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CT7

USER MANUAL

	NAME AND FUNCTION	DATE	SIGNATURE
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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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Table of Contents

1 Objective

This document provides description of CT7 reflectometer to the depth necessary for the user to effectively work with the instrument.

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.

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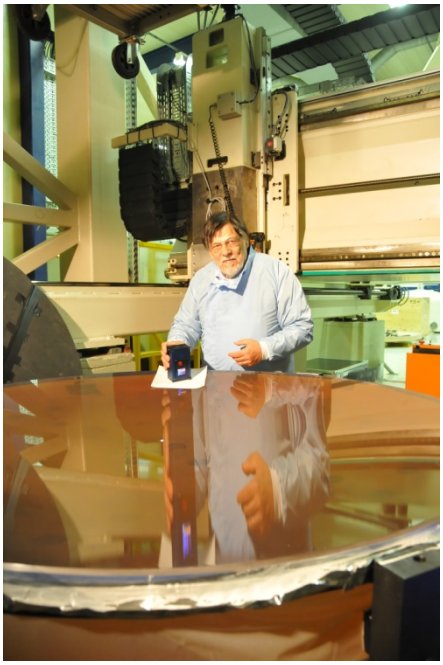
3 The CT7 instrument

3.1 Introduction

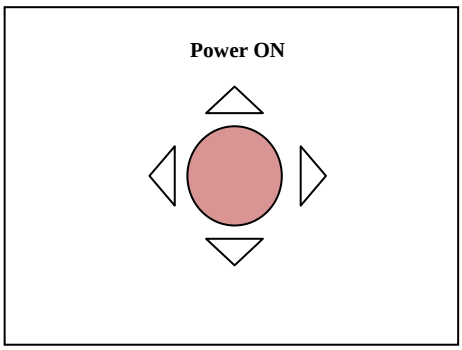
The CT7 is dedicated to monitoring of the coating's quality of the high grade optical surfaces.

CT7 measures the specular reflection and (option) scattering index using seven wavelengths covering the range from UV to near IR.
The user can use all of them or select the wavelengths which are interesting for his particular measurement.
Measurements are performed few second after pressing the START, enabling gently placing on the precious mirror surface.
Configurations of the instrument and data retrieval are facilitated by PC application **CT-7 Console.**



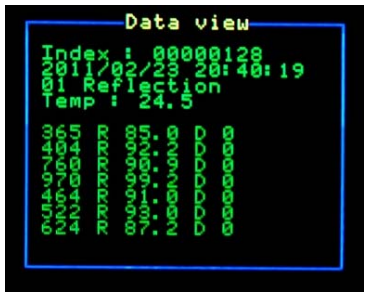
3.2 Quick Start. First measurement

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



- At the first Power ON , if necessary, the instrument prompts for time setting. (Only when the time introduced, CT7 is ready for the measurements.)
- Than 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.
- The MEASURE option is highlighted and may by 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.

*The measurements are performed as specified by a user's **Cart** indicating the wavelengths and type of measurements to be performed and bearing an identifier. The user can create and select as many **Carts** as needed(64). Carts are created or suppressed from PC application CT7-Console. The new instrument comes with a default permanent **Cart** list starting with NORMAL that provides all measurements at all wavelength.*

3.3 CT7 Features brief

3.3.1 CT7 Instrument

The CT_7 instrument was built to fulfill the following requirement list:

1. CT7 is a handheld instrument.
2. The measurement is performed with instrument standing on the measured mirror.
3. The results are displayed and stored to non volatile memory.
4. All measurements are time-stamped thanks to the real time clock.
5. An USB connection allows for data retrieval to PC.
6. The instrument has three power modes: ACTIVE, SLEEP and CHARGE.
7. There is no power ON/ power OFF switch; after a period of inactivity, the instrument goes to sleep mode.
8. Power-up is invoked by touching the control joystick.
9. Auto OFF feature protects the batteries against accidental discharge.
10. Two NiMh, AA-size rechargeable cells power the instrument.
11. Charging of AA cells is primarily performed by built-in charger powered from USB connector of the PC
12. Batteries shall not be removed from CT7 for charging.

3.3.2 CT-7 Console software

Small display and simple joystick as data entry interface is definitively not adequate to enter texts, names and figures necessary for user friendly options of CT7. For this reason, a PC based interface application ***CT7-Console*** was created.

The main purpose of this application is:

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

CT7-Console provides following functions:

1.1. USER level instrument control
  1.1.1. Data retrieval and handling of measurement results (export).
  1.1.2. Device management by user: configuration view, diagnosis, and up- and down-load of the user configuration (Measurements **Carts:** named series of measurements).
  1.1.3. Update Firmware
1.2. PROCESSING
  1.2.1. Sorting and saving data (*)
1.3. FACTORY level instrument control (*not available for standard user*)
  1.3.1. Setting and testing the device at the factory.
  1.3.2. Down-and up-load factory configuration.
  1.3.3. Manage LED driver parameters

(*) the exported data are saved in .csv format (Excel compatible), so further data processing and graphical presentations can be done with specialized software.

4 CT7 Concepts

4.1 Quick Start.

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

4.1.1 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**

4.1.2 Profesional work-flow

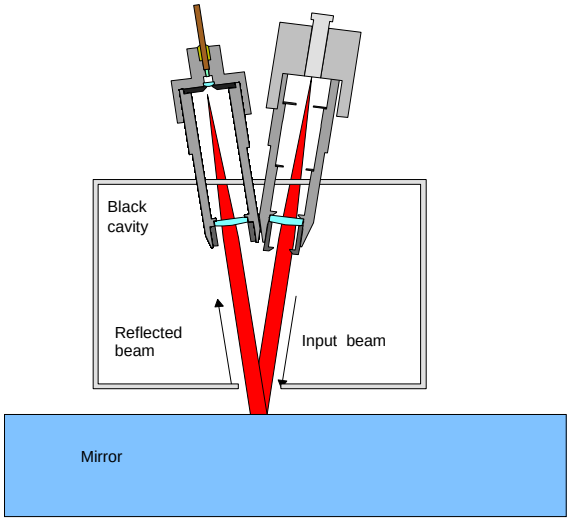
- **Install CT7 Console provided on CT7 Flash Disk on your PC, and start it.**
- **Connect CT7, awake it and activate SERVICE/ PC-Link mode**
- **Indicate the COM port to be used (at first connection)**
- **Open Measurement Configuration Management**
- **Read Configuration from CT7**
- **Edit table: 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

4.2 CT7 design protects telescope mirror

4.2.1 Contact of CT7 with telescope mirror

As the instrument measures specular reflectivity, its angular position with respect to the normal to the mirror's surface must be exact, and this can only be achieved by a three point isostatic contact. The actual contact is provided by three spherical touching feet made out of white Teflon. 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.



Optical scheme of CT7

Taking a measurement with mirror protecting tissue.

4.2.2 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. The **user can set-up and trigger the measurement still holding CT7 in his hands**. When everything is ready, he may carefully place it on fragile telescope mirror, avoiding from rubbing the surface. Note that additional protection is provided by laying the CT7 on a pad of optical tissue with a one inch hole for the beam (see below)

The remaining time before measurement is indicated by a count down on display.
The delay timer may be set between 0 and 30 seconds.

4.2.3 Wavelengths selection: Carts 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.
User can store up to 64 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	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
	1	T1M1	☑	☑	☑	☑	☑	☑	☑	☑	☐	☑	☐	☑	☐	☐
	2	T1M2	☑	☑	☑	☑	☑	☑	☑	☑	☐	☑	☐	☑	☐	☐
	3	T1M3	☑	☑	☑	☑	☑	☑	☑	☑	☐	☑	☐	☑	☐	☐
▶	4	T2M1	☑	☑	☐	☐	☑	☐	☐	☑	☑	☐	☐	☐	☐	☐
	5	T2M2	☑	☑	☐	☐	☑	☐	☐	☑	☑	☐	☐	☐	☐	☐
	6	T3M1	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐
	7	T3M2	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐
	8	T3M3	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐
	9		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

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.

4.3 Interfaces

4.3.1 Viewing the results.

The user can recall the results of measurements by selecting the View Results, option.
The most recent results are displayed first, and can be scrolled back and forward with the joystick.
If the current Cart is not FULL, only the results from this Cart will be displayed.
When the FULL Cart is active, all the results are displayed in the chronological order.

4.3.2 PC Software: CT7 Console

The PC software is described in section 7 .
The main functions are:

4. Data retrieval
5. CT7 configuration
6. CT7 laboratory operation

4.3.3 Display

CT7 is menu operated. Menu system is inspired by DSLR cameras.
On the left side of the display, there is a category menu with pictograms, on the right side, for selected category, a sub menu presents text options.
In contradiction to LCD displays, this active organic LED display is fully operational in negative temperatures.

4.3.4 Joystick

The user selects options from the menu, thanks to a 5 position joystick (left- right, up –down, press).
In addition, the joystick provides the Power-On function.

4.3.5 Beep

The operations are confirmed by a short beep.

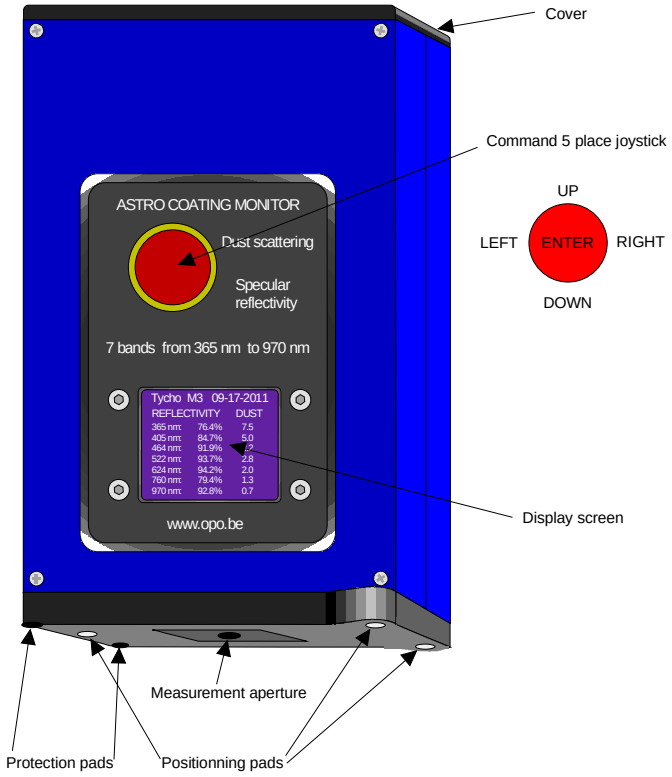
4.3.6 USB connector

This is a data interface and an integrated battery charger power connection.
W connected to a PC, it will provide power for battery charging and give access to the PC operation of the instrument when the latter is set to **PC-link** mode.

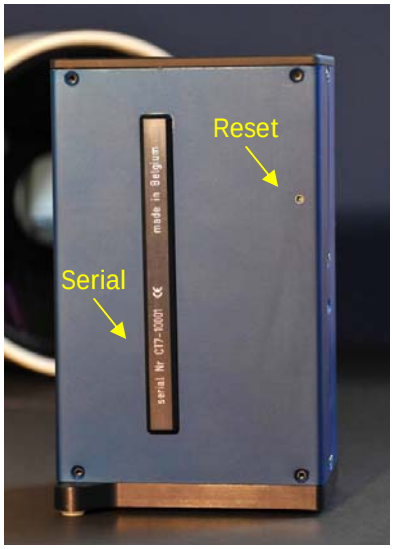
5 CT7 Operation

5.1 CT7 description

The following drawing shows the main features of CT7 :



CT-7 Instrument.

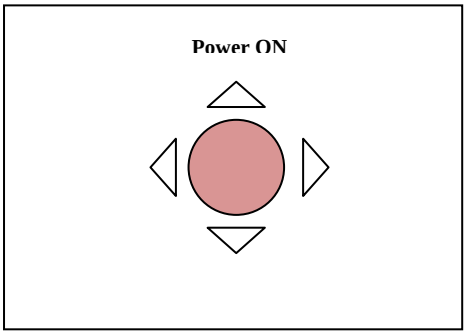


On the top cover you find an access for the <**mini USB-B**> connector for connection CT7 to a PC (power and data connection).
On the back side, there is a 1 mm hole that gives a protected access to a **RESET** switch.
Also on the back side you may find the **Serial Number** of the instrument. The same number is returned by soft to CT7 Console.

5.2 CT7 basics

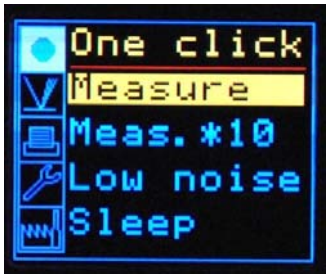
5.2.1 Power ON

When performing actual measurements CT7 is not connected to a PC
To start, just push the joystick **UP**



Pressing shortly joystick will toggle the supply ON and start processor start-up.
After a short delay, about 3s, the **Start-up screen** will show up. A few seconds later the CT-7 start screen followed by *date and time* will be displayed.

After next few seconds, the ONE CLICK menu will appear.



NOTE: It is vital to set correctly the date and time. If the date and time is not set, the result indexing is not working corrctly. The CT7 will prevent you from making the measurements and communicating with PC.

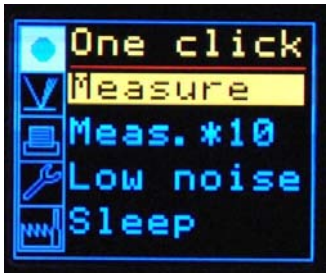
Time NOT SET >> go to MEASURE / DATE TIME and set *date and time*

5.3 Working with menus

The CT7 Interfaces are limited to

1. Color Display
2. Five way Joystick
3. USB connector

In the field operation, the user selects options from the menu with the joystick.
Most of the customization, requiring typing of text data, shall be performed from a PC.



Pressing joystick LEFT activates left column menu of pictograms representing higher level options:

- One Click — *fastest way to measure*
- Measure — *measure and related parameters*
- Report — *data reviewing,*
- Service — ***PC LINK** and utility functions*
- Factory — *test and configuration functions*

Once the required menu is selected, pressing ENTER opens the list of the lower level options on the right side.

The following paragraphs explain the available functions.

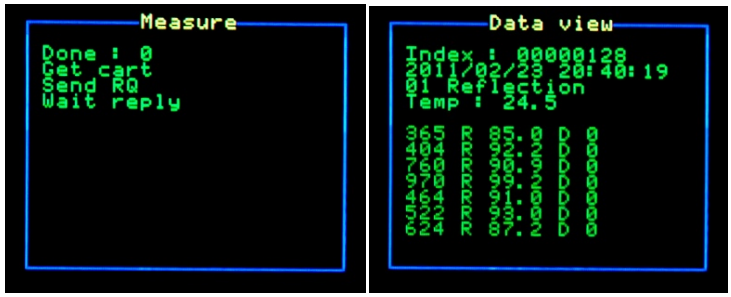
6 CT7 Menu reference

6.1 One Click menu

This menu is initiated by awakening the instrument; one can return to this menu from another one by pressing the joystick **LEFT** and selecting the first menu in the left column with the **Up** and **DOWN** positions of the joystick.

6.1.1 MEASURE

At power up **MEASURE** is highlighted on the **One Click** screen: you are ready to perform a basic measurement utilizing the CART by default (the last one used if this is not the first measurement). To initiate the measurement, you have to push the joystick straight; you have "time delay" seconds to position the instrument on the mirror before the measurement actually starts. The two following screens will show in succession.



Press **ENTER to go to the next measurement.** Screen **ONE CLICK** appears and you can continue making successive measurements; you can also shift to **Meas.*10** or to **Low noise** type of measurement by selecting the one you want with up and down strokes of the joystick.

6.1.2 Meas.*10

CT7 performs the basic measurement 10 times and displays the last one on the screen, but memorize the ten measurements (you can see this as the index has been incremented ten places).

6.1.3 Low noise

CT7 performs five blank measurements then ten measurements that are averaged and the average result is shown on the screen and memorized.

During the multiple measurements like **Meas 10** or **Low noise**, during acquisition the number of current step is printed and finally the results are displayed.

6.1.4 Sleep

The last place on the **One Click** menu is **Sleep** . Entering **Sleep** will shut down the instrument.

6.2 Measure menu

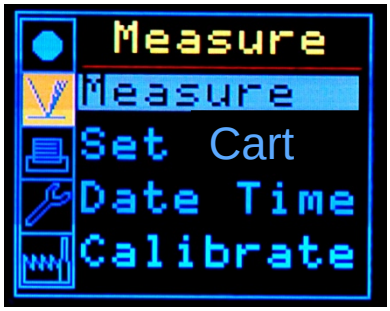
Selected as the second position in the list on the left of the screen; then go back to the right in order to navigate among the four operation options of the **Measure** menu. (Left – Down – Right)

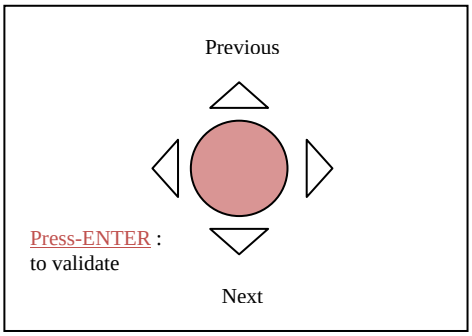
6.2.1 Measure

Measure operation is the same as on the **One Click** menu. Before start of a measurement , the operator is prompted for selection of CART for wavelength selection. The selected Cart becomes default for later operations.

6.2.2 Set CART

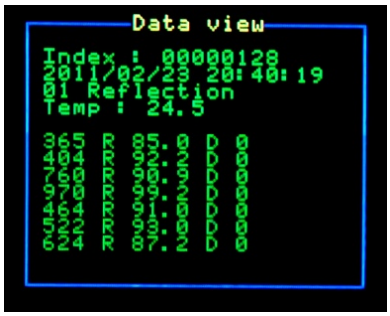
Set CART operation allows selecting as default another CART without making a measurement. The list of pre defined CARTS that appears when entering **Set CART**.





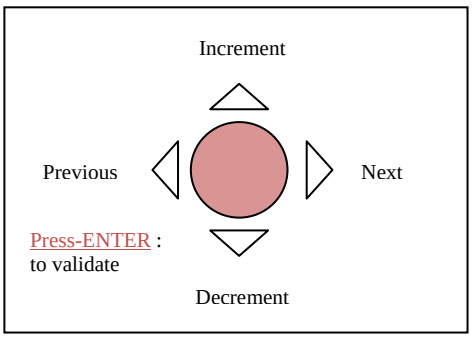
New CARTs or any modifications can be introduced only in PC mode.

After a new **CART** has been selected, basic measurement with this CART can be immediately initiated from the same menu by entering **Measure** (one Up). When the measure is finished, the result is shown in **Data View**

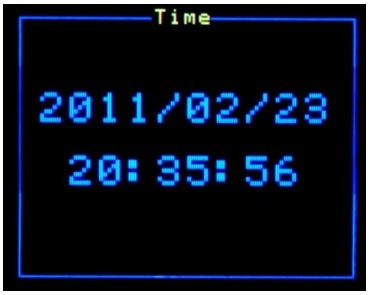


6.2.3 Date Time

Date Time operation allows setting or resetting the date and the time. Pressing the joystick LEFT activates setting and entering the selected values (red highlight).



Pressing ENTER finish the date and time edition – red highlight disappears.



Pressing ENTER again, takes us back to MEASURE menu.

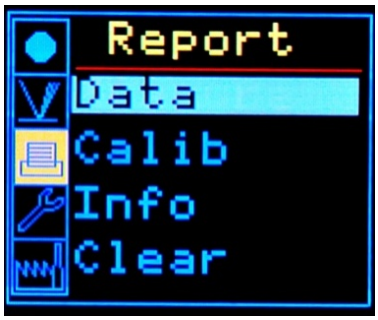
6.2.4 Calibrate

The instruments performs calibration : by measuring 15 times the known mirror, the channels calibrations coefficients are set and stored. The reference reflectivity values are stored in nonvolatile memory.

The reference values and actual coefficients may be read in CT7 Console Device Management window.

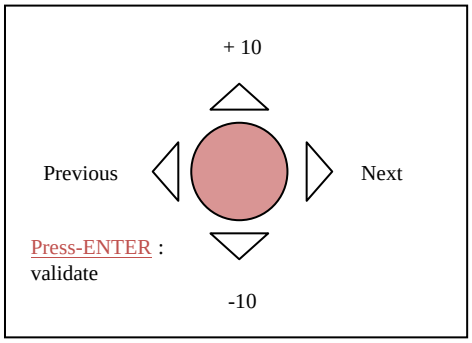
6.3 Report menu

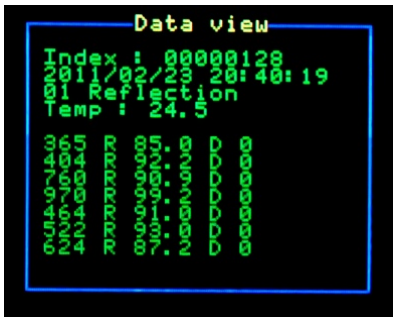
Choose the **Report** menu by navigating in the left column and entering the selected third place (Left – Down – Right).



6.3.1 Data

Data operation allows displaying the results that are memorized in the instrument.
The data pertaining to the last measurement are shown upon entering the **Data** operation.

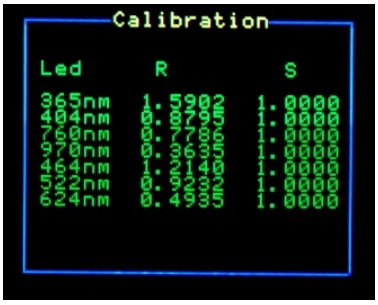




When the screen shows a measurement data, other measurement can be displayed by navigating with the joystick: **LEF**T for displaying the previous measurement, **RIGHT** for displaying the next, **UP** will move 10 measurements later, and **DOWN** ten measurements before the displayed one. Measurements can be identified by their index and date.

6.3.2 Calib

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.

6.3.3 Info

This operation will display general information about the instrument as it appears on the screen hereunder.

The list provides following parameters:

Actual CART #
Number of measurements in the memory (since last CLEAR)
Absolute counter of the measurements since assembly of the instrument
Language selected 0=English
Delay after Trigger before start of the actual measurements (in seconds)
Delay before Automatic Sleep (in minutes)
Flash addr – base address of data block in internal FLASH memory
Serial number of the CT7 instrument (same as on the back of the housing)

Flash Addr: - The base address of block of memory actually used . The results, even for hundreds of measurement, are quite limited in volume: several kilobytes. CT7 changes periodically position of data block within its huge 2Gbytes flash data memory.

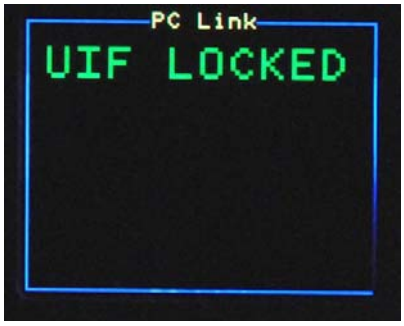
6.4 Service menu

Obtained by selecting the fourth place in the left column (Left – Down – Right).

6.4.1 PC Link

PC Link operation is used to connect the instrument to a PC. The PC program **CT7 Console** must run and the USB connection done before this operation can be executed. The connection is validated by a mark in the case "**PC connected"** on the left bottom of the PC screen).

Once this operation has been entered, the autonomous operation of CT7 is disabled (the joystick is not operating anymore. The display shows **UIF LOCKED**. (User Interface Locked)



This status can be reversed by **closing the CT7 Console program** on the PC or by **resetting the instrument** using the reset switch at the rear of CT7.

Note: This mode may be used for long term test of CT7, ant the instrument is assumed to be powered by PC via USB, so the Automatic SLEEP function is disabled. However, some PC with active power saving may shut down or hibernate after some time, switching off the USB. In such case CT7 will remain ON and heavy battery discharge may occur. (See "CT7 does not power up" troubleshooting).

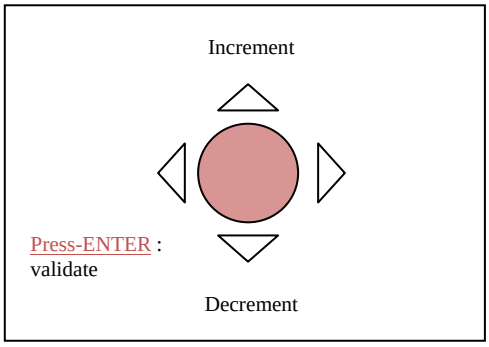
6.4.2 Status

This operation displays various household data of the instrument the list of which is on the left of the screen.

Temp1 – Detector temperature
Temp2 – Battery temperature
V0 -DSP supply 5V
V1 -DSPsupply 3.3V
V2 TEST LED Re Voltage (for special test only)
V3 Battery voltage (2.2V low – 2.9V Fully Charged)
V4 - Analog +5V
V5- Analog -5V (sign neglected)
V6 Aux supply 3.3V
V7 /not connected /

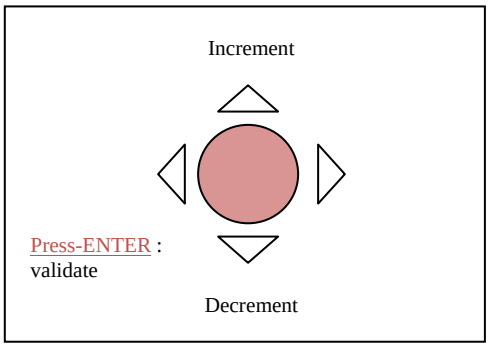
6.4.3 Delay Ms

Wait time for **Delayed MEASURE** This operation allows resetting the delay **in seconds** before the measurement starts after pushing the measurement start button.



6.4.4 Delay Sl.

Delay for **SLEEP** function. This operation allows resetting the delay in **minutes** before the instrument goes to sleep after the last touch to the joystick.



Before going to sleep, a beeping count-down will show for ten seconds.

NOTE: *automatic sleep count-down is disabled in following actions: "Status"," Meas 1/Minute", and "UIF- Locked".*

6.5 Factory menu

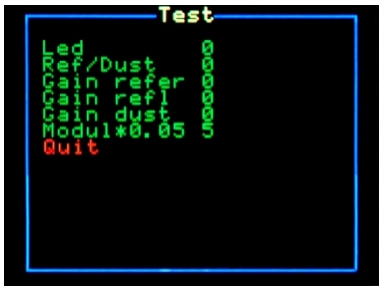
This is the last menu of the list in the left column. It is not intended to be used by the operator.

6.5.1 Francais/English – Language toggle

Choice allows toggling between French and English versions of menus.

6.5.2 Test

TEST allows testing a number of internal parameters.
The CT7 configuration is not modified with changes done in this menu.



If ENTER is pressed when option “Quit” is NOT highlighted, a single measurement starts with selected wavelength (LED 0-6), on reflection/Dust channel, using given gain for reference and measure channels and using specified modulation amplitude. Trial conditions are printed in yellow.
Pressing ENTER when QUIT is selected, will return to the FACTORY menu

6.5.3 Meas/1 min

Meas/1 min operation allows setting the instrument to perform and record one measurement per minute indefinitely. The measurements are done using the active CART. This function is used for performing thermal tests.
Note: Automatic SLEEP function is disabled in this mode. Battery discharge may occur if not powered with USB

6.5.4 Version

Display the versions of the operating software.

Note:
CT7 is powered by two processors: one for OLED display and a second one, a DSP for acquisition and processing.

In consequence, there are two software versions.

7 CT7-Console

The main functions of this PC interface are:

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

7.1 Installation

7.1.1 Components

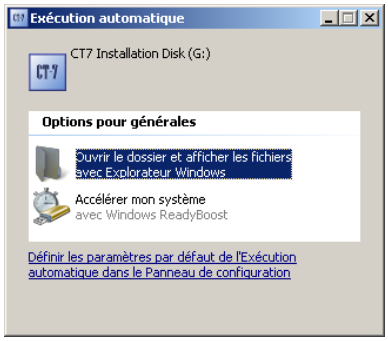
Following elements shall be installed on the PC:

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

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

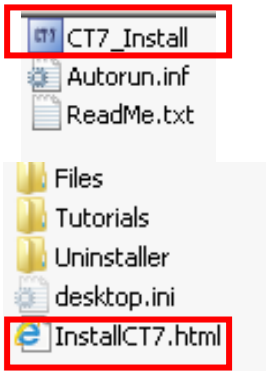
7.1.2 Installation process

When you connect the Flash Drive, following Windows AutoPlay window will open:



Select **Open Folder**.

- Following list will appear:

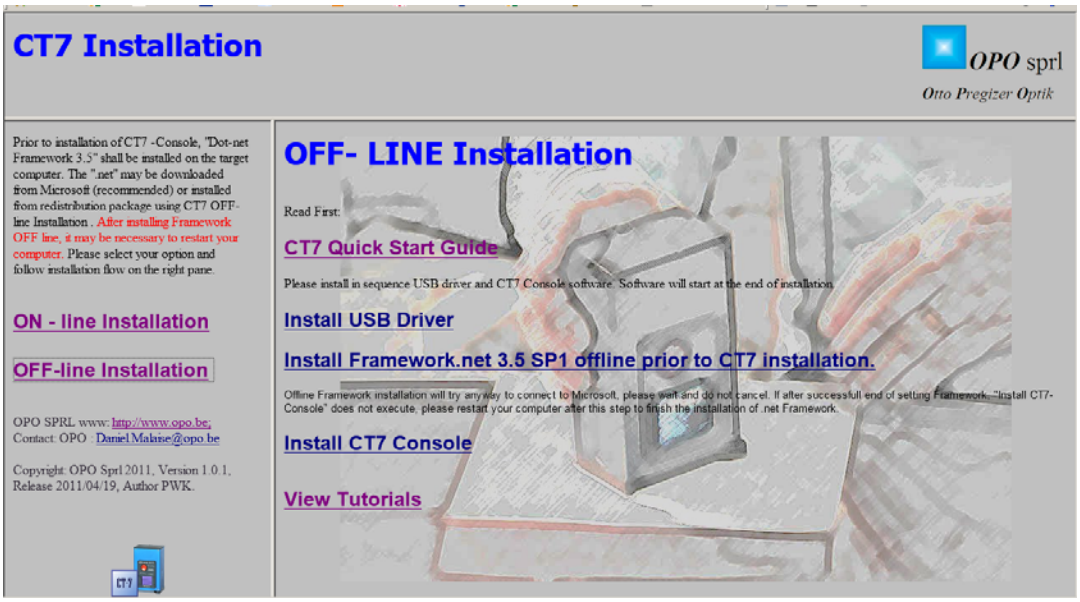


Select **CT7_Install** folder

- This folder contains:

Open **InstallCT7.html** with I Explorer.

The actual installation procedure is given by this file.



There are two ways to install the software: ON-Line and OFF-line
Both starts with installing the driver USB for CT7 USB (universal XP, Vista Win7 driver provided by FTDI)

Then, depending on the access to internet, we can download automatically DOT.NET Framework from Microsoft (ON LINE INSTALLATION) or install it from redistribution package provided on CT7 Flash Drive.)

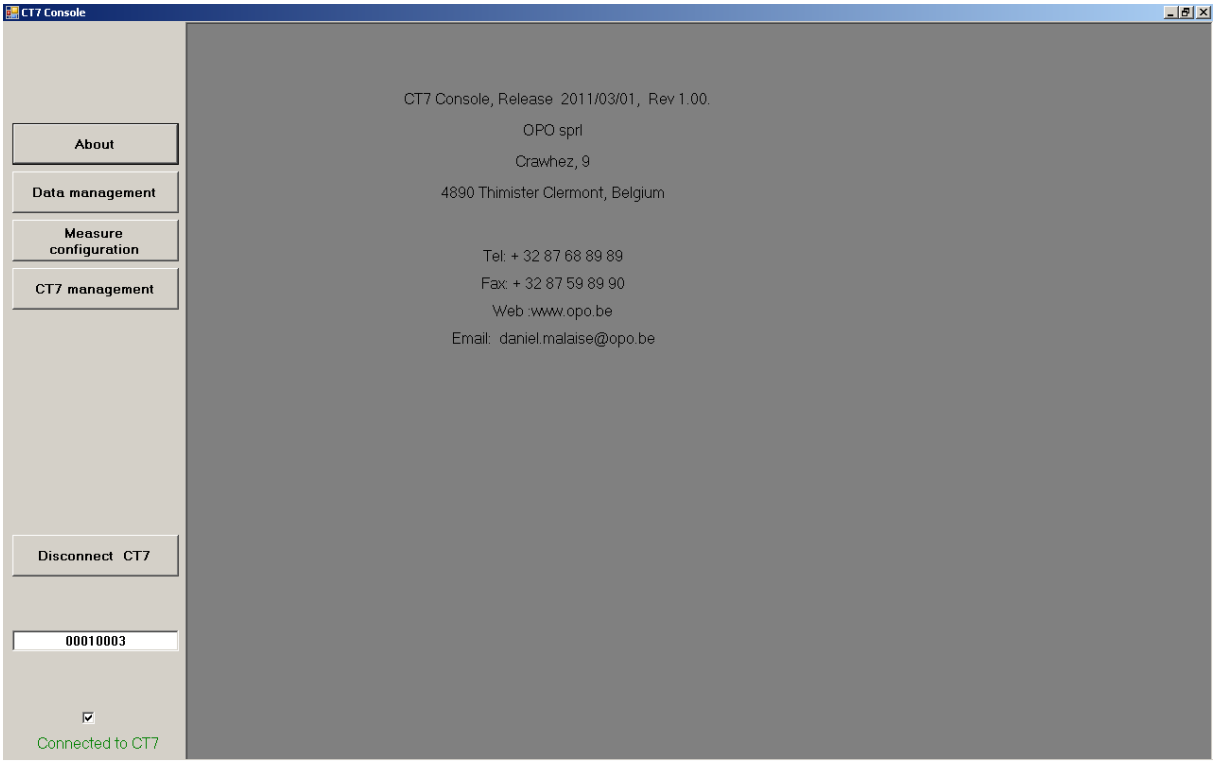
7.2 PC-Link mode of operation

To use the PC mode, you must:

- have installed the **CT7 Console** software *(see 7.1 Installation,)*
- run the **CT7 Console** program on PC,
- connect the **CT7** with PC *(USB cable)*
- awake **CT7**, activate **PC-link** (para 6.4.1 PC Link) *(With the left menu (LEFT) select SERVICE (DOWN - DOWN); then select (RIGHT) and Enter the PC-Link function.)*

7.3 CT7-Console reference

The following screen appears (English version is implemented in the instrument):



You should observe in the lower left corner of the PC screen the case "**connected/non-connected"** shown as **"connected".** If this is not the case, push the button **Connection to CT7**.

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 measures)
- CT7 management (Gestion du CT7)

7.3.1 About

This entry gives information on the software version and OPO address.

7.3.2 Data handling

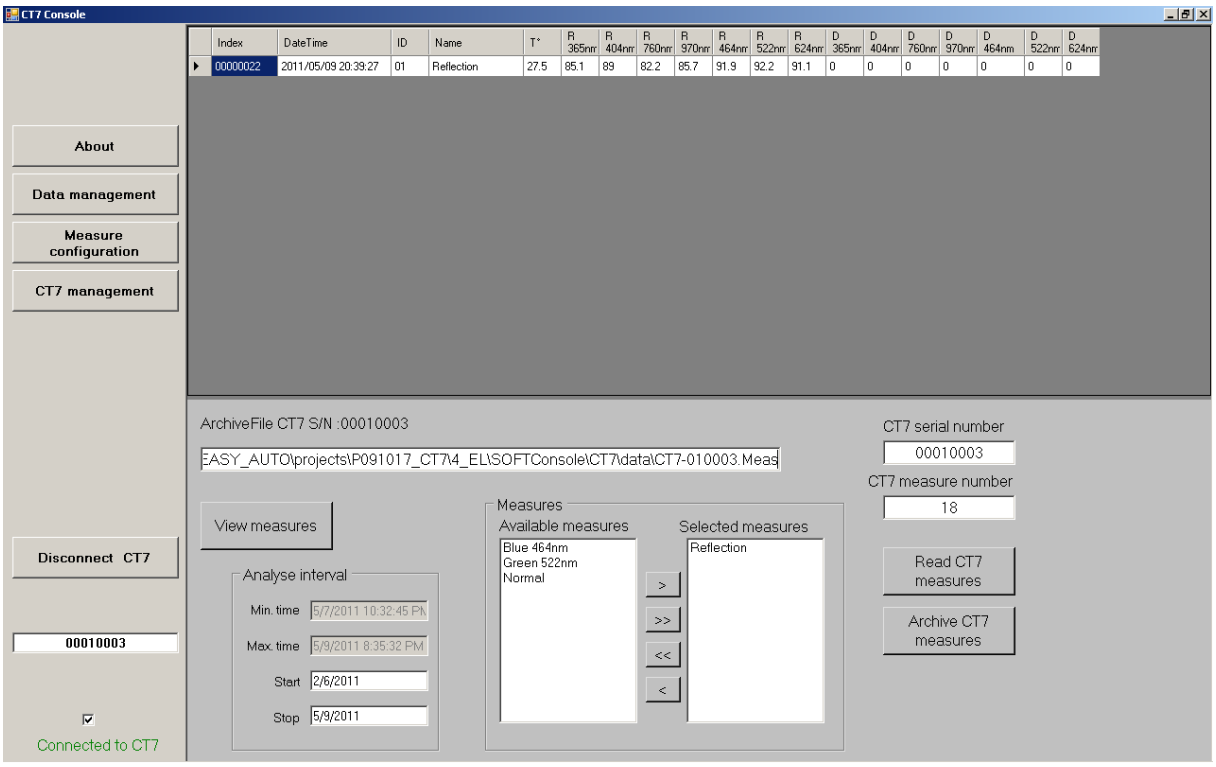
This entry initiates a function allowing manipulating the data, retrieving data from the instrument and saving them into the PC etc. Note that only the data recorded off line in the CT7 are concerned here; data recorded in PC mode are directly entered in a PC file and do not transit through the CT7.

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

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.

In order to read new data from the CT7 you have to push the button Read measurements from CT7 (Lire les measures du CT7). Only new measurements will be appended to the folder.

In order to work with the data, you can 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 measures) or you may export the selected measurements for further handling by pressing Export the measurements (Exporter les measures).



7.3.3 Working with data

7.3.3.1 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 indexed with

7.3.3.2 Data sorting

The viewer of CT-7 console allows sorting data by date and by cart.

7.3.3.3 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.

7.3.3.4 Data format

The fields in exported CVS file are separated with tabulation sign.
The record is terminated by a Carriage Return.

Time stamp; Cart; R1; R2; R3; R4;.. R7; S1; S2; .. S7; CR

Note: The user may select utilizing or not specific wavelengths. The results for not utilized bands are replaced by a place holder: zero “0”

Where:
Time Stamp *yyyy/mm/dd hh:mm:ss*

Cart: the name given for selection of wavelength used for this measurement

Rx - reflection for given emitter in %
Sx – scattering index for given emitter in %

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7.3.4 Measurement Configuration (Configuration des measures)

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.

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

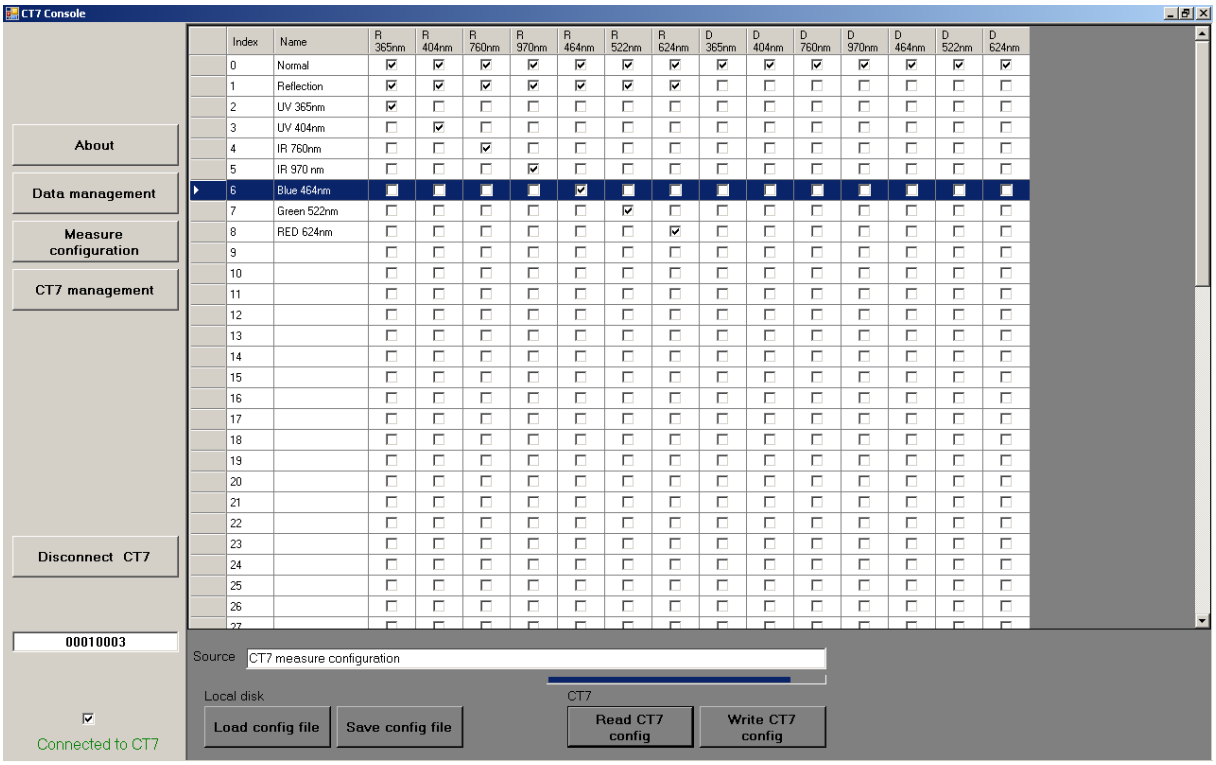
- Loading from an external file (Chargement fichier)
- Saving in an external file (Sauvegarde fichier)
- Reading from CT (Lecture VT7)
- Writing to CT7 (Ecriture CT7)

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.

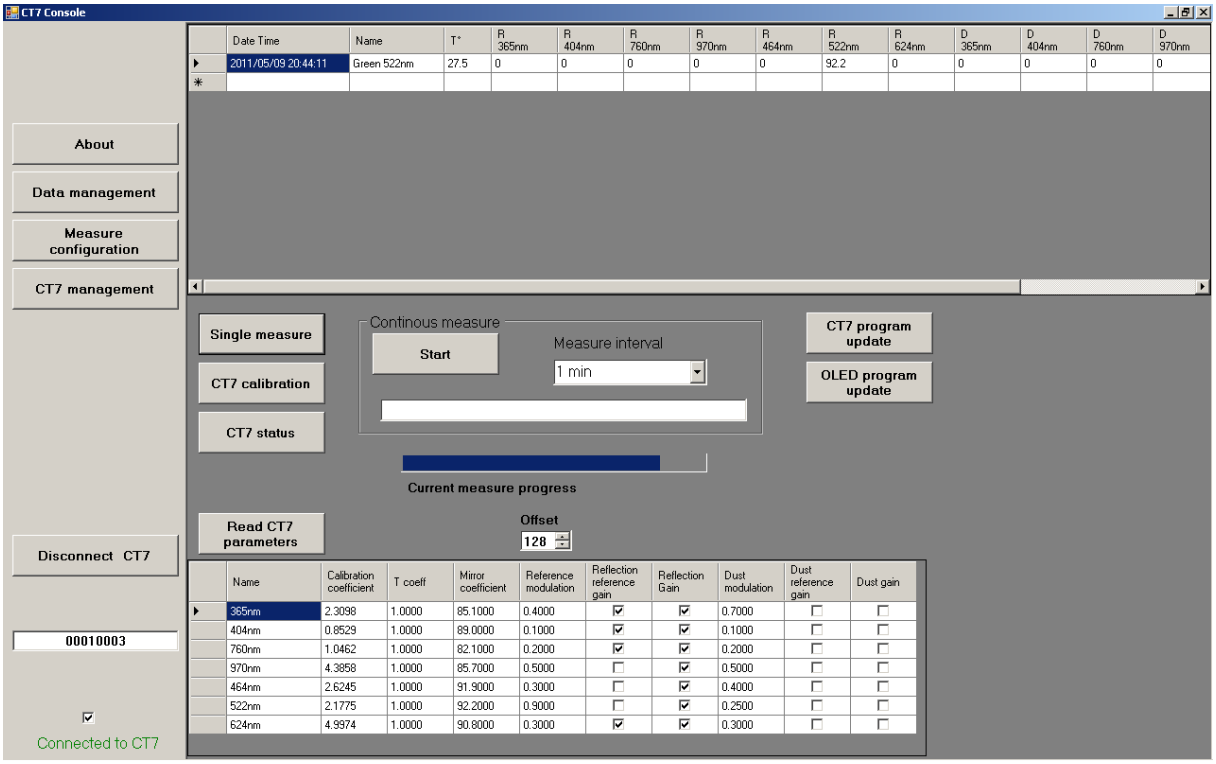
In the list, each line is a CART for which you may chose a name and select any combination of measurements. There should be at least one measurement on each CART.

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



7.3.5 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.



Continuous measure allows endless measurements loop with data displayed and saved to file .cvs .
The fine name is created automatically using the name of the active CART.

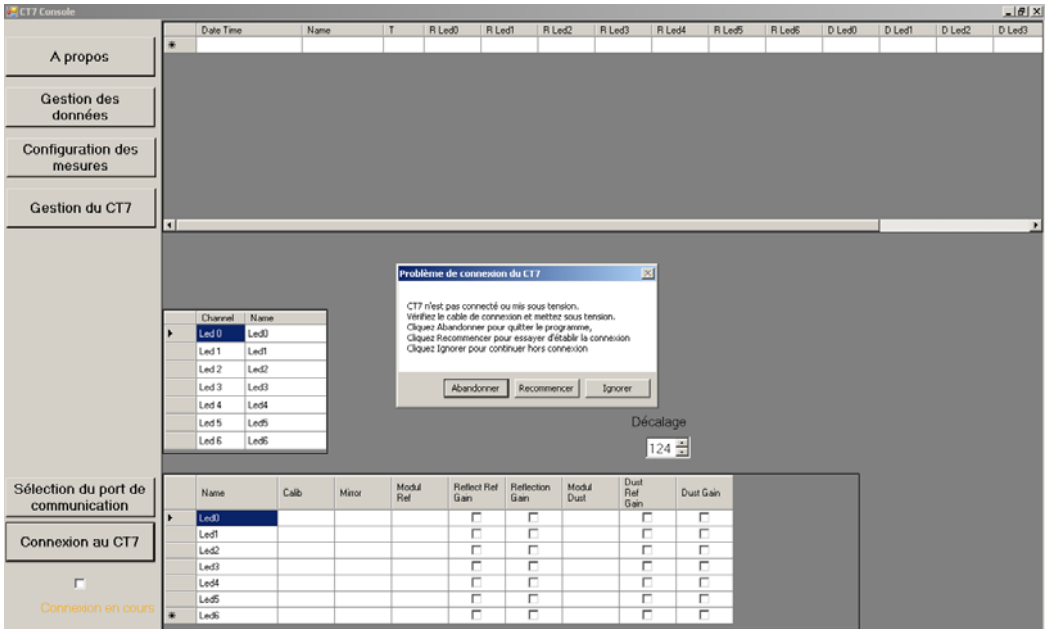
Hint: edit CART name without writing it to CT7 to change the name of the data file.

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

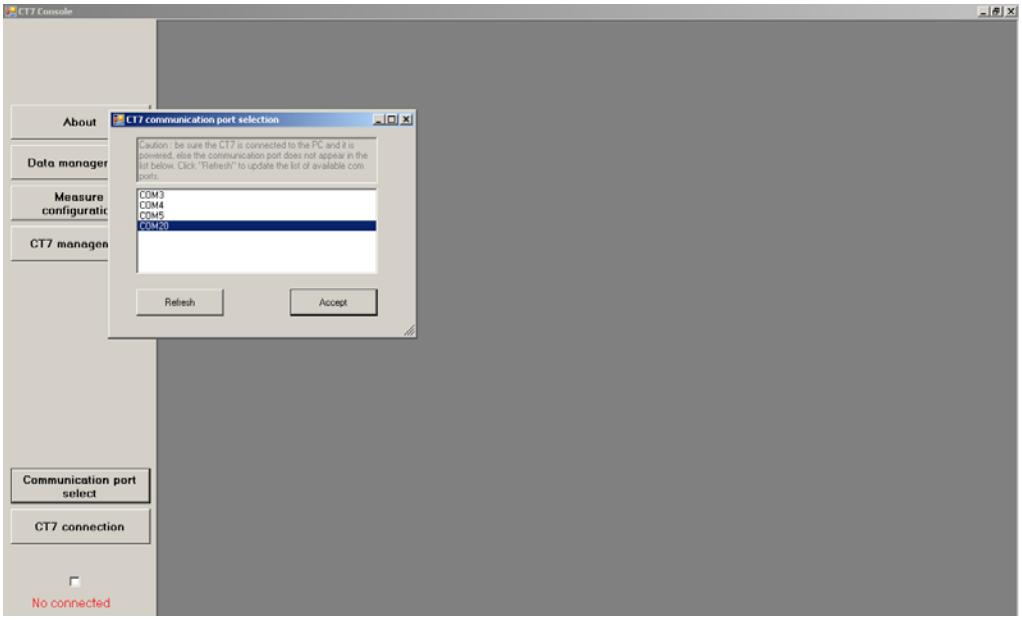
Note: The measurements initiated from PC are not stored to internal CT7 memory. They are not included into measurement instrument archive file.

7.3.6 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"** shown as **"connected".** If this is not the case, probably the time-out message will pop-up CONNECTION PROBLEM.
Ignore this message and push the button Post Selection **Connection to CT7**.



A list of active COM ports appears. Most probably the CT7 port is the last one.
Select it, pres ACCEPT button:



Than 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.

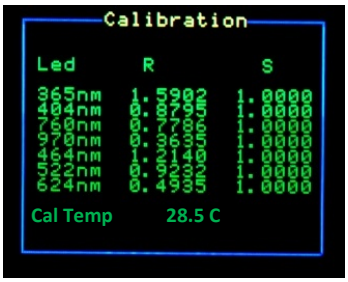
8 Maitenance

8.1 Calibration

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

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.

Note: The short term calibration is not requested because the instrument uses a digital lock in detection by which the ratio of reflected signal to the source signal is directly recorded. By doing this, the main reason for instrument drift is suppressed: that is the source intensity variations.
The remaining drift cause is the cleanliness of the collimator and collecting lenses. But these are inside a cavity and further protected by stops so that pollution has little chance to get there. That is why the instrument can remain stable for years without recalibration like an electronic multi-meter. But of course accidental pollution by smoke for instance can happen, and after several years, it would be more secure to check the calibration. The great difference with other instruments is that you really do not need frequent (daily) recalibration. These anyhow rely on a gauge that can change over a period of time.

8.2 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**. The internal CT7 fuse (resettable) provides protection of the power source.

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.

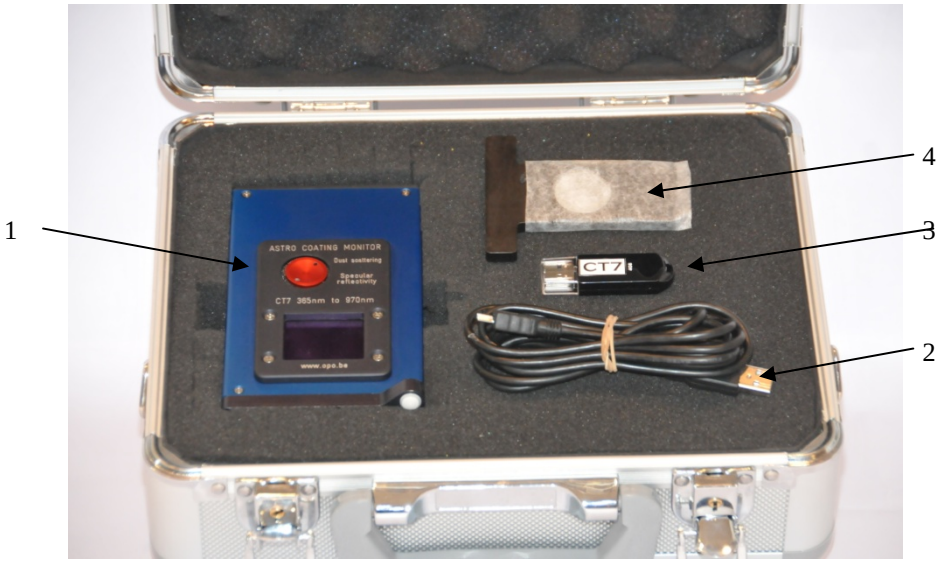
If the CT7 is ON while charging the charge time increase considerably (2..3 x).

For battery change the instrument shall be dismounted. We advice to change the batteries each 2 years during periodic revision at OPO.

9 Delivrables

CT7 box contents

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



The Software Installation Package and User's Manual (as pdf) are provided in USB Flash memory.

Note: the "soft" delivery helps us to provide the user always with the latest version of documentation and PC application.

Additional information may be found at www.opo.be

10 Abréviations

FWHM	- Full Width Half Maximum
TBC	- To Be Confirmed
TBD	- To Be Defined
USB	- Universal Serial Bus

11 Annex 1 Charateristisc

	Parameter	Value	Comments
1			
2	Reflection wavelengths	365nm 404nm 760nm 970nm 464nm 522nm 624nm	Sources are LED
3	Scattering (DUST) index wavelengths	Same as reflection	Not implemented
4	Detectors	Silicon Photodiodes	
5	Operating temperature	-15 .. +40 °C	Note : may need recalibration at actual temperature Batteries may show reduction of capacity at low temperatures.
6	Storage temperature	-20°C +60°C	Not operating .
7	Power consumption	5V, Current limited to 450mA	Limited by construction. Protected by resettable fuse
8	Battery	2x AA NiMh 2450mAh	Actually installed may be higher capacity
9	Charge	About 5h	From USB socket, CT7 switched OFF
10	Battery practical capacity	200 measures Reflection, 3 days in stand by	
11	Power/data connector	Mini USB, type B	
12	Dimensions	73 x 85 x 143 mm	
13	Mass	685g	

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12 Annex 2 Trouble shooting

	Problem	Most probable Cause	Solution / notes
1	JOYSTICK: Cannot obtain ENTER pressing the joystick	Joystick needs to be precisely positioned while pressing Enter.	Training. After short training joystick operations seems to be easier. Note. The software behind the joystick interprets double action (like enter and right) as Enter. However the enter contact may be reached only in very strict direction. The new mechanical design will solve this problem.
2	POWER: CT7 does not power – up	Battery discharged	Press RESET button, connect to USB power, try again after 15 minutes of charge (still connected to USB)
3	POWER: CT7 switch off during operation	Battery discharged	Charge the battery with USB, try to see Status voltage V3. V3 shall be above 2.2V to power up.
4	CT-7 Console does not connect in automatic way to the connected instrument	Virtual COM port number has changed	CT-7 instrument dialogues with PC using a virtual COM port. CT-7 console stores the last used port and tries to connect using the same the next time CT7 is connected. Open SELECT PORT option and REFRESH list of ports. Try to Select the last port at the first try (most probably this is CT7 port), if co connection is obtained than follow with others
5	CT-7 Console does not connect in automatic way to the connected instrument, interface seems to be frozen	CT-7 is in “false UIF”mode – the processors of the OLED Display and DSP are desynchronized	RESET CT7, go to PC-link mode again. OBSERVE: at CT7_Console SELECT-PORT a list of COM ports before and after connecting CT7 usb cable (do not forget to refresh the list) – a new port shall appear.

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13 Annex 3 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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