

Quanta Intraoral Camera Q-tube-I User Manual

version 0.8

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0.5	2016.3.9	U	Chain Hsu	P. 27 產品規格中操作/儲存的大氣壓力範圍 P. 29 符號說明
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0.7	2016.4.28	U	Katrina Wu	封面加上文件編號 更新Model name P. 37-39 新增CE/FCC相關警語 P. 40-45 新增EMC宣告
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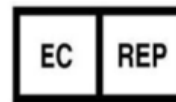


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Introduction

Intended Use

The Quanta Intraoral Camera Q-tube-I is intended for chairside use by licensed dentists during oral health examinations, not for patients. It provides magnified digital color images of intraoral or extra oral anatomy via the tablet. Both still and video images can be captured and stored. The device allows practitioners to view the interior of the oral cavity and assist in the assessment of the overall oral health of the patient. The Quanta Intraoral Camera Q-tube-I also provides a tool for communicating treatment requirements or results by allowing practitioner and patient to view areas of concern together, before and after procedures.

Packaging

The Quanta Intraoral Camera Q-tube-I consists of a wireless digital intraoral camera, software application, a charge cable and docking station.

Item	Description	Quantity
1	Q-tube-I (Intraoral Camera)	1
2	AC charger(*)	1
3	Charging dock	1
4	Protective sleeve	30

(*)Note : AC Charger specifications

- ❑ Model: MIL050200U
- ❑ AC Input: 100-240V~, 50~60Hz
- ❑ DC Output: +5V --- 2A max

Warning & Caution

Please make sure to familiarize all operating personnel with the general safety information in this summary. Specific warnings and cautions are also found throughout this manual. Such specific warnings and cautions may not appear here in this summary.

Caution

A caution statement in this manual identifies condition or practice, which if not corrected or discontinued immediately, could lead to equipment failure, equipment damage, or data loss.

- Thoroughly read this manual to ensure patient safety and obtain optimum performance .
- Do not attempt to disinfect the Quanta Intraoral Camera Q-tube-I using ethylene oxide gas, steam, glutaraldehyde products or any other gas or liquid disinfectant except alcohol.
- Do not use the Quanta Intraoral Camera Q-tube-I if you notice any signs of damage to the components of the system. Contact customer service for assistance.
- Do not apply chemicals, or water to the lens. Any liquids or solution entering the optical assembly will damage internal components.
- Before each use, the outer surface of Quanta Intraoral Camera Q-tube-I which is intended to be inserted into a PATIENT should be checked to ensure there are no unintended rough surfaces, sharp edges or protrusions which may Cause a SAFETY HAZARD.

Warning

A warning statement in this manual identifies a condition or practice which if not corrected or discontinued immediately, could lead to injury, illness, or death.

- Do not use Quanta Intraoral Camera Q-tube-I in the presence of flammable anesthetics.
- This instrument is not intended to be used in the eye. Do not stare at them in order to avoid any ocular risk.
- The camera must be barrier protected with the protective sheath before use.
- This product has no user replaceable parts. Refer all service to qualified personnel.
- Do not stare at the light on Q-tube-I when it is illuminating. Otherwise it may damage your eyesight.

Product Operation

Appearance



















1 Indicator Lights

Button	Function	Operation
2 photo	Take a photo (incl. during video mode)	Quick press
3 Record	Take a video	Quick press
4 Brightness	Adjust brightness	Quick press (5 levels)
5 Power	Turn on	Press and hold (5 seconds)
	Turn off	Press and hold (5 seconds)
	Wake from sleep mode	Quick press
	Return to previous page	Quick press at preview page

Automatic sleep mode after 2 minutes of idle time
Automatic shutdown after 3 hours of idle time

Indicator Lights

	Sufficient	Low Battery
Turning On	 	
Ready for use	 	 
Sleep mode	 	
Bluetooth/Wi-Fi Connecting	 	

	Charging Battery
Low battery	 
Charging	 
Fully charged	 

When Q-tube-I battery is low and not connected to the docking station, no indicator light will turn on and the device will not turn on.

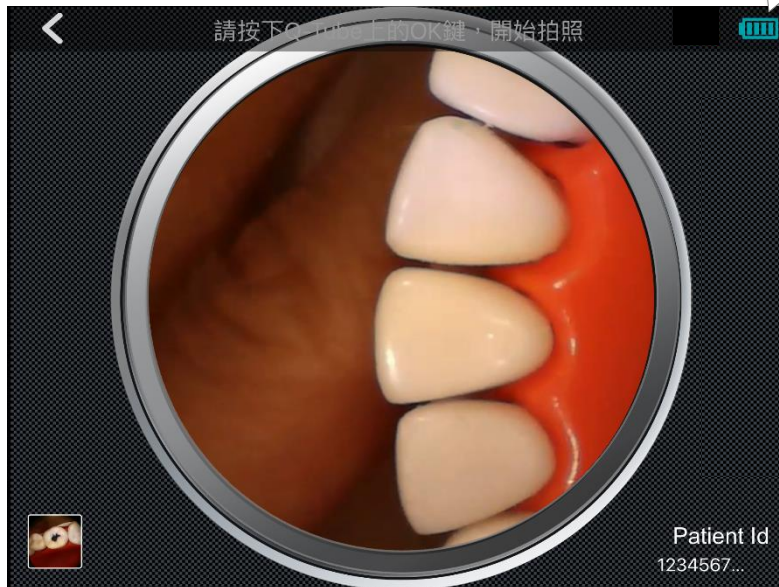







Power Management

Power Display

Battery status is shown at the upper right corner of the Image Capture screen in the Q-Tube App. When the battery is low, connect Q-tube-I to the docking station to charge.

The battery of Q-tube-I is sufficient.



-  Fully charged
-  75% battery remaining
-  50% battery remaining
-  25% battery remaining
-  No charge



Turning On

1. Press and hold the power button for 5 seconds to turn on Q-tube-I (solid blue indicator light)
2. Q-tube-I is ready to use when the indicator light turns solid green

Turning Off

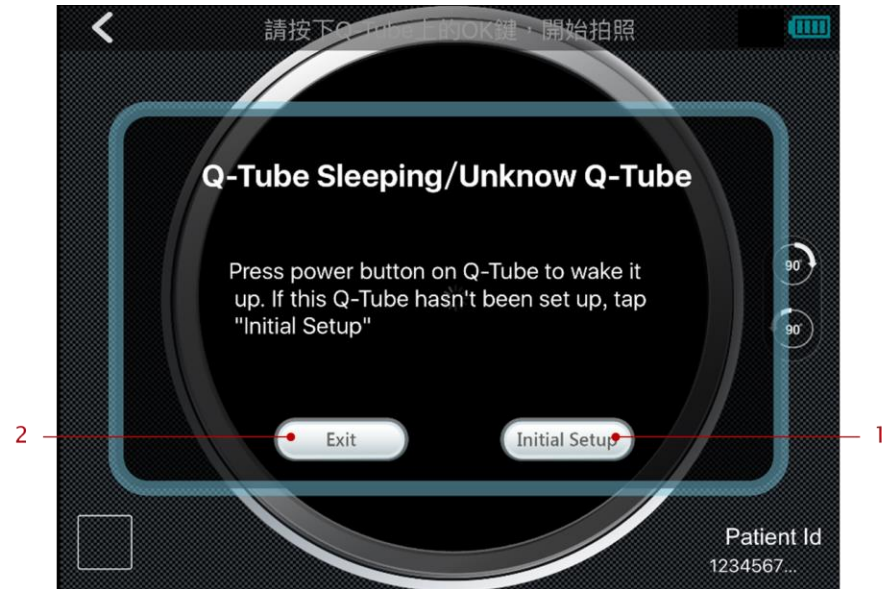
1. Press and hold the power button for 5 seconds to turn off Q-tube-I
2. Q-tube-I is shut down when the indicator light turns off

Auto Sleep Mode/Auto Shutdown

Q-tube-I uses a non-removable battery. For efficient battery management, Q-tube-I automatically enters sleep mode after 2 minutes of idle time (solid yellow indicator light) and automatically turns off after 3 hours of idle time (indicator light turns off).

* If Q-tube-I is unpaired, it will automatically enter sleep mode after 20 minutes of idle time. This changes to 2 minutes after the first pairing.

Sleep mode is indicated on the preview screen



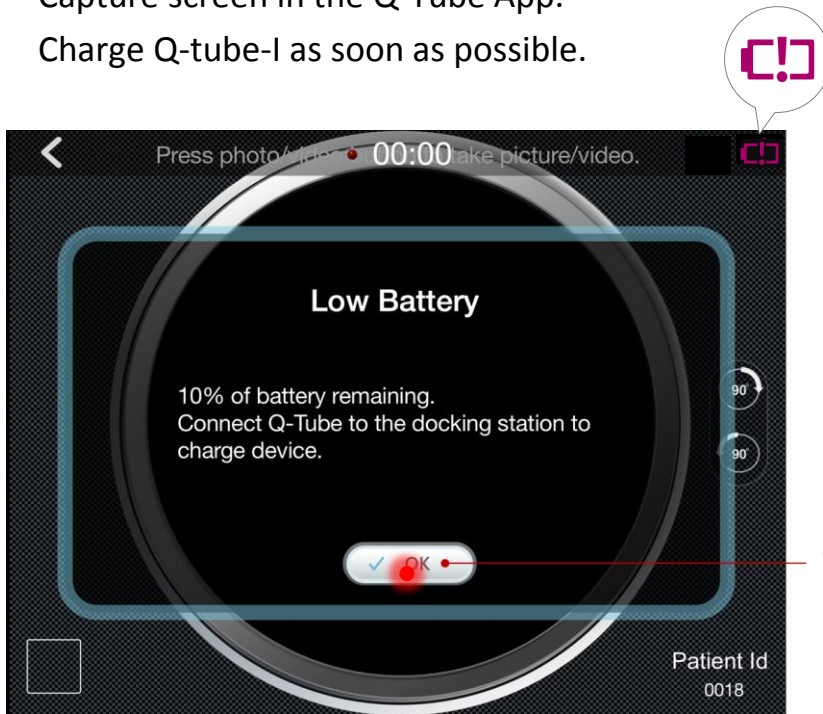
1. If Q-tube-I has never paired with smart device, please press the button.
2. Pressing the button can leaving the preview page.

Waking Up

Wake up Q-tube-I from sleep mode by pressing the power button (solid green indicator light).

Low Battery Notification

1. The battery indicator light blinks red when less than 20% charge remains. Battery status is shown at the upper right corner of the Image Capture screen in the Q-Tube App.
2. Charge Q-tube-I as soon as possible.



1. Press here to close notification.

Charging the Battery

1. Place Q-tube-I in the charging station and connect the power supply.



1. Indicator lights on docking station

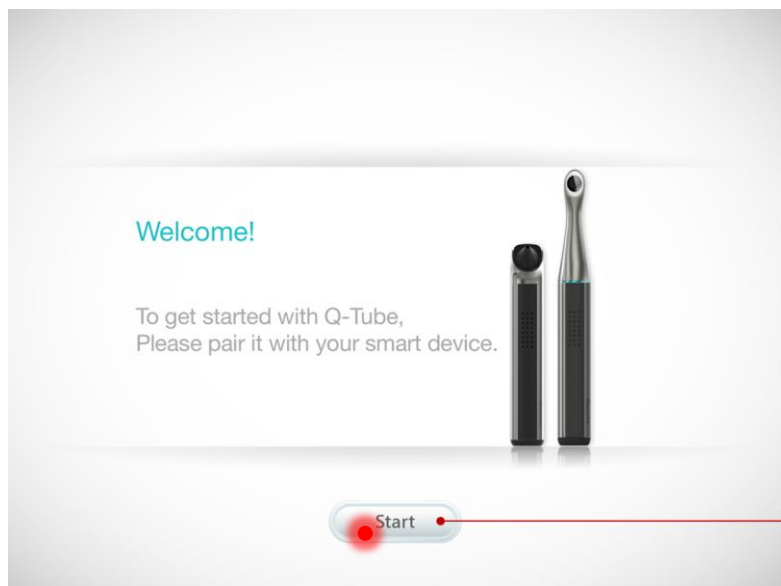
CAUTION

Charging Q-tube-I is intended for environment without any patient. Please ensure that no patient is around the environment Q-tube-I is charged in.

Pairing Q-tube-I with Smart Device

Getting Started

The welcome page appears the first time you install the Q-Tube App. Press Start to pair Q-tube-I with your smart device.



1. Press here to start pairing Q-tube-I with smart device.

Step 1. Restarting Q-tube-I

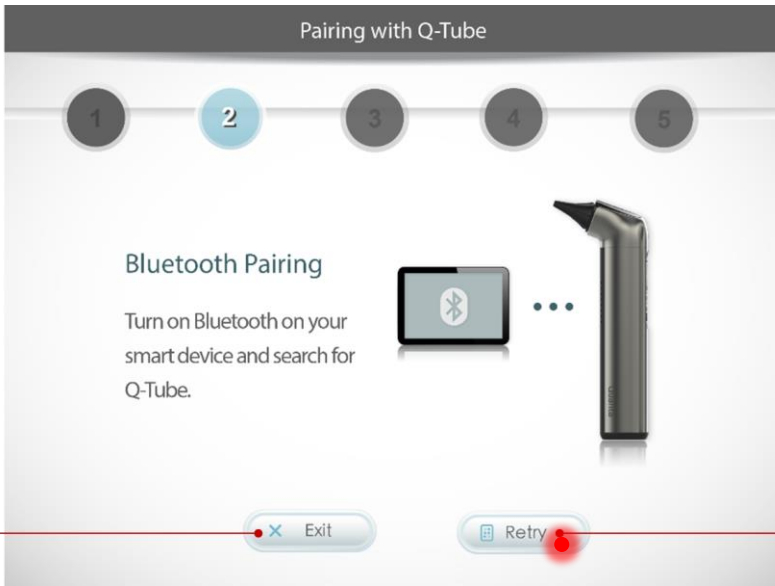
Press power button on Q-tube-I 5 seconds to turn off, and press power button 5 seconds to turn on.



1. After restarting Q-tube-I, please press here to enter next step of pairing setting.
2. Press here to cancel the pairing flow.

Step 2. Turn on Bluetooth on your smart device

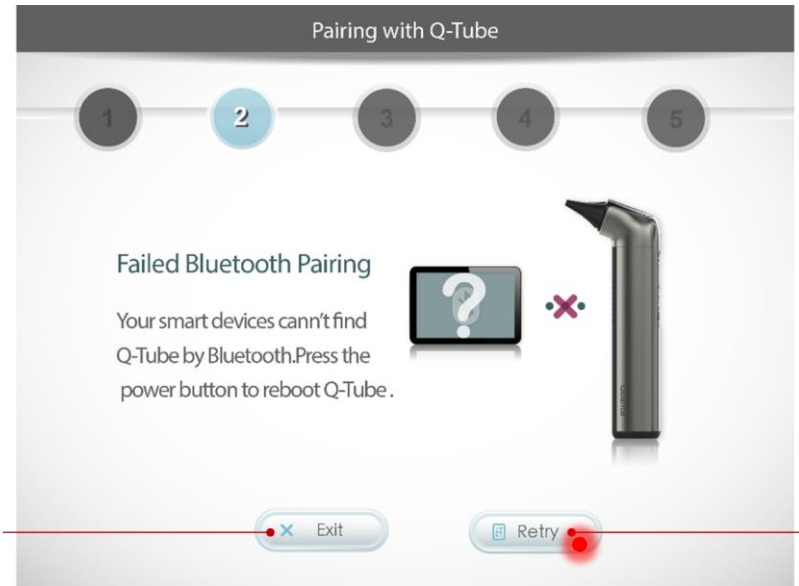
Turn on Bluetooth on your smart device; then press Next



1. Turn on Bluetooth on smart device and press here to enter next step of pairing setting.
2. Press here to cancel the pairing flow.

[Error Message] Smart device Bluetooth is off

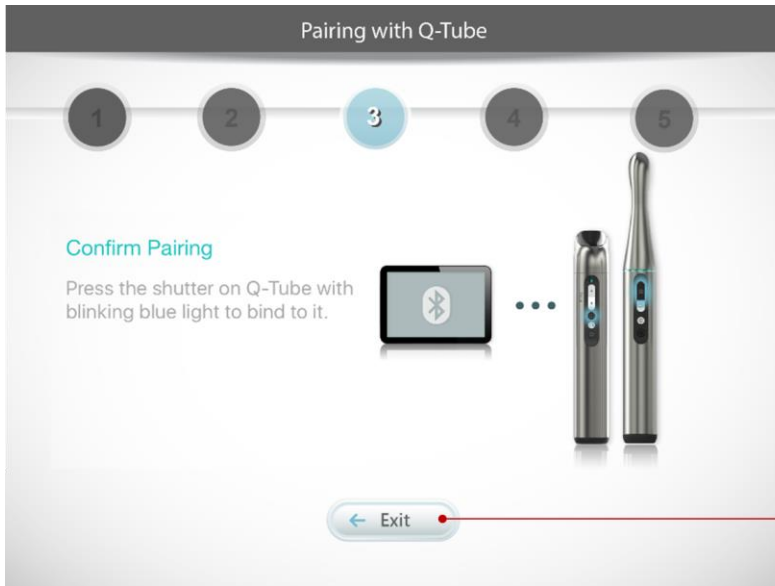
Ensure that Bluetooth is on and press Retry



1. After restarting Q-tube-I and confirm Bluetooth on smart device is turn on, press here to enter next step of pairing setting.
2. Press here to cancel the pairing flow.

Step 3. Confirm Q-tube-I pairing

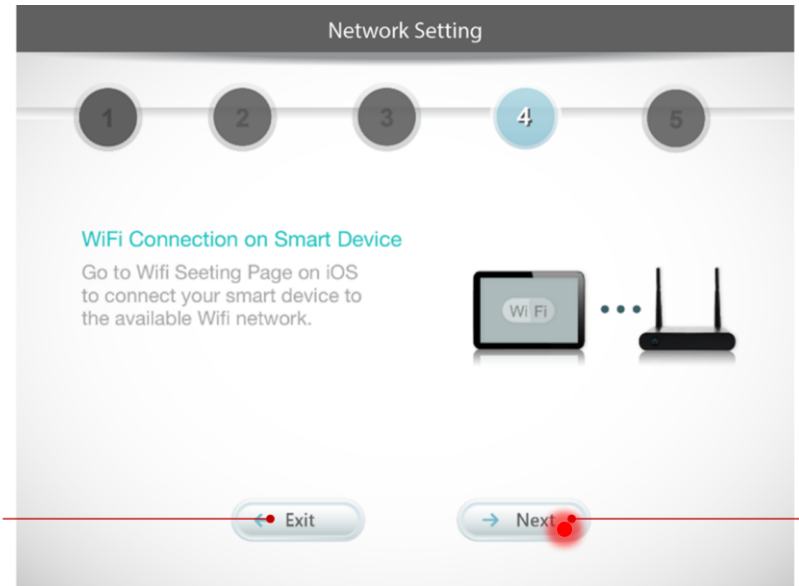
When the indicator light on your Q-tube-I blinks blue, press the photo button to confirm pairing



1. Press here to cancel the pairing flow.

Step 4. Connect smart device to Wi-Fi

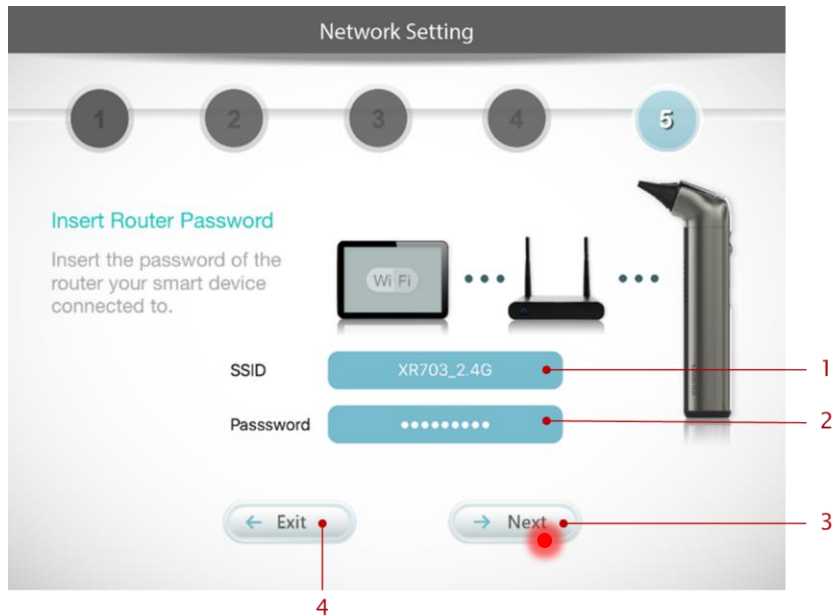
Connect your smart device to an available Wi-Fi network; then press Next (iOS) or Settings (Android)



1. Connect your smart device to the available Wi-Fi network; then press here to enter next step of pairing setting.
2. Press here to cancel the pairing flow.

Step 5. Enter router password

Enter the password for the router your smart device is connected to; then press Next

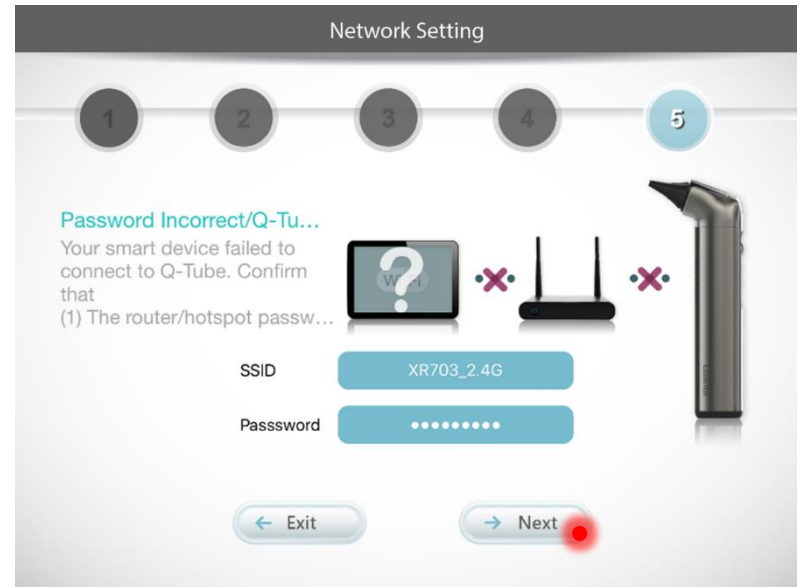


1. Insert the SSID (with 20-character limit) of the Wi-Fi router your smart device connected to.
2. Insert the password of the Wi-Fi router your smart device connected to.
3. After inserting the SSID & password of the Wi-Fi router, press here to submit.
4. Press here to cancel the pairing flow.

* Only Wi-Fi network with WPA/WPA2 encryption is accessible by Q-Tube App.

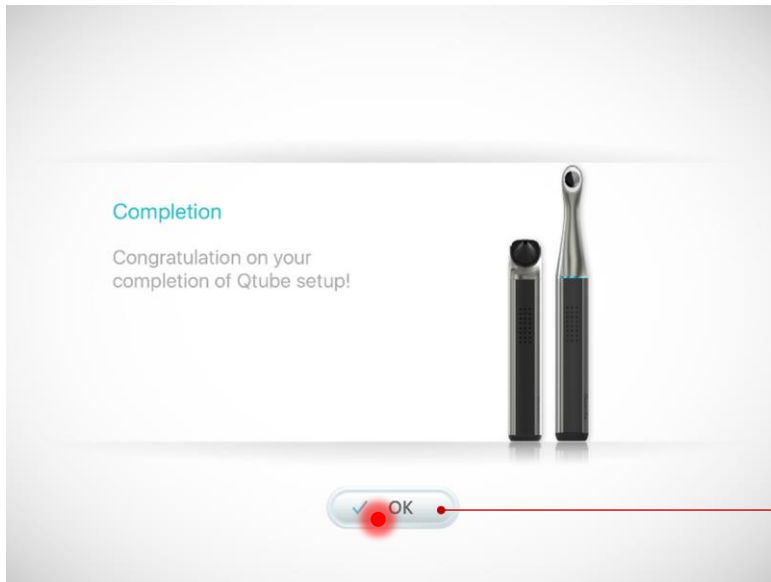
[Error Message] Password Incorrect

Confirm that the password of Wi-Fi is correct; then press Next.



Pairing Complete

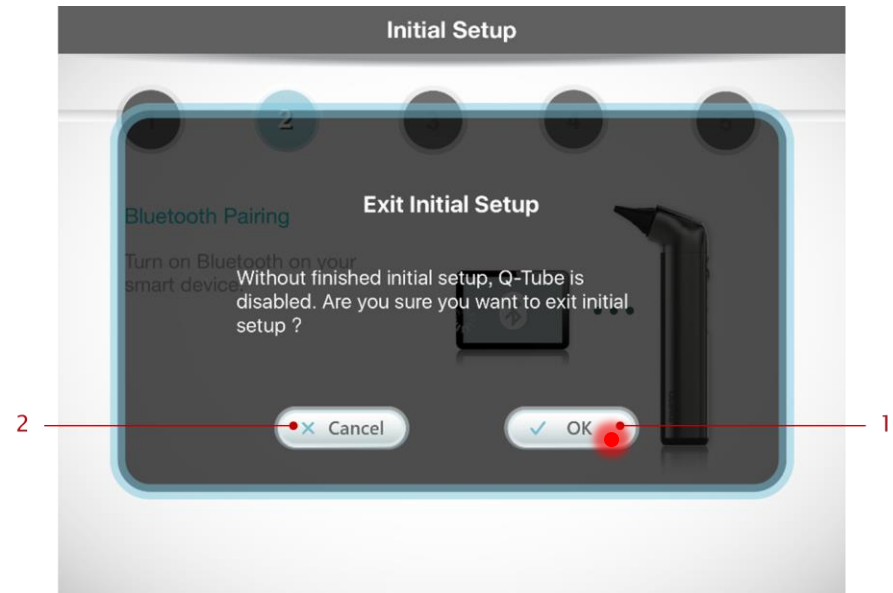
Pairing is completed. Press OK to start using the Q-Tube App.



1. Press here to complete the pairing settings between Q-tube-I & smart device.

Cancel Pairing

To cancel pairing the device, press Exit at any time during Step 1-5 and press OK to confirm

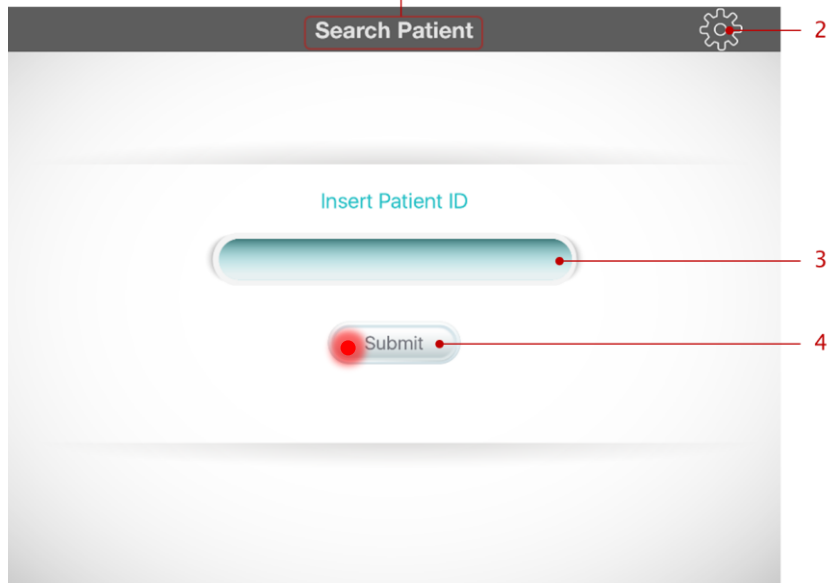


1. To cancel pairing settings between Q-tube-I & smart device, press here to cancel the pairing flow.
2. Press here to return to the pairing flow.

Patient ID

Enter Patient ID

Enter the medical record number for the patient (must be 12 characters in length containing letters or numbers); then press Submit

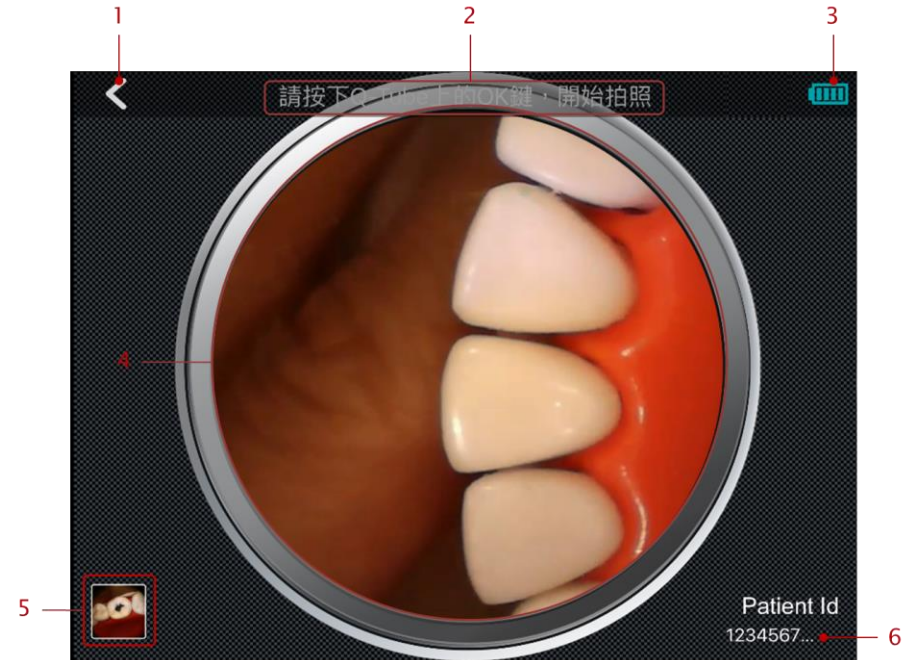


1. Page Title: indicates the function of this page.
2. Press here to go to device management page and view the Q-tube-I device information pairing with smart device.
3. Insert the patient id to be searched here.
4. After inserting the patient id to be searched, press here to submit.

Photo & Video

Photo

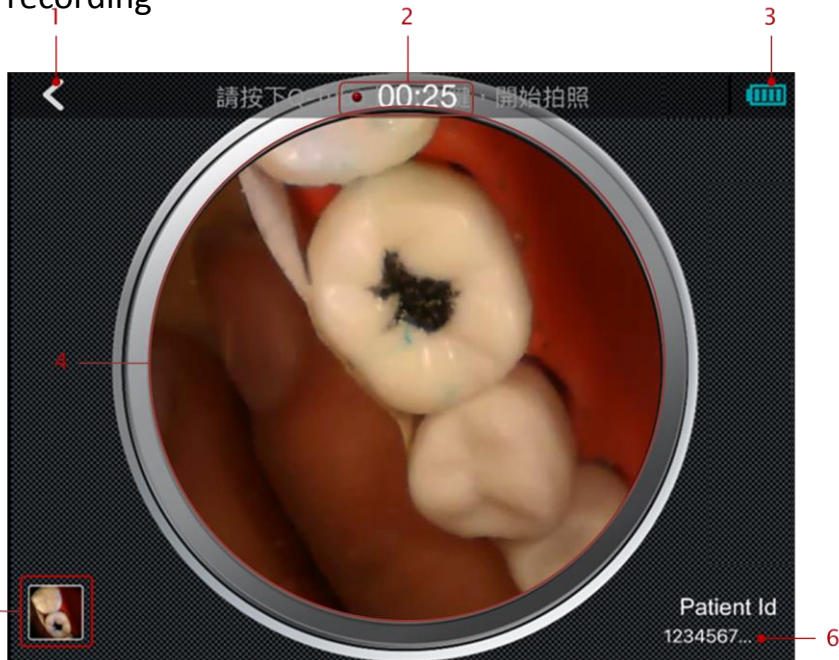
Press the photo button to take a photo.



1. Back button: press here to return to previous page
2. Indicated the operation related to preview page. Press the photo button on Q-tube-I to take a picture.
3. The remaining battery of Q-tube-I
4. Real-time video streaming view
5. The thumbnail image of the newest photo and video. Press here to view photos & videos.
6. The id of the examined patient.

Video

Press the record button on Q-tube-I to start/stop recording



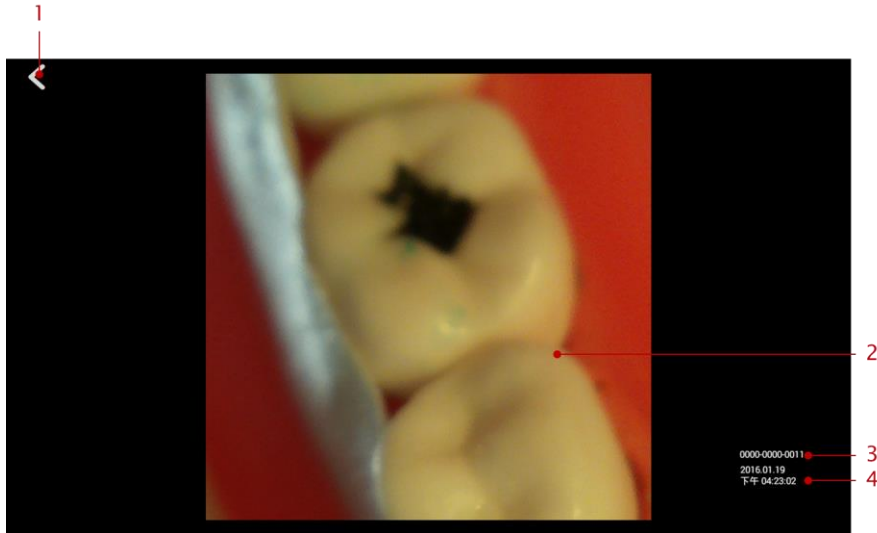
1. Back button: press here to return to previous page
2. Display how long it has recorded when recording video.
3. The remaining battery of Q-tube-I
4. Real-time video streaming view
5. The thumbnail image of the newest photo and video. Press here to view photos & videos.
6. The id of the examined patient.

Preview Photo/Video

Step 1. Press on the thumbnail image in the lower left corner of the screen to preview Photo/Video.

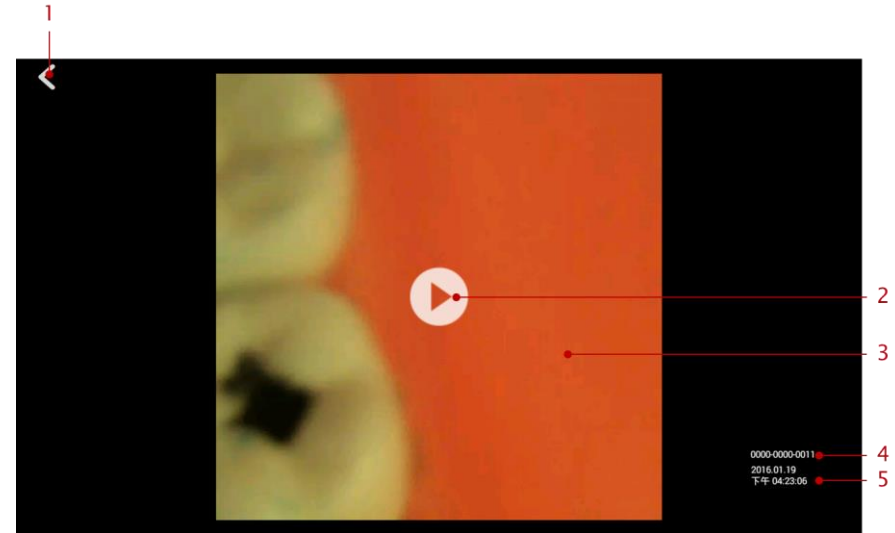


View a Photo



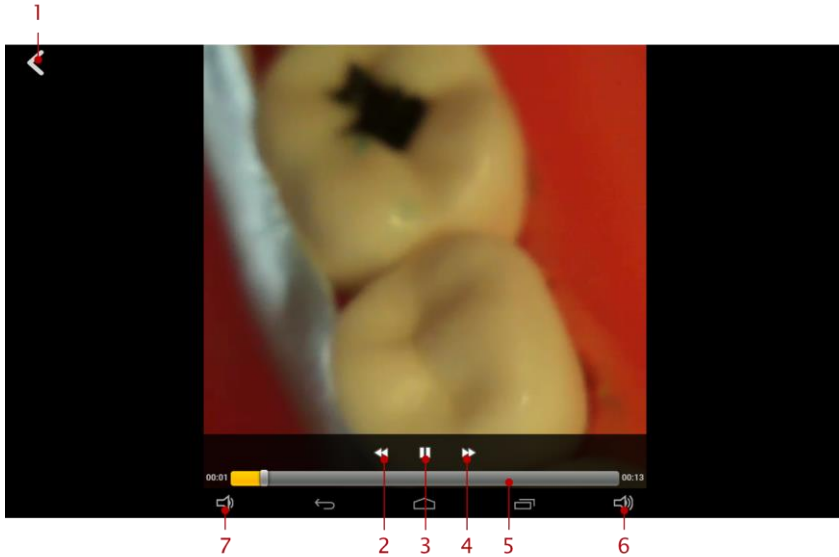
1. Back button: press here to return to previous page
2. The photo obtained from Q-tube-I. View the next/last photo or video by sliding to left/right.
3. Patient id: indicates the patient the photo belongs to.
4. The taken time of the photo.

View a Video



1. Back button: press here to return to previous page
2. Play button: press here to play video
3. The video obtained from Q-tube-I. View the next/last photo or video by sliding to left/right.
4. Patient id: indicates the patient the video belongs to.
5. The taken time of the video.

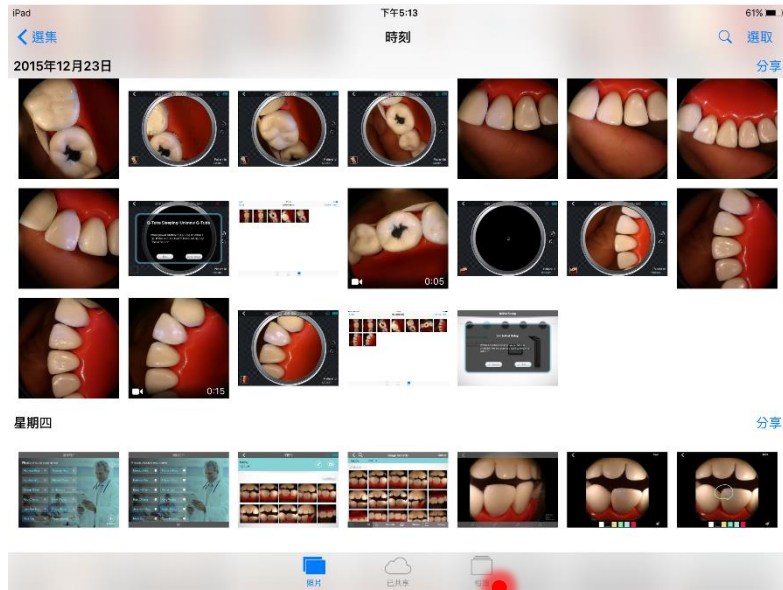
Video Playing



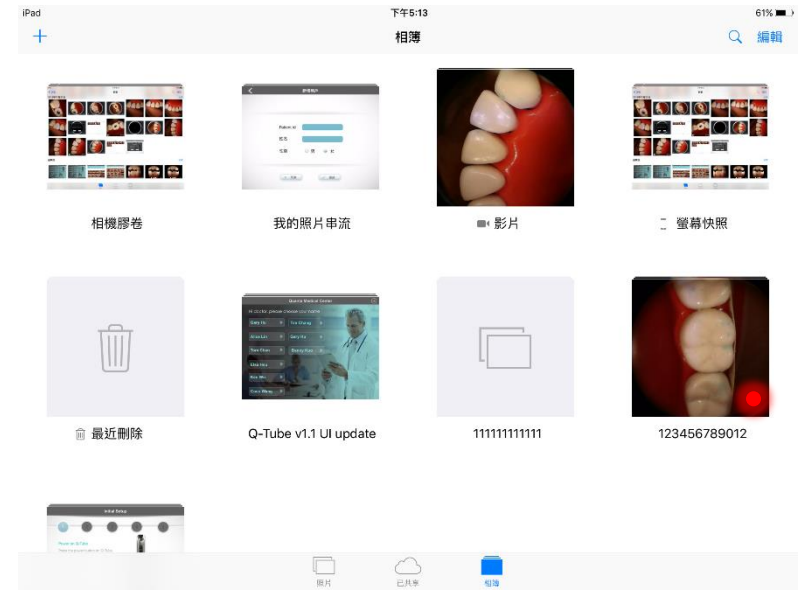
1. Back button: press here to return to previous page
2. Turn-back button: turn back the video
3. Pause button: pause the playing video
4. Fast-forward button: fast-forward the video
5. Video progress bar: click to go to the specified progress
6. Volume up button: click to increase the system volume
7. Mute button: click to mute the system volume

Access Photos/Videos (iOS version)

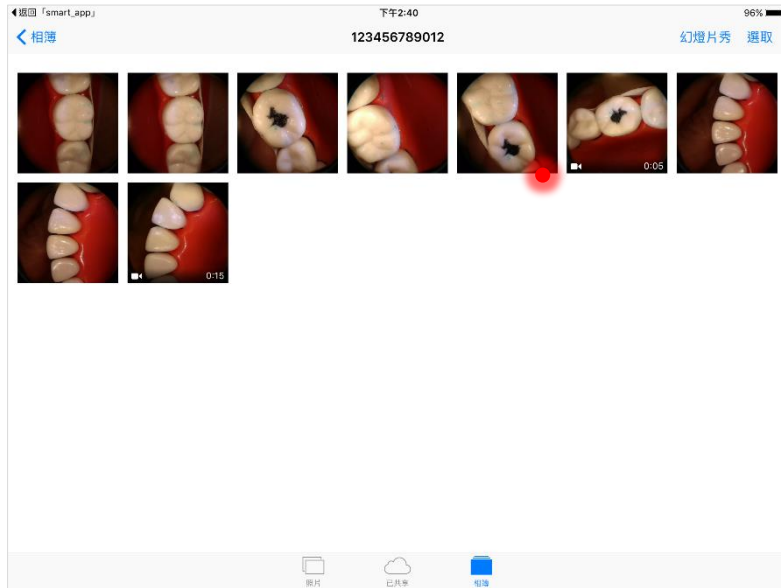
Step 1. Press Photo Album at the bottom of the screen



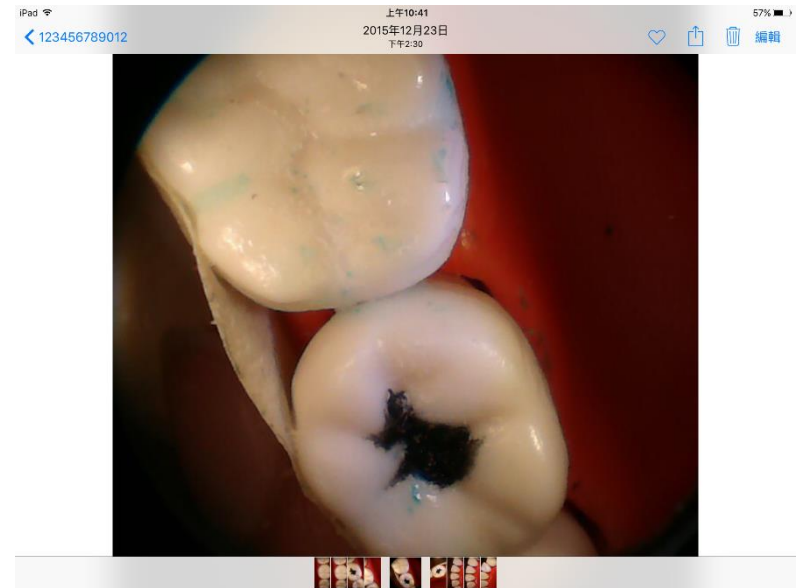
Step 2. Select the folder corresponding to the patient ID, for example, 123456789012



Step 3. Select a photo/video for an enlarged view



Step 4. Built-in photo/video management functions can be used for enlarged photos/videos



Access Photo/Video (iOS version)

Please open the file management application on smart device, and go to DCIM > Q-tube-I folder to search for specified patient id. You can find all photos & videos of the patient.

e.g., to find the patient whose id is 1234-5678-9012, please go to DCIM > Q-tube-I > 0000-1234-0000 to view all photos & videos of the patient.

Low Storage Space Notification

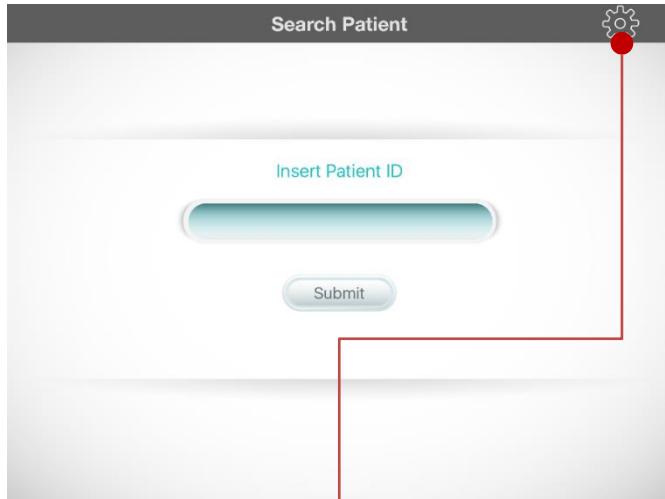
A low storage space notification is shown when available storage space on the smart device is less than 5%; press OK to open the Photo Album to delete files



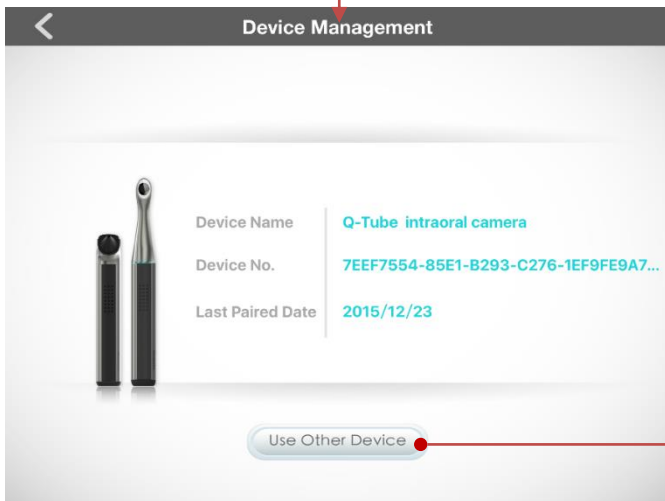
Settings

View Paired Device

On the Enter Patient ID page, press the Settings icon in the upper right corner



to see information about the device paired with the Q-Tube App



Change Paired Device

To change the device paired with the Q-Tube App, press Use Other Device and press OK to confirm



Troubleshooting

Problem	Solution
Q-tube-I does not turn on/off or operate normally	<ul style="list-style-type: none"><li data-bbox="678 297 1754 404">• The battery may be too low (indicator light is solid red and Q-tube-I does not turn on after connecting Q-tube-I to the docking station). Turn on Q-tube-I after the battery is fully charged.<li data-bbox="678 411 1754 518">• If the problem is still not solved, simultaneously press the brightness and power buttons to force shut down Q-tube-I. Then press the power button again to turn it on.

Product Specification







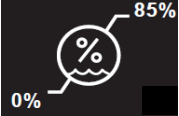
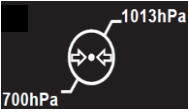
Hardware Specification

Item	Specification
Dimension	
Otoscope	175.1(L) x 28(W) x 34.5(D) mm
Docking station	66.1mm(Diameter) x 27mm(H)
Weight	
Otoscope	164g +/- 15g
Docking station	30 +/- 5g
Sensor	OV5648, 1/4 Inch 5MP CMOS
Focus	0~35mm (From the small hole of Otoscope specula)
Magnification (Pixel/mm)	About 80x
Lighting	4 LED, CRI > 85
Battery	2600mAh, the battery is not replaceable
Power consumption	Active: 2.7W / Suspend: 0.3W
Continuous operation time	About 2-3 hours
Standby time	About 30 hours
White balance	Manual
Exposure	Automatic
Environment	
Operating temperature	0~ 35 °C
Transportation and storage temperature	-30 ~ 65 °C
Operating Relative humidity	0 ~ 85 % RH
Transportation and storage Relative Humidity	0 ~ 85 % RH
Operating Atmospheric pressure	700-1013 hPa
Transportation and Storage Atmospheric Pressure	700-1013 hPa

Application Software Specification

Item	Specification
System Requirement	
OS	Android 5.0 / iOS 9.1
Communication interface	Wi-Fi and BT 4.0
Communication	
Bluetooth	BT 4.0
Wi-Fi	IEEE 802.11b/g/n
Remote Control Mechanism	RPC
Streaming Encryption	WPA2/WPA
Image Capability	
Resolution	Up to 640x640
SNR	36 dB
Photo	Format JPEG
Video	H.264, fps up to 15, average bit rate ~400kbps

Used Symbol Description

Symbol	Description
	The CE symbol ensures that the product herein specified meets the provisions of European Council Directive 93/42 EEC concerning medical devices.
	Correct Disposal of This Product (Waste Electrical & Electronic Equipment)
	Please refer to user manual before you use this product
 =type B	Applied part
	Caution : Please refer to the written instructions of this manual
	Storage and transportation conditions: -30 ~ 65 °C
	Transportation and storage Relative Humidity: 0 ~ 85 % RH
	Transportation and Storage Atmospheric Pressure: 700-1013 hPa

Maintenance

Perform the following maintenance activities on your camera and accessories regularly. The camera is not delivered in disinfected condition. To ensure maximum hygienic safety for the patient, carefully follow the instructions to disinfect the camera before use.

Cleaning & Disinfecting the Camera

- Before applying cleaning or disinfecting solution
 - **disconnect the camera from power and the USB cable from the USB port.**
- Do not soak the camera.
- Always dry completely after cleaning or disinfecting.

To clean: Use a lint-free cloth to apply a solution of mild soap and water.

To disinfect: Use a lint-free cloth to apply isopropyl alcohol (70%).

Cleaning the Camera

If the camera is visibly contaminated with blood or body fluids, you must clean the camera before disinfecting it. To clean the camera, follow these steps:

- Dampen (**not soak**) a lint-free cloth with lukewarm water.
- Remove the blood or body fluids with the dampened lint-free cloth.
- Wipe with isopropyl alcohol (70%) between patients.

Disinfecting the Camera

Before each patient, the camera must be thoroughly disinfected.

To adequately disinfect the camera, follow the disinfectant manufacturer's instructions for the appropriate contact time.

To disinfect the camera, follow these steps:

1. Remove the protective sleeve.
2. Remove all visible soil (**If the camera is visibly soiled, it must be thoroughly cleaned prior to disinfecting.**)
3. Dampen (**not soak**) a lint-free cloth with isopropyl alcohol (70%).
4. Wipe all surfaces of the camera thoroughly.
5. Allow to dry in the open air.

Inspecting the Camera for Damage

Inspect the camera for signs of deterioration, such as the buttons. If damage is noted, do not use the camera and contact your representative.

Protective Sleeve for the Camera

The protective sleeve covers the camera and provides a sanitary shield for the patient.

1. Make sure the window is clean by wiping it with a moist lint-free cloth or lens tissue for at least one minute with each patient.
2. Use a new protective sleeve with each patient. Always discard the protective sheath after each use.
3. Adjust the protective sheath if necessary. The end should be tight to prevent fogging or blurring of the image.
4. Only use the protective sheaths designed specifically for this camera.
5. For additional protective sleeves, contact the protective sleeves manufacturer.

Disposal of Waste

Within the EU



Do not dispose of this product as unsorted municipal refuse. Submit for separate collection as specified by Directive 2002/96/EC of the European Parliament and the Council of the European Union on Waste Electronic and Electrical Equipment (WEEE). If this product is contaminated, this directive does not apply. For more specific disposal information contact Customer Service.



Outside the EU

When the product and its components reach end of life, recycle the product according to national, state, and local regulations.

For information on disposal/recycling options in the European Union, see the European Portable Battery Association (EPBA) at <http://www.epbaeurope.net/>.

Warranty & Service

Limited Hardware Warranty (through distributors & resellers)

Quanta hardware products come with a 1-year limited hardware warranty. The warranty is extended through Quanta authorized representatives and resellers.

If you have a warranty claim, please contact the store, distributor, or website through which the product was purchased.

Manufacturer's Declaration

- Any changes not following User Manual to the it-network could cause Q-tube-I and Q-Tube App not able to work normally.
 - Changes to the it-network include:
 - changes in network configuration
 - connection of additional items
 - disconnection of Q-tube-I and your smart device.
 - operating system of smart device is updated or upgraded to a not supported version, which is specified in application software specification of user manual.
- Please use this device with fine WIFI connection and do not use it in static environment.
- If the poor quality of the network connection, or accidentally under static environment, the Q-Tube App will pop up a prompt window, and pause preview screen, you can wait for the automatic connection or restart.

- This camera, classified as Medical Electrical Equipment, requires special precautions regarding EMC and must be installed and put into service according to the EMC information provided in the accompanying product documentation. Portable and mobile RF communications equipment can effect Medical Electrical Equipment.
- This camera complies with EMC requirements when used with the cables and accessories supplied with the product. The use of accessories and cables other than those sold by Quanta Computer Inc. and specified as replacement parts for internal components, may result in increased emissions or decreased immunity of this camera.
- This camera should not be used adjacent to or stacked with other equipment. If adjacent or stacked use is necessary, this camera should be observed to verify normal operation in the configuration in which it will be used.

Federal Communications Commission (FCC) Statement

15.19

This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

- 1) this device may not cause harmful interference and
- 2) this device must accept any interference received, including interference that may cause undesired operation of the device.

15.21

You are cautioned that changes or modifications not expressly approved by the part responsible for compliance could void the user's authority to operate the equipment.

15.105(b)

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

For body worn operation, this device has been tested and meets FCC RF exposure guidelines when used with an accessory that contains no metal and that positions the handset a minimum of **5 mm** from the body. Use of other accessories may not ensure compliance with FCC RF exposure guidelines

The highest FCC SAR values:

- **0.412 W/Kg (1g) (Body)**

CE marking

This equipment complies with the requirements of Directive 1999/5/EC of the European Parliament and Commission from 9 March, 1999 governing Radio and Telecommunications Equipment and mutual recognition of conformity.

The device complies with the following harmonized European

EN 301489-1 V1.9.2 / EN 301489-17 V2.2.1 / EN 300328 V1.9.1

EN 50566: 2013 / EN 62209-2:2010 / EN 62479: 2010

CE RF Exposure Compliance

This device meets the EU requirements (1999/519/EC) on the limitation of exposure of the general public to electromagnetic fields by way of health protection.

For body-worn operation, this device has been tested and meets the ICNIRP guidelines and the European Standard EN 62209-2, for use with dedicated accessories. SAR is measured with this device at a separation of **5 mm** to the body, while transmitting at the highest certified output power level in all frequency bands of this device. Use of other accessories which contain metals may not ensure compliance with ICNIRP exposure guidelines.

The highest CE SAR values for the device is **0.575 W/Kg (10g) (Body)**

EMC Declaration Table

Guidance and manufacturer's declaration-electromagnetic emissions		
<p>The <u>Q-tube-I</u> is intended for use in the electromagnetic environment specified below.</p> <p>The customer or the user of the <u>Q-tube-I</u> should assure that it is used in such an environment.</p>		
Emission test	Compliance	Electromagnetic environment-guidance
RF emissions CISPR 11	Group 1	The <u>Q-tube-I</u> uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	The <u>Q-tube-I</u> is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations /flicker emissions IEC 61000-3-3	Compliance	

Guidance and manufacturer's declaration-electromagnetic immunity

The Q-tube-I is intended for use in the electromagnetic environment specified below.

The customer or the user of the Q-tube-I should assure that it is used in such an environment.

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment-guidance
Electrostatic discharge(ESD) IEC 61000-4-2	± 6 kV contact ± 8 kV air	± 6 kV contact ± 8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%
Electrical fast transient/burst IEC 61000-4-4	± 2 kV for power supply lines ± 1 kV for input/output lines	± 2 kV for power supply lines Not applicable	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	± 1 kV line(s) to line(s) ± 2 kV line(s) to earth	± 1 kV differential mode Not applicable	Mains power quality should be that of a typical commercial or hospital environment.


<p>Voltage Dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11</p>	<p><5% UT(>95% dip in UT) for 0,5 cycle 40% UT(60% dip in UT) for 5 cycles 70% UT(30% dip in UT) for 25 cycles <5% UT(>95% dip in UT) for 5 s</p>	<p><5% UT(>95% dip in UT) for 0,5 cycle 40% UT(60% dip in UT) for 5 cycles 70% UT(30% dip in UT) for 25 cycles <5% UT(>95% dip in UT) for 5 s</p>	<p>Mains power quality should be that of a typical commercial or hospital environment. If the user of the <u>Q-tube-I</u> requires continued operation during power mains interruptions, it is recommended that the <u>Q-tube-I</u> be powered from an uninterruptible power supply or a battery.</p>
<p>Power frequency(50, 60 Hz) magnetic field IEC 61000-4-8</p>	<p>3 A/m</p>	<p>3 A/m</p>	<p>The <u>Q-tube-I</u> power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.</p>

NOTE UT is the a.c. mains voltage prior to application of the test level.

Guidance and manufacturer's declaration-electromagnetic immunity

The Q-tube-I is intended for use in the electromagnetic environment specified below.

The customer or the user of the Q-tube-I should assure that is used in such and environment.

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment-guidance
<p>Conducted RF IEC 61000-4-6</p>	<p>3 Vrms 150 KHz to 80 MHz</p>	<p>3 Vrms</p>	<p>Portable and mobile RF communications equipment should be used no closer to any part of the <u>Q-tube-I</u> including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.</p> <p>Recommended separation distance:</p> <p>$d = 1,2 \sqrt{P}$</p> <p>$d = 1,2 \sqrt{P}$ 80MHz to 800 MHz</p> <p>$d = 2,3 \sqrt{P}$ 800MHz to 2,5 GHz</p>
<p>Radiated RF IEC 61000-4-3</p>	<p>3 V/m 80MHz to 2,5 GHz</p>	<p>3 V/m</p>	<p>Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in metres (m).</p> <p>Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,^a should be less than the compliance level in each frequency range.^b</p> <p>Interference may occur in the vicinity of equipment marked with the following symbol:</p> 

NOTE1 At 80 MHz and 800 MHz, the higher frequency range applies.

NOTE2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

- a Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the Q-tube-I is used exceeds the applicable RF compliance level above, the Q-tube-I should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the Q-tube-I.
- b Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

**Recommended separation distance between
portable and mobile RF communications equipment and the Q-tube-I**

The Q-tube-I is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the Q-tube-I can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the Q-tube-I as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter W	Separation distance according to frequency of transmitter m		
	150 kHz to 80 MHz $d = 1,2\sqrt{P}$	80 MHz to 800 MHz $d = 1,2\sqrt{P}$	800 MHz to 2,5 GHz $d = 2,3\sqrt{P}$
0,01	0,12	0,12	0,23
0,1	0,38	0,38	0,73
1	1,2	1,2	2,3
10	3,8	3,8	7,3
100	12	12	23

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in metres (m) can be estimated using the equation applicable to the frequency of the transmitter, where p is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

NOTE2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.