Mars1417V serial

Wireless Digital Flat Panel Detector

User Manual

iRay Technology (Shanghai) Ltd.

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DATE: 2013-08-09

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To customers

Thank you for purchasing iRay's Mars1417V serial Medical X-ray Radiography Flat Panel Detector. This User's Manual explains the general usage of the detector and peripheral equipment. Before using this product, please read this manual thoroughly. Our company will not be responsible for any abnormalities, malfunction and body harms caused by violations of the user's manual.

Important information on usage and management of equipment

1. Only a physician or a legally certified operator is allowed to use this product.
2. The equipment should be maintained in a safe and operable condition by maintenance personnel.
3. Use only computers and image display monitors complying with IEC 60601-1 or IEC 60950-1. For details, consult our sales representative or local iRay dealer.
4. Use only the dedicated cables. Do not use any cables other than those supplied with this product.
5. Opening the detector by the unauthorized personnel of our company is forbidden.
6. Prevent the liquid or electrical conductive substance entering into the detector.
7. The detector should not be used in circumstance with flammable gas or corrosive gas.
8. The detector's radiation protection complies with IEC 60601-1-3.
9. Prevent the detectors from sharp/hard things, or the cover will be broken. If the painting or the cover is broken, do not contact with surface directly.
10. To pull out the plug is the only way to cut down the main power supply.
11. For product available in the USA/Canada market, only channel 1~11 can be operated. Selection of other channels is not possible.

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Disclaimer

1. In no event shall iRay be liable for any damage or loss arising from fire, earthquake, any action or accident by a third party, any intentional or negligent action by user, any trial usage, or other usage under abnormal conditions.
2. Roentgenography, image processing, image reading, and image data storage must be performed in accordance with the laws of the country or region in which the product is being used. The user is responsible for maintaining the privacy of image data.
3. In no event shall iRay be liable for personal physical harm or property damage that is sustained when the instructions are not followed or the product is misused.
4. It is the responsibility of the attending physicians to provide medical care services. iRay will not be liable for faulty diagnoses.
5. In no event shall iRay be liable for direct or indirect consequential damages arising from the use or unavailability of this product. iRay shall not be liable for loss of image for any reason.
6. In no event shall iRay be liable for any damage arising from moving, alteration, inspection or repair by a person other than authorized service engineers.
7. Specifications, composition, and appearance of this product may change without prior notice.

About CE

MARS1417V SERIAL is compliant with the standard of

IEC 60601-1，General requirements for basic safety and essential performance and IEC 60601-1-2, Electromagnetic Compatibility –Medical Electrical Instrument.

The detector can connect to public power supply as defined in CISPR 11 (the class defines GROUP1 Class B).

Please refer to chapter V: Regulatory information for CE testing standard.

For more information, please contact with iRay.

About FCC

FCC Compliance

This device complies with Part 15 of the FCC Rules. Operation is subject to the

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following tow conditions:
1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.
Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.
NOTE: 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 instruction, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment dose cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encourage 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.
- FCC requires this product to be used indoors for the frequency range 5.15 to 5.25 GHz to reduce the potential for harmful interference to co-channel Mobile Satellite systems.
Federal Communication Commission (FCC) Radiation Exposure Statement.
This EUT is compliance with SAR for general population/uncontrolled exposure limits in ANSI/IEEE C95.1-1999 and had been tested in accordance with the measurement methods and procedures specified in OET Bulletin 65 Supplement C. This equipment should be installed and operated contact with the radiator & your body.

Note on installation

Please request your sales representative or local iRay dealer to install this product.

Note on disposal of this product

Disposal of this product in an unlawful manner may have a negative impact on health and environment. Be absolutely sure to follow the procedure which is in conformity with the laws and regulations applicable in your area when disposing

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of this product.

European Union (and EEA) only.

This symbol indicates that this product can not be disposed of with your household waste, according to the WEEE Directive (2002/96/EC) and your national law. This product should be handed over to a designated collection point, e.g., on an authorized one-for-one basis when you buy a new similar product or an authorized collection site for recycling waste electrical and electronic equipment (EEE). Improper handling of this type of waste could have a possible negative impact on the environment and human health due to potentially hazardous substances that are generally associated with EEE. At the same time, your cooperation in the correct disposal of this product will contribute to fully utilizing natural resources. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, waste authority, approved WEEE scheme or your household waste disposal service.

For more information about return and recycling of WEEE products, please contact iRay.

About Service Information

- Please refer to iRay or iRay's authorized service personnel only.
- iRay or iRay's authorized agents provide telephone service and site services if it is determined necessary.
- Expense of service and component may be charged to the customer according to the warranty.
- Any unauthorized attempt to repair instrument under warranty voids that warranty.
- Client shall provide product's serial number to obtain service.
- Replaced component becomes the manufacturer's property.
- Customers shall be responsible for the instruments damage because of transportation from customer to iRay or authorized agency.

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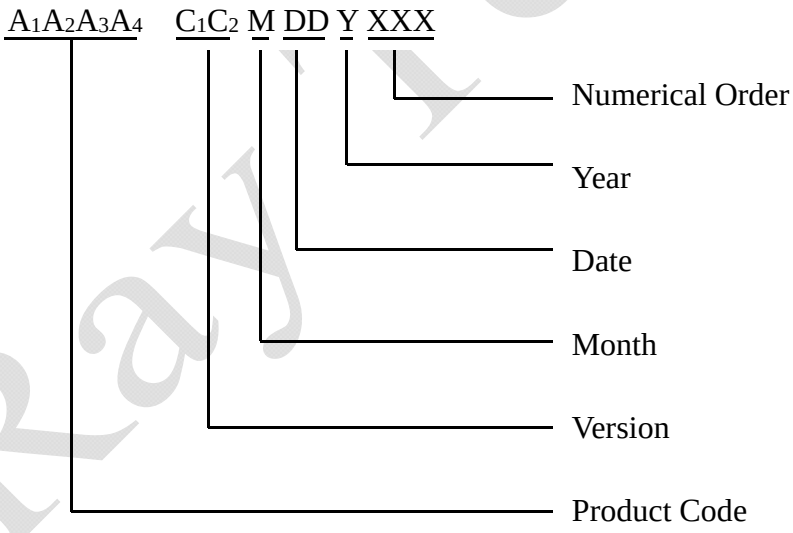
Symbols

The list of the symbols used in this instrument is as follows:

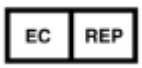
Symbol for “caution, consult accompanying documents”

For an instrument which has passed the CE test, the CE mark shall be placed on the instrument’s label followed by the CE number

a. This symbol shall be accompanied by the manufacturer’s serial number. The serial number shall be after, below or adjacent to the symbol.
b. The relative size of the symbol and the serial number are not specified.
c. So far our product serial number is made of thirteen digits:



a. The symbol shall be accompanied by the name and address of the manufacturer,adjacent to the symbol. The address is not required with the symbol on an immediate container as specified in EN375 AND EN376, except the immediate container is also the outer container.
b. The relative size of the symbol ,the name and address is not specified.



a. The symbol shall be accompanied by the name and address of the authorized representative in the European Community, adjacent to the symbol. The address is not required with the symbol on an immediate container as specified in EN375 AND EN376, except the immediate container is also the outer container.
b. The relative size of the symbol, the name and address is not specified.

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Symbol for “consult instructions for use”, “consult operation instructions”.

Safety Signs: Symbol for “refer to instruction manual”

Safety Signs： Symbol for “Dangerous Voltage”

“ON” (power)

“OFF” (power)

Protective Earth Conductor(ground)

This Mark indicates that this equipment must be handled with care

Do not jolt or apply excessive load to the equipment

The equipment shall be operated during the upper and lower limitsof emperature

Fragile, the package should be handledwith care, **package symbol**

Keep awayfrom sunlight, **package symbol**

Keep dry, **package symbol**

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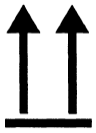
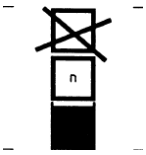
The humidity limitationshall be indicated adjacentto the upper horizontal lines, **package symbol**

The storage temperatureshall be indicated adjacentto the upper horizontal lines, **package symbol**



Indicates correctupright position ofthe transportpackage, **package symbol**

Transport packageshall not be rolled, **package symbol**



Stacking limit by number,**package symbol**

Trademarks

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Safety notices

The following safety notices are used to emphasize certain safety instructions. This manual uses the caution symbol along with a caution message.

This notice 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.

This is used to indicate important operations and restrictions. Be sure to read this notice to prevent property damage or malfunction.

This is used to indicate operations for reference and complementary information. Users are recommended to read this notice.

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1. Chapter I Safety Information

1.1 Safety precautions

Follow these safeguards and properly use the equipment to prevent injury and damage to any equipment/data.

WARNING
Installation and environment of use    • **Do not use or store the equipment near flammable chemicals such as alcohol, thinner, benzene, etc.** If chemicals are spilled or evaporate, it may result in fire or electric shock through contact with electric parts inside the equipment. Also, some disinfectants are flammable. Be sure to take care when using them. **Do not connect the equipment with anything other than specified.** Doing so may result in fire or electric shock.
Power supply    • **Do not operate the equipment using any type of power supply other than the one indicated on the rating label.** Otherwise, it may result in fire or electric shock. • **Do not handle the equipment with wet hands.** You may experience electric shock that could result in death or serious injury. • **Do not place heavy object such as medical equipment on cables and cords. Do not pull, bend, bundle, or step on them to prevent their sheath from being damaged, and do not alter them neither.** Doing so may damage the cords which could result in fire or electric shock. • **Do not supply power to more than one piece of equipment using the same AC outlet.** Doing so may result in fire or electric shock. • **Do not turn ON the system power when condensation has formed on the equipment.** Doing so may result in fire or electric shock. • **Do not connect a multiple portable socket-outlet or extension cord to the system.** Doing so may result in fire or electric shock. • **To avoid the risk of electric shock, this equipment must only be connected to power supply with protective earth.** Not doing so may result in fire or electric shock.

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- **Securely plug the power cord into the AC outlet.**

  If contact failure occurs, or if metal objects come into contact with the exposed metal prongs of the plug, fire or electric shock may result.
- **Be sure to turn OFF the power to each piece of equipment before connecting or disconnecting the cords.**

  Otherwise, you may get an electric shock that could result in death or serious injury.
- **Be sure to hold the plug or connector to disconnect the cord.**

  If you pull the cord, the core wire may be damaged, resulting in fire or electric shock.

WARNING

If the detector is intended to assemble mobile DR system, the sensor cable and Detector cable must be ordered no longer than4m, and the cable must be collected in the fixed position, not doing this may cause the DR system be toppled.

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WARNING

Handling

- **Never disassemble or modify the equipment. No modification of this equipment is allowed**
  Doing so may result in fire or electric shock. Also, since the equipment incorporates parts that may cause electric shock as well as other hazardous parts, touching them may cause death or serious injury.

- **Do not place anything on top of the equipment.**
  The object may fall and cause an injury. Also, if metal objects such as needles or clips fall into the equipment, or if liquid is spilled, it may result in fire or electric shock.
- **Do not hit or drop the equipment.**
  The equipment may be damaged if it receives a strong jolt, which may result in fire or electric shock if the equipment is used without being repaired.
- **Do not put the equipment and pointed objects together.**

The equipment may be damaged. If so, the equipment should be used in bucky.

- **Have the patient take a fixed posture and do not let the patient touch parts unnecessarily.**
  If the patient touches connectors or switches, it may result in electric shock or malfunction of the equipment.

When a problem occurs

- **Should any of the following occurs, immediately turn OFF the power to each piece of equipment, 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 has been spilled into the equipment or a metal object has entered through an opening
  - When the equipment has been dropped and damaged

Maintenance and inspection

- **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 for safety. NEVER use methanol, benzene, acid and base because they will erode the equipment.**
- **DON'T dip the equipment into the liquid.**
- **Please make sure that the equipment's surface & plugs are dry before turning ON.**
  Otherwise, it may result in fire or electric shock.

- **Clean the plug of the power cord periodically by unplugging it from the AC outlet and removing dust or dirt from the plug, its periphery and AC outlet with a dry cloth.**
  If the cord is kept plugged in for a long time in a dusty, humid or sooty place, dust around the plug will attract moisture; 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 the performing inspections indicated in this manual.**
  Otherwise, electric shocks may occur.

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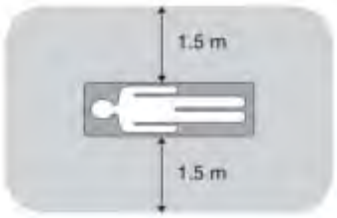
CAUTION

Installation and environment of use

- **Do not install the equipment in any of the locations listed below. Doing so may result in failure, malfunction, equipment falling, fire or injury.**
  - Close to facilities where water is used
  - Where it will be exposed to direct sunlight
  - Close to the air outlet of an air-conditioner or ventilation equipment
  - Close to heat source such as a heater
  - Where the power supply is unstable
  - In a dusty environment
  - In a saline or sulfurous environment
  - Where temperature or humidity is high
  - Where there is freezing or condensation
  - In areas prone to vibration
  - On an incline or in an unstable area
- **Because the equipment cable is long, take care that cables do not become tangled during use. Also, be careful not to get your feet caught in the cable.**
  Otherwise, it may cause a malfunction of the equipment or the injury of the user due to tripping over the cable.
- **Non-medical equipment such as the battery charger, access point and IR data communication unit cannot be used in patient's vicinity.**



Power supply

- **Always connect the three-core power cord plug to a grounded AC power outlet.**
- **To make it easy to disconnect the plug at any time, avoid putting any obstacles near the outlet. Otherwise, it may not be possible to disconnect the plug in an emergency.**
- **Be sure to ground the equipment to an indoor grounded connector. Also, be sure to connect all the grounds for the system to a common ground.**
- **Do not use any power source other than the one provided with this equipment**.
  Otherwise, fire or electric shock may be caused due to leakage.

Handling

- **Do not spill liquid or chemicals onto the equipment. In case the patient is injured, it is not allowed to contact with blood or other body fluids.**
  Doing so may result in fire or electric shock.
  In such a situation, protect the equipment with a disposable cover as necessary.
- **Turn OFF the power and pull out the plug to each piece of equipment for safety when not used.**

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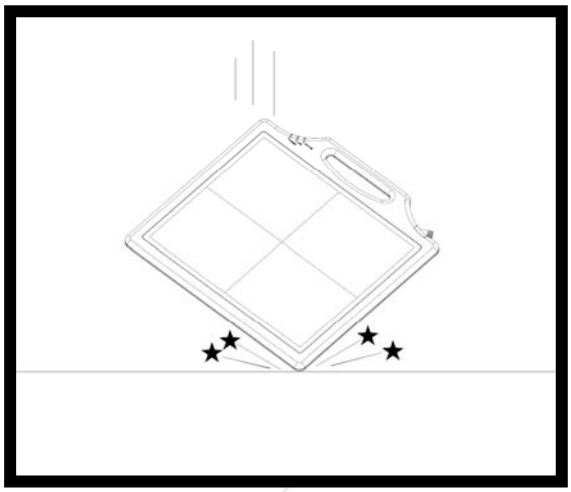
CAUTION

Handling

- **Handle the equipment carefully.**
- **Do not submerge the equipment in water.**
- **The internal image sensor may be damaged if something hits against it, or if it is dropped. If the equipment is dropped, the drop sensor will turn red and the equipment will not be warranted by iRay.**



- **Do not place excessive weight on the detector.**
  Otherwise, the internal image sensor may be damaged and image may be incorrect.
- **Be sure to use the detector on a flat surface so it will not bend. Otherwise, the internal image sensor may be damaged. Be sure to securely hold the detector while using it in upright positions. Otherwise, the detector may fall over, resulting in injury to the user or patient, or may flip over, resulting in damage to the inner device.**
- **The detector should be used in the bucky or holder to keep the same load (same pressure) on the detector when acquiring the image. Or the image will be incorrect.**

1.2 Notes for using the equipment

When using the equipment, take the following precautions. Otherwise, problems may occur and the equipment may not function correctly.

Before exposure

- Be sure to check the equipment daily and confirm that it works properly.
- **Check the cable MPN No. & control box version.**
- Sudden heating of the room in cold areas will cause condensation to form on the equipment. In this case, wait until the condensation evaporates before performing an exposure. If the

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

- The detector should warm up for 25 minutes before exposure or updating the gain map or defect map.

During exposure

- Do not move the power or Ethernet Cables during exposure, or it may cause image noise or artifacts, even incorrect images.
- Do not use the devices near the equipment generating a strong magnetic field. Otherwise, it may cause image noise, artifacts or even incorrect images.

Disinfection and Cleaning

- After every examination, wipe the patient contact surfaces of the detector using disinfectants such as ethanol, to prevent the risk of infection. For details on how to sterilize, consult a specialist.
- Do not spray the detector directly with disinfectants or detergents.
- Wipe it with a cloth slightly damped with a neutral detergent. Do not use solvents such as alcohol, thinner, benzene, acid and base. Doing so may damage the surface of the equipment.
- It’s recommended to use a waterproof non-woven cover as the isolated layer between detector and the blooding patient.

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Replace Cables

- Turn **OFF** the power of the equipment and unplug the power cord from the AC outlet before operation. Unplug the detector cable from the float outlet, or it may result in fire or electric shock.
- Eliminate the static before replacing cable, including operating platform, tools and operator, or ESD may damage the detector.

Operating/storage environment

Be sure to use and store this equipment under the conditions described below:

	Temperature	Temperature change	Humidity	Atmospheric Pressure	Pressure Change
Operating	5~30℃	<1k/min	10~70% RH	700~1000hPa10~70% RH	<10kp/min (1kp=1.0197E-5Pa)
Storage	-20~60℃		≤93% RH		

- Do not expose this equipment to high temperatures and/or high humidity. Malfunctions may occur.
- Keep air flow around the equipment, especially when the environment temperature is above 30℃.
- When the environment temperature is above 33℃ or running for a long time, the equipment should be used in a holder or a bucky. The surface temperature may be above 41℃.
- When not in use, keep the detector and grid in a designated and safe location.
- The labeling for Packaging marked with special handling instructions for transport and storage:
- The product should be storage or transport under the temperature from -20~60℃, the humidity under 93% RH.

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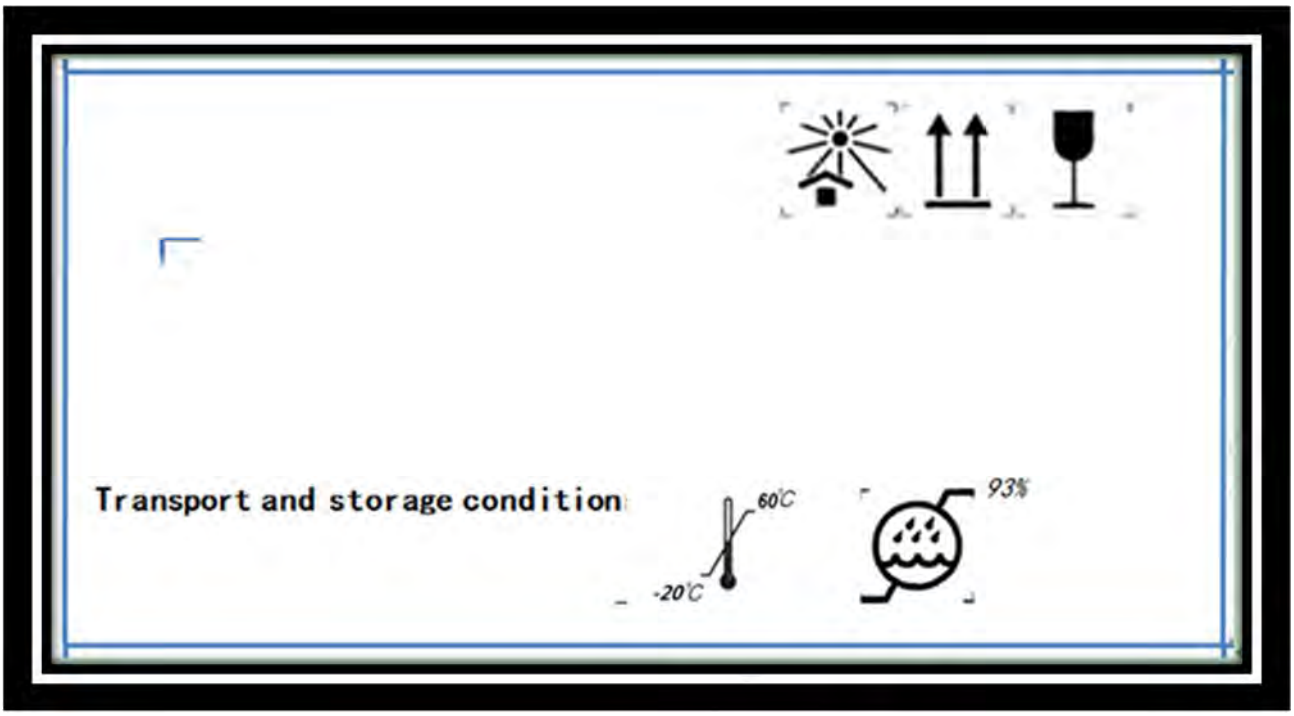

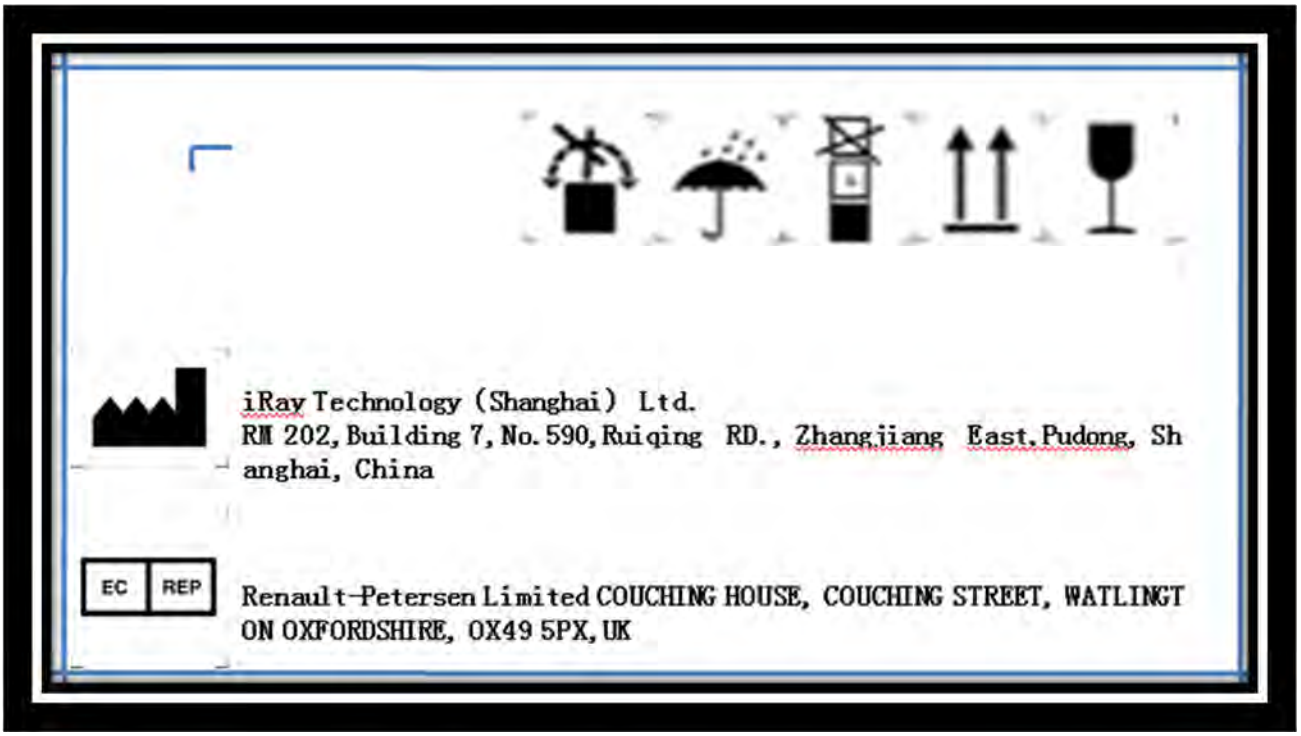

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2. Chapter II General Description

The Mars1417V-PSI is the cassette-size (digital radiographic) X-ray flat panel detector based on amorphous silicon thin-film transistor technologies. It is designed to provide the highest quality of radiographic image, which contains an active matrix of2304×2800 pixels with 150μm pitch.Users can select the type of scintillator such as Standard GOS(Gadolinium Sulfoxylate), DRZ Plus, or CsI (Cesium Iodide).The data interface is Gigabit Ethernet which can afford high data transfer rates. In addition, Mars1417V-PSI is equipped with iRay's unique sync-shot function to make the hardware connection between the equipment and HVG (High Voltage Generator)unnecessary.

Along with the equipment, iRay also provides a Microsoft Visual Studio (2008) library

IrayAcquireLib.lib, and a demo program iDemo® with source code to assist users' integration of the equipment into their existing DR system. The library **IrayAcquireLib.lib** contains functions for image acquisition and equipment configuration. iDemo® demonstrates the usage of **IrayAcquireLib.lib** and provides a simple user interface to acquire and preview X-ray images.

2.1Scope

This manual contains information about the iRay Mars1417V. All operators must read and understand this manual before using the equipment. All information in this manual, including the illustrations, is based on equipment prototype. If configuration of your equipment does not have any of these items, information about these items in the manual does not apply to your equipment.

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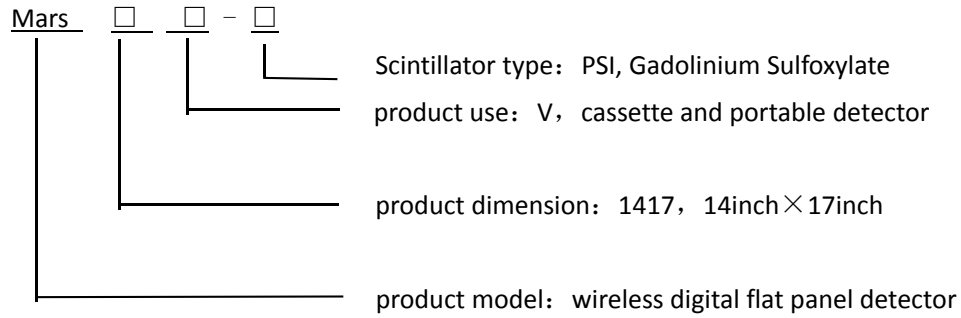
2.2Model



Specification of Mars1417V serial Flat Panel Detector：

No.	Model	Brand Name	Type of Use	Active area(cm^2)	Pixel matrix	Pixel Pitch(μm)
1	**Mars1417V-PSI**	**Mars1417V-PSI**	**Cassette and portable**	34.3×41.6	2304×2800	150

2.3Characteristic

- Fixed static Flat Panel Detector used for general radiography.
- Sync-Shot exposure trigger
- Gigabit Ethernet
- DRZ Plus or CsI scintillation screen.
- Easy to change the cable and upgrade firmware.

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2.4Intended use

This equipment provides digital X-ray imaging for diagnosis of disease, injury, or any applicable health problem. The image is obtained as the result of X-ray passing through the human body and detected by the equipment. This device is intended to be used in the holder or bucky which is well insulated to the detector. Or the holder or the bucky is well grounded. This device is not intended for directly touching the person.

iRay will provide equipment and software support for integration of system. The total length of Detector cable and Extension cable cannot exceed 9 m, or the impedance of protective earth connections may exceed the safety threshold.

This device is not intended for mammography or dental applications，and prohibited for pregnant women and children

2.5Standard configuration

The Mars1417Vcomes with a power supply which connects to 100-240 AC outlets and generates DC voltages needed by the equipment.

Mars1417V sub types ending with suffix -I are equipped with internal X-ray sensors which automatically detect the X-ray and synchronize image acquisition with the X-ray exposure, therefore, they do not need to be connected to high voltage generator of the user's DR system. Mars1417V subtypes ending with the suffix -M are not equipped with any internal X-ray sensor and need to be connected to the user's high voltage generator through a supplied cable for synchronization between image acquisition and X-ray exposure.

The equipment shall be connected to a computer through the Ethernet cable for data transfer. There is also a serial cable connecting the detector to the computer for configuration and image acquisition commands.

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2.6 Standard Package List

Item	Qty
Detector: Mars1417V (with detector cable) 	1
Medical Adaptor: (Control box is specified as a part of ME Equipment) 	2
Battery： 	3
Wireless AP 	2
LAN Cable 	1
Ethernet Cable 	1
Power Cable 	2

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Power convert cable		1

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2.7 Main Specifications

2.7.1 Useful entrance field size

All the iRay's detectors should meet the following requirements; the useful entrance field size should be more than 95% nominal entrance field size.

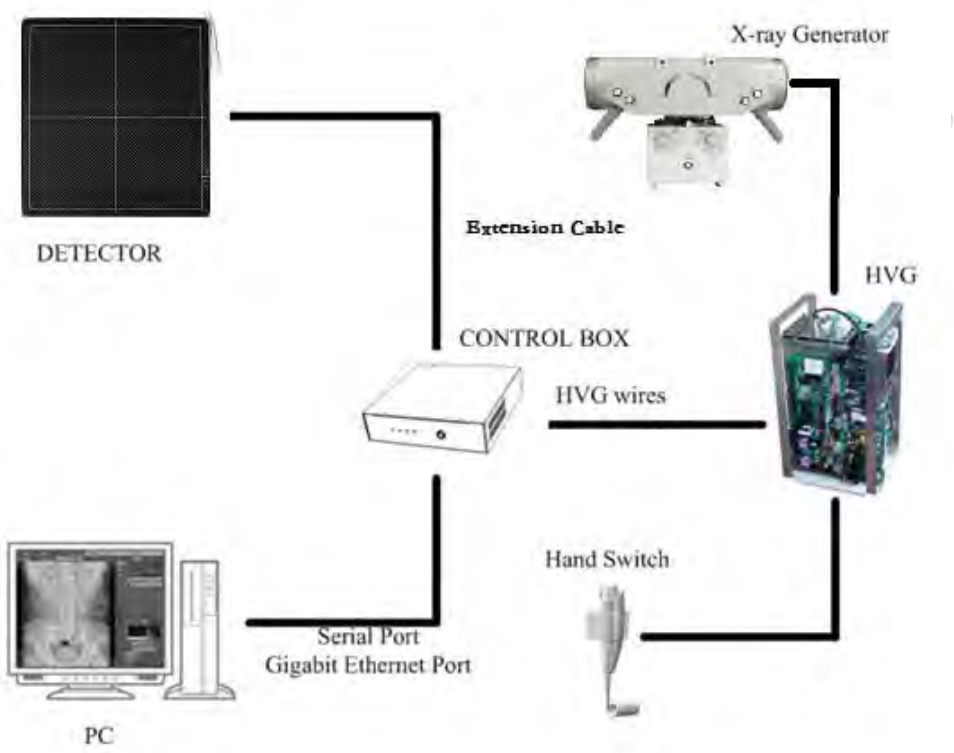

Table 2.7.1 Entrance field size

Model	Nominal entrance field size(cm)	Useful entrance field size(cm)
Mars1417V serial	**35 × 43**	34.3×41.6

2.7.2 Minimum detectable dose should be less than100nGy.

2.7.3 Maximum linearity dose should be more than 60μGy，and the correlation coefficient（r^2）should be not less than 0.99.

2.7.4 Limiting spatial resolution should be not less than2.8Lp/mm(Standard GOS)/ 3.1Lp/mm(DRZ Plus or CsI).

2.7.5 Low-contrast resolution should be more than 0.0055（with the air kerma should be 50μGy

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in the test process）.

2.7.6 Defects

Defects	Max Number Allowed
Full Class 0	13500
Full Class 1	1500
Full Class 2	1050
Full Class 3	300
Full Class 4	150
Full Class 5	120
Full Class 6	0
Full Class 7	0
Full Class 8	0
Meta 7+8 Class 1	0
Meta 7+8 Class 2	0
Meta 7+8 Class 3	0
Meta 7+8 Class 4	0
Meta 7+8 Class 5	0
Meta 7+8 Class 6	0
Meta 7+8 Class 7	0
Meta 7+8 Class 8	0
Single Horizontal Defect Lines	5
Single Vertical Defect Lines	5
Double Horizontal Defect Lines	0
Double Vertical Defect Lines	2
Double Vertical Defect Lines in Central Area	0
Triple Vertical or Horizontal Lines	0
Min Gap between Vertical Defect Lines/Line Pairs	10
Min Gap between Horizontal Defect Lines/Line Pairs	10

2.7.7 Flat uniformity should be not exceed 2.2%

2.7.8 Modulation transfer function[MTF（u，v）]

The MTF should meet the following table

Standard radiation quality No.RQA/μGy	Spatial frequency (lp/mm)	MTF (DRZ-Plus)	MTF(CSI)
5/2.5	0.5	⩾0.65	⩾0.77
	1.0	⩾0.35	⩾0.58
	1.5	⩾0.20	⩾0.39
	2.0	⩾0.10	⩾0.25
	2.5	⩾0.05	⩾0.15
	3.3	⩾0.01	⩾0.10

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2.7.9 Detective quantum efficiency（DQE）

The DQE should meet the following table

Standard radiation quality No.RQA/μGy	Spatial frequency(lp/mm)	DQE (DRZ-Plus)	DQE (CSI)
5/2.5	0	⩾0.20	⩾0.58
	0.5	⩾0.15	⩾0.50
	1.0	⩾0.10	⩾0.40
	2.0	⩾0.02	⩾0.21
	2.5	⩾0.01	⩾0.14

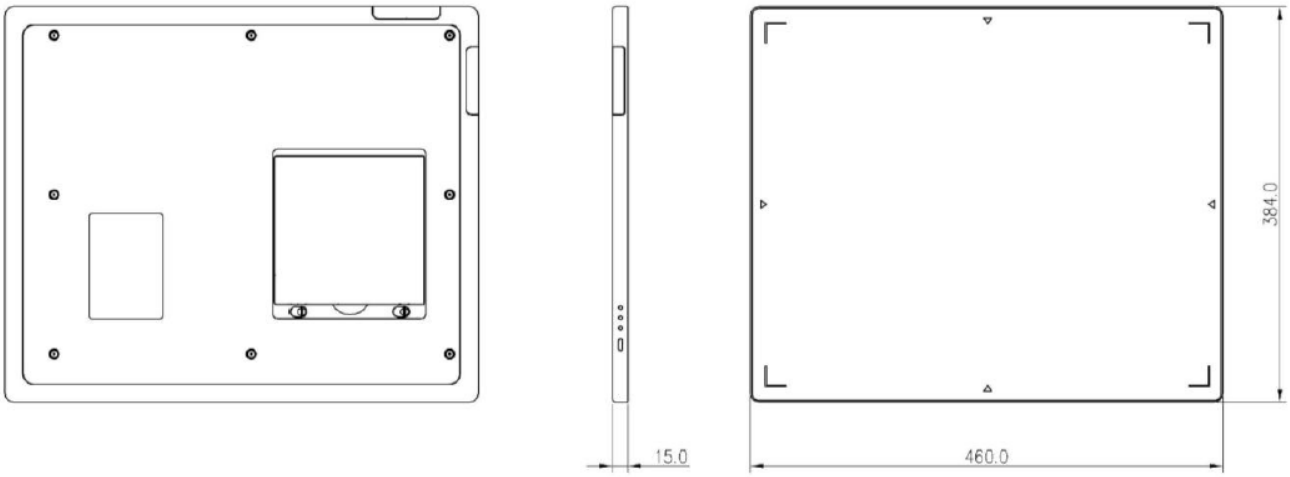
2.7.10 Lag effect should be less than 3%.

2.7.11 adaptor (Control Box is specified as a part of ME equipment)

Power: Input: 110-240V~ 50-60Hz

Output: 12V⎓1A

Rated Input: 110VA



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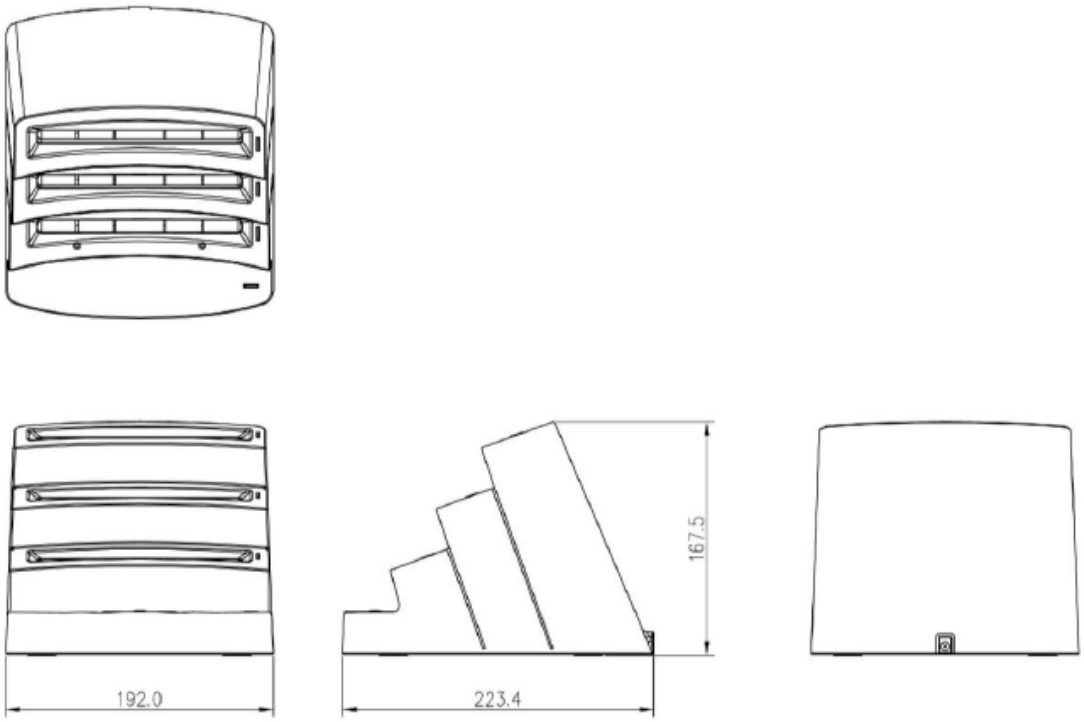

2.8 Description of Indicators

Fig. 2.8.1 Detector Indicators

Table 2.8.1 Description of Detector Indicators

Items	Color	Descriptions
Power	OFF	Power OFF
	Green(steady)	Power supply is normal
Status	OFF	Power OFF or Idle
	Yellow(steady)	Power up, load firmware or there exists error
	Green(blinking)	Data transmission between equipment and workstation

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Link	OFF	Power OFF
	Green(steady)	Gigabit Ethernet link is normal

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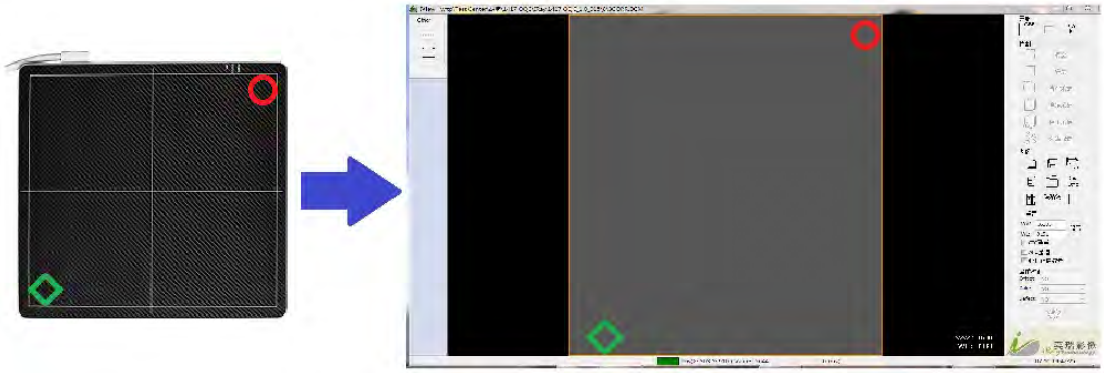
2.9 Image Direction

Please notice that the image direction is defined as follows:



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3. Chapter III Installation and Operation

Important

- ***The following is a general installation guide. The interface & operation may be different between different firmware and software editions. Please contact iRay service office for the details.***
- ***Before installation, please check the MPN (Manufactory Product Number) of the equipment cable and the version of the control box. Please see Appendix B and Appendix C.***
- ***Do not place the detector/control box/cable near the AC-DC adapter, the electromagnet or the RF equipment. Please find details from chapter 5.2.***
- ***iDemo 1.0.6.1(SDK 1.0.6.1) or above supports Software Auto-Clear Mode, when the mode is enabled, please note the status message. Commands should be sent only when it is "Exposure Enabled" or "Ready", if it is "Exposure Prohibit (Auto-Clearing), the commands will be ignored if they are sent. Please find details from SDK Manual and iRayDR User Guide.***
- ***The operator should have the experience of computer operation and X-ray diagnostic system operation. Before using the product, the operation should be trained by iRay's FAE or iRay's authorized engineers.***

The equipment should be used with the specified power supply.

1. Turn on the computer.
2. Install a Gigabit Ethernet card in the computer if not installed.
3. Install *WinPcap* 4.1.2 for the Gigabit Ethernet interface.
4. Connect the power supply to a 110-240V AC outlet.
5. Connect the extension cable to the equipment.
6. Connect control box to PC and high voltage generator with interface cable(serial cable and Ethernet cable).
7. Turn on power supply and the green indicator of the detector shall be lit up.
8. Run one image acquisition software such as iDemo.

3.1Quick Start

Before using the equipment, the user shall read the appendix A for details of SDK installation.

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Then the user can use the Quick Start software **iDemo®** for image acquisition.

3.2First Image Acquisition

iRay provides a Microsoft Visual Studio (2008) library ***IrayAcquireLib.lib*** and a demo program **iDemo®** with source code to assist the users' integration of the equipment into their existing DR system. The library ***IrayAcquireLib.lib*** contains functions of image acquisition and detector configuration. iDemo demonstrates the usage of ***IrayAcquireLib.lib*** and provides a simple user interface to acquire and preview X-ray images.

The user can start the iDemo by double clicking on the executable file iDemo.exe included in the CD ROM. iDemo loads the acquisition driver and sends commands through Gigabit Ethernet port. The image data acquired by Mars1417V serial will be sent through the Gigabit Ethernet cable to the computer. iDemo can perform offset, gain and defect correction on the image and then display the image on screen.

After setting up the FPD and running iDemo, Please find the details from the ***SDK Manual or contact with iRay Service Office.***

3.3 Operation Notes

The following notes should be noticed before using the detector.

- Basic Configuration Setting

  There are some basic parameters on the "Config" Dialog when click the "Config" button on the main window of the iDemo. The parameters should be set and checked as following, or the image will be incorrect or no images will be gotten.

Parameters	Description	Comment
Set Delay	The time between the end of ***Clear*** process and the beginning of the ***Acquire*** process of the "PREP Acquire" Command.	Range from 0 to 9500 and should be less than ***Exp Window-200***

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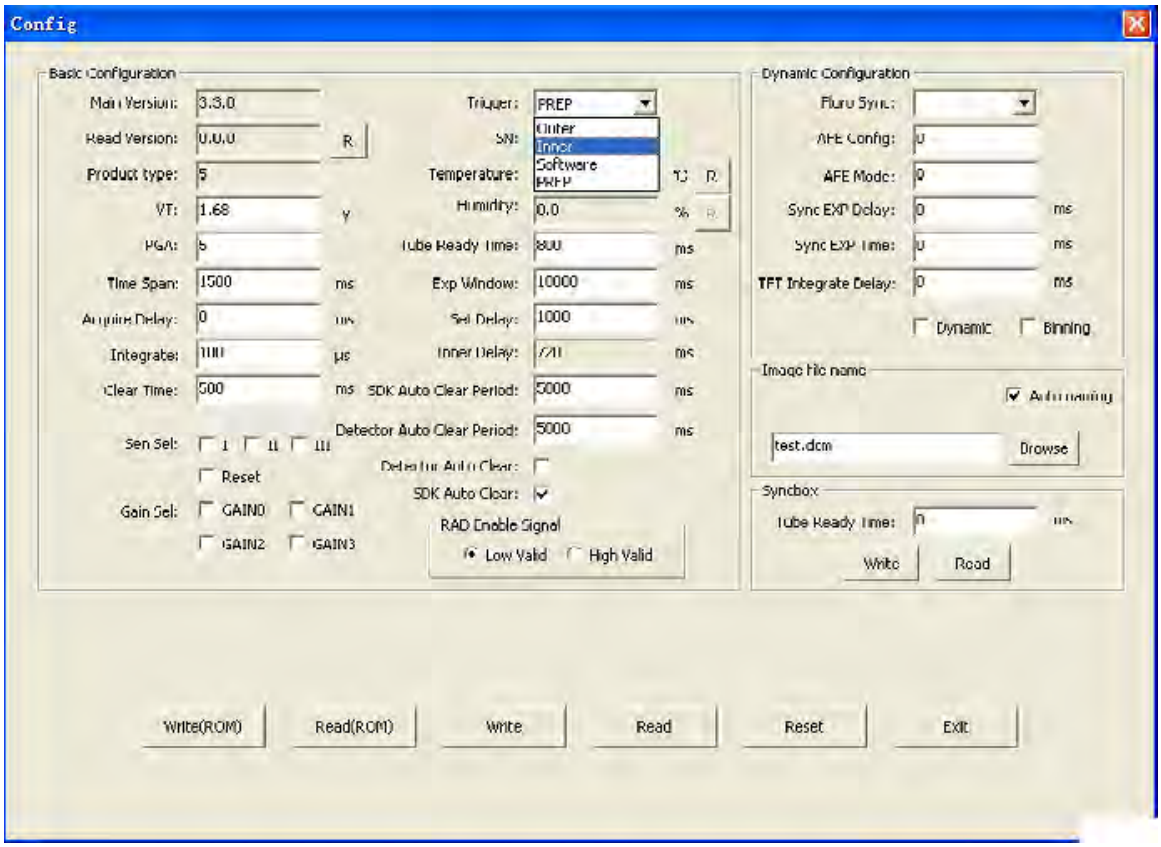
Acquire Delay	The time between the end of the trigger signal and the beginning of the ***Acquire*** process of the "Acquire" command.	Range from 0 to 9500 and should be less than ***Exp Window-200*** It's recommended to keep the default value.
Exp Window	The exposure window.	Range from 100 to 10000
Trigger	To set the mode of the trigger	Should be checked before installation

Please keep the other parameters as the default. Or contact with the service office of iRay.



- Acquisition and post-offset calibration

Post-offset calibration needs the interval from the end of "Clear" and the beginning of the "Acquire". So with post-offset calibration, be sure to send "Clear" command before "Acquire" or it'll take long time to get the image or no images will be gotten.

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- Gigabit Ethernet Connection

  The detector can set stable connection with the Ethernet Card from Intel or Broadcom. The computer should meet the minimum requirements of the hardware and software. Please find the details from Appendix D If there is a connection problem, please check the hardware settings, including connector, cable or the computer. Re-plugging the Ethernet cable may be helpful to set the connection.

- To acquire a normal clinical diagnostic image

  The clinical diagnostic image does not contain the defect pixel, defect data line and any other image defect. Human tissue should be fit for the requirements of clinical diagnosis, the image should be clearly and identifiable.

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4. Chapter IV Control Box Interface

Control box is the relay device between computer and equipment. It is specified as a part of ME equipment. As shown in the figure, there are 1 connection ports & 4 LEDs at the front panel and 6 connection ports at the back panel of the control box. Some of these interfaces may not provide the function in some versions, please contact ***iRay service office***. All the plug and connector should be placed in a portable position. To avoid the connection error, all the plug and connector are designed to insert error hardly.

- AC Input: Three-phase (electric) outlet for AC110-240V power input.
- LAN: Gigabit Ethernet port connected to PC.
- RS232: Reserved.
- HVG: Control interface connected to high voltage generator.
- FS : Foot Switch interface
- DETECTOR: Integrated interface with power and data connected to Equipment.
- MS: Hand Switch (Manual Switch) interface.
- Status indicators:
  - POWER: indicate power status
  - READY: indicate equipment is ready for X-ray exposure
  - EXPOSURE: indicate there is X-ray shot
  - ERROR: indicate power up or there exists error

    Please find the details from ***§2.8 Description of Indicators***

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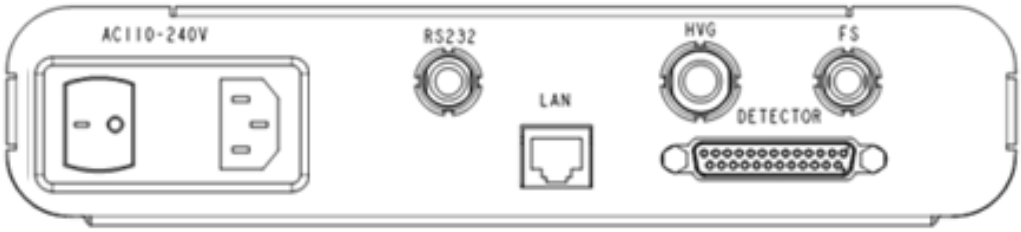
Front View of Control Box



Rear View of Control Box

4.1AC Input

AC input shall be connected to AC 100-240V three-phase power supply. Be careful that the AC socket must have right earth connection terminals. The control box shall conform to IEC 60601-1.

4.2 Serial Port

The serial port is reserved for firmware updating.

4.3Gigabit Ethernet Port

The GBE port shall be connected with an Ethernet cable to a Gigabit Ethernet Port of the user's computer. The GBE port transmits image data through Gigabit Ethernet protocol. For NIC (Network Interface Card), Intel Pro EXP9301CT PRO Gigabit Network Adapter with PCIe interface is recommended. If the user prefers any other Gigabit Network Adapter, only those with PCIe interface should be considered.

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4.4HVG Interface

The HVG interface with 16 pins is to synchronize HVG with the equipment.

The descriptions of HVG interface & HVG Cable				
Pin No.	Wire Color	Name	I/O	Signal Description
1	Shield	NC	/	Not Connected
2	White	Syn_OUT_N	O	***Reserved for dynamic mode***, the negative part of trigger signal provided by the equipment.
3	Red/white	Xray_On_N/ Syn_IN_N	I	***Reserved for dynamic mode***, the negative part of trigger signal provided by the HVG.
4	Black	SYN_OUT_P	O	***Reserved for dynamic mode***, the positive part of trigger signal provided by the equipment.
5	Green	***Reserved***	O	***Please left float***
6	Gray	Expose_OK_N	O	Negative part of ready signal for high voltage generator. When the signal is active, it indicates that the equipment is ready for exposure.
7	Brown	***Reserved***	/	***Please left float***
8	Brown/ white	Expose_Ok_P	O	Positive part of ready signal for high voltage generator. When the signal is active, it indicates that the equipment is ready for exposure.
9	Blue	Frame_Request_P	I	Positive part of request provided by the HVG. Ask for preparation of the equipment.
10	Yellow	EXT_VOUT	O	+5V power supply
11	Black/ white	Frame_Request_N	O	Negative part of request provided by the HVG. Ask for preparation of the detector.
12	Pink	EXT_GND	/	Ground of EXT_VOUT
13	Red	Xray_ON_P /Syn_IN_P	I	***Reserved for dynamic mode***, positive part of trigger signal provided by the HVG.
14	Cyan	G_SW_XON	O	***Reserved for hand switch or foot switch***, relay pin for X-ray exposure
15	Purple	G_SW_EN	O	***Reserved for hand switch or foots witch,*** relay pin for X-ray preparation
16	Orange	G_SW_COM	O	***Reserved for hand switch or foot switch,*** relay common pin

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Table 4.4.1 DC characteristic of HVG interface

	I_{typ}(mA)	I_{max}(mA)	U_{min}(V)	U_{typ}(V)	U_{max}(V)	U_{rev_max}(V)
Input(P-N)	-16	-25	4	5	6.5	5
Output(P-N)	-1	-10	4	5	6.5	5
Power Output	/	1000	4.5	5	5.5	/

4.5 InnerTriggerModule

The detector has anembedded well-proved Inner Trigger module consisting of X-ray sensor and inner trigger board. It can simplify the connection with the HVG.The energy range is from 50kV to 150kV.

Important

The voltage and current of tube should be set properly to get sufficient dose rate. Otherwise, no images will be gotten after the exposure and another “Acquire” command should be sent to get the image back.

4.6 X-ray Image Acquisition

Mars1417V serial provides carefully designed functions and commands for the terminal users to acquire X-ray images under various environments. The users need to select one of three acquisition trigger modes: Prep-trigger mode, Inner-trigger mode and Soft-trigger mode.

Important

The trigger mode must be set correct before image acquisition; otherwise the FPDs may not work properly.

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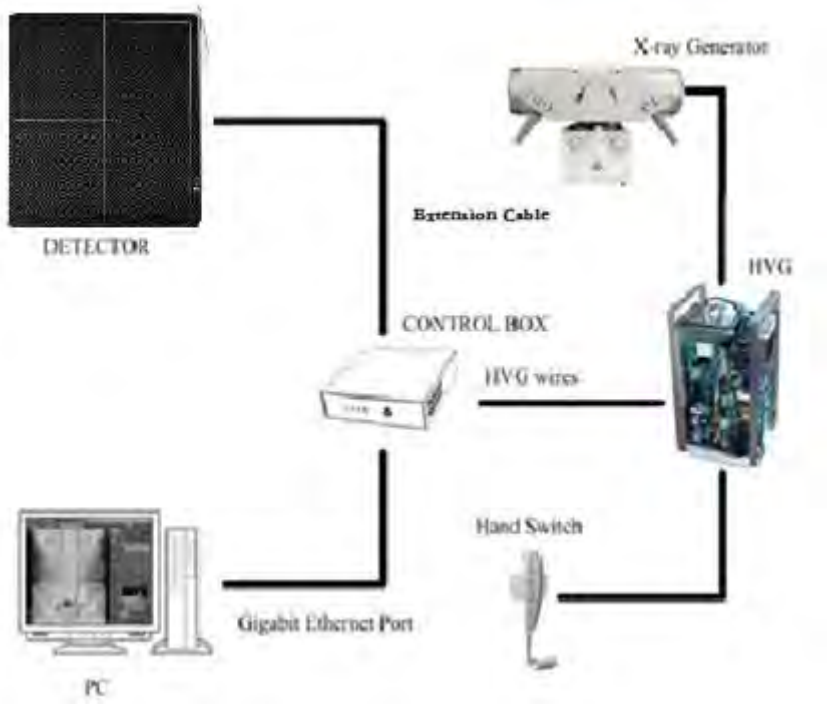

Fig 4.6.1 Basic Connection

4.6.1 Prep-trigger mode

Important ***Before connecting to the HVG (High Voltage Generator), please check the control box version. The HVG connection is different between two versions, but both of them can support Prep-Trigger mode .Please see Appendix C or find the details from iRay service office. The Following is for V1.***

In the Prep-trigger mode, HVG (High Voltage Generator) needs to be connected to the control box. The whole acquisition process (including prepare, exposure, acquisition and transmission) is trigged by the request from HVG. If the process is started, the images will be acquired and transmitted to the Ethernet port, no matter X-ray is fired or not.

- System installation

  Control box provides 2pairs of signals and 1 pair of power (Fig. 4.6.2).

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For Prep-trigger mode, only *Frame_Request,Expose_OK* are needed. To work properly some pull-up/pull-down circuits may be necessary for different HVG, please find details from your HVG manual. The control box also has output power supply for pull-up/pull down circuits.

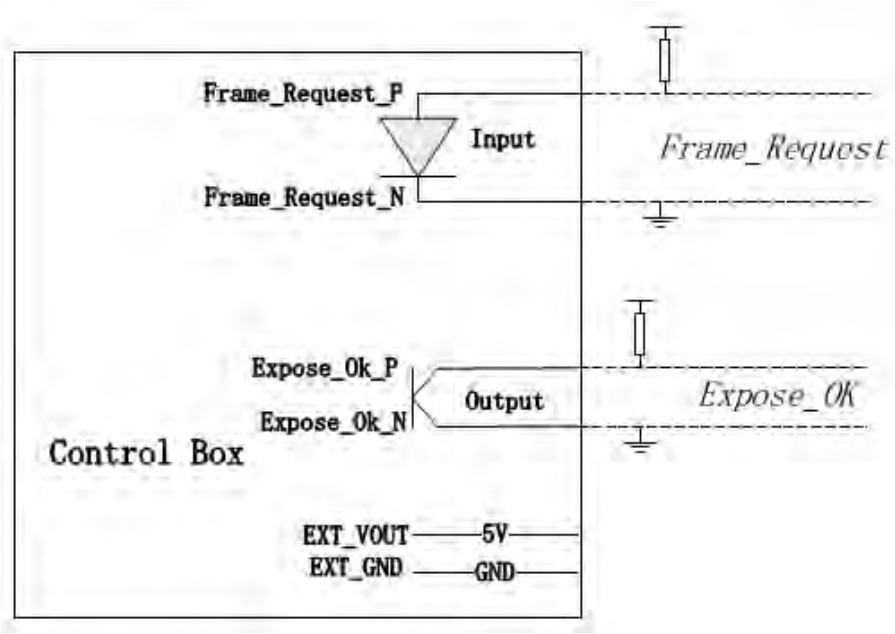

Fig. 4.6.2 HVG Port of Control Box

Important

The Frame_request is low level valid.

- X-ray image acquisition timing

  In **Prep-trigger mode**, the acquisition process is triggered by the *Frame_Request* from the HVG **when there is no "Exposure Prohibited (auto clear)" shown in software status box**. And equipment will start preparing for exposure and sending the message "Exposure Prohibited" to the workstation to indicate that the X-ray should not be fired before the equipment is ready.

  After the equipment is ready, it sends the message "Exposure Enabled" to the workstation to indicate that the detector is ready for exposure， and the signal "*Exposure_OK*" is given to HVG at the same time.

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When the detector is ready, it starts the “prep trigger window”. X-ray should be fired in the “prep trigger window” to get the proper images. After “preptrigger window”, an image will be acquired no matter the X-ray is fired or not.

Important ***If the “post-offset” is enabled, DO NOT trigger another exposure or acquisition before the previous image is on screen.***

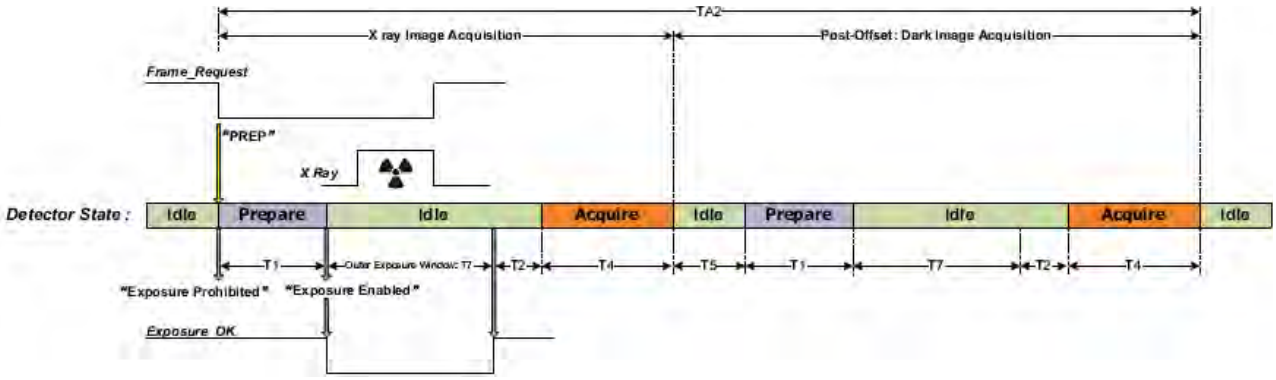

Fig. 4.6.3 Prep-Trigger Timing

If the “post-offset” is enabled, the dark image acquisition will start automatically after the light image acquisition. The dark image provides the offset calibration information to workstation. The calibrated image will be shown when workstation receives light image and dark image, or there may be no image shown.

Table 4.6.2 Typical Value of Mars1417V serial in prep-trigger mode (unit:sec)

T1	Prepare time of equipment.	0.5
T2	Interval between end of prep-trigger window and beginning of acquisition process.	/
T4	Data acquire and transmission time of detector	0.7
T5	Interval between the end of light image acquisition and the beginning of dark image acquisition.	0.3
T7	Prep trigger window	Set Delay Time
TA2	Cycle time of the image acquisition when “post-offset” is enabled	/

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4.6.2 Inner-trigger mode,

- System installation

  In **Inner-trigger mode**, the acquisition is triggered by sync-shot module in the equipment. The connection between HVG and control box is unnecessary.

- X-ray image acquisition timing

  The acquisition is triggered by the “Prep” (“Prepare”) command provided by the workstation **when there is no “Exposure Prohibited (auto clear)” shown in software status box**. Then the equipment will start preparing and feedbacking the message “Exposure Prohibited” to the workstation to indicate that X-ray should not be fired before the equipment is ready.

  When the equipment is ready, it starts “inner trigger window” and feedbacks the message “Exposure Enabled” to the workstation to indicate that the equipment is ready for exposure.

  To get proper image, X-ray should be fired in the “inner triggerwindow” (see fig.4.6.4)，or equipment gives the message “Expired & Exposure Prohibited” to indicate that no image is acquired and the equipment is not ready for X-ray.(see fig. 4.6.5).

Important ***If the “post-offset” is enabled, DO NOT trigger another exposure or acquisition before the previous image is on screen.***

If the “post-offset” is enabled, the dark image acquisition will start automatically after the light image received. The dark image provides the offset calibration information to workstation. The calibrated image will be shown when workstation receives light image and dark image, or there may be no image shown.

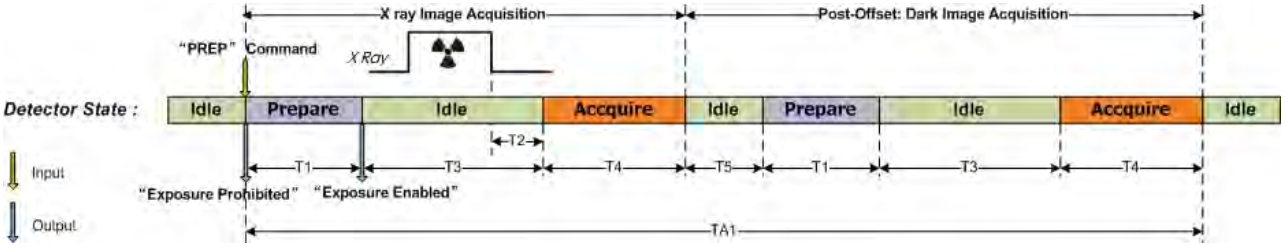

Fig. 4.6.4 Timing of Inner Trigger Mode: Normal Operation

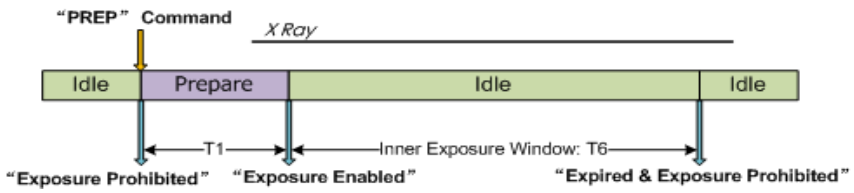

Fig.4.6.5 Timing of Inner Trigger Mode: No Exposure

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Table 4.6.3 Typical Value of Mars1417V serial in inner-trigger mode (unit:sec)

T1	Prepare time of equipment.	0.5
T2	Interval between end of prep-trigger window and beginning of acquisition process.	/
T3	Inner-trigger window	<10
T4	Data acquire and transmission time of detector	0.7
T5	Interval between of the end of light image acquisition and the beginning of dark image acquisition.	0.3
TA1	Cycle time of the image acquisition when “post-offset” is enabled	2.7+2T3

4.6.3 Soft-trigger mode

- System installation

  In **soft-trigger mode**, the acquisition is triggered by the “PREP Acquire” command provided by workstation **when there is no “Exposure Prohibited (auto clear)” shown in software status box**. The connection between HVG and equipment is unnecessary.

- X-ray image acquisition timing

  In **soft-trigger mode**, equipment starts preparation when receiving “PREP Acquire” command provided by workstation. And the message “Exposure Prohibited” will be sent to the workstation to indicate that X-ray should not be fired before the equipment is ready.

  After the equipment is ready, it sends the message “Exposure Enabled” to indicate that equipment is ready for exposure. To acquire X-ray image (light image), X-ray should be fired(see fig.4.6.6).Please note that the image acquisition is just triggered by the “PREP Acquire” command, so an image will be acquired if the detector gets the “PREP Acquire” command no matter X-ray is fired or not.

  If “post-offset” is enabled, the dark image acquisition starts automatically after the light image acquisition is successful. The dark image provides the offset calibration information to workstation. The calibrated image will be on screen when workstation receives light image and dark image, otherwise there may be no image shown.

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Important ***If the "post-offset" is enabled, DO NOT triggers another exposure or acquisition before the previous image is shown.***

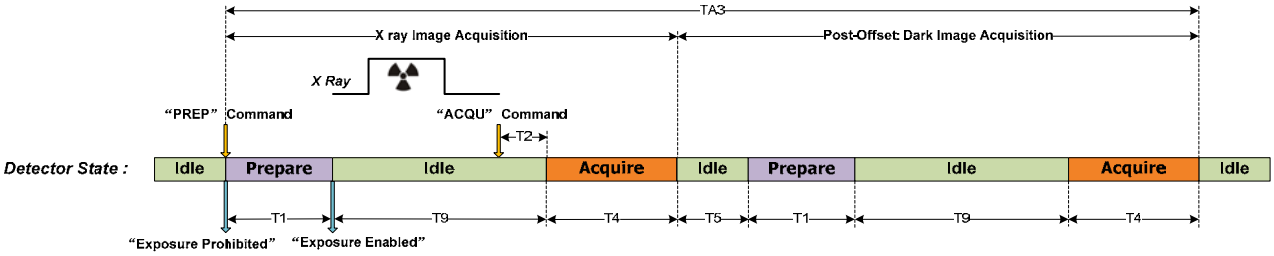

Fig. 4.6.6 Timing of Software Trigger Mode: Normal Operation

Table 4.6.4 Typical Value of Mars1417V serial in soft-trigger mode (unit:sec)

T1	Prepare time of equipment.	0.5
T2	Interval between receiving image acquisition command and beginning of acquisiton process.	/
T4	Data acquire and transmission time of equipment	0.7
T5	Interval between the end of light image acquisition and the beginning of dark image acquisition.	0.3
T9	Interval between the equipment is ready and the beginning of the image acquisition	<T6
TA3	Cycle time of the image acquisition when "post-offset" is enabled	2.7+2T9

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5. Chapter V Regulatory Information

The product safety standards that apply to Mars1417V serial, which include the main units: detector and adaptor.

5.1 Medical equipment safety standards

◆ Medical equipment classification

Type of protection against electrical shock	external electrical power source equipment Class I Equipment, with wiring unit
Degree of protection against electrical shock	B type Applied Parts
Degree of protection against ingress of water	IP21
Mode of operation	Continuous operation
Flammable anesthetics	Not suitable for use in the presence of a flammable anesthetic mixture with air or with, oxygen or nitrous oxide Not suitable for use in the oxygen rich environment

◆ Product safety standards

EN 60601-1:2006+AC：2010	Medical electrical equipment -- Part 1: General requirements for basic safety and essential performance
EN 60601-1-2:2007+AC：2010	Medical electrical equipment – Part 1-2: Collateral standard: Electromagnetic compatibility – Requirements and tests
EN 60601-1-3:2008	Medical electrical equipment – Part 1-3: Collateral standard: General requirements for radiation protection in diagnostic X-ray equipment
EN 60601-2-54:2009	Medical electrical equipment -- Part 2-54: Particular requirements for the basic safety and essential performance of X-ray equipment for radiography and radioscopy
EN 62220-1:2004	Medical electrical equipment - Characteristics of digital X-ray imaging devices -- Part 1: Determination of the detective quantum efficiency
EN 300 328 V1.8.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques
EN 301 893	Broadband Radio Access Networks (BRAN);5 GHz high performance

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	RLAN; Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive V1.2.3
EN 301 489-1/-17	
EN 62311:2008	Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz)
FCC Part 15 Subpart B Class B and Part 15 Subpart C	

5.2 Guidance and manufacture's declaration for EMC

◆ Electromagnetic emissions

Mars1417V serial is intended for use in the electromagnetic environment specified below. The customer or the user of Mars1417V serial should assure that it is used in such an environment.		
Emission Test	Compliance	Electromagnetic Environment - Guidance
RF emissions CISPR 11	GROUP1	Mars1417V serial uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	Mars1417V serial is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class B	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Pass	

◆ Electromagnetic immunity

Mars1417V serialis intended for use in the electromagnetic environment specified below. Thecustomer or the user of Mars1417V serial should assure that it is used in such an environment.			
Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment - Guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8)kV air	±6)kV contact ±8kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/ burst	±2 kV for power supply lines	±2 kV for power supply lines	Mains power quality should be that of a typical commercial or hospital environment.

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IEC 61000-4-4	±1 kV for input/ output lines	±1 kV for input/ output lines	
Surge IEC 61000-4-5	±1 kV differential mode ±2 kV common mode	±1 kV differential mode ±2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5% UT (>95% dip in UT) for 0.5 cycle. 40% UT (60% dip in UT) for 5 cycle. 70% UT (30% dip in UT) for 25 cycle. <5% UT (>95% dip in UT) for 5 sec.	<5% UT (>95% dip in UT) for 0.5 cycle. 40% UT (60% dip in UT) for 5 cycle. 70% UT (30% dip in UT) for 25 cycle. <5% UT (>95% dip in UT) for 5 sec.	Mains power quality should be that of a typical commercial or hospital environment. If the user of that requires continued operation during power mains interruptions, it is recommended that (?) be powered from an uninterruptible power supply.
Power frequency (50/60Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
UT is the a.c. mains voltage prior to application of the test level.			

◆ Guidance and manufacturer's declaration----electromagnetic immunity

Mars1417V serial is intended for use in the electromagnetic environment specified below. Thecustomer or the user of Mars1417V serial should assure that it is used in such an environment.

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment - Guidance
Conducted RF IEC 61000-4-6	3 Vrms 150kHz to 80MHz	3 Vrms	Portable and mobile RF communications equipmentshould be used no closer to any part of the ModelMars1417V serial, including cables, than the recommendedseparation distance calculated from the equationapplicable to the frequency of the transmitter. Recommended separation distance $d = 1,2 \sqrt{p}$ $d = 1,2 \sqrt{p}$ 80 MHz to 800 MHz $d = 2,3 \sqrt{p}$ 800 MHz to 2,5 GHz Where P is the maximum output power rating of thetransmitter in watts (W) according to the transmittermanufacturer and d is the recommended separationdistance in meters (m).
Radiated RF IEC 61000-4-3	3 V/m 80MHz to 2.5GHz	3 V/m	

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			Field strengths from fixed RF transmitters, as determinedby an electromagnetic site survey, shouldbe less than the compliance level in each frequency range. Interference may occur in the vicinity of equipmentmarked with the following symbol: 

NOTE: UT is the a.c. mains voltage prior to application of the test level.

NOTE1 At 80 MHz and 800 MHz, the higher frequency range applies.

NOTE2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

a Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which Mars1417V serialis used exceeds the applicable RF compliance level above, Mars1417V serialshould be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating Mars1417V serial.

b Over the frequency range 150 kHz to 80 MHz, field strengths should be less than [V1] V/m.

◆ Recommended separation distances between portable and mobile RF communications equipment and Mars1417V serial

Mars1417V serial is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of Mars1417V serial can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and Mars1417V serial as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter /W	Separation distance according to frequency of transmitter /m		
	150kHz~80 MHz $d = 1.2\sqrt{p}$	80 MHz~800 MHz $d = 1.2\sqrt{p}$	800 MHz ~2.5GHz $d = 2.3\sqrt{p}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

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For transmitters rated at a maximum output power not listed above, the recommended separation distance d inmeters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.
NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.
NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

◆ Below cables information are provided for EMC reference.

Cable	Recommended cable length	Shielded or Unshielded	Number	Cable classification
Adaptor Power Cable	3m	Unshielded	1 Set	AC Power
LAN port Cable	>3m	Shielded	1 pcs	Signal
Data Cable	>3m	Shielded	1 pcs	Signal

◆ **Important information regarding Electro Magnetic Compatibility (EMC)**

Mars1417V serialneeds special precautions regarding EMC and needs to be installed only by iRay or authorization engineer and put into service according to the EMC information provided in the user manual; Mars1417V serial in use may be susceptible to electromagnetic interference from portable and mobile RF communications such as mobile (cellular) telephones. Electromagnetic interference may result in incorrect operation of the system and create a potentially unsafe situation.

Mars1417V serial conforms to this EN60601-1-2:2007 standard for both immunity and emissions.

Nevertheless, special precautions need to be observed:

The use of accessories, transmitters and cables other than those specified by this User Manual, with the exception of accessories and cables sold by iRay of Mars1417V serial as replacement parts for internal components, may result in increased EMISSIONS or decreased IMMUNITY of Mars1417V serial.

Mars1417V serial should not be used adjacent to or stacked with other equipment. In case adjacent or stacked use is necessary, Mars1417V serial should be observed to verify normal

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operation in configuration.

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6. Chapter VI ImagingSoftwareSDK

Please find the details from iRay***SDKManual***ortheupdated versions. Please contact iRay service office.

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7. Chapter VII Service Information

Product lifetime

The estimated product lifetime is up to 8 years under appropriate regular inspection and maintenance.

Regular inspection and maintenance

In order to ensure the safety of patients, operator and third parties, and maintain the performance and reliability of the equipment, be sure to perform regular inspection at least once a year. If necessary, clean up the equipment, make adjustments, or replace consumables. There may be cases where overhaul is recommended depending on conditions. Contact your sales representative or local iRay dealer for regular inspection or maintenance.

Repair

If a problem cannot be solved even taking the measures indicated in troubleshooting, contact your sales representative or local iRay dealer for repairs. Please refer to the name label and provide the following information:

Product Name: Venu-
Serial Number:
Description of Problem: In details as clear as possible.

Replacement parts support

Performance parts (parts required to maintain the functioning of the product) of this product will be stocked for 5 years after discontinuance of production, to allow for repair.

Trouble Shooting

When you encounter problems or error message in using MARS1417V SERIAL detector, search the table below for the problem or error message and try the solutions. If the problem persists, turn off the detector and consult your sales representative or local dealer. Please refer to the detail of the problem or error message.

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symptom	Causer / Error messages in control system.	Remedy
Failed to turn on	Damage of control box	Check the power supply connector and power plug, plug the power cord again. Check the fuses holder. Consult iRay's or iRay's authorized Filed Application Engineer.
Link lamp does not light up	The communication circuit is not secured.	Check the LAN cable whether loose, plug the LAN cable again. Consult iRay's or iRay's authorized Filed Application Engineer.
Power lamp does not light up	The power circuit is not secured.	Check the power supply connector and power plug, plug the power cord again. Check the fuses holder. Consult iRay's or iRay's authorized Filed Application Engineer.
Detector's parameter does not read out.	The control interface is not secured.	Consult iRay's or iRay's authorized Filed Application Engineer.
When send acquisition command to detector, no image can acquire.	The control interface is not secured.	Consult iRay's or iRay's authorized Filed Application Engineer.

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Appendix A Installation of SDK

The equipment provides two interfaces for image acquisition. For using, user must install the related software correctly.

A.1Installation of Gigabit Ethernet Driver

In order to use the Gigabit Ethernet interface for data transfer, the uses needs to install the driver WinPcap4.1.2, which has been included in the CD-ROM.

Click “next” button to start installation.

Click the “I Agree” button to confirm with the license agreement.

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Do not select the “Automatically start the WinPcap driver at boot time” item. The function will be loaded bytheimage acquisition software.

Then installation completed

Important When using a new computer, the user shall configure the settings of network card.

As shown below, click “Configure” button of Local Area Connection Properties, set the value of **Large Send Offload** as Disabled, and the value of **Speed & Duplex** as **1.0 Gbps Full Duplex**. Error settings may consult in abnormal network connection.

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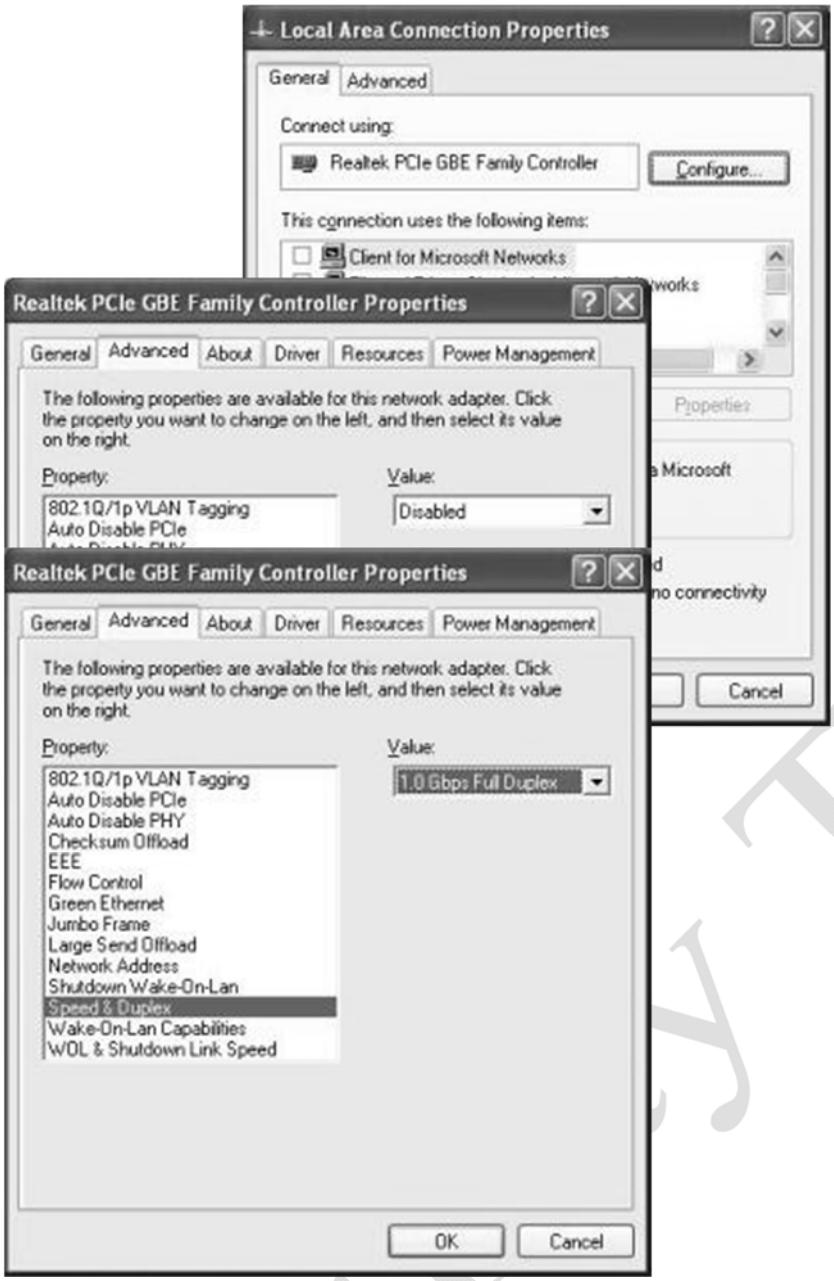

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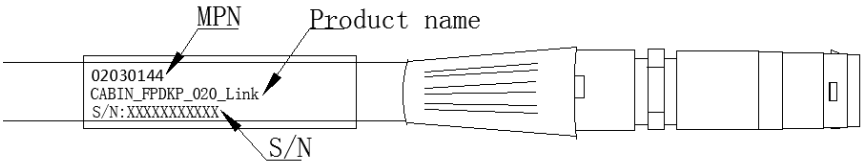
Appendix B Description of Different Cable Series

A. Check the MPN of the Extension cables and the Detector cables of the equipment.

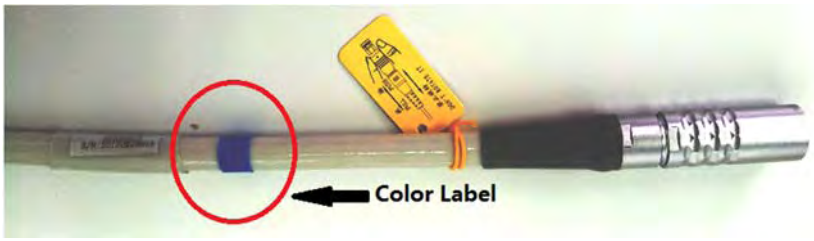


MPN Label of the Detector Cable

There is a printed label near the float plug/socket on the cable. The first line is the ***MPN***. IF there is no label or different label on the cable, please find the details from iRay service office.

B. Check the color label of the cable

There are color labels on the Detector cable and Extension cable. If the label color is same that means the definition of the Detector cable can match the Extension cable. For Mars1417V serial, **ONLY** series B is available whose color label is **BLUE.**



Important

The same color means the pin definitions of the cables are same or matching. But before installation, please check the cable length. The total length of the Detector cable and Extension cable should be less than 9m.

C. Compatibility of different cable series

Cable Series	Detector Cable	Extension Cable
A	02040002	02040003 (long) 02040023 (short)
B	02030144	02040013 (long) 02040019 (short)

Important

Cables can ONLY be used with the same series. Mixed use of cables in series A and B may result in damage of the equipment or Control Box circuit.

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Appendix C Different Version of Control Box

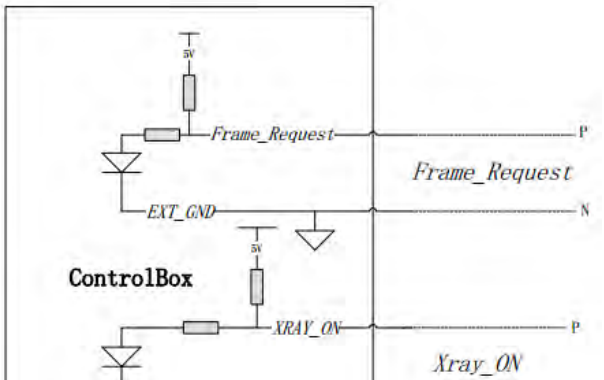
There are two versions of control box. They can be told by the label on the bottom of the control box. The V0 used the label only in English or Chinese (Fig. C1). The V1's label has both English and Chinese descriptions (Fig. C2)

Both versions share the same circuit architecture and have the same performance. But the definition of the HVG port is different.

The descriptions of HVG interface & HVG Cable of**V0**

Pin No.	Wire Color	Name	I/O	Signal Description
1	Shield	NC	/	***No Connection***
2	White	Reserved	/	***No Connection***
3	Red/white	Xray_On	I	The synchronizing signal to the X-ray given by the HVG. Detector will start data acquire after the signal shift from the low level to the high level
4	Black	Reserved	/	***No Connection***
5	Green	Frame_Request	I	Request given by the HVG, it's a prepare signal of the detector.
6	Gray	Expose_OK	O	When the signal is low , it indicates that the detector is ready for the exposure
7	Brown	Reserved	/	***No Connection***
8	Brown/white	EXT_GND	/	GND
9	Blue	Reserved	/	***No Connection***
10	Yellow	EXT_VOUT	O	+12V(I_{max}=450mA) power supply
11	Black/white	Reserved	O	***No Connection***
12	Pink	Reserved	O	***No Connection***
13	Red	Reserved	O	***No Connection***
14	Cyan	Reserved	I	***No Connection***
15	Purple	Reserved	/	***No Connection***
16	Orange	Reserved	O	***No Connection***

The V0 control box also supports the prep-trigger mode. There are pull-up/pull-down circuits inside the control box, so the external pull-up/pull-down circuits are unnecessary. (Fig.C3)



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Appendix DRecommended Computer Platform

	Minimum	Recommended Desktop	Recommended Laptop
CPU	Intel Core i3 2.8G	Intel Core i73.6G	Intel Core i73.6G
Memory	2G DDR3	4G DDR3	4G DDR3
Hard Disk	160 G	640 G	320 G
Monitor	1280×1024	1680 x 1050	1600×900
Memory of Display Adapter	512Mbits	1Gbits	1Gbits
Ethernet Card	Gigabit Network Adapter with PCIe interface of Intel or Broadcom	Intel Pro EXP9301CT PRO Gigabit Network Adapter with PCIe interface	Intel(R) 82579LM Gigabit Network Connection
Others	USB2.0		
OS	Windows XP 32bit		

Important

Please set the computer to "high performance" and set "power saving" disabled, when the SDK or detector is running. It's also recommended to set "screen saver" disabled.

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Function List of Different Hardware/Firmware Versions

Detector	Control Box	Cable	Firmware	Function
V0	V0	Series A Or Series B	Detector: 2.2.x Control Box: 1.2.x	1. RS232 command interface 2. Static image acquisition 3. Default mode:inner-triggermode
V0	V1		Detector: 2.2.x Control Box: 1.2.x	
V1	V1	SeriesB	Detector: 3.3.x Control Box:1.3.x	1. Static image acquisition 2. Gigabit Ethernet command interface 3. Default mode: inner-trigger mode， but can be configured by customers 4. Temperature feedback 5. Detector SN. Feedback 6. Replaceable sensor cable

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Appendix EFirmware Update

Mars1417V serial allows user upgrade firmware without removing cover of the equipment. Please do as follows:

a)Turn off the power

b)Open the cover of the JTAG port on it. You will see the port as FigE1.

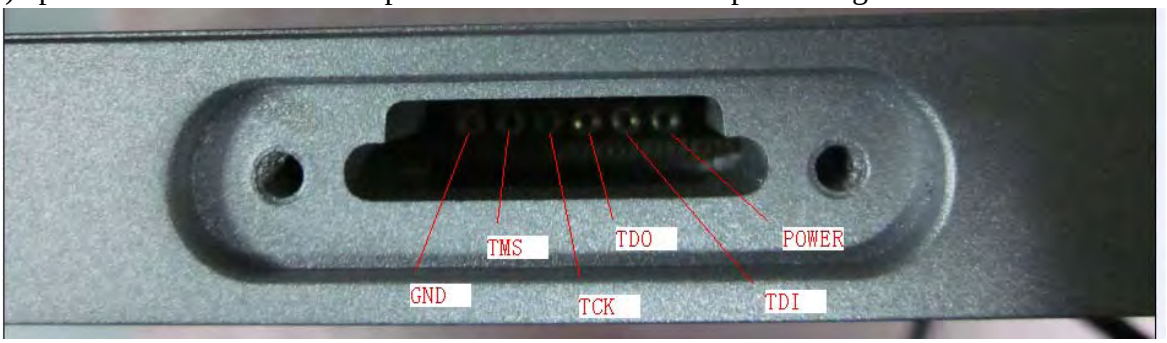

Fig.E1 JTAG Port

c)Insert the FPD JTAGBoard into the port.

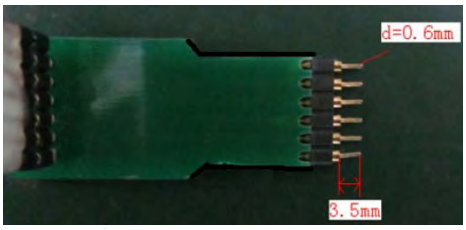

Fig.E2JTAGBoard

d)Connect the Xilinx JTAG Adapter to the JTAGBoard and Computer. Then turn on the power. The LED on the Adapter will turn on, Fig A/E3.

FigE3. Xilinx JTAG Adapter

a) Open the Xilinx iMPACT® software;

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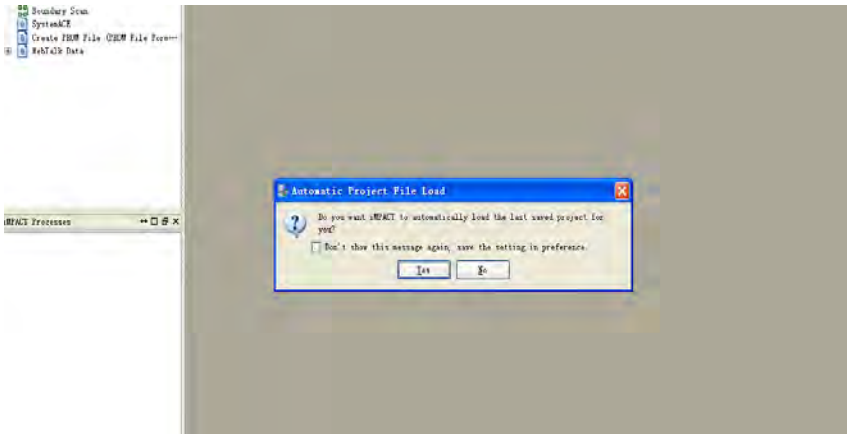
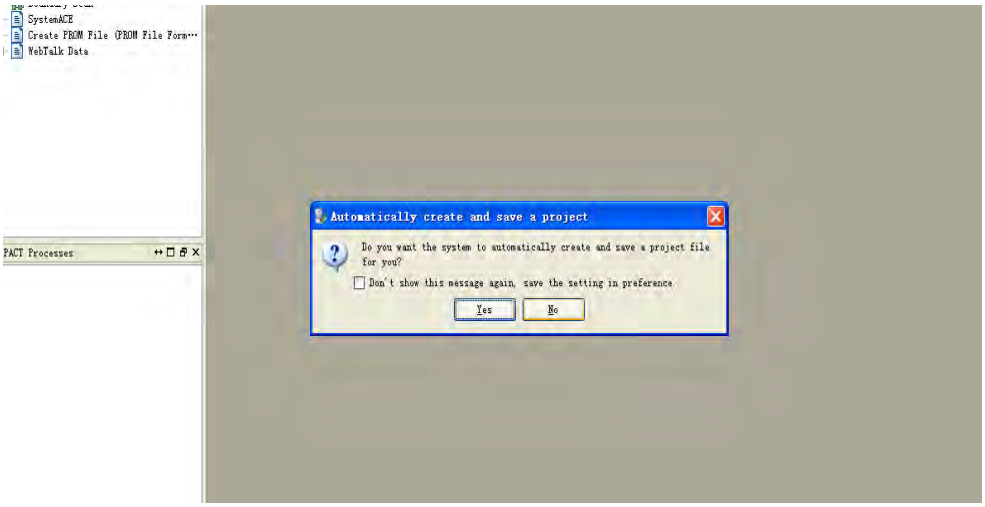


Select “No”



Select “No”

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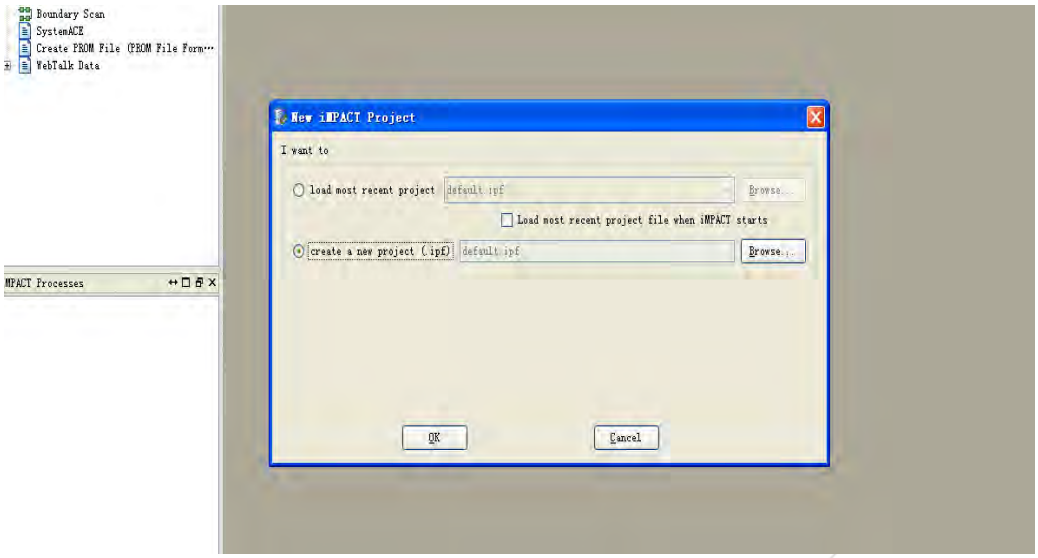
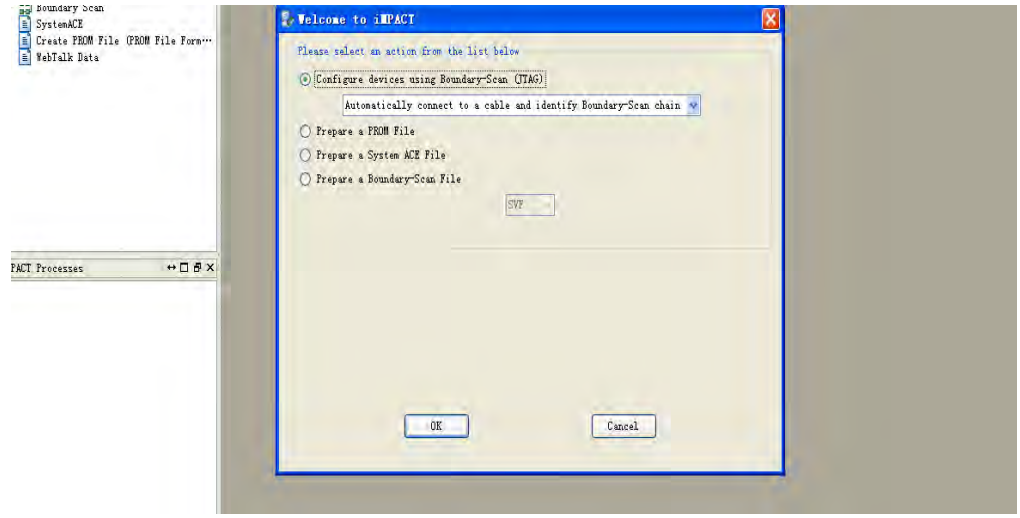
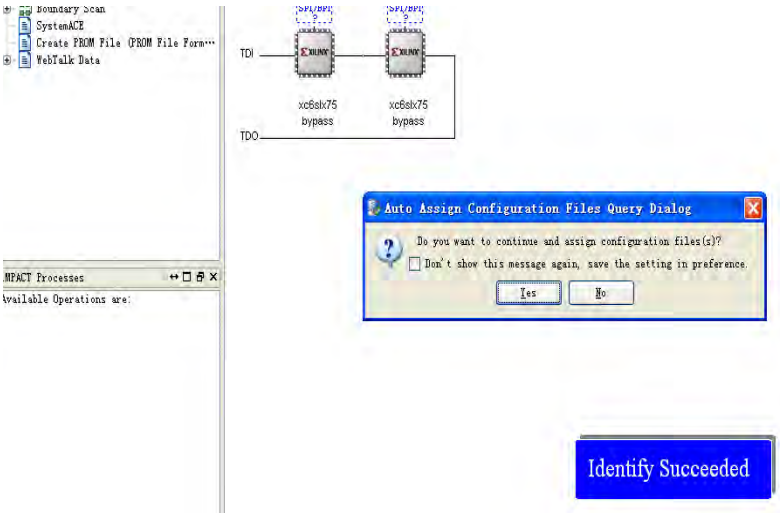


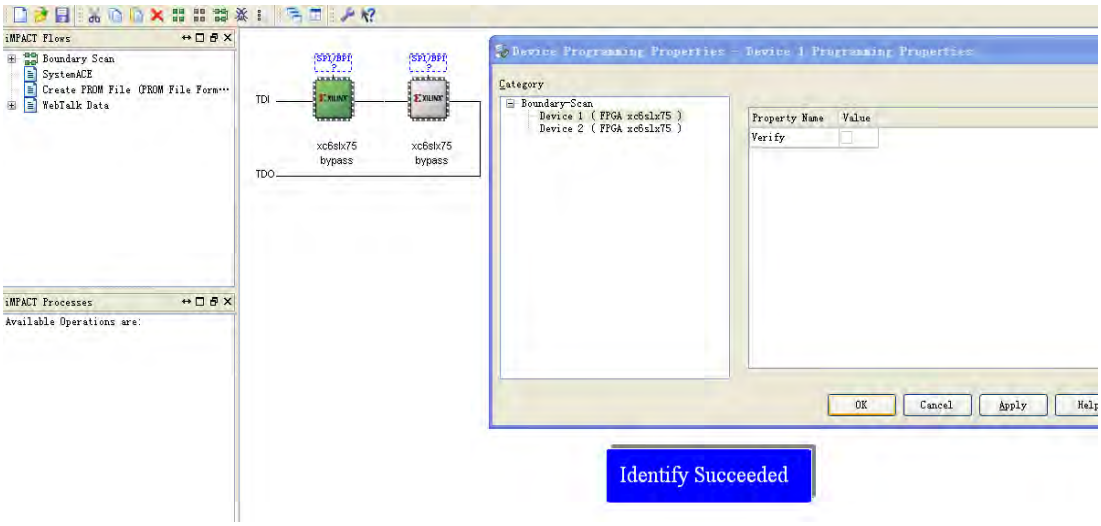
Select “Create a new project”



Select “Configure devices using Boundary-Scan(JTAG)”, then “OK”

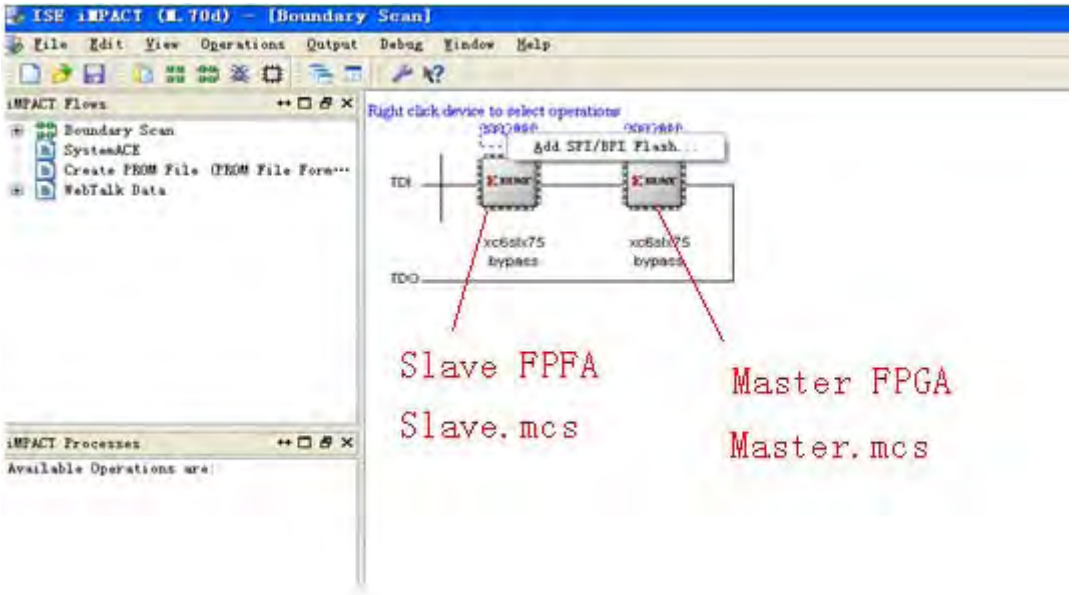


Select “NO”



Select“Cancel”

f)Program the FPGA



Select the first FPGA，right click and select“Add SPI/BPI Flash”

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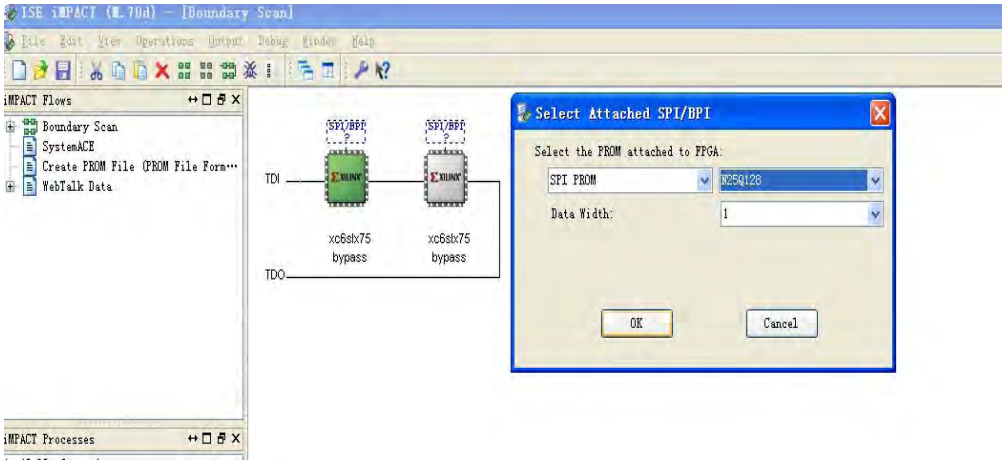
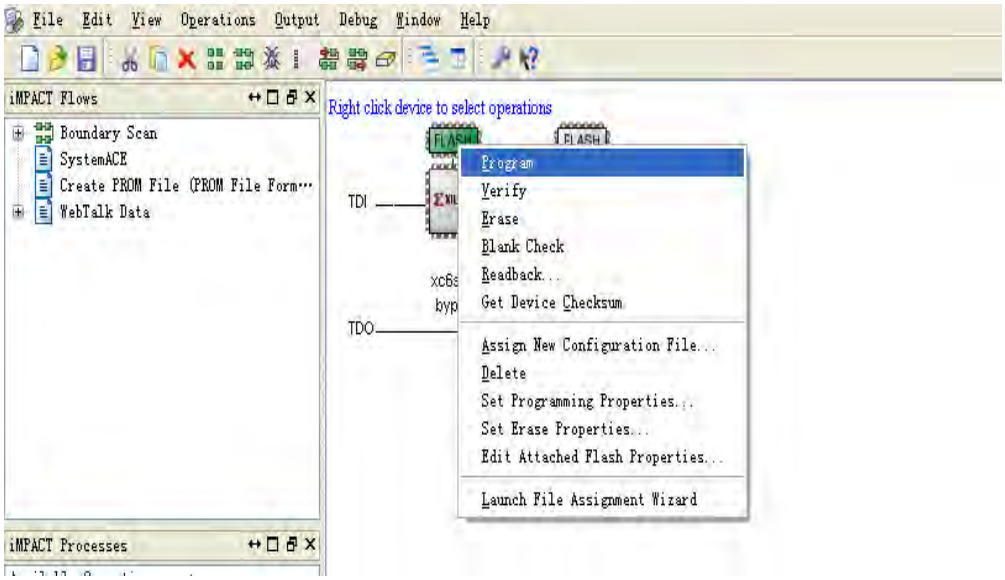
Select “slave.mcs”



Select Flash type “N25Q128”,then “OK”



Right click and select “Program”

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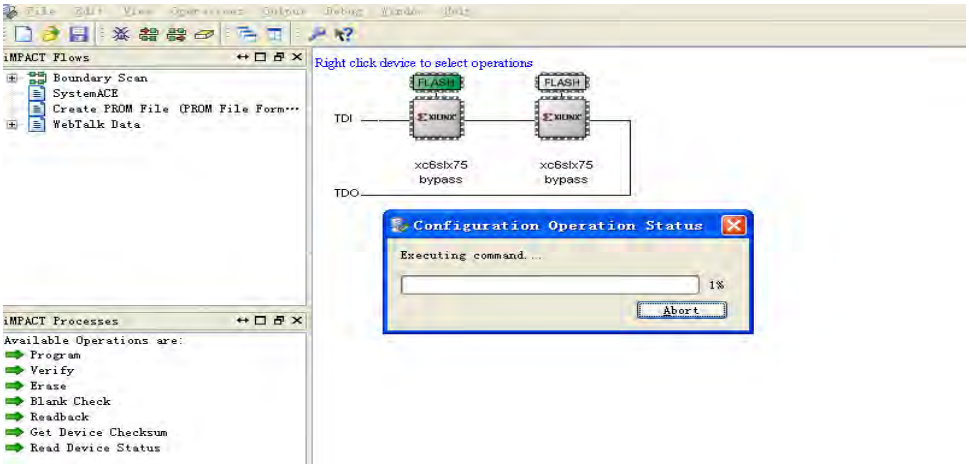
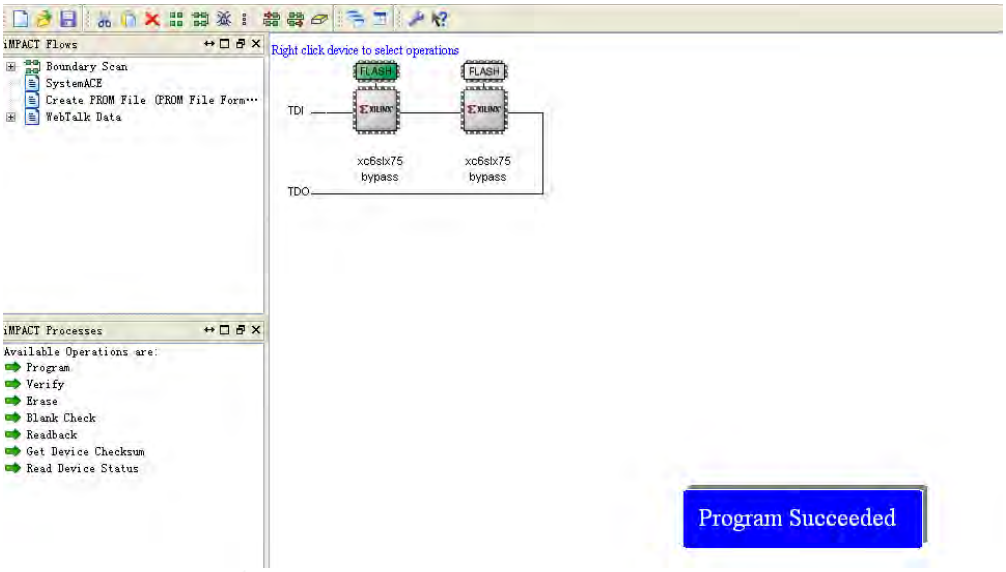


Ittakes several minutes to finish updating



b) As the same steps, upgrade the master FPGA's firmware
c) Reboot the Flat Panel Detector;

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Appendix F Dummy Lines

There are 8 dummy lines on the each long edge of the image.

Fig D1

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In details

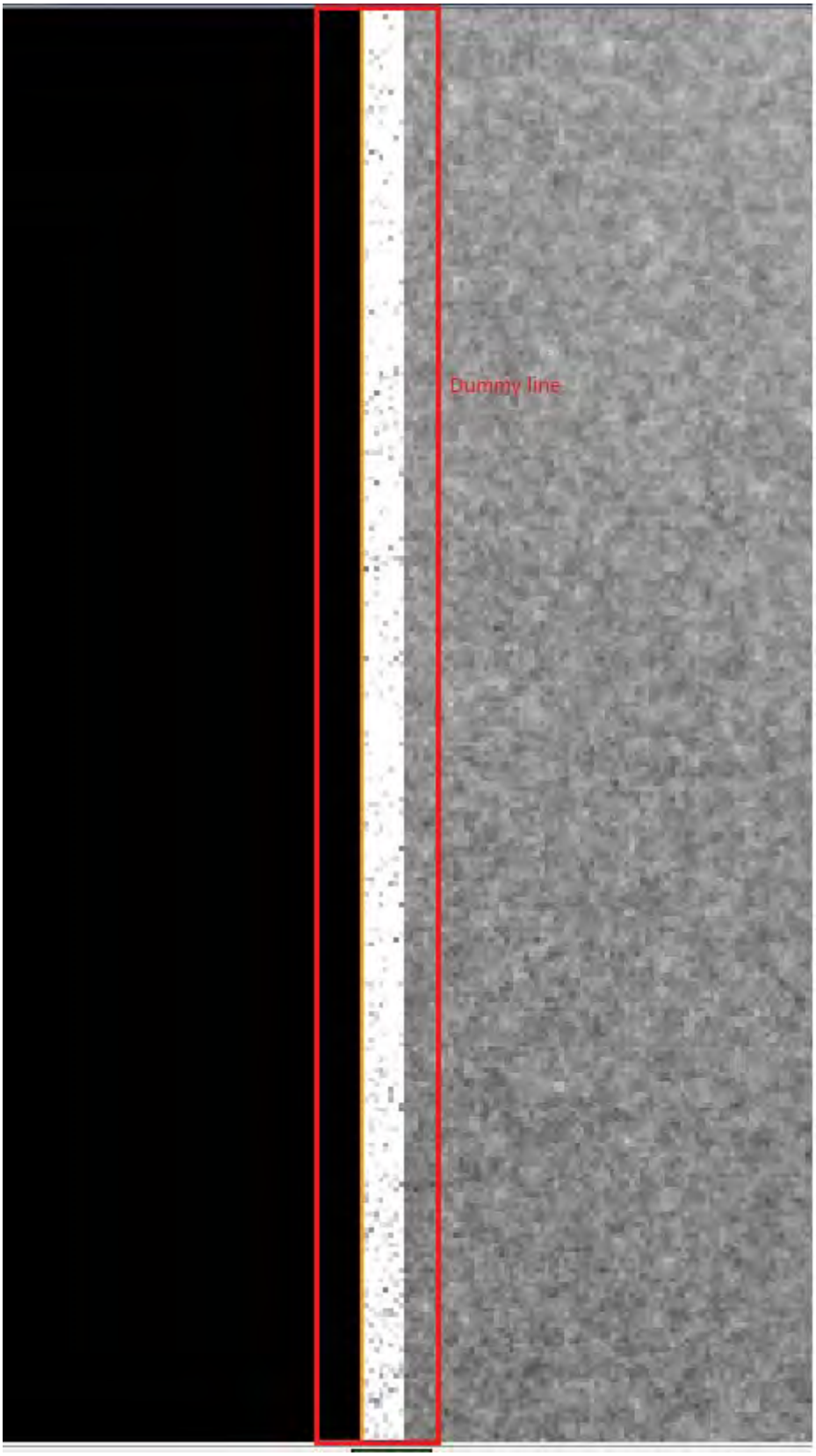

Fig D2

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Appendix GDefinition of Defects

Defect Pixel:

A defect pixel is defined as a pixel whose value is deviated from the median of its neighboring 32x32 pixels by more than 6 times of the standard deviation of this regionafter gain-offset correctionunder any X-ray condition. In addition, if there is defect which is not included in the defect map the supplier defined, then new defect should be added to the defect map. If the final statistics is above the quality control limit, then the detector should be returned.

Defect Line:

The horizontal or verticallinesof which more than 5% of the pixels are determined as defect pixels.

Full Class 0-8:

"Class N" defect is a defective pixel with N adjacent defect(s). "Full" means that all defective pixels (even included in a defective line or column) are individually counted.

Meta 7+8 Class1-8:

"Meta 7+8" means that on the original defect map, isolate the defective pixels corresponding to Class 7 and Class 8: this gives a new defect map where each Class 7 or Class 8 cluster is replaced by one single defective pixel. On this new defect map, re-calculate the distribution of defect Class N, this gives the "Meta 7+8 Class N" defect.

Central Area:

The area in which both the x-coordinates and y-coordinates of the pixels are between 1/6 to 5/6 width and height of the panel respectively. For example, for a 2304x2800 panel, the central area is defined as the area where $384 \leqslant x \leqslant 1920$ and $467 \leqslant y \leqslant 2333$.

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Appendix H Information of Service Office

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Address: 2F, Building 7, No.590, Ruiqing Rd, Pudong, Shanghai, China PC: 20120

Appendix I Information of Manufactures

COMPANY: iRayTechnology(Shanghai) Ltd.

ADDRESS: Rm202, Building 7, No. 590, Ruiqing Rd, Zhangjiang East, Pudong New Area, Shanghai, China

ZIPCODE: 201201

TELEPHONE: +86-21-50720560

FAX: +86-21-50720561

HOMEPAGE: WWW.IRAY-TECH.COM

SERVICE: SERVICE DEPARTMENT of iRay

SERVICE TEL: +86-21-50720560

MARKET TEL: +86-21-50720560