

User Manual

X-ray Inspection System

- Classic Series

Please read this manual carefully before use



Electronics and Computer Industry and Trade Inc.

Factory: Atatürk Organized Industrial Zone 10024 Street No: 9 Çiğli - İzmir / TURKEY
Tel: +90 [232]328 16 45 pbx - Fax: +90 [232]328 16 74 sales: +90 [232]328 16 45/121
Web: www.polimek.com.tr - www.smartguard.com.tr - Email: ekin.polat@polimek.com.tr

Content

Preface.....	0
1. Safety Notification.....	1
1.1. Warning Labels installed on the X-ray Inspection System.....	1
1.2. Safety Operation Instructions.....	1
1.3. X-ray Safety Standards and Approval for Use.....	5
1.4. Safety Protection.....	6
1.4.1. Safety Protection and Precautions.....	6
1.4.2. X-ray Inspection Scanner.....	6
2. Device Principle and General Specification.....	10
2.1. Application.....	10
2.2. Working Principle.....	10
2.3. Operation Environment.....	10
2.4. Accessories*.....	10
2.5. System Composition.....	11
2.6. Subsystem and Function.....	11
2.6.1. X Ray Source.....	11
2.6.2. X-ray Source Control and Drive.....	12
2.6.3. L-shape Detector Box.....	12
2.6.4. Sub Control Board.....	12
2.6.5. Control/ Data Processing (IPC).....	12
2.6.6. Monitor.....	12
2.6.7. Conveyor Belt.....	13
2.6.8. Photosensors (Infrared Sensor).....	13
2.6.9. Main Switchboard.....	13
2.7. Software-7 Color Imaging System.....	15
3. Scanner Operating.....	15
3.1. System Check.....	15
3.2. Power Connection.....	16
3.3. Switching On.....	16
3.4. Login Procedure.....	16
3.4.1. Call up the Login Window.....	16
3.4.2. Login.....	16
3.5. Scanning Screen.....	17
3.6. Function Zone.....	17
3.6.1. Account Information.....	17
3.6.2. Date Time Display.....	17
3.6.3. Baggage Count.....	17
3.6.4. System Indicator.....	17
3.7. Calibration.....	18
3.8. Baggage Scanning.....	18
3.9. Maximum Baggage Size.....	18
3.10. Imaging Processing Functions on Scanning Screen.....	18

3.11. Keyboard Equivalents(Configuration Table).....	19
3.12. Control Panel(Standard Keyboard) Operation.....	20
3.13. Image Processing Functions Key.....	20
3.14. Programmable Function Key.....	21
3.15. Conveyor Control.....	21
3.15.1. Conveyor Forward.....	21
3.15.2. Conveyor Stop.....	22
3.15.3. Conveyor Reverse.....	22
3.16. Basic Material Discrimination.....	22
3.16.1. Organic Only.....	23
3.16.2. Mixture Only.....	23
3.16.3. Inorganic Only.....	24
3.16.4. Inverse.....	24
3.16.5. Gray(Black&White).....	25
3.16.6. High Penetration with Gray.....	25
3.16.7. Low Penetration.....	26
3.16.8. Variable Gray Scan.....	26
3.16.9. Gaussian Blur.....	27
3.16.10. Sharpen(Edge Enhancement).....	27
3.16.11. Exponential Transform.....	28
3.16.12. Logarithm Transform.....	28
3.16.13. Pseudo Color.....	29
3.16.14. Super Enhancement.....	30
3.16.15. Partial Enhancement.....	30
3.17. Density Threshold Alert(DTA).....	31
3.18. Zeff-scan(Assist Scanning).....	31
3.19. Reset Image.....	32
3.20. Combined Function.....	33
3.21. Other Functions.....	33
3.21.1. On-screen Keyboard.....	33
3.21.2. AI-Roller*.....	33
3.21.3. Previous Picture.....	33
3.21.4. Next Picture.....	33
3.21.5. Calibrate.....	34
3.21.6. Quit.....	34
3.21.7. Zoom Function and Image Translation.....	34
4. Technical Menu-Administrator Menu.....	15
4.1. Database Interface.....	35
4.1.1. Query X-ray Images.....	36
4.1.2. Delete X-ray Images.....	36
4.1.3. Print X-ray Images.....	36
4.1.4. Backup X-ray Images.....	36
4.1.5. Open X-ray Images.....	36
4.1.6. Modify X-ray Images.....	36

4.2. Curve.....	37
4.3. Image Configuration.....	37
4.3.1. Default Display.....	37
4.3.2. Calibration.....	38
4.3.3. Scanning.....	39
4.3.4. Assistant Function.....	39
• Density Threshold Alert(DTA) setting.....	39
• Zeff Scan setting.....	40
• AL Roller* setting.....	40
• Continuous Scan setting.....	40
4.3.5. Custom Button.....	40
4.4. System.....	42
4.4.1. DA Board.....	42
4.4.2. Control Board.....	42
4.4.3. System.....	43
• Language.....	43
• Storage Path.....	43
• Storage Type.....	44
4.5. User.....	44
4.5.1. Primary-Administrator Account (PAA).....	44
4.5.2. Secondary-Administrator Account (SAA).....	45
4.5.3. Operator Account(OA).....	46
4.5.4. Add User.....	46
4.5.5. Privilege.....	47
4.5.6. Access Rights.....	47
• User Management.....	47
• Operation.....	47
• Historical Record.....	47
• Modify Image.....	47
• Delete Image.....	47
• Backup Image.....	47
• Configuration.....	47
• Diagnostics.....	47
• TIP*.....	48
4.5.7. Delete User.....	48
4.6. Logout.....	48
5. Power Off.....	49
6. Transportation and Storage.....	50
6.1. Attention of Transportation.....	50
6.2. Storage Precautions.....	50
7. Maintenance and Common Faults.....	50
7.1. Safety Attention of Maintenance.....	50
7.2. Side Panel Dismantling.....	51
7.3. Weekly Maintenance.....	51

7.3.1. Visual Checking.....	51
7.3.2. Conveyor Belt and LCD Monitor Casing.....	51
7.3.3. LCD Monitor Screen.....	51
7.4. Three Month Maintenance.....	51
7.4.1. Scanner Housing.....	51
7.4.2. Lead Curtains.....	51
7.4.3. Conveyor Visual Checking.....	52
7.4.4. Indicator and Buttons Checks.....	52
7.4.5. Photosensors-Infrared Sensors Checks.....	52
7.4.6. Radiator-Fan Checks.....	52
7.4.7. Conveyor Motion Checks.....	52
7.4.8. Radiation Leakage.....	52
8. Common Faults and Trouble-shooting.....	53
8.1. Turn the key switch to the open state “On”, press the green start button, the device cannot be turned on.....	53
8.2. The power indicator is on, but the display is off.....	54
8.3. After power on, the software close then shut down automatically.....	54
8.4. Baggage image is blanked and no image display.....	54
8.5. There is an image but the color is abnormal.....	55
8.6. The conveyor belt does not rotate.....	55
8.7. No image, snowflake dots, all in black.....	55
8.8. The image has black lines.....	55
8.9. The alarm no sound.....	56
8.10. The roller can't rotate automatically when scanning baggage.....	56
8.11. The IPC can't start automatically.....	56
8.12. The software connection indicator“Connect”does not light up.....	56
8.13. The scanner cannot be shut down.....	56
9. After-sales Services.....	57
9.1. Manufacturer Guarantee.....	57
9.2. Device Acceptance Inspection.....	57
9.3. Technical Training.....	57
9.4. After-sales Services Items.....	57
9.5. Device Disposal.....	58
10. X-Ray Certificate Examples	59

Preface

This manual covers the operation and general maintenance to help the operator to correctly operate the X-ray system, we recommend to read carefully before installing and using. Please keep this user manual at working place for ready reference by operator.

We have always been committed to constant technological innovation and continuous improvement. This user manual is subject to change without notice.

This user manual apply to the staffs as below:

- Authorized Operator for X-ray Inspection System
- Authorized Administrator for X-ray Inspection System
- Authorized Maintainer for X-ray Inspection System





This user manual included system that are equipped with an x-ray generator 80kV(single energy) and 140kV(dual energy), 160kV(dual energy)* for generating an x-ray image with one(single) view of baggage, .

- F5030A
- F5030C
- F6550A
- F6550C
- F8065C
- F10080C
- F100100C
- Non-standard customized X-ray Inspection System

Statement of Rights and Responsibilities













- This manual contains confidential and proprietary information that is protected by international copyright and patents. All right and reserved. No part of this manual may be copied, photocopied, reproduced, translated, or transcribed in any manner without written permission from us.
- We disclaim any responsibility for any damage arising in consequence of negligence or improper operation and third-party claimant.

Symbols and text representations used

*	Equipment, accessories or functions marked * are options which are not part of the standard equipment. Your sales partner will inform you about which of the mentioned options are available to the x-ray inspection system. To get to know the functions that the model already equipped with, please have a look at the Configuration table[P-19] .
P-12	Page reference lead to additional information and instructions.
 	Warning! These instructions give further important information and facilitate the use of the x-ray inspection system, which may cause a possibly dangerous situation. Non-compliance leads to the most severe injuries.
	Attention! These instructions give further important information and facilitate the use of the x-ray inspection system, which may cause a possibly detrimental situation for the system. Non-compliance can lead to damages and data loss and malfunctions!
	Refer to further documentation.

1. Safety Notification

1.1. Warning Labels installed on the X-ray Inspection System

No.	Labels	Meaning	Location
1		Ionizing radiation!	Sideward of both Entry and Exit
2		X-radiation warning sign(Canada)	Sideward of both Entry and Exit
3		Film safety	Sideward of both Entry and Exit
4		Baggage correct place	Sideward of both Entry and Exit
5		Baggage wrong place	Sideward of both Entry and Exit
6		Dangerous voltage	X-ray Generation Side
7		Danger of crushing	Around Conveyor Belt of both Entry and Exit
8		Forklift position	Bottom of side panel
9		Power light indicator	Around Power Light
10		X Ray indicator	Around X ray Indicator
11		Alarm indicator	Around Alarm Light
12		Emergency stop	Around Emergency Button

1.2. Safety Operation Instructions

For your better and safer use of the channel X-ray inspection system, we strongly recommend that you carefully read the contents of this manual before starting to use the equipment, and strictly observe the following rules during use:

- Before operating the X-ray inspection system, it is necessary to comply with the requirements of local laws and regulations. Relevant training on radiation protection;



- Before operating the X-ray inspection system, operators need to understand the relevant regulations and requirements for radiation protection:
 - GB 15208-2005 《Micro-dose X-ray safety inspection equipment》
 - GB 4208-93 《Shell protection class (IP code)》
 - GB 18871-2002 《Basic standards for ionizing radiation protection and radiation source safety》



Attention!

- It is forbidden for operators to open the sealed L-shape Box(Warranty Void if Removed) and to operate all the internal components. Only those technicians with professional qualifications are allowed to perform such operations as installation, commissioning and maintenance of the equipment.



Attention!

- Please do not switch on the X-ray scanner if it has not operated a period of 3 months! At this time, the X-ray generator must be restarted by a professional technician. The non-respect of the rule may cause X-ray generator damaged.



Attention!

- Store the X-ray scanner in closed rooms only and do not operate it outdoor! Only operate the unit if the operating conditions regarding ambient temperature(0~40℃) and humidity of the air(10%~90%, non-condensing) are kept during operation! Protect the system entirely against heavy dirt(dust, waste gas, etc.) and rain, snow, direct sunlight, etc.



Attention!

- If X-ray scanner's housing parts, cables, conveyor or lead curtains are damaged, it is required to stop operation, and checked by a trained service technician!
- It is forbidden to arbitrarily modify or change any part of the equipment!



Attention!

- Before the scanner is powered on, make sure that the power voltage supplied by the scanner on site is consistent with the power voltage required, and that the capacity of the power supply is not lower than the power used by the scanner. For the specific parameters, refer to the power parameters of each model of the X-ray inspection system.
- The main outlet must be grounded. The installation site should have a reliable grounding configuration. If the grounding conditions are not met, the use of the scanner must be prohibited.



Attention!

- When the device is working, do not cover the ventilation openings of the scanner to ensure good heat dissipation inside.



Attention!

- Please ensure that the X-ray scanner is regularly serviced and checked for electrical safety after cut off the power supply by a qualified service technician!



Attention!

- Do not spill liquid or other non-solid items/dirty on the feed and discharge conveyors. If so, please switch the scanner off immediately and disconnect the main power supply by closing the key switch or unplugging the mains plug to avoid further damage to the scanner or soiling of the objects to be scanned. If with UPS installed, switch it off as well!



Attention!

- Do not change the technical settings in the software Config
- Do not change and delete any documentations in the computer disk D:
all the . The default parameters have been set well, only can be changed if indeed with permission of the technician.



Attention!

- Switch the scanner off by means of the key switch before cleaning and maintenance work! Please log out the system then close the key switch to switch off the scanner.
- Please use soft, slightly damp cloth to clean. Do not use chemical cleaning agents because they might damage the scanner's surface and labels.



Warning!

- The object to be scanned with loose belt or loose packaging and objects that cannot be placed firmly on the conveyors as well as all kinds of clothes must be placed into appropriate plastic containers. Please note that the material and structure of the plastic containers may effect the X-ray scanner's material detection characteristics.



Warning!

- The short or flat items need to be put into plastic containers to be ensure they can be detected and scanned. Alternatively, the scanner can be operated in "Continuous Scanning Mode". Please keep in mind that the X-ray is keeping on emitting after the "Continuous Scanning Mode" is activated!



Warning!

- When the X-ray scanner is activated, it is forbidden to stand or sit on the conveyor belt of the scanner or touch moving parts, and stack heavy objects on the conveyor belt of the scanner for a long time.



Warning!

- X-ray inspection system can only be used to inspect items and is strictly prohibited for human and living animal detection.
- Do not insert any part of the body(e.g your hand) into the inspection tunnel, when the system is energized X-ray Hazard!



Warning!

- Please do not operate or switch off the scanner if the lead curtain is defective, which will exposure radiation. And have to be fixed and checked by the qualified service technician.



Warning!

- Inside the X-ray scanner there are no parts to be operated or serviced by the user! Screwed covers and parts of the housing may only be removed by a qualified service technician!



Warning!

- When working near running conveyor belts rotating rollers, do not wear loose scarves or identity card or key lanyards put around your neck or ties. Do not wear your hair hanging loose! If you are charged with loading and unloading roller or modular plastic belt conveyor, wear clothes that fit tightly!



Attention!

- Please keep in mind that this X-ray baggage inspection system generally does not automatically detect dangerous items. The objects that cannot be identified as suspect, please recheck.
- If need, please contact your sale partner for more details about the AI Detection System*.



Attention!

- Objects represented in black, which cannot be brightened up with different image processing tools, always need a manual recheck. The dangerous objects might be hidden behind.



Attention!

- If the conveyor has been stopped during scanning, and the baggage had not yet been finished, user can press the “Forward” or “Reverse” to continue the scanning in same direction, but the current X-ray image will be cut and the later part X-ray image will be missed. Please rescan this baggage.

1.3. X-ray Safety Standards and Approval for Use

The X-ray inspection system produced by us has taken reliable protective measures against X-ray radiation and has effectively ensured the safety of operators. These measures are:

- The X-ray source used by the system is an active component. X-rays can be emitted only when high pressure is applied. Therefore, X-rays are not generated during transportation, storage, and unpowered conditions.
- Due to the single detection dose of the system is small, the rack and the collimator are shielded with lead plates. The inlet and outlet ports are all equipped with lead curtains, which help to block scattered X-rays from escaping the tunnel.
- In order to ensure the safety of maintenance personnel, two **interlock*** located in both panels (any one of the interlock will not emit X-rays), the X-rays will not be emitted when the conveyor stops operating and there is no object in the tunnel, so that the maintenance personnel will not be exposed to X-rays damage.(Optional)
- The equipment has a grounding mark, which can effectively avoid electric shock and equipment damage.
- Overload protection and over-current protection are installed inside the equipment to minimize accidents and dangers.



Our X-ray baggage inspection system complies but not limited to below standards:

- Title 21--Food and Drugs Chapter I--Food and Drugs Administration Department of Health and Human Services Subchapter J - Radiological Health Part 1020 -- Performance Standards for Ionizing Radiation Emitting Products Sec. 1020.40 Cabinet x-ray systems.
(c) Requirements - (1) Emission limit. (i) Radiation emitted from the cabinet x-ray system shall not exceed an exposure of 0.5 milliroentgen in one hour (5 μ Sv/hr (0.5mRem/hr) at any point five centimeters outside the external surface.
(ii) Compliance with the exposure limit in paragraph (c)(1)(i) of this section shall be determined by measurements averaged over a cross-sectional area of ten square centimeters with no linear dimension greater than 5 centimeters, with the cabinet x-ray system operated at those combinations of x-ray tube potential, current, beam orientation, and conditions of scatter radiation which produce the maximum x-ray exposure at the external surface, and with the door(s) and access panel(s) fully closed as well as fixed at any other position(s) which will allow the generation of x radiation
- Radiation Emitting Devices Regulations (C.R.C., c. 1370) SCHEDULE II (Section 3) PART IV Baggage Inspection X-ray Devices, PART XV Cabinet X-ray Equipment
(b) under all operating conditions of X-ray generation,
the average exposure rate of X-rays, averaged over a period that is not less than 5 minutes, to an object having a 10 square centimetre cross section and centered at 5 centimetres, from any accessible external surface of the device or from the imaginary plane surface that is drawn to close openings of the device, where baggage is inserted or removed, does not exceed 0.5 milliroentgen per hour (5 μ Sv/hr (0.5mRem/hr).
- The U.K. regulations state that the surface radiation should not exceed 1 μ Sv/hr (0.1mRem/hr).

The design of X-ray inspection system can protect the safety of operators and maintenance personnel under any circumstances. The system has a very low X-ray dose, and at the same time it can ensure sufficient penetration of the object being inspected. Sensitive materials, foods, medicines and tapes are not affected, and even multiple exposures are no problem. The device is equipped with a large lead shield to prevent X-ray leakage. A set of lead curtains reduce the irradiance to almost 0.1 μ Sy/h. When any interlock* switch is turned off, the equipment will automatically cut off the power to the conveyor and turn off the X-rays generator.

The X-ray generator system of the scanner cannot emit X-rays after the power is cut off.

1.4. Safety Protection

1.4.1. Safety Protection and Precautions

- The scanner has obvious red X-ray emission indicators at both entrance and exit. The system power indicator is green.
- The scanner is equipped with an emergency stop(E-Stop) at both entrance and exit of the X-ray tunnel. Once an emergency occurs and one of the button pressed, the power supply to the X-ray generator and the conveyor system can be cut off immediately.
- The scanner is equipped with a rated power protection device to prevent the risk of fire due to the failure of internal components or other accidental over currents.
- The device has a key switch. The key switch clearly identifies the "on" and "off" positions.
- Safety **interlocks*** are installed in the X-ray emission area. Once the **interlocks*** is disconnected, the X-rays stop transmitting immediately.
- The scanner has a protective earth terminal and the color of the ground wire is yellow/green.
- Software with login password protection only for authorized operator.
- Prominent safety labels that warn users to not insert any part of their body when the x-ray are produced.



WARNING!

We will not accept liability for damage or personal injury caused directly or indirectly by either incorrect or poor quality termination of the local main power supply or power cables. And is not responsible for damage or injury caused by unauthorized modification, maintenance, operation or tampering with this equipment.

1.4.2. X-ray Inspection System

Model	F5030A	F5030C	F6550A	F6550C	F8065C	F10080C	F100100C
Tunnel Size(W*H mm)	507*303	507*303	655*500	655*500	805*650	1005*800	1005*1000
Conveyor Max Load(kg) Evenly Distributed Load	100	150	100	150	200	250	250
Tube Voltage(kV)	80	140	80	140	140	140	140
Tube Current(mA)	0.6	0.7	0.6	0.7	0.7	0.7	0.7
Beam Direction	Upward	Upward	Upward	Upward	Downward	Downward	Downward
X-ray Sensor (Single/Dual-energy)	Single	Dual	Single	Dual	Dual	Dual	Dual
Display	21.5"LCD Monitor, Standard Keyboard, Mouse						
Standard Accessories	0.7m standard extension table				Console and Landing Platform		
Cooling/Duty Cycle	Oil Cooling /100%						

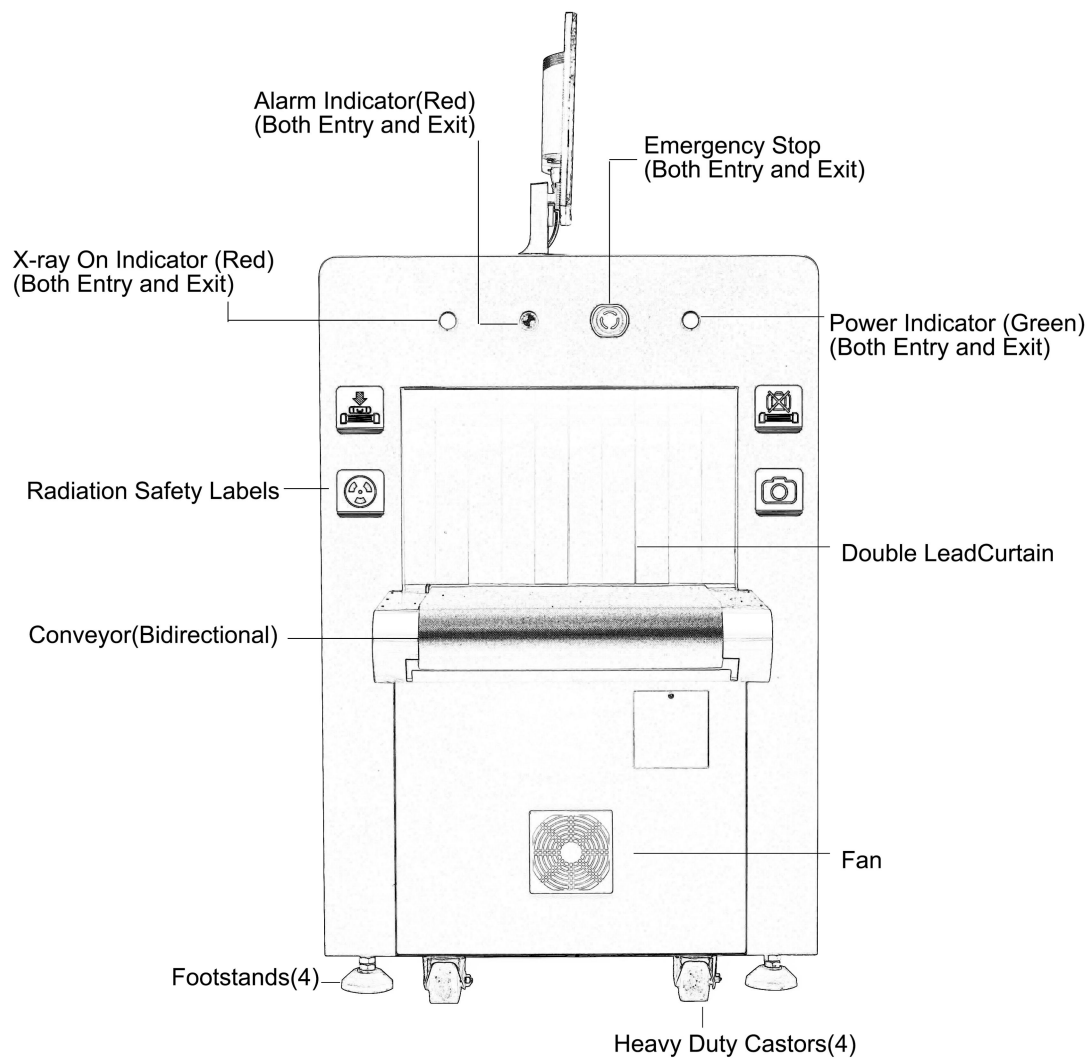


Figure 1 Compact Model (Exit)

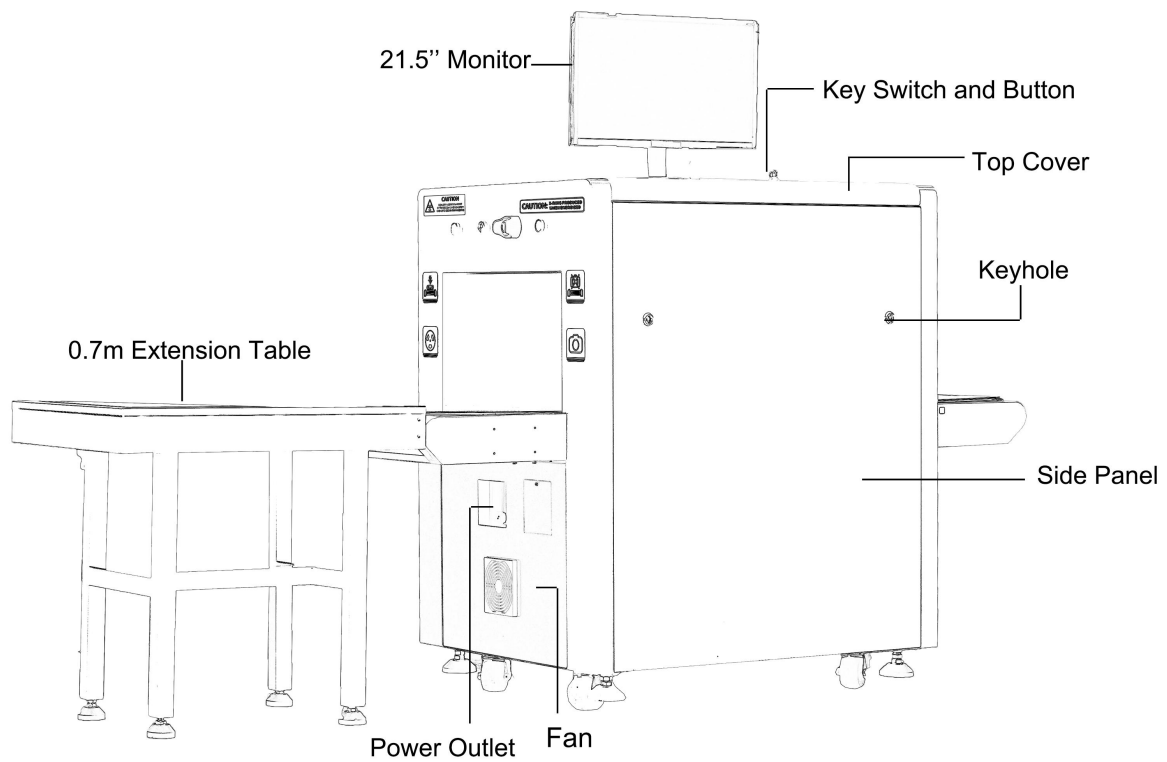


Figure 2 Compact Model(LXDA Side)

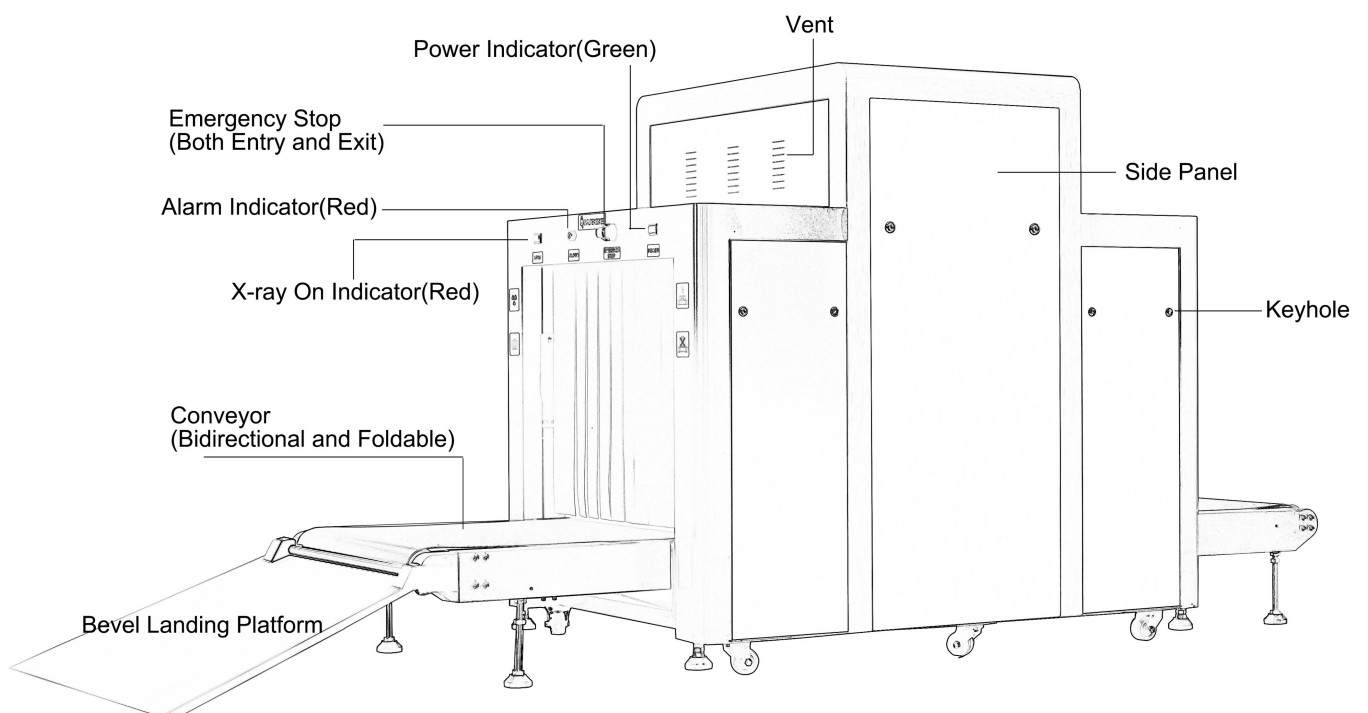


Figure 3 Large Model(Exit)

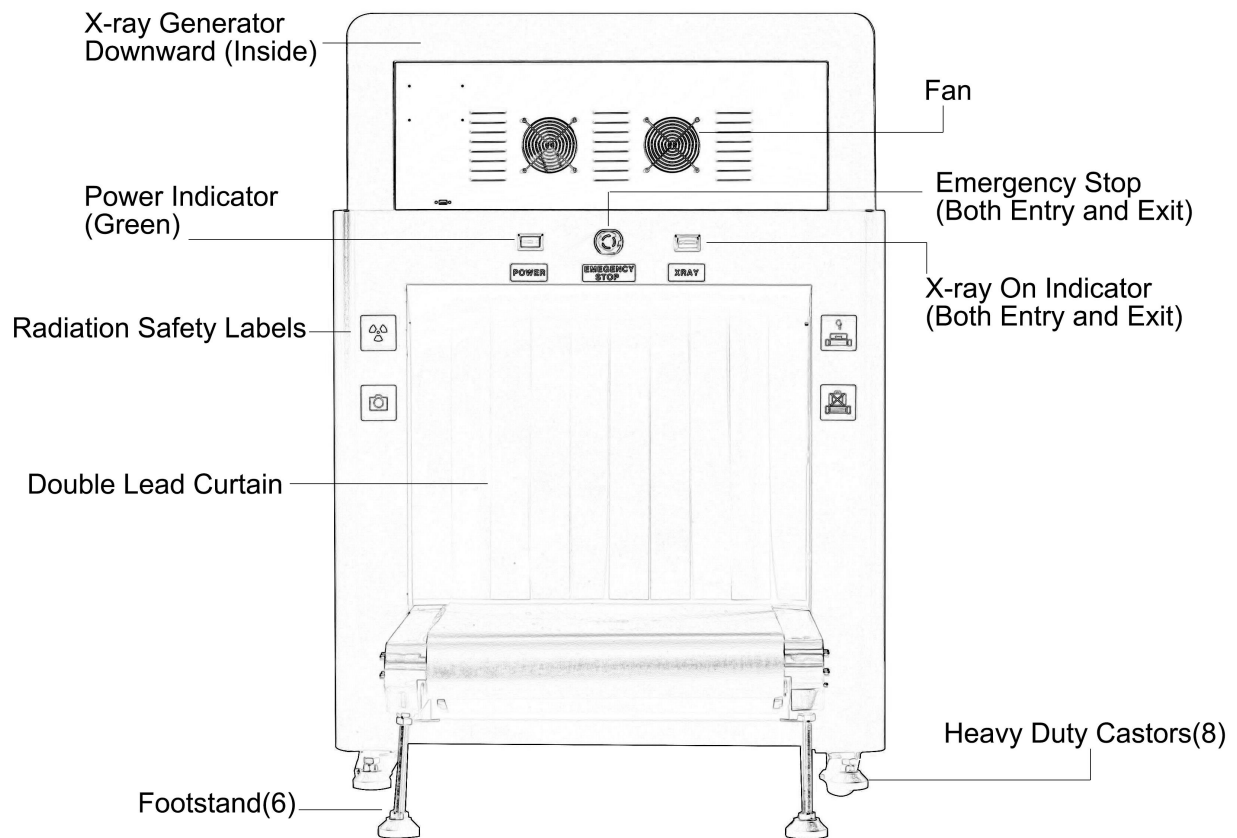


Figure 4 Large Model(Entry)

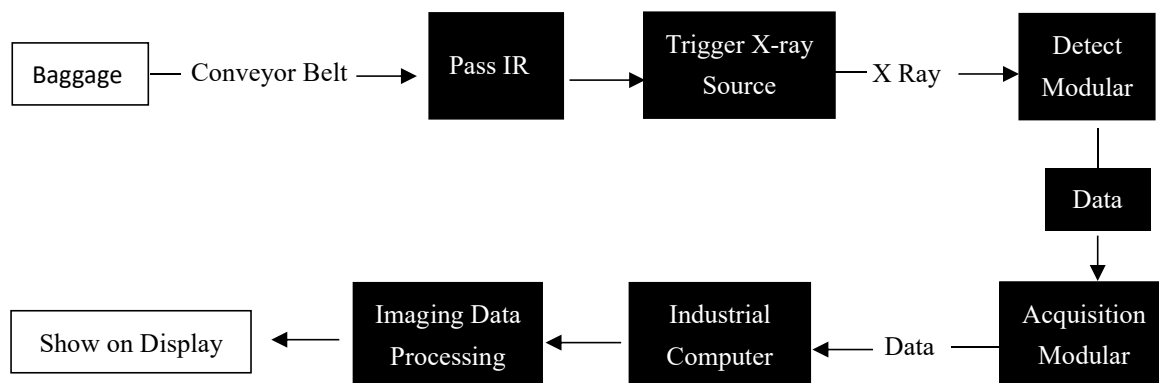
2. Device Principle and General Specification

2.1. Application

Our new developed High Definition x ray inspection system adopts the latest imaging technology, the display resolution is as high as 1920*1080P, the image is clearer, and various dangerous goods can be quickly and effectively detected. It is widely used in government agencies, embassies, airports, convention centers, expo centers, tourist attractions, sports culture Locations, express delivery, logistics, shopping malls, hotels, schools, and other safety inspection sites are suitable for testing luggage, luggage, and cargo.

2.2. Working Principle

The X-ray inspection system consists of baggage transport section, X-ray source and control section, signal acquisition processing, image processing section, and electrical control section. The X-ray inspection system is to use the conveyor belt to sent the baggage items to the inspection channel, when objects into the channel, will blocking the infrared sensor, with shielding signal obtained by the main control unit, will trigger X-ray source emission, and start item scanning & image acquisition, after the image optimization process, the image display system will show a high-quality image, the working principle is as shown below:



2.3. Operation Environment

Due to the different power supply conditions in different regions, there are high or low supply voltages and large voltage fluctuations. Therefore, it is recommended that you configure the regulated power supply for the X Ray inspection System.

For the long-term safe and stable work of the equipment, the equipment working environment requires the following:

- Ambient temperature range: 0 °C~ + 40 °C
- Humidity range: 10% to 90% (non-condensing)
- Atmospheric pressure range: 86~106kPa
- Operating voltage requirements: AC110~230V (±10%) 50Hz/60Hz±3Hz

Regulated power parameters:

- Output Power: 0.8~2KW
- Output Current: 8~12A

2.4. Accessories*

We has made available a wide range of accessories for use with X-ray scanners to assist airport security staff with baggage handling- from simple offload devices to fully integrated transfer tables and search bench systems. Choose from standard items available, or contact us for custom-designed solutions. For questions concerning options and accessories, please contact your sales partner.

- **Part#SE-XR002: 32"LCD Touch Screen Stand***
Large-size screen monitor, get a broader vision, easier and faster operation. Resolution: 1920*1080
- **Part#SE-XR004: Monitoring Console***
Operator working station to put the monitor and keyboard. Equipped With wheels for quick portability.
- **Part#SE-XR006: Intelligentized(AI) Roller***
Belt rolling only when the IR be triggered, or it remains static, which is energy-saving and helps to extend machine lifetime.
- **Part#SE-XR007: Superior Motorless Roller Tables***
The rollerbeds are all made of 304# superior stainless steel, mounted on both exit and entrance to keep the subsequent baggage before entering tunnel orderly. Adjust freely according to the height of machine.
Length: 0.5 m increment
- **Part#SE-XR008: Voltage Stabilizer***
Filter out the unstable current voltage crest value, stable output with rated current voltage, to protect device.
- **Part#SE-XR009: Uninterrupted Power Supply***
For Computer: 20 min
For Machine: 2 hours
For Data protection when electricity cut off.

2.5. System Composition

The X-ray inspection system is mainly divided into below major components

- Control system
- X-ray source and generator
- Detector system (X-ray data detection, transmission and acquisition in L-shape Detector Box)
- Main switchboard
- Leaded frame and conveyor assembly
- Leaded curtains
- Photosensors(infrared sensor) to detect the presence of baggage in the system
- Power distribution system
- Operator control panel: standard keyboard
- Computers and monitor
- The proprietary Systems software that controls the entire system and allows the operator to view images in various modes, enhancing the Operator's detection capabilities.
- A dual-energy type machine configured to display images with different colors according to the atomic number and density of the objects being scanned.

2.6. Subsystem and Function

2.6.1. X Ray Source

X Ray Source includes 3 parts:

- High-voltage generator
- X Ray Tube
- Collimator

X-ray tube consists of two voltage doublers. An X-ray tube and a high voltage generator consisting of two voltage doubler and feedback circuits are placed in an oil-filled, lead-shielded housing , The cable WS9 provides filaments and high voltage drive signals to the X-ray source. And the high-voltage and anode current sampling signals are fed back to the X-ray control and drive chassis.In order to maintain the high voltage and anode current stability during the inspection. The collimator acts to convert the X-ray beam into a fan beam.

2.6.2. X-ray Source Control and Drive

X-ray source control and drive includes:

- High-voltage control board
- Anode current control board
- Power driver board
- Interface Circuit

The main functions of X-ray control and drive are:

Dual-energy devices that drive the height and anode current of the X-ray tube through a closed-loop control circuit and maintain its stability, which makes the operating parameters of the X-ray tube do not fluctuate with changes in commercial power.

The X-ray source is prevented from being damaged by some error detection circuit, and X-rays are automatically turned off if the circuit detects any errors.

Through the reserved interface to receive from the system control panel "ray emission ~ OFF" command, and through the dedicated interface to send back the important parameters of the X-ray source in order to facilitate the system self-diagnosis.

2.6.3. L-shape Detector Box

The detector box is L-shape to solve the problem of detecting dead angle. Each probe board contains 64 channels, and each channel containing a low-energy signal and a high-energy signal.

2.6.4. Sub Control Board

The device contains a main control system to control the equipment operating status.

The main control system is responsible for the operation of the entire equipment. It includes a signal communication system, and signal input and output.

The main control system receives the motor control commands from the buttons, controls the motor operation and steering, monitors the light barrier status, baggage input and output the inspection tunnel, controls the launching and closing of X-rays, and monitors whether the X-ray control module is working properly. If an abnormality is found, it will send out different signals.

2.6.5. Control/Data Processing (IPC)

IPC mainly includes four main functions:

- Image processing function
The device provides basic image processing functions such as edge enhancement, super image enhancement, grayscale conversion, pseudo color, and zooming;
- Data storage and retrieval
The device provides functions for storing images, retrieving images, and recording the work of operators;
- The communication with control system
Can communicate directly with the control system and control the system operation.
- Communication with keyboard board
Receiving user operation instructions, processing and displaying images according to user requirements.

2.6.6. Monitor

The system uses a 21.5-inch high-resolution display that can display color and black-and-white images as needed.

2.6.7. Conveyor Belt

Conveyor Belt Includes:

- Conveyor Belt
- One electric roller at the exit end of the conveyor
- One passive roller at the entry end of the conveyor
- 4 to 6 different size carrying Idler

The electric roller contains a single-phase motor. The driving torque of the motor is transmitted to the surface of the roller through a gear reduction mechanism to form the force of the driving belt. Passive roller for belt tension adjustment.

2.6.8. Photosensors (Infrared Sensor)

A pair of photosensors (through-beam photo electric sensors) are installed at both side of entrance and exit in the back of lead curtain inside inspection tunnel. Used to detect baggage in and out the inspection tunnel when the conveyor is moving forward or reverse. If the photosensors being blocked, the photosensors receiving-end outputs a signal to the control board, and the controller board will send signal to the X ray controller to start emitting X-rays.

The photosensors's transmitter end and receiver end, all with indicators indicate their working status. In the case of +12V applied:

The transmitter indicator:

Green indicator will always on. The indicator is not on when blocked if damaged.

The receiver indicator:

The indicator is not on as always, will be with Red indicator when receiving signal from the receiver.

The indicator is not on when blocked if damaged.

2.6.9. Main Switchboard

The main switchboard is located on the side or top of the tunnel, mainly equipped with over-current protection and electrical components of the power distribution. The layout of the power board is as follows:

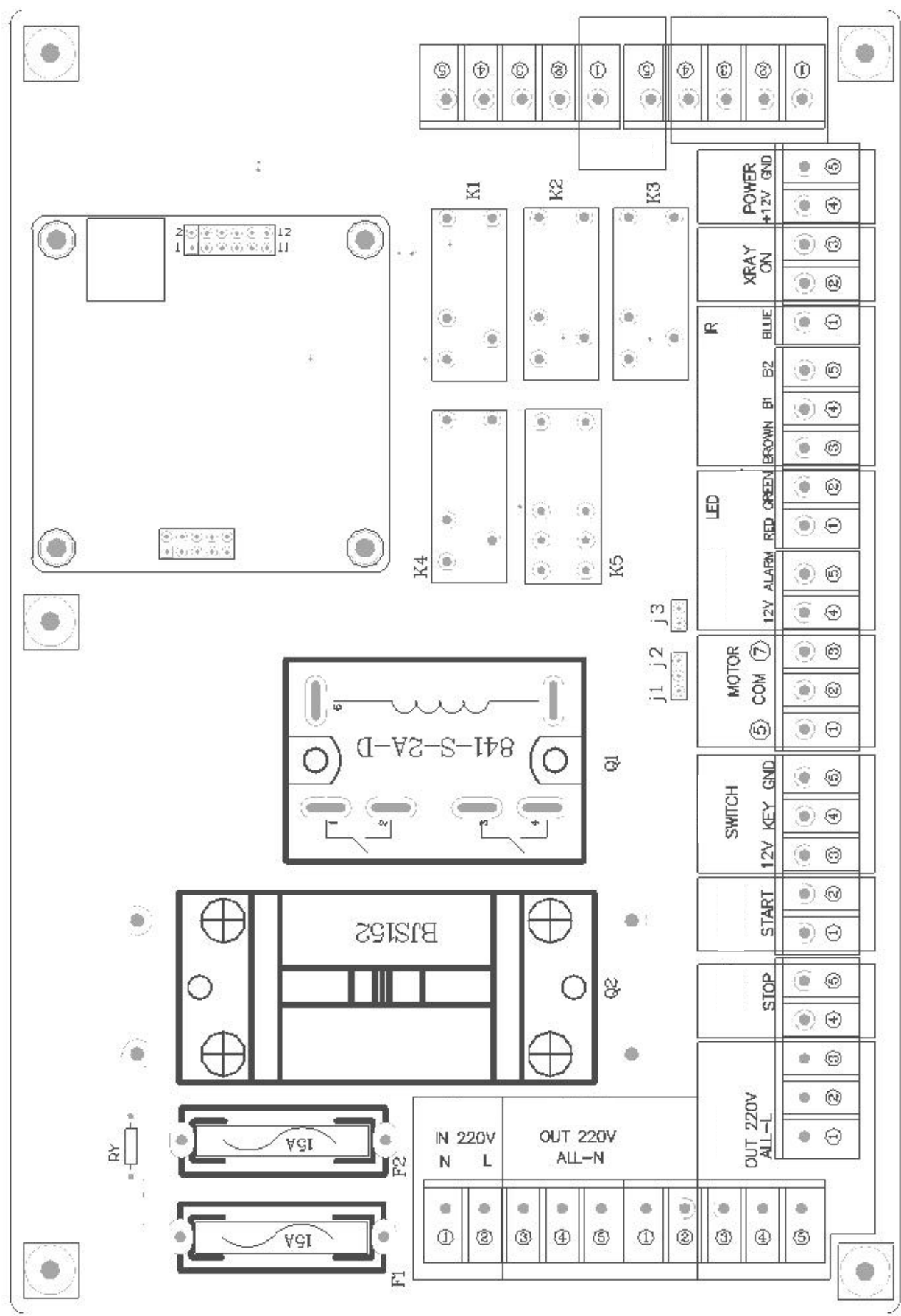
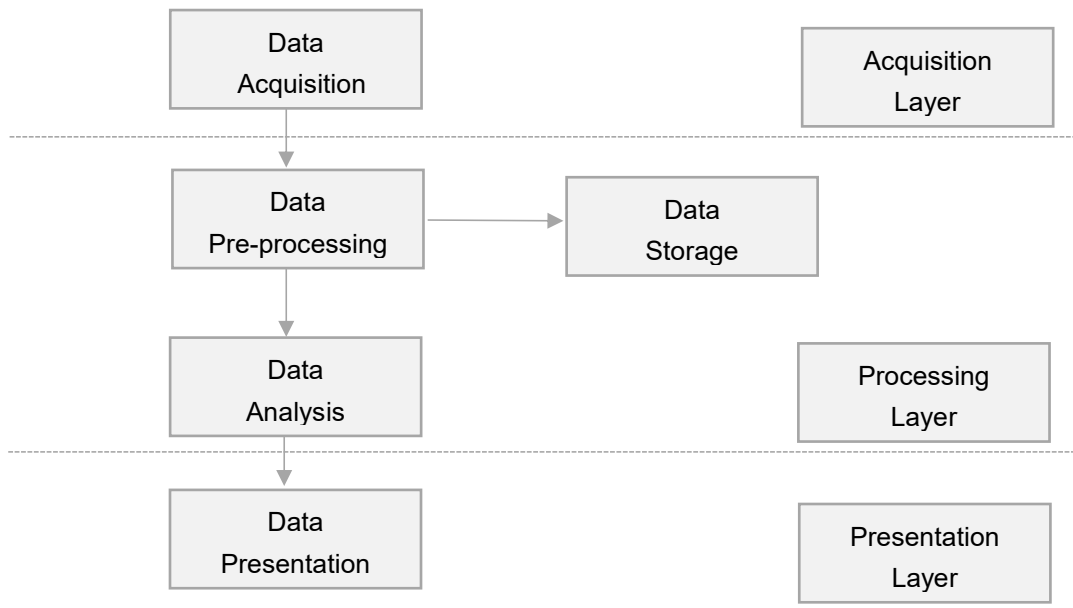


Figure 5 Main Switchboard

2.7. Software

The Dual Energy X-ray inspection scanner equipped with 140kV X-ray generator adopts the 4 color imaging technology that enables operator to achieve optimal material identification by allowing them to view screened objects in 4 colors, each color correlating to a specific range of Atomic Z-numbers.



The X-ray Inspection System software is written in C++, which runs on Windows, support XP/Win7/10. With the features of organized and easily extensible that is achieved by modularized design and humanized UI design, easy to operate.

Three Layer of Software Architectures.

- **Data Acquisition Layer:** the deepest layer of software, is in charge of real-time fetching data flow from data acquisition card(DAQ).
- **Data Acquisition Layer mainly includes the following modules:** Data Pre-processing Module: Pre-processing of the collected data, including data normalization, dead pixel processing, etc., the pre-processing data will be used for imaging presentation and storage.
- **Data Storage Module:** Store the imaging data.
- **Data Analysis Module:** Analyzes high and low energy data, calculates material properties, and performs color matching. Collect material density information and material types, perform dangerous goods analysis and other operations.
- **Data Presentation Layer:** Display the result of the processing layer. Supports display modes such as high x-ray, low x-ray, organic and inorganic stripping, reverse , color, black and white, and other display operations.

3. Scanner Operating

3.1. System Check

Please check the following before switch on:

- Check all the service cable connection is well and connected.
- The power supply grounding of the scanner is equipped.
- All emergency stop buttons on scanner/Monitor Console* are released.
- Whether the lateral cover panels, monitor, keyboard, and cables of the device are damaged or not.
- Whether the lead curtains are missing or not, if any, please replace it in time.
- Check the conveyor belt is

- If there are any items in the inspection tunnel, clear it out of tunnel if so.
- All covers of the scanner are covered and no parts are exposed.

3.2. Power Connection

Every X-ray inspection system has a name plate or rating plate which is located near the power inlet. Ensure that voltage and frequency marked on the plate is appropriate for your power supply before connecting.

3.3. Switching On

Rotate the key-switch [P-6-Figure1] and press the green button on the top cover of X-ray scanner. Then the Green power indicator in both sides of tunnels will be on, and the X-ray scanner will begin to power up.

3.4. Login Procedure

3.4.1. Call up the Login Window

Double click the software icon on the computer desktop, then it will pop-up.

3.4.2. Login

Factory predetermined administrator account(PAA) with all access rights, please assign a secondary administrator account(SAA) as soon as possible and modify the password of this PAA via the SAA to avoid any unauthorized access.

- Username: admin
- Password: admin
- Password can consist of 1~18 alphanumeric characters. Please always keep all the user data secret.
- Using the keyboard to enter the predetermined user name mentioned above.
- To ensure security, when typing in your password, asterisk characters(*)are printed on the screen, then click on "Login" or hit "Enter"on the keyboard.

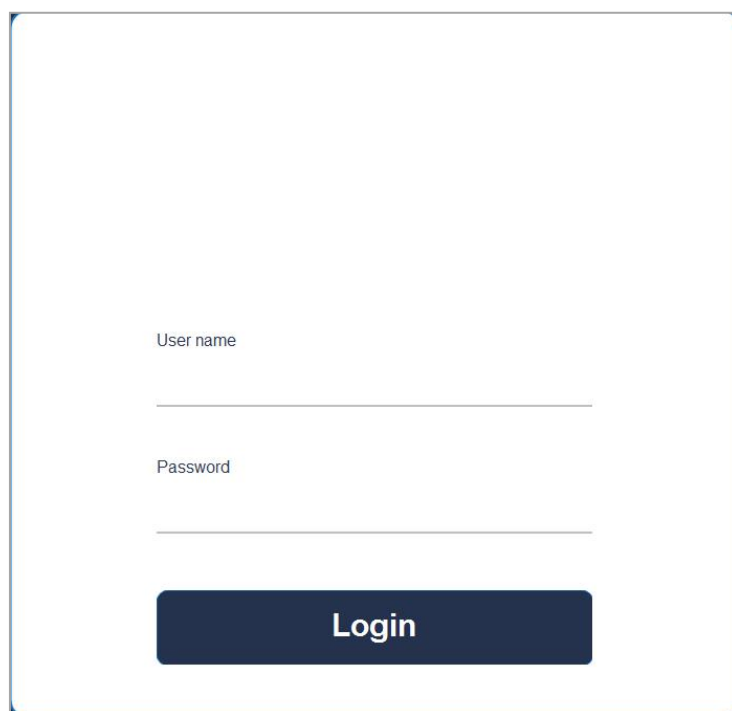
The image shows a login window with a white background and a blue border. It contains two input fields: "User name" and "Password", each with a horizontal line for text entry. Below these fields is a dark blue button with the word "Login" in white text.

Figure 6 Login

3.5. Scanning Screen

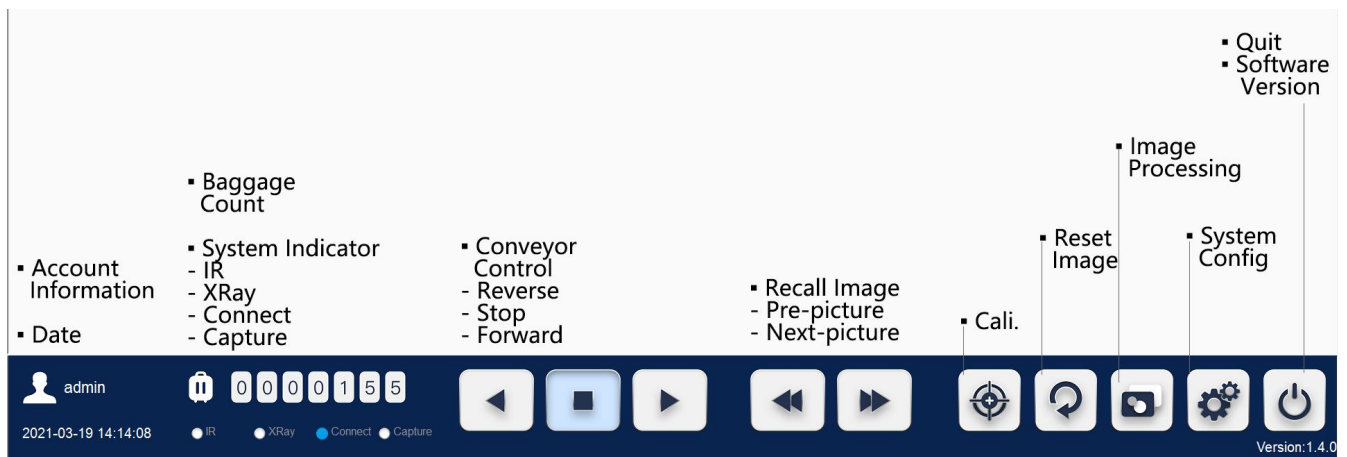


Figure 7 Scanning Screen

3.6. Function Zone

The administrator and operator account share the same scanning screen. Please note that the operator can be authorized with different access rights, the unauthorized function zone will be inactivated accordingly.

- **Account Information**
- **Date/Time Display (yy/mm/dd/hh/mm/ss)**
- **Baggage Count**
- **System Indicator: "IR", "XRay", "Connect", "Capture"**
- **Conveyor Direction Control: Reverse, Stop, Forward**
- **Recall Image: Pre-picture, Next Picture**
- **Calibration**
- **Rest Image**
- **Imaging Processing**
- **System Config**
- **Quit**
- **Software Version**

3.6.1. Account Information

Display the current operator/administrator's name.

3.6.2. Date Time Display

Display the current date and time, automatically fetches and matches computer time zones.

3.6.3. Baggage Count

Display Baggage counting for all the scanned objects.

3.6.4. System Indicator

- **IR(Infrared Sensor):** It will become lit when infrared sensors(2 groups inside tunnel) triggered by the bag on the rolling conveyor.
- **XRay:** It will become lit(X-ray generated) when press the "Calibration" button and during baggage scanning.
- **Connect:** It will become lit when system ready-IPC(Industrial Personal Computer) and control board are ready.
- **Capture:** It will become lit when Infrared Sensors triggered, then the detectors start to collect the imaging data.

After a successful login, the Scanning Screen appears, and the indicator **“Connect”** becomes Blue●, which means the system is ready.

For every baggage scanning, all the **“IR”, “XRay”, “Connect”, “Capture”** will become Blue●.

3.7. Calibration

Before any operation, you need to click on the **“Calibration”** [P-17 Figure 7] firstly to calibrate the background color. Or you can press the “Calibrate” button on the standard keyboard [P-20 Figure 10]

Please ensure that there is no baggage inside the tunnel before calibrating.

- Click the Calibration Icon in scanning screen
- The conveyor is moving
- The X-ray Indicators light on 4 corner of top cover become red
- The 4 system indicators become Blue [P-17 Figure 7]
- The calibration progress will be shown on scanning screen



WARNING!

The belt is running and x-ray will be generated when calibration activated.

3.8. Baggage Scanning

The baggage to be scanned should be placed lengthwise on the conveyor belt with all straps and projections underneath to get the best image. Please be aware of that the baggage should always be placed in front of the lead curtain!

Please place baggage to be inspected in the middle of the input roller table* or the extension table.

3.9. Maximum Baggage Size

Please ensure the objects can fit the space of the tunnel size. As lead curtain with angle of bend around 30° when objects coming through, which will take up around around 4cm of tunnel height, to insure the bag can move with conveyor belt smoothly, so also need to take up around 2cm/side from width.

3.10. Imaging Processing Functions on Scanning Screen

The image processing group of icons allows the user to change the color, edge and other attributes of an image in order to be able to better identify potential threats within the image.

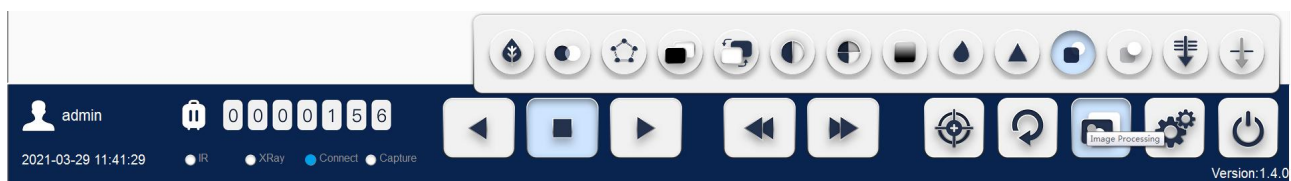


Figure 8 Image Processing(Multi-energy)



Figure 9 Image Processing(Single-energy)

3.11. Keyboard Equivalents(Configuration Table)

Most functions keys on standard keyboard are **Hotkey** with two or three image processing functions.

“●” means the “with this function”. “○” means the “without this function”. “/” means the “do not embody”.

Function	Keyboard	Scanning Screen	Dual Energy Scanner	Single Energy Scanner
Organic Only	E		●	○
Mixture Only			●	○
Inorganic Only			●	○
Inverse	I		●	●
Color/Gray	F		●	●
Low Penetration	G		●	●
High Penetration			●	●
Gray Scan			●	●
Gaussian Blur	H		●	●
Sharpen			●	●
Exponential Transform	J	/	●	●
Logarithm Transform		/	●	●
6 kinds of Pseudo Color	K	/	●	●
Super Enhancement	M		●	●
Partial Enhancement			●	●
High Energy	/		●	○
Low Energy	/		●	○
Forward	A		●	●
Stop	S		●	●
Reverse	D		●	●
Config	L		●	●

Calibrate	C			•	•
Quit	V			•	•
Next-picture	B			•	•
Previous-picture	N			•	•
Reset Image	Enter			•	•
Alarm(DTA)	O	/		•	•
AI-Roller*	P	/		•	•
On-screen Keyboard	Q	/		○	○
P1 Function Key-inactive	R-inactive	/ -inactive		○	○
P2 Function Key	T	/		•	•
P3 Function Key	Y	/		•	•
P4 Function Key	U	/		•	•
Zeff -Scan	/	/		•	○
Image Move Up	↑	Long press the Right Mouse Click to move		•	•
Image Move Down	↓			•	•
Image Move Left	←			•	•
Image Move Right	→			•	•

3.12. Control Panel(Standard Keyboard) Operation

The standard keyboard integrated with function key of the image processing tools for quick operation.



Figure 10 Standard Keyboard

3.13. Image Processing Functions Key

All the image processing functions can be applied to images when conveyor have been stopped, and the image are stopped on the scanning screen. They are also working for the recall images.

- E-OM: Organic Only
- E-IM/OM: Mixture Only
- E-IM: Inorganic Only
- I: Inverse
- F: Color
- F: Gray
- G-L-X: Low Penetration
- GL-H-X: High Penetration
- H: Gaussian Blur
- H: Sharpen
- J-Exp: Exponential Transform
- J-Lop: Logarithm Transform
- K: 6 kinds of Pseudo Color
- M-Sup.+ : Super Enhancement
- M-Par.+ : Partial Enhancement

When the baggage are still moving through the inspection tunnel, the images scrolling across the scanning screen, below image processing functions on the standard keyboard are workable only.

- I: Inverse
- F: Color
- F: Gray
- G: Low Penetration
- G: High Penetration
- J: Exp
- J: Log
- K: 6 kinds of Pseudo Color

3.14. Programmable Function Key

The keyboard includes 3 function keys:

- **T: P2**
- **Y: P3**
- **U: P4**

They are the programmable function buttons that can be configured by the operator who had been authorized. So as to reflect the functions most often used by the operators.

If the other operator wants different functions assigned to those buttons, the authorized operator can modify themselves. If not, please contact the administrator to reprogram.

Please be aware of that each button can perform multiple functions. For example, the P1 can be programmed to perform Organic and super Enhancement simultaneously.

3.15. Conveyor Control

The X-ray inspection scanner supports bidirectional scanning and imaging.

3.15.1. Conveyor Forward



Scanning Screen Icon

Keyboard Button: A

When the **Forward** button is pressed, the conveyor will start working, and the object put on belt will proceed to the inspection tunnel for scanning.

The imaging direction in the software scanner screen is also in forward direction

3.15.2. Conveyor Stop



Scanning Screen Icon

Keyboard Button: S

When the **Stop** button is pressed, the conveyor will halt.

Notice!!!: If the stop button is pressed during scanning, the later part of the object will be missed from the image. Please reverse the conveyor and re-scan this object.

3.15.3. Conveyor Reverse



Scanning Screen Icon

Keyboard Button: C

When the **Reverse** button is pressed, the conveyor will move in the reverse direction, and the object put on belt will proceed to the inspection tunnel for scanning in reverse direction.


The imaging direction in the software scanner screen is also in reverse direction

3.16. Basic Material Discrimination(140kV, Dual Energy)

Contrary to the gray image, 6 pseudo colors image, the scanned objects with different material composition will be colored with 3 different basic colors and shades according to their effective atomic number of chemical elements contained.

If different materials are overlapping in a baggage, the system will take the mean value of the involved atomic and molecules. In this case, the color indicates the kind of material, the brightness of the color indicates the material thickness.

Notice!!!: The Single Energy X-ray inspection System with 80kV is NOT work with this material discrimination.

Color-Figure 11	Atomic Number	Example	Possible Threats
	<10	Polyethylene, Light hydrocarbons, timber, oil, alcohol, water, paper, teflon, food, wood etc.	Natural gas, gasoline, explosives, pure drugs, diamonds, etc.
	10~18	Glass, Aluminum, silicon, cooking salt etc.	Gunpowder, detonators, etc.
	18~30+	Iron, steel, copper, brass, nickel, titanium, tin, silver, bronze etc.	Weapons, ammunition knives etc.
	-	Lead, bismuth.	Hidden threats.

In case of different materials are overlying, the X-ray image will be colored according to the material that absorbed most of the radiation. e.g. light organic material and heavy materials were overlapped, the X-ray image to be colored orange, green or blue depending on the thickness of every single material.

Impenetrable Material cannot be defined and colored Black. Some items like thick metals absorb a lot of the X-rays and appear black on the image. Such as lead, steel/metal with big thickness that the x-ray cannot penetrate. Or some material will be colored white(Almost Transparent in the X-ray image) due to the very low X-ray absorption.

Notice!!!: Please keep in mind that the X-ray scanner with multi-energy can support the Organic/Mixture/Inorganic, High/Low Energy, Zeff-scan functions only.

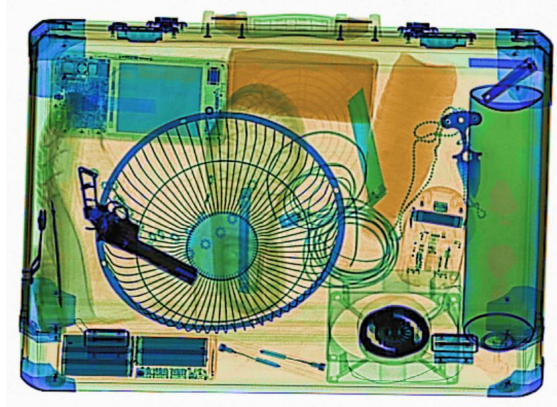


Figure 12 Standard X-ray Image(140kV/Dual Energy)

3.16.1. Organic Only



Scanning Screen Icon

Keyboard Button: E

Emphasize organic materials colored Orange only in X-ray images, and the objects will be displayed in gray.

“Organic” items are of special interest because the most powerful and dangerous(military) explosives and “organic” compounds. Organic items are also very common, such as foods, most clothing, paper and currencies etc.

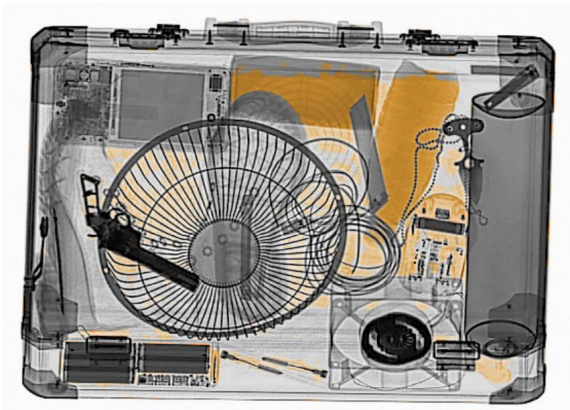


Figure 13 Organic Only

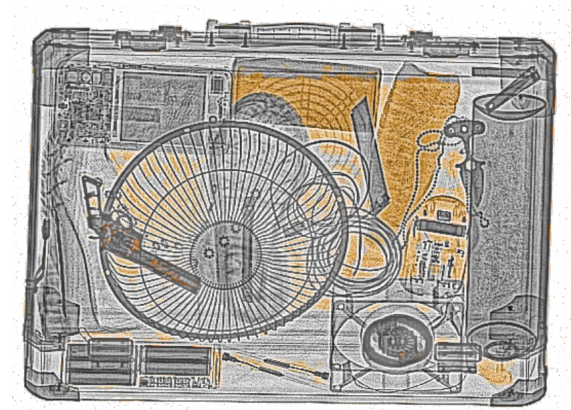


Figure 14 Organic Only+Super Enhancement

3.16.2. Mixture Only



Scanning Screen Icon

Keyboard Button: E

Emphasize mixture materials colored Green only in X-ray images, mixture of organic and metallic(inorganic) overlapped, as well as, aluminium and glass are displayed in green.

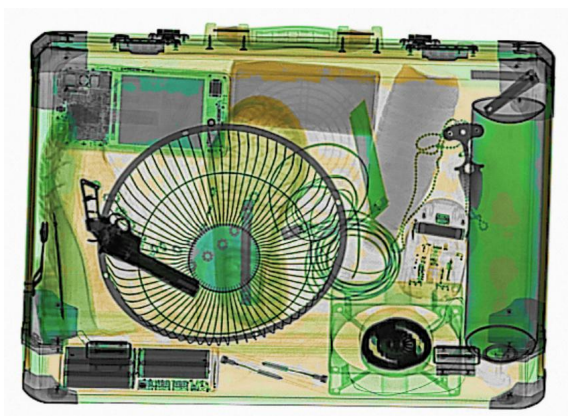


Figure 15 Mixture Only

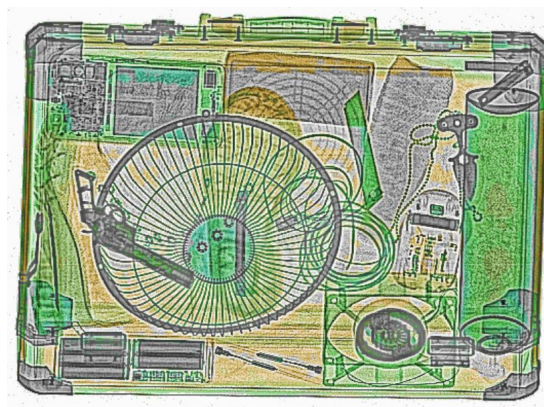


Figure 16 Mixture Only+Super Enhancement

3.16.3. Inorganic Only



Scanning Screen Icon

Keyboard Button: E

Emphasize inorganic materials colored Blue only in X-ray images. "Inorganic" material are of special interest because most weapons including guns, knives, shanks, and "brass"knuckles are usually constructed of inorganic metal such as steel, brass, and aluminium. However, it is to note that deadly weapons can also be constructed from dense "organic" plastics.

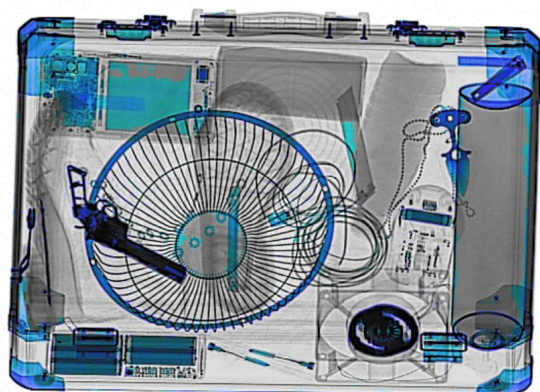


Figure 17 Inorganic Only

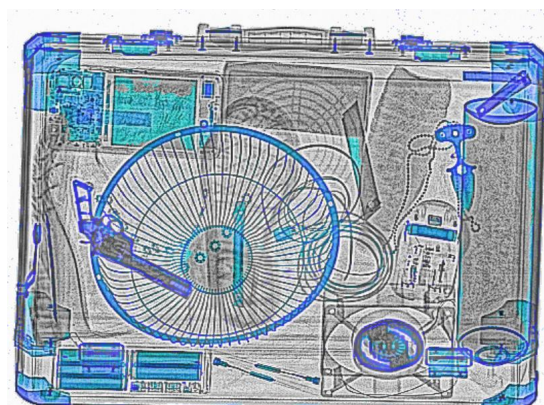


Figure 18 Inorganic Only+Super Enhancement

3.16.4. Inverse



Scanning Screen Icon

Keyboard Button: I

Invert white background in black and dense objects in white to enhance the potential threats.

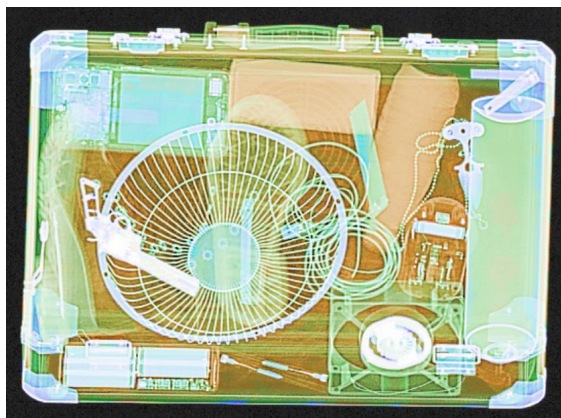


Figure 19 Inverse

3.16.5. Gray(Black&White)



Scanning Screen Icon

Keyboard Button: F

Cause a scanned image to display in gray tones on screen, the darkness of the grays depends on the density of the scanned object.

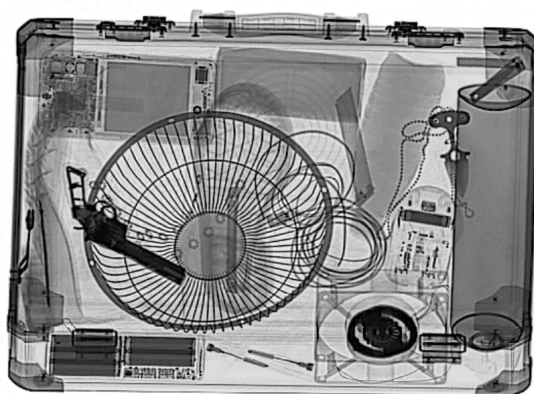


Figure 20 Gray

3.16.6. High Penetration



Scanning Screen Icon

Keyboard Button: G

Brighten the penetration of dense areas(usually inorganic) of the image. User can use to see through the items hidden behind other high absorbing objects. Continuous click the “Penetration”, the penetration effectiveness is incrementally. The dense area will be more clearly visible. The thicker layers of light organic objects also are emphasized. Please note that the low absorption objects will be filtered out gradually.

Click the **icon** on Scanning Screen, it will present **single penetration** for every click.

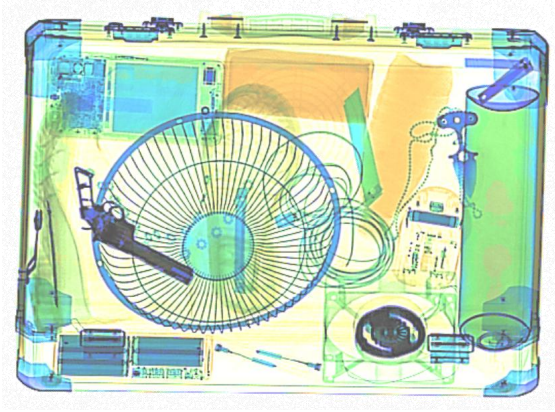


Figure 21 High Penetration

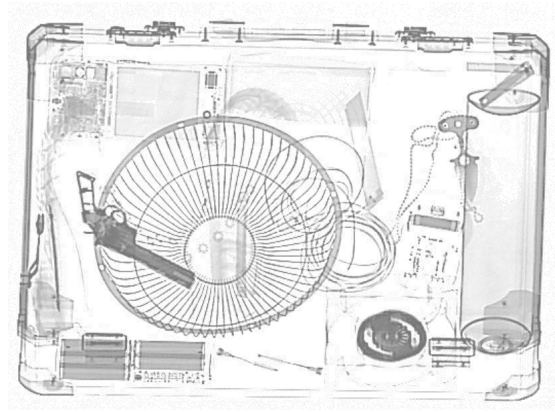


Figure 22 High Penetration+Gray

3.16.7. Low Penetration



Scanning Screen Icon

Keyboard Button: **G**

The contrast of the brighter image parts that are easy to penetrate. The low absorption areas will be more clearly visible.

Click the **icon** on Scanning Screen, it will present **single penetration** for every click.

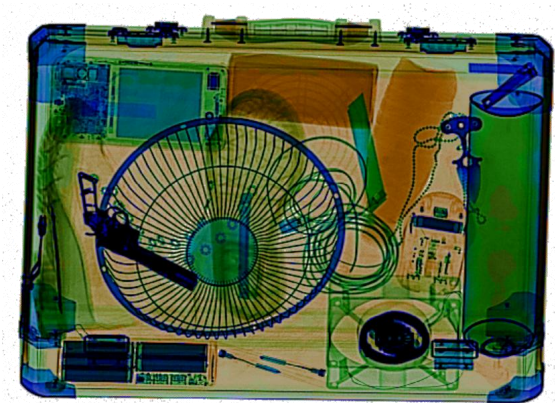


Figure 23 Low Penetration

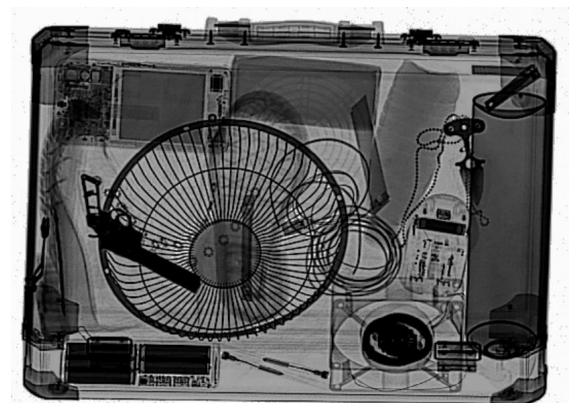


Figure 24 Low Penetration+Gray

3.16.8. Variable Gray Scan



Scanning Screen Icon

Keyboard Button: **G**

Variable contrast of the brighter image parts that are easy to penetrate and darker areas that are difficult to penetrate.

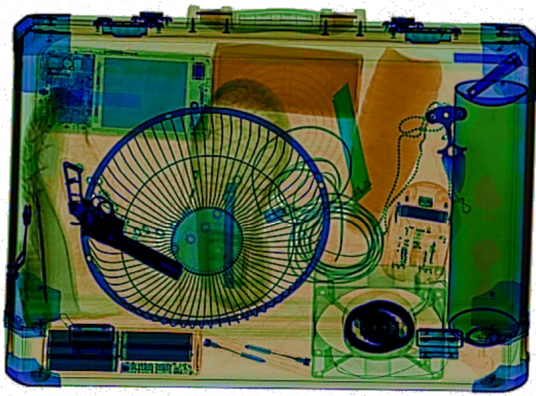


Figure 25 Low Penetration

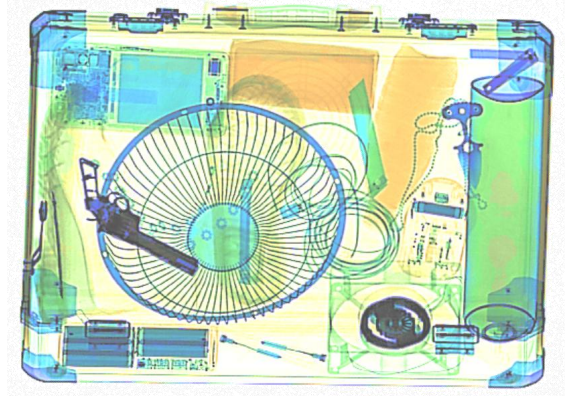


Figure 26 High Penetration

Notice!!!

For the High Penetration, Low Penetration and Gray Scan Functions.

Press the **button “G L-X/H-X”** on Standard Keyboard, it will present the **variable penetration** from High to Low, same as the Gray Scan. In this mode, the “Reset ” button does not work on it, user needs to press the **“G L-X/H-X”** one more time to stop the variable penetration, then press the “Reset”, this X-ray image will be go back to color mode of current scanning.

3.16.9. Gaussian Blur



Scanning Screen Icon

Keyboard Button: H

Smooth image brightness, and reduce the mutation gradient.

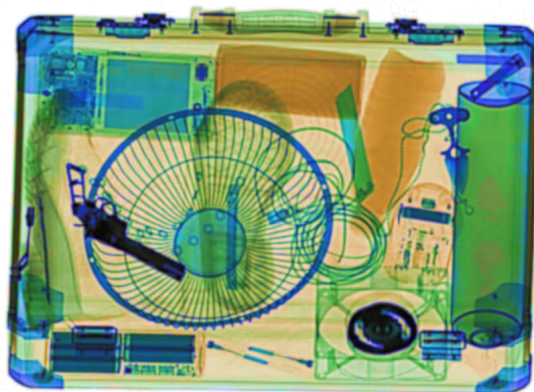


Figure 27 Blur

3.16.10. Sharpen(Edge Enhancement)



Scanning Screen Icon

Keyboard Button: H

Increase the sharpness of boundaries within the scanned objects.

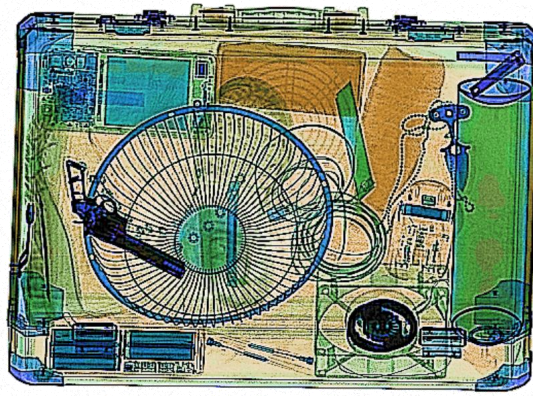


Figure 28 Sharpen(Edge Enhancement)

3.16.11. Exponential Transform

No Icon on Scanning Screen

Keyboard Button: J

Contrary to logarithmic transformation, the function of exponential transformation is to expand the high gray level of the image and compress the low gray level.

To enhance the contrast of high gray-scale pixel in the image. It makes the contour of the objects with high gray-scale pixel in the image more three-dimensional and clear.

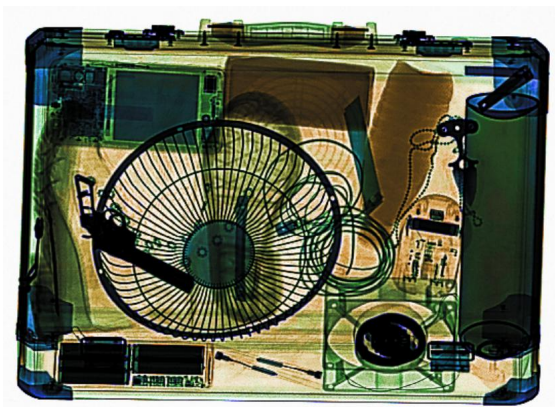


Figure 29 Exponential Transform

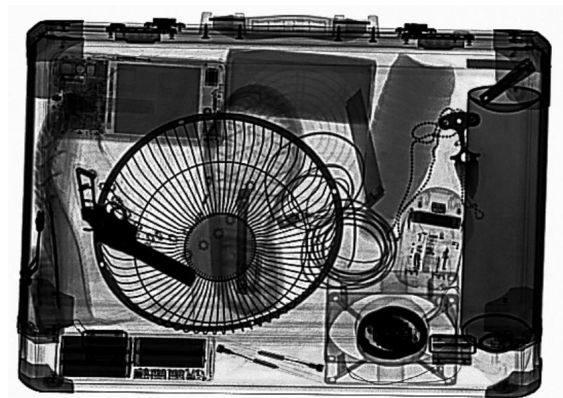


Figure 30 Exponential Transform+Gray

3.16.12. Logarithm Transform

No Icon on Scanning Screen

Keyboard Button: J

This transformation maps a narrow-band low-gray input image value to a wide-band output value. The opposite is the high adjustment value of the input grayscale. This transformation can be used to expand the dark pixels in the compressed high-value image.

To extend the dark pixels in the compressed high-value image. Specially for the high-dense objects.

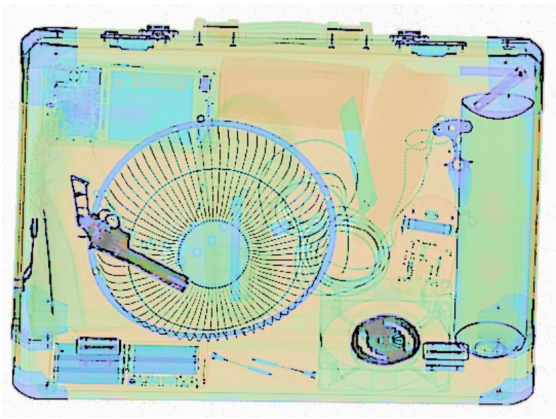


Figure 31 Logarithm Transform

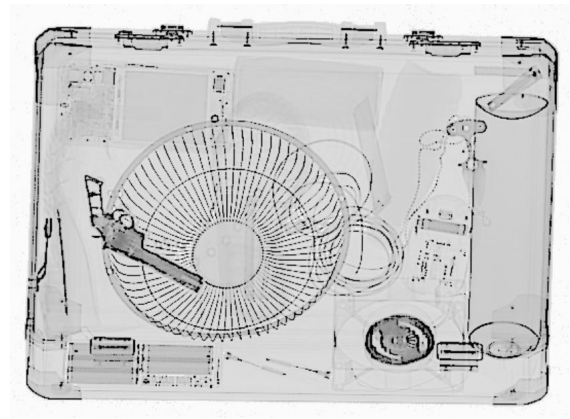


Figure 32 Logarithm Transform+Gray

3.16.13. Pseudo Color

No Icon on Scanning Screen

Keyboard Button: K

The 6 pseudo color mode that is no direction relation between absorption and gray levels, brightness, and between color and material kind. It is a kinds of color image that can be more silhouetted and visible.

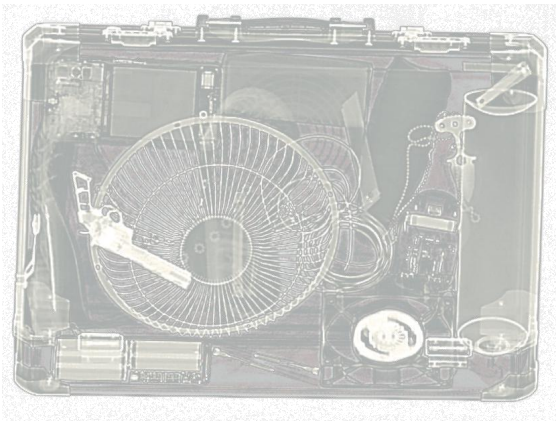


Figure 33 Pseudo Color 1

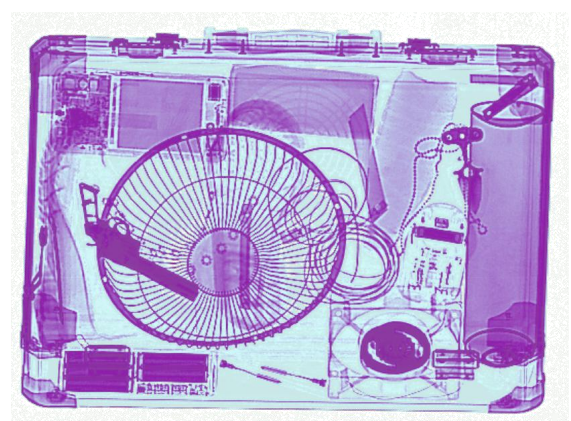


Figure 34 Pseudo Color 2

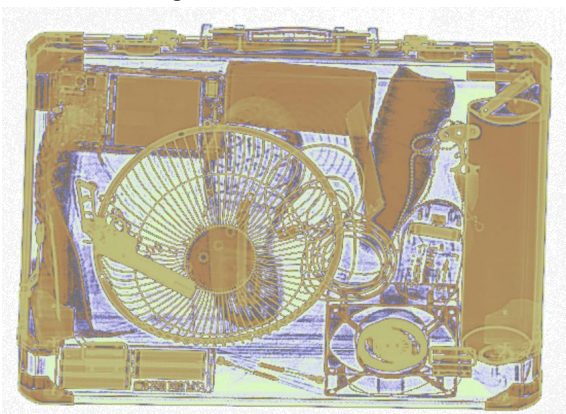


Figure 35 Pseudo Color 3

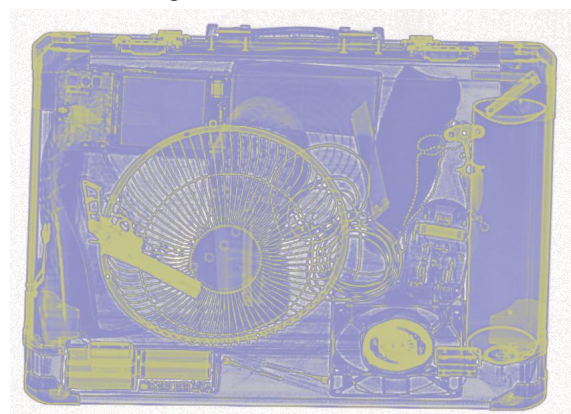


Figure 36 Pseudo Color 4

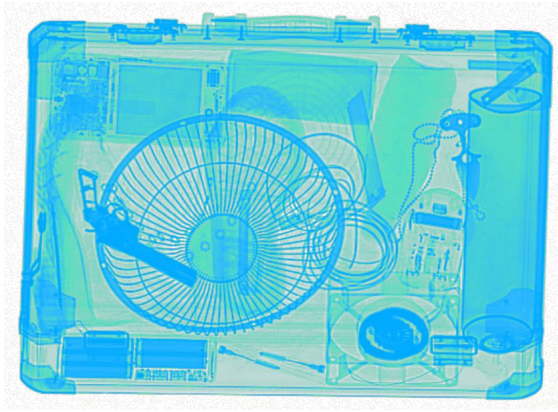


Figure 37 Pseudo Color 5

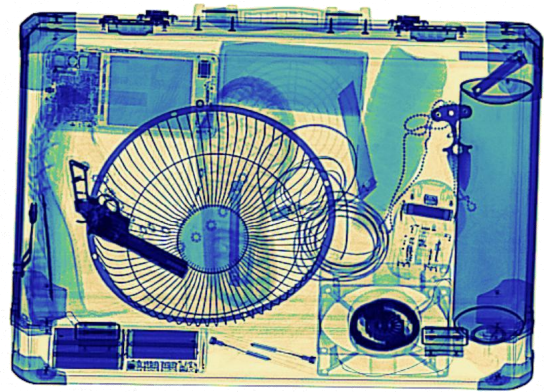


Figure38 Pseudo Color 6

3.16.14. Super Enhancement



Scanning Screen Icon

Non on Keyboard

It is to perform non-linear stretching of the image and redistribute the image pixel values so that the number of pixels in a certain gray scale range is roughly the same. The operator can combine with other image processing functions based on the super enhancement to have a better contrast, such as gray, organic, inorganic, mixture, Z-scan etc.

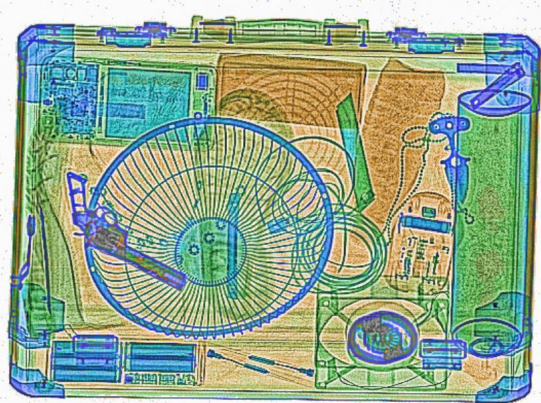


Figure 39 Super Enhancement

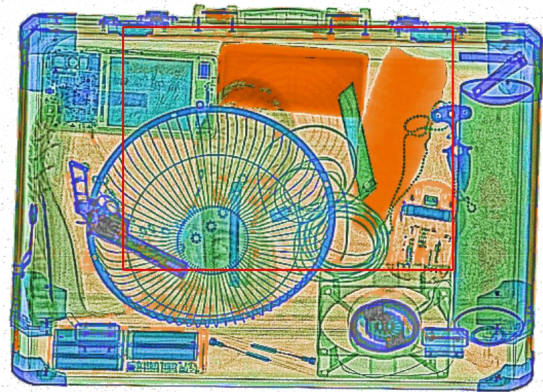


Figure 40 Super Enhancement+Z-scan

3.16.15. Partial Enhancement



Scanning Screen Icon

No on Keyboard

Enhance the dense object in black specially.

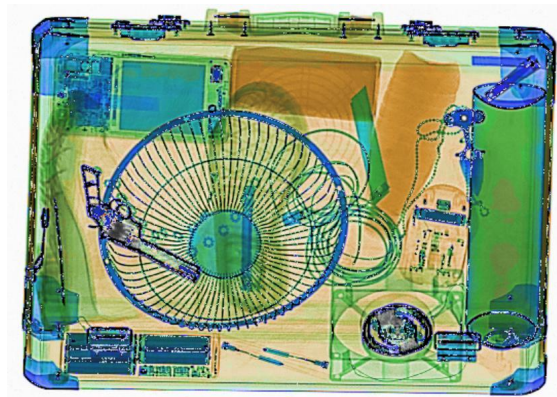


Figure41 Partial Enhancement

3.17. Density Threshold Alert(DTA)

Keyboard Button: **O**

Or Scanning Screen >> Config >> Image Config >> Assistant Function >> Density Threshold Alert

DTA will be of special interest function that highlights the around area of presence of dense object in X-ray images if exceed a preset density threshold; The setting threshold for the DTA varies according to scanner type and the objects to be scanned.

Please be aware of that the dense objects are typically metallic that cannot or hard to see by X-ray, and they will be colored dark or black in the X-ray image, they might gun, knife, etc, behind, or NOT an absolute threat.

- It'll activate the audible alarm and dense area will be marked with **YELLOW** frame.
- The smaller the alarm threshold (beep), the larger the yellow frame area is.
- The DTA will also frequently draw a single large yellow frame around a cluster of dense objects.
- The conveyor belt stopped.
- Please keep in mind that the DTA is kind of assist detection function to recognize the dense objects threats. NOT an absolute threat detection function.
- User can use **High Penetration, Partial Enhancement and Gamma Gradient** to see the high dense object in the Yellow frame.

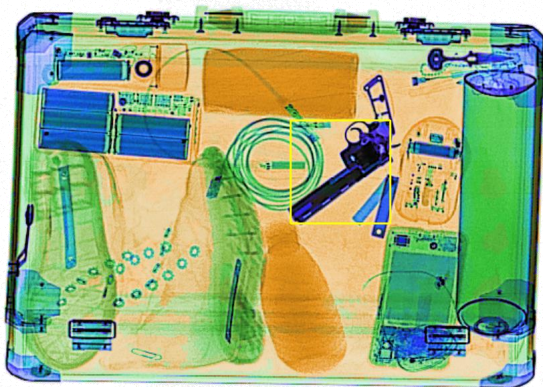


Figure 42 DTA Yellow Frame 1

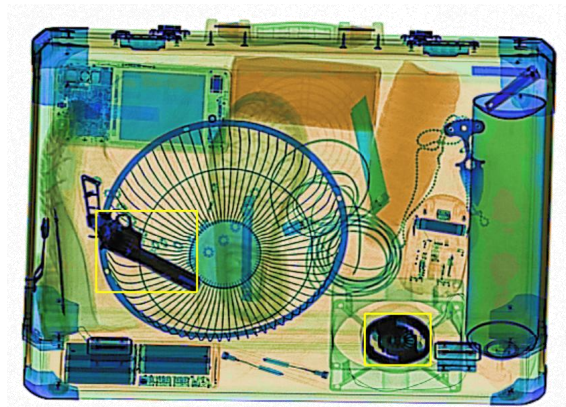


Figure 43 DTA Yellow Frame 2

Please always note that the DTA draws the frame according to the preset density threshold. If some thinner threats are not marked with yellow frame, for example blades, this is because the DTA reacts to objects that are too thick to be penetrated by X-rays. The blade is thinner that can be penetrated by the X-rays totally, so it did not trigger the DTA, and can see it very clearly on the X-ray image.

3.18. Zeff-scan(Assist Scanning)

Scanning Screen >> Config >> Image Config >> Assistant Function >> Zeff Scan

You can further distinguish any significant mass of organic objects that has same Z_{eff} number as military explosives or drugs, it will draw a **RED** frame and highlight the area of the special organic material with effective atomic number Z_{eff} -7, Z_{eff} -8, Z_{eff} -9.

- It'll activate the audible alarm and Z_{eff} -7,8,9 area will be marked with red frame.
- The **Z-scan** will also frequently draw a single large red frame around a cluster of Z_{eff} -7, 8, 9 objects.
- The conveyor belt stopped.
- Please keep in mind that the **Z-scan** is kind of assist detection function to further recognize the explosive and drug threats from Organic objects colored Orange. NOT an absolute threat detection function.

Please always note that if materials are covered by materials with different atomic number, for example, the canned food, the can or other containers with different food/material is packed, then the effective atomic number is changed. Please pay attention to thins kinds of objects.

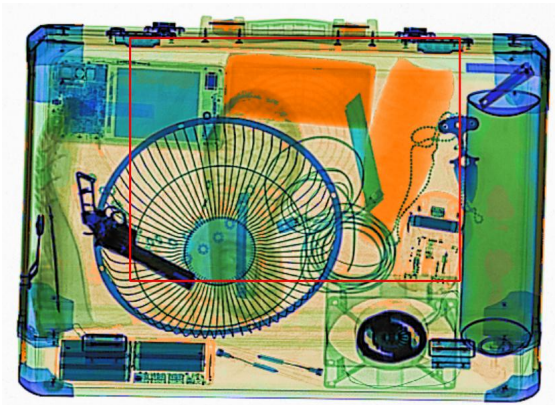


Figure 44 Bright: see the flicker in the red box.

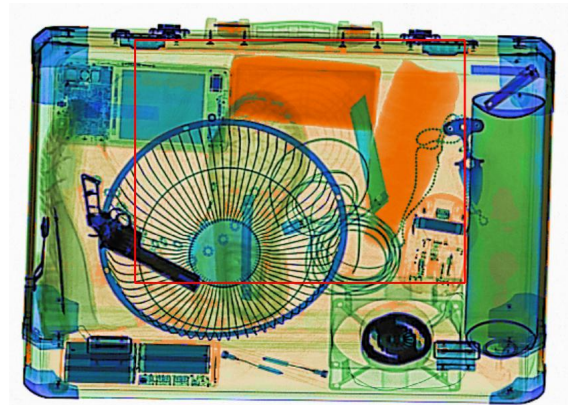


Figure 45 Dark: see the flicker in the red box.

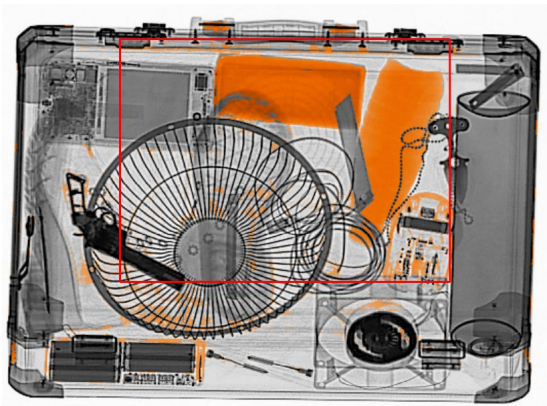


Figure 46 Z-scan+Gray

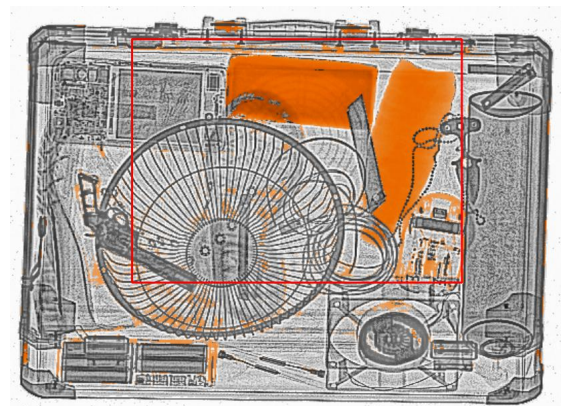


Figure 47 Z-scan+Gray+Super Enhancement

3.19. Reset Image



Scanning Screen Icon

Keyboard Button: "Enter"

It is used to reset the X-ray images from a series of image processing.

3.20. Combined Function

Scanning Screen << Config << Image Config << Custom Button

The X-ray inspection software allows to use more than one image processing function simultaneously.

This combination functions can be set by the Function Key P1(inactivated), P2, P3, P4.

It is also possible to activate these combined imaging processing in the scanning screen directly.

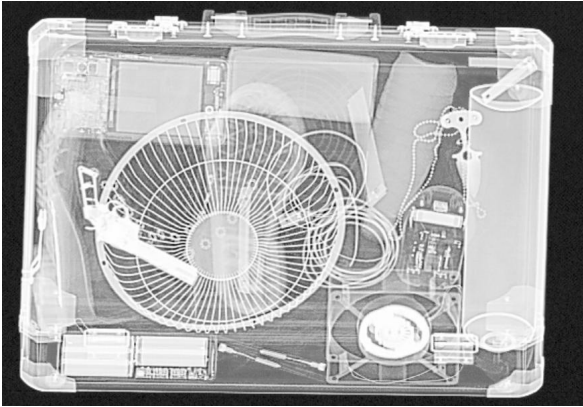


Figure 48 Gray+Inverse

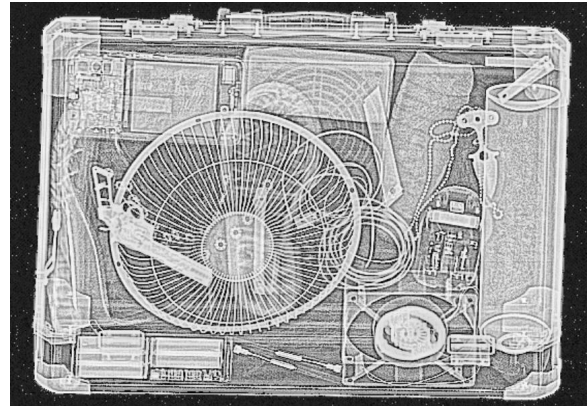


Figure 49 Gray+Inverse+Super Enhancement

3.21. Other Functions

3.21.1. On-Screen Keyboard-Canceled

3.21.2. AI-Roller*

No Icon on Scanning Screen

Keyboard Button: P

Or Scanning Screen >> Config >> Image Config >> Assistant Function >> AI Roller

It is used to enable/disable the AI-Roller* function. If the X-ray scanner equipped with the AI Roller*, it is possible to auto activate/inactivate the conveyor by triggering the photosensors(infrared sensor) at both entrance and exit.

Conveyor belt is rolling only when the infrared sensor be triggered,or it remains static till the next bag put on the belt, which is energy-saving and helps to extend machine lifetime.

Notice!!!: Please keep in mind that DONOT open the AI-Roller if you did not buy for your X-ray scanner.

3.21.3. Previous Picture



Scanning Screen Icon

Keyboard Button:N

- Only workable when the conveyor had been stopped.

Allow the operator to go back to a previous bag stored in the database, the recalled images will continuously scroll on the scanning screen, select the target X-ray image, then press the "Stop" or keyboard button S to stop the scrolling images or exit the Recall function. In this case, user can view the X-ray images with different image processing functions.

3.21.4. Next Picture



Scanning Screen Icon

Keyboard Button: B

- Only workable when the conveyor had been stopped.

Allow the operator to view the next bag in line stored in the database, the recalled images will continuously scroll on the scanning screen, select the target X-ray image, then press the "Stop" or keyboard button S to stop the scrolling images or exit the Recall function. In this case, user can view the X-ray images with different image processing functions.

3.21.5. Calibrate



Scanning Screen Icon

Keyboard Button: C

Click it firstly when running the machine to calibrate the background color or when the image background is not clean.

3.21.6. Quit



Scanning Screen Icon

Keyboard Button: V

To end the X-ray inspection software.

3.21.7. Zoom Function and Image Translation

The zoom function includes the Local Zoom and Zoom in and Zoom Out (more than 64X), it is also possible to translate X-ray image in the scanning screen. All these functions can be applied to images via the mouse below.

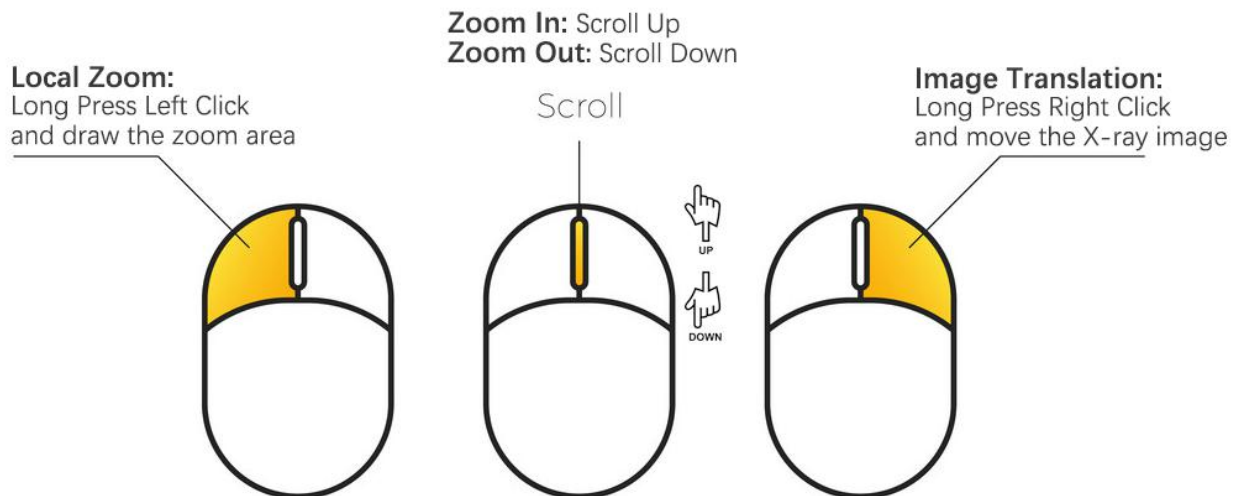


Figure 50 Mouse

- **Local Zoom:**

Select the X-ray image to be zoomed, long press the left click to draw the area on the X-ray image, the selected area will be zoom in once at a time.

- **Zoom In and Zoom Out**

Select the X-ray image firstly, scrolling up, the full X-ray image will be zoomed in inch by inch with the continuous scrolling on the scanning screen,

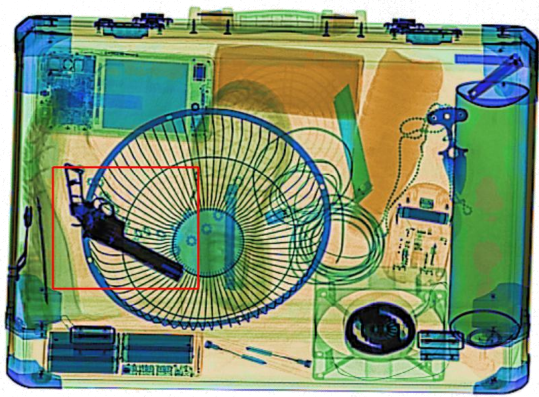


Figure 51 Local Zoom-Draw with Red Frame

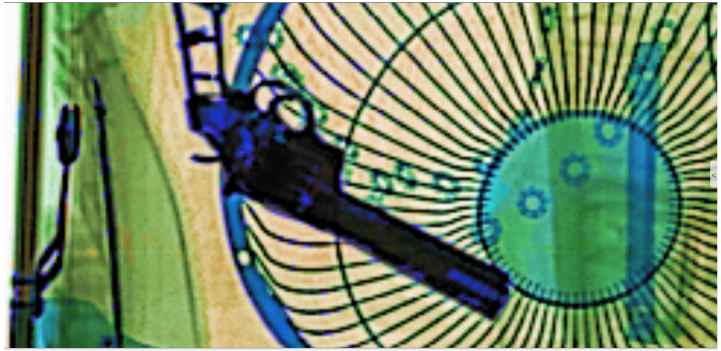


Figure 52 Local Zoom Area

4. Technical Menu-Administrator Menu

The Administrator Menu includes five parts configurations, the administrator can authorize different rights to the operator based on their access levels.

- Database(X-ray images library)
- Curve
- Image Config
- System
- User

4.1. Database Interface



How to open: Scanning Screen >> Config >> Database

Image archive retrieval, user can search the scanned image by criteria of **Image ID**, **Image Name**, **Scan Time**, **Operator Account**, and **Threat Quantity**. User can **open**, **modify**, **a single delete**, **bulk delete**, **print** and **a single backup**, **bulk backup** the stored images.

Image ID	Image Name	Scan Time	Threat	Operator	Operation
35	171532.jpg	2020-5-20 17:15:32	0	admin	Open Modify Delete Print Backup
34	171359.jpg	2020-5-20 17:13:59	0	admin	Open Modify Delete Print Backup
33	171212.jpg	2020-5-20 17:12:12	0	admin	Open Modify Delete Print Backup
32	170932.jpg	2020-5-20 17:9:32	0	admin	Open Modify Delete Print Backup
31	164726.jpg	2020-5-20 16:47:26	0	admin	Open Modify Delete Print Backup
30	164619.jpg	2020-5-20 16:46:19	0	admin	Open Modify Delete Print Backup
29	164100.jpg	2020-5-20 16:41:0	0	admin	Open Modify Delete Print Backup

Figure 53 Config >> Database

4.1.1. Query X-ray Images

If review or search the storage image by Data from xxx to xxx, click the switch  firstly, position the cursor over the YY/MM/DD/HH/MM/SS, click the up and down arrow  to select the date, time, then click **Query**, the selected image library will appear. Same steps to review image by other tools, by Image ID, Image Name,

4.1.2. Delete X-ray Images

Click **Delete**, a pup-up window of delete appears to ask delete or not.

4.1.3. Print X-ray Images

The X-ray scanner has embedded with wireless LAN to support network connection, connect to printer firstly before print.

4.1.4. Backup X-ray Images

Single Backup, click the **Backup Path** to set the image backup location firstly, then click **Backup**, the image you chose will be saved to the pre-selected folder automatically.

Or Bulk Backup, click the **Backup Path** to set the image backup location firstly, the selected image can be saved once at a time.

This function does not allow user to create and name the file while saving. However the specified image will be named by the "Image Name". It would be wise to create a folder before backup by the authorized operator.

4.1.5. Open X-ray Images

Click **Open**, the current image will appear on the scanning screen.

4.1.6. Modify X-ray Images

Click **Modify**, modify Image window appears, the Image Name, Threat, and Remarks can be edited. If the current image with threats, user can enter the threat number and remark threats' information that shows on the box located bottom right of the image library.

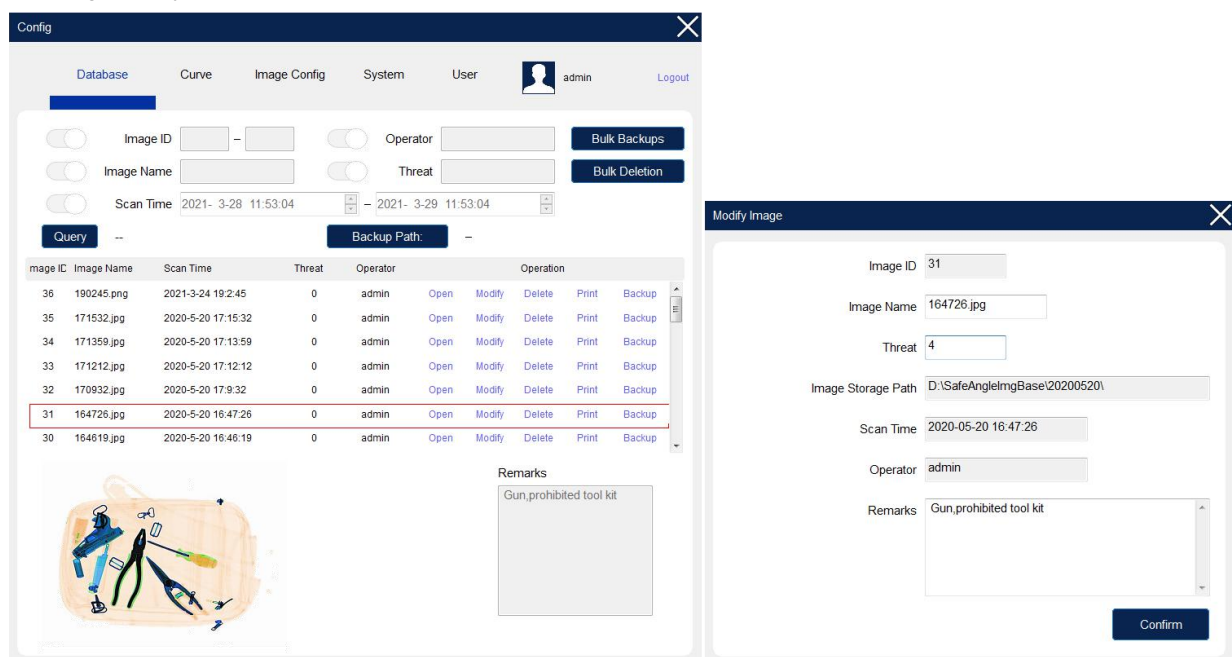


Figure 54 Config >>Database >> Modify

4.2. Curve

How to open: Scanning Screen >> Config >> Curve

Only authorized administrator or technician can manage below date.

The X-ray source and acquisition board can be diagnosed:

Click the switch of "**Capture**" and "**XRay**" to activate and generate the acquisition board curve.

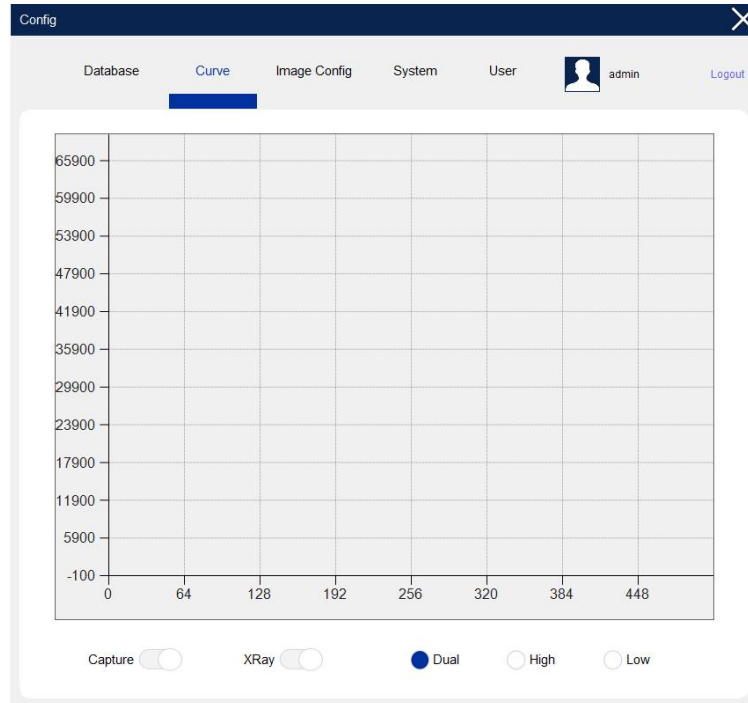


Figure 55 Config >> Curve



WARNING!

When open the "XRay", the x-ray generator will be activated to generate x-ray radiation, please exercise the utmost safety.

4.3. Image Configuration

How to open: Scanning Screen >> Config >> Image Config

The Image Configuration consists of **Default Display**, **Calibration**, **Scanning**, **Assistant Function** and **Custom Button**, which only can be managed by the administrator.

- The default parameters have been set well, only can be changed if indeed with permission of the technician.
- Administrator are suggested to block these setting(Configuration) when create new operator account.
- Please click the "**Apply**" to confirm and save the setting.

4.3.1. Default Display

This parameter of energy display mode have been set well according to factory working standard, only authorized administrator or technician can manage below date.

- **Only High:** Only display the X-ray image collected from the High-energy detector.
- **High Low Mix:** Only display the X-ray image collected from the dual-energy detector.
- **Only Low:** Only display the X-ray image collected from the Low-energy detector.

- **The Display Scale**

Allow to adjust the X-ray image display scale on scanning screen.

- **Color Style**

User can choose the 3 Color Styles from the “Dual-energy Color Style” - Style 1, Style 2, Style 3 that will be applied to the X-ray Image. These 3 color styles are based on the image brightness, user can choose one of the color styles that can help to check the X-ray image easily.

The screenshot shows the 'Image Config' window with the 'Default Display' tab selected. The 'High Low Mix' radio button is selected. The 'Color Mode of Single-energy' is set to 'Gray'. The 'Display Scale' is set to '100'. The 'Dual-energy Color Style' is set to 'Style3'. An 'Apply' button is located at the bottom right of the configuration area.

Figure 56 Image Config >> Default Display

4.3.2. Calibration

The number of up-shield and down-shield can shield the useless detector(s)(can't receive the x-rays) up and down the acquisition board, setting by default and is unchangeable. The number of special shield, position is on dead pixel of the acquisition board.

- **Calibration** parameters have been set well, only can be changed if indeed with permission of the technician.

The screenshot shows the 'Image Config' window with the 'Calibration' tab selected. The 'Up Shield Pen' is set to '16'. The 'Down Shield Pen' is set to '0'. The 'Number of Special Shield Pen' is set to '0'. There are five 'Special Shield Pen Position' fields, all set to '0'. An 'Apply' button is located at the bottom right of the configuration area.

Figure 57 Image Config >> Calibration

4.3.3. Scanning

To invert the conveyor current scanning direction and imaging direction based on actual needs.

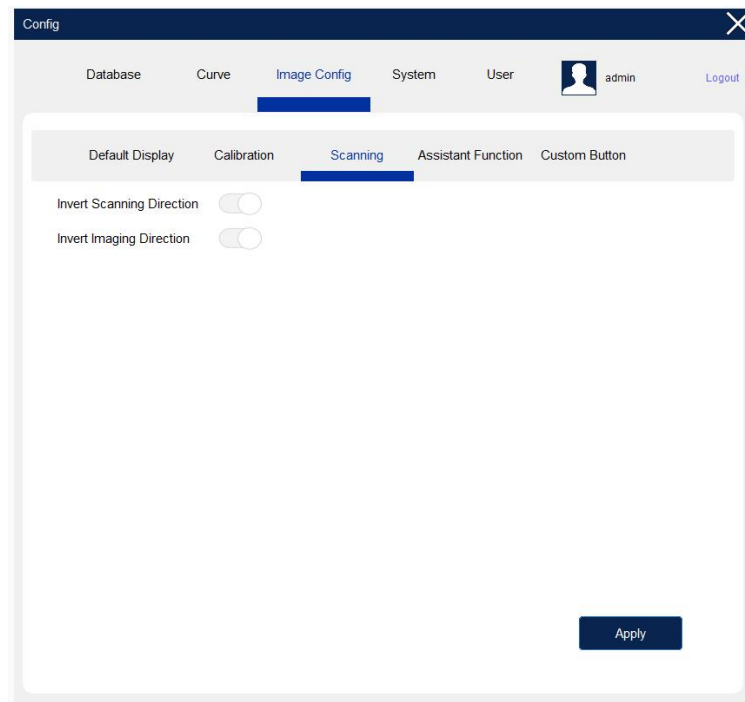


Figure 58 Image Config >> Scanning

4.3.4. Assistant Function

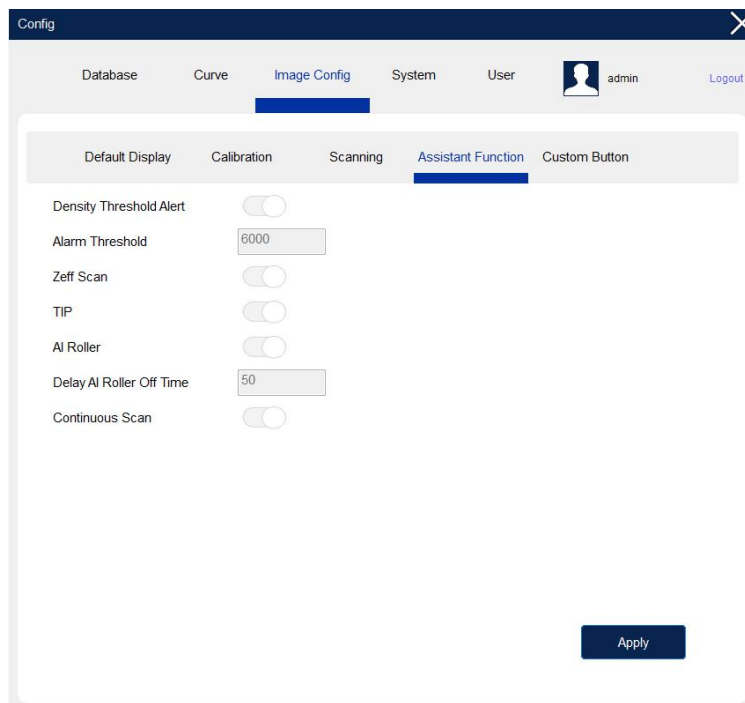


Figure 59 Image Config >> Assistance Function

- **Density Threshold Alert(DTA) setting**
More details description please check [\[P-31\]](#). In this screen, operator can open the **DTA** function and set the alarm density threshold.

- **Zeff Scan setting**

More details description please check [\[P-31\]](#). In this screen, operator can open the **Zeff Scan** function.

- **Threat Image Projection (TIP)* setting (Upgrading)**

- **AL Roller* setting**

More details description please check [\[P-33\]](#).

In this screen, operator can open the **AL Roller*** function and set the Delay AI Roller Off Time, the default is 50 seconds, which means when the previous bag had been scanned and passed infrared sensor at exit, the conveyor belt will be stopped after 50 seconds since previous bag.

- **Continuous Scan setting**

With the Continuous Scan turned on:

it is possible to scan the short and flat objects that cannot trigger the infrared sensor in the inspection tunnel. Such as the letters, documentation, express envelope etc.

The X-ray generator will be activated as long as the conveyor is running, till turn the Continuous Scan function off. If there is no bag to scan, please do not turn on the conveyor control buttons, "Forward", and "Reverse".

For Safety, please control this permission to the operator account in order to avoid misoperation.

For Safety, it is prohibited to stand in front of exit and entrance, or look into the inspection tunnel.

If turn off the Continuous Scan, please ensure the X-ray indicators at four corners put out or the three indicators "XRay", "Connect", "Capture" on scanning screen are blank when the conveyor is running without bag.



WARNING!

When activated the Continuous Scan, and conveyor is running, the x-ray generator will be activated to generate x-ray radiation, please exercise the utmost safety.

4.3.5. Custom Button(Programmable Function Key)

The X-ray inspection software allows to use more than one image processing function simultaneously.

This combination functions can be set by the Function Key **P1(inactive)**, **P2**, **P3**, **P4**.

Select the Custom Button Number.

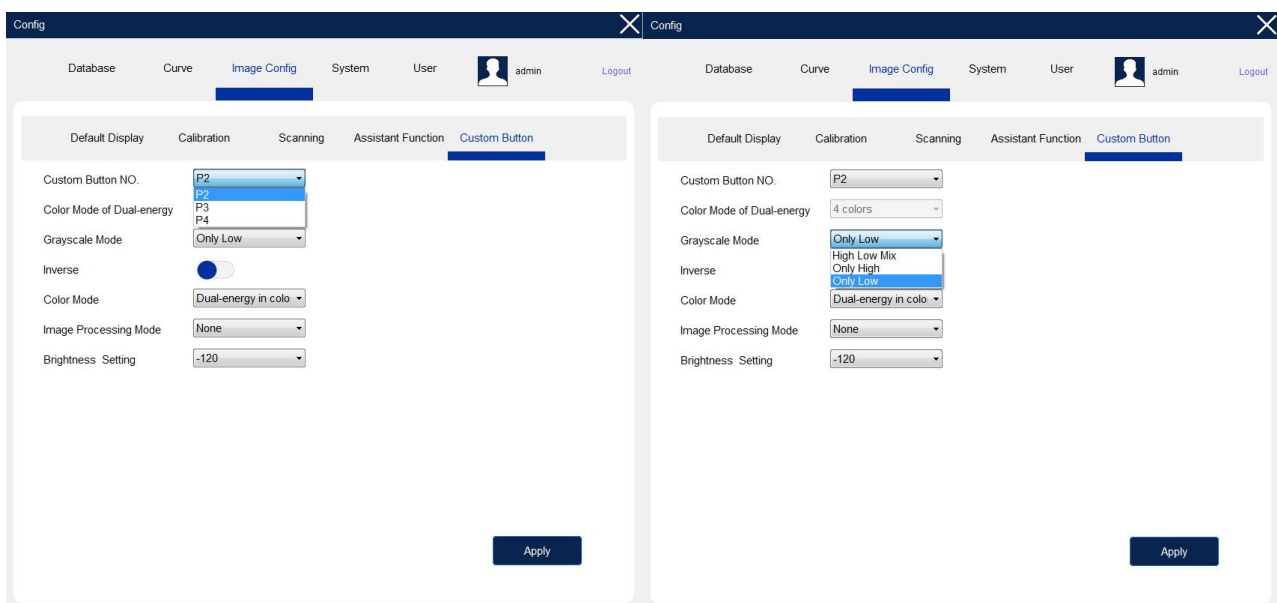


Figure 60 Image Config >> Custom Button

- Select one of the image enhancement function from Color Mode that includes:

- Gray
- Dual-energy in color
- Organic
- Mixture
- Inorganic
- Pseudo Color 1
- Pseudo Color 2
- Pseudo Color 3
- Pseudo Color 4
- Pseudo Color 5
- Pseudo Color 6
- Pseudo Color 7

- Select the Grayscale Mode(Only for X-ray Scanner with Dual-energy)

- High Low Mix as standard
- Only High
- Only Low

- Select one of the image enhancement function from Image Processing Mode that includes:

- None
- Exponential Transform
- Logarithm Transform
- Blur
- Sharpen
- Super Enhancement
- Partial Enhancement

- Can open the “Inverse” as option.

- Select the brightness level.

After the parameter setting is completed, press the programmable function key P2, P3, P4 on the keyboard, these preset image processing functions will be applied to the current X-ray image once at a time.

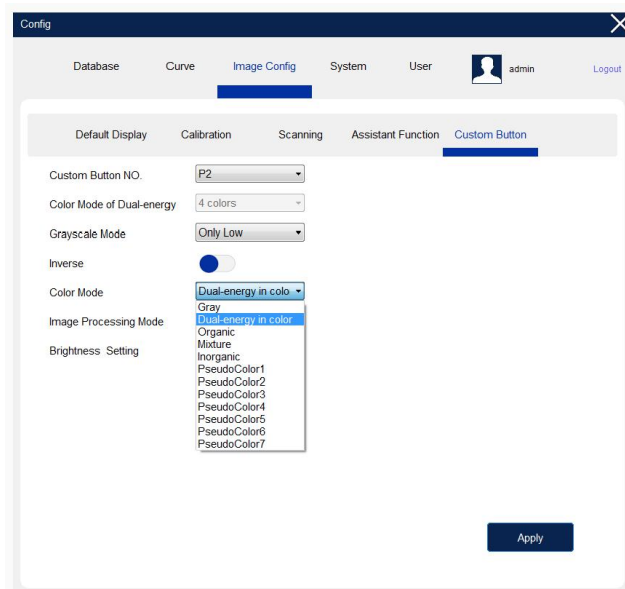


Figure 61 Image Config >> Custom Button 1

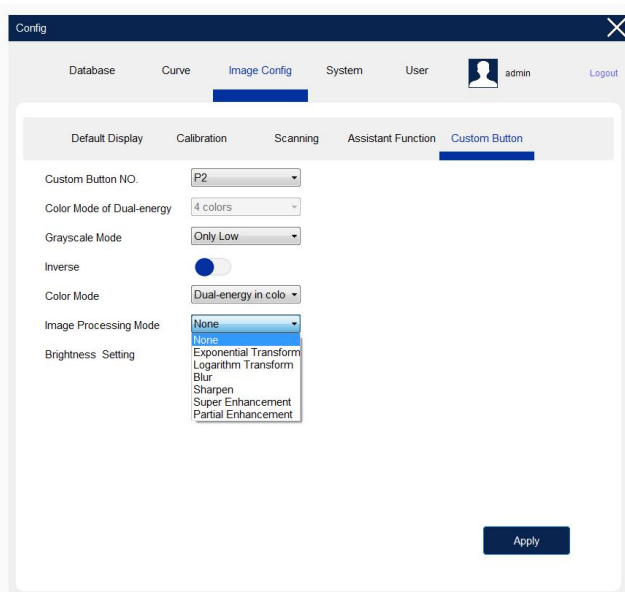


Figure 62 Image Config >> Custom Button 2

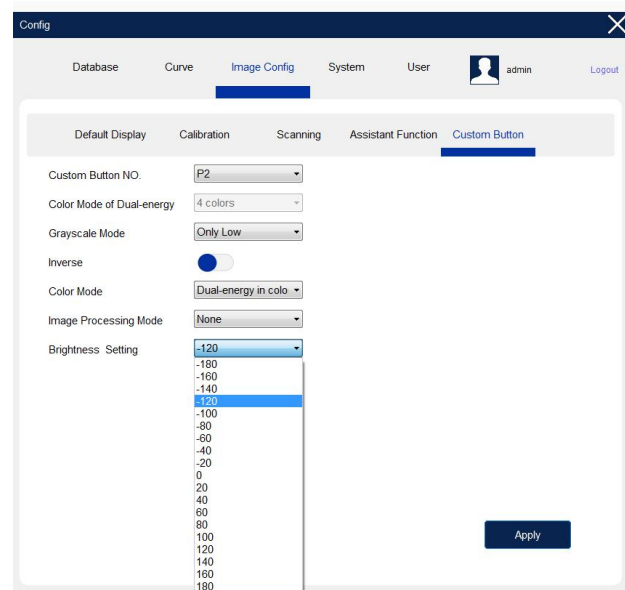


Figure 63 Image Config >> Custom Button 3

4.4. System

How to open: Scanning Screen >> Config >> System

The System consists of **DA Board, Control Board, System** which only can be managed by the authorized administrator.

- The default parameters have been set well, only can be changed if indeed with permission of the technician.
- Administrator are suggested to block these setting when create new operator account.
- Please click the “**Apply**” to confirm and save the setting.

4.4.1. DA Board

Parameters setting of the DA Board.(Detector Board).

- **DA Board Type, DA Board Numbers, DA Board Channels, Energy Mode.**

Only authorized administrator or technician can manage below data.

- **Energy Mode:**
- Only authorized administrator or technician can manage below data.
- **Dual:** the X-ray scanner with Dual High-energy and Low-energy
- **High:** the X-ray scanner with Single High-energy
- **Low:** the X-ray scanner with Single Low-energy. (usually the X-ray scanner equipped with 80kV generator)

The screenshot shows a web-based configuration interface. At the top, there's a 'Config' window with a close button. Below it, a navigation bar includes 'Database', 'Curve', 'Image Config', 'System' (selected), 'User', and a user profile 'admin' with a 'Logout' link. The 'System' section has three sub-tabs: 'DA Board' (selected), 'Control Board', and 'System'. Under the 'DA Board' sub-tab, there's a message: 'Only authorized administrator can manage below data.' Below this message are four settings: 'DA Board Type' (a dropdown menu showing '2'), 'DA Board Numbers' (a text input field showing '8'), 'DA Board Channels' (a text input field showing '64'), and 'Energy Mode' (a dropdown menu showing 'Dual' with a list of options: 'Dual', 'High', and 'Low'). An 'Apply' button is located at the bottom right of the configuration area.

Figure 64System >> DA Board

4.4.2. Control Board

Parameters setting of the Control Board.

- Only authorized administrator or technician can manage below data.
- Keep this COM number(COM*) same as **Local Computer >> Computer Management >> Device Manager >> Ports(COM & LPT) >> USB-SERIAL CH340 (COM*)**. Otherwise, the indicator “Connect” on scanning screen do not lit, which will cause no X-ray image on the scanning screen with conveyor running.

Notice!!!

Must Keep this COM number(COM*) same as USB-SERIAL CH340 (COM*) in Device Manage of Local Computer.

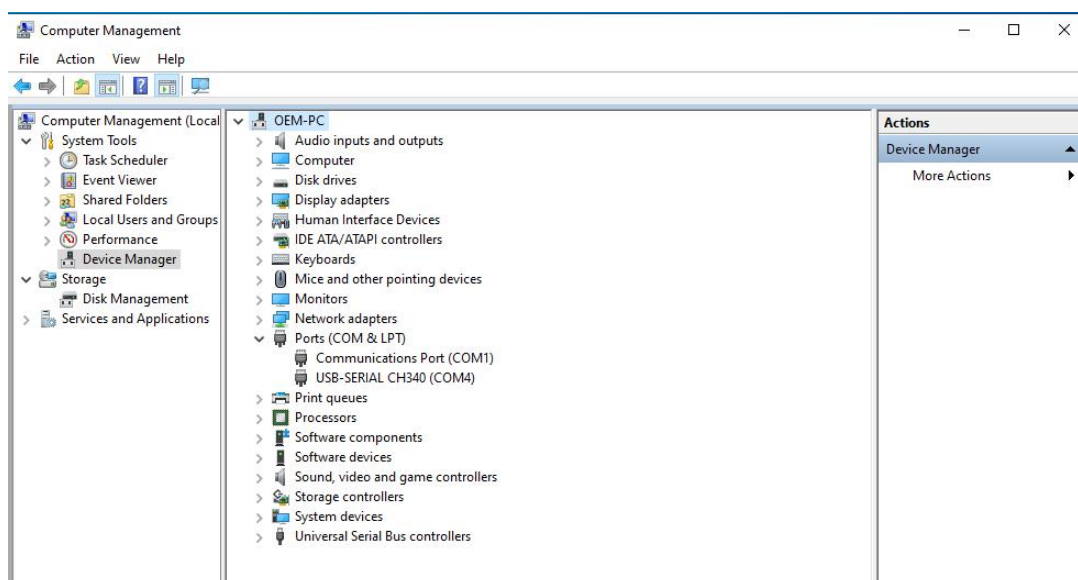


Figure 65 Computer Device Manager

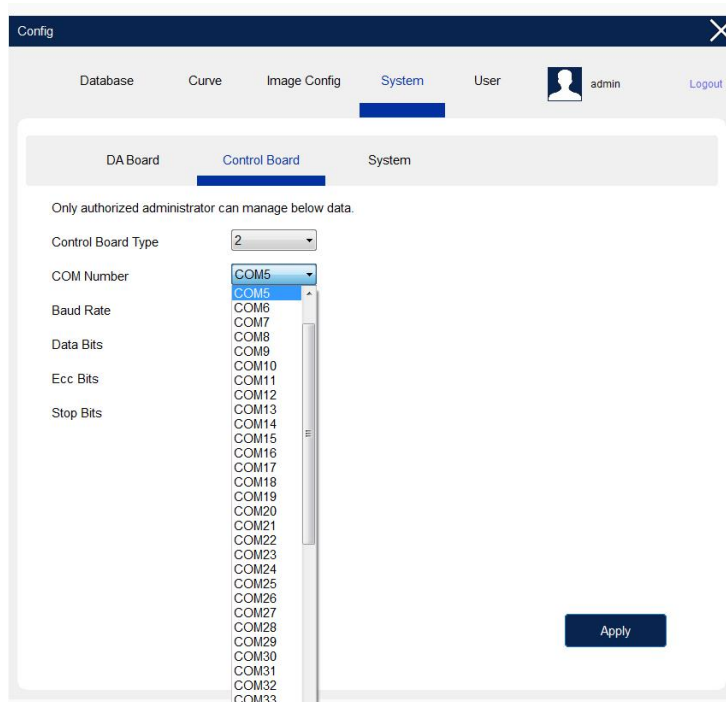


Figure 66 System >> Control Board

4.4.3. System

Delay Acquisition, Off Delay, Delay X-ray Off Time parameters have been set well, only can be changed if indeed by authorized administrator or technician.

- **Language**

Available with Simplified Chinese, English, Russian, Traditional Chinese, Turkish in drop down menu.
(Please contact us for more Languages that can be customized.)

- **Storage Path**

It is for auto archive X-ray images, default location is D:/SafeAgleImmgBase, and it cannot be changed.

- **Storage Type**

Supports PNG, JPEG, BMP, TIFF, default type is PNG.

The screenshot shows a web-based configuration interface. At the top, there's a 'Config' header with a close button. Below it, a navigation bar includes 'Database', 'Curve', 'Image Config', 'System' (highlighted), and 'User'. A user profile 'admin' and a 'Logout' link are on the right. The main content area has three sub-tabs: 'DA Board', 'Control Board', and 'System' (highlighted). Under the 'System' sub-tab, there are several settings: 'Language' (English), 'Storage Path' (D:\\SafeAngle\\mgBase\\), 'Storage Type' (PNG), 'Delay Acquisition' (140), 'Off Delay' (30), and 'Delay X-Ray Off time' (30). An 'Apply' button is located at the bottom right of the configuration area.

Figure 67 System >> System

4.5. User

How to open: Scanning Screen >> Config >> User

User can be grouped into:

- Primary-Administrator Account (PAA)
- Secondary-Administrator Account (SAA)
- Operator Account(OA)

4.5.1. Primary-Administrator Account (PAA)

- It is the top level account that can't be deleted, but can self-modifying for the Password and Access Rights. Please keep note that the modification can be taken effect after re-login.
- Can't manage SAA.
- Can be modified by SAA only when the SAA **overstepped**.

Every time the SAA login and enter the “**User**” screen, the operation state shown as **Figure 69 User - SAA (every time first enter)** , after the SAA modified successfully any part in this “**User**” **screen**, the SAA overstepped and become the “top level account” with permission to modify the PAA provisionally now, the operation state show as **Figure 70 User List - SAA (After Modification)**.

- 1) SAA cannot change the PAA's name and privilege.
 - 2) SAA can change PAA's access rights and password. It can help when the PAA forgot the password.
- Can create, modify, delete, change password, and authorize access right for every operator account.

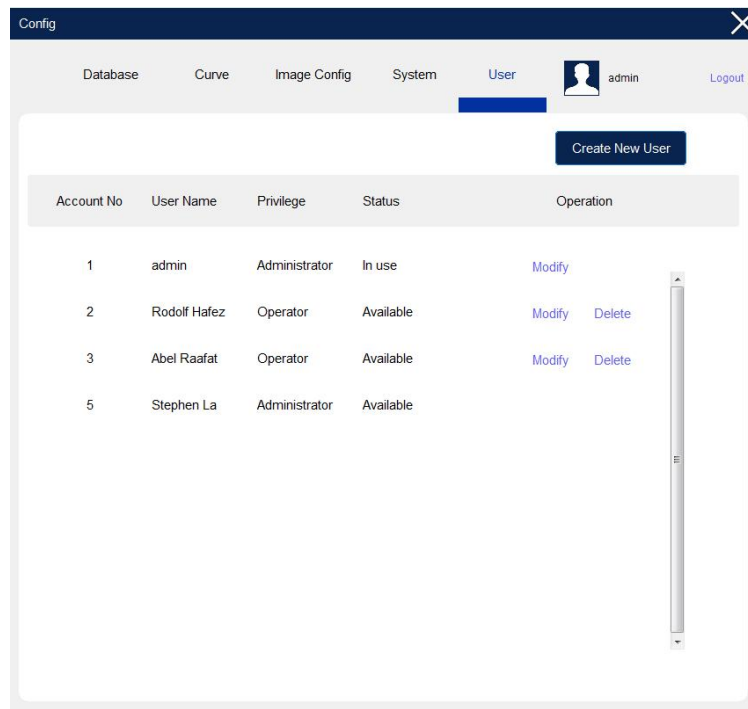


Figure 68 User >> User List

4.5.2. Secondary-Administrator Account (SAA)

- It can't be deleted by PAA, but can be self-modifying, including delete itself, including modify "User Name", "Password" and the "Privilege". Please keep note that the modification can be taken effect after re-login.
- Can create, modify, delete, change password, and authorize access right for every operator account.
- Can manage PAA only when the SAA **overstepped**.

Every time the SAA login and enter the "User" screen, the operation state shown as **Figure 69 User - SAA (every time first enter)**, after the SAA modified successfully any part in this "User" screen, the SAA overstepped and become the "top level account" with permission to modify the PAA provisionally now, the operation state show as **Figure 70 User List - SAA (After Modification)**.

- 1) SAA cannot change the PAA's name and privilege.
- 2) SAA can change PAA's access rights and password. It can help when the PAA forgot the password.

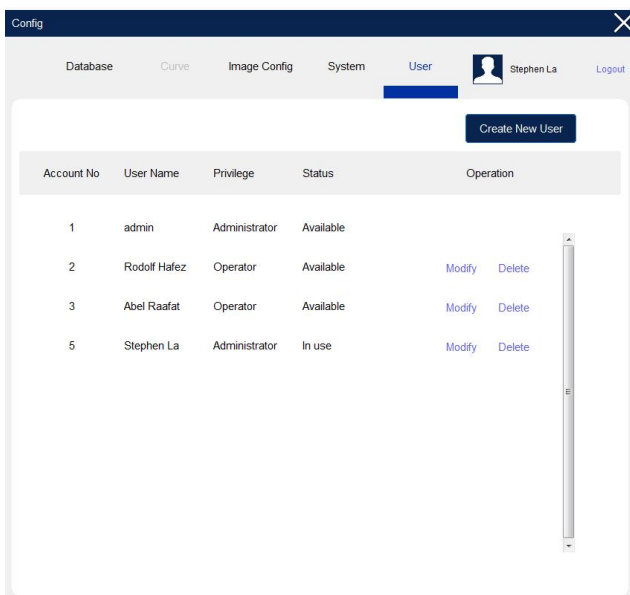


Figure 69 User - SAA (every time first enter)

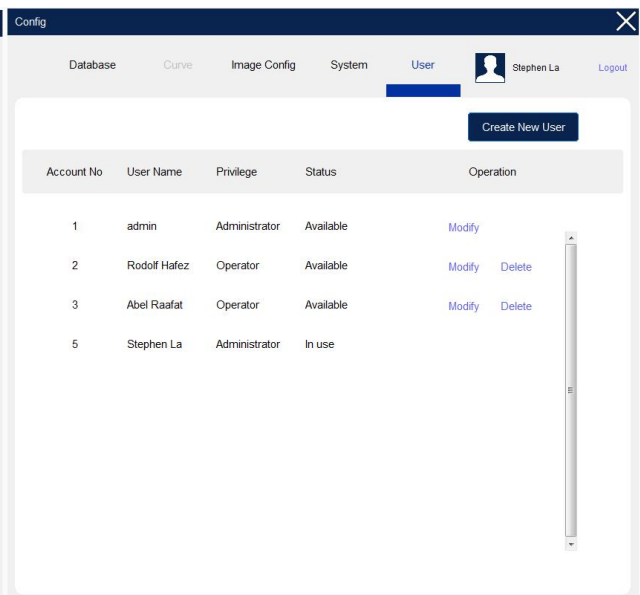


Figure 70 User List - SAA (After Modification)

4.5.3. Operator Account(OA)

- OA can only check his/her own account information and change password.
- Click Modify into **User Management** screen to change password
- Cannot change the privilege and access rights.

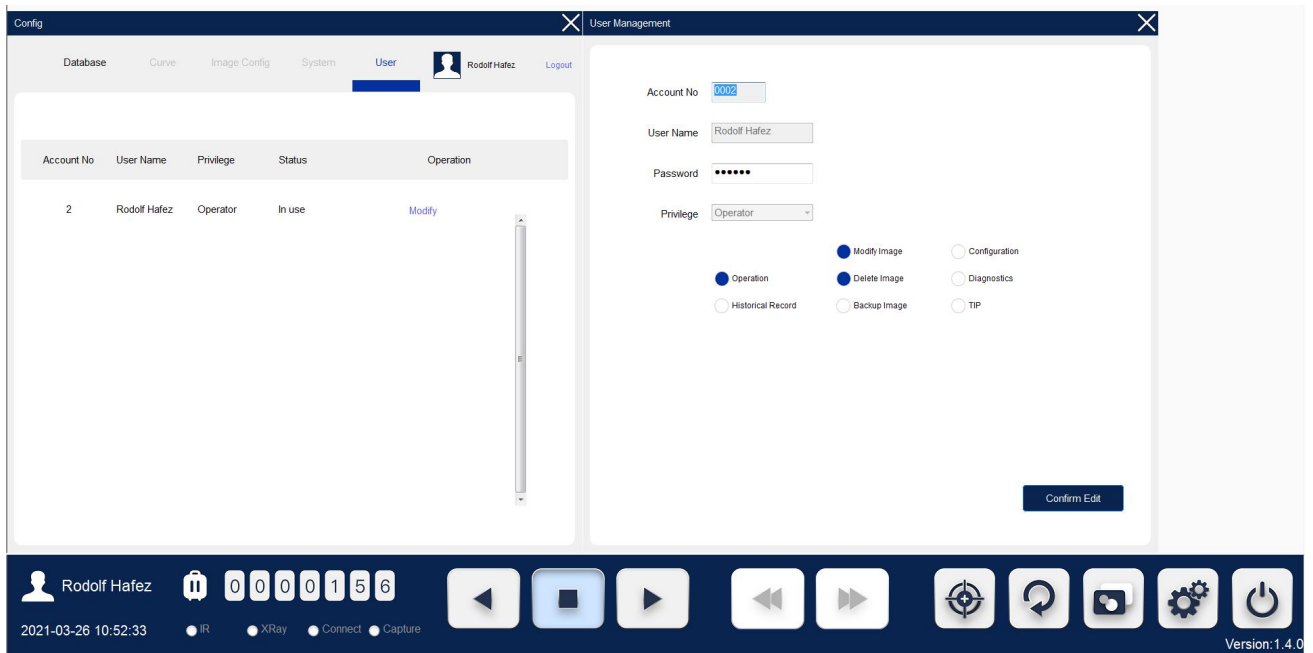


Figure 71 OA -Modify

4.5.4. Add User

Click **Create New User** that only appears on Administrator account, the **User Management** screen appears.

- ID number is automatically generated by system from 2, 1 is the PAA.
- Enter the User Name consisting of a maximum of 26 letters/numbers, case sensitive
- Enter the Password consisting of a maximum of 16 letters/numbers, then keep it will, case sensitive. To ensure security, when typing in your password, asterisk characters(*) are printed on the screen.
- Privilege can be Administrator with 9 options of access rights and Operator with 8 access rights of permissions.
- Click "**Create New User**" to confirm.

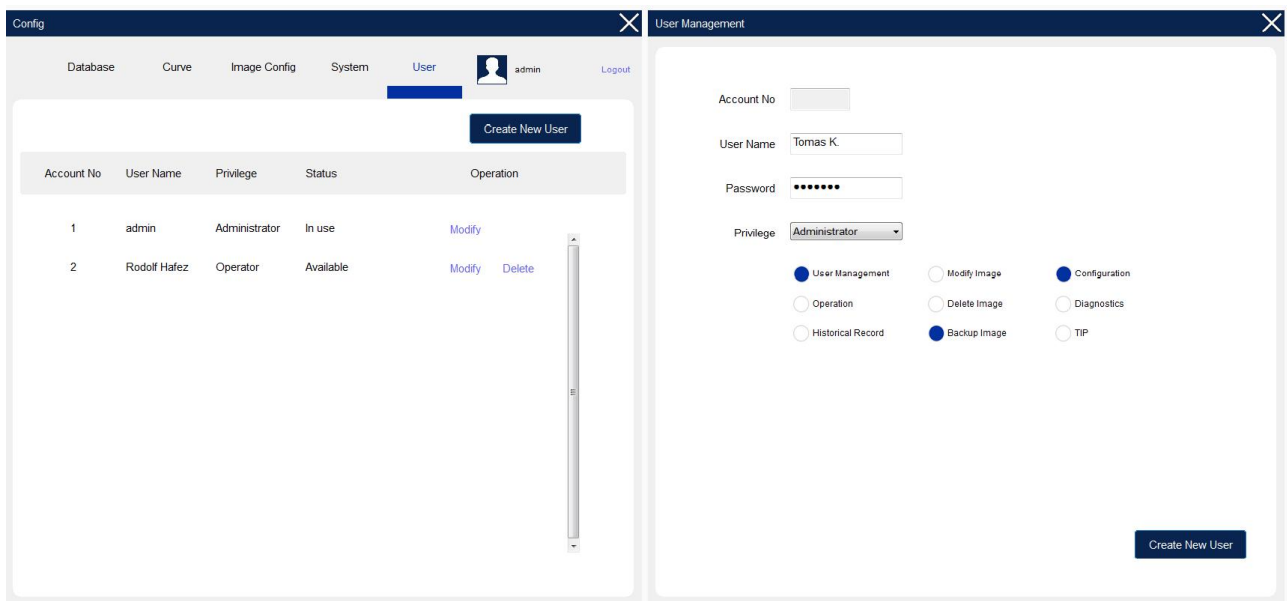


Figure 72 Add User-Administrator

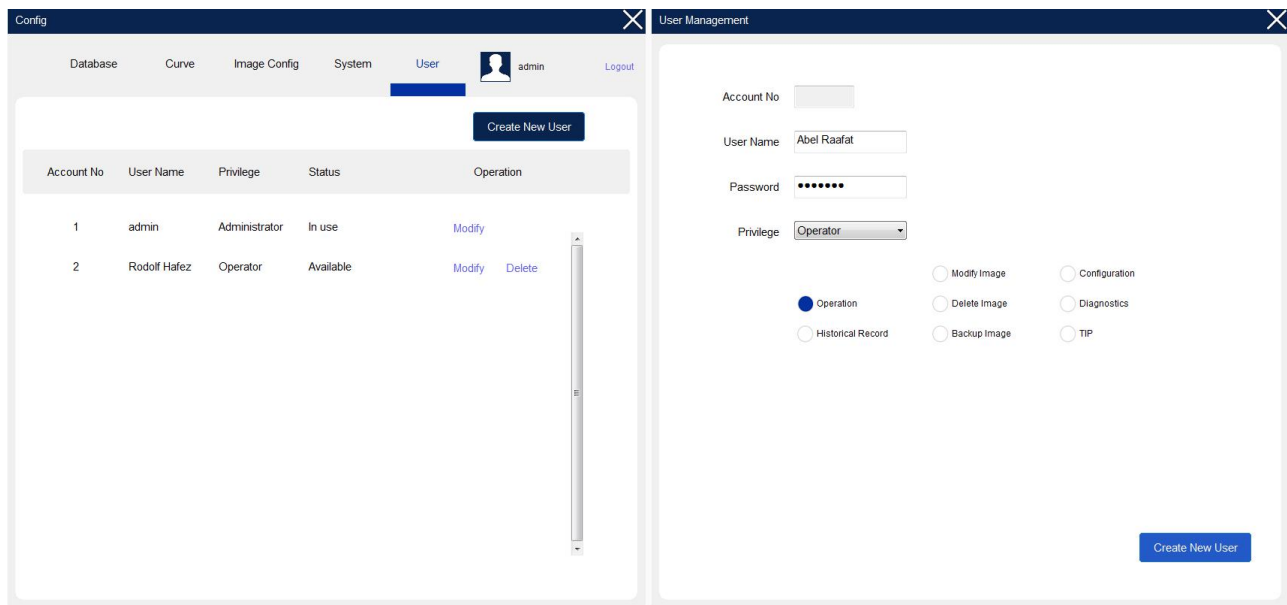


Figure 73 Add User-Operator

4.5.5. Privilege

It is available with Administrator and Operator.

Note: All operator accounts are allowed to open the User screen that shows with their own account information only.

4.5.6. Access Rights

• User Management

Available for administrator account only.

Allow to open the “**User**” to manage the user management.

• Operation

Allow to operate the functions in the scanning screen, except the Image Review of “Previous Picture” and “Next Picture”.

It is usual for basic operator who takes charge of daily security check.

• Historical Record

Allow to query and open image in the Database screen, the Image Review of “Previous Picture” and “Next Picture”.

• Modify Image

Allow to query and modify image in the Database screen.

• Delete Image

Allow to query and delete image in the Database screen.

• Backup Image

Allow to query and backup image in the Database screen.

• Configuration

Allow to manage:

- **Image Config:** Default Display, Calibration, Scanning, Assistant Function and Custom Button.
- **System:** System
- **DA Board and Control Board:** they are not allowed to modify. Please take note that the DA Board and Control Board can be manage for the user who authorized both the **Configuration** and **Diagnostics** rights.

• Diagnostics

Allow to open and manage the Curve screen.

- **TIP***

Allow to operate TIP software function(**Upgrading**)

4.5.7. Delete User

Only the Administrator can delete the operator account.

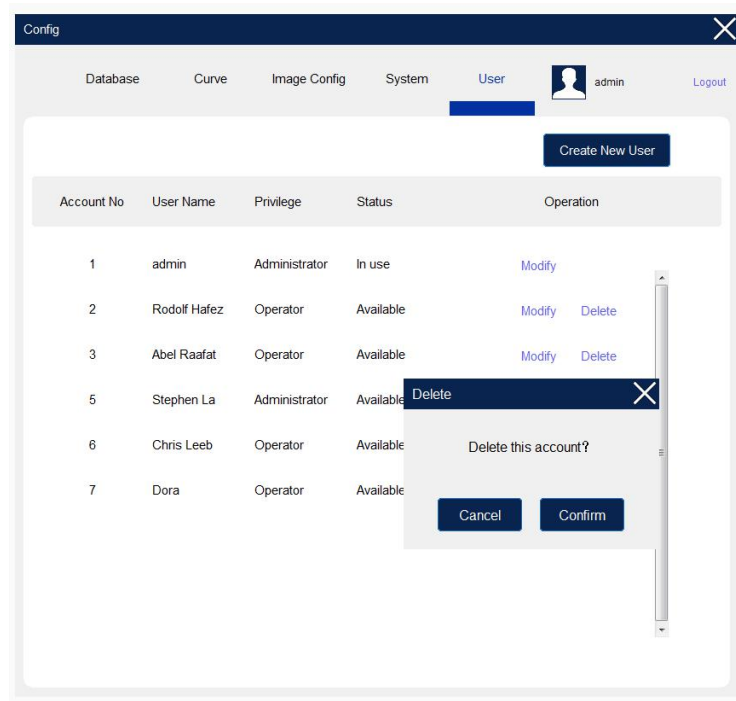






Figure 74 Delete User

4.6. Logout

How to open: Scanning Screen >> Config >> Logout

Click **Logout** to logout current account, then the scanning screen will be inactivated, only the System **Config**  and **Quit**  Icon are activated. Click  to login, click  to exit software.

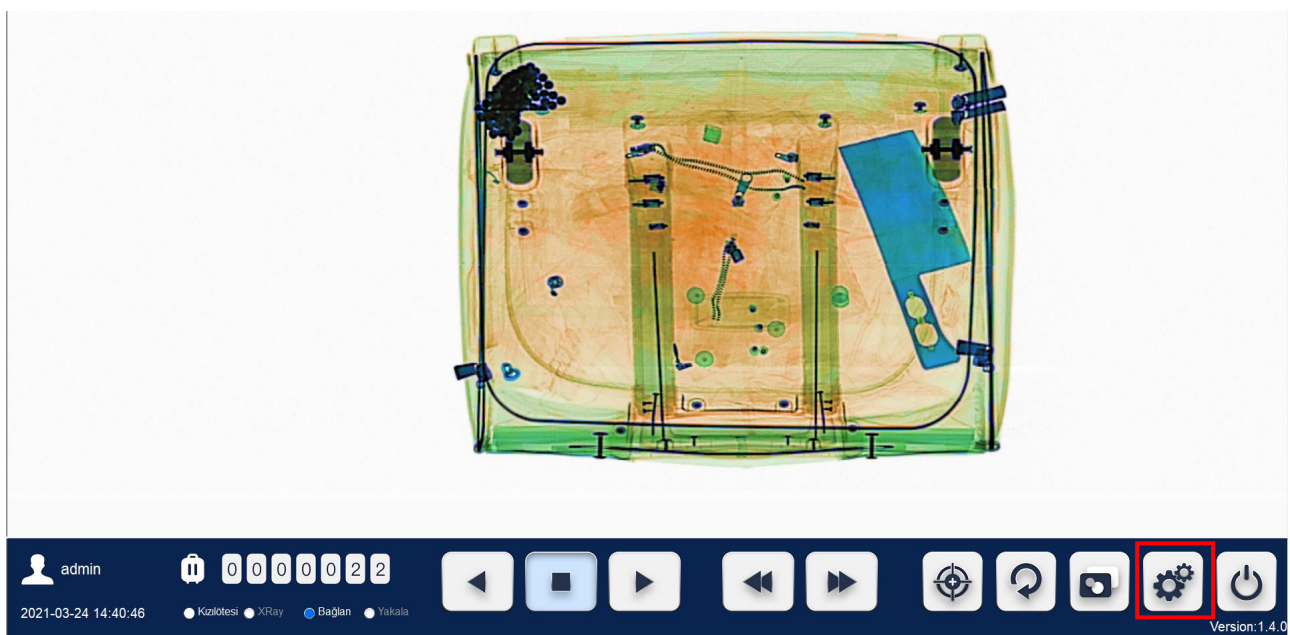


Figure 75 Scanning Screen - Config



Figure 76 Config - Logout



Figure 77 Inactivated Scanning Screen after Log out

5. Power Off

Before shutting down the X-ray scanner, please make sure:

- The scanning of the current object has been completed.
- There are no object in the inspection tunnel, if necessary, have the conveyor move left or right to ensure the inspection tunnel is empty.
- The conveyor belt has stopped running.
- Logout. Please refer to [\[P-49-Figure 76\]](#)
- **Stay on the Scanning screen - Logout State** [\[P-49-Figure 77\]](#), then turn the key switch on the top cover of X-ray scanner anticlockwise to "OFF" and the device will start to shut down. After about 1 minute, the system and all the device indicators will run out.
- The power off finished, keys should be drew out and keep in a safe place.
- The external power supply of the scanner can be disconnected.

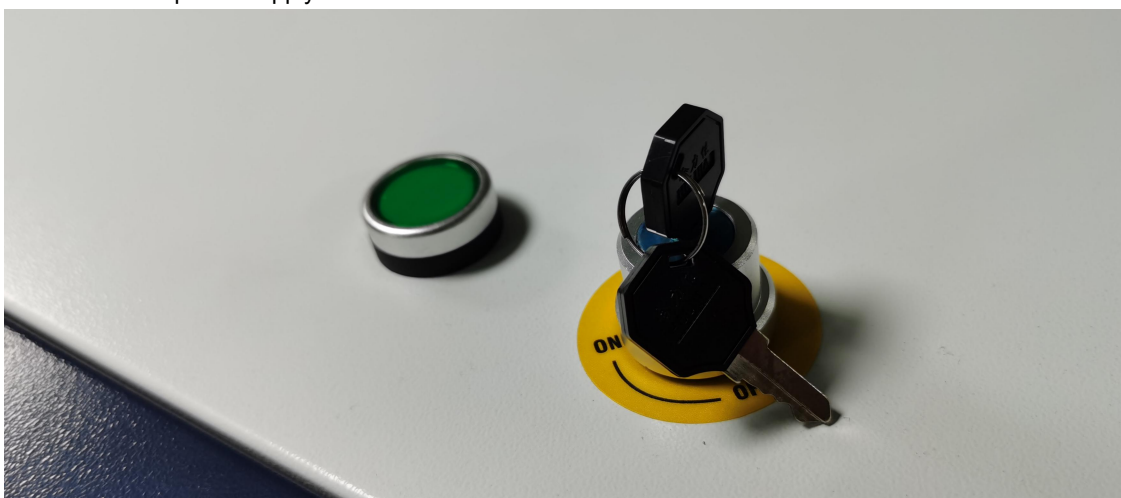


Figure 78 Key Switch - Button

6. Transportation and Storage

6.1. Attention of Transportation

- The X-ray scanner can be transported by air, sea and land vehicles, but it must be packed strictly before transportation. Plywood case is our standard packing material.
- Avoid contact with rain and snow during transportation, and avoid direct exposure to the northern lights.
- When transferring, try to not put it in an open air environment, but put it inside.
- Device should be placed firmly, it must not be upside down.

6.2. Storage Precautions

- The X-ray scanner should be stored in a clean and dry place as much as possible. The wet environment may affect the normal operation of the detector. If the X-ray scanner lies idle for a long time, it should be stored in the original plywood case.
- The environment where the X-ray scanner is stored for a long period should be dry and well-ventilated. Excessively wet and corrosive gases will affect the operation.
- Storage conditions:
Storage temperature: -20°C- 60°C \ -4°F- 140°F
Storage humidity: 10% to 95% (non-condensing)
If the storage environment does not match the above conditions, please move the device to an appropriate environment as soon as possible to avoid jeopardizing the service life.

7. Maintenance and Common Faults

In view of the fact that X-ray security inspection system is the combination of high-tech and electronic mechanics, users have to understand the technical capability, structure principle and operation regulations, meanwhile operators should be good at daily maintenance, in order to make it fully efficient for service life extension, and ensure the safety for both operators and equipment.

7.1. Safety Attention of Maintenance

- During the maintenance process, no foreign matter or water droplets can enter the equipment to avoid device damage or safety accidents;
- The machine consist of many components with 220V working voltage, common maintenance must be carried out when power off. If operated under the state of electrification, the operators must have been trained and take measures to avoid electric shock.
- The machine consist of large number of precision electronic components, please take measures to prevent electric static damage before maintenance.
- Considering that lead shield used to prevent the x-ray leakage, please wear cotton gloves during operation, and wash hands after operation.

- Please make double check all wires connected correctly before device power on.
- Please cover the plate to avoid x-ray leakage before turn on x-ray.

7.2. Side Panel Dismantling

- Power off the X-ray scanner firstly.
- The both side covers have built-in locks with triangle keyholes [P-8 Figure 2], the technician can disassemble with triangle key when having maintenance.
- Open the side panel, lift it upward to remove the side panel.
- Put the side panel in a safe place and prevent scratches, the side panel is heavy, please take care of your safety and around people.

7.3. Weekly Maintenance

The weekly maintenance routines are mainly concerned with visual inspection and cleanliness of the X-ray inspection system; they are detailed in sequential order. It is necessary to be performed more regularly if the operating environment warrants it.

Read the warnings and labels signs at the beginning of this manual before proceeding. Switch off the system. Remove the mains supply to the system.

7.3.1. Visual Checking

- Visually check all the covers and panels for damage and security-damaged covers and panels and any missing fasteners must be replaced.
- When the components or connectors have loose phenomenon, please tighten them immediately.
- If any components damaged, please find out the reasons then replace new ones. After replacement, the relevant parameters should be adjusted before working.

7.3.2. Conveyor Belt and LCD Monitor Casing

- Wipe the surface of the conveyor belt and monitor casing with a wet, lint-free cloth, using soap foam if necessary. Dry all cleaned surfaces with a dry lint-free cloth.
- It can not allow foreign substances or liquids into the device, avoid leakage or accident.

7.3.3. LCD Monitor Screen

- Clean the screen with an anti-static spray or liquid and a lint-free cloth.

7.4. Three Month Maintenance

Read the warnings and labels signs at the beginning of this manual before proceeding. Switch off the system. Remove the mains supply to the system.

7.4.1. Scanner Housing

- Wipe the surface of the scanning housing with a wet, lint-free cloth, using soap foam if necessary. Dry all cleaned surfaces with a dry lint-free cloth.

7.4.2. Lead Curtains

- Visually check the lead curtains screening at the entrance and exit of the inspection tunnel for damage.

Replace any strips found to be damaged.

7.4.3. Conveyor Visual Checking

- Visually inspect the conveyor belt for tears and holes, replace the belt if excessive damage is found. Also check if with dust between the conveyor and the belt, this is a sign that the belt rubs against the inside housing. In this case, please clean the inspection tunnel, also the collimating slit inside the inspection tunnel, then adjust the belt tightness.

7.4.4. Indicator and Buttons Checks

This checking is required to turn on the X-ray system.

- Check the power indicator bar above the exit and entry. The green light is on when the device powered on.
- Check four X-ray indicators at four corners of top panel. The red light is on during X-ray emitting.
- Check the emergency stop button above the exit and entry, once press down the button, the conveyor and x-ray generator will power off immediately. And the device can not be restarted without resetting this button.

7.4.5. Photosensors-Infrared Sensors Checks

This checking is required to turn on the X-ray system.

- Check Infrared Sensors at exit and entry. Place opaque objects on the running belt and the x-ray can be turned on normally. After the device is powered off, wipe the IR lens with a dry lint free cloth.
- IR Transmitter: the red light is always on in the standby state, and the light is off when it fails.
- IR Receiver: when in standby mode, the light is not on, the red light is on when it is faulty or being blocked.

7.4.6. Radiator-Fan Checks

- Check whether the cooling fan is working properly and remove the dust from the protection net and the bracket.

7.4.7. Conveyor Motion Checks

This checking is required to turn on the X-ray system.

- Press the forward button ("A" on standard keyboard), and observe that the associated indicator on scanning screen is lit the conveyor moves in the forward direction. Check for excessive noise from each roller bearing- this will indicate that the bearing is defective. Check the conveyor belt central deviation at each end. The maximum deviation allowable is within 20mm within 10 minutes after started.
- Press the STOP button ("S" on standard keyboard). Press the reverse button ("D" on standard keyboard), and observe that the associated indicator on scanning screen is lit and the conveyor moves in the reverse direction. Check the conveyor belt central deviation at each end. The maximum deviation allowable is within 20mm within 10 minutes after started.

7.4.8. Radiation Leakage

- Using a high sensitivity dosimeter, e.g. measure the surface leakage of the system when the X-rays are on, including exit and entry. Normally, the surface leakage lies within the range of natural radiation. The limit for radiation is 1 $\mu\text{Sv/hour}$ externally. The external radiation emission of U.S. federal limit is 5 $\mu\text{Sv/hour}$.

8. Common Faults and Trouble-shooting

This chapter will introduce the common faults and trouble-shooting which may occurred during daily use. Please read Safety instructions carefully before maintenance.

The maintenance of X-ray security inspection system can only be carried out with the components provided by our company. For any faults caused by maintenance without manufacturer's authorization or using components provided by manufacturers, our company shall not undertake any responsibility.

We reaffirm that all the maintenance and adjustment should be taken by qualified technician. Before powering on the X-ray inspection scanner ensure that all the circuit boards are inserted to the proper position.

NOTE! Please note that the machine must be powered off when pulling and plugging printed circuit board.

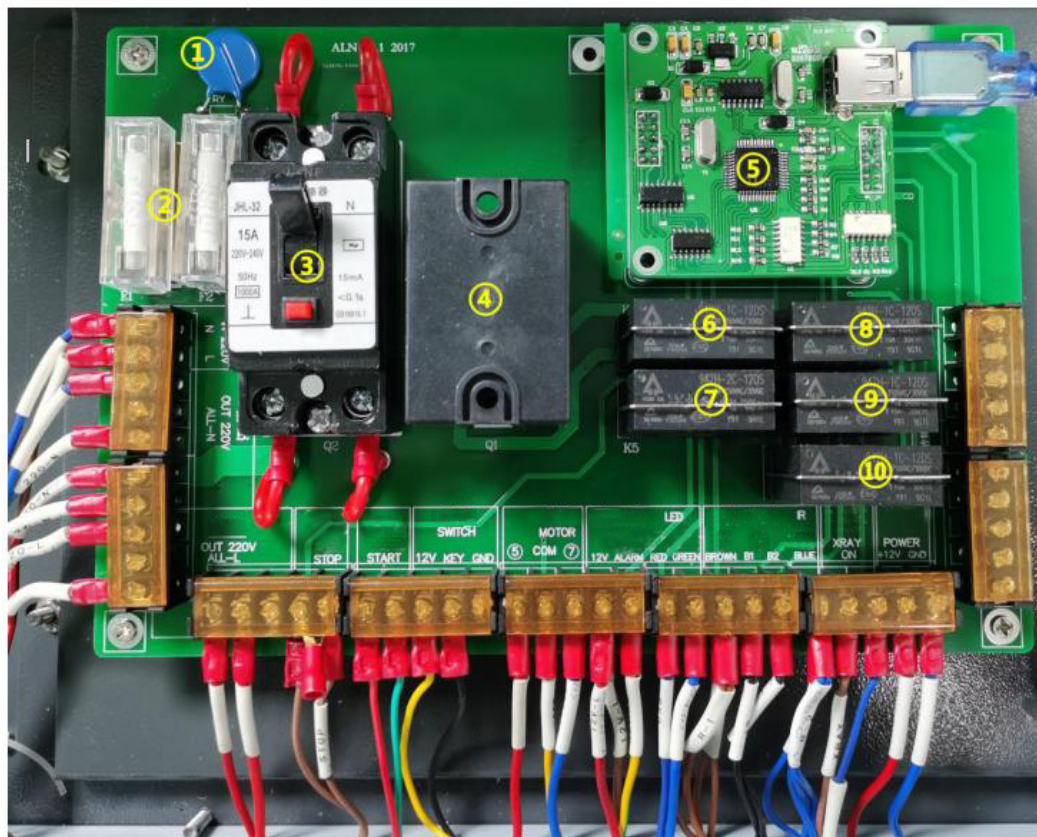


Figure 79 Key Main Switchboard

1. Capacitance
2. Protective Tube
3. Leakage Protector
4. AC Contactor
5. Sub Control Board
6. Relay Switch
7. Relay of Emergency Stop
8. Relay of X-ray Generator
- 9/10. Relay of motorized Roller

8.1. Turn the key switch to the open state “On”, press the green start button, the device cannot be turned on

A: Use a multimeter to check whether there is voltage at the input interface on the switchboard.
Replace power supply

B: Check whether the leakage protector switch has tripped.
Turn on the leakage protector on the main switchboard.

C: Use a multimeter to check whether the two ends of the protective tube are connected to each other.
Replace the protective tube on the main switchboard.

D: Check whether the power supply cable of the main switchboard is properly connected , whether the cable are loose.

Connect correctly, or replace the main switchboard.

8.2. The power indicator is on, but the display is off.

A: Check whether the industrial personal computer(IPC) is turned on.
Press the IPC's switch button.

B: Check whether the VGA cable is damaged.
Replace VGA

C: Check whether the power supply cable and VGA cable of the monitor are disconnected or damaged.
Re-plug the cables, replace it if it breaks

D: Check if the monitor is damaged.
Replace the monitor.

8.3. After power on, the software close then shut down automatically.

A: Whether the sub control board is damaged.
Replace the sub control board.

B: The key switch is not turned on.
Turn the key switch to the "On" position.

C: Check whether the switch button circuit is connected normally.
Connect the cables correctly.

8.4. Baggage image is blanked and no image display.

A: The background color(belt) is not calibrated.
The background color needs to be calibrated every time after the scanner is turned on.

B: Whether the infrared Sensor working condition.
Replace the infrared sensor
Transmitter: the red light is always on in the standby state, and the light is off when it fails
Receiver: When in standby mode, the light is not on, the red light is on when it is faulty or blocked

C: Check whether the network cable (old version) or data cable(new version) is loose.
Re-plug the network cable again, and replace the network cable or data cable again

D: Check whether the 5V power supply lamp is not on.
Replace the power supply.

E: Check the network board is damaged.
Change the network board.

F: Check whether the terminal (in the L-Shape Box) is plugged in or damaged.
Plugin the terminal or replace the terminal.

G: Check if there is a problem with the flat cable.
Replace the flat cable.

H: Check that the IPC's IP address is correct. Fixed IP address: 192.168.5.20, Subnet Mask: 255.255.255.0
Correct the IP address

8.5. There is an image but the color is abnormal.

A: Check whether the network board is damaged.
Replace the network board

B: Check whether the terminal (in the L-Shape Box) is off or damaged.
Insert the terminal tightly, or replace the terminal if damaged.

8.6. The conveyor belt does not rotate.

A: Check whether the emergency stops in both tunnel access(or in the special keyboard/console) is pressed and whether the side panels are closed.
Turn the emergency stop button till it pup-up, and close the side panels.

B: Check whether the software connection indicator "Connect" is on and change the serial port ID.

C: Whether the Controller for Motorized Roller circuit is loose.
Tighten the circuit.

D: Whether the 60V power supply of Motorized Roller is normal (compact size scanner).
Replace the motorized roller power supply.

E: Whether the Motorized Roller circuit is broken or hot.
Replace the Motorized Roller.

F: Whether the red light of the motorized roller relay is on, two lights on or no light on is abnormal (large size scanner).
Replace the motorized roller relay.

G: Check conveyor belt is running off or stuck.
Adjust the belt.

8.7. No image, snowflake dots, all in black.

A: Check whether the X-ray Generator is turned on.
Turn on green switch.

B: Check whether the collection indicator"Connect" in software is on.
Re-plug the network cable back in, or make a new crystal head.

C: Check whether the network board is damaged. (Can't judge with the naked eye.)
Replace the network board.

D: Open the the "Curve" in the X-ray software, click the "Capture" then click "X-ray", and see if there is a curve.
If no curve: and the green "X-RAY" red indicator in the X-ray generator is on, please replace the x-ray source.
If with curve: x-ray generator system is working well.

E: Click the Calibration in the software "Calibrate" to see if the "X-RAY " light in the X-ray generator is on.
If it is not on, replace the control line, or replace the X-ray generator.

8.8. The image has black lines.

A: The acquisition board is damaged.
Replace the acquisition board.

B: There are metal objects in the channel.
Clean the metal in the channel.

8.9. The alarm no sound.

A: Check whether the alarm setting is turned on.
Turn on the high-density alarm setting in the settings.

B: Whether the warning light circuit is off.
Connect the wiring correctly.

C: Whether the warning light is damaged.
Replace the warning light.

8.10. The roller can't rotate automatically when scanning baggage.

A: Check the AI roller setting in the software whether is turned on.
Turn on the AI roller in the software.

B: Check the built-in infrared sensors light on the both sides tunnel whether is red or not.
When the sensor blocked, both sensors light are not on, then they were damaged.
When no block, both sensors light are on, then they were damaged.

8.11. The IPC can't start automatically.

A: The power socket whether is off.
Reconnect the power socket firmly.

B: The adapter whether is damaged.
Replace the adapter.

C: Check the power supply on the main switchboard whether is properly connected.
Connect the power supply correctly.

D: The main board battery is dead. Replace the main board battery.

8.12. The software connection indicator“Connect”does not light up.

A: Check whether the sub control board is damaged.
Replace the sub control board.

B: Check whether the serial COM port setting is correct
Change the serial COM port settings, keep the COM number same in both IPC and x-ray software.

C: Check whether the USB cable is damaged.
Replace the USB cable.

8.13. The scanner cannot be shut down.

A: Check whether the Com port is selected correctly.
Reset the correct serial port.

B: Whether to shut down via the software.
If use the key to shut down, must stay in the X-ray software, then switch the key.

C: Check whether the USB cable is damaged.
Replace the USB cable.

D: Check whether the sub control board light flashes.
Replace the sub control board if the light flashes.

E: Whether the key button line of the console is correct.
Correctly connect the key cables or replace the key button.

F: Whether the start button cables is correct.
Correctly connect the start button cables, or replace the start button.

9. After-sales Services

9.1. Manufacturer Guarantee

We are the professional manufacturer and supplier of security inspection equipment to put technical support and after-sales services at the forefront and we are dedicated to providing quality services to our customers.

9.2. Device Acceptance Inspection

- After the receipt of the equipment, the user should inform our company, so that we will arrange professional engineer to conduct acceptance, installation and debugging. For the sake of users, technical support engineers should carefully make an inventory of the equipment and accessories according to order contract and packing list one by one. If there are any damage and mistakes, the technical support engineers shall assist to execute the claim work, or inform the company immediately to make corrections and supplement, and then carry out the installation and debugging work according to technical specification of equipment.
- During installing and debugging, users should actively coordinate the work to ensure the system put into operation as soon as possible.
- Equipment acceptance standard: The equipment acceptance should be conducted according to the standards and methods specified in the contract.
- Equipment acceptance period: The warranty shall take effect seven days after receipt of the goods. The acceptance report is signed by the user, and this day is defined as the begin day of the warranty period. If overdue, the company will not undertake any responsibility.

9.3. Technical Training

This manual has included all the operation knowledge of the X-ray inspection system, please read it carefully after this basic technical training. Please contact your sales partner to have video version about training.

1.1.1 Basic Operation Training

- How to install the scanner
- How to ensure safety, including the safety labels, radiation safety
- How to start the scanner
- How to scan bag
- How to display x-ray image
- How to terminate your work

9.4. After-sales Services Items


Thank you for choosing our X-ray inspection system.

The services are as follows:

- Choose the near maintenance units authorized by our company.
- If you have any questions and maintenance difficulties, please firstly contact with our after-sales department. Please have the following information available when you call:

- The *model* and *serial number* of your x-ray baggage scanner;
Note: The serial number of our scanner is located under the conveyor bed.
- A description of the problem and any error messages that were displayed. Sending back the relative picture and video materials.
- The following cases are not covered by the warranty.
 - Damage caused by users improper operation, maintenance and storage.
 - Damage caused by irresistible force.
 - Maintenance carried out by non-designated maintenance units or oneself.
 - Combination or assembly with the equipment from other companies without the expressly written permitted by our company.

9.5. Device Disposal

<h3>Device Disposal</h3> <p>Respected User: When you are no longer using this product and want to drop it, please keep in mind that it contains many components with recyclable valuable. Please don't discard this product at random, but consult local authorities. Scrap X-RAY source please return to supplier for safe disposal.</p>	
--	--

10. X-Ray Certificate Examples

Verification of Compliance

Certificate Number: B-E171115564

Equipment Class: FCC Part 15 Class B

Beide
Compliance Laboratory

Holder.....: Polimek Electronics A.S

Address.....: AOSB 10024 STREET, NO:9, CIGLI, IZMIR, TURKEY

Manufacturer.....: Same as holder

Address.....: Same as holder

Product.....: X Ray Baggage Scanner

Model No.....: 5030A,5030C,6550A,6550C,8065,10080,100100

Technical Data....: 120V~,60Hz,0.5KW

This device is in conformance with Part of the FCC Rules and Regulations for Information Technology Equipment. Operation of this product is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

We, the responsible party:


Polimek Electronics A.S

Declare that the product

X Ray Baggage Scanner

M/N: 5030C




Certification Manager
Date: Nov. 20, 2017

KOPYADIR



Company No.07113834



Be tested to conform to the applicable FCC Rules and Regulations. The method of testing was in accordance to the most accurate measurement standards possible, and that all necessary steps have been enforced to assure that all production units of same equipment will continue to comply with the Federal Communications Commission's requirements.

Certificate of Conformity

Certificate Number: B-S171115565

Low Voltage Directive 2014/35/EU

Beide
Compliance Laboratory

Holder: Polimek Electronics A.S
Address.....: AOSB 10024 STREET, NO:9, CIGLI, IZMIR, TURKEY
Manufacturer.....: Same As Holder
Address.....: Same As Holder
Product.....: X Ray Baggage Scanner
Model No.....: 5030A,5030C,6550A,6550C,8065,10080,100100

Technical Data....: 220-230V~,50Hz,0.5KW

The submitted products have been tested by us with the following standard(s) and found to be in compliance with the listed European Directives.

EN 60204-1:2006+A1:2009

The test results apply only to the particular sample tested and to the specific tests carried out. Technical Report and documentation are at the Holder's disposal.

This certificate applies specifically to the sample investigated in our test reference number only. The CE markings as shown below can be affixed on the product after preparation of necessary technical documentation. Other relevant Directives have to be observed.



Certification Manager
Date:Nov.22,2017



KOPYADIR



Company No.07113834



0090 5820

Beide (UK) Product Service Limited

U.K.: Flat 107, 25 Indecon Square, London, United Kingdom

China: 6F, Bldg E, Hourui 3rd Ind Zone, Xixiang, Bao'an Dist, Shenzhen, China

Http://www.szbeide.com E-mail: admin@szbeide.com

Certificate of Conformity

Certificate Number: B-E171115566
EMC Directive 2014/30/EU

Beide
Compliance Laboratory

Holder.....: Polimek Electronics A.S
Address.....: AOSB 10024 STREET, NO:9, CIGLI, IZMIR, TURKEY
Manufacturer.....: Same As Holder
Product.....: X Ray Baggage Scanner
Model No.....: 5030A,5030C,6550A,6550C,8065,10080,100100
Technical Data...: 220-230V~,50Hz,0.5KW

The submitted products have been tested by us with the following standard(s) and found to be in compliance with the listed European Directives.

EN 61000-6-3:2007+A1:2011;
EN 61000-6-1:2007;
EN 61000-3-2:2014;
EN 61000-3-3:2013

The test results apply only to the particular sample tested and to the specific tests carried out. Technical Report and documentation are at the Holder's disposal.

This certificate applies specifically to the sample investigated in our test reference number only. The CE markings as shown below can be affixed on the product after preparation of necessary technical documentation. Other relevant Directives have to be observed.



Certification Manager
Date: Nov. 20, 2017



Company No. 07113834



0 0 9 0 5 8 2 0

Beide (UK) Product Service Limited

KOPYADIR

U.K.: Flat 107, 25 Indescon Square, London, United Kingdom

China: 6F, Bldg E, Hourui 3rd Ind Zone, Xixiang, Bao'an Dist, Shenzhen, China

Http://www.szbeide.com E-mail: admin@szbeide.com

11. Packing Acceptance List

NO.	NAME	SPECIFICATION AND MODELS	QUANTITY	UNIT	NOTE
1	Model	<input type="checkbox"/> 5030 <input type="checkbox"/> 5335 <input type="checkbox"/> 6040 <input type="checkbox"/> 6550 <input type="checkbox"/> 8065 <input type="checkbox"/> 10080 <input type="checkbox"/> 100100 <input type="checkbox"/> 150180 <input type="checkbox"/> _____		set	
2	Industrial Control Host	<input type="checkbox"/> _____ <input type="checkbox"/> _____ ;		set	
3	Display	<input checked="" type="checkbox"/> 21.5inch ; <input type="checkbox"/> _____ ;		set	
4	Special Keyboard	<input type="checkbox"/> Special keyboard ; <input type="checkbox"/> No		set	
5	Alternative Keyboard/Mouse	<input type="checkbox"/> _____ ; <input type="checkbox"/> _____ ;		set	
6	User Manual	<input checked="" type="checkbox"/> User Manual	1	copy	
7	Certificate	<input checked="" type="checkbox"/> Certificate	1	copy	
8	Written Warranty	<input checked="" type="checkbox"/> Written Warranty	1	copy	
9	Project Acceptance Certificate	<input checked="" type="checkbox"/> Project Acceptance Certificate	1	copy	
10	Warranty Card	<input checked="" type="checkbox"/> Warranty Card	1	copy	
11	Packing List	<input checked="" type="checkbox"/> Packing List	1	piece	Customer use
12	Roller Table	<input type="checkbox"/> Standard Type <input type="checkbox"/> Customized	1	set	
13	Operation Desk	<input type="checkbox"/> Single Display Work Station <input type="checkbox"/> Dual Display Work Station <input type="checkbox"/> _____ ;		set	
Date of Survey : _____. Inspector : _____.					

Security Products Warranty

Security products Certificate

Thanks for using our following products:

Equipment Model:

<input type="checkbox"/> 5030	Quantity:	set
<input type="checkbox"/> 5335	Quantity:	set
<input type="checkbox"/> 6040	Quantity:	set
<input type="checkbox"/> 6550	Quantity:	set
<input type="checkbox"/> 8065	Quantity:	set
<input type="checkbox"/> 10080	Quantity:	set
<input type="checkbox"/> 100100	Quantity:	set
<input type="checkbox"/> 150180	Quantity:	set
<input type="checkbox"/> _____	Quantity:	set

Thanks for using of our following products:

Product Name: X-ray security inspection equipment

Product Model: _____

Product Number: _____

The product model in accordance with "GB15208.1-2005 micro-dose X-ray security inspection equipment" standard, rigorous testing.

Conclusion is: _____ grant factory

Inspectors:

Inspection date:

During usage, please follow the instructions accordingly, the manufacturer will offer

free maintenance for non-artificial damage during warranty period.

polimek®

WARRANTY CERTIFICATE



The warranty period starts from the delivery date of the goods and is 1 (one) year.

All parts of the goods and the products itself are under our company's warranty.

In case of failure of the goods during the warranty period, the period of repair is added to the warranty period. The repair period of the goods is up to 30 working days. This period starts from the date of notification to the service station of the defective goods, if the service station is not available to one of the sellers, dealers, agents, representatives, importers or manufacturers of the goods.

In case of failure of the product due to both material and workmanship and installation errors during the warranty period, products shall be repaired without any charge for the replacement part or labour cost..

Malfunctions caused by the usage of the product beside explained in the user manual are not covered by the warranty.

A handwritten signature in blue ink.

CEO