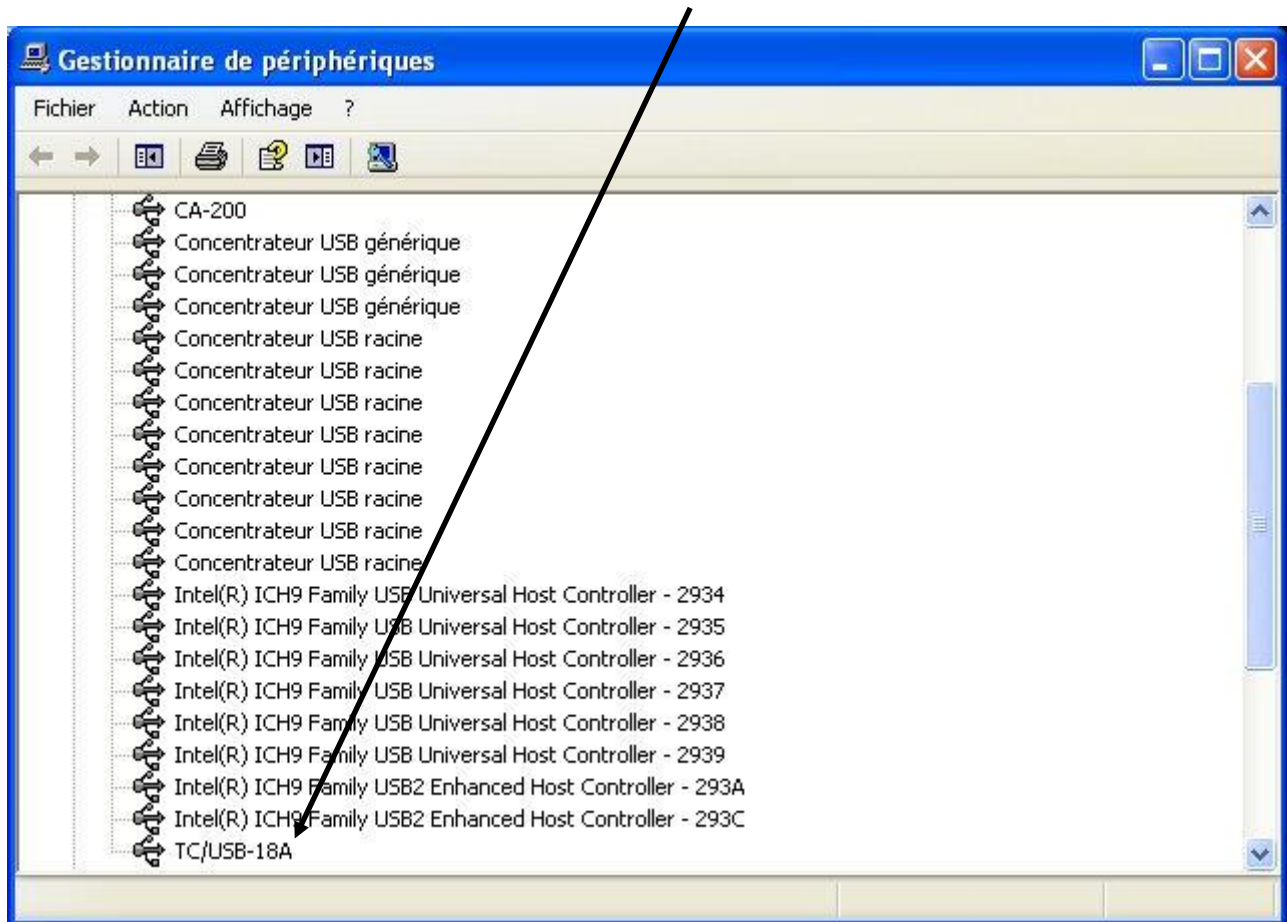
When installing, Windows say “This driver has not pass WHQL testing ...” answer “Continue anyway”



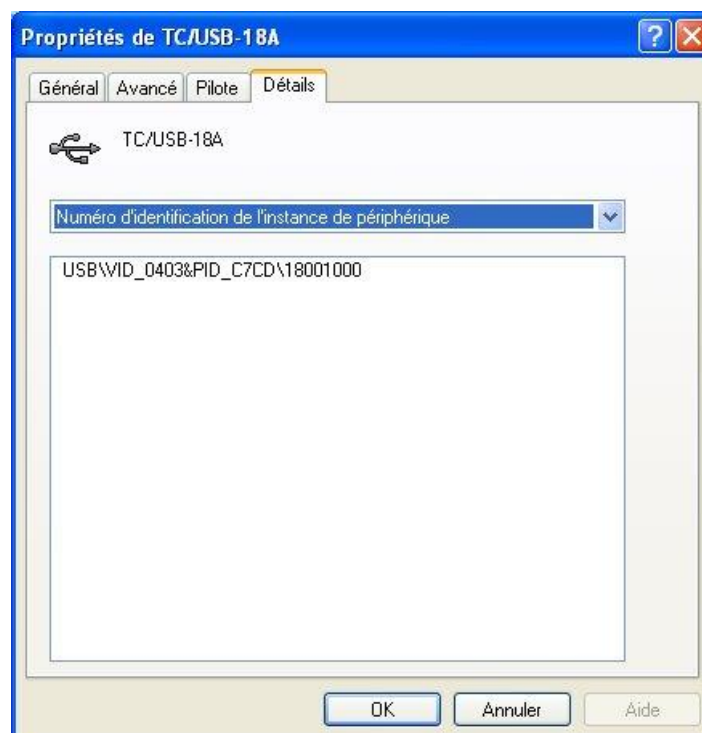
At end, Windows display the following message “Completing the found New hardware wizard”



You can verify in configuration panel that TCUSB-18A device is installed:



You can also read serial number on property / detail tab :



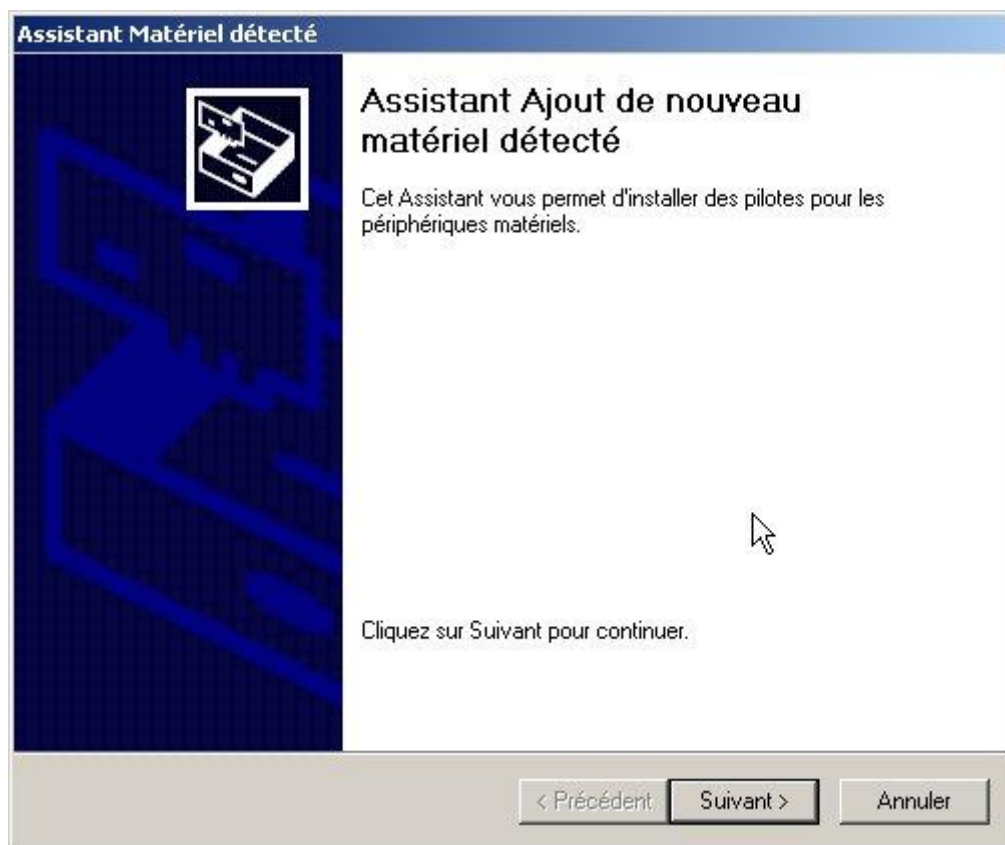
Then you can run program **TCUSB18A\WIN\DEMO\DemoTCUSB18A.EXE** in order to verify that module is working.

Driver installation under Windows 2000

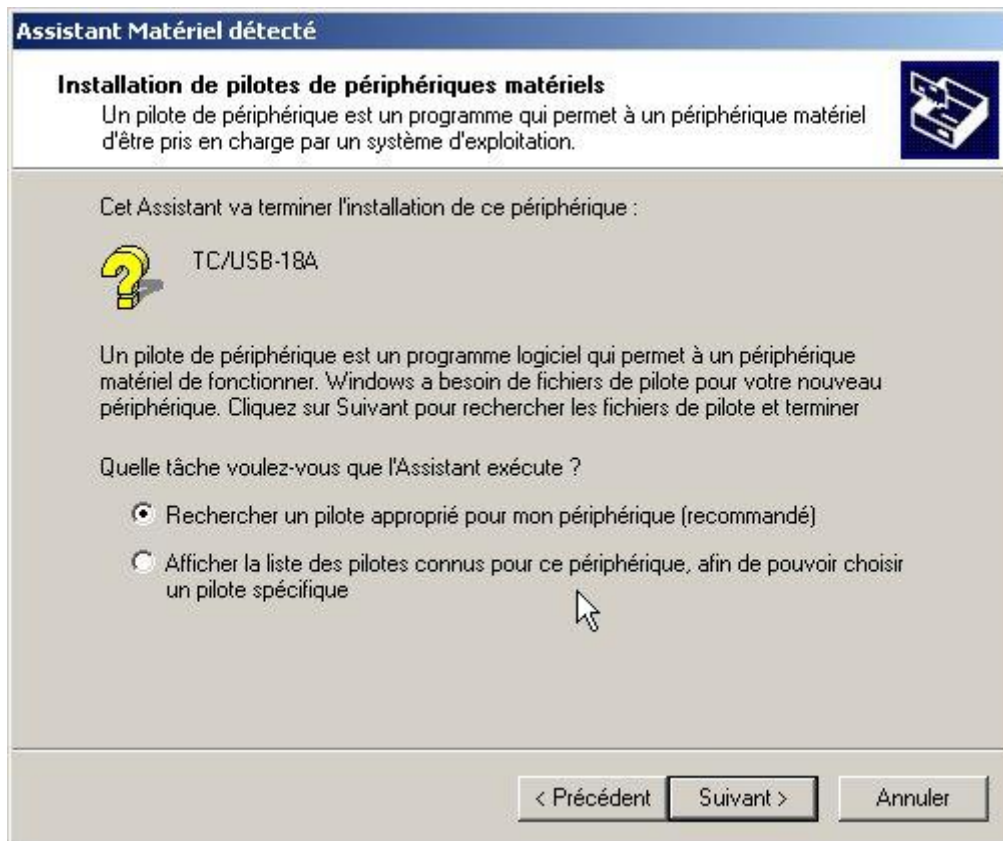
- Connect module to PC, Windows must detect it and show a message box :



- Click on Next



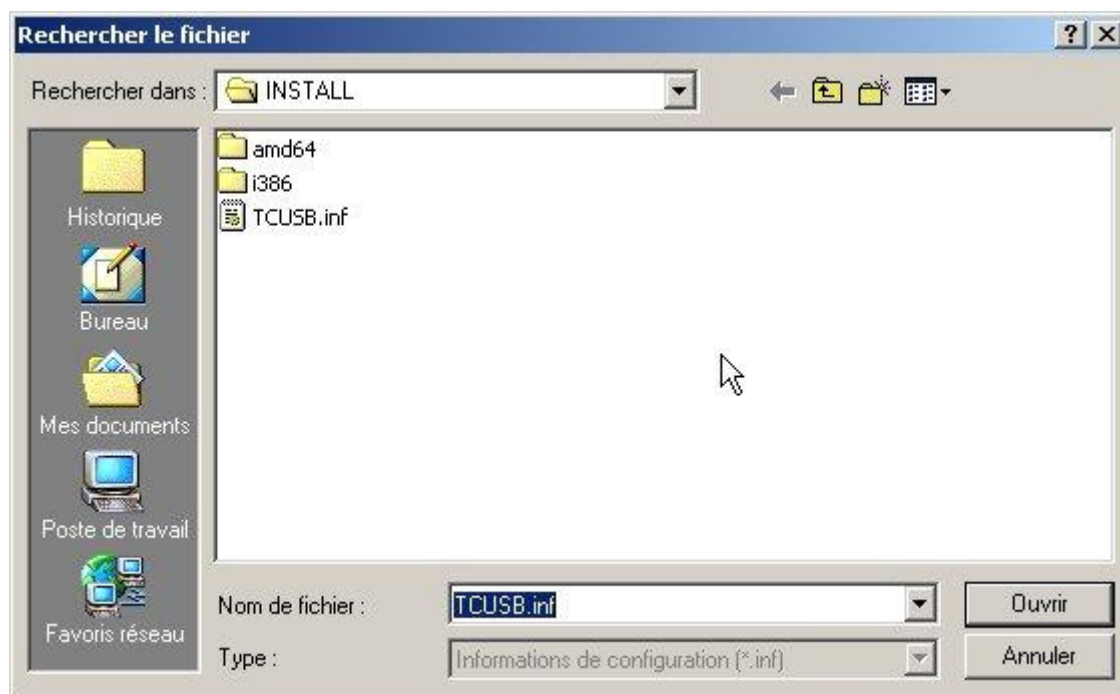
- In next screen select « Search for driver ...»



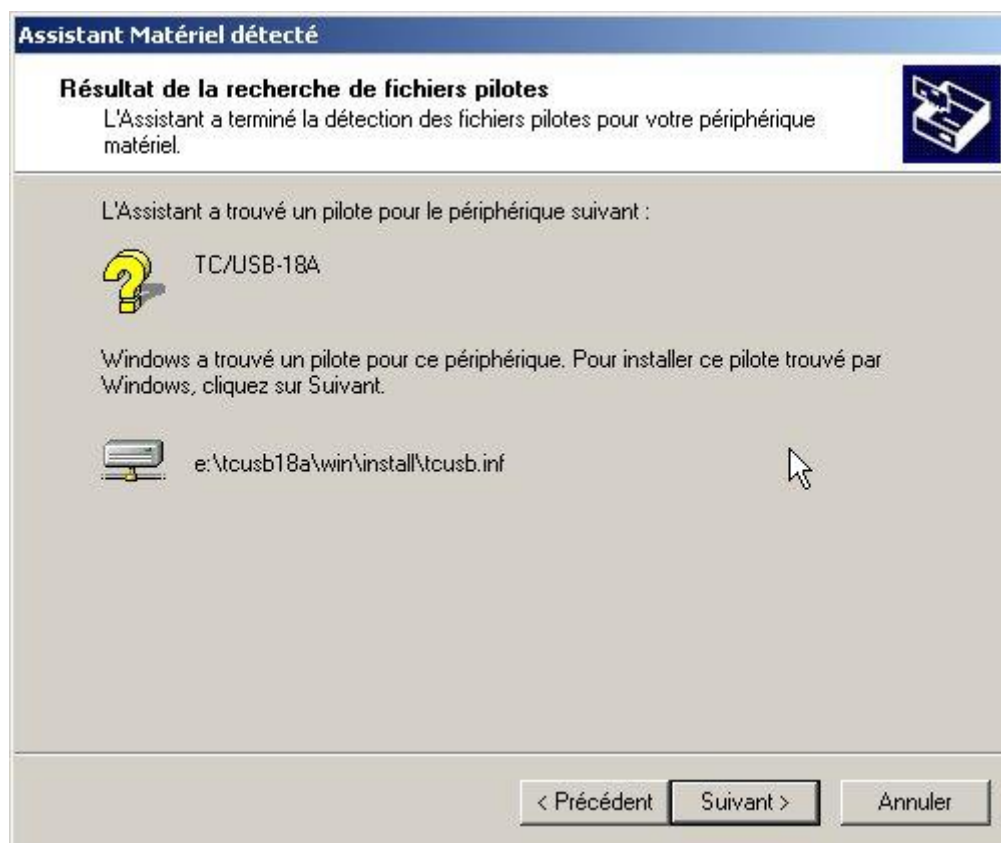
- Select specific location



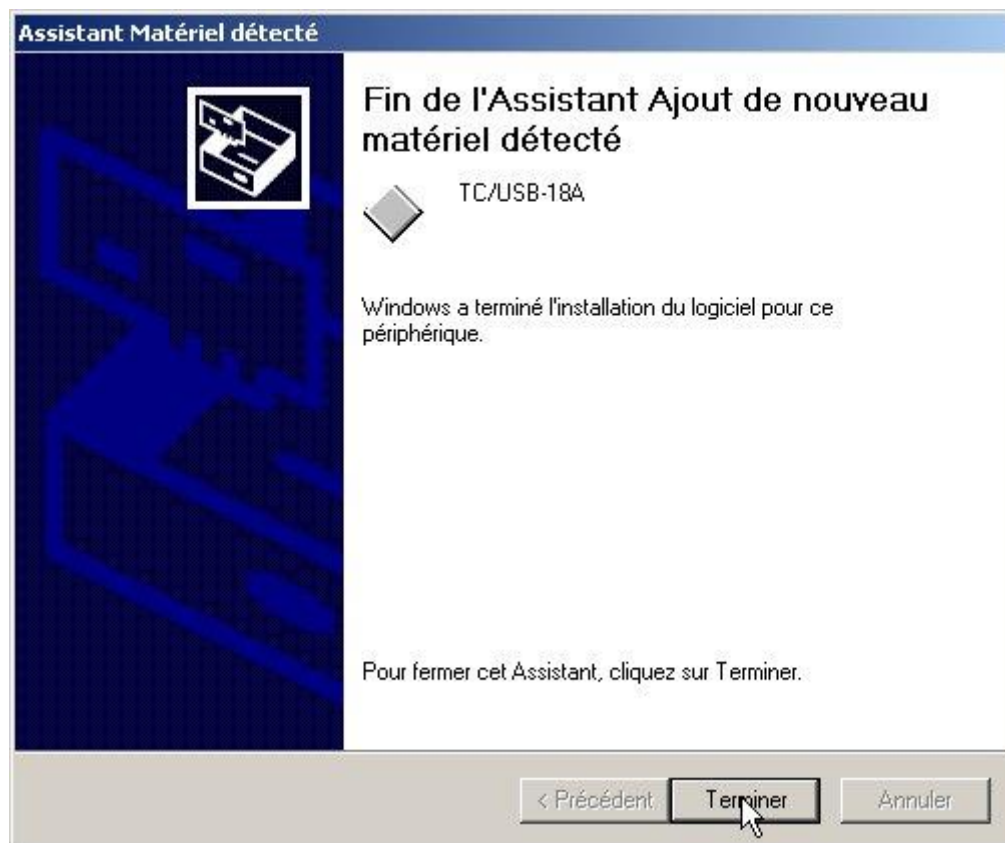
- Browse on CDROM to directory **TCUSB18A\WINVINSTALL\TCUSB.INF**, click on Open.



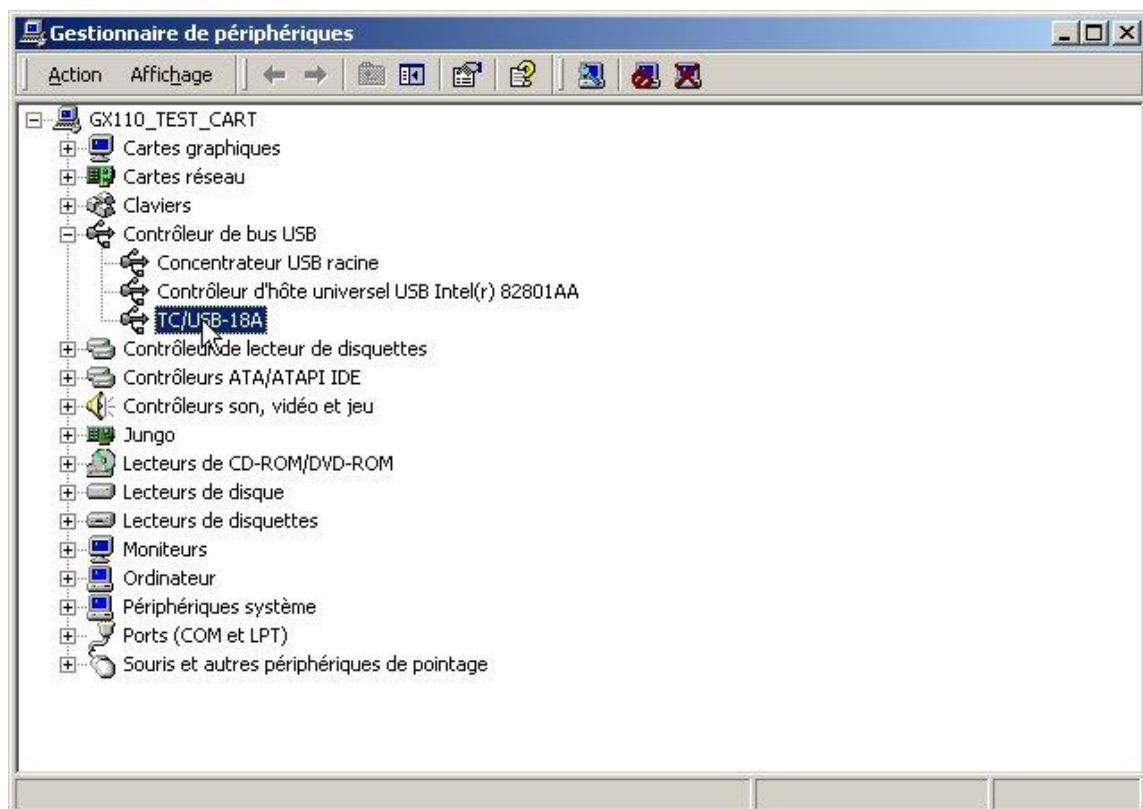
- Resume screen, click on « Next »



- Installation complete :



You can verify in configuration panel that TCUSB-18A device is installed:



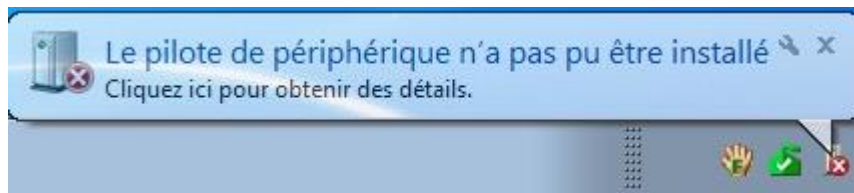
Then you can run program **TCUSB18A\WIN\DEMO\DemoTCUSB18A.EXE** in order to verify that module is working.

Driver installation under Windows 7

- Connect module to PC, Windows must detect it and show a message box :



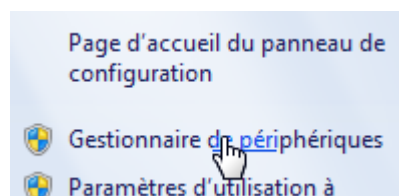
- Driver cannot be installed automatically by windows, an error is displayed :



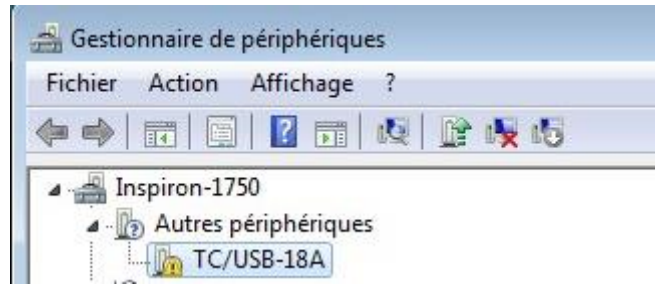
- Right click on computer icon for properties :



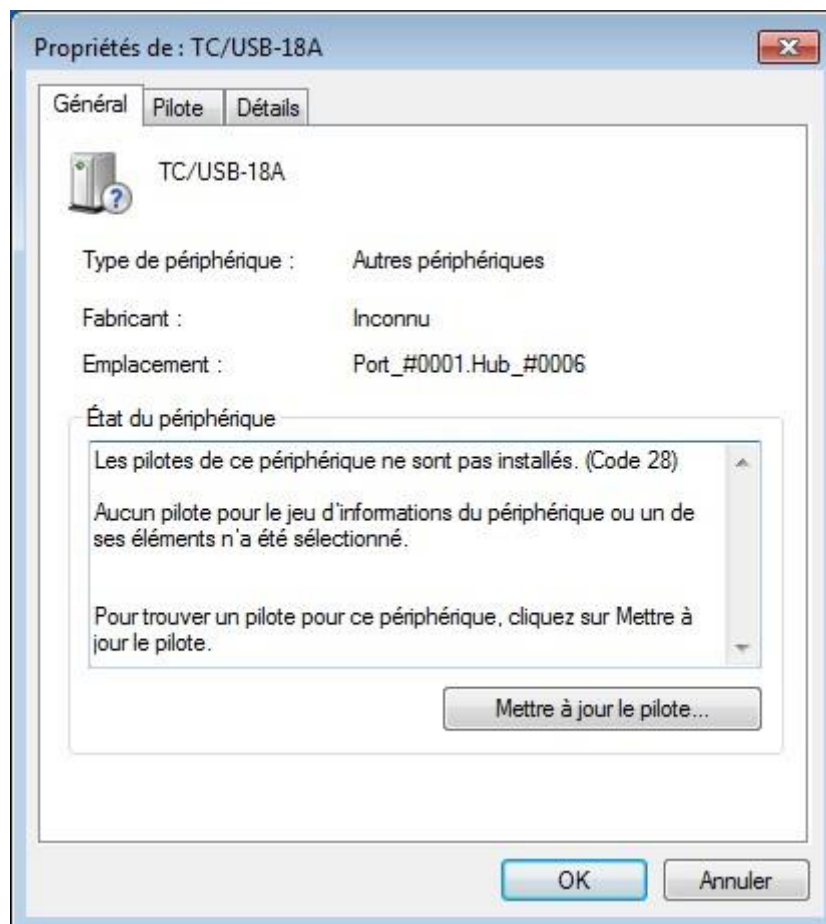
- Windows display configuration panel
- On left window select peripheral manager



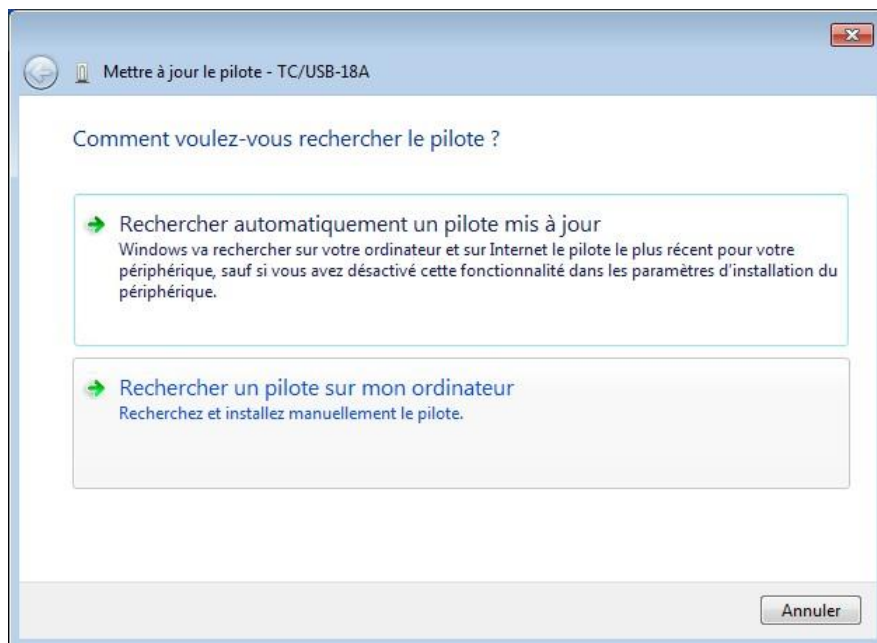
- The following window must appear :



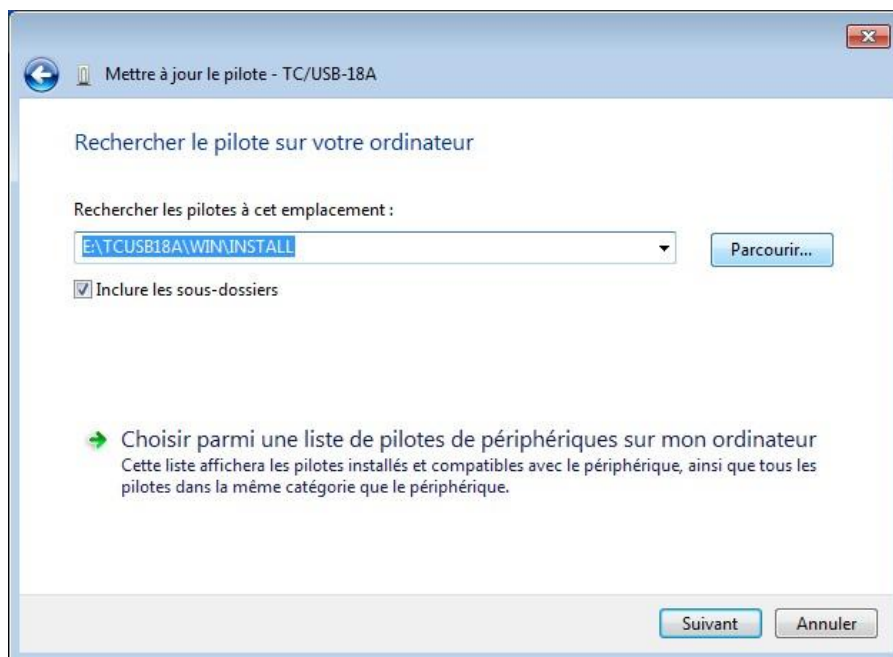
- Yellow exclamation dot indicates that TCUSB18A as been detect but driver is not installed
- Click two times on line :



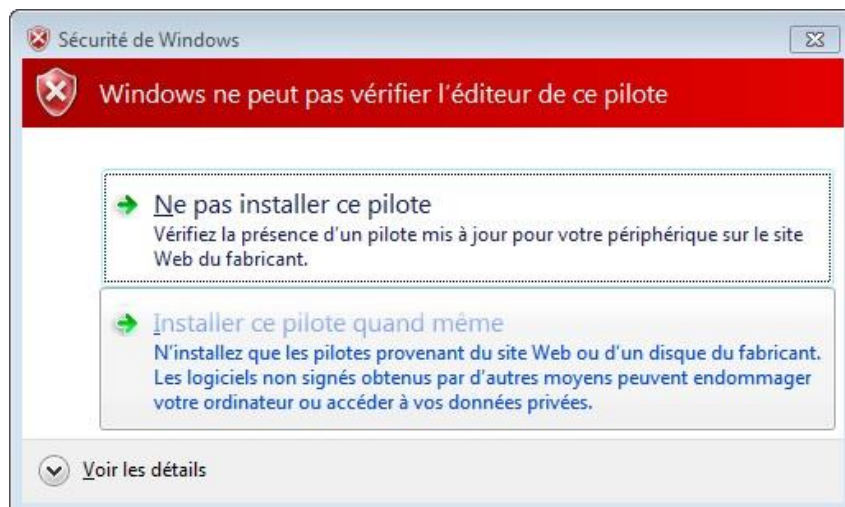
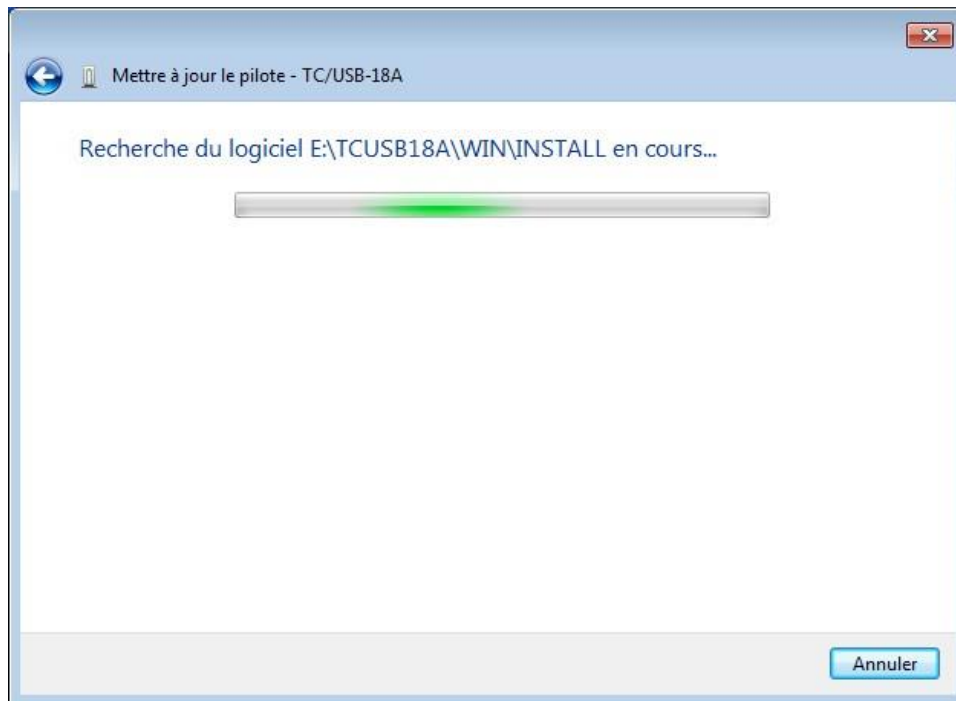
- Click on update driver :



- Click on find driver on my computer

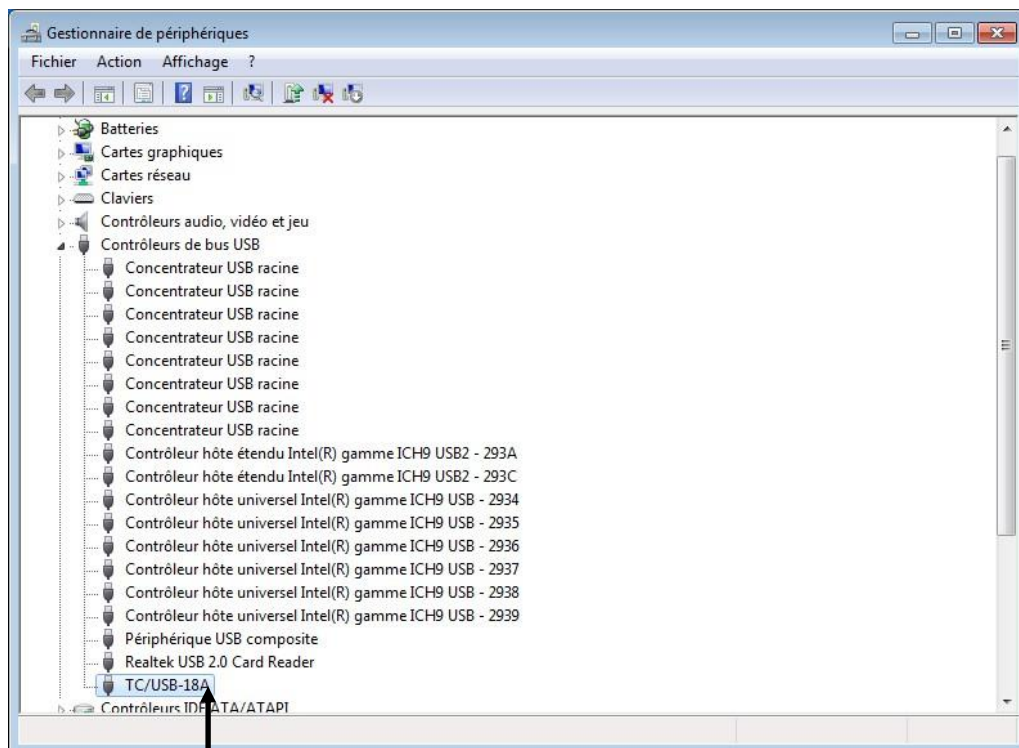
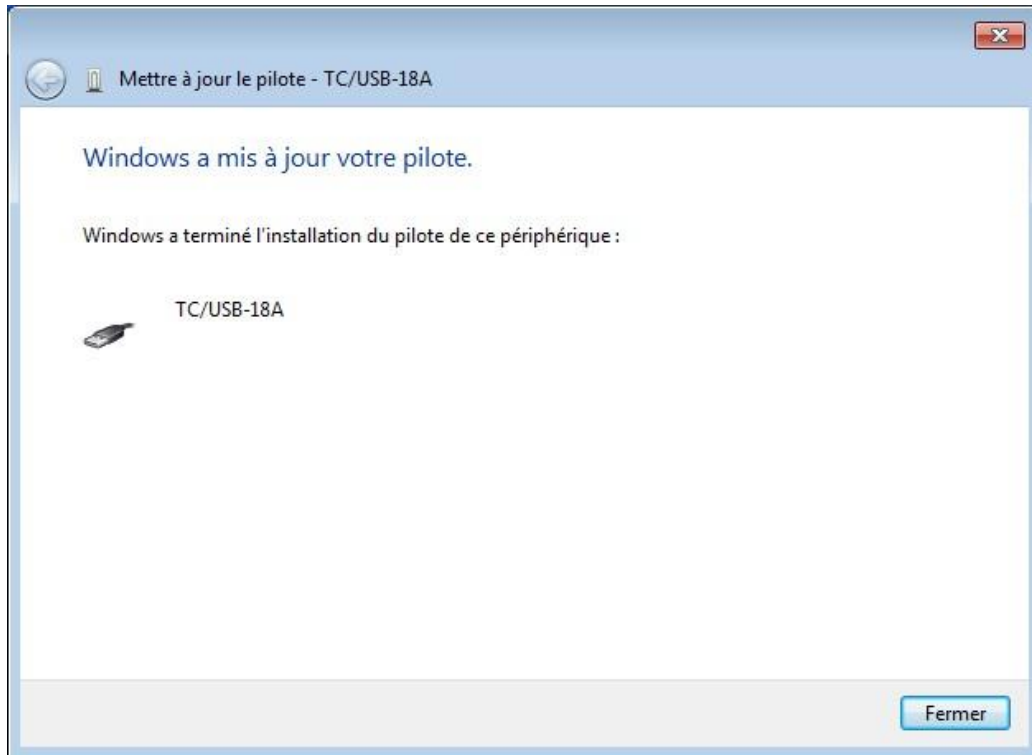


- Give path to « CDROM:\TCUSB18A\WIN\INSTALL » and click on NEXT

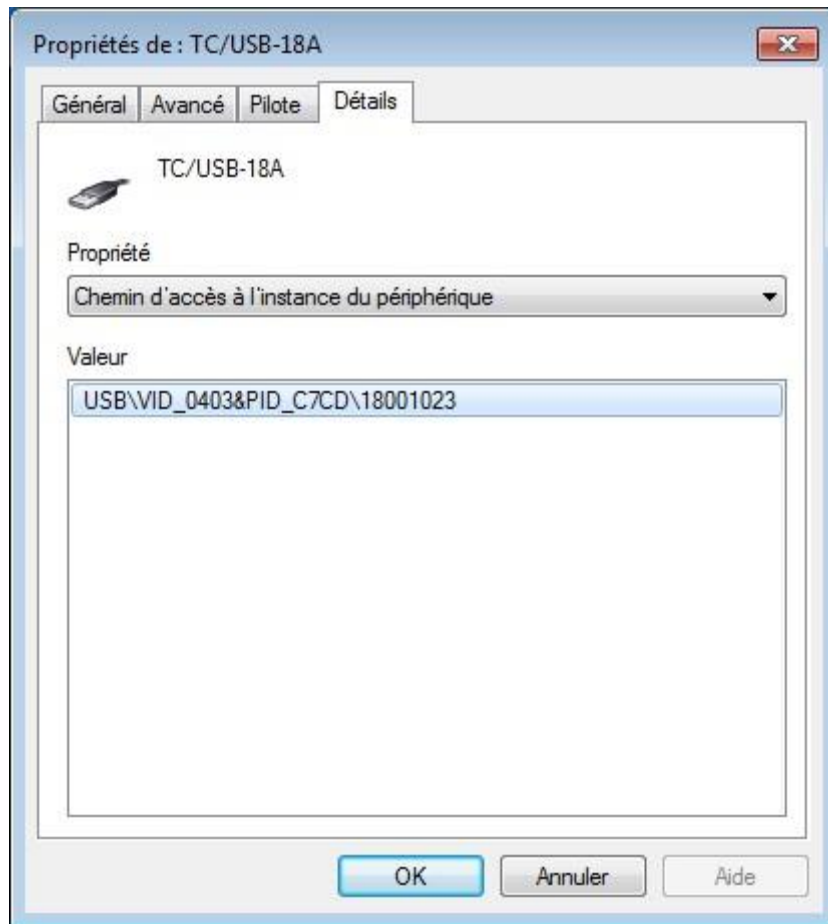


- Ignore warning and click on « Install »

- Successful installation :



- You can use properties to find TC/USB-18A serial number on sheet details.



Then you can run program ***TCUSB18A\WIN\DEMO\DemoTCUSB18A.EXE*** in order to verify that module is working.

- Exclamation mark in Device manager :

An exclamation mark is display when driver is not correctly detect. Use properties tabs and update driver to restart driver installation as describe before.

- Interrupted installation :

Restart computer without module, and then connect module again. Restart installation as the first time.

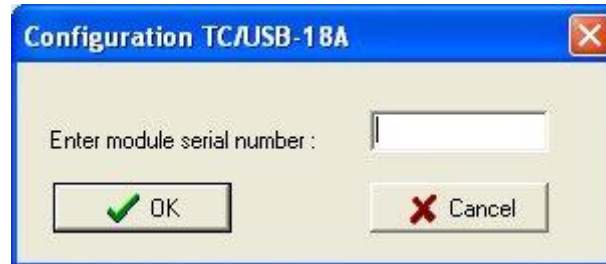
- Driver uninstallation:

To uninstall the module's driver, execute the batch file "Uninstall Driver TCUSB18A.bat" on the cd-rom shipped with it.

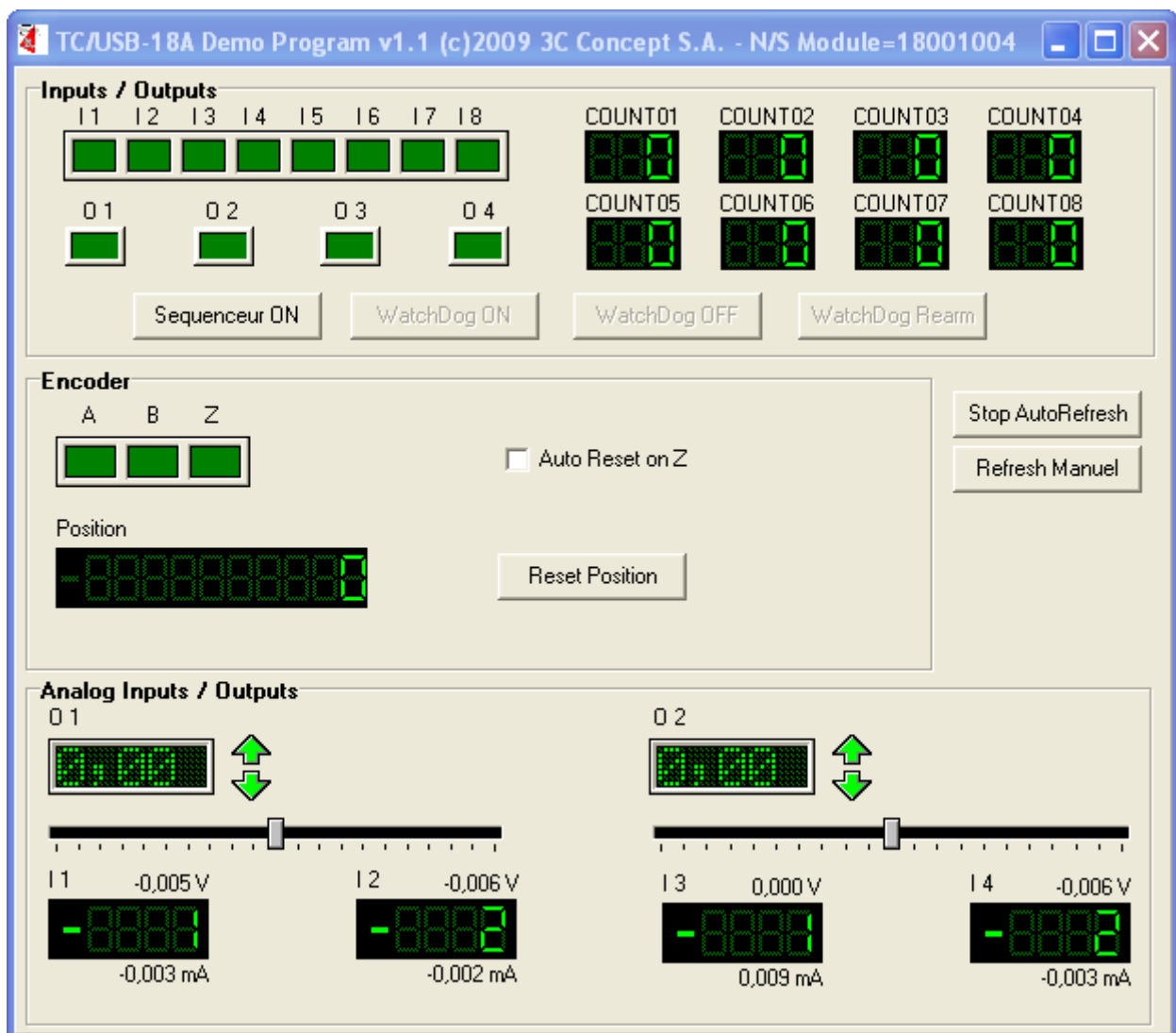
Before, you have to copy "**Uninstall Driver TCUSB18A.bat**" et "**CDMUninstaller.exe**" from CD-ROM to HDD, in order to allow the creation of a log file for the uninstallation process.

Demonstration software

Demonstration software is on CD-ROM: « TCUSB18A\Win\Demo\DemoTCUSB18A.exe».



Give module serial number (display on label under product) or enter OK without number if you have only one module attach to your computer.



All outputs can be drive with a click on green symbol.

All analog outputs can be set manually with cursor or Up/Down arrows.

Button “ Sequenceur ON/OFF “ : Automatically drive outputs

Button “WatchDogOn” : Activate watchdog timer

Button “ WatchdogOff” : Stop watchdog timer

Button “ WatchDogRearm” : Manual watchdog update, must be done every 2 seconds.

Button “StopAutoRefresh” : Stop updating display

Button “Reset Position” : Clear encoder value

Using DLL TCUSB18A.DLL

Windows 32 DLL can be use with different languages:

With PASCAL compiler (DELPHI):

Use files TCUSB18A.INC and DLL TCUSB18A.DLL

With C compiler:

Use files TCUSB18A.H and DLL TCUSB18A.DLL

With Basic compiler:

Use files TCUSB18A.BAS and DLL TCUSB18A.DLL

With C# compiler:

Use files TCUSB18A.CS and DLL TCUSB18A.DLL

Shared object under Linux:

Look at directory « linux » on CDROM, textfile explain how to use it (TCUSB18A\Linux)

ⓘ Attention : All functions works on memory image update by function TCUSB16IO_Refresh. This function must be call before every function using inputs AND after every function using outputs. Do not use this function after every commands because of the transmission delay on USB bus.

An information window can appear on startup if driver is not the latest (3 seconds display). In this case, please download the new release and update your driver.

Functions description:

TCUSB18A_OpenN(Nmodule, NumSerie)

Parameter : Nmodule: 32 bits signed integer (to 8).

Numserie : Pointer on unsigned Dword (32 bits) initialized with serial number.

Return : 32 bits signed integer with error code.

Initialize driver, assign module number to serial number send in parameter. If serial number is set to 0, variable is update with real serial number (only if one module is attached to computer).

Use this function before all other one.

Close session with TCUSB18A_Close .

TCUSB18A_Open(Nmodule, NumSerie) (due to string configuration in many languages)

Initialize driver, assign module number (1 to 8) to serial number send in parameter. If serial number string is empty, variable is update with real serial number (only if one module is attached to computer).

Use this function before all other one.

Close session with TCUSB18A_Close .

TCUSB18A_Close(NModule)

Parameter : Nmodule: 32 bits signed integer.

Return : 32 bits signed integer with error code.

Close session and close driver (necessary at the end of program)

TCUSB18A_Refresh(NModule)

Parameter : Nmodule: 32 bits signed integer.

Return : 32 bits signed integer with error code.

Update data on specified module. This function must be call BEFORE using inputs data and AFTER modifying outputs data.

TCUSB18A_Input(Nmodule , Data) ⁽¹⁾

Parameter : Nmodule: 32 bits signed integer.

Data : Pointer on 32 bits unsigned Dword.

Return : 32 bits signed integer with error code.

Read digital inputs status (8 digital inputs) and 3 encoder inputs.

Bit Number	Bit10	Bit9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Stand for	Z	B	A	E8	E7	E6	E5	E4	E3	E2	E1

TCUSB18A_Output(Nmodule, Data) ⁽¹⁾

Parameter : Nmodule: 32 bits signed integer.

Data : Unsigned Byte 8 bits.

Return : 32 bits signed integer with error code.

Send on outputs value from variable Data.

TCUSB18A_BitInput(Nmodule , Entrée, Data) ⁽¹⁾

Parameter : Nmodule: 32 bits signed integer (1 to 8).
Entrée : 32 bits signed integer (1 to 8).
Data: Pointer on Byte, contains input status (0 to 1)
Return : 32 bits signed integer with error code.

Read status of specified input / module

TCUSB18A_BitOutput(NModule,Sortie,etat) ⁽¹⁾

Parameter : Nmodule: 32 bits signed integer (1 to 8).
Sortie : 32 bits signed integer (1 to 4).
etat : 32 bits signed integer (0 or 1).
Return : None (Procedure)

Force output « Sortie » to state « etat » (0 or 1)

TCUSB18A_BitReadBack(NModule,Sortie,Data) ⁽¹⁾

Parameter : Nmodule: 32 bits signed integer.
Sortie : 32 bits signed integer (1 to 4).
Data: Pointer on Byte, contains output status (0 to 1)
Return : 32 bits signed integer with error code

Read output status (0 or 1)

TCUSB18A_Counter(NModule,Entree,Data) ⁽¹⁾

Parameter : Nmodule: 32 bits signed integer.
Entree : 32 bits signed integer.
Data : Pointer on unsigned Byte (8 bits).
Return : 32 bits signed integer with error code.

Read events counter attached to specified input « Entree ».

TCUSB18A_Config(Nmodule,Data) ⁽¹⁾

Parameter : Nmodule: 32 bits signed integer.
Data : unsigned Byte (8 bits).
Return : 32 bits signed integer with error code.

Module configuration byte, Data.bit 4 (0x10) must be set for automatic position reset on Z input.

TCUSB18A_Pos(Nmodule,Data) ⁽¹⁾

Parameter : Nmodule: 32 bits signed integer.
Data : Pointer on 32 bits unsigned Dword.
Return : 32 bits signed integer with error code.

Read encoder counter (position) on 32 bits

TCUSB18A_ResetPos(Nmodule)

Parameter : Nmodule: 32 bits signed integer.

Return : 32 bits signed integer with error code.

Clear encoder counter (position)

TCUSB18A_Analn(NModule, Voie, Data)

Parameter : Nmodule: 32 bits signed integer.

Voie : 8 bits signed integer (channel).

Data : Pointer on signed Word (16 bits).

Return : 32 bits signed integer with error code.

Read analog input and return measure in variable Data. This is the direct converter value without calibration. Prefer using TCUSB18A_AnalnVolts or TCUSB18A_AnalnmA.

Current mode :

Data= 0 then I=Imin (~=0mA)

Data= +2047 then I=Imax (~=25mA)

Voltage mode :

Data= -2048pts then V=Vmin (near -10V)

Data= +2047pts then V=Vmax (near +10V)

TCUSB18A_AnalnVolts(NModule, Voie, Data)

Parameter : Nmodule: 32 bits signed integer.

Voie : 8 bits signed integer (channel).

Data : Pointer on float (64 bits).

Return : 32 bits signed integer with error code.

Read analog input and return measure in variable Data. This is the real value in volts with calibration data.

TCUSB18A_AnalnmA(NModule, Voie, Data)

Parameter : Nmodule: 32 bits signed integer.

Voie : 8 bits signed integer (channel).

Data : Pointer on float (64 bits).

Return : 32 bits signed integer with error code.

Read analog input and return measure in variable Data. This is the real value in milliamps with calibration data.

TCUSB18A_AnaOut(NModule, Voie, Data)

Parameter : Nmodule: 32 bits signed integer.

Voie : 8 bits signed integer (channel).

Data : signed integer (16 bits)

Return : 32 bits signed integer with error code.

Set analog output with Data value. The value is send directly to converter value without using calibration. Prefer using TCUSB18A_AnaOutVolts.

Data= -2048pts then V=Vmin (near -10V)
Data= +2047pts then V=Vmax (near +10V)

TCUSB18A_AnaOutVolts(NModule, Voie, Data)

Parameter : Nmodule: 32 bits signed integer.
Voie : 8 bits signed integer (channel).
Data : Pointer on float (64 bits).
Return : 32 bits signed integer with error code.

Set analog output and return measure in variable Data. Send the real value in volts, calibration data are used.

TCUSB18A_WdgRun(Nmodule)

Parameter : Nmodule: 32 bits signed integer.
Return : None (Procedure)

Activated watchdog timer

TCUSB18A_WdgStop(Nmodule)

Parameter : Nmodule: 32 bits signed integer.
Return : None (Procedure)

Inactivated watchdog timer

TCUSB18A_WdgRearm(NModule)

Parameter : Nmodule: 32 bits signed integer.
Return : None (Procedure)

Update watchdog timer (must be call less than every 2 seconds)

TCUSB18A_ResetPort(NModule)

Parameter : Nmodule: 32 bits signed integer.
Return : None (Procedure)

USB port restart, this can be use in case of communication trouble on an active module.

TCUSB18A_CyclePort(NModule)

Parameter : Nmodule: 32 bits signed integer.
Return : None (Procedure)

Similar to unconnect and reconnect USB port to restart communication between computer and module after serious error.

TCUSB18A_Version(NModule,Data1,Data2) (1)

Parameter : Nmodule: 32 bits signed integer.
Data1 : Pointer on unsigned Byte (8 bits).
Data2 : Pointer on unsigned Byte (8 bits).
Return : 32 bits signed integer with error code.

Read firmware release number and driver release number. Values are set in data1 and data2 variables.

(1) Look at TCUSB18A_Refresh information at the beginning of this section.

Error list :

Number	Designation
0	No error
1	Bad serial number
2	Bad module number (1 to 8)
3	No TC/USB-18A detected
4	Non-initialized module
5	Write error
6	Read error
7	Close error