Wireless Digital Flat Panel Detector

NDT1417MA

User Manual

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Before operating, please read this user manual and pay attention to all safety precautions.

Please ensure that this user's manual is properly maintained so that it can be accessed at any time (reserve).

Please use it correctly on the basis of full understanding of the content.

FCC Regulations

Contains FCC ID: 2ACHK-01070189

- This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
- This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
    - —Reorient or relocate the receiving antenna.
    - —Increase the separation between the equipment and receiver.
    - —Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
    - —Consult the dealer or an experienced radio/ TV technician for help.
- Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.
- 5150-5250MHz for indoor use only

Radio Frequency (RF) Energy

This device is designed and manufactured not to exceed the emission limits for exposure to radio frequency (RF) energy set by the Federal Communications Commission of the United States.

The exposure standard for wireless devices employing a unit of measurement is known as the Specific Absorption Rate, or SAR. The SAR limit recommended by the general public is 1.6W/kg Averaged over one gram of tissue by IEEE Std 1528.

The FCC has granted an Equipment Authorization for this product with all reported SAR Levels evaluated as in compliance with the FCC RF exposure guidelines.

While there may be differences between the SAR levels of various product and at various positions, they all meet the government requirements.

SAR compliance for body-worn operation is based on a separation distance of 0 mm between the unit and the human body. Carry this device at least 0 mm away from your body to ensure RF exposure level compliant or lower to the reported level.

IC Notice

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

(1) this device may not cause interference, and

(2) this device must accept any interference, including interference that may cause undesired operation of the device.

This Class B digital apparatus complies with Canadian ICES-001.

Contains IC: 25116-01070189

IC Radiation Exposure Statement

5150-5250MHz for indoor use only

This EUT is in compliance with SAR for general population/uncontrolled exposure limits in IC RSS-102 and had been tested in accordance with the measurement methods and procedures specified in IEC/IEEE 62209-1528: 2020. The SAR limit is 1.6 W/kg by Industry Canada. This equipment should be installed and operated with minimum distance of 0 mm between the radiator and your body. This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

Remarque IC

Cet appareil est conforme aux Normes RSS d'Industy Canada. Son utilisation est soumise à deux conditions:

(1) Ce dispositif ne peut pas provoquer d'interférences, et

(2) Ce dispositif doit accepter toutes les interférences reçues, y compris les interférences susceptibles de provoquer un fonctionnement non souhaité.

Cet appareil de classe B est conforme à la norme canadienne ICES-001.

Contient IC: 25116-01070189

Déclaration d'exposition IC

5150-5250MHz pour l’usage d’intérieur seulement

Cet EUT est conforme aux valeurs SAR à la norme SAR pour le grand public ainsi qu'aux limites d'exposition non règlementée IC RSS-102 et a été testé selon les méthodes et procédures spécifiées par les Normes IEC/IEEE 62209-1528: 2020..La limite DAS est de 1,6W/kg par Industrie Canada. Cet appareil devrait être installé et utilisé en respectant une distance minimale de 0 mm avec votre corps. Cet appareil et son (ses) antenne (s) ne doivent pas être situés à proximité l'un de l'autre et ne doivent pas fonctionner en même temps qu'une autre antenne ou qu'un autre émetteur.

To Customers

Congratulations on your purchase of the Wireless Digital Flat Panel (hereinafter referred to as **NDT1417MA** which is manufactured by iRay Technology Taicang Ltd. (Hereinafter referred to as iRay).

At iRay, we strive to not only make the world-class products that deliver the best value possible to our customers but also offer the highest quality of service and customer care. Please take time to read through this user guide in order to utilize the product effectively. We hope you enjoy the experience with iRay **NDT1417MA**

If you have any questions or suggestions, please feel free to contact us.

Service Office

Tel.: +86 0512-50720560

Fax: +86 0512-50720561

E-mail: service@iraygroup.com

Location: No.33, Xinggang Rd, Taicang Port Economic and Technological Development Zone, Jiangsu Province, 215434, China

Notes on usage and management of the equipment

1. Please read the user manual and pay full attention to all the safety precautions before your operation;
2. This product must be stored and operated in a specified industrial environment, and should be maintained by professional maintenance personnel in a safe and feasible condition;
3. This product adopts computers and displays complying with GB9706.1 or GB4943. For details, please consult our sales representative or local iRay dealer;
4. Only the dedicated cables can be used. Do not use cable other than the cable provided with this product;
5. This product cannot be used in the environment with inflammable gas or corrosive gas;
6. This product should prevent from intruding by liquid or conductive material, so as to avoid short circuit;
7. Radiation protection of this X-ray device meets the requirements of GB9706.3;
8. No unauthorized personnel shall be allowed to open the enclosure;
9. This product should be installed by the sales representative or local dealer.

Caring for your environment

This symbol indicates that this product cannot be disposed as domestic or commercial waste.

Recycling iRay Equipment

Please do not dispose of this product as domestic or commercial waste. Improper handling of this type of waste may result in a negative impact on health and environment. Some countries or regions, such as the European Union, set up systems to collect and recycle electrical or electronic waste items. Please contact your local authorities for information. If no instructions are available, call iRay Customer Service for assistance.

Disclaimer

1. iRay shall not be liable to the purchaser of this product or third parties in case of damage or injury incurred by purchaser or third parties as a result of fire, earthquake, misuse or abuse of this product.
2. iRay will not take any legal liability in case of loss and injury due to unauthorized modification to this product or failure to strictly comply with the User Manual of iRay.
3. iRay will not take any legal liability in case of loss and injury due to the use of products other than iRay′ s products.
4. During X-ray imaging, collecting, processing, reading and storing of image data, the user should comply with the law of the countries where the product is used. The users and operators of the product should protect the privacy of image data.
5. Information regarding specification, compositions, and appearance of this product is subject to change without prior notice.
6. Since the image collected by this product cannot be used for final product detection, this product is only provided as a part to manufacturer of complete industrial X-ray photography system device, and such manufacturer, during system-level product registration, should perform type test on the complete machine, to ensure safe and effective system operation.
7. Do not use in an oxygen-rich environment.

Copyright

Trademarks

iRay and the logo of iRay are the registered trademarks of iRay Technology Taicang Ltd.

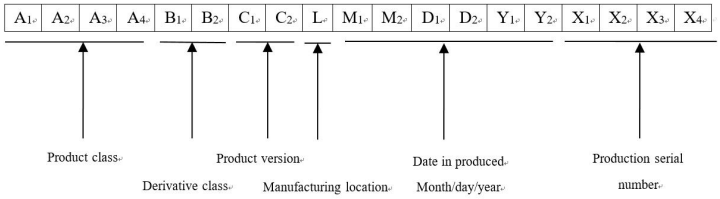
Symbols and Conventions

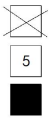
The following symbols and conventions are used in the whole user's manual.

	This symbol is used to identify conditions under which improper use of the product may cause death or serious personal injury.
	This notice is used to identify conditions under which improper use of the product may cause minor personal injury.
	This notice is used to identify conditions under which improper use of the product may cause property damage.
	This is used to indicate a prohibited operation.
	This is used to indicate an action that must be performed.

Labels and markings on the equipment

The labels and markings on the equipment of our company are explained as follows:

Symbol	Guide
	This symbol is used to suggest that users should refer to the accompanying documents for the important safety-related information, such as the warnings and cautions that cannot be shown on the machine due to some reasons.
	This symbol is used to indicate the serial number of manufacturer. The serial number of our products is usually composed of 19 digits, as follows: 
	This symbol is used to indicate the name and address of manufacturer.
 20XX-XX	This symbol is used to indicate the date of manufacture.
 20XX-XX-XX	This symbol is used to indicate the period of use until the date indicated.
	This symbol is used to indicate consultation of user manual for instructions.
	This symbol is used to indicate that the product must be sent to the appropriate facility for recycling when the end user intends to discard the product.
	This symbol is used to indicate “Safety sign: please see safety instructions”.
	This symbol is used to indicate “Safety sign: dangerous voltage.”

	This symbol indicates that it should be handled with care.
	This symbol is shown on the package and indicates that it is fragile.
	This symbol is shown on the package and indicates that it should be kept away from direct sunlight.
	This symbol is shown on the package and indicates that it should be kept dry.
	This symbol is shown on the package and indicates that the equipment should be kept up right.
	This symbol is shown on the package and indicates that the packaging box should not be rolled over.
	This symbol is shown on the package and indicates the maximum number of stacking layers.

Contents

1. Safety Information

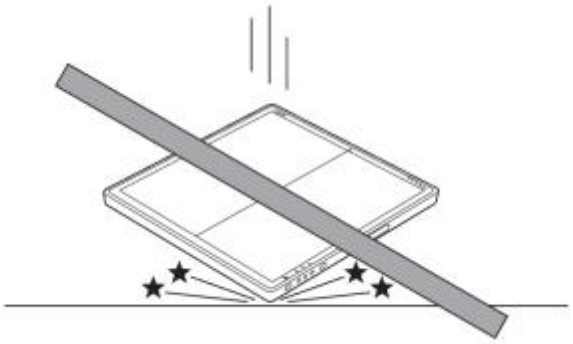
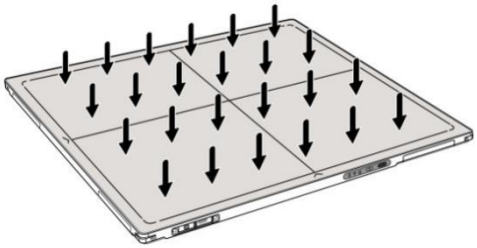
1.1 Safety Precautions

Follow the following safety precautions and use the equipment properly to prevent personal injury and equipment damage.

Warning	
 	**Do not use or store the equipment near flammable chemicals such as alcohol, thinner, benzene, etc.** If chemicals are spilled or evaporated onto the equipment, it may contact with electric parts inside the equipment and cause fire or electric shock. Also, some disinfectants are flammable. Be sure to take care when using them. **Do not connect the equipment with any devices other than those specified.** Otherwise, it may result in fire or electric shock.
Power supply 	**Do not supply power to the equipment with power source other than that specified in the nameplate.** Otherwise, it may result in fire or electric shock. **Do not handle the equipment with wet hands.** Otherwise, it may result in electric shock that could result in death or serious injury. **Do not place heavy objects on cables. Do not pull, bend, bundle, or step on cables to prevent their sheath from being damaged.** Otherwise, it may damage the cables which could result in fire or electric shock. **Do not use a same AC outlet to supply power to more than one piece of equipment.** Otherwise, it may result in fire or electric shock. **Do not turn ON the system power when condensation has formed on the equipment.** Otherwise, it may result in fire or electric shock. **Do not connect a portable socket-outlet or extension cord with multiple interfaces to the equipment.** Otherwise, it may result in fire or electric shock. **To avoid the risk of electric shock, this equipment must be connected to the power supply with protective earth.** Otherwise, it may result in fire or electric shock.

	**Maintain good contact between the power cord and the AC power outlet.** **If contact failure occurs, or metal objects contact with the plug, fire or electric shock may be caused.** **Be sure to turn OFF the power before connecting or disconnecting the cables between equipment.** Otherwise, it may result in electric shock that could result in death or serious injury. **Be sure to hold the plug or connector firmly when disconnecting the cable.** If you pull the cable with force, the core wire may be damaged, resulting in fire or electric shock.
Notes for operation 	**Do not disassemble or modify the equipment. No modification to this equipment is allowed.** Otherwise, it may result in fire or electric shock. Also, touching the integrated parts may cause electric shock, which may cause death or serious injury. **Do not place heavy objects on the equipment.** The objects may drop and be damaged. In addition, if any metal items such as needle or clamp, or liquid drop into the equipment, it may cause fire or electric shock. **Do not hit or drop the equipment.** The equipment may be damaged if it is jolted strongly, which may result in fire or electric shock if the equipment is used without being repaired. **Do not put the equipment together with the pointed objects.** Doing so may damage the equipment.
fault treatment 	**In case of any one of the following conditions, immediately turn OFF the power supply, unplug the power cord from the AC outlet, and contact your sales representative or local iRay dealer:** When there is smoke, an odd smell or abnormal sound. When liquid is spilled into the equipment or a metal object enters into the equipment through an opening. When the equipment drops and is damaged.
Maintenance and tion 	**Please turn OFF the power of the equipment and unplug the power cord from the AC outlet before cleaning.** NEVER use alcohol, ether and other flammable cleaning agent to clean the equipment for the sake of safety. NEVER use methanol, benzene, acid, alkali or other corrosive liquids to clean the equipment. **Do not immerse the equipment in liquid.**

	Please make sure that the equipment's surface & plugs are dry before turning ON the power. Otherwise, it may result in fire or electric shock.
	**Unplug the plug from the AC outlet periodically for cleaning the plug and clean the AC outlet and its periphery with a dry cloth.** If the power cord is kept plugged in for a long time in a dusty, dark and humid environment, dust around the plug will absorb moisture and this could cause insulation failure that may result in a fire. **For safety reasons, be sure to turn OFF the power to each piece of equipment when performing routine inspections indicated in this manual.** Otherwise, it may result in electric shock.
Installation and use environment 	**Do not install and use the equipment in the following conditions. Otherwise, it may result in equipment failure, fire or personal injury.** Near air-conditioning or ventilation equipment Near heat sources, such as heater Unstable power supply In saline or acid environment In the environment with high temperature and humidity In freezing or condensing environment In the environment prone to vibration In slope or unstable area **Make sure the cables will not twist during use. Furthermore, do not make your feet be wound by the cable.** Otherwise, it may result in equipment failure or personal injury.
power supply 	**Always connect the three-core power cord plug to a properly grounded power outlet.** For easy access to power cord plug, avoid placing any obstacle near the outlet. Otherwise, it may not be possible to turn off the power immediately in case of an emergency. **Be sure to ground the equipment to an indoor grounded connector. Also, be sure to connect all the devices to a common ground.** **Do not use any power source other than the one provided with this equipment.** Otherwise, it may result in fire or electric shock.
nota matt ope 	**Turn OFF the power when the equipment is not used for the sake of safety.**

	Handle the equipment carefully. **Do not immerse the equipment in water.**  **If the equipment is subject to strike or dropping, the internal image sensor may be damaged.** **Do not place heavy objects on the equipment.** Otherwise, the internal sensor may be damaged and the equipment may not work normally to collect images. Load limit:  **Be sure to ll not bend. Otherwise, the internal image sensor may be damaged.** **Be sure to securely hold the detector while using it in upright positions.** **Maintain even load (same pressure) on the detector when collecting images to ensure good image quality.**
	Adverse events that may occur on the product Fail to acquire valuable images after exposure due to improper operation or failure of corresponding devices. Fail to acquire valuable image after exposure due to interference of the equipment not complying with YY 0505-2012 standard that results in abnormal performance.
Caution!	**This product should be used in conjunction with registered X-ray machine. For installation of this product and software operation, referring to the manual of this product.** **For other operations, referring to manual of the X-ray machine.**
Caution!	**Monitoring, evaluation and controlling method**

	**For state indicator of this product, referring to Chapter "Product installation and connection" of this manual. If the indicated state is incorrect, do not use the equipment.**
Caution! 	**After replacement or reinstallation of the plat panel detector, the measurement function must be recalibrated.** **If no disassembly occurs, the measurement function should be recalibrated once half a year.**

1.2 Notes for Using the Equipment

Pay attention to the following precautions when using the equipment. Otherwise, the equipment may not function properly.

Before exposure

Be sure to check the equipment daily and confirm that it works properly.

When the room is heated up suddenly in cold areas, it will cause condensation on the equipment. In this case, wait until the condensation evaporates before performing an exposure. If condensation occurs during the use of the equipment, the images captured may suffer from quality problems. When an air-conditioner is used, be sure to raise/decrease temperature gradually to ensure that the temperature difference between room and equipment will not cause condensation.

The detector should be warmed up for 15 minutes before exposure or creation of calibration template.

Exposure should make the dose rate to the surface of the detector be greater than 900 nGy/s.

Do not use the equipment in areas with alternating current strong magnetic field and make sure to keep away from interference sources such as power adapter and high-voltage power lines. Otherwise, it may cause image noise, artifacts or incorrect images.

During exposure

Do not move the power supply box or Ethernet Cables during exposure. Otherwise, it may cause image noise, artifacts or incorrect images.

Do not use the equipment in areas with strong magnetic field. Otherwise, it may cause image noise, artifacts or incorrect images.

Do not press on the surface of the detector to generate varying pressure and do not knock or vibrate the equipment during exposure, so as to avoid image noise or artifacts.

After exposure

Turn off the power to the detector when the flat panel detector is not used.

Disinfecting and Cleaning

Do not spray disinfectants or detergent directly on the detector.

Wipe it with a cloth slightly dampened with neutral detergent. Do not use corrosive or flammable solvents such as alcohol, thinner, benzene, acid or alkali, because

these kinds of solvents may damage the surface of the equipment or cause a safety hazard.

1.3 Operating and Storage Environment

Be sure to use the equipment under the conditions described below:

	Temperature	Temperature Change	Humidity	Atmospheric Pressure	Pressure Change
Operating	-10~40℃	≤0.5℃/min	20~90% RH	700~1060mbar	≤10 mbar/hour
Storage	-20~55℃	≤1℃/min	10~95% RH		≤20 mbar/hour

- Do not operate the equipment at an altitude more than 3000m.
- Do not expose the equipment to the environment with high temperature and high humidity.

2. General Introduction

2.1 Product Introduction

The NDT1417MA X-ray wireless digital flat panel detector (hereinafter referred to as flat panel detector) is used in conjunction with an X-ray imaging system for X-ray imaging system manufacturers to realize imaging of measured objects, and the imaged data is output to a processing device after still images are acquired.

NDT1417MA flat panel detector is based on amorphous silicon technology. The size of the flat panel detector is 390mm×450mm×20mm, the effective area is 350mm×430mm, the pixel size is 100um, and the pixel matrix is 3500×4300. It supports wired and wireless data transmission.

2.2 Working Principle of the Flat Panel Detector Host

After the bulb tube of the system emits X-rays, the scintillation screen is exited through the carbon fiber plate to emit visible light, and the visible light is captured by the TFT sensor of the pixel matrix to complete the charge integration process. The READOUT circuit board completes the visible light-charge-digital conversion through the charge integral sampling of the AFE channel and the AD data acquisition and conversion, and performs data pre-processing such as image stitching and packetization on the onboard ARM chip of the motherboard, and uploads to PC through the data transmission channel. PC completes the post-processing and display of the image through the relevant software of the DR system.

2.3 Applicable Scope of the Manual

This manual contains information about NDT1417MA. All users must read and understand this manual before using the equipment. All the information, including figures, in this manual is based on the prototype equipment. If your equipment does not contain certain configurations, the corresponding information is not applicable to your equipment.

2.4 Product Characteristics

- Static flat panel detector
- 14 inches x 17 inches
- Supports both wired and wireless data transmission modes
- Support AP/Client wireless working mode

- Support 5G/2.4G wireless data transmission
- External cable can be replaced
- 16-bit ADC
- IP65

2.5 Expected Purpose

The NDT1417MA flat panel detector is used in conjunction with an X-ray machine for digital X-ray imaging of the measured object by relevant enterprises.

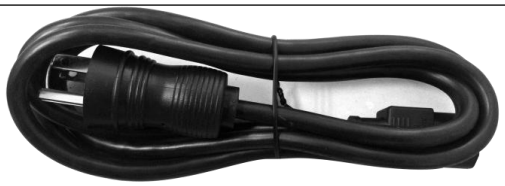
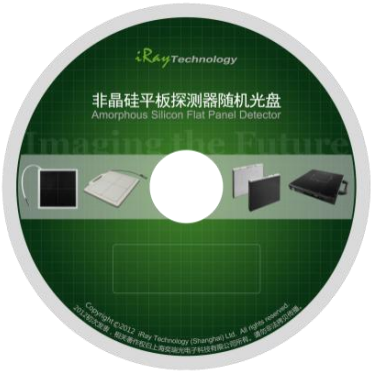
After the digital X-ray imaging system is formed, it should be verified to ensure safety and effectiveness.

Installation, use and maintenance of the equipment must be carried out by trained and qualified personnel.

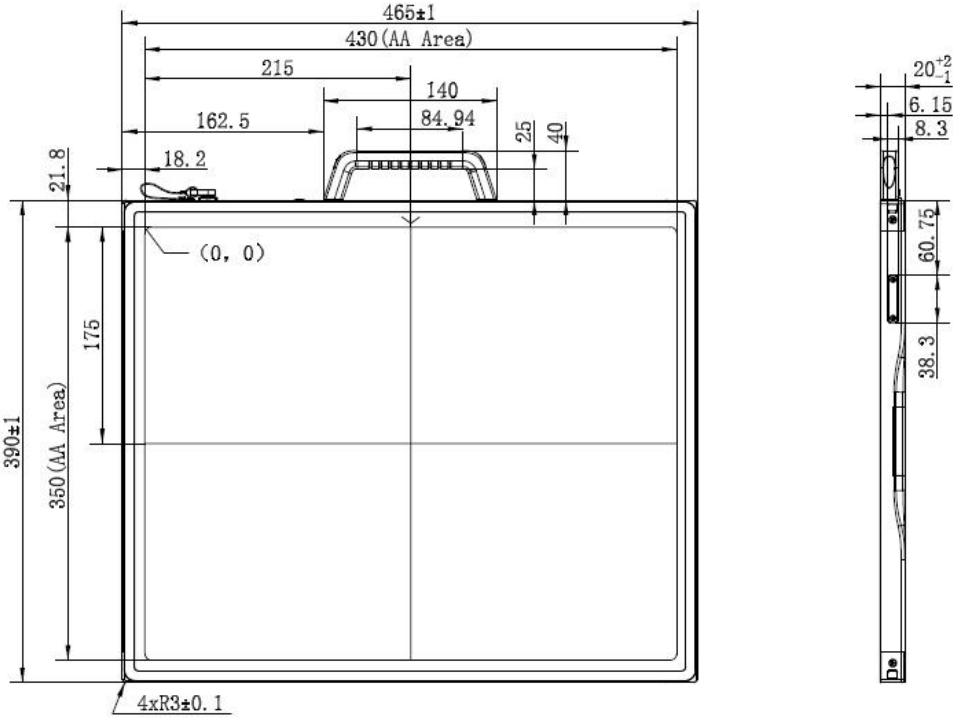
According to the expected purpose of the NDT1417MA and the results of the risk assessment, the basic performance of the product is identified as: image acquisition of the flat panel detector.

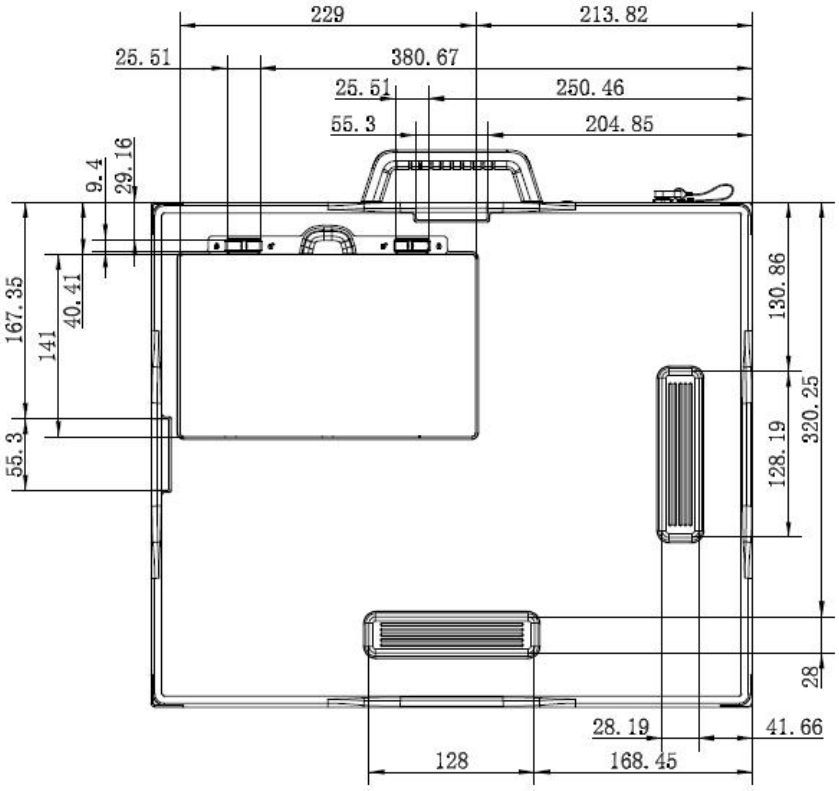
2.6 Equipment Composition

Name	Figure	Description
Flat Panel Detector		NDT1417MA 1pcs
Battery		7.6V Lithium Battery 2pcs

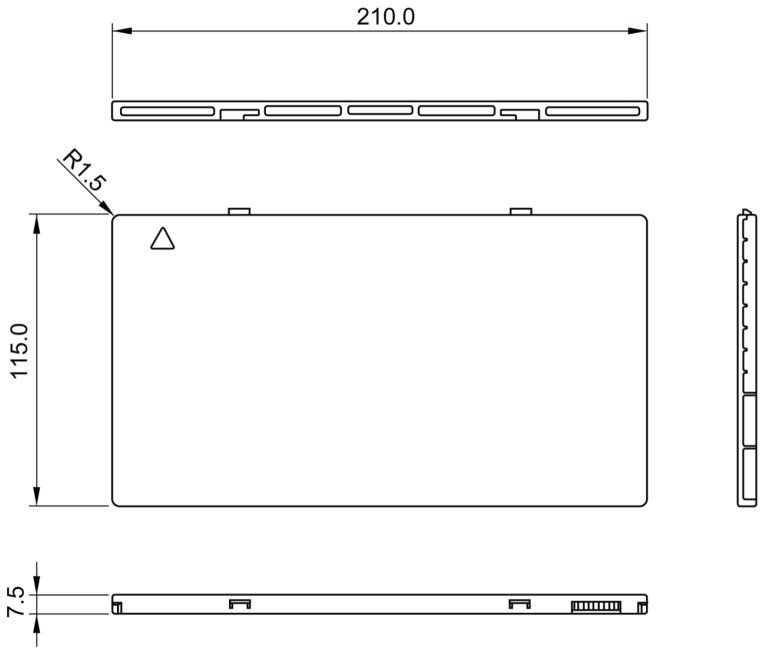
Battery Charger		Support 3pcs battery charging 1pcs
Composite Cable		1pcs
AC Power Cord		Use with adapter 1pcs GB, EP, US standards optional
CD Disc		Bad point calibration template Software development kit User manual

2.6.1 Detector Host





2.6.2 Battery



Item	Specifications
Model	Battery-KV
Rated Capacity	Typ. 4180mAh @ Discharge 0.2C
Nominal Voltage	10.8V
Charge Voltage	12.6±0.05V
Discharged End Voltage	9V
Charging Method	CC-CV
Operating Temperature	Charge 0℃-+60℃, Discharge-10℃-+60℃
Storage Temperature	≤3 month -20℃-+45℃ ≤6 month -20℃-+35℃
Relative Humidity	5%~95%
Dimension (L × W × H)	210 x 115 x 7.5 mm
Weight	0.28kg

2.6.3 Battery Charger

Item	Specifications
Model	Charger-Combo
Simultaneous Charging	1 battery packs
Full charging time	≤3 hours
Rated power supply	90~264V(AC)
Dimension (L × W × H)	240 x 184 x 38 mm
Weight	0.55 kg

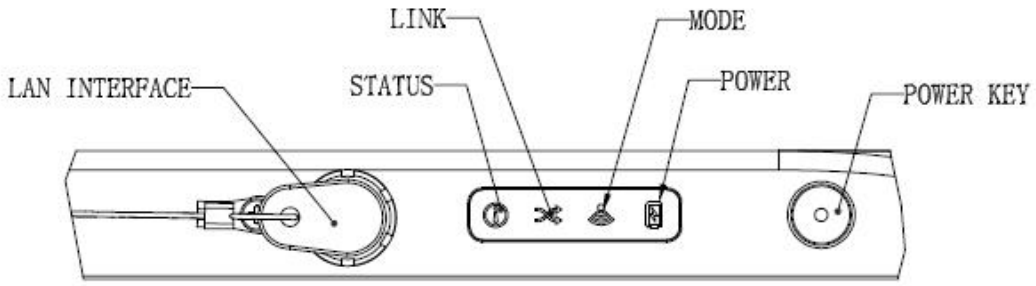
2.7 Product Specification

2.7.1 Basic Parameters

Item	Details
Type	NDT1417MA
Image Sensor	Amorphous Silicon Thin Film Transistor
Pixel Size	100um
Fill Factor	60%
Pixel Matrix	3500x4300
Gray Scale	16bit
Effective Area (H x V)	350mm×430mm
Data Transmission	5G/2.4G/Gigabit network
Size (L × W × H)	390mm×465mm×20mm

3. Indicator Status Introduction

3.1 Indicator Status



3.2 PWR Indicator

Indicating Status	Power Light Status	Flat Panel Status		
		Battery	DC Power Supply	Despriptio n
	Off	Off	Off	Detector Off
	Orange keeps on	< 20%	Off	Detector On
	Green keeps on	≥20%	Off	Detector On
		Off	On	

Note: When the battery charge is less than 10% and there is no external power supply, the detector will not turn on.

3.3 MOD Indicator

Figure	MOD Indicator Status	Flat Panel Detector Status
	Off	1.Both wired and wireless connections are not established 2.The detector is not turned on
	Green keeps on	Wired connection physical layer connection has been established
	Blue keeps on	Wireless connection has been established

3.4 LIN Indicator

Figure	LIN Indicator Status	Flat Panel Detector Status

	Off	Detector is not turned on
	Green keeps on	AP mode, wireless mode is valid

3.5 STA Indicator

Figure	STA Indicator Status	Flat Panel Detector Status
	Off	1. Detector is not turned on 2. No exposure allowed
	Green keeps on	Allow exposure
	Orange Flashing	Detector is in start state
	Orange keeps on	Detector has an abnormal error

4. Software installation and introduction

4.1 Workstation configuration

The operation of iDetector requires the support of Windows 7/Windows 8/Windows 10 and other Windows operating systems. The operating system should be installed with the latest service pack, and the installation requires that the computer's operating memory be above 4G. It is recommended to turn off the firewall in the computer operating system, and the workstation configuration is recommended to be above the following recommended configuration to avoid abnormal network communication problems.

Item	Description
Operating system	Windows 7 32/64bit
CPU	Intel Core i7 3.6G
Memory	4G DDR3
Hard disk	640 G
Network card	Intel Pro EXP9301CT PRO

4.2 Operating environment construction

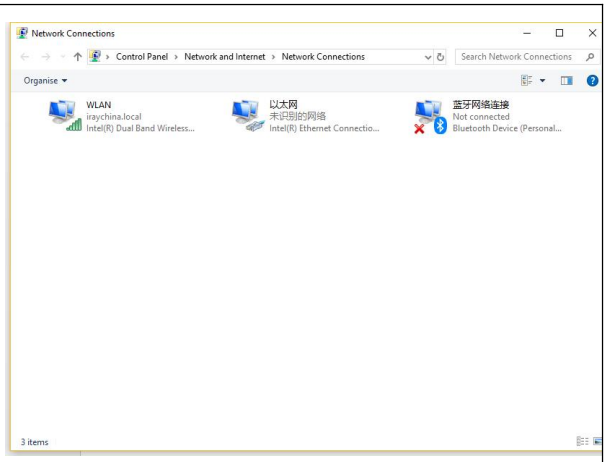
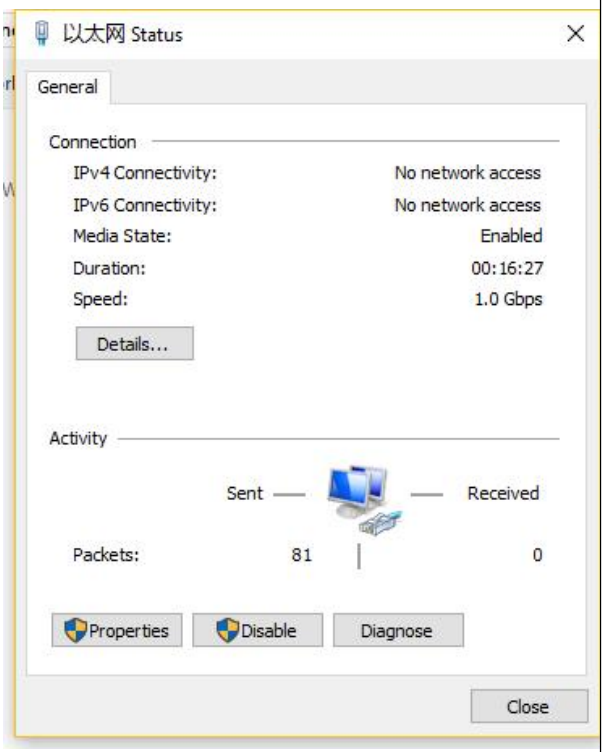
The runtime environment installation files or download paths are included in the following directory of the SDK distribution package: Tools\env_setup.

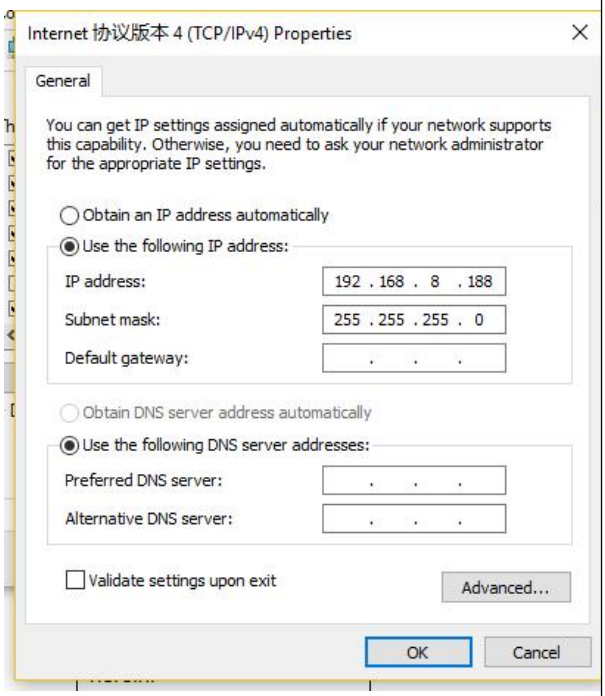
1. Install Microsoft .NET Framework 4.5 before using (XP can only install version 4.0), you need to download it from Microsoft website.

2. The VC distribution package vcredist_x86_2013 (or vcredist_x64_vs2013) needs to be installed.

3. In the XP environment, the absolute path must be used in the bind.txt setting.

4.3 Wired connection

Select the network to which FPD is connected; In particular, for workstations with multiple network cards, you need to confirm whether the selection is correct.	
Open local network configuration	

Open IPV4 settings Default IP and subnet mask settings IP address: 192.168.8.188 Subnet mask: 255.255.255.0 If the user has changed the default IP, please set it to the actual IP address herein.	

4.4 Wireless connection

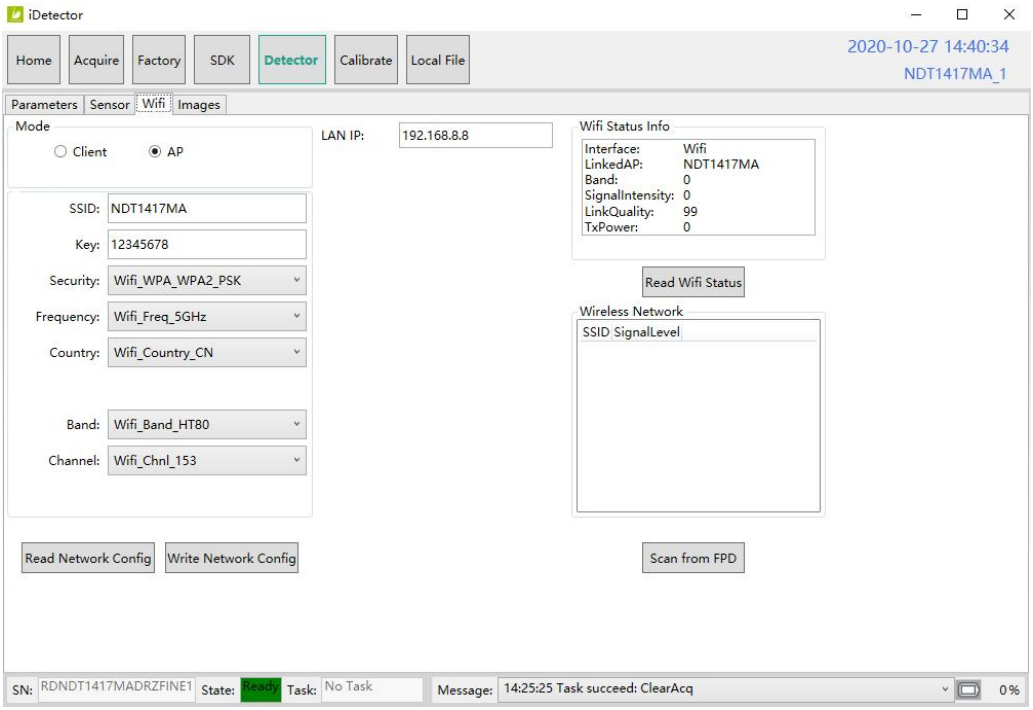
The wireless connection has two modes, one is AP mode and the other is Client mode.

4.4.1 AP Mode

In AP mode, the detector acts as an access point and the workstation searches for wireless signals from the detector.

The interface for setting the Wifi parameters is as shown below. The configuration parameters such as SSID may differ from the figure.

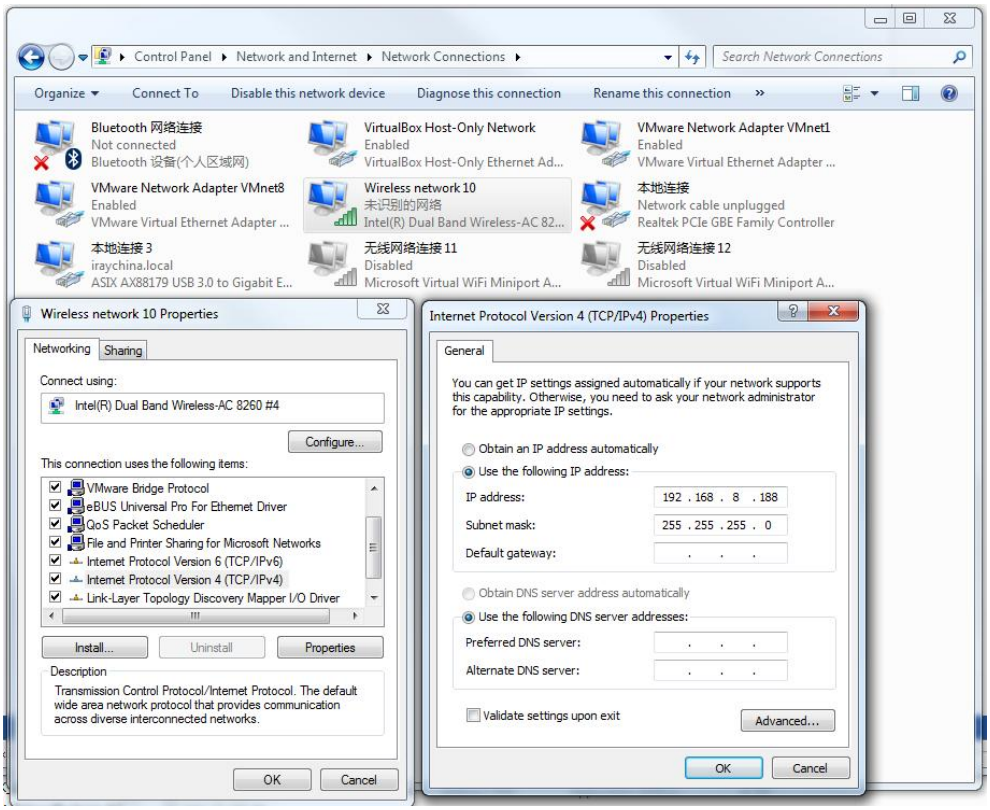
According to the current test results, after writing the KR and RU country codes in AP mode, the wireless signal may disappear.



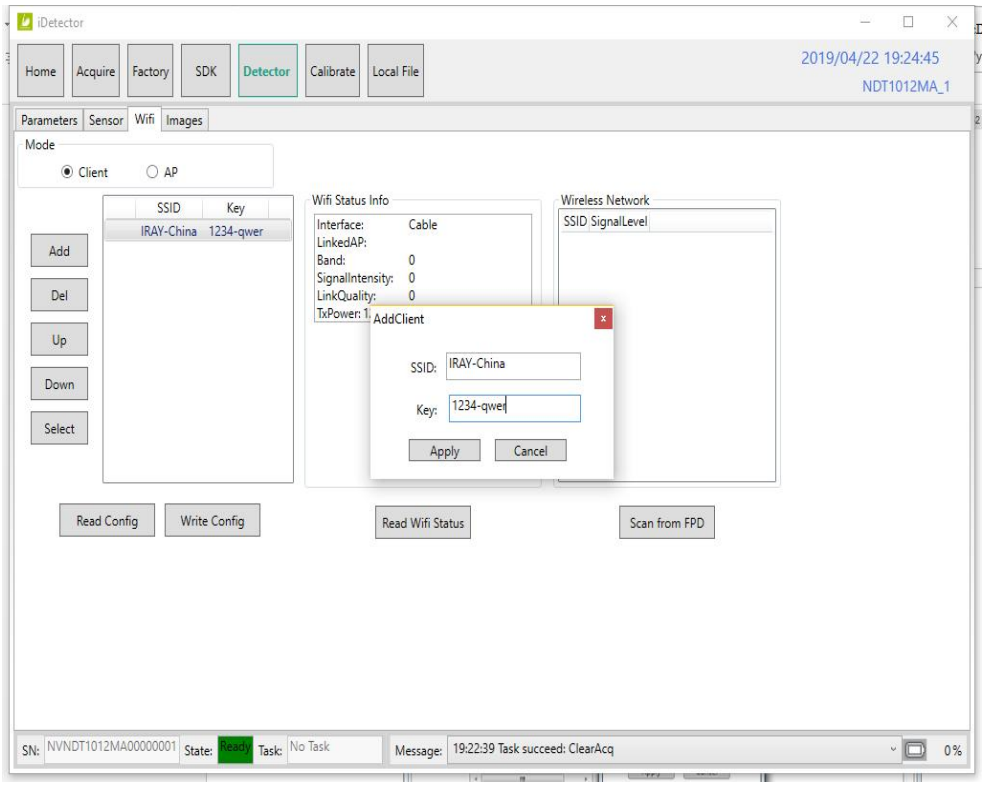
Click the Read Config button to read the current parameter configuration in the detector. After modifying the parameters, click the Write Config button to write the modified parameters to the detector.

After the detector is configured, the wireless signal of the detector can be searched on the workstation side (Need to configure a wireless network card).

A default password is required to be input during the connection process. In addition, similar to the wired connection, ensure that the IP address of the wireless network configuration is correct. The default IP address is 192.168.8.188, as shown in the following figure:



4.4.2 Client Mode



In Client mode, the detector side needs to configure the SSID and password of a router, as shown in the figure above. The detector is connected with the workstation through the router. Referring to the corresponding product manual for the setting of the router.

4.5 Software Interface

SDK provides the tool software iDetector:

32-bit system, iDetector.exe location: Tools\iDetector\w32

64-bit system, iDetector.exe location: Tools\iDetector\x64

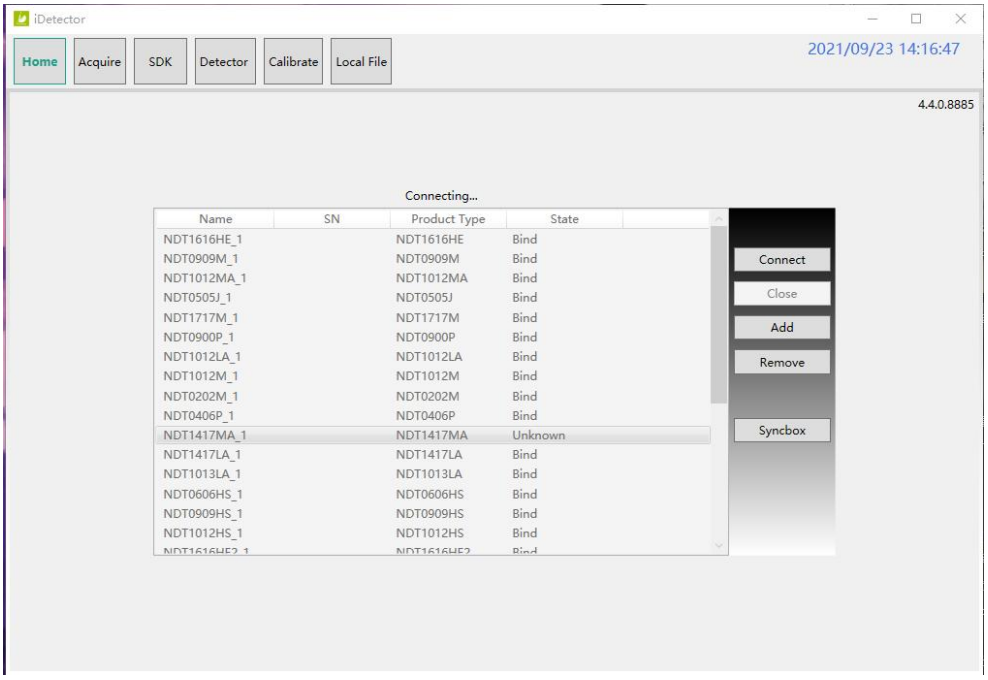
For detailed operation instructions of the software, referring to: Help\Doc

Double-click iDetector.exe to open the software, the page display contents may be different for different software versions without prior notice. NDT1417MA in the interface is equivalent to NDT1417MA, which will not be described later.

Interface	Function Description
Home	Mainly used to connect the detector and view the connection state
Acquire	Used to acquire images, choose correction method, store and process images (raw, Tiff formats)
SDK	Config.ini parameter settings, and Log level settings
Detector	Used for parameter configuration, acquisition method configuration, etc.
Calibrate	Used to generate and manage calibration template file
Local Files	Used to open local images and process images

4.5.1 Home Interface

After opening iDetector.exe, the main interface can be seen as follows. The main function of this interface is to connect the detector.



Item	Function Description
Name	Display detector name
SN	Display the SN number of the detector (this item can be omitted in the bind file and will be displayed in the list after the detector connection is successful)
Product Type	Display detector type
State	Display detector connection status (Bind, Unknown, Ready, etc.)

Button	Function Description
Connect	Click this button to connect the selected detector
Close	Close the connection to the selected detector
Add	Add a working directory
Remove	Delete a working directory
Syncbox	Open the Syncbox configuration window (if Syncbox is not configured in the system, you don't need to use this function)

4.5.2 Acquire Interface

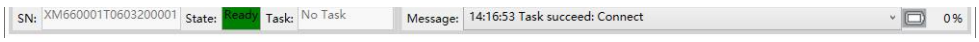
This page is mainly used for image acquisition in different modes. Users can select the image correction method according to their needs. The Acquire interface in different modes will be different.

After the image acquisition is completed, the acquired image is displayed in the image frame. The properties of the image are displayed in the Image Properties on the left side of the image. The latest 5 images are displayed in the Image List on the right side of the image. Double-click the image in the Image List to display the image in the image frame.

The acquired images can be saved in raw, tiff and Dicom file formats, and support single-frame saving and continuous saving. Dicom images do not support continuous saving.

Users can rotate and mirror the image; a ROI tool can be used to select the area to view the AVG, SV and SNR values of the image.

A status bar is located at the bottom of this page, the status bar shows the SN number of the detector, the current status and tasks, and feedback information of system execution commands. This status bar is also displayed on the pages of Detector, Calibrate, etc., and will not be described later.



Operation bar	Function Description
HWPostOffset	Select to use a FPD internal processor to perform PostOffset correction on the acquired image
HWGain	Select to use the FPD internal processor to perform Gain correction on the acquired image
HWDefect	Select to use the FPD internal processor to perform Defect correction on the acquired image.
Prep	Send an clear command to the FPD, the FPD will start the clear action, and use in conjunction with Acquire in Software mode.
PrepAcq	Send the clear acquisition command to the FPD, the FPD will start the clear, delay, and acquisition actions.
Acquire	Acquire images and use in conjunction with Prep in Software mode
Save	Save the currently acquired image, the format supports raw, tiff, and dicom
Sleep	Put the detector into sleep mode
Wakeup	Wake up the detector
PowerOff	Send a shutdown command to the FPD
Status bar	**Function description**

SN	The SN number of the currently connected detector
State	The state of the detector, such as Busy, Ready
Task	The detector's current task
Message	Feedback on the result of the action of the detector, such as succeded, failed

Image property bar	Function description
WW	Window width
WL	Window level
PosX	The X coordinate value of the current cursor point
PosY	The Y coordinate value of the current cursor point
Value	The value of the current cursor point
Width	Image width
Height	Image height
FPS	Acquisition frame rate
Frames	Acquisition frame number display
Rotate	Rotate the image clockwise, 90 degrees per rotation
Reverse	Rotate the image counterclockwise, 90 degrees per rotation
Mirror	Turn on or turn off mirror for the image
ROI	ROI tool, you can view the AVG, SV, SNR and other parameters of the image. Hold down the Ctrl key and press the right mouse button to draw multiple ROI areas. To delete an ROI area, use the delete button.
WW/WL	Automatically adjust the window width and window level according to the frame selected area of the right button
Image List	Show the latest 5 images acquired

Shortcut key description:

Double-click the left mouse button to center and maximize the image;

Double-click the right mouse button to restore the window width and window level to WL: 32767/WW: 65535;

Drag the image with the left mouse button;

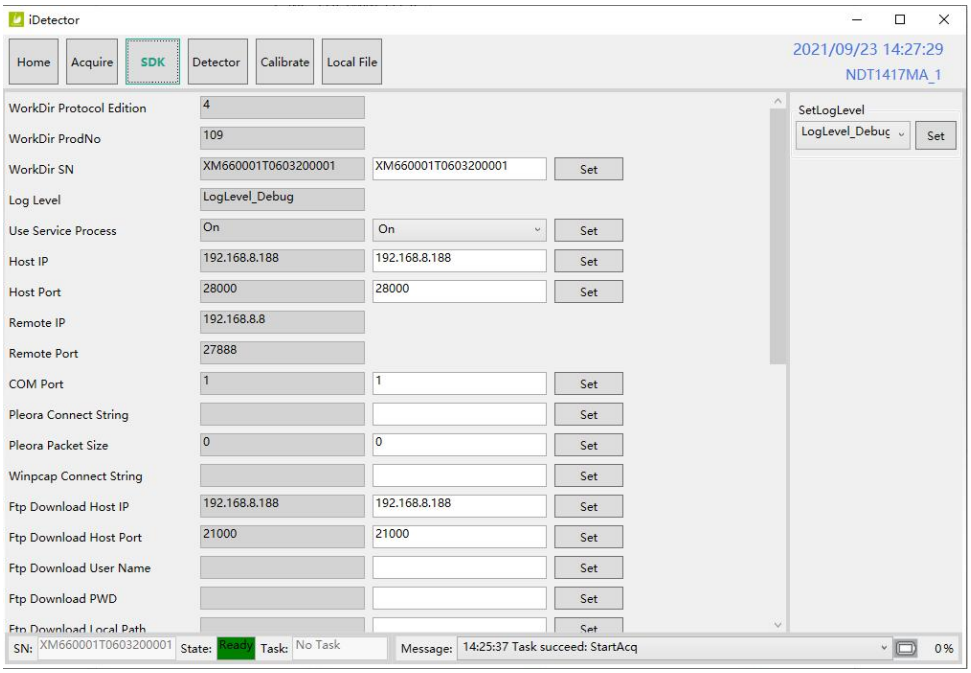
Horizontally drag the right mouse button to adjust the display of window width, and vertically drag the right mouse button to adjust the window level;

F3 button: Quickly locate the window width and window level of the image.

F4 button: Automatically adjust the window width and window level.

4.5.3 SDK Interface

This interface is used to configure the config.ini parameters and set the log display level in real time (SetLogLevel drop-down box), as shown in the following figure.



4.5.4 Detector Interface

There are 3 tabs in this interface: Parameters, Sensor and Images. When entering the Detector interface, the Parameters tab is activated by default.

4.5.1 Parameters Tab

This page has five areas, including a parameter item area, a parameter reading area, a parameter writing area, and a function operation button area from left to right, and a status bar at the bottom.

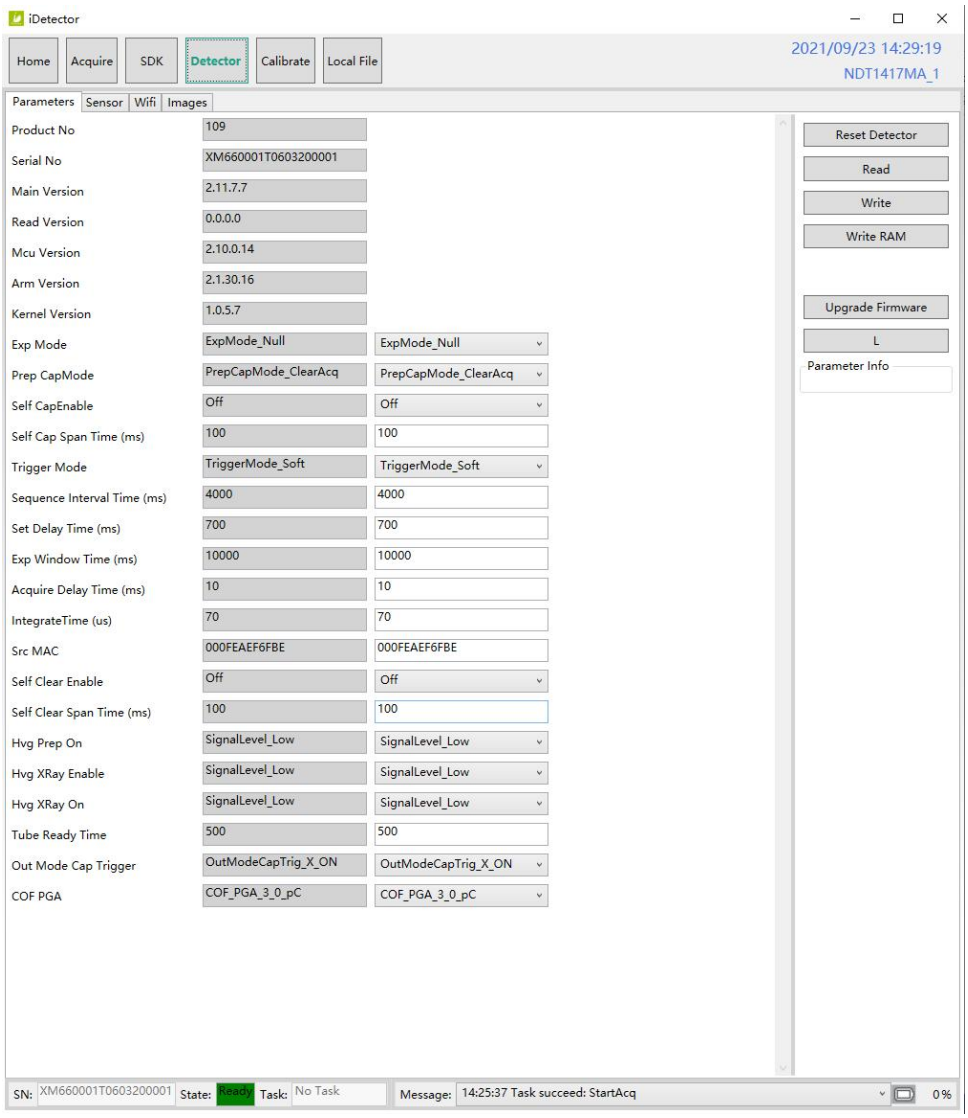
Parameter item: display parameter name.

Parameter reading area: the parameter value read by Read is displayed in this area.

Parameter writing area: Enter the value of the corresponding parameter in this area and click Write to make the setting take effect.

Function operation button area: display function operation button.

Status bar: feedback detector status and information of reading and writing parameters, etc.



Parameter configuration item description:

Parameter	Description	Whether can be changed or not
Product No.	Product number	No
Sub Product No.	Sub product number	No
Main Version	Main board firmware version number in the detector	No
Read Version	Read board firmware version number in the detector	No
Mcu Version	MCU version number in the detector	No
Arm Version	ARM App version number in the detector	No

Kernel Version	ARM Kernel version in the detector	No
Prep CapMode	PrepCapMode_ClearAcq, no changes allowed	No
Self CapEnable	Not applicable to this product, no changes allowed	No
Self Cap Span Time	Not applicable to this product, no changes allowed	No
Trigger Mode	Trigger mode, support Software, prohibit setting to other modes	No
Exp Mode	Acquisition mode design Null, single acquisition mode Continous, continuous acquisition mode	Yes
SequenceIntervalTime (ms)	Acquisition collection interval	Yes
Set Delay Time(ms)	Delay time setting	No
Exp Window Time(ms)	Exposure window settings	No
Acquire Dleay Time(ms)	Not applicable to this product, no changes allowed	No
Integrate Time(us)	Not applicable to this product, no changes allowed	No
Src MAC	Detector MAC address	Yes
Self Clear Enable	Self-clear enable control, off by default	No
Self Clear Span Time(ms)	Self-clear interval	No
Hvg Prep On	Not applicable to this product, no changes allowed	No
Hvg Xray Enable	Not applicable to this	No

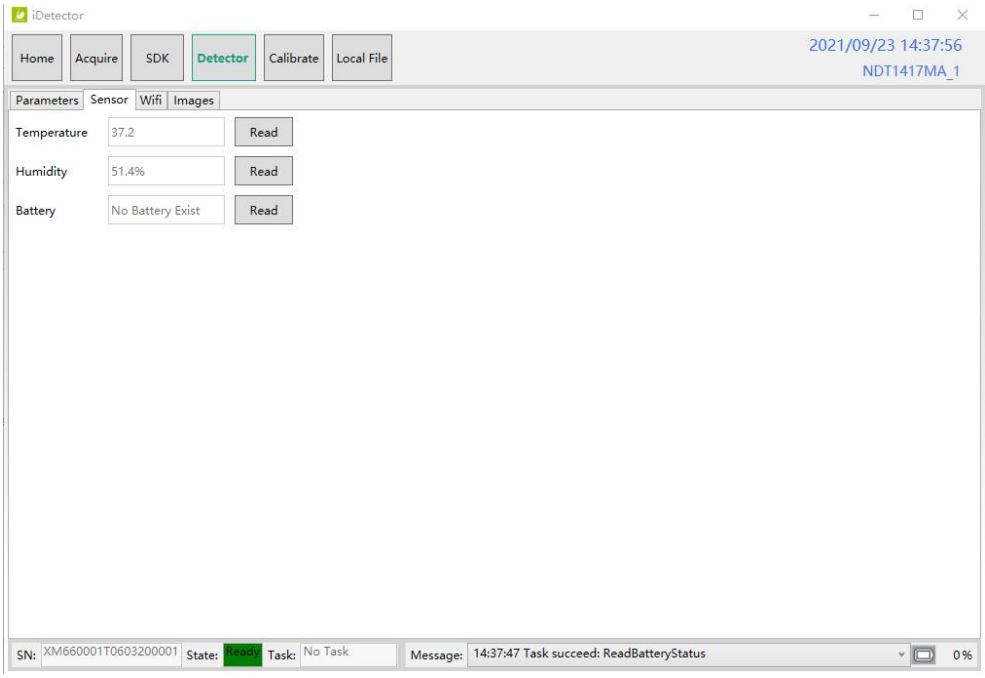
	product, no changes allowed	
Hvg Xray On	Not applicable to this product, no changes allowed	No
Tube Ready Time	Not applicable to this product, no changes allowed	No
Out mode cap trigger	Not applicable to this product, no changes allowed	No
COF PGA	Not applicable to this product, no changes allowed	No

Botton function description:

Button	Description
Reset Detector	Restart the detector
Read	Read parameters of the detector
Write	Write parameters to the interior of the detector. The parameters are valid after change when power is off
Write RAM	Write parameters to the interior of the detector, the parameters are invalid after change when power is off
Upgrade Firmware	Firmware upgrade
L	Upload the ARM log in the detector

4.5.2 Sensor Tab

This page is mainly used to check the temperature and humidity of the detector.



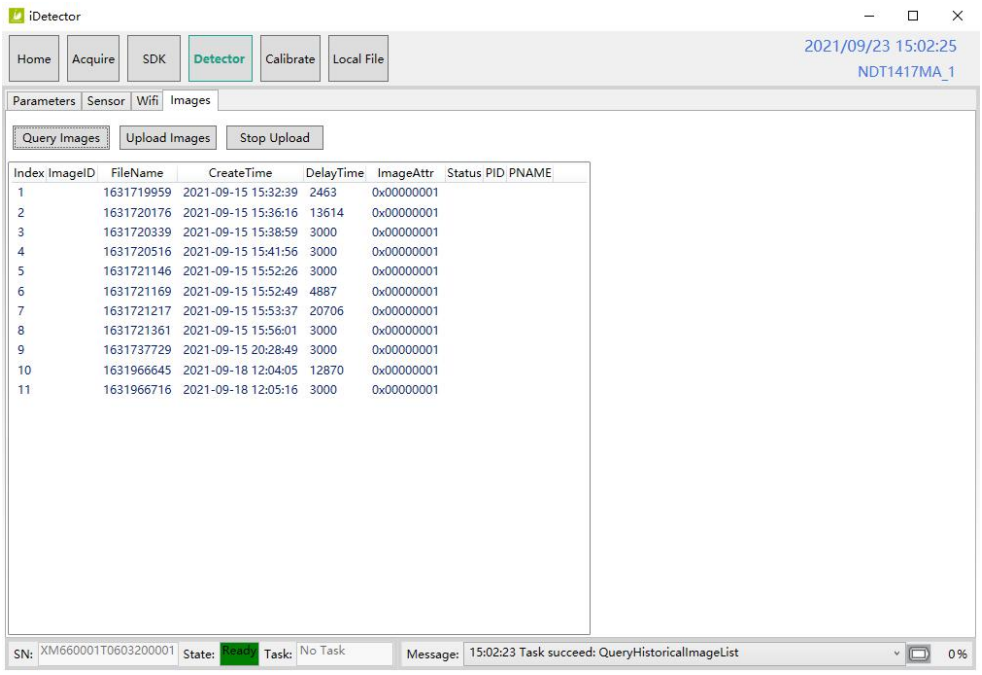
Sensor Type	Description
Temperature	Click Read to read the detector temperature value.
Humidity	Click Read to read the detector humidity value.
Battery	Click Read to read the detector power

4.5.3 Win Tab

Referring to Section 4.4

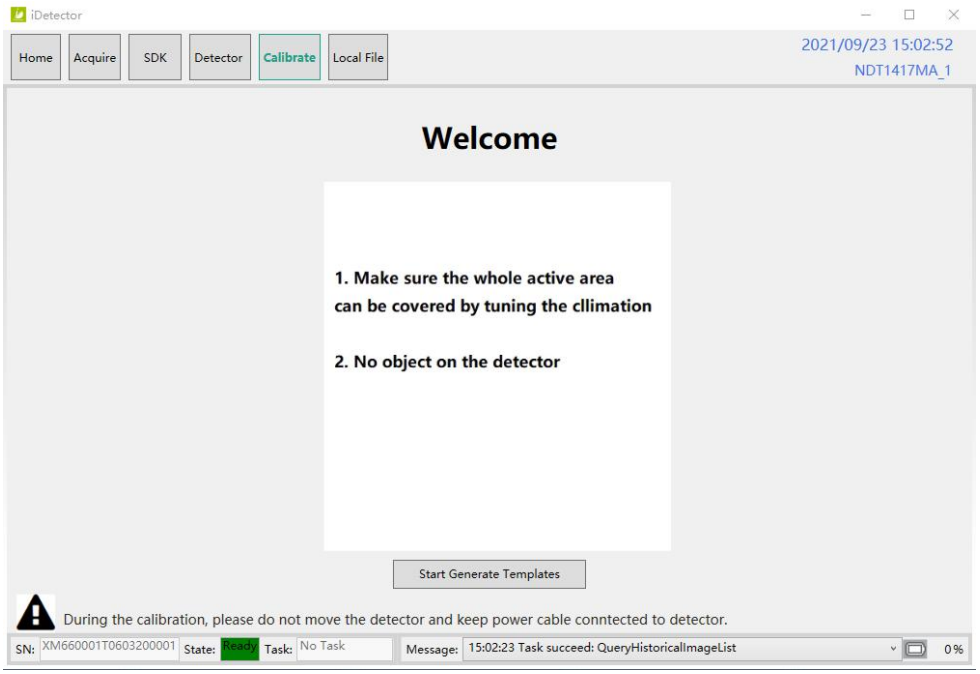
4.5.4 Images Tab

Query the image inside the detector and upload the image to the workstation.

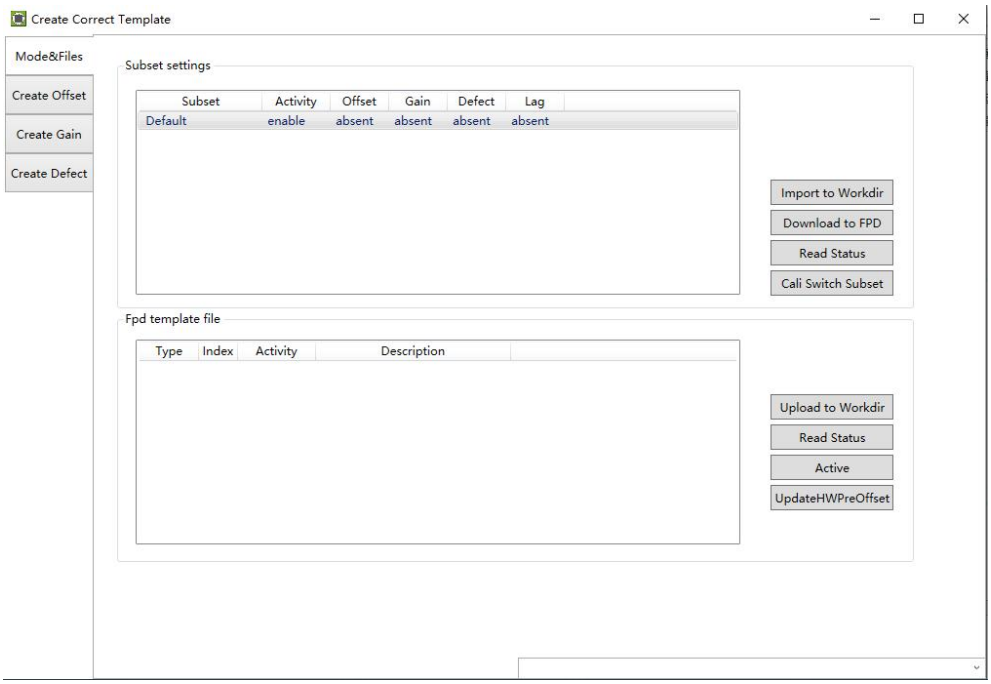


4.5.5 Calibrate Interface

This interface is used to generate a calibration template.



Click Start Generate Templates to enter the template generation page.



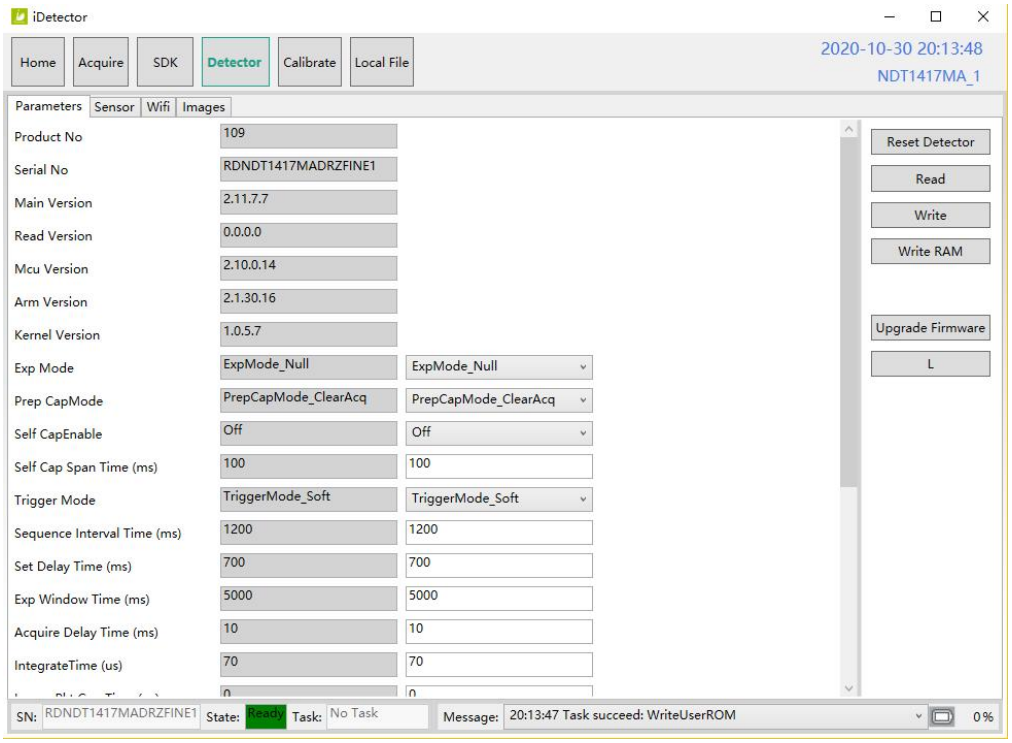
Subpage	Description
Mode&Files	Administrating template file
Create Offset	Create an Offset template
Create Gain	Create a Gain template
Create Defect	Create a Defect template

Mode&Files Page Button	Description
Import to Workdir	Copy the CD-ROM or templates at other locations to the current working directory
Download to FPD	Download the local template to the detector
UpLoad to Workdir	Upload the template in the detector to the current working directory of the SDK
Upload Lag	Upload the Lag template in the detector to the current working directory of the SDK
Active	Use the currently selected calibration template
UpdateHWPreOffset	Update the Pre offset template in the detector (this function is usually not needed)
ReadStatus	Read the status of the calibration template in the current detector or current working directory

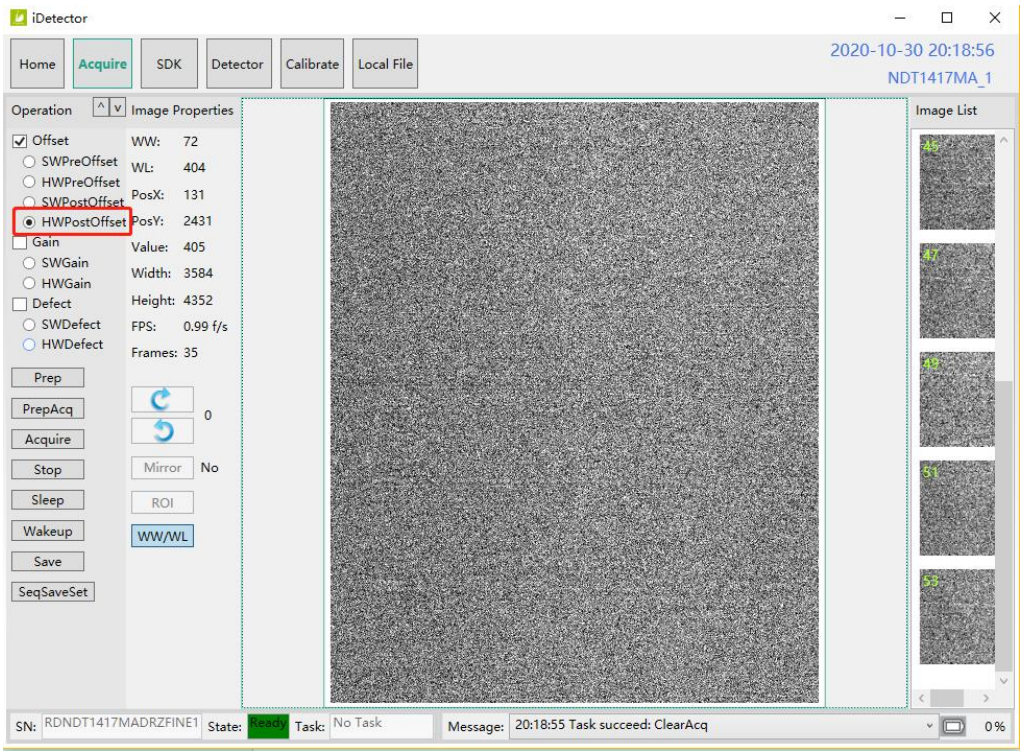
4.5.5 Generate Offset, Gain, Defect templates

Software-null Mode：

The current version of IDetector is successfully connected. In the Detector option, set Exp Mode to Exp Mode_Null and Trigger Mode to TriggerMode_soft,

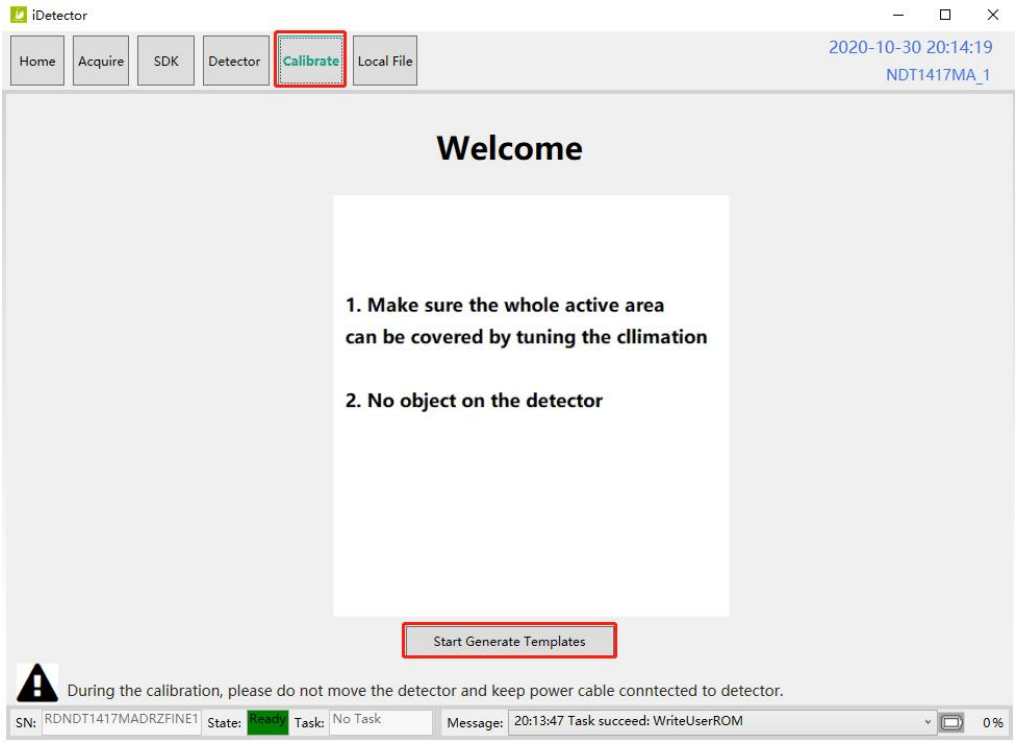


Check HWpostoffset correction under the Acquire page。

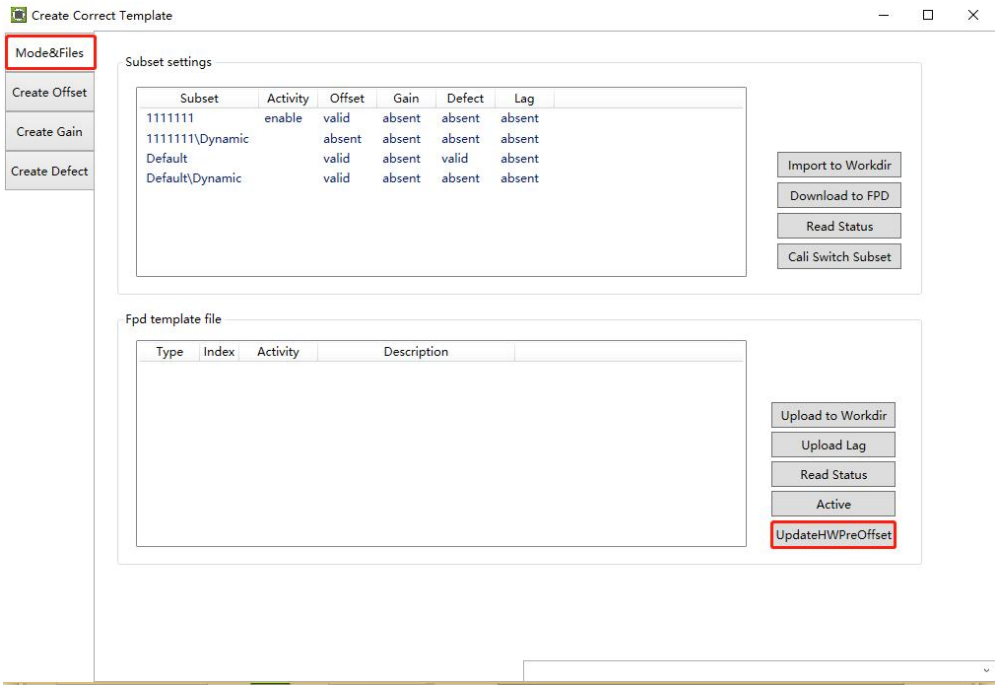


Generation Gain template：

Click "Calibrate" to create a Gain calibration template, as shown below, click "Start Generate Templates" to enter the next step。



On the Mode&Files interface, click UpdateHWPreOffset in the lower right corner to update the offset correction template. This process takes a long time, about 10 minutes, please wait. After this item is updated once, there is no need to do each test. Only when the detector is shut down for a long time or the image confirmation is out of calibration, you can try to update again. Do not do it within 10 days of downtime, skip this
step.



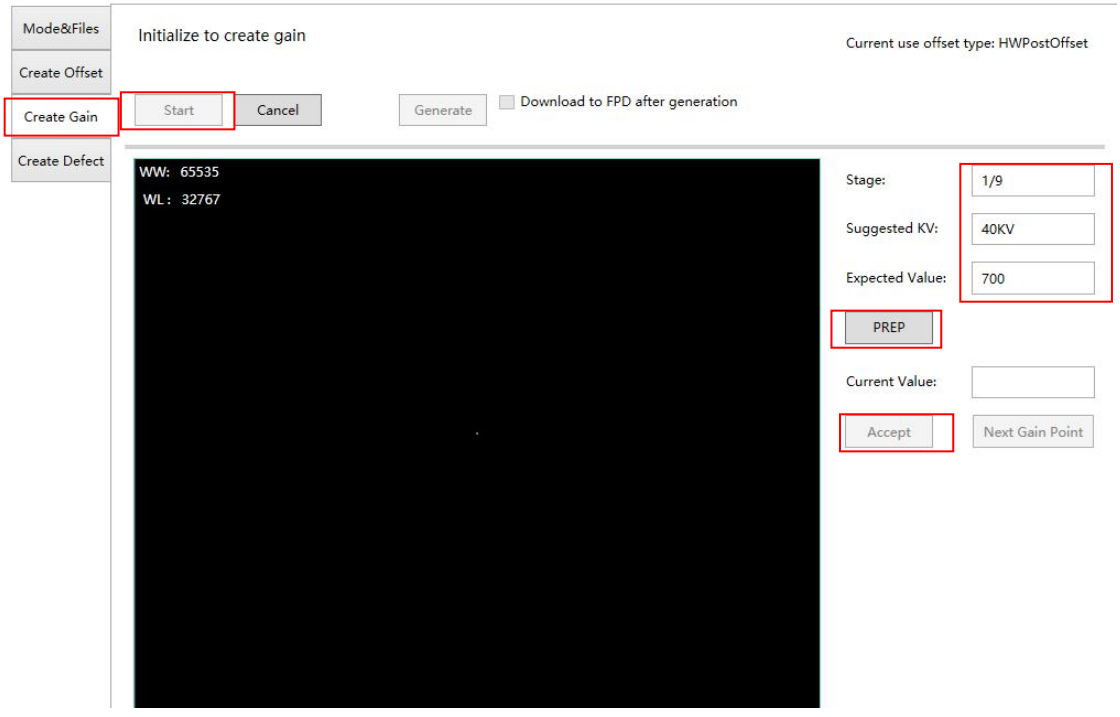
Enter "Create Gain" and click start, the corresponding parameters as shown in the figure below appear. The following two methods are given for gain correction. The first one is recommended (it can effectively improve the channel artifacts that appear in the fixed position inside the thick metal):

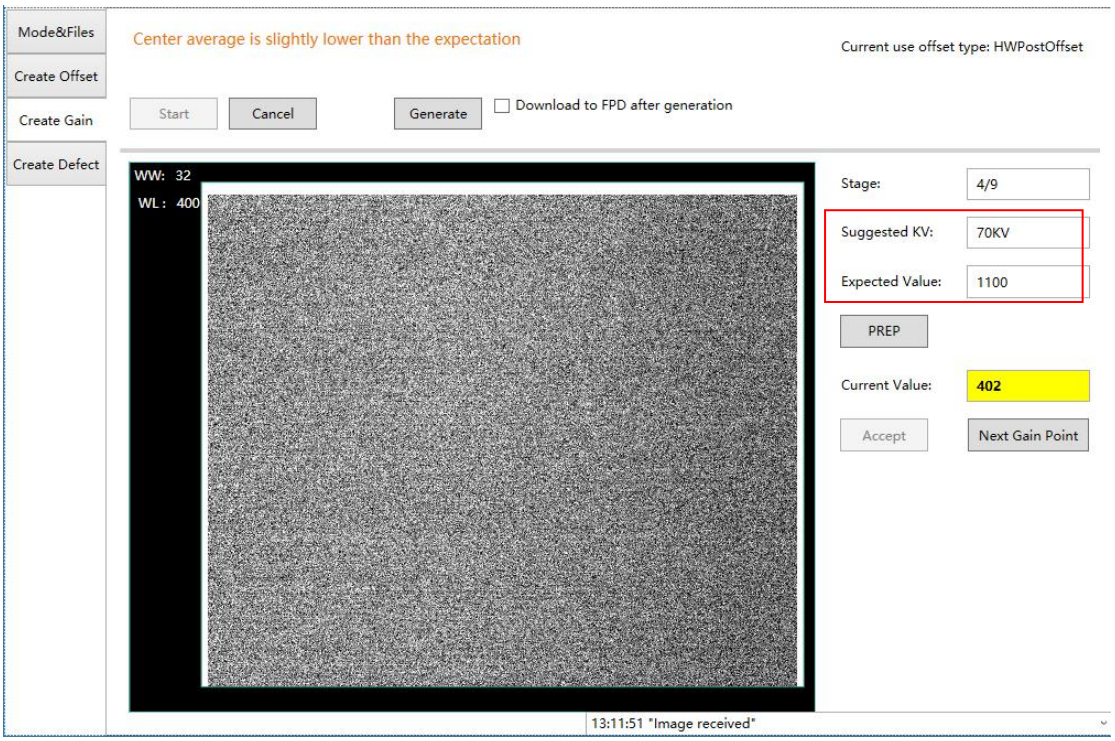
Method one:

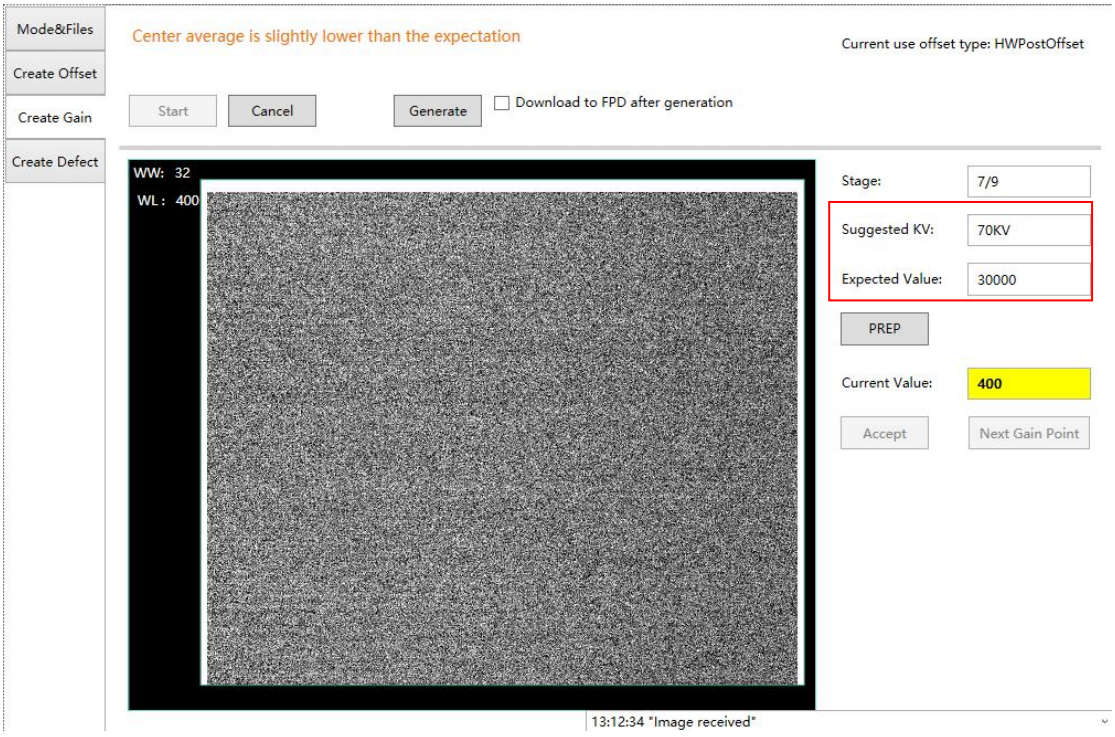
Adjust the exposure gear that can reach the desired Value (about 700) according to the kV given in the interface, click PREP, and then press the hand brake to start exposure. After the exposure is complete, click Accept. Then repeat the image acquisition of the expected Value for a total of 3 images.

After the third image is collected, the next expected Value (approximately 1100) is automatically changed. After the same collection of 3 photos is completed, the next set of expected Value values (about 30,000) are automatically changed, and 3 photos are also collected. A total of 9 images are collected in 3 gears. When these 9 pictures only adjust mAs and cannot reach the expected value。

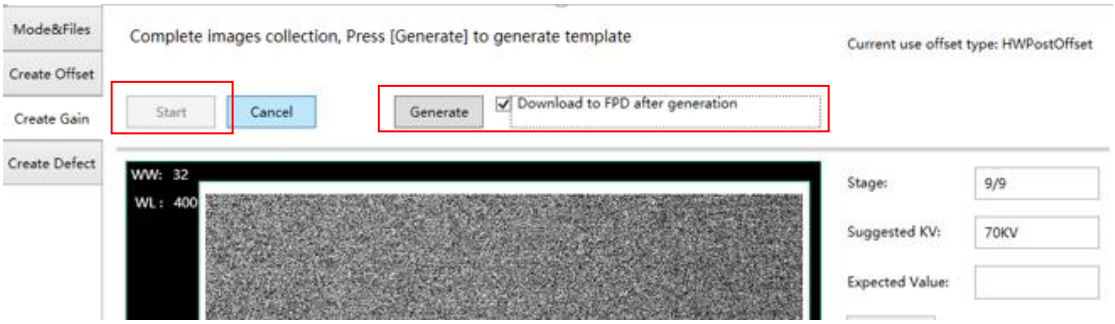
Note: Some industrial ray sources may not be able to adjust the low gear kV. You only need to give priority to the desired value (700, 1100, 30000). When the KV is lowered, the desired value is still not achieved. You can try to increase the copper filter or aluminum filter. To achieve the desired gray level, to ensure the best image quality



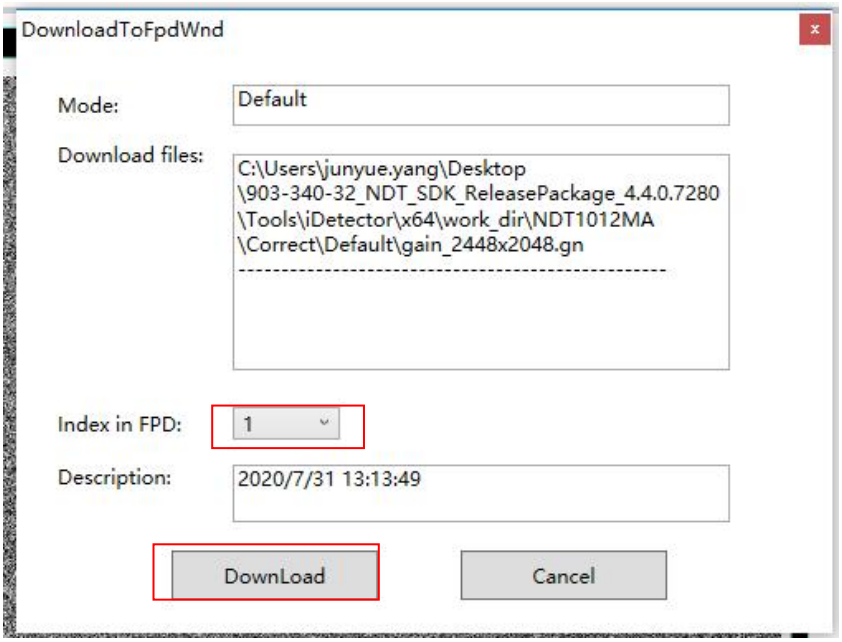

Mode&Files
Create Offset
Create Gain
Create Defect
Center average is slightly lower than the expectation
Current use offset type: HWPostOffset
Start
Cancel
Generate
Download to FPD after generation
WW: 32
WL : 400
Stage:
4/9
Suggested KV:
70KV
Expected Value:
1100
PREP
Current Value:
402
Accept
Next Gain Point
13:11:51 "Image received"


Mode&Files
Create Offset
Create Gain
Create Defect
Center average is slightly lower than the expectation
Current use offset type: HWPostOffset
Start
Cancel
Generate
Download to FPD after generation
WW: 32
WL : 400
Stage:
7/9
Suggested KV:
70KV
Expected Value:
30000
PREP
Current Value:
400
Accept
Next Gain Point
13:12:34 "Image received"

After shooting 9 gain template images, first check the "Download to FPD after generation" above the image, and then click the "Generate" button to generate the gain template.



Select the template number, the default is 1, and click Download. To generate a gain template。

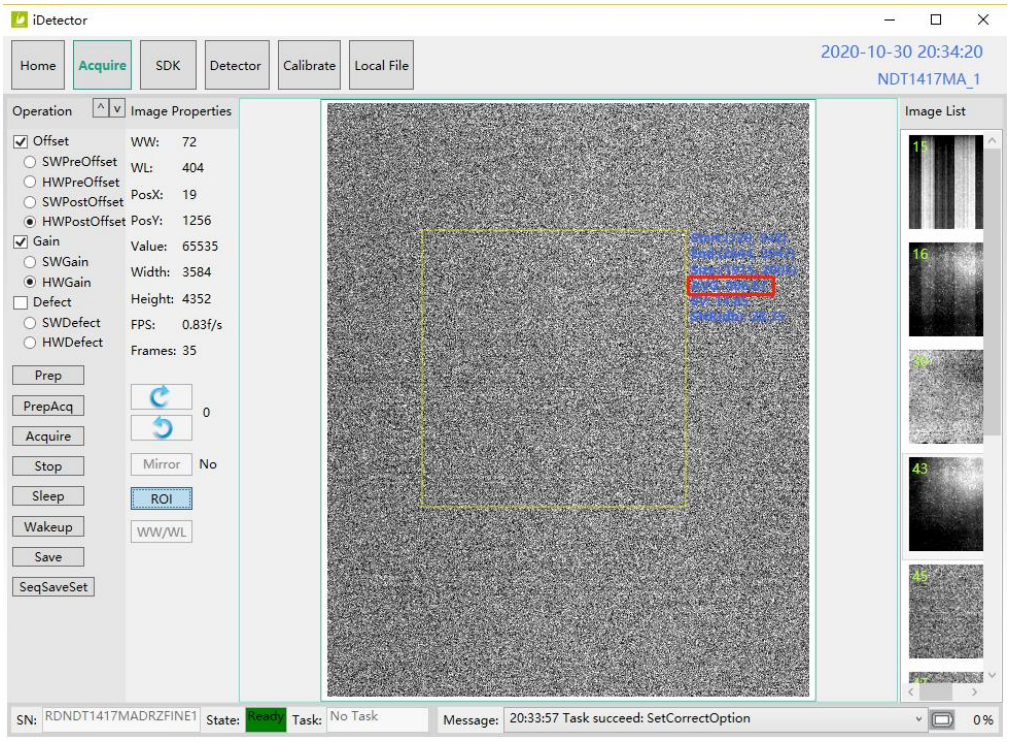


Method two：

When shooting fixed workpieces and fixed measurement, you can use method two to make templates

For the workpiece shooting, find suitable conditions according to the user's image effect needs, and perform empty field shooting according to suitable

conditions.



Select the ROI tool to get the gray value in the red box, and use the current gray value as the expected gray value of the Gain template to correct (the recommended parameters can be ignored here) to get the best template in this way。

Note: Some industrial ray sources may not be able to adjust the low gear kV. You only need to give priority to the expectations (700, 1100, 30000). When the KV is lowered, the expectations are still not met. You can try to increase the copper filter or aluminum filter. Achieve the desired gray level and ensure the best image quality。

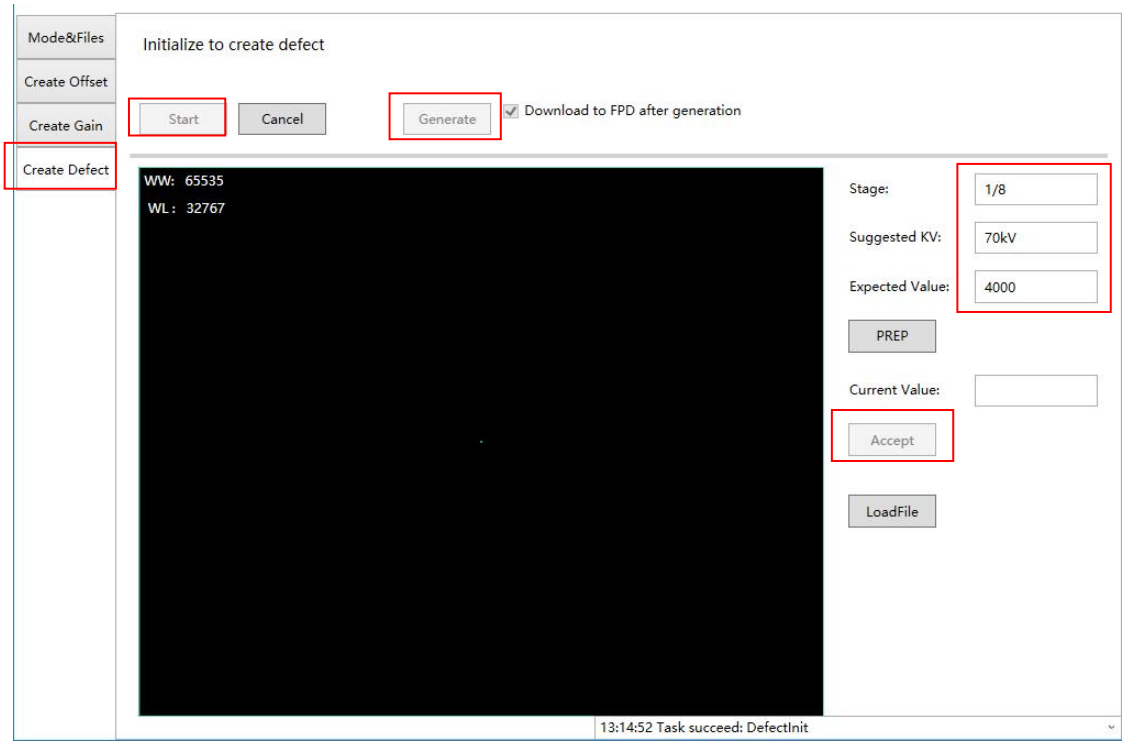
Generation Defect template：

Click Create Defect to generate the defect correction template, and then click start, the following interface appears。

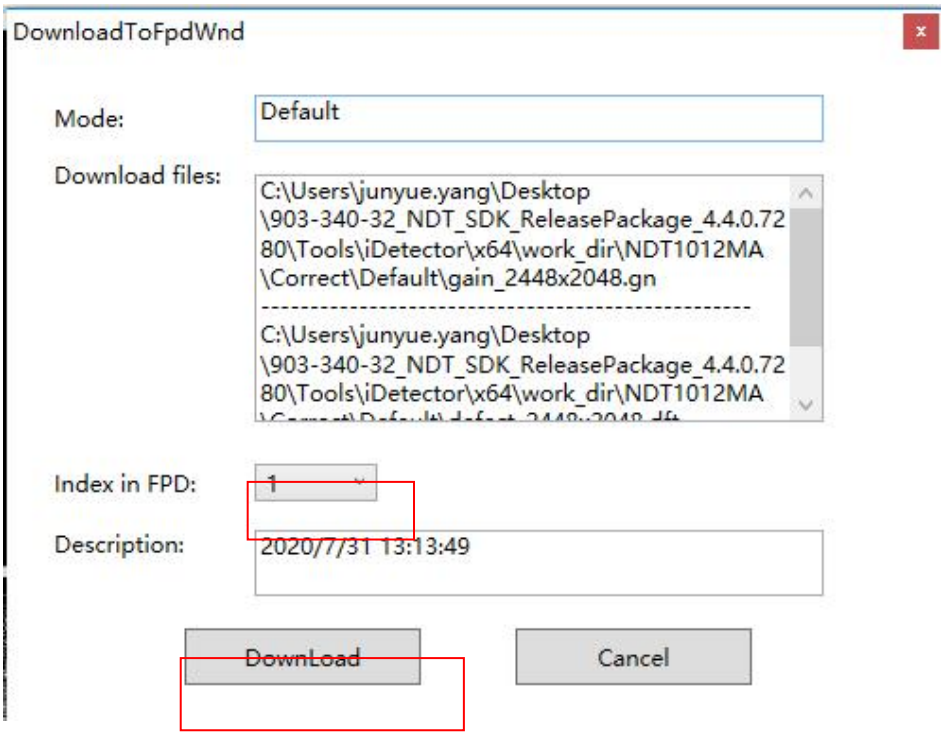
Adjust the exposure gear that can achieve the desired Value according to the given kV. Click PREP, and then press the hand brake to start exposure. After the

exposure is complete, click Accept. You can start the second image acquisition, repeat the steps and refer to the interface prompts. After all 8 images are collected, click Generate button to generate Defect correction template;

Note: Some industrial ray sources may not be able to adjust the low gear kV. You only need to give priority to the Expected Value. When the KV is lowered, the Expected Value still cannot be achieved. You can try to increase the copper filter or aluminum filter to achieve the desired grayscale. Ensure the best image quality.。

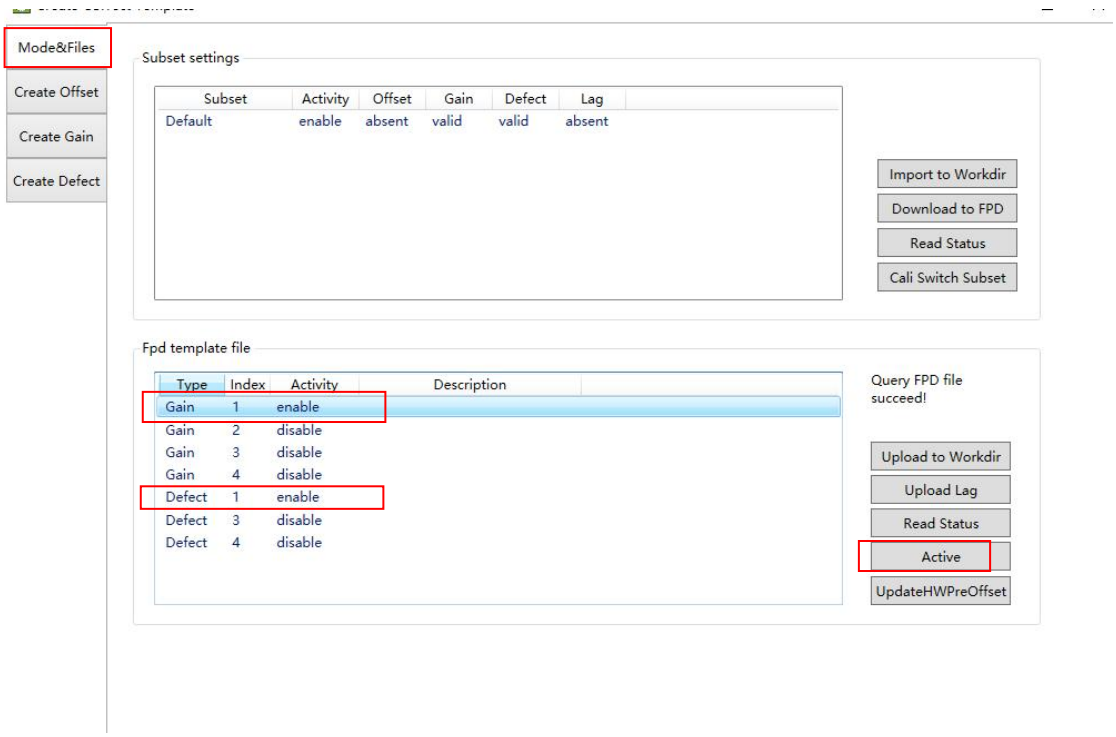


After the Defect template is completed, click Generate directly, wait for the following picture information to appear, and then click DownLoad to complete the template loading。



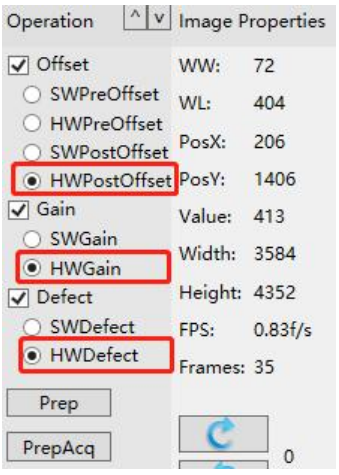
Confirm that the generated gain template and defect template are available

Select the mode&Files option, click Read Status in the lower right corner to read the template status, and confirm that the generated gain1 and defect1 templates are in the enable state. If it is in the disabled state, select gain1 or defect1, and click Active in the lower right corner to activate。



Use hardware calibration template

Select HWpostOffset, HWGain and HWDefect in the Acquire interface to start capturing images。

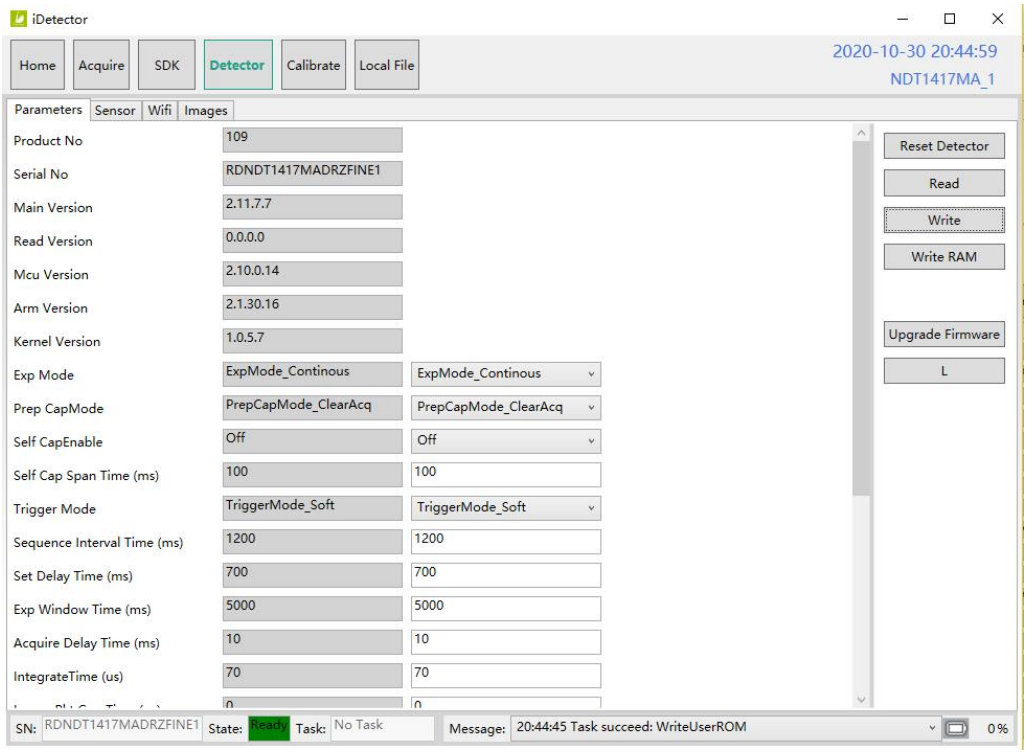


After exposing the image above, the calibration template in the detector just loaded is used。

Soft-Continous Mode

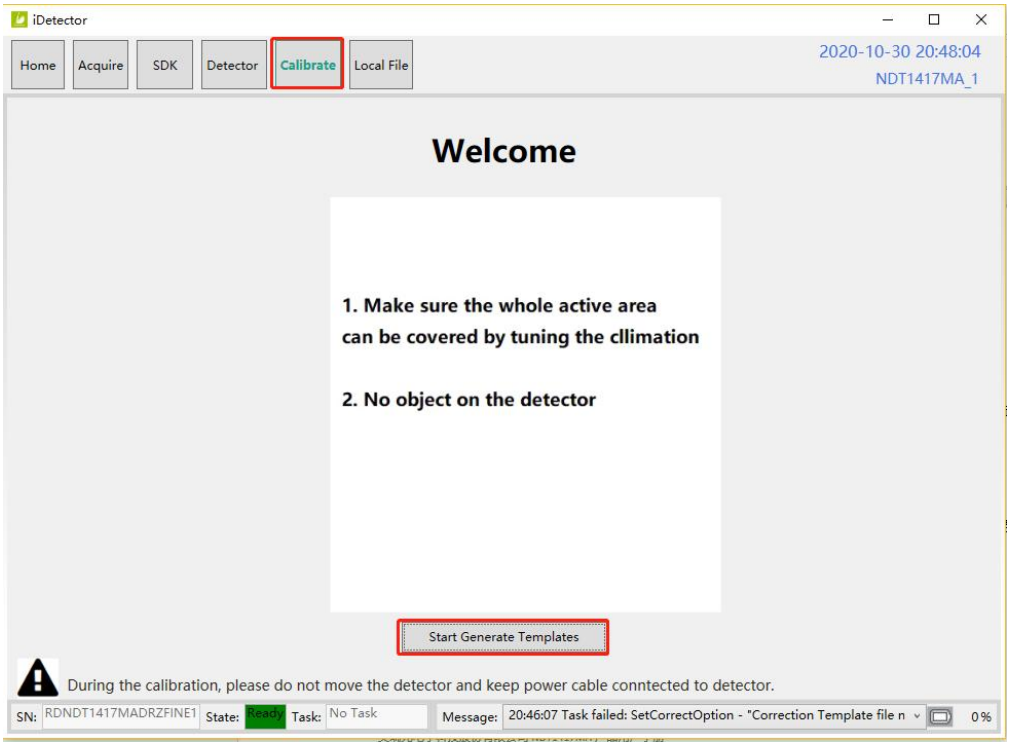
After successfully connecting to the current version of IDetector, in the Detector option, set Exp Mode to Exp Mode_Continous and Trigger Mode to TriggerMode_soft. Click on the right test Write to write。

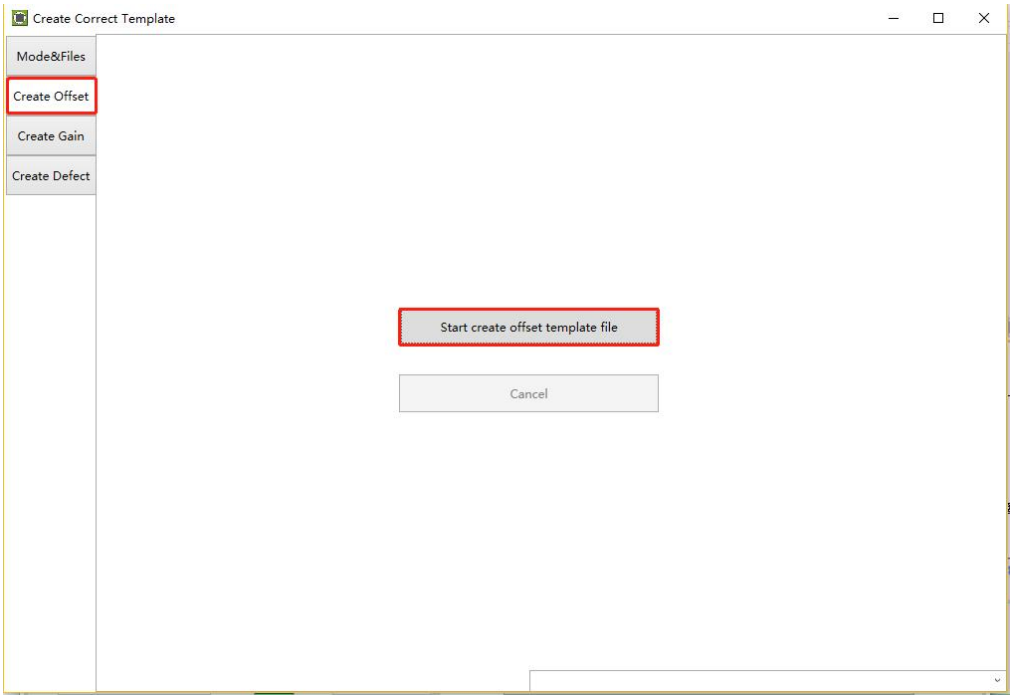
When the box on the left side of the red box in the figure below shows Exp Mode_Continous, the writing is successful。

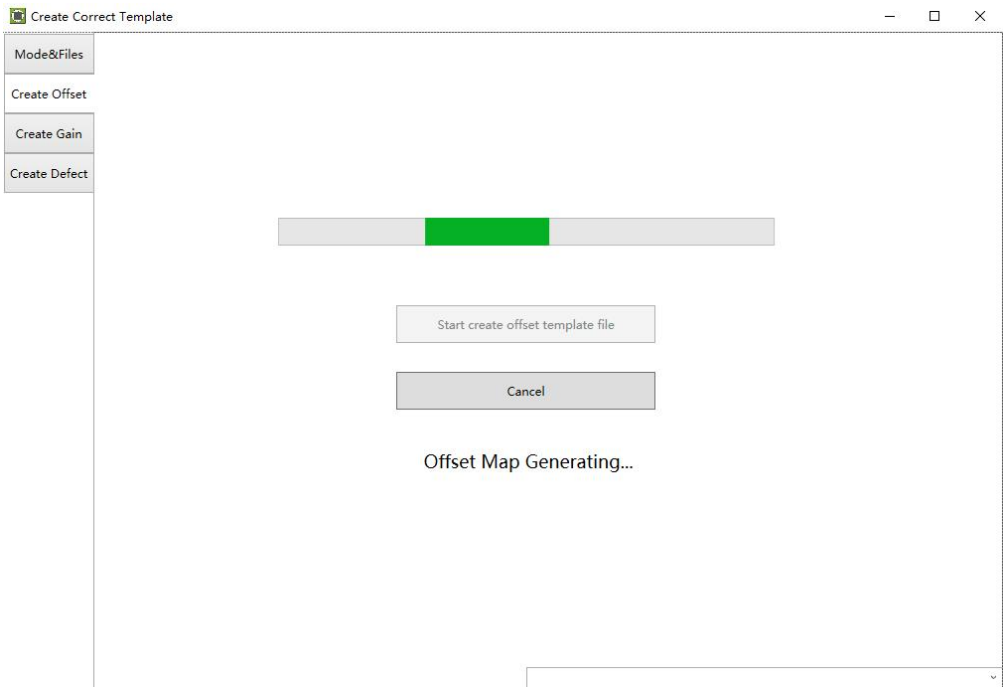


Generation Offset template

In the Calibrate interface, click Start Generate Templates, click Great offset, and then click Start Great offset Templates. When the page prompts Offset MAP Generated!, the offset generation is now complete。

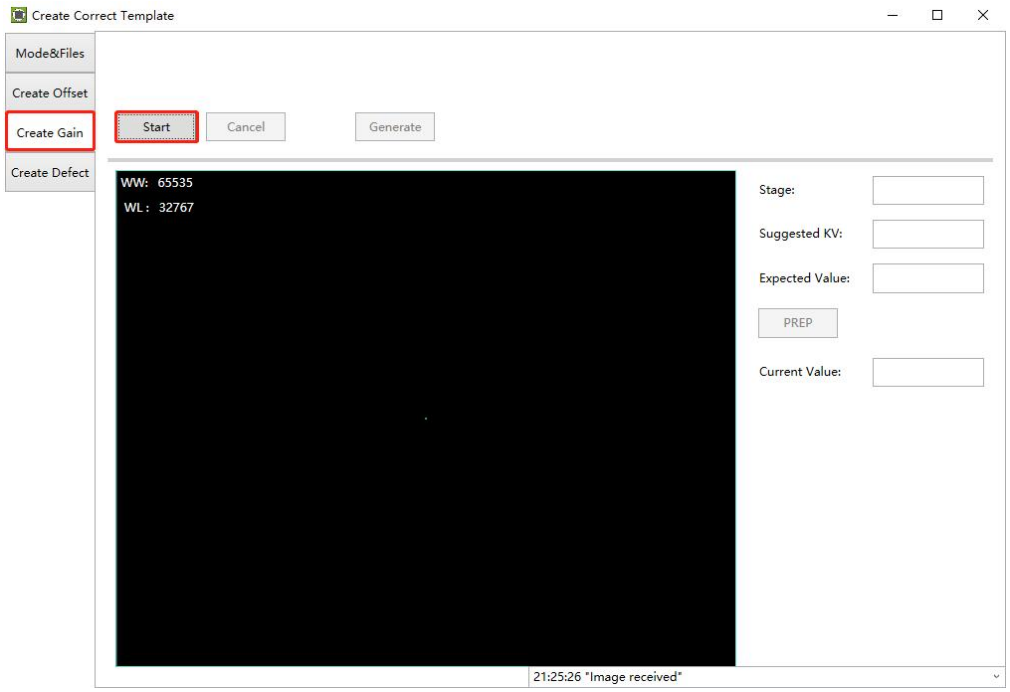

iDetector
Home
Acquire
SDK
Detector
Calibrate
Local File
2020-10-30 20:48:04
NDT1417MA_1
Welcome
1. Make sure the whole active area
can be covered by tuning the cllimation
2. No object on the detector
Start Generate Templates
During the calibration, please do not move the detector and keep power cable conntected to detector.
SN: RDNDT1417MADRZFINE1
State: Ready
Task: No Task
Message: 20:46:07 Task failed: SetCorrectOption - "Correction Template file n
0%


Create Correct Template
Mode&Files
Create Offset
Create Gain
Create Defect
Start create offset template file
Cancel



Generation Gain template

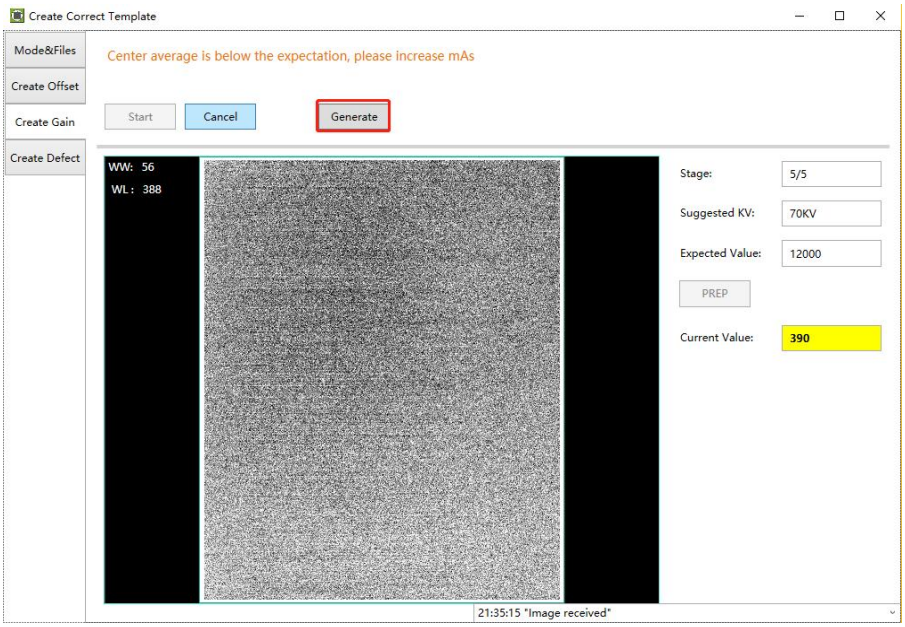
Click the Greate Gain template to generate the Gain template, and click Start at the same time to start the gain calibration process



Click prep to start Gain calibration and turn on the ray source。

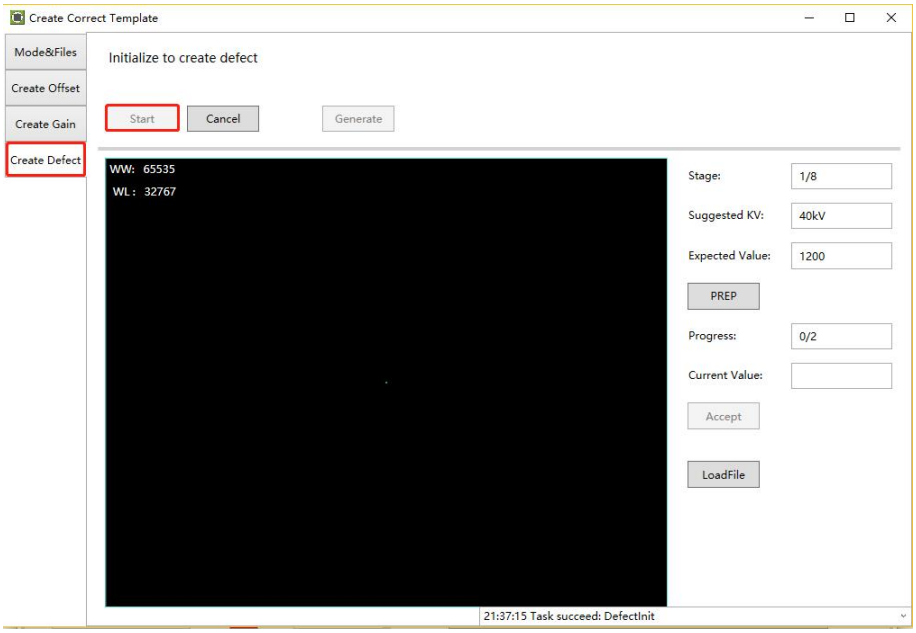
Note: For some industrial ray sources, it may not be possible to adjust the low gear kV. You only need to give priority to the Expected Value. When the KV is lowered, the expected value is still not achieved. You can try to increase the copper filter or aluminum filter to achieve the desired grayscale.。

After completing the collection of 5 desired grayscale images, click Genrate to complete the template Download



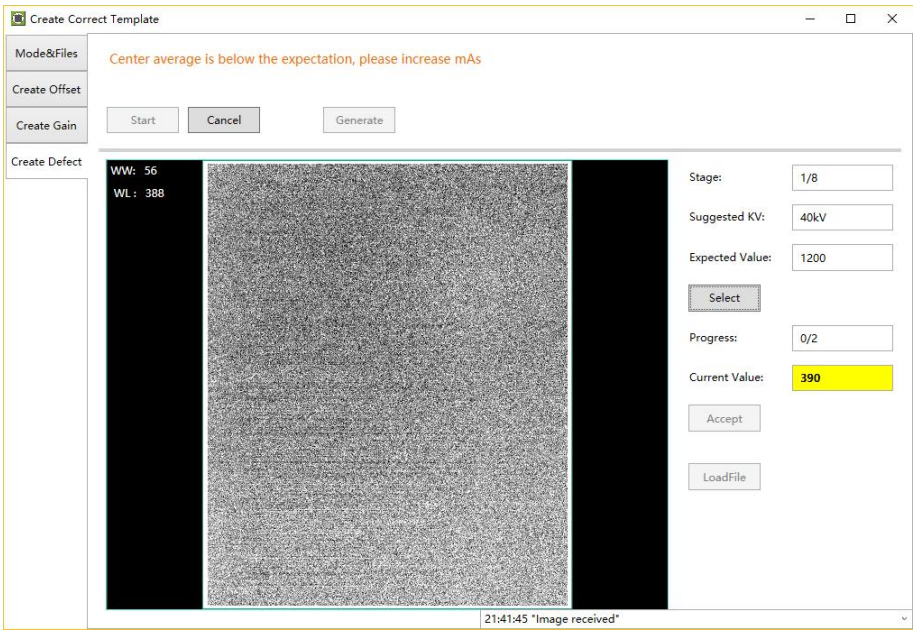
Generation Defect template

Click Greate Defect, click Start, enter the Defct calibration process，

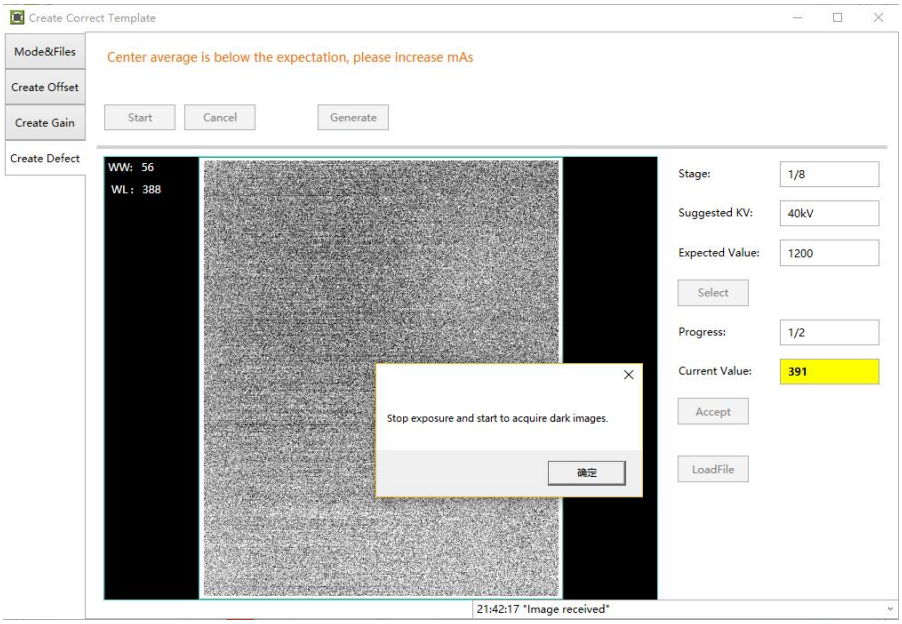


Click prep, start Defect correction, turn on the ray source, select Select to complete the first step。

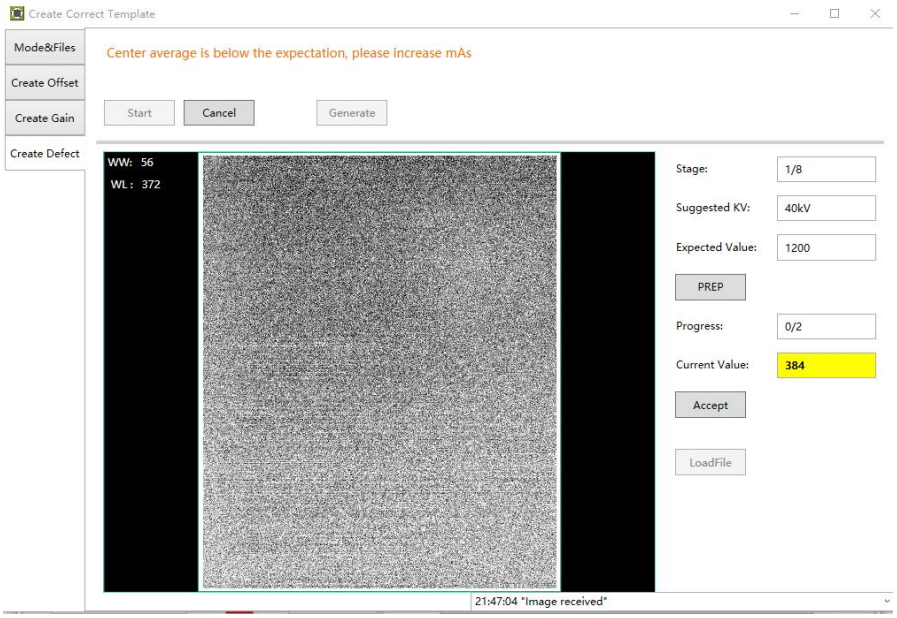
Note: For some industrial ray sources, it may not be possible to adjust the low gear kV. You only need to give priority to the Expected Value. When the KV is lowered, the expected value is still not achieved. You can try to increase the copper filter or aluminum filter to achieve the desired grayscale. Ensure the best image template quality.



After acquiring a light image, turn off the ray source according to the prompts and click the confirmation button in the prompt box.

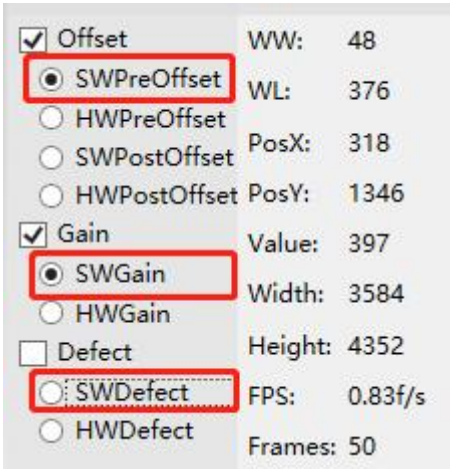


Click Accept to receive

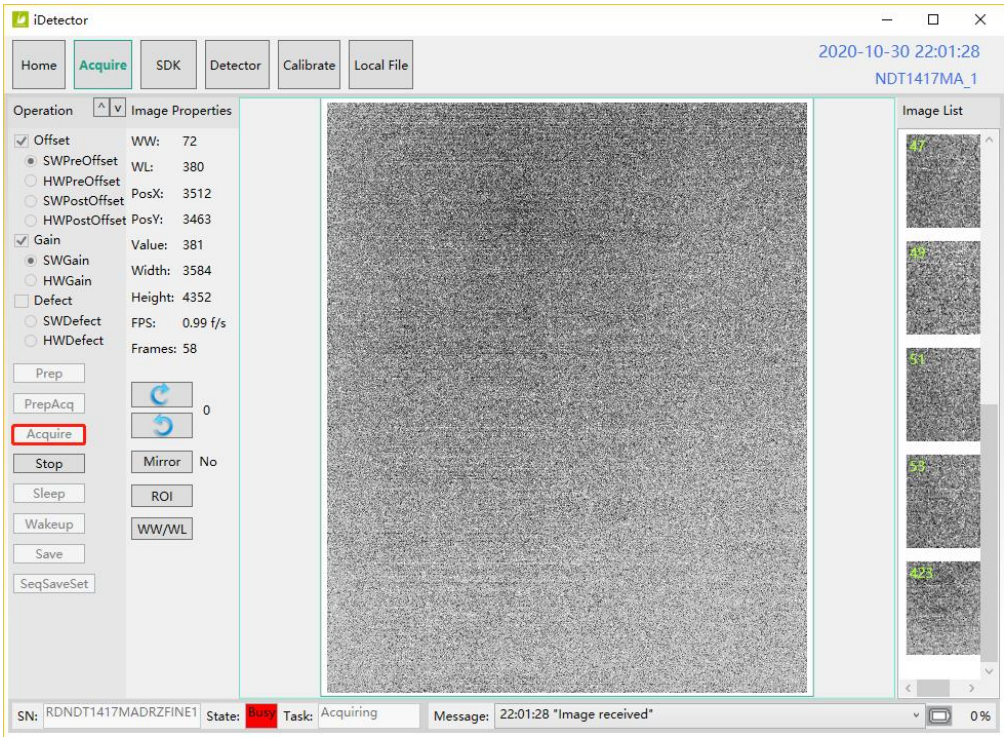


After completing the desired gray-scale image acquisition according to the instructions on the operation interface, click Genrate to complete the template download

Select SWpostOffset, SWGain and SWDefect in the Acquire interface to start capturing images。

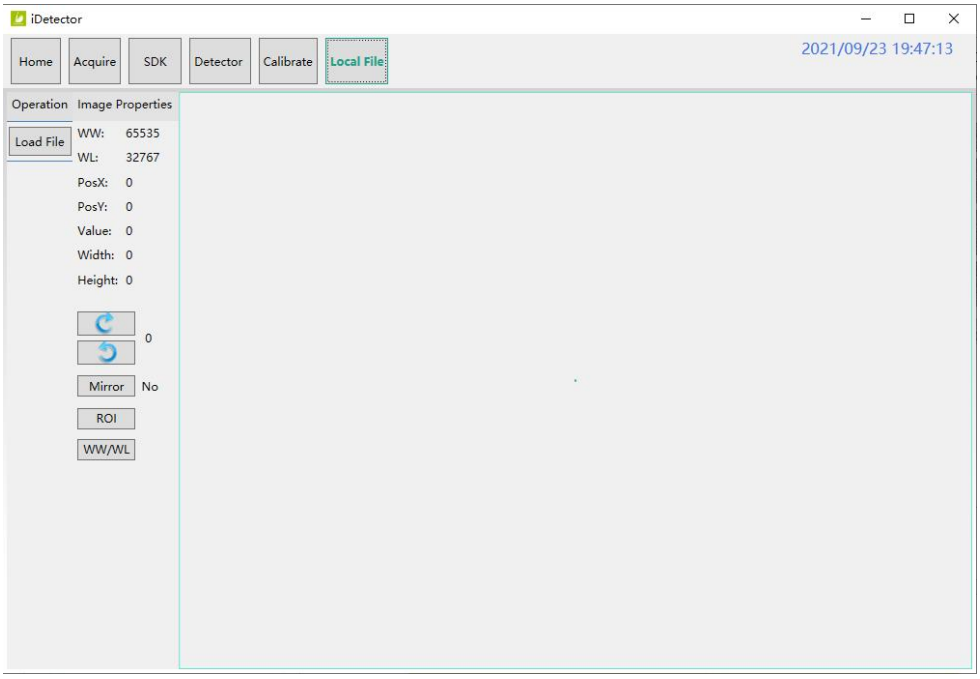


Load calibration template ,Click Acquire to start the image acquisition, click Stop to end the image acquisition。



Local Image Check

Click “Local File” button in “Local File” UI, choose the specified file。



Choose images stored in Workstation, images would be shown on screen

Image property bar	Function Description
WW	Window width
WL	Window level
PosX	The X coordinate value of the current cursor point
PosY	The Y coordinate value of the current cursor point
Value	The value of the current cursor point
Width	Image width
Height	Image height
	Rotate the image clockwise, 90 degrees per rotation
	Rotate the image counterclockwise, 90 degrees per rotation
Mirror	Turn on or turn off mirror for the image
ROI	ROI tool, the AVG, SV, SNR and other parameters of the image can be viewed. Hold down the Ctrl key and press the right mouse button to draw multiple ROI areas. Use the delete button to delete the ROI area.
WW/WL	Automatically adjust the window width and window level according to the frame selected area of the right button

5. Operation and Use

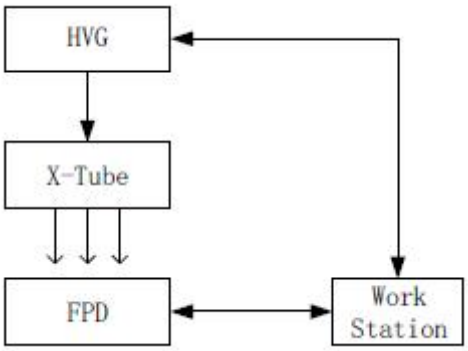
5.1 Starting Up

The detector is started up mainly in the following steps:

- Power on the detector by inserting the battery or connecting the adapter after checking the hardware;
- Wait until the indicator status keeps on (indicating that data link self-check is finished);
- Connect to working software
- Select working mode
- Allow the detector to warm up for 15 minutes in case of cold start to ensure a good thermal balance and then create relevant calibration templates;
- Acquire images in the selected working mode

5.2 Acquiring Images

The main purpose of the NDT1417MA is X-ray image acquisition, which supports the Software trigger mode. In this mode, there is no hardware synchronization interface between the Flat Panel Detector (FPD) and the High Voltage Generator (HVG). The workstation (WS) needs to control the FPD and HVG to ensure that the FPD can receive the required X-Ray.



In Software Trigger mode, three image acquisition methods are provided:

- Clear and acquisition, using the clear command and acquisition command to complete;
- Clear acquisition, using the clear acquisition command to complete;

- Continuous acquisition, using the continuous acquisition command to complete.

5.2.1 Prep and Acquire

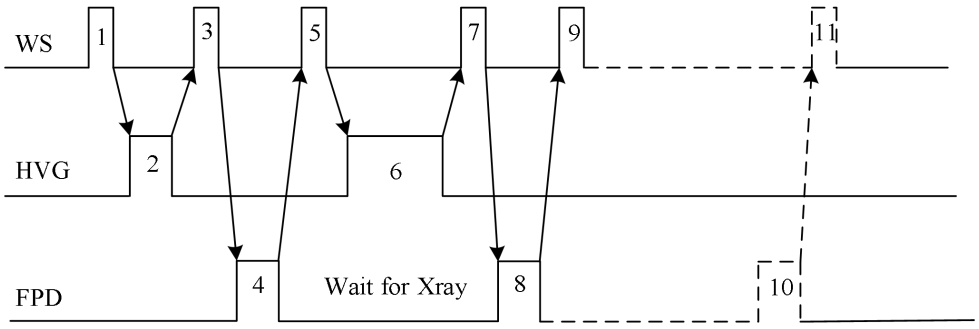
Select Software in Trigger Mode

Select Null in Exp Mode

Calibration options are: HWPostOffset, HWGain, and HWDefect

When no calibration is selected, the detector get the original image

The workflow is shown below:



WS is directly connected to HVG, and HVG has a feedback signal:

- WS sends an instruction to HVG, requesting HVG for preparation
- Notify WS after HVG is ready
- WS sends an instruction to FPD, asking FPD to prepare to receive X-Ray
- After FPD is ready, notify WS and start waiting for the X-Ray signal.
- WS sends an instruction to WS, asking HVG to emit X-Ray
- HVG emits Xray
- WS asks FPD to start aquisition
- FPD transfers the preview to WS (the original image is transfered when HWPostOffset is not selected)
- WS receives the preview (the original image is transfered when HWPostOffset is not selected)
- FPD transfers the corrected image to WS (only when HWPostOffset is selected)
- WS receives the processed image data (only when HWPostOffset is selected)

WS is directly connected to HVG, and HVG has no feedback signal:

WS cannot receive feedback signals from HVG and can be synchronized by software delay

WS indirectly controls HVG through the control box:
The workflow is basically the same as "WS is directly connected to HVG ".
The difference is that WS communicates with the control box to indirectly control HVG.

The time that FPD waits to accept X-Ray:

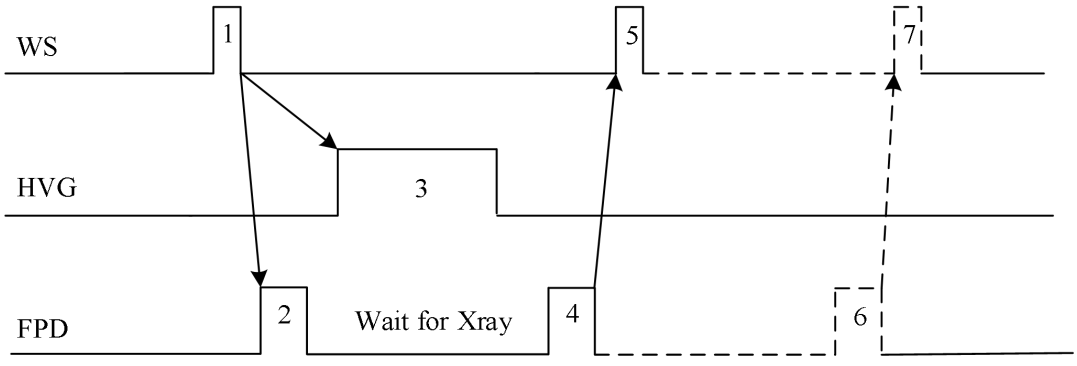
In this mode, the maximum time that FPD waits to accept X-Ray is 180s, which is determined by the time interval between the "clear" command and the "acquisition" command.

After FPD receives the "clear" command, it begins preparations and then waits to accept X-Ray; after receiving the "acquisition" command, it begins to acquire images. Set the time when FPD is ready to accept X-Ray as t1 and the time to start the acquisition after receiving the "acquisition" command as t2, and the actual time is t2-t1.

For better image quality, try to choose a shorter t2-t1.

5.2.2 PrepAcq

Select Software in Trigger Mode
Select Null in Exp Mode
Calibration options are: HWPostOffset, HWGain, and HWDefect
When no correction is selected, using the original image
The workflow is shown below:



- WS sends instructions to HVG and FPD, requesting HVG and FPD for preparation
- After FPD is ready, wait for X-Ray within the set time.
- HVG emits X-Ray

- FPD transfers the preview to WS (the original image is transfered when HWPostOffset is not selected)
- WS receives the preview (the original image is transfered when HWPostOffset is not selected)
- FPD transfers the corrected image to WS (only when HWPostOffset is selected)
- WS receives the processed image data (only when HWPostOffset is selected)

The time that FPD waits to accept X-Ray:

In this mode, the maximum time that FPD waits to accept X-Ray is 65s, which is set by the Clear Acq Delay Time in the SDK tab.

After FPD receives the "Clear Acquisition" command, it starts preparation work and delays the Clear Acq Delay Time for acquisition image after the preparation is completed.

For better image quality, try to choose a shorter wait time.

5.2.3 Continuous Aquisition

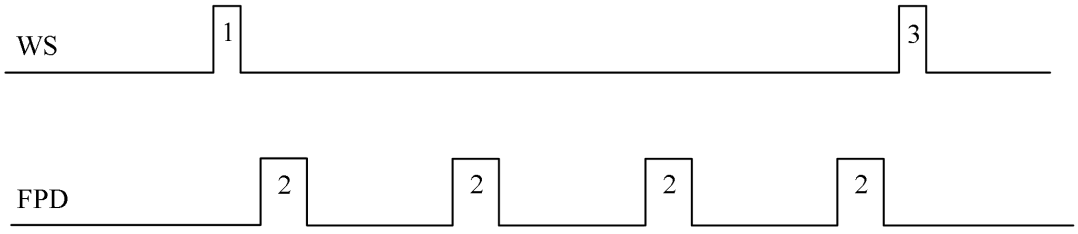
Select Software in Trigger Mode

Select Continous in Exp Mode

Calibration options are SWPostOffset, SWGain, and SWDefect

When no correction is selected, using the original image.

The workflow is shown below:



- 1. WS sends an acquisition instruction to FPD
- 2. FPD continuously acquires images and transfers them to WS
- 3. WS sends a stop acquisition command to FPD, FPD stops acquisition

Acquisition Interval:

The acquisition interval is set by the SequenceIntervalTime parameter in the Detector interface, and the minimum value is 1s. This value needs to be set according to the actual network environment.

5.3 Turn off Steps

1. Turn off the detector

2. Close the software

3. Disconnect the detector power

4. Organize the detector and relevant accessories

6. Trouble shooting

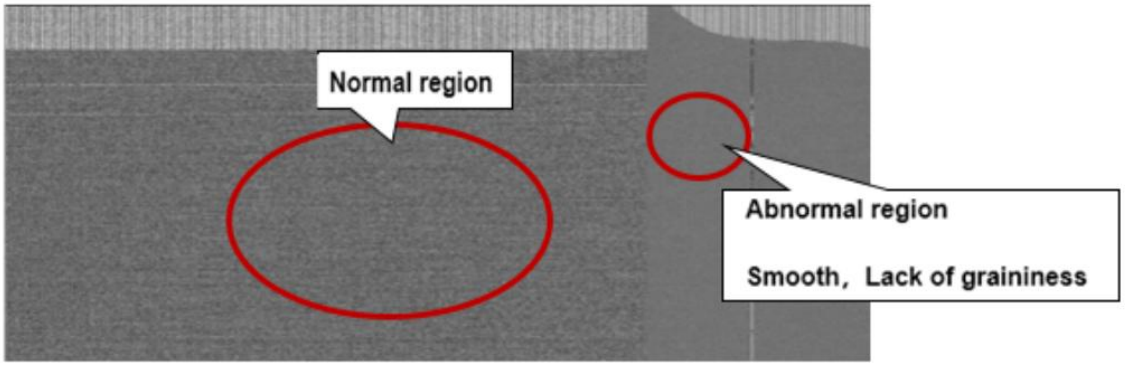
You should know some basic electronic knowledge and computer skill to read this user manual. Users should know how to use iDetector. If you have any question that is not mentioned in this manual, please contact our customer service department.

6.1 Log

Users can read the main operation information of the detector from the log. The store path of log is …\DetectorDir\detector.log.

6.2 TFT Damaged

Acquire a frame of dark field image. If a part of the image is smoother than normal dark field image, TFT must have cracked due to a strong impact.



7. Service Information

7.1 Product Life Cycle

The product life is expected to be 7 years under appropriate periodic inspection and maintenance.

7.2 Periodic Inspection and Maintenance

Periodic inspection must be conducted at least once a year to ensure the safety of operator and other third parties as well as to keep good performance and reliability of the equipment. If necessary, clean the equipment, debug parameters or replace consumables according to the safety requirements in the introduction of this manual.

For maintenance and repair requiring the disassembly of equipment enclosure, users should contact our after-sale service engineer who has corresponding qualification. Please contact after-sale service department of iRay or product dealer.

7.2.1 Daily inspection

The following checks are required before and after using this product.

Check item	operating
detector	Ensure that the detector has no loose or cracked screws Ensure that the cable is not damaged and the cable housing is not torn Ensure reliable connection of the socket
External wiring harness	Ensure that the cable is not damaged and the cable housing is not torn Ensure reliable connection of the socket

7.2.2 Monthly inspection and annual inspection

Check item	Frequency	Performing operations
Resolution	Monthly/Annual	Check the resolution of the detector by resolution map or

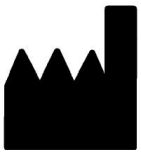
		using phantom
Correction	Monthly/Annual	When the X-ray generator, bulb tube, collimator, or exposure environment changes

7.3 Maintenance

In the event of product failure that cannot be removed, please contact after-sale service department of iRay or product dealer, and provide the following information as per the product nameplate:

- Name and model of product;
- Serial number of product;
- Detector log
- Abnormal Image
- Description of product failure as detailed as possible.

APPENDIX Manufacturer Information



Manufacturer: iRay Technology Taicang Ltd.

Address: No. 33 Xinggang Road, Taicang Port Economic and Technological Development Zone, Taicang 215434, Jiangsu, China

Tel: +86-512-53690872

Fax: +86-512-53690872

Website: www.iraygroup.com