COCOON

USER MANUAL (Model Name : DX-7017 / DX-7020)

CE 1370

DEXCOWIN®

The Portable Handheld Veterinary Radiography System (Product Name: COCOON) is indicated for use only by trained and qualified veterinary surgeon. It is powered by DC adapter or Internal or External battery for a hand-held use.

1. Do not operate this device until you read and review the accompanying user manual completely.

2. See the Certificate of Conformance accompanying your device. COCOON is also complies with DHHS Radiation Performance Standard, 21CFR Subchapter J.

3. COCOON is a trademark registered by Dexcowin Co., Ltd in Korea and other countries. All right reserved.

4. If any serious incident in relation to the device, please report it to the manufacturer and the authority.

Symbols used in this Manual

SYMBOL	NAME	DETAIL
	Radiation warning	"Radiation Warning" sign explains details of possible user radiation hazard.
	Warning	"Warning" sign explains details of possible user damage, death or physical damage.
	Caution	"Caution" sign explains details of possible body damage due to incorrect use of product.
	Check	"Check" sign explains details of necessarily items that users should follow in product installation, operation, and maintenance.

Symbols marked on the packaging of COCOON

SYMBOL	NAME	DESCRIPTION / FUNCTION
	Keep away from rain	This symbol means that transport package shall be kept away from rain.
	Fragile	This symbol means that contents of the transport package are fragile therefore it shall be handled with care.
	This way up	This symbol indicates correct upright position of the transport package.

Symbols marked on COCOON
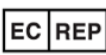
SYMBOL	NAME	DESCRIPTION / FUNCTION
☢ Radiation warning symbol	**Radiation warning**	This symbol indicates radiation hazard.
⚠ Warning symbol	**Warning**	This symbol indicates hazard.
Consult documents symbol	**Consult accompanying documents**	This symbol advises the reader to consult the accompanying documents.
Manufacturer symbol	**Manufacturer information**	This symbol is followed by the name and address of the device manufacturer.
Manufacture date symbol	**Manufacture date**	This symbol is followed by the device manufacture date in the form YYYY-MM.
SN	**Serial number**	This symbol is followed by the device serial number.
EC|REP	**Representatives information**	The manufacturer's EU representative information shows with this symbol.
WEEE symbol	**Separate collection for electrical and electronic equipment**	Indicates the need for separate collection for electrical and electronic equipment in compliance with the Waste Electrical and Electronic Equipment (WEEE) Directive. This symbol indicates that electrical and electronic equipment wastes must not be disposed as unsorted municipal waste and must be collected separately. Please contact the manufacturer or an authorized disposal company to decommission your equipment according to local regulations
CE 1370	**CE symbol**	This symbol indicates the CE notified Body.

TABLE OF CONTENTS

1   Getting Started

1.1   Intended Use/ Prohibition of use

- COCOON is intended for use only by trained and qualified veterinary surgeon for animal use.
- The device is intended used in animal hospital/ animal clinic environment.

1.2   Unpack and Check COCOON

1.2.1   Product composition

COCOON consists of item below.

DX-7017& DX-7020

- Main body: 1EA
- Charging cradle: 1EA
- Charger &AC Cord: 1SET
- Neck strap (Optional) : 1EA
- Back Scattered shield: 1EA
- Product bag : 1EA
- External Battery (Optional) : 1EA
- User Manual (include product warranty certificate): 1EA

Main body	Charging Cradle	Charger & AC Cord
Neck strap (Optional)	Back scattered shield	Product bag
External battery (Optional)		User manual & Warranty

Figure1.1 Product Composition (DX-7017 / DX-7020)

1.2.2 Preliminary Checks

Item	Check
Device Labels	As shown in Figure 1.2 below, make sure that the label is attached to the device in place.
Other Labels	Make sure that the serial number on the Warranty matches the device serial number and the device carrying case serial number.
Collimator cone	Inspect for damage. The lead lining must cover the entire interior surface.
Trigger switch	Should move freely in and out when it is pushed and released.
Control panel	Should be smooth and free of scratches, damage or nicks.

- Label-Outside (applicable to both Model: DX-7017, DX-7020)

This X-ray is complied with all applicable standards under 21CFR subchapter J.
Warning! : This X-ray unit may be dangerous to patient and operator unless safe exposure factors, operating instructions and maintenance schedules are observed.

Focal Spot

①Model: DX-7017　　　　　　　　　②Model: DX-7020

Portable Handheld X ray System
Trade mark : Cocoon
Model : DX-7017
Sources of electricity : DC 14.8V
Tube voltage : 70kV (Fixed)
Tube courrent : 1.7mA (Fixed)
Total filitration : 2.3mmAl (Inherent filitration 1.5mmAl)
CE 1370 Made in Korea
Manufacturer #905, 2, Gasan digital 1-ro, Geumcheon-gu, Seoul. Korea.
DEXCOWIN Co., LTD Tel : +82-2-2027-2880 / Fax : +82-2-2027-2884

Portable Handheld X ray System
Trade mark : Cocoon
Model : DX-7020
Sources of electricity : DC 14.8V
Tube voltage : 70kV (Fixed)
Tube courrent : 2.0mA (Fixed)
Total filitration : 2.3mmAl (Inherent filitration 1.5mmAl)
CE 1370 Made in Korea
Manufacturer #905, 2, Gasan digital 1-ro, Geumcheon-gu, Seoul. Korea.
DEXCOWIN Co., LTD Tel : +82-2-2027-2880 / Fax : +82-2-2027-2884

Figure 1.2 labeling on Main Body

Inside: X-ray tube assembly

①Model: DX-7017

High Voltage Tank

Model : DXG-7017
- Manufacturer : DEXCOWIN Co., Ltd.
- Rating : 70kV, 1.7mA
- Output Power : 119W
- Added Filtration : 0.8 mmAl

X-ray Tube
- Manufacturer : TOSHIBA Corp.
- Model : D-041
- Focal Spot : 0.4mm
- Inherent Filtration : 1.0mmAl

②Model: DX-7020

High Voltage Tank

Model : DXG-7020
- Manufacturer : DEXCOWIN Co., Ltd.
- Rating : 70kV, 2mA
- Output Power : 140W
- Added Filtration : 0.8 mmAl

X-ray Tube
- Manufacturer : TOSHIBA Corp.
- Model : D-041
- Focal Spot : 0.4mm
- Inherent Filtration : 1.0mmAl

Figure 1.3 Labeling on X-ray tube assembly

Caution :
Use only Dexcowin's adapter and cord originally packaged with the device to prevent damage to battery or accident. Otherwise, the warranty will be avoided or product liability by a manufacturer will be exempted.

DEXCOWIN®
Adapter
※ When charging the Dexcowin's battery or device, only use this adapter.

Figure 1.4 Charging Cradle and Adapter

1.3 Product Features

1.3.1 Features

- Medical Device Name: Portable Handheld X-RAY System

- Product Name: COCOON

- Model Name: DX-7017, DX-7020
  * Differences between the DX-7017 and DX-7020
  The operating principle of both models is the same. Only rating is different.
  The rating of the DX-7017 is (70kV, 1.7mA) and the rating of the DX-7020 is (70kV, 2.0mA).

- Display: 3.12″ OLED (Resolution: 256 x 64)

- Function for user

  - Exposure time can be set

  - Intuitive Graphic User Interface

  - Radiation Exposure Interval Setting Function

  - Trigger use

  - Automatic Shut Down

- Designed for user's wrist protection

COCOON LEFT   COCOON TOP   COCOON FRONT   COCOON BACK
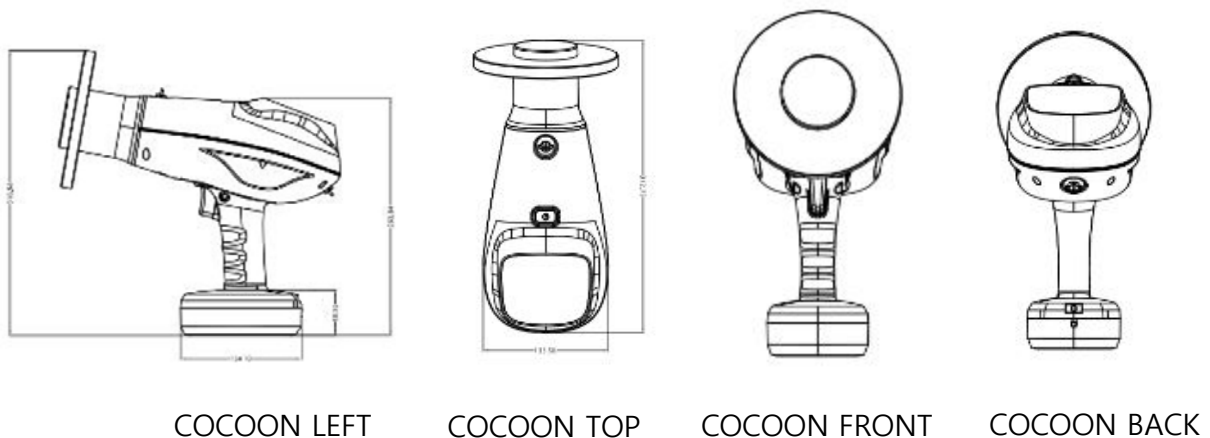
Figure1.5 COCOON drawing

1.4 Product specifications

1.4.1 Device main body

	Model Name	DX-7017	DX-7020
	X-RAY tube focal spot size	0.4 mm	
	Protection type	B type	
	Grade for electrical shock		
	Waterproof rating	IPX0	
	Mode of operation	Discontinuous operation	
	Cooling method	Oil cooling method	
	Total filtration	More than 2.3mmAl (inherent filtration: 1.0 mmAl)	
	Input power	DC 14.8 V	
	Target Angle	12.5˚	
	Distance to target	Distance between target and Focal Spot > 18 cm (7 inch)	
COCOON Main Body	Main body weight	2.3 kg (Exclusion Back scattered shield)	
	Operating temperature	10 - 40℃	
	Operating humidity	30-75% RH, non-condensing	
	Atmosphere pressure condition of use	700 ~ 1060 hPa	
	Battery Type	Embedded inside of main body not removable battery type	External battery type
	kV (fixed)	70kV	70kV
	mA (fixed)	1.7mA	2.0mA
	Power consumption	350 W	350 W
	Exposure time	0.05~1.0sec	0.05~1.0sec
	Exposure time setting interval	0.01 sec	0.01 sec

*Note : Differences between the DX-7017 and DX-7020

The operating principle of both models is the same. Only rating is different.

The rating of the DX-7017 is (70kV, 1.7mA) and the rating of the DX-7020 is (70kV, 2.0mA).

1.4.2 Charger specification

- Model name: BPL910S16F01
- Input: AC 100-240[V], 50/60 [Hz], 0.5 [A]
- Output Voltage: DC 16.8 [V]
- Output Current: 1.0 [A]

1.4.3 Battery charging cradle

- Model name: Cradle
- Charging voltage: DC 16.8 [V]
- Charging current: 1.0 [A]
- Discharging voltage (at the time of battery connection): vary depending on discharging condition
- Discharging current (at the time of battery connection): vary depending on discharging condition
- Size: 270(L) x 132(W) x 195(H)

1.4.4 Each part name of main body

● Each part name of main body is as following.

①DX-7017& DX-7020

Figure 1.6 Each part name of main body (DX-7017/DX-7020)

1.4.5 DC adaptor & cord

- The part name of charger is as shown in Figure 1.6.

(TOP)   (BOTTOM)

Output indicator lamp

Charging
adapter label

Charging power jack

AC input connector

AC power cord

Figure 1.7 Part name of DC adaptor part

- Output indicator lamp: displays the current output status.
- Charging power jack: supplies DC output power from the adapter.
- Charging adapter label: lists the model name, input/output conditions, certification, serial number, and so on.
- AC input connector: connects the AC input of the power cord.
- AC power cord: connects external AC power.

1.4.6 Battery charging cradle

① The name for each part on charging cradle

Charging terminals

Charge indicating lamp

DC input connector

Figure 1.8 Part name of charging cradle

- **Charging terminals:** connect output terminal of battery pack to charging terminals of charging cradle and charge the battery.
- **Charge indicating lamp:** Indicates each status of charging or charge completion by different colors.(red: charging, green: charge completion, yellow: charge error)
- **DC input connector:** receives charging power from charging adaptor

1.4.7 External Battery

Output terminal jack

Battery label

Battery state LED

Charge terminal
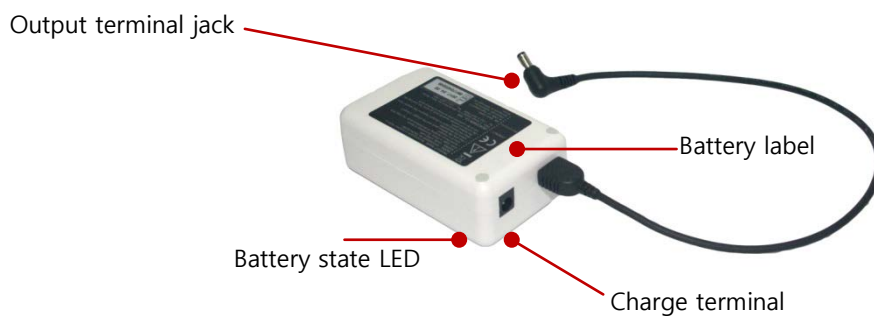
Figure 1.9 Part name of external battery (Optional)

- Output terminal jack: supplies DC output power from the external battery. It's length over than 14.5 inches.
- Battery label: lists the model name, input/output conditions, certification, serial number, and so on.
- Battery state LED: indicates each status of charging or charge completion by different colors (red: charging, green: charge completion)

- Charge terminal: connect charging power jack of DC adaptor to charge terminal of external battery. Then the external battery is charged.

1.5 Charging the Battery

NOTE : The battery is tested and fully charged for shipping at the factory. However battery is to be fully charged prior to initial use to prevent function damage of battery or discharged to lower level in case unused stored for long time period such as three(3) months.

DX-7017& DX-7020 (Inner Battery)

- ① Connect the AC power cord to the AC socket on the charger.
- ② Connect the DC output connector to the cradle.
- ③ Put handle of the main body to the cradle.
- ④Connect the AC power cord to a power outlet rated AC 100-240[V], 50-60[HZ].
- ⑤Battery charging cradle's and DC adapter's LED indicator turns on the red when power is connected.
- ⑥ When charging is finished, Battery charging cradle's and DC adapter's LED indicator turns on the green.

① Connect the AC power cord to the charger.

② Connect the DC output connector to the cradle then put handle of the main body to the cradle.

③ When charging is finished, battery charging cradle's and DC adapter's LED indicator turns on green.

Figure 1.10 Charging the battery (DX-7017)

Charging external battery

- ① Connect the AC power cord to the AC socket on the DC adapter

- ② Connect the DC output connector to the External battery

- ③ Connect the AC power cord to a power outlet rated AC 100-240[V], 50-60[HZ]

- ④ External battery's and DC adapter's LED indicator turns on the red when power is connected

- ⑤ When charging is finished, External battery's and DC adapter's LED indicator turns on the green

① Connect the AC power cord to the DC adapter.

② Connect the DC output connector to the external battery. When power is connected, DC adapter's and External battery's LED indicator turns on red.

③ When charging is finished, External battery's and DC adapter's LED indicator turns on green.

Figure 1.11 Charging the External battery

Caution

Use only Dexcowin's adapter and cord originally packaged with the device to prevent damage to battery or accident.

Otherwise, the warranty will be avoided or product liability by a manufacturer will be exempted.

2   Safety Precautions

2.1   Radiation Safety

	WARNING
☢	This X-ray unit could be dangerous to the animals or the operators unless safe exposure factors, operating instructions and maintenance schedule are observed.

- X-RAY operator must pay attention on the status of a patient in case of emergency.
- X-RAY operator must stop operating if disorder is detected.

Symbols and details

⊘	**"Warning"** sign explains details of possible user damage, death or physical damage.
⚠	**"Warning"** means potential danger, in order to avoid serious personal injury or death.

2.2   Cleaning

- Power off or separate power supply before cleaning.
- Before cleaning the battery charger, make sure that the battery charger is unplugged.
- This device is not waterproof device (IPX0)
- Do not use any liquid, wet cloth or spray for the device cleaning.
- The warranty will be avoided or any product liability will be exempted in case of inundation relevant complaints.

> ⚠ **CAUTION**
>
> Turn off the device before carrying out cleaning operations.
> Do not spray products directly on the device. Apply the product on a clean cloth.

This device is not waterproof device (IPX0)
Do not use any liquid, wet cloth or spray for the device cleaning
The warranty will be avoided or any product liability will be exempted in case of inundation relevant complaints

2.3   Security, Storage, and Transportation

- To prevent unauthorized use, COCOON should be stored securely when not in used.
- If you have finished using COCOON, keep it in a separate place to prevent unauthorized use.

2.3.1 Storage

- Store the device in a safe place for access by qualified person.
- The X-RAY section that is in direct contact with the animal should be cleaned with rubbing alcohol frequently.
- Do not use near heaters or heating devices.
- Please keep in storage after use.
- Do not randomly convert. If SEAL attached to the product is damaged, A/S is not provided free of charge.
- Use device and parts safely after performing regular check-up at designated A/S center only.
- Avoid following places for storage and use of device.
  - Place with lots of moisture
  - Place with direct sunlight
  - Place with lots of dust
  - Place with high humidity
  - Place with no ventilation
  - Place with lots of saltiness
  - Place with chemical substance or explosive gas

2.3.2 Check for Product storage

- Avoid place with high humidity or direct sunlight when storing.
- Avoid place with lots of dust, slope, and dirt when storing.
- Do not store in place with extreme temperatures.

2.3.3 Transportation and Storage conditions

- Transportation and storage temperature: -25 ~ 40 ℃

- Transportation and storage humidity: 10 ~ 95 %
- Transportation and storage atmosphere pressure: 500 ~ 1060hPa

3 Warning / Caution and instructions

3.1 Warning and instructions

3.1.1 Warning for product use

- Do not modify the device without authorization of the manufacturer.
- When using device, if radiation exposure safety regulations and operation related guidelines are not followed, both animals and operators can be at risk.
- Only authorized skilled technician or person can operate this device.
- Please use this device only for designated purpose.
- When using this device, if any abnormalities are found with the animals, please stop using the device, and ensure the safety of animals.
- Please do not randomly alter the device while using.
- Make sure fire extinguisher is onsite in case of fire-related emergencies.
- Patients with pacemakers may experience malfunction.

3.1.2 Warnings for Product inspection

- Do not touch product, power supply, or plug with wet hands to avoid electrical shock.
- When cleaning the product, please separate the device from a power outlet and clean it with dry clothes.

3.2 Caution and instructions

3.2.1 Caution for product use

- Please ensure not to exceed X-RAY exposure required for image diagnosis.
- Handle the device with care; do not use sharp object or cause a severe impact on the device. Follow the instruction carefully and use for recommended applications.
- Use only in the recommended temperature, humidity and pressure.
- Do not let the device get wet or be exposed to liquids.

3.2.2 Caution for storage

- Moisture, salinity, dust and etc. can affect the performance of device. Do not store device in places with such conditions.
- Do not store product in places with frequent temperature changes or direct sunlight for extended periods. In extreme temperatures, the high voltage generator's cooling and insulating oil could be shrunk, swollen, frozen, or overheat causing critical damages to device function.
- Do not store product together with explosive gas or chemicals.
- The device must be stored in protection case. When being damaged physically at unsafe place, it may cause critical damages to device function.
- Do not place the device on high shelf or any narrow place. If the device falls, it may be damaged or harm the user.
- Do not store the device in the trunk of car or at cargo van of vehicle. If device must be stored in those locations, ensure it is tightly secured.

3.2.3 Caution for other matters

- In case of device breakdown, mark properly and leave it to designated professional at A/S center
- Do not let animals touch the device at their own risk.
- If device is dropped, do not turn it on and detach power supply.
- When discarding product,

Indicate the need for separate collection for electrical and electronic product in compliance with the Waste Electrical and Electronic Equipment(WEEE)Directive. This symbol indicates that electrical and electronic equipment wastes must not be disposed as unsorted municipal waste and must be collected separately. Please contact the manufacturer or an authorized disposal company to decommission your equipment according to local regulations

Warning: If any serious incident in relation to the device, Please contact by fax or e-mail to European representative or Dexcowin CO., LTD. or the local authority.

4   Items to check

4.1   Items to Check

- Read user manual before operating the device for proper usage.
- Double check the part of device that directly contacts animals.
- Use device with designated sequence.
- Use device at stable location with good ventilation.
- Clean the device with dry cloth. Do not wet the device.
- Regularly inspect device for malfunctions.

5 Setup and Check

5.1 The Back scattered shield

5.1.1 Performance of back scattered shield

- Figure 5.1 indicates the scattering radiation area which is changed using back scattered shield.
- The back scattered shield limits scattering radiation area to the intended target.

Scattering radiation area without back scattered shield

Scattering radiation area with back scattered shield
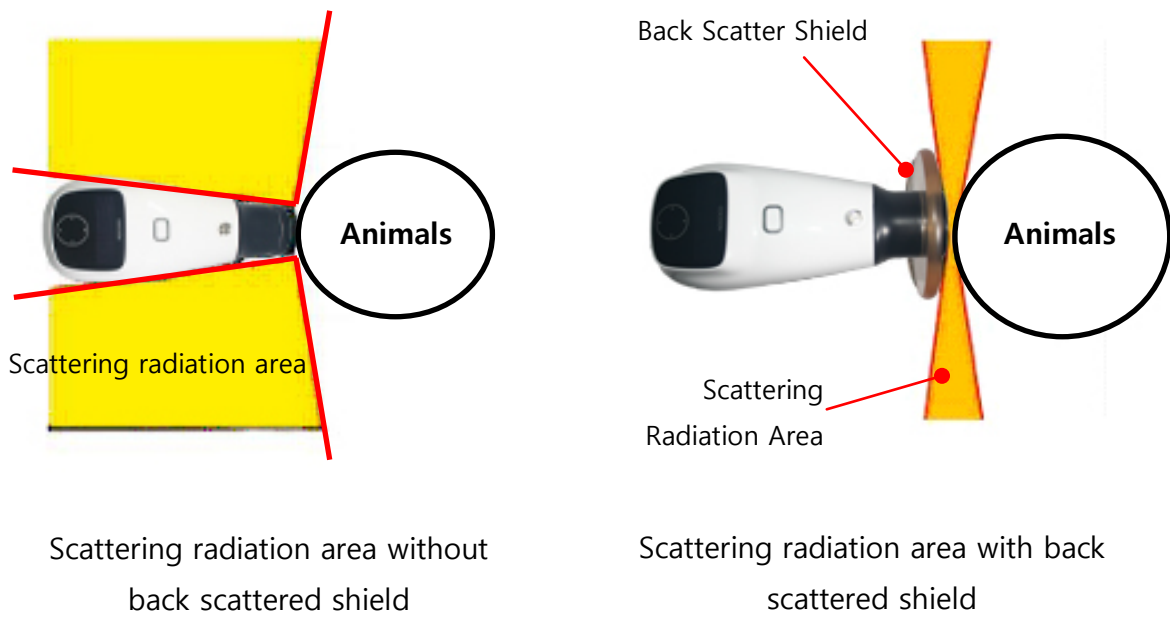
Figure 5.1 Comparison of Scattering Radiation Areas, With and Without use of Back Scattered Shield

5.2 Detachable battery

- COCOON's battery type is the detachable battery.
- The battery is detachable from the main body.
- Turn on the power to check that the device is working properly.
- If it occurred trouble shooting, see section 8.1.

Figure 5.2 Detachable battery type

5.3 External Battery

- Connect the external battery output terminal to main body's external terminal connector.
- Turn on the power to check that the device is working properly.
- If it occurred trouble shooting, see section 8.1.

Figure 5.3External battery

5.4 Checking for Power and Battery Charge State

After fully charging the battery, press and release the POWER button. The OLED display should illuminate, accompanied by a single audible signal.

②Check the battery level indication and remaining battery level on the upper right of the main screen.

③As battery is low; it would be warned by buzzer, low battery indicator lamp on OLED window or warning sound.

④If battery level gets low; it needs to be charged before use.

5.5 Basic Function Checks

● COCOON is calibrated at the factory and tested prior to shipping out. There are no adjustment options.

①**ON/OFF button**: Fully charge the COCOON battery. Press the POWER button to check the ON and OFF button status.

②**Increase/Decrease touch panel (Up and Down Arrows)** : With the device on, press the Increase and Decrease, Left and Right touch panel to select the option you want to adjust.

③**Automatic Shut-Off:** Press the power button to turn the device on and wait for about 5 minutes until it turns off automatically if it is not in use.

6 Operation

6.1 Powering up

● Name for each button on top side of COCOON is shown in figure 6.1

.

Power On/Off button

Direction panel: up/down/left/right

Exposure lamp

Figure 6.1 Name for Each part on top side button and panels

● After pressing power button on the top of main body for 1 second, a green light should appear around the button, along with buzzer sound. Display should turn on with manufacturer's logo as pictured in Figure 6.2.

Figure6.2Manufacturer logo

● After logo disappears, Main (X-ray) control screen will be displayed.

6.2   Checking the battery charge

- Low battery will be indicated by buzzer sound, OLED screen, Low battery indication lamp and battery warning sound when power is on.

- The battery level displays on the upper right side of the main control screen are shown in Figure 6.3.When the battery level is between 0 ~ 15%, please charge the battery.

Figure6.3 Battery level indication

- If the device is used without charging the battery even after the 'LOW' battery indicator is displayed, the battery warning massage shown in Figure 6.4 appears on the OLED screen for a few seconds and then the device is forcibly turned off.

Figure 6.4 OLED screen Indicating Low Battery

6.3 Powering off

● TO turn off COCOON, press down the POWER button for one seconds. (COCOON will turn off automatically if not used for about 5 minutes.)

Figure 6.5 POWER BUTTON

6.4 Exposure Techniques

6.4.1 Animal's positioning

● Place animal bilateral symmetry to the chair.

● Make sure animal's position is fixed.

● It is recommended to set exposure position about 15~30° from animal's position, but the degree and position can be adjusted according to the user's convenience. However, the animal should not move while exposed.

> **CHECK**
> Before operator exposes X-ray, position of film or intraoral sensor or PSP and COCOON should be parallel. If the angle is deviated, the image can be distorted.

6.5 Control of COCOON

6.5.1 Main control screen composition

①Main(X-ray) control screen
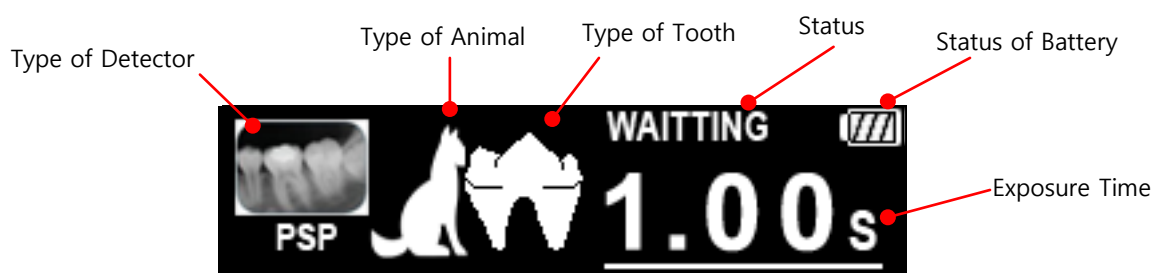
Figure 6.7Name for each part on Main(X-ray) control screen

- Type of Detector: Indicates the type of detector you are going to use for exposure.
- Type of Animal: Indicates the animal's type(size)
- Type of Tooth: Indicates animal's type of tooth (incisors, canine, premolar, molar)
- Status: Indicates the current operating state of the device.
- Status of Battery: Indicates the current state of the battery.
- Exposure time: Indicates X-ray exposure time.

6.5.2 Main control screen

- At main control screen, Exposure time can be adjusted.
- Each parameter is adjustable using the touch panel on the main body as shown in Figure 6.8.
- Touch the ▲ ▼ ◄ ► touch panel to change each of the setting options you have on the screen.

Figure 6.8 Control screen on the main body

6.5.3 Setting the Exposure Time

- When power is turned off, the most recent setting for exposure time is stored in memory and redisplays when power is turned on again.
- Recommended exposure time is preset according to the type of detector, animal or tooth you choose, but exposure time can be adjusted.
- To change setting options, touch the ▲ ▼ ◄ ▶(increase/ decrease/ left/ right) touch panel.

> **CAUTION**
>
> X-ray is generated while x-ray exposure trigger is pressed only. If the exposure trigger is released while exposure buzzer sounds, exposure stops immediately.

Table 6-1. Time set table by tooth

Classification			Teeth types and exposure time			
		Tooth Object Size	Incisors	Canines	Premolars	Molars
Distance between cone and skin (18cm)	SENSOR	Small (Cat)	0.05 ~ 0.10	0.10 ~ 0.20	0.20 ~ 0.30	0.30 ~
		Medium (Dog)	0.10 ~ 0.15	0.15 ~ 0.25	0.25 ~ 0.35	0.35 ~
		Large	0.10 ~ 0.20	0.20 ~ 0.30	0.30 ~ 0.40	0.40 ~
	PSP	Small (Cat)	0.10 ~ 0.20	0.20 ~ 0.30	0.30 ~ 0.40	0.40 ~
		Medium (Dog)	0.15 ~ 0.25	0.25 ~ 0.35	0.35 ~ 0.45	0.45 ~
		Large	0.20 ~ 0.30	0.30 ~ 0.40	0.40 ~ 0.50	0.50 ~
	FILM	Small (Cat)	0.20 ~ 0.30	0.30 ~ 0.40	0.40 ~ 0.50	0.50 ~
		Medium (Dog)	0.25 ~ 0.35	0.35 ~ 0.45	0.45 ~ 0.55	0.55 ~

		Large	0.30 ~ 0.40	0.40 ~ 0.50	0.50 ~ 0.60	0.60 ~

6.5.4 X-RAY exposure

● The position of exposure trigger and safety lock is as shown in Figure 6.10.

Exposure trigger

Safety lock

Figure 6.10 Exposure trigger and Safety catch of COCOON

● When X-ray exposes, the user must keep pressed the exposure trigger.

● COCOON's X-ray exposure procedure is described below. Please set up the location of user and animal at the best for shooting before exposure X-ray.

● When pressing trigger, a melody plays to signal the x-ray exposure warning sound, which is followed by a consecutive buzzer sound. X-ray is only generated during the period of consecutive buzzer sound.

● When X-ray is generated, the 'READY' signal on upper main control screen changes to 'EXPOSURE'. The X-ray indicating lamp of main body is changed from green to

yellow.

- When the X-ray exposure is finished, the 'EXPOSURE' signal disappear from the upper main control screen and 'WAITTING' signal is displayed and turn off the led. There after the 'READY' signal returns. When the 'READY' signal returns, the lamp will turn on to green.

- Exposing of X-ray is only during buzzer sound while the trigger is being pressed, and exposure will stop when trigger is released.(DMS method - Dead Man's Switch)

Figure 6.11 Before, During and After Exposure screen

> **CHECK**
>
> Exposure time set will be saved automatically when the device turns off and the last setting will stay until a new setting is attempted after the device turns back on.

6.5.5 Screen setting

● Touch▲ ▼panels together to move to the screen setting. The current menu is displayed as the location of the cursor. The name of each part on the screen is shown in Figure 6.12.
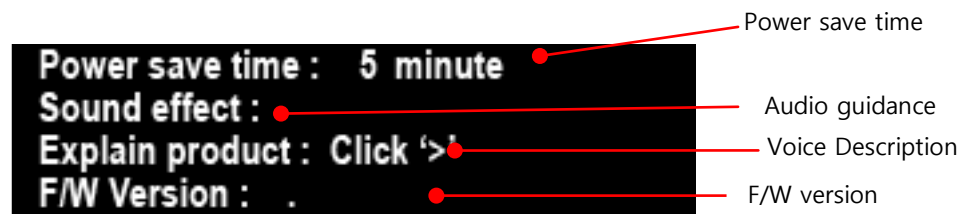
Figure 6.12 Setting screen

● Use the 'Select' panel to select the menu with the cursor in front.

● Touch◀ ▶panels to change the parameter.

● **Power save time:** Indicates that device turns off automatically if not used for a few minutes.

● **Sound effect:** Guide the function and status to voice.

● **Explanation of products :** A brief description of the product is played for about 3 minutes

● **F/W version:** Indicates the currently applied software version.

7　Quick user guide

Press power button over 1 second. Then the OLED display should illuminate, accompanied by a single audible signal.

②Change setting value by▲/▼＆◀/▶ direction touch panel.

③Check the safety lock position before expose the x-ray. Then press exposure trigger.

④ Check the X-ray image. If the image has any problem, try the above procedure again. If there is no abnormality, press power button over 1 second in order to turn off the device.

⑤After use COCOON, please keep in a safe place.

8 Inspection items before repair request

8.1 Check items before requesting inspection

● If abnormality is found in product, confirm following items before inspection request

Table 8-1.Steps to take for device malfunctions

SYMPTOM		STEPS TO TAKE
Power defect	**After turning on power, both sound or OLED screen are not turned on**	● Check that the battery is charged.
	Device turns off automatically while in use	● Check that the battery is charged.
Exposure defect	**Exposure sound is not heard when X-RAY is exposure**	● Check if OLED display is main control screen status. X-ray is exposed with main control screen only.
Others	**DC adaptor is not working**	● Check that the DC adaptor is connected to the AC power cord. ● Check that the AC power cord is connected correctly to AC power outlet. Correct input voltage of this device is AC 100-240V, 50/60[Hz] ● When DC adaptor is connected correctly to the power outlet, LED light at upper main part of the device lights up green. ● If the device does not operate despite successful connection, disconnect it from the power outlet and contact an authorized service center.

8.2 Troubleshooting

Table 8-2.Troubleshooting

PROBLEM	CAUSE	SOLUTION
Nothing lights up	The battery is low.	Connect the battery charger
No X-ray emission	Generator is preparing an exposure. No display on screen.	Wait for ready to X-ray exposure (about 5 seconds)
	Button or trigger defective.	Call a qualified service technician.
X-ray emission works, but exposure is too light or completely white	Receptor defective.	Call a qualified service technician.
	Exposure is positioned incorrectly.	Adjust the position of the exposure according to the user manual.
	Exposure time is too short.	Increase the exposure time.
	Device defective.	Call a qualified service technician.
X-ray emission works, but exposure is too dark	Receptor defective.	Change the receptor or compare with another receptor.
	Exposure time is too long.	Decrease the exposure time.
	Device defective	Call a qualified service technician.

8.3 Maintenance schedule

- Periodically review Section '1.1 Intended use / Prohibition for Use' for use and product labeling to verify instructions for COCOON.
- User should regularly familiarize themselves with Section 3 Warning / Caution and, Section 4 Items to check instructions.
- When a malfunction occurs, please refer to section 8 to inspect the item. Please contact the manufacturer/dealer immediately if the product seems to have abnormalities.

8.3.1 On-going check

- When turning on product power, confirm if 'power on' sound plays and normal initial screen is displayed.
- Exposure time settings is changed by using direction touch panel, confirm if time is changed normally.
- When X-ray exposure, confirm if buzzer sound plays, and exposure indicating lamp turns to yellow
- After device power on, check that the LED light is on and that the device is operating properly.

8.3.2 Annual User Check

- User should review the following material yearly, and be sure to record their results in the Maintenance Log Sheets located in Section 8.3.4.
  - ➢ Power button verification: If you press the power button for 1 second, a beep will sound to signal that the machine has powered on. While the machine is on, press the power button for 1 second to shut the machine down. Please check that the machine has indeed turned off.

➢ Confirm that the status on the Main Control screen is 'Ready' and that it blinks when the 'select' panel is touched.

➢ Dead-man button verification: Set the exposure time to maximum seconds. Then use the exposure trigger to start the X-ray exposure. Before the exposure time reaches maximum seconds, release the trigger. Check that the X-ray exposure terminates.

➢ Setting verification: Under the setting screen, check that the appropriate settings have been saved.

➢ DC adaptor verification: Connect the DC adaptor to AC source, and make sure that the LED light signaling turns on.

8.3.3 Annual Calibration

- Set up a calibrated Performance Meter (such as the Piranha554) according to manufacturer's specifications to detect and report the following: X-ray Tube Voltage, Exposure Time, and Dose.

- Measurement Method: Final performance measurements are made using a Piranha554. Exposure time is measured from the moment X-rays are detected until they are no longer detected, which means 90% crossing setting is selected with no timer delays. Linearity is calculated per IEC60601-2-7, 50.102.2a

- Enable the COCOON and, with the collimator perpendicular to the test detector, check exposures into by using the test detector. Compare results with the factory release parameters indicated in the chart below.
  For results outside these parameters, discontinue use and contact DEXCOWIN.

- This device should be calibrated once a year.

Table 8-3 Test Acceptance Ranges

Test Description	Acceptance limits	Exposure Time (mSec)				
		50ms	100ms	300ms	500mS	1000ms
kVp Accuracy	70kV ±10%	64 ~ 77kV	64 ~ 77kV	64 ~ 77kV	64 ~ 77kV	64 ~ 77kV
Timer Accuracy	Set point ±10%	45 ~ 55ms	90~ 110ms	270~ 330ms	450 ~ 550ms	900 ~ 1100ms

8.3.4 Maintenance Log Sheet

Table 8-4.Maintenance Log Sheet

Maintenance Test	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
	Date /Initial	Date /Initial	Date /Initial	Date /Initial	Date /Initial	Date /Initial
1. Power button						
2. Exposure sequence						
3. Remote button						
4. Dead-man button						
5. Setting						
6. DC adaptor						
7. Calibration						

9 Technical Description and Product Warranty

9.1 Basic Technical specifications

COCOON Main Body	Product Type	Portable Handheld X-RAY System	
	Protection type	B type	
	Grade for electrical shock		
	Waterproof rating	IPX0	
	Mode of operation	Discontinuous operation	
	Cooling method	Oil cooling method	
	Total filtration	More than 2.3mmAl	
	Input voltage	DC 14.8V	
	Model Name	DX-7017	DX-7020
	kV (fixed)	70kV	70kV
	mA (fixed)	1.7mA	2.0mA
	Power consumption	350W	350W
	Exposure time	0.05~1.0sec	0.05~1.0sec
High voltage Generator	Model name	DXG-7017	DXG-7020
	Input voltage	DC 14.8V	
	Max Output power	119 W	140 W
	Rating	70kV, 1.7mA	70kV, 2.0mA
X-ray tube D-041	Focal spot	0.4 mm	
	Target Angle	12.5˚	
	Inherent Filtration	At least 1.0mmAl	
	Operating tube voltage	70kV	

9.2   High voltage generator

9.2.1 X-ray Tube Specifications and Characteristics

- X-ray tube model name   D-041

  - Manufacturer   TOSHIBA(JAPAN)
  - Operating Tube Voltage   70kV
  - X-ray tube focal spot   0.4
  - Nominal Anode Input Power (at 1.0s)   See rating chart
  - Constant potential high-voltage generator   430W
  - Anode Angle   12.5 degree
  - Material   Tungsten
  - Inherent Filtration   At least 1.0 mmAl
  - X-ray Coverage   φ70 mm at SID 200 mm
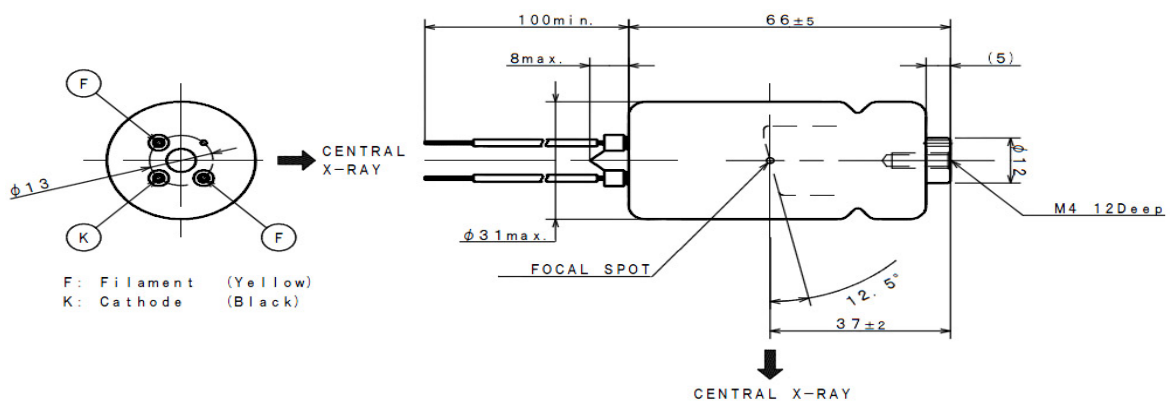 - Anode Heat Content   4300 J
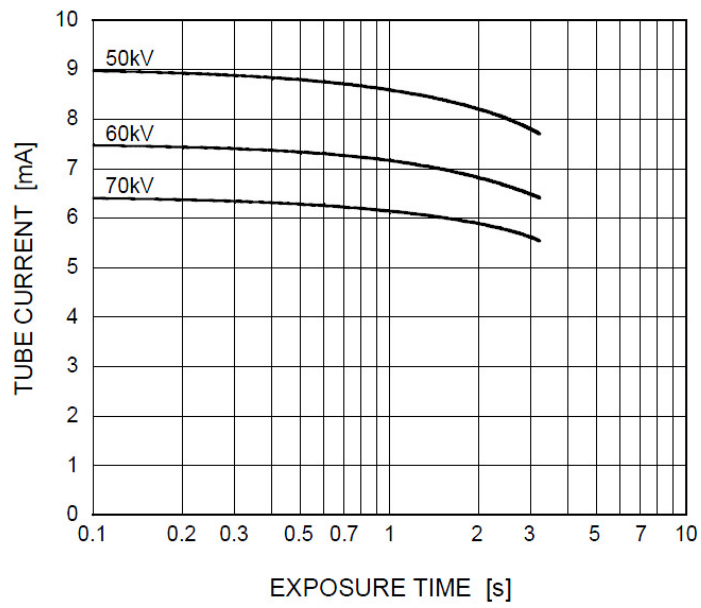 - Maximum Radiographic Exposure Time   3.2 s
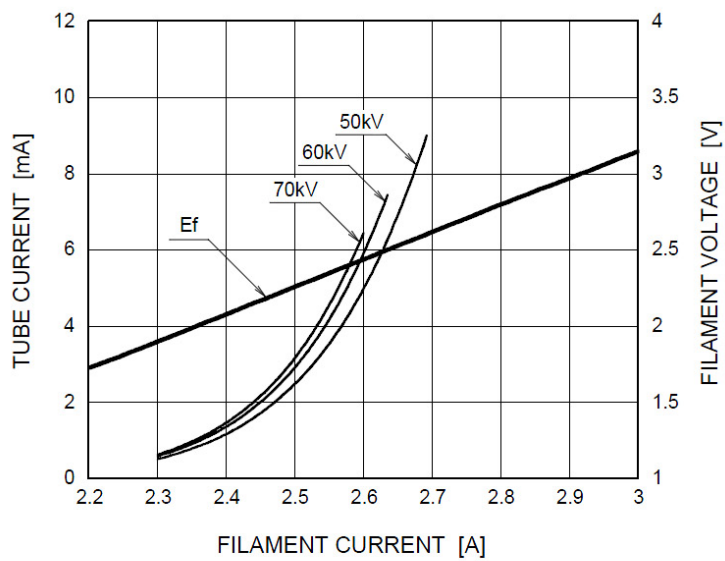

Figure 8.1 Toshiba D-041 X-ray tube outline drawing

Figure 8.2 Maximum rating charts

Note: This graph indicates typical characteristics.

Figure 8.3 Emission & Filament characteristics

9.3 EMC Data

> **WARNING**
>
> Other cables and accessories may negatively affect EMC performance.
> Use of other accessories may result in non-compliance.
> COCOON should not be used adjacent to or stacked with other equipment. If adjacent or stacked use is necessary, COCOON should be observed to verify normal operation.

- Mobile RF communications equipment can affect medical devices.
- This equipment generate, use and emit radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to other devices in the vicinity. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to other devices, 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 device.
- Increase the separation between the equipment.
- Consult the manufacturer or field service technician for help.

Table 8-1.Electromagnetic emission

The COCOON is intended for use in electromagnetic environment specified below. The customer or the user of the COCOON should assures that it is used in such an environment.

Emission test	Compliance	Electromagnetic environment - guidance
RF emissions – CISPR11	Group 1	The COCOON 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- CISPR11	Class B	The COCOON is suitable for use in all establishments, including domestic establishment 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 IEC6100-3-3	Complies	

9.3.1 Electromagnetic interference

- Radiated emission (electric field): 30 ~ 1000[MHz].

- Min. limit margin: 4.9dB at 1000[MHz].

Table 8-2.Radiated emission data

TEST	FREQUENCY [MHz]	ATENNA POL. [H/V]	READING LEVEL [dBuV]	CORRECTION (AF+CL) [dB/m]	EMISSION LEVEL	LIMIT(10m) [dBuV/m]	MARGIN [dBu/V]
Value	1000	H/V-	<2.0	30.1	<32.1	37	>4.9

Table 8-3.Electromagnetic Susceptibility

FIELD	CONTENTS			
Radiation field	**Frequency range**	**Field strength**	**Modulation**	**Frequency step**
	80 ~ 2500 [MHz]	3 [V/m] 10 [V/m]	AM 80 [%] 1 [kHz] sine wave	1 [%] / 3 step
Magnetic field	**Test frequency**	**Field level(EMF)**	**Duration**	**Axis of orientation**
	50 [Hz]	3 [A/m]	60 seconds each axis	X. Y, Z axis

9.4   Product Warranty

- Dexcowin offers a manufacturer warranty for all products by One year from the purchase date or installation date.

- This product is manufactured under strict quality assurance standard and inspection process.

- If breakdown occurs during warranty period under normal usage, free repair service will be provided.

- If breakdowns are due to incorrect usage or negligence, there will be charges for repair services even if within warranty period.

- The warranty for a battery is not extended or the extension of warranty policy is not applicable to the battery.

- We strongly recommend the battery is to be replaced every year It must be at least every two years to prevent any possible accident.

- If the battery replacement rule is refused or not accepted by the customer, Dexcowin will be exempted or free from any product liability for an accident caused by the battery.

- If you have other questions or product related inquiries, please contact Dexcowin Co., Ltd., customer service center.

For better management of quality and customer service, fill out all of the above, and fax or email to our company.

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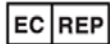# DEXCOWIN®

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