VETSMART Veterinary X-Ray System™

Pre-Installation, Installation, and Service Manual

VETSMART

Table of Contents:

I. INTRODUCTION

1 Revision History

Revision	Date	Document Name (Reason for Change)
A	12/22/2020	Original document

2 References

Only the device configurations and connections described in this instruction manual (excluding instruments that have not been specifically approved by our company) meet the following standards.

Part No.	Description	Part No.	Description
GB/T191	2008 Packaging storage and transportation icon	GB/T9969	2008 Instruction Manual for Industrial Equipment
GB9706.1	2007 Medical electrical equipment Part 1: General requirements for safety	GB9706.3	2000 Medical electrical equipment Part 2: Requirements for the safety of high-voltage generators for diagnostic X-ray generating equipment
GB9706.12	1997 Medical electrical equipment Part 1-3: General requirements for safety General requirements for radiation protection of diagnostic X-ray equipment	GB/T10149	1988 Medical X-ray equipment terms and symbols
GB/T10151	2008 Technical requirements for high voltage cable plugs and sockets for medical diagnostic X-ray equipment	YY 0076	1992 classification of coatings for metal parts
YY 0505	2012 Medical electrical equipment-Part 1-2-General requirements for safety-Parallel Standards Electromagnetic Compatibility-Requirements and tests	YY/T 0106	2008 General technical requirements for medical diagnostic X-ray machines
YY/T 0291	2016 Environmental requirements and test methods for medical X-ray equipment	YY/T 0316	2008 Application of medical device risk management

3 Intended Use:

The VetSmart Veterinary X-Ray System™ is suitable for animal clinical medical diagnostics only. Do Not use on humans. It is not tested for medical use on humans. Intended use is for animals classified as pets, exotic species, and zoo animals up to 330 lbs.

4 Advisory Symbols

Indicates a hazardous situation that might result in serious injury or death if instructions are not followed properly.

Indicates a dangerous situation that might result in serious injury if the instructions are not followed properly.

Indicates a hazardous situation that may result in moderate or minor injury if instructions are not followed properly. It is also applicable to indicate a hazardous situation where damage is only limited to the material or related accessories.

It is not a warning solely. It provides the correct use and operating methods to avoid mishandling and malfunctioning of the equipment.

5 Definitions

Indicates protective grounding initiated

Warning: Electricity in use

Read manual prior to using or operating this equipment.

Important Information to follow. Read the safety sign to avoid incorrect operation.

Manufacturer

Production Date

Serial Number

Proper storage for Electrical Waste and Electronic Equipment

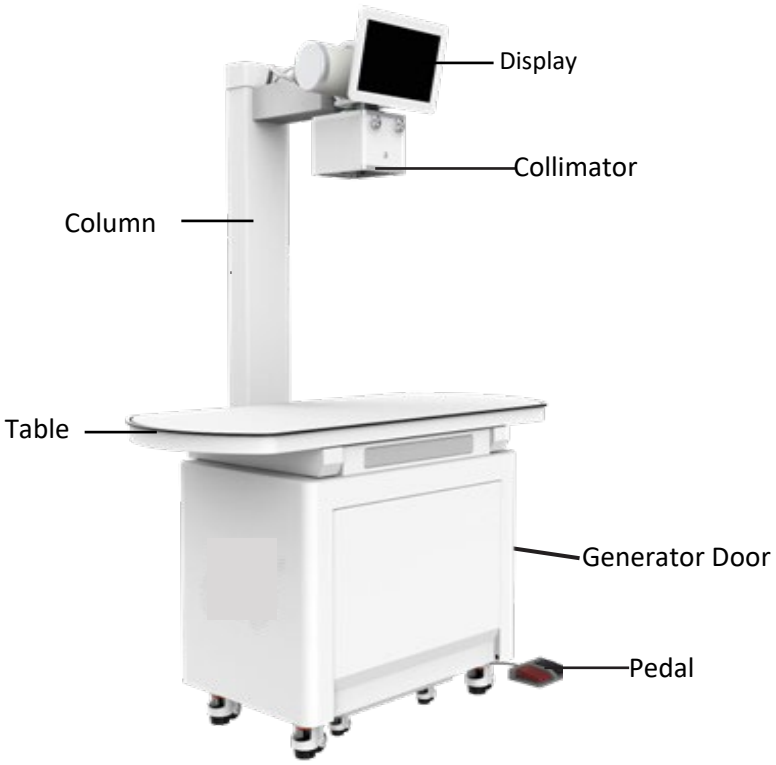
Non-Ionizing Radiation

6 System Overview

System Description:

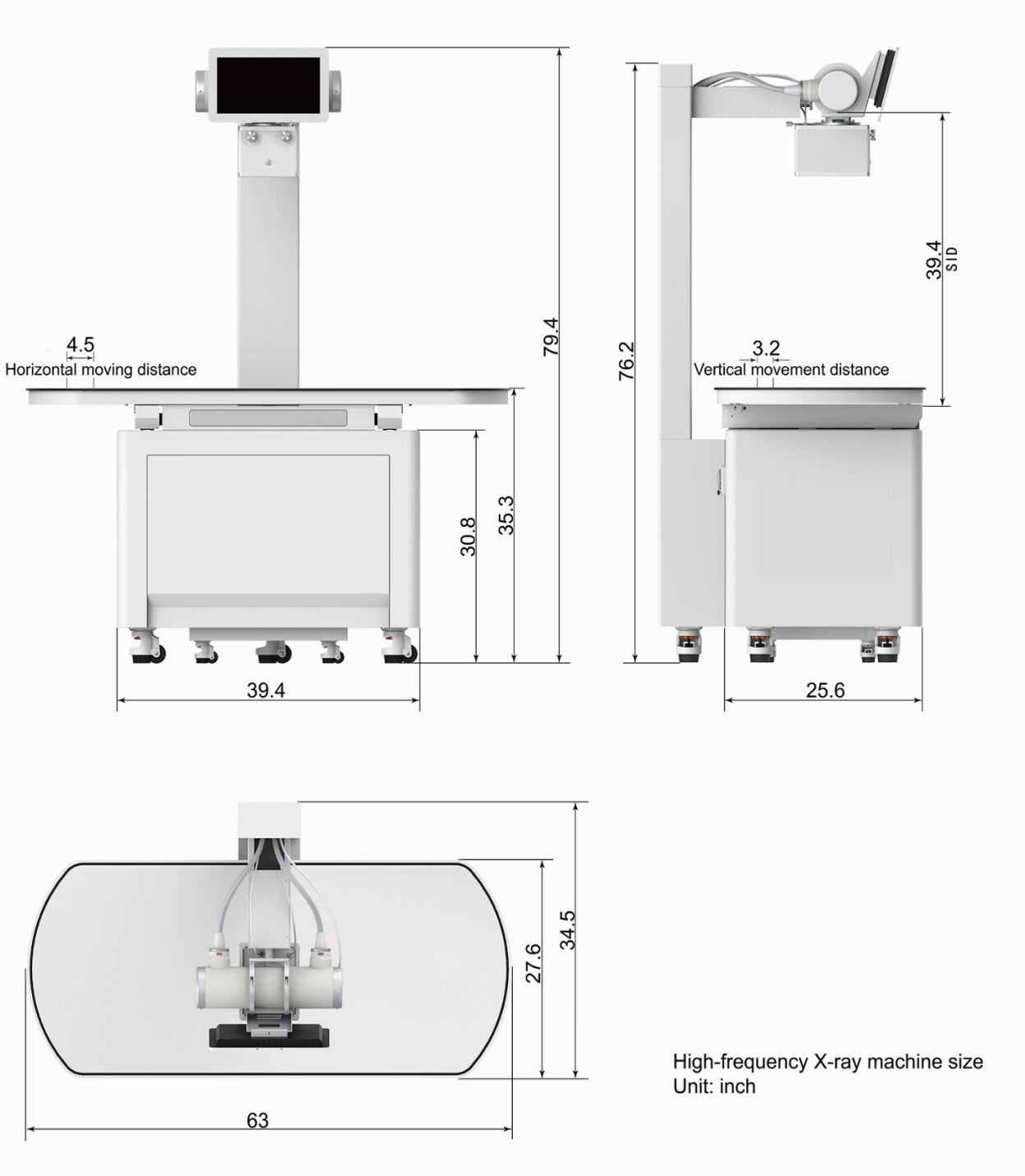
The VetSmart Veterinary X-Ray System™ uses animal specific features with advanced image processing to acquire an exam in under six seconds. The collimator is equipped with an innovative camera that can measure depth when taking an image. The user-friendly interface comes with touch screen enabled technology and pre-set X-Ray exams that are customizable.

The VetSmart Veterinary X-Ray System™ table-top can be moved to align and position the pet easily under crosshairs and to target the respective image for clinical diagnosis. The quick one-touch floor pedal allows for fast exposure trigger which can eliminate repeat images.



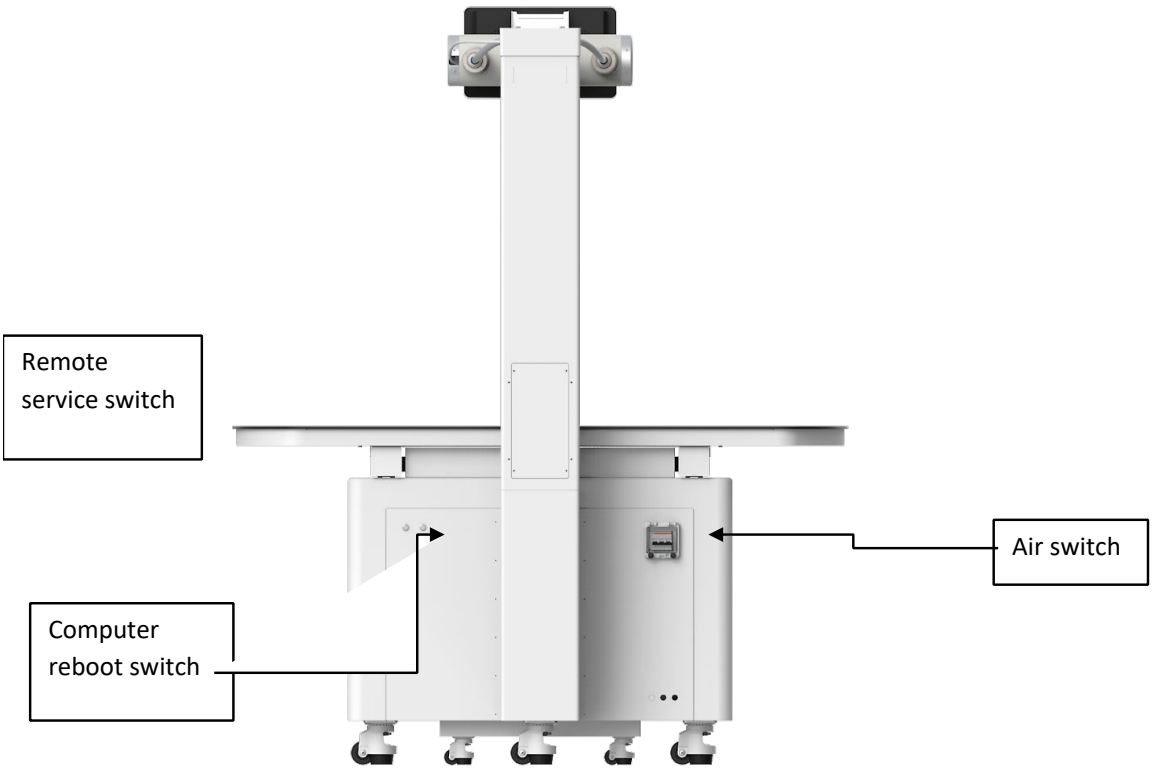
Component and Description	
SMART High Frequency Generator iMi-SHF32	
X-Ray Tube Assembly iMi-XRT-7239	
SMART Collimator iMi-SVC-120	
Veterinary X-Ray Table iMi-VXT	

System Dimensions

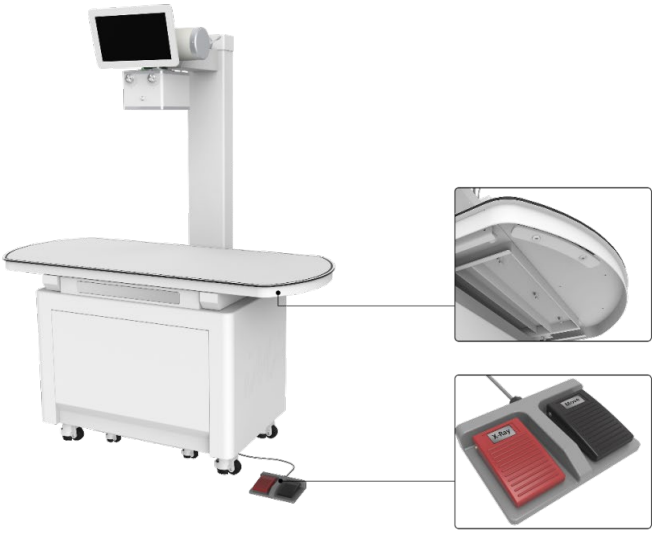


High-frequency X-ray machine size
Unit: inch

1. Switch descriptions



2. Table top movement and foot exposure switch



Veterinary X-Ray table
Maximum cassette size: 17” × 17”
Recommended flat panel detector size: 14” ×17”, 17” × 17”; thickness ≤ 24 mm
Applicable grid size: 15” × 18” and 18” × 18”
Focal screen distance SID: 1000 mm ± 15 mm
Maximum table load bearing capacity ≤ 150 kg (330 lbs.)
4-way float table-top
24 V electromagnets used for braking
Assembled with high quality minimum noise medical casters; base is equipped with High frequency generator mounting tray equipped with casters to mechanically integrate the complete system

SMART High Frequency Generator
Dimensions (L × W × H) : 523 mm ×550 mm ×450 mm (20.6” × 21.7” × 17.8”)
Weight: 68 Kg (150 lbs.)
Power supply voltage/ Line voltage: 220 ± 22V/ 208 VAC- 5% -230 VAC + 10%
Power phase: Single phase (1 phase)- three wire system
Power frequency/ Line frequency: 50/60 Hz ± 1 Hz
Working frequency: 80 kHz ~ 300 kHz
Maximum Output power: 32 kW
Tube Voltage: 40 kV ~ 150 kV (continuous step-up voltage- 1 kV)
KV exposure accuracy: ± (5% + 2 kV)
Tube current: 10mA to 400mA
mA exposure accuracy: ± (5% + 1mA) @ ≥10ms,
Current time product: 0.1 ~ 320mAs, stepwise adjustment

SMART Collimator
Weight: 5.2 kg (11.5 lbs.)
dimensions (length × width × height): 262mm
× 214 mm × 170 mm (20.6” ×17.8” × 21.7”)
Supported X-ray tube maximum working volt- age: 150 kV
Maximum radiation field: SID (FFD) = 1000mm, not less than 430 mm × 430 mm
Minimum radiation field: 0 × 0 mm
Intrinsic filtration: ≤ 1.5 mm · Al / 75kVp
Additional filtration: 1 mm · Al and 2 mm · Al
Lead leaf opening control method: manual knob adjustment
Working power: AC24V / DC24V
Illumination (when SID = 1000 mm): ≥100 lx
Light source delay: 26-30s
Distance from focal point to mounting plane: 58 mm

X-Ray tube (Canon/Toshiba 7239)
Weight: 16kg (35 lbs.)
Focus: 2.0mm for large focus; 1.0 mm for small focus
Tube voltage: 40 ~ 125kV;
Maximum tube current: 570mA for large focus, 340mA for small focus
Anode target surface target angle: 16 degrees, diameter: 74mm,
Anode thermal capacity: 100kJ (140KHU)

Working Conditions
Ambient temperature: + 10 ° C to + 40 ° C
Relative humidity: 30% to 75%
Atmospheric pressure: 70kPa to 106kPa

II. SAFETY

7 Safety Equipment

Use the following safety equipment until the installation is complete.

- **Protective Goggles**
- **Back Support**
- **Safety Shoes**

8 Personal Requirements

At Least two people should participate in the installation and each person.

9 Indications for Use

The VetSmart Veterinary X-Ray System™ is suitable for animal clinical medical diagnostics. only. **Do Not Use on Humans.** It is not tested for medical use on humans. It is intended for animals classifying into pets, exotic species and zoo animals up to 330 lbs.

Images can be obtained with animals in the sitting, standing, or lying position. Animals may be physically abled, disabled, or immobilized.

"Normal use" of this equipment is defined as the intended use plus the maintenance and service tasks.

Do not use the equipment for any purposes other than for which it is intended. Operations of the equipment for unintended purposes could lead to fatal or other serious injury.

Do not use on animals weighing more than 330 lbs.

Use proper protective equipment when using the foot pedal to operate the equipment within the X-Ray room.

10 Warnings

For continued safe use of this equipment, follow the instructions in this installation manual. Operators and service personnel must study this manual carefully. Instructions herein should be thoroughly read and understood before attempting to place the equipment in operation, especially the instructions concerning safety, regulations, dosage, and radiation protection.

Please study this manual and the referenced manuals for each system component to be fully aware of all the safety, installation, calibration, and operational requirements.

Take adequate steps to ensure protection from exposure to radiation. It is vitally important that everyone working with X-Ray radiation is properly in- formed and trained on its hazards. Wear Personal Protective Equipment (PPE) at all times.

Operators must have sufficient training to perform diagnostic imaging procedures with X-Ray devices. Training should be conducted by and governed by Federal and State laws and regulations.

Service personnel must have sufficient knowledge to completely perform the service tasks related to X-Ray devices and particularly to the equipment described in this manual. This knowledge is acquired through a variety of educational methods for technicians in accordance with local laws or regulations, including specific training on this equipment.

Use of Equipment Safety:

X-Ray equipment is potentially dangerous to both animals and operators. Protection measures must be strictly observed. If the equipment is not used properly, it may cause injury.

Use of this equipment adjacent to or stacked with other equipment should be avoided because it could result in improper operation. If such use is necessary, this equipment should be observed to verify it is working properly.

Use of accessories, transducers, and cables other than those specified or provided by the manufacturer of the equipment could result in increased electromagnetic emissions or decreased electromagnetic immunity of this equipment and result in improper operation.

Portable RF communication equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm (12 inches) to any part on the 2020 Veterinary X-Ray System including cables specified by the manufacturer. Or it could result in degradation of performance.

Failure to use this equipment in specific type of shielded location could result in degradation of performance of this equipment interference with other equipment, or interference with radio services.

This equipment should not be used with or near high frequency electrosurgery equipment.

Operating instructions and maintenance schedules must be strictly observed.

If the main power switch is turned on, dangerous voltages exist inside the high voltage cables.

Do not place any liquid on any part of the equipment. Make sure that water and other liquids shall not splash into the device and cause short circuit and corrosion of the equipment.

Keep the exposure interval of the high voltage generator more than 30 seconds. Frequent short time interval exposure can cause early system heating and shorten the life of the equipment.

After the prolonged period of idleness or inactivity of the equipment, it is necessary to check the operation and stable working condition of the equipment before use.

Do not uses or store in an environment related to dense moisture, heat sources, salt water or sulfur.

Do not use or store the device in an environment where the air pressure, temperature, or humidity exceeds the recommended range.

Keep well ventilated, avoid direct sunlight, and prevent erosion by dust and corrosive air. Avoid instability, vibration, and shock (including during transportation).

Do not use or store it in any place where there are any chemicals, flammable gases, or flammable and explosive materials.

Client Assumed Liabilities for Safety:

The equipment herein described is sold with the understanding that the manufacturer, its agents, and representatives are not liable for injury or damage that may result from overexposure of animals or operators or personnel to X-Ray radiation.

The manufacturer does not accept any responsibility for overexposure of animals or personnel to X-Ray radiation generated by this equipment which is a result of poor operating techniques or procedures.

It is the responsibility of the operator to ensure the safety of the animal equipment is in operation, by visual observation, proper animal positioning, and use of the devices intended to prevent animal injury such as the floor pedal.

It is the responsibility of the purchaser/ customer to provide means for securing injured animals while using this equipment.

It is the responsibility of the operator to ensure that all exposure parameters are correct before performing an exam. The operator should verify that the parameter selection has not been modified unintentionally.

Make sure that the X-Ray tube is set in working position with the reference axis (X-Ray Beam) pointing to the reception detector.

The equipment described is sold with the understanding that the manufacturer, its agents, and representatives are not liable for injury due to improper use of equipment.

III. PRE-INSTALLATION

11 Responsibilities of Operators

The purchaser or customer is responsible for the Maintenance and proper use of all equipment. This responsibility includes the following:

- A clean and safe work environment for the installation of the product (finished floor, ceiling, walls, and proper room lighting.
- A location suitable for the installation of the product.
- Suitable support structures in the floor and walls necessary for the product or its components.
- Electrical power and grounds of specified quality and reliability.
- Electrical power of the required voltage output and adequate KVA rating, including the emergency off switches in the room. Power and ground cables to the electrical cabinet (main disconnect).
- Installation of all safety devices according to this document, local codes, and service manuals.
- Properly installed and sized junction boxes, including covers and fittings, at locations required and called-out in architectural drawings.
- Installation of non-electrical services (if re-quired).
- Current room dimensions plan, including hallway and entry door.
- The manufacturer does not accept any responsibility for overexposure of animals or personnel to X-Ray radiation generated by this equipment which is a result of poor operating techniques or procedures.
- To ensure your basic protection requirements, please refer to the relevant X-ray health protection standards provided by your radiation protection department.
- Make sure that the X-Ray tube is set in working position with the reference axis (X-Ray Beam) pointing to the reception detector.

12 Technical Information:

Environmental and Structural Requirements:

- Because X-Ray equipment produces radiation, special precautions may need to be taken or special site modifications may be required. It is the responsibility of the installer to consult a radiation physicist for advice on radiation protection in X-Ray rooms.
- Prior to installation, inspect the site and verify that the X-Ray room complies with pre-installation requirements.
- Attenuation requirements: X-Ray attenuation equivalent. Follow Federal, State, and Local Regulations as required.
- Minimum door sizes also apply to the hallway and elevator. The minimum door height must be 80" and door width 36" to allow delivery and installation of the system.
- Any elevator that will be used to transport the equipment must have a depth of 65" and capacity for 330 lbs. including the handler.
- Recommended X-Ray room dimensions: ≥ 2m X 3m X 3m (L X W X H); minimum door size: ≥ 1.0m X 2.2m (W X H)
- Recommended flooring requirements: Solid foundation floor with weight bearing capacity of ≥ 350 kg/＞; flat and clean; dry and well-ventilated surface.
- Marking instructions: Ionizing radiation signs and X-Ray room posters are required outside the door of the x-ray room for precautions.
- Auxiliary protection requirements: Each x-ray system should be equipped with required auxiliary protective equipment like lead aprons, lead gloves and lead glasses.
- Ambient temperature: 10 ℃ ＞ 40 ℃, it is recommended to equip with heating and cooling air conditioner to control the temperature at 25 ℃ ± 2 ℃
- Relative humidity: 30% to 75%.
- Be careful about the temperature change rate inside the equipment room which must not exceed the range of 10 ℃ per hour to avoid the damage of equipment caused by the condensation in the control cabinet.
- It is recommended to install air-conditioning equipment with dehumidification function in the equipment room to ensure that it works within the range, which is conducive to the long-term stable operation of the equipment.

Accessibility:

Make sure the room is planned with the following access requirements:

1. Provide easy access to equipment.
2. Position pedal so that animals cannot activate the equipment.
3. Position pedal so that operators can access easily during exams.

13 Electrical Requirements:

ROUTING CABLES:

Run Cables neatly through column and secure with cable ties.

14 Power Requirements:

1. Power supply voltage/ Line voltage: 220 ± 22V/ 208 VAC- 5% -230 VAC + 10%; phases: single-phase three-wire system with independent safety ground wire.
2. Power frequency/ Line frequency: 50 / 60Hz ± 1Hz.
3. Power supply internal resistance/ Mains line internal resistance: less than 0.5Ω.
4. The equipment room should be equipped with a dedicated air switch.
5. Power supply capacity: ≥13.2kVA
6. The cross-sectional area of the length of all the wires from the power switch to the external power transformer is an important factor related to the internal resistance of the power supply. Therefore, a sufficient cross-sectional area of the wire (≥6m m²copper wire) should be selected according to the input power requirements.
7. Requirements for protective grounding devices: The grounding devices and terminals shall be safe and reliable. The grounding area of the grounding terminal shall be ≥0.36 m²; the cross-sectional area of the grounding copper wire shall be ≥2.5mm².

The grounding resistance must meet the requirements of <4Ω. The grounding wire directly enters the air switch of the power distribution box, and there is no grounding device and connection connector in the middle.

To avoid the risk of electric shock, this equipment must be connected to a power source with a protective ground.

Since X-ray systems are relatively precise electrical equipment, they should be **HANDLED WITH CARE** during transportation to avoid vibration or shock. Especially the X-ray tube components which are fragile.

When the floor bearing capacity and the height of the room cannot meet the requirements, **DO NOT INSTALL** the system.

IV. INSTALLATION

15 Tools and Equipment:

Tools for Uncrating:

- Pliers
- 8mm Socket, Adaptor for Impact wrench
- Impact wrench
- Phillips Screwdriver (crosshead)
- Utility Knife
- 6 mm Allen Wrench
- 5 mm Allen Wrench

Tools for Installing:

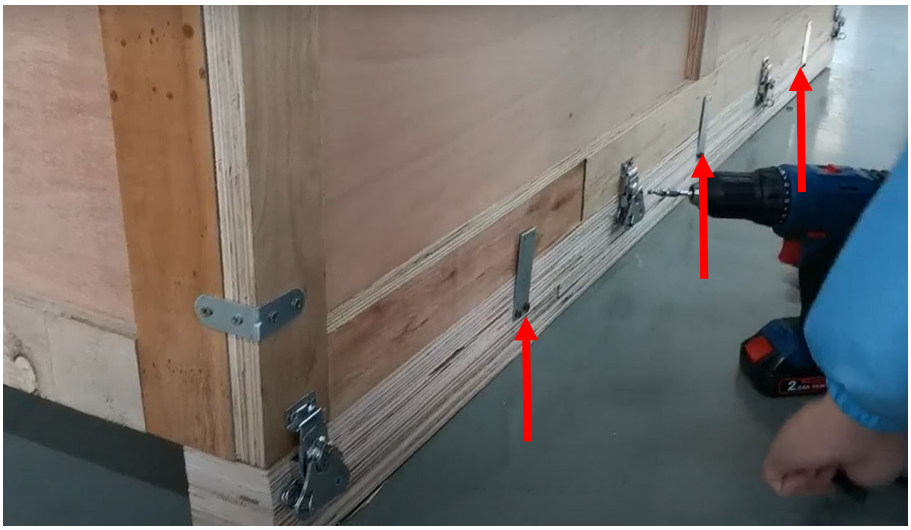
- Standard and Metric Socket Set with wrenches
- Standard and Metric Allen Wrench Set
- Set if JIS screw drivers advised size 1 and 2
- Digital Voltmeter
- Standard and Metric Tape Measure
- Wire cutters
- Wire stripper
- Wrist ground strap (rare cases)

Test Equipment for Configuration and Calibration:

- Non-invasive, digital dose multimeter capable of measuring KVP, mA, mS, and HVL

16 Uncrating

1. Undo the shipping brackets by removing the screws located at the bottom of both sides of the wooden crate.



2. Bend the tab on the brackets using pliers and twist the lock to release the four brackets on both sides of the crate.

3. Remove the entire crate cover to reveal the contents. (This may take two people).

4. Remove the shrink wrap and take out the front door panel from the backside of the table first and set aside.

5. Remove all the packaged boxes from the crate and place them aside. Unscrew the rest of the wooden pieces from the bottom.

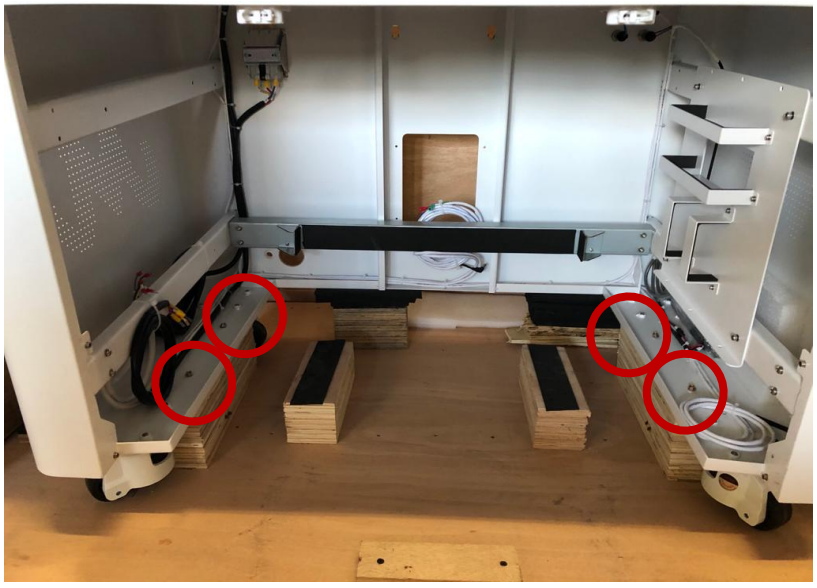
6. 

7. Put aside the column and column base carefully (Warning: Heavy and big structures). Make sure to remove all the components packages from the crate except the table and generator.

8. Unscrew the transportation brackets inside the table one by one. First remove the front one and keep it aside. Use one of the wooden panels as a plank onto the base of the crate. Lift the Generator up and pull it out ensuring that the generator is inserted between the wooden supports on the base and slide it on the plank for easy removal. (Make sure to take necessary precautions for sliding the generator out)

9. Watch for the wooden fixings on the bottom to prevent any damage to the table and slide it on the same plank for easy removal.

10. Unscrew the following bolts according to the diagram below and ensure to unlock the four wheels.



11. Unlock the four wheels and push the table to either side of the crate to slide it out.
12. After uncrating all the components, refer to the installation portion of manual for further instructions.

Note: For any issue or concerns related to the product, contact your local dealer support directly.

17 Installation of the Table and Head Column

1. Install the column base by removing 2 Allen head bolts from the bottom followed by loosening 2 Allen bolts on the top.
2. Insert the top two notches and position the column vertical to the column base.
3. Tighten all the four (4) bolts.

Figure 17.1: Column Base inserted to table 1

4. Connect the column-to-column base with the bolts provided in the column:
   a. First, remove the metal plate on the back of the column by unscrewing the four (4) bolts.

   b. Unscrew the Allen bolts from the top of column base and slide the column vertically to the column base.

   c. Insert the removed Allen bolts from the column base back and tighten them. Do not replace covers until all cables are run and secure.

Figure 17.4: Column Base inserted to table 2

18 Installation of the X-Ray Tube, Smart Collimator, and Display

1. Install the trunnion rings:
2. Remove the two (2) Allen bolts from each of the hoops.
3. Unscrew the top Allen Bolt (AB-3) until it is level with the hoop radius, and it becomes flat as shown in the picture below.

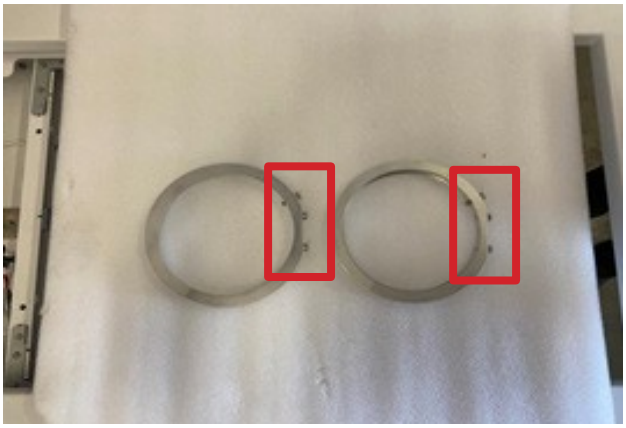


Figure 18.3.a: Trunnion Ring Screws

Figure 18.3.b: Trunnion Rings Unscrewed

4. Unscrew the metal plate (red highlighted area in picture below) from the top of the column.
5. Position the Mount plate (blue highlighted area) on front of the tube holder in upward direction and tighten the Allen bolts inside the removed metal plate.

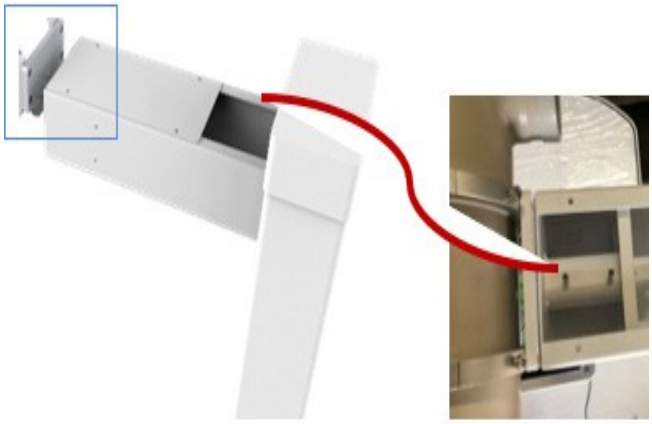


Figure 18.1: Mount Plate

6. Install the flat part of the hoop on to the column as shown below by screwing in the removed Allen Bolts. Note: the tube securing Allen Bolts (AB-3) are at the top.

Figure 18.2: Hoop Attachment

7. Secure the tube with trunnion using the Allen Bolts removed in the previous step. Do not tighten the Allen bolt (AB-3).

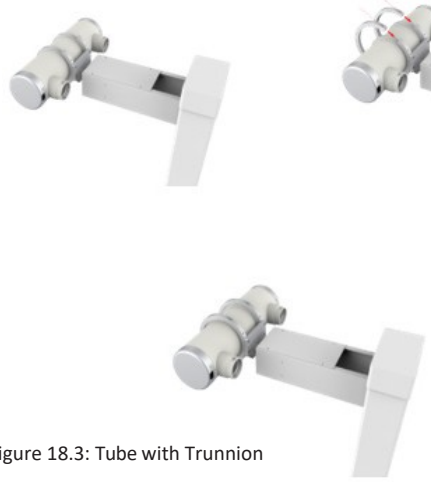


Figure 18.3: Tube with Trunnion

8. Mount the monitor/display base and collimator flange (ensure the side of the flange falling outward is on directed to the bottom).

Figure 18.4 A and B: Display Mount

9. Remove the butterfly bolt from the LCD/ touch screen back to take off the mounting plate. Position them onto each other as shown below and screw

in the butterfly bolt.

19 Installation of the Collimator and X-Ray Tube

1. The collimator and the X-ray tube assembly are connected through a flange (see Figure 6 below).
2. The four hexagon socket screws M6x20 are screwed onto the flange to the output window of the X-ray tube assembly.
3. Insert the collimator into the flange so that the end face of the flange is close to the connection end face of the collimator.
4. Close the stencil into the flange and lock in place.
5. Lock collimator in place using fingers to tighten only. (Collimator lock)
6. Check that the collimator is securely installed.

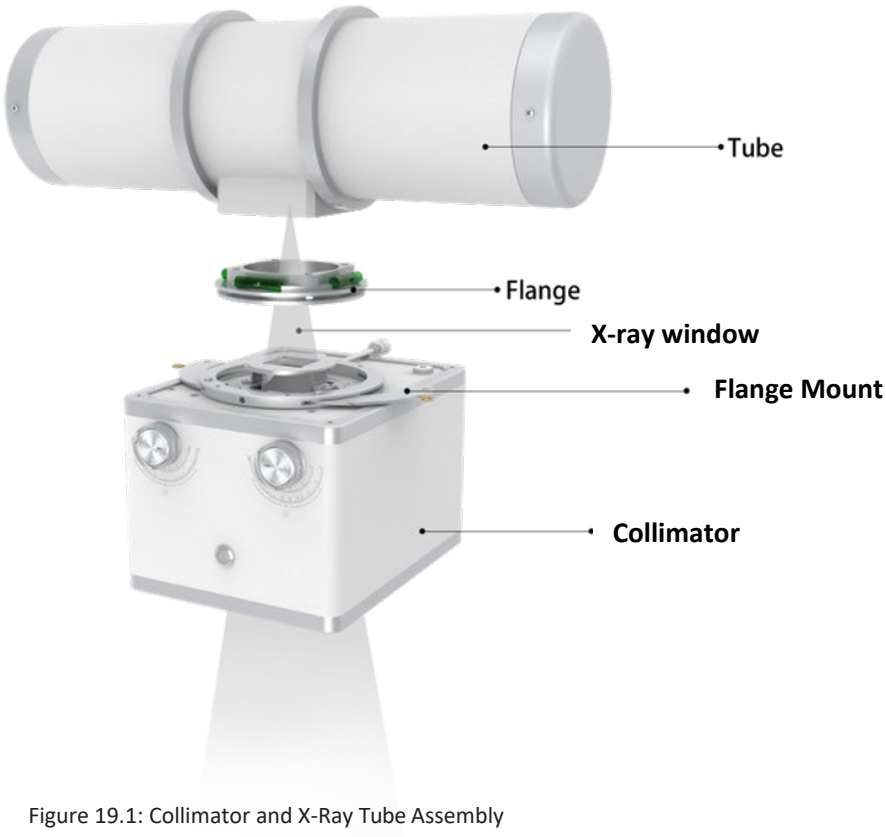
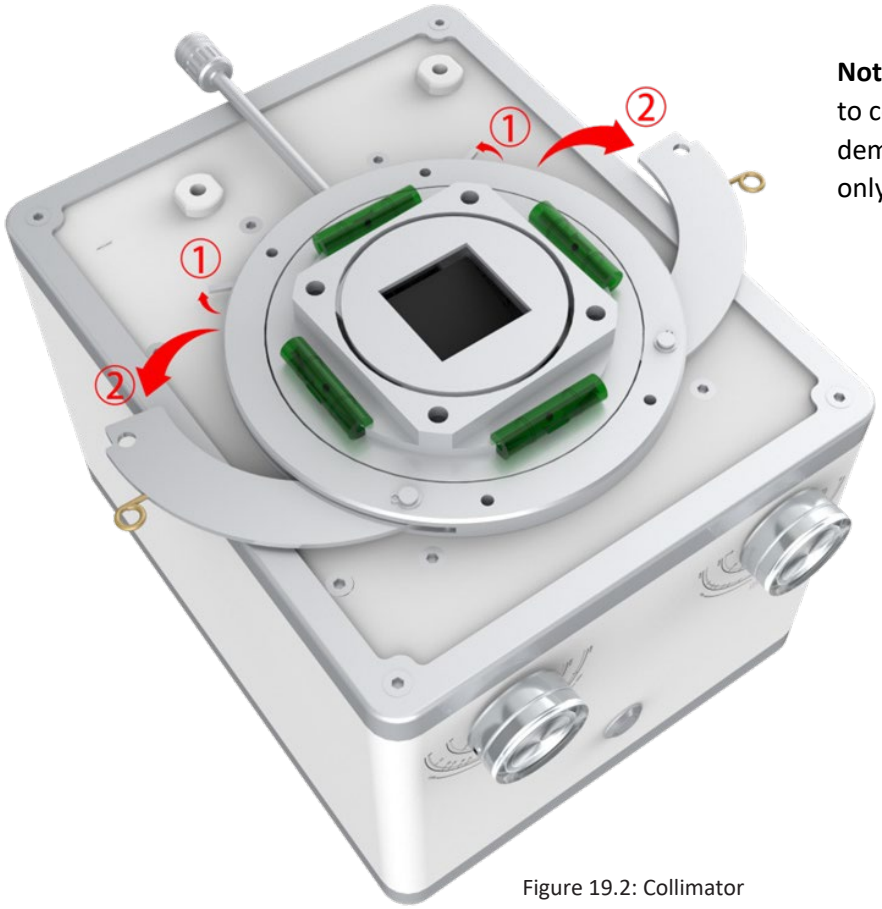


Figure 19.1: Collimator and X-Ray Tube Assembly



Note: Flange is mounted to collimator for demonstration purposes only.

Figure 19.2: Collimator

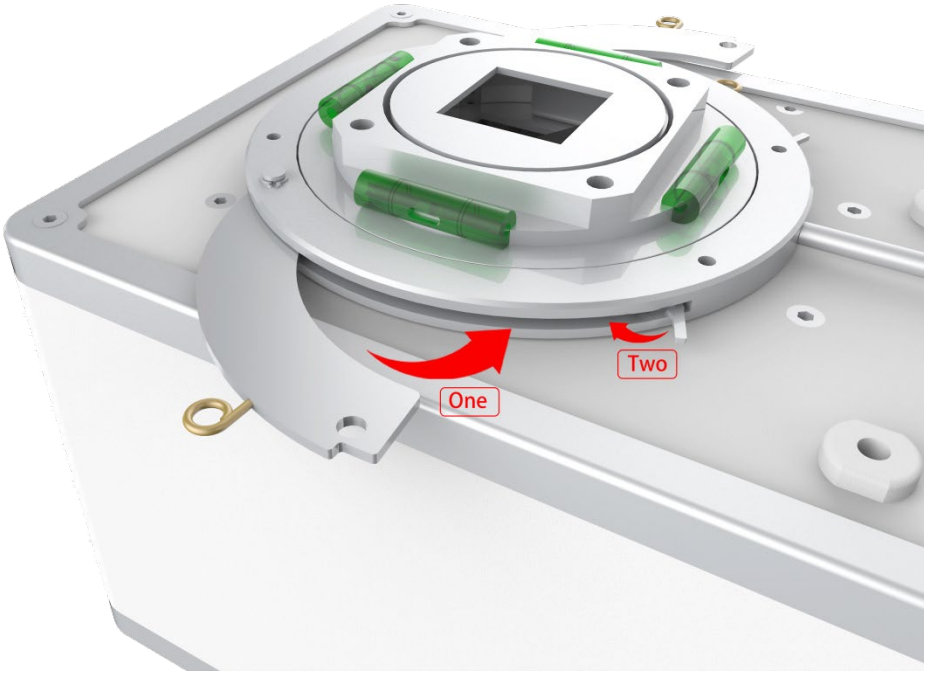


Figure 19.3: Collimator

7. Install the SMART collimator and lock the flange stencils.

Figure 19.4: Install Collimator

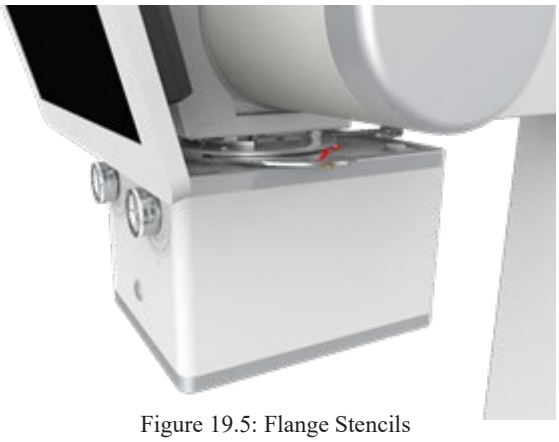


Figure 19.5: Flange Stencils

8. Adjust the x-ray tube level with the collimator level. Align to the center of flat panel detector and tighten the Allen bolts (AB-3) for complete mounting. Note: Refer to Collimator section for adjustment and calibration.

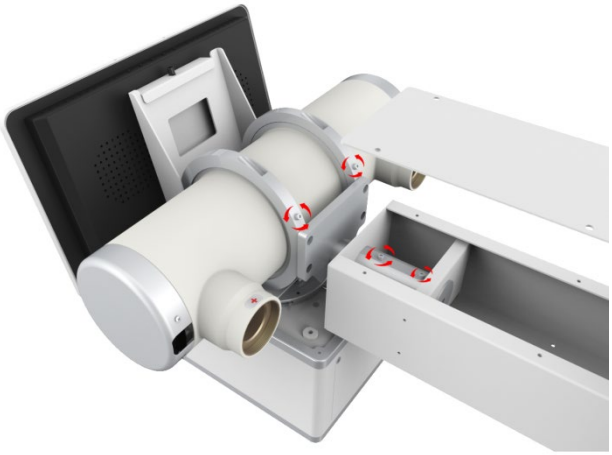


Figure 19.6: Adjust the X-Ray Tube

20 Installation of Flat Panel Detectors (Tabletop Removal and Grid Installation)

1. Unplug the plastic hole plugs from the bottom of tabletop as shown below and remove transfer fixings.
    a. Disconnect the cable and remove the six wing nuts.

Figure 20.1: Six Wing Nuts

Figure 20.2: Transfer

    b. Install the flat panel detector and grid by removing the shipping brackets to release the tray and table locks.

Figure 20.3: Shipping Brackets

21 Installation of Flat Panel Detector and Grid

1. Install tethered panel with cable to the front of machine. Connect panel cable to cable from control box. Coil excess cable and tie wrap to side.

Figure 21.1 A

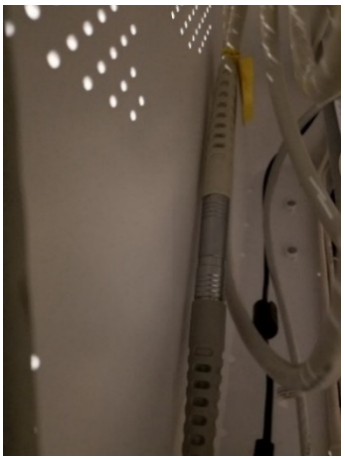


Figure 21.1 B

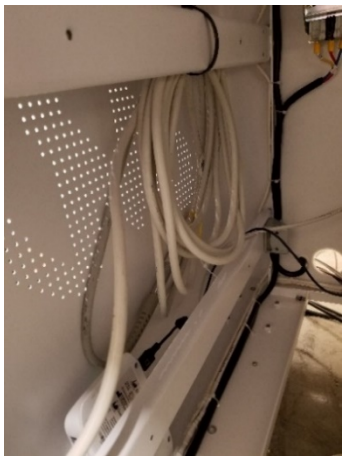
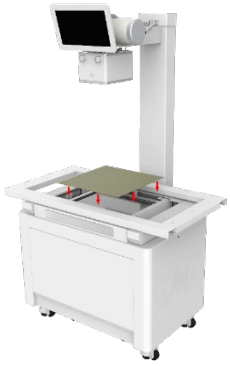


Figure 21.1 C

2. Place the grid inside the table brackets and tighten the four screws.



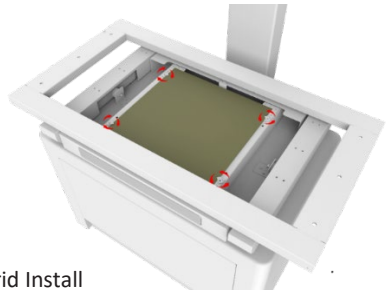


Figure 21.2: A and B Grid Install

3. After panel is installed and the alignment is checked install grid according to manufacture instructions. Secure with tabs by loosening the Philips head screw and rotating tab over edge of grid and retighten screw. See Figure 21.3.

21.3. Do this on all for corners.

4. Install Grid in relation to the X-Ray Field.

5. The Tethered panel requires connection to the power supply from the breaker of the table using the provided cable. Connect to load side of breaker.

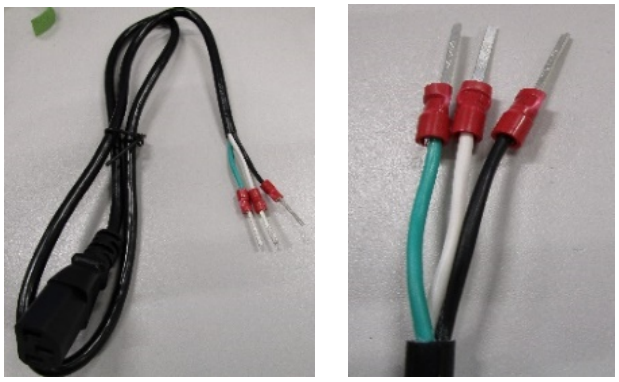


Figure 21.4: Tethered panel to breaker cable

6. Power pack is 100-240v We are connecting to 208v. Make sure power is off at main disconnect. Remove breaker from bracket by loosening 2 screws on retention bar and 4 screws that attach to base.

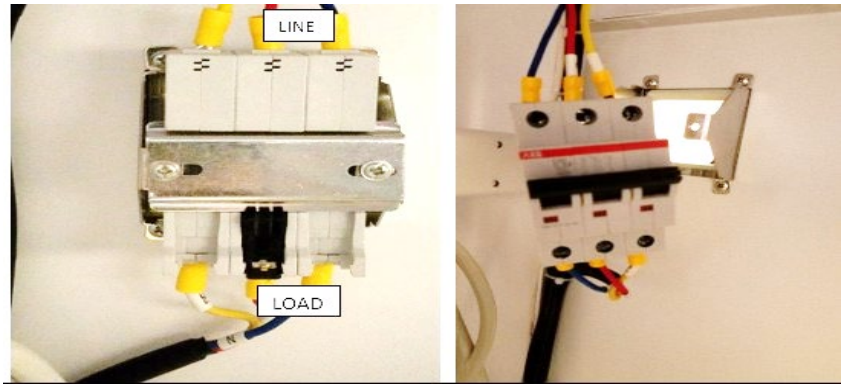


Figure 21.4: Breaker Connection

7. Connect ground to yellow wire, white to red wire, and black to blue wire. This will supply power to panel when air switch is on. For wireless panel see separate install document. Re-attach breaker and secure wire with tie wraps.

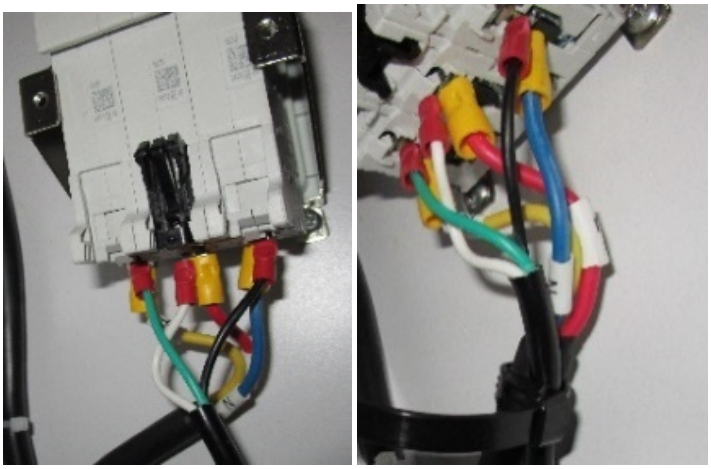


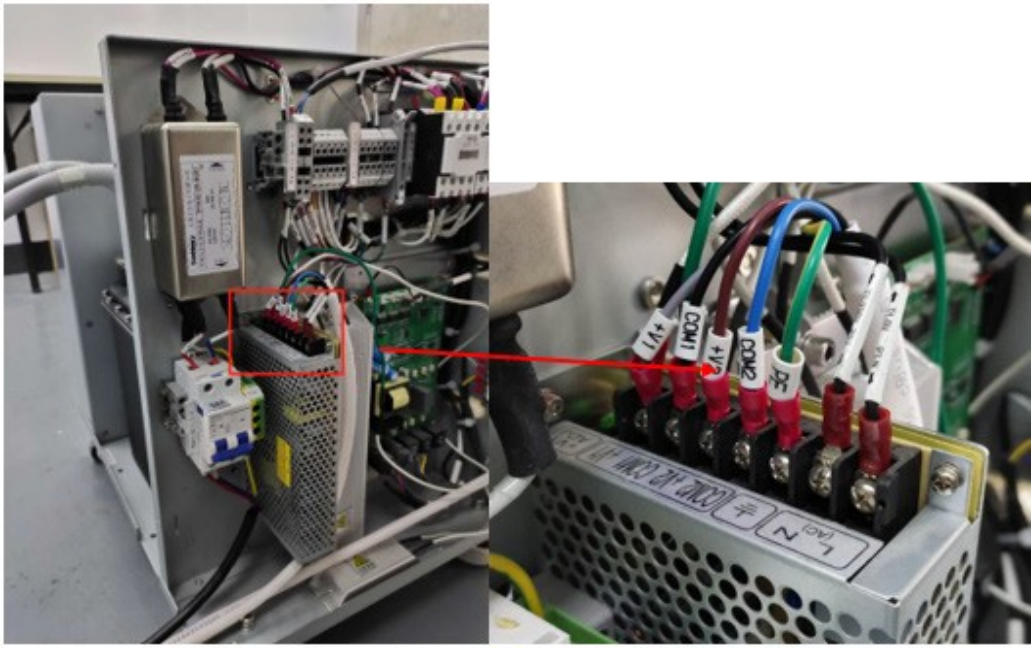
Figure 21.5: Panel Wires

22 Electrical Connections

All connections should be made using the following figures and diagrams. Be sure to check the connections prior to powering on the equipment. Keep wires neat with cable ties.

1. **Connect the X-ray table and smart high frequency generator following the figures below.**

Figure 22.1.A: Showing connection of computer, SMART collimator, display, and electromagnet through internal Power supply unit.



2. **Connect the SMART high frequency generator and X-Ray tube following the figures below.**

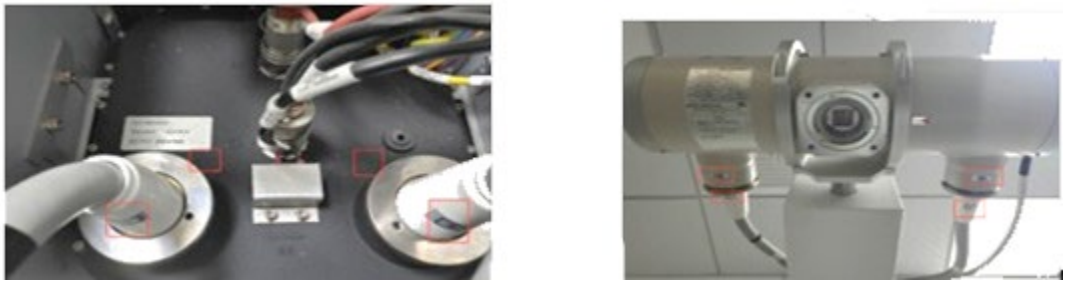


Figure 22.1: Showing connection between SMART HF generator and X-ray tube using high voltage cables and rotating anode

- The cathode of high voltage tank is connected to the cathode of tube by high voltage cable, and the anode of high voltage tank is connected to the anode of tube.
- Open the blue cover of the high-voltage interface on the top cover of high voltage tank.
- Clean the socket threads and the inside of the bottom barrel with oil-absorbing paper. No foreign body is allowed. Wipe the high voltage plug and the black sealing ring with absolute alcohol.
- After wiping, it needs to be dried for 2 minutes.

- After drying, (If included) sealing disc is inserted on to the high voltage plug and insulating silicone grease is applied on the surface. See photo below.

Figure 22.3: HV Plug and disc

Anode Connection:

- Positive end from the tube should be inserted into positive side of generator.

Figure 22.4 A and B: Anode Connection

Cathode Connection:

- Negative end from the tube should be inserted into negative side of the generator.

Figure 22.5 A and B: Cathode Connection

- Connect stator cable from tube to anode drive board as shown in chart and photo below.

Rotating anode:

Figure 22.6.A: Anode drive board

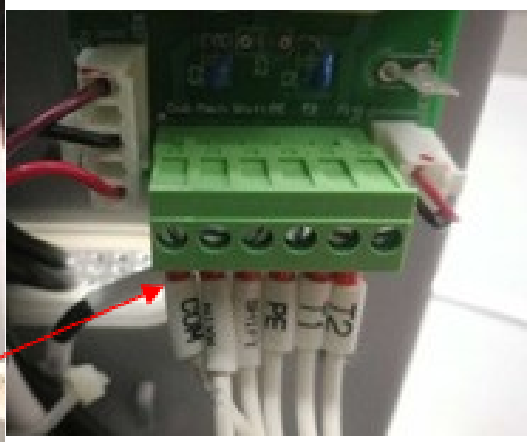


Figure 22.6.B: Stator connections

Figure 22.7: Pin Definitions for the Rotating Anode Drive and Heat Switch

Name	Function	Pin No.	Pin definition	Detailed description
P1	Rotating Anode Drive and Heat Switch	Pin1	COM	Neutral Point in Tube Anode Motor
		Pin2	MAIN	Main Winding in Tube Anode Motor
		Pin3	SHIFT	Auxiliary winding in Tube Anode Motor
		Pin4	PE	Ground
		Pin5	T1	The heat switch drawn from the ball tube will give a high-voltage alarm when the heat exceeds a certain limit.
		Pin6	T2	Ground of heat switch

3. Tube Interface:

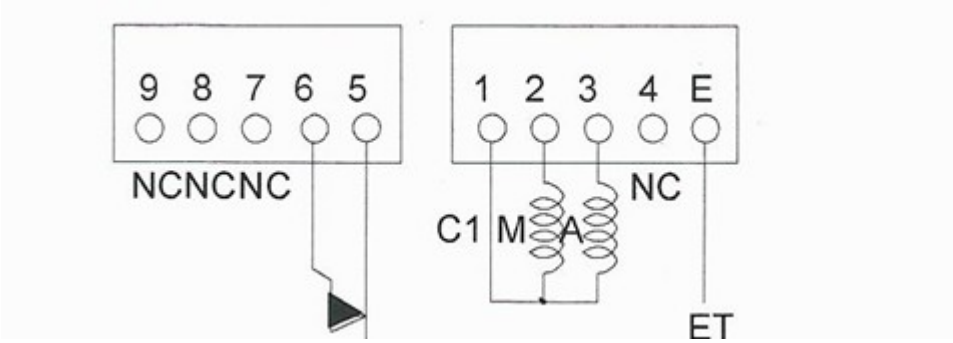


Figure 22.8: Tube Interface Map

Figure 22.9: Tube connections

4. **Connection between SMART high frequency generator and Opal PC**

Connect the 232 serial cables to the interface board port P11 using the figures below.

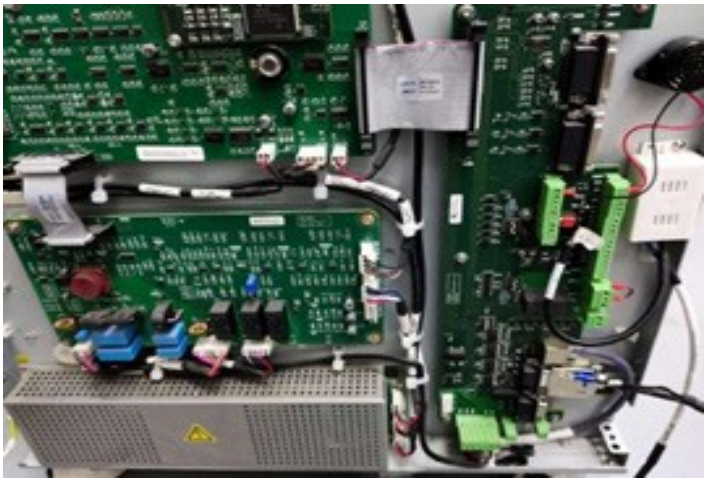


Figure 22.10 A: Interface Board Figure 22.10.B:

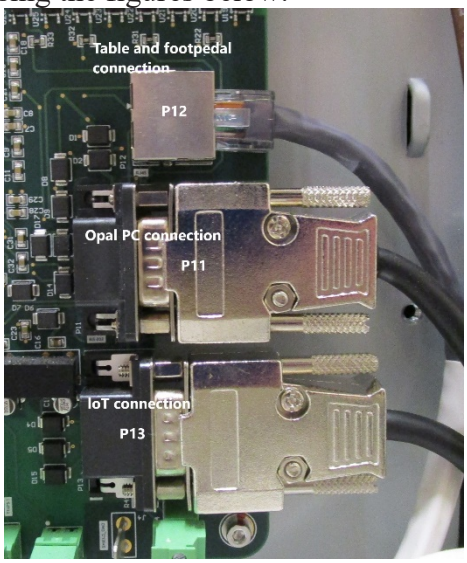


Figure 22.10.B: Interface Board Port

5. **Connect the SMART high frequency generator and exposure switch using the figure below.**

The connection for remote service switch, foot switch exposure and remote held exposure is established through interface board P12.

Figure 22.11: Interface Board

6. **Connect the SMART high frequency generator and tabletop using the figure below.**

This ensures wiring connection of generator to the tabletop switches to enable four-way floating function (through SW1). Insert in two connections.

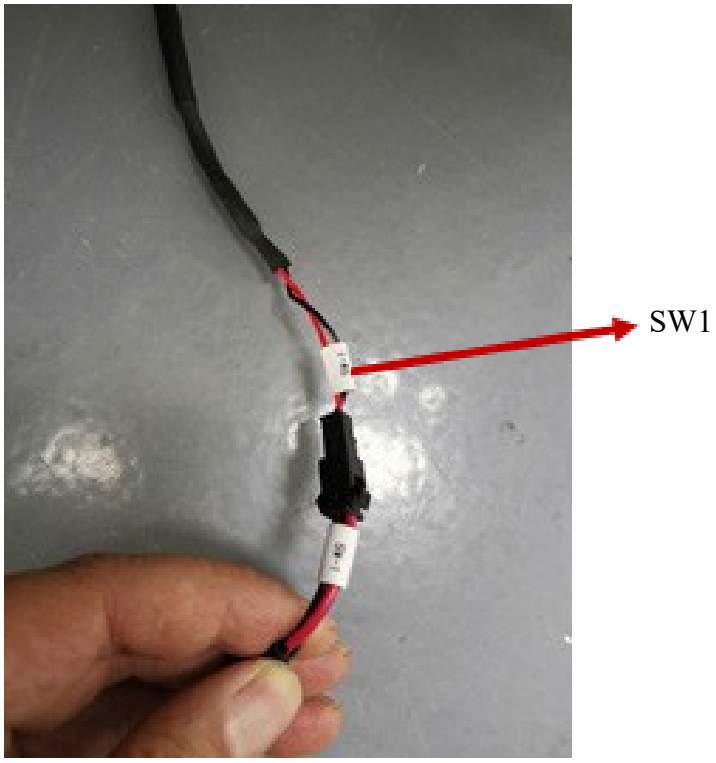


Figure 22.12: Table 4-Way Float Connection

7. **Connect the SMART high frequency generator and SMART Collimator using the figures below.**

The power cables coming out from the collimator should be connected to the cable coming from the X-ray table. Make connections carefully.

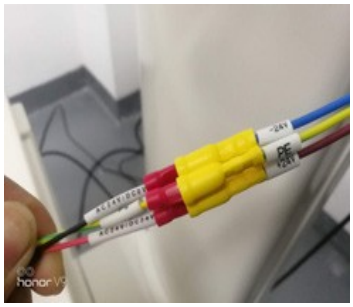


Figure 22.13.A: 24v Collimator

Figure 22.13.B: USB 3 Camera

PE Ground

L L

N N

The orange USB collimator camera connector to the computer USB 3.0 port

8. Display connections:

Ensure the HDMI, USB, and power supply cables are connected to the display touch screen. The other end of HDMI and USB should be connected to the OPAL computer. HDMI to DP converter will be in box. Power supply of display touchscreen is connected through the table itself.

9. Computer connections:

Connect the computer power cables, network cables, serial cables, USB extension cables, and touch screen cables. See diagram below for connection locations. This is a two-monitor system. Right click on the desktop and go to **display settings.** Select monitor 2 scroll down to **multiple display settings** and select duplicate desktop on 1 and 2.

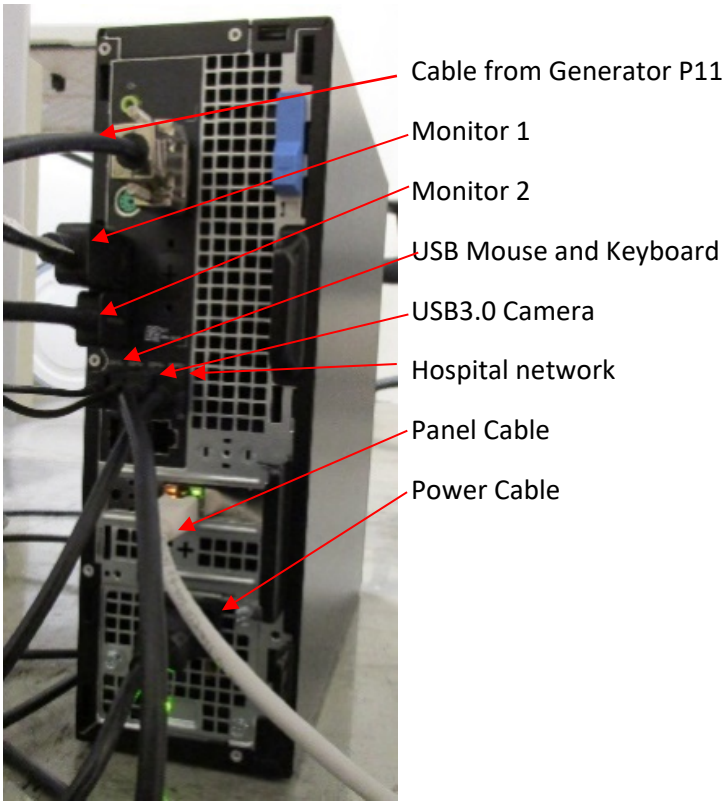


Figure 22.14: Opal PC connections

10. Connect the IoT monitoring platform with SMART HF Generator using the figures below.

Connect IoT data communication with PORT P13 using RS232 to USB control unit.
Connect the Power of loT following the images below. Cables labeled ***L*** and ***N***
L connects to 230v ***N*** connects to 0v.

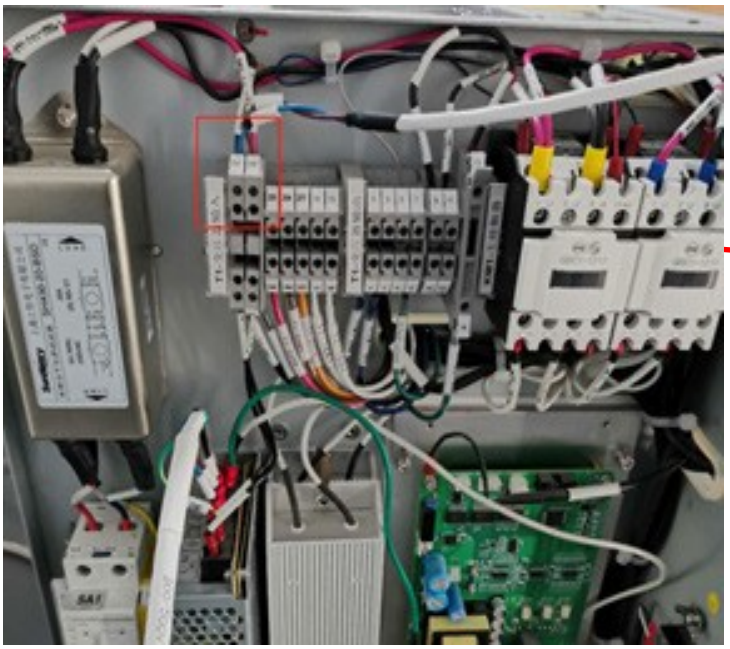


Figure 22.15.A: IoT Power Connection

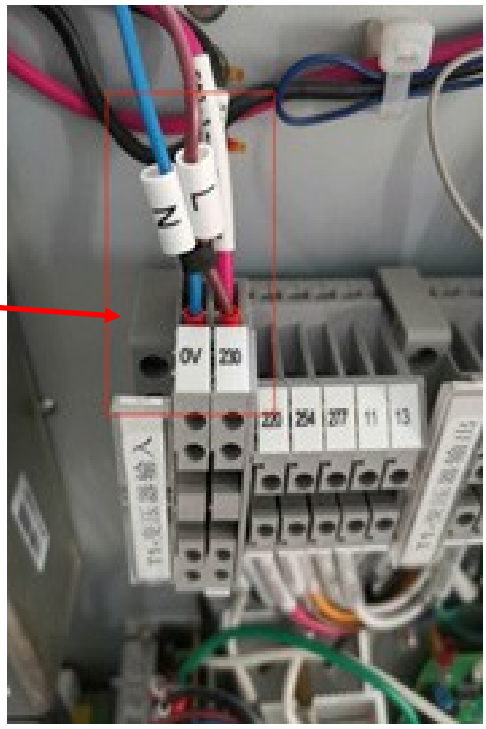


Figure 22.15.B Power Connection

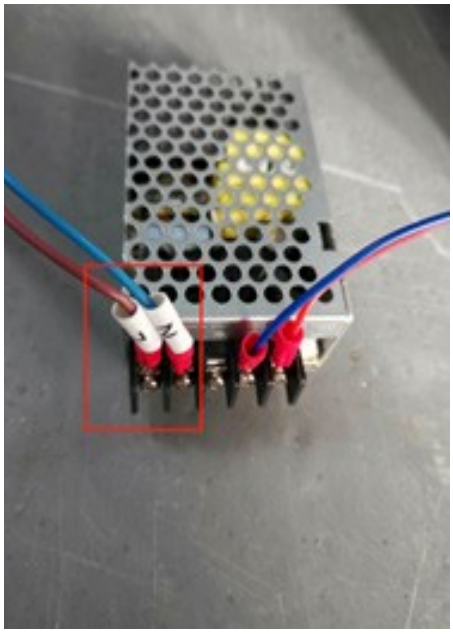


Figure 22.15.C IoT power supply

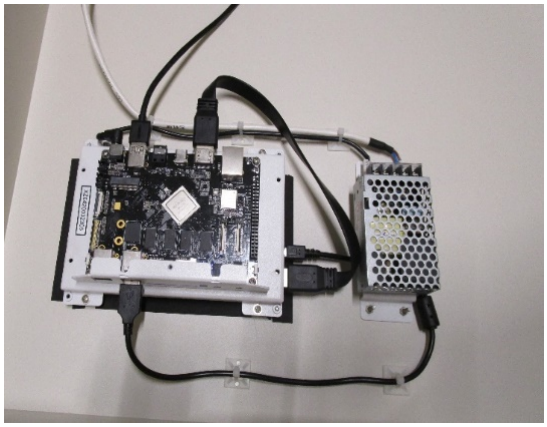


Figure 22.15.D: Port P13 IoT to generator

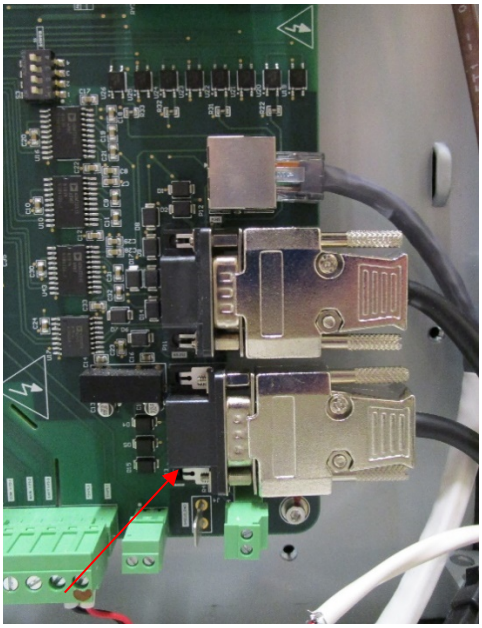


Figure 22.15.D: loT and connection P13

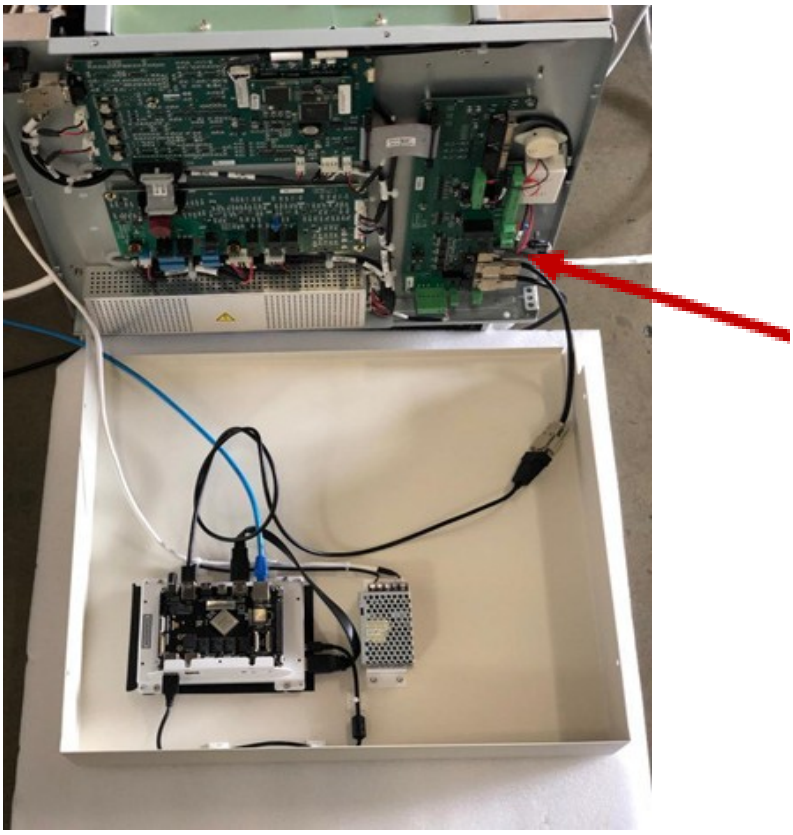


Figure 22.15.E: Image for reference only

11. Wiring:

All the wiring connections should be arranged neatly and in order. Tie the cables with nylon cable ties. Check for worn wires or cables.

12. Connect the Main or input power supply following the image below (Load side from table breaker air switch) to the line side of iMi-HF32 generator breaker.
    - L >> L
    - N >> N
    - Ground >> PE

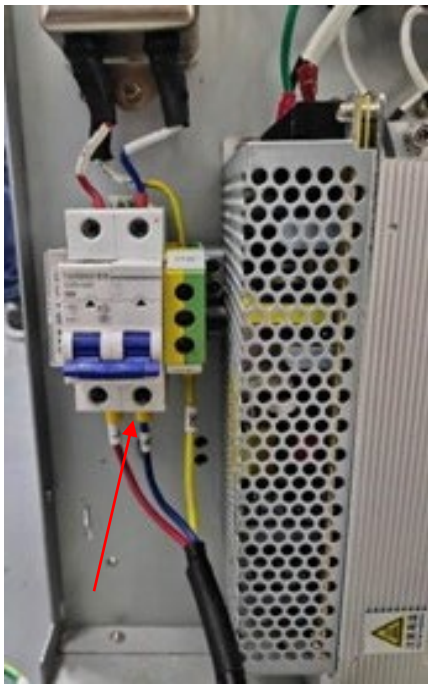


Figure 22.16: Main power to generator

23 Generator Configuration and Tube Calibration

Software interface introduction

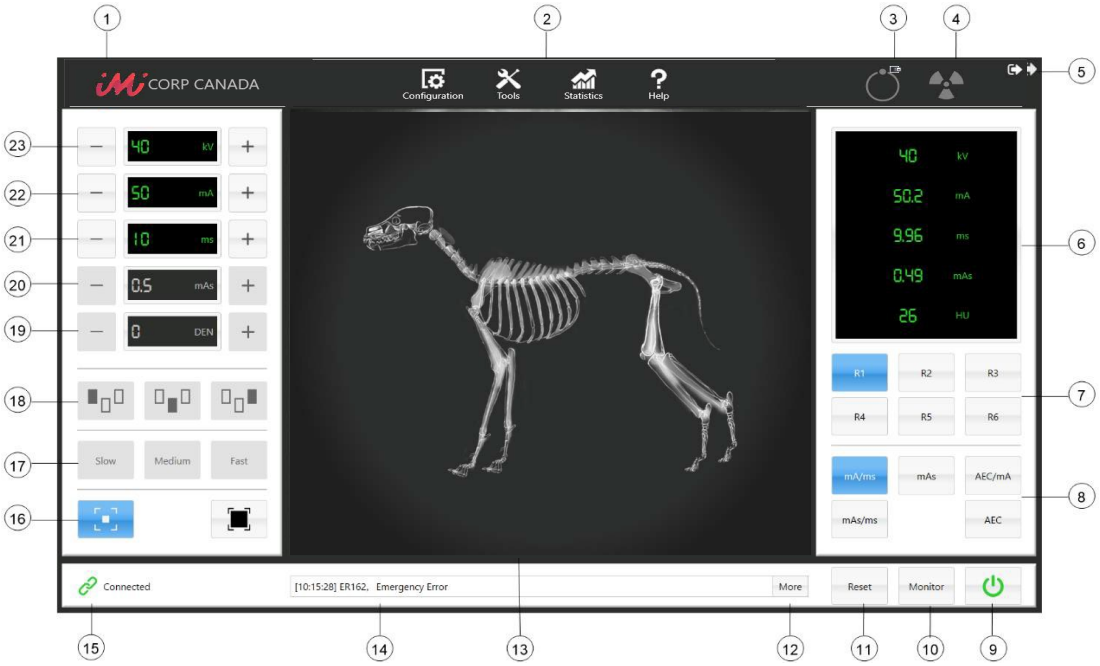


Figure 23.1 Software interface

Software Interface Definitions
1) Corporate Logo, that is a status identifier, is highlighted in orange as both the generator is powered-on and it's communicating well with software otherwise the Logo appears gray.
2) Parameters setting menu, with four items ("Configuration", "Tools", "Statistics" and "Help"). "Configuration" contains generator configuration and software configuration; "Tools" contains Filament Calibration, AEC Calibration and auto aging; "Statistics" contains exposure counting and system log; "Help" contains product information, help document and firmware updating.
3) Prepare indicator
4) Exposure state indicator
5) Exit button. Click this button then quit from the software system.
6) Data feedback
7) Work station selection (Don't open for user).
8) Exposure technical setting
9) Power on/off, see 3.3.7.2 for detail.
10) Serial interface monitor. It's used to monitor the data of serial interface, convenient to service engineer.
11) Internal test (not open for user)
12) Detailed error message.
13) Brief error message
14) Working area of menu. When the menu is selected, the details of menu will show up in this area.
15) Communication state,
16) Focus select
17) Internal test function (not open to user)
18) Internal test function (not open to user)
19) Internal test function (not open to user)
20) Product of current and time setting
21) Time setting
22) Current setting
23) Voltage setting.

1. Double click the shortcut "" logo to pop up the interface shown below which indicates that the software has been set up.

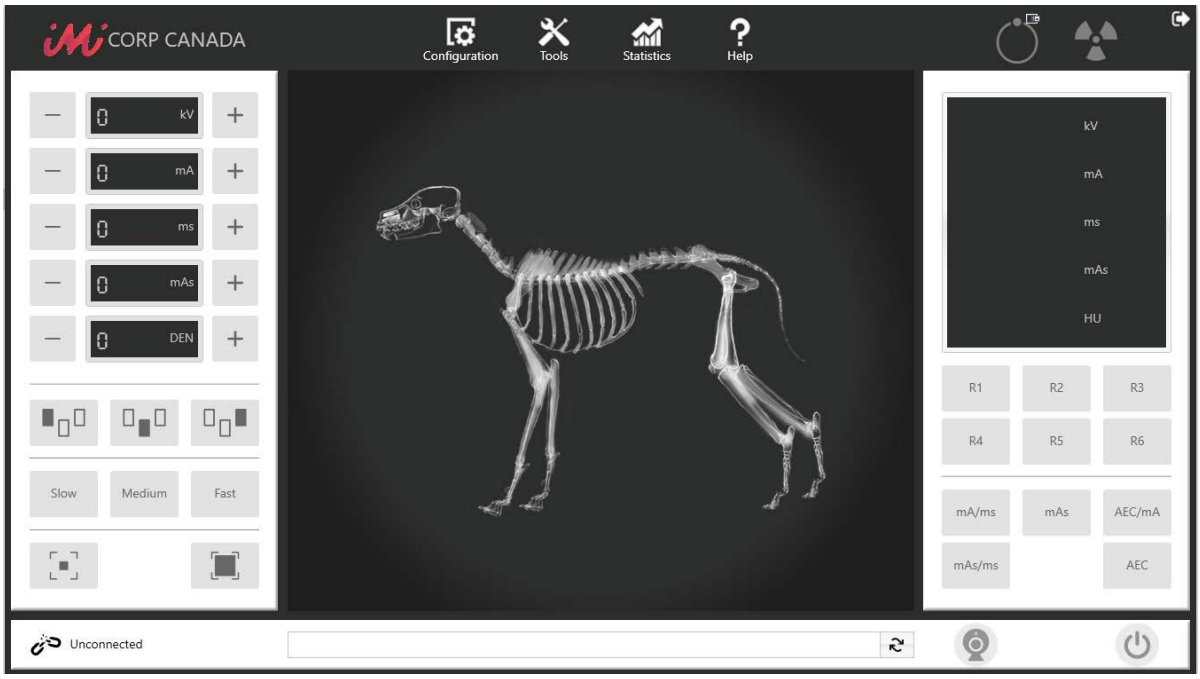


Figure 23.1 Service software

2. In PC OS, open Device Manager and check the Comport Connection Name to ensure it is correct.

3. Select the "Configuration" icon.

4. Open the "Local" tab.

5. Select the "COM" dropdown menu.

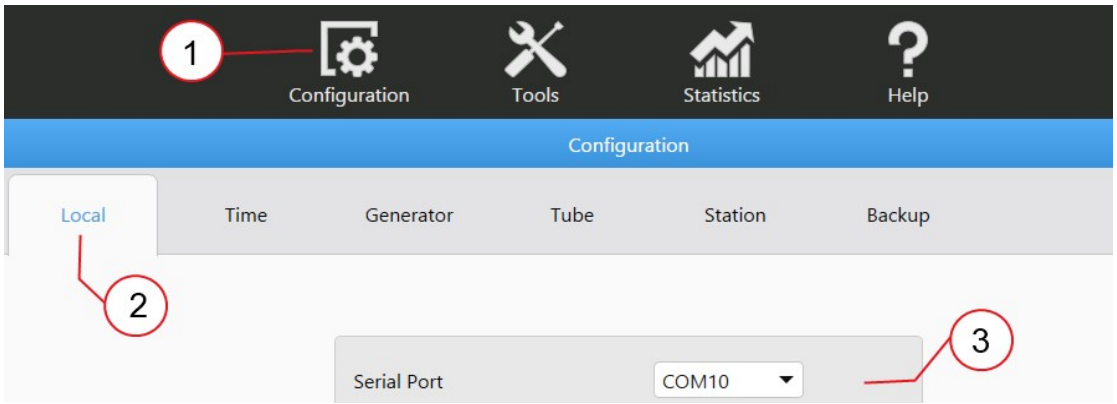


Figure 23.2 Local Tab and COM menu

6. Click on the drop-down arrow on the right of "Serial Port"， it will list all COM ports on this computer. Choose, "Com port" in Device Manager.

Figure 23.3 COM Dropdown

7. Once a COM port is chosen, select ***Apply*** then select ***Yes*** to reboot your software.

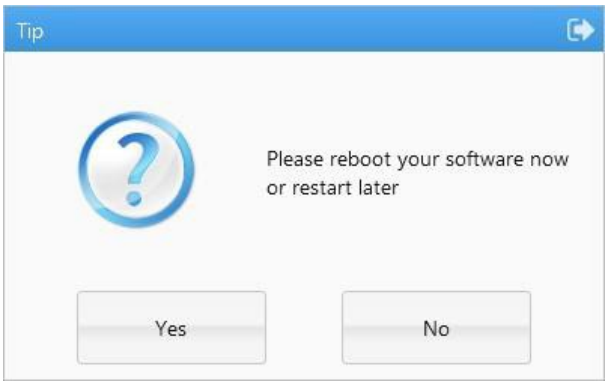


Figure 23.4 Reboot request

A. Generator Parameters Configuration.

1. Click on the ***Configuration*** tool.
2. Select the ***Generator*** Tab to enter Generator Limits.

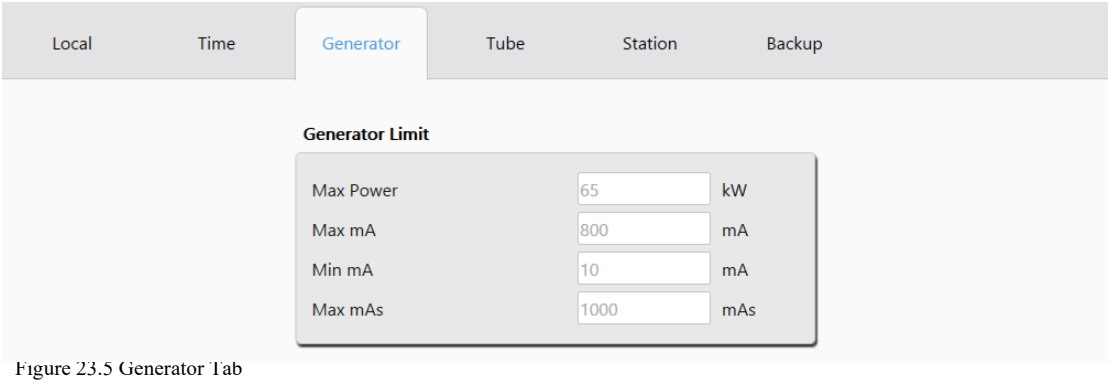
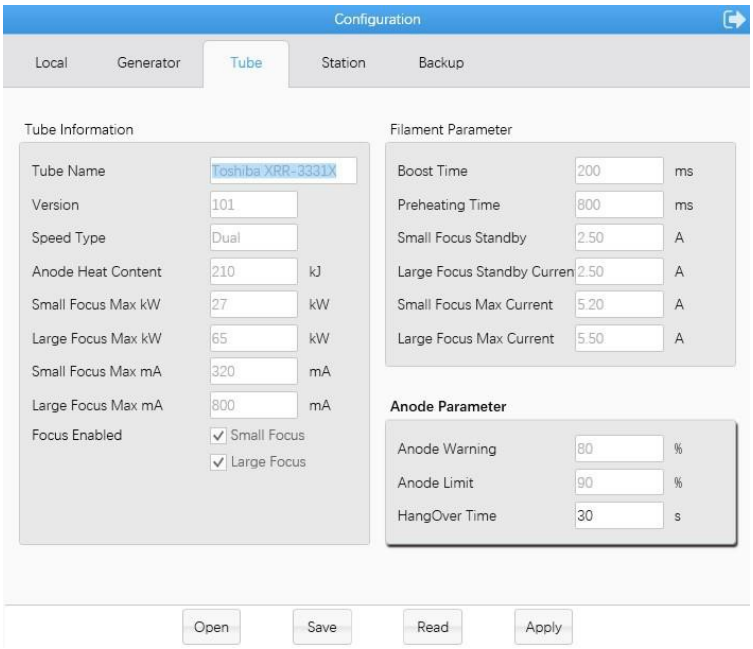


Figure 23.5 Generator Tab

a. Max Power is the maximum power the generator will allow for an exposure.
b. Min mA is the Minimum value supported by the generator to run the tube.
c. Max mA is the Maximum value supported by the generator tube.
d. Max mAs Maximum tube current plus time supported by the generator.

B. Tube Data Configuration

1. Configure the tube data after installation of the tube. Re-configure the tube data in the generator every time it is replaced.
2. Select the Configuration icon.
3. Select the “Tube” tab.
4. Key in the following:
    - “Name”: Name of tube
    - “Version”: Version of software
    - “Speed Type”: Velocity of the tubes low, high, or dual speed
    - Max Heat Storage”: Maximum value of heat capacity of anode.
    - Small Focus Max kW”: Maximum power of small filament.
    - Large Focus kW”: Maximum power of large filament.
    - Small Focus Max mA”: Maximum tube current for small filament.
    - Large Focus Max mA”: Maximum tube current of large filament.
    - Small Focus Enabled”: Whether the small filament is available or not, the selected filament is available, and the unselected filament is disabled.
    - “Large Focus Enabled”: Whether the big filament is available or not, the selected filament is available, and the unselected filament is disabled.
    - “Anode Warning”: Anode heat capacity warning value, if the heat capacity exceeds this value, the generator can still exposure but will send out a warning.
    - “Anode Limit”: The maximum heat capacity of the anode, if the heat capacity exceeds this value, the generator will not exposure.
    - “Hangover Time”: The duration of the "Hangover"' state after each exposure.
    - “Boost Time”: Filament Boost Time.
    - “Preheating”: Filament Preheating Time.
    - “Small Focus Standby”: Standby current of small filament.
    - “Large Focus Standby”: Standby current of large filament.
    - “Small Focus Max Current”: Max current of small filament.
    - “Large Focus Max Current”: Max current of big filament.



C. Function Description

Function	Description
Open	Open the configuration file stored by the computer
Save	Store data in the local computer
Read	Read the configuration file stored in HVG
Apply	Apply data in HVG

Figure 23.7 Function Description

Note:

1. Be sure to select the appropriate tube configuration file for setting, or read the data stored in the generator first.
2. If the configuration file attached to the software does not contain the type of tube you are using, please contact 20/20 imaging for the corresponding configuration file.
3. A file only corresponds to one tube data. Do not save or apply data to other tube.

1) **Read configuration:** There are two ways to read the configuration. One is to click "Open" to pull up the interface.

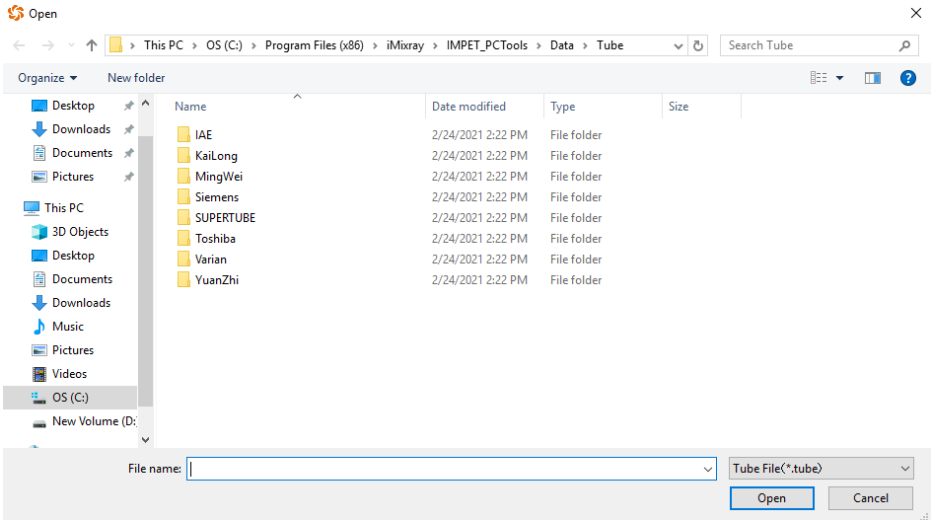


Figure 23.8 Read Configuration

a. Select the corresponding file and click “Open”. At this point, you can see the data in the interface has changed, indicating that it has been read successfully. If the file is corrupted, the system will pop up the error warning box shown below. 。

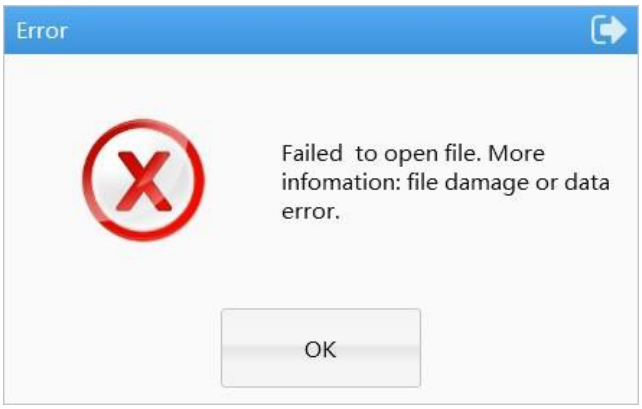


Figure 23.9 Error Warning Box

b. Another way of reading is to directly read the data stored in the generator by clicking “Read”. If the reading fails, the warning box will show in Figure below. Ensure the communication is normal and try again.

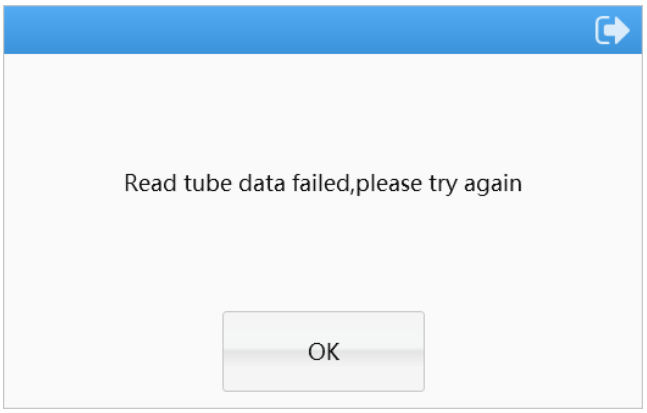


Figure 23.10 Data Failed Box

2) **Modify configuration** ：It can be configurated with due care according to the configuration file provided by the company. To avoid the unreasonable setting of data by users’ mis-operation, the software provides the verification function of some data. If the input data is unreasonable, the warning information as shown below will pop up on the right side of the screen.

Figure 23.11 Hangover Time Value

Note: Some data may not have a verification function, so please observe the unit to fill in the data and set reasonable values. Do not rely on the verification function.

3) **Apply configuration:** Click “apply” after opening or modify configurations. If successfully, it will show up the following the warning box, otherwise it will also show up as a failure warning box.

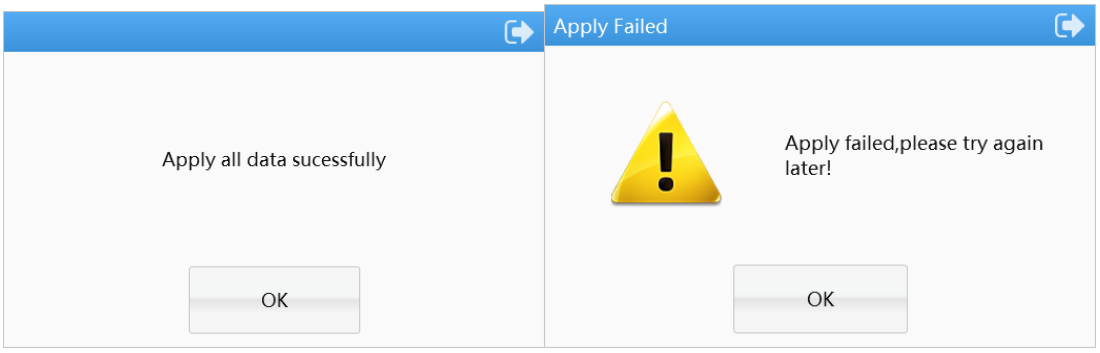


Figure 23.12 A and B Apply Configuration Success and Fail Boxes

4) Save configuration: Click “save” to save the modified data in the local computer.

D. Workstation Configuration

The workstation needs to be configured before using HVG. The configuration method is as follows: click “Configuration” and select the “Station” tab. Set all stations the same as the image below.

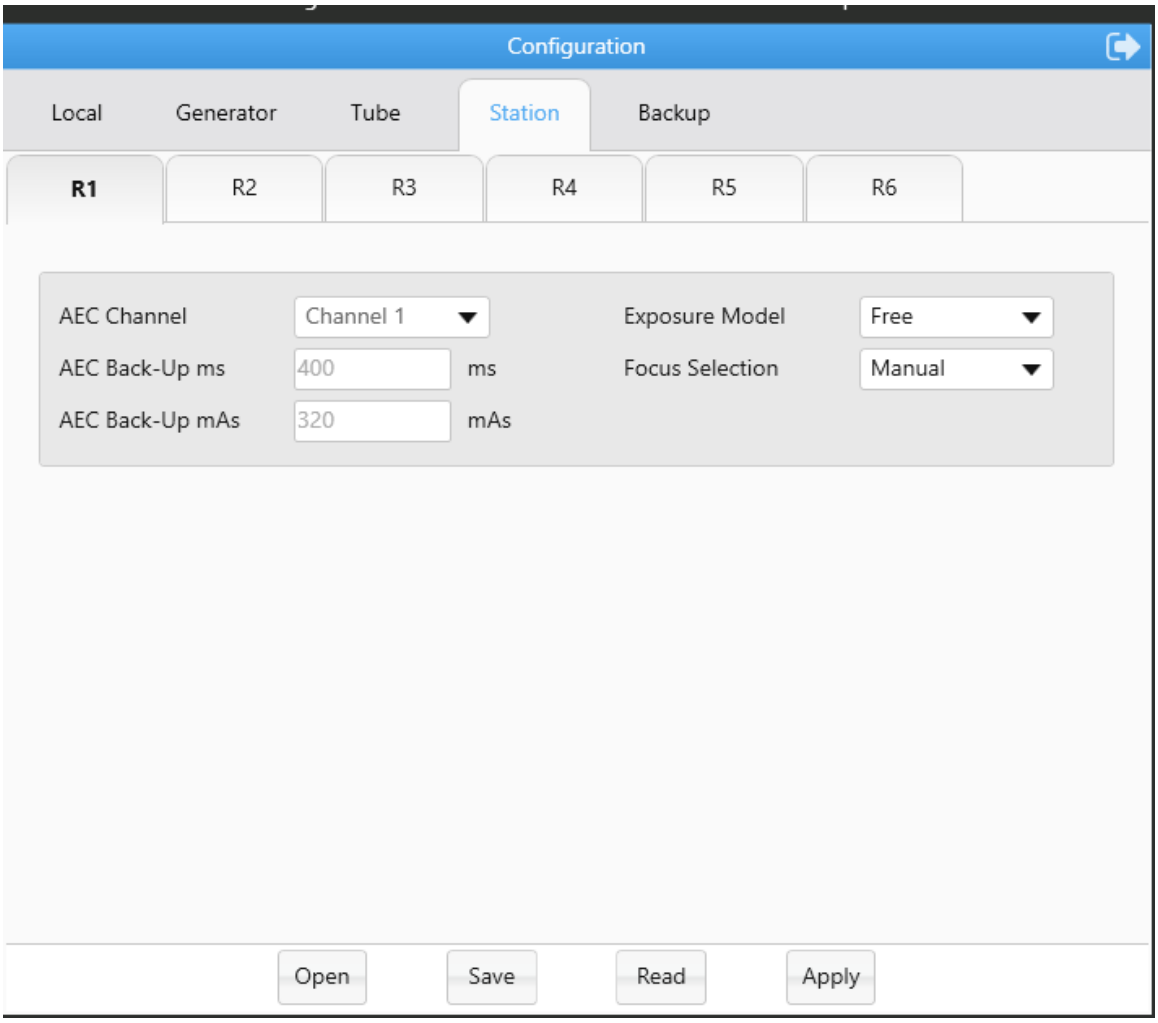


Figure 23.13 Workstation Configuration Interface

E. Interface Introduction

The software can be set up for six workstations, namely R1, R2, R3, R4, R5 and R6. Choose each tab to configure a workstation.

Function Description:

Function	Description
Open	Open the configuration file stored in the computer
Save	Store data in a local computer
Read	Read the configuration file stored in HVG
Apply	Apply data in HVG

Figure 23.14 Function Description

Note: “Open”, “Save”, “Read” and “Apply” in the functional area are used for six workstations, not for selected workstations.

Time settings:

Click ***configuration*** then ***time*** in the dialog box to set-up the time for the generator.

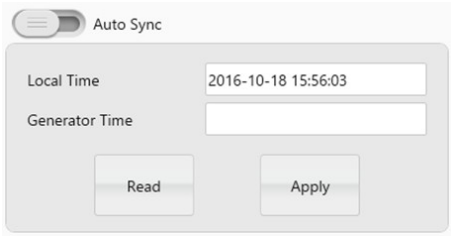


Figure 23.15 Time Settings of Generator

Auto configuration:

The software can automatically synchronize the time of generator. Turn on the "Auto Sync" symbol to  . The generator will synchronize the time with the computer whenever powered-on.

Note: The system self-synchronizes the time. Do not change this configuration if not

Manual configuration:

The manual setting time is as follows:

1. Turn off the "Auto Sync" to  .
2. Set the time at "Generator Time", such as 2017-01-01 14:01:32.
3. Click ***Apply***, the following dialog will pop up, select ***ok***.

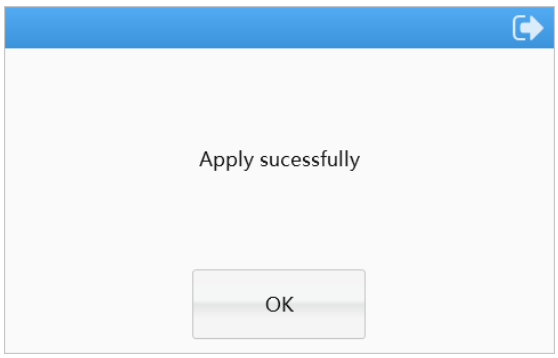


Figure 23.16 Time setting applied successfully

Sound configuration:

The software can make a sound when an exposure is taken and when there is an error warning. The interface allows users to click the sound icon to turn the sound on/off. Click ***Apply*** to have the changes take effect, without restarting the software.

- Playing exposure sound on: 
- Playing error warning sound on: 

Message configuration:

The error message will pop up while improper operation or system errors. Click ***OK*** to close the window. The system supports automatically close the window after the “Popup Display Time”.

Notes: 0s represent the window always show up until manually closing the message window.

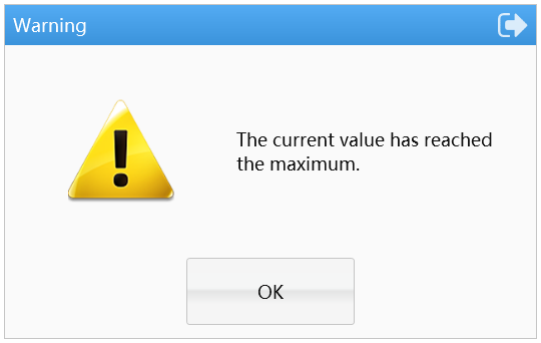


Figure 23.17: Message Window

F. Exposure Parameters Settings

Exposure parameters need to be set before exposure with foot pedal. If exposure parameters are not set, a failure may occur.

Selection of Exposure model:

As shown in the Figure below, there are five modes to be chosen from, namely mA/ms, mAs, AEC/mA, mAs/ms and AEC. While the parameters of each mode are different, the color of the parameters that cannot be adjusted are grayed out, so they cannot be chosen on the interface.

Figure 23.18: Exposure model Settings

The parameters that can be modified under each exposure model are different and shown in the Table below, √ means adjustable, × means non-adjustable.

	mA/ms	mAs	mAs/ms	AEC	AEC/mA
Large/mall focus	√	√	√	√	√
kV	√	√	√	√	√
mA	√	×	×	×	√
ms	√	×	√	×	×
mAs	×	√	√	×	×

Figure 23.19: Exposure Parameters

Focus Selection:

Focus selection is shown below. The first one is the small focus, the second one is the large focus. The color is blue when the icon is selected as seen in the large focus icon below.

Note: If any of the focus in the tube data is disabled, the focus cannot be switched. If both focuses are disabled, the focus cannot be set.

Figure 23.20 Focus selection

Note: The focus must be set before exposure, otherwise it may cause failure.

Tube Voltage Setting:

Click on the ”+” or ”-” to set the kV. The”-” reduces the kV. Holding the button down will continuously reduce the kV. The ”+” increases the kV, and holding down the button will continuously increase. The max value of kV settings is 150 kV, and it can also be set for the max value according to different tube configuration files (the setting max value of kV is never more than 150 kV).

Figure 23.21: KV settings

Note: 1. If kV does not change by clicking on "-" or "+", it means that the kV has reached the limit value under the current exposure conditions (exposure parameters: mA, ms) and cannot be adjusted. 2. The KV is adjusted once per 50ms while the theoretical time to increase the KV from 40 KV to 150 KV is 5.5 seconds.

Tube Current Setting:

As shown below, click on “+” or “-” to set the mA. The ”-” reduces the mA, and holding the button will continuously reduce the setting more quickly. The”"+” increases the mA and holding down the button will continuously increase the settings by 50 mA/ms.

Figure 23.22 mA settings

Note: 1. The mA settings can only be available when the exposure mode is mA/ms and AEC/mA. 2. Due to the limitation of power, heat capacity and tube current, it may be unable to adjust the “+” and “-” and report errors. 3. The mA is adjusted once per 50ms by holding down the button.

Exposure Time Settings:

As shown in the Figure below, click on the "+" or "-" to set the ms. The "-" reduces the ms and holding the button will continuously reduce more quickly. The "+" increases the ms and holding down the button will continuously increase more quickly.

Figure 23.23: ms settings

Note: 1. The exposure time settings can only be available when the exposure mode is mA/ms and mAs/ms. 2. Due to the limitation of power, heat capacity and tube current, it may be unable to adjust "+" and "-" and report errors. 3. The ms is adjusted once per 50ms by long press.

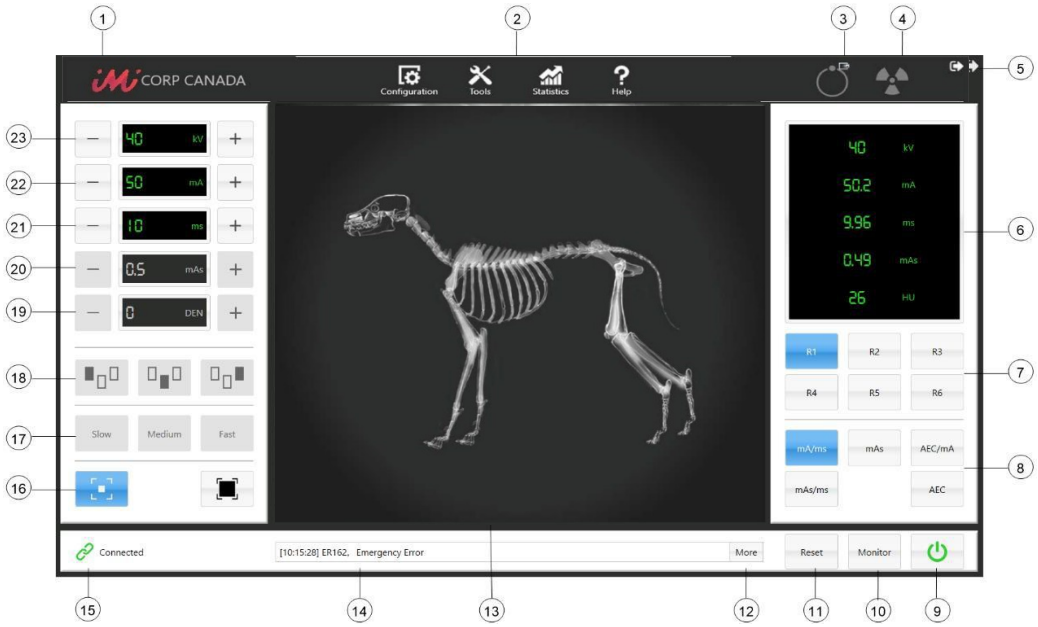
Exposure Time Product Settings:

As shown in Figure below, click on"+" or"-" set the mAs. The"-" reduces the mAs, and holding down the button will continuously reduce the numbers more quickly. The "+" increases the mAs and holding down the button will continuously increase the numbers more quickly.

Figure 23.24: mAs settings

Note: 1. The mAs settings can only be available when the exposure mode is mA/ms and mAs/ms. 2. Due to the limitation of power, heat capacity and tube current, it may be unable to adjust "+" and "-" and report errors. 3. The mAs is adjusted once per 50ms by long press.

G. Generator State



Communication State:

The annotation (14) in the main interface shown represents the communication status. The sign showing green indicates that the software has been connected to the generator.

The gray broken connection sign indicates that the software cannot be connected with the generator. Please wait for about 10 seconds. If the connection is still not established, please check whether the generator is powered on or whether the serial port configuration is normal.

Powered-On /Off State:

The annotation (9) in the main interface shown represents the powered-on/off state.

The red power symbol represents that the generator is shut down, and the generator will power on by clicking the power sign.

The green power symbol represents that the generator is powered-on, and the generator will power off by clicking the power sign.

The gray power symbol represents that the generator's connection is unknown. It may be that the device is out of work or the communication is wrong. For safety, use the mouse to click the shutdown command.

Standby State:

The annotation (3) in the main interface represents the preparation status during exposure.

The gray sign means the foot pedal has not been pressed or had exposed.

The green sign means it is in "standby" after pressing the foot pedal.

Exposure State:

The annotation (4) in the main interface represents the exposure state，

The yellow sign indicates that the generator is under the exposure state. To prevent maloperation, the software interface is set gray and the button is not available. If you need to sound to play when an exposure is taken, it can beconfigured.

The gray sign indicates that the generator has completed an exposure or waiting and ready to take the next exposure.

Data Feedback:

The annotation ⑥ in the main interface shown below represents the feedback statistics from the generator. From top to bottom it is the feedback of KV, mA, ms, mA/s and heat capacity after the exposure. The heat capacity of tube is in %, range from 0 to100. It is real-time feedback the heat feedback from internal tube.

Figure 23.25: Data Feedback

H. Filament Calibration

Whenever the tube is replaced or used for about 6 months, it needs to be calibrated. Open the menu "**Tools"** then "Filament" and the interface will pop up as shown below.

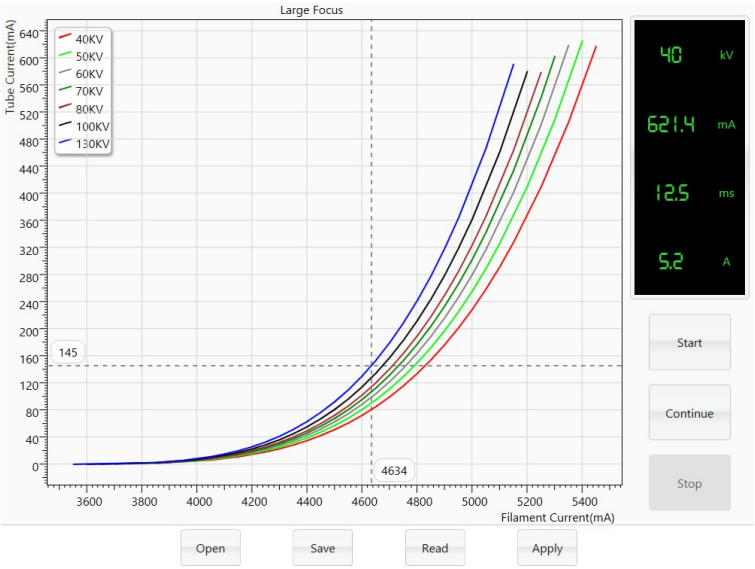


Figure 23.26: Filament Calibration Interface

Start Calibrating:

Select the corresponding focus and click ***start***, and the following window will pop up.

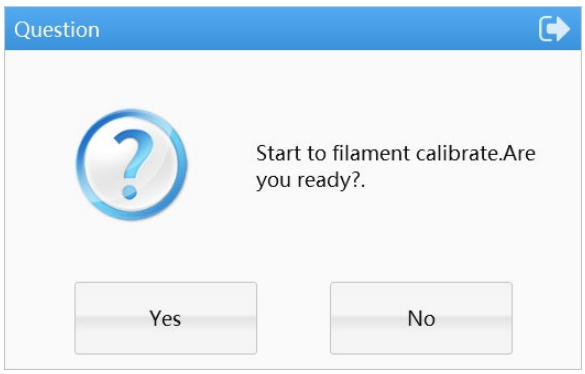


Figure 23.27: Filament calibrating

Click ***Yes*** and press the footswitch till the "Calibrate successfully" shows on the screen. Click ***No*** to go back to the previous page.

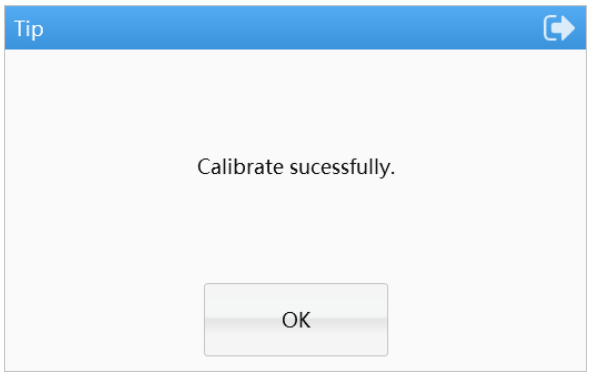


Figure 23.28: Filament calibration successfully

Continue Calibrating:

If the calibration was interrupted manually or abnormally, the operator can click ***continue*** to carry on calibration.

Notes: Difference between "Start" and "Continue". Click, ***Start***. The generator will start calibrating from 40kV until calibration is done. Click, ***Continue*** to start the generator from the last kV testing point until calibration is completed.

Stop Calibration:

If the calibration has begun and you want to stop, click ***Stop*** to stop the calibration.

Note: Please re-calibrate the tube after stopping, or restarting the generator, otherwise it is impossible

Abnormal Calibration:

If an error occurs during the calibration process, the calibration will be terminated, click ***Start*** to re-calibrate or click ***Continue*** to continue to the last calibration prior to handling the fault.

Curve Calibration:

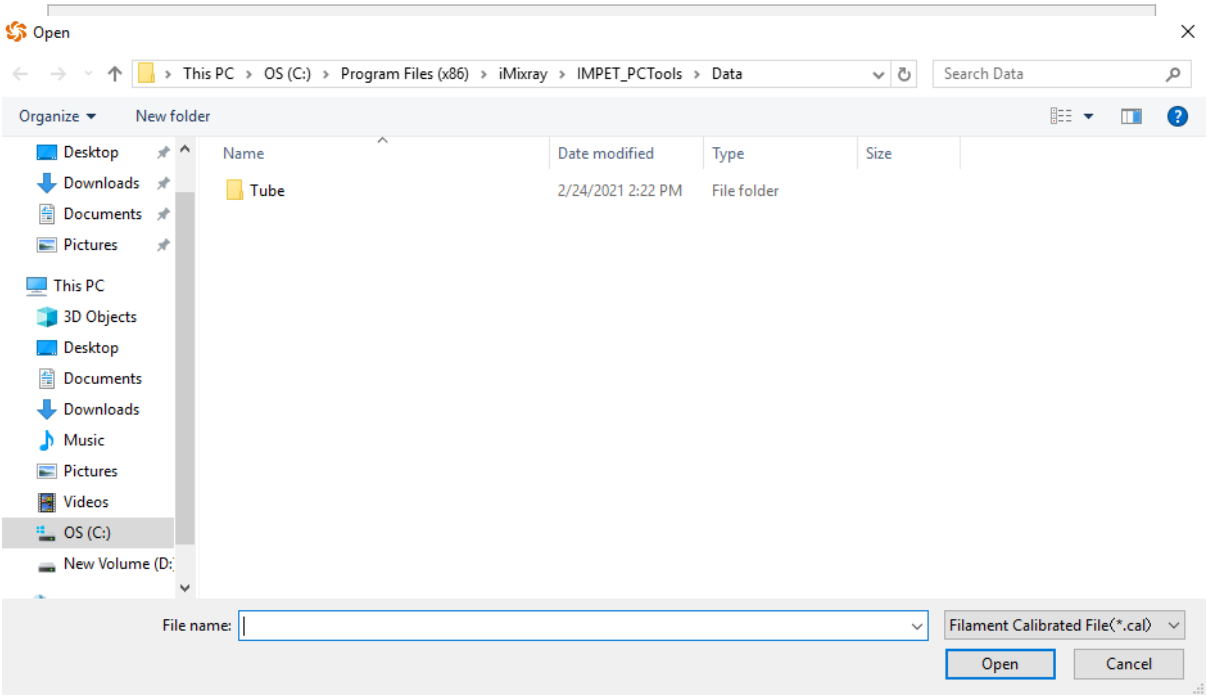
Curve calibration function has been implanted in the software; therefore, the software will automatically draw the calibration curve. In case the curve is not seen on the screen, the axis might be manually adjusted. Please press ***Home*** on the keyboard to resume. The software can also save and read the calibration curve.

Notes: The curves appeared in the calibration process are plotted through real-time exposure points. The curves are fitted based on all exposure data after calibrating, so that the curve after calibrating and the curve during calibration may not be consistent.

1 Opening curves

Click "***open***" to access the screen below. Select the ".cal" curve file to open the curve data.

Figure 23.29: Opening the curve calibration file



2 Saving curves

Click ***Save*** and select the saved path and file name to save the curve calibration file. A dialog box will pop up after saving successfully.

3 Reading Curves

Select the filament, then click "***Read***" in filament calibration page to read the corresponding calibration curve from the generator.

> Note: If the focus has never been corrected, a "reading failure" prompt box may pop up or the page does not appear any curves.

4 Applying curves

Click ***Apply*** and the system will apply the curve data into the generator, after that the generator will take an exposure by setting the filament current according to this calibration curve. If there is no curve on the page, the dialog box shown in Figure 23.30 will pop up by clicking "***Apply***" directly.

Figure 23.30: No Curve Box

Report from Statistics and Exposure Statistics:

By clicking "***Statistics***"- then "***Exposure Count***" in the menu, it will take you to the screen shown below. Click "***Read***" to see the exposure times.

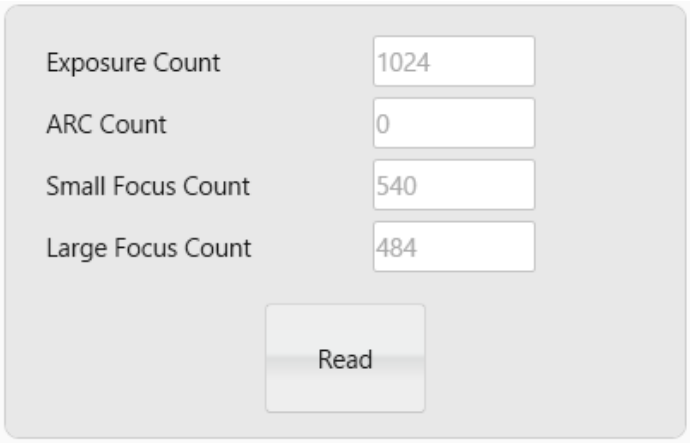


Figure 23.31: Exposure statistics

Exposure Count: Total exposure times

- ARC Count: Internal test function, not open for users.
- Small Focus Count: Small focus exposure times.
- Large Focus Count: Large focus exposure times.

Note: Failure to read exposure data may occur when the software communication with the

PC Log:

By clicking "***Statistics***"-then" ***Log***" in the menu, the interface shown below will pop up.

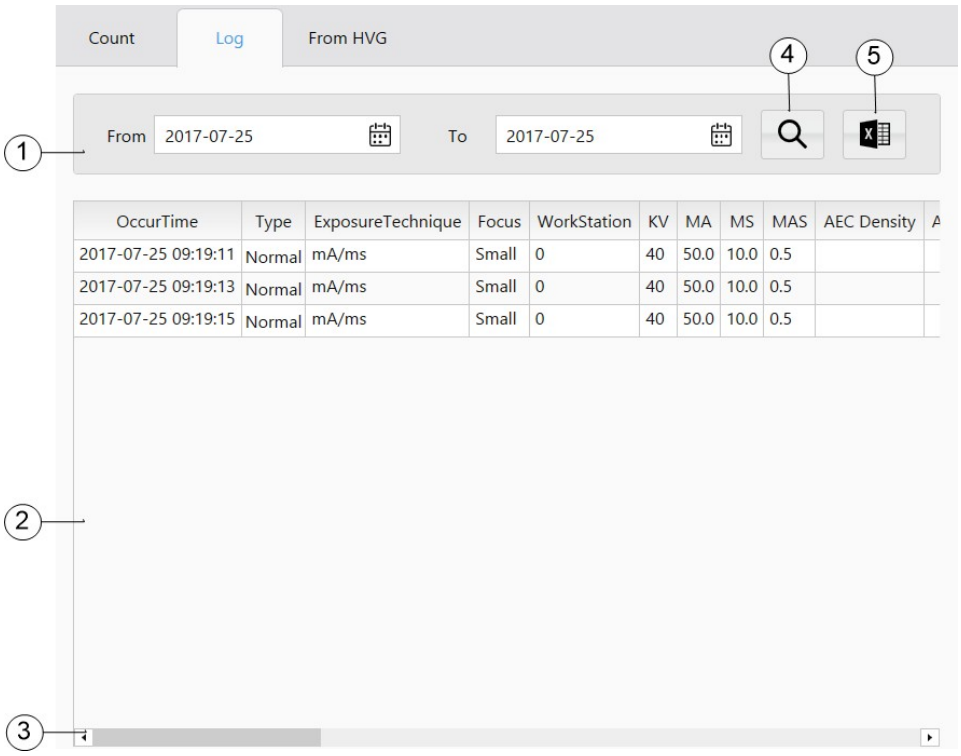


Figure 23.32: Exposure record

① Date Selection Column. The date can be searched from start-date to end-date.

② Display area. The results of the query display in this area, sorting by clicking the title bar.

③ Left and right scroll bar. More items can be displayed by this scroll bar.

④ Search button. Screening log records by date

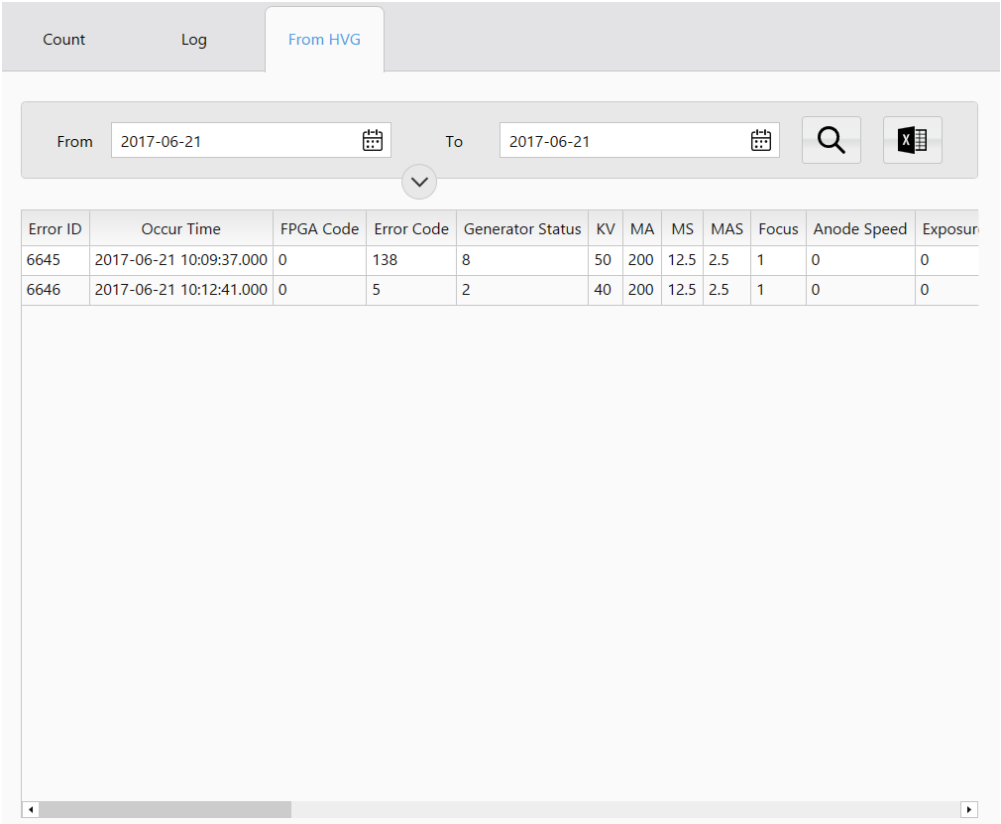
⑤ Excel Export. The data can export from ② in format of ".xlsx", Excel 97-2003 not supported for its max capacity of 65536 statistics.

No.	Message	Description	Unit
1	Occur Time	Occur Time	/
2	Type	Log types are “Exposure”, “Calibrate,” “Reset,” “ER,” “EL,” “EI,” and “Aging”. If the type is “ER,” “EL,” or “EI” the explanation of the corresponding error codes can display by hovering over the cell.	/
3	Exposure Technique	Exposure Technique displayed in characters.	/
4	Focus	Focus displayed in characters.	/
5	WorkStation	WorkStation. 0-5 represents R1、R2…R6.	/
6	KV	KV settings displayed in values.	kV
7	MA	MA settings displayed in values.	mA
8	MS	MS settings displayed in values.	ms
9	MAS	MAS settings displayed in values.	mAs
10	Filament Current	Filament Current settings.	A
11	PostKV	KV feedback	kV
12	PostMA	MA feedback	mA
13	PostMS	MS feedback	ms
14	PostMAS	MAS feedback	mAs
15	Post Filament Current	Filament Current feedback	A
16	HU	Heat capacity	%
17	Bus Voltage	Bus Voltage	V
18	Inverter Temperature	Inverter Temperature	℃
19	Anode Start Voltage	Anode Start Voltage	V
20	Anode Start Current	Anode Start Current	A
21	Anode Operating Voltage	Anode Operating Voltage	V
22	Anode Operating Current	Anode Operating Current	A
23	AEC Stop Voltage Set	AEC Stop Voltage Set	V
24	AEC Stop Voltage Feedback	AEC Stop Voltage Feedback	V

HVG Log:

By clicking the "***Statistics***" then " ***From HVG***" in the menu, the interface shown below will pop up.

For service engineers, not only need to know the exposure details, but also the error record. This part of the record stored in the generator can be read through the service software.



Error ID	Occur Time	FPGA Code	Error Code	Generator Status	KV	MA	MS	MAS	Focus	Anode Speed	Exposur
6645	2017-06-21 10:09:37.000	0	138	8	50	200	12.5	2.5	1	0	0
6646	2017-06-21 10:12:41.000	0	5	2	40	200	12.5	2.5	1	0	0

Figure 23. 33: Error record

Record message list:

No.	Error Code	Description	Unit
1	Error ID	Error ID	/
2	Occur Time	Error occur Time	/
3	Error Code	Error Code, see in appendix A	/
4	Generator Status	Generator Status, the state 1-8 is consistent with communication protocol.	/
5	Exposure Technique	Exposure Technique is consistent with communication protocol.	/
6	Focus	Focus is consistent with communication protocol.	/
7	WorkStation	WorkStation. 0-5 represents R1、R2……R6.	/
8	kV	KV settings displayed in values.	kV
9	MA	MA settings displayed in values.	mA
10	MS	MS settings displayed in values.	ms
11	MAS	MAS settings displayed in values.	mAs
12	Filament Current	Filament Current settings.	A
13	Anode Speed	Anode Speed, 0 @low speed、1@high speed	/
14	Exposure Finished Status	Exposure Finished Status	/
15	Stop Reason	The reason of exposure stop is consistent with communication protocol.	/
16	Post KV	KV feedback	kV
17	Post MA	MA feedback	mA
18	Post MS	MS feedback	ms
19	Post MAS	MAS feedback	mAs
20	Post Filament Current	Filament Current feedback	A
21	HU	Anode heat capacity	%

Notes:

1. Clicking “Search” will only read the local HVG log, it does not automatically synchronize with the generator.
2. Every time you get in the “From HVG page”, the system will automatically synchronize the HVG logs. When the log is synchronizing, the interface on both sides will be virtual; once it is completed, the interface on both sides will return to normal.
3. The page will not synchronize the HVG log in real time, so after entering the page, if the generator fails, the system cannot synchronize in real time.

Firmware update:

The system can upgrade firmware by clicking “***Help***"-then" ***Upgrade***", the interface shown below will pop up. Checking in the upgrade file provided by the manufacturer and then clicking "***Start***" to start the firmware upgrade.

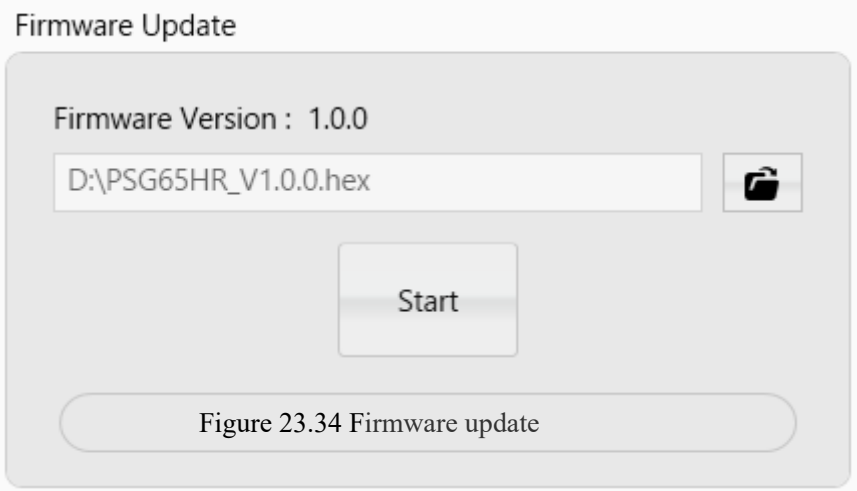


Figure 23.34 Firmware update

Note: Do not close the page or power off during update process. If the update fails, try the update operation again.

About us:

Clicking "***Help***" then "***About***" will open the interface. The corresponding generator model, software version and firmware version will be displayed. Click on the blue "***United Imaging***" icon to access the company's website.

Help Document:

When you need to browse the help document in the software, please click "***Help***"-then " ***Document***" and the interface will open.

Interface Introduction:

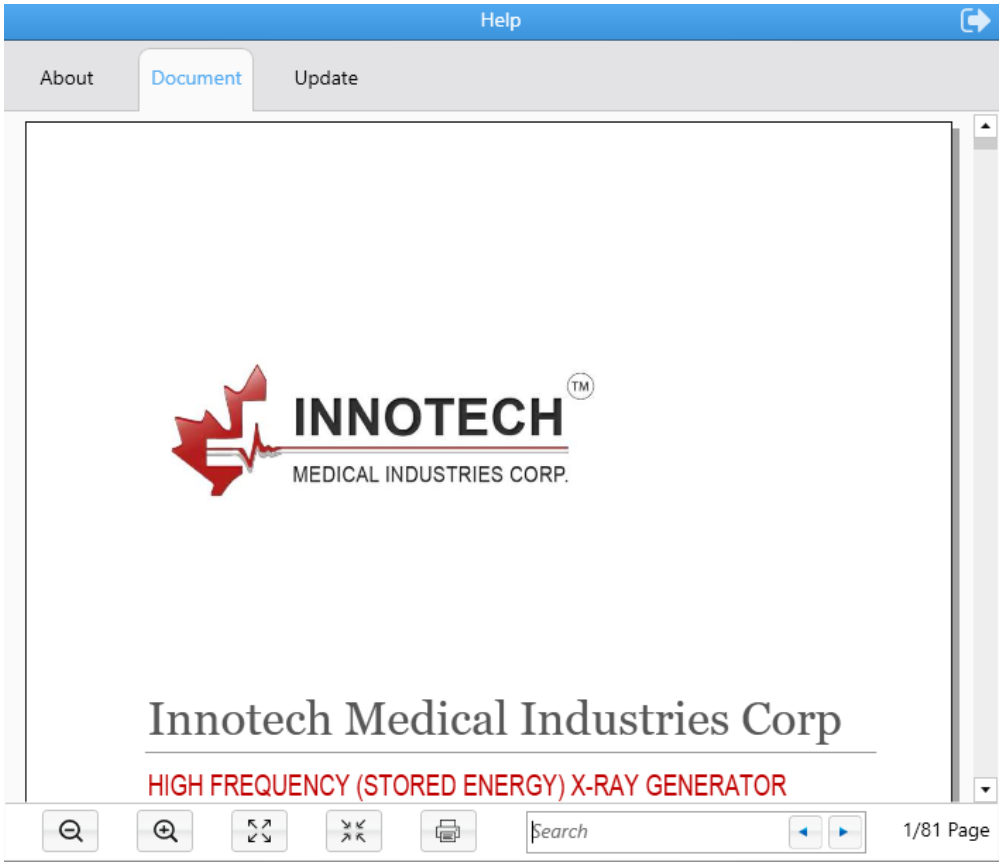


Figure 23.35 Help document interface

I. Software Operating Settings

1. Serial Port Configuration

After connecting the pc and generator via serial data cable, open the service software from the imi logo.

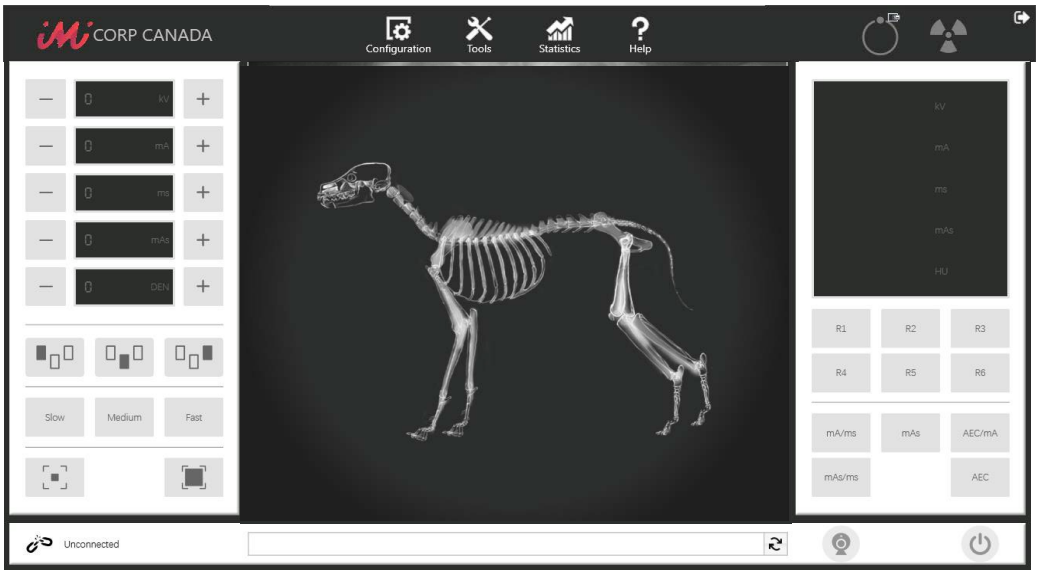


Figure 23.36: Software interface

Click "***Configuration***" then "***Local***" to choose the correct port No. as shown below.

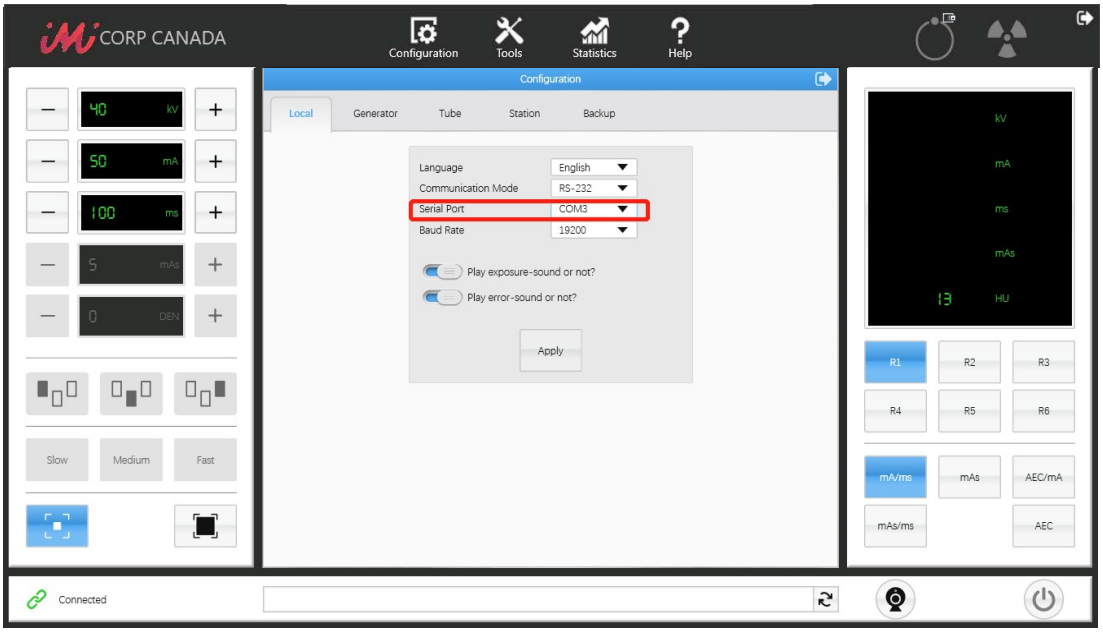


Figure 23.37: Port Location

Serial port configuration1 Other serial port No. can be found in device manager on the PC.

In the PC OS search bar, enter and open Device Manager to check Port (COM and LPT) as shown below.

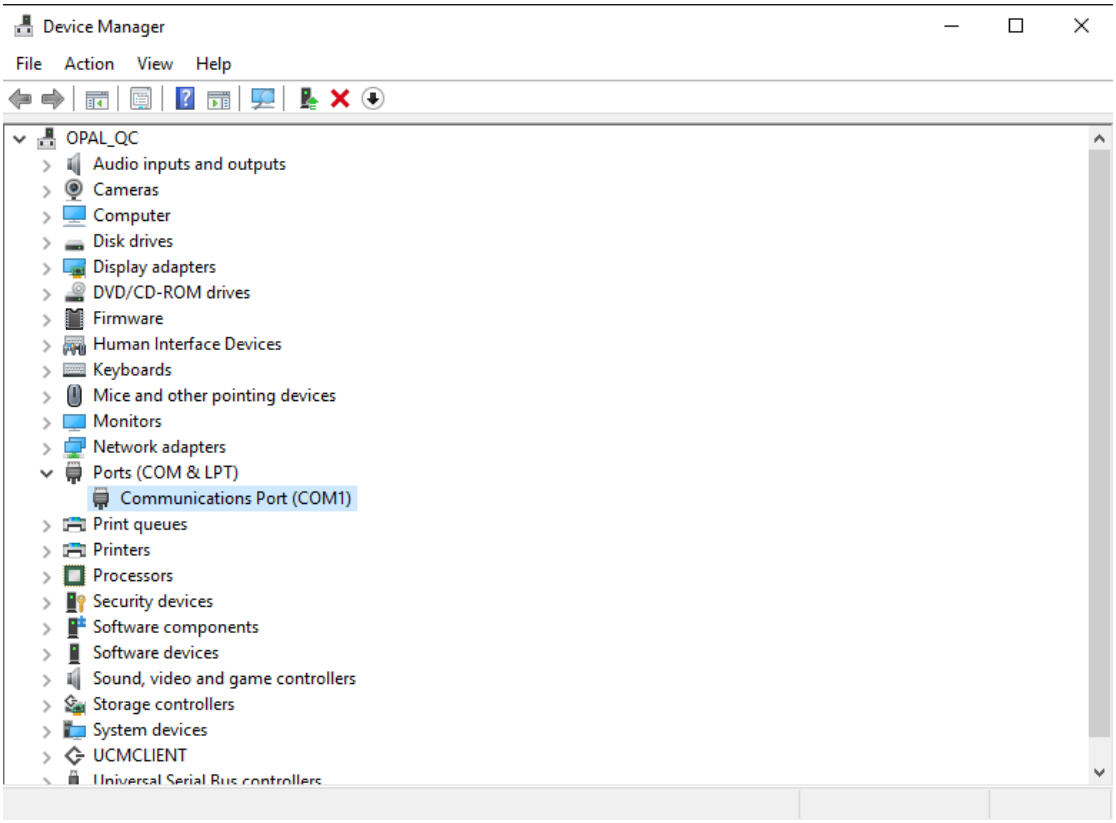


Figure 23.38 PC device manager interface

After selecting the correct COM port, the software will automatically restart by clicking on "***Apply***" and selecting "***Yes***", then the software interface will turn green to indicate that the communication is normal, as shown below.

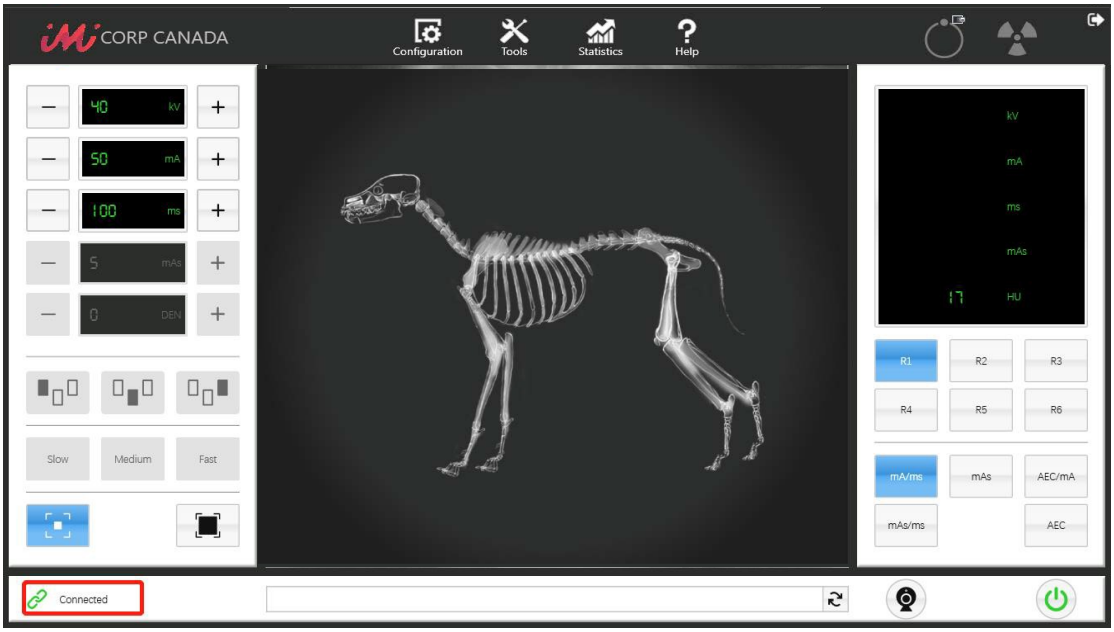


Figure 23.39 Connection Normal

Power-on

Software interface for normal communication service. When all the above-mentioned steps are done, power on the generator after making sure the voltage on the breaker is normal.

Click the switch button on the service software, as shown below. The lower right corner of the service software turns green after starting up successfully.

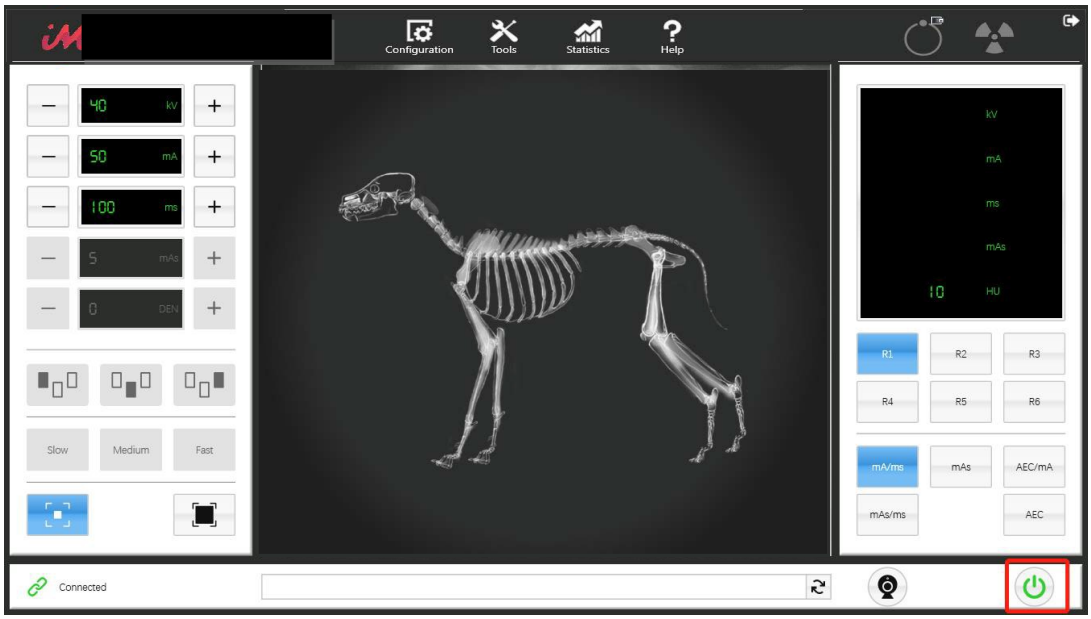


Figure 23.40 Power Button

J. Tube Configuration

Software switch icon

We must confirm whether the model of tube we selected on service software match with the tube we connected before exposure. Click ***Configuration***, and then click on the ***Tube tab*** to check the tube model.

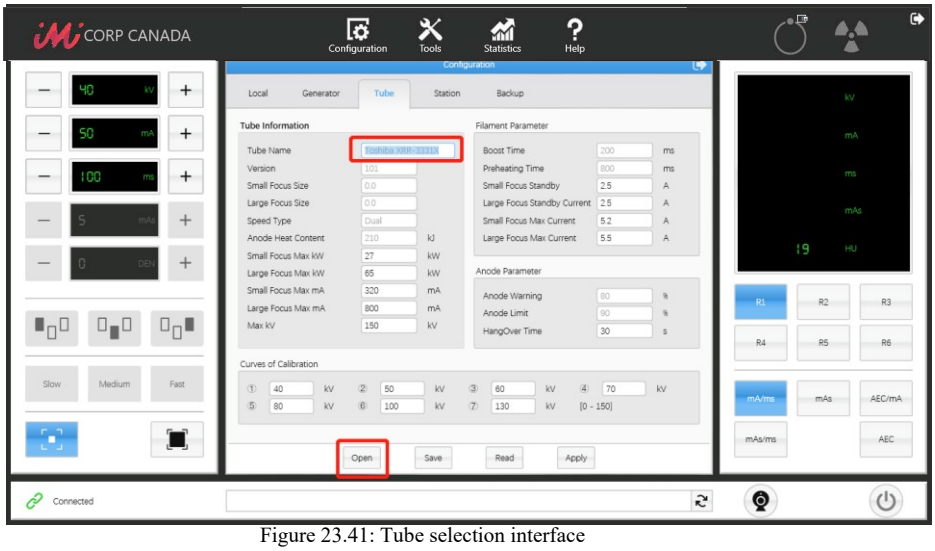


Figure 23.41: Tube selection interface

The Tube library folder will display by clicking "***Open***" if the models of the tube are not consistent, in which you can select the corresponding tube configuration file as shown below.

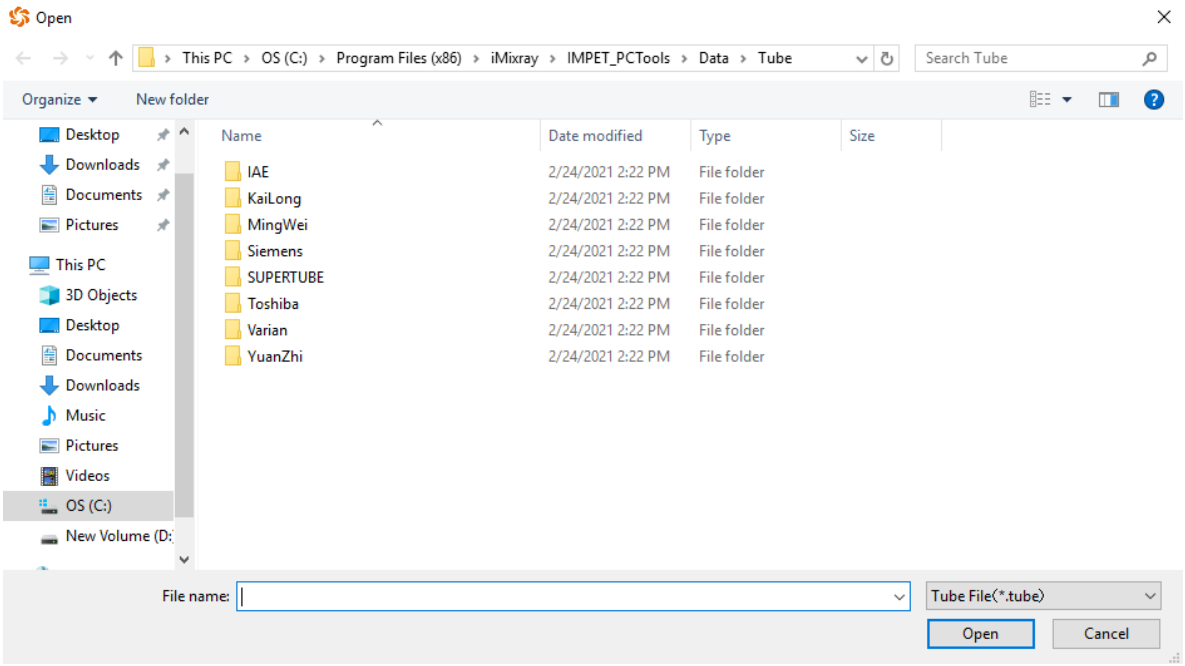


Figure 23.42 Tube library folder 1

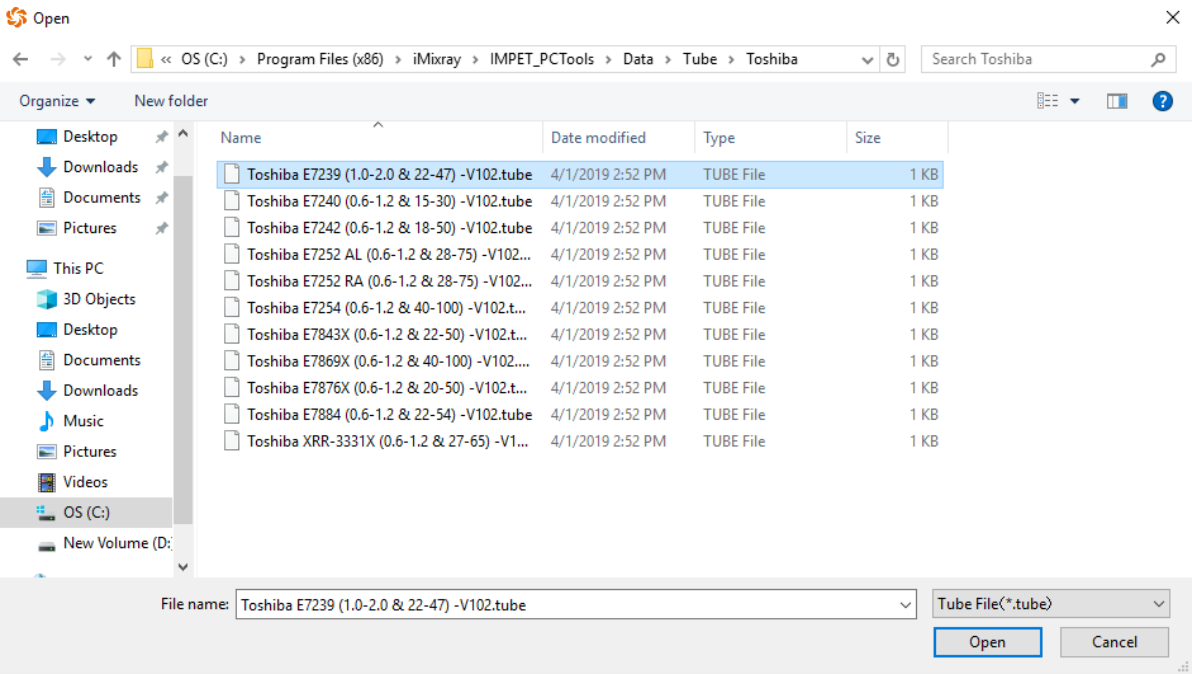


Figure 23.43: Tube library folder 2

After selecting the corresponding tube model, click "***open (O)***" to check whether the Tube Name is consistent. If the type is consistent, click "***Apply***"

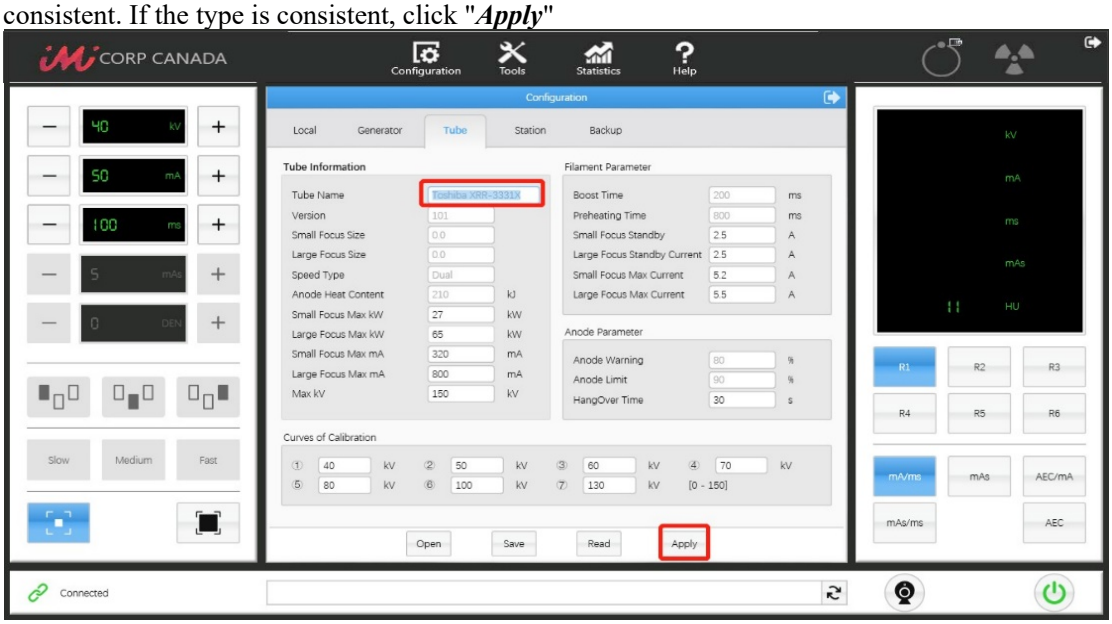


Figure 23.44 Application of Tube Model

Tube application interface1 Display of "Apply successfully" indicates successful application.

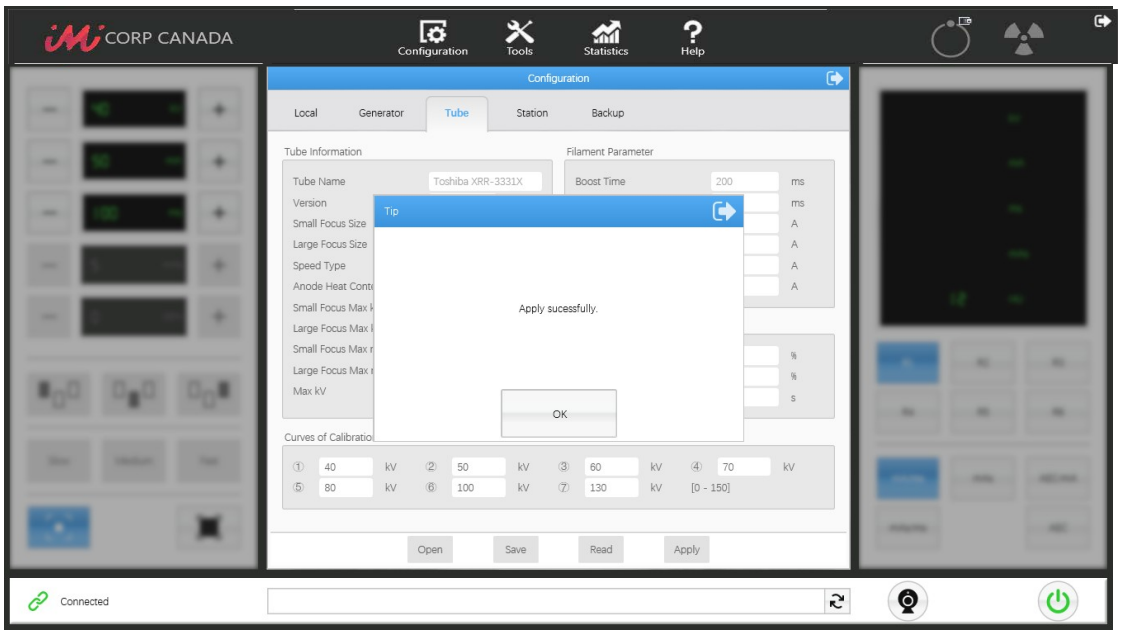
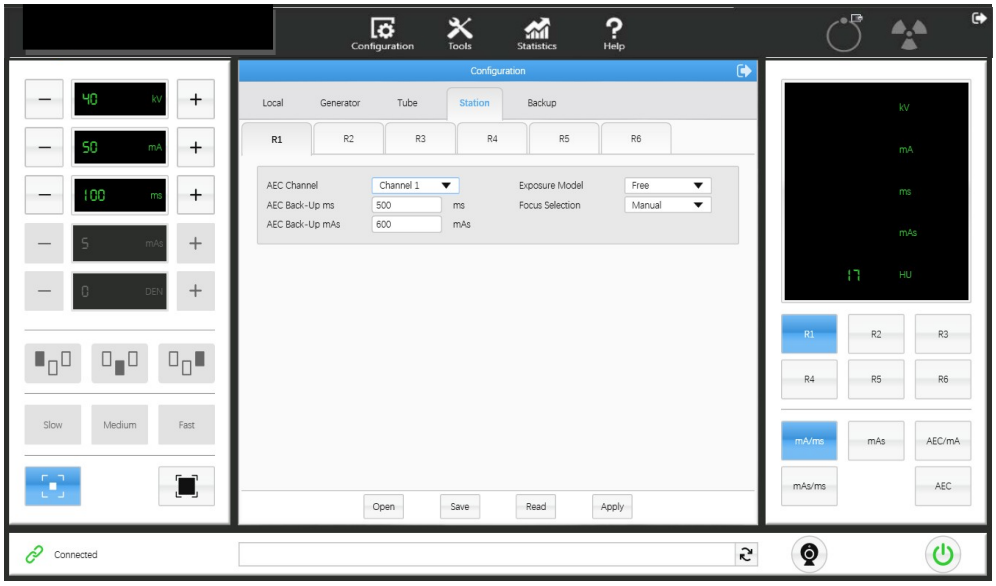


Figure 23.45: Tube application interface2

Attention: If the tube data you choose is not in the Tube library, send the official specification to us and we will complete the tube configuration file within one week and send it back to you.

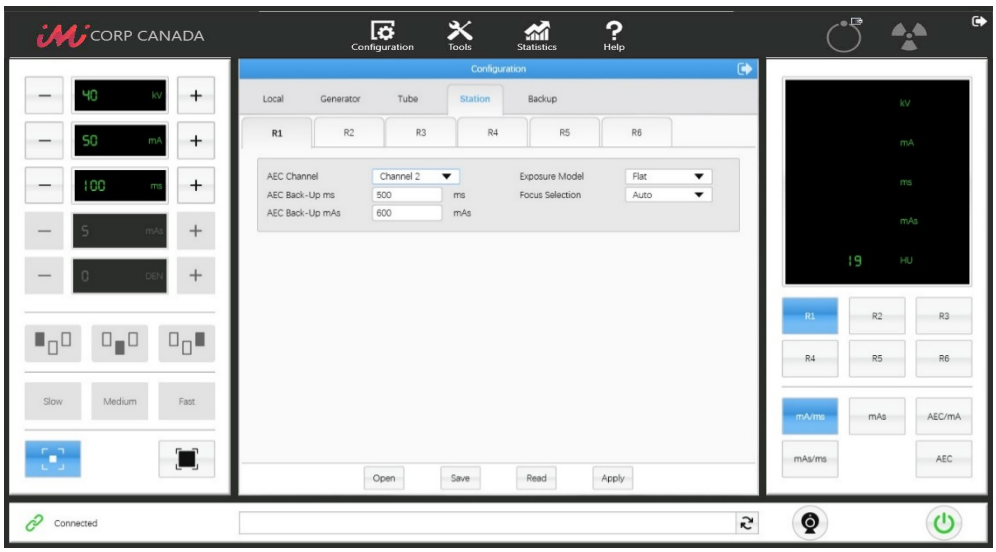
K. Workstation configuration

Go Back to Configuration by clicking "***Station***" to enter the page, we can configurate 6 workstations (R1、R2、R3、R4, R5、R6), each workstation can be set according to the actual needs of customers.



Workstation1

The specific operation is as follows: clicking "R1", as shown below, we can choose AEC channel 1 or 2, exposure mode (Exposure Model) selecting plate mode Flat or free mode Free etc., focus selection, manual switch or automatic switch:



Workstation interface2

According to the customers' actual needs, clicking "Apply", display of "Apply successfully" means the configuration is done.

L. Operations

Once the above wiring and software settings have been completed, press the left pedal for a short period to confirm whether the tube anode is rotating. If it is rotating, set a small exposure condition (40 kV, 40mA, 10ms) for the first exposure.

23.1.1 Installation Information

Installation Engineer/technician:

Site address:

Installation Date: / / — / / （year/month/day）

All the details should be filled correctly in the On-site installation form.

23.1.2 Generator Information

Version of High Voltage Generator; Serial Number:

All the details should be filled correctly in the On-site installation form.

23.1.3 Grounding Inspection

Grounding Wire Installation □	No Grounding Wire Installation □

23.2 Starting-up Test

23.2.1 Power-on Test

Pass □	Fail □

23.2.2 Exposure Verification

System calibration: exposure test verification			
Exposure conditions	Test value	Load range	Result
100kV	kV	95≤kV≤105	Pass □ Fail □
100mA	mA	89≤mA≤111	Pass □ Fail □
100ms	ms	89≤ms≤111	Pass □ Fail □
10mAs	mAs	8.8≤mAs≤11.2	Pass □ Fail □

24 iRay 17x17X Panel Configuration and Testing

24.1 Hardware Set-up:

Note: Panel is already preconfigured, so the panel calibration needs to be checked.

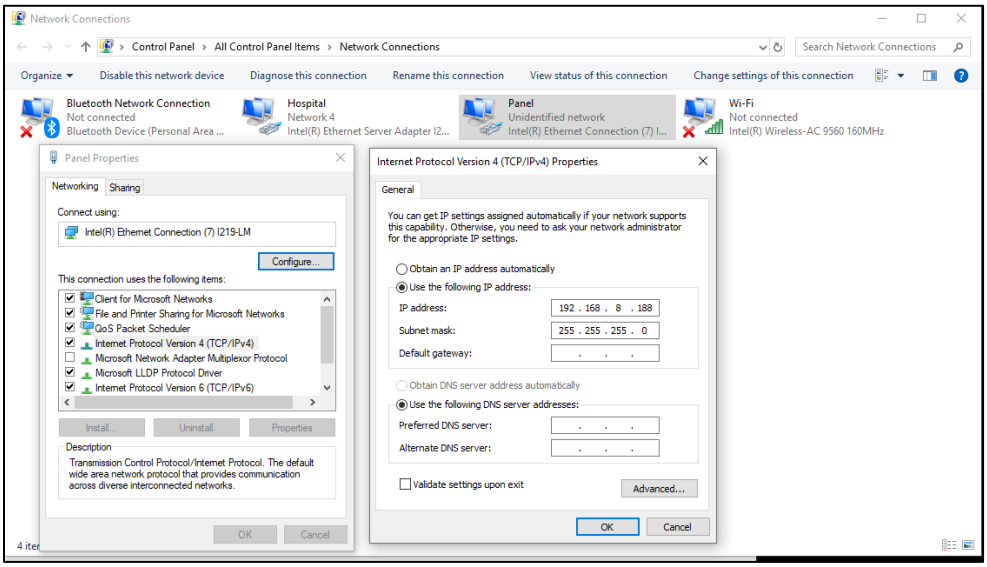
a. Plug the Ethernet cable to the desktop.

b. Plug the Ethernet and power cables into the iRay PSU.

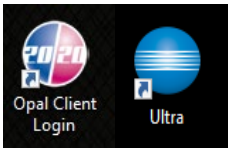
c. Plug the iRay long side tether cable into the iRay 17x17X panel.

24.2 Software setup (This will all be preconfigured no action needed)

24.2.1 Assign the Gigabit CT adapter IP address to 192.168.8.188 and set the subnet mask to 255.255.255.0.

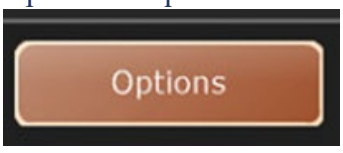


24.2.2 Run the Opal or Ultra software.

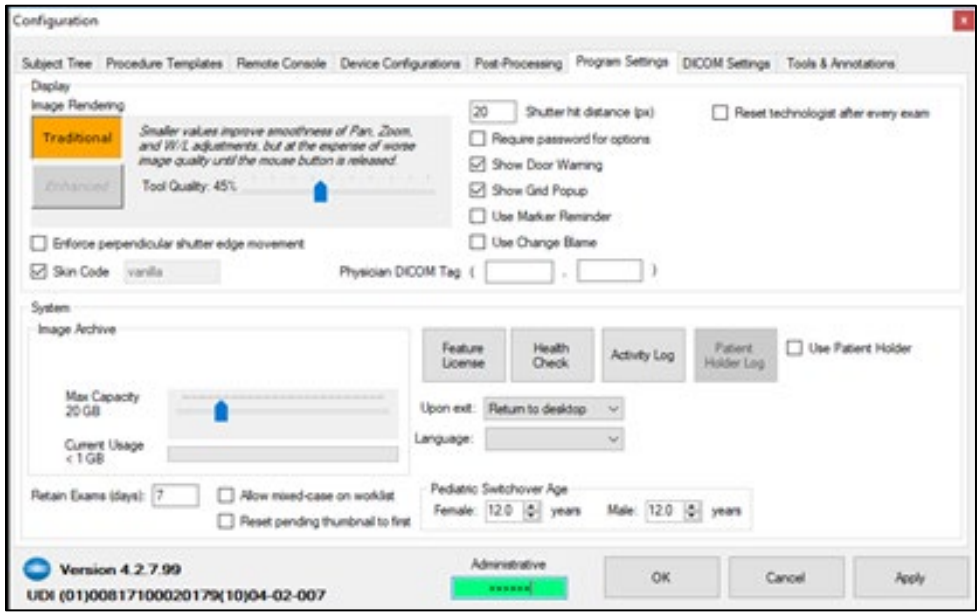


24.2.3 A message may appear stating “This appears to be the first time you have run the software. Your settings have been reset” Click **OK**.

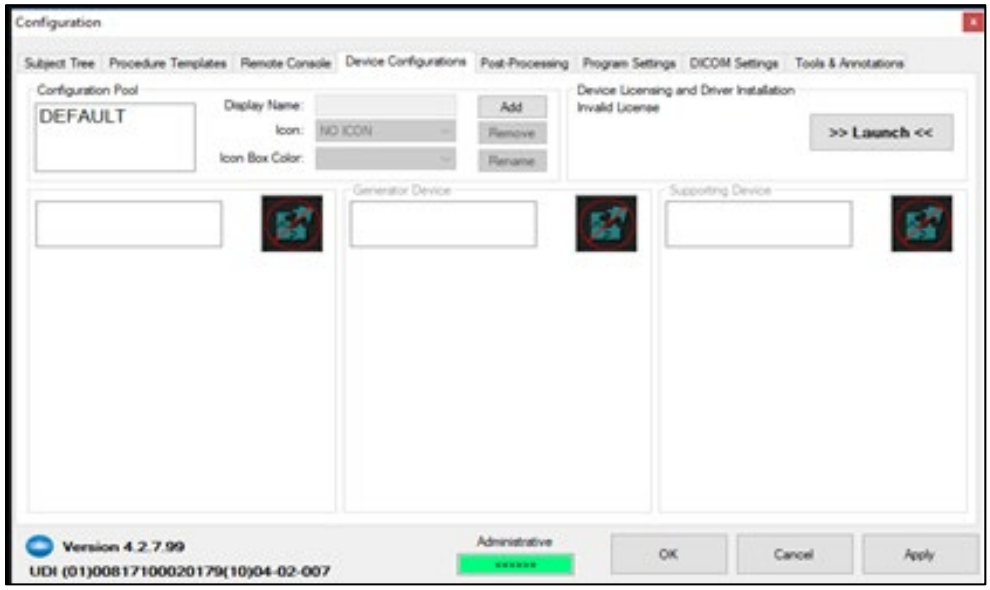
24.2.4 Open the acquisition screen then click **Options**.



24.2.5 Type **adc4me** in the Administrative box.

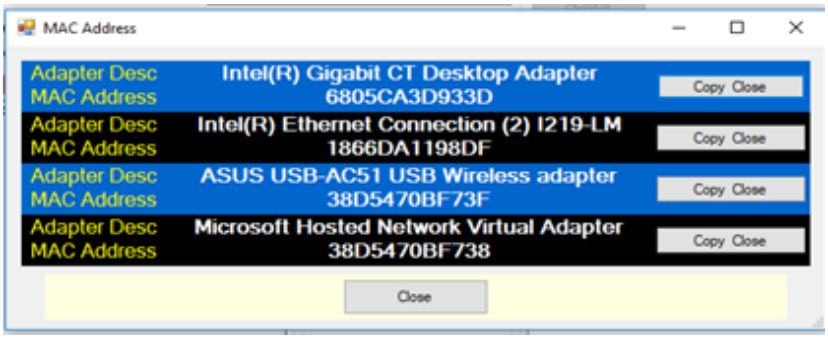


24.2.6 Click on the **Device Configuration** tab. Then click **Launch**.

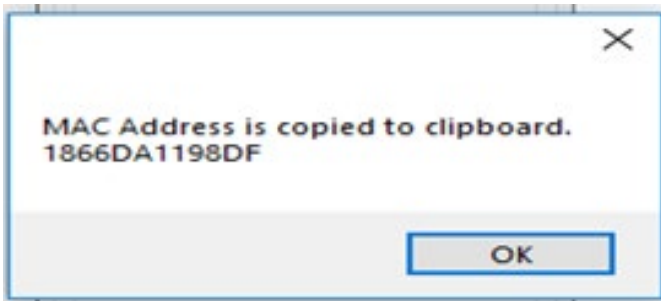


24.2.7 Click **Multiple Found**.

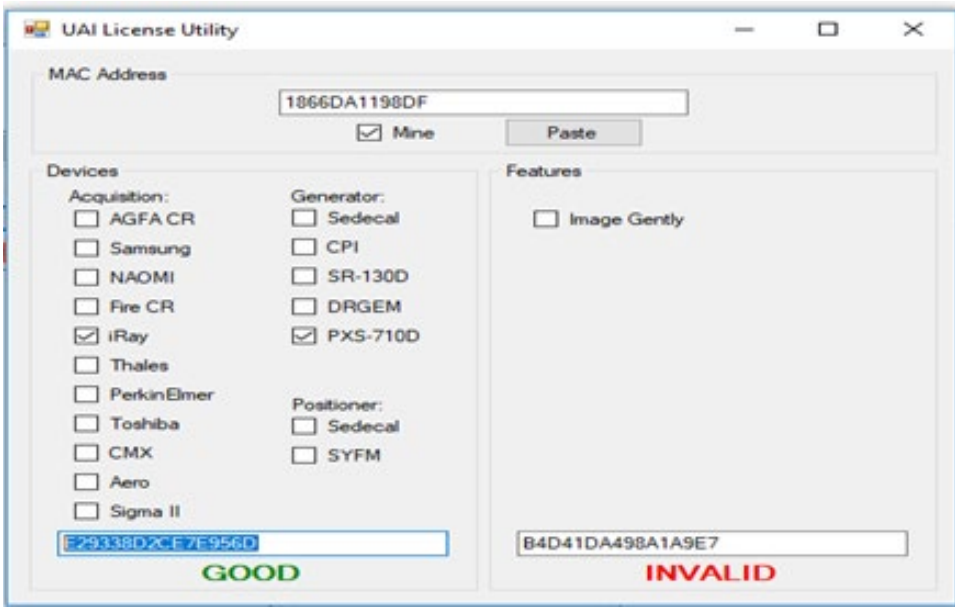
24.2.8 Click **Copy Close** next to the onboard adapter. This will copy the current MAC address of the device selected.



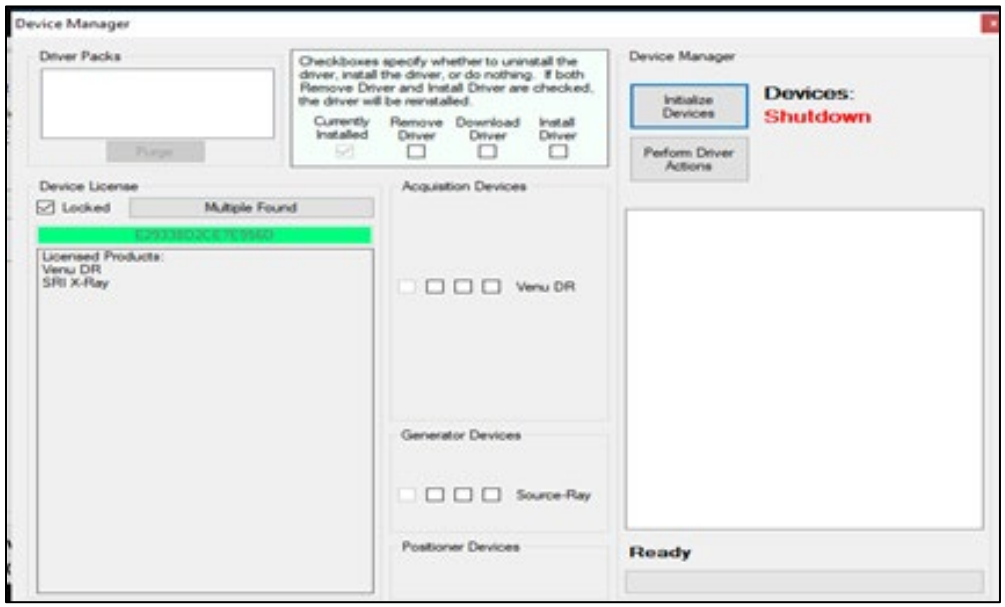
24.2.9 Click **OK**.



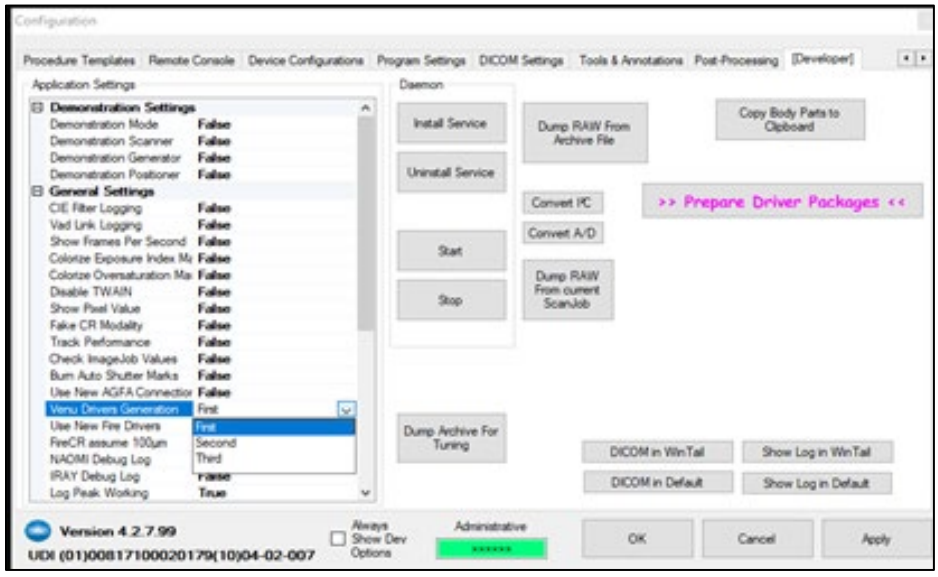
24.2.10 Open the Universal Acquisition Interface licensing utility and paste the MAC address into the MAC address box. Then select the boxes for **iRay**. Copy the license number in the **GOOD** field.



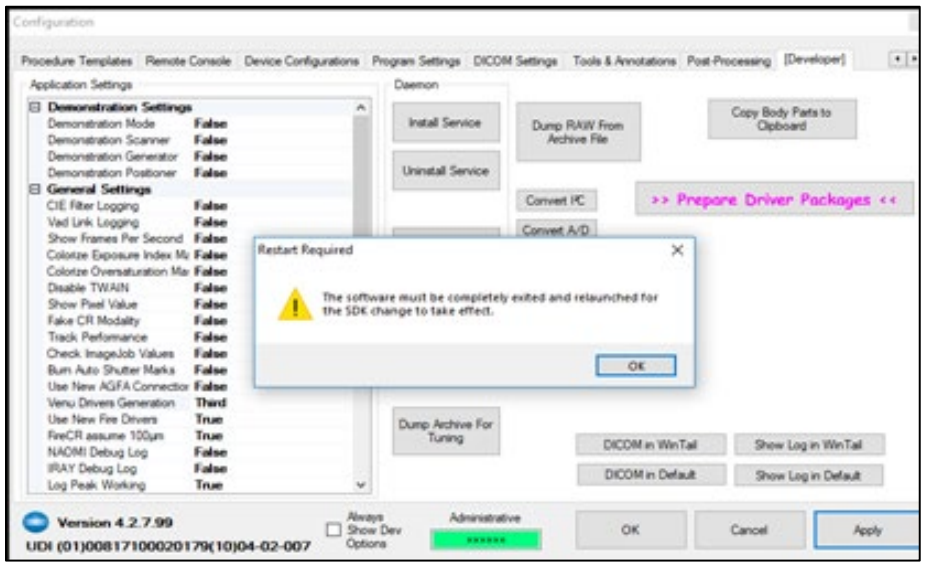
24.2.11 Deselect the box next to Locked; then paste the license number into the license field.



24.2.12 Do not run the driver install at this point. Close the **Device Manager** window; then double-click on the Konica logo in the lower left corner of the Configuration window, the **Developer** tab displays in the upper right corner. Click on the **Developer** tab, select the drop-down menu next to Venu Drivers Generation, and then select **Third**.



24.2.13 Click **OK**.



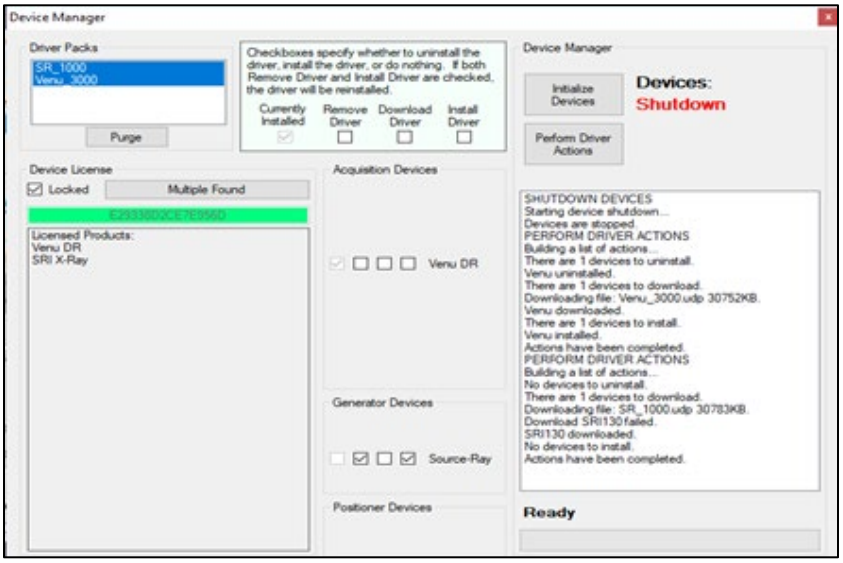
24.2.14 Click **OK** on the Restart Required window; then click **OK** to close the configuration window.

24.2.15 Exit the Acquisition screen and the Opal study list.

24.2.16 Open the Opal study list; then open the acquisition screen. Click on **Options** and select the **Device Configuration** tab.

24.2.17 Click **Launch**; then click **Shutdown**.

24.2.18 Select all three boxes next to Venu DR. Then click **Perform Driver Actions**.

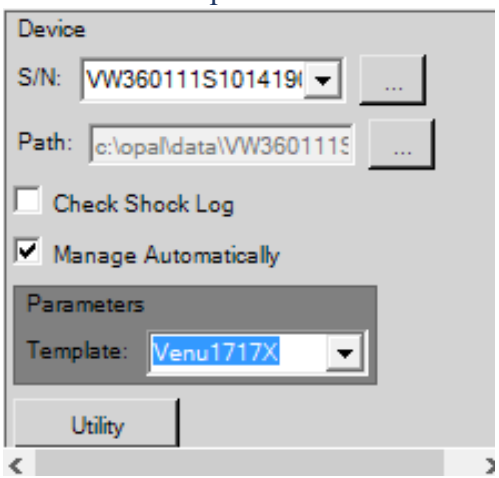


24.2.19 After the driver downloads complete, click **Initialize Devices**, and then close the window.

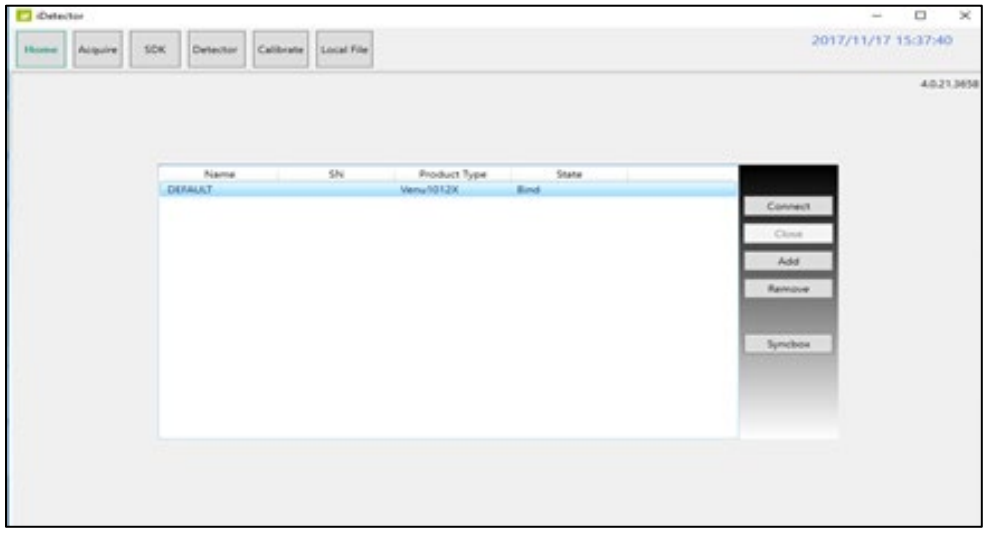
24.2.20 Connect the 17x17 iRay panel to the addon network card.

24.2.21 Click on the **Device Configuration** tab. Scroll to the Device window and then click on the button to the right of the S/N field. This will populate the S/N field with the attached panel's serial number.

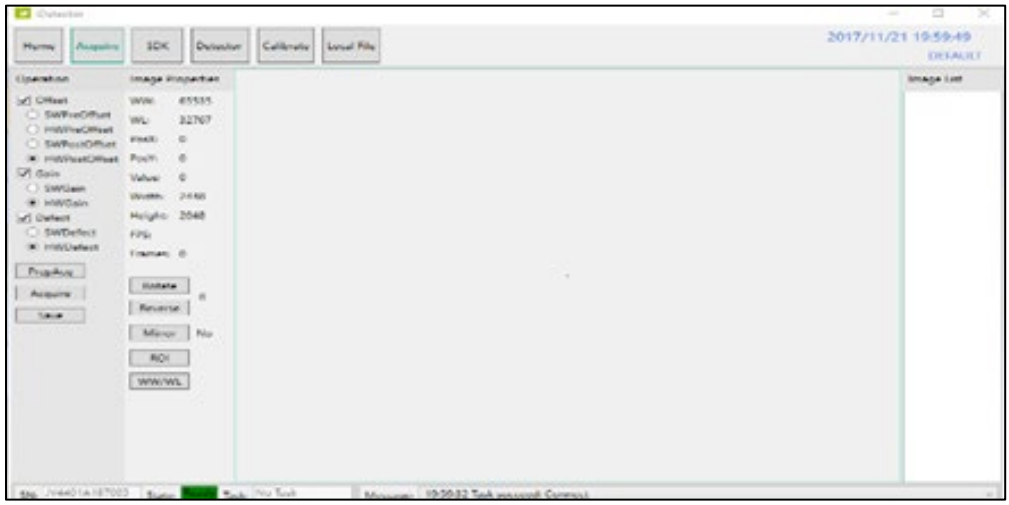
24.2.22 Click on the drop-down menu next to the Template field and select **Venu1717x**.



24.2.23 Click **Utility**, highlight **Default** and then click **Connect**.



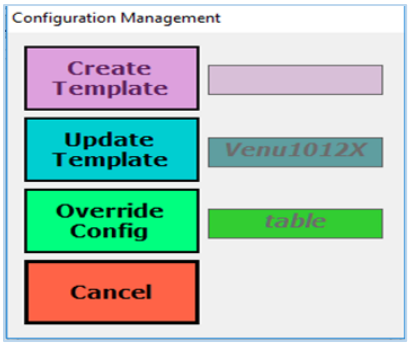
24.2.24 iDetector will automatically switch to the Acquisition tab when the panel connects.



24.2.25 Click on the **Home** tab,

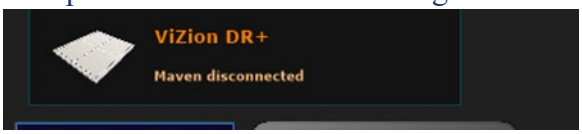
24.2.26 Click **Close**; then close the window.

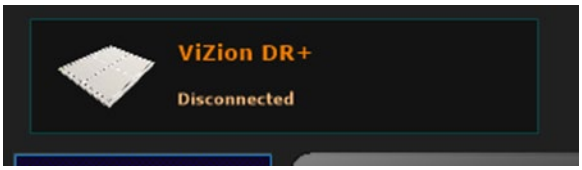
24.2.27 Click Override Config

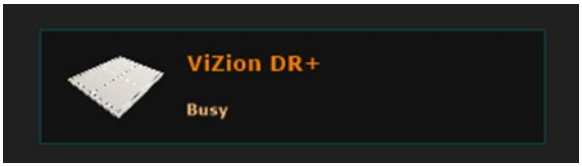


Note: Image used as reference only, template changes based on panel.

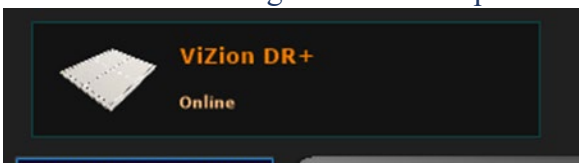
24.2.28 Close the Configuration window and return to the Acquisition screen. The 17x17X panel will show the following status messages while connecting:





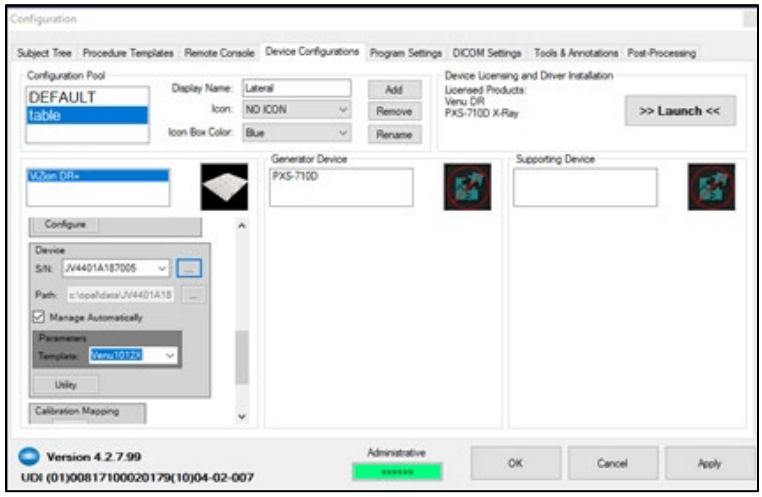


24.2.29 The Online status message indicates the panel is ready for image acquisition.

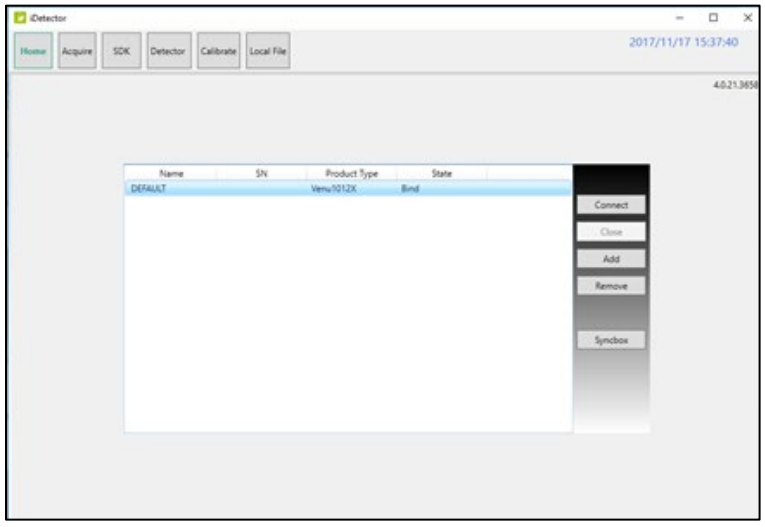


24.2.30 Take a test shot on the panel to verify functionality.

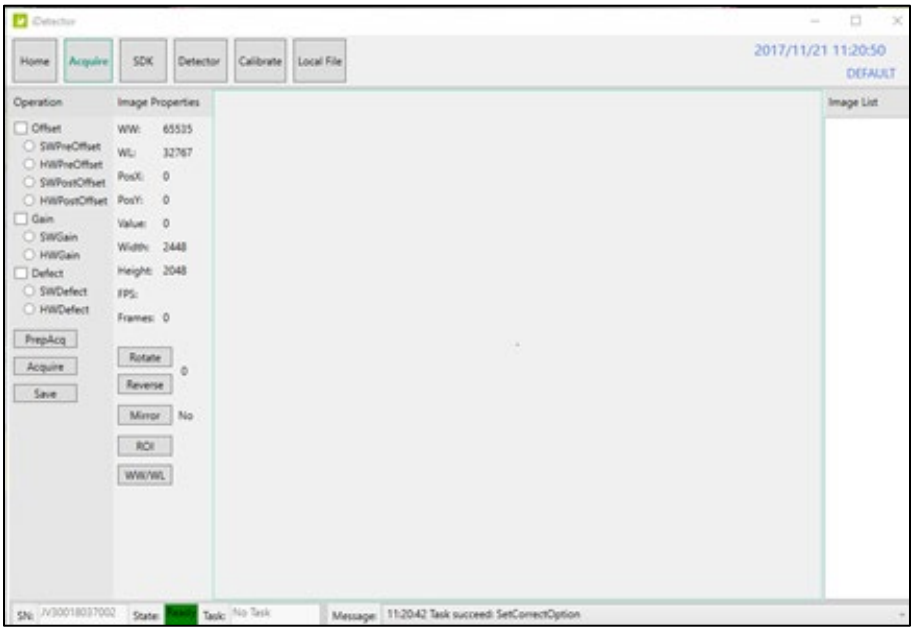
24.2.31 To calibrate, click on **Options** from the acquisition screen; then click on the **Device Configuration** tab. Scroll down to the Device window and then click **Utility**.



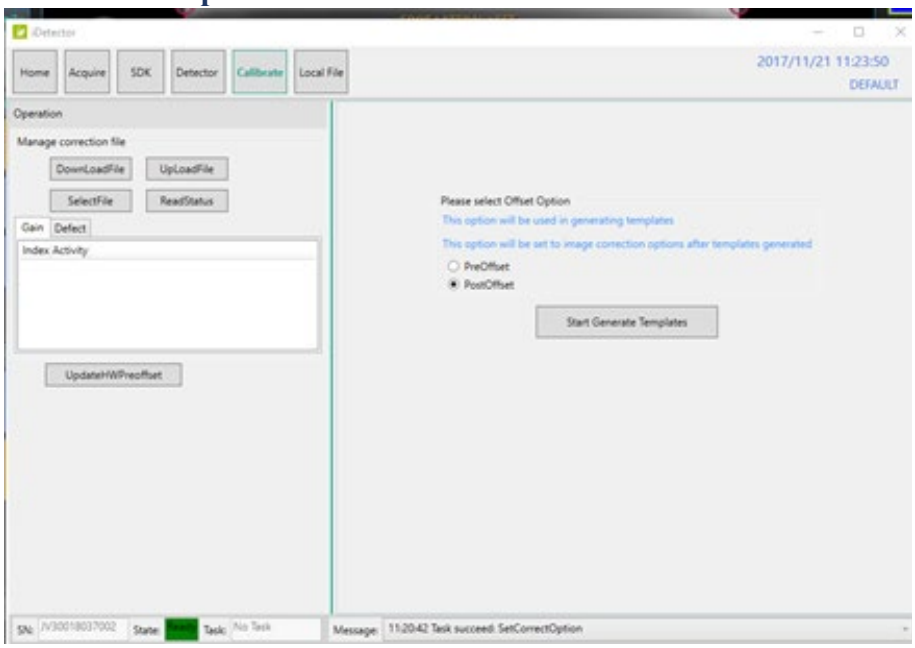
24.2.32 From the IDetector Home tab, highlight **Default** then click **Connect**.



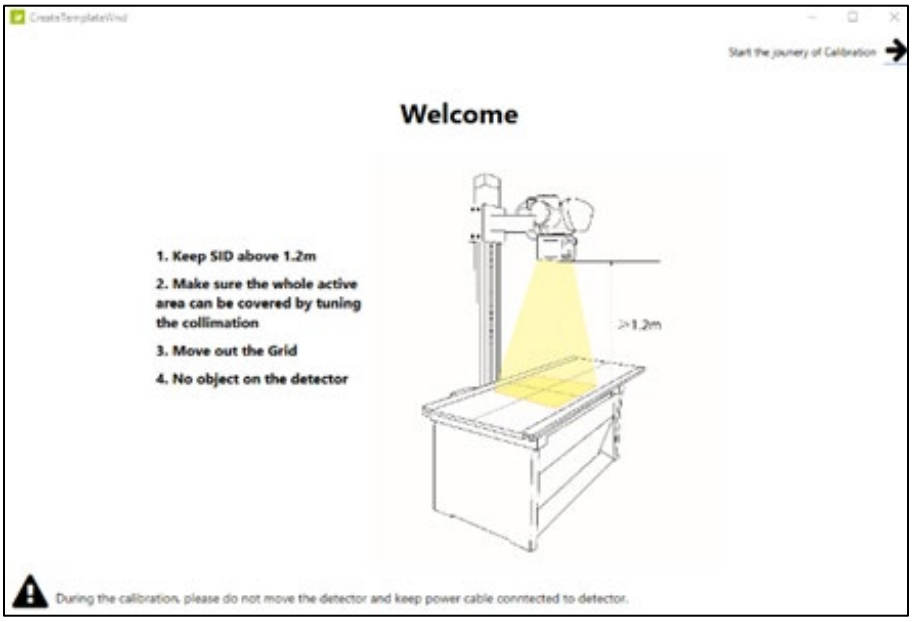
24.2.33 On the **Acquire** tab deselect the **Defect**, **Gain**, and **Offset** boxes in this order.



24.2.34 Click on the **Calibrate** tab, select the **PostOffset** radial, and then click **Start Generate Template**.

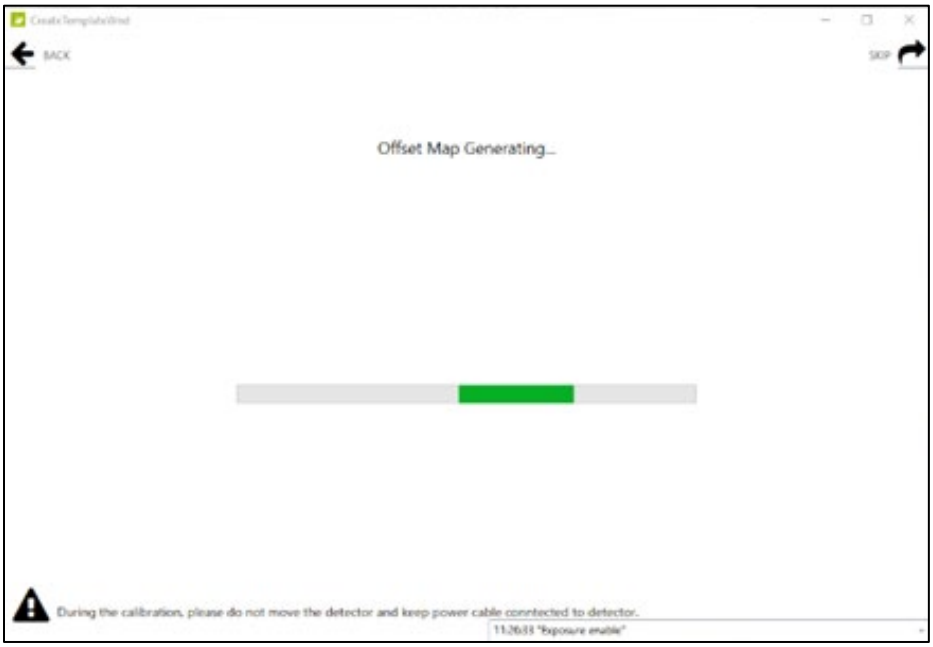


24.2.35 Click the arrow next to the Start the journey of Calibration message.

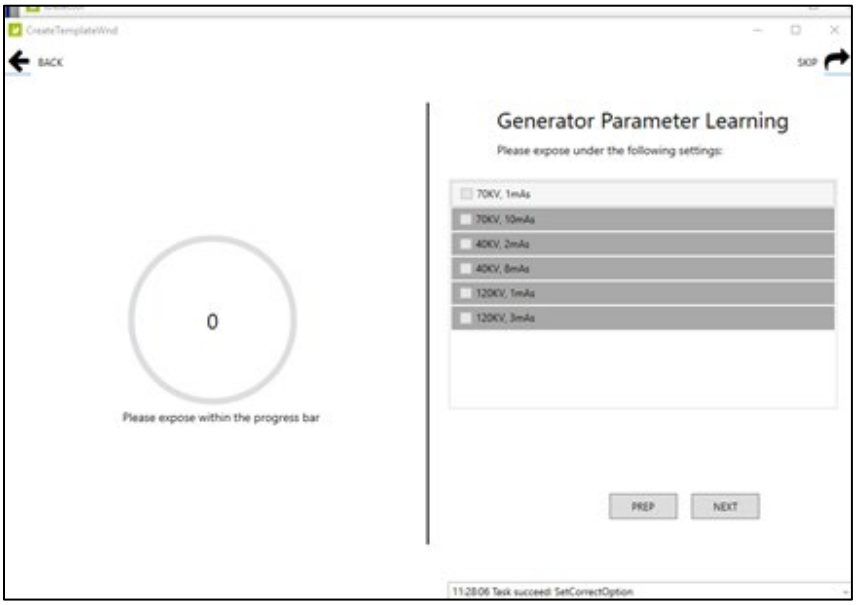


24.2.36 Click **SKIP** at the Offset Map Generating window.

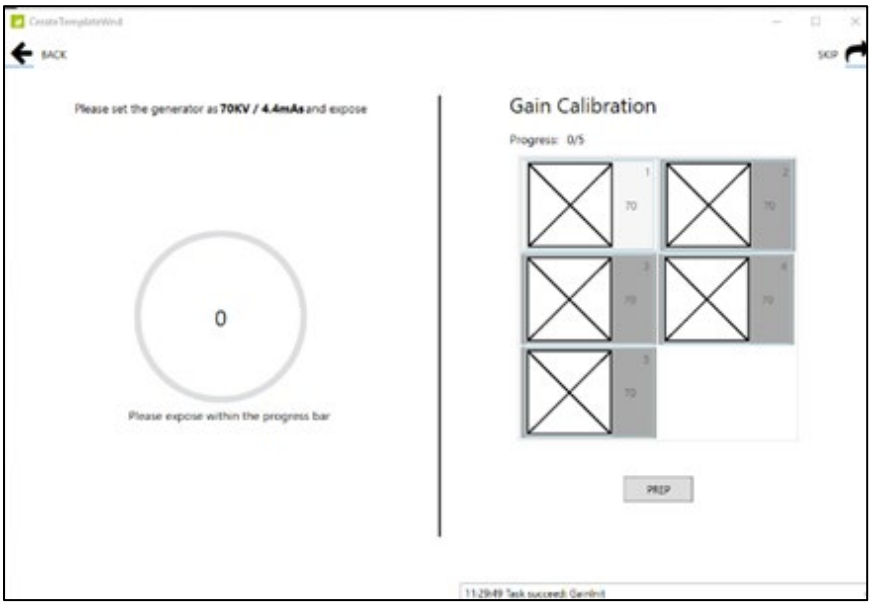
Note: If you do not click Skip within two seconds you will have to wait for the Offset Map to be generated. The 17x17X panel does not use the offset map.



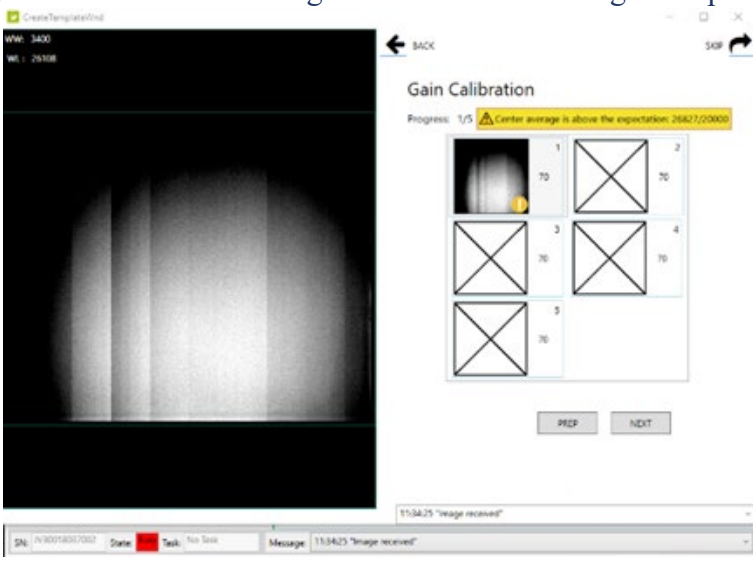
24.2.37 Click **SKIP** on the Generator Parameter Learning window.



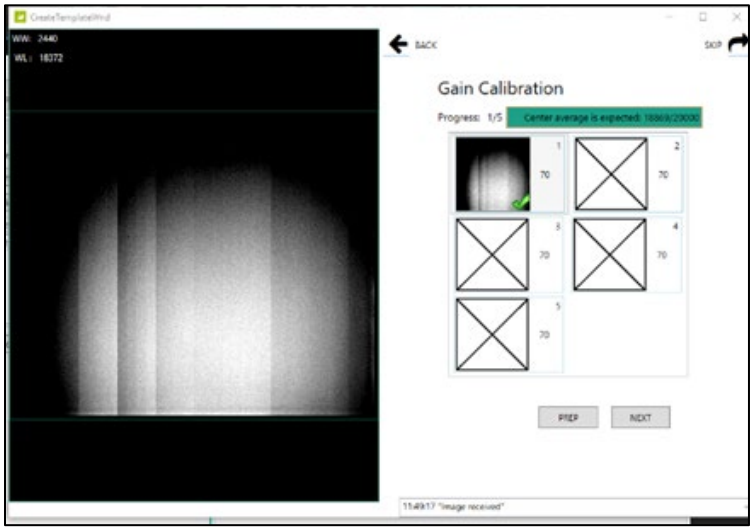
24.2.38 Click **PREP**; then take an exposure.



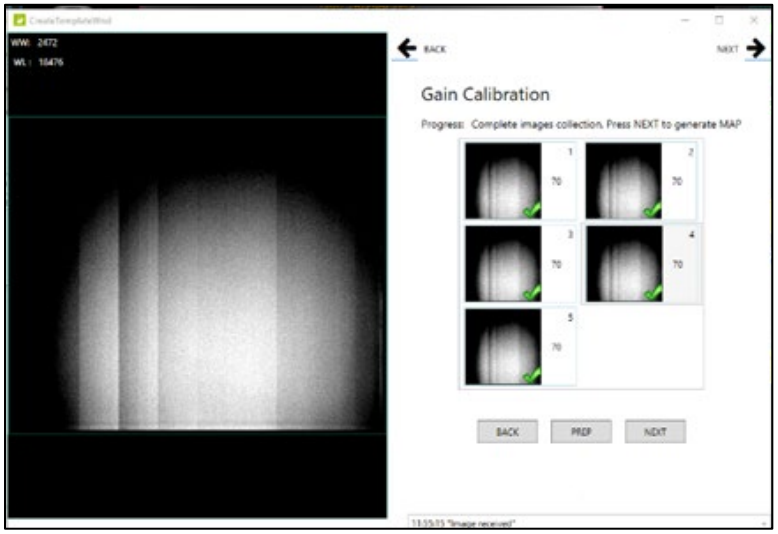
24.2.39 Adjust dose until the message states “Center Average is expected”.



24.2.40 After getting the correct dose. Click **NEXT**; then **PREP** and take another shot.

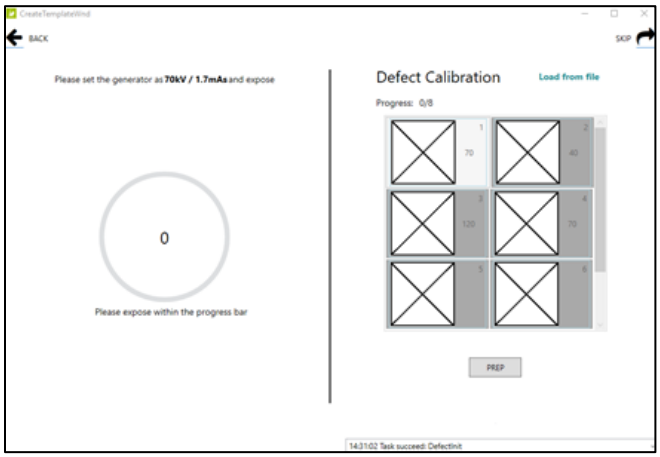


24.2.41 Complete the gain calibration shots; then click the **NEXT** arrow.

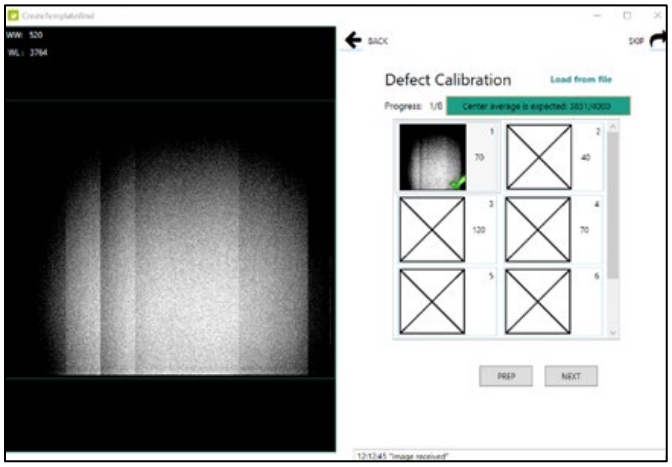


24.2.42 Click **NEXT**.

24.2.43 Click on the **PREP** icon and take a defect shot.



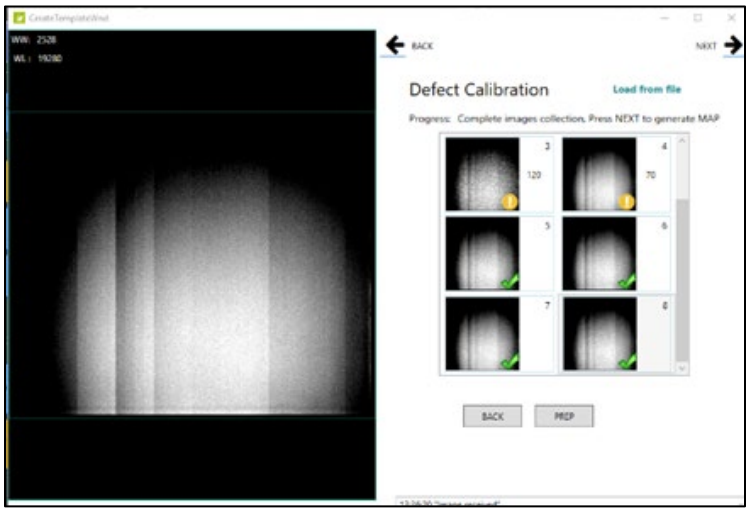
24.2.44 Adjust dose until the "Center average is expected" message displays. Click **Next** and **PREP** then take another shot.



24.2.45 Adjust dose during the Defect calibration.

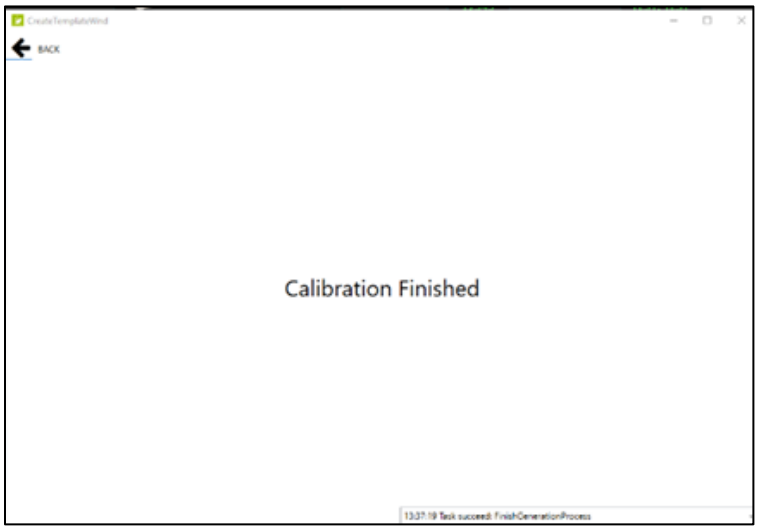
24.2.46 Monitor the Progress status messages and adjust dose accordingly.

24.2.47 After shot 6, scroll down to complete shots 7 and 8. After completing shot 8 click **Next**.

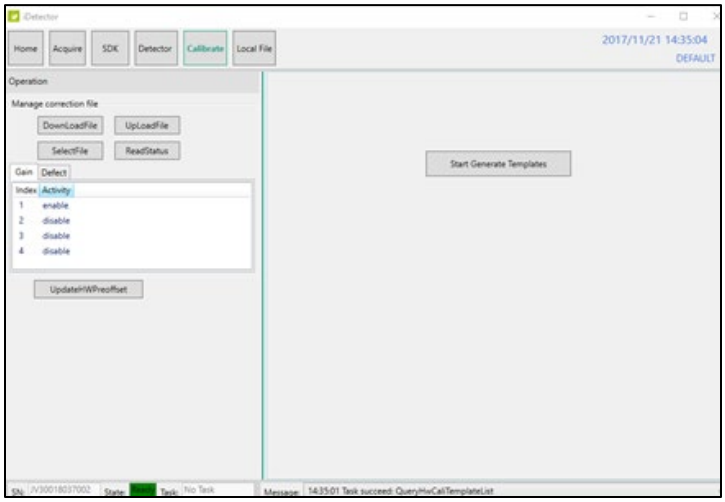


24.2.48 After the Defect MAP generates, click **Next**.

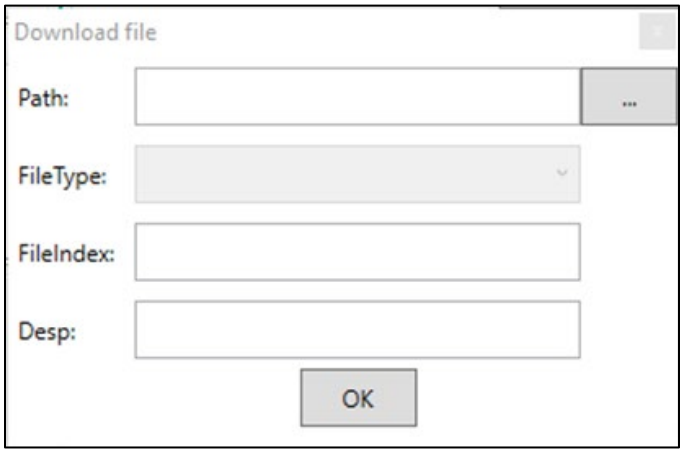
24.2.49 Close the window at the Calibration Finished screen.



24.2.50 Return to the **Calibration** tab. Click on the **Gain** tab then click **ReadStatus**. Highlight option 1 then click **SelectFile**. This changes the option one status to enable. Next click **DownloadFile**.

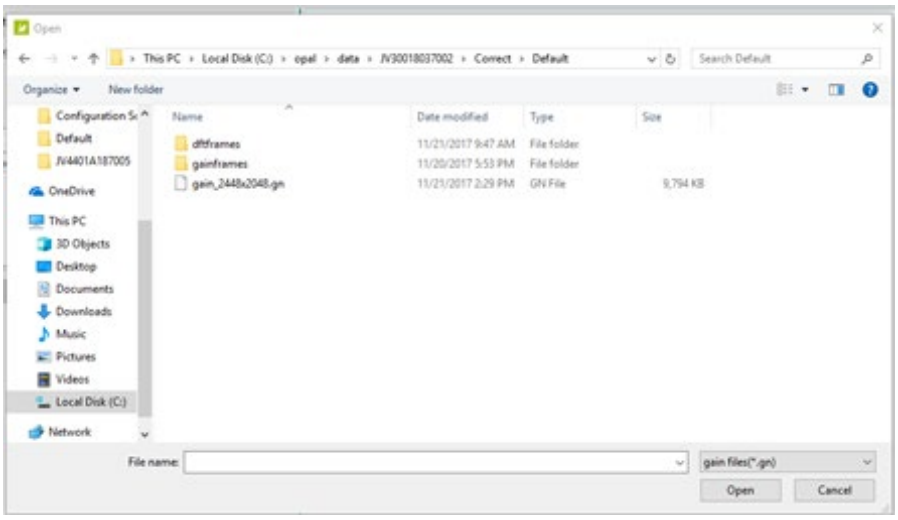


24.2.51 Click **Path**.

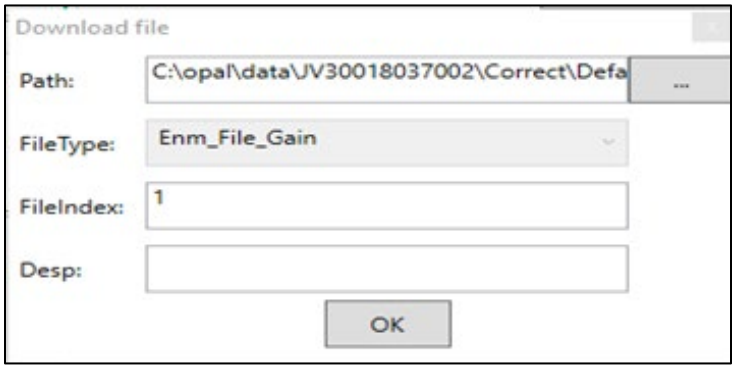


24.2.52 Browse to C:\Opal\data\Panel Serial\Correct\Default and select the gain_2448_2048.gn file. Click **Open**.

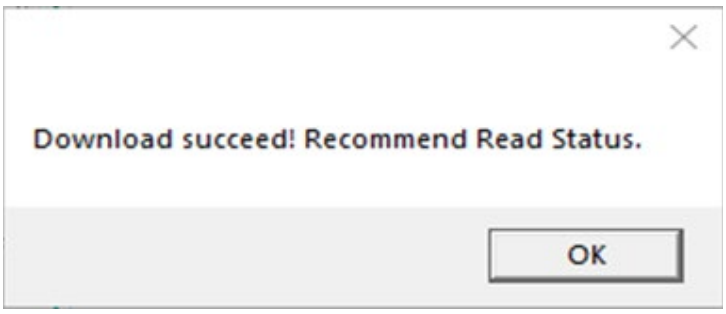
Note: If the gain file does not appear, verify the file type drop down menu in the lower right corner is set to gain files(*.gn).



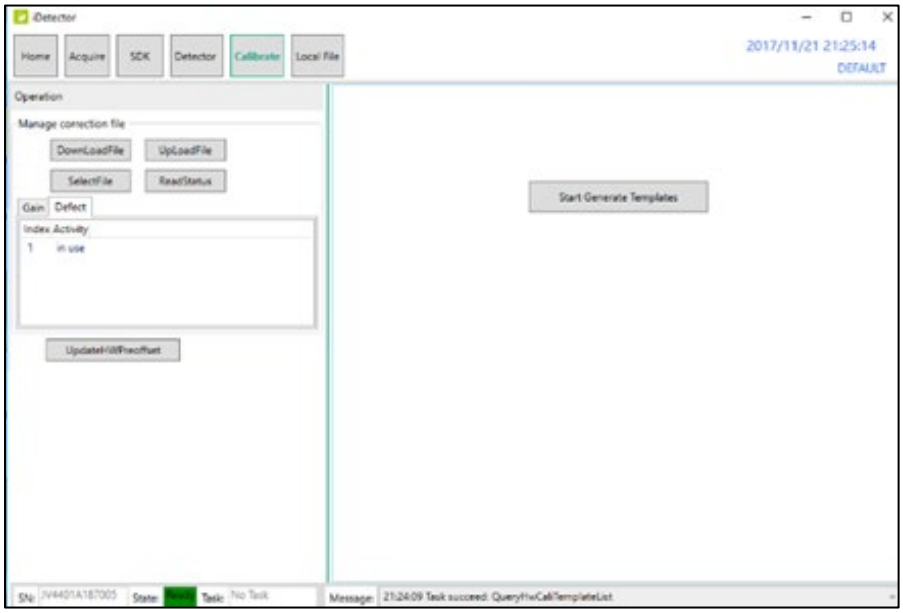
24.2.53 Type **1** in the FileIndex box then click **OK**.



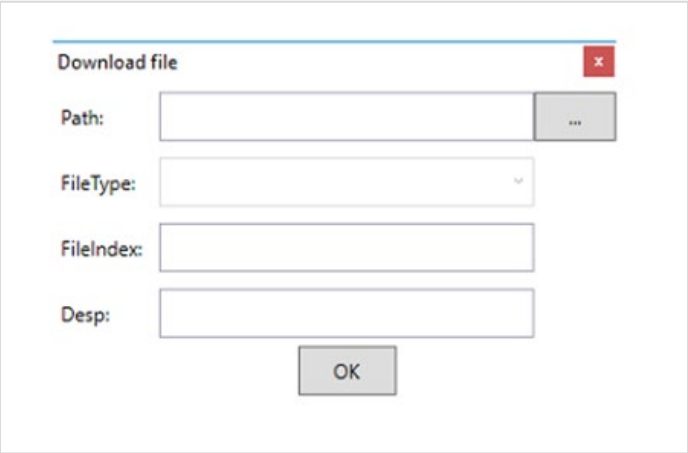
24.2.54 "When Download succeed! Recommended Read Status" message displays after the gain file has been downloaded to the panel. Click **OK**.



24.2.55 Click on the **Defect** tab, click on **ReadStatus** , and then highlight **option 1**. Click on **SelectFile**. This changes the option one status to enable. Click **Download**.

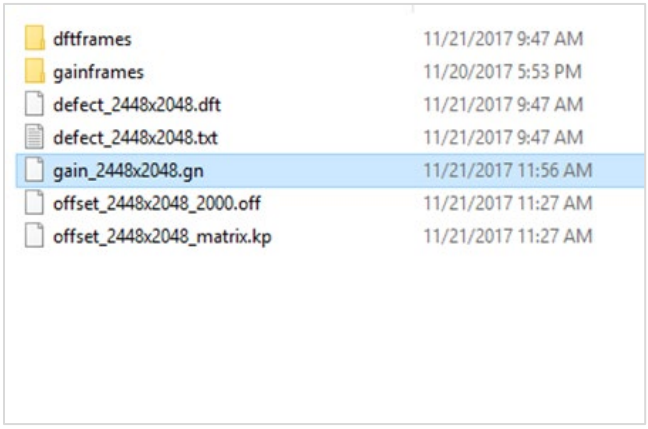


24.2.56 Click on ellipsis button to the right of the **Path** field.

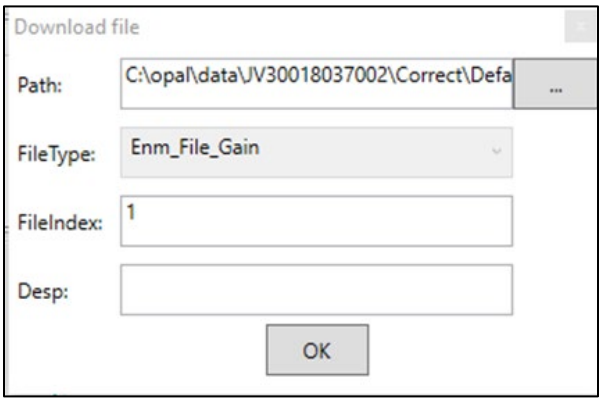


24.2.57 Browse to C:\Opal\data\Panel Serial\Correct\Default and select the defect_2448x2048.dft.

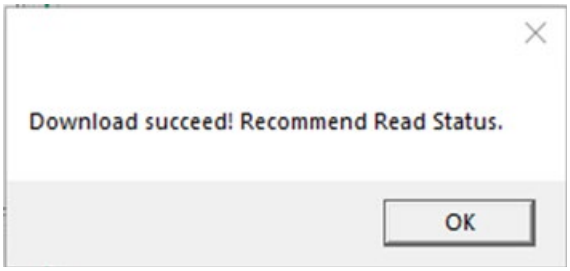
Note: If the gain file does not appear, verify the file type drop down menu in the lower right corner is set to defect files(*.dft).



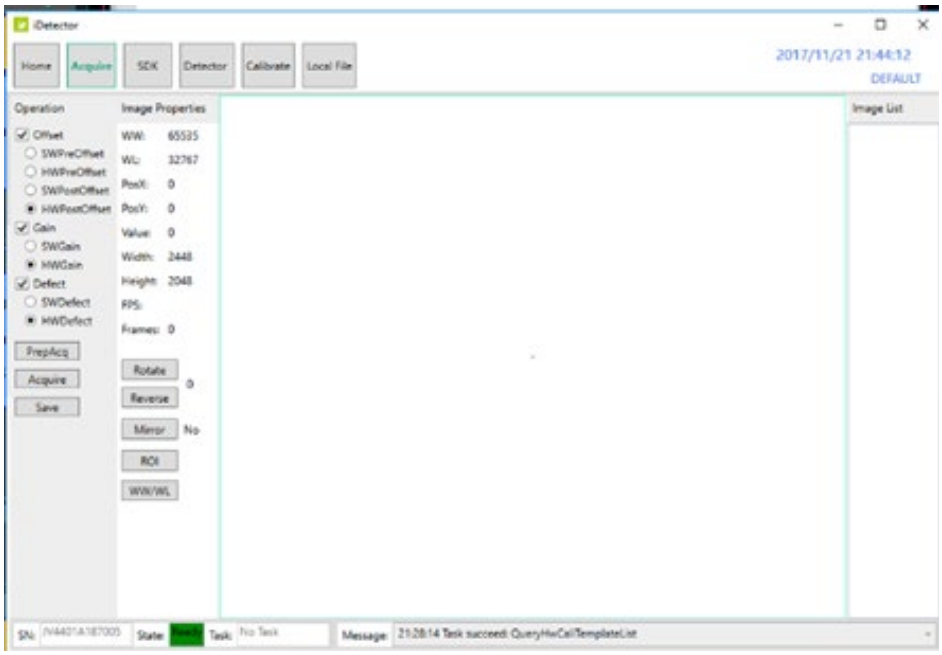
24.2.58 Type **1** in the FileIndex box; then click **OK**.



24.2.59 Click **OK**.



24.2.60 Turn the Offset, Gain, and Defect back on in that order. Check the radials for HWDefect, HWGain, and HWPostOffset. Close IDetector.



24.2.61 Complete the calibration for the other panel; then take test shots.

V. SERVICE

To ensure that the X-ray system is in good working condition, the equipment should be regularly inspected and maintained during its lifetime. It is very important to follow a routine maintenance schedule. There are two aspects of maintenance:

1. Daily maintenance performed by routine users or operators.
2. Professional maintenance performed by X-ray maintenance personnel designated by the manufacturer/ distributor or national or regional health standards.

25 Authorized Service Personnel

Regular users must do the following maintenance procedures:

No.	Regular Maintenance Procedures
1.	The x-ray room should be clean, dry, and well ventilated. Avoid high temperatures. The equipment should avoid direct sunlight.
2.	The X-ray tube is a glass product and is expensive. It should be handled with care while operating to avoid any collisions or damage.
3.	Dielectric Insulating Compound in high-voltage sockets should be replaced regularly. Inspect and replace the high-voltage generator components not more than once every two years and X-ray tube components not more than once every six months respectively. Attention should be paid to frequent updates.
4.	The X-ray tube assembly generates a lot of heat when it is operating, and the transformer oil and rubber parts can get aged due to long-term heating, so the transformer oil and rubber parts should be replaced at most once every 5 years.
5.	Avoid opening the high-pressure tank cover and expansion valve to prevent the trans- former oil from absorbing moisture or allowing dust particles to reduce the insulation performance; if properly stored, the transformer oil does not need to be replaced within 5 years.
6.	After the X-ray tube assembly is not used after a prolonged period of time, it must be properly calibrated before use.
7.	Regularly check the electrical components and their wiring (except the interior of the high-voltage generator assembly and the X-ray tube assembly) for loose parts or any torn or worn connections.
8.	Ensure the Main connection or main power supply. Check whether the internal resistance of the power supply (power supply voltage drop) has changed and ensure that the equipment requires power supply.
9.	Regularly check the grounding device to ensure that the grounding wire of the component is safe and reliable.
10.	Turn off the power before cleaning and use safe cleaning practices.
11.	When the disconnect air switch of the power supply flips or powered OFF due to other reasons or protection fault, the air switch should be turned on after the internal fault is eliminated.
12.	Damaged or worn-out components should be purchased from the manufacturer/authorized distributor for replacement parts of the same type.
13.	The electroplated part between each part should be prevented from rusting and it should be wiped with oil cloth frequently.
14.	Regularly check for loose screws or connections and if needed, tighten them.
15.	For any short circuit of fuses due to electrical fault or any other reasons, the fuse of the corresponding specification should be replaced in time after the internal fault is eliminated. Replace the fuse with the external power supply completely disconnected.

26 Service and Maintenance

26.1 Testing equipment:

For authorized professional maintenance, you must have the following tools:

26.1.1 Tektronix TDS1002 Storage oscilloscope, recommended Tektronix TDS1002 Digital multimeter

26.2 User Maintenance:

26.2.1 Surface cleaning: Clean the device regularly. Use a slightly damp cloth or cotton to wipe dusty areas on the device's case and surface.

Before any kind of maintenance, all power to the equipment must be powered off. When the X-Ray host is working, do not clean any part of the equipment.

Do not use any abrasive cleaners and organic solvents or cleaning agents containing solvents (such as gasoline, alcohol, detergents).

Do not spray anything directly on to the device! Under no circumstances should the cleaning fluid flow into the device!

26.3 Internal Cleaning:

26.3.1 Carefully observe all major components that are exposed to dust or other debris and check for possible short circuits or loose connections. Use a dry brush for internal cleaning of dust removal.

Attention: Make sure that the residual energy in each capacitor has been completely discharged. Be sure to wait until each light-emitting diode fades out.

26.4 Cable Inspections:

26.4.1 Check that all circuit connections are secure, and all line cables are in place and cable sheaths are not peeled or abraded.

a. Ground Connection

- The ground point of the main ground wire of the X-ray host system is in the generator cabinet. Check whether the connection is well connected. Use the smallest Ω range of the multimeter to check the connection between each part of the system and the ground point.

b. AC power in X-ray system workshop

- Measure the voltage of the power supply and check whether it meets the installation requirements of the power supply.

26.5 High pressure tank:

26.5.1 Check carefully to confirm the following:

a. Ensure there is no oil leakage.
b. Ensure the Dielectric Insulating Compound of the high-voltage socket is clean and there is no sign of arc flash discharge.
c. Ensure the sealing ring on the high voltage plug is still reliable.

26.6 X-Ray Tube:

26.6.1 Check carefully to confirm the following:

a. Ensure there is no oil leakage.
b. Ensure the Dielectric Insulating Compound of the high voltage socket is clean, and there is no sign of arc flash discharge.
c. Ensure the sealing ring on the high-voltage plug is still reliable.

27 Environmental Requirements

27.1 Follow local government regulations and recycling plans for the disposal or recycling of equipment components.

27.2 The components replaced during the repair process must be properly disposed of or recycled to prevent potential environmental pollution and adverse effects on human health.

27.3 If high-voltage transformer oil needs to be replaced, the disposal of waste oil must comply with local environmental protection requirements.

27.4 For more information on recycling this equipment component, please refer to local government disposal or recycling regulations and recycling plans.

28 High Frequency Generator Service

28.1 System Grounding

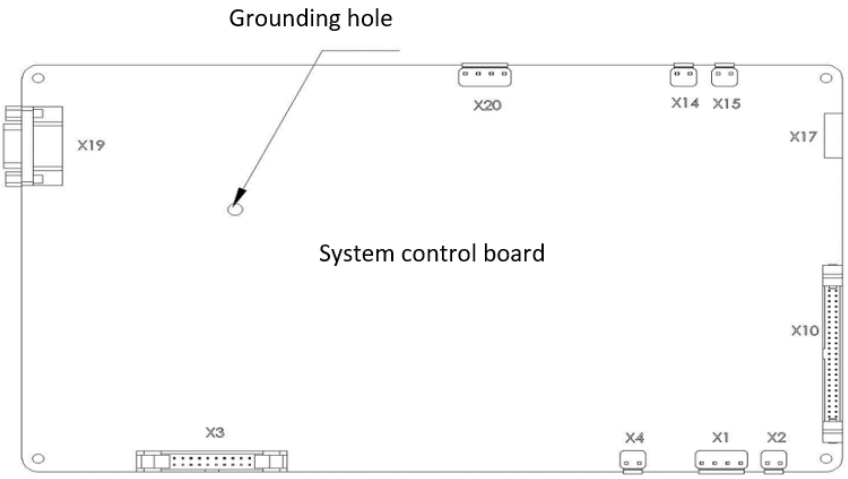


Chart 2-14 Main control board grounding

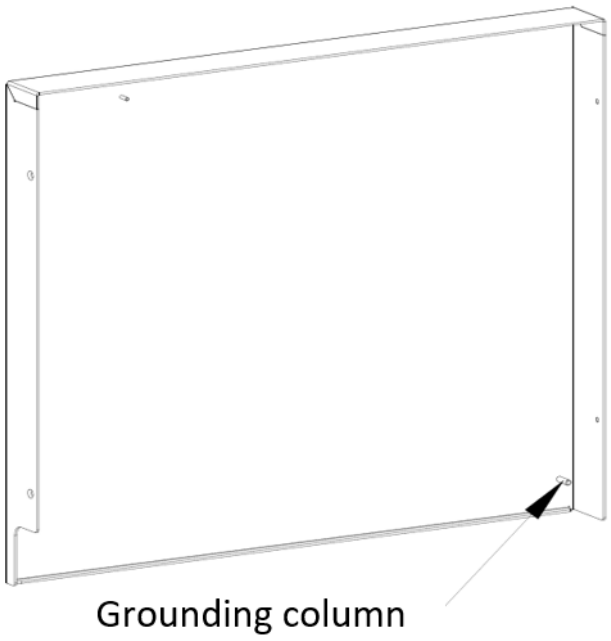


Chart 2-15 Front panel grounding

Troubleshooting

28.2 Fault Management

28.2.1 Exposure Limit

Exposure suppression occurs when the technical conditions exceed the limit of a tube or a high voltage generator, exposing according to the limit value.

28.2.2 Interlocking Conditions

Do not expose when the interlock switch is valid.

28.3 Diagnostic Mode

The high voltage generator is self-checked when powered on, including：

1) Control Board Inspection (Control Board Operating Lamp Flashing)
2) Anode Drive Board Communication Detection
3) Filament Driving Current Detection
4) High Voltage Configuration Parameter Detection

When powered on, if no fault is detected, the default workstation and tube data are used. If there are any errors, it will report to the host computer.

Table of lock errors

Code	Description	Error types	Causes	Solution
EL001	Generator CPU Real Time Clock Error	Locked	1. Real-time clock failure 2. Installation of core board and MCB board is unreliable	1. Open the service software and keep it for 1 minute. 2. Power up again 3. Check the reliability of the connection between the core plate and the bottom plate. 4. If the above cannot be solved, contact the manufacturer to replace the MCB board.
EL002	Main Connector Error	Locked	1. The connection of terminal of filament power supply board is unreliable 2. Damage of filament power supply board	1. Power up again 2. Check whether the connection between X1 and X6 terminals of filament power board is reliable. 3. Replacement of filament

Code	Description	Error types	Causes	Solution
			3. Damage of main connector	power supply board 4. Replacement of main connector
EL003	Rotor Fault	Locked	1. Anode cable not connected or connected in reverse sequence 2. Anode Output Over-current 3. Anode plate damage	1. Check whether the connection of X9 terminal cable of anode plate is normal, Check whether the X2 cable connection of the interface board is normal, Check whether the interface board P5 connection is normal, Check whether the connection of spherical pipe and cable is normal 2. Power up again 3. Replacement of anode plate
EL004	DC Bus Voltage too Low	Locked	1. Pre-charging anomaly, that is, during generator pre-charging process, voltage below the set value (350V) is due to the failure of auxiliary connector or main connector, or the failure of pre-charging resistance. 2. HVG input voltage is too low to make generator voltage too low 3. DC generator has short circuit, which makes generator voltage low 4. Generator Detection Circuit Abnormality	1. Power up again 2. Check whether the input voltage on the network side is low or not 3. Check whether the drive coil connection of the auxiliary connector or the main connector is normal, and whether the X6 terminal is reliable. 4. Check whether the auxiliary connector or the main connector is out of order (i.e. can't be connected or disconnected). If there is a failure, the corresponding connector should be replaced. 5. Check if the pre-charging resistor is malfunctioning (i.e. if its resistance value is greater than 200 ohms) 6. After the system is powered

Code	Description	Error types	Causes	Solution
				off, please check the short circuit of DC generator with multimeter. 7. Replacement of filament power supply board
EL005	DC Bus Voltage too High	Locked	1. HVG input voltage is too high to make generator voltage too high 2. Generator Detection Circuit Abnormality	1. Power up again 2. Detecting whether the input voltage of the network side is too high 3. Replacement of filament power supply board
EL006	Filament Adjust Error	Locked	1. The filament output terminal of the filament power supply board is not connected 2. The connection of cathode high pressure rod of TANK (high pressure tank) is unreliable 3. Fusion of tube filament 4. Damage of filament power supply board	1. Power up again 2. Check the reliability of the filament output terminal X5 connection of the filament power board 3. Check the reliability of cathode high pressure rod connection of TANK (high pressure tank) 4. Check whether the tube filament is broken or the resistance value exceeds 5Ω. If the above phenomenon occurs, it indicates that the tube filament is fused and the tube should be replaced. 5. If the above cannot be solved, please replace the filament power board
EL007	Filament Power Board Not Connected	Locked	1. The connection between filament power supply board and MCB board is unreliable 2. Damage of filament power supply card	1. Power up again 2. Check whether the connection between filament power supply board and MCB board terminal X1 is reliable. If not, it needs to be re-fixed. 3. If the above cannot be

Code	Description	Error types	Causes	Solution
				solved, please replace the filament power board
EL008	Filament Short Circuit	Locked	Damage of filament power supply board	1. Power up again 2. If the above cannot be solved, please replace the filament power board
EL009	Filament Overcurrent	Locked	Damage of filament power supply board	1. Power up again 2. If the above cannot be solved, please replace the filament power board
EL010	Anode Overcurrent	Locked	1. Anode overcurrent 2. Poor contact between core plate and MCB floor 3. Core board failure 4. MCB floor failure	1. Power up again 2. Check the reliability of the connection between the core plate and the bottom plate. 3. Replacement of core board 4. Contact Manufacturer to Replace MCB Circuit Board
EL011	Cathode Overcurrent	Locked	1. Cathode overcurrent 2. The short joint connection of mA test point is unreliable 3. Poor contact between core plate and MCB floor 4. Core board failure 5. MCB floor failure	1. Power up again 2. Reconnect the short patches of mA and measure the resistance of the two terminals to less than 0.5 ohms 3. Check the reliability of the connection between the core plate and the bottom plate 4. Replacement of core board 5. Contact Manufacturer to Replace MCB Circuit Board
EL012	Anode Overvoltage	Locked	1. Anode overvoltage 2. The connection between MCB and TANK is unreliable 3. Poor contact between core plate	1. Power up again 2. Check whether the connection between MCB and TANK is reliable 3. Check the reliability of the connection between the core

Code	Description	Error types	Causes	Solution
			and MCB floor 4. Core board failure 5. MCB floor failure 6. TANK failure	plate and the bottom plate 4. Replacement of core board 5. Contact Manufacturer
EL013	Cathode Overvoltage	Locked	1. Cathode overvoltage 2. The connection between MCB and TANK is unreliable 3. Poor contact between core plate and MCB floor 4. Core board failure 5. MCB floor failure 6. TANK failure	1. Power up again 2. Check whether the connection between MCB and TANK is reliable 3. Check the reliability of the connection between the core plate and the bottom plate 4. Replacement of core board 5. Contact Manufacturer
EL014	ARC	Locked	1. High Voltage Cable Fire 2. Tube fire 3. TANK (high pressure tank) fire 4. Tube not used for a long time or working under high voltage 5. Poor contact between core plate and MCB floor 6. Core board failure 7. MCB floor failure	1. Check the black spot of ignition and carbonization or grey mark of creeping electricity in the tube, TANK (high-pressure tank) high-pressure rod and high-pressure socket respectively. If the above phenomenon occurs, oil-absorbing paper is needed to clean the ignition point and re-coat high-pressure silicone grease to ensure the reliable connection of high-pressure rod without loosening. 2. If the exposure times of the tube are too many, and the low-voltage is normal, and the high-voltage is fired, the insulation failure of the tube will be explained. If low-voltage exposure, there is still fire phenomenon, indicating that TANK (high-pressure tank) is damaged. People should

Code	Description	Error types	Causes	Solution
				contact with manufacturers to replace TANK (high-pressure tank) 3. If the tube is not used for a long time, it needs to be aged before the first using. 4. Check the reliability of the connection between the core plate and the bottom plate 5. Replacement of core board 6. Contact Manufacturer to Replace MCB Circuit Board
EL015	Short Current 1	Locked	1. Generator Short Circuit of Inverter Board 1 2. Short circuit of inverter board 1 output line to ground	1. Power up again 2. Replacement of Inverter Board 1 3. Check whether the cables and chassis of the inverter output are burnt. If the above phenomenon occurs, please contact the generator manufacturer to solve.
EL016	Short Current 2	Locked	1. Generator Short Circuit of Inverter Board 2 2. Short circuit of inverter board 2 output line to ground	1. Power up again 2. Replacement of Inverter Board 2 3. Check whether the cables and chassis of the inverter output are burnt. If the above phenomenon occurs, please contact the generator manufacturer to solve.
EL017	Short Current A	Locked	1. Generator Short Circuit of Inverter Board 1 2. Short circuit of inverter board 1 output line to ground	1. Power up again 2. Replacement of Inverter Board 1 3. Check whether the cables and chassis of the inverter output are burnt. If the above phenomenon occurs, please contact the generator manufacturer to solve.

Code	Description	Error types	Causes	Solution
EL018	Short Current B	Locked	1. Generator Short Circuit of Inverter Board 2 2. Short circuit of inverter board 2 output line to ground	1. Power up again 2. Replacement of Inverter Board 2 3. Check whether the cables and chassis of the inverter output are burnt. If the above phenomenon occurs, please contact the generator manufacturer to solve.

Table of unlocked errors

Code	Description	Error types	Causes	Solution
ER100	AEC Back-up Timer - Exposure Terminated	Unlock-ed	1. AEC Back-up Timer set too short 2. Incorrect use of water film 3. Under AEC mA mode, mA set too low 4. AEC correction data is incorrect	1. Check whether the Back-up Timer setting is too short (default is 500 ms), set a reasonable BACKUP time 2. Please use water film correctly 3. Increase mA value 4. AEC correction data is unreasonable, do AEC correction again
ER101	AEC mAs Exceeded - Exposure Terminated	Unlock-ed	1. AEC Back-up mAs setting is too little 2. Incorrect use of water film 3. AEC correction data is incorrect	1. Check whether the Back-up mAs setting is normal (default is 600 mAs, please set a reasonable Back-up mAs 2. Please use water film correctly 3. AEC correction data is unreasonable, do AEC correction again

Code	Description	Error types	Causes	Solution
ER102	Door Interlock Error	Unlocked	1. The door of the lead room is opened. 2. The door switch connection of the interface panel is unreliable 3. Damage of door switch 4. Damage of interface board	1. Check whether the door of lead room is open 2. Check whether the door switch terminal P3 of the interface panel is reliable. 3. Under the condition that the lead door is closed, check whether the P3 terminal is short or not. If it is open, the door switch is abnormal. 4. Replacement of interface board
ER103	Calibration Data Corrupt Error	unlocked	1. Tube calibration data is damaged or missing 2. Poor connection between core plate and MCB floor 3. Memory Chip Damage	1. Power up again 2. Check the reliability of the connection between the core plate and the bottom plate 3. Filament re-correction 4. If the above cannot be solved, contact the manufacturer to replace the MCB circuit board
ER104	AEC Data Corrupt Error	unlocked	1. AEC correction data has been damaged 2. Poor connection between core plate and MCB floor 3. Memory Chip Damage	1. Power up again 2. Check the reliability of the connection between the core plate and the bottom plate 3. Re-do AEC correction or download backup AEC correction data to high voltage generator 4. If the above cannot be solved, contact the manufacturer to replace the MCB circuit board
ER105	Receptor Data Corrupt Error	unlocked	1. Workstation data has been damaged 2. Poor connection between core plate and MCB floor 3. Memory Chip Damage	1. Power up again 2. Check the reliability of the connection between the core plate and the bottom plate 3. Download back-up workstation data to high voltage generator.

Code	Description	Error types	Causes	Solution
				4. If the above cannot be solved, contact the manufacturer to replace the MCB circuit board
ER106	Tube Data Corrupt Error	unlocked	1. Tube data has been damaged 2. Poor connection between core plate and MCB floor 3. Memory Chip Damage	1. Download back-up tube data to high voltage generator 2. If the above cannot be solved, contact the manufacturer to replace the MCB circuit board
ER107	Generator Limit Data Corrupt Error	unlocked	Limit data of high voltage generator has been damaged	1. Download back-up workstation data to high voltage generator 2. If the above cannot be solved, contact the manufacturer to replace the MCB circuit board
ER108	mA Correction Data Corrupt Error	unlocked	1. mA calibration parameters has been damaged 2. Poor connection between core plate and MCB floor 3. Memory Chip Damage	1.Power up of DR system again 2. Check the reliability of the connection between the core plate and the bottom plate 3. If the above cannot be solved, contact the manufacturer to replace the MCB circuit board
ER110	AEC Feedback Error - No Feedback Signal Detected	unlocked	Feedback of AEC is abnormal 1. The ionization chamber cable connection is not reliable 2. The channel configuration error, or interface board hardware connection error 3. The wire harness is	1. Check ionization chamber cable connection (specific terminal number) 2. Check whether the AEC BACKUP time setting is normal 3. Check the AEC channel selection is correct, AEC correction data is correct. 4. Check the existence of feedback voltage, if there is no feedback voltage, check whether the ionization

Code	Description	Error types	Causes	Solution
			not open or not in correct orientation. 4. Under AEC mA model, mA settings is too low	chamber is working properly and whether the exposure dose is produced. 5. If the feedback voltage exists, and the problem still can't be solved, please contact the manufacturer of the high voltage generator.
ER112	Calibration Error - No mA	unlocked	1. Cathode and Anode Connection Reverse of High Voltage Cable 2. Fusion of tube filament 3. Failure of filament power supply board	1. You need to switch the size of the filament to expose it. If both filaments are abnormal, it is necessary to check whether the cathode and anode connection of the high voltage cable on the top cover of TANK on the high voltage side is correct, and whether the cathode and anode connection of the high voltage cable on the tube side is correct. 2. Measure the resistance value of small filament and big filament of tube, whether it is disconnected or more than 5Ω, indicating that the filament is fused, and the tube needs to be replaced. 3. Check the working status of the indicator lamp on the filament power board. If no error is reported, observe the reliability of the connection terminal of the filament output. 4. Replacement of filament power supply board

Code	Description	Error types	Causes	Solution
ER113	Calibration Error - Maximum Filament Current Exceeded	unlocked	1. The filament resistance becomes larger when the tube is used for a long time, which leads to the lower filament current of the tube. 2. Damage of filament power supply board leads to low filament current	1. Measure the resistance of small filament and large filament of tube, whether it is disconnected or over 5Ω. If the above phenomenon occurs, the tube needs to be replaced. 2. Replacement of filament power board and do filament re-correction
ER114	MA During Exposure too High	unlocked	Long time no management	1. Re-manage 2. If the above can't be solved, please contact the manufacturer of high voltage generator to solve the problem.
ER115	MA During Exposure too Low	unlocked	Long time no management	1. Re-manage 2. If the above can't be solved, please contact the manufacturer of high voltage generator to solve the problem.
ER116	Generator KW Limit	unlocked	1. Set kV or mA wrong, the power is greater than the maximum power of generator	1. Adjust the exposure parameters and make the power less than the maximum power of generator
			2. The maximum power of generator is wrong	2. Modified maximum power of generator
ER117	Generator KV Limit	unlocked	The kV parameter is wrong	Reduce KV
ER118	Generator MA Limit	unlocked	The mA parameter is wrong	Reduce mA

Code	Description	Error types	Causes	Solution
ER119	Generator MS Limit	unlocked	The ms parameter is wrong	Reduce ms
ER121	Tube KW Limit	unlocked	If exposed with current parameters, it will exceed the kW limit of the tube	Reduce KV or mA
ER122	Tube KV Limit	unlocked	If exposed with current parameters, it will exceed the kv limit of the tube	Reduce KV
ER123	Tube MA Limit	unlocked	If exposed with current parameters, it will exceed the mA limit of the tube	Reduce mA
ER124	Tube MAS Limit	unlocked	If exposed with current parameters, it will exceed the mAs limit of the tube	Reduce mAs
ER125	Parameter Limit	unlocked	The selected parameters have reached the limit.	Reduce exposure parameters
ER126	Manually Terminated Exposure	unlocked	1. Actively releasing hand brake during exposure 2. Hand brake damage	1. Please release the hand brake after exposure. 2.Check whether the hand brake is invalid
ER127	Preparation Time-out Error prep time is over 30s or 60s	unlocked	Exposure preparation exceeded 60s	1. Please press the second hand brake exposure within 60 seconds of the first hand brake press 2. Check whether the hand brake is invalid

Code	Description	Error types	Causes	Solution
ER128	Prep Input Active During Initialization Phase	unlocked	The exposure preparation hand brake was pressed without power on	1. Please turn on the power first and then expose 2. Check whether the hand brake is invalid
ER129	X-ray Input Active During Initialization Phase	unlocked	The exposure hand brake was pressed without power on.	1. Please turn on the power first and then expose 2. Check whether the hand brake is invalid
ER130	No Fields Selected in AEC mode	unlocked	AEC exposure mode has no choice of field	1. Under AEC mode exposure, select field first 2. If the field has been selected, please check whether the field selection signal is normal.
ER131	Generator AEC Density Limit	unlocked	AEC Density Excess Limit	Adjust AEC density between - 3 and + 3
ER132	Calibration Error - Manually Terminated	unlocked	Release hand brake during correction	1.Please release the hand brake after filament correction 2. Check whether the hand brake is invalid
ER133	EEPROM Communication Error	unlocked	1.Memory Chip Communication Error 2. Poor connection between core plate and MCB floor 3. Memory Chip Damage	1. Power up again 2. Check the reliability of the connection between the core plate and the bottom plate 3. If the above cannot be solved, contact the manufacturer to replace the MCB circuit board
ER134	RTC Communication Error	unlocked	1. RTC Chip Communication Error 2. Poor connection between core plate and MCB floor 3. RTC chip damage	1.Power up again 2. Check the reliability of the connection between the core plate and the bottom plate 3. If the above cannot be solved, contact the

Code	Description	Error types	Causes	Solution
				manufacturer to replace the MCB circuit board
ER136	Anode Communication Error	unlocked	1. Anode communication error 2. Unreliable Anode Communication Cable Connection 3. Anode plate damage	1. Power up again 2. Check whether the X3 terminal connection of the anode board communication cable is normal or not, check whether the X4 terminal connection of the MCB board communication cable is normal or not. 3. Replacement of anode plate
ER137	EXP_OK TimeOut	unlocked	1. Exp ok signal waiting timeout, more than 3S 2. Incorrect or unreliable connection of flat cable 3. Flat plate failure 4. Interface board failure	1. Please check whether the plate board is working properly. 2. Check whether the cable connected to the flat plate is correct 3. Check plate status 4.Replacement of interface board
ER138	KV TimeOut	unlocked	1. Within 8 ms exposure, kV did not rise to 75% of the set value. 2. Unreliable connection between core plate and bottom plate 3. TANK (high voltage tank) damage	1. Power up again 2. Check the reliability of the connection between the core plate and the bottom plate

Code	Description	Error types	Causes	Solution
ER139	MOSFET Temperature Limit Exceeded	unlocked	1.Inverter temperature exceeds set temperature 2. Failure of Temperature Acquisition Sensor	1. Wait for 5 minutes, then expose when the temperature drops. 2. Replacement of Temperature Acquisition Sensor
ER140	HU Power Limit	unlocked	If exposed with the current parameters, the power limit of level 2 is exceeded.	1. Check whether the power limit threshold is correct 2. Please reduce exposure parameters
ER141	HU Power Warning	unlocked	If exposed with the current parameters, the power limit of level 1 is exceeded.	1.Check whether the power limit threshold is correct 2. Please reduce exposure parameters
ER142	Small Focus Disable	unlocked	Small filament not enabled	Please enable the small filament
ER143	Large Focus Disable	unlocked	Big filament not enabled	Please enable the big filament
ER146	Anode Heat Warning Exceeded	unlocked	Anode Overheating Warning	1. Wait 5 minutes before exposure. 2. Re-exposure after Reducing Exposure Parameters
ER147	Anode Heat Limit Exceeded	unlocked	Anode overheating Limit	1.Wait 5 minutes before exposure. 2.Re-exposure after Reducing Exposure Parameters
ER148	KV Unbalance	unlocked	KV unbalance error, cathode and anode KV unbalance	Please contact the manufacturer of high voltage generator to solve the problem.
ER149	Thermal Switch Interlock Error	unlocked	Tube sleeve overheating	Wait 5 minutes before exposure

Code	Description	Error types	Causes	Solution
ER150	Emergency Error	unlocked	1.The emergency stop button is pressed 2. The emergency stop button is damaged	1.Turn up the emergency stop button 2. Power up again 3. Replace the emergency stop button
ER151	KV Correction Data Corrupt Error	unlocked	1. Damage of Calibration Parameters of kV 2. Poor connection between core plate and MCB floor 3. Memory Chip Damage	1. Power up again 2. Check the reliability of the connection between the core plate and the bottom plate 3. If the above cannot be solved, contact the manufacturer to replace the MCB circuit board
ER152	Generator Tank Power Limit	unlocked	Several high-power exposures in one minute exceeded the power limit of high-voltage tanks.	Wait 1 minutes before exposure
ER153	AEC Standby Signal Error	unlocked	1. Abnormal ionization chamber and power supply	1. Check ionization chamber cable connection (specific terminal number) 2. Check whether the ionization chamber power supply is normal 3. Replacement of ionization chamber
ER157	Power Off In X-Ray State	unlocked	1. Shut down during exposure 2. The shutdown signal is interfered	1. Check whether the shutdown signal is invalid 2. Check the reliability of the connection between the core plate and the bottom plate 3. Power up again 4. If the above cannot be solved, contact the manufacturer to replace the MCB circuit board

Table Tips list

CODE	DESCRIPTION
EI400	Enter the service mode
EI401	Exit the service mode
EI402	Resonance Overcurrent1

Spare Parts List

Item	Spare part number	Spare part name	Packaging type	Consumption of single station
1	702-00005	System board	Antistatic bag	1
2	702-00007	Interface board	Antistatic bag	1
3	702-00013	Anode drive plate	Antistatic bag	1
4	702-00037	Inverter board 50K LOCAL	Antistatic bag	1
5	702-00033	Capacitance plate	Antistatic bag	2
6	702-00003	Power filament board	Antistatic bag	1
7	702-00006	Driving plate	Antistatic bag	1
8	318-00001	Ceramic fuse（R055）	Paper packaging	1
9	302-00002	AC connector（GSC1-1210）	Paper packaging	2

Replacement and Maintenance

1) Ensure the main power circuit breaker is disconnected and cannot be turned ON under any circumstance.
2) Remove the housing of the generator.

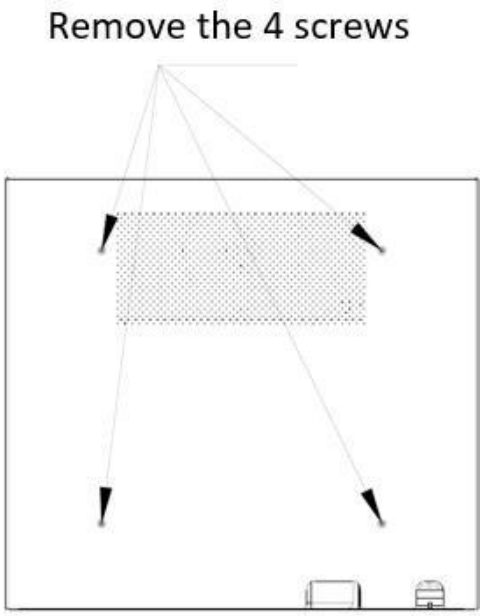


Chart 5-1 Latter Plate Disassembly Chart

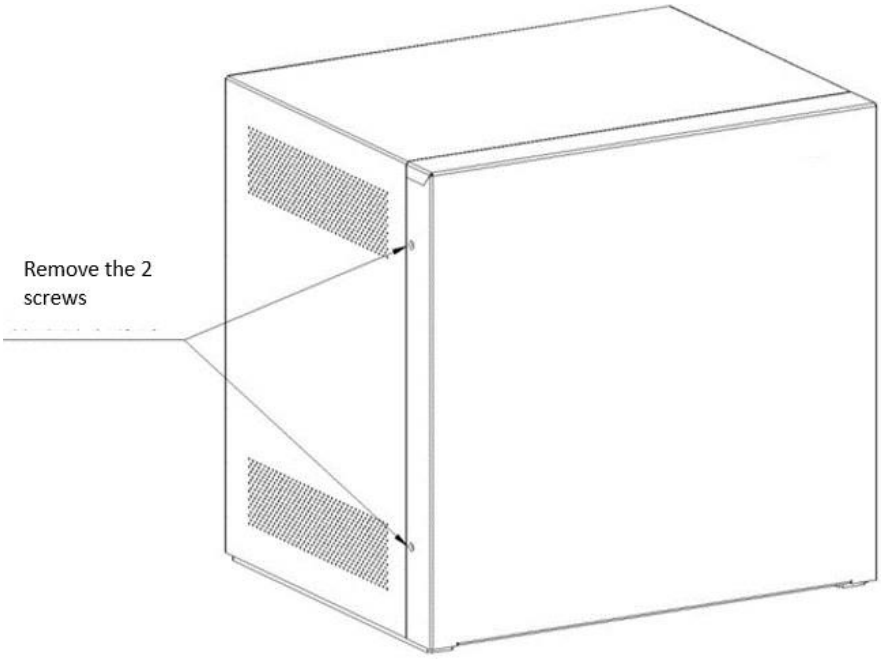


Chart 5-2 Front Plate Disassembly Chart 1

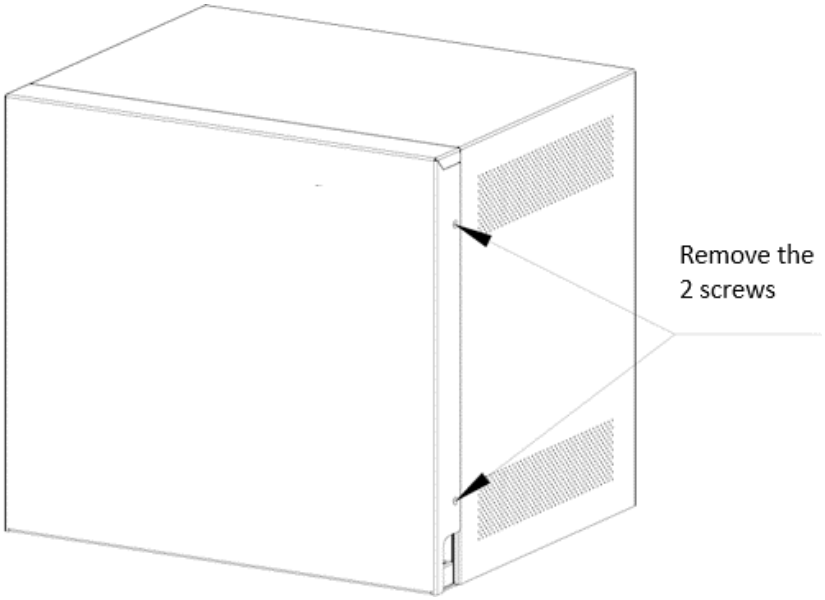


Chart 5-3 Front Plate Disassembly Chart 2

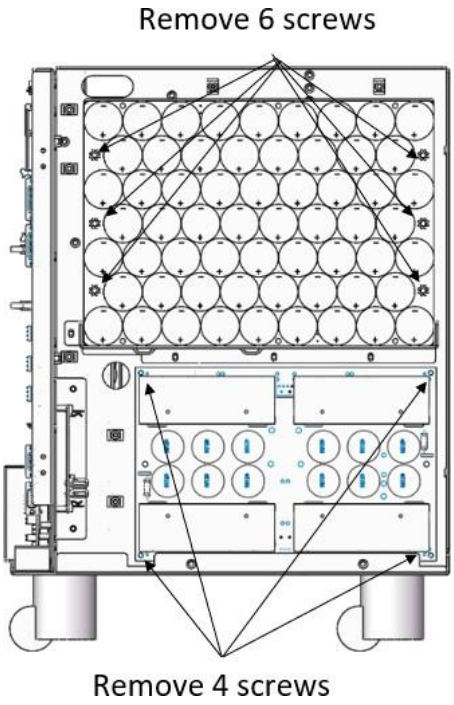


Chart 5-4 Replacement Diagram of Capacitor Board and Inverter Board,

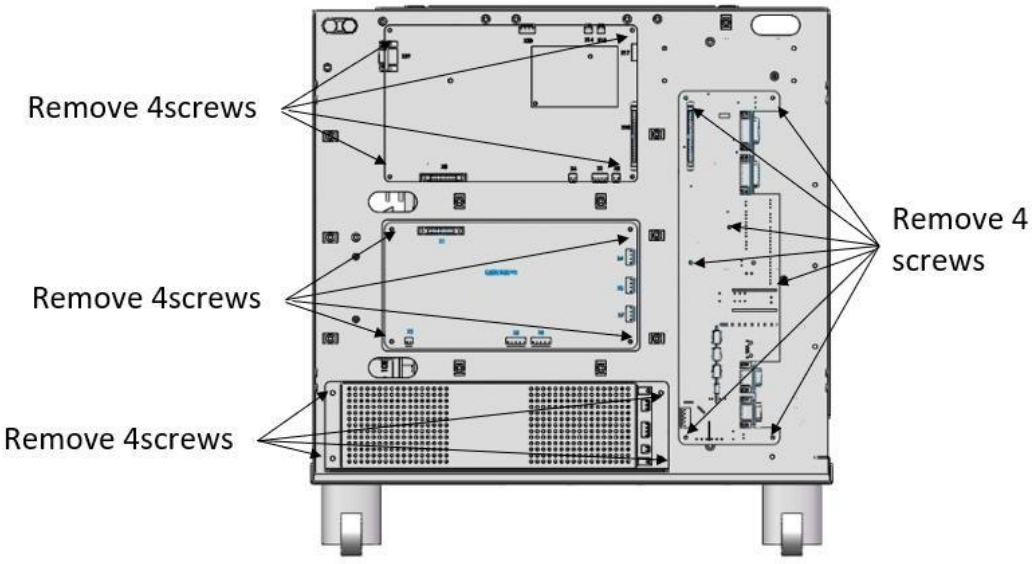


Chart 5-5 Replacement diagram of Control Board, Filament board, Drive board, Power supply Module and Interface board

Replacement of TANK (High Voltage Tank)

1) Ensure the main power circuit breaker is disconnected and cannot be turned ON under any circumstances.
2) Replace the high voltage tank.

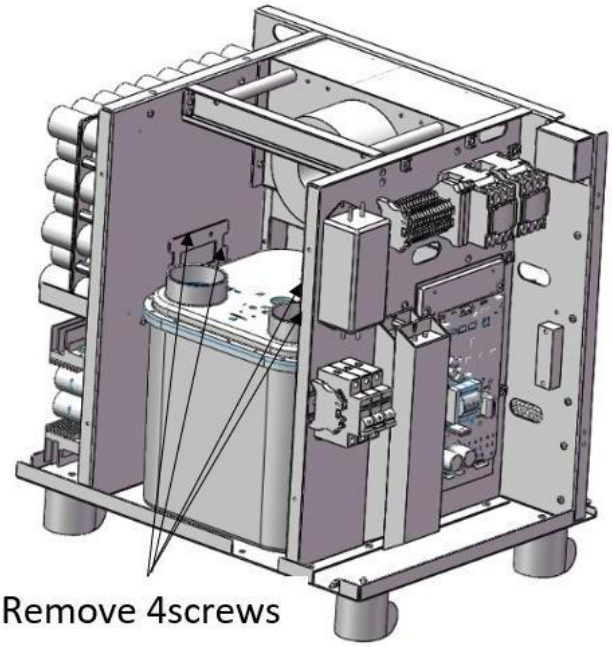


Chart 5-6 TANK (high voltage tank) Replacement chart 1

28.4 Confirmation Test

In order to ensure the normal use of the product, the service engineer needs to make the following confirmation ：

1) Select the size of filament and expose it separately to observe whether the output of KV and mA is normal.
2) Check whether the service software has an error message, if not, it is normal.

28.5 Maintenance Purpose

Making sure the high-voltage equipment is in good working condition. Therefore, it can be put into operation at any time, reduce the downtime, improve the intact rate of equipment, prolong the service life of equipment, reduce maintenance costs, and ensure safe operation.

28.6 Maintenance Content

After turning off all the power supply, make sure that all the labels are not blurred by external wear. Check that all the important labels are on the generator.

28.6.1 Visual Inspection

1） **Identification check:**

Turn off all power supply and confirm that all warning signs are not missing or are unrecognizable due to abrasion.

2） **Cable firmness/ageing**:

Turn off all power and visually check for signs of burning of cables.

28.6.2 Cleaning

Turn off all the power supply and check the dust on the anode plate, filament board, main control board and interface board every two years. (Note: When cleaning dust, please use cardboard to shield the switching power supply to avoid dust entry). The shell can be cleaned with cleaning fluid. The label part should be protected.

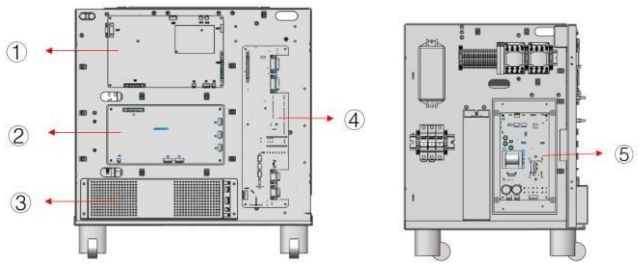


Chart 5-4 Cleaning

Note： ① Main control board ② Filament board ③ switching power supply

④Interface board ⑤Anode plate

28.6.3 Insulating Silicone Grease

In order to prevent arcing, technicians should apply insulating silicone grease on both ends of high voltage tube plugs.

1) Clean high voltage plug and the black sealing ring.
2) Insert the black sealing ring into the bottom of the high-pressure plug.
3) The insulating silicone grease is evenly coated on the surface of the plugs.

28.6.4 Regular Management

Semi-annual management of the tube

Waste Disposal

Return the replaced circuit boards to the manufacturer for proper disposal.

Fuse Replacement

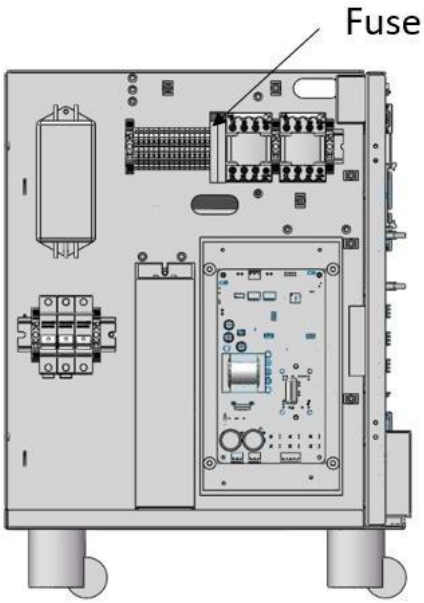


Chart 5-5 Fuse replacement schematic diagram

As shown in Chart 5-8, when replacing the fuse, the upper cover of the fuse seat should be opened, the original fuse should be taken out and replaced with a new one. Fuse models: R055, R058.

28.7 Packaging and Transportation

In transportation, first clean the inside and outside of the box, then screw the machine on the bottom of the box, and load the front, left, back and right boards of the box, next put the packaging material pearl cotton into the front and back, left and right and top of the machine, and finally put the top board of the box.

28.8 Packing List

Chart 5-9

Number	Objects	Quantity	Note
1	Energy Storage X-ray High Frequency Generator	1	
2	Inspection Report	1	
3	Cabinet shell sunk screw M4*8	4 PCS/machine	
4	Cabinet shell sunk screw M4*10	8 PCS/machine	
5	Certificate	1	
6	Drier	5 bags	

Working Principles

The high-voltage generator is mainly composed of filter part, pre-charging part, rectifier and filter part, inverter, resonant component and high-pressure fuel tank. DC generator generates alternating square-wave voltage after inversion. Through the resonant circuit, energy is transferred to the high-voltage transformer. The voltage gain corresponding to different operating frequencies is different, so different frequencies can be controlled to generate corresponding power.

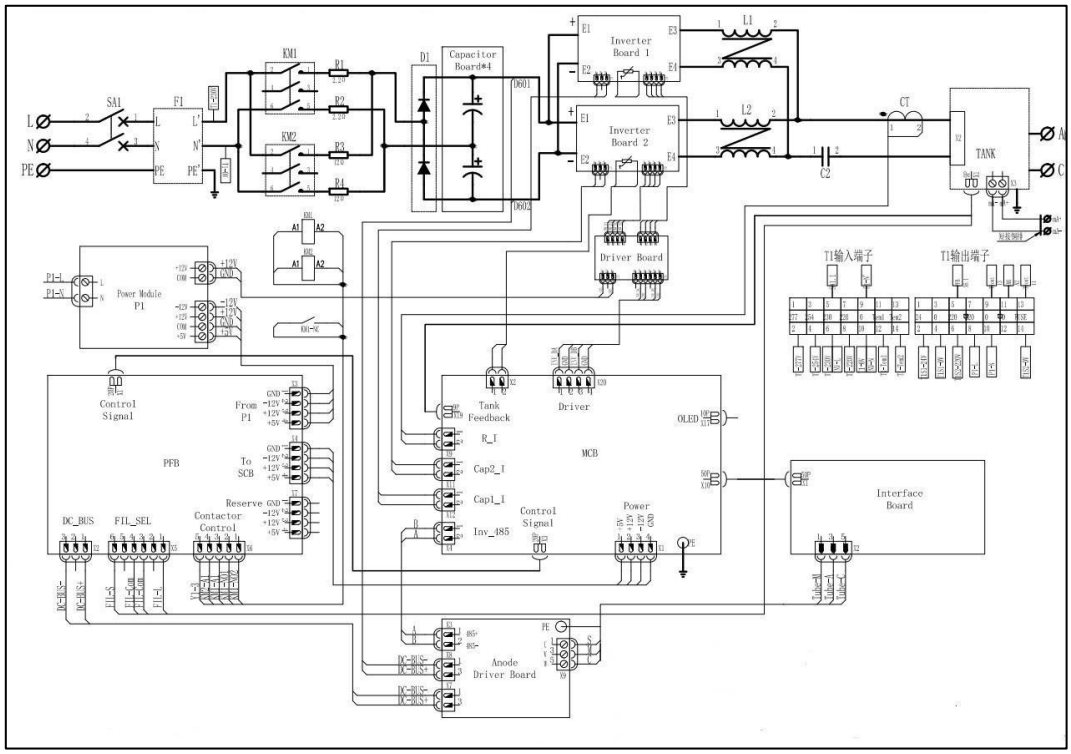


Chart 6-1 P2 series complete machine connection diagram

Chart 6-2 Names of each part

No.	Material number	Name	Specifications
1	301-00003	2P Circuit breaker	Circuit breaker, GSB2-2P/D20
2	D.4XA-10013	Distribution terminal	Distribution terminal row, USLKG 35, YELLOW/GREEN, PHOENIX
3	303-00011	Filter	Single-phase filter SH430-20- BSD Shang Heng
4	304-00001	Toroidal transformer	460W 220V-230V-254V-277V Optional input,24V-220V Two way output
5	312-00001	Distribution terminal	Distribution terminal, OUK 5 N, GREY, OUMANN
6	605-00001	Terminal fixture	General terminal fixture, E-OUK, Ou Man
7	601-00001	Distribution terminal short adapter	Distribution terminal short adapter, FBI2-6, OUMANN
8	302-00002	AC connector	GSC1-1210 Tian Shui 25A 220V
9	308-00015	Aluminum housing resistance	Aluminum housing resistance 12 Ohms/100W
10	308-00016	Aluminum housing resistance13	Aluminum housing resistance2.2 Ohms

No.	Material number	Name	Specifications
			/400W
11	305-00001	Rectifier bridge	Three Phase Bridge MDS150-16 150A 1600V W540
2	898-00001	Resonant inductor	HR-65kW-7T
13	307-00001	Resonant capacitor	Resonant capacitor CHR1V122C105JSM7M
14	306-00001	Resonant Current Ratio	Magnetic core T38*19*15 75 round
15	899-00001	TANK-HR65	HR-65kW
16	309-00003	Switching Power Supply	RPT-60B
17	309-00004	Switching Power Supply	RPS-120-12
18	702-00013	PCBA Anode drive plate	Anode_Driver_Board
19	702-00003	PCBA Filament power board	Power_FIL_Board
20	702-00004	PCBA Main control board	Main_Control_Board
21	702-00005	PCBA System board	System_Control_Board
22	702-00006	PCBA Driving board	Driver_Board
23	702-00059	PCBA General Interface Board	Common_InterFace_Board
24	702-00008	PCBA Power Connecting Board	Power_Connect_Board

No.	Material number	Name	Specifications
25	702-00036	PCBA Inverter board 65K LOCAL	Inverter Board (65K)
26	702-00033	PCBA Capacitance board	Capacitor_Board
27	500-00008	Chassis	Chassis IMI-SVG-32 P2

Name	Function	Pin number	Pin definition	Detailed description
P1	Logical signals connected to the outside	pin1	EXP_REQ_ 1	Logic Signal from High Voltage to Flat Plate 1 Low Level Effective：DIP S2-1 ON, S2- 2 OFF; High Level Effective：DIP S2-1 OFF, S2-2 ON
		pin2	GND_24V DC	24V Power ground
		pin3	24VDC	24V Power
		pin4	GND_24V DC	24V Power ground
		pin5	EXP_OK_1	Logic signal from flat plate 1 to high voltage. Low Level Effective：DIPS1-1 ON, S1- 2 OFF;
		pin6	GND_24V DC	High Level Effective：DIPS1-1 OFF, S1-2 ON 24V Power ground
		pin1	EXP_REQ_2	Logic Signal from High Voltage to Flat Plate 2 Low Level Effective：DIPS2-3 ON, S2- 4 OFF;

Name	Function	Pin number	Pin definition	Detailed description
P2	Logical signals connected to the outside			High Level Effective ： DIPS2-3 OFF, S2-4 ON
		pin2	GND_24V DC	24V Power ground
		pin3	24VDC	24V Power
		pin4	GND_24V DC	24V Power ground
		pin5	EXP_OK_ 2	Logic signal from flat plate 2 to high voltage. Low Level Effective ：DIPS1-3 ON, S1- 4 OFF; High Level Effective ： DIPS1-3 OFF, S1-4 ON
		pin6	GND_24V DC	24V Power ground
P3	Door switch	pin1	DOOR_OP EN	When X affects the opening of the door, the exposure function will be prohibited.
		pin2	/	/
		pin3	GND_24V DC	Ground
	Door light	pin1	roomlightA	Control signal A for warning light in X-ray imaging room

Name	Function	Pin number	Pin definition	Detailed description
P4	control	pin2	roomlightB	Control signal B for warning light in X-ray imaging room
P5	Reserve	pin1	/	/
		pin2	/	/
		pin3	/	/
		pin4	/	/
		pin5	/	/
		Pin6	/	/
P6	AEC Channel 1 Control	pin1	/	/
		pin2	/	/
		pin3	/	/
		pin4	/	/
		pin5	GND	Ground
		pin6	PTRAMP1	Analog input from ionization chamber to high voltage generator
		pin7	GND	Ground
		pin8	AEC_START	Ionization chamber reset/start signal
		pin9	AEC_LFDSEL	Left field selection of ionization chamber
		pin10	AEC_MFDSEL	Middle field selection of ionization chamber

Name	Function	Pin number	Pin definition	Detailed description
		pin11	AEC_RFDSEL	Right field selection of ionization chamber
		pin12	GND	Ground
		pin13	VCC-15V	Negative power supply for ionization chamber
		pin14	GND	Ground
		pin15	VCC+15V	Positive power supply for ionization chamber
P7	+24V Power and ground	pin1	+24VDC	24V Power
		pin2	/	/
		pin3	GND_24VDC	Ground
P8	Prepare light, exposure lamp, buzzer	pin1	PREP_LED	Logical signals sent to the outside when the system is in preparation. Low level (0V) is effective.
		pin2	GND_24VDC	24V Power ground
		pin3	XRAY_LED	Logical signals sent to the outside when the system is in exposure. Low level (0V) is effective.
		pin4	GND_24VDC	24V Power ground

Name	Function	Pin number	Pin definition	Detailed description
	output	pin5	EXP_BUZZER	Logical signals sent to the outside when the system is in exposure. Low level (0V) is effective.
		pin6	GND_24VDC	24V Power ground
P9	AEC Channel 1 Control	pin1	/	/
		pin2	/	/
		pin3	/	/
		pin4	/	/
		pin5	GND	Ground
		pin6	PTRAMP2	Analog input from ionization chamber to high voltage generator
		pin7	GND	Ground
		pin8	AEC_START	Ionization chamber reset/start signal
		pin9	AEC_LFDSEL	Left field selection of ionization chamber
		pin10	AEC_MFDSEL	Middle field selection of ionization chamber
		pin11	AEC_RFDSEL	Right field selection of ionization chamber
		pin12	GND	Ground

Name	Function	Pin number	Pin definition	Detailed description
		pin13	VCC-15V	Negative power supply for ionization chamber
		pin14	GND	Ground
		pin15	VCC+15V	Positive power supply for ionization chamber
P10	Emergency stop button	pin1	INTERLOCK_HV	The emergency stop button will be pressed and stop the system when there is a serious error in the system. Low level (OV) is effective.
		pin2	/	/
		pin3	GND_24V DC	24V Power ground
		pin1	GND_24V	24V Power ground
		pin2	TXD_ISO	RS232 Communication port, RX.
		pin3	RXD_ISO	RS232 Communication port, TX.
		pin4	POWER_OFF	The shutdown logic signal from the system is isolated from the internal signal of the generator. Low Level Effective
		pin5	GND_UART	Isolated ground, ground for RS232 communication.
		pin6	/	/

Name	Function	Pin number	Pin definition	Detailed description
P11	serial communication	pin7	PREP_ISO	Preparatory logic (level 1 hand brake) signal from the outside (hand brake or foot brake) is isolated from the internal signal of the generator. Low Level Effective (OV)
		pin8	XRAY_IS O	Exposure logic (level 2 hand brake) signal from the outside (hand brake or foot brake) is isolated from the internal signal of the generator. Low Level Effective (OV)
		pin9	POWER_O N	The boot logic signal from the system is isolated from the internal signal of the generator. Low Level Effective
P12	RJ45 communication	pin1	RXD_ISO_ RJ45	RS232 Communication port, RX
		pin2	TXD_ISO_ RJ45	RS232 Communication port, TX
		pin3	GND_UAR T	Isolated ground, ground for RS232 communication.
		pin4	PREP_ISO	Preparatory logic (level 1 hand brake) signal from the outside (hand brake or foot brake) is isolated from the internal signal of the generator. Low Level Effective

Name	Function	Pin number	Pin definition	Detailed description
		pin5	XRAY_IS O	Exposure logic (level 2 hand brake) signal from the outside (hand brake or foot brake) is isolated from the internal signal of the generator. Low Level Effective
		pin6	POWER_O N	The boot logic signal from the system is isolated from the internal signal of the generator. Low Level Effective
		pin7	POWER_O FF	The shutdown logic signal from the system is isolated from the internal signal of the generator. Low Level Effective
		pin8	GND_24V	24VPower ground
P13	DAP function	pin1	/	/
		pin2	RXD_ISO_ RJ45	RS232 Communication port, RX
		pin3	TXD_ISO_ RJ45	RS232 Communication port, TX
		pin4	/	/
		pin5	GND_UAR T	Isolated ground, public ground for RS232 communication.
		pin6	/	/
		pin7	/	/
		pin8	/	/

Name	Function	Pin number	Pin definition	Detailed description
		pin9	/	/
P14	CAN communication	pin1	CANL	CAN general line L
		pin2	CANH	CAN general line H
P15	Reserve	pin1	/	/
		pin2	/	/
P16	Integrated interface	pin1	+24VDC	24V Power
		pin2	INTERLOCK_HV	The emergency stop button will be pressed and stop the system when there is a serious error in the system. Low Level (0V) Effective
		pin3	POWER_ON	The boot logic signal from the system is isolated from the internal signal of the generator. Low Level (0V) Effective
		pin4	POWER_OFF	The shutdown logic signal from the system is isolated from the internal signal of the generator. Low Level (0V) Effective
		pin5	PREP_ISO	Preparatory logic (level 1 hand brake) signal from the outside (hand brake or foot brake) is isolated from the internal signal of the generator. Low Level (0V) Effective

Name	Function	Pin number	Pin definition	Detailed description
		pin6	XRAY_ISO	Exposure logic (level 2 hand brake) signal from the outside (hand brake or foot brake) is isolated from the internal signal of the generator. Low Level (0V) Effective
		pin7	EXP_REQ_1	Logic signal from high voltage to flat 1.
		pin8	EXP_OK_1	Logic signal from flat 1 to high voltage.
		pin9	EXP_BUZZER	Logical signals sent to the outside when the system is exposed. Low Level (0V) Effective

Tables

Table A Error Code

EL001	Real-time clock error
EL002	AC contactor error
EL003	Anode Rotor Error
EL004	Generator voltage is too low
EL005	Generator voltage is too high
EL006	Filament adjustment error
EL007	The filament power board is not connected
EL008	Filament short circuit
EL009	Filament overcurrent
EL010	Anode overcurrent
EL011	Cathode overvoltage
EL012	Anode overvoltage
EL013	Cathode overvoltage
EL014	High Voltage Sparking
EL015	Short circuit overcurrent
EL016	Short circuit overcurrent
EL017	Short circuit overcurrent
EL018	Short circuit overcurrent
ER100	Exposure time exceeds backup time in AEC mode
ER101	Exposure of mAs exceeds backup mAs in AEC mode
ER102	The lead door was opened.
ER103	Damage of filament correction data
ER104	Damage of AEC correction data

ER105	Damage of workstation data
ER106	Damage of tube data
ER107	Damage of High voltage Parameters
ER108	Damage of tube current correction data
ER109	The workstation currently in use is not enabled
ER110	AEC mode, no ionization chamber feedback signal
ER111	Under Standby condition, the second hand brake is effective.
ER112	When filament is corrected, the tube current is too low
ER113	When the filament is corrected, the filament current reaches its maximum value and the tube current does not reach its maximum value.
ER114	Too high tube current during exposure
ER115	Too low tube current during exposure
ER116	Exposure parameters exceed power limit of high voltage
ER117	Exposure parameters exceed KV limits of high voltage
ER118	Exposure parameters exceed MA limits of high voltage
ER119	Exposure parameters exceed MS limits of high voltage
ER120	Exposure parameters exceed MAS limits of high voltage
ER121	Exposure parameters exceed power limit of tube
ER122	Exposure parameters exceed KV limit of tube
ER123	Exposure parameters exceed MA limit of tube
ER124	Exposure parameters exceed MAS limit of tube
ER125	The selected exposure parameters exceed the limit value
ER126	Active release of hand brake during exposure
ER127	Exposure preparation timeout

ER128	In the Initialization state, the first level hand brake is effective
ER129	In the Initialization state, the second level hand brake is effective
ER130	AEC mode, no choice of field
ER131	AEC Model, Density Exceeding Limit Value
ER132	Active release of hand brake during filament calibration
ER133	Memory chip communication error
ER134	Real-time clock communication error
ER135	AEC channel selection error
ER136	Anode communication error
ER137	Flat waiting timeout
ER138	KV build timeout
ER139	MOSFET temperature is too high
ER140	Exposure power exceeding limits of anode heat capacity
ER141	Exposure power exceeding warning value of anode heat capacity
ER142	Small focus failure of tube
ER143	Big focus failure of tube
ER144	Low speed tube failure
ER145	High speed tube failure
ER146	Anode heat capacity reaches warning value
ER147	Anode heat capacity reaches its limit
ER148	KV unbalance
ER149	Heat alarm of tube sleeve
ER150	The emergency stop button is pressed.
ER151	KV correction coefficient damaged
ER152	Continuous exposure exceeds fuel tank heat limit

ER153	Static signal error in ionization chamber
ER154	Generator Voltage Correction Coefficient Damaged
ER155	Perspective time reaches its maximum
ER156	In the Initialization state, foot brakes are effective
ER157	Shut down during exposure or perspective
EI400	Service software start-up
EI401	Service Software Exit
EI402	Resonant overcurrent 1
EI403	Resonant overcurrent 2
EI404	Resonant overcurrent 3
EI405	Charging, please wait
EI406	DA chip reset
EI407	Shut down during exposure
EI408	Perspective is not enabled
EI409	Perspective time arrives at warning value

Table B Parameter Range

R'10 standard value

Parameter name	Scope and stride	Unit
KV	40-150, minimal stride 1kV	kV
MA	10,12.5,16,20,25,32,40,50,63,80,100,125,160,200,250,320,400,50 0,630,800,1000	mA
MS	1,1.25,1.6,2,2.5,3.2,4,5,6.3,8,10,12.5,16,20,25,32,40,50,63,80,100, 125,160,200,250,320,400,500,630,800,1000,1250,1600,2000,2500 ,3200,4000,5000,6300,8000,10000	ms
MAS	0.1,0.12,0.16,0.2,0.25,0.32,0.4,0.5,0.63,0.8,1,1.25,1.6,2,2.5,3.2,4,5 ,6.3,8,10,12.5,16,20,25,32,40,50,63,80,100,125,160,200,250,320,4 00,500,630,800,1000	mAs
Density	-3,-2,-1,0,1,2,3	/

R'20 standard value

Parameter name	Scope and stride	Unit
KV	40-150,minimal stride 1kV	kV
MA	10,11,12.5,14,16,18,20,22,25,28,32,36,40,45,50,56,63,71,80,90, 100,110,125,140,160,180,200,220,250,280,320,360,400,450,500,560,630,710,800,900,1000	mA
MS	1,1.1,1.25,1.4,1.6,1.8,2.0,2.2,2.5,2.8,3.2,3.6,4.0,4.5,5.0,5.6,6.3,7.1,8. 0,9.0,10,11,12.5,14,16,18,20,22,25,28,32,36,40,45,50,56,63,71,80,90,100,110,125,140,160,180,200,220,250,280,320,360,400,450,500,5 60,630,710,800,900,1000,1100,1250,1400,1600,1800,2000,2200,2500,2800,3200,3600,4000,4500,5000,5600,6300,7100,8000,9000,10 00	ms
MAS	0.1,0.11,0.12,0.14,0.16,0.18,0.2,0.22,0.25,0.28,0.32,0.36,0.40,0.45,0 .50,0.56,0.63,0.71,0.80,0.90,1,1.1,1.25,1.4,1.6,1.8,2.0,2.2,2.5,2.8,3.2 ,3.6,4.0,4.5,5.0,5.6,6.3,7.1,8.0,9.0,10,11,12.5,14,16,18,20,22,25,28,3 2,36,40,45,50,56,63,71,80,90,100,110,125,140,160,180,200,220,250 ,280,320,360,400,450,500,560,630,710,800,900,1000	mAs
Density	-3,-2,-1,0,1,2,3	/

29 Collimator Service and Maintenance

29.1 Collimator Calibration

WARNING: The calibration should be performed under exposed x-rays and proper measures should be taken to prevent any user from directly or indirectly x-rays exposures.

29.1.1 Adjustment

The steps of calibration and adjustment of the X-ray radiation field and the center of the imaging plane are as follows:

- Mark the center of the imaging plane.
- Make the X-ray radiation field as small as possible.
- Loosen the sleeve set screw and sleeve slip ring brake knob of the sleeve.
- Adjust the position of the tube sleeve; take an image to make the center of the X-ray radiation field and center of the imaging plane coincide.
- Tighten the set screw and brake knob.

In order to effectively select, combine, and adjust the collimator panel, there are dimensions corresponding to all X-ray field ranges at various focal points to image receiver distances, allowing the operator to adjust the vertical and horizontal knobs. Determine the X-ray field range suitable for normal use according to the distance before loading. Meet the requirements of standard 29.202.6 in GB9706.12.

29.1.2 Method to Measure Light Field Size

First set a light field size, then measure the light field size with a precision ruler perpendicular to the plane of the reference axis at the specified distance from the focal point to the image receiving surface to meet the requirements of 29.202.7 in GB9706, 12.

29.1.3 Replace the Light Source

This collimator uses LED lights as the light source of the field device. When replacing the lamp beads/LEDs: remove the rear cover of the collimator lamp holder and lamp bead component cover; then remove the damaged lamp bead components from the mounting base plate, and then reinstall and tighten the new lamp bead components. When replacing the lamp bead parts, ensure to clean your hands to avoid staining the lamp bead parts. After replacing the lamp beads, take a picture to check whether the center of the light irradiation field coincides with the center of the X-ray radiation field. If necessary, you can loosen the position of the fixed lamp holder to adjust.

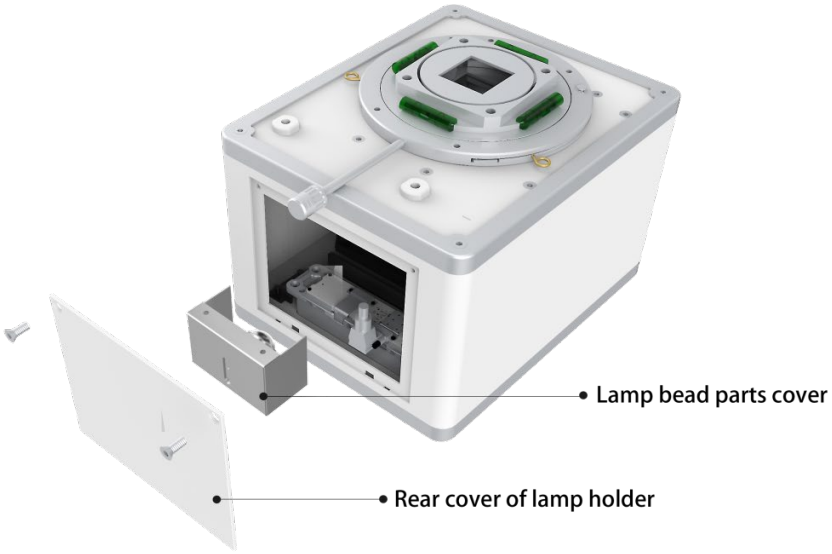


Figure 7 collimator rear removal procedure

29.1.4 Check the Calibration of Light Field and Irradiation Field (standard: GB9706.1229.202.9)

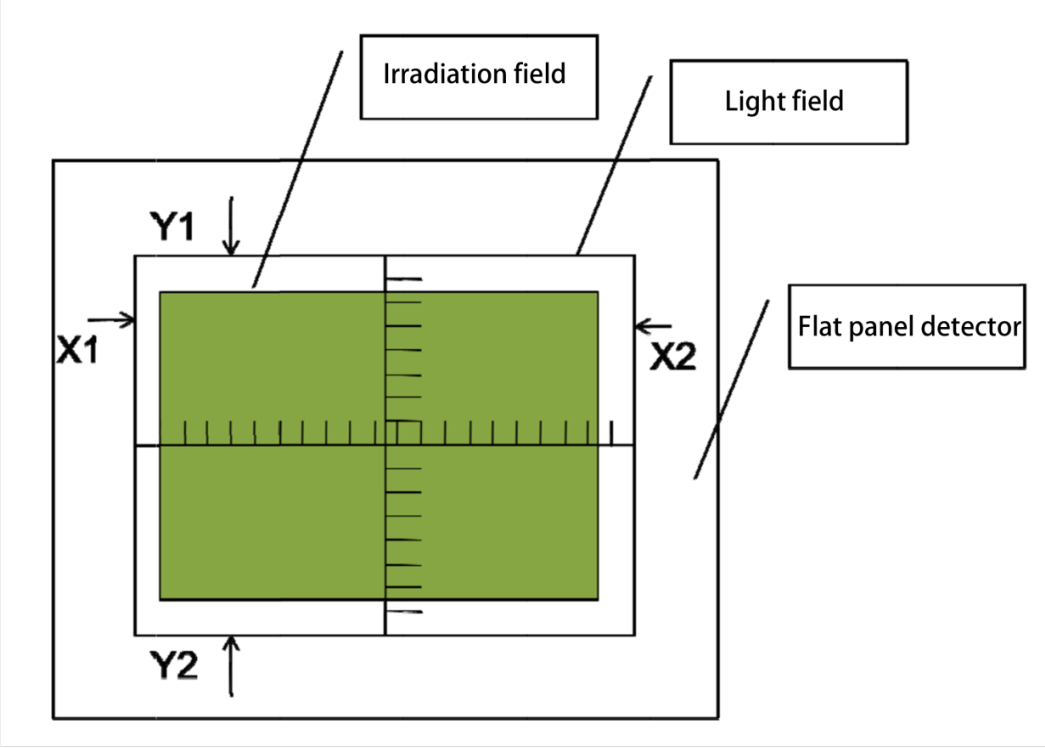


Figure 8 Light field and x-ray field calibration requirements - ≤2 % of FFD in X and Y directions i.e. less than 20 mm

1. Place the light field consistency test board on the flat panel detector and align the center of the light field consistency test board with the light field center of the collimator.
2. Use a tape measure to adjust the vertical distance (SID) of 100cm.
3. Set a light field grid of 18cm × 24cm on the light field consistency test board.
4. Exposure once (60KV, 8mAs) and check the image output by the detector.
5. Measure the deviation (X1, X2, Y1, Y2) between the boundary of the light field and the boundary of the light field and write it down or mark it in the corresponding place.
6. Calculate the total deviation in the X and Y directions, respectively.
7. The total deviation in the length (ΣY) and width (ΣX) directions must be less than 20mm.
8. If the deviation value is greater than the standard requirements, use a Phillips screwdriver to remove the 4 Phillips screws of the rear cover of the lamp bead, remove the rear cover, and adjust the vertical and horizontal positions of the positioning lamp holder so that the positioning light field coincides with the actual X-ray field of view to meet the standard requirements, lock the screws after the adjustment is completed and install the lamp bead cover.
9. If the X and Y directions deviate greatly, please check the distance from the focal point to the plane of the collimator and adjust with a spacer if necessary. The distance error should be controlled as much as possible ± 1mm.
10. When the light field consistency adjustment is completed, loosen the fixing screws of the plexiglass plate with the cross line drawn on the bottom of the Collimator. Do not unscrew the bolts completely. Adjust the position of the plexiglass plate and adjust the crossline positioning center to make the cross positioning. The center point is the same as the center of the light field. After the adjustment is completed, the locking screw presses the plexiglass plate. Be careful not to over-tighten the glass plate to crack.

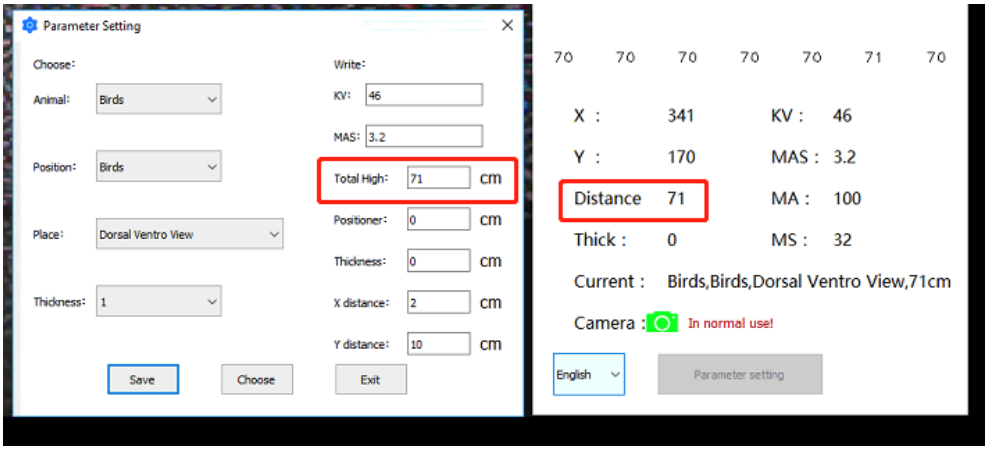
Crosshair Calibration

1. Open light field
2. Turn the knob on the panel in each direction in turn to adjust the light field to a narrow line.
3. Check that the crosshairs are focused on narrow rays in each direction.
4. For adjustment, loosen the four bolts slightly (on the additional filter slot).
5. Move the panel and position it so that the crosshairs focus on the light.
6. Tighten the four bolts.

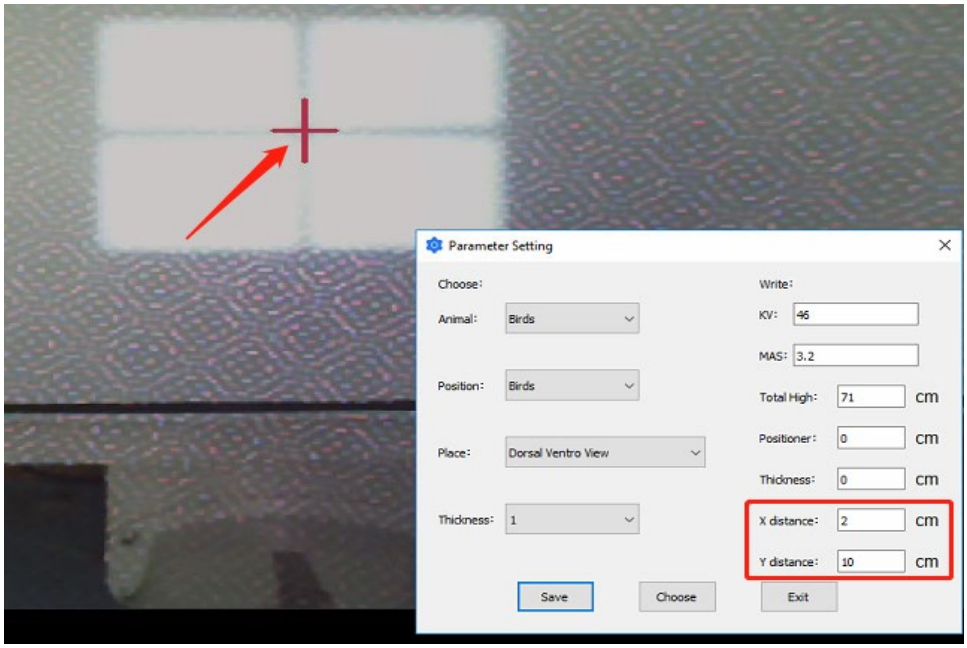
29.1.5 Binocular Lens Calibration

1. Double-click **2020-ATD** to open the software.

2. Click "**Parameter Settings**" to calibrate the distance. Make sure there is no foreign body on the bed. Adjust the height and set the thickness to 0 (restart after adjusting the height).



3. Calibrate the measurement center, press the collimator light button, and adjust the distance between the X axis and the Y axis in the parameter settings so that the center point is directly opposite the center field of the light field. After adjustment, click **Save**.



29.2 Maintenance and Repairs

1. The operating environment of the collimator should be kept clean and dry.

2. After the collimator is installed ensure no other the external force to reduce/hinder the firmness and reliability of the connection; ensure no external stress for any physical damage to collimator.

3. The installation of the collimator should be checked regularly along with lead leaf of diaphragm (Recommended monthly inspection). Add a thin amount of lubricating oil to mechanical parts as needed; the excess oil must be wiped clean.

4. Use a soft, plain, and colorless cotton woven cloth for cleaning the housing and transparent window of the collimator (soak in little inorganic cleaner and gently wipe out from inside-out. **DO NOT** use a hard or colored cotton cloth to avoid scratches after friction or wipe with organic solvent-based cleaners.

5. All the faults or related issues should be addressed or repaired by a qualified professional authorized by the manufacturer or dealer tech support.

6. The light field simulation lamp in the beam limiter is LED lamp beads/ LEDs, and the specifications are: CREE XPG2 R5 white light lamp beads. When new lamp beads need to be replaced, products of the same model and specifications should be used for any replacements.

29.3 Troubleshoot

For any detected faults or related issue, do not use the collimator. Using a faulty collimator imposes safety hazards to operators and patients.

Basic troubleshoots guidance:

Failure phenomenon	Failure analysis	Solution
Dead light	1. Lamp beads/ LED are damaged. 2.Circuit board failure 3.Power problems	1. Replace the lamp beads. 2. Check whether the electric circuit board is output. 3.Check the power supply
The light does not turn off	Timer is broken	Replaces the regulated delay circuit board
	Button is broken	Replace button
No image feed on camera, no action on sensor	camera is broken	Replace binocular lens
	Camera communication line is loose	Check communication lines
	Communication failure between computer and camera	Contact the technical support for dealer/manufacturer
The center of the light field is not the same as the center of the X-ray field	Adjust light field consistency	See Calibration of Light Field to X-Ray Field See Calibration of the collimator
Light field size readings do not match	Knob pointers are inconsistent	Adjust after loosening the knob bolt
The edges of the light field are not clear	The shutter is not in the correct position	Adjust the visor

29.4 Replacement, disassembly, transportation

The following operations must be prepared in advance and completed by authorized personnel:

29.5 Lamp Replacement

1. Cut off the Mains power supply.
2. Remove the rear panel.
3. Remove the lamp heat sink.
4. Remove the defected lamp.
5. Replace the lamp/LED of same specification.
6. Check the corresponding light/x-ray field.

29.6 Delay Board Replacement

1. Cut off the Mains power supply.
2. Remove the knobs.
3. Remove the front panel.
4. Remove the outer casing/cover.
5. Identify the wires and location on terminal block.
6. Disconnect the wires from the terminal block.
7. Replace the broken circuit with a new circuit board.
8. Attach the base and front panel, knobs and monitor the field display.

29.7 Binocular Lens Replacement

1. Cut off the Mains power supply.
2. Disconnect the collimator from the USB extension cable.
3. Remove the rear panel and unplug the USB 3.0 cable.
4. Loosen the bolts that secure the cameras.
5. Remove the broken and install the new camera.

29.8 Remove Collimator

1. Disconnect the collimator from the Mains power supply.
2. Disconnect the collimator from the USB extension cable.
3. Disconnect the power chord.
4. Disconnect the protective ground wire.
5. If the X-ray source component bracket is fixed on a spring balanced support frame, ensure to lock the component bracket first.
6. Loosen the 4 fixing bolts o top of collimator and be careful to not to drop it.

29.9 Shipping Package Instructions

For any repairs or RMA:

1. Packaging must be appropriate (contact the dealer/manufacturer for instructions).
2. Install all removed covers while troubleshoot.
3. Wrap the collimator in clean plastic bag to prevent shock absorbing packaging material entry to the collimator.
4. Shipping package must be advised to "**HANDLE WITH CARE**" with proper labels on it.

29.10 Circuit Diagram

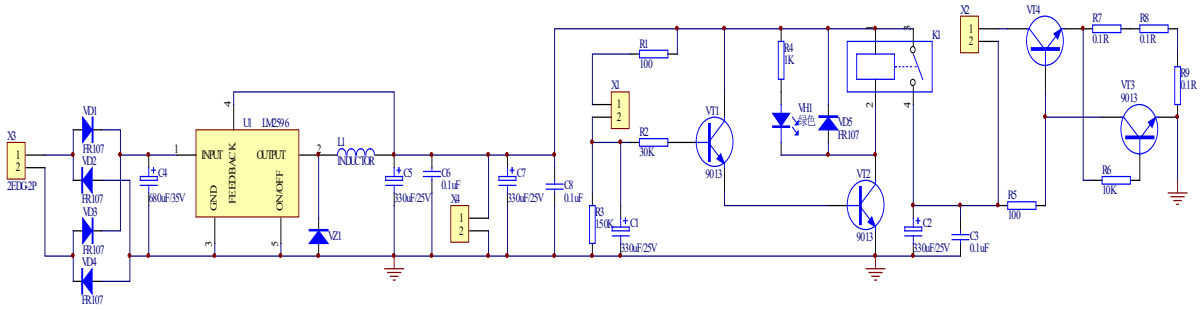


Figure Circuit diagram of collimator

Part / Part Description	Toxic and Harmful Substances and Elements					
	lead	HG	cadmium	Hexavalent chromium	Polybrominated biphenyls	PBDE
Housing and coupling plate	0	0	0	0	0	0
Diaphragm transmission	0	0	0	0	0	0
Lamp bead lamp holder	0	0	0	0	0	0
wire	0	0	0	0	0	0
A printed circuit board	X	0	0	0	0	0
Diaphragm	X	0	0	0	0	0

Electronic Product Information

Key:

0: Refers to the toxic and harmful substance contained in all uniform materials of this part. The content is lower than the limit of SJ / T11363-2006.

X: Means that at least one of the uniform materials used in this part contains this toxic and harmful substance, which is higher than the limit of SJ / T11363-2006.

Note: The environmental protection use period depends on the environmental conditions for normal product operation and the ability and level of maintenance.

30 Venu1717X Panel Service and Maintenance

This documentation is provided to you, the service technician, with all information necessary to calibrate the Venu1717X Panel. For more detailed information on the operation and specifications of your wireless detector, please review the following documentation:

Manual References:

• *072-201-02 User Manual of Venu1717X_A0_20180909*

CE 0197

Only qualified service personnel should attempt to install, modify, service or operate the Venu1717X detector.

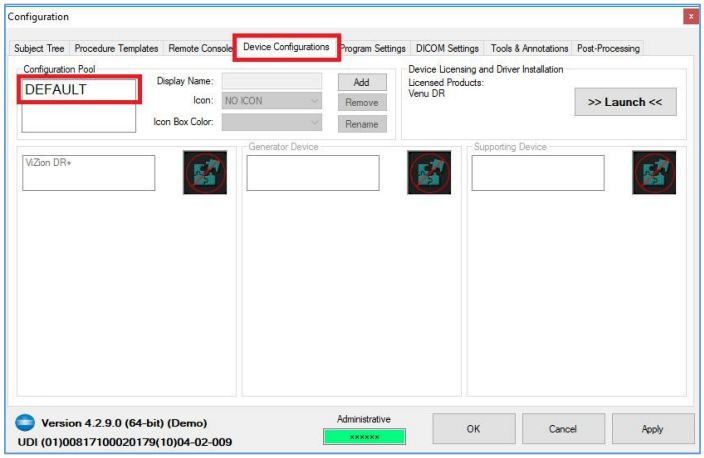
30.1 Venu1717X Wired Panel Calibration

30.1.1 Panel Calibration

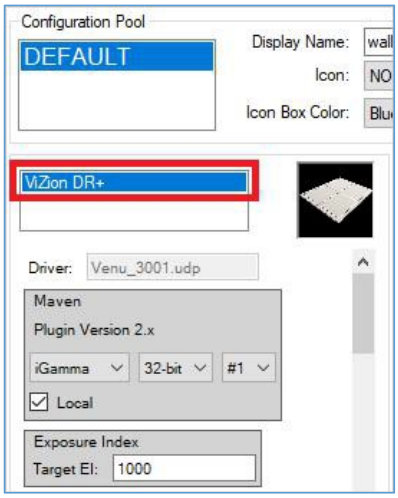
Before performing the following steps, make sure the Venu1717X panel is powered on with External Power cord and connected with the supplied **Link cable**.

1. From the Acquire screen, select **Options.**

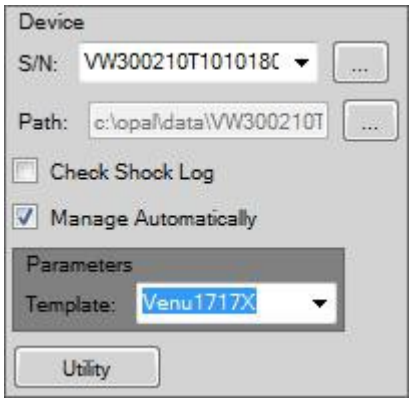
2. Select Device Configurations tab.
3. Click to highlight DEFAULT under the "Configuration Pool" section.



4. Click on ViZion DR+ and the panel device configuration section will appear below it.



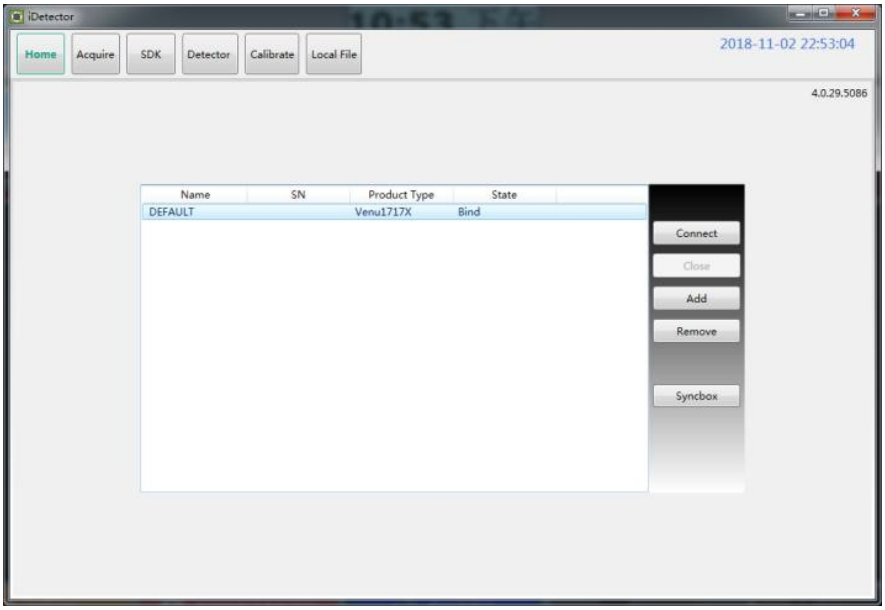
5. Scroll down to the Device section and click on Utility to open the iDetector interface.



Note: After clicking on Utility, the Maven software will shut down communication between the panel and the Ultra UAI software, and close Maven. The iDetector software will automatically launch as a popup window.

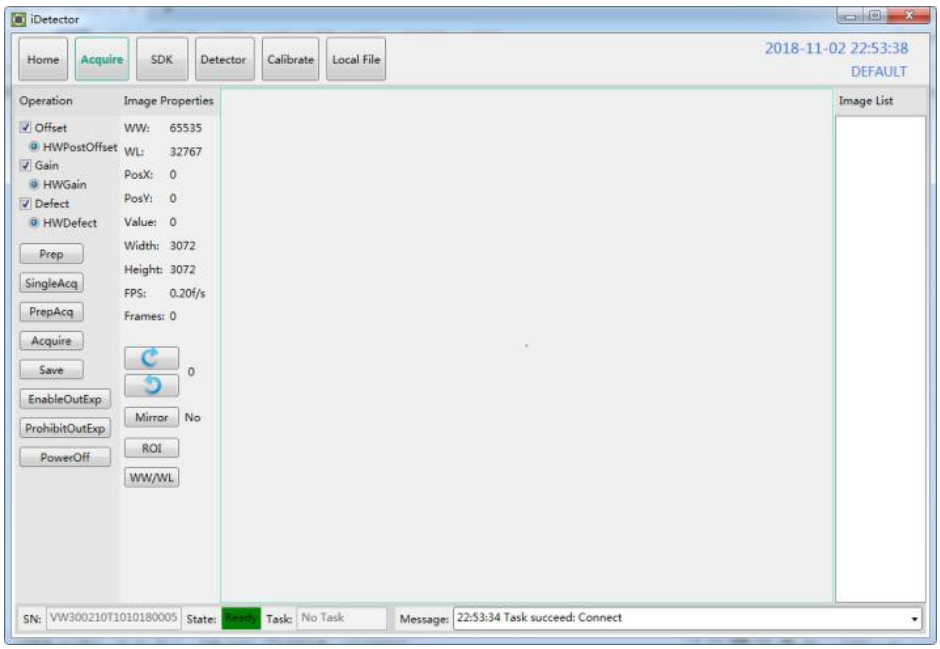
30.1.2 iDetector Interface

1. After clicking **Utility** under the panel's Device settings, the iDetector interface window will open.
2. Connecting *into the Panel from iDetector*
3. Click to highlight **DEFAULT** under the name column and then click **Connect**.



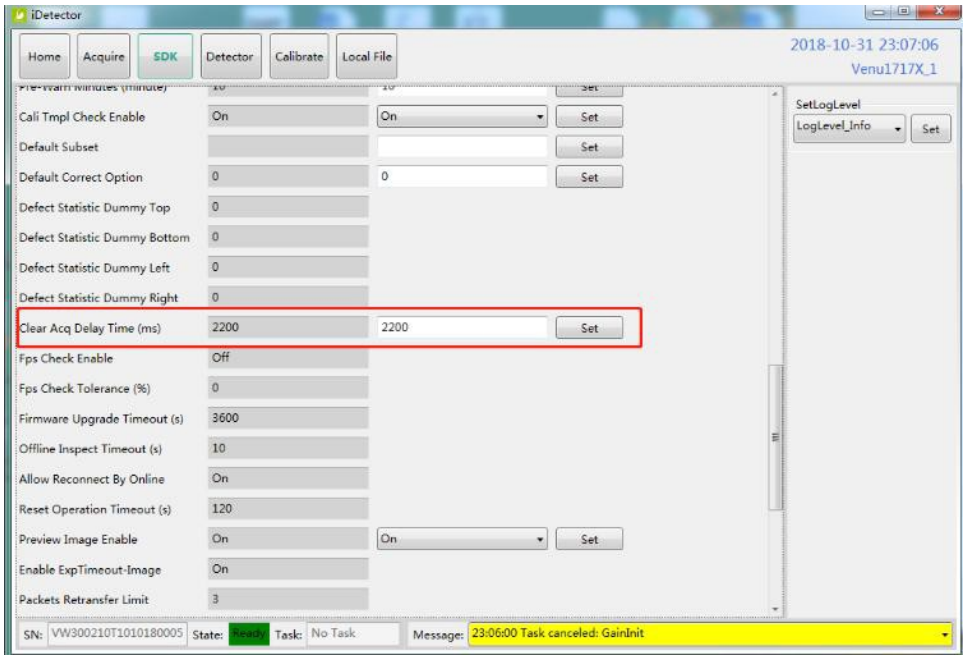
Warning: before exiting iDetector, **DO NOT CLICK THE RED X** in the top right corner, without first going to **Home** tab, click **Close**, then click the **X** and select **Override Config**.

1. The Acquire tab is selected by default when you first connect to the panel in iDetector.

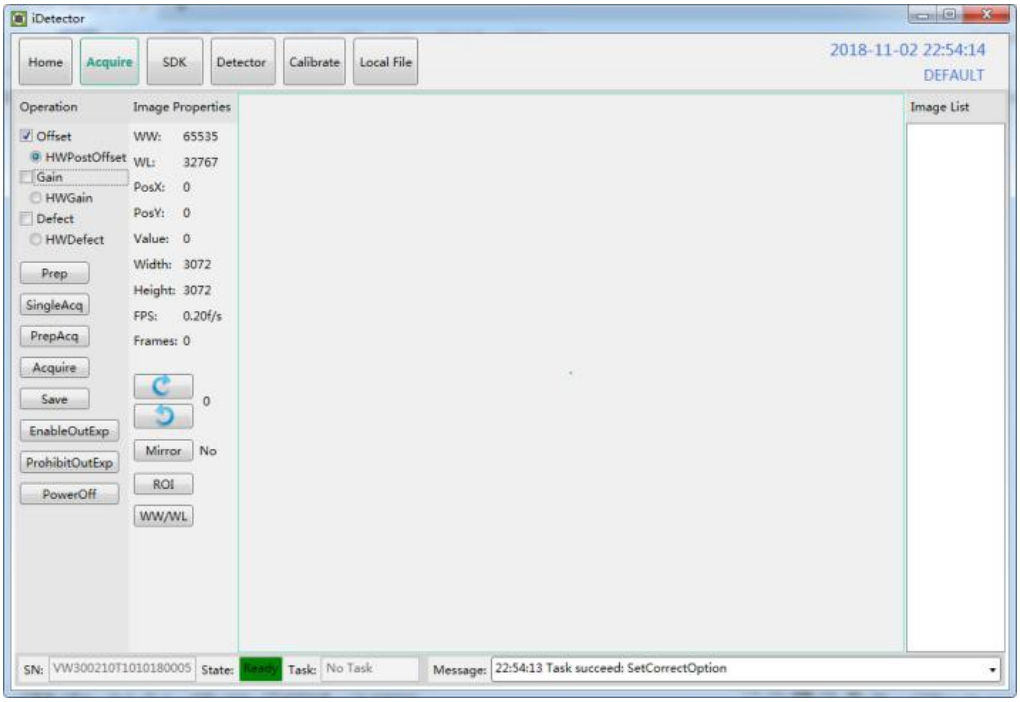


30.1.3 Panel Calibration Setup

1. Before start calibrate the panel. Click SDK Tab and change the Clear Acq. Delay time to 2200 then click “set” button.



2. On the Acquire tab in iDetector, uncheck the Defect, Gain checkboxes in that order.

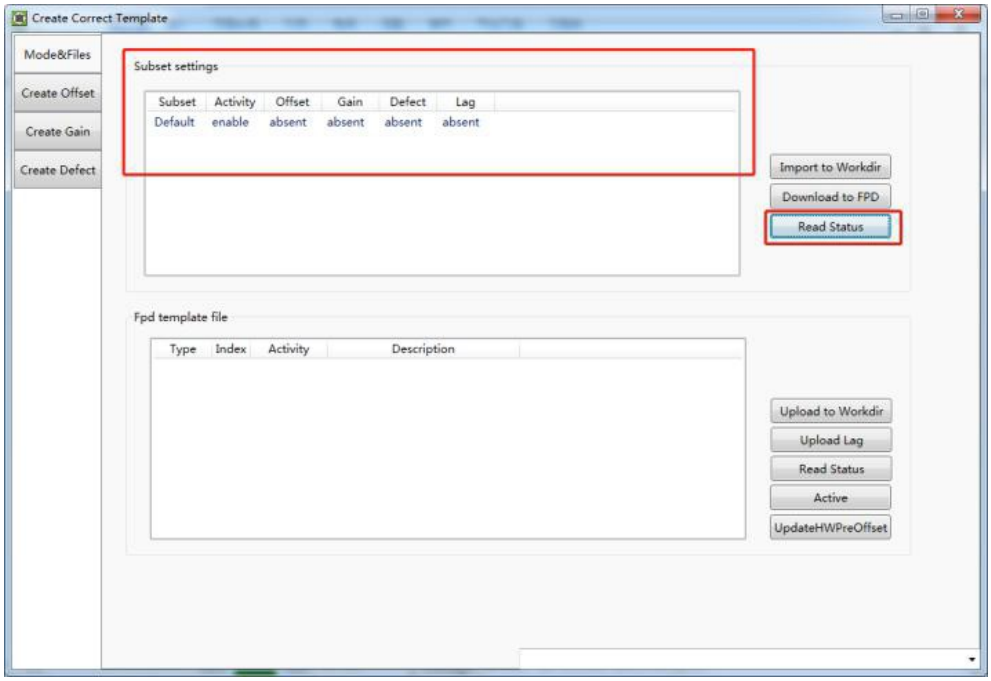


3. Select the Calibrate tab, and click Start Generate Templates,

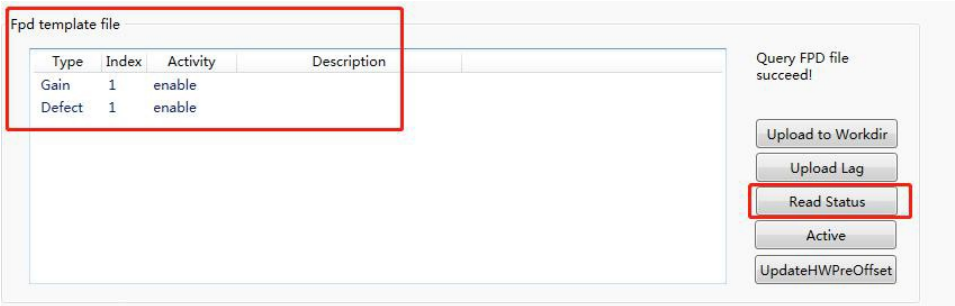
The Calibration wizard will open into a new window, presenting the **Welcome** screen.

30.1.4 Set X-ray environment:

1. **Tube SID** = 50” or higher (at least greater than 47”).
2. **No Collimation =** open collimator blades at least 1” past the edges of the panel on all sides.
3. **No Grid** = remove any grid or pressure grid cover.
4. **No Objects** = remove any objects from the surface of the panel.
5. Click the **Mode & Files Tab,** Click **Read Status** button on the top right side to get the status of the calibration file under **C:\opal\data\VW300210T1010180005\Correct\Default.** Currently there is no calibration file.



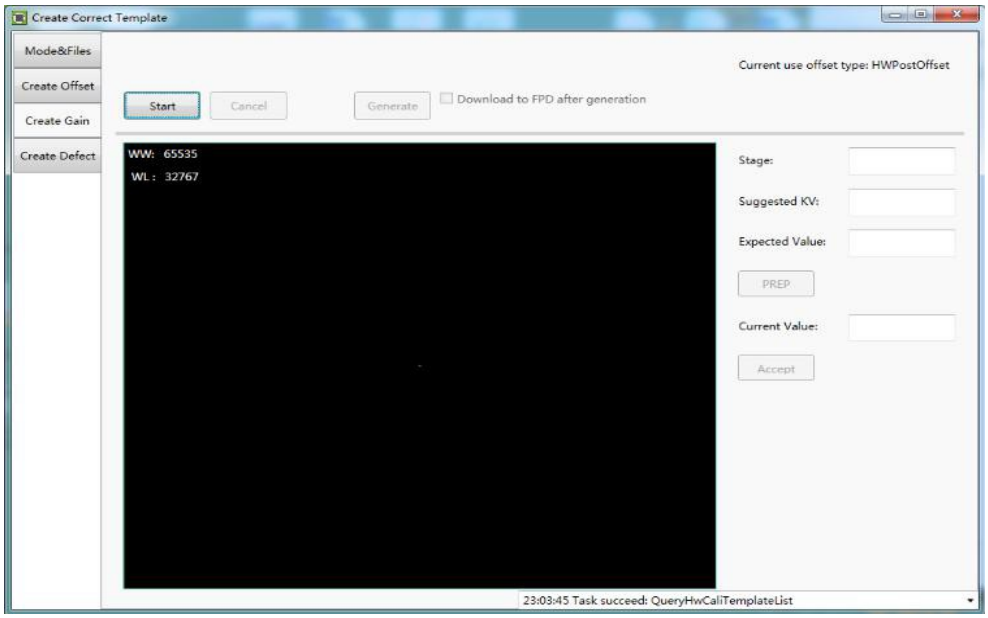
6. Click the **Read Status** button on the bottom right side to get the calibration status in the panel, the panel already has the original gain and defect template in it.

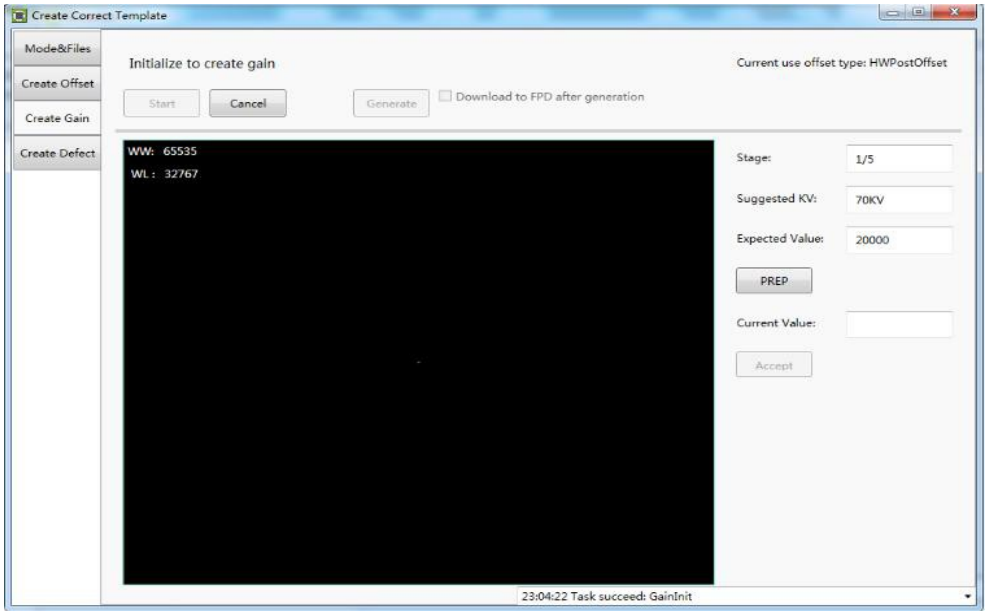


30.1.5 Panel Gain Calibration

Note: The Gain Calibration screen requires 5 exposures. The left-hand side of the screen tells you the image you get. The right-hand side tells you the suggested KV to use for the current exposure.

1. Click **Create Gain** Tab, then the **Start** button.

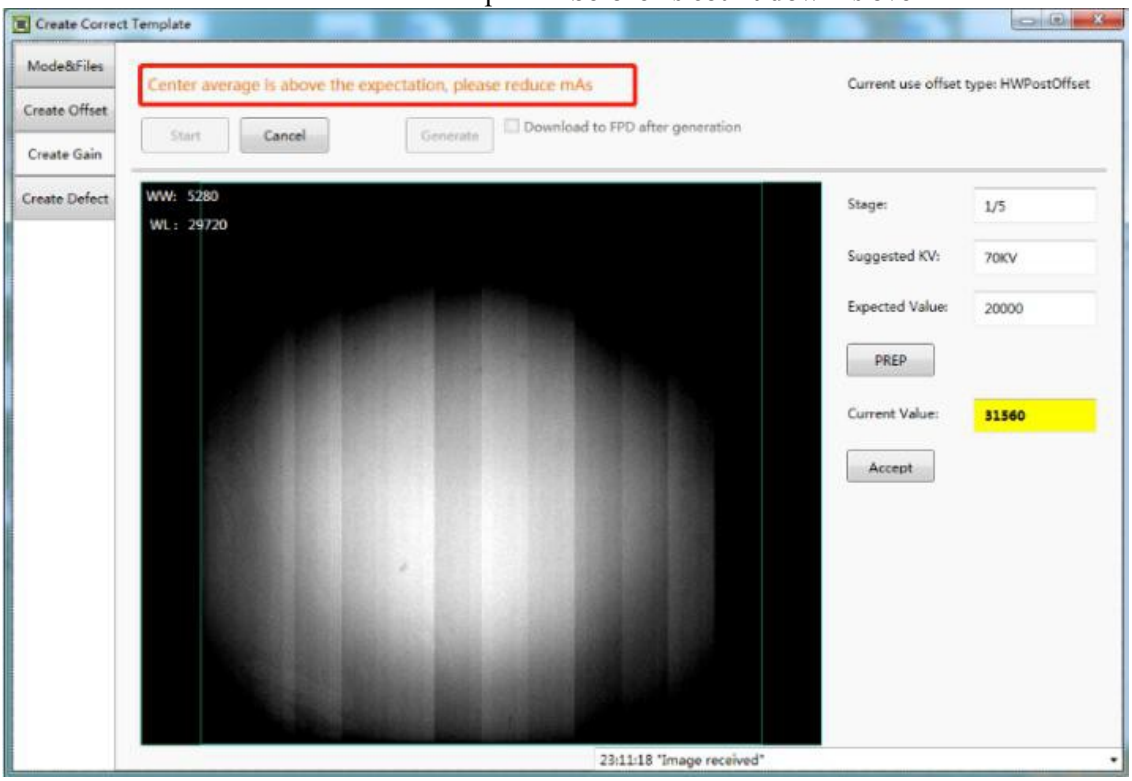




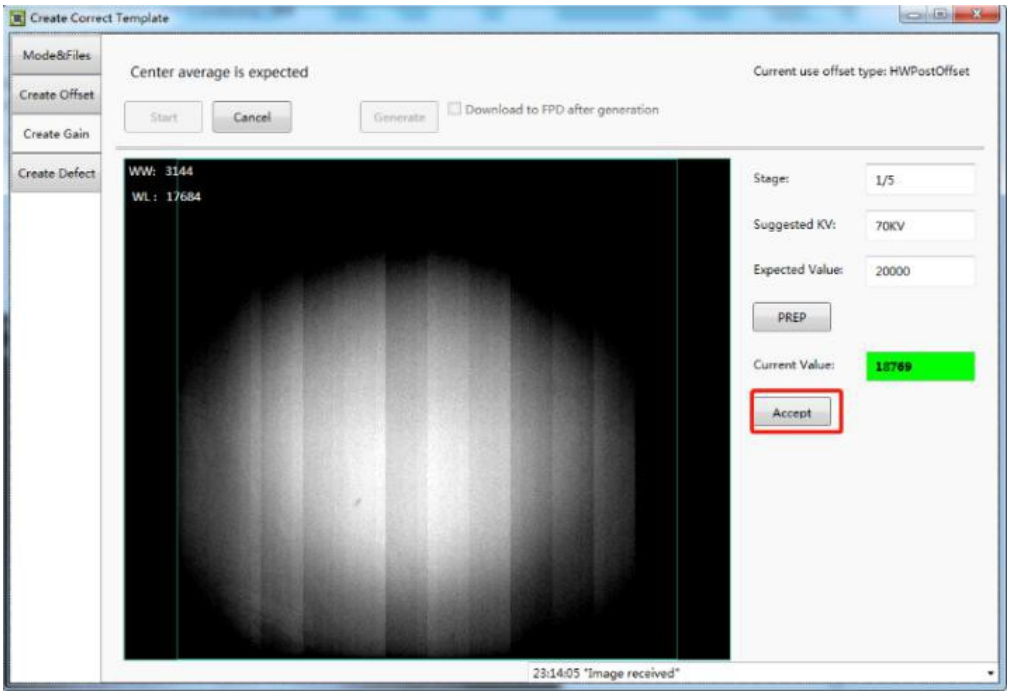
2. Set your techniques to **70kV / 3.2mAs.** Prep the generate then click the **PREP** button take your **first** exposure **before 2s count down is over**.

> **Note**: After taking an exposure, the Current Value will either be highlighted green, if it was successful, or yellow, which means to adjust mAs and exposure again

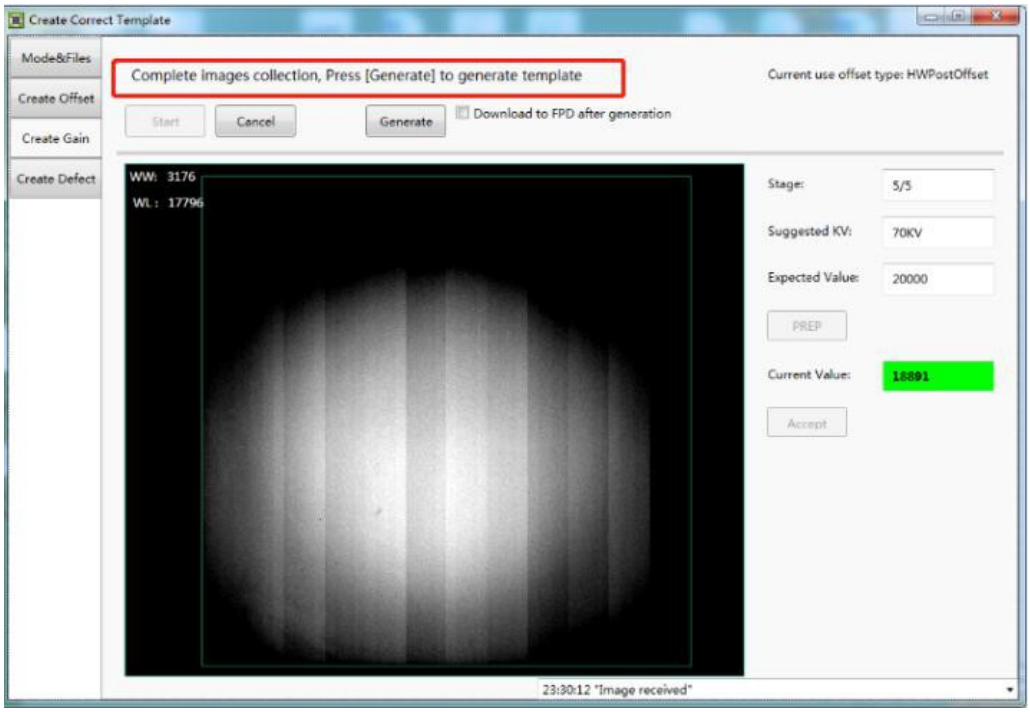
3. If the exposure was NOT acceptable (yellow), adjust mAs up or down, Prep the generate then click the **PREP** button to take another exposure **before 2s count down is over**.



4. If the exposure was acceptable (green status), click **Accept** to move to the next gain frame.



5. After taking all 5 gain exposures, click **Generate** button in the top.



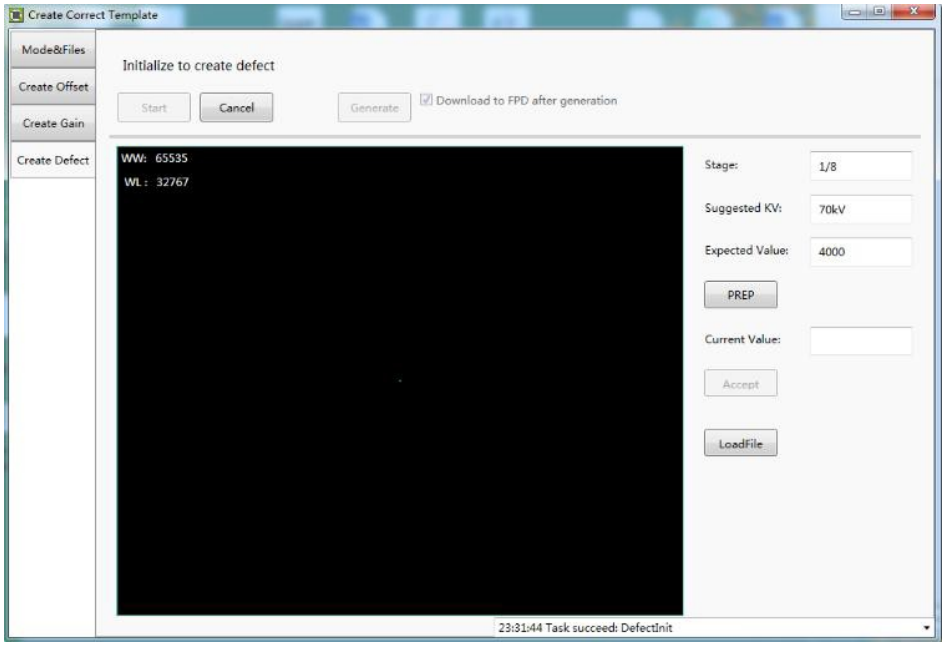
30.1.6 Panel Defect Calibration (Optional)

A new defect map can be created by running the Defect Calibration. A defect calibration is **ONLY** needed if you are seeing dead pixels or lines in your images.

1. Right after you finished the Gain calibration in section 29.1.5, click **Create Defect Tab** proceed to the **Defect Calibration** screen.

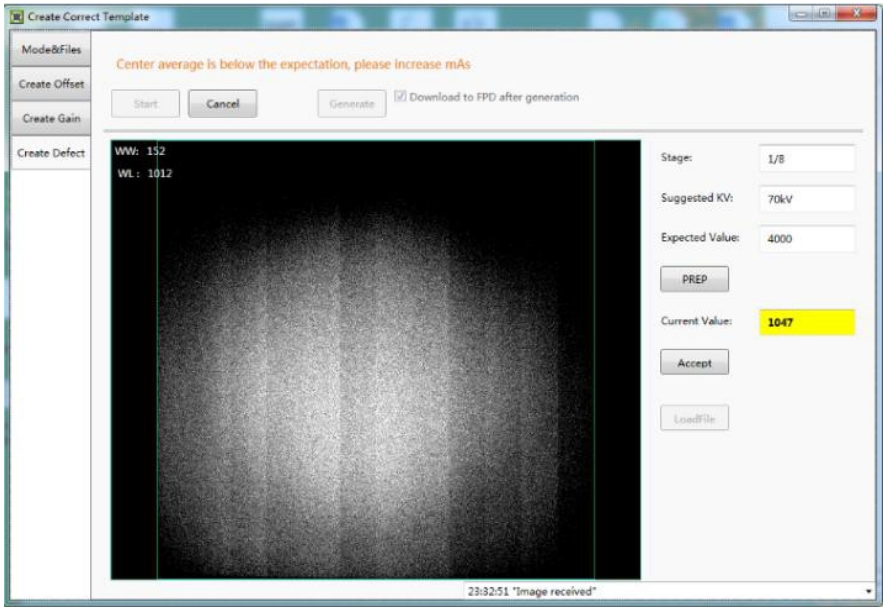
> **Note**: The Defect Calibration screen requires 8 exposures the screen tells you the suggested KV to use for the current exposure.

2. Set your techniques to 70kV / 0.64 mAs Prep the generate then click PREP button, take your first exposure before 2s count down is over.

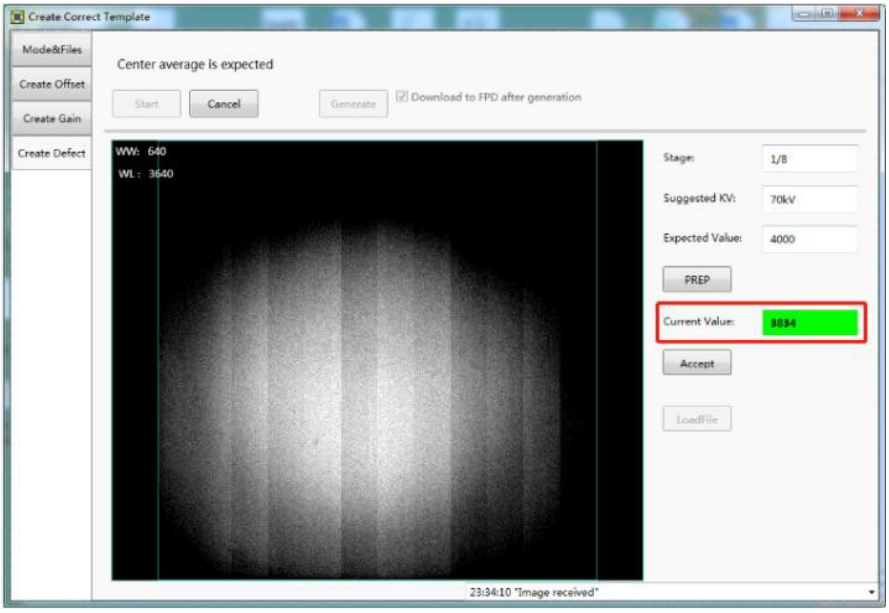


> **Note**: After taking an exposure, the Current Value will be highlighted green, if it was successful, or yellow, which means to adjust mAs and exposure again.

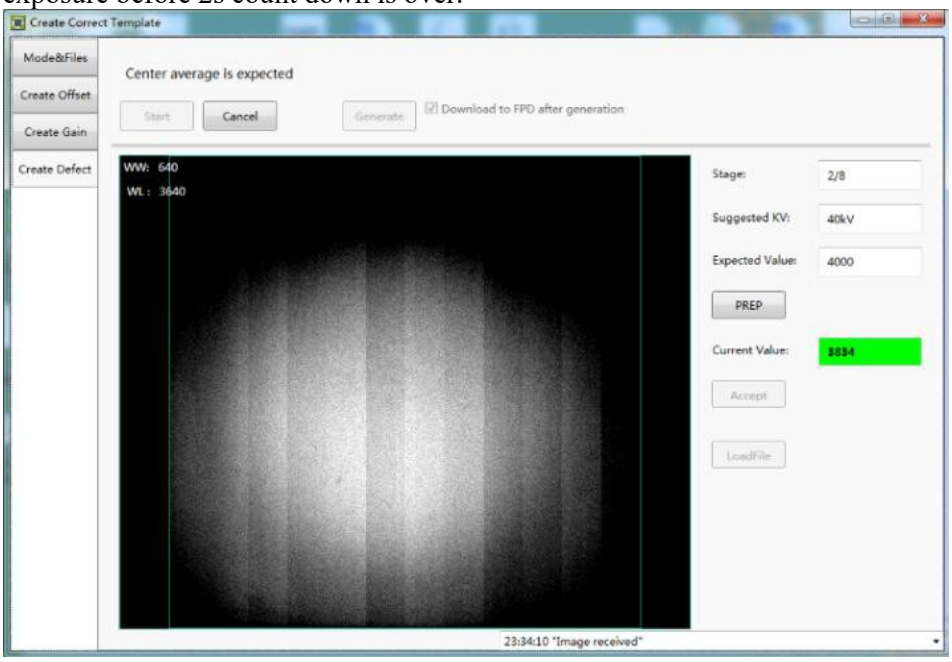
3. If the exposure was NOT acceptable (yellow status), adjust mAs up or down, Prep the generate then click PREP button to take another exposure before 2s count down is over.



4. If the exposure was acceptable (green status), click Accept to move to the next frame.



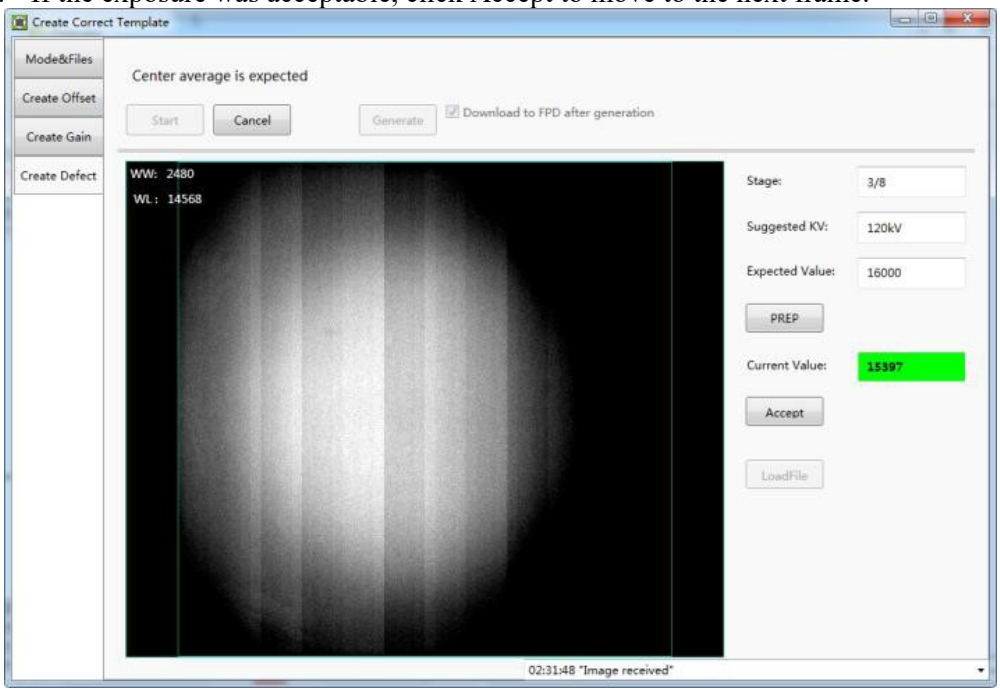
5. Set your techniques to 40kV / 5 mAs, Prep the generate then click PREP button to take your second exposure before 2s count down is over.



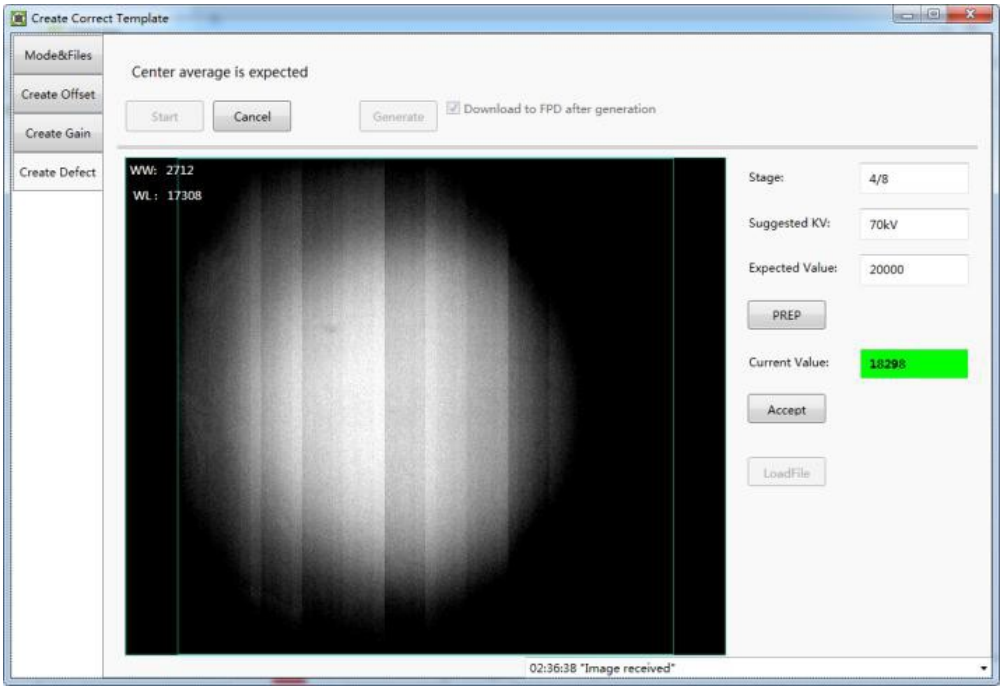
6. If the exposure was acceptable, click Accept to move to the next frame.

    a. Set your techniques to 120kV / 0.64 mAs, Prep the generate then click PREP button to take your third exposure before 2s count down is over.

7. If the exposure was acceptable, click Accept to move to the next frame.

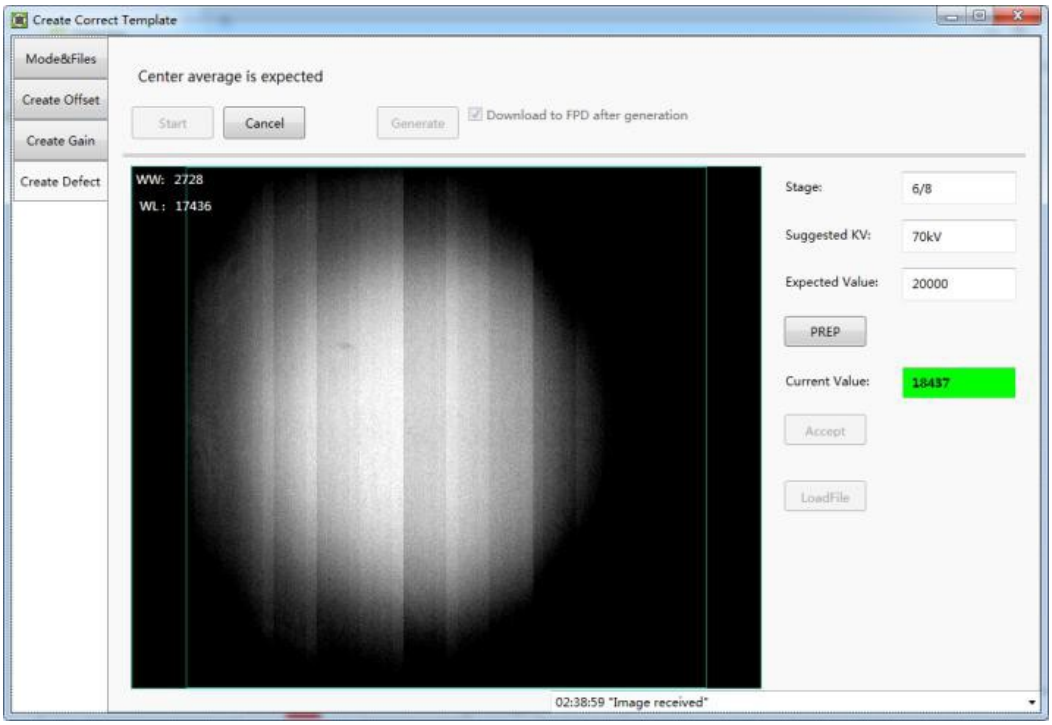


8. Set your techniques to 70kV / 3.2mAs, Prep the generate then click PREP button to take your Fourth exposure before 2s count down is over.

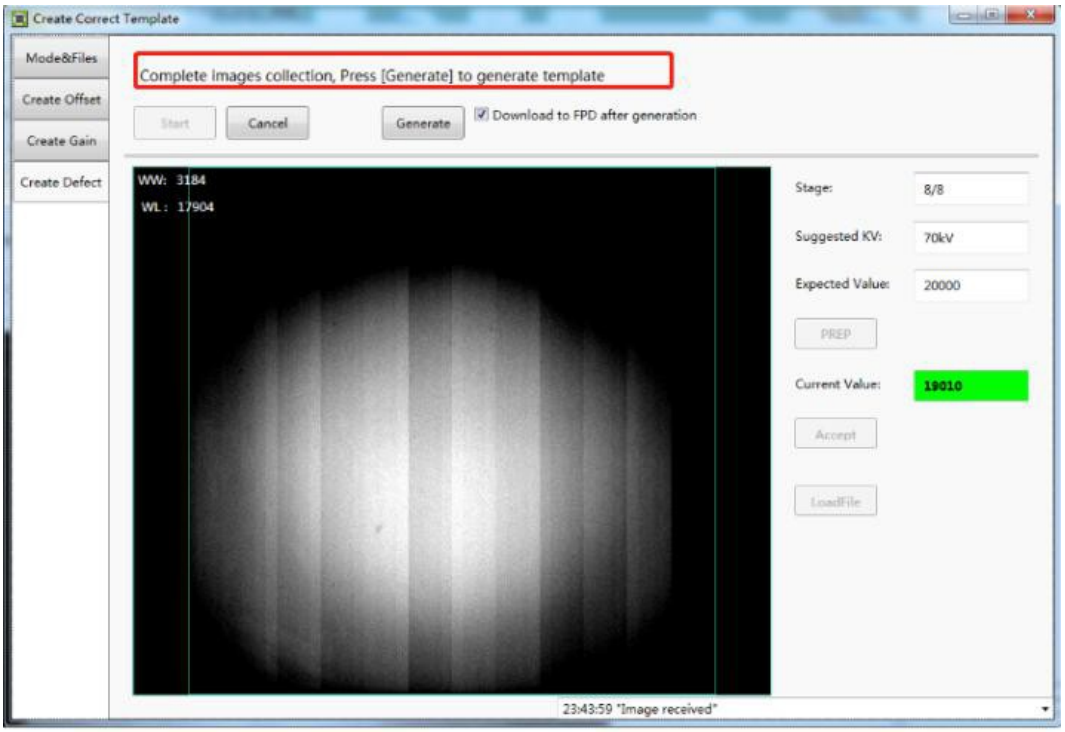


9. If the exposure was acceptable, click Accept to move to the next frame.

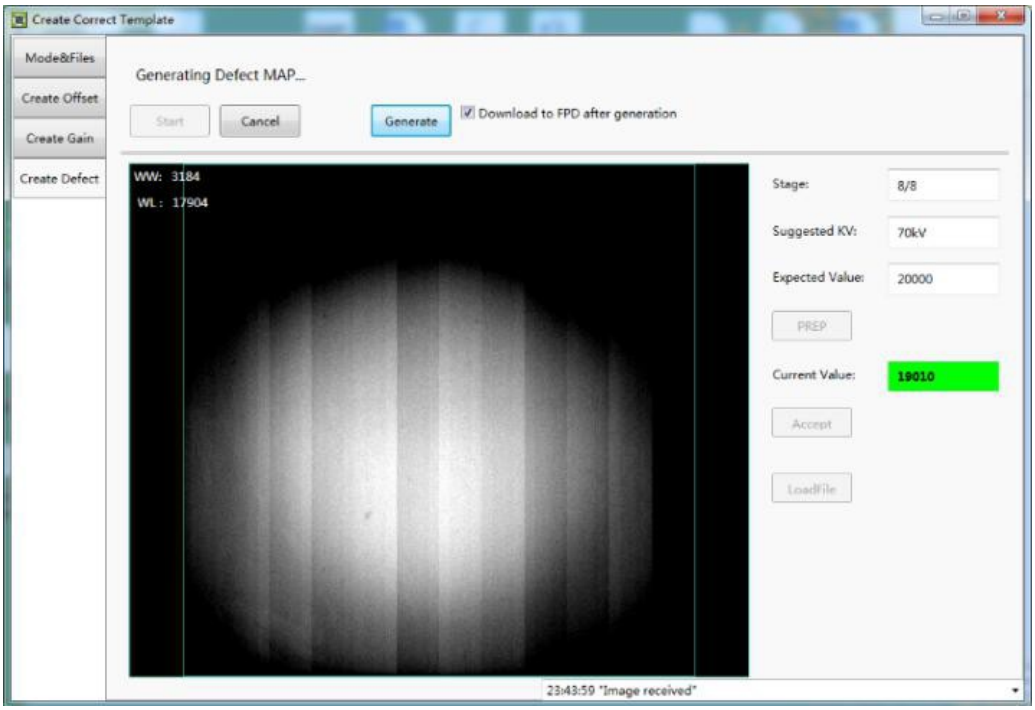
10. Continue to take exposures with techniques set to 70kV / 3.2mAs for the remaining frames (5-8).



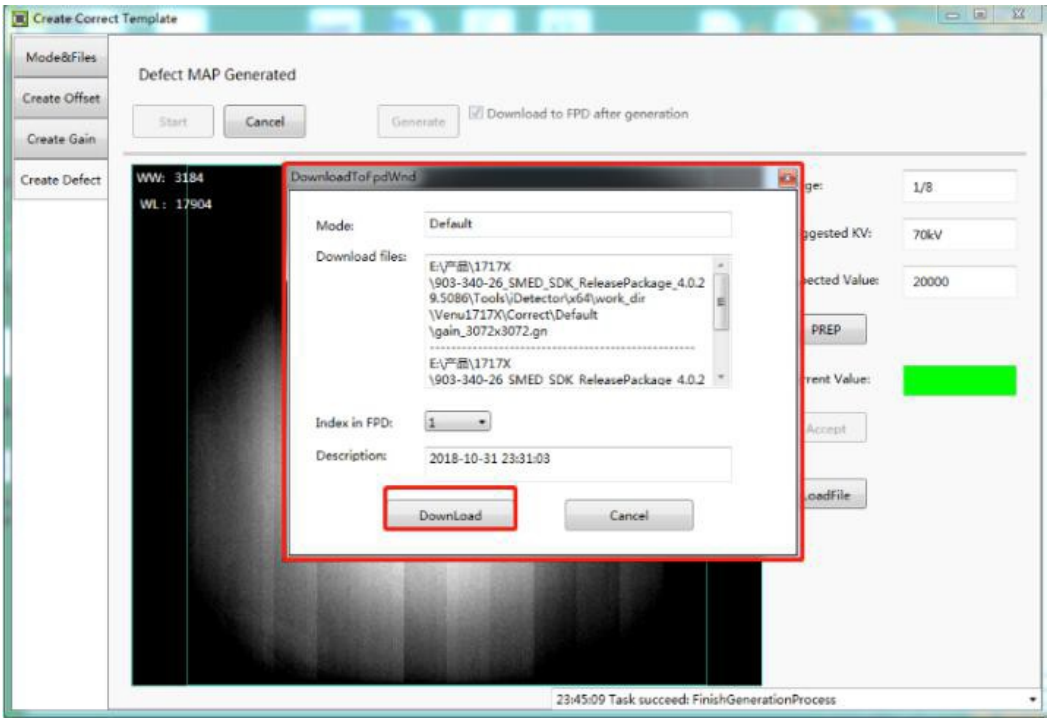
11. After taking all 8 defect exposures, Click Generate Button to generate the Defect template.



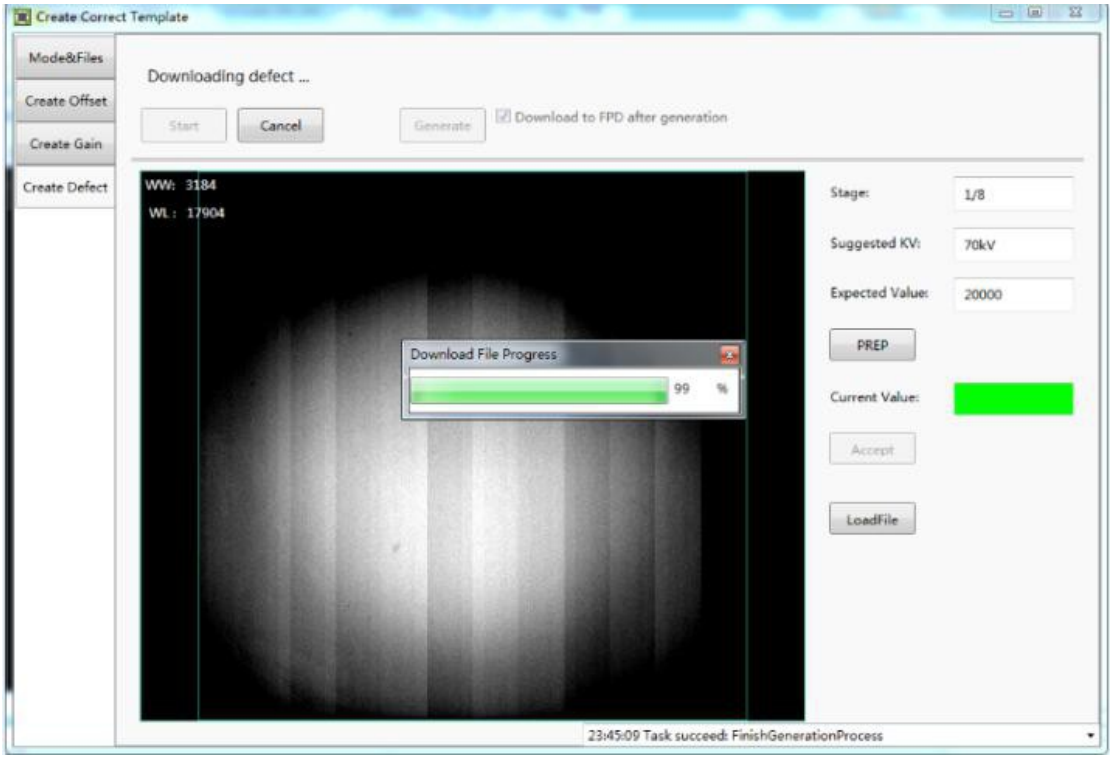
12. Wait for the Defect Map Generation to complete.



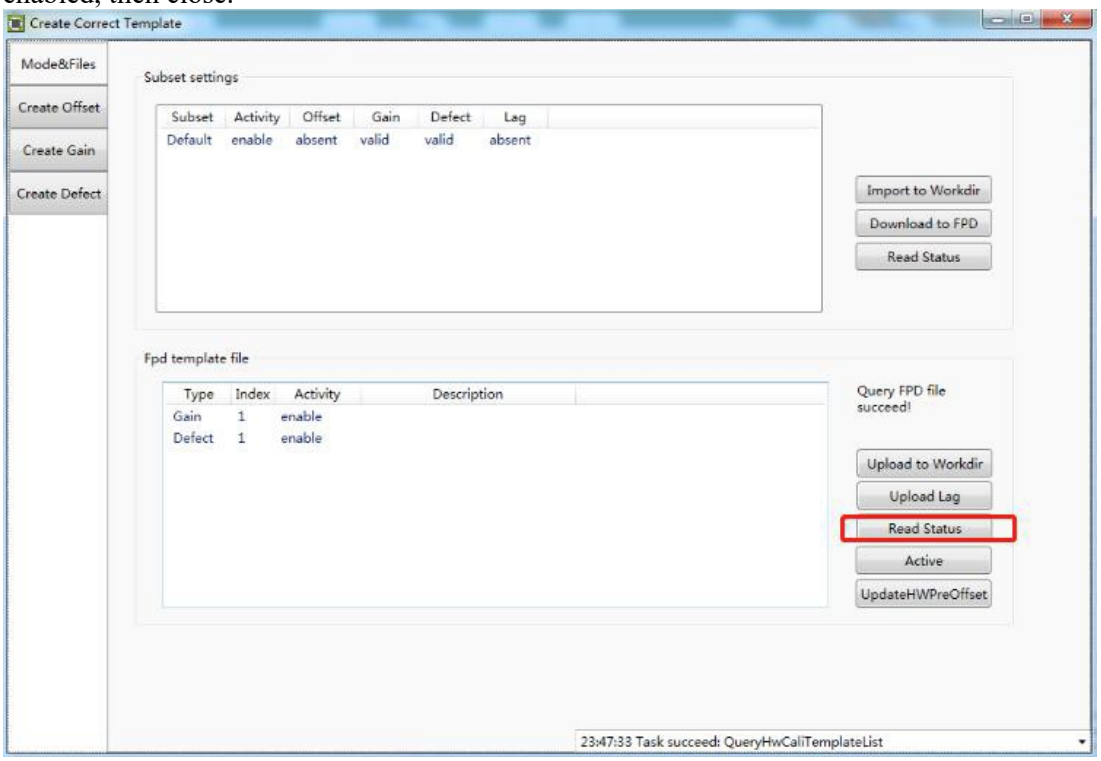
13. After defect template was generated, an interface will pop up, Click download to download the gain and defect template you just created into the panel.



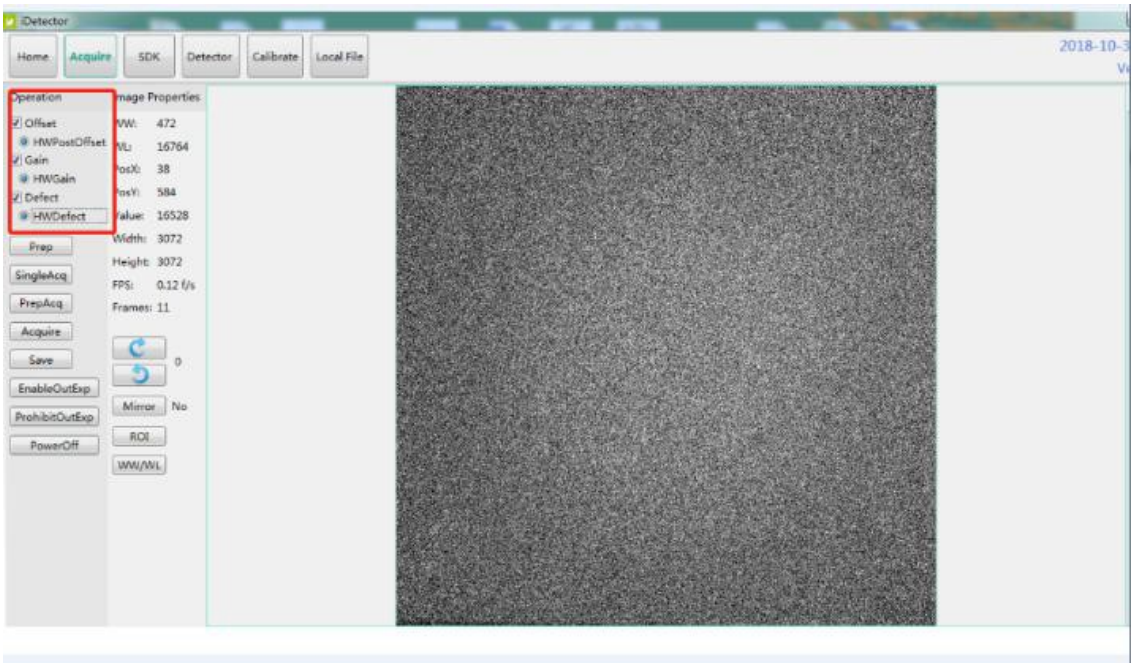
14. Wait till the download was successful.



15. Click on Mode and Files then Click Read Status. If FPD template file shows gain and Defect as enabled, then close.



16. Click Acquire Tab and Take a test shot with HWGain and HWDefect was checked.

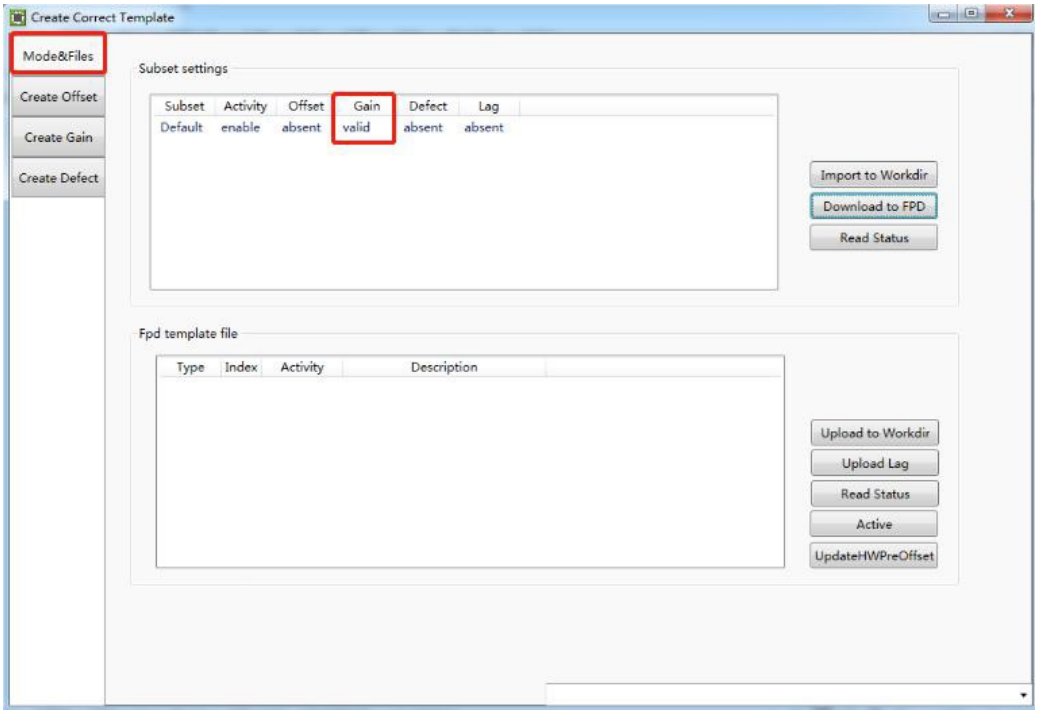


17. Calibration is good.

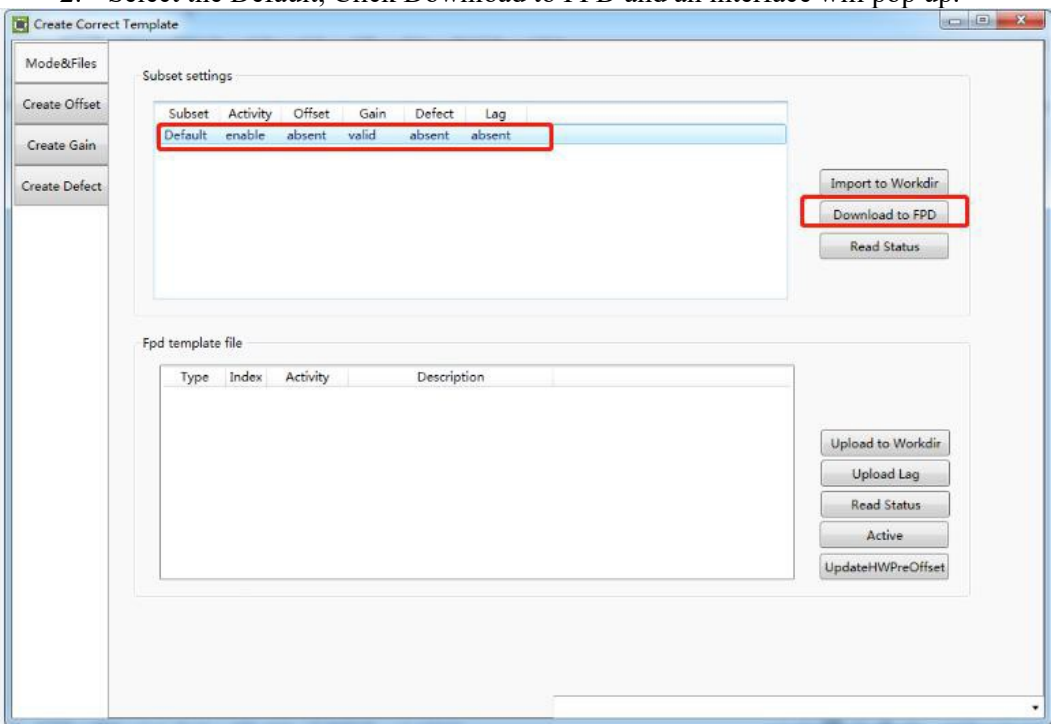
30.1.7 Download the New Gain Calibration File to the Panel

After Create the Gain and Now we need to download the new calibration files to the panel.

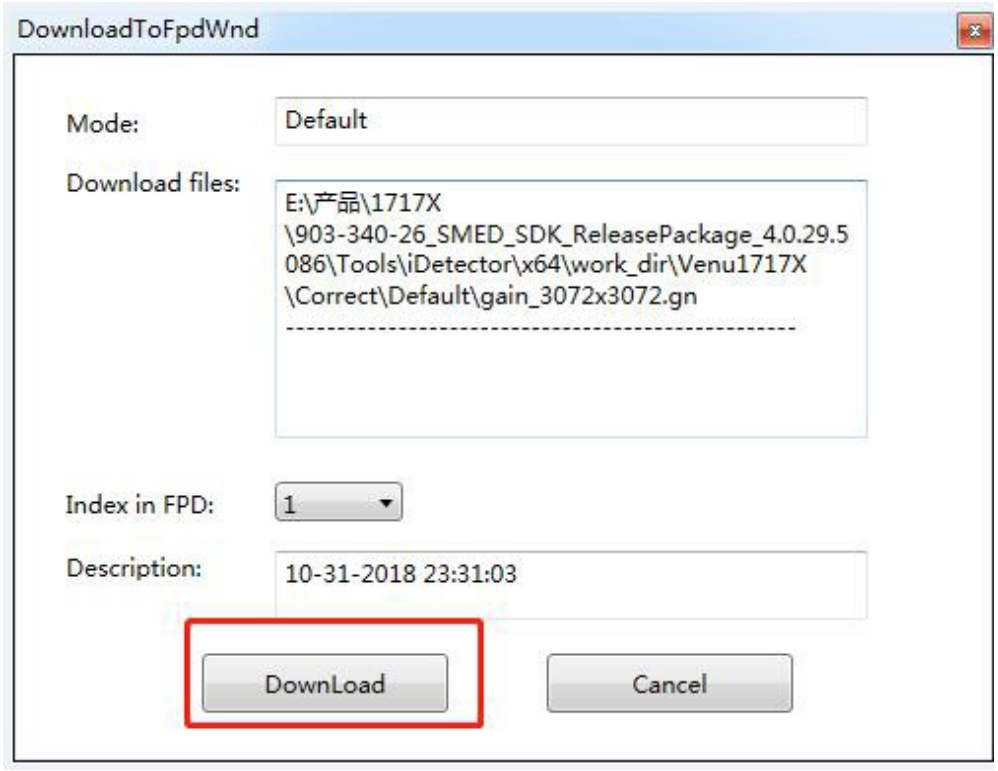
1. Within the Calibrate tab, click the “Mode & Files” tab, then click the “Read Status” button. Gain template shows valid**.**



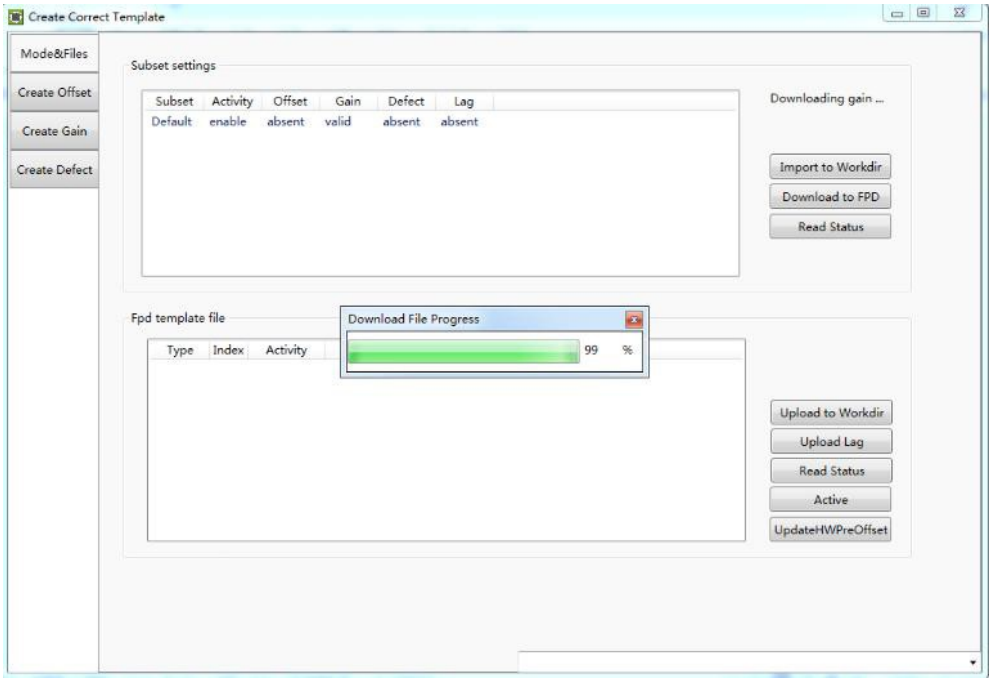
2. Select the Default, Click Download to FPD and an interface will pop up.

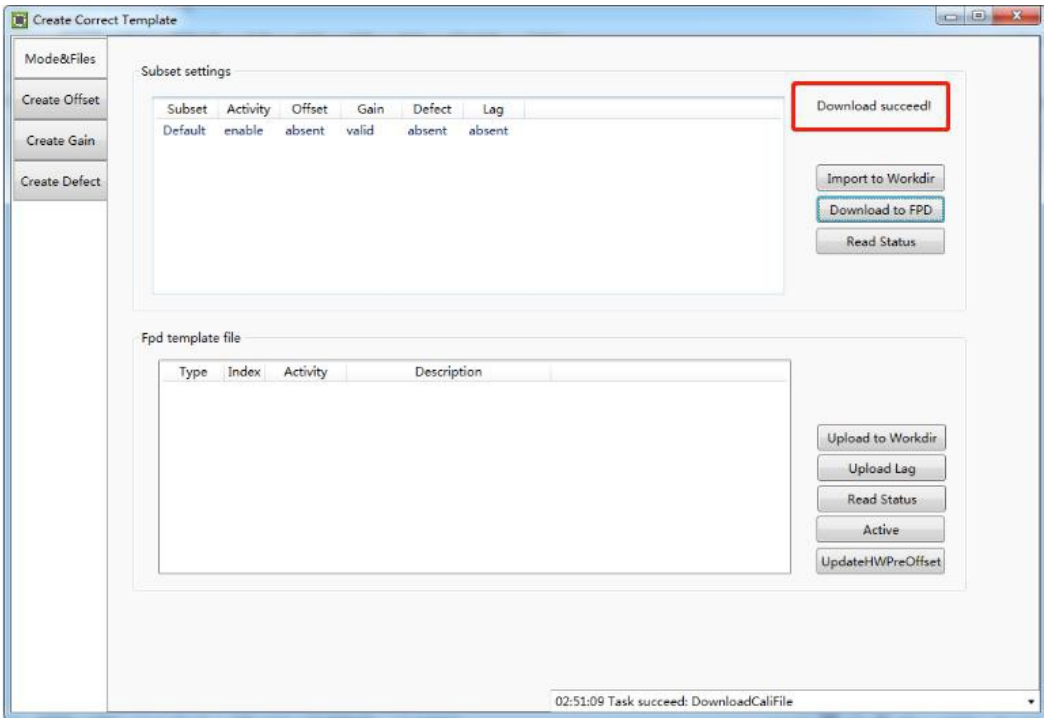


3. Click Download button



4. Wait till the download was successful.

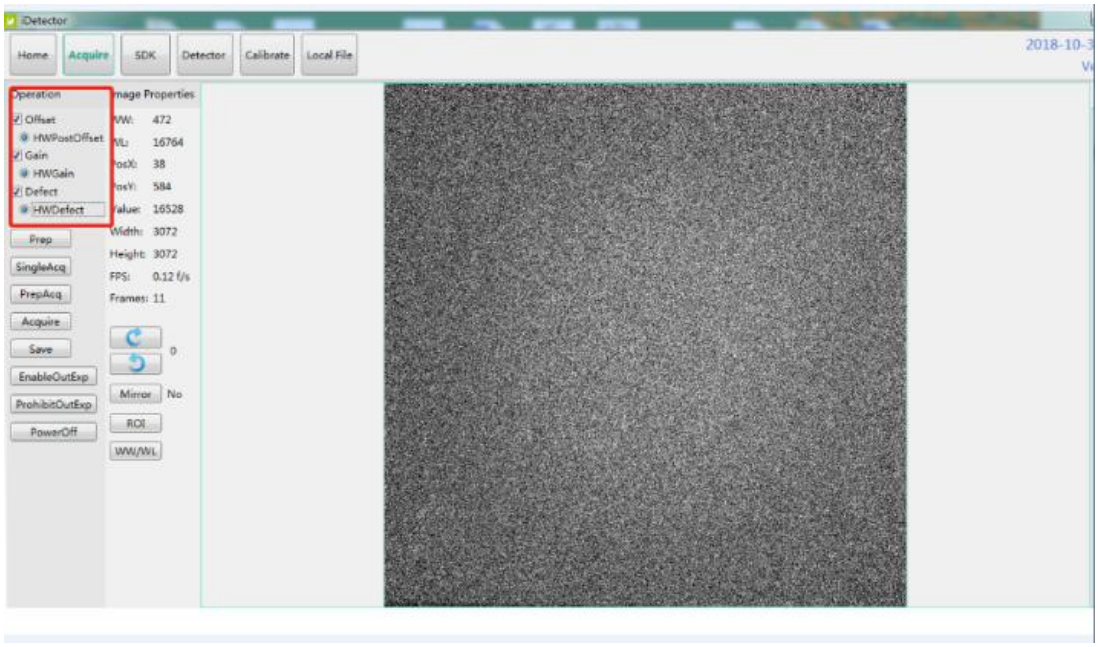




Note: If the download failed, please disable the firewall and antivirus. If it still does not work go to **C:\opal\plugins32\iGamma** and manually start **FTPServer.exe**

30.1.8 Re-enabling the Calibration Operation Options

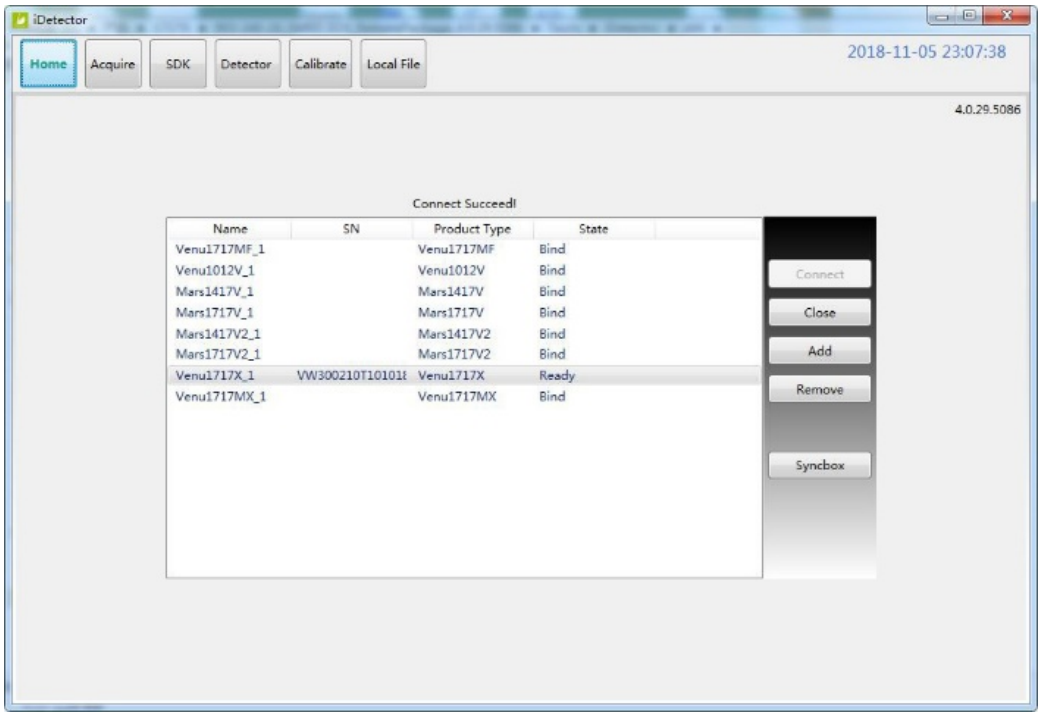
1. Select the **Acquire** tab and check the **HWPostOffset**, **HWGain** and **HWDefect**. checkboxes, **in that order**.



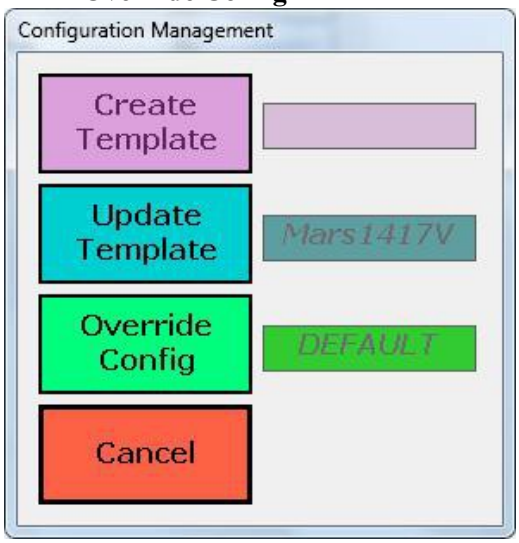
2. Closing iDetector

It's important to close iDetector properly, in order to sync the changes made in iDetector with Ultra UAI.

a. Select the **Home** tab and click **Close**.



b. Select **Override Config**.



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