2MX-4233

X-Ray Baggage Scanner

User Manual

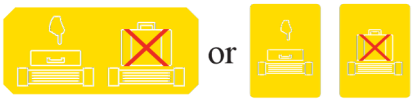


Manual Version: 2025-10

Chapter I Safety Warning Signs

Please refer to table 1.1 for meaning and position of safety warning Signs on X-ray inspection system.

Table 1.1 Meaning of Safety Signs

No.	Sign	Purpose or Meaning	Position
1		Film safety and radiation hazard	Lintel of access
2		Baggage placing mode	Lintel of access
4		Warning sign for strong current	Exterior of power box
5		GND terminal sign	Internal GND of equipment
6		Sign for X-Ray Source	X-ray source or sensor box
7		Sign for Moving Parts Present	Both sides of roller
8		Sign for Minding your hand	The front of the console panel
9	**EMERGENCY**	Sign for emergency stop	Near Emergency Stop button
10	**POWER**	Sign for Power Light	On or Near the power light
11	**X-RAY**	Sign for X-ray light	On or near the x-ray light
12	**ALARM**	Sign for alarm light	On or near the alarm light

Chapter II Safety Precautions

1. Operators shall receive trainings on radiation protection according to the requirements of local laws and regulations before operating the X-ray inspection system.
2. If necessary, the installation and operation of X-ray inspection system shall be notified to relevant competent authorities at the place where the equipment is used, and the radiation safety inspection shall be carried out. Please inspect the radiation protection of X-ray periodically.
3. Operators shall know specifications and requirements on radiation protection before operating the X-ray inspection system.
4. In case of power failure of internal X-ray generator for a long period, preheating is required before reuse, to guarantee the service life of X-ray generator. Please operate as per the corresponding prompt message of the operation inspection station.
5. The environment where the X-ray inspection system is operated and stored shall be free from conductive dust and chemical gas, etc.
6. Operators shall receive necessary trainings on use before using the equipment.
7. Before power on the equipment, the supply voltage provided on site for the equipment shall be in conformity to requirements, and the power capacity shall not be lower than the service power of equipment. Please refer to the power supply parameters of X-ray inspection system for the parameters.
8. The power supply shall be earthed in good conditions and the equipment shall not be used in case of unconformity to the required earthing conditions.
9. Please contact professional maintenance personnel or local after-sales sector for installation or replacement of parts.
10. Stop using the equipment and contact local after-sales service sector at the sight of damage of external cables, conveyer, lead curtain or indicator.
11. Operators shall not open the shield plate to operate internal components. Such operation shall be only limited for professional maintenance personnel.
12. During operation of equipment, someone shall be on duty.
13. During operation of equipment, any part of human body (or other living organisms) shall not enter the aisle.
14. Articles to be inspected shall be placed on the rubber belt or roller way of conveyer in compliance with requirements indicated by labels at the entrance and exit of aisle.
15. After the conveyer is started, operators shall pay attention to the position of inspected articles on the conveyer, avoiding articles to be inspected from blocking the aisle or falling off.
16. During inspection, no liquid shall flow into the equipment. In the event of similar conditions, stop the machine to clear it immediately.
17. During operation of equipment, do not cover the ventilation opening of shield plate, to guarantee the good internal heat dissipation.
18. During daily cleaning and maintenance, please power off to ensure the safety.

Chapter III Appearance and Special Keyboard

Introduction of::

- Appearance
- Special keyboard

3.1 Appearance

The typical equipment is as shown in 10080.

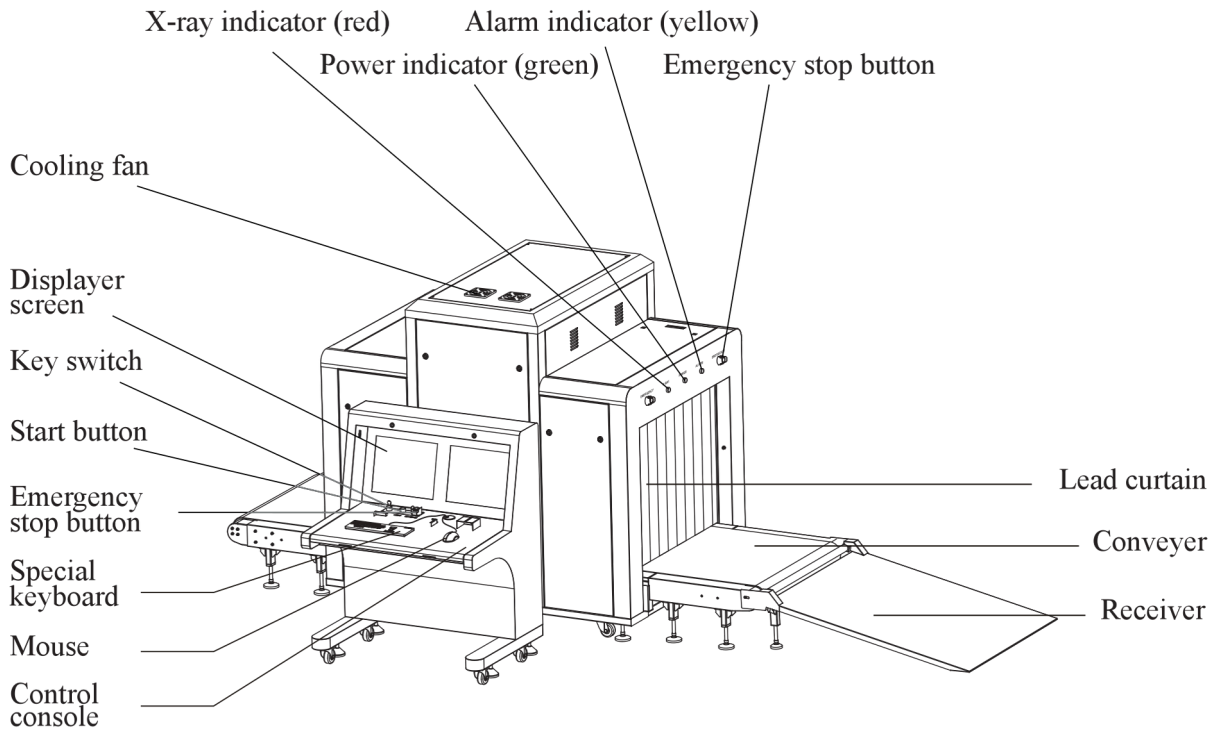


Fig 3.1 10080 Outline Drawing

Emergency Stop button: Emergency stop buttons are installed above exit (2 pcs) and entrance (2 pcs) of scanning aisle and on the control console. In the event of emergency, press any emergency stop button to stop x-ray emission and operation of conveyer.

> ★ **NOTE:**
>
> Note: An emergency stop button has locking function, so you may rotate the button gently at about 30° as per the arrow direction to bounce the button to reset it to the normal state.

Cooling fan: Two cooling fans are installed on the top of equipment. They operate after power-on of equipment to effectively dissipate the heat of X-ray source during operation, extending the service life of light source.

Power indicator: Green power indicators are installed above the entrance and exit of scanning aisle. They will be on simultaneously after power-on of equipment.

X-ray indicator: Red X-ray indicators are installed above the entrance and exit of scanning aisle. They will be on simultaneously during X-ray emission.
Alarm indicator: Yellow alarm indicators are installed above the entrance and exit of scanning aisle. When the alarm function started, the scanning image will be indicated with marker box and the alarm indicators will be on if inspected articles contain suspected hazardous articles, drugs and impenetrable articles.
Lead curtain: Lead curtains are installed at the entrance and exit of scanning aisle. During X-ray emission,they can block X-ray inside the aisle to prevent X-ray from external leakage.
Conveyer: A conveyer is installed in the aisle. It's mainly composed of electric drum, roller, direction changing roll, rubber belt and holder and used for conveying inspected articles.
Control console (operation desk): It includes a displayer and a special keyboard. The displayer shows images of inspected articles and the special keyboard provides equipment hardware control operation and image processing operation.
PC mouse: Roll the mouse wheel to zoom images. After enlargement, press left mouse button to drag images. Images can be used flexibly either at the motion status or static status.
Articles receiver: An articles receiver is installed at the exit of aisle to allow customers to take out the inspected articles after security inspection.
Key switch (ON/OFF): It's used to power on the control system of equipment and to prevent non-operating personnel from operating the equipment. Rotate 90° clockwise to the "ON" position to power on the control system; rotate 90° anticlockwise to the "OFF"position, it will exit the software and power off the system automatically.

> ★ **NOTE:**
> The key can be pulled out only at "OFF" position.

Start button (START): Press the "start button" when the key switch at "ON" position to power on and start the system, and the power indicator will be on simultaneously.

3.2 Special Keyboard

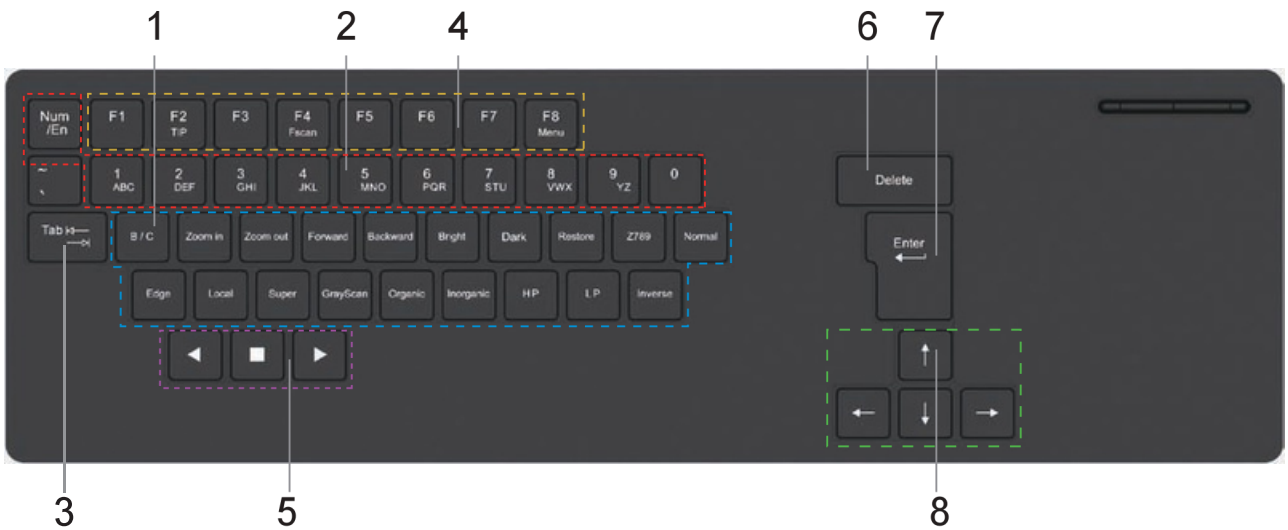


Fig 3.2 Special Keyboard

1. Image Processing Function Keys



B/C : switches color display and black/white display.



Organic : removes inorganics and highlights organics



Inorganic : removes organics and highlights inorganics



Inverse : switches display of positive and negative films.



Edge : highlights edge contour of image.



Local : highlights high absorption zone of image.



Super: enhances the overall image and highlights details.



HP : improves contrast ratio of high absorption zone.



LP : improves contrast ratio of low absorption zone.



Z789 : highlights suspected explosive in image.



Bright : increases image brightness.



Dark : Reduces image brightness.



Restore : restores to default status.



Normal : calibratethe system manually (Note: Empty the aisle at first. Otherwise, calibration will fail or images will be abnormal).



Forward : displays previous baggage scanned.



Backward : displays next baggage scanned.



Zoom in : enlarges the image.



Zoom out: scales the image.



Grayscan : displays zones of image with different absorption rate dynamically.

2. Character Input Keys



: (Shift key) Press the key to shift input digit or letter.



: Inputs ` or ~ with the help of shift key.



: Inputs 1 or a, b and c with the help of shift key.



: Inputs 2 or d, e and f with the help of shift key.



: Inputs 3 or g, h and I with the help of shift key.

4 JKL : Inputs 4 or j, k and l with the help of shift key.

5 MNO : Inputs 5 or m, n and o with the help of shift key.

6 PQR : Inputs 6 or p, q and r with the help of shift key.

7 STU : Inputs 7 or s, t and u with the help of shift key.

8 VWX : Inputs 8 or v, w and x with the help of shift key.

9 YZ : Inputs 9 or y, z with the help of shift key.

0 : Inputs 0.

3. Tabulator Key

Tab : Reserved key.

4. Function Group Keys

9 YZ : Detects hazardous articles.

9 YZ : Suspends conveyer and put in thin articles to be scanned after pressing the key F4 (force scan). Run the conveyer to start the force scan and display the scanned image.

9 YZ : Suspends the conveyer. Press the key F8 (menu) to show main menu interface.

Note: Other F keys have no default function, and they are reserved for other functions.

5. Conveyer Control Key

◄ ■ ► : Press " ◄ " to control the roller to rotate forward, press " ■ " to stop the roller and Press " ► " to control the roller to rotate reversely.

6. Delete Key

Delete :Deletes characters or other content.

7. Confirm Key

Enter : Press the key to confirm during setup of X-ray inspection system parameters. You may also click the "confirm" key on the interface after parameters setup to confirm it.

8. Direction Keys

↑ ← ↓ → :At the enlarged status of image, press such direction keys to move the image vertically and horizontally.

Chapter IV Equipment Operation

Introduction of:

- Inspection before startup
- Startup
- Articles inspection
- Shutdown

> ★ **NOTE**
> Please read "Safety Precautions" in this manual carefully before operating the equipment.

4.1 Inspection before startup

Step 1 Please inspect whether the connection of power supplycables is good; whether the earthing of power supply is good; whether the emergency stop button on the shield plate of machine is pressed (If pressed, please rotate clockwise to reset it); whether the emergency stop switch on the control console is pressed (If pressed, please rotate it clockwise to reset it); whether the keys of special keyboard operate normally.

The power connection position is as shown in figure 4.1:



Fig 4.1 Power Supply Connection Position

> ★ **NOTE**
> In case of damage of cable sheath damage, failure of emergency stop button or jam of special keyboard, stop using the equipment and contact local after-sales service sector.

Step 2 Inspect whether the lead curtains at the entrance and exit of aisle for prevention of X-ray leakage are good; curtains shall have no evident gap and no evident damages.

> ★ **NOTE**
> In case of excessive gap or severe damage of lead curtains, stop using the equipment and contact local after-sales service sector.

Step 3 Inspect the surface of conveyer belt. There shall be of no cracks on the surface, and a certain distance shall be provided between the conveyer belt edge and guard plates at both sides.

> ★ **NOTE**
> In case of evident deviation of conveyer position from the aisle center (snap of edge into guard plates at both sides) or insufficient tensile force (loose conveyer surface), adjust the conveyer position under the professionals' guide, or read the maintenance manual carefully.

Step 4 Inspect whether there are articles in the aisle, and clear them out of the aisle if any.

4.2 Startup

Step 1 Step1Insert the power cable plug into the power socket at the service site, ensuring the normal power supply.

Step 2 Insert the key into the key switch (ON/OFF)  of special keyboard, rotate 90°clockwise to the ON position and power on the control system; press the start button (START) , You will hear the closing sound of internal relay, Then wait for startup.

> ★ **NOTE**
> Before pressing the start button, please inspect whether the emergency stop button  at the exit and entrance of equipment or the emergency stop button  on the control console is pressed. If pressed, X-ray generator and conveyer shall not be started. Before starting the equipment, please rotate the emergency stop button  30 degrees clockwise to reset it.

Step 3 The power indicator  on the equipment is on, which indicates the inspection system has been started.

> ★ **NOTE**
> During start of equipment, in the event of fault of conveyer, X-ray generator, you may press the emergency stop button  to power off the parts above.

Step 4 As shown in figure 4.2, the software system will enter the interface of "clear aisle" and you may select the clear mode as per the prompt.



Figure 4.2 Prompt Interface of Clear Aisle

Selection of Clear Mode:

- In case of articles in the aisle, please click the button Left or Right on the interface of Clear Aisle to clear the articles in the aisle. Click the button Stop to stop the conveyer.
- After the clear is completed or if no clear step is required, click Close on the interface of clear aisle or lightly press any key of special keyboard to enter the interface of "Set Fulls" as shown in figure 4.2.

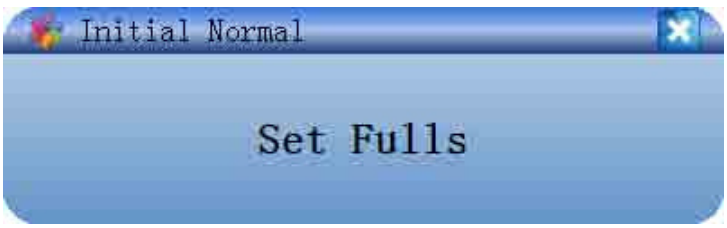


Figure 4.3 Prompt Interface of Set Fulls

After Initial success, enter the main interface of inspection station.

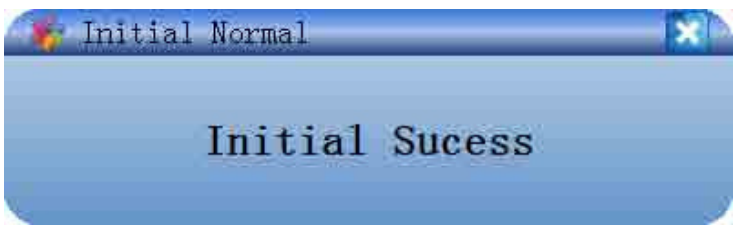
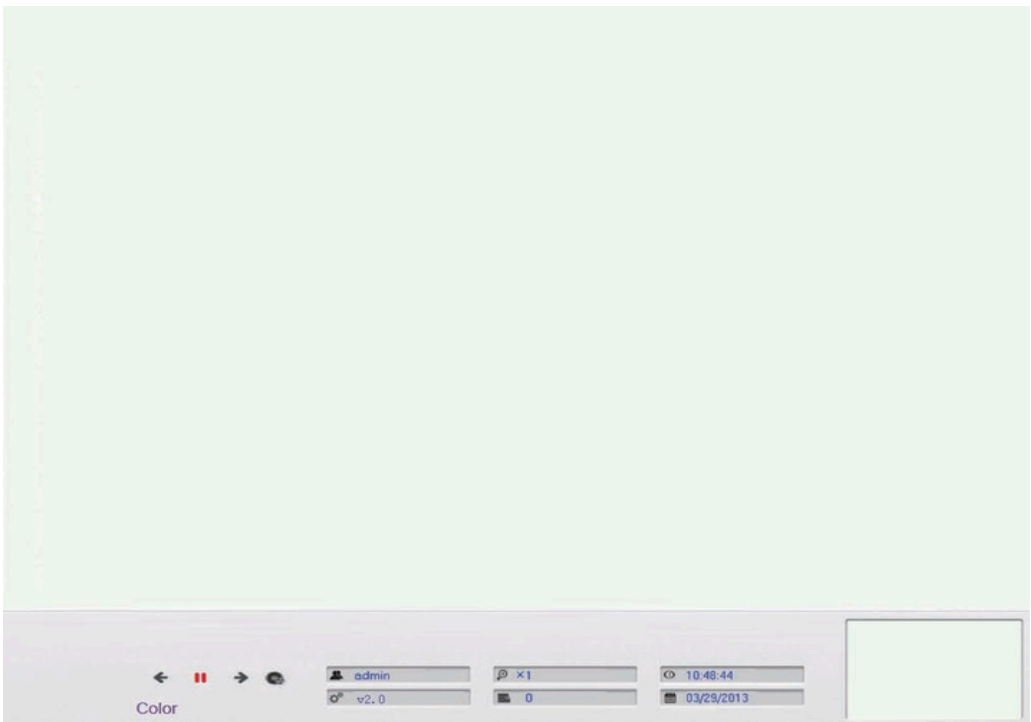


Figure 4.4 Prompt Interface of Initial Success

System Main Interface:

As shown in figure 4.5, It is the main interface of inspection station.



4.5 Main Interface of X-ray Inspection System

The white zone above the main interface is the display zone of scanned image. During scan, such zone will show the scanned image of inspected article in the form of scroll. The status information zone and image navigation zone are below the image display zone.

4.3 Inspection of Articles

Step1 The system will complete calibration automatically when entering the main interface and will start inspection of articles when prompting “normal success”.

Step2 Articles inspected shall be placed on the conveyer steadily as per the mode indicated by the “articles placing label”  or  at the entrance of equipmen.

> ★ **NOTE**
> Light articles, smudgyarticles or articles with damaged outer packing shall be put in an appropriate plastic container for inspection.

> ★ **NOTE**
> Inspected articles must be placed outside of lead curtain! Do not put hands into the aisle!
> Do not drop or stack up inspected articles at the exit and entrance of equipment. If so, press the emergency stop button  on the equipment or emergency stop button  on the control console to stop the conveyer.

Step 3 Lightly press  or  on the special keyboard to operate the conveyer and place the inspected articles on the center of conveyer. The inspected articles will enter the aisle along with the conveyer. When the inspected articles in the aisle are scanned, the red X-ray indicator  will be on and the system will show scanned images on the displayer, as shown in figure 4.4.



Figure 4.6 Scanned Image

> ★ **NOTE**
> In case photoelectric sensors are installed at the entrance and exit, you may press ◄ or ► to scan the articles bi-directionally. Otherwise, the articles can be only scanned at forward rotation.

Step 4 You may click the image function keys on the special keyboard to read images as per the conditions of scanned images.

Step 5 Lightly press ■ on the special keyboard after inspected articles are moved out of the aisle along with the conveyor, to stop the conveyer. Then, the inspected articles may be taken away or further inspection may be made.

4.4 Power OFF

> ★ **NOTE**
> Before shutdown, Please confirm scanning has been completed and there are no articles in the aisle.

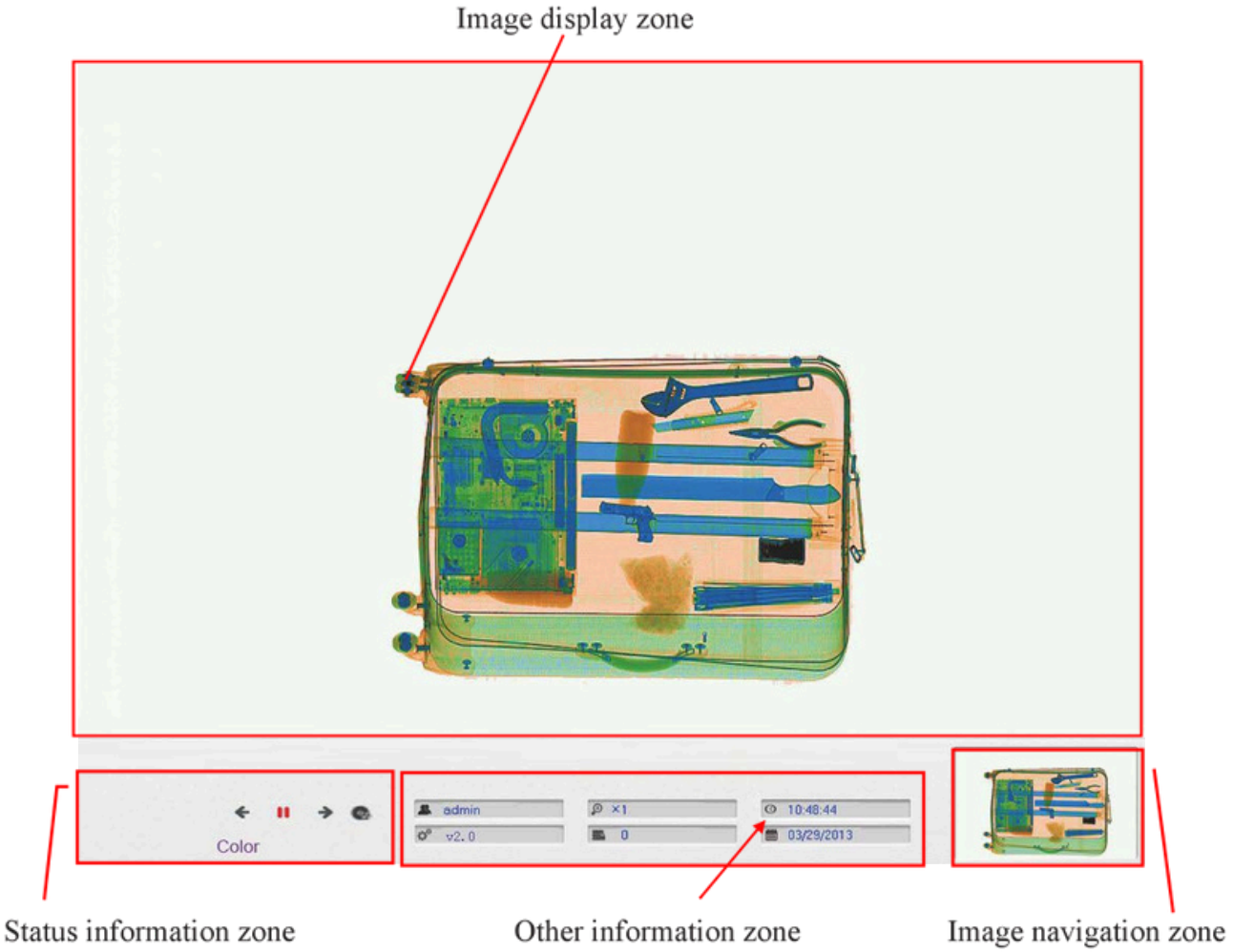
Step 1 Lightly press ■ on the special keyboard after inspection ends to stop the conveyer.

Step 2 Rotate the key switch anticlockwise to "OFF". The equipment will start being shut down. About 3 seconds later, the system equipment and all indicators will be off. At this moment, you may disconnect the external power supply.

> ★ **NOTE**
> After rotating the key switch to OFF, do not disconnect the external power supply immediately. Observe the prompt on monitor interface and disconnect the external power supply after all indicators are off.
> In case of UPS equipped, shut down the UPS after all indicators are off.

Step 3 Take out the key and keep it properly.

Chapter V Image Reading



Introduction of:

- Status information zone
- Other information zone
- Image navigation zone
- Image display zone

5.1 Status Information Zone

It includes error status display zone, operation status display zone and image processing status zone. These three sub-zones show the operation information, as shown in figure 5.1.

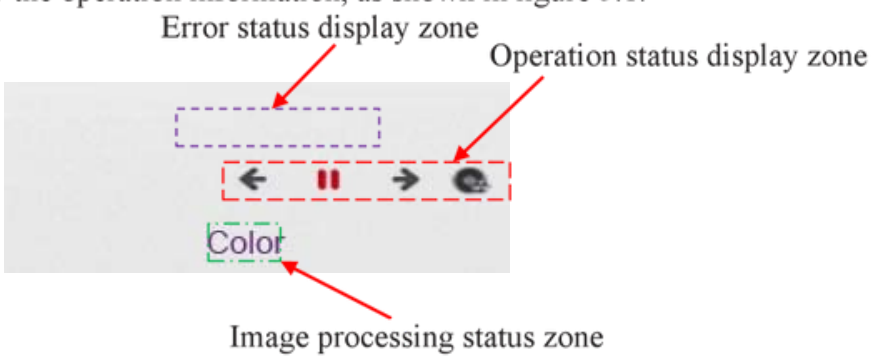


Figure 5.1 Status Information Zone

5.1.1 Error status display zone

prompts current error information. In case of no any prompt information currently, it indicates no errors, as shown in figure 5.1 above.

a) Calibration failure: Background and air calibration is unfinished (display failure of scanned images).

b) Side plate opening: The side plate is opened (failure of X-ray start and conveyer operation).

c) X-ray generator error: X-ray generator doesn't operate.

d) Probe box opening: The probe box is opened (failure of X-ray start and conveyer operation).

e) Motor error: Over-temperature protection of motor (the motor doesn't operate)

f) Emergency stop: Any emergency stop switch on the equipment or on the control console is pressed.

g) Acquisition system error: The acquisition system fails in collecting data of probe board.

h) Force scan: Click F4 to start the function of force scan.

5.1.2 Operation status display zone

displays current operation status of equipment. As show in figure 5.1, there are five operation statuses: "forward", "pause", "reverse", "X-ray on" and "X-ray off".

a)  **:** "forward" status of conveyer.

b)  **:** "pause" status of conveyer.

c)  **:** "reverse" status of conveyer.

d)  **:** "OFF" status of X-ray.

e)  **:** "ON" status of X-ray.

5.1.3 Image processing status zone

displays current image processing status, including color, local reinforcement, super reinforcement, edge reinforcement, gray scan, organic, inorganic, inverse, high penetration, low penetration, bright, dark, organics marker and black and white. You may directly operate through the special keyboard.



Figure 5.2 Articles Picture

a) Color / Black and White (B / C)

Press B/C on the special keyboard to shift between color and B/C. As shown in figure 5.3, you may press the button B/C to shift the display of color image and gray image.

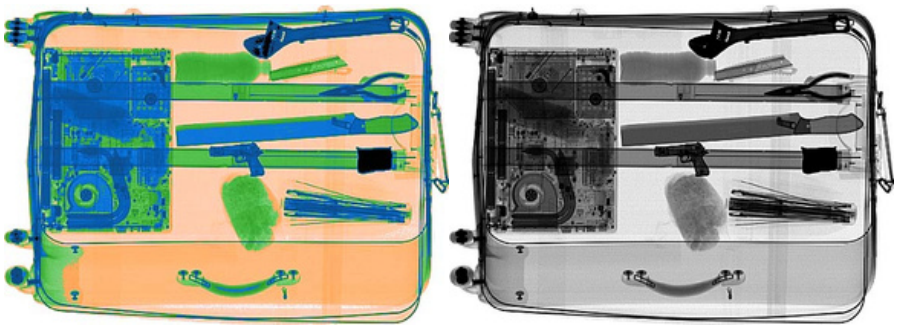


Figure 5.3 Color/Black and White Image Contrast

b) Local Reinforcement (Local)

Press Local on the special keyboard to reinforce dark zone in the image to clearly show the articles hidden behind the thick ones without impact on normal image zone. As shown in figure 5.4, you may press such key at the status of normal image display for local reinforcement, and re-press it to return to the status of normal image display.



Figure 5.4 Color Image / Local Reinforcement

c) Super Reinforcement (Super)

Press Super on the special keyboard to reinforce details of image to clearly show the articles hidden behind the thick ones. As shown in figure 5.5, you may not shift normal display and super display.



Figure 5.5 Color Image / Super Reinforcement Display Effect

d) Edge Reinforcement (Edge)

Press Edge on the special keyboard to sharpen the original image to highlight the outline. The system software will reinforce the edge of original image by default. As shown in figure 5.6, the original image is on the left and the edge reinforcement image is on the right.



Figure 5.6 Color Image /Edge Reinforcement Image

e) Gray Scan

Press GrayScan on the special keyboard,the image will automatically shift to gray mapping to brighten the dark zone gradually and darken the bright zone gradually. Thus, the operator can find acontrast and luminance effect most suitable for current image. You may re-press it to suspend the image effect display. The image effect can be displayed in circulation. The contrast effect of original image and gray scan image is as shown in figure 5.7.



Figure 5.7 Color Image/Gray Scan

f) Organic Highlight (Organic)

Press Organic on the special keyboard to show the blue part with gray and highlight the orange part. As shown in figure 5.8, the operator can identify inflammables such as explosive, drugs and gasoline, etc.



Figure 5.8 Color Image / Organic Highlight Display Effect

g) Inorganic Highlight (Inorganic)

Press Inorganic on the special keyboard to show the orange part with gray and highlight the blue part . As shown in figure 5.9, the operator can identify knives, guns and gas tank, etc.



Figure 5.9 Color Image / Inorganic Highlight Display Effect

h) Inverse

As shown in figure 5.10, press Inverse on the special keyboard to show articles with high absorption rate of X-ray as dark black and the ones with low absorption rate as bright white, to make tiny high density articles (such as metal wire) become clearer.



Figure 5.10 Color Image / Inverse Image Contrast

i) High Penetration (HP)

Press HP on the special keyboard to show the high penetration zone (bright and small contrast). As shown in figure 5.11, you may show the bright zone with an appropriate contrast through “HP” operation to show the high penetration zone clearly, but the normal zone will be affected and the contrast will be reduced.



Figure 5.11 Color Image / HP Effect

j) Low Penetration (LP)

Press LP on the special keyboard to show the low penetration zone (dark and not easy for observation). As shown in figure 5.12, you may brighten the zone and increase the contrast of the zone through "LP" to clearly show the image of such zone, but the normal zone will be affected and the contrast will be reduced.



Figure 5.12 Color Image / LP Effect

k) Bright

As shown in figure 5.13, press Bright on the special keyboard to brighten the whole image.



Figure 5.13 Color Image/ Brightened Image Contrast

l) Dark

As shown in figure 5.14, press Dark on the special keyboard to darken the whole image.



Figure 5.14 Color Image / Darkened Image Contrast

m) Suspected Organic Marker (Z789)

Press Z789 on the special keyboard to show suspected organics in reinforcement, i.e., to further highlight organics with equivalent atomic number Zeff=7, 8 or 9. You may view organics with equivalent atomic number Zeff=7, 8 or 9 in sequence. At this moment, as shown in figure 5.15, other zones of the image show gray and the zone where organics with designated equivalent atomic number are located with purple red to examine suspected articles.



Figure 5.15 Color Image /Suspected Organic Marker

n) Zoom in and out

Press Zoom in or Zoom out on the special keyboard to zoom in or out. There is a contracted drawing of amplified image at the lower right corner. You may move the enlarged zone with direction keys. You may also enlarge the image flexibly by mouse wheel, drag the image by left mouse button or drag the image by lightly pressing the direction keys ↑ ← ↓ → at the enlarged status.



Figure 5.16 Image Magnification

o) Forward and Backward

Press Forward or Backward on the special keyboard (in case of adapting to the screen) to pull the image forward and backward.

5.2 Other Information Zone

As shown in figure 5.17, other information zone shows user name, firmware version number, magnification times, number of baggages, current time and current date.

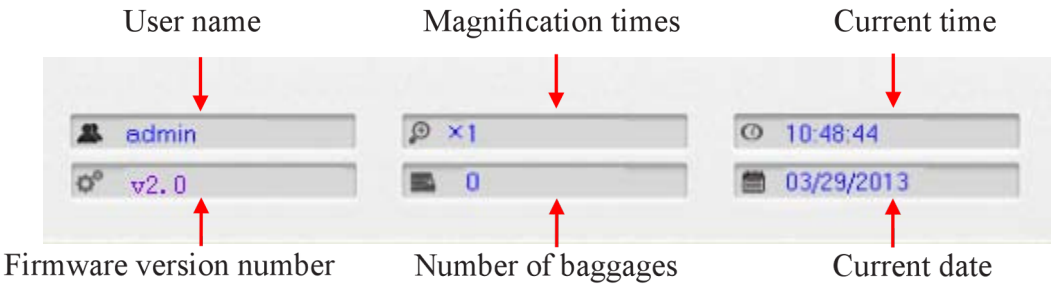


Figure 5.17 Other Information Zone

User name: prompts current user name.

Magnification times: prompts magnification times of inspected article image currently.

Current time: shows current time.

Current date: shows current date.

Number of baggages: prompts total number of baggages scanned from startup.

Note: Such data may be reset at the data counter of the main menu.

Firmware version number: shows the version number of firmware.

Note: At the train status, the box of firmware version number shows “train”.

5.3 Image Navigation Zone

Image direction navigation zone shows the relevant position of image in the whole display screen.

5.4 Image Display Zone

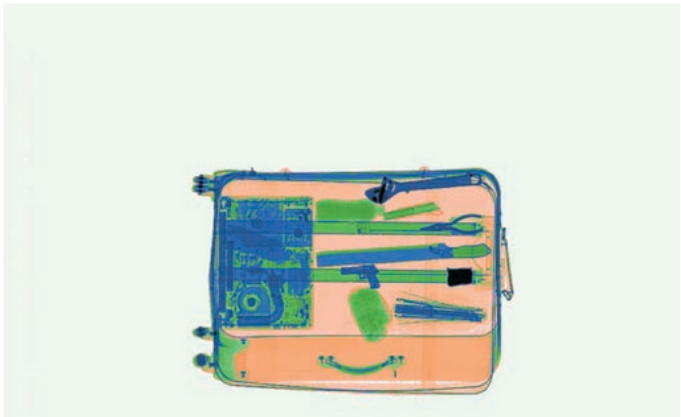


Figure 5.18 Other Information Zone

Image display zone: Inspected articles are shown in such zone in form of image after being scanned through the aisle. The operator may preview the images and operate image processing function keys to timely preview processed images.

Chapter VI Menu Operation

Introduction of:

- Login
- User Manage
- Real time curve
- Time Set
- Probe Point Set
- XRay Source Set
- Alarm Set
- Error Diagnosis
- Image Set
- Register
- Authority Manage
- Language
- Log Manage
- About
- TIP Report System
- TIP Manage
- Function Set
- Data Counter
- File Manage
- System Param Set

1) The interface of main menu is as shown in figure 6.0:
2) Operation procedure: In baggage scanning status or train status, press stop firstly and then press F8 Menu. Then, the system will pop up the interface of main menu automatically. You can not enter any submenu in case of no login, so please log in firstly: Input your user name and password in “Login” and click “login” (as shown in figure 6.1).
3) The user may make corresponding operations according to his /herown authority. Note: In case such user has no some authority, the button of this function module will become gray and unavailable, i.e., such user has no such authority to enter such menu for operation.



Figure 6.0 Main Menu Interface

6.1 Login

Click the menu of Login to enter the interface of login (figure 6.1). Input superuser name: admin (default) and password: 12345 (default). All menu functions are available only after the login is clicked.

The system presets four authorities: ordinary operator (Test 2), system maintenance personnel (Test), common administrator (THSD) and super administrator (admin). The user may select login to operate corresponding function menus (case-insensitive when input).



Figure 6.1 Login Interface

6.2 User Manage

Click “User Manage” menu to enter the interface as shown in figure 6.2.



Figure 6.2 User Manage Interface

The system deems current user as effect user. You may set basic user information, add, modify or delete users. Press “Cancel” to cancel current operation and “close” to exit the menu. Select history user to view deleted users and “Recovery User” to modify the deleted user to current effect user.

Operation procedure:

a. “Add” – input user, password, set user level – “save” – “close”.

b. “Modify” – input password and level to be modified – “save” – “close”.

c. Select “History User” to view history user information.

Note: Only the super administration can add and modify users.

6.3 Real Time Curve

1) Click real time curve to show the data collected on the probe board. Such curve is an aided adjustment of diagnosis function. The curve data is related to the image quality to some extent. Steady curve has the best effect.
2) Operation procedure: Select “high energy” curve , “start” – “turn on X-ray” – “stop” – “turn off X-ray” – “exit”.
3) Note: In case of no data, please inspect whether the transfer plate operates normally or whether the drive is installed (whether the indicator on the transfer plate is normal). The correlation of image curve and acquisition board, identification and adjustment, etc. are not described herein.

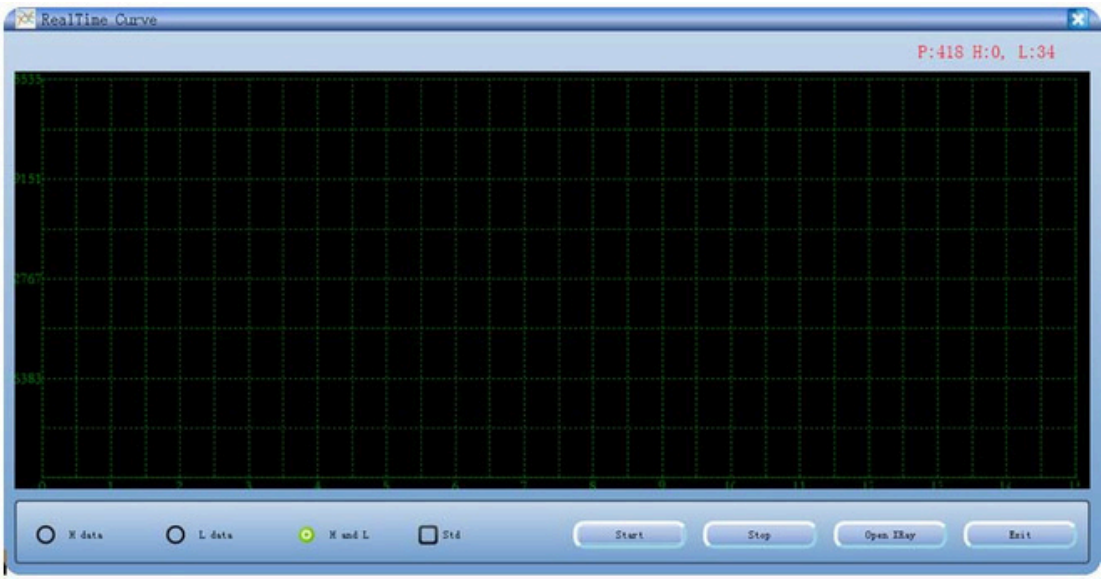


Figure 6.3 Real Time Curve

6.4 Time Set

1) Get DateTime can acquire current time of operation system;

2) Procedure:

a. Input the system time;

Note: Do not change arbitrarily, for it may result in re-registration.

b. Click the set datetime



Figure 6.4 Time Set Interface

6.5 Probe Point Set

Delete defective points of high and low energy probe manually and show the defective points deleted by the system automatically in the display zone. Set the probe point effectively as per different models, and then click apply (save) and OK to exit.

Note: Do not delete probe points, for it will result in breakpoint of image.

Operation procedure:

1. Select high energy or low energy, input the probe number, Select "Add" to delete probe points self-defined and "Delete" to recover. Note the system may delete defective points automatically due to the probe affected by damp, so the machine shall be placed in a dry well-ventilated position.
2. Input the scope of effective probe points – "apply" (save) – "OK".

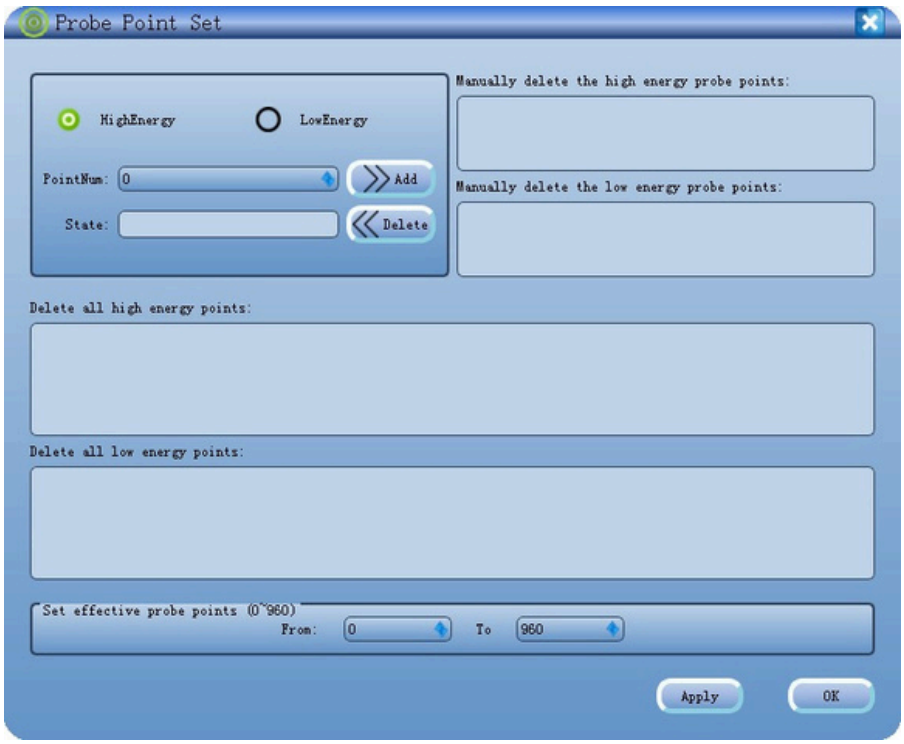


Figure 6.5 Probe Point Set Interface

6.6 X Ray Source Set

1) You may set the type of X-ray source on this menu. The system can operate normally only when such menu is in conformity to the actual hardware configuration. Parameters can be set only when it's set as XRay Source 1. XRay Source 2 operates with parameters defaulted by the system.
2) Operation procedure for XRay Source 1 Set: Select XRay Source 1 and view "Serial Port Status". Open "Real Time Curve" if it shows serial port has been turned on. Operate as per the real time curve procedure. In case the curveoscillogram is viewed, it indicates the serial port has been turned on and XRay Source is set correctly.
3) XRay Source 1 can set the voltage and current (such as 140 KV, 350 uA, etc.). Note: If changevoltage or current, it will have impact on the image of the first baggage.
4) In the event of fault of XRay source 1, you may acquire the error information through Status Query.

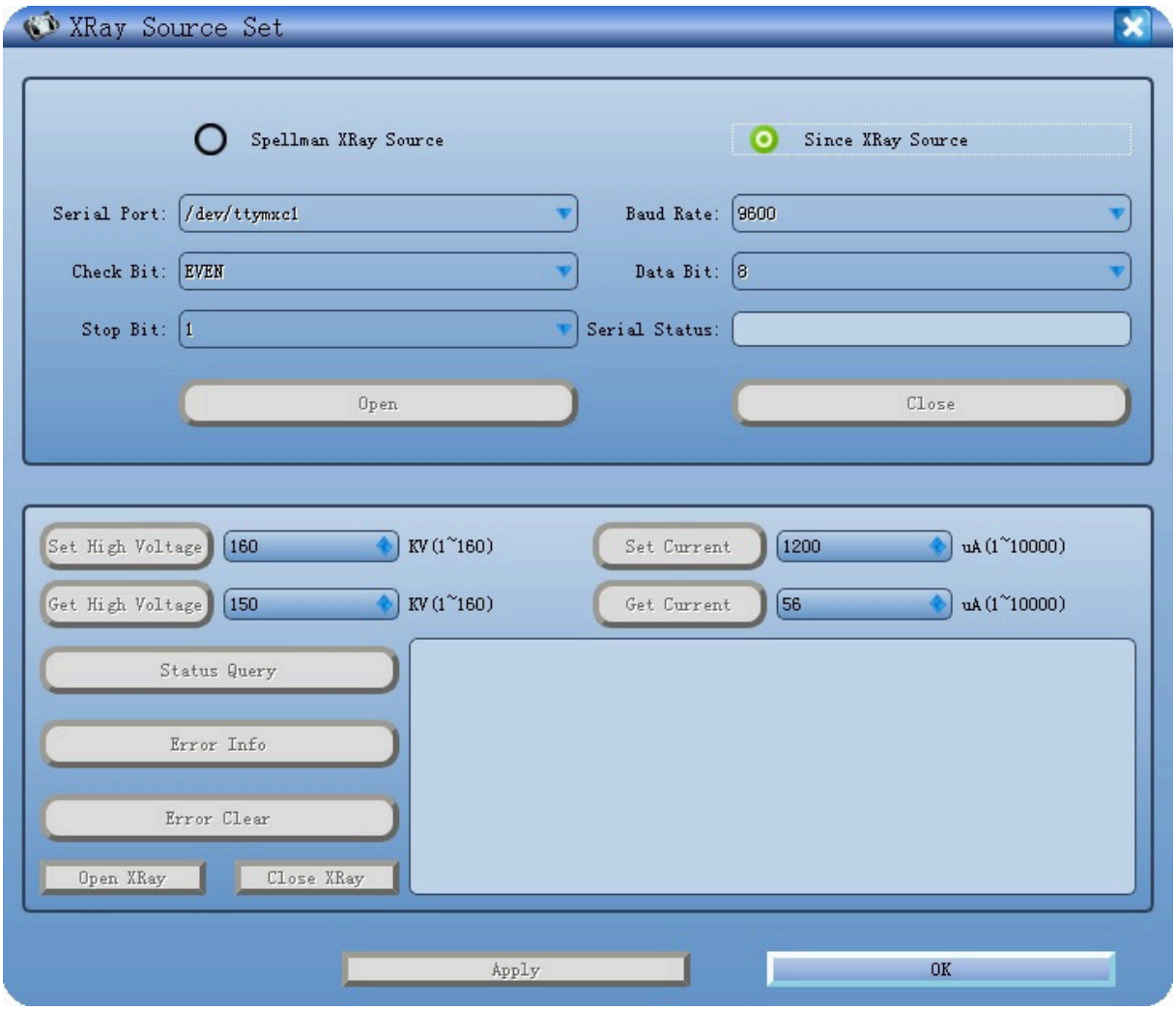


Figure 6.6 XRay Source Set Interface

6.7 Alarm Set

Alarm set function: As shown in the figure, when the alarm function is on, an alarm will be emitted in the event of hazardous articles, explosives, fireworks and impenetrable articles during real time baggage scanning.

Level min. size: the minimum impenetrable alarm size at horizontal direction (unit: pixel); an alarm will not be emitted in case of less than such size at horizontal direction.

Vertical min. size: the minimum impenetrable alarm size at vertical direction (unit: pixel); an alarm will not be emitted in case of less than such size at vertical direction.

Max. absorb: An impenetrable alarm will be emitted when the absorption of articles to X-ray is bigger than the “max. absorb”. The parameter is AD value. Smaller parameter setup leads to more insensitive alarm.

Operation procedure: Tick “Auto Discern” – “Box”, “Sound-light alarm” – parameters setup – “Apply” – “OK”. In case of “Auto Discern” not ticked, the alarm box and sound-light alarm will not be started.

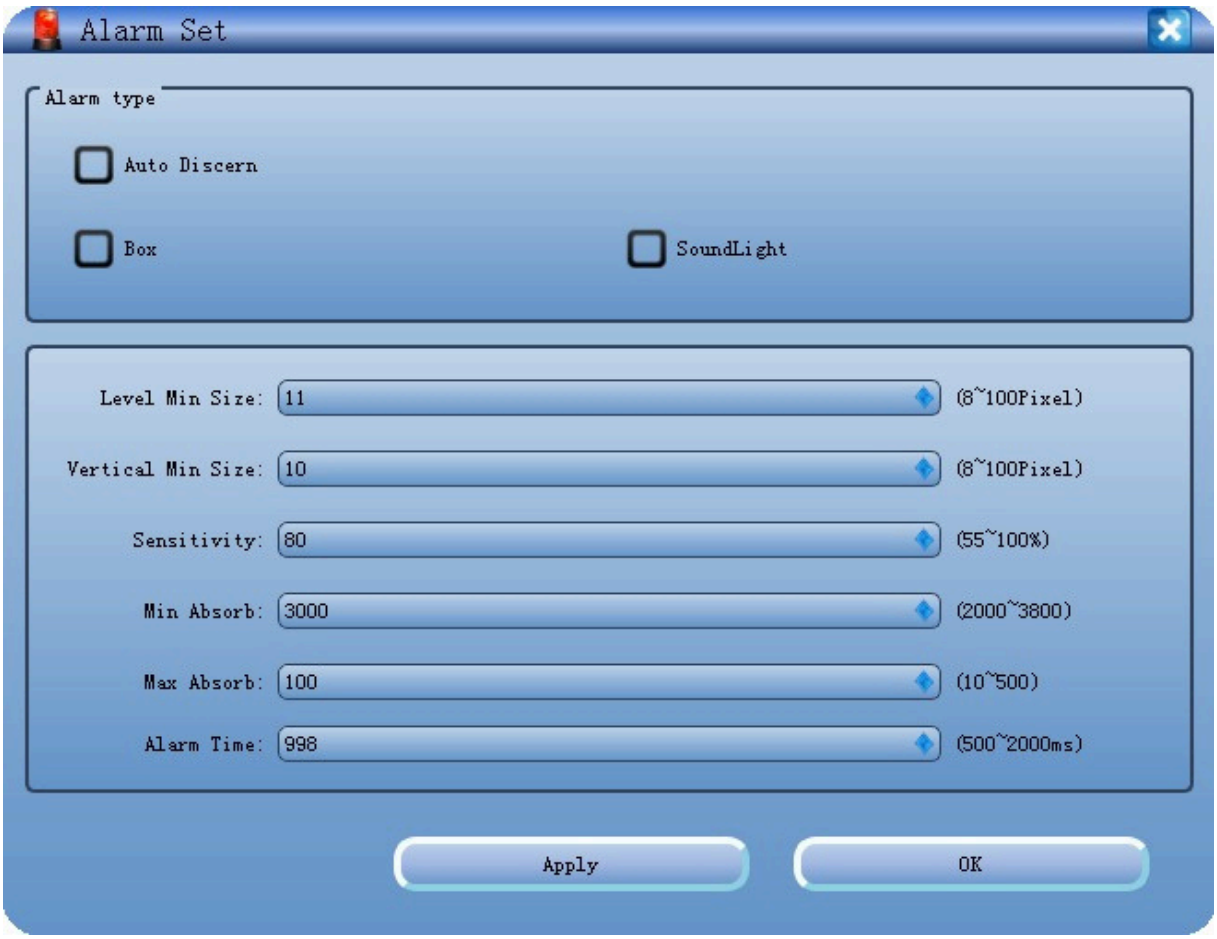


Figure 6.7 XRay Alarm Set Interface

6.8 Error Diagnosis

Roller control: Click “forward”, “stop” and “back” to test whether the roller operates normally;

X-Ray control: Click “Xray On” and “Xray Off” to inspect whether the X-ray generatorcommunication is normal;

States: shows whether each part is in normal state;

IN0Reg and voltage value: inspect whether the hardware is normal.

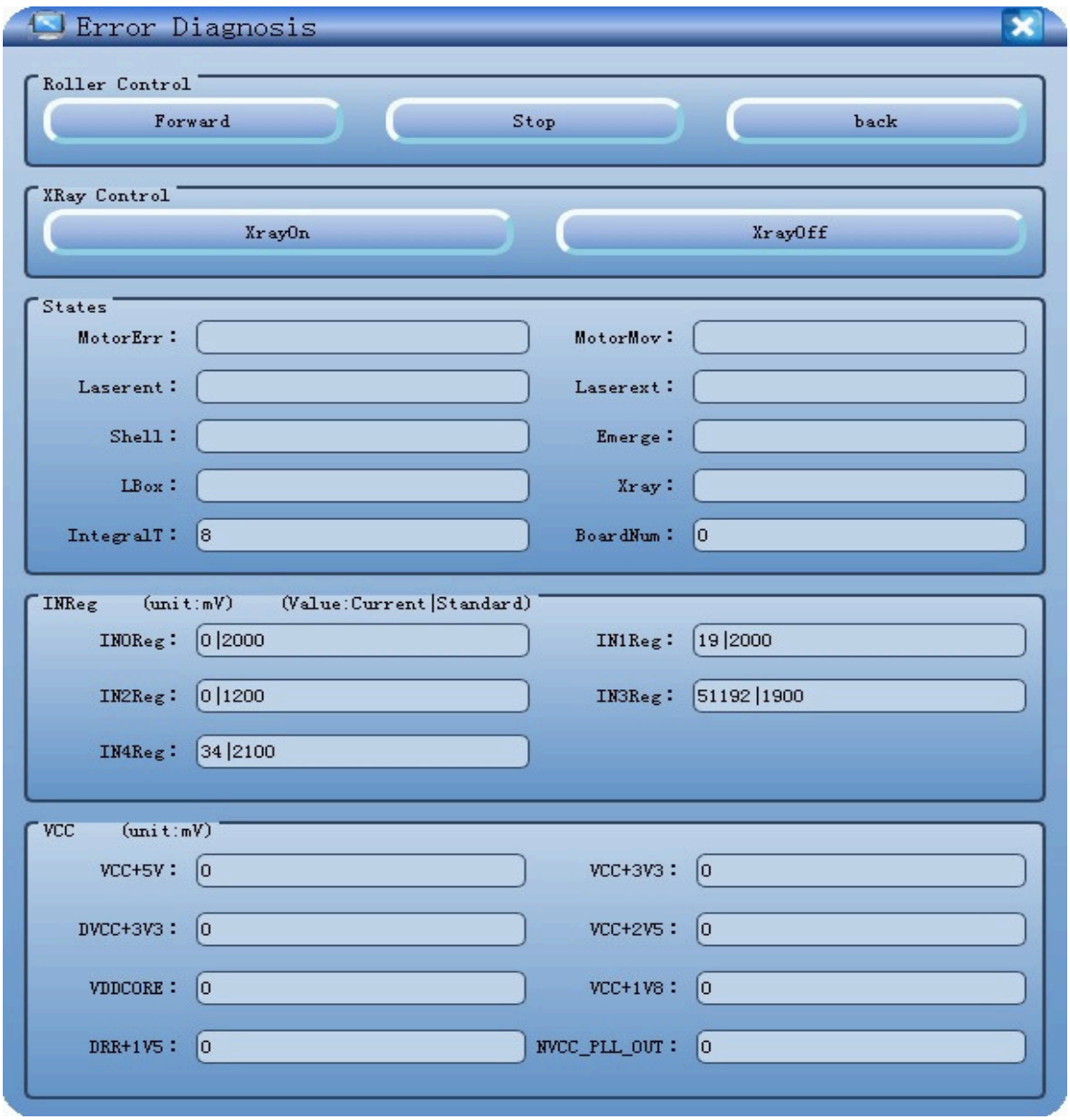


Figure 6.8 Error Diagnosis Display Interface

6.9 Image set

1) As shown in figure 6.9, click the image set button to configure relevant parameters of image set.
2) Roller Direction, you may adjust the roller direction to be in conformity to the icon of roller control displayed on the software interface.
3) Image Direction, two options are provided. One is to follow the roller direction automatically, i.e., the image direction is in conformity to the roller direction from left to right or from right to left; Or you may set the display direction manually, set the image moving direction as per your own preference.



Figure 6.9 Image Set Interface

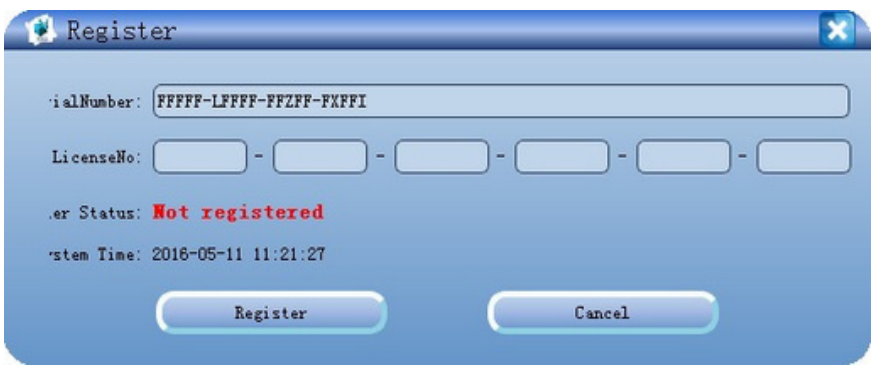
6.10 Register

"Equipment number": provided by the manufacturer at commissioning.

In case of register overdue, you have to register again. Then, you may send equipment number to the after-sales personnel to acquire the license number for re-registration.

Operation procedure: Please restart the software after successful registration. **Note:** One machine can only have one equipment number.

Note: Reinstallation of system may result in losing of equipment number, and the equipment number shall be re-set.



6.10 Register Interface

6.11 Authority Manage

You may set different default authority or self-defined authority as per the user level.

Operation procedure: Select the user – “default” or “all” or “custom” – “apply” – “confirm”.

Note: Only the super administrator can modify the user authority.



Figure 6.11 Authority Manage Interface

6.12 Language Set

You may shift Chinese and English in language list (effective after restart).



Figure 6.12 Language Set Interface

6.13 Log Manage

Through such function, you may search the log information on user's set in any menu in some time period, reducing the inconvenience due to incorrect set.

Operation procedure: Set start time and end time and then search.

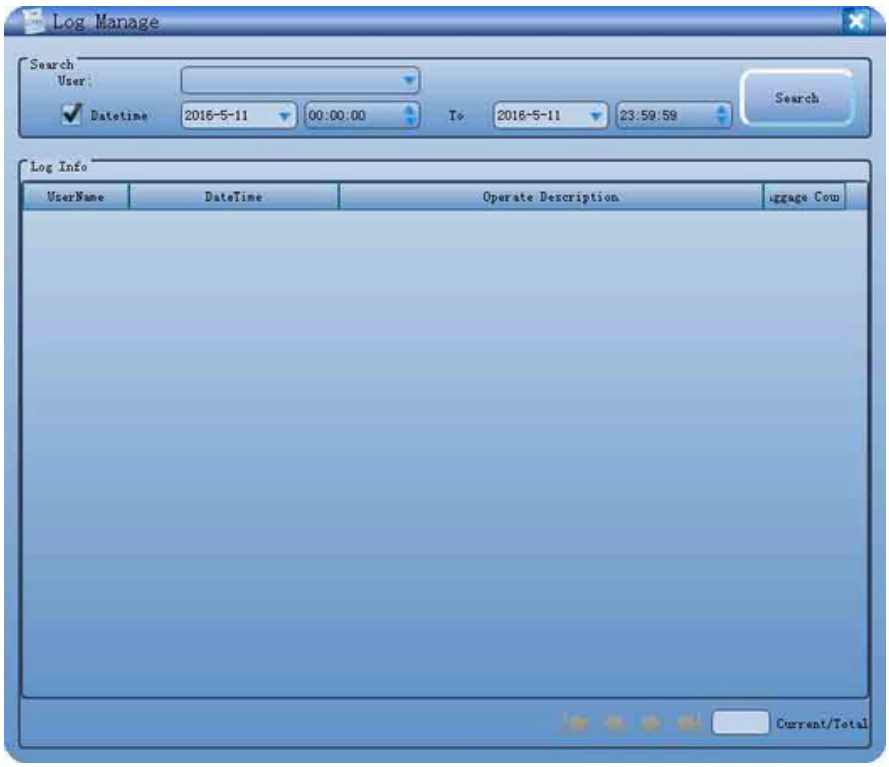


Figure 6.13 Log Manage Interface

6.14 About

Basic information of software and equipment model, etc.



Figure 6.14 About Interface

6.15 Tip Report System

1) Through this function, you may report the training results of trained personnel in train mode and with inserting of Tip.
2) Report generation: Report available, tip count, tip mark and error count, etc.

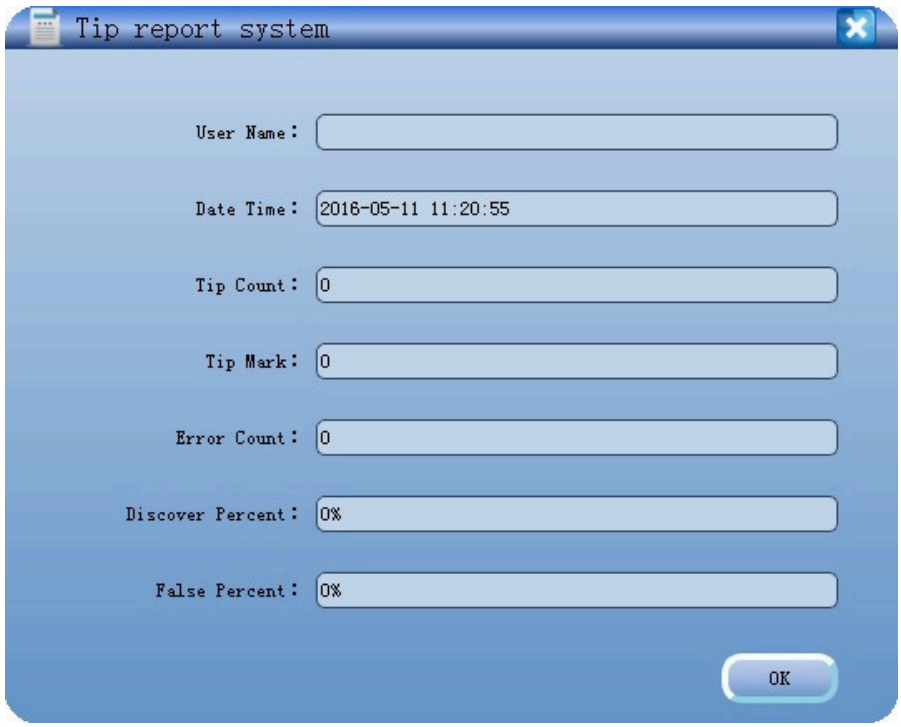


Figure 6.15 TIP Report System Interface

6.16 Tip Manage

Operation procedure:

a. Click F8 to open the main menu– open the interface of "Tip Manage".
b. Select (tick) "Dangerous product insertion" – set identification time, length time and enter frequency, etc., -- "apply" – "exit".
c. Then, exit the menu and begin to scan, the dangerous product pictures will be insert into the scanning images when scanning.
d. In case of dangerous product insertion, please press F2 to indicate dangerous product has been discovered and marked. Otherwise, it prompts "please concentrate". In case there is no dangerous product and F2 is also pressed, it belongs to misjudgment. The system prompts "No dangerous product and misjudgment. Please concentrate".
e. Tip system report , stop the belt and press F8 to open the main menu. Select corresponding employee number (user name at login) and click to generate a report for view (see operation of tip system report for details).
f. If you want add TIP pictures, they should be in form of BMP.

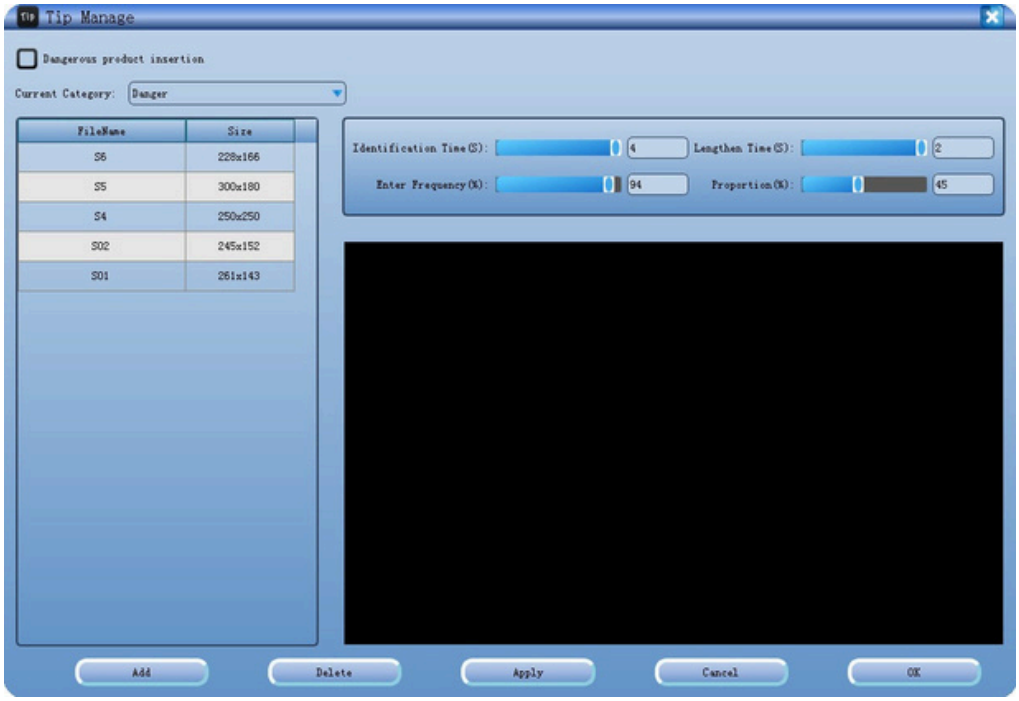


Figure 6.16 TIP Manage Interface

6.17 File Manage

1) Click the file manage button to call back the image of history records and search the records saved originally as per conditions set.

2) File retrieval operation: Select the retrieval conditions to retrieve as per time or user. In case of retrieval as per time, set the time before search. You shall notice following maters:

a. The back-up image files will delete original high and low energy data.

b. In case of no data retrieved, click such file name and the system will delete the file name automatically.

3) Full screen display: Select the file to be viewed, and double-click the left mouse button to view the image at full screen.

4) Data download: Downloads the security inspection data to the route designated.

5) Photo save: Selects the images to save to the route designated.

6) Photos save to: Saves files retrieved to the route designated together.

7) Photo backup: Backups files selected to the route designated.

8) Photo backup all: Backups files retrieved to the route designated.

9) Restore DB: If there is no data in datafile under D:\, it will clear the data base; Otherwise, it will restore the data to the data base, ensuring conformity of data file and data base.

10) Two keys added: image for tip whole baggage insertion and image for tip single article insertion. The user may self-define the insertion images used for training through these two keys, easy for operation.

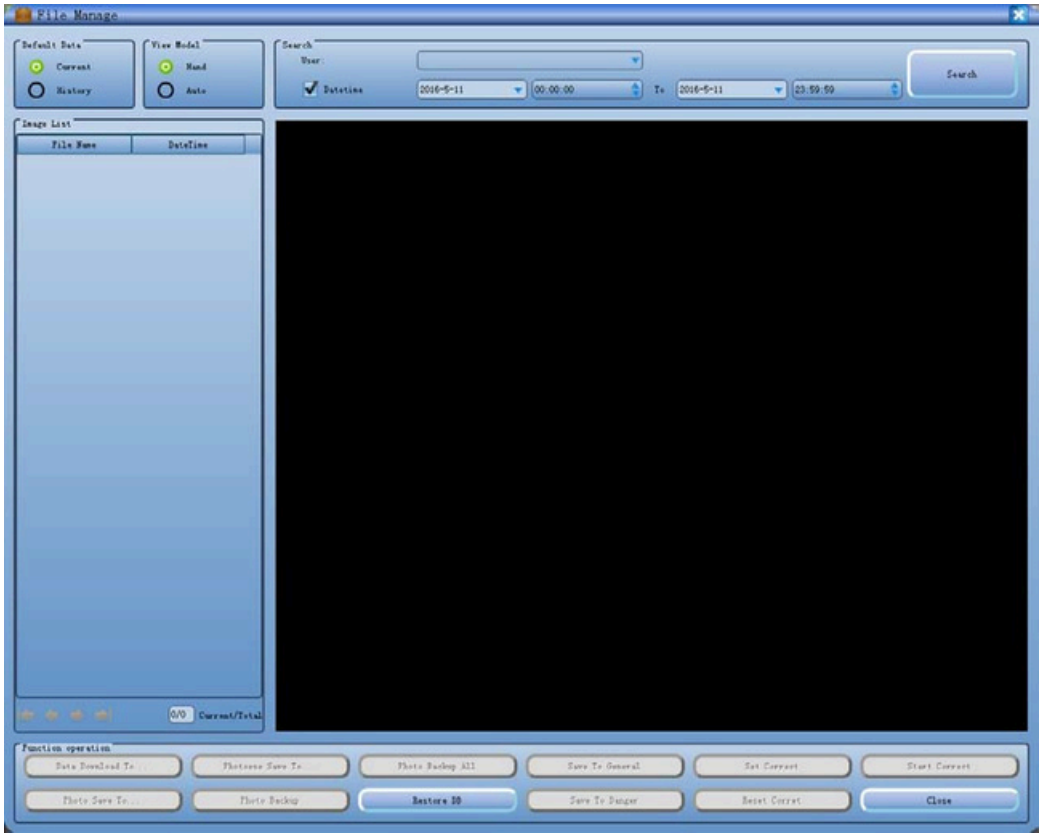


Figure 6.17 File Manage Interface

6.18 Function Set

1) Click F8 to open the main menu and select “Function Set” to enter the interface as shown in figure 6.18.
2) Click the function set button in the menu column to pop up the interface as shown in figure 6.18. It’s not recommended to change it.
3) Log level set: Generally, the basic log is set, and it’s not recommended to modify it (Different sets mean different record information. It can be understood as per literal meaning and used at maintenance.)
4) Initial login: After ticked, you shall log in when power on next time to use the X-ray machine.
5) Intelligent roller: After startup, the software will judge whether baggages to be scanned intelligently to control the rotation of roller automatically (customization function).
6) Train function: Select this function to train new employees. You shall notice following matters in selecting such function:
   a. Select “File Manage” in the main menu and recover the data base through “recovery data base” in the file manage interface.
   b. In case dangerous product needs to be inserted, select “Tip Manage” in the main menu to open the tip manage menu. Tick tip insertion function and then set the required identification time and enter frequency, etc.
   c. Exit the menu to use the train function.
7) Roller auto check: The roller checks automatically and returns to the error state (customization function).
8) Network support: Transfers the security inspection data through network (customization function).

9) Black box: The user must inspect whether the video equipment operates normally before using this function. This function is mainly to record the videos of each baggage carrier. (A camera shall be installed on the security inspection machine; customization function).
10) The file operation set box sets the data save time.
11) It shall be noticed: The function of "Auto delete expired" set by file operation saves for the longest time. If you select such function, the system can save data or images for the set maximum number of days. If it's set as 180 days, X-ray machine will calculate whether files are expired as per the current system time. Therefore, it's recommended to use this function prudently. Do not modify the system time arbitrarily, to prevent data is deleted by mistake.
12) Intelligent roller: Generally, the detection sensitivity is set as 37 and the static time is set as 34.

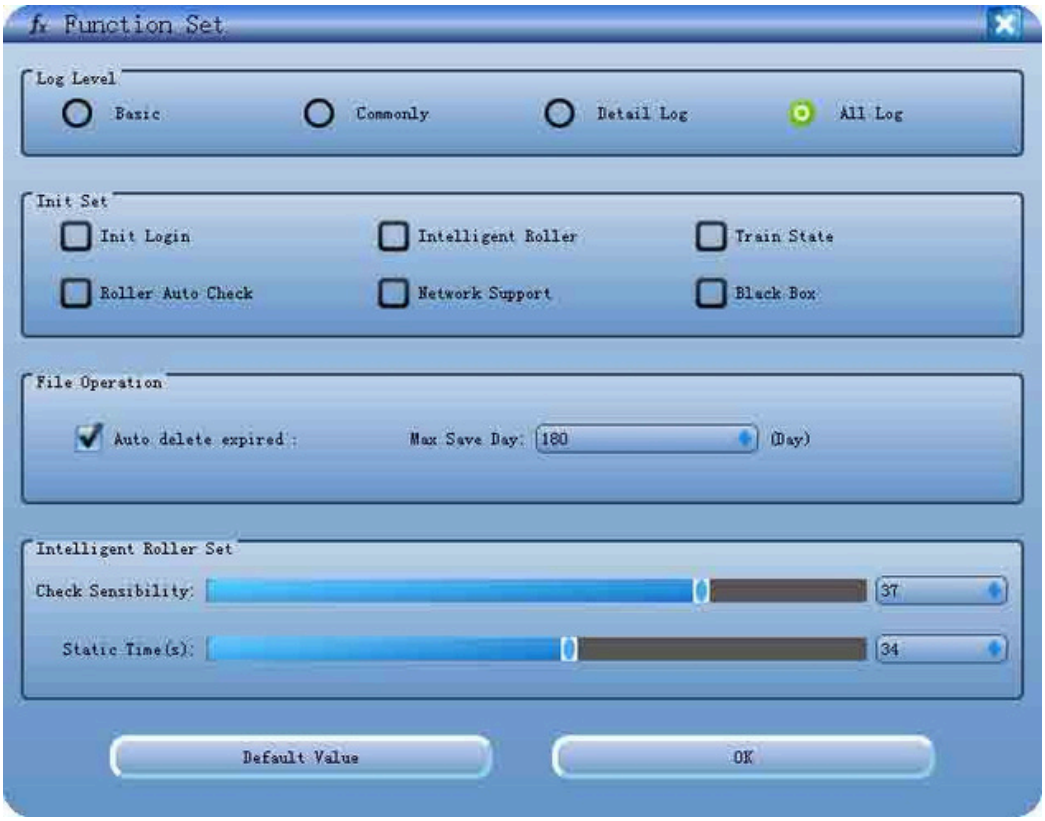


Figure 6.18 Function Set Interface

6.19 Data Counter

It counts system time and baggage count etc. The system time refers to the operating hours of software after the software is started this time, and baggage count refers to the count after startup on the day and it can be cleared; in case of train mode, baggage count refers to the number of current user's scanned baggages. In case of user shift, it will be cleared, and the XRay time will be also cleared. XRay time refers to the accumulative duration of X-ray light (accumulative operating duration of X-ray light).

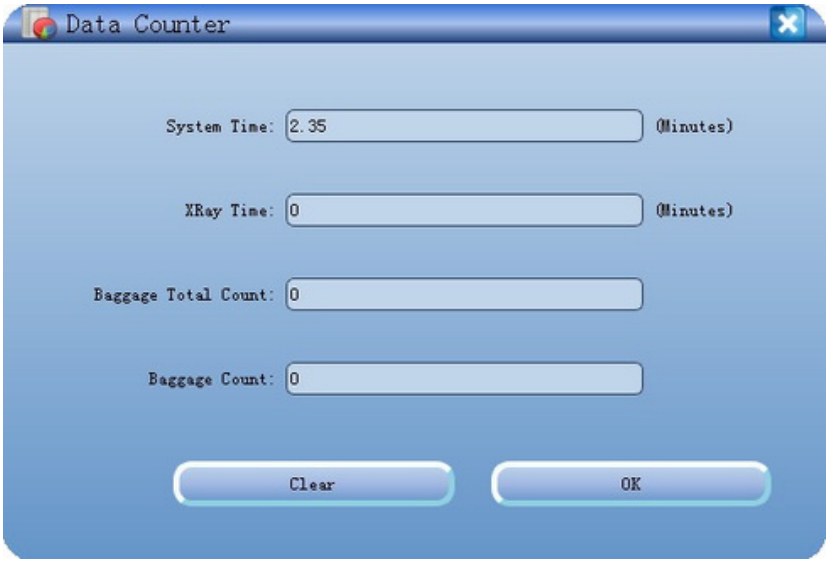


Figure 6.19 Data Counter Interface

6.20 System Param Set

I. System

1) Export Data Directory: sets data export directory. After setup, you may press the key "Data Download To" in File Manage to export selected data to such directory;

2) Export JPG Directory: sets images export directory. After setup, you may press the key "Photo Save To" or "Photos Save To" in File Manage to export the selected data to such directory in form of jpg;

3) Backup Directory: sets backup directory. After setup, you may press the key "Photo Backup" or "Photo Backup All" to backup selected data to such directory;

4) Motor Type: sets motor type. Do not change the motor type in case of factory set. Otherwise, you may not control the motor normally;

5) Debug Model: for factory debugging. Do not select it;

6) Machine Type, Gain: factory set; do not change them;

7) Screen Width, Screen Height: factory set; do not change them;

8) Belt Back Interval, Belt Forward Interval and Belt Forward Wait: sets parameters interrupted for processing (i.e., the motor is stopped when the baggage is scanned half way). Belt Back Interval refers to the reverse distance of motor after it's stopped; Belt Forward Interval refers to the useless data frames to be discarded at resumption of scanning after interruption; Belt Forward Wait refers to time interval prior to light source stabilization.

For example: In case the motor is stopped during the baggage scanning and then the motor is re-started for resumption of scanning, you may reduce the forward interval or increase the back interval to correct if finding loss of images (i.e., fault in center of image); or reduce the back interval or increase the forward interval to correct if finding redundancy of image (i.e., extra part in center of image).

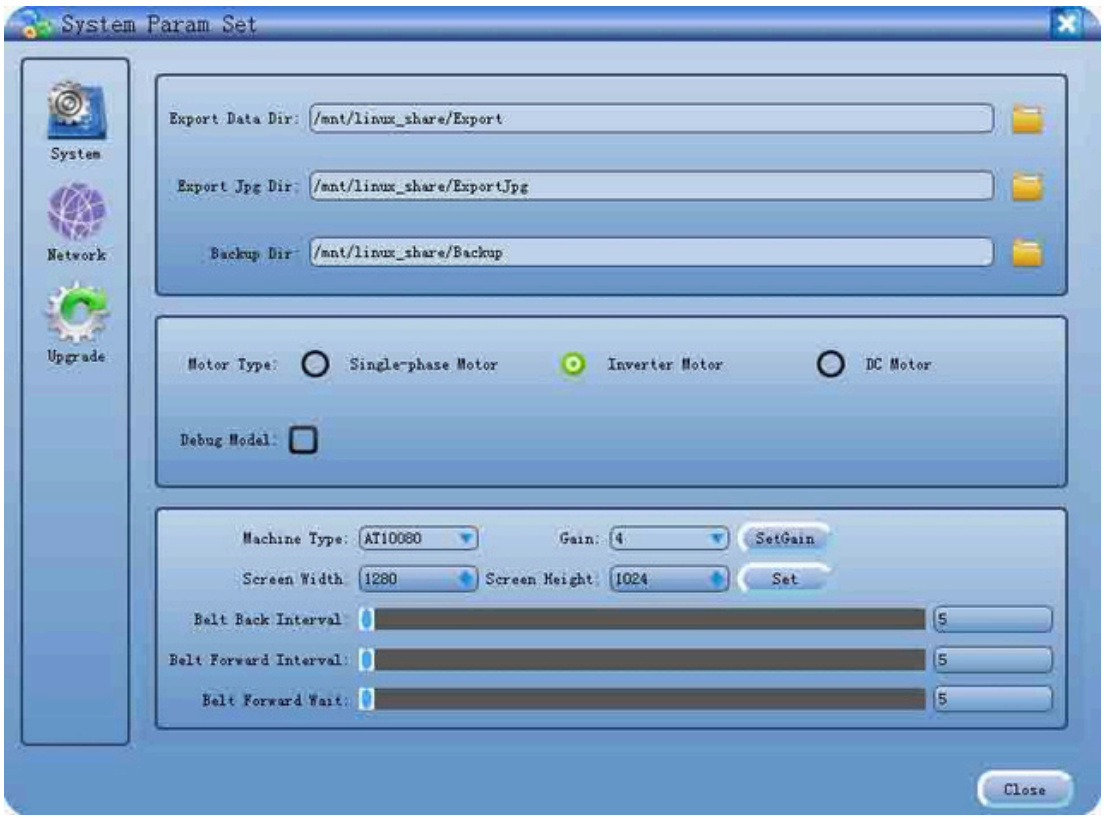


Figure 6.20 System Param Set Interface

II. Upgrade

The system is upgraded in the form of USB flash disk. The procedure is as follows:

1) Insert USB flash disk into the main board and select the system parameters set – system upgrade;
2) The system will find the USB flash disk inserted automatically in USB route and list files in the USB flash disk;
3) The default target path: /XrayWork/;
4) Select files to be upgraded and click upgrade;
5) Restart the X-ray equipment after it prompts “upgrade completion”;

Example of whole software upgrade:

The whole software is an XrayWork folder. Copy it to the USB flash disk and insert the USB flash disk into the main board. Such folder will be shown in the system upgrade menu of System Param Set. Double-click to enter such folder. Select all files and click “Upgrade”.

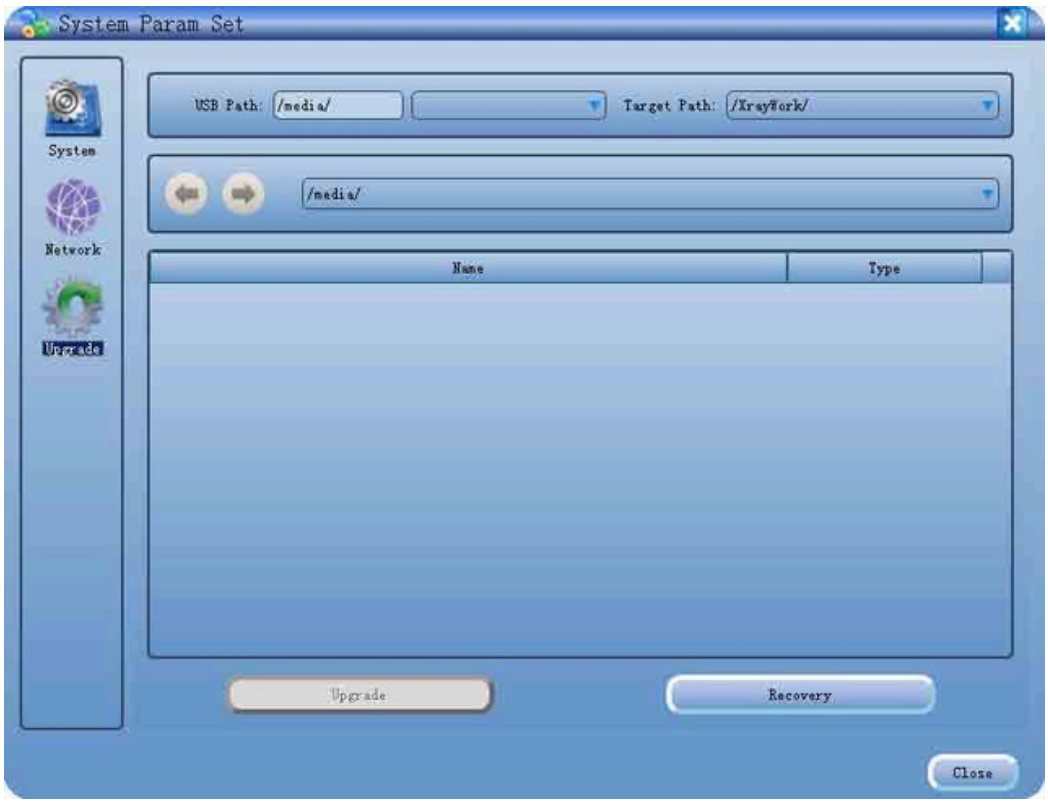


Figure 6.21 System Upgrade Interface

III. Network

This module is mainly for customized development and is not the standard configuration;

1. Local IP: sets IP address;
2. Local Machine No.: represents the host when used for setting network communication;
3. Server IP: sets relevant information for connection of remote data base;
4. Work Station IP: sets IP and port of server connected with the monitoring center;
5. Express Delivery: partial customized development;
6. Other parts not described are required for customized development;

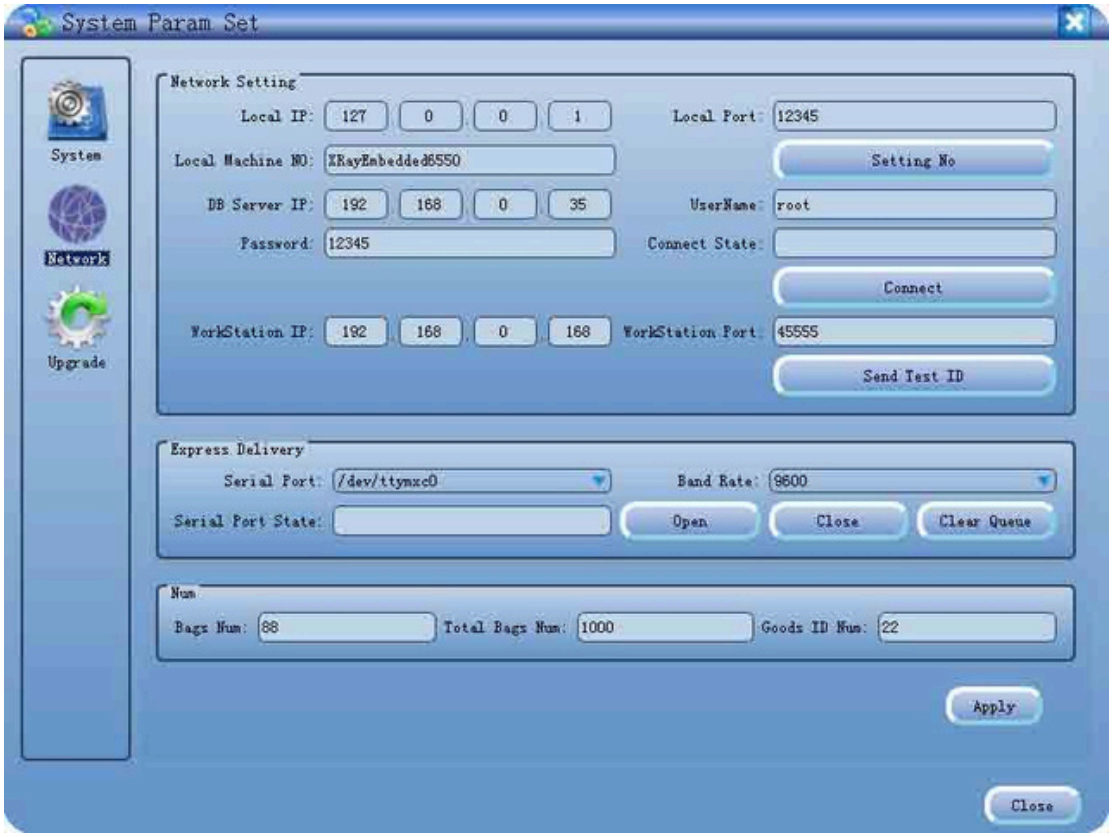


Figure 6.22 Network Set Interface

Chapter VII Maintenance

Daily maintenance refers to the necessary work during the system operation period under the guide of prevention first. It's one of important steps to use and operate the system reasonably.

Introduction of:

- External Cleaning
- Clearing of Photoelectric Sensor
- Cleaning of Displayer
- Inspection of Conveyor
- Inspection of Lead Curtain at Entrance and Exit of Aisle
- Inspection of X-ray and Power Indicators
- Inspection of Emergency Stop Button

7.1 External Cleaning

During long-time operation, the equipment will have dust and dirt on the external surface. To ensure normal operation, external cleaning is required periodically.

Clean the external surface with wet towel.

Clean the shield plate and column.

> ★ **NOTE**
> Power off the equipment and disconnect external power supply before external cleaning.

7.2 Clearing of Photoelectric Sensor

Photoelectric sensor may be blocked or shielded. After the conveyer is started, the equipment will scan immediately. Inspect the system setup. The photoelectric sensor may be blocked or shielded if "force scan" function is not started.

Please power off the equipment and take out the key of special keyboard and carry it with you. Inspect the state of photoelectric sensor. The photoelectric sensor shall be located at the aisle inner wall inside the lead curtains. Inspect whether the photoelectric sensor is blocked, affecting the accuracy of photoelectric sensor signal. At this moment, wipe the surface of photoelectric sensor lightly with slightly wet cotton ball to recover the cleanness of surface.

7.3 Cleaning of Displayer

During long-time operation, the displayer will have dust or fingerprint on the surface, affecting the operator's reading of images. At this moment, you may clean the displayer screen and adjust the brightness with the special cleaner after powering off the displayer.y.

7.4 Inspection of Conveyor

During long-time operation, the conveyer belt may deviate from the center position of aisle. You may adjust the conveyer belt if the motor end is exposed due to deviation of conveyer. Please contact the specialized maintenance personnel to adjust the operation state of conveyer belt, or read the maintenance manual carefully.

7.5 Inspection of Lead Curtain at Entrance and Exit of Aisle

In case of excessive gap, or fall-off and damages of lead curtains, please contact the specialized maintenance personnel for replacement or repair.

> ★ **NOTE**
> The operator shall wear gloves to adjust lead curtains.

7.6 Inspection of X-ray and Power Indicators

> ★ **NOTE**
> The system administrator and maintenance personnel may inspect state of X-ray indicators through corresponding operation in diagnostic maintenance procedure..

7.7 Inspection of Emergency Stop Button

The emergency stop buttons  on the shield plate and control console are key safety devices. In case of loose installation of button and shell damages, stop the equipment immediately and contact the specialized maintenance personnel to repair or replace it. The equipment can be used continuously only after maintenance is completed.

> ★ **NOTE**
> After the maintenance, press such emergency stop button  , and the motor in the system stops operating, X-ray generator stops and the displayer shows the prompt “the emergency stop button pressed” at this moment, which indicates such button can operate normally.

Chapter VIII Handling of Common Errors

This chapter mainly introduces handling methods of following common errors.

Introduction of:

- Displayer Failure after Power-on of System
- Conveyer Failure
- Automatic Shutdown of Equipment during Operation

8.1 Displayer Failure after Power-on of System

Conditions

The displayer doesn't work after the equipment is powered on and started.

Diagnosis

The power switch of displayer is off.

The cable plug is loose.

Solutions

Step 1: Inspect the power switch of displayer firstly and ensure the power switch has been turned on. At this moment, the switch indicator shall be on.

Step 2: Please inspect whether the cable plug is loose. If so, please re-insert it, and secure it by rotating bolts at both sides.

Step 3: Observe the displayer screen. The error has been cleared if it outputs images.

> ★ **NOTE**
> Please contact the specialized maintenance personnel if the error is not cleared as per the procedure above

8.2 Conveyer Failure

Conditions

Press ◄ or ► , and the conveyer doesn't operate.

Diagnosis

False pressing of emergency stop button or false triggering of safety interlock.

Solutions

Step 1: Please inspect whether the system state panel shows the prompt "emergency stop". If so, please handle it as follows.

Step 2: Inspect emergency stop buttons on the shield plate and keyboard. In case anyone is pressed, please rotate it clockwise to reset it.

Step 3: Observe whether the information "emergency stop" on the panel disappears. If so, re-press ◄ or ► , and the conveyer shall operate. In case it shows the information "side plate opened", please handle it as follows.

Step 4: Inspect whether each shield plate is installed properly in sequence. In case any loose shield plate is found, please re-install it.

Step 5: Observe whether the information "side plate opened" disappears. If so, please re-press ◄ or ► , and the conveyer shall operate.

> **★ NOTE**
> Please contact the specialized maintenance personnel if the error is not cleared as per the procedure above.

8.3 Automatic Shutdown of Equipment during Operation

Conditions

During operation of equipment, the displayer has black screen suddenly and the power indicator is off.

Diagnosis

The external power supply is loose or the circuit breaker or fuse is disconnected.

Solutions

Step 1: Please inspect whether the external power line plug and power socket are loose. If so, please insert the power plug tightly, and take measures to prevent loosing of plug.

Step 2: If not, please inspect whether the circuit breaker or fuse is disconnected. Open the shield plate of circuit breaker and fuse by tools and inspect whether the circuit breaker or fuse is in good conditions.

> **★ NOTE**
> Please contact the specialized maintenance personnel if the error is not cleared as per the procedure above.

Chapter IX After-sales Service

Introduction of:

- After-Sales Service
- Packing List
- Certificate of Conformity
- Warranty
- Repair Request

9.1 After-Sales Service

a) Manufacturer's Warranty

We put technical support and after-sales service in priority and offer high-quality service for customers.

b) Equipment Acceptance

1. The user shall notify us after receiving the equipment. We will arrange specialized technical support engineers to assist the unpacking acceptance and carry out installation and debugging. The technical support engineers shall carefully check the equipment and accessories one by one with referent to the order contract and packing list in line with the responsible awareness. In case of damages, mistakes and omissions, the technical support engineers shall assist in handling claims, or notify the company for correction, supplement, and shall install and debug the equipment in compliance with the technical specification.
2. During the period of installation and debugging, the user shall provide active coordination, to guarantee the system to be put into operation as soon as possible.
3. Acceptance standard: in compliance with the standard and methods specified by the contract.
4. Acceptance period: The acceptance of equipment shall be completed in 5 days after the installation and debugging are completed. The day when the user signs the acceptance report shall be set as the start day of warranty period. In case of expiry, we will not assume any responsibilities.

c) Technical Support and Training

The technical training includes basic operation training and training on images identification skills. We provide the basic operation training for users free of charges.

1. **Objective:** To let the user know the system composition and basically grasp the operation of electromechanical part and supporting software, and to make the preliminary evaluation to the quality conditions of arrival equipment.
2. **Time:** Arranged as per the user's requirements and actual conditions.
3. **Site:** The operation training shall be arranged at the site where the equipment is used in principle.

9.2 After-Sales Service Items

Thank you very much for choosing our equipment. We will provide you superior after-sales service, including:

1. Select our franchised maintenance unit nearby for maintenance.
2. If any doubts and maintenance difficulty, please contact the maintenance center in the province (municipal city).

The security inspection equipment with one of following conditions doesn't belong to the warranty scope:

1. The trade mark of serial number of equipment or accessories is removed or modified.
2. The damages are caused by the user's improper use, maintenance or custody.
3. The damages are caused by acts of God.
4. The equipment was repaired by a non-designated maintenance unit or the user.
5. The equipment is combined or assembled with devices not provided by us, unless accepted by us in the written form.

Chapter X Attachments

10.1 Terminology

■ **Equipment**	Micro-dose X-ray security inspection equipment based on the computer platform for energy resolution.
■ **Line Resolution:**	The equipment has the ability to distinguish the single solid copper line. The line resolution is generally expressed in the nominal diameter of the line (mm) or the corresponding wire size (AWG).
■ **Penetration Resolution**	The equipment has the ability to distinguish the single solid copper line under the condition of the aluminum alloy steps with the specified thickness. The penetration resolution is generally expressed in the nominal diameter of the line (mm) or the corresponding wire size (AWG).
■ **Penetrating Power**	It refers to the ability of the equipment to penetrate the goods to be inspected and is generally expressed in the thickness of the steel plate (mm).
■ **Space Resolution**	It refers to the ability to distinguish the metal wire and is generally expressed the nominal diameter of the line (mm).
■ **Equivalent Atomic Number**	In interaction of X-ray and matter, the equivalent atomic number is the characteristic parameter used to calculate the attenuation, absorption and scattering ability regard with to X-ray. For the elementary substance, the position number in the periodic table, namely the electron number of an atom for the substance, it is the atomic number; for the compound or mixture, it is obtained by calculation or experiment.
■ **Organics**	Substance with the equivalent atomic number less than 10.
■ **Inorganics**	Substance with the equivalent atomic number more than 18.
■ **Organics Resolution**	It refers to the ability of the equipment to distinguish organics and is expressed in the thickness of discriminable organic step.
■ **Inorganics Resolution**	It refers to the ability of the equipment to distinguish inorganics and is expressed in the thickness of discriminable steel step.
■ **Impenetrable Area**	It refers to the area where the goods to be inspected cannot be identified by the equipment. The strength that the X-ray penetrates the goods to be inspected and reaches the detector is almost zero.
■ **Uncertain Material Area**	It refers to the area where the X-ray can penetrate but the detector cannot identify the material property of the goods to be inspected.
■ **Pass Rate**	It refers to the quantity of goods in length of 1 meter inspected by the equipment within one hour.

■ **Single Inspection Dose**	X-ray dose absorbed by the goods to be inspected in the process of one inspection in Gy (1Gy=1J/kg).
■ **Ray Leaking Dose Rate**	Ionizing radiation intensity per unit time of the X-ray which penetrates the radiation shield and leaks out of the equipment in uGy/h.
■ **Micro-dose X-ray Security Inspection System**	X-ray security inspection system with the single inspection dose less than 5uGy.
■ **Start Button of Secondary Electric Power Supply**	It refers to the switch component which should be confirmed twice to power on the equipment, and is generally applied for the radiation equipment.
■ **Scroll**	It is used to display the image from left to right of the screen or from right to left.
■ **Operator Sensor**	Sensor used to detect the operator on-the-job state. If the system is equipped with such component, then when the operator is close to it, the equipment can normally; when the operator is away from it, the equipment will automatically shut off the power supplies of the X-ray generator and the conveyor.
■ **Emergency Stop button**	It is used in an emergency and will cut off the power supplies of the X-ray generator and the conveyor at once.
■ **X –ray Detector**	A sensor which can detect (measure) X-ray and convert the X-ray intensity into the processed electrical signal.
■ **Test Object (Box)**	Test object used to test and evaluate the performance indications of X-ray image
■ **Test Card**	Test object used to test and evaluate an index of X-ray image

Remarks: The definitions of terminologies above are from the national standard (GB 15208.1-2005) and other data.

10.2 Connection Block Diagram of Cables between Parts

