

1012WGB User manual



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Attention

For improvement of product performance, supplementation, or follow-up of information; the contents of this manual are subject to change without separate prior notice.

Please note that our company has neither responsibility for any accidents nor obligation to do free repair service for any damage of the equipment due to user's mistake, which resulted from failure to follow the contents in this manual. Make sure to be familiar with the safety precautions and usage procedures. Also note that the product may slightly differ from the contents of this manual depending on specification.

The following marks are used for the effective use of the product in this manual.



Attention, consult accompanying documents.



This is used to emphasize essential information. Be sure to read this information to avoid incorrect operation.



This indicates hazardous situation which, if not heeded, may result in minor or moderate injury to you or others, or may result in machine damage.



This indicates a potentially hazardous situation which, if not heeded, could result in death or serious injury to you or others.

Federal Law restricts this device to sale by or the order of a radiologist or any other practitioners licensed by the law of the state in which that person practices to use or order the use of the device.

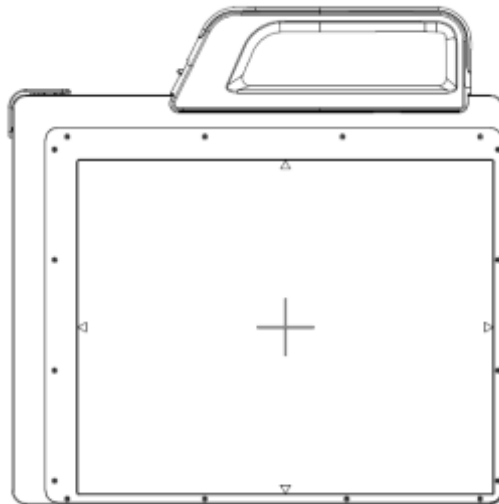
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1. Introduction

(1) Overview

The 1012WGB is a digital X-ray flat panel detector that can generate images of NDT. This X-ray imaging system consists of a scintillator directly coupled to an a-Si TFT sensor. It makes high-resolution, high-sensitive digital images.

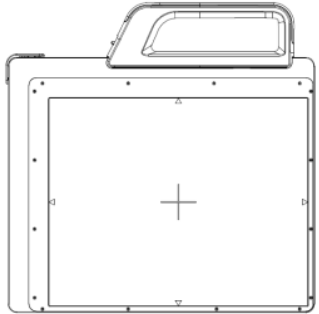
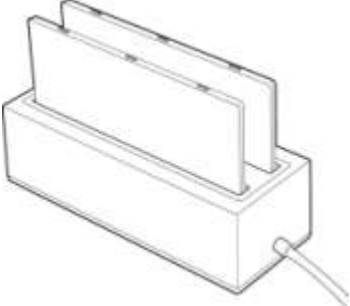
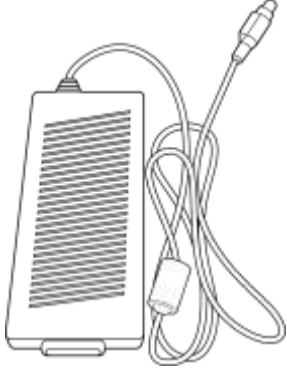




(2) Product features




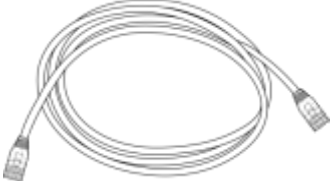


- Based on a-Si TFT active matrix
- Compact (18mm thickness) and light weight
- High resolution : Min. 2.5 lp/mm, Max 3.9 lp/mm
- 14/16-bit digital output
- Easy integration

(3) Product component

- Industrial Image Processing Unit

Photo	Item	Quantity
	Detector	1
	Handle	1
	Battery pack	2
	Battery charger	1
	Charger adapter	1
	AGI	1
	Power supply box	1

- Cable

	Item	Length	Quantity
	Link cable	6m	1
	P-Interface cable	8m	1
	USB cable(A to B)	1.8m	1
	LAN cable	10m	1
	AC Power cord	1.8m	1
	Trigger cable	3m	1

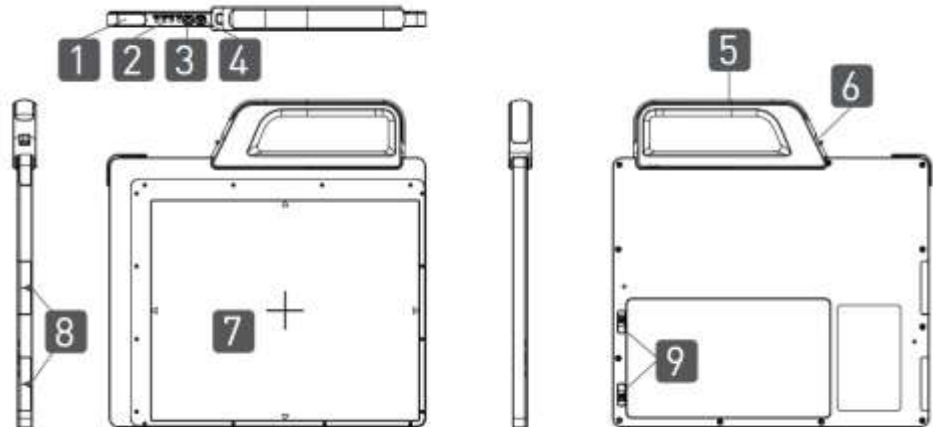
- Installation CD
 - Manual
 - Detector Library
- Option
 - Trigger cable

(4) Components Description

The detector is designed to capture radiographic images.

Captured images are transmitted to PC using the wired connection.

(1) Detector



1. Link Cable Connector : This is a connector for Wire communication and power supplying. Connect the detector to the power supply using Link cable.

2. LED indicator: The LED indicates the state of detector.

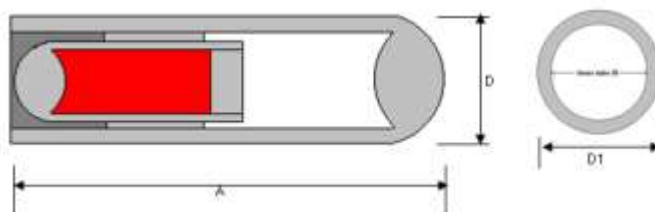
LED	LED Color	Status
PWR	Green	Power On
	None	Power Off
LINK	Blinking Green	Connected
	None	Not Connected
BAT	Red	Low Battery
MODE	Green	AP Mode(Wireless)
	Orange	Station Mode(Wireless)
	None	Wired Mode
	Blinking Orange and Green alternatively	Sleep Mode

3. Power Button : Power on / off switch (Press for over 3 seconds)

4. AP Mode Select Button : Button for changing mode

5. Handle : Hold this handle when carrying the sensor unit. It is removable. (Horizon/Vertical)

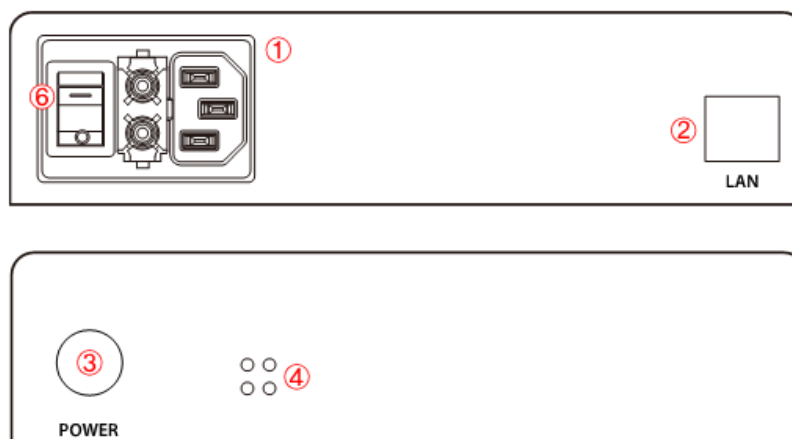
6. **Handle unlock-lever** : This is an unlock-lever to remove handle.
7. **CFRP(Carbon Fiber Reinforced Plastic)** : The part of the patient's body to which an image is to be taken should be placed against this plate.
8. **Shock sensor** : Detector has built-in 2 Shock sensors. It detects and records impact and mishandling of fragile



Type	A LENGTH	D(D1) DIAMETER OF OUTER TUBE
CLIP_CX 35	17.145± 0.25	2.387±0.05

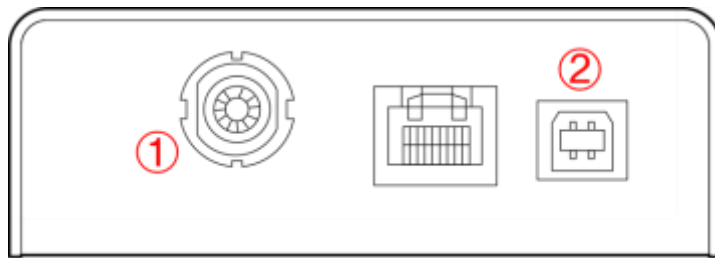
9. **Battery unlock-lever** : This is an unlock-lever to remove battery.

(2) Power supply



1. **Power plug connector**: Connect with AC power supply cord
 2. **LAN connector** : Ethernet port for transmitting the image/command between detector and PC
 3. **Link cable connector**: Power connector for detector operating
 4. **LED indicator**: Four LEDs to display the status
- ※ **Changeable part**: Fuse T3.15 AL 250V

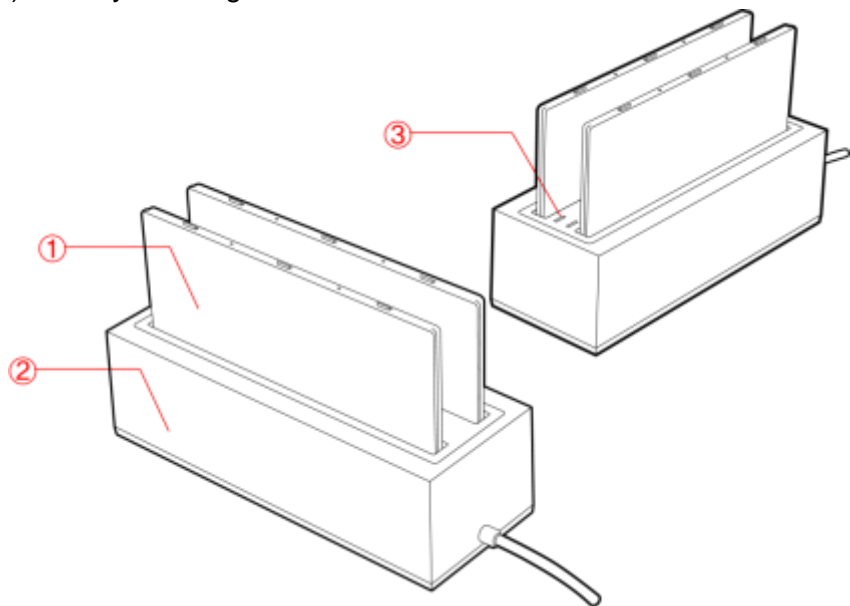
(3) AGI



<AGI is needed on only Manual Trigger Mode>

1. **Trigger connector:** This is a connector for synchronization between detector and generator. Connect the AGI to the generator using P-interface cable..
2. **USB connector:** This is a connector for communication between AGI and PC. Connect the AGI to the PC using USB cable

(4) Battery & Charger



1. **Battery :** Lithium ion battery. The number of times being acquired image is 960 images(@ cycle time : 15s). The batteries last 2.5 hours and are rechargeable.
2. **Charger :** Two port cradle type.
3. **LED indicator :**
 - i. **Orange on :** charging
 - ii. **Green on :** Charging is completed.

※Wireless Module and Wireless Antenna

Wireless antennas:

The module adopts the latest 802.11n Dual-Band technology.

DUT does not support simultaneous transmission.

The transmitter of the module is powered by host equipment (Detector).

The antennas are 2 printed-dipole and correlated antennas.

Does not support beamforming.

※Wireless module:

The end product will use the in original certified transmitter module and will keep the original authorization condition except the change in antenna of the module during the final end product assembly.

Data transmission is always initiated by software, which is the passed down through the MAC, through the digital and analog baseband, and finally to the RF chip. Several special packets are initiated by the MAC. These are the only ways the digital baseband portion will turn on the RF transmitter, which it then turns off at the end of the packet. Therefore, the transmitter will be on only while one of the aforementioned packets is being transmitted. In other words, this device automatically discontinues transmission in case of either absence of information to transmit or operational failure.

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.

FCC CAUTION

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

When installing it in a mobile equipment

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines in Supplement C to OET65. This equipment has very low levels of RF energy that it deemed to comply without maximum permissive exposure evaluation (MPE). But it is desirable that it should be installed and operated keeping the radiator at least 20cm or more away from person's body (excluding extremities: hands, wrists, feet and ankles).

When you use the detector with wire mode, the wireless function is automatically off.

※5150~5250 MHz band is restricted to indoor operations only.

This device complies with Industry Canada licence-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.

Le present appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisee aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioelectrique subi, meme si le brouillage est susceptible d'en compromettre le fonctionnement.

Operations to just the specific band(s) : limited device Software program.

User cannot enable the other bands, because PC set up should be necessary.

(details for user manual_Ch.3 Installation and Calibration)



(5) Warning

Environment of Use and Storage

Follow the specified process of operational instructions written in this manual for the safety of the users

Does not use or store the instrument near any flammable chemicals such as thinner, benzene, etc. Also, this instrument is not a category AP or APG equipment. If chemicals are spilled or evaporate, it may result in fire or electric shock through contact with electric parts inside the instruments. Also, some disinfectants are flammable. Be sure to take care when using them.

Connection

Do not connect the instrument with anything other than specified. Otherwise, it may result in fire or electric shock.

To avoid the risk of electric shock, this equipment must only be connected to a supply mains with protective earth.

Handling

Always be sure to keep checking the condition of the system to ensure they are normal during the use of the instrument. If any problem is found, take appropriate measures, such as stopping the operation of the instrument, as required.

Never disassemble or modify the product as it may result in fire or electric shock. Also, since the instrument incorporates parts that may cause electric shocks and other hazardous parts, touching them may cause death or serious injury.

Do not hit or drop the instrument. The instrument may be damaged if it receives a strong jolt, which may result in fire or electric shock if the instrument is used without it being repaired.

When Problem Occurs

Should any of the following occur, immediately turn OFF the power of each instruments, unplug the power supply cord from the AC outlet, and contact Rayence representative or distributor.

- When there is smoke, odd smell or abnormal sound.
- When liquid has been spilled into the instrument or a metal object has entered through an opening.
- When the instrument has been dropped and it is damaged.



Make sure
to observe
the following right.

Maintenance and Inspection

For safety reasons, be sure to turn OFF the power of each instrument when the inspections indicated in this manual are going to be performed. Otherwise, it may result in electric shock.

When the instrument is going to be cleaned, be sure to turn OFF the power of each instrument, and unplug the power supply cord from the AC outlet. Never use benzene, thinner or any other flammable cleaning agents. Otherwise, fire or electric shock may result.

The instrument must be repaired by a qualified engineer only. If it is not repaired properly, it may cause fire, electric shock, or accident.

(6) Caution

Environment of Use and Storage

Do not install the instrument in a location with the conditions listed below. Otherwise, it may result in failure or malfunction, fall or cause fire or injury.

- Close to facilities where water is used.
- Close to air-conditioner or ventilation equipment.
- Close to heat source such as a heater.
- Prone to vibration.
- Insecure place.
- Dusty environment.
- Saline or sulfurous environment.
- High temperature or humidity.
- Freezing or condensation.

Do not place the storage case in a location with the conditions listed below.

- Where the cable of the sensor unit will be strongly pulled when the sensor unit is put into the case, otherwise, the cable may be damaged, resulting in fire or electric shock.
- Where someone might get their foot caught in the cable of the sensor unit is put in the case. Otherwise they could trip over, resulting in injury

Handling

Wipe the CFRP plate of the sensor unit with ethanol or glutaraldehyde solution

Turn off the power of each instrument for safety when they are not going to be used.

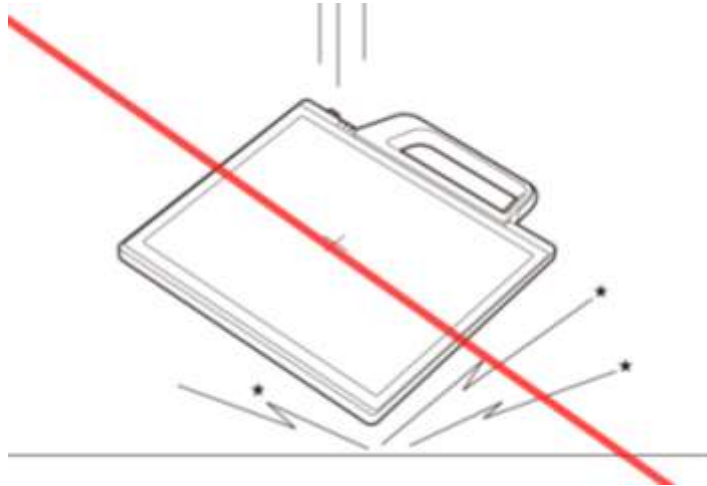
Maintenance and Inspection

For safety reasons, be sure to inspect the instrument before using it. In addition, carry out a regular inspection at least once a year.

If the device does not work, do not disassemble yourself. Please contact to the Rayence C/S team.

2. Notes for Using the Detector

(1) Handling



Handle the instrument carefully, as it may be damaged if something is hit against it, dropped, or receives a strong jolt.

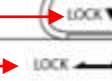
(2) Handle Assembly

Please confirm lever position. When the handle is locked, the lever should be same position with the right picture.



If the handle is not locked, the detector can be dropped.

Insert the handle in the same direction



※ Insert the handle always in the same

(3) Before Exposure

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

Sudden heating of the room in cold areas will cause condensation to form on the instrument. In this case, wait until condensation disappears before performing exposure.

If the instrument is used with condensation formed on it, problems may occur in the quality of the instrument. When an air-conditioner is going to be used, be sure to raise/lower the temperature gradually so that a difference in temperature in the room and in the instrument does not occur, to prevent forming of condensation.

(4) During Exposure

Do not use the detector near devices generating a strong magnetic field. Doing so may produce image noise or artifacts.

Do not apply excessive weight to the sensor unit. Otherwise, the sensor may be damaged.

(5) Disinfection and Cleaning

Do not spray the detector directly with disinfectants or detergents.

Do not use anything other than neutral detergent for cleaning the cover of the instrument. Otherwise, the coating will be corroded.

(6) Others

Be sure to reconnect the cables to the proper connectors. Otherwise, the instrument may malfunction or may be damaged.

3. Technical Features

(1) Mechanical Features

Size	385 x 320 x 18 mm
Weight	3.2 kg (incl. Battery, not incl. handle)
Encapsulation Material	Mg
Window Material	Carbon fiber plate

(2) Electrical Features

Detector

Sensor Type	Amorphous Silicon with TFT (Single Panel)
X-ray Converter	Gd ₂ O ₂ S:Tb
Total Pixel Number	2560 × 2048 pixels
Total Pixel Area	325.1 x 260.1 mm
Effective Pixel Number	2520 × 2008 pixels
Effective Pixel Area	320 x 255 mm
Pixel Pitch	127 μm
Limiting Resolution	Max. 3.9 lp/mm
Energy Range	40 - 150 kV
A/D Conversion	14 / 16 bits
Preview Time	< 2.0 sec (wired) < 5.0 sec (wireless)
Data Interface	Gigabit Ethernet Wi-Fi (802.11a/g/n)

Table 1: Product specification





- Under RQA5 condition (70kVp, 21mmAl)
- Preview time is not included post-processing time

Battery

Size	232.2 x 130.9 x 7 mm
Weight	Typ. 0.3 kg
Input	12.6 VDC
Output	11.1 VDC
Charging time	Typ. 3 hours
Capacity	Typ. 3400 mAh
The number of times being acquired image	180 images (@general x-ray exposure condition)

The Battery level can be displayed on the LED status of battery.

If the battery level goes down under 25%, please charge the battery

Display	Battery level
	75~100 %
	50~75 %
	25~50 %
	0~25 %

Charger

Size	267.5 x 100 x 77 mm
Weight	Typ. 0.7 kg
Input	20 VDC
Output	12.6 VDC

Adapter

Size	160 x 76 x 43.7mm (cable length: 1.28m)
Weight	Typ. 0.8 kg
Input	100~240 VAC, 47~63 Hz, 1.4~0.6A
Output	20 VDC, Max 6.0A

Wireless Spec

Standard	802.11a/g/n compliance Without DFS (5.25GH to 5.35GHz and 5.47 to 5.725) Band
Peak Rate	300Mbps
Frequency	2.4 GHz / 5 GHz
Bandwidth	20MHz/40MHz
MIMO	2x2

※ Maximum wireless signal rate derived from IEEE standard specifications. Actual data throughput will Network conditions and environmental factors, including volume of network traffic, building materials and construction, and network overhead, lower actual data throughput rate.

※Recommended Maximum operable distance : 10m (From the Access Point)

※Wireless Module and Wireless Antenna

※Wireless antennas: The module adopts the latest 802.11n Dual-Band technology (2.4Ghz and 5Ghz).

The transmitter of the module is powered by host equipment (Detector). The antennas are 2 printed-dipole antennas.

※Wireless module: The SparkLAN WPEA-121N 802.11 a/b/g/n half mini PCI-e module is implemented. It supports 2T2R (2 transmit 2 receive) MIMO technology, which delivers throughput up to 300Mbps. 1012WGB in the RF module does not use DFS band.

(3) Environmental requirement

Item	Min	Typ.	Max.	Unit	Note
Temperature	5		40	°C	
Humidity	30		75	% H.R.	
Pressure	70		106	kPa	
Vibrations (Wrapping condition)		2G (8G)			10-150Hz, 10Sweeps, 1min/Octa ve, XYZ axis

(4) PC Requirements

- Processor: At least Intel Pentium IV HT with 2.8GHz, Intel Core Duo / Core 2 or comparable AMD Dual Core processor
- At least 3GB of RAM requirement (4GB for 32 BITS OS and 8GB for 64 BITS OS recommended)
- At least 500GB for application and archiving. Recommended 500GB for applications and secondary drive of 1TB for image archiving..
- Dual 10/100/1000 network card system required. One for network (Internet) and one for the DR Panel communication
- Graphics card / monitor: Resolution of at least 1,600 x 900 for desktop and 1366 x 768 for laptop. For diagnostics purpose we recommend 1920 x 1080 resolution (2 mega pixels) monitor
- Microsoft® Windows 7 32BIT/64BIT
- No antivirus except for Microsoft® Security Essentials.

4. Installation



Portable Imaging processing

unit must be installed in a way that enables the user to achieve optimal use

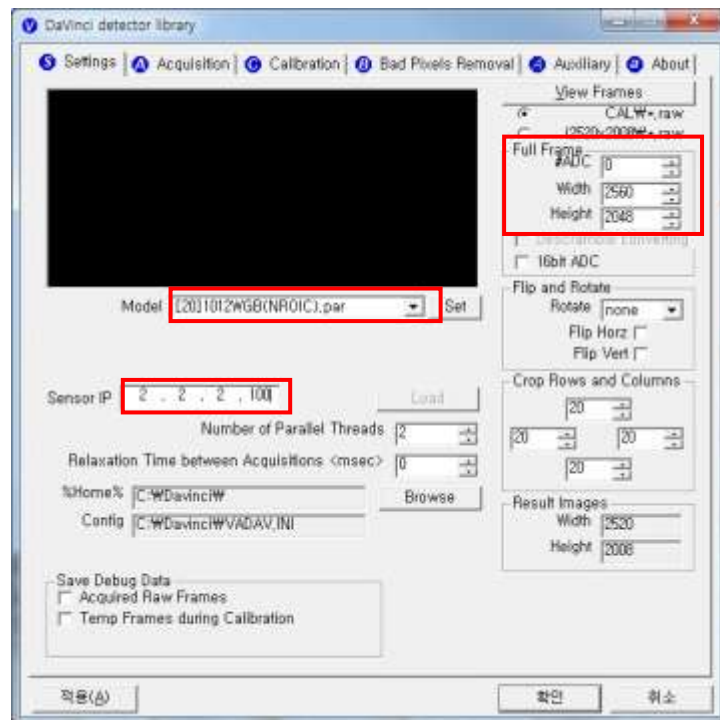
The Detector is composed of sensitive electronic parts and components. It is recommended to use the product in a clean place and to exercise caution to ensure that it is not affected by dust or liquids. It is recommended to Use a dry and soft cloth to clean the detector housing.

(1) Program setup

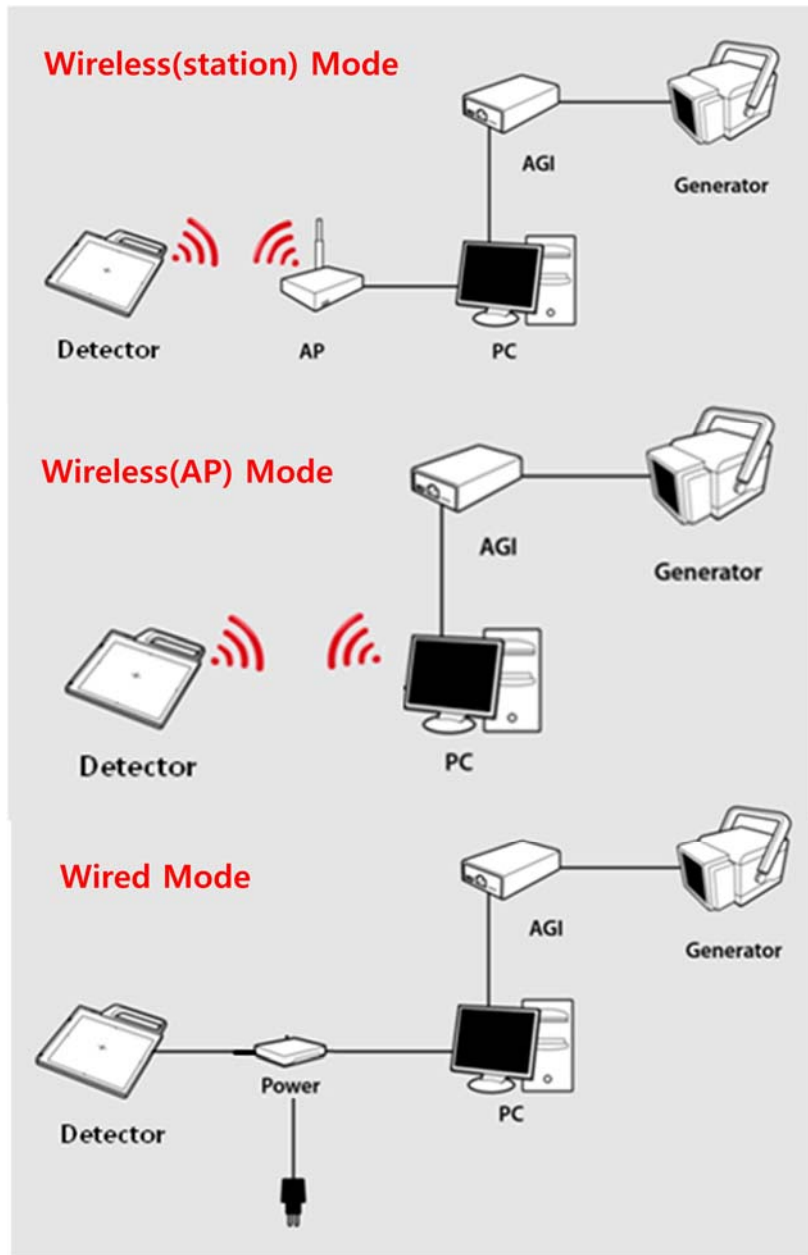
To acquire images, run _vadav.lnk program.

Please set the following figures

- Detector's IP : Wireless-2.2.2.100, Wired-2.2.2.101
- Detector's number of ADC : 0
- Detector's size of image : 2560 x 2080



(2) Connection (Manual Trigger)



Power Connection

A. Connect the battery pack or power cable to the equipment.

* In wired mode, the frame ground is necessary.

* When you use the detector with wired mode, the WLAN function is automatically off.

※ Be sure to use only the dedicated battery pack, RB37WH for 1012WGB.

Wireless Communication

A. AP Router(Line sharer) setting

- SSID : Griffon
- Internal network
 - IP address : 2.2.2.1
 - Subnet mask : 255.255.255.0
 - Dynamic IP allocation range : 2.2.2.2 ~ 2.2.2.254
- Pre-Shared Key(Password) : project302
 - Authentication methods : WPAPSK or WPA2PSK
 - Password methods : TKIP/AES
- AP IP : 2.2.2.1
- Channel (Frequency)
 - Avoid crowded channel
(Using wireless detector under crowded channel result in low performance)
 - If available, Use 'Auto-Channel Selection' function of router to find optimal channel

B. Reception Indicator

Link LED flickering

Blink Speed : Slow – Low link quality

Fast – High link quality

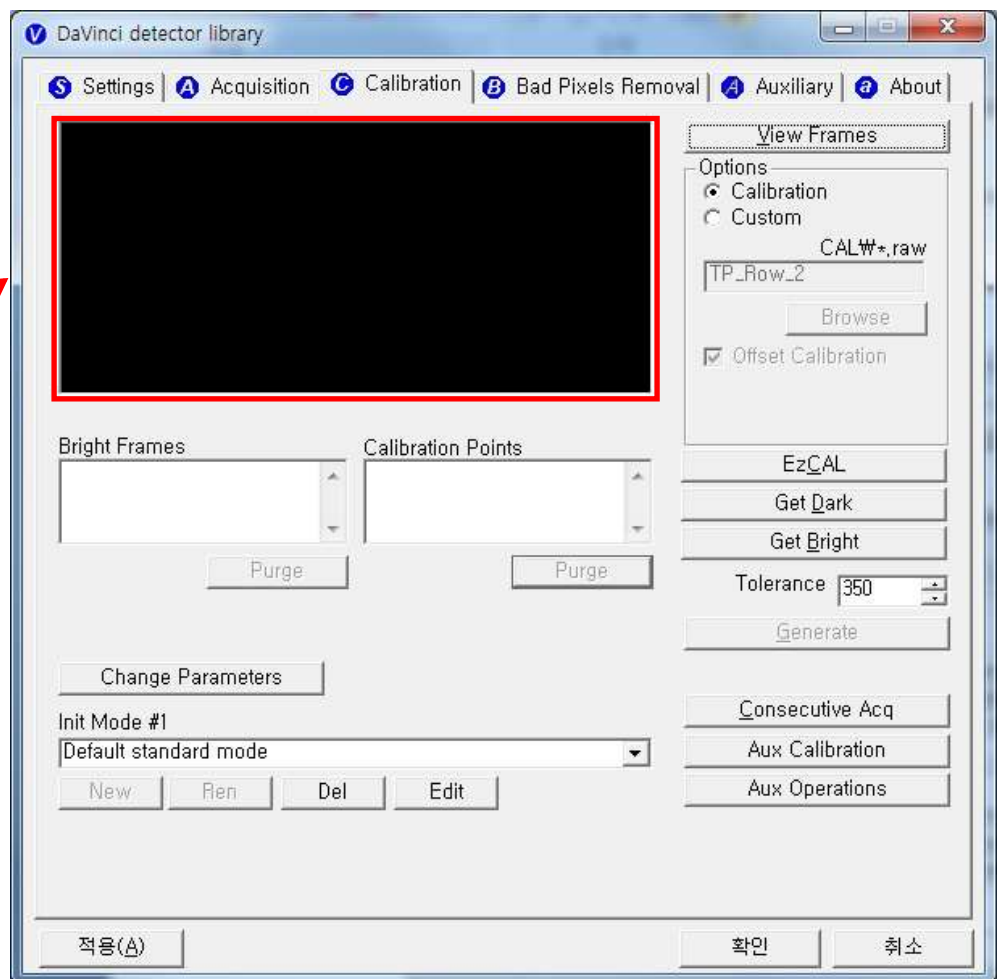
C. Checking Link Quality & Battery Remain

- After wireless connection is established, perform 'Get Bright' in 'Calibration' tap.

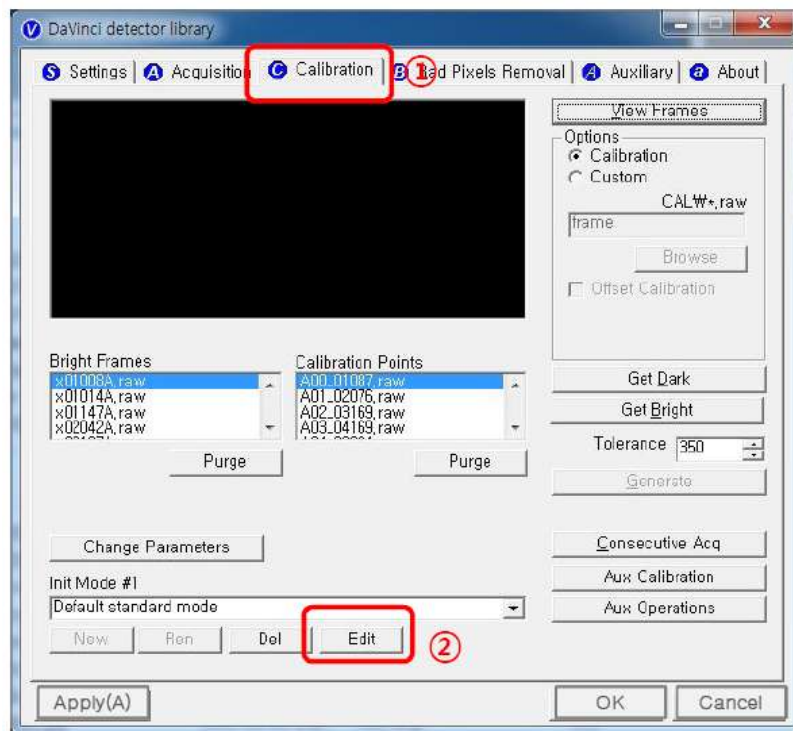
- Check the value named 'Wireless Signal' in black log screen.
Wireless Signal = Link Quality (Max. 100)

- Check the value named 'Battery Remain' in black log screen.
Battery Remain = Battery Remain(Max. 100)

The value 'Wireless Signal' will be displayed here

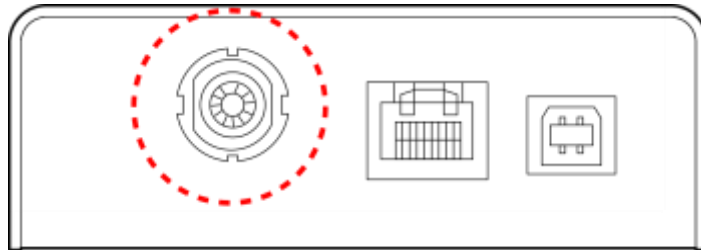


Software Setting (Manual trigger)



Trigger Connection

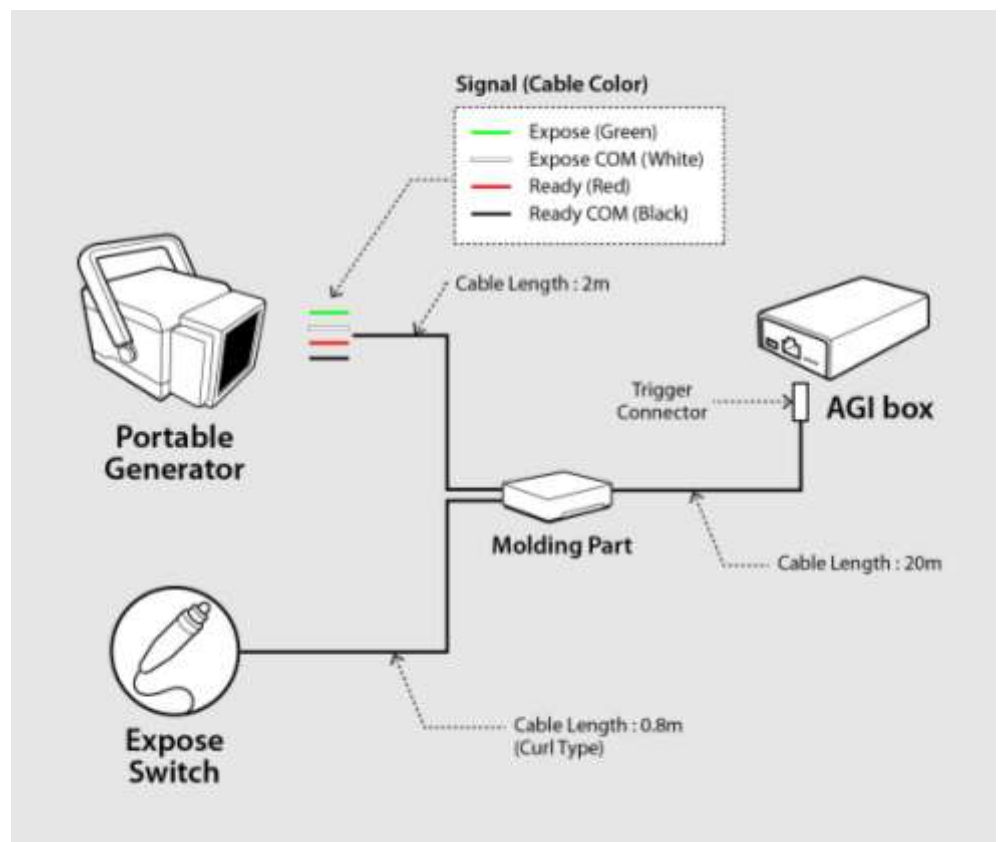
A. Connect the P-interface cable or trigger cable to the generator

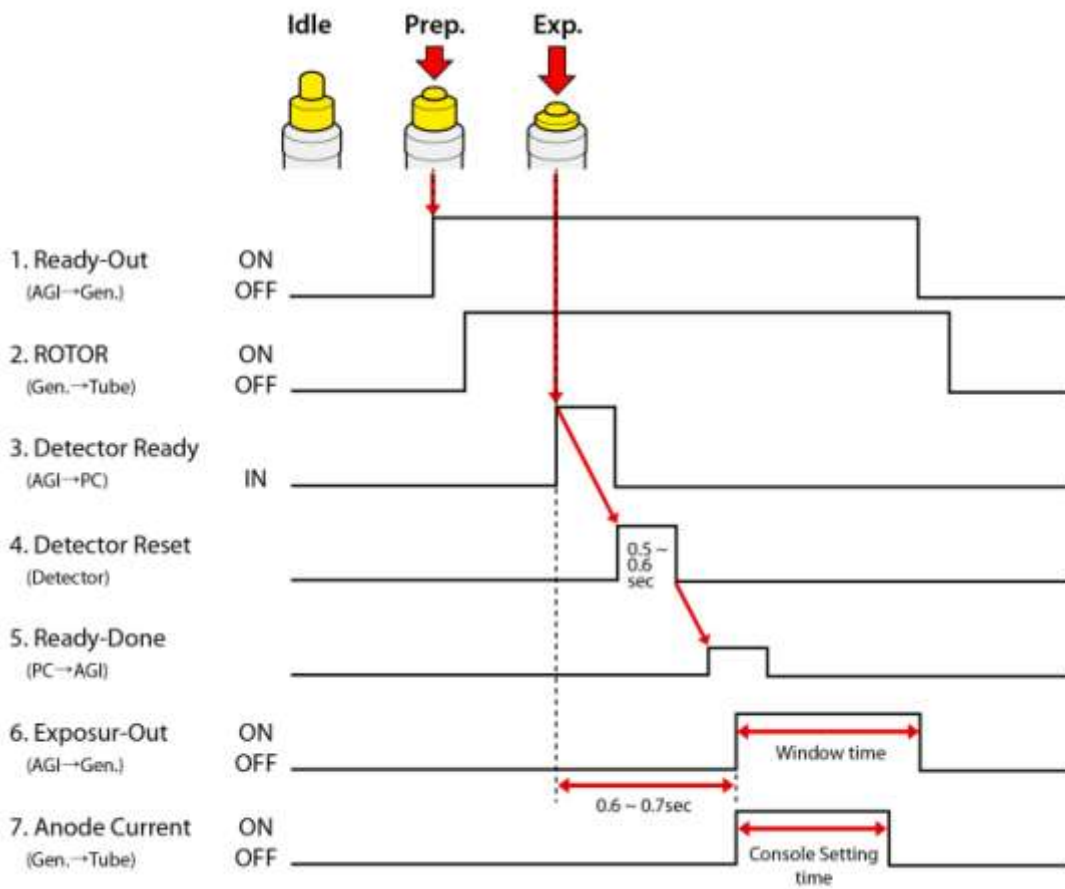


X-ray Generator Connection

A. Mode 1 : P-interface cable mode

Connect the P-interface cable between the AGI box and X-ray generator.





The window time can be changed. Refer to the following pictures

 **NOTE**
 Exposure Time
 500ms is
 designate to 0.5sec

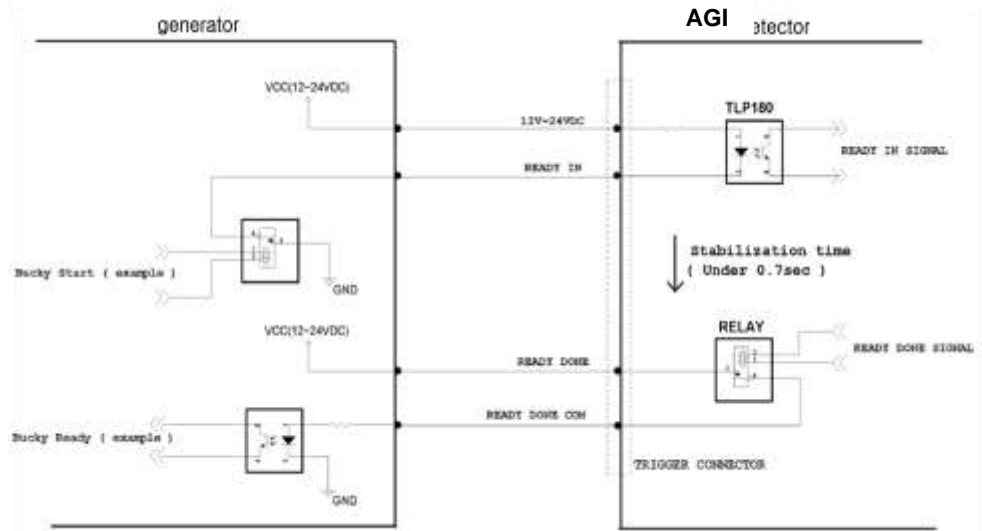




Make assurance doubly sure
SIGNAL RATING
 before connection.

B. Mode 2 : Trigger cable mode

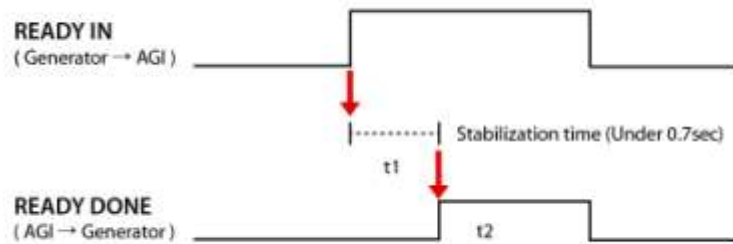
Connect the Trigger cable between the X-ray enable connector of AGI with X-ray generator.



Connection description

Signal	New Label	Old Label	Color	Input / Output
READY IN	12V~24VDC	R.E.C. +12-24V	Red	Input
	READY IN	Ready Input Signal	Black	Input
READY DONE	READY DONE	Exposure Output SW1	Green	Output
	READY DONE COM	Exposure Output SW2	Blue	Output

Operating description



t_1 : It will be occurred when exposure switch is pushed completely after.

t_2 : Window time of detector is varying 0 sec ~ 15 sec. which can be control by S/W.

→ Expose relay switch ON time (Window Time) and X-ray exposure time must be same.

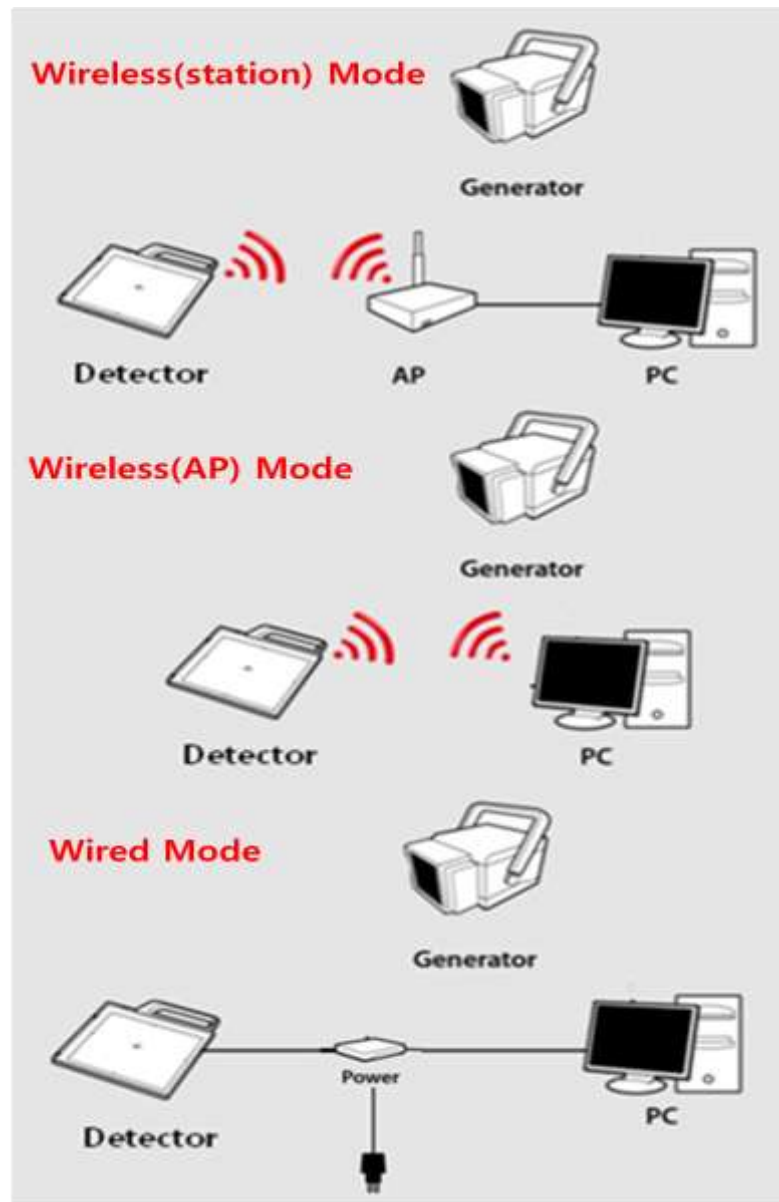
→ t_2 time can be control by S/W

The window time can be changed. Refer to the following pictures



NOTE
Exposure Time 500ms is designate to 0.5sec

(3) Connection (Auto Trigger)



Power Connection

A. Connect the battery pack or power cable to the equipment.

* In wired mode, the frame ground is necessary.

※ Be sure to use only the dedicated battery pack, RB37WH for 1012WGB.

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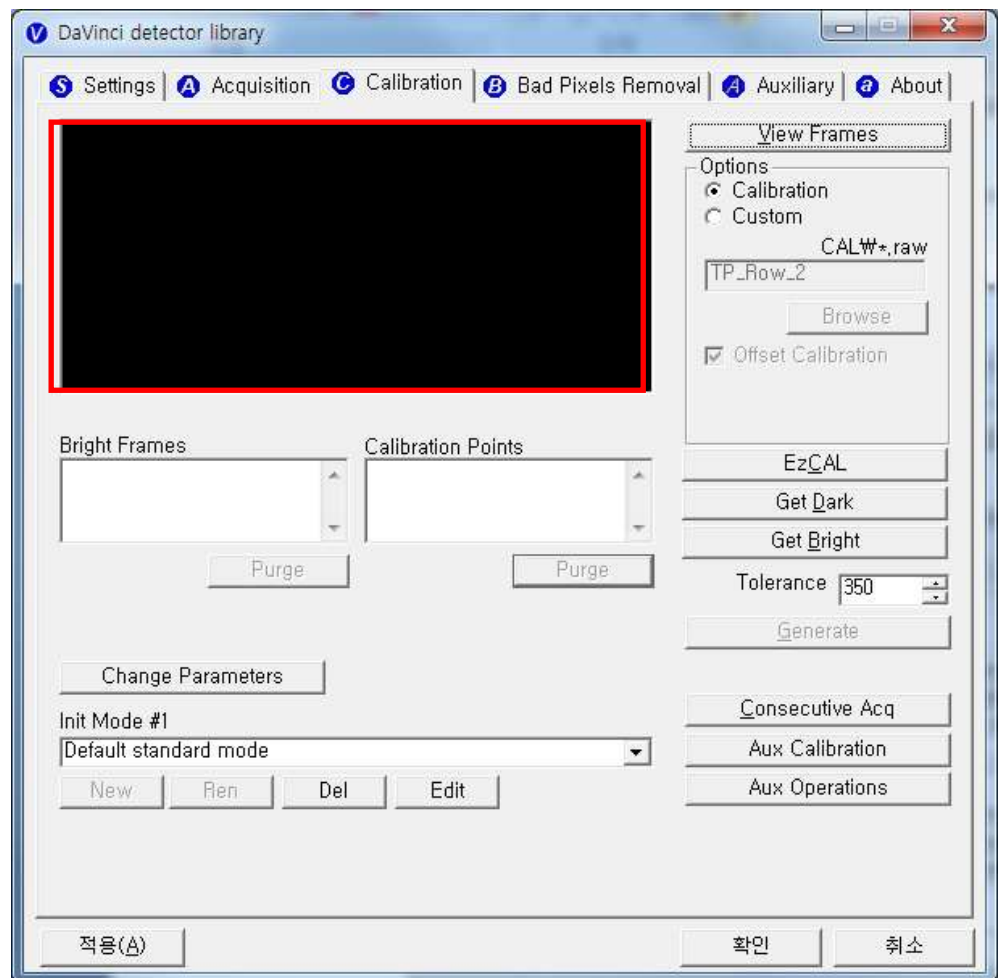
C. Checking Link Quality & Battery Remain

- After wireless connection is established, perform 'Get Bright' in 'Calibration' tap.

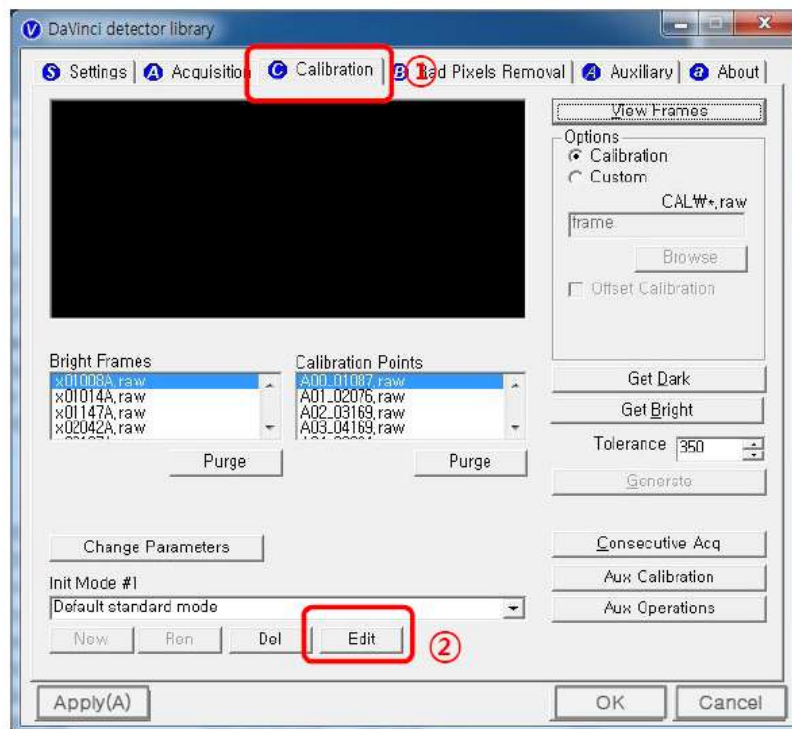
- Check the value named 'Wireless Signal' in black log screen.
Wireless Signal = Link Quality (Max. 100)

- Check the value named 'Battery Remain' in black log screen.
Battery Remain = Battery Remain(Max. 100)

The value 'Wireless Signal' will be displayed here



Software Setting (Auto trigger)



Important Note

In AUTO TRIGGER MODE, the trigger will be forced not to acquire images when detector senses vibration or shock.

In READY mode, Detector will automatically switch to WAIT mode when detector senses vibration or shock, so that user won't acquire images in WAIT mode although X-ray exposure applies.

WAIT mode switches back to READY mode after 2-3 seconds.

If you don't want to use ANTI-SHOCK FUNCTION, please click OPTION "Anti-shock



IF you don't use ANTI-SHOCK FUNCTION, you are able to get images regardless detector senses vibration or shock. However, you should keep in mind there is also a possibility images can be acquired by vibration or shock without X-ray exposure.

(4) IP set up

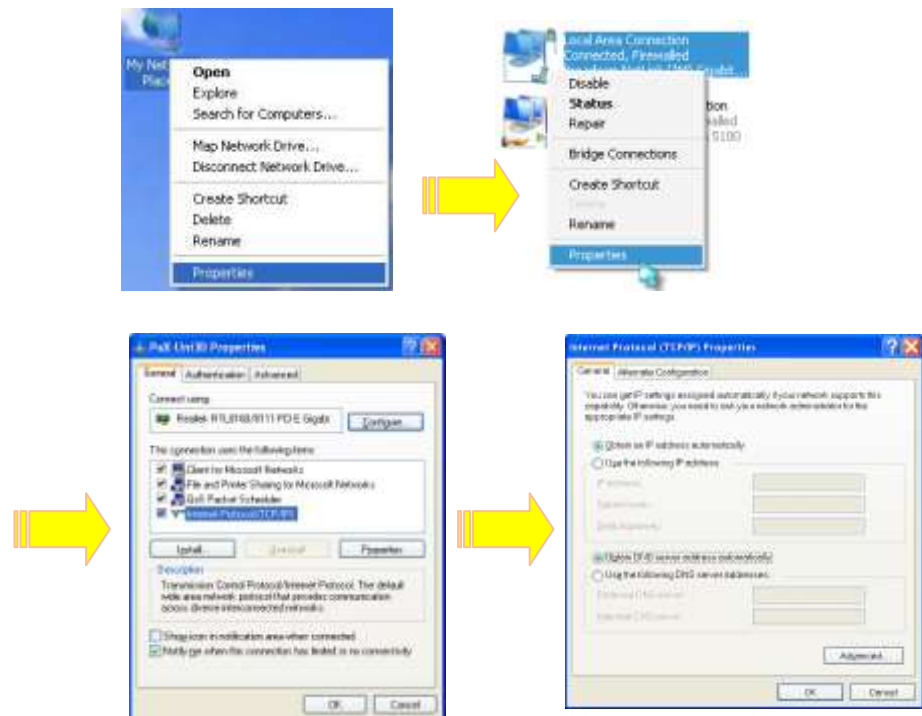
Wired & Station mode

[My Network Places] → [Properties] → [Local Area Connection]

→ [Properties] → [Internet Protocol (TCP/IP)]

→ [Use the following IP address]

IP address: Obtain an IP address automatically



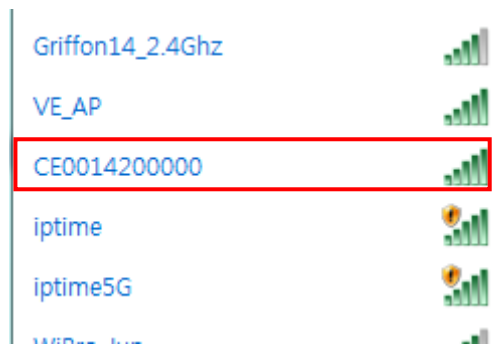
IP address : Obtain an IP address automatically

AP mode

[Search wireless network] → [Connect detector serial Number] →

[Input Password]

(* Password: Project302)



→ [Wireless connection IP address setting: Obtain an IP address automatically]

(5) Checking Connection

- Check LED on the detector & power supply
- Ping test: [Start] → [Run] → ping -t 2.2.2.100

5. Calibration



X-ray detector should be used at stable state within driving temperature range. Acquire the X-ray images after power on and 30 minutes warming up to obtain high quality images.

(1) General Principle

Notation

Calibration can be done by image acquisition S/W. The gain-offset correction (under calibration) will be done with one dark, at least one bright and object frame.

Parameter	Description
Offset	Dark image, acquired image without X-ray exposure
Bright	Acquired image with X-ray exposure
Object	Bright image with object, will be calibrated
Gain	Gain of imaging system, offset subtracted image
Offset correction	Offset subtract
Gain correction	Compensate gain variance of pixel

Table 4: Parameter description



The calibration range of bright is can be select by which exposure level is maximum level that user want to use. If the maximum level of user want to use is '6500' in this case the level is contained in Bright point of '3'(refer 'Table 5 : Median value'). The meaning is you don't have to make bright point for '4'(In this case, it will be does not working if you get image on higher level than maximum bright point.)

Bright Calibration Point

To gain correction, bright frame and dark frame should be acquired. The dark frame is needed only one frame. The bright frame is recommended to be acquired more than 2 different levels of median values of bright frames. The X-ray source condition will be recommended the tube energy level of 70kVp with variable tube current and exposure time. To acquire at least 2 frames at same condition will be recommended. The median values of bright frames are below.

(Additional 21mm Al filter is recommended for calibration)

Point	1	2	3	4
Median Value [LSB]	500~1000	2900~3400	6200~6700	9500~10000

Table 5 : Median value

The Purpose of Bright Calibration

The center of the non calibrated image is brighter than the edge due to hill effect of X-ray exposure. Generally, the intensity of X-ray flux at center region of exposed area is higher than surroundings due to the X-ray expose like cone shape. A calibration process is used to compensate for this effect. Generally, called it 'Flat Field Correction' (Bright calibration).

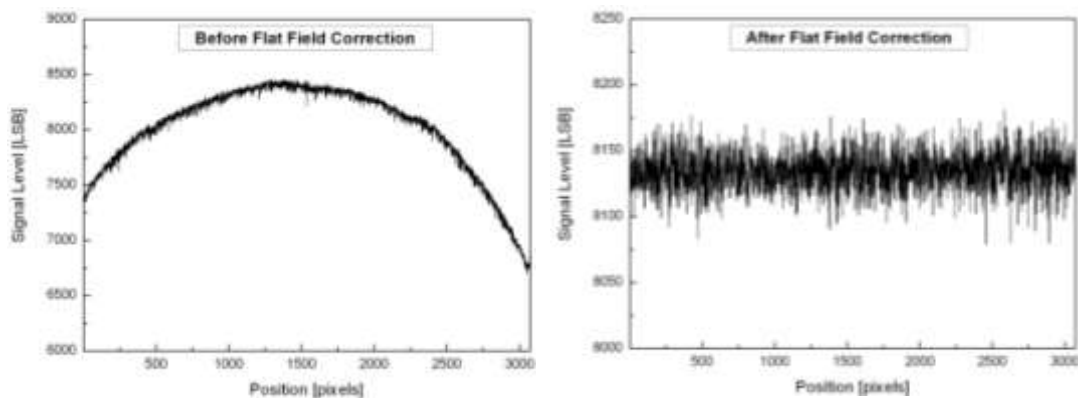


Figure 8: Comparison of flat field correction processing

(2) Calibration

Describe the calibration step by step.

1st Step

Click on the “Get Dark” button. The acquired dark frame “dark.raw” will be generated in the “\cal\” folder.

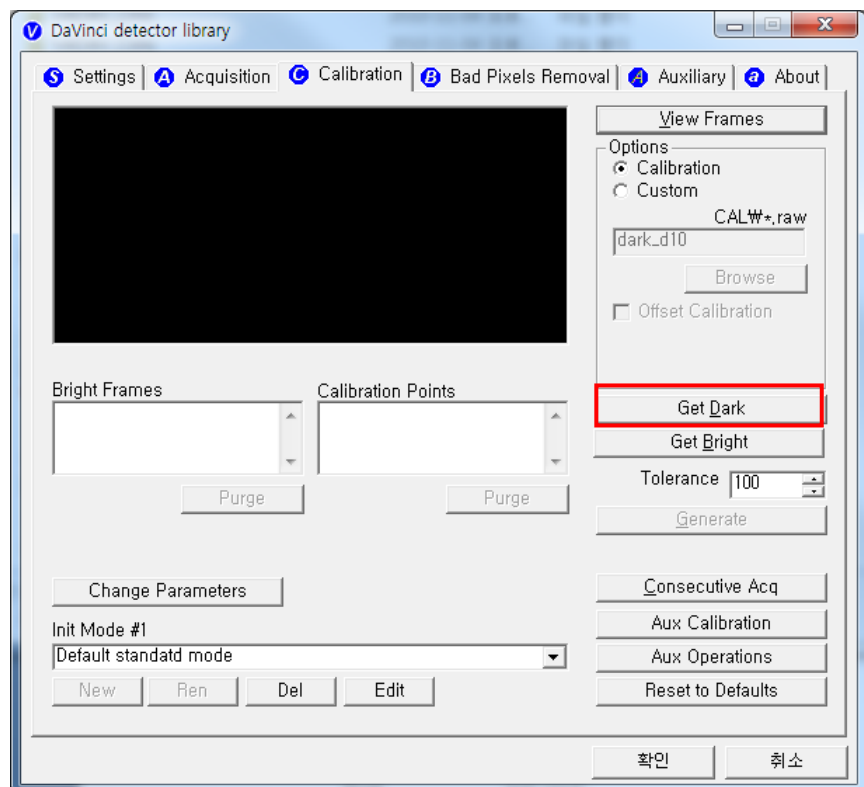


Figure 9: Get dark



Click button [Get Bright]. It will produce *frame* with name %CAL% xNNNNNA.raw, where NNNNN is median pixel's value within current *image* borders after offset calibration (cut frame edges are never used during calibration). Suffix 'A' (it also could be 'B', 'C' etc) avoids casual coincidence of file names.

2nd Step

Push "Get Bright" button at different four of X-ray condition. The X-ray condition should be set or tested before, same as the level of '1.2'. Push "Get Bright" button at least 2 times at same condition, and then the offset subtracted bright (gain) is generated which of filename is "xNNNNNA.raw(Refer to NOTE)

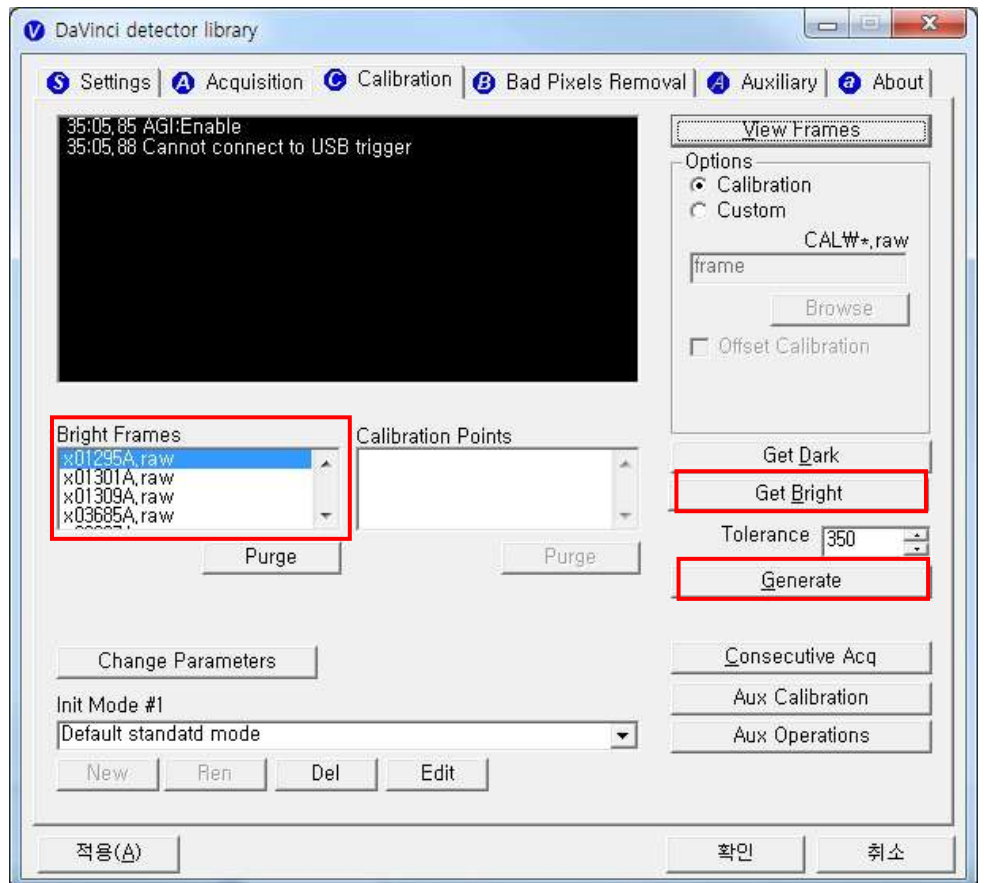


Figure 10: Get bright.

3rd step

After 2nd step, the “Generate” button will be activated. Click the button “Generate”, and then calibration point will be generated which of file name is “A # of point_ ‘median value of generated point’” like file of bright frame. The acquired bright frames within tolerance value which is variance of median level of acquired bright frames will be averaged and generated to a calibration point. The tolerance value can be edited.

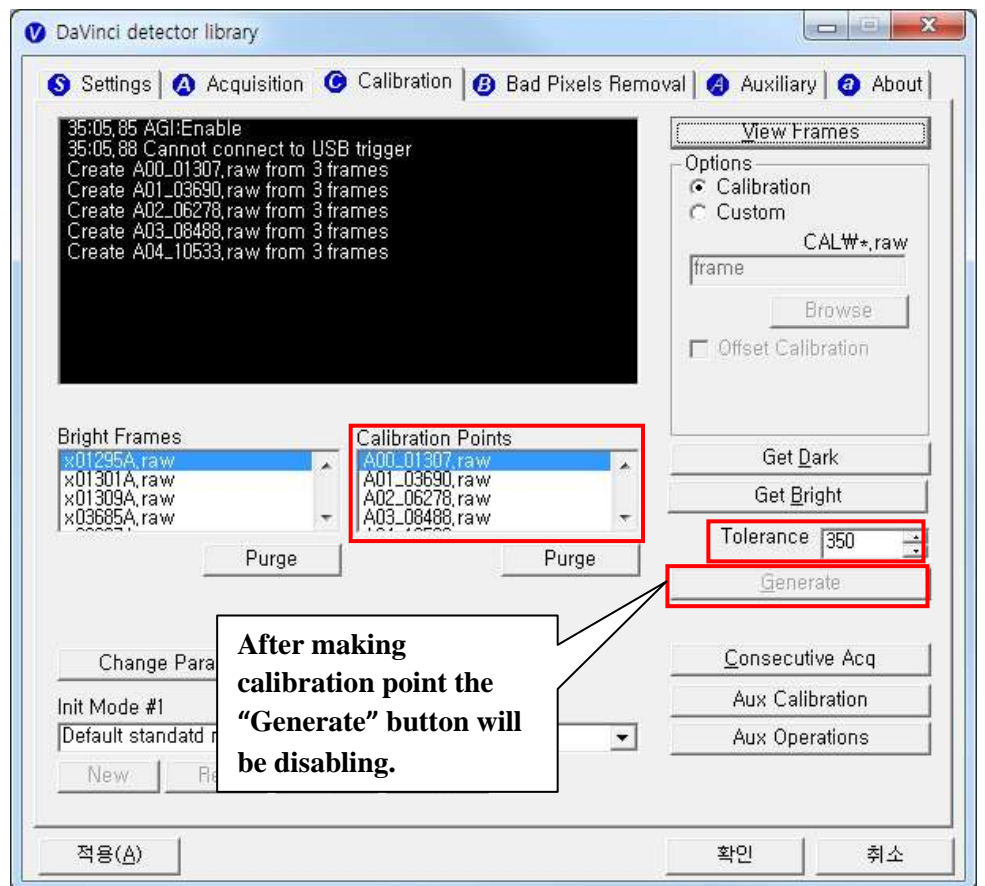


Figure 11: Generate

4th step

After 3rd step, Change Bad Pixels Removal Tab, Click the button “Generate Auto BPM”, and then Defect Map will be generated which of file name is “BPM.raw “ at the “cal\” folder.

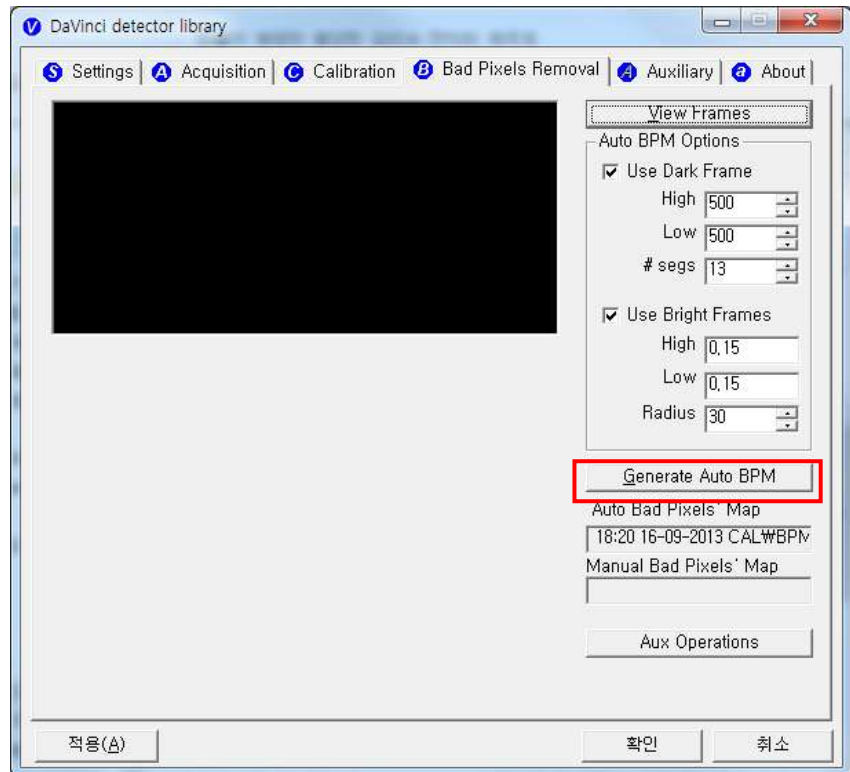


Figure 12: Bad pixels removal

5th step

For additional Defect correction, if “BPMM.raw” is existed at the install CD, copy to the “\cal\” folder.

6th step

On Acquisition Tab. Check the box “Offset Calibration”, “Gain Calibration”, “Bad Pix Map” for activate to each calibration and Bad Pixels Removal. Otherwise, it will does not working when going to pre-processing .



Figure13: Application of calibration

6. Image Acquisition Test

(1) Get Image

On Acquisition tab, click the “Get Image” button to get image. After click the button, you can see pop-up window, which is display window time and process of acquiring image.

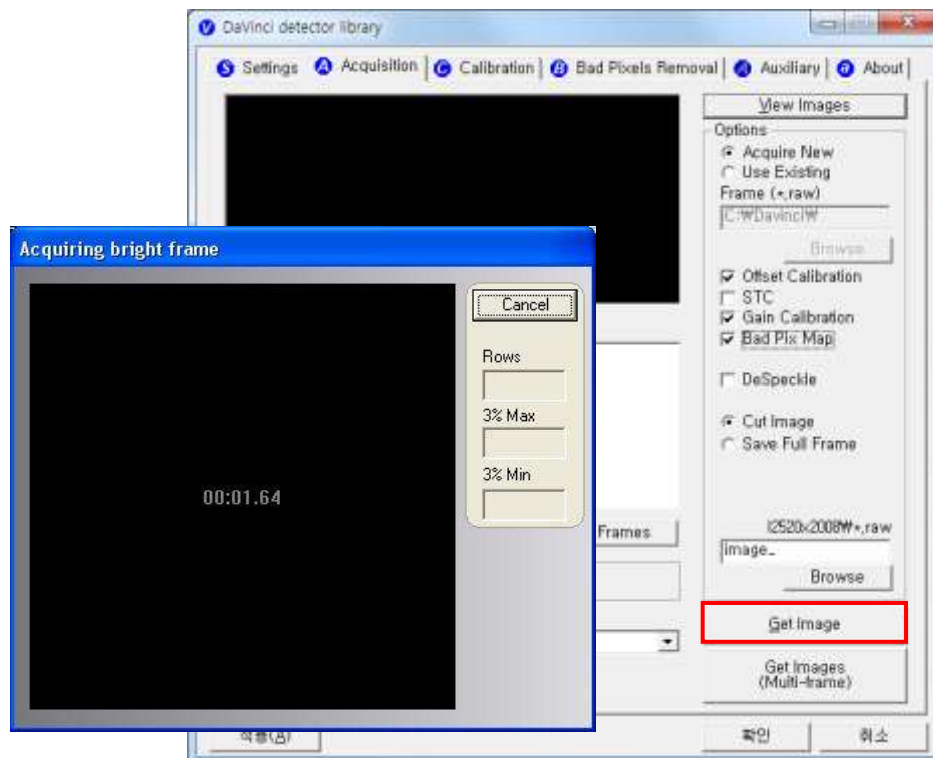


Figure 14: Get image

(2) View Images

Frame- and image-files have extension “raw” and contain pixel data in signed 16-bits little-endian format. One could view those files in Photoshop or another image editor.



Figure 15: View images

Common controls and displayed statistics

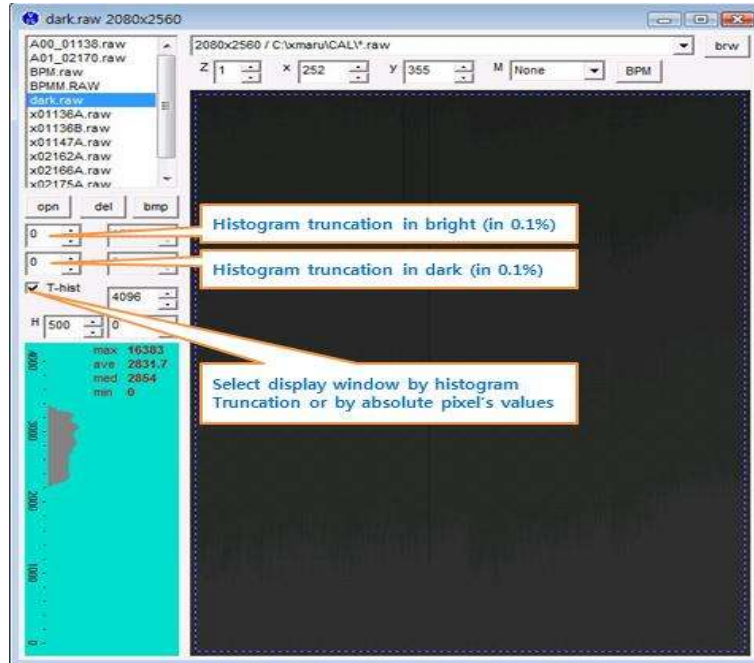


Figure 16: Description of viewer 1

- Pixel_Min – minimum pixel value in frame- or image- data
- Pixel_Max – maximum pixel value
- Pixel_Black – if a pixel \leq Pixel_Black then it is displayed as black (RGB 0, 0, 0)
- Pixel_White – if a pixel \geq Pixel_White then it is displayed as white (RGB 255, 255, 255)

Histogram's presentation

Relative Histogram Scale $[H]=1000$ means that the distance depicted as "H" on the drawing matches 1% of total number of pixels. Respectively $[H]=100$ means that "H" matches 0.1% of pixels and $[H]=500$ means that "H" matches 0.5% of pixels.

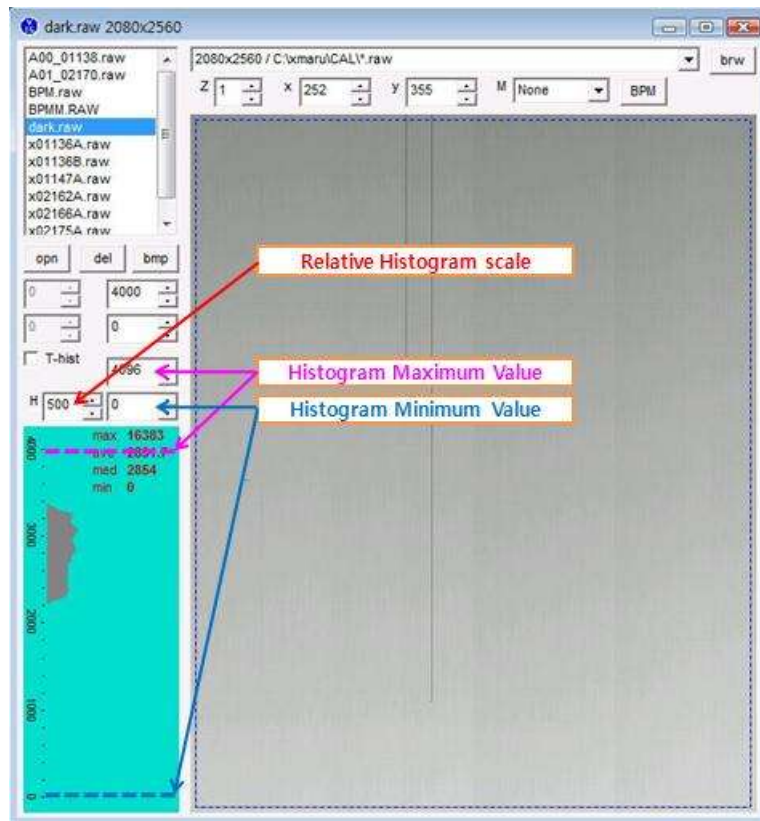


Figure 17: Description of histogram

Marker type "S"

Displays local surround of selected location

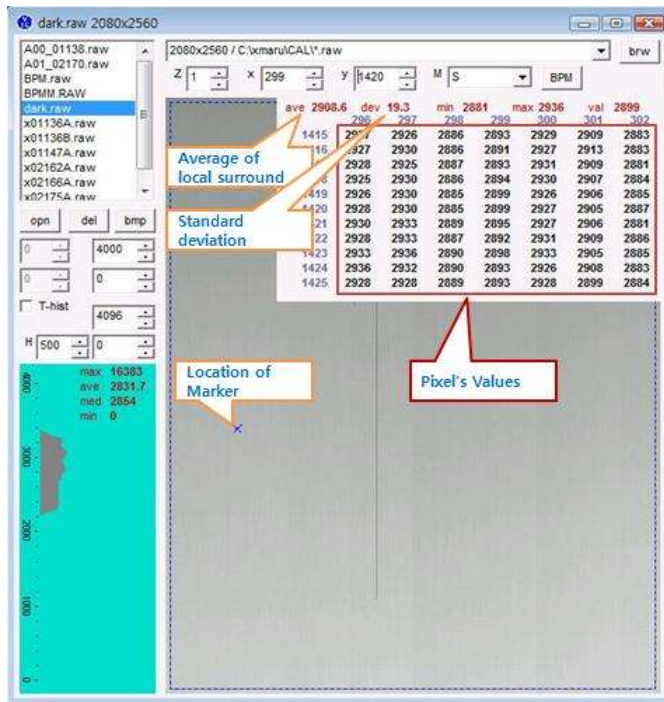


Figure 184: Description of marker type "S"

Marker type "R"

Display profile chart of a row.

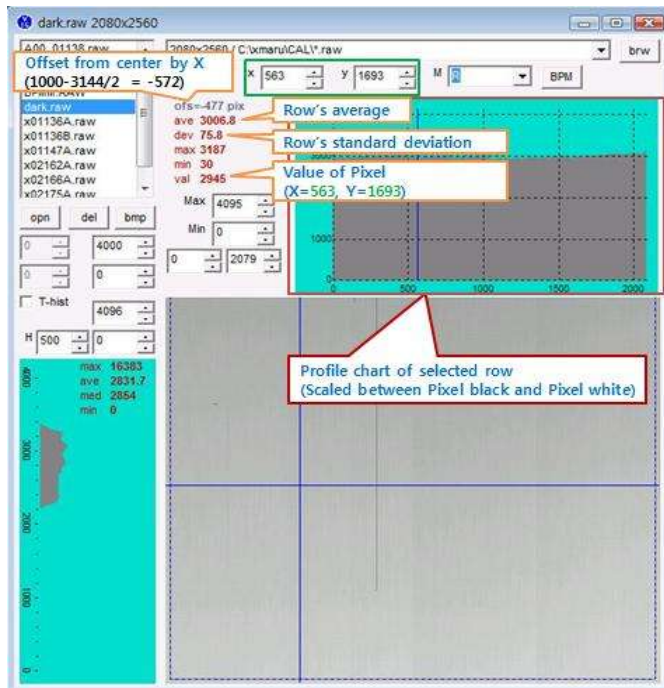


Figure 19: Description of marker type "R"

Marker type "C"

Display profile chart of a column.

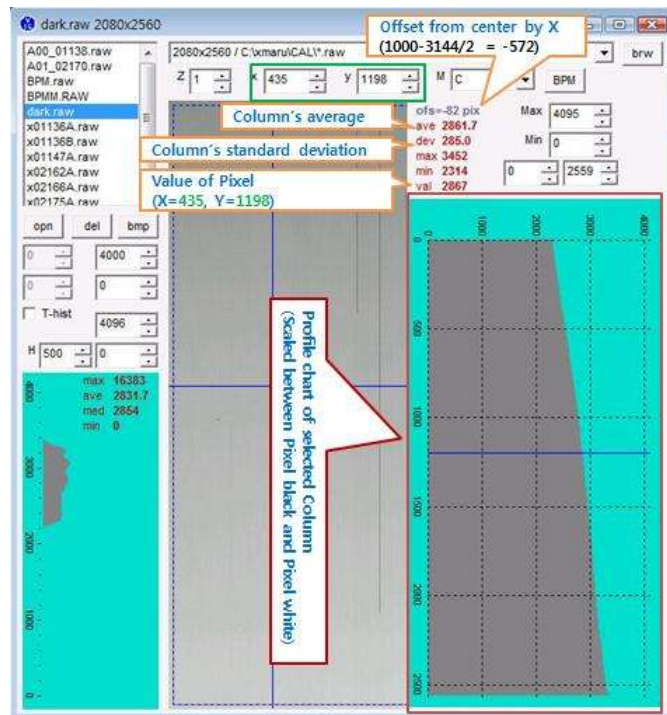


Figure 20: Description of marker type "C"

7. Operation

(1) Recommend

X-ray detector should be used at stable state within driving temperature range.

Acquire the X-ray images after power on and 30 minutes warming up to obtain high quality images.

The calibration should be performed every 6 months

(2) Switching power on / off

- All connection should be done, before turn on the power.
- Press the power button by more than 3 sec, when power on/off.
- The green light of the LED indicator on the detector is on, the detector power is on.
- The green light of the LED indicator on the detector is blinking, the detector is getting prepared to work and initialize.
- After power off, separate the battery.

(3) Storage

Store the sensor unit in clean and dry place. Ensure that storage place should be not affected by dust or liquids.

8. Radio Frequency compliance

(1) FCC Notice (U.S.A)

- **Test standards**

- 47CFR Part 15.107 (b) / 47CFR Part 15.109 (g) Class A.
- FCC Part 15 C Section 15.247, Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz
- FCC Part 15 C Section 15.407, Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz

- **FCC ID: QIIRY1012WGB**

5.15- 5.25 GHz band is restricted to indoor operations only.

Host device of the approved module shall be marked with the following item:

Compliance with FCC requirement 15.407(c)

Data transmission is always initiated by software, which is the passed down through the MAC, through the digital and analog baseband, and finally to the RF chip. Several special packets are initiated by the MAC. These are the only ways the digital baseband portion will turn on the RF transmitter, which it then turns off at the end of the packet. Therefore, the transmitter will be on only while one of the aforementioned packets is being transmitted. In other words, this device automatically discontinues transmission in case of either absence of information to transmit or operational failure.

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.

FCC CAUTION

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

When installing it in a mobile equipment

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines in Supplement C to OET65. This equipment has very low levels of RF energy that it deemed to comply without maximum permissive exposure evaluation (MPE). But it is desirable that it should be installed and operated keeping the radiator at least 20cm or more away from person's body (excluding extremities: hands, wrists, feet and ankles).

When you use the detector with wire mode, the wireless function is automatically off.

(2) IC Notice (CANADA)

- **Test standards**

- ICES-003 Issue 4

- IC RSS-210 Issue 7, Operation within the bands

- 902–928MHz, 2400–2483.5 MHz, and 5725–5850 MHz

- IC RSS-210 Issue 7, Operation within the bands 902–928 MHz,

- 2400–2483.5 MHz, and 5725–5850 MHz

- **IC: 10742A-1012WGB**

This Class A digital apparatus complies with Canadian ICES-003

This device complies with Industry Canada licence-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.

Le present appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisee aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioelectrique subi, meme si le brouillage est susceptible d'en compromettre le fonctionnement.

(3) R&TTE Notice (European Union)

- **Test standards**
 - EN 62311
 - ETSI EN 301 489-1
 - ETSI EN 301 489-17
 - ETSI EN 300 328
 - ETSI EN 301 893

9. Maintenance

(1) Maintenance

- Maintenance of the detector should be done by an authorized service provider
- If the Detector Panel is defective, the detector will be returned as is to the manufacturer for repair
- Clean the equipment with a dry soft cloth, or a soft cloth lightly moistened with mild detergent solution. Do not use any type of solvent, such as benzene
- This equipment and accessories are to be disposed of safely after the life span of them and national regulation must be observed.
- For safety reasons, be sure to inspect the instrument before using it. In addition, carry out a regular inspection at least once a year.
- Arrange the detector and power supply link cable to prevent the damage of the cable's rubber tube. For example, do not press the cable under the legs of the table or the people.
- If you need more information, please contact to the Rayence C/S team, they will provide it.



When the instrument is going to be cleaned, be sure to turn OFF the power of each instrument, and unplug the power cable from the AC outlet. Never use benzene, thinner or any other flammable cleaning agents. Otherwise, fire or electric shock may result.

(2) Cleaning

Cover

Clean the cover by the left warning box, if it is dirty.

CFRP of Detector

Wipe the CFRP plate of the sensor unit with ethanol or glutaraldehyde solution. If you are using disinfectant other than those specified above, or you are mixing another disinfectant with



For safety reasons, be sure to turn OFF the power of the detector when the following inspections are going to be performed. Otherwise, it may result in electric shock.

ethanol, please also consult a specialist, because they may harm the CFRP plate.









(3) Inspection

In order to ensure that the instrument is used safely and normally, please be sure to inspect the instrument before use. If any problem is found during the inspection, please take measures indicated in this chapter. If problem still cannot be corrected, please contact Rayence representative or distributor. It is recommended that a record of the inspection be kept by making copies of the check lists in this section, or making a separate check list.

Inspection chart

Inspection	User	Vendor	Cycle
Check that cables are not damaged or cover of cables is not torn	<input type="radio"/>		Daily
Check that the plugs and locks of connectors are not loose	<input type="radio"/>		Daily
Check that the cover or parts are not damaged and not loose	<input type="radio"/>		Daily
Check the LED indicator	<input type="radio"/>		Daily
Check the bad pixel map		<input type="radio"/>	Half year
Check the performance of the instrument by performing exposures using a phantom or a resolution chart		<input type="radio"/>	Yearly

(4) Marking and labeling symbols

Symbols	Meaning
	Caution : "Attention, see instructions for use"
	Alternate current
	Protective earth (Ground)
	Off (power : disconnect from the main switch)
	On (power : connect to the main switch)
	Warning
	Caution
	Note



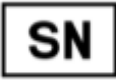

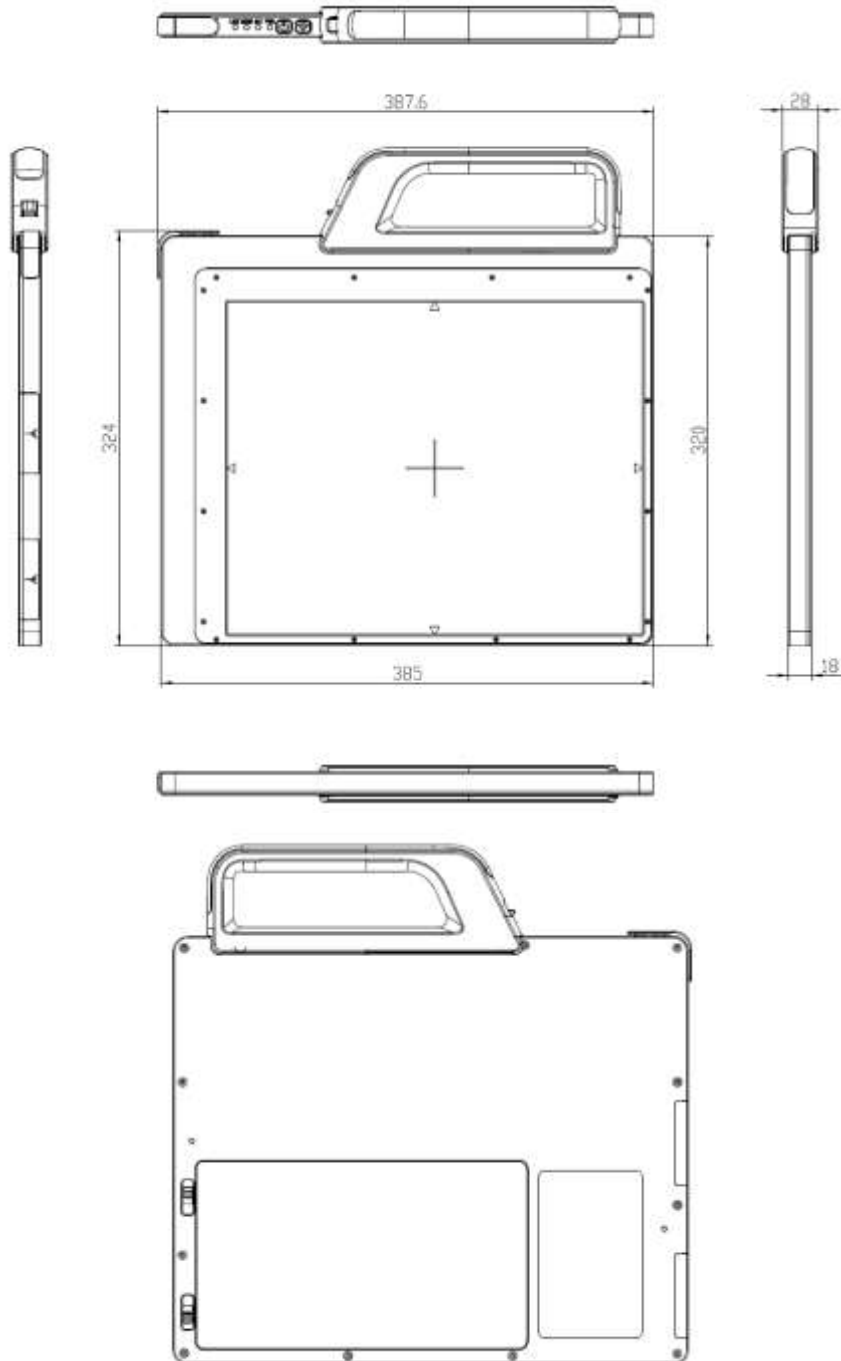
	<p>Manufacturer</p>
	<p>Date of manufacture</p>
	<p>Serial number</p>
	<p>WEEE : Waste Electrical and Electronic Equipment</p>

Figure 21: Labeling symbols

Appendix

Dimension

[unit : mm]





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