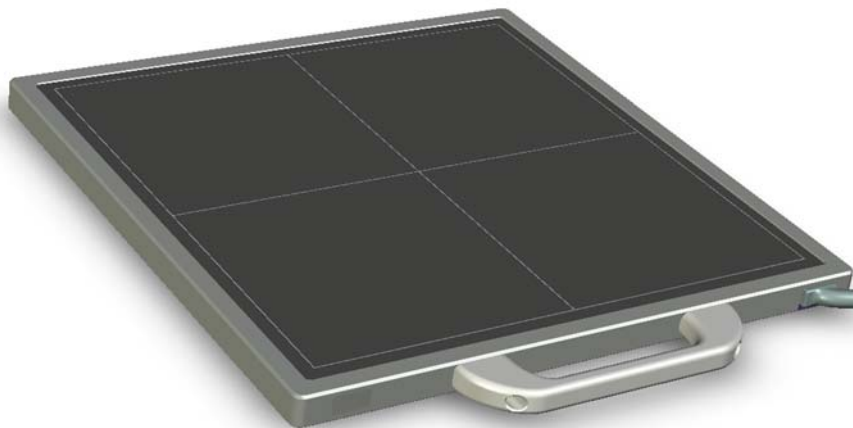




FPD1M (Brand name: Venu1717M)

Digital Flat Panel Detector User Manual



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DATE: 2011-05

To customers

Trademarks

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Thank you for purchasing iRay's FPD Medical X-ray Radiography Flat Panel Detector (Hereinafter referred to as FPD1M). This User's Manual explains the general usage of the detector and peripheral equipment. Before using this product, please read this manual thoroughly. Any abnormalities or malfunction or body harms caused by violations of the user's manual will not be responsible by our company, nor any warranties will be made by iRay.

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, and under a system configuration comply with IEC 60601-1. For details, consult our sales representative or local iRay dealer.
4. User 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 the circumstance with flammable gas or corrosive gas.
8. The detector with radiation protection in accordance with IEC 60601-1-3.
9. To pull out the plug is the only way to cut down the main power supply.

10. 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.

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.

Note on installation

- 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 on the environment. When disposing of this product, therefore, be absolutely sure to follow the procedure which is in conformity with the laws and regulations applicable in your area.



European Union (and EEA) only.

This symbol indicates that this product is 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 to an authorized collection site for recycling waste electrical and electronic equipment(WEEE). 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 WEEE. At the same time, your cooperation in the correct disposal of this product will contribute to the effective usage of 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 regarding return and recycling of WEEE products, please visit www.iray-tech.com.

About Service Information

- Refer instrument servicing to iRay or iRay's authorized service personnel only.
- iRay or iRay's authorized agents provide telephone service and other communication services, if it is determined necessary.. Local services are decided by fact.
- Some services need pay for service expense except components expense.
- Any unauthorized attempt to repair instrument under warranty voids that warranty.
- Client must offer product's serial number.

- Under warranty, some damages don't need take any service expense and components expense because of unartificial factors.
- Under warranty, some damages only need take components expense and need not take any service expense because of artificialness.
- Outside warranty, some damages need take service expense and components expense because of artificialness.
- Boards and components that come from repair belong to manufacturer all and singular.
- During the way which be sent to iRay or iRay's authorized agent for examination or repair, the customers should take the responsibility if the instruments damage because of transportation or unartificial factors.

Symbols

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



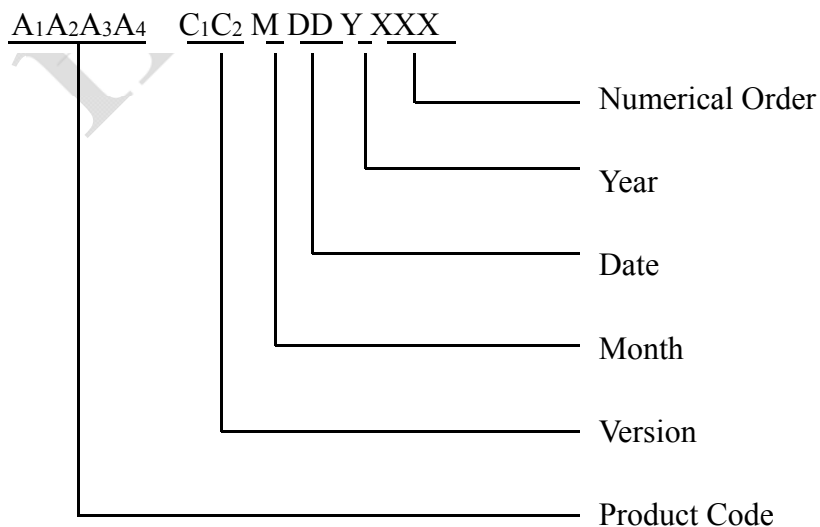
Symbol for "caution, consult accompanying documents".



Symbol for "CE mark"

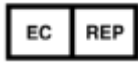


Symbol for Serial "number"





Symbol for “the name and the address of the manufacturer”



Symbol for “The name and the address of the authorized representative in the European Community”



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



Safety Signs: Symbol for “refer to instruction manual”



Safety Signs: Symbol for “Dangerous Voltage”



Symbol for “Equipotentiality”



Symbol for “Type B applied part”, applied part complying with the specified requirements of EN IEC60601-1



Symbol for “ON” (power)



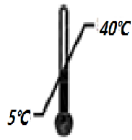
Symbol for “OFF” (power)



Symbol for Protective Earth Conductor(ground)



Symbol for “handled with care”



Symbol for “The equipment shall be operated during the upper and lower limits of temperature”



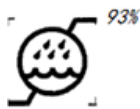
Package symbol, symbol for “Fragile, the package should be handled with care”



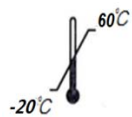
Package symbol, symbol for “Keep away from sunlight”



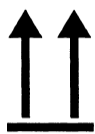
Package symbol, symbol for “Keep dry”



Package symbol, symbol for “The humidity limitations shall be indicated adjacent to the upper horizontal lines”



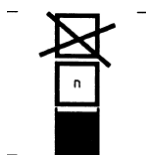
Package symbol, symbol for “The storage temperatures shall be indicated adjacent to the upper horizontal lines”



Package symbol, symbol for “Indicates correct upright position of the transport package”



Package symbol, symbol for “Transport packages shall not be rolled”



Package symbol, symbol for “Stacking limit by number”

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ipRay Tech.

Safety notices

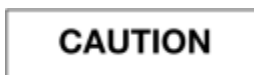
The following safety notices are used to emphasize certain safety instructions. This manual uses the caution symbol along with a caution message.



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.

1. Safety Information

1.1 Safety precautions

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

WARNING	
 Prohibited	Installation and environment of use <ul style="list-style-type: none"> • 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. • Do not operate the equipment at an altitude more than 3000m. Doing so may result electric shock or equipment failure. • Do not stand or sit on the detector directly, that may cause lose balance and hurt patient.
 Prohibited	Power supply <ul style="list-style-type: none"> • Do not operate the equipment using any type of power supply other than the one indicated on the rating lable. Otherwise, it may result in fire or electric shock. • Do not handle the equipment with wet hands. You may experience an electric shock that could result in death or serious injury. • Do not place heavy object such as medical equipment on cables and cords, or do not pull, bend, bundle, or step on them to prevent their sheath from being damaged, and do not alter them neither. Doing so many 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 connectedto a supply mains with protective earth.

Not doing so may result in fire or electric shock.



- **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 than 4m, and the cable must be collected in the fixed position, not doing this may cause the DR system to be toppled.

WARNING

Handling



Prohibited

- **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 occur, 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 is damaged

Maintenance and inspection



Prohibited

- **When the equipment is going to be cleaned, be sure to turn OFF the power each equipment, and unplug the power cord from the AC outlet. Never use alcohol, benzene, thinner or any other flammable cleaning agent.**
Otherwise, it may result in fire or electric shock.

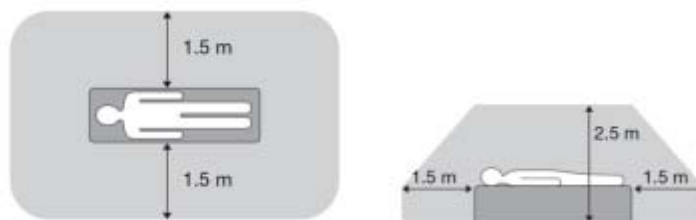


- **Clean the plug of the power cord periodically by unplugging it from the AC outlet and removing dust or dirt from the plug, its periphery and AC outlet with a dry cloth.**
If the cord is kept plugged in for a long time in a dusty, humid or sooty place, dust around the plug will attract moisture, and this could cause insulation failure that could result in a fire.
- **For safety reasons, be sure to turn OFF the power to each piece of equipment when the inspections indicated in this manual are going to be performed.**
Otherwise, electric shocks may occur.

CAUTION

Installation and environment of use

- **Do not install the equipment in any of the locations listed below. Doing so may result in failure or malfunction, equipment falling, or 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.
- !

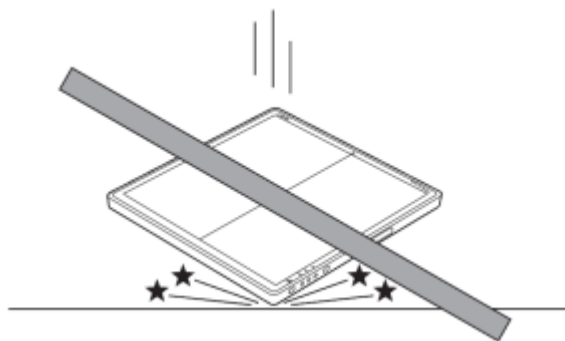
Handling

- **Do not spill liquid or chemicals onto the equipment or, in cases where the patient is injured, allow it to come in 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 covering as necessary.
 - **Turn OFF the power to each piece of equipment for safety when not being used.**
- !

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, the drop sensor will turn red and the equipment will not be warranted by iRay.
-

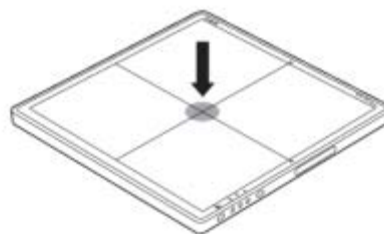
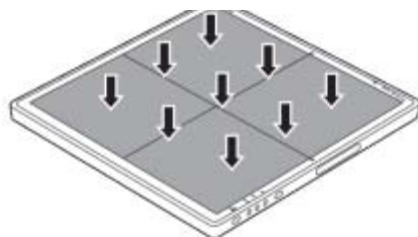


- **Do not place excessive weight on the detector.**
Otherwise, the internal image sensor may be damaged.

<Load Limit>

Uniform load: 75kg over the
whole area of the detector
surface

Local load: 50kg on an area 40
mm diameter



- 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.
- 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 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 in temperature in the room and in the 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, Cameralink, Ethernet or serial cables during exposure. Doing so may cause image noise or artifacts, even error image.
- 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 European approved disinfectants, to prevent the risk of cross infection. For details on how to disinfect, consult iRay's specialist.
- Do not spray the detector directly with disinfectants or detergents.

Wipe the detector using a cloth wetted with neutral detergent. Do not use solvents such as alcohol, thinner or benzene. Doing so may damage the surface of the equipment. It's recommended to use a waterproof non-woven covers the isolated layer between detector and the bleeding patient.


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	5~40°C	<1k/min	30~75% RH	700~1060hPa	<10kp/min (1kp=1.0197E-5Pa)
Storage	-20~60°C		≤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 40°C.
- When not in use, keep the detector and grid in a designated and safe location.
- Be sure to use and store this equipment under the conditions described below:







iRay Technology (Shanghai) Ltd.
RM 202, Building 7, No. 590, Ruiqing RD., Zhangjiang East, Pudong, Shanghai, China

EC	REP
----	-----

Renault-Petersen Limited COUCHING HOUSE, COUCHING STREET, WATLINGTON OXFORDSHIRE, OX49 5PX, UK

2. General Description

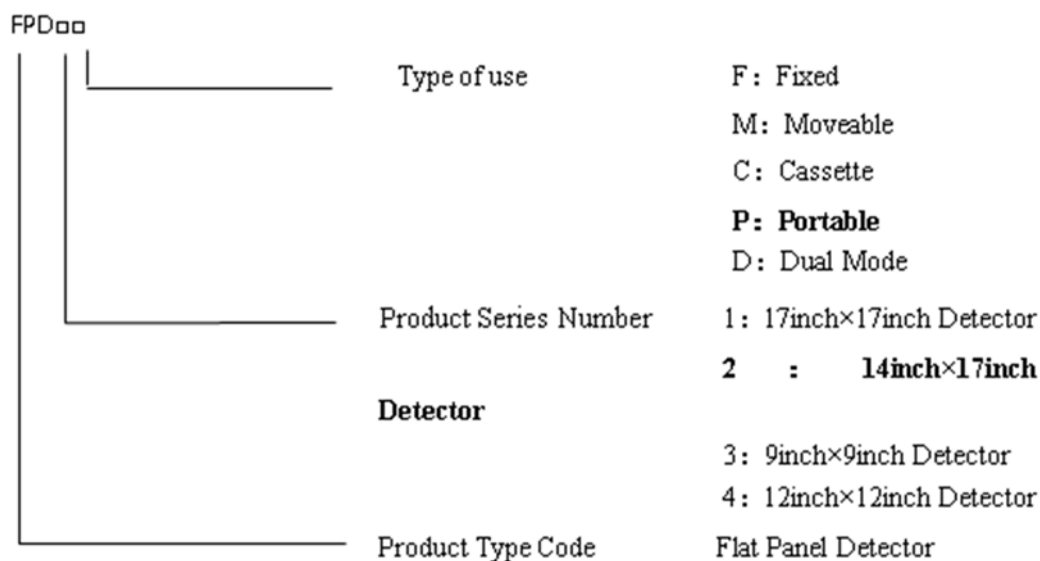
FPD1M[®] is an advanced digital radiographic flat panel detector based on amorphous silicon thin-film transistor technologies. FPD1M is a member of iRay's detector family for static x-ray imaging. FPD1M is designed to provide the highest quality of radiographic image. FPD1M contains an active matrix of 3072 × 3072 pixels with 139μm pitch. Users can select GOS (Gadolinium Sulfoxylate) or CsI (Cesium Iodide) as the scintillation screen. Camera link and Gigabit Ethernet interfaces are both available for data transfer from the detector to a computer. In addition, FPD1M is equipped with iRay's unique sync-shot, SYNC-SHOT and binning functions to meet users' various needs.

Along with the detector, iRay also provides a Microsoft Visual Studio (2008) library **IrayAcquireLib.lib**, and a demo program Demo[®] and its source code to assist users' integration of the detector into their existing DR system. The library **IrayAcquireLib.lib** contains functions for 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.

2.1 Scope

This manual contains information about the iRayFPD1M detector. All operators must read and understand this manual before using the detector. All information in this manual, including the illustrations, is based on detector model. If your detector configuration lacks any of these options, then some information in this manual does not apply.

2.2 Model



No.	Model	Brand Name	Type of Use	Active area (cm ²)	Pixel matrix	Pixel Size (μm)
1	FPD1M	Venu1717M	Moveable	42.7×42.7	3072×3072	139

2.3 Characteristic

- Fixed static Flat Panel Detector used for general radiography.
- Sync-Shot exposure trigger and/or Automatic Exposure Control.
- Camera link and Gigabit Internet interface.
- GOS or CsI scintillation screen.
- Support multiple type of Pixel binning mode.
- Capable for tomosynthesis and energy subtraction (applied with only –D model).

2.4 Intended use

This device provides digital X-ray imaging for diagnosis of disease, injury, or any applicable health problem. The image is obtained as the result of imaging X-ray passing through the human body and being detected by the device. This device is not intended for mammography or dental applications.

For DR System Maker

iRay will provide detector and software support for integration of system.

For Distributor

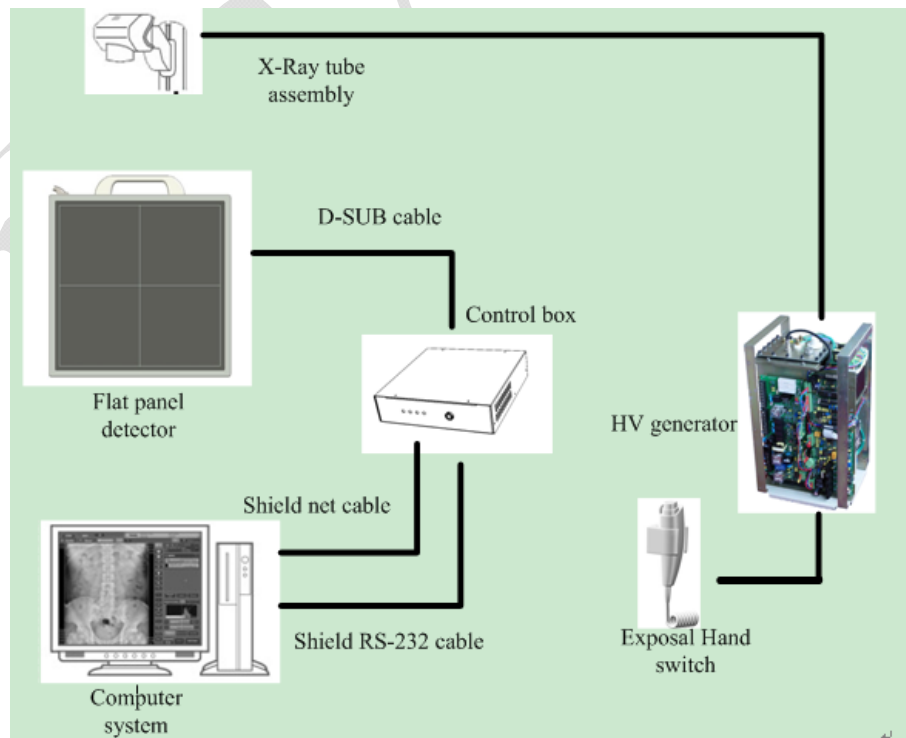
iRay will provide detector and software support for upgrading of system.

2.5 Standard configuration

The FPD1M detector comes with a power supply which connects to 110-240 AC outlet and generates DC voltages needed by the detector.

FPD1M ending with suffix -I or -A are equipped with internal x-ray sensors which automatically detect the x-ray and synchronize image acquisition with the x-ray exposure, therefore do not need to be connected to high-voltage generator of the user's DR system. FPD1M 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 detector 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 detector configuration and acquisition commands.



2.6 Main Specifications

2.6.1 Useful entrance field size

All the FPD detectors should meet the following requirements, the useful entrance field size should be more than 95% nominal entrance field size.

Entrance field size

Model	Nominal entrance field size (cm)	Useful entrance field size(cm)
FPD1M	43 × 43	42.70(±0.01) × 42.70(±0.01)

2.6.2 Minimum detectable dose should be less than 100nGy。

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

2.6.4 Limiting spatial resolution should be not less than 3.1Lp/mm。

2.6.5 Low contrast resolution should be more than 0.0055 (with the air kerma should be 50μGy in the test process)。

2.6.6 Defect pixel

- 3×3 correctable defect pixels should not more than 0.1% of all pixels.
- 3×3 uncorrectable but 5×5 correctable defect pixels should not more than 0.01% of all pixels.
- There should be no 5×5 uncorrectable defect pixel.

2.6.7 Defect data line should be less than 10.

2.6.8 There should be no erasure thoroughness.

2.6.9 There should be no artifact.

2.6.10 **Flat uniformity should be not more than 2.2%**

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

2.6.12 The MTF should meet the following table

Standard radiation quality No. RQA/μGy	Spatial frequency /mm ⁻¹	MTF (horizontal) or (vertical)
5/2.5	0.5	0.69
	1.0	0.39
	1.5	0.21

2. General Description

	2.0	0.12
	2.5	0.07
	3.0	0.04
	3.5	0.02

2.6.13 Detective quantum efficiency (DQE)

The MTF should meet the following table

Standard radiation quality No. RQA/ μ Gy	Spatial frequency /mm ⁻¹	MTF (horizontal) or (vertical)
5/2.5	0	0.2
	0.5	0.15
	1.0	0.1
	1.5	0.05
	2.0	0.02
	2.5	0.01

2.6.14 Lag effect should be less than 0.5%。

2.6.15 Multiplicative lag effect should be less than 0.5%。


2.6.16 FPD1M effective area, pixel matrix and pixel dimension

Model	Brand name	Normal use	Effective area (cm ²)	pixel matrix	pixel dimension (μ m)
FPD1M	FPD1M	Moveable	42.7×42.7	3072×3072	139

2.6.17 input rate :80VA

2.6.18 Product weight: 6.0kg



2.7 Standard Package List

Item	Qty
Detector: FPD1M (FPD1M) (with detector cable) 	1

2. General Description

Item	Qty
FPD1M Handle Grip and two screws 	1
Control Box: (Control box is specified as a part of ME Equipment) 	1
FPD1M UART WIRE 	1
Extension Cable 	1
HVG Cable 	1
Ethernet Cable 	1

2. General Description

Item	Qty
Power Cable 	1
Fuse 	2

2.8 Description of Indicators

Indicator of Control box:

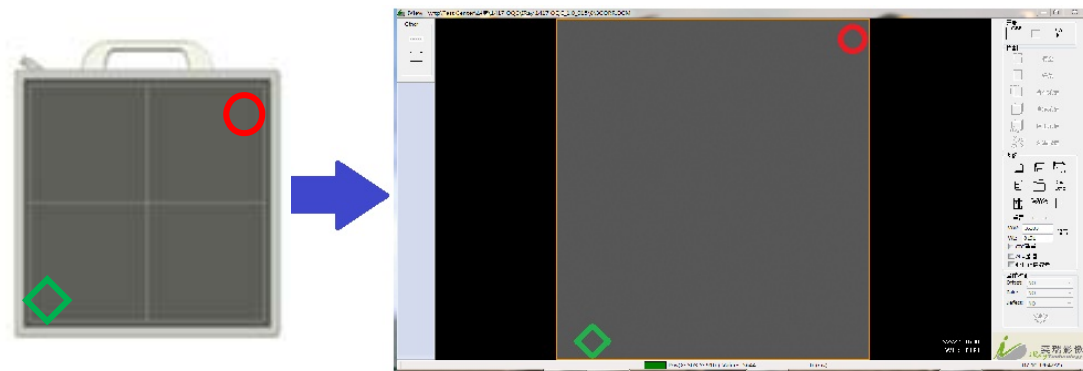
Items	Color	Descriptions
Power	OFF	Power OFF
	Green(steady)	Power supply is normal

Indicators of detector

Items	Color	Descriptions
Power	OFF	Power OFF
	Green(steady)	Power supply is normal
data	OFF	Power OFF
	Green(steady)	Data transmission between equipment and workstation
Link	OFF	Power OFF
	Green(steady)	Gigabit Ethernetlink is normal

2.9 Image Direction

Please notice that the image direction is defined as follows:



3. Installation and Operation



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 operate the equipment at an altitude above 3000 meters.
- 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 FPD1M detector must use the specified power supply and shall be connected with the grounding wires.

1. Turn off the computer.
2. Install a Gigabit Ethernet card in the computer if none has been installed.
3. Install **WinPcap** 4.1.2 for the Gigabit Ethernet interface.
4. Connect a ground cable and the power supply cable to the detector.
5. Connect the power supply to a 110-240V AC outlet.
6. For Venu1717 -M subtypes, connect the synchronization cable between the detector and a high-voltage generator.
7. Turn on the switch of power supply and the red indicator of the detector shall be lit up.
8. Run one image acquisition software such as iStart or iDemo.

3.1 Quick Start

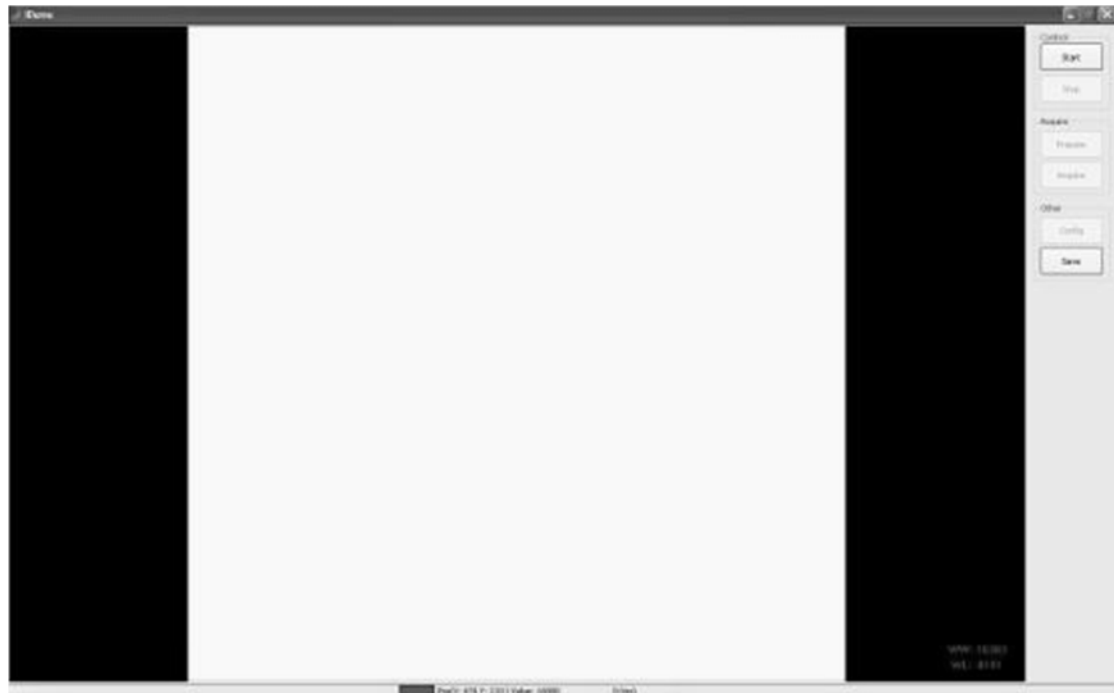
Before using the detector, user must read the appendix A for details of SDK installation.

Then user can use the Quick Start software **iStart**[®] for image acquisition.

3.2 First Image Acquisition

iRay provides a Microsoft Visual Studio (2008) library [IrayAcquireLib.lib](#), and a demo program **iDemo**[®] and its source code to assist the users' integration of the detector into their existing DR system. The library [IrayAcquireLib.lib](#) contains functions for 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 program by double click on the executable file iDemo.exe included in the CD ROM. iDemo loads the acquisition driver and sends the acquisition commands to the detector through a UART port. The image data acquired by FPD1M 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 the computer



screen.

As shown in the above figure, on the right there are 5 class's buttons.

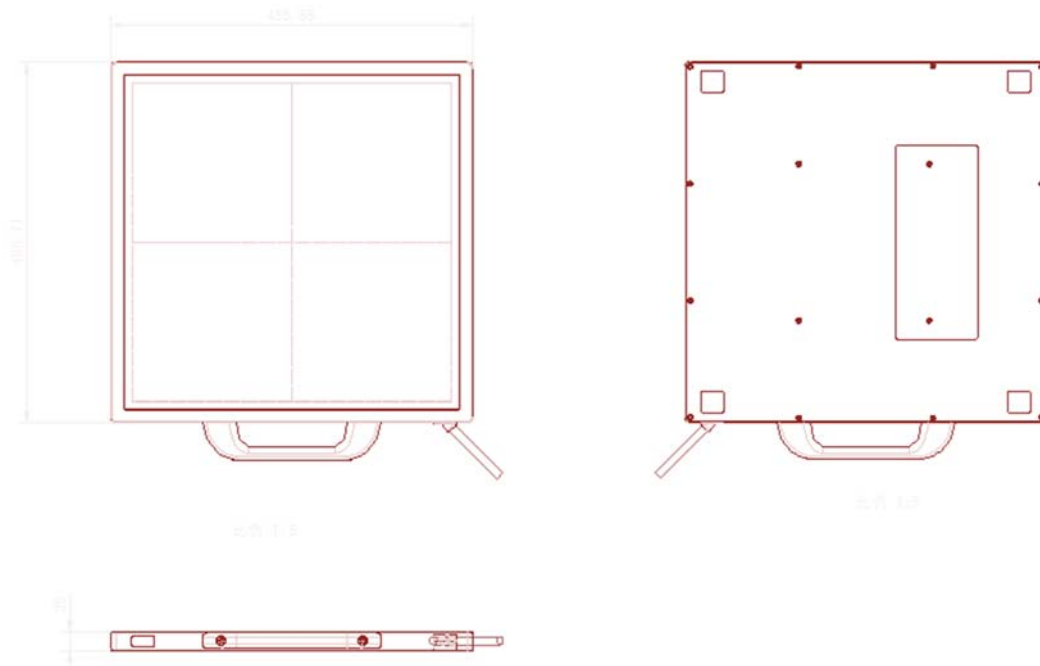
- (1) Control class: “**Start**” button to initialize the Gigabit Ethernet driver. The user needs to select the Gigabit Ethernet adapter that has been connected to FPD1M. “**Stop**” button to unload the Gigabit Ethernet driver.



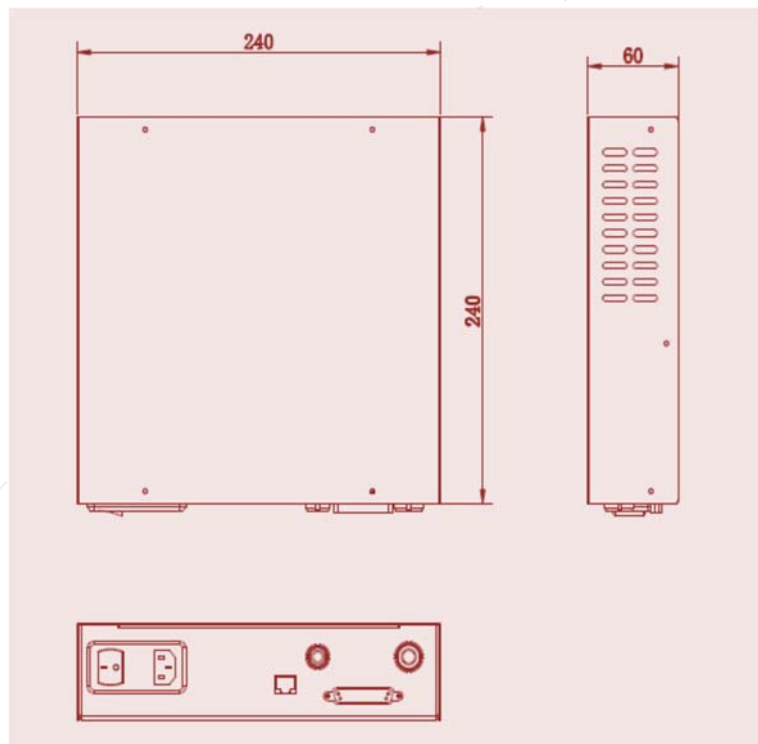
After clicking OK, iDemowill test the linking speed of the device.

- (2) Acquire class: “**Prepare**” button to start the clearing process of detector. “**Acquire**” button to acquire one image from the detector.
- (3) Other class: “**Config**” button to read, write or reset the settings of detector. “**Save**” button to save the image acquired from the detector with DICOM format.
- (4) GBE Window class: “**Set**” button to set the user selected Gigabit Ethernet device as the default Gigabit Ethernet device.
- (5) Correction class: iDemo provide correction wizard to generate the offset, gain and defect correction. For offset correction, user can select no offset, pre-offset or post-offset mode.

3.3 Mechanical Drawing



FPD1M detector structure diagram



FPD1M control box structure diagram

3.4 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.



4. Control Box Interface

Control box which is regarded as a part of medical electrical equipment is the relay device between computer and detector. All the plug and connector should be placed in a



portable position. As shown in the figure, there are 5 connection ports at the back of the control box, which is a part of ME EQUIPMENT

- AC Input: Three-phase (electric) outlet for AC110-240V power input.
- LAN: Gigabit Ethernet port connected to PC.
- RS-232: Serial port connected to PC.
- HVG: Control interface connected to HVG.
- Detector: Integrated interface with power and data connected to detector.

4.1 Power Supply Port

The power supply port shall be connected to the specified power supply of FPD1M, which is included in the package.

The ground wire must be connected to the grounding terminal for restraining the power disturbing.

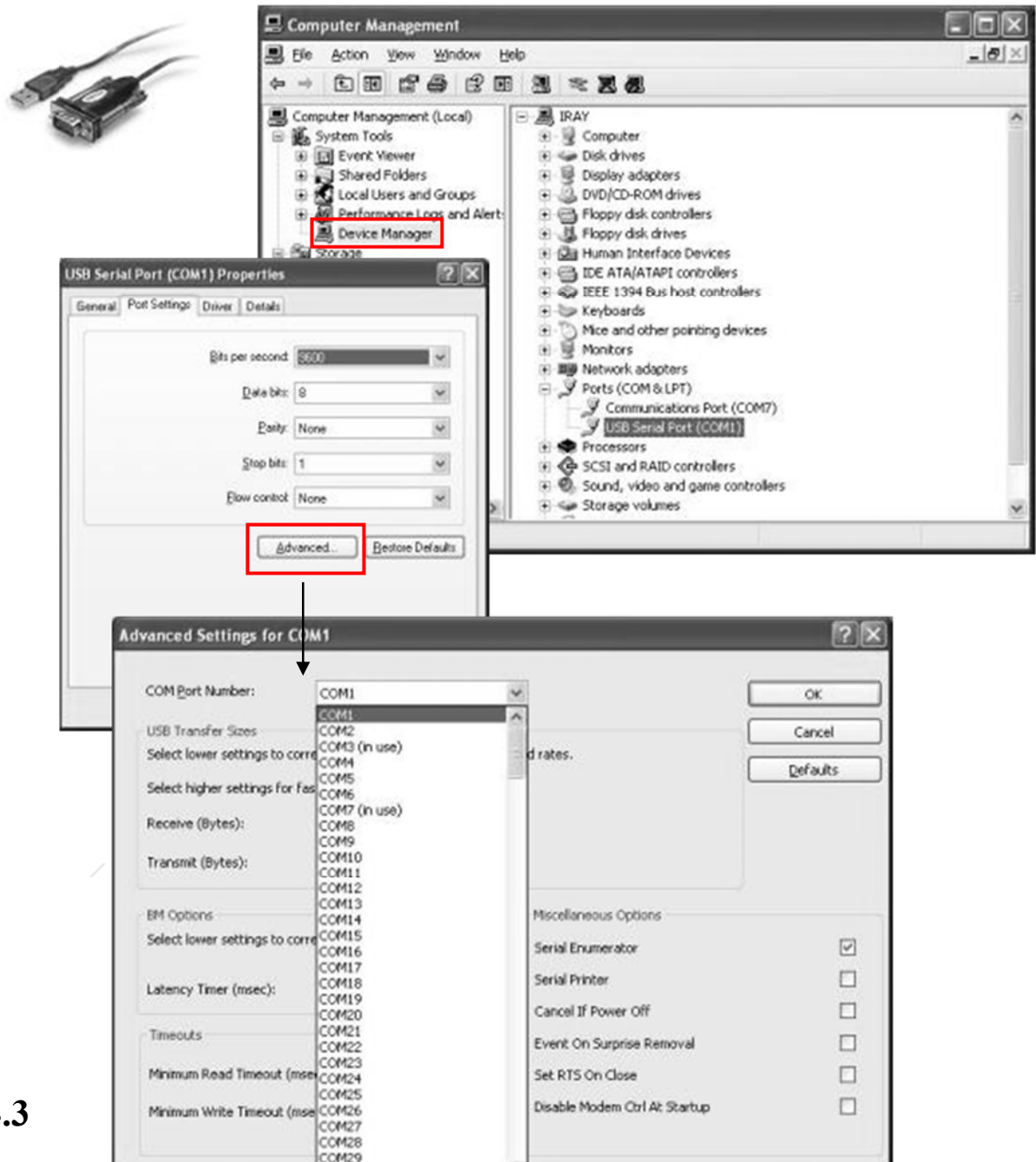
4.2 D-Sub serial Port

The Serial Port shall be connected with the D-Sub 9 serial cable (included in the package) to a serial port of the user's computer. The serial port is used to transmit image

acquisition and configuration commands from the user's computer to the detector.



If the pc does not have a standard serial port, the user can use a USB-to-serial converter. When a USB-to-serial converter is plugged into a USB port, the user should set the port number to be COM1 as shown in the figure.



4.3

Gigabit 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 PROGigabit Network Adapter with PCIe interface is recommended. Any use prefers use any other Gigabit Network Adapter, PCIe interface should be considered.

4.4 HVG Interface

The HVG interface with 16 cores is connecting to HVG for synchrolock HVG signals. (The wire labels signed in italic and with “*” mean the function has not been open.)

Wire Label	Wire Color	I/O	Signal Description
GND	Shield	/	Gnd
<i>*SYNC-SHOT_SELA</i>	<i>White</i>	<i>O</i>	<i>Sync-shot sensor selected signal A</i>
<i>*SYNC-SHOT_SELB</i>	<i>Red/white</i>	<i>O</i>	<i>Sync-shot sensor selected signal B</i>
SYSN_IN	Black	I	HVG synchrolock signal in Fluoro mode
<i>*SYNC-SHOT/ABS</i>	<i>Green</i>	<i>O</i>	<i>Sync-shot analog output signal</i>
<i>*SYNC-SHOT_SELC</i>	<i>Gray</i>	<i>O</i>	<i>Sync-shot sensor selected signal C</i>
<i>*SYSN_OUT</i>	<i>Brown</i>	<i>O</i>	<i>Detector synchrolock signal in Fluoro mode</i>
<i>*SYNC-SHOT_V+</i>	<i>Brown/white</i>	<i>I</i>	<i>HVG power supply</i>
GND	Blue	/	Gnd
GND	Yellow	/	Gnd
PREP	Black/white	I	HVG prep signal
RAD_EN	Pink	O	HVG rad_en signal
RAD	Red	I	HVG rad signal
<i>*HBK_I</i>	<i>Cyan</i>	<i>O</i>	<i>HVG hand-brake I</i>
<i>*HBK_II</i>	<i>Purple</i>	<i>O</i>	<i>HVG hand-brake II</i>
<i>*HBK_COM</i>	<i>Orange</i>	<i>O</i>	<i>HVG hand-brake COM</i>

4.5 Inner Digital sync-shot Module

The detector has an embedded well-proved sync-shot module with Ionization Chamber and sync-shot board for automatic exposure control. The sync-shot module can provides a very stable inner trigger signal of calibrated pulses with a resolution of up to 5nGy. The energy range is from 40kV to 150kV.

4.6 X-ray Image Acquisition

FPD1M provide hardware or software methods to acquisition the X-ray image. All the methods mean three modes, that is, outer-trigger mode, inner-trigger mode and soft-trigger mode.



Any trigger mode must be set rightly by DR software at first, or else none image will be acquisitioned.

Outer-trigger mode: User can operate hand-brake or control-panel to prepare and fire X-ray, and then the X-ray image can transfer automatically. The PREP/ XRAY_EN/ XRAY wires must connect to High-voltage Generator to synchrolock the exposure timing.

Inner-trigger mode: User can operate hand-brake or control-panel to prepare and fire X-ray, and then the X-ray image can transfer automatically. None wires should be connected to High-voltage Generator. The Inner SYNC-SHOT Ionisation Chambers is embedded in detector to generate the inner trigger signal.

Soft-trigger mode: User can operate hand-brake or control-panel to prepare and fire X-ray, and then DR software to acquisition the X-ray.

About FPD1M, the concept **EVENT** should be noted

- **Prep Event (P-EVENT)**

When prep event occur, detector will start clearing lag process for ready. The clear time of Single Driver type is 1500ms, and Dual Driver type is 800ms.

Applied Trigger Mode	Trigger Method
Outer-trigger mode	Prep signal of HVG
Inner-trigger mode	Software command

Soft-trigger mode	Software command
-------------------	------------------

- **Acqu Event (A-EVENT)**

When acqu event occur, detector will start progressive scanning and acquisition the image of TFT matrix sensor. In addition, use can adjust the acqu event delay time for some requirements.

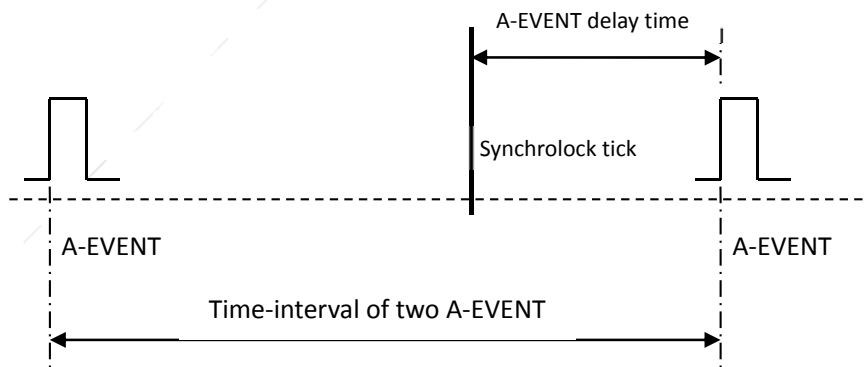
Applied Trigger Mode	Trigger Method
Outer-trigger mode	Xray signal of HVG
Inner-trigger mode	Inner SYNC-SHOT trigger signal
Soft-trigger mode	Software command

- **Prep Acqu Event (PA-EVENT)**

When prep acqu event occur, detector will start clearing lag process, delay some time , then start progressive scanning and acquisition the image of TFT matrix sensor automatically. The PA-EVENT may be applied in post-offset image acquisition.

- **Serial Acqu Event (SA-EVENT)**

When serial acqu event occur, detector will start progressive scanning and acquisition the image continuously.



If the A-EVENT delay time is set by exposing time, and fire the X-ray at the synchrolock tick, DR software can realize the dynamic acquisition.

- **Time Event (T-EVENT)**

A time counter is in detector for record time (ms) between the recent P-EVENT and A-EVENT. The P-EVENT will start the counter from 0, and then E-EVENT will get the current counter value as the tick time. Meanwhile the tick time will be return. DR

software can get this value then invoke the PA-EVENT for precise post-offset.

5. Regulatory Information

The product safety standards that apply to the FPD1M, which includes the main unit detector and power adaptor.

5.1 Medical equipment safety standards

◆ Medical equipment classification

Type of protection against electrical shock	Internally powered equipment Class I Equipment, with wiring unit
Degree of protection against electrical shock	Type B Applied Parts The applied parts is the poly film on the surface of carbon fiber plate
Degree of protection against ingress of water	IP20
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	Medical electrical equipment – Part 1: General requirements for basic safety and essential performance.
EN 60601-1-2	Medical electrical equipment – Part 1-2: Collateral standard: Electromagnetic compatibility – Requirements and tests
EN 60601-1-3	Medical electrical equipment – Part 1-3: Collateral standard: General requirements for radiation protection in diagnostic X-ray equipment
EN 60601-1-6	Medical electrical equipment-Part 1-6: General requirements for basic safety and essential performance - Collateral Standard: Usability

EN 60601-2-54	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	Medical electrical equipment-Characteristics of digital X-ray imaging devices- Part 1: Determination of the detective quantum efficiency
EN 62304	Medical device software - Software life-cycle processes
EN 62366	Medical devices-Application of usability engineering to medical devices

5.2 Guidance and manufacture's declaration for EMC

◆ Electromagnetic emissions

The FPD1M detector is intended for use in the electromagnetic environment specified below. The customer or the user of the FPD1M detector should assure that it is used in such an environment.

Emission Test	Compliance	Electromagnetic Environment - Guidance
RF emissions CISPR 11	GROUP1	It uses RF energy only for its internal function. Its RF emissions are very low and are not likely to cause any interference in nearby electromagnetic equipment
RF emissions CISPR 11	Class B	It is suitable for use in all establishments other than domestic 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


The FPD1M detector is intended for use in the electromagnetic environment specified below. The customer or the user of the FPD1M detector should assure that it is used in such an environment.

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment - Guidance
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5. Regulatory Information

Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8kV air	±6kV 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 IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/output lines	±2 kV for power supply lines ±1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
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.
Conducted RF IEC 61000-4-6	3 Vrms 150kHz to 80MHz	3 Vrms	Portable and mobile RF communications equipments should be used no closer to any part of the Model FPD1M, including cables, than the recommended separation distance calculated from the equation applicable 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
Radiated RF IEC 61000-4-3	3 V/m 80MHz to 2.5GHz	3 V/m	

5. Regulatory Information

			<p>where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in metres (m).</p> <p>Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,^a should be less than the compliance level in each frequency range.</p> <p>Interference may occur in the vicinity of equipment marked with the following symbol:</p> 
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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 the FPD1M detector is used exceeds the applicable RF compliance level above, the FPD1M detector should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the FPD1M detector.

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 the FPD1M detector

The FPD1M detector is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the

FPD1M detector can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the FPD1M detector 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	80 MHz~800 MHz	800 MHz ~2.5GHz
	$d = 1.2 \sqrt{P}$	$d = 1.2 \sqrt{P}$	$d = 2.3 \sqrt{P}$
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

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in metres (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
Controlbox Input Power Cable	3m	Unshielded	1 Set	AC Power
RS232 to PC Cable	>3m	Shielded	1 pcs	Signal
LAN port Cable	>3m	Shielded	1 pcs	Signal
Interface to HVG Cable	>3m	Shielded	1 pcs	Signal
Data Cable	>3m	Shielded	1 pcs	Signal

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

The FPD1M detector needs 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; The FPD1M detector 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.

The FPD1M detector 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 the FPD1M detector as replacement parts for internal components, may result in increased EMISSIONS or decreased IMMUNITY of the FPD1M detector.

The FPD1M detector should not be used adjacent to or stacked with other equipment. In case adjacent or stacked use is necessary, The FPD1M detector should be observed to verify normal operation in the configuration in which it will be used.

Description and Specification of ringcore

Part number: 7427154

Description: STAR-RING ringcore with plastic case



Manufactory: WurthElektronik Co.

The recommended use of ringcore shown as following:

- a) The RS232 to PC Cable should be winding more than 2 turns near the RS232 port on the controlbox .

- b) The Interface to HVG Cable should be winding more than 2 turns near the Interface port on the controlbox.
- c) If USB to RS232 cable were used, the cable should be winding more than 2 turns near the USB port.

6. Imaging Software SDK

The imaging software library **IrayAcquireLib.lib** provides the fundamental functions for detector configuration and image acquisition. A program iDemo has been included in the package to demonstrate how to use this library. Please note that the images acquired from the **IrayAcquireLib.lib** have only been modestly processed and the users need to develop their own software with a separate image processing engine.

6.1 Description of Library (IrayAcquireLib.lib)

Item	Description
Acquisition_Initialize	Initialize capture communication library.
Acquisition_Close	Unload uart device.
Acquisition_GetImageSize	Get height and width pixel size of image.
Acquisition_SetCommDCB	Set uart device parameters.
Acquisition_StartAcquisition	Start capture one frame image.
Acquisition_StopSequence	Stop capture image.
Acquisition_ReadDRConfig	Read the current settings of detector.
Acquisition_GetDRConfigVersion	Get firmware version.
Acquisition_StartAecReady	Start ready for inner exposure trigger.
Acquisition_SetAecCallback	Set the callback function of inner exposure trigger.

Acquisition_SetImageCallback	Set callback function of capturing image by Cameralink card object.
Acquisition_SetComCallback	Set callback function of uart settings.
Acquisition_GigeGetAdapterList	Get the network card list of PC.
Acquisition_GigeFreeAdapterList	Release the network card list of PC.
Acquisition_GigeCreateAdapterObject	Create the object of selected network card.
Acquisition_GigeDeleteAdapterObject	Release the object of selected network card.
Acquisition_GigeGetAdapterObjectSpeed	Test the link-speed of the used object of network card.
Acquisition_GigeAdapterObjectSetImageCallback	Set callback function of capturing image by network card object.

6.2 Description of Function:

6.2.1 Acquisition_Initialize

The function is initializing the uart device. The parameters of uart will be obtained by pCom.

```
ACQUIRE_HEADER_API INT Acquisition_Initialize(  
PCHAR pCom  
);
```

Description of parameters:

pCom: The number of used uart port, such as com1.

Return values:

1: Successful.

-1000: Failed.

Attention: initializing capture library.

6.2.2 Acquisition_Close

The function unloads the uart device and closes the connection with uart device, then release the uart object.

```
ACQUIRE_HEADER_API void Acquisition_Close();
```

6.2.3 Acquisition_GetImageSize

The function is to obtain the height and width (in number of pixels) of the image.

```
ACQUIRE_HEADER_API void Acquisition_GetImageSize(  
DWORD &dwSizeX,  
DWORD &dwSizeY  
);
```

Description of parameters:

dwSizeX: width of image. Unit is pixel.

dwSizeY: width of image. Unit is pixel.

6.2.4 Acquisition_SetCommDCB

The function is set the function of uart device, which is created by the function **Acquisition_InitAcquire** or **Acquisition_InitCom**. The format of setting is 9600/N/8/1.

e.g. *Acquisition_SetCommDCB("baud=9600 parity=N data=8 stop=1");*
**ACQUIRE_HEADER_API BOOL Acquisition_SetCommDCB(
PCHAR strDCB
);**

Description of parameters:

strDCB: Parameter of uart device.

Return values:

FALSE: Failed.

TRUE: Successful.

6.2.5Acquisition_StartAcquisition

The function is start acquisition one frame of image. When execute this function, one-frame-acquisition command will be sent by com port. Then the detector will start scan and transfer image back. User must confirm the connection status of uart is normal.

ACQUIRE_HEADER_API BOOL Acquisition_StartAcquisition();

Return values:

FALSE: Failed.

TRUE: Successful.

6.2.6Acquisition_StopSequence

The function is stop acquisition. When execute this function, stop-acquisition command will be sent by com port. Then the detector will stop do not other scan and transfer image back.

ACQUIRE_HEADER_API BOOL Acquisition_StopSequence();

Return values:

FALSE: Failed.

TRUE: Successful.

6.2.7Acquisition_ReadDRConfig

The function is read current settings of detector.

ACQUIRE_HEADER_API BOOL Acquisition_ReadDRConfig();

Return values:

FALSE: Failed.

TRUE: Successful.

6.2.8 Acquisition_GetDRConfigVersion

The function retrieves the firmware version.

```
ACQUIRE_HEADER_API WORD Acquisition_GetDRConfigVersion(  
WORD &wV1,  
WORD &wV2,  
WORD &wV3  
);
```

Description of parameters:

wV1: Product No..

wV2: Release No..

wV3: Amendment No..

6.2.9 Acquisition_StartAecReady

The function is start SYNC-SHOT ready. When execute this function, one-frame-acquisition command will be sent by com port. Then the detector will start scan and transfer image back. User must confirm the connection status of uart is normal.

```
ACQUIRE_HEADER_API BOOL Acquisition_StartAecReady();
```

Return values:

FALSE: Failed.

TRUE: Successful.

6.2.10 Acquisition_SetAecCallback

The function is set callback function of AEC information. The parameter pAecInfo is function pointer of SYNC-SHOT information. When user creates the global function to transfer the parameter pAecInfo, then this function is received by running library and registered. Once SYNC-SHOT ready, the callback function will return the SYNC-SHOT information by this function pointer.

```
ACQUIRE_HEADER_API void Acquisition_SetAecCallback(  
AecInfoCallbackpAecInfo,  
LPVOIDpUser  
);
```

Description of parameters:

pAecInfo: The callback function of SYNC-SHOT.

pUser: The pointer of user.

6.2.11Acquisition_SetImageCallback

The function is set the callback function of acquisition image. The parameter pImageHandle is the function pointer of image information. When the user creates the global function to transfer the parameter pImageHandle, then this function is received by running library and registered. Once one image is acquisitioned, the callback function will return the image data by this function pointer.

```
ACQUIRE_HEADER_API void Acquisition_SetImageCallback(  
NewDataCallbackpImageHandle,  
LPVOID pUser  
);
```

Description of parameters:

pImageHandle: Callback function of image data.

pUser: The pointer of user.

6.2.12Acquisition_ComCallback

The function is set the callback function of uart information. The parameter pComInfo is function pointer of uart information. When user create the global function to transfer the parameter pComInfo, then this function is received by running library and registered. Once uart data is acquisitioned, the callback function will return the uart data by this function pointer.

```
ACQUIRE_HEADER_API void Acquisition_ComCallback(  
GetComInfopComInfo,  
LPVOID pUserInfo  
);
```

Description of parameters:

pComInfo: Uart information.

pUserInfo: The pointer of user.

6.2.13 GIGE_ADAPTERNAMELIST* Acquisition_GigeGetAdapterList();

The function is to return the pointer of structGIGE_ADAPTERNAMELIST. It is

a one-way chained list, which has saved the name of network card.

Return values:

GIGE_ADAPTERNAMELIST: The header of chained list of network card name.

```
6.2.14 VOID Acquisition_GigeFreeAdapterList(  
    GIGE_ADAPTERNAMELIST* pAdapterList  
    );
```

The function is release the list pointer from Acquisition_GigeGetAdapterList

Description of parameters:

pAdapterList: The chained list pointer of network card.

```
6.2.15 INT Acquisition_GigeCreateAdapterObject(  
    PCHAR pAdapterName,  
    HANDLE &pAdapter  
    );
```

The function is open the network card used by pAdapterName, and return the handle of network card object.

Description of parameters:

pAdapterName : The return string name of network card from Acquisition_GigeGetAdapterList.

pAdapter: The handle of return object.

Return values:

<0, means open failed.

```
6.2.16 INT Acquisition_GigeDeleteAdapterObject(  
    HANDLE pAdapter  
    );
```

The function is release the handle of the network card object which is created by Acquisition_GigeCreateAdapterObject

Description of parameters:

pAdapter: The handle of network card object which will be released.

Return values:

<0, means open failed.

6.2.17 `UINT Acquisition_GigeGetAdapterObjectSpeed(HANDLE pAdapter);`

The function is used for test the speed of current linked network card. If the speed is lower than 1000M, means linking failed.

Description of parameters:

pAdapter: The handle of linked network card object.

6.2.18 `void Acquisition_GigeAdapterObjectSetImageCallback(HANDLE pAdapter, NewDataCallbackpImageHandle, LPVOID pUser);`

The function is set the callback function of image data of network card object.

Description of parameters:

pAdapter: The network card object.

pImageHandle: The pointer of callback function.

pUser: The pointer of user.

6.3 Demo illustration

Example: How to acquisition one frame image data by Gigabit Internet interface?

1. Initializing

1) Initializing the network card and uart port.

Acquisition_Initialize("com1");

2) Set the settings of uart port and other parameters

Acquisition_SetCommDCB("baud=9600 parity=N data=8 stop=1");

//Get the list of NIC.

GIGE_ADAPTERNAMELIST* pList=Acquisition_GigeGetAdapterList();

//Create the object of NIC.

Acquisition_GigeCreateAdapterObject(pAdapterName,m_hGigeAdapter);

3). Return the connection information of NIC.

Acquisition_GigeAdapterIsConnected(PCHAR pAdapterName,BOOL

&bConnect)

- 4). Set the callback function of image acquisition.

Acquisition_GigeAdapterObjectSetImageCallback(m_hGigeAdapter,pImageCallback,pUser);

- 7). Set the callback function of Uart.

Acquisition_SetComCallback(pStatusCallback, pUser);

2. Start acquisition the image

- 1). Acquisition the dark image.

Acquisition_StartAcquisition();

- 2). Acquisition the exposing image.

3. Unload

- 1). Unload the network card

Acquisition_GigeDeleteAdapterObject(m_hGigeAdapter);

- 2). Unload capture card and uart port

Acquisition_Close();

4. Acquisition Mode

- 1). Set the trigger mode.

Acquisition_SetDRConfigAecMode(wMode);

- 2). Get the trigger mode.

Acquisition_GetDRConfigAecMode ();

- 3). Update the trigger mode.

Acquisition_DRConfigUpdateAll ();

Others, please reference the source code of iDemo.

7. Service Information

Product lifetime

The estimated product lifetime is up to 5 years under appropriate regular inspection and maintenance.

Regular inspection and maintenance

In order to ensure the safety of patients, operating personal and third parties, and to 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 the 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 as much detail 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.

Replacement of the fuse

Type of fuse: F2AL250V $\phi 5 \times 20$ mm.

Steps of fuse replacement:

- a) Turn off the power (shift the switch to the position “o”) and unplug the power cable
- b) Remove the fuse holder from the power filter following the arrows direction in Fig. 7.1.



Fig 7.1 Remove the fuse holder from the power filter

- c) Replace the fuse with a new one (Fig.7.2)
- d) Insert the fuse holder back into the power filter.

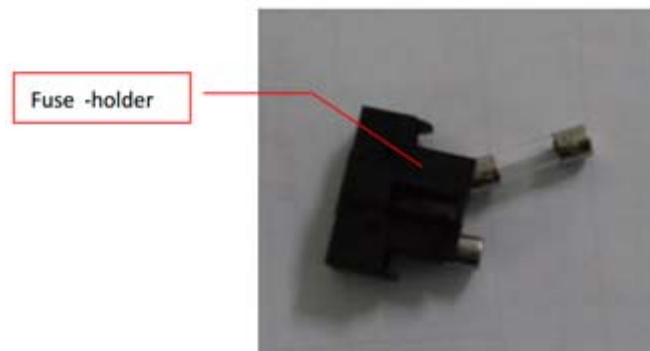


Fig 7.2 Replace the fuse

Trouble Shooting

When you encounter problems or error message in using FPD1M 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.

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.

Appendix A Installation of SDK

The detector provides two interfaces for image acquisition. For using, user must install the relative software rightly.

A.1 Installation of Gigabit Ethernet Driver

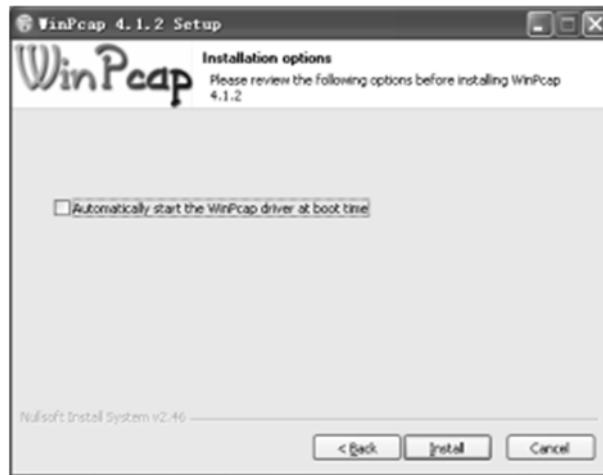
In order to use the Gigabit Ethernet interface for data transfer, the use need to install the driver files WinPcap4.1.2, this has been included in the CD-ROM.



Click “next” button to start installation.



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



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

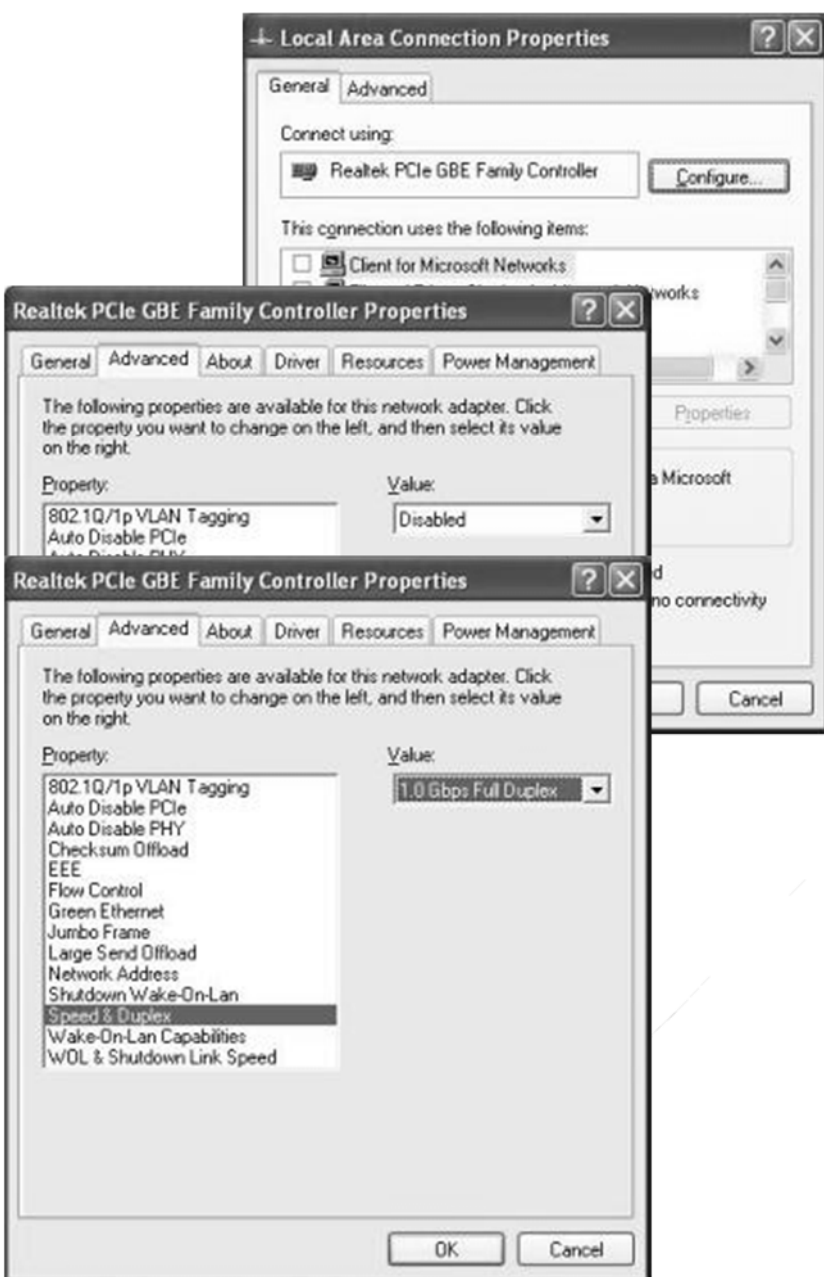


Then installation completed



When use one new computer, user must set the settings of network card for working normally.

As figure, 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 of network connection.



Appendix B FPD1M Dummy Lines

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

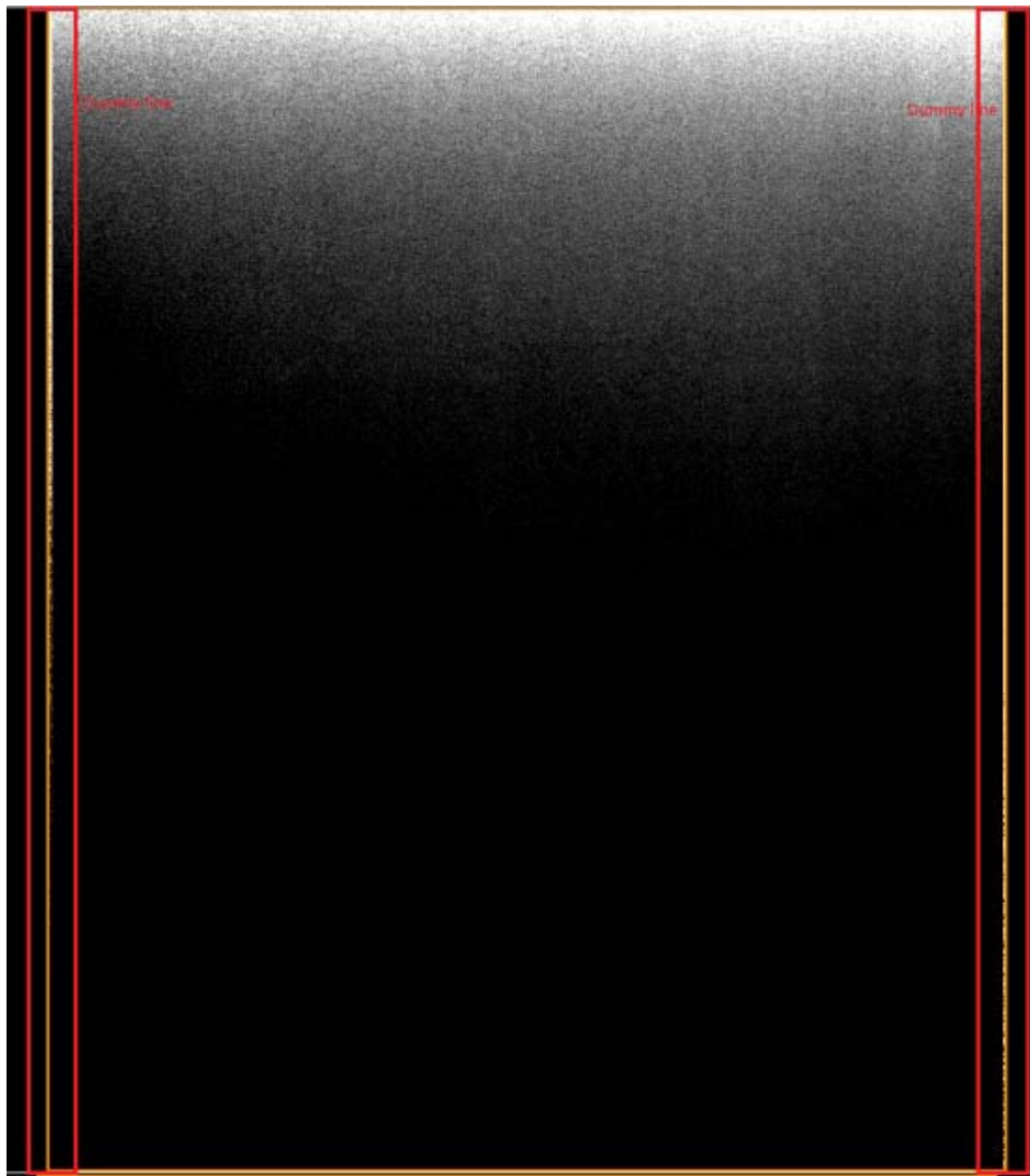


Fig D1

In details

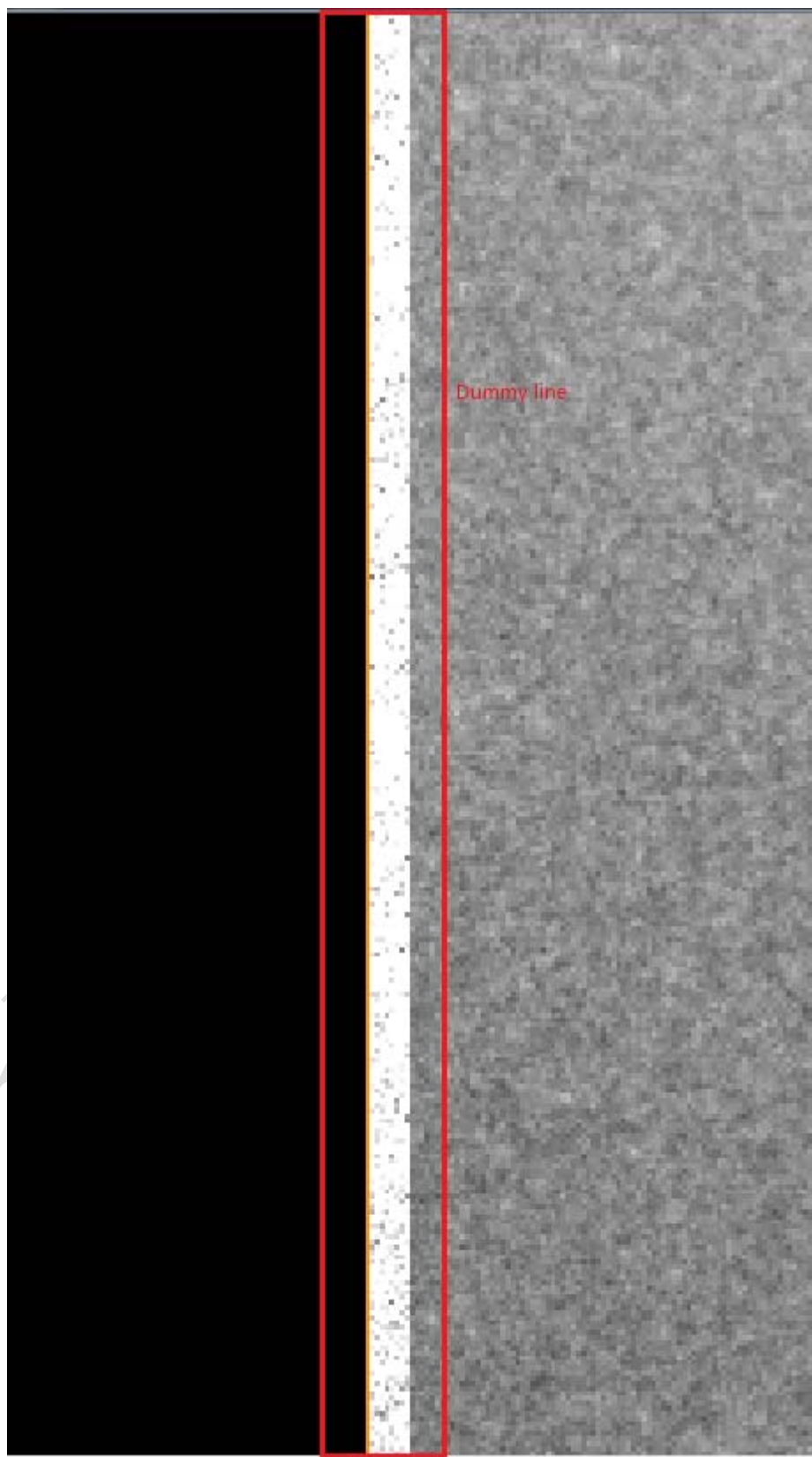


Fig D2

Appendix C Function List of Different Hardware/Firmware Versions

Detector	Firmware	Function
V0	main board: 3.3.18 read board : 3.1.5	1. RS232 command interface 2. Static image acquisition 3. Gigabit Ethernet command interface 4. Default mode can be configured by customers
V1	main board: 3.3.20 read board : 3.1.6	
V2	main board: 3.3.22 read board:4.1.4	1. RS232 command interface 2. Static image acquisition 3. Gigabit Ethernet command interface 4. Default mode: inner-trigger mode, but can be configured by customers 5. Temperature feedback 6. Detector SN. Feedback 7. Inner circuit: read board ,gate board

Appendix D Recommended 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		

Appendix E Definition 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 region after gain-offset correction under 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 vertical lines of 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 Class 1-8:

"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, recalculate 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 $384 \leq x \leq 1920$ and $467 \leq y \leq 2333$.

Appendix F Information of Manufacture



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