

LCT-14

INSTRUCTION MANUAL



NOTICE

The functionality of the instrument may be impaired if the system is used in a manner not specified in this manual.

NOTICE

The present manual is an accessory part of the LCT-14. Please retain these instructions for future reference.

QBIT Srl
via La Farina 47
50132 Firenze - ITALY
Tel: +39.0573.72660
Fax: +39.0573.72660
sales@qbit-optronics.com

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GENERAL NOTICES

QBIT s.r.l. is responsible of safety, reliability and performance only if:

- . the system is used according to the instructions reported in this manual – regarding both safety precautions and use;
- . any change, adjustment and maintenance operation is performed by qualified personnel duly authorized by QBIT s.r.l. ;
- . the instrument is connected to an electrical system which is consistent with both IEC and local directions;

The system LCT-14 is a portable Particulate Matter (PM) detector. The field of use is air quality monitoring, in industrial plants, working stations or residence buildings.

It may be used both in “indoor” and “outdoor” applications. In the latter case, it must be placed in protected areas, in order to prevent exposure to strong rainfall, snow or hail.

FOREWARD

The following instructions must be carefully read and observed in order to properly install the system and avoid any damage risk.

1. UNPACKING AND INITIAL CHECKS

When you receive the instrument, please unpack it promptly and make a visual inspection to make sure that no damage has occurred during shipment and that all the ordered items have been received. If damage was found, immediately file a claim with the carrier.

N.B.: by law, any good is shipped at buyer's risk and, if not clearly stated, without insurance.

QBIT is not responsible of any damage following dispatch, freight, unloading and unpacking.

2. OPERATION ENVIRONMENT

The operation environment must be consistent with local directives regarding the electrical system and human working area.

3. LIABILITY

QBIT warrants, as final seller, that the system is consistent with CE Council Directives N° 2004/108/EC (Electromagnetic Compatibility) and N° 2006/95/EC (Electrical safety of low voltage equipment).

The responsibility of use, safety in the working area and any other action rests entirely with the employer, following local laws and European Directive N° 89/391/CEE.

The only manufacturer responsibility is that stated by local laws and European Directives.

The manufacturer is not responsible for any impairment due to installation, use and maintenance not consistent with the instructions reported in the present manual.

The manufacturer is not responsible for the lack of any care and safety precaution necessary to avoid every damage or prejudice.

4. WARRANTY

QBIT s.r.l. warrants that, at the time of delivery, this product is free from defects or malfunctions, and it conforms substantially to the specifications reported in the present manual. QBIT's liability is limited to the repair or replacement, at QBIT's option, of this product or parts thereof returned to seller and shown to QBIT's reasonable satisfaction to have been defective; provided that written notice of the defect shall have been given by Buyer to QBIT within one (1) year after the date of delivery of this product by QBIT.

The warranty does not apply to parts the instruction manual designates as having a limited shelf-life or as being expended in normal use (e.g. filters).

Excepting those parts subject to maintenance, disassembly, change or modification to the instrument will void the warranty. Any control, adjustment or procedure different from those reported in the present manual will also void the warranty.

CHAPTER I

SAFETY

Safety is essential in the use and maintenance of the equipment. Therefore the present chapter provides important safety information concerning the operation and maintenance of the LCT08 system.

I.1. GENERAL SAFETY

The system LCT08 is consistent with the following directives:

- **CE Council Directive 2006/95/EC** (Electrical safety of low voltage equipment);
- **CE Council Directive 2004/108/EC** (Electromagnetic Compatibility).

I.2. SAFETY PRECAUTIONS

Even if the system has been produced in agreement with safety directives, a proper and careful use is very important for safe operation.

IN ORDER TO CORRECTLY OPERATE THE SYSTEM, IT IS STRICTLY REQUESTED TO FOLLOW THE SPECIFICATIONS REPORTED IN THE NEXT PARAGRAPHS.

I.2.1. Instrument safe location:

Locate the equipment on a flat surface, far from heat sources or strong air flows. For the best operation in outdoor applications, the instrument should be placed in protected areas, in order to prevent exposure to strong rainfall, snow or hail. During summer at noontide, it is suggested to avoid exposure to direct sun light.

I.2.2. AC power and grounding:

The instrument is equipped with a power supply accepting 220 VAC, 50/60 Hz standard line input. **UNDER NO CIRCUMSTANCES SHOULD THIS INSTRUMENT BE OPERATED WITHOUT CONNECTION TO A PROTECTIVE GROUND. DOING SO CREATES A POTENTIAL SHOCK HAZARD AND IS ALSO A VIOLATION OF ELECTRICAL SAFETY STANDARDS APPLICABLE TO THIS TYPE OF EQUIPMENT.**

I.2.3. Proper use:

Do not operate this instrument in the presence of flammable liquids, vapors or aerosols. Both when the equipment is working and when it is not in use, avoid to lean the instrument on the floor, or anywhere it risks to be hit, crushed and thus damaged. During system operation avoid to obstruct the cyclone inlet and the sample air exhaust on the rear panel. **CAREFULLY PREVENT ANY LIQUID TO BE SUCKED UP IN THE CYCLONE FILTER; THE INSTRUMENT MAY BE SERIOUSLY DAMAGED.**

I.2.4. In case of malfunction:

Do not continue to use this equipment if there are any symptoms of malfunction or failure. In the case of such occurrence, unplug the AC power cord, refer to Chapter VI of the present manual and contact technical service.

I.2.5. Cleaning:

Use a dry cloth to clean the outside of the case. Do not use soap and water. Do not use blast of compressed air.

When the system is not in use, it is suggested to set the equipment in a dry, dust free place.

CHAPTER II

SPECIFICATIONS

II.1. OPERATING PRINCIPLE

The Particulate Matter (PM) monitor system LCT-14 by QBIT is based on “Laser Scattering” principle. A sample of air flows through an optical cell, and the laser light scattered by micron-sized particles is measured. This system allows to reconstruct a real-time estimation of the PM present in the sampled air. Anyway, this quantity is not a direct measurement of the PM weight. The amount of scattered light is proportional to PM density, given certain physical, chemical and granular properties of the PM itself. The obtained optical signal is then to be calibrated with reference to a primary system which correctly measures the PM mass. Consequently, in order to guarantee the best accuracy, air sampled during calibration should be as similar as possible to that surrounding the measuring station.

II.2. ACCURACY AND RESOLUTION – Table II.1

Quantity	Value	Units	Notes
PM signal resolution	1/4096	full scale	(1)
PM signal accuracy	<1%	full scale	full range of measurement times (2)
Maximum PM range	10000	$\mu\text{g}/\text{m}^3$	factory adjustable (3)
Temperature resolution	0.01	$^{\circ}\text{C}$	
Temperature accuracy	0.3	$^{\circ}\text{C}$	(4)
Pressure resolution	0.01	kPa	
Pressure accuracy	0.5	kPa	
Relative humidity resolution	0.04	%	
Relative humidity accuracy	+/- 2	%	20% < R. H. < 80%

(1) As previously specified, PM resolution and accuracy refer to the optical signal produced by the scattered light. The corresponding specs in terms of PM mass are derived from a calibration process affected by the properties of PM itself (carbon based dust produced by heating - typical of winter season – gives a conversion coefficient larger than that of silicon based dust – summer season).

Thus it is important to compare the measurements in a given place and time interval with a gravimetric instrument (primary system).

(2) The longer the measurement time, the higher the accuracy will be. With measurement interval larger than 10 seconds, the accuracy may be better than 10^{-3} .

(3) The factory selected standard range corresponds to $1500 \mu\text{g}/\text{m}^3$ full scale. Following (2), this implies a sensitivity better than $2 \mu\text{g}/\text{m}^3$ with measurement interval lasting 10 seconds or more.

(4) The temperature is measured close to the fan. Due to instrument internal dissipation, it may be different from “environmental external temperature” of few degrees.

II.3. GENERAL SPECIFICATIONS – Table II.2

Quantity	Value	Units	Notes
Supply voltage	24	V _{dc}	From 220 V _{ac} power supply or battery
Average power absorption	<5	W	2.2 l/min flow rate
Peak power absorption	15	W	During calibration, with 3 l/min flow rate
Flow rate range	0 - 3	l/min	Adjustable by knob
PM2.5 cyclone flow rate	2.2	l/min	Factory adjusted
Measurement interval	1-120	sec	SW adjustable
Calibration interval	1-600	min	SW adjustable
Single measure dimension	64	Byte	
Control unit			Tablet Toshiba Encore Mini WT7-C-100
Free memory on disk	~2	GByte	Allows recording more than 1 million measures
Life time	∞		With 220 V _{ac} power supply (a)
	>15	hours	With 24V/5Ah battery
	>24	hours	With 24V/8Ah battery

(a) The Tablet (control unit) battery is powered and maintained in charge by the instrument. In case of black-out, the Tablet remains on for about 4 hours; it lets the measurements restart as soon as external power is restored.

II.4. CURRENT MODELS (dimension and weight) – Table II.3

Model	Functionality	Internal battery	Dimensions (cm)	Weight (kg)
PC-R	External PC	NO	318x257x152	3.4
T-R	Tablet on board	NO	318x257x152	3.4
PC-B	External PC	24V- 5Ah	318x257x152	5.8
T-B	Tablet on board	24V-5Ah	318x257x152	5.8

II.5. EXTERNAL BATTERIES (dimension and weight) – Table II.4

Battery	Voltage	Capacity	Duration / recharge time	Enclosure	Dimensions (cm)	Weight (kg)
UPS	220 Vac	12V -7Ah (84 Wh)	4-5 h / 3h	UPS (plastic)	90x160x285	5.5
Lead 10 Ah	24 V	24V/10Ah	24h / 24h	Metal	100x150x200	8-9
LiFePO 5Ah	24 V	24V- 5Ah (120 Wh)	>15 h / 2.5h	Aluminium	55x146x222	1.5
LiFePO 8 Ah	24 V	24V-8Ah (192 Wh)	~24 h / 4h	Aluminium	105x121x171	2.0

II.6. TECHNICAL TERMS

MAIN UNIT: main case equipped with 24V DC input connector, main switch, cyclone filter, adjustable handle bar.

POWER SUPPLY/BATTERY CHARGER: external 220 Vac power supply, with two color led and connection for main unit and battery.

BATTERY: external box including connections for battery charger and main unit.

TABLET: external control unit connected to the main unit by USB-micro cable.

II.7. DISPOSAL

At the end of lifetime, the system is to be disposed as electronic material, following European Directives 2002/95/EC e 2003/108/EC. The Buyer will contact QBIT s.r.l. to get any instruction about disposal or return of the equipment.

CHAPTER III

FUNCTIONAL OVERVIEW

The system LCT-14 is a portable device for real-time detection of Particulate Matter (PM- also called micro-dust) which allows air quality control. The instrument is based on an optical measurement. A sample of air flows through an optical cell, and the laser light scattered by micron-sized particles is measured. Without input pneumatic filter, the LCT-14 is sensitive to any kind of fine dust (with dimensions ranging from fraction of micron to some tens of microns). The class of detected PM (typically PM2.5 or PM10) then depends on the selecting input filter placed at the sample air inlet. The LCT-14 adopts cyclone filters (inertial selection principle). The state-of-the-art detection method, based on laser light scattering, leads to high sensitivity, short response time, reduced ownership costs and long lifetime.

The system consists of an easily portable suit-case (main unit) and a group of accessories, depending on the chosen configuration. The case may be powered from different sources (AC line, batteries and also photovoltaic units). Through USB interface it may be connected to several control devices: computer, tablet or smartphone.

The present manual refers to the standard configuration, including a mini-Tablet (powered by the main unit); it specially suits measurements where portability and full autonomy are requested.

The LCT-14 is excellent for any application in air quality control, and for installation and maintenance of large industrial plants. In these fields, the LCT-14 allows monitoring of dust emissions, thus contributing to the control of environmental pollution.

III.1. MAIN PANEL

By releasing the lateral blocking locks of the case it is possible to lift the cover and access the main panel (Figure III.1).



Figure III.1. Main panel. In this figure are shown two main units in standard configuration, with cyclone filter and *Toshiba Encore Mini WT7-C-100* tablet.

III.1.1. Main switch

The electric power can be switched ON and OFF by means of the black switch located on the main panel.

III.1.2. Identification plate

Below the main switch, the instrument identification plate reports the model and the serial number.

III.1.3. USB cable

The USB cable is used for connecting the main unit with a control unit like a tablet (standard version), a PC or a smartphone. The control unit is interfaced by means of a proprietary software described in the appendix of this manual. All measurement files are saved in the memory of the control unit, and later are uploaded to the server, where they remain stored and can be shared with other users.

III.1.4. Flow regulation knob

In the left side of the main panel a 15-turns knob allows fine regulation of the flow rate. The flow rate should be tuned with the calibration curve of the cyclone filter, and usually it is factory adjusted. The user is committed to change this setting, both in case of any flow derating and if a different input filter is adopted.

III.1.5. Pneumatic circuit jumper

Below the flow regulation knob, a pneumatic circuit jumper is placed. By removing the short plastic tube it is possible to insert an external filter which remains in series between the pump and the optical cell. By this accessory, the PM accumulated on the filter may be weighed or chemically analyzed after the measurement session.

III.2. REAR PANEL

In Figure III.2 the rear panel is shown. In what follows the components are described from left to right hand.



Figure III.2. Rear panel.

III.2.1. Sample air exhaust

The pneumatic circuitry ends with the sample air exhaust, consisting in a filtering brass fitting.

III.2.2. USB-A connector

In those instruments equipped for working with a wireless router (III.3. ACCESSORIES), an USB-A connector is present on the rear panel. This connector (supply 5V -1A) is not used for communication; it allows to maintain powered the router whenever the main unit is externally powered. In such a way, the internet connection is never lost due to the depletion of the router battery.

III.2.3. Fan

The rear panel fan allows continuous flow of external air in order to assure the correct operation of the three environmental sensors (temperature, pressure and relative humidity).

III.2.4. Power supply / battery connector

The screw socket is used for connecting the external power supply or the battery.

III.2.5. Cyclone filter connector

The right hand side connector is used for plugging the cyclone tube. It also may be used for checking the flow rate of the instrument.

III.3. TABLET

The standard instrument configuration adopts on-board tablet mod. *Toshiba Encore Mini WT7-C-100*, Display 7", Processor Intel Atom Quad Core, 1GB, eMMC 16 G (Figure III.1). The tablet is supplied with its original package. Store this package on which serial number and product number are reported; it is requested for applying warranty.

III.4. CYCLONE FILTER AND ACCESSORIES

III.4.1. Standard accessories

Figure III.3 shows instrument standard accessories.

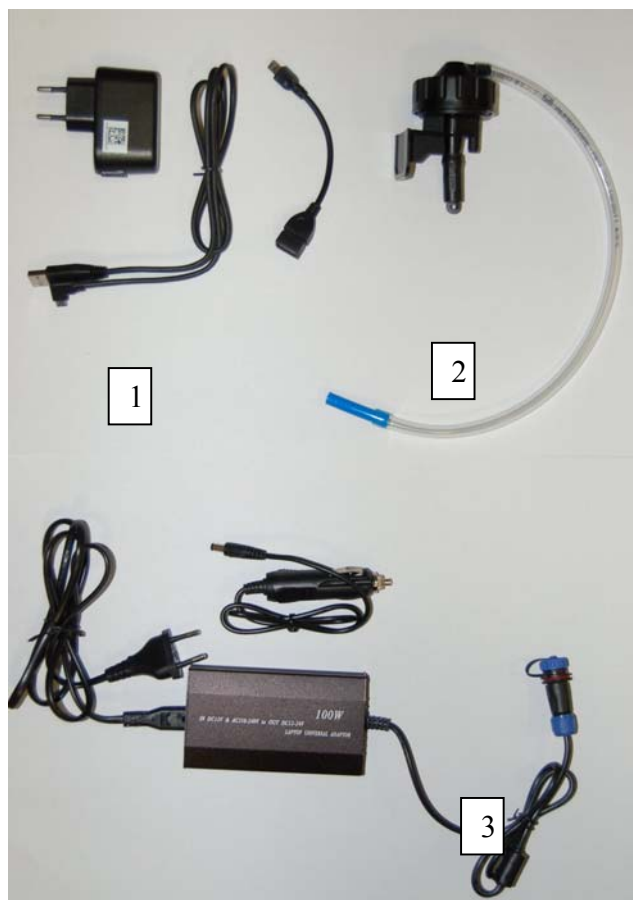


Figure III.3. Standard accessories.

Group 1 includes the Toshiba tablet accessories: USB cable and wall plug (5V-1.5A) for fast recharge. USB-OTG cable for peripherals interfacing (disks, pen-memory etc...) and data transfer.

Group 2 includes the cyclone filter for PM2.5 or PM10 selection and the plastic tube for main unit connection (III.2.5).

Group 3 includes the external power supply/battery charger. The power supply is equipped with a warning light which is red when electrical current is supplied and becomes green if no current is delivered.

III.4.2. Optional accessories

Figure III.4 reports the LiFePO₄ battery rated 24 V – 5Ah . This battery allows 15 hours of working life-time to the system [main unit + tablet] in standard operating conditions (flow rate 2.2 l/min for PM2.5 selector).

The battery box presents two connectors. The first to be connected to the main unit, the second to be connected to the battery charger. The instrument may be powered using the battery and the battery charger at the same time. Such configuration allows continuous operation even in occurrence of a black-out, thanks to the battery. Anyway, it is always suggested to start measurement sessions with completely charged battery.



Figure III.4. Battery and battery charger.

Figure III.5 shows another optional accessory of the instrument: a wireless router supplied by the USB-A plug on the rear panel (III.2.2). This accessory allows internet connection through mobile network with 3G modality.



Figure III.5. Wireless router.

III.5. MANUAL

The present operating manual is an accessory of LCT-14. Retain these instructions for future reference. Electronic version of any technical document is also available at the URL www.qbit-optronics.com/.

CHAPTER IV

PREPARING FOR OPERATION

NOTICE:

ANY CONTROL, ADJUSTMENT OR PROCEDURE DIFFERENT FROM THOSE REPORTED IN THE PRESENT MANUAL MAY CAUSE ERRORS AND/OR INSTRUMENT IMPAIRMENT.

IV.1. LOCATION

Locate the equipment on a flat surface, far from heat sources or strong air flows. For the best operation in outdoor applications, the instrument should be placed in protected areas, in order to prevent exposure to strong rainfall, snow or hail. During summer at noontide, it is suggested to avoid exposure to direct sun light.

IV.2. INITIAL OPERATION

Unpack the instrument and accessories. Connect the AC power cord to the instrument and then plug the power cord into a nearby AC line connector. Let the system supplied until the battery is fully charged (the led light on the battery charger switches from red to green).

UNDER NO CIRCUMSTANCES CAN THIS INSTRUMENT BE OPERATED WITHOUT CONNECTION TO A PROTECTIVE GROUND.

NOTICE

Do not operate this instrument in the presence of flammable liquids, vapors or aerosols.

Both when the equipment is working and when it is not in use, avoid to lean the instrument on the floor, or anywhere it risks to be hit, crushed and thus damaged.

During system operation avoid to obstruct the cyclone inlet and the sample air exhaust on the rear panel.

CAREFULLY PREVENT ANY LIQUID TO BE SUCKED UP IN THE CYCLONE FILTER;THE INSTRUMENT MAY BE SERIOUSLY DAMAGED.

CHAPTER V

SYSTEM FUNCTIONALITY

V.1. CYCLONE FILTER MOUNTING

The class of detected PM (PM_{2.5}, PM₁₀) depends on the selecting input filter placed at the sample air inlet. The LCT-14 adopts cyclone filters (inertial selection principle) that are calibrated for a given air flow rate, so that heavier particles are not allowed to enter the measuring chamber. Although the correct flow rate is factory adjusted, the user is committed to change this setting (both in case of any flow derating and if a different input filter is adopted) by using the knob placed on the main panel (III.1.4).

For the correct cyclone mounting, the soft end of the plastic tube and the blue terminal should be connected to the filter and to the main case, respectively. The blue terminal should be pressed into the fast connector shown by the arrow in Figure V.1.



Figure V.1. Cyclone filter connections.

In order to unplug the tube from the case, press the connector external ring and pull the tube out (take care not to separate the plastic tube and the blue terminal). The cyclone filter may be placed in its final position by inserting it in the lateral clamp shown by the arrow in Figure V.2.



Figure V.2. Cyclone clamp.

V.2. POWER SUPPLY CONNECTIONS

V.2.1. Connection to external AC line

The link to an external AC line is obtained through the 29 V power supply/battery charger shown in Figure V.3. Connect the male and female black/blue connectors and tighten the safety nut.

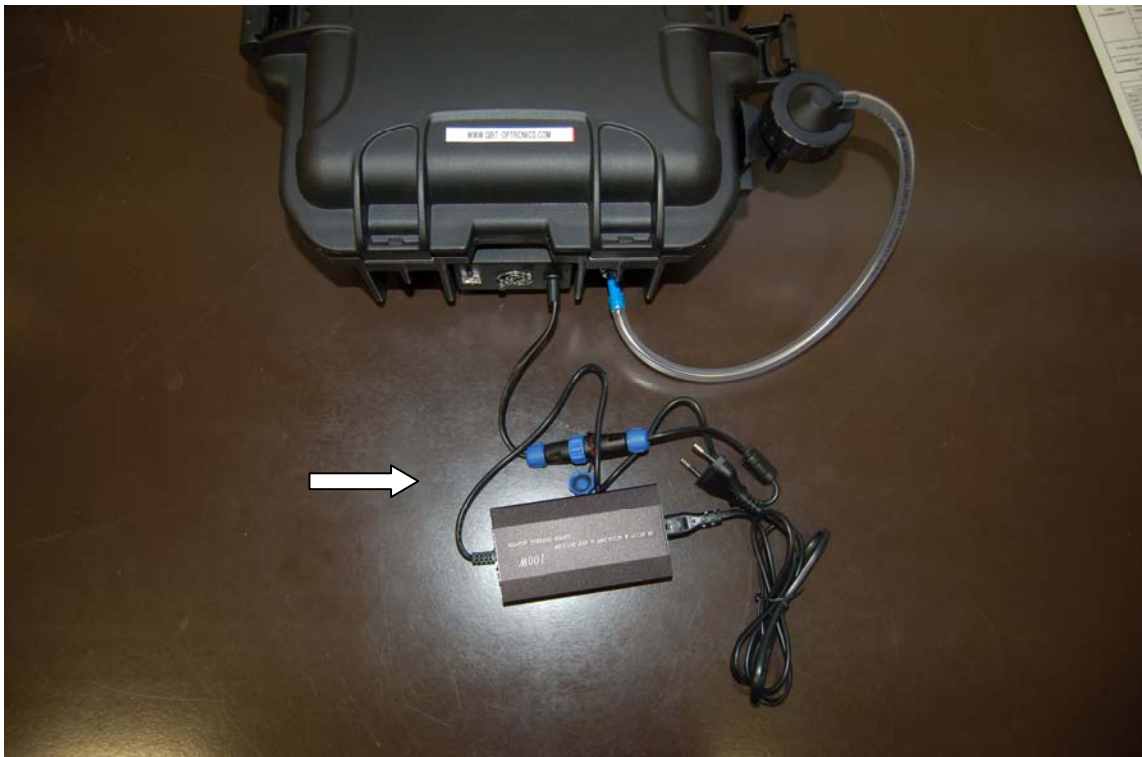


Figure V.3. Connection to AC line.

V.2.2. External battery connection

When an external battery is present, connect it to the case through the black/blue connector. The battery may also be powered by means of the battery charger (Figure V.4).



Figure V.4. External battery connection.

V.3. TABLET AND INSTRUMENT

The standard configuration of the instrument adopts a tablet mod. *Toshiba Encore Mini WT7-C-100*, Display 7", Intel Atom Quad Core Processor, 1GB, eMMC 16 G. The tablet is delivered with its original package. It is suggested to retain the package where serial and product numbers are reported. Warranty does not apply if these identification numbers are lost.

Although the USB is used for data transfer in "host" configuration, the tablet by Toshiba can also be recharged through the same connector. This allows to maintain the tablet battery powered and to work for an indefinite measuring time. This mode of operation (more safe in case of contemporary use of the USB for data transfer) exploits a slow recharging procedure. For this reason the screen brilliance is reduced to have lower power consumption. It is also suggested to start a measurement session having the tablet battery 100% charged (an external battery charger is supplied, Figure III.3). Finally, in order to avoid any measurement stop, no energy saving procedure is to be selected.

The tablet is supplied with 4 velcro-straps, which allow to fix it on the main unit, preferably over the main panel (Figure V.5) or in the suit-case cover. In this case and whenever the suit-case is closed, attention should be paid to avoid any mechanical interference with the pneumatic circuit jumper over the main panel (III.1.5).



Figure V.5. Tablet over main panel.

Placing the tablet over the main panel optimizes the USB cable path and the case can be easily closed also during measurements. Since the tablet is turned 180° with respect to its standard position (Figure V.5), the screen rotation has been frozen. All these settings are factory prepared, but they may be changed through standard Windows utilities. The tablet is turned on and off by a prolonged pressing on the main switch (see “quick reference guide” by Toshiba). The tablet stand-by condition (short pressing of the switch) is not suggested, since it may cause an unwanted battery run-down. A fast battery recharge can be obtained connecting the tablet (preferably switched off) to the external line by means of its battery charger (see Figure V.6).

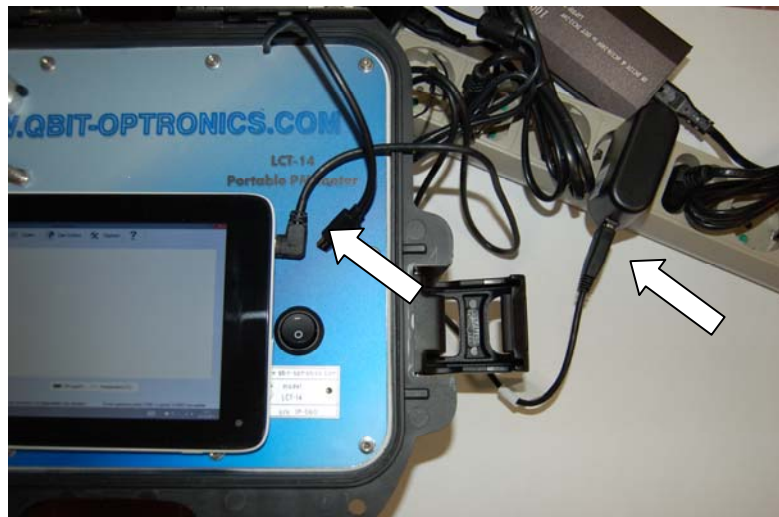


Figure V.6. Tablet with battery charger.

Quando il tablet viene acceso dopo lo splash-screen Toshiba (di fabbrica orientato “a testa in giù” per montaggio Qbit) si apre la schermata di accesso di Windows correttamente orientata. L’utente deve inizialmente accedere al sistema operativo (alla consegna le credenziali sono: user= qbit ; password= qbit . Si possono cambiare questi settaggi da pannello di controllo di Windows).

V.4. MAIN UNIT TURN-ON

The main unit is turned on with the black switch (O/I) placed over the main panel, just above the identification plate. The tablet is charged by the main unit only if the main unit is on. When the main unit is switched on the rear panel fan is also activated. The internal pump starts working only when a measurement cycle is initiated by the QBIT dedicated software. This software is pre-installed on the tablet and it is available as a Windows application or in the desktop bar of Windows start menu.

V.5. INSTALLATION AND SW START-UP

The QBIT application (Figure V.7) is factory pre-installed in the tablet, and the start icon is in the application bar of Windows desktop. It is possible to down-load the software from QBIT web-site (www.qbit-optronics.com/software_qbit/) if software recover is necessary or any new revisions are available. The down-load procedure is password protected. The user password can be obtained sending an e-mail to: tech@qbit-optronics.com. The software is also available as an auto-installing executable file.

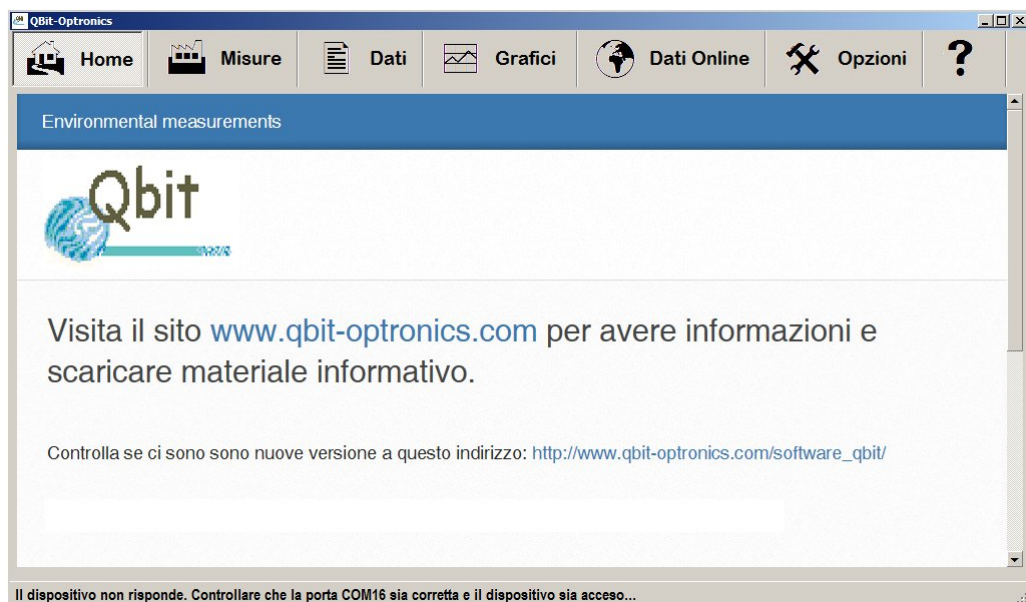


Figure V.7. Initial SW screenshot.

V.6. QBIT APPLICATION FOR LCT-14

The QBIT application is available among the other applications of the operative system Windows 8.1, or in the desktop start-menu bar. In order to enter the instrument control window it is sufficient to launch the application.

The complete software description is reported in the appendix. The first operation to do is to enter the “Options” menu and set the correct serial port (typically COM3, sometimes a successive number if the tablet has been already interfaced with other virtual-com devices). With the rotating-arrows key it is possible to see the complete list of available ports. Select the correct one from the “Porta COM” window and confirm by pressing OK. If the procedure has succeeded, the instrument serial number is displayed in the lower application bar. If the COM to be selected is unknown, unplug the USB cable from the tablet and verify again the list of available COMs. The one disappeared from the list is that automatically assigned by the tablet to the main unit. Connect again the USB and repeat the COM selection procedure.

The Qbit software presents a simple and friendly graphic interface. The full SW description is also available at the following URL

www.qbit-optronics.com/it/wp-content/uploads/2015/07/Guida_Software_Qbit-Optronics_ver11.pdf

The Qbit application is optimized for the full screen resolution of the Toshiba tablet (that is screen zoom set to 100%). Anyway, it may be not practical to use the 7” touch screen with such resolution in Windows desktop mode. Of course, it is convenient to change this setting, especially if managing files. Reset the zoom to 100% when the Qbit application is restarted.

CHAPTER VI

TROUBLESHOOTING

VI.1. TROUBLESHOOTING

In Table VI.1, the most frequently occurring errors and malfunctions are reported, together with any user countermeasure.

Table VI.1

Malfunction	What to do
Main unit turn-on failure	Verify that the power cord is connected and AC required specifications are met. Check the warning light on the power supply and the fan on the rear panel. If fan is not working and light is off the power supply is damaged.
Tablet turn-on failure	Verify the charge level of the battery. Disconnect the tablet from the main unit and charge it with the external charger. Then try again.
Software commands are ignored	Verify the correct selection of the COM port (paragraph V.6). If the problem persists turn off the instrument and restart it.
Temperature too high	Turn off the system and wait at least 30 minutes to allow cooling. Reduce the working place temperature or move the instrument to a cooler location. Verify that the fan is correctly working.
Temperature, pressure and humidity measures do not match other external instruments	Verify that the rear panel fan is not obstructed.
The internal pump is too noisy	Verify that the air exhaust on the rear panel (brass filter) is not obstructed. Verify that the cyclone is correctly connected. Verify the flow rate. Inspect the pneumatic circuit jumper on the main panel.
The flow regulation knob is blocked	Unlock the knob by rotating counter-clockwise the small lateral lever.
Rotating the knob, flow rate does not change	Verify that the flow meter is correctly connected to the rear panel fitting. Inspect the pneumatic circuit jumper on the main panel.

PM measures are irregular	Verify the flow rate and that cyclone filter is correctly connected. Inspect the pneumatic circuit jumper on the main panel.
Internet connection is not working	Verify the charge level of the external router. Verify the available credit of SIM.

CHAPTER VII

MAINTENANCE

For a long and reliable operation of the LCT-14 system, a few maintenance operations are suggested to be performed by the user and by qualified personnel.

VII.1. USER MAINTENANCE

VII.1.1. Cleaning suggestions

Daily cleaning

- remove dust and solid particles from the instrument;
- do not use abrasive products;
- wipe with soft and clean cloths.

Precautions

- avoid dust or grease get into the cyclone filter;
- avoid moisture or liquids get into the cyclone filter;
- avoid dust get into the main case apertures;
- do not use chemical solvents and/or abrasive detergents;
- do not use alcohol to clean the tablet and the main panel.

ALWAYS DISCONNECT THE AC POWER BEFORE ANY MAINTENANCE OPERATION.

When the system is not in use, it is suggested to set the equipment in a dry, dust free place.

VII.1.2. Cyclone filter cleaning

This maintenance operation can be performed by the user, at time intervals which depend on working conditions and external environment.

Disconnect the cyclone filter from main unit. Open the conical filter cap unscrewing the circular nut. Clean out the dust from the internal chamber and verify that the air inlet is not obstructed. Remount the cap. Remove and clean the rubber cap placed below the filter.

VII.1.3. Flow rate setting

The user is committed to change the flow rate setting (see also III.1.4), both in case of any flow derating and if a different input filter is adopted.

Disconnect the cyclone filter from the main unit and connect the flow meter to the fast connector (rear panel) using an 8 mm external diameter tube. Turn on the pump by the Qbit application (see appendix). Unlock the knob on the main panel by rotating counter-clockwise the small lateral lever. Tune the flow rate to the desired value acting on the knob, then lock it again. Disconnect the flow meter and reconnect the cyclone filter.

VII.2. QUALIFIED PERSONNEL MAINTENANCE

IN ORDER TO ENSURE SYSTEM ACCURACY AND RELIABILITY, THE FOLLOWING MAINTENANCE OPERATIONS ARE TO BE PERFORMED BY QUALIFIED PERSONNEL AT REGULAR INTERVALS (PREFERABLY ONCE A YEAR):

- internal zero-pass filter replacement;
- laser scattering sensor calibration;
- flow rate calibration;
- electric insulation check.