DIAGNOSTIC X-RAY UNIT

User Manual

mini 90

CE

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For better performance and safety, this manual may be changed without any prior notice.
The original version of mini 90 is being written in English.

DIAGNOSTIC X-RAY UNIT

USER MANUAL **mini 90**

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Section 1.

General Information

DIAGNOSTIC X-RAY UNIT
USER MANUAL **mini 90**

Contact

Manufacturer

ECORAY Co., Ltd.

- Manufacturer : ECORAY Co., Ltd
- Address : #714-716 ForHu B/D, 58, Wangsimni-ro, Seongdong-gu, Seoul, Korea 04778
- TEL : +82 70 7510 3400
- FAX : +82 70 8630 3420
- E-mail : info@eocray.kr
- URL : www.ecoray.kr

Complied Standard

The diagnostic x-ray unit is manufactured according to the following standard and associated unit.

■ Safety

☞ IEC 60601-1 (Test Report No. : UL-2022-SM-357)
Medical Electrical Equipment
Part 1: General requirements for basic safety and essential performance

■ EMC

☞ IEC 61000-3-2 / 61000-3-3 (Test Report No. : 4790718886-CE1V1)

- Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤16 A per phase)
- Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤16 A per phase and not subject to conditional connection

■ Rechargeable Lithium Polymer Battery Pack

☞ ST/SG/AC.10/11/Rev.7 (Test Report No. : HCT-BA-2201-RE005)
(Recommendations on the Transport of Dangerous Goods: Manual of Tests and Criteria, Part III, Sub-Section 38.3-Lithium metal and lithium ion batteries)

☞ IEC 62133-2 : 2017 (Test Report No. : KR217O8U 001)
(Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for portable sealed secondary lithium cells, and for batteries made from them, for use in portable applications)

■ FCC (Federal Communication Commission)

☞ FCC Part 15 Subpart B, Class A (Test Report No. : 4790681577-FE1V1)

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

Guarantee Condition & Contact

Manufacturer offers the following guarantee to the purchaser of this unit. The guarantee is valid for **24 months** (**Battery Pack : 12 months**) from when the unit is handed over to the first retail purchaser. The guarantee covers all problems caused by faulty manufacture or faulty material. Call the customer department where purchased when problems arise. Customer responsible for freight charges for repairs.

- The guarantee is valid only when the unit is installed in the proper environment as specified in the usage guide section. Make sure to use the unit as instructed in the usage guide section.
- The guarantee does not cover the damage and loss caused by outside factors such as fire, flood, storm, tidal wave, lightening, earthquake, theft, abnormal conditions of operation, and intentional destruction of the system.
- Insubstantial defects do not qualify refund e.g. prices for the batteries, training materials, and supplies are not covered.
- We do not take responsibility for damages or loss which appear after the guarantee period.
- The guarantee does not cover additional and indirect damages related with system operation.
- Service may be requested by callings +82 70 7510 3400 (or email to info@ecoray.com) customer service department for R.A numbers. The product name, serial number, date of purchase and the details of the problem should be provided.
- Defective unit should be packed properly in a return box and return to authorized dealer or manufacturer.
- This guarantee can replace all other guarantees for detailed parts and product4.

Safety Information

Caution

[General]

- This unit should be used by a qualified radiologist or medical specialist.
- The unit has been factory-adjustment for optimum performance. Do not attempt to adjust any present controls or switches except those specified in this manual for operation.
- Before you operate the unit, please fix the unit at a mobile or any stand.
- Attention should be paid not expose the unit to factors such as, slant, vibration and shock (including when traveling) in where the unit should be.
- If you have experienced any trouble with the unit, turn off the main switch immediately, and contact its authorized dealer or manufacturer for the service for assistance.
- Do not use the other connector which it does not provided from manufacturer.
- The unit is designed for the purpose of radiographic diagnostic x-ray use therefore the unit shall not be used for fluoroscopy.
- The unit is designed for the diagnosis purposes, the unit shall not be used for therapy.
- Be careful not to drop the unit when moving or installation.
- The system should be away from water.
- Do not use with wet hands.
- Do not use the unit random.
- Review operational environmental condition in the manual before use.

Caution

[Battery]

- When you discover strange smell or liquid leakage, turn off the power immediately and report to authorized dealer or manufacturer.
- If any liquids from the battery get into eyes, clean it with pure water immediately and take a medical service as soon as possible.
- If battery does not fully charge after prescribed time, stop the recharging and report to authorized dealer or manufacturer.
- Used battery packs have to keep out from reach of infant or children. Electric shock may be occurred by residual current.
- Don't utilize the used battery packs for other purposes except using at this unit. Should be disposal it according to national laws or standards.
- If user do not use this unit for a long time, recharge the battery periodically for preventing a shortening of battery life.
- When you change the battery pack or find an error in battery charging, please take an inspection through engineer of branch-office which you bought the unit. If the user arbitrarily remove(combine) the battery pack from(to) the unit, there might be an electrical problem.
- If you do not use the unit for a long period of time or use the unit occasionally, the battery pack may discharge or chemicals leak. To prevent this case, the battery pack should be removed from the unit and stored in a cool, dry place.
  See Page 35 for instructions on how remove the battery pack.

[Battery Charger]

- The battery charger for this unit is rechargeable. Should not be used for any purpose except recharging.
- If the battery charger defect, contact the dealer or manufacturer and do not disassemble or repair it arbitrarily.

[Cleaning]

- To make sure that power is off for portable x-ray unit while cleaning. Use a non-alcohol based disinfectant only - wipes, or a cloth dampened with liquid. The portable x-ray unit is not designed to be used to sterilize anything else. Do not use by any other chemical liquid.

Radiation Information

This unit is manufactured with the necessary devices and it protects operator from the ionized radiation that is radiated form the X-ray source assembly.

Caution

- User and operator must use a protective devices (X-ray protection partition) and a protective clothing (Lead Apron) as appropriate to the workload involved.
- During X-ray exposure, only animal should stay in the region of radiation. Otherwise, the extra object can make unexpected effect to X-ray image that may interfere correct diagnosis.
- Eliminate all the useless objects from the zones, because they are a further source of secondary radiation, above all near the source.
- The focal to skin distance shall be no shorter than 45 cm.
- Operators are requested to use minimum kV and mAs values for experimental use.
- Do not exceed in the size of the radiograms and limit the X-ray field size to the size of interest only.
- If you hold the unit by hand and expose an X-ray, the image will shake and you will have to re-expose. Therefore, please use it after fixing it on the X-ray stand.

Warning Information

This is the important information for the user. User should pay attention to this important information. If not, serious damage to people or unit can be occurred.

Warning

[General]

- Do not modify this unit without authorization of the manufacturer.
- This unit has built-in dual laser modules for targeting SID therefore Please keep your eyes away from the source of laser that may harm your bare eyes.
- Do not use the unit close to a flammable or an aesthetic gas. It has the danger of explosion.

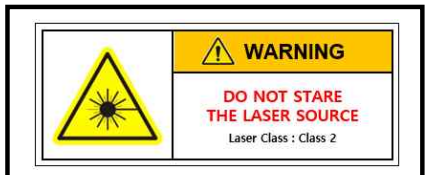
[Battery]

- This unit has a built-in battery pack. So, it must avoid high temperature, direct ray of light. If temperature of battery rise up, heating, explosion and ignition may be occurred by internal short.
- Don't put the battery pack into fire. Don't heat it. A electrolyte can be leaked if insulating materials are melted. And this can make also heating, explosion and ignition.
- Don't give a strong impact to the battery pack. A protective device of battery can be destroyed so the battery may be recharged by abnormal current & voltage. Also, an abnormal reaction(heating, explosion, ignition and etc.) can be happened.
- Don't take apart or remodel the battery pack. It causes also abnormal reaction(heating, explosion, ignition and etc.).
- The battery pack has a protective device. Don't use the unit in the place with lots of static electricity. The protective device can be damaged and abnormal reaction stated above can be happened.

[Battery charger]

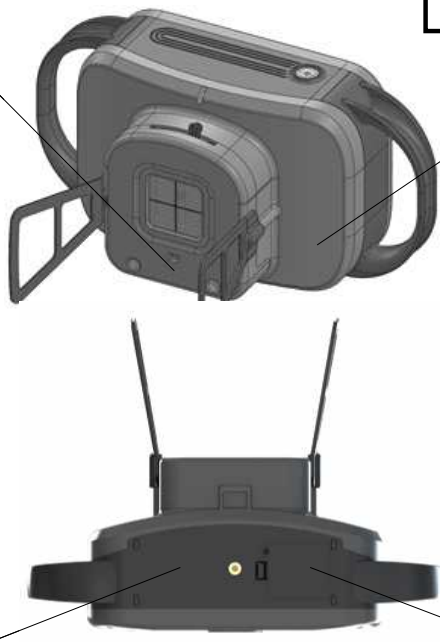
- Please use the battery charger sold by its manufacturer only. Using uncertified battery charger can make heating, explosion and ignition due to overcharging or abnormal current.

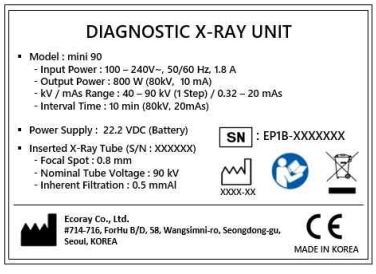
Label Information



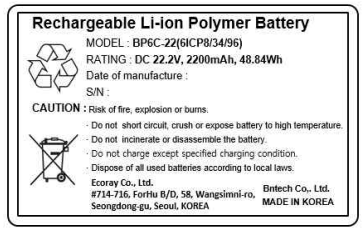
Warning of Laser
This label placed in front of the collimator. Please keep your eyes away from the source of laser that may harm your bare eyes.

Warning of ionized Radiation
This label placed on the front right bottom of the case. The ionized radiation is dangerous for the operator if the appropriate safety measures are not strictly observed.



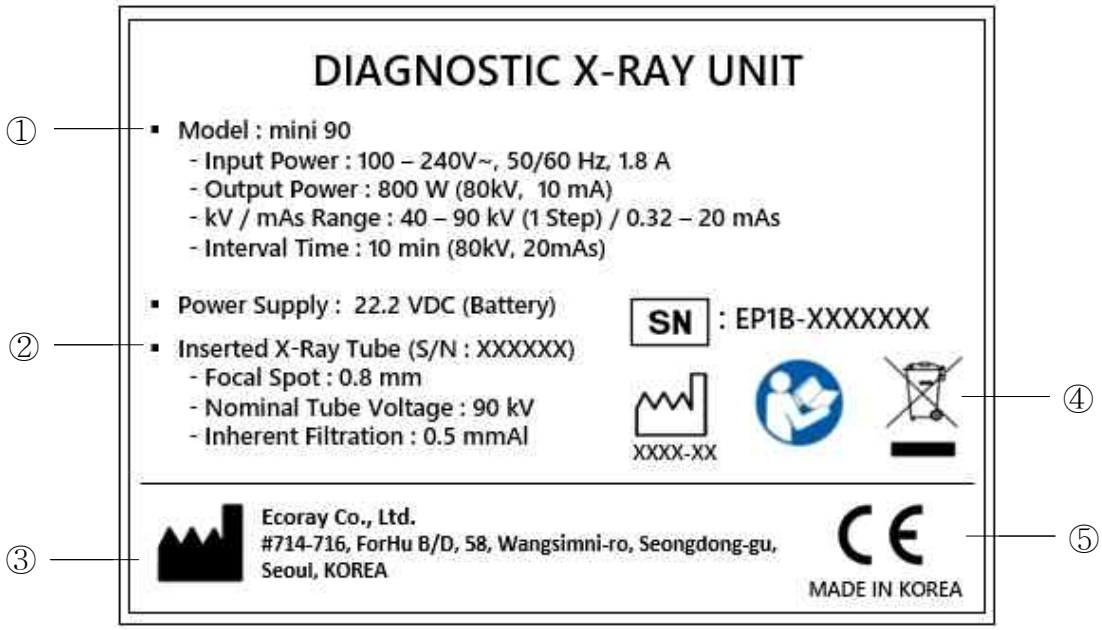


Identification
This label placed on the bottom case. This label explained product information.



Battery Pack
This label placed on the battery pack inside the case. This label explained battery pack information.

Identification Label



No.	Explanation		
①	General Information		
②	X-Ray Tube Information		
③		Manufacturer Information	Basic information of manufacturer.
④	SN	Serial Number	The serial number of the product
	XXXX-XX	Date of Manufacturer	Date of product manufacture.
		User Manual	User must be fully aware of the manual before using.
		Disposal	Disposal of this product must be handled according to local laws and regulations.
⑤	CE	CE Mark	Commuaute Europeenne (European Community)

Intended Use

This x-ray unit for veterinary only is equipment to diagnose the fracture of equine's joint especially.

Product Name Designation

- Product name : Diagnostic X-ray Unit
- Model name : mini 90

Notes to User

To ensure safe operation and long term performance stability, it is essential that you fully understand the functions, operating and maintenance instruction reading this manual before operating unit.

Particular attention must be paid to all warnings, cautions and notes incorporated herein. In correct operation, or failure of the user to maintain the unit relieves the manufacturer or his agent from responsibility for any damage or injury as a result of the system noncompliance.

The responsibility about use of medical apparatus and management of maintenance is in a user side.

Symbols and Terms

The following symbols will be used in this manual: their meaning and their application are described further below.

Warning : It warns of the conditions and situations which, if not taken over or avoided, could cause heavy damages to people or cause fatal unrepeatable damages to the unit.

Caution : Calls attentions to action or conditions that could cause light injury to the user or damage to the instrument or user's data, and precautions that can be taken to prevent such occurrences.

Note : They inform the reader about the relevant facts and conditions ; they draw the attention to important information but, if they are not taken into consideration, they do not necessarily cause damages to people or to the unit.

Proper Environment

Caution : Avoid the following environments for operation or

- Where the unit is exposed to water vapor.
- Where the unit is exposed to direct sunlight.
- Where the unit is exposed to dust.
- Where the unit is exposed to high humidity.
- Where there is a ventilation problem.
- Where the unit is exposed to a salty atmosphere.
- Where the unit is exposed to chemicals or any gas.

■ For normal operation, you must keep away from the place with a strong vibration and maintain the following range of temperature and humidity.

- Operation Environment

Temperature range:	10 - 40°C (Charge)
	10 - 40°C (Discharge)
Relative humidity range:	30 - 75% RH
Pressure:	700 - 1,060 hPa
Height range:	0 - 2,000 m

- The most optimal recommended rage of temperature and humidity

Temperature range:	17 - 23°C,
Relative humidity range:	40 - 60% RH

■ For storage and transportation condition, you must maintain the following range of temperature and humidity and atmosphere.

- Storage / Transport Environment

Temperature range:	-20 - 45°C (Storage less than 1 month)
	-20 - 35°C (Storage less than 3 month)
	-20 - 20°C (Storage less than 1 year)
Relative humidity range:	10 - 95% RH
Air pressure range:	500 - 1,060 hPa

* non-condensing, not packaged for outdoor storage.

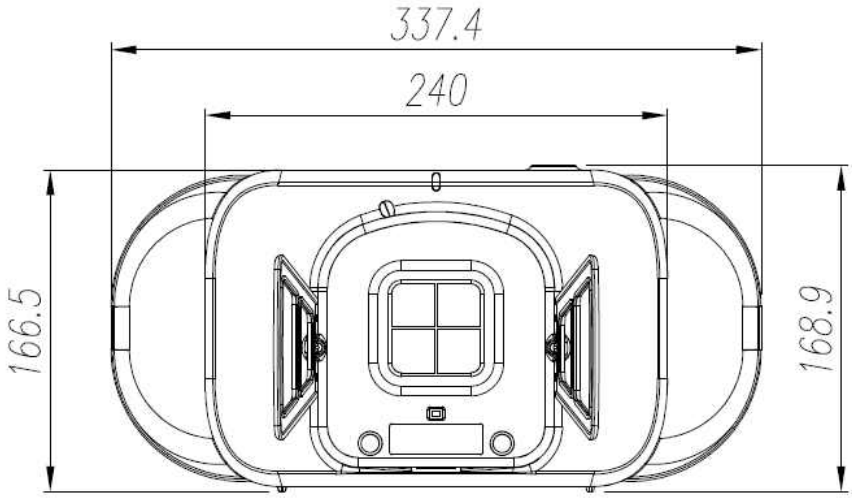
Accessories Composition

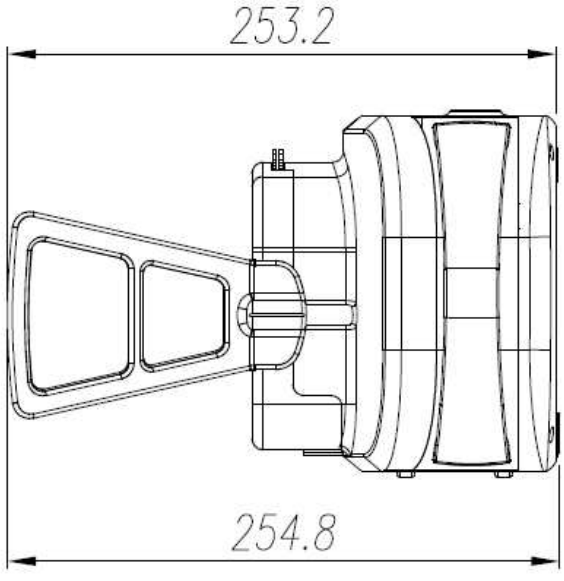
This portable x-ray unit is essentially built up of the following parts:
Since portable x-ray unit is integrated one body X-ray unit therefore following regions are firmly fixed and connected of consist of.

Picture	Name	Specification
	Hand Switch	- Manufacture : OMRON - Model : C2U (Push button switch)
	Battery Charger	- Manufacture: JIANGXI FUDIAN YOU PIN - Model : FY0682521500 - Input : 100 ~ 240V~, 50/60 Hz, 1.8 A - Output : 25.2 V ⎓ 1.5 A
	Battery Pack (Lithium-Ion Polymer)	- Manufacture : BN Tech Co., Ltd. - Voltage : 22.2 VDC - Charge Voltage : 25.2 VDC ± 0.03 VDC - Capacity : 2200 mAh - Size : W45 X L110 X H40 mm
	Skin Guard	- Size : W95 X L138
	User Manual	- Size : W150 X H210 mm
	Aluminum Carrying Case Shoulder Strap	- Length : 125 mm
	Aluminum Carrying Case	- Size : W395 X L245 X H220 mm

Caution : Use hand switch and battery charge **battery charger**, battery pack which provided from manufacture only. When problems occur by using other parts, the manufacture does not bear any responsibility.

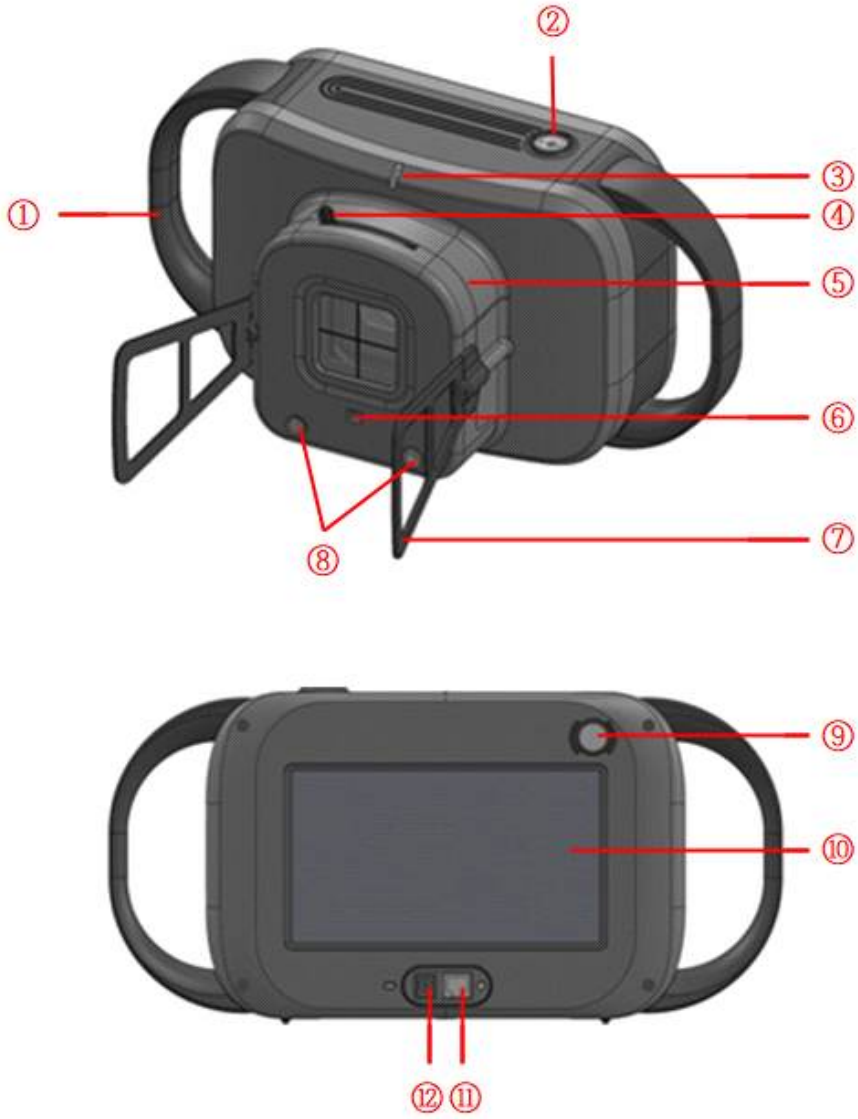
Dimension





[Unit : mm, Without accessories Weight : About 4 kg]

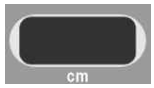
Name of Each Part



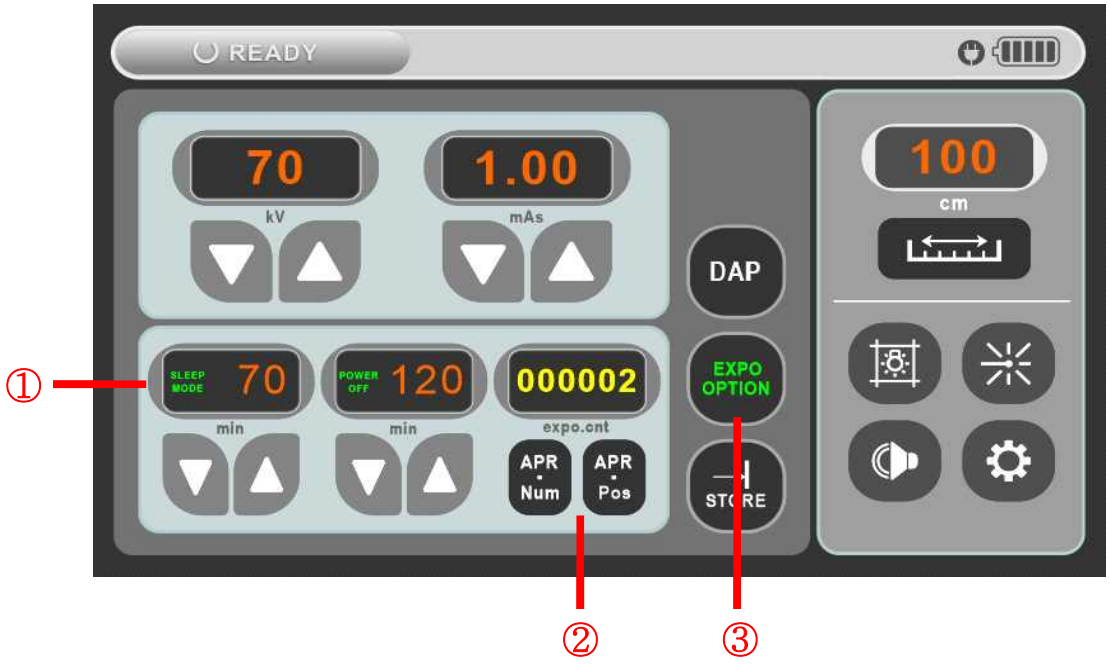
①	Handle	⑦	Skin Guard
②	Power ON/OFF Switch	⑧	Laser Pointer
③	X-ray State Lamp	⑨	X-ray Exposure Button
④	Collimator Knob	⑩	7 inch LCD Monitor
⑤	Collimator	⑪	Hand Switch Port
⑥	Distance Measuring Sensor	⑫	Battery Charging Port

Operation Panel

①	X-Ray State	READY	Displayed when unit wait to ready.
		READY OK	Displayed when the unit is ready for X-ray emitting..
		EXPOSING	Displayed when the unit is emitting X-ray.
		WAIT	Displayed during rest fo the unit for the next operation.
		CHECK	Displayed when unit problems occur.
②	Set X-Ray Value Key		Press the up and down key to set kV, mAs
	DAP Key	DAP	This is the key to check the DAP value after X-ray exposure.
③	APR Key	1 - 8 / -	A total of 16 types of APR modes are available. (Number : 8 Modes, Position : 8 Modes)
	Store Key	STORE	Save the selected APR data.

④	Clear Key		Button to remove error message.
	Battery Charging		Display when charging with battery charger.
	Battery State		Display battery charging and remaining state.
⑤	Distance		Display distance between unit and animal
⑥	Distance Measurement Key		Key for automatically measure a distance.
⑦	Collimator Lamp Key		It indicates a field to be exposed.
	Laser Pointer Key		For exposure focus.
	Sound Key		Sound ON / OFF
	Setting Key		A key that sets the modes of the unit. - Set the unit sleep and power-off time mode - Check the number of x-ray exposure - Select APR number or APR position - Collimator lamp, sound and laser point ON/OFF function during X-ray exposure.

Setting Mode



①	Sleep Mode		The LCD screen turns off at a set time while the unit is turned on and enters a power-saving mode. [Configurable Time : 0 - 30 min]
	Power Off		The unit powers off at the set time. [Configurable Time : 0 - 120 min]
	X-ray Exposure Count		Shows the number of X-ray exposure.
②	APR Number		APR number mode select key
	APR Position		APR position mode select key
③	Exposure Option		Collimator lamp, sound and laser point ON/OFF selection key during X-ray exposure

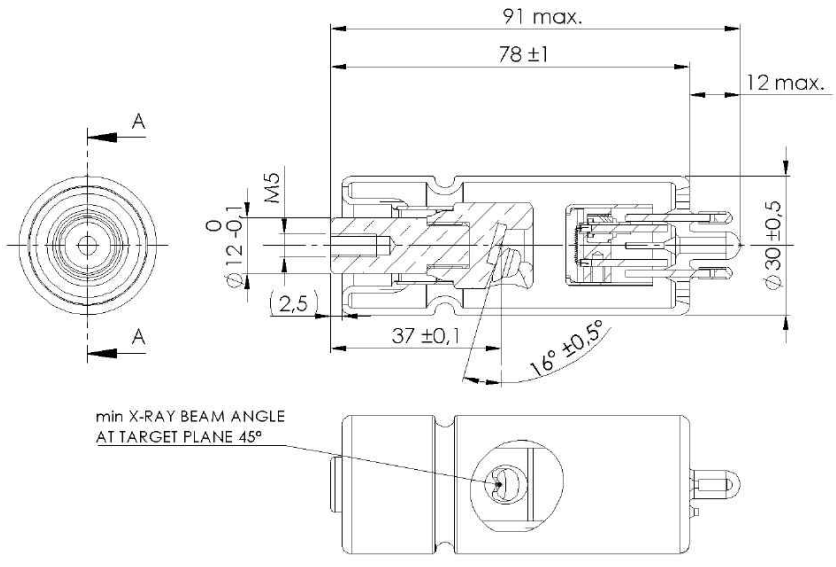
Specification

▪ **X-ray Generator**	Power Output	800 W (80 kV, 10 mA)
	kV Range	40 - 90 kV (1 kV step)
	mA Range	8 - 10 mA
	mAs Range	0.32 – 20 mAs
	SID	SID 100 cm / 44 cm X 44 cm
▪ **Collimator**	Lamp	LED Lamp / 3.25 VDC / 10 W
▪ **X-ray Tube**	Type	Stationary
	Focal Spot	0.8 mm
	Target Angle	16 degrees
	Anode Heat Storage Capacity	8000 J
	Maximum Anode Cooling Rate	110 W
	Nominal Anode Input Power at 0.1 s (DC)	1280 W
	Inherent Filtration	0.5 mm Al
▪ **Power Requirement**	Li-polymer Battery	22.2 VDC, 2,200 mAh
	Number of Exposures	About 150 times (70 kV, 5 mAs)
	Battery Charger	AC 100 – 240 V, 50/60 Hz (Output : 25.2 V ⎓ 1.5 A)
	Charging Time of Battery	About 1.0 – 1.2 hour
▪ **Weight**	Main Body	About 4 kg
▪ **Dimension**	Main Body	337.4 X 254.8 X 168.9 mm

X-ray Tube Specification

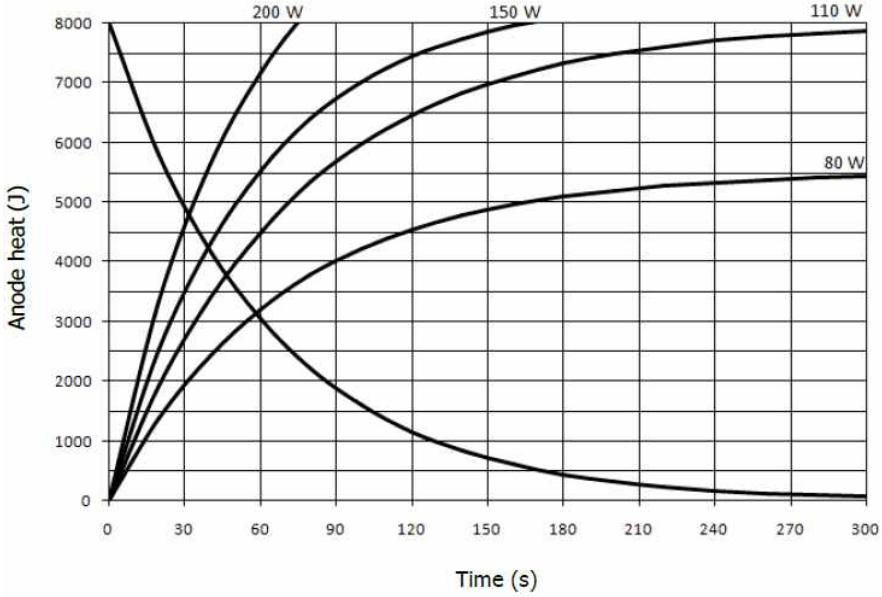
▪ Manufacture		C.E.I OX/80-0.8	
▪ Type		Stationary	
▪ Voltage	nominal	90*	kV
	maximum for test	99*	
▪ Focal spot (IEC60336:2005)		0,8	mm
▪ Filament characteristics		1,5 ÷ 3,3	V
		1,7 ÷ 2,3	A
▪ Anode material		Tungsten	
▪ Target angle		16°	°
▪ Anode heat storage capacity		8000	J
▪ Maximum anode cooling rate		110	W
▪ Nominal anode input power at 0.1 s (DC)		1280	W
▪ Inherent filtration		0,5 mm Al	
▪ Maximum diameter		30	mm
▪ Overall length		91 max	mm
▪ Weight (without lead shield)		115	g

*Tube with lead shield must be used in bipolar configuration only

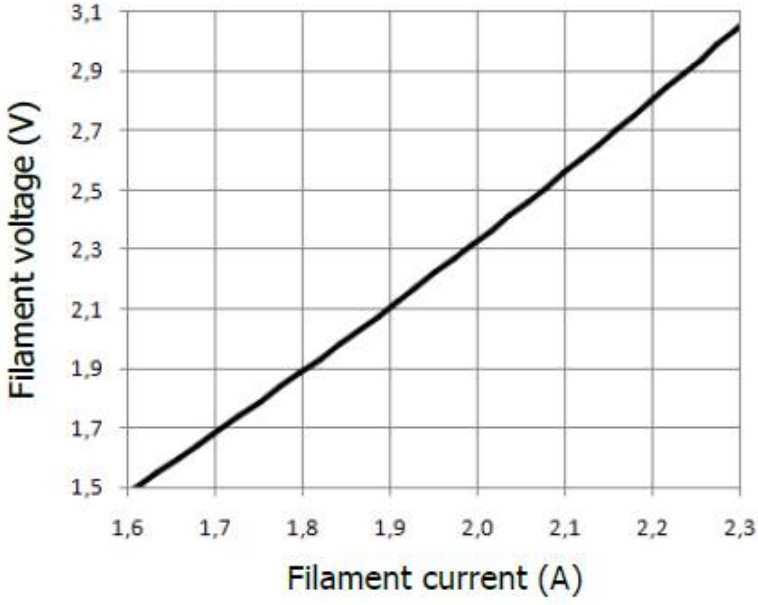


[X-Ray Tube Dimensions]

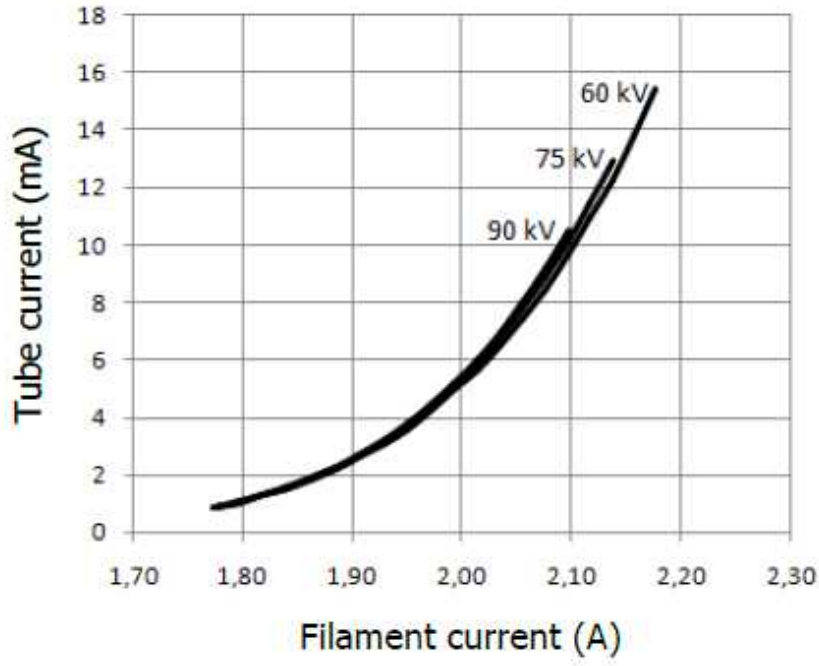
▪ Thermal Curves



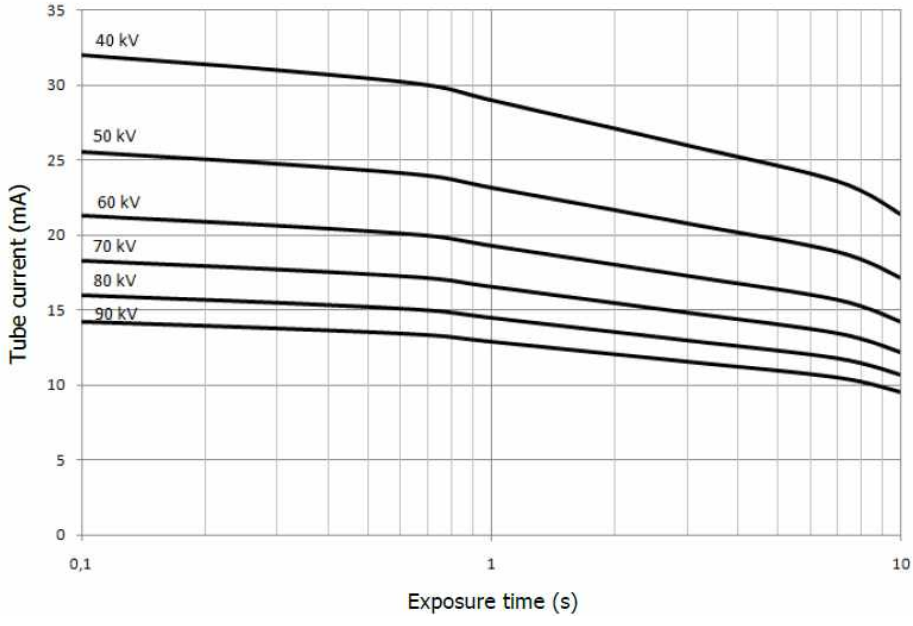
▪ Filament Characteristics



▪ Emission Characteristics DC



▪ Rating Charts DC



Section 2.

Operation

Operation Conditions

- **Power Source**
  - Battery : 22.2 VDC, 2,200 mAh (Lithium-Ion Polymer Battery)
  - Battery Charger : AC 100 – 240 V~, 50/60 Hz, 1.8 A (Input)
    25.2 V ⎓ 1.5 A (Output)
  - Battery charging time : About 1.5 hrs
  - Power consumption : Approximately 800 W (Max.)

- The portable x-ray unit has the technique selection function as follows.
  - Manual : kV, mAs
  - APR (Anatomical Programming Radiography) : 16 Modes (Number : 8 Modes, Position : 8 Modes)

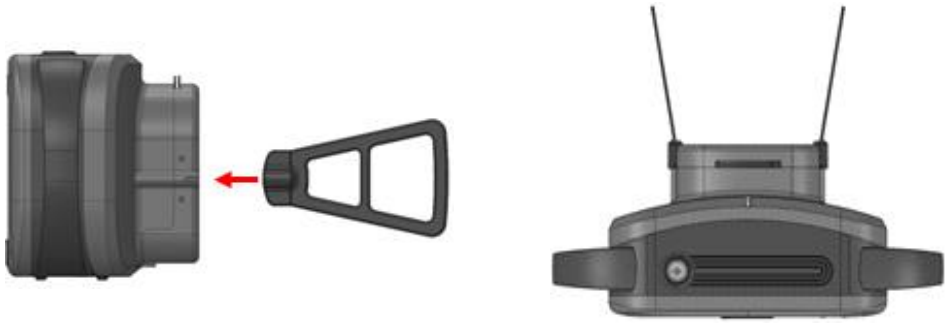
- The parameters chosen by the operator (kV, mAs)
  - kV : The operator establishes the value; the system chooses automatically the maximum value of mA in order to obtain the maximum radiological result.
  - mAs : The operator establishes the value; the system chooses automatically the minimum value in order to the maximum radiological result.

- Interval Time : 10 Min (Max. 80 kV, 20 mAs)

Preparation

1. Install Skin Guard

   Secure the two skin guards by pushing them into the left and right side holes of the collimator as shown below.



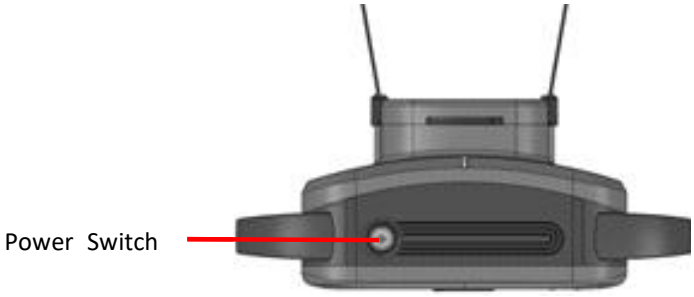
2. Install Hand Switch and Battery Charger

   1) The unit has an X-ray exposure button, but in use to exposure X-ray with the hand switch, connect the hand switch connector to the hand switch port.

   2) To charge battery, connect the battery charger connector to the battery charging port and charge it. This unit can exposure X-rays even while charging.

Operation

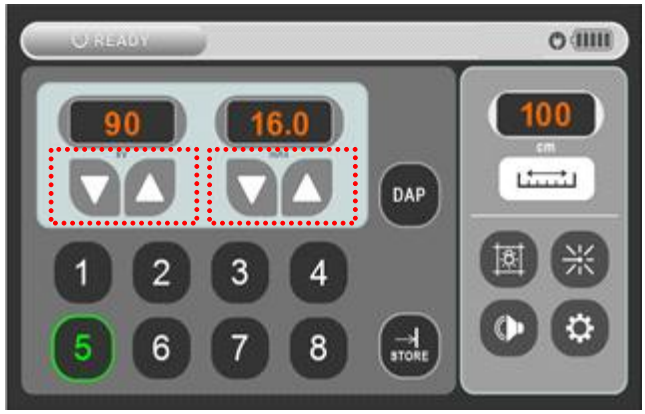
1. Press the power switch to turn on the unit.



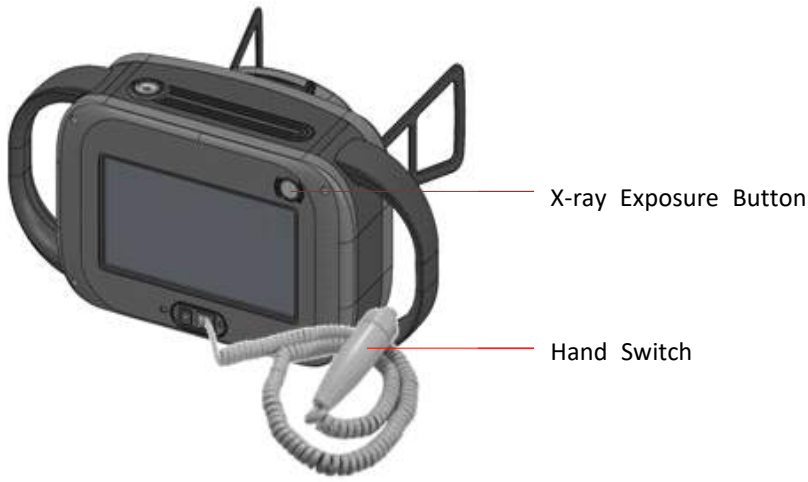
2. Use a distance measurement sensor to obtain X-ray exposure distance.

3. Place the detector behind the animal's X-ray area, turn on the collimator lamp, and use the collimator knob to set the area to be exposed with X-rays.

4. Press the kV and mAs keys on the LCD monitor to set the desired X-ray exposure value.



5. After setting the X-ray exposure value, exposure the X-ray with the "X-ray exposure button"on the back of the unit or hand switch.



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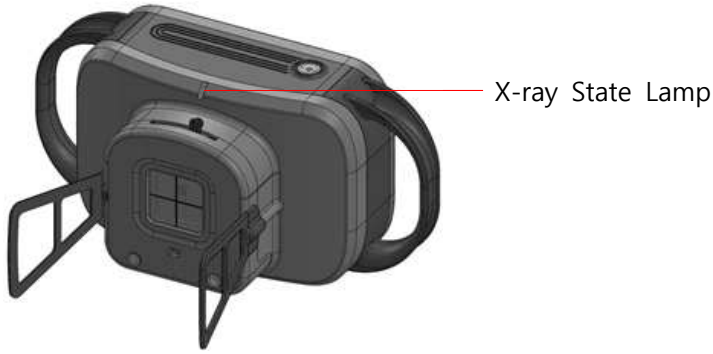
6. When the "X-ray exposure button" or hand switch of the unit is pressed for X-ray exposure, the distance measuring sensor measures the distance. If a sufficient distance for X-ray exposure is not secured, a warning message "**UNSAFE DISTANCE!**" is displayed at the top of the LCD screen. In this case, re-exposure the X-ray after securing a sufficient distance.



7. In the case of X-ray exposure, if you press the "X-ray exposure button" or the hand switch button on the top of the device for 1-2 seconds, " READY OK " is displayed on the LCD and a green light is turned on in the "X-ray state lamp". At this time, if you release the "X-ray exposure button" or hand switch button that you have been holding down and press the "X-ray exposure button" or hand switch button again, " EXPOSING " is displayed on the LCD and the red light on the "X-ray state lamp" turns on and X-ray is exposed.

8. If " READY OK " is displayed on the LCD and the "X-ray exposure button" or the hand switch button is released and the X-ray is not exposed within 10 seconds, the " READY " state is returned.

9. When the X-ray is complete, the LCD displays " WAIT " and the green light of "X-ray state lamp" flashes. Afterwards, when the " WAIT " mark disappears on the LCD and the green light of the "X-ray state lamp" disappears, X-ray imaging is possible again.

APR Mode

The 'APR Mode' is a function for user's convenience, that user can store an irradiation values of each exposure part in advance. In 'APR number and APR position Mode', User can store each 8 values at 'each 8 Modes'. Therefore, a total of 16 modes can be stored.

Mode	APR Key			
APR Number (8 Modes)	1 2 3 4 5 6 7 8			
APR Position (8 Modes)	Skull	Skull	Humerus	Humerus
	Shoulder	Shoulder	Thorax	Thorax
	Pelvis	Pelvis	Abdomen	Abdomen
	Femur	Femur	Limb	Limb

1. Turn on the unit power switch.
2. Press the setting key on the lower right side of the LCD screen for 1 to 2 seconds.
3. You can check the APR Num key and APR Pos key at lower center side of the LCD screen. Press the desired APR mode APR Num or APR Pos key and press the STORE key to save the selected APR mode until a "beep" sound. Then press the setting key to display the selected APR mode screen until a "beep".

4. When the selected APR mode screen appears, the user selects one of the desired number or anatomical keys and sets kV and mAs values for the selected key. Then press the 

key to make a "beep" sound, and the set value is saved.

Power Saving Mode

Press the setting key  on the main screen to see the "SLEEP MODE" 

and "POWER OFF" 

of power-saving modes.

"SLEEP MODE" means that if you set the desired time from 0 to 30 minutes while the power is on, the LCD screen of the device turns off at the set time and enters power saving mode. To use the device again, press the LCD screen or any of the buttons to turn the LCD screen ON.

"POWER OFF" means that when the unit is powered on and the desired time is set from 0 to up to 120 minutes, the unit is powered off at the set time.

To save the time for the selected mode of the above two modes, press the 

key until the "beep" sound is over, and then press the setting key  to return to the main screen.

Exposure Option

The "EXPO OPTION" function is a function that allows the user to turn ON/OFF the collimator lamp and laser point as needed, as it can cause discomfort to the animal's eyes if the animal sees the collimator lamp and laser point during X-ray irradiation.

1. Press the setting key  on the main screen to see the "EXPO OPTION" 

key.

2. Press the "EXPO OPTION" 

key, select the collimator lamp  , laser point  and sound  the user wants, and press the 

key until the "beep" sound ends to save.

DAP Does Indication

Each of displayed value of reference air KERMA rate and accrue reference air KERMA cannot be exceeded ±35 % deviation of 6 mGy/minute and maximum 100 mGy. Does rate in the below animal is the average of the measured values.

kV	mAs	Does Rate (mGy)
40	5	2.0
45		2.7
50		3.5
51	6.3	4.6
55		5.4
60		6.4
61	8	8.5
65		9.6
70		10.9
71	10	14.0
75		15.4
80		17.0
81	8	13.9
85		15.0
90		16.4

Error & Check Code

In the event of a problem with the unit, the following error or check codes are displayed on the LCD screen.

Error & Check Code	Meaning of Error	Corrective Action
ERROR 1 > OCP	It is displayed when the over current protect is detected.	Please contact the manufacturer or distributor.
ERROR 2 > OVP	It is displayed when the over voltage protect is detected.	Please contact the manufacturer or distributor.
ERROR 3 > kV LOW	It is displayed when the kV is low to expose the X-ray.	Please contact the manufacturer or distributor.
ERROR 4 > mA LOW	It is displayed when the mA is low to expose the X-ray.	Please contact the manufacturer or distributor.
ERROR 5 > FIL LOW	It is displayed when the Filament Feedback signal is not detected in the state of standby.	Please contact the manufacturer or distributor.
CHECK 1 > KEY OFF	It is displayed when user releasing the exposure button while the X-ray is being exposed.	After "CHECK 1 > KEY OFF" is released and "Ready" is displayed, exposure the X-Ray again.
CHECK 2 > BATTERY LOW	It is displayed when the battery charge is low.	Please charge the battery.
CHECK 3 > TEMPERATURE	It is displayed when overheated(50 ℃) of HV tank.	When the temperature reaches 45 ℃, "Wait" is displayed and can exposure the X-Ray again.

Note: If an error code as shown in the table above appears on the LCD screen while the user is using the unit, the "CLR" key also appears. If an error code appears on the LCD screen, the device does not operate. It may be a temporary error. If you press and hold the "CLR" key for 1~2 seconds, the error will be released. At this time, if the same error occurs even after using the device again, contact the manufacturer or the distributor.

Exposure Data Table

[CHART FOR EQUINE]

ANATOMY	VIEW	High Contrast		ESD/Radiograph (mGy)	Mid Contrast		ESD/Radiograph (mGy)
		kV	mAs		kV	mAs	
NAVICULAR	AP	74	1.6	0.10	78	1.25	0.08
	LAT	74	1.25	0.08	78	1.0	0.07
	P3	74	1.0	0.06	-	-	-
FETLOCK	AP	74	1.6	0.10	78	1.25	0.08
	LAT	70	1.25	0.08	78	1.0	0.07
KNEE	AP/FLEX	74	1.6	0.10	78	1.25	0.08
	LAT/OBI	74	1.25	0.08	78	1.0	0.07
SPLINT BONE	LAT	70	1.0	0.05	76	0.8	0.05
HOCK	AP/HIGH	74	2.0	0.13	78	1.6	0.11
	AP/LOW	74	1.6	0.10	78	1.25	0.08
	LAT	74	1.25	0.08	78	1.0	0.07
STIFLE	LAT	-	-	-	80	3.2	0.24
	PA	-	-	-	80	5.0	0.37
ELBOW	AP	-	-	-	80	3.2	0.24
	OTHER	-	-	-	80	2.0	0.15

* Digital Radiography Detector : DRTECH DR (EVS 3643)

Note: 1. This exposure data table can considerable different accordingly development condition.
2. This exposure data table can different kV and mAs accordingly a object body situation.

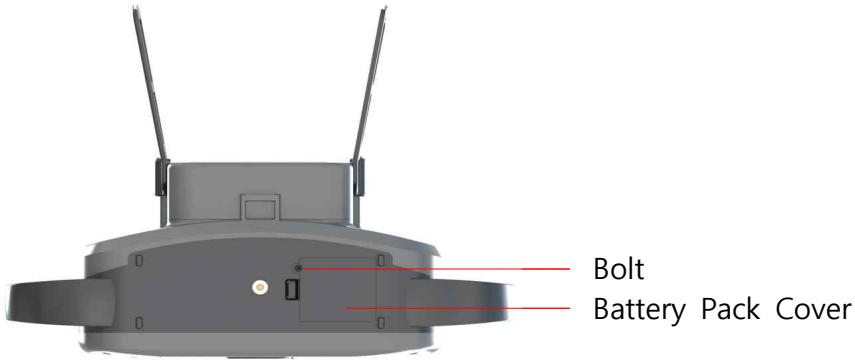
Section 3.

Service Manual

Battery Pack Exchange Procedure

The procedure for replacing the battery pack is as follows.

1. As shown in the picture below, remove the bolt on the cover of the battery pack on the bottom of the device using a Phillips screwdriver and open the cover.



2. When you open the battery pack cover of the case, the two connectors was connected as shown in the picture below. Disconnect the two connectors and take out the old battery pack.

[Connected]

[Disconnect]

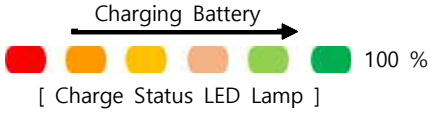
3. Put the prepared new battery pack back into the case in the reverse order and assemble it.

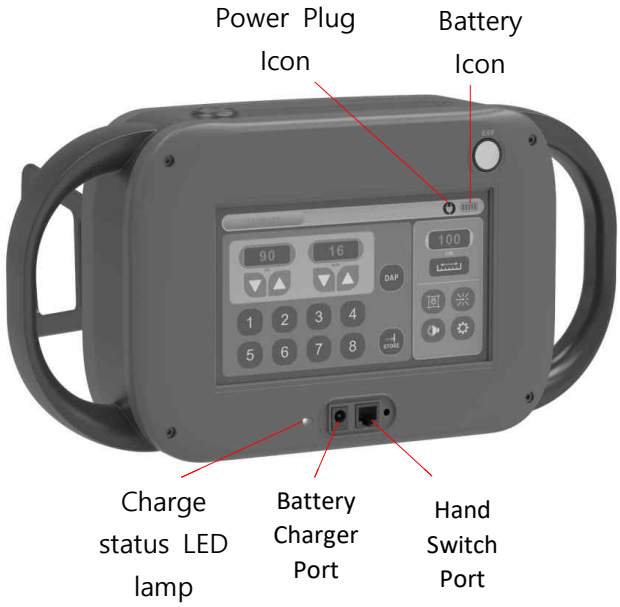
Caution : Please make sure to use the battery pack supplied by the manufacturer. Failure to do so can cause significant damage to the product.

Charging the Battery

1. Use the manufacturer supplied battery charger when charging the battery.

2. As shown in the picture below, open the silicone cover with the battery charging and hand switch ports on the back of the unit and connect the battery charger connector to the battery charging port.





3. There are two ways to identify the state of charge when charging the battery : the LED lamp on the left side of the battery charger port and the battery icon [▮▮▮▮▮] on the top right of the LCD monitor.

4. The LED lamp on the left side of the battery charger port turns red when the battery needs to be charged when the battery charger is connected, and then gradually turns orange when the battery is charged and green when fully charged.

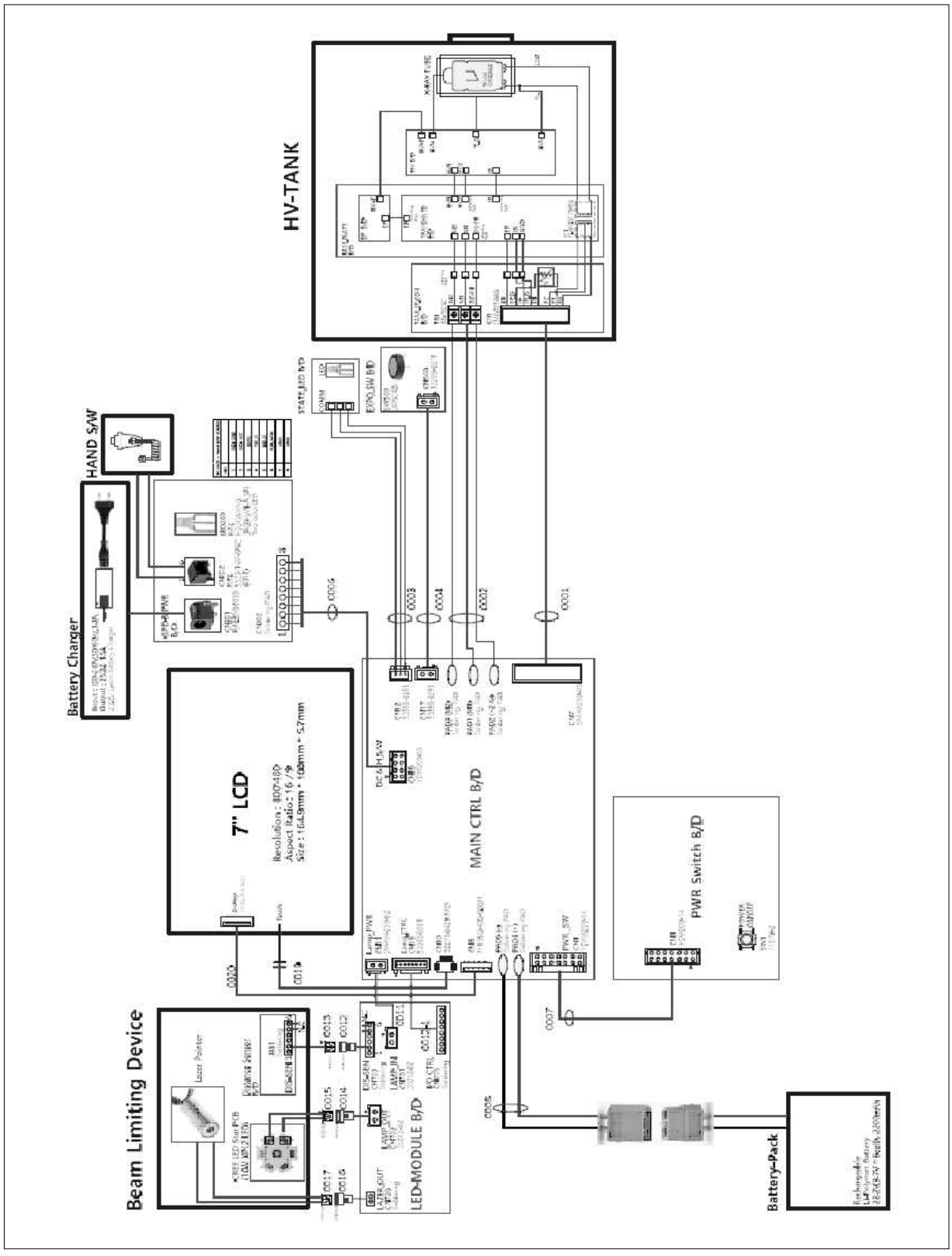
5. The battery icon on the top right of the LCD monitor has a total of 5 cells, and when it is gradually charged, the battery cell increases by one each, and when fully charged, all 5 cells are filled. And when charging, the power plug icon [⏻] appears to the left of the battery icon to let you know that the battery is charging.

Caution : When charging the battery, use the battery charger provided by the manufacturer. If you use a battery charger that is not provided by the manufacturer, it may cause battery failure and danger, resulting in unit failure.

Section 4.

Schematics

Block Diagram



Main Board