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CT7

Quick Start Guide



	NAME AND FUNCTION	DATE	SIGNATURE
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Issue	Date	Modified Pages	Rationale
1	28/04/2011	All	Document Creation Applicable for Instruments: SN : 10001, 10002, 10003,10004 Software versions CT7_DSP: v 1.0.2 built 28/04/2011 CT7_OLED v 1.0.2 built 29/04/2011 CT7 Console v 1.00 built 1/05/2010

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1 Objective

To provide basis necessary for operations of CT7 reflectometer.

2 Scope

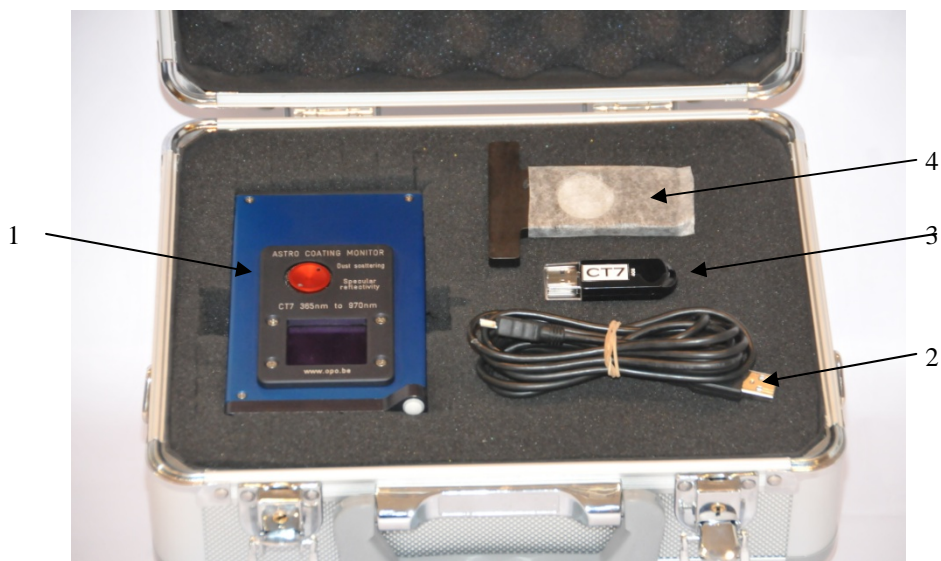
This document is applicable for the Beta phase of the project, defined as phase of initial design improvements till the acceptance by the beta tester.

3 CT7 Introduction

- CT7 is dedicated to monitoring of the coating's quality of the high grade optical surfaces.
- CT7 measures the specular reflection and (option) scattering index using seven wavelengths covering the range from UV to near IR.
- Configurations of the instrument and data retrieval are facilitated by PC application **CT-7 Console**.

4 CT7 box contents

1. CT7 (with batteries)
2. Cable USB
3. USB Flash memory (Install and documentation)
4. calibration mirror (Option)



The USB Flash memory. Contains the Software Installation Package and User's Manual.

5 Quick Start.

We recommend to calibrate CT7 after transport and when it is exposed to important temperature change.

5.1 Single measurement in brief

In current use the measure sequence is following:

- **Power up CT7 (Press joystick UP)**
- **Keeping it in hand, go to MEASURE option and trigger it. You have 5 seconds before the measurement starts.**
- **Place CT7 gently on the mirror.**
- **When the measurement is finished, and the results show-up, pick up carefully CT7.**
- **Perform your measurements repeating the above steps.**
- **Once in the office, connect to PC , run CT7-Console and power-up CT7, activate SERVICE/PC-Link mode**
- **Retrieve data from CT7 to archive file.**
- **Sort data by date ,by cart, than export to Excel and finish your report with usual edition tools**

5.2 Profesional work-flow

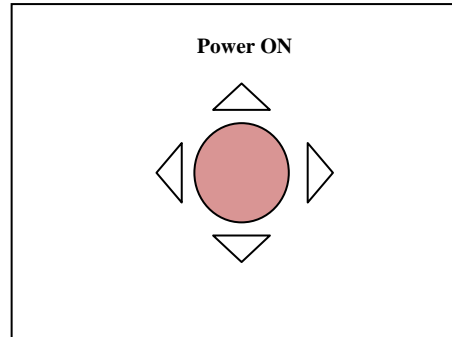
- **Install CT7 Console provided on CT7 Flash Disk on your PC, and start it.**
- **Connect CT7, awake it and activate SERVICE/ PC-Link mode**
- **Indicate the COM port to be used (at first connection)**
- **Open Measurement Configuration Management**
- **Read Configuration from CT7**
- **Edit table: selecting wavelengths to be used and give names to CARTs for specific mirrors. The CART name will help you to sort-out the data for specific mirror.**
- **Write Configuration to CT7**
- **Disconnect by closing CT7-Console.**
- **Now you are ready to monitor the mirrors. Select the active CART in menu MEASURE/ Sel. Cart. Perform your measurements following single measurement flow.**

Notes:

You may always review results using menu **Report/Data** of CT7

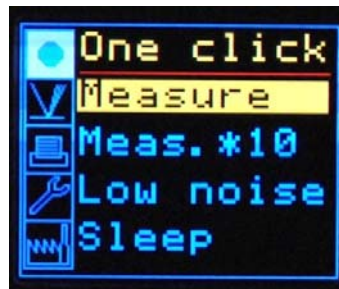
5.3 Measurement Step by Step

- The CT7 is normally in sleep mode and can be awakened by pressing the joystick **up**.

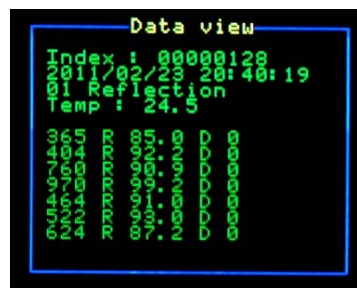


Joystick functions

- At the first Power ON, if necessary, the instrument prompts for time setting. Once the Time introduced, CT7 is ready for the measurements.
- Then CT7 is ready to perform quick “One click” measurement with the active **Cart** of wavelength selection. By default, the NORMAL measurement configuration is active i.e. 7 bands in reflectivity and 7 bands in scattering. (option).
- The MEASURE option is highlighted and may be triggered when pressing the joystick (**Enter**).



- Trigger the measure still keeping CT7 in your hand: you have 5 seconds to place the instrument gently on the mirror.**
- After the measurement, the results are displayed and stored with the *time stamp* and *Cart ID*.



- Pressing joystick (ENTER) returns to the menu.

5.4 CT7 design protects telescope mirror

5.4.1 Contact of CT7 with telescope mirror

Teflon can in no way mark the mirror's substrate, but it can mark the coating especially if rubbed. The **delayed start** allows the operator to lay gently the CT7 on the mirror after starting the measurement and remove it after measurement without the need to touch it while it sits on the coating. Moreover, the small incidence angle of the measuring beams makes the result little sensitive to the measurement distance so that **the instrument can stand on an optical tissue**. This tissue (paper or cloth) must provide an opening for the beam (25 mm hole) and should be of equal thickness (+/-0.05 mm) under the three feet.



Taking a measurement with mirror protected by lint-free wiper.

5.4.2 Delayed Start

By default, triggering “measure” option invokes a 5 seconds delay before the measurement actually starts. The objective of this feature is the protection of the mirror: no operation is required when CT7 is in contact with mirror.

6 Working with CARTS, Calibration, battery charging.

6.1 CART and customized measurements

The user can select 0 to 7 wavelengths to be used for measurement of reflection and 0 ..7 for scattering. However, at least one wavelength shall be selected either in reflectivity or in scattering. Once customized, given configuration may be named and saved. From **CT7-Console** one can create and modify named *Carts* of customized measurements.

The aim of the **Cart** operation is the following: assuming that the user has four telescopes (i.e. T1 ... T3) to monitor and that each of them has several mirrors (i.e. M1 ... M8); he can prepare the following **Carts** (illustrated by actual screen-shot from CT7-Console):

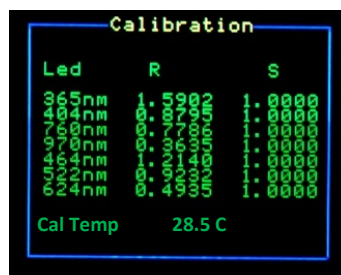
	Index	Nom	R 365nm	R 404nm	R 760nm	R 970nm	R 464nm	R 522nm	R 624nm	D 365nm	D 404nm	D 760nm	D 970nm	D 464nm	D 522nm	D 624nm
	0	Normal	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	1	T1M1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2	T1M2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3	T1M3	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4	T2M1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5	T2M2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	6	T3M1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	7	T3M2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	8	T3M3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	9		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Even after a long time, without noting anything, the user unloading the CT7 memory in its PC will be able to extract all measurements pertaining to any mirror of a particular telescope and trace its evolution with time (through the date and time attached to each measurement). In this example, we have chosen to select the same measurement sequence for each mirror of the same telescope but this is not requested. The **Cart** operation is a powerful and simple way of keeping order and uniformity among measurements on the long term.

6.2 Calibration

CT7 is designed as instrument not requiring calibration. Nevertheless, we **recommend to calibrate is after delivery and when instrument is subjected to important temperature change.**

Usually calibration is performed when one suspects any pollution or if time elapsed since the last calibration is estimated too long, or if some measured values are suspect. Place CT7 at the calibration target, activate Menu **MEASURE / Calibrate.**



Note: OPO has devised a VW jig allowing direct absolute calibration of a gauge just before using it. This is the only procedure that allows checking the calibration of the instrument and correcting it if needed.

6.3 Battery Charge

CT7 uses two NiMh 2450mAh AA cells as a source of energy.

Any USB socket of a PC is able to provide current up to 500mA. Hence, full charging of empty CT7 accumulators having a capacity of 2450mAh may last **5 to 6 hours**.



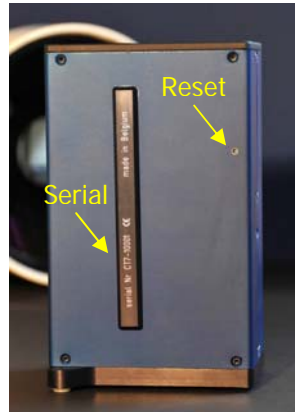
On the top cover you find an access for the <mini USB-B> connector for connection CT7 to a PC (power and data connection).

The state of charge can be checked thanks to STATUS option: v3 is battery voltage. When V3=2.2V, the batteries are empty, at 2.9V they are fully charged.

If CT7 is ON while charging the charge time increase considerably (2..3 x).

6.4 Reset

In case of software lock-up, a RESET of CT7 may be obtained by pressing a hidden switch.



On the back side, there is a 1 mm hole that gives a protected access to a **RESET** switch.

This switch is used also in firmware update procedure.

7 CT7-Console – PC software

The main functions of this PC interface are:

1. Data retrieval
2. CT7 configuration
3. CT7 laboratory operation

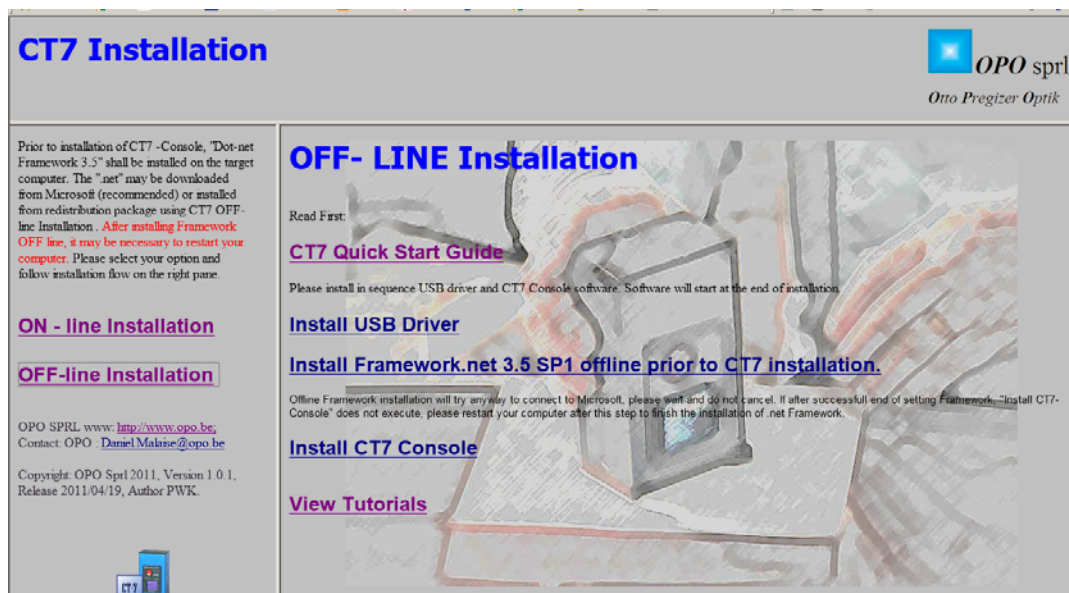
7.1 Installation

Following elements shall be installed on the PC:

- USB driver
- .net Framework necessary for installation
- CT7-Console

All these components, together with documentation, are provided on a USB Flash Drive.

Connect the USB Flash drive to PC, explore the folder, open CT7_Install folder and then open with internet explorer file InstallCT7.html. This file will lead you in the installation process and provide necessary information.



Once the software is installed CT7 Console starts immediately.

7.2 Working with CT7 Console

To use CT7 with the PC, you must:

- have installed **CT7 Console** software
- have **CT7 Console** program running on PC
- connect the **CT7** activate **PC-link** (menu: SERVICE/PC-Link)

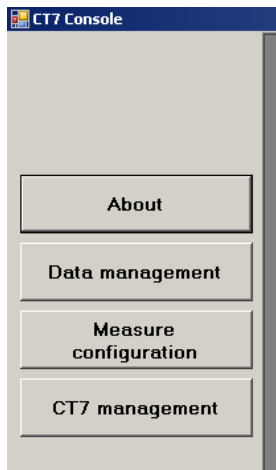
CT7: Now, you should see this screen:



PC - on the monitor you should observe in the lower left corner of the PC screen the case “**connected/non-connected**” shown as “**connected**”. The serial number of CT7 is displayed in the message box.



There are four functions commanded by buttons in the upper left corner of the screen:



- About (A propos)
- Data handling (Gestion des données)
- Measurements configuration (Configuration des mesures)
- CT7 management (Gestion du CT7)

7.2.1 Data handling (Gestion des données)

This entry initiates a function allowing manipulating and retrieving data from the instrument, them to disk etc. Note that only the data recorded off line (triggered with Joystick) are concerned here; data of measurements triggered in PC-Link mode are not stored in the internal memory. They are directly written to a PC file and do not transit through the CT7 memory.

It is operated through a self explanatory screen as it appears below.

7.2.1.1 Archive file

The data from the Instrument may be retrieved to the PC and stored to the archive file. This file contains ALL the measurements retrieved from CT7.

The archive file is Serial Number specific and indexed with absolute measure counter.

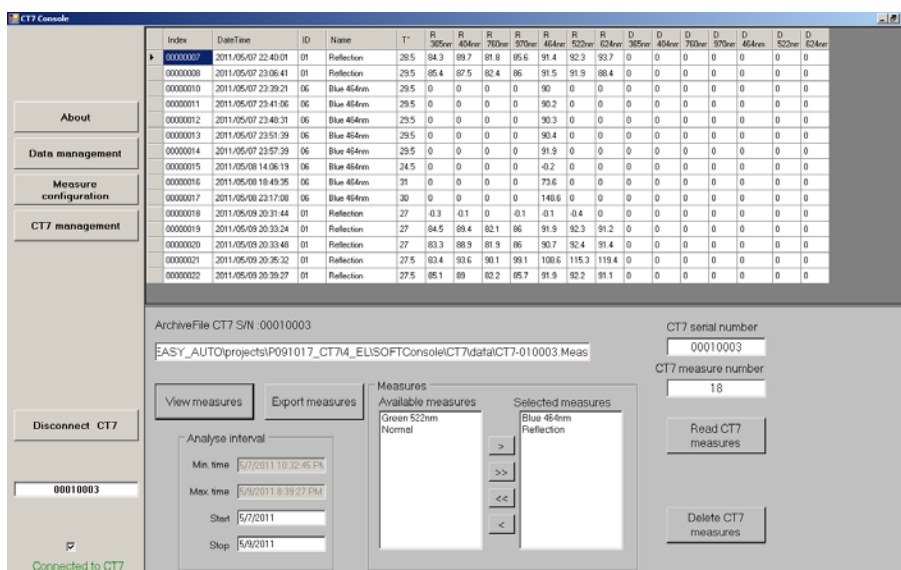
You have to define and save a folder to keep the data of the CT7 that is connected to the PC; once defined, each time the same instrument is connected, and it will open the defined folder and if data are read out from the CT7 new data will be appended to the previous ones in the folder.

7.2.1.2 Data sorting

Select data by their name from a list of available names (Mesures disponibles). The available list is limited in time between two dates (Période d'analyse) defined in the two cases at the left bottom of the page by the Start (départ) date and the Stop (arrêt) date. Select data names in the "Available list" (left box) and toggle them to the Selected list (right box) using the appropriate button in between the two boxes (>); if you want to select all available data, use the >> button. The reverse buttons are used to suppress data names from the Select list. Once you have completed the selection you want, you may inspect the selected data (by pressing Visualize the measurements (Visualiser les mesures)

7.2.1.3 Exporting data

The selected data lines may be stored in CVS format for further processing in EXCEL. Eventually a conversion DATA/ Text to columns may be necessary (delimited by tabulation). Excel provides full interface for graphic data presentation and report creation. Press "Export the measurements" (Exporter les mesures).



7.2.2 Measurement Configuration (Configuration des mesures)

This function allows the user to define modify or cancel measurement CARTs, read the CARTs that are memorized in the CT7 and load CARTs in the CT7 memory for selection by name.

These tasks are managed and performed through a graphic interface as shown bellow.

- Loading from an external file (Chargement fichier)
- Saving in an external file (Sauvegarde fichier)
- Reading from CT (Lecture VT7)
- Writing to CT7 (Ecriture CT7)

The first two commands allow exchanging lists of CARTs between an external folder that you have defined and a CT7 instrument. This might be useful when several CT7 must work with the same choice of CARTs for instance.

The last two commands allow exchanging a list of CARTs between the PC and any CT7 instrument.

In the list, each line is a CART for which you may chose a name and select any combination of measurements. There should be at least one measurement on each CART.

The first CART, *NORMAL* (# 0) contains all measurement and cannot be modified or removed.

The screenshot shows the 'CT7 Console' window. On the left is a sidebar with menu items: 'About', 'Data management', 'Measure configuration', 'CT7 management', and 'Disconnect CT7'. The main area contains a table with columns for 'Index', 'Name', and 16 measurement types (R 365nm, R 404nm, R 760nm, R 970nm, R 464nm, R 522nm, R 624nm, D 365nm, D 404nm, D 760nm, D 970nm, D 464nm, D 522nm, D 624nm). Row 6, 'Blue 464nm', is selected. Below the table, there is a 'Source' field set to 'CT7 measure configuration'. At the bottom, there are two sets of buttons: 'Load config file' and 'Save config file' (highlighted with a blue box and labeled 'Configuration saving and loading from disk'), and 'Read CT7 config' and 'Write CT7 config' (highlighted with a red box and labeled 'Reading and writing configuration to CT7'). A status bar at the bottom left shows '00010003' and 'Connected to CT7'.

7.2.3 CT7 management (Gestion du CT7)

This screen allows to perform measurements, calibration and to introduce parameters into the CT7. This is done through a graphic interface shown below.

Name	Calibration coefficient	T coeff	Mirror coefficient	Reference modulation	Reflection reference gain	Reflection Gain	Dust modulation	Dust reference gain	Dust gain
365nm	2.3098	1.0000	85.1000	0.4000	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0.7000	<input type="checkbox"/>	<input type="checkbox"/>
404nm	0.8529	1.0000	89.0000	0.1000	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0.1000	<input type="checkbox"/>	<input type="checkbox"/>
760nm	1.0462	1.0000	82.1000	0.2000	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0.2000	<input type="checkbox"/>	<input type="checkbox"/>
970nm	4.3858	1.0000	85.7000	0.5000	<input type="checkbox"/>	<input checked="" type="checkbox"/>	0.5000	<input type="checkbox"/>	<input type="checkbox"/>
464nm	2.6245	1.0000	91.9000	0.3000	<input type="checkbox"/>	<input checked="" type="checkbox"/>	0.4000	<input type="checkbox"/>	<input type="checkbox"/>
522nm	2.1775	1.0000	92.2000	0.9000	<input type="checkbox"/>	<input checked="" type="checkbox"/>	0.2500	<input type="checkbox"/>	<input type="checkbox"/>
624nm	4.9974	1.0000	90.8000	0.3000	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0.3000	<input type="checkbox"/>	<input type="checkbox"/>

Continuous measure allows endless measurements loop with data displayed and saved to file .csv .

The file name is created automatically using the name of the active CART.

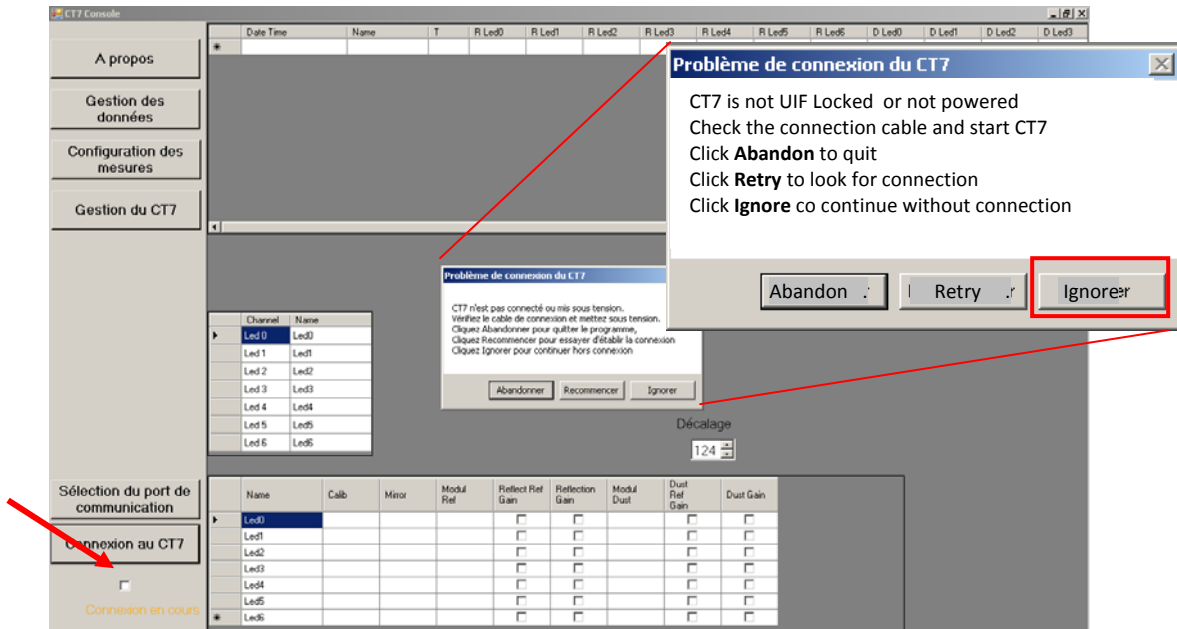
Hint: edit CART name without writing it to CT7 to change the name of the data file.

Hint: You may copy data from screen to clipboard and paste them to Excel.

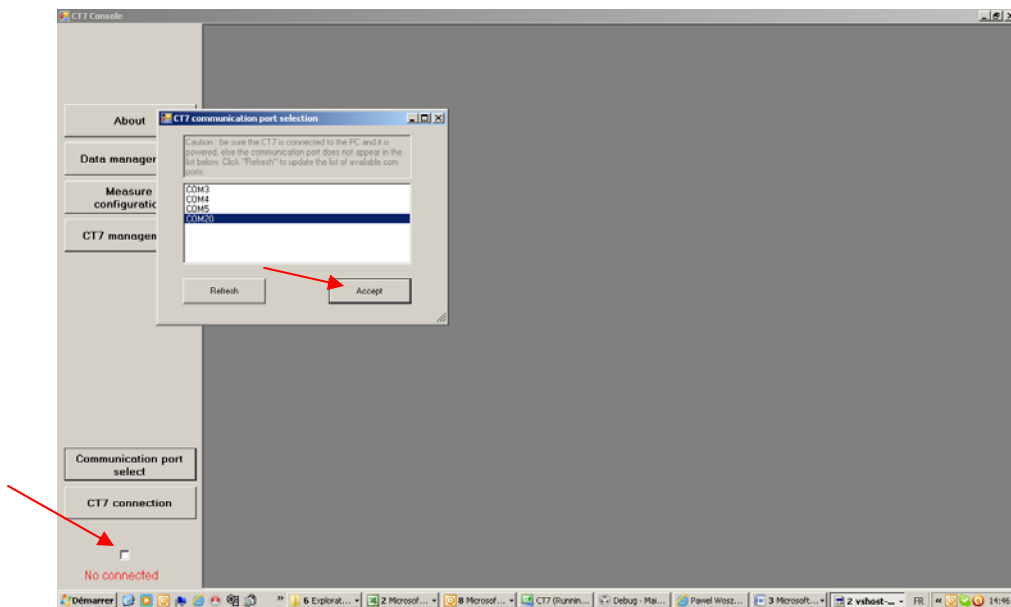
Note: The measurements initiated from PC are not stored to internal CT7 memory. They are not included into measurement instrument archive file.

7.2.4 Connecting to CT7

Especially for the first time connection, you should observe in the lower left corner of the PC screen the case “**connected/non-connected**” If this is not the case, a **CONNECTION PROBLEM** message pops-up. Ignore this message and push the button **Port Selection**



A list of active COM ports appears. Most probably the CT7 port is the last one. Select it, press **OK** button.



Then try again the connection to CT7 – press **CONNECT CT7** button. If connection is established at the left bottom of the screen a message: **Connected to CT7** will appear in green. The COM port number is stored and the next time the connection will be transparent.

In case of persisting connection problem see troubleshooting.

8 Support

Additional information may be found at www.i-veo.com in **CT7 user area**.

Login: CT7user

Password: Mizar1975

For any issue not covered by this document you may contact also :

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- Pawel Woszczyk; I-VEO ltd; pwk@i-veo.com; www.i-veo.com