

**Diagnostic Ultrasound System
DICOM Quick Guide FAQ Manual**

Intellectual Property Statement

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Content

DICOM Quick Guide FAQ Manual	1
Intellectual Property Statement	1
1 Preset	4
1.1 DICOM Preset	4
1.2 DICOM Service Preset	5
1.2.1 DICOM Storage Preset.....	5
1.2.2 DICOM Print Preset.....	7
1.2.3 Worklist Preset.....	9
1.2.4 MPPS Preset	10
1.2.5 Storage Commitment Preset	11
1.2.6 Query/Retrieve Preset	12
1.2.7 HL7Query Preset.....	13
1.2.8 DICOM Strategy Preset	14
2 DICOM Service	16
2.1 Verify Connectivity.....	16
2.2 DICOM Storage	16
2.1.1 Storage Operation.....	16
2.1.2 Structured Report (SR)	19
2.1.3 Encapsulated PDF	20
2.1.4 3D/4D.....	21
2.1.5 Send DCM File	21
2.3 DICOM Print	23
2.3.1 Send to DICOM Print Manually	23
2.3.2 Send to DICOM Print Automatically.....	23
2.4 DICOM WorkList.....	24
2.5 HL7Query	26
2.6 MPPS.....	27
2.7 Storage Commitment.....	27
2.8 Query/ Retrieve.....	27
2.9 DICOM Media Storage and Review.....	28
2.9.1 DICOM Media Storage.....	29
2.9.2 DICOMDIR Review.....	29
2.10 Task Management	29
3 Common Failures and Troubleshooting	31
3.1 Common Failure: Service Verification Failed.....	31
3.2 Common Failure: Server disconnects the ultrasound system during implementing storage	31
3.3 Common Failure: Multiframe transmission is failed, but single frame is succeeded.	32
3.4 Common Failure: Network disconnected (shown by network icon) during transmission	32
3.5 Common failure: Worklist query succeeded, but no patient is shown	32
3.6 Common failure: Printing succeeded but the film is blank.....	32
3.7 Common Failure: Verification of connecting DICOM printer is succeed but printing is failed	33
3.8 Common Failure: Printed image is too small.....	33
3.9 Common Failure: MPPS message is not sent out correctly or not received by the server .	33
3.10 Common Failure: Storage commitment is failed.....	33
3.11 Common Failure: Query is succeeded, but retrieve is failed, with the prompting that the remote server is wrong.....	34
3.12 Common Failure: Error messages in DICOM Task Management	35

3.12.1	Association aborts	35
3.12.2	Network error: Socket sending error	35
3.13	Print Service Examples.....	36
3.13.1	Example 1	36
3.13.2	Example 2	39

Note: Before using DICOM, please read the electronic file DICOM CONFORMANCE STATEMENT along with the device. At the same time, please verify that the SCU services provided by ultrasound machine can be supported by the SCP services provided by the systems such like PACS/RIS/HIS and so on.

The chapter is confined to the preset, connection verification and DICOM services of the DICOM-configured ultrasound machine, not including SCP configurations like PACS/RIS/HIS.

The DICOM package is optional, so the description here is only applicable for the system configured with the DICOM package.

This system supports the following DICOM functions:

- Verify Connectivity
- DICOM Storage
- DICOM Print
- DICOM Worklist
- MPPS (Modality Performed Procedure Step)
- Storage Commitment
- DICOM Medium Storage (DICOMDIR Review)
- DICOM Task Management

Workflows of DICOM Applications are briefly described as follows:

1. DICOM preset (Localhost DICOM Service Property, Server Setting, and Set DICOM Service).
2. Verify connectivity.
3. DICOM application (Image Storage, Print, MPPS, Worklist, Storage Commitment, DICOMDIR Review, Q/R and Task Management).

Abbreviation introduction:

The followings are the abbreviations in this chapter.

Abbreviation	Description
DICOM	Digital Imaging and Communications in Medicine
AE	Application Entity
MPPS	Modality Performed Procedure Step
PDU	Protocol Data Unit
SCU	Service Class User (DICOM client)
SCP	Service Class Provider (DICOM server)
SOP	Service-Object Pair
SR	Structured Report
HL7	Health Level 7

1 Preset

1.1 DICOM Preset

To open the DICOM preset screen:

1. Press <Setup> key to show the Setup menu.
2. Move the cursor onto [DICOM/HL7 Preset] to open the screen, you can set up the Localhost DICOM Service Property, Server Setting and DICOM Services, as shown in Figure 1 DICOM Preset Screen:

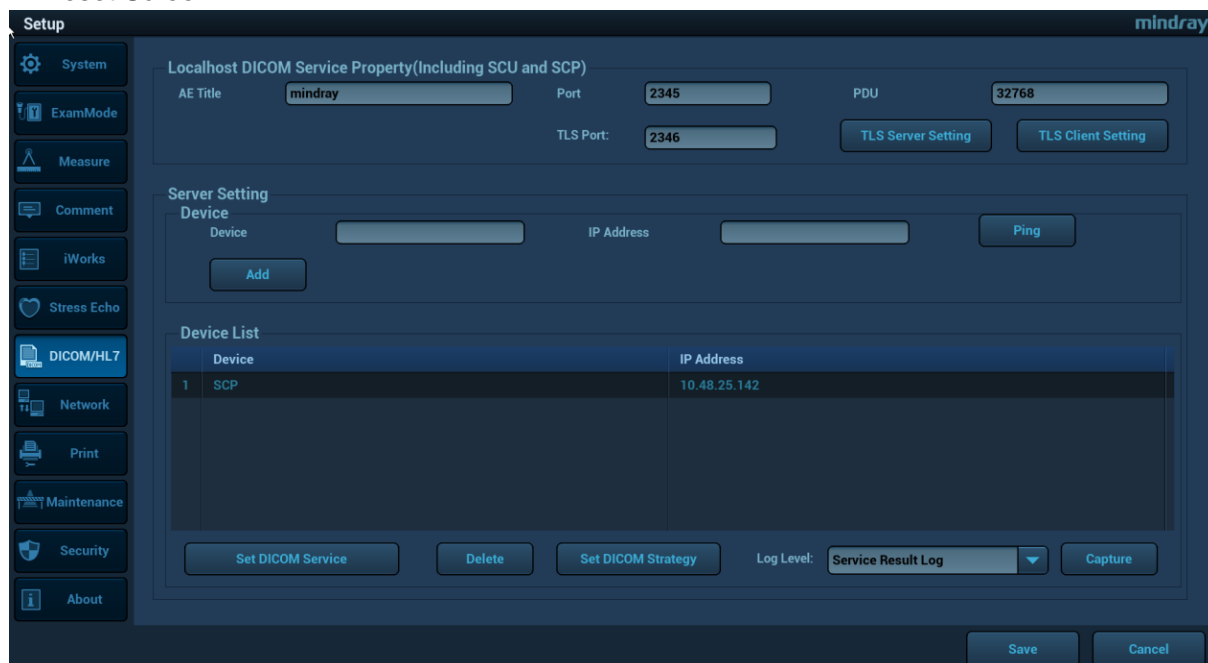


Figure 1 DICOM Preset Screen

The main parameters of localhost DICOM preset are described as follows:

In the above screen, please enter AE Title, Port, and PDU according to the actual situation, and then click [Save] to exit the screen.

Tip:

- AE Title should be the same with the SCU AE Title preset in the server (PACS/RIS/HIS), for example, if the AE Title of the server preset in the print server is Printer, and the AE Title of the accepted SCU is preset as Machine, then in the figure above, the AE Title of Local should be Machine, and the AE Title of print server should be Printer.
- 1) The device name can be entered to your preference. If the currently entered name has already existed, the system will show a tip: "The server name exists!" Click [OK] to enter another name.
- Port must not be set as 4001, 6000, 3001, 6555.
- 2) IP address must be the actual IP address of the server.

1.2 DICOM Service Preset

To open the DICOM Service screen:

1. Press <Setup> key to show the Setup menu. Move the cursor onto the [DICOM/HL7 Preset] item to open the screen.
2. Click the [Set DICOM Service] to set the attributes of services.

After DICOM is installed and DICOM Worklist, MPPS, and Query/Retrieve are optionally configured, there will be related screen for presetting.

1.2.1 DICOM Storage Preset

Figure 2 DICOM Storage Preset Screen

The main parameters of DICOM Storage are described as below:

Name	Description
Devices	After you set the server (s) in DICOM Server screen, the name (s) will appear in the drop-down list, select the name of the storage server.
Service name	Default is xxx-Storage, user-changeable.
AE Title	Application Entity title, here, it should be consistent with that of the storage server.
Port	DICOM communication port, 104 is default. Here, the port should be consistent with that of the storage server port.
Maximum Retries	0–9 times are optional, the default is 3, if the DICOM storage task that is sent to this server is failed, the task will be retried automatically, the retry times is set here.
Interval Time (Sec)	5–1800 seconds, 15 seconds is default. (Reserved)
TLS	User encrypted transmission when checked.
Timeout (Sec)	Refers to the amount of time after which the system will stop trying to establish a connection to the service. Value: 5-60s, in increments of 5s, and 15 is default.

Cine Zoom Mode	Original, 640*480, 800*600, 1024*768 are optional, the default is Original.
Compression Mode	Uncompressed(The image is uncompressed), RLE(The image is lossless compressed), JPEG(Please refer to the information of provider to confirm whether SCP can support JPGE compression. If not, please do not select it) are optional, the default is JPEG.
Compression Ratio	LossLess, High, Middle and Low, three kinds of Compression Ratio are optional. Compression Ratio is in inverse proportion to image quality.
Color Mode	Three options are available, Color means the images sent from system to server will be coded by 24bit, Mixed means the images sent from system to server will be coded by 8bit or 24 bit depends on whether the images themselves are captured in color imaging mode or colorize switch is in "on" state or not, if they do so, will be coded by 24bit, else 8bit. Gray means the images sent from system to server will be coded by 8bit. The default is Color.
Allow Multiframe	If SCP supports this function, then select it.
Max Framerate	25,30,35, Full are available, user-changeable
3D\4D	Normal, Rawdata, Volume are optional when sending the 3D\4D image files, the default is Normal.
SR Storage Option	Three options are available when Structured Reporting is needed to send. You can select "Attach SR When Store Images", "Only Store SR", or "Not Store SR".
Encapsulated PDF	Encapsulate a PDF document within the DCM file. If SCP supports this function, then select it, the default is unselected.
Doppler Audio	None, MPEG_MP@ML are optional. None means the audio will be not sent and MPEG_MP@ML means the audio and image will be coded with MPEG2 Main Level
Storage Mode	Parallel file, Parallel frame are optional, Parallel file is default. Please refer to the information of SCP to confirm whether SCP can support empty Basic Offset Table (zero length) of encapsulated Multi-Frame image. If not, please do not select it
Add	Add the DICOM service to the service list.
Cancel	Click to cancel parameter preset.
Update	Select an item in the service list, change the parameters in the above area, and click [Update] to update the item in the service list.
Delete	Click to delete the selected service in the service list.
Verify	Click to verify if the two DICOM application entities are normally connected.
Default	Select an item in the service list, click [Default] and you can see "Y" in the Default column.
Exit	Click to exit the screen.

Tip:

- JPEG is one of the storage types, but not all SCPs can support it. Please refer to the electronic file DICOM CONFORMANCE STATEMENT to check whether SCP supports this function.
- AE Title and Port must be consistent with those of server.
- Click the item in Service List to modify the parameters and click [Update] to update them.
- You can click [Delete] to delete the item in Service List.

1.2.2 DICOM Print Preset

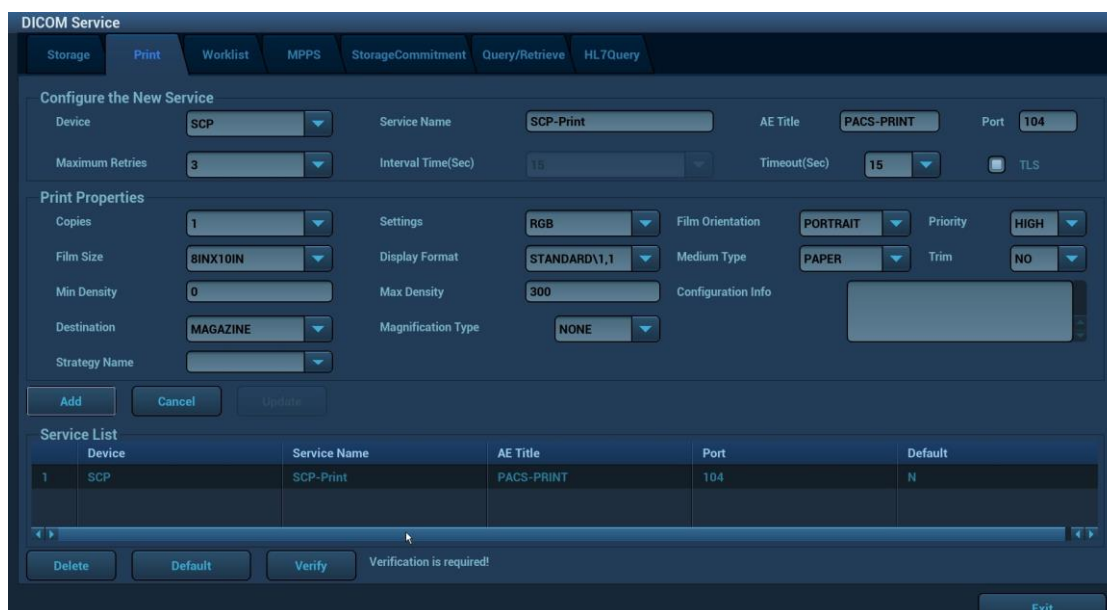


Figure 3 DICOM Print Preset Screen

The main parameters of DICOM Print are described as below:

Name	Description
Devices	After you set the server (s) in DICOM Server screen, the name (s) will appear in the drop-down list, select the name of the print server.
Service name	Default is xxx-Print, user-changeable.
AE Title	Application Entity title, here, it should be consistent with that of the print server.
Port	DICOM communication port, 104 is default. Here, the port should be consistent with that of the print server port.
Maximum Retries	0–9 times are optional, the default is 3. If the DICOM storage task that is sent to this server is failed, the task will be retried automatically, the retry times is set here.
Interval Time (Sec)	5–1800 seconds, 15 seconds is default. (Reserved)
Timeout (Sec)	Refers to timeout during association establishment. Value: 5-60s, in increments of 5s, and 15 is default.
TLS	User encrypted transmission when checked.
Copies	Refer to copies of printed files. You can select among 1 through 5, or directly enter the numeral.
Settings	The system supports RGB (color printing) and MONOCHROME2 (black and white printing). Please select the type the printer supports.
Film Orientation	Select between LANDSCAPE and PORTRAIT.
Priority	High、 Middle、 Low
Film Size	Select film size among the selections listed in the drop down list.
Display Format	Specify quantity of printed files, e.g. STANDARD2, 3 indicates 6 images are printed for each page.
Media Type	Specify print medium: Paper, Clear Film, Blue Film; select Blue Film or Clear Film for black and white printing; select Paper for color printing.

Trim	Specify whether you want a trim box to be printed around each image on the film: Yes or No.
Min Density	Enter the minimum density of the film. The default is 0.
Max Density	Enter the maximum density of the film. The default is 300.
Magnification Type	Select how the printer magnifies an image to fit the film. Replicate: interpolated pixels belong to duplicate of adjacent pixels); Bilinear: interpolated pixels are generated from bilinear interpolations between adjacent pixels; Cubic: interpolated pixels are generated from cubic interpolations between adjacent pixels; None: without interpolation.
Destination	Specify where the file is exposed: MAGAZINE (stored in the magazine), or, PROCESSOR (exposed in the processor).
Configuration Info	Enter configuration information in the field.
Add	Add the DICOM service to the service list.
Delete	Click to delete the selected service in the service list.
Cancel	Click to cancel parameter preset
Update	Select an item in the service list, change the parameters in the above area, and click [Update] to update the item in the service list. .
Verify	Click to verify if the two DICOM application entities are normally connected.
Default	Select an item in the service list, click [Default] and you can see "Y" in the Default column.
Exit	Click to exit the screen.

Tips:

The parameters preset should be meet the requirements of printer, for instances:

1. If the printer cannot support the [Film Size] of 8IN*10IN, please modify it that the printer can support.
2. It will implement color printing when [Settings] is set as RGB, black and white printing when it is set as MONOCHROME2.
3. For [Media Type], select Blue Film or Clear Film for black and white printing; select Paper for color printing.
4. Other parameters can use defaulted values. If there are special requirements for printer, please modify it.

1.2.3 Worklist Preset

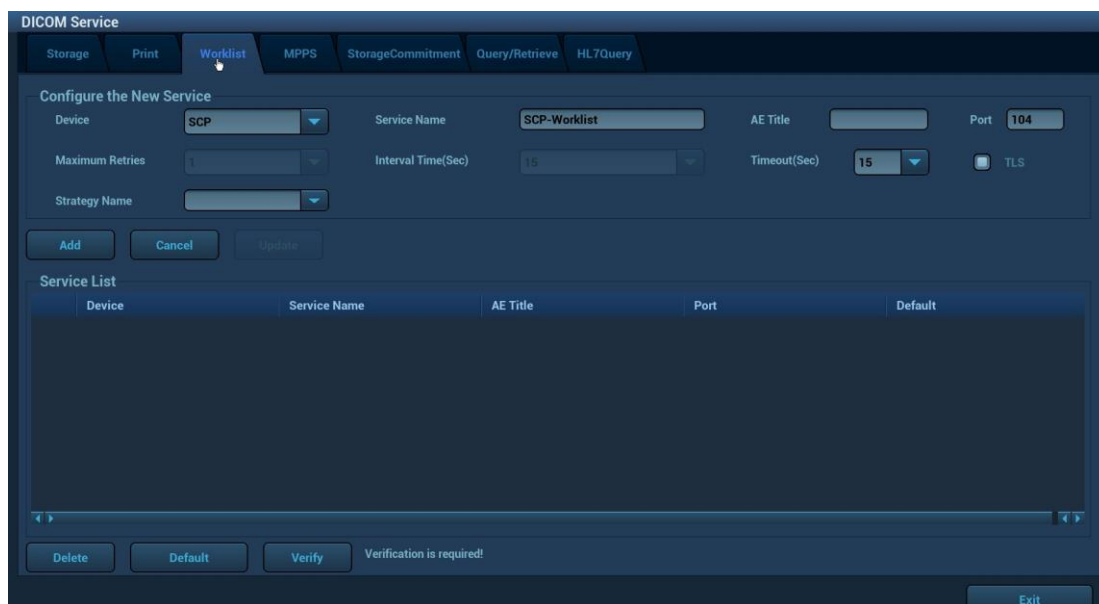


Figure 4 DICOM Worklist Preset Screen

The main parameters of DICOM Worklist are described as below:

Name	Description
Devices	After you set the server (s) in DICOM Server screen, the name (s) will appear in the drop-down list, select the name of the Worklist server.
Service name	Default is xxx-Worklist, user-changeable.
AE Title	Application Entity title, here, it should be consistent with that of the Worklist server.
Port	DICOM communication port, 104 is default. Here, the port should be consistent with that of the Worklist server port.
Maximum Retries	0—9 times are optional, the default is 3. (Reserved)
Interval Time (Sec)	5—1800 seconds, 15 seconds is default. (Reserved)
Timeout (Sec)	5-60s, in increments of 5s, and 15 is default. Timeout is the overtime of connecting Association.
TLS	User encrypted transmission when checked.
Add	Click it to add the Worklist service to the service list.
Cancel	Click to cancel parameter preset.
Update	Select an item in the service list, change the parameters in the above area, and click [Update] to update the item in the service list.
Delete	Click to delete the selected service in the service list.
Verify	Click to verify if the two DICOM application entities are normally connected.
Default	Select an item in the service list, click [Default] and you can see "Y" in the Default column.
Exit	Click to exit the setup screen.

1.2.4 MPPS Preset

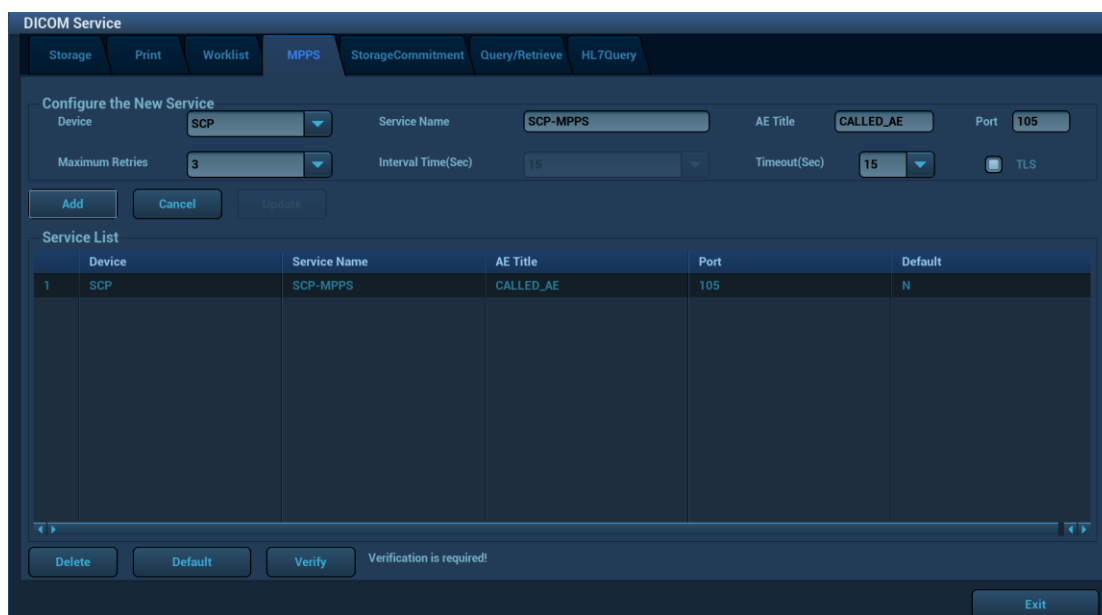


Figure 5 DICOM MPPS Preset Screen

The main parameters of DICOM MPPS are described as below:

Name	Description
Devices	After you set the server (s) in DICOM Server screen, the name (s) will appear in the drop-down list, select the name of the MPPS server.
Service name	Default is xxx-Worklist, user-changeable.
AE Title	Application Entity title, here, it should be consistent with that of the MPPS server.
Port	DICOM communication port, 104 is default. Here, the port should be consistent with that of the MPPS server port.
Maximum Retries	0—9 times are optional, the default is 3. if the DICOM storage task that is sent to this server is failed, the task will be retried automatically, the retry times is set here.
Interval Time (Sec)	5—1800 seconds, 15 seconds is default. (Reserved)
Timeout (Sec)	5-60s, in increments of 5s, and 15 is default. After user sending MPPS for 15 seconds, the connection will be closed.
TLS	User encrypted transmission when checked.
Add	Add the DICOM service to the service list.
Cancel	Click to cancel parameter preset.
Update	Select an item in the service list, change the parameters in the above area, and click [Update] to update the item in the service list.
Delete	Click to delete the selected service in the service list.
Verify	Click to verify if the two DICOM application entities are normally connected.
Default	Select an item in the service list, click [Default] and you can see “Y” in the Default column.
Exit	Click to exit the preset screen.

Tip: You should set MPPS as default server when you use it.

1.2.5 Storage Commitment Preset

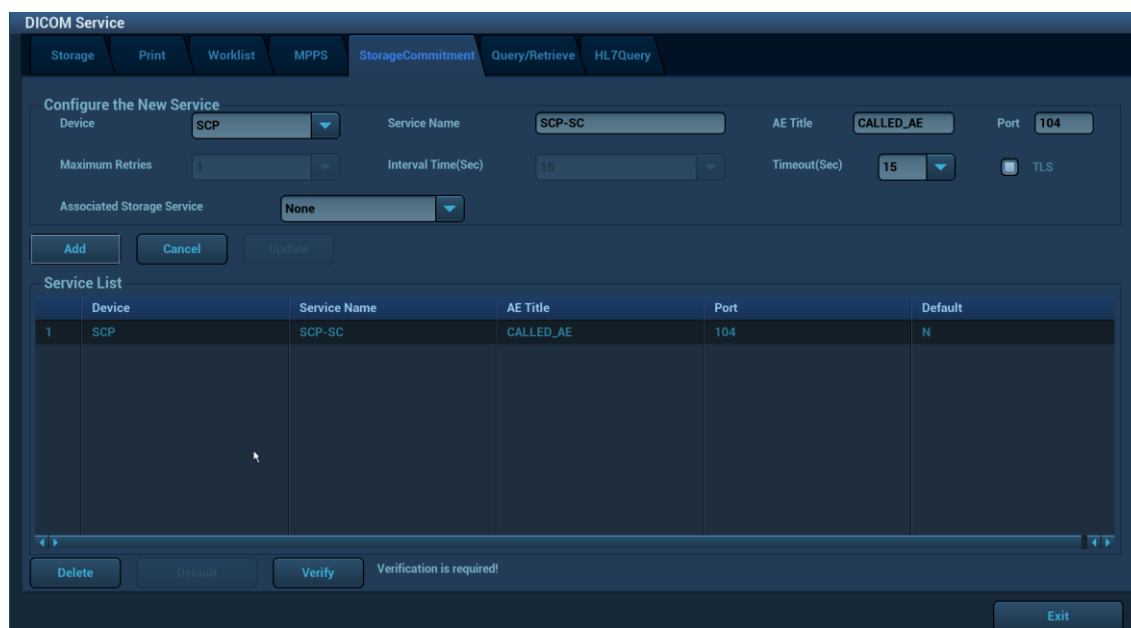


Figure 6 DICOM Commitment Preset Screen

The main parameters of storage commitment are described as below:

Name	Description
Devices	After you set the server (s) in DICOM Server Preset screen, the name (s) will appear in the drop-down list, select the name of the server.
Service name	Default is xxx-SC, user-changeable.
AE Title	Application Entity title, here, it should be consistent with that of the storage commitment server.
Port	DICOM communication port, 104 is default. Here, the port should be consistent with that of the storage commitment server port.
Maximum Retries	0—9 times are optional, the default is 3. (Reserved)
Interval Time	5—1800 seconds, 15 seconds is default. (Reserved)
Timeout	Value: 5-60s, in increments of 5s, and 15 is default. After user sending storage commitment for 15 seconds, the connection is closed.
TLS	User encrypted transmission when checked.
Associated Storage Service	The associated storage server is preset before storage commitment, only after the exam is sent out, can storage commitment be created.
Add	Add the DICOM service to the service list.
Cancel	Click to cancel parameter preset.
Update	Select an item in the service list, change the parameters in the above area, and click [Update] to update the item in the service list.
Delete	Click to delete the selected service in the service list.
Verify	Click to verify if the two DICOM application entities are

	normally connected.
Default	Unavailable
Exit	Click to exit the setup screen.

Tips:

1. Set storage server relating to storage commitment.
2. Set the port for message return and IP at server end, which are respectively corresponding to the port in DICOM Local and IP in TCP/IP preset.

1.2.6 Query/Retrieve Preset

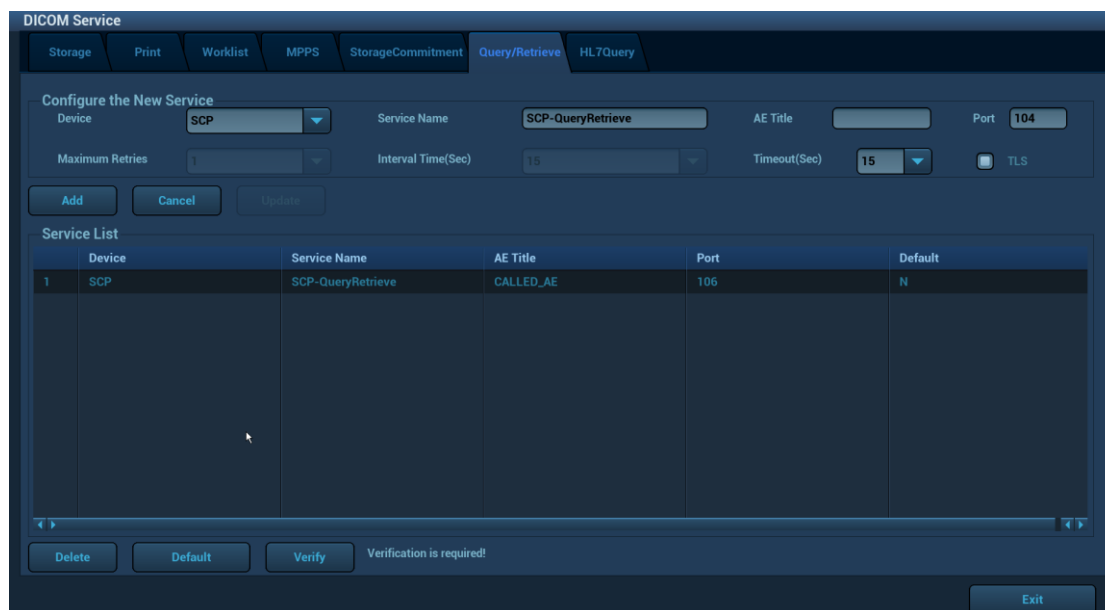


Figure 7 DICOM Query/Retrieve Preset Screen

The main parameters of Query/Retrieve are described as below:

Name	Description
Devices	After you set the server (s) in DICOM Server Preset screen, the name (s) will appear in the drop-down list, select the name of the storage commitment server.
Service name	Default is xxx-QueryRetrieve, user-changeable.
AE Title	Application Entity title, here, it should be consistent with that of the storage commitment server.
Port	DICOM communication port, 104 is default. Here, the port should be consistent with that of the storage commitment server port.
Maximum Retries	0—9 times are optional, the default is 3. (Reserved)
Interval Time	5—1800 seconds, 15 seconds is default. (Reserved)
Timeout	Value: 5-60s, in increments of 5s, and 15 is default. After user sending storage commitment for 15 seconds, the connection is closed.
TLS	User encrypted transmission when checked.
Add	Add the DICOM service to the service list.
Cancel	Click to cancel parameter preset.
Update	Select an item in the service list, change the parameters in the above area, and

	click [Update] to update the item in the service list.
Delete	Click to delete the selected service in the service list.
Verify	Click to verify if the two DICOM application entities are normally connected.
Default	Select an item in the service list, click [Default] and you can see “Y” in the Default column.
Exit	Click to exit the preset screen.

1.2.7 HL7Query Preset

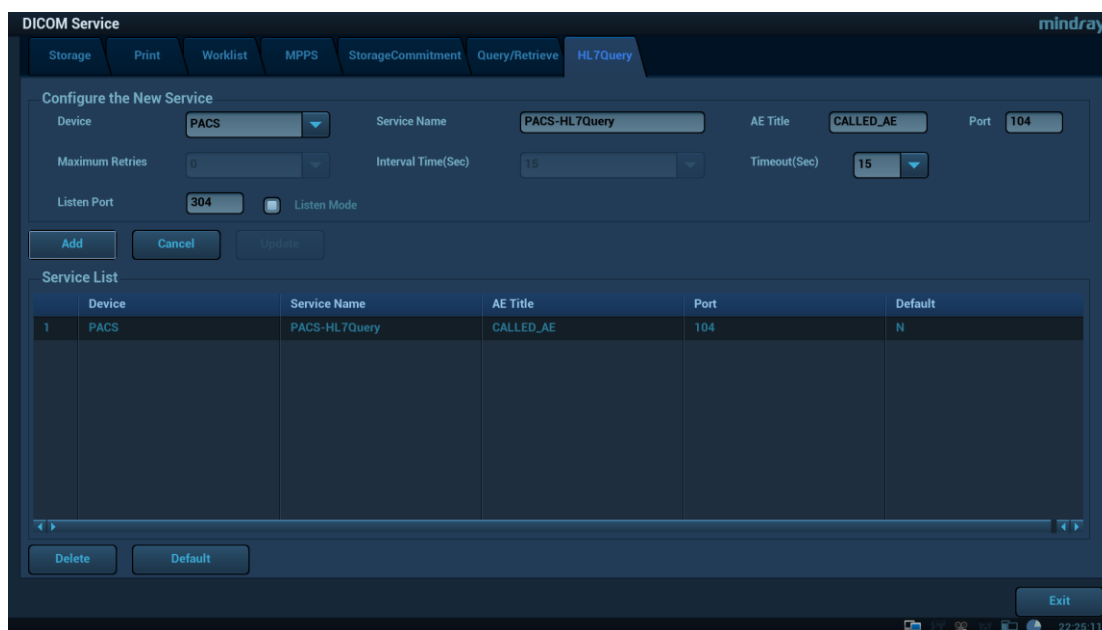


Figure 8 HL7Query Preset Screen

The main parameters of HL7Query are described as below:

Name	Description
Devices	After you set the server (s) in DICOM Server screen, the name (s) will appear in the drop-down list, select the name of the HL7 server.
Service name	Default is xxx-HL7Query, user-changeable.
AE Title	Application Entity title, here, it's optional and empty by default.
Port	HL7 communication port, 104 by default. The port should be consistent with that of the HL7 server port.
Maximum Retries	0—9 times, and the default is 3. (Reserved)
Interval Time (Sec)	5—1800 seconds, and 15 seconds is default. (Reserved)
Timeout (Sec)	5-60s, in increments of 5s, and 15 is default. Timeout is the overtime of connecting Association, after the set time, DC-60 will disconnect the TCP connection.
Lisen Port	HL7 Listen Port, the default is 304. This port is used to receive patient query result message.
Listen Mode	Under Listen Mode, Ultrasound Diagnostic System sends patient query message as client and receives query result from peer as server; Under non-Listen Mode, Ultrasound Diagnostic System sends and receives HL7 message in one TCP connection. The

	default is unselected.
Add	Click it to add the HL7 service to the service list.
Cancel	Click to cancel parameter preset changes.
Update	Select an item in the service list, change the parameters in the above area, and click [Update] to update the item in the service list.
Delete	Click to delete the selected service in the service list.
Default	Select an item in the service list, click [Default] and you can see "Y" in the Default column.
Exit	Click to exit the setup screen.

1.2.8 DICOM Strategy Preset

On the DICOM/HL7 preset screen, click [Set DICOM Strategy] to enter the strategy preset screen as Figure 9.

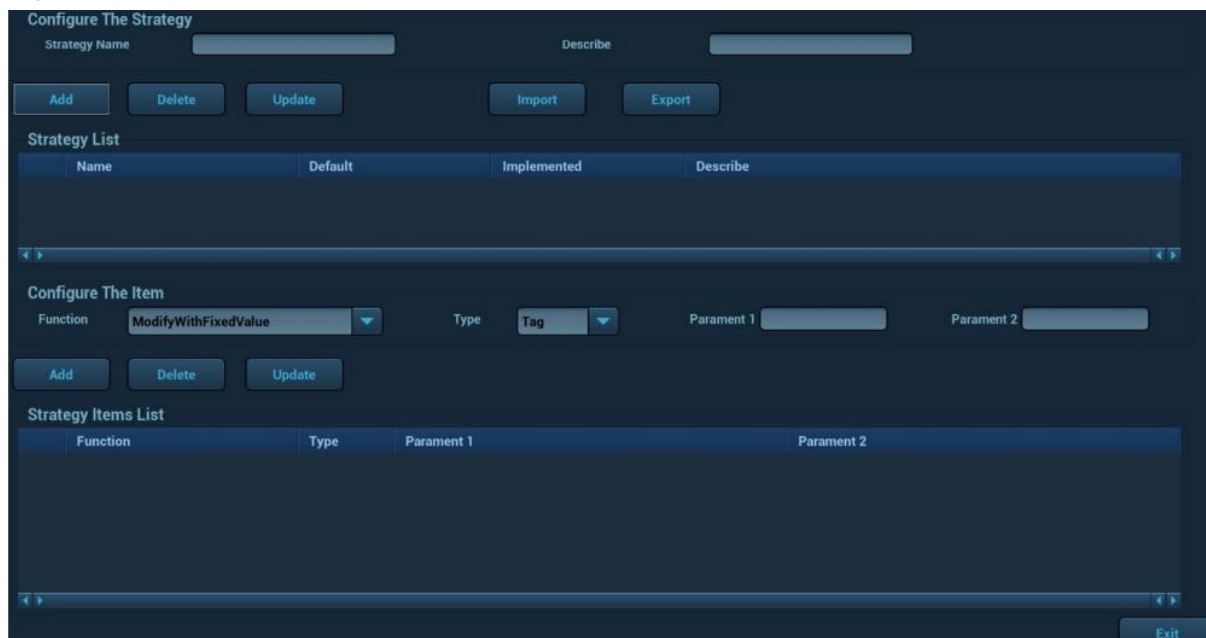


Figure 9 Configure the Strategy

Name	Description
Strategy Name	The strategy name is limited to 32-100 characters. Cases including duplication of name, comma and leaving a blank are forbidden.
Describe	Description of the strategy.
Add	Add the DICOM strategy to the strategy list.
Delete	Click to remove the DICOM strategy from the strategy list.
Update	Select an item in the strategy list, change the parameters in the above area, and click [Update] to update the item in the strategy list.
Import	Import DICOM strategy.
Export	Export DICOM strategy.

Function	HL7 Listen Port, the default is 304. This port is used to receive patient query result message.
Type	Under Listen Mode, Ultrasound Diagnostic System sends patient query message as client and receives query result from peer as server; Under non-Listen Mode, Ultrasound Diagnostic System sends and receives HL7 message in one TCP connection. The default is unselected.
Parament 1	Set the parameter according to needs. The maximum character length is 64.
Parament 2	Set the parameter according to needs. The maximum character length is 64.
Add	Add the DICOM strategy item to the strategy item list.
Delete	Click to remove the DICOM strategy item from the strategy item list.
Update	Select an item in the strategy item list, change the parameters in the above area, and click [Update] to update the item in the strategy item list.

NOTE: The DICOM strategy must be configured by qualified personnel with good knowledge of DICOM standards. The qualified personnel must ensure the validity of the DICOM strategy.

2 DICOM Service

2.1 Verify Connectivity

If you want to verify connectivity (it is not a must), you can click [Verify] button on Storage, Print or Worklist, MPPS, Storage Commitment and Query/Retrieve pages respectively. If the verification succeeded, the system prompts “xxx Verify Succeed”. Otherwise, it prompts “xxx Verify Failed”, which means the connection is wrong. Please reconfirm it.

Tip:

Not all the SCPs can support verification; please consult SCP belongings to confirm whether SCP can support this service. If not, the verification won't pass.

2.2 DICOM Storage

DICOM Storage is used to send images (and SR) to DICOM storage server for remote storage. The entrances of storage include:

- ◆ Patient information management (iStation)
- ◆ Review status (Review)
- ◆ Real time/Freeze status (auto workflow)
- ◆ Thumbnail area

DICOM storage supports:

- ◆ Single file transfer
- ◆ Exam transfer
- ◆ Batch transfer
- ◆ Static image and Cine file

Batch transfer means multiple exam records can be selected and sent for storage with one DICOM task for each exam. Multiple files in one exam will be sent in one DICOM connection.

The auto send function can be triggered by:

- ◆ Ending the exam (send to default storage service)
- ◆ Saving an image by pressing the user-defined save key (image is sent to the default DICOM storage server as well as saved).

2.1.1 Storage Operation

The system supports automatic and manual storage.

The operations for manual storage service are described below:

Take “send to DICOM storage” in iStation page as an example, the operations are:

1. Configure the storage server according to the above descriptions about service preset.
2. Press <iStation> on the control panel to enter the patient information management page.
3. Select one or more exam records (that contain images. If not, the system will prompt) in exam list, or select one or more images in an exam, as shown in Figure 10 iStation Screen.

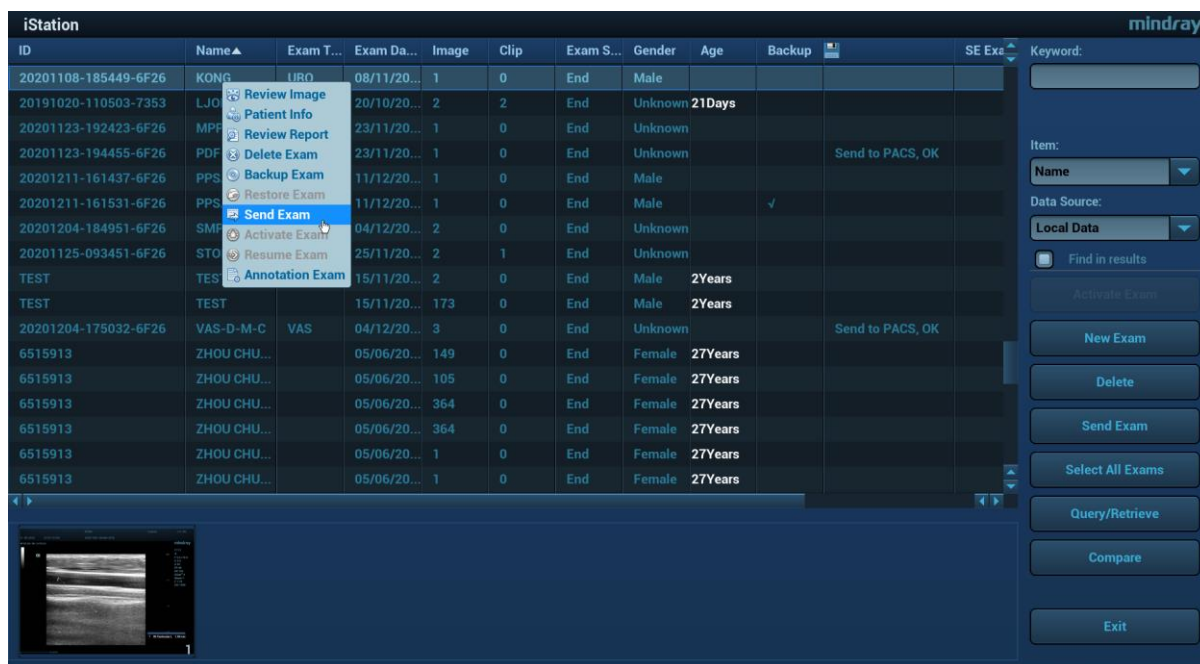


Figure 10 iStation Screen

4. Click [Send Exam] to pop up the [Send To] dialog box.
5. Select the remote DICOM Server; click [OK] to send, as shown in Figure 11 DICOM Send To Screen.

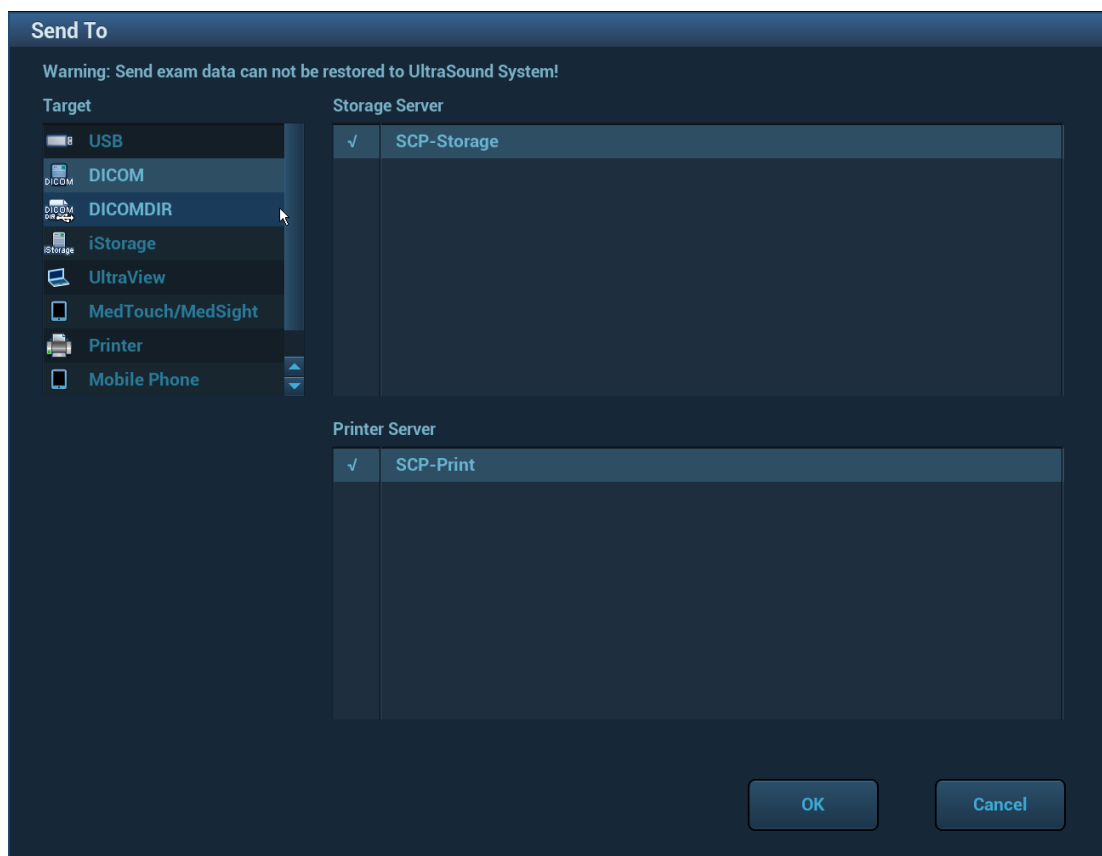



Figure 11 DICOM Send To Screen

6. Click  in the right corner of the screen to open Management, in which, you can review sending status. Select one record, and there is sending result in prompt dialog box, as shown in Figure 12 Task Management.

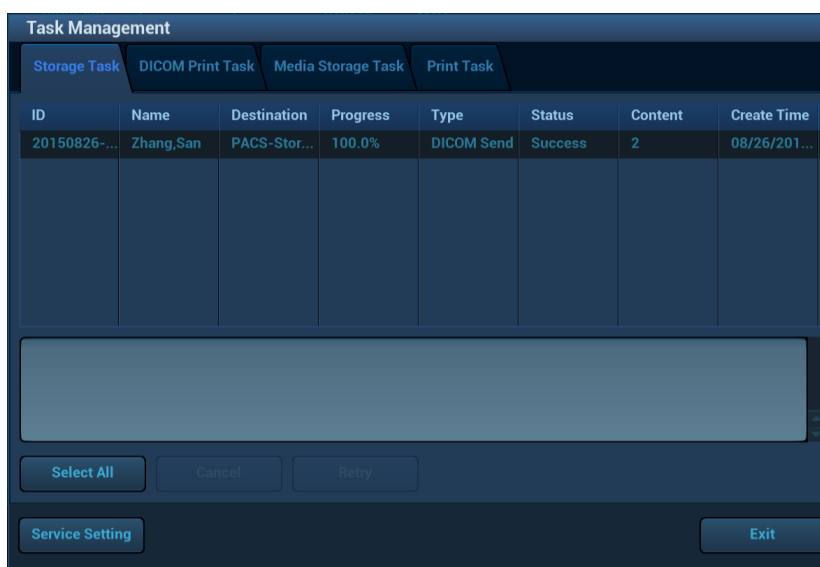


Figure 12 Task Management

Function paths of sending image to DICOM storage and sending images by user-defined key after ending exam automatically:

A. Send Image after end exam:

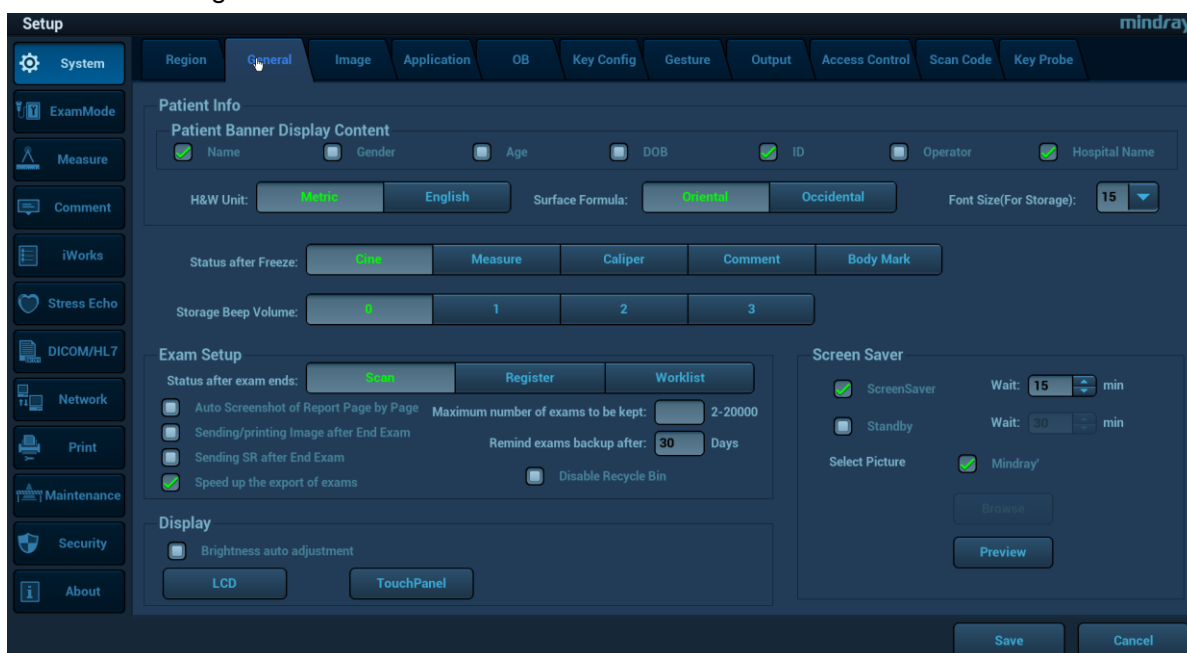


Figure 13 Send Image after End Exam

Steps:

1. In Setup -> System -> General, select, as shown in Figure 13 Send Image after End Exam.
2. In Setup -> DICOM/HL7 -> DICOM Service -> Storage, set the default storage server (one or more).
3. When pressing <End Exam> with the current exam being active, all images (and SR) of the current exam are sent to the default DICOM storage server.

B. Send to DICOM Storage by user-defined shortcut key

1. In Setup -> System -> Key Config, the NULL key can be set as "Send Image to DICOM storage", as shown in Figure 14 Send to DICOM Storage by User-defined Key.

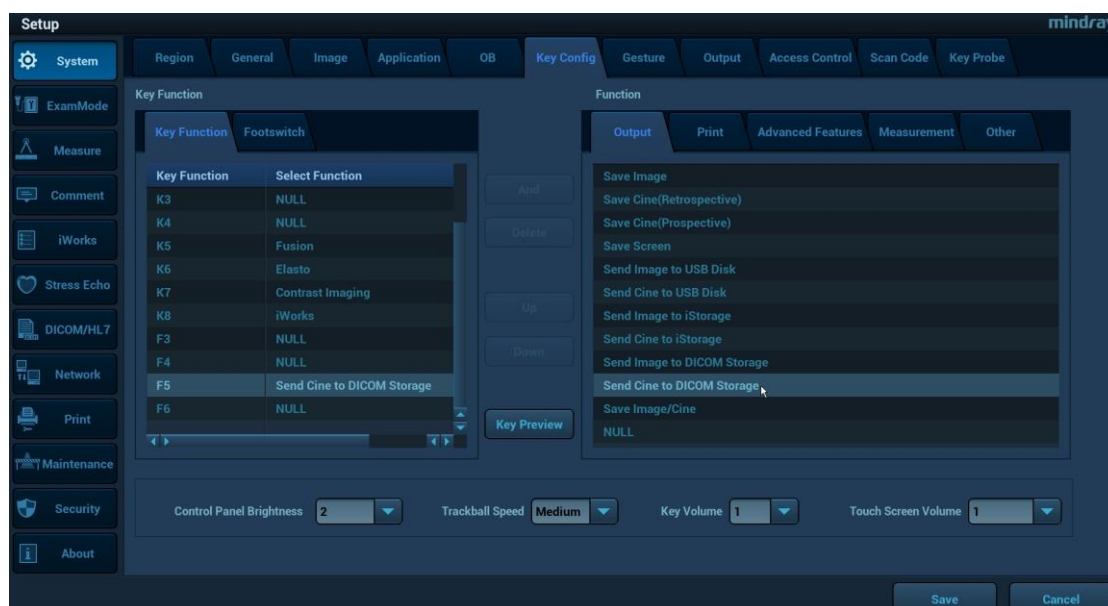


Figure 14 Send to DICOM Storage by User-defined Key

- In Setup -> DICOM/HL7 -> DICOM Service -> Storage, set the default storage server (one or more).
- In current exam, press <F4> (according to the user preset), the system will send a single-frame image to remote DICOM storage automatically. When pressing <F5>, the system will send a multi-frame image to remote DICOM storage

2.1.2 Structured Report (SR)

The system provides SRs in gynecology, obstetric, cardiac, vascular, and breast exams that specified in the DICOM standard. The SR can not only be sent alone to a DICOM server but also be sent along with an exam record that has image(s) saved. The type of SR to be sent is determined by the application region of the exam:

- Send obstetric SR: gynecology and obstetrics exam;
- Send cardiac SR: cardiac exam;
- Send Vascular SR: vascular, abdomen and urology exam. (The vascular SR contains the superficial, abdominal and kidney vascular, application region of which corresponds to the vascular, abdomen and urology exam respectively.)
- Send breast SR: breast exam;
- Send Abdomen SR: abdomen exam(The abdomen SR contains the abdomen measurements, abdominal and kidney vascular.)
- Send Small Part SR: SMP exam and part of URO exam.
- Send Pediatric SR: PED exam.

The SR only could be sent in the circumstance as below:

- The exam type is obstetric, gynecology, cardiac, vascular, breast
- The SR Key for the exam type must be installed in option preset UI.
- Exam is the unit to send.
- The status of the exam is "End", "Paused" or "Cancelled". SR would not be sent when an active exam is selected.
- The DICOM storage service SCPs should be set as "Attach SR When Store Images" or "Only Store SR"

A. Attach SR When Store Images

Send image and gynecology and obstetric SR (or cardiac, vascular, breast SR, abdomen SR) in iStation screen:

1. Select "Attach SR when Store Images" in DICOM Service -> Storage-> SR Storage Option(See 1.2.1)
2. Start a new patient:
 - Press <Patient>, enter the Patient ID, Patient Name etc, select [OB] (or GYN, CAR, VAS, BREAST, ABD) application region, click [OK]
 - Or, load a patient from the WorkList, click [Start Exam] (commonly used in hospital)
3. Perform obstetric (gynecology, cardiac, vascular, breast, ABD) measurements:
4. Save image(s)
 - Freeze the image, press <Save> (a user-defined key, maybe preset for other function) on the control panel to save single-frame file.
5. End the exam
6. Enter iStation screen; select the patient, click [Send Exam].A dialog box pops up, as shown in Figure 15 Send To.

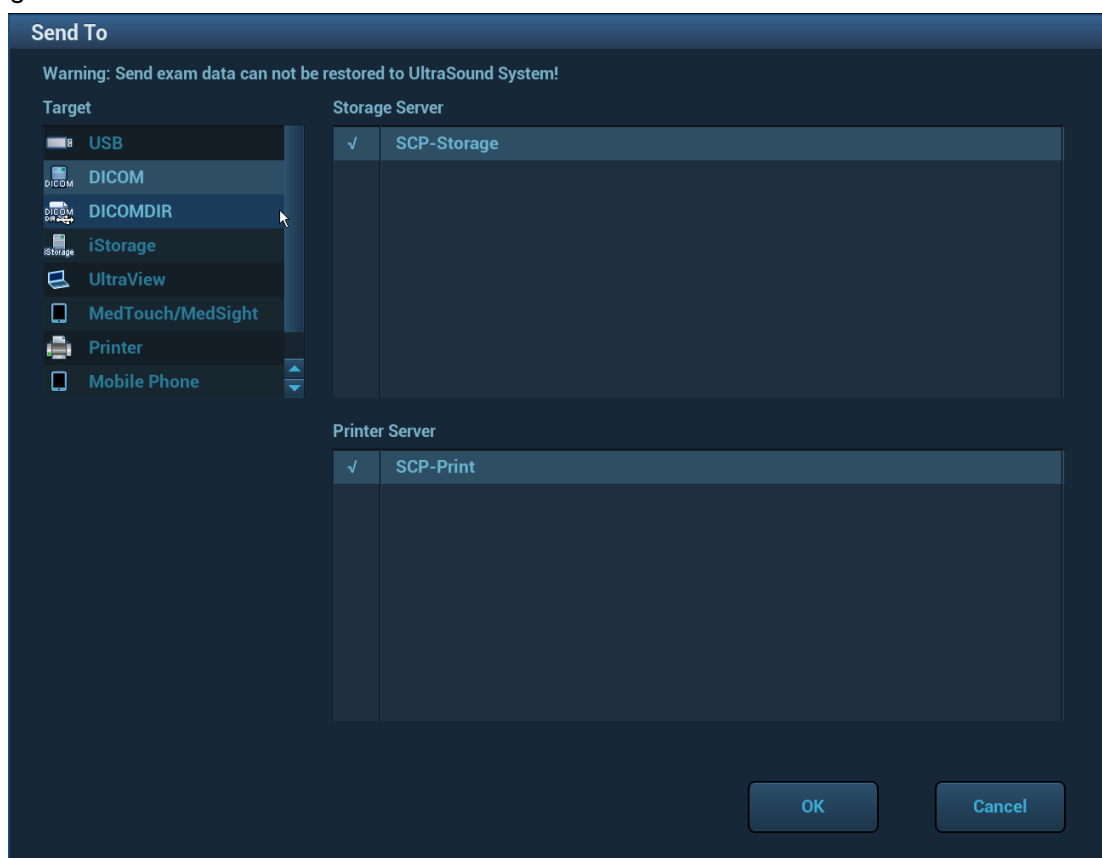


Figure 15 Send To

7. Select DICOM in the [Target] list; select a server in the [Storage Server] list.
 8. Click [OK], the status of sending task can be viewed in DICOM task management.
- NOTE: For sending SR automatically, the same procedures are followed as in 2.1.1 Storage Operation.

B. Only Storage SR

Select "Only Store SR" in DICOM Storage Preset -> SR Store Option (See 1.2.1). The procedures are as the same as "Attach SR when Store Images".

2.1.3 Encapsulated PDF

Encapsulated PDF is a PDF document that has been encapsulated within a DICOM information object, which is used to encapsulate the report document in this system.

The Encapsulated PDF only could be sent in the circumstance as below:

- Exam is the unit to send.
- The status of the exam is "End", "Paused" or "Cancelled". Encapsulated PDF would not be sent when an active exam is selected.
- The "Encapsulated PDF" should be enabled in DICOM storage service preset.
- Measuring result should be existent in default report template, which is to say that measurement in the exam type must be done.

The operation to send Encapsulated PDF: After [Encapsulated PDF] is enabled in preset, select exam to send or send after ending exam automatically as 2.1.1.

2.1.4 3D/4D

3D/4D images could send as pre-configuration form:

- Normal: send as the same as 2D images.
- Volume: send as 3D volume dataset encapsulated within Enhanced US Volume Storage IOD;
- Raw data: private form. Transfer with Raw data form is mainly used for 4DViewer to get the raw data of the 3D or 4D images. The 3D or 4D images are encapsulated within Raw Data Storage IOD to send to 4DViewer and 4DViewer could review them.

The "3D/4D" option is only effective for 3D and 4D images, but isn't for 2D images. The operation to send 3D/4D images: After the [3D/4D] option is set correctly in preset, select 3D or 4D images to send as 2.1.1.

2.1.5 Send DCM File

System allows saving images as DCM format to external media or device. The operations are described below:

A. Send to External Media

When the system is connected to external storage media, it allows saving the image as DCM format. The detailed operations are as follows:

1. Select one or more exams (with image) in iStation, click [Send].
2. In the dialog box popped up, select the [Destination] as connected external media.
3. Select the Export Image "DCM"; after confirming, click [OK], the selected exam or the image(s) of the exam can be sent to the specified external media with the format of DCM, as shown in Figure 16 Save as DCM Format.

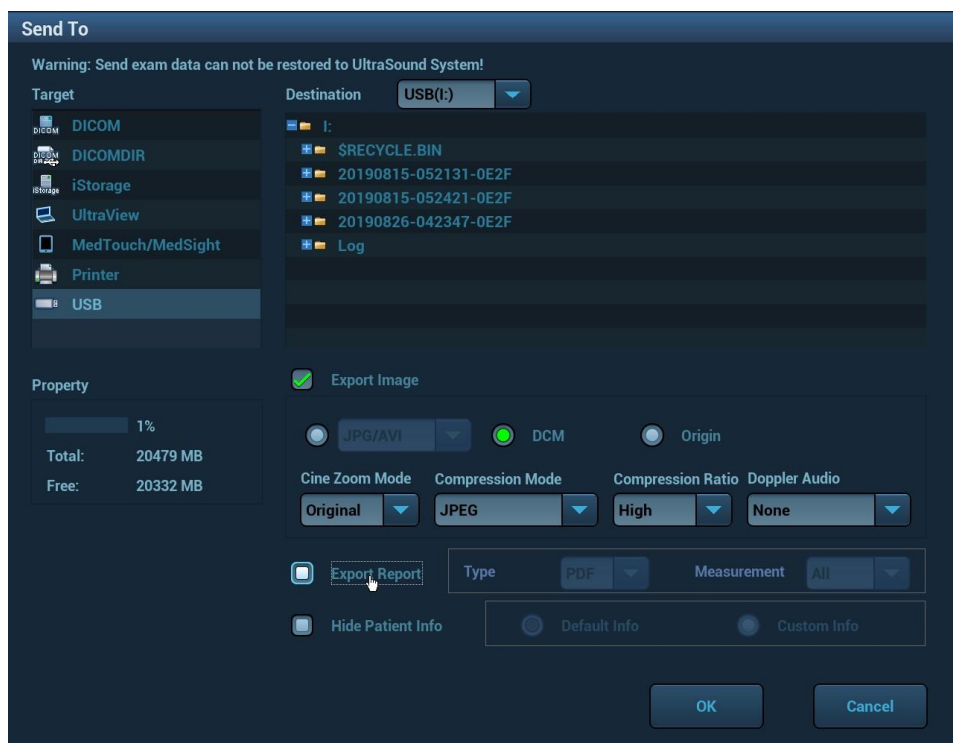


Figure 16 Save as DCM Format

B. Send to iStorage

When the system is connected to UltraAssist, it also allows sending files as DCM format. The detailed operations are as follows:

1. Configure the iStorage server in Setup -> Network -> iStorage.
2. Select one or more exams (with image) in iStation, click [Send].
3. In the dialog box popped up, select the iStorage server.
4. Select the Export Image “DCM”; after confirming, click [OK], the selected exam or the image(s) Doppler Audio of the exam can be sent to the specified iStorage server with the format of DCM, as shown in Figure 17 Send to iStorage.

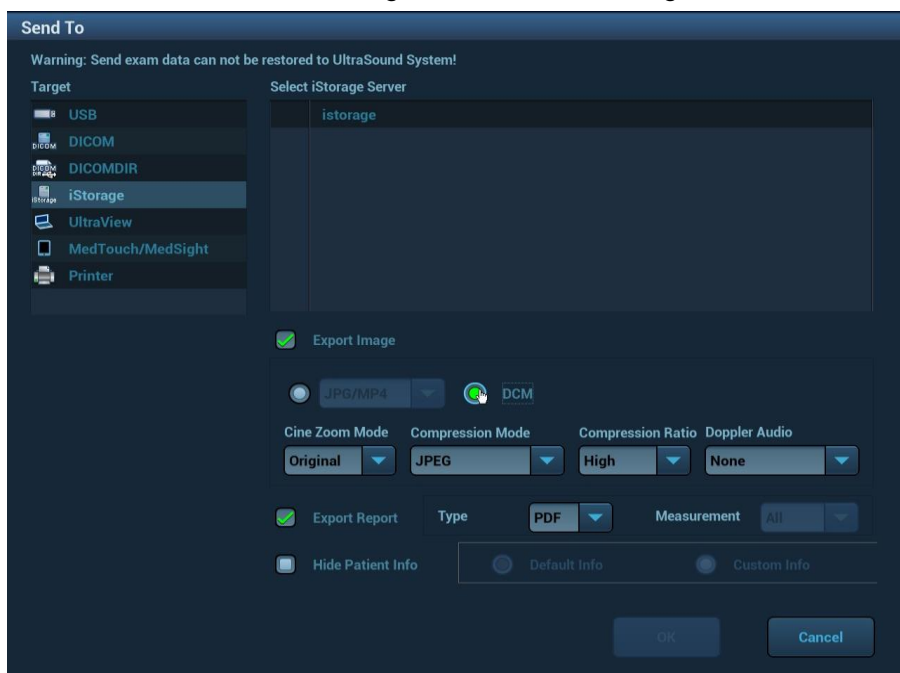


Figure 17 Send to iStorage

Note: The DCM files sent to external media or iStorage can be used as teaching files if “Hide Patient Information” on the send to dialog is selected, patient information will not be included in these DCM files.

2.3 DICOM Print

DICOM print provides local image printing via the remote DICOM service or printer that supports the DICOM standard. The image displayed on screen can be printed via the selected DICOM print device during exam or image browsing. Print function entrances:

- Patient information management (iStation)
- Review status (Review)
- Real time/ freeze status (auto workflow)
- Thumbnail area

DICOM print supports:

- Single file transfer
- Exam transfer
- Batch transfer
- Static image file
- Succeeding frames printing is available if more than one frame is being sent for printing.

Batch transfer means multiple exam records can be selected and sent for printing with one DICOM task for each exam. Multiple files in one exam will be sent in one DICOM connection.

The auto send function can be triggered by (presettable):

- Ending the exam (send to default print service)
- Saving an image by pressing the user-defined save key (image is sent to the default DICOM service as well as saved)

2.3.1 Send to DICOM Print Manually

Take “send to DICOM print” in iStation screen as an example, the operation steps are:

1. Configure the print server according to the upper descriptions of service preset.
2. Press <iStation> on the control panel to enter the patient information management screen.
3. Select one or more exam records (that contain images) in exam list, or select one or more images in an exam.
4. Click [Send Exam] to pop up the [Send To] dialog box, select the Printer Server, click [OK] to print.

2.3.2 Send to DICOM Print Automatically

Function paths of sending to DICOM print automatically:

■ Send to DICOM print when ending the exam

Steps:

1. In Setup -> System -> General, select “Sending/ printing Image after End Exam”.
2. In Setup -> DICOM/HL7 -> DICOM Service -> Print Service, set the default print server.
3. When pressing <End Exam> with the current exam being active, all images (and SR) of the current exam are sent to the default DICOM print server.

■ Send to DICOM print when pressing user-defined key

1. In Setup -> System -> Key Config, the NULL key can be set as “Save Image” ,Press “Add ” to combine this key with function of “Send Image to DICOM Printer”.
2. as shown in Figure 18 Send to DICOM print when pressing user-defined key.

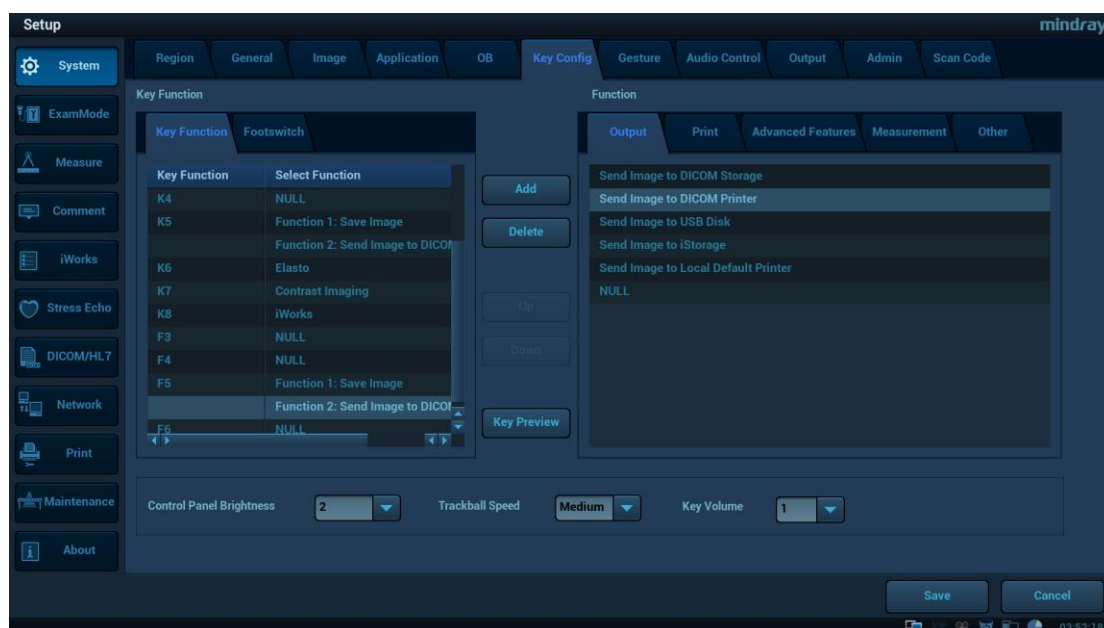


Figure 18 Send to DICOM print when pressing user-defined key

3. In DICOM Preset -> Print Service, set the default print server.
4. In current exam, press <F5> (according to the user preset), the system will save and send a single-frame image to remote DICOM printer automatically.
5. View the print status in the DICOM Task Management, check the DICOM preset and network connection if a print error occurs.

2.4 DICOM WorkList

The user can set query conditions when finding exam record(s) from the RIS or other Worklist server, and import the patient information selected in the query result.

Steps:

1. Press <Info> to open the Patient Info screen.
2. Click [WorkList] to enter the WorkList screen.
3. Query the patient information by setting conditions such as Patient ID, Name, and Key words, Exam Date, Modality, WorkList Server, and Scheduled Station AE Title. The default Exam Date is "today" of the system time. Patient records will be listed after clicking [Query].

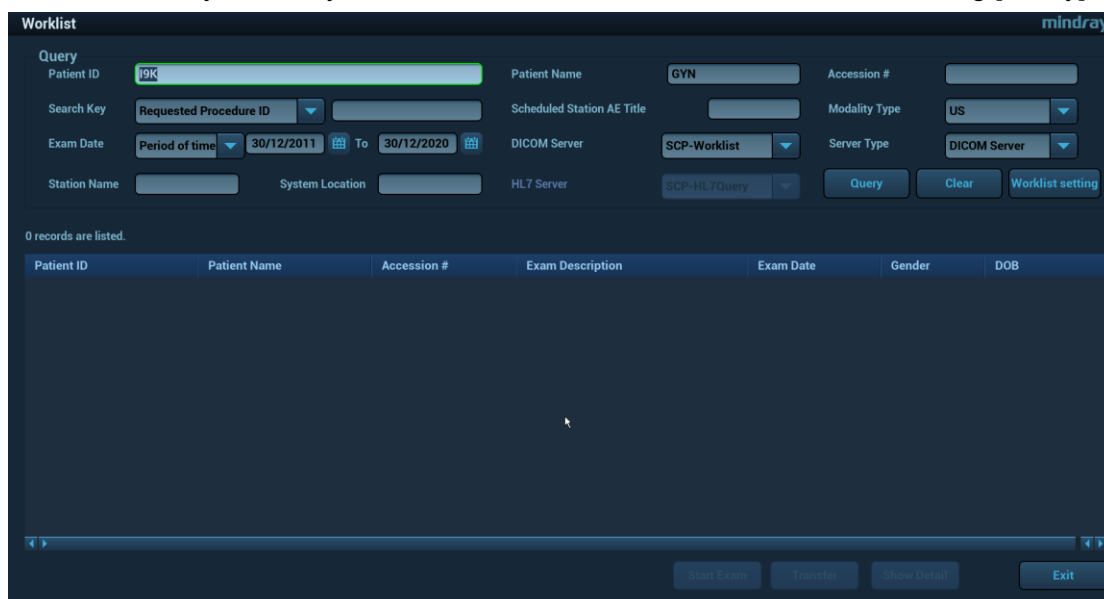
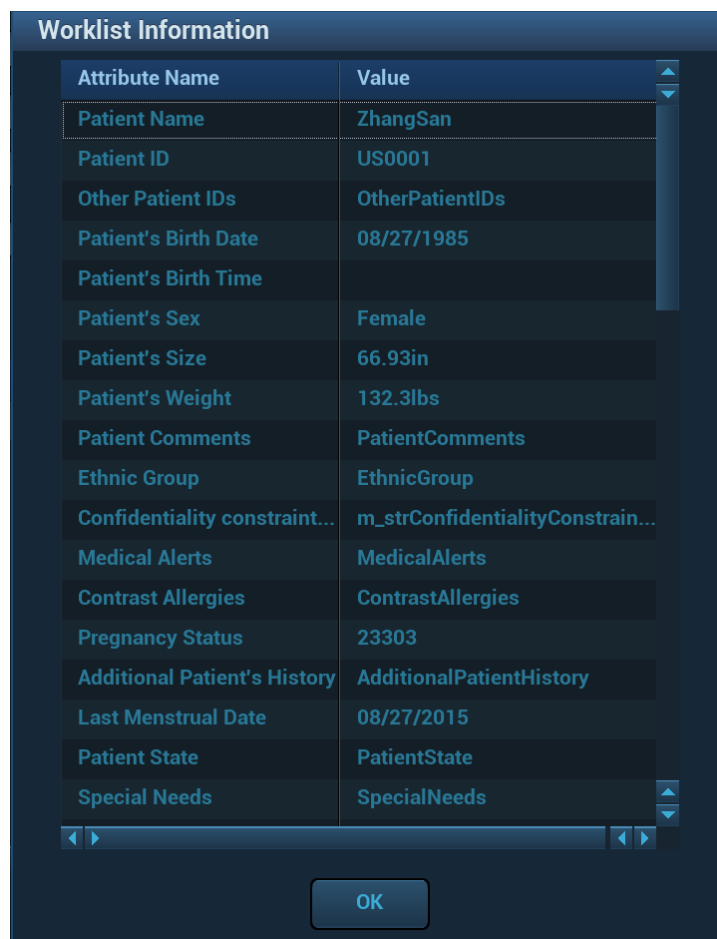


Figure 19 Query in WorkList

4. After the first query is finished, you can perform the second query within the range of the scheduled patients in the first time. The scheduled patients in the list will change in real time.
5. Select a patient record, click [Start Exam], the system import this patient and start the exam; Click [Transfer] will launch the patient record selected into the Patient Info screen to edit and restart the exam; Click [Show Detail] to view the detailed information of the patient. As shown in Figure 20 Detailed Information.



The screenshot shows a 'Worklist Information' dialog box with a table of patient attributes and values. The table has two columns: 'Attribute Name' and 'Value'. The data is as follows:

Attribute Name	Value
Patient Name	ZhangSan
Patient ID	US0001
Other Patient IDs	OtherPatientIDs
Patient's Birth Date	08/27/1985
Patient's Birth Time	
Patient's Sex	Female
Patient's Size	66.93in
Patient's Weight	132.3lbs
Patient Comments	PatientComments
Ethnic Group	EthnicGroup
Confidentiality constraint...	m_strConfidentialityConstrain...
Medical Alerts	MedicalAlerts
Contrast Allergies	ContrastAllergies
Pregnancy Status	23303
Additional Patient's History	AdditionalPatientHistory
Last Menstrual Date	08/27/2015
Patient State	PatientState
Special Needs	SpecialNeeds

At the bottom of the dialog box is an 'OK' button.

Figure 20 Detailed Information

6. If necessary, click [Worklist setting] to make following settings for worklist as figure 21.
 - (1) Select the character set from the drop-down list of "Character set", and the system converts the character set of retrieved patient records to current system character set from the selected character set in "Character set".
 - (2) Select the field from the drop-down list of "Study description mapping", and the system displays the corresponding field of retrieved patient data in the column of "Exam Description".
 - (3) Tick [Query on Display], and next time the system enters the worklist screen, the system starts query automatically according to last searching condition.

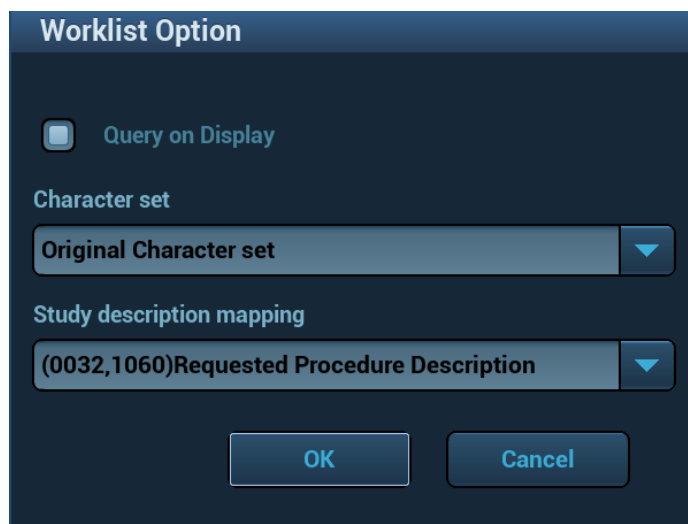


Figure 21 Worklist Setting

NOTE:

The modality type can be entered by the user.

If you set the “Scheduled Station AE Title” in Worklist Query Screen, then this item configured should be consistent with the one set in the server.

Second query and detail information are still available during off-line.

Check the DICOM preset and network connection if a query error occurs.

2.5 HL7Query

The user can set query conditions when finding exam record(s) from the Patient Monitors or other HL7 server, and import the patient information selected in the query result.

Steps:

1. Press <Info> to open the Patient Info screen.
2. Click [WorkList] to enter the WorkList screen.
3. Select the Server Type to be “HL7 Server”, Query the patient information by setting conditions such as Patient ID, Name or combination of them. Patient records will be listed after clicking [Query].

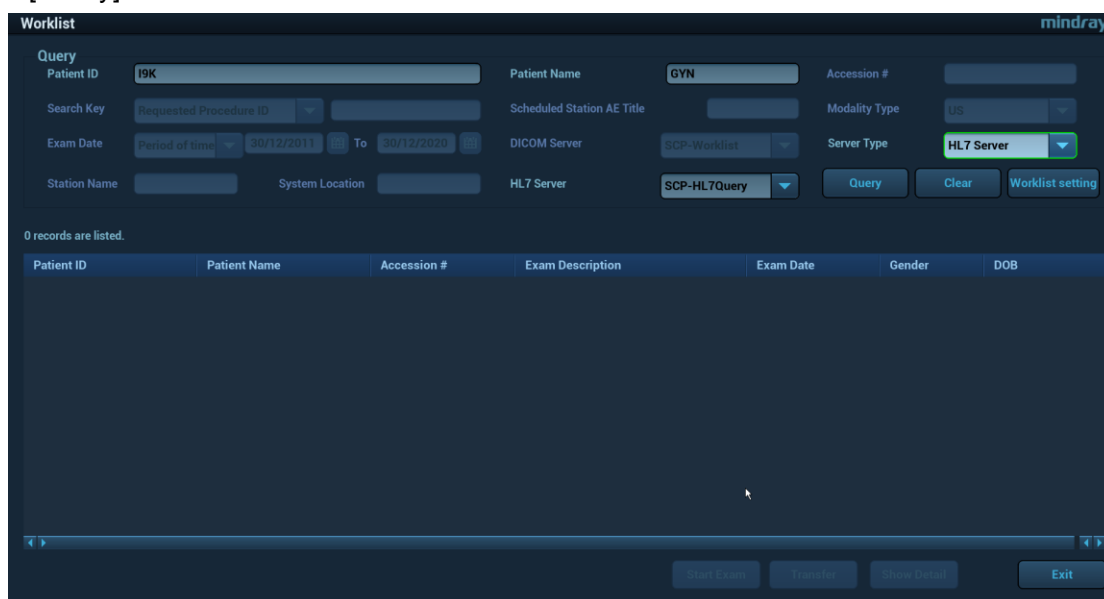


Figure 22 HL7 Query

4. After the first query is finished, you can perform the second query within the range of the scheduled patients in the first time. The scheduled patients in the list will change in real time.
5. Select a patient record, click [Start Exam], the system import this patient and start the exam; Click [Transfer] will launch the patient record selected into the Patient Info screen to edit and restart the exam; Click [Show Detail] to view the detailed information of the patient. As shown in Figure 20 Detailed Information.

NOTE:

Only Patient ID and Patient Name can be input in HL7Query.

Second query and detail information are still available during off-line status.

The query will be executed automatically according to the default query conditions each time entering the [WorkList] screen if a default HL7 Query Server is set.

Check the DICOM preset and network connection if a query error occurs.

2.6 MPPS

MPPS is to send the states information of exams to the configured server. Thus the exam states can be known and edited by other systems. Prerequisite: a default MPPS server is needed.

The MPPS function will be started by:

- Starting a new exam
- Canceling an exam
- Ending an exam
- Activating an exam


The states are listed in the [Exam State] column in iStation screen. MPPS sending is hidden to the user.

2.7 Storage Commitment

Storage commitment is to ensure that the image data will be stored into the server correctly.

Prerequisite: a Storage Commitment server is needed, and a relative storage server must be set.

Steps:

1. A default storage commitment server is preset and a relative storage server is set.
2. Send image (and SR) to the storage server, the storage commitments are sent to the commitment server automatically.
3. The state of the committed service will be returned with the  column in iStation screen marked with a tick if the commitment is succeeded. Otherwise the column will not be marked.

2.8 Query/ Retrieve

The query/ retrieve function is to query and get the patient exam record from a specified server.

Steps:

1. A query/ retrieve server is preset.
2. Path1: press <iStation> -> [Query/ Retrieve].
3. Path2: press <Patient> -> <iStation> -> [Query/ Retrieve].
4. Select the Source server, enter Search Key words and click [Query]. As shown in Figure 23 Query.

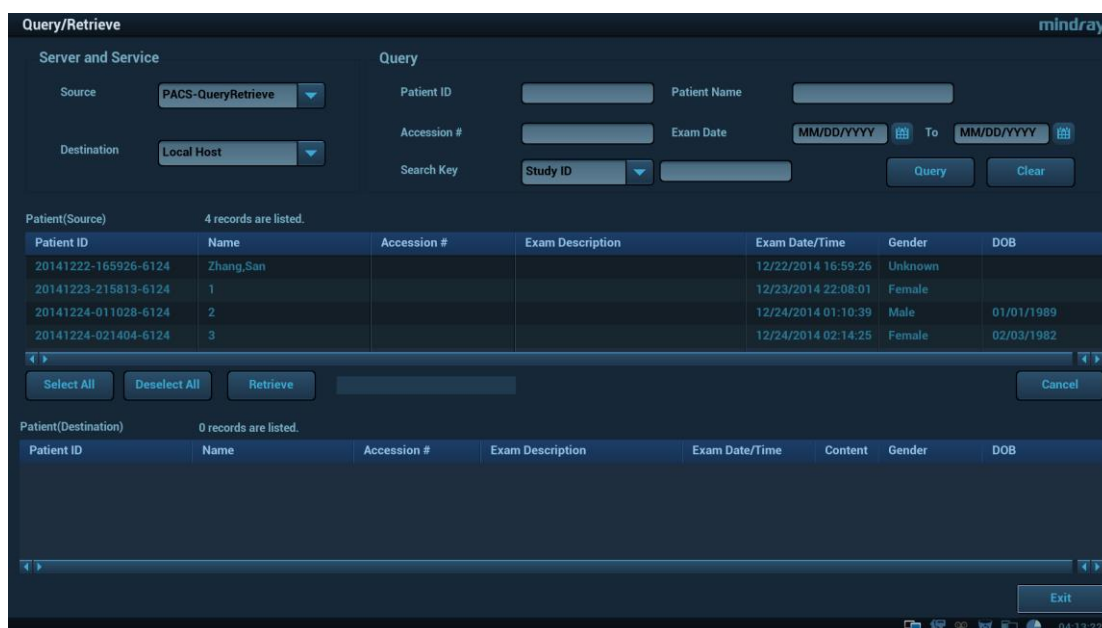


Figure 23 Query

- Select one or more records and click [Retrieve] to get the records down to local system, as shown in Figure 24 Retrieve.

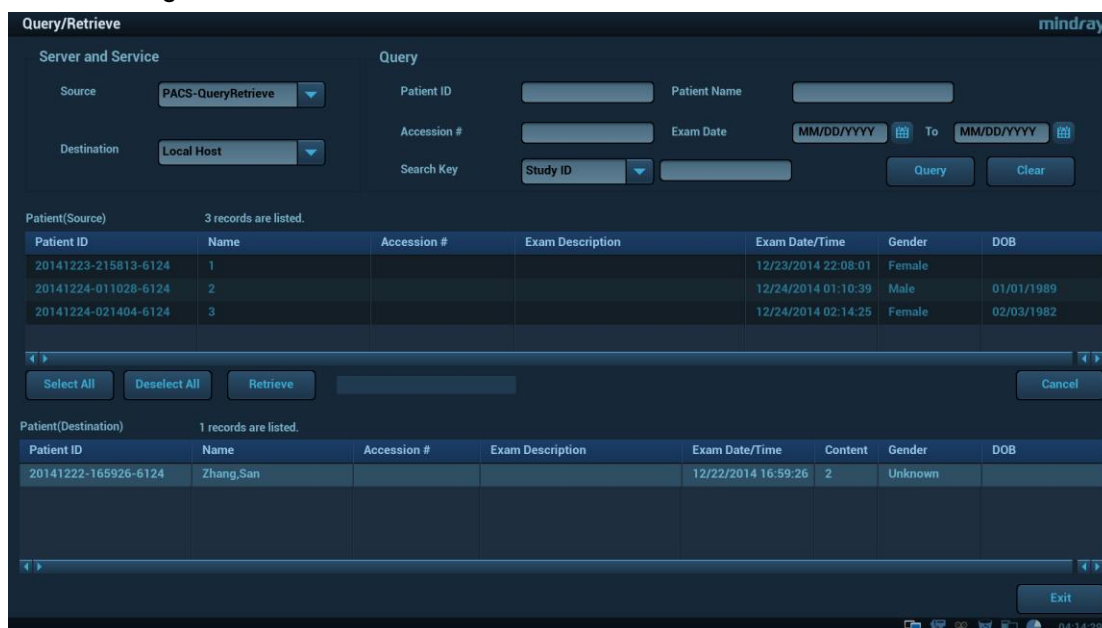


Figure 24 Retrieve

- Click [Exit], the obtained patient records can be viewed in iStation screen.

2.9 DICOM Media Storage and Review

DICOM media storage supports storing ultrasonic diagnostic data (patient and image information) into the media (USB flash drive, optical disk or removable hard disk). DICOM media review (DICOMDIR) function supports viewing DCM image(s) stored in external media.

Prerequisites for DICOM media storage and DICOMDIR:

- Configured with DVD recorder that working normally
- Normally read/ write of the USB ports on the ultrasound system
- File system format of CD/ DVD optical file should be ISO9660, and the optical disk should not be damaged

- File system format of DVD optical file should be UDF, and the optical disk should not be damaged
- File system format of removable device (USB flash drive) is FAT32 and the media should not be damaged

2.9.1 DICOM Media Storage

Steps:

1. Press <iStation> on the control panel to enter the patient information screen
2. Select one or more exams (with image) that is not active, click [Send Exam] to pop up the [Send To] dialog box.
3. Select the target [DICOMDIR], and select the [Destination] as shown in Figure 25 DICOM Media Storage.

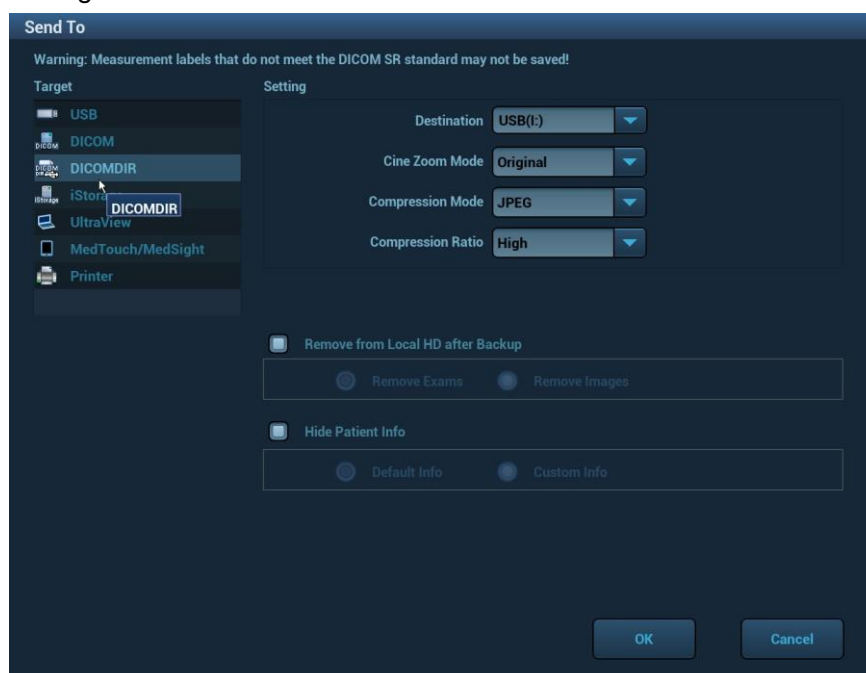


Figure 25 DICOM MediaStorage

4. Click [OK], to export the image in current exam to the external media in DICOM format
5. If the export is succeeded, [Backup] in the iStation screen will be marked with ✓; otherwise no ✓ is marked

NOTE: make sure enough space on the media; otherwise the media storage process will be failed due to insufficient space.


2.9.2 DICOMDIR Review

Steps:




1. Press <iStation> on the control panel to enter the patient information screen
2. Select the external media from “Data Source”
3. The exam(s) and image(s) will display in the iStation screen if the media is read successfully.

2.10 Task Management

The task management is a platform for the user to manage, view, delete or restart the background task, including DICOM tasks.

Click  icon in the lower right corner of the screen to open the DICOM Task Management dialog box, as shown in Figure 11 DICOM Send To Screen.

Task progress and status of storage task, print task and media storage task can be viewed in this dialog box. The task management icon indicates the status of the task:

1. Task in progress, the icon indicates in green. 
2. No task is in progress with failed task exists, the icon indicates in yellow. 
3. No task is in progress without failed task, the icon is .

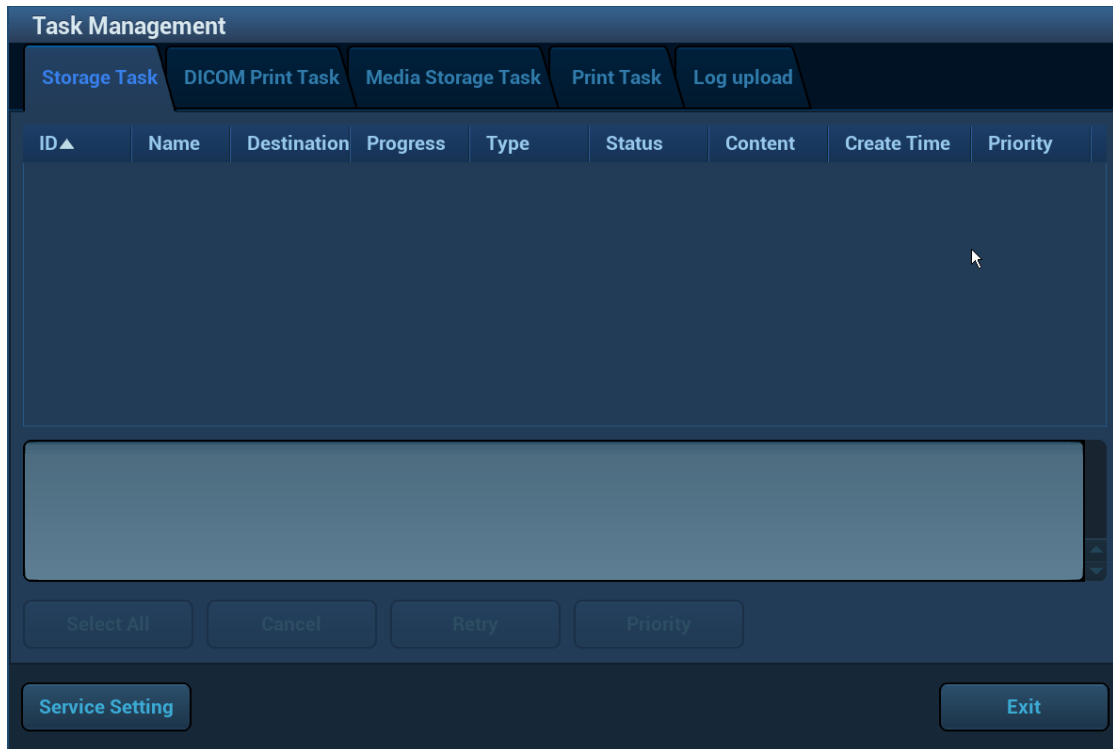


Figure 26 Task Management

3 Common Failures and Troubleshooting

3.1 Common Failure: Service Verification Failed

Potential Reasons:

- Failed network connect, please check the network cable and connection;
- Verification service is not supported by the server;
- The verification is supported but not activated on the server; check the server setting if the verification service is activated.

Troubleshooting:

- Check the network cable and connection.
- Check the DICOM Conformance Statement if the SCP is supported;
- Enable the SCP service referring to the Server Manual or DICOM Conformance Statement.
- If the verification is still failed after all above steps and the operating system is Windows 7, please add the server port to the "Inbound Rules" of Windows Firewall. Steps:
 - Control Panel->Windows Firewall->Advanced settings-> Inbound Rules;
 - Click "New rules", select Port in the pop-up dialog and then click "Next";
 - Select "TCP" to which the rule applies and Input the server port in "Specific local ports" edit box, then click "Next";
 - Select "Allow the connection" and click "Next";
 - Specify the profiles for which the rule applies and click "Next";
 - Input the Name of the rule and click "Finish".

3.2 Common Failure: Server disconnects the ultrasound system during implementing storage

Potential Reasons:

- The JPG compression is enabled on local device but is not supported on the server;
- Wrong AE TITLE settings on local device and the server.

Troubleshooting:

- Select "uncompressed" in DICOM Service -> Storage;
- Set the correct local AE TITLE and server AE TITLE on local device according to the DICOM Conformance Statement or settings of the server.

3.3 Common Failure: Multiframe transmission is failed, but single frame is succeeded.

Potential Reasons:

- "Allow Multiframe" is not selected in the dialog box of Storage preset.

Troubleshooting:

- Select " Allow Multiframe " in the dialog box of Storage preset.

3.4 Common Failure: Network disconnected (shown by network icon) during transmission

Potential Reasons:

- The network cable or wireless network is disconnected during transmission;
- The connected switch, router or hub is down or in failure.

Troubleshooting:

- Connect the network;
- Reset the switch, router or hub, or replace a network device with higher performance.

3.5 Common failure: Worklist query succeeded, but no patient is shown

Potential Reasons:

- Scheduled Station AE Title in the preset is not consistent with the setting on server;
- Records on the server database are not accordant with the query conditions on local ultrasound system

Troubleshooting:

- Preset the right Scheduled Station AE Title on Worklist screen according to the server settings.
- The ultrasound system is defaulted only to inquire the patient information that the Modality is US, and the patient needs the server to provide US attribute. Change the query conditions (e.g. date or patient name) to make the server find the record accordingly. Based on DICOM standard, Patient ID cannot support fuzzy inquiry, only can support the whole word match. Please confirm the entered Patient ID is right or not.

3.6 Common failure: Printing succeeded but the film is blank

Potential Reasons:

- The printer doesn't support color printing which is performed by the ultrasound system;
- The film or paper of the printer doesn't support color printing.

Troubleshooting:

- Check the printer conformance statement if the printer can support color printing; if not, modify the "Settings" in Print Preset Screen -> Print to B/W type (MONOCHROME2);
- Generally, the "Medium Type" is set to "Blue File" for B/W printing while "Paper" or "Clear Film" for color printing

3.7 Common Failure: Verification of connecting DICOM printer is succeed but printing is failed

Potential Reasons:

- Wrong AE_TITLE settings on local device and the server.
- The parameters set in DICOM Service -> Print are not supported.
- IP address of printer server is the same with the system IP.

Troubleshooting:

- Set the correct local AE_TITLE and server AE_TITLE on local device according to the DICOM Conformance Statement or settings of the printer.
- Refer to the printer conformance statement for the printing parameters (Format, Film Size) value that supported. Check film size and type, and then correctly set Film Size, Format, Medium Type etc. in print service preset in ultrasound system.
- Set the correct IP address of the printer server.

3.8 Common Failure: Printed image is too small

Potential Reasons:

The Magnification Type of local ultrasound system is set to NONE while this parameter on printer is set to same with the local ultrasound system.

Troubleshooting:

- Set the right Magnification Type in local ultrasound DICOM Service preset according to the Magnification Type specified in the printer conformance statement. If there is no printer conformance statement for reference, set the Magnification Type as Bilinear, CUBIC or REPLICATE.

3.9 Common Failure: MPPS message is not sent out correctly or not received by the server

Potential Reasons:

The MPPS server is not set as default.

Troubleshooting:

Set the MPPS server as default after setting the Port and AE Title correctly.

3.10 Common Failure: Storage commitment is failed


Potential Reasons:

1. The associated storage commitment server is incorrect;
2. The port and IP address settings on the commitment server are inconsistent with the local preset.

Troubleshooting:

1. Check if the associated storage commitment server is correct;
2. Check if the port and IP address settings on the commitment server are consistent with the local preset.

NOTE:

The storage commitment icon  in [iStation] screen is not refreshed in real time. Exit and enter the [iStation] screen will refresh the commitment icon if a storage commitment is succeeded.

3.11 Common Failure: Query is succeeded, but retrieve is failed, with the prompting that the remote server is wrong

Potential Reasons:

1. The client port, AE Title and IP address settings on the Q/R server are inconsistent with the local preset.
2. The setting of the local storage SCP port is wrong.

Troubleshooting:

1. Check if client port, AE Title and IP address settings on the Q/R server are consistent with the local preset.
2. Some servers only support the specified port as the storage SCP port. Please confirm whether the server has this restriction. If it has, please modify the serial number of local port. See the Figure 27 DICOM Local Preset.

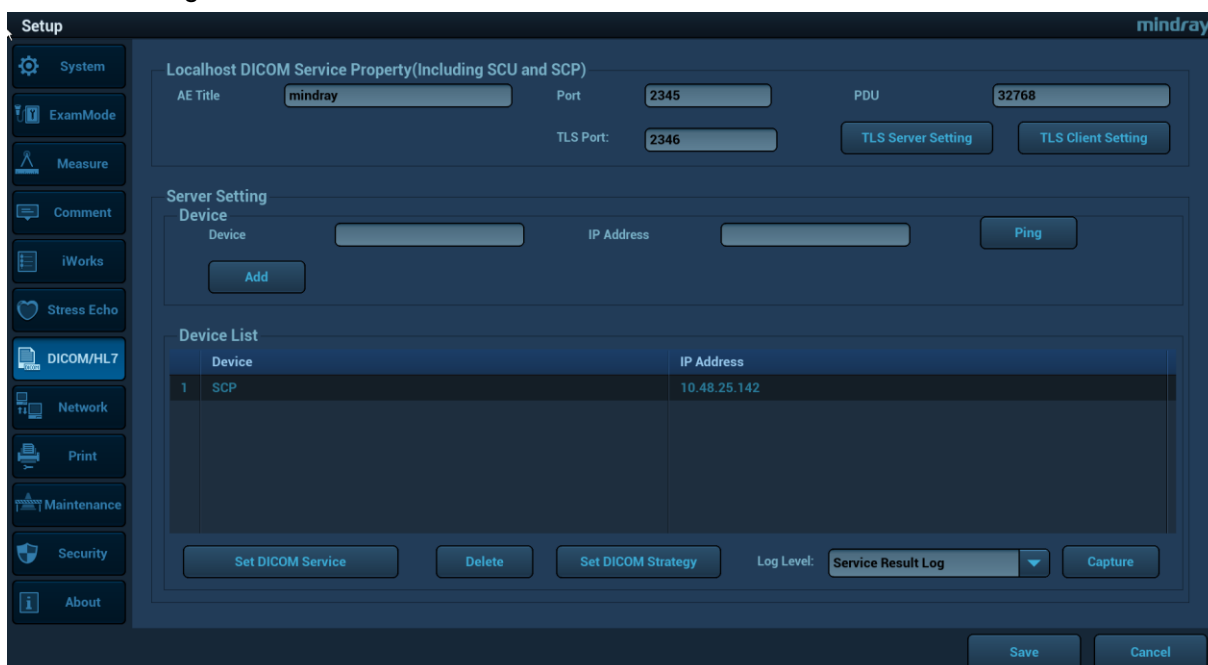


Figure 27 DICOM Local Preset

3.12 Common Failure: Error messages in DICOM Task Management

3.12.1 Association aborts

Potential Reasons: The association is denied by the SCP due to incorrect setting of AE TITLE on the SCU. See Figure 28 Association aborts.

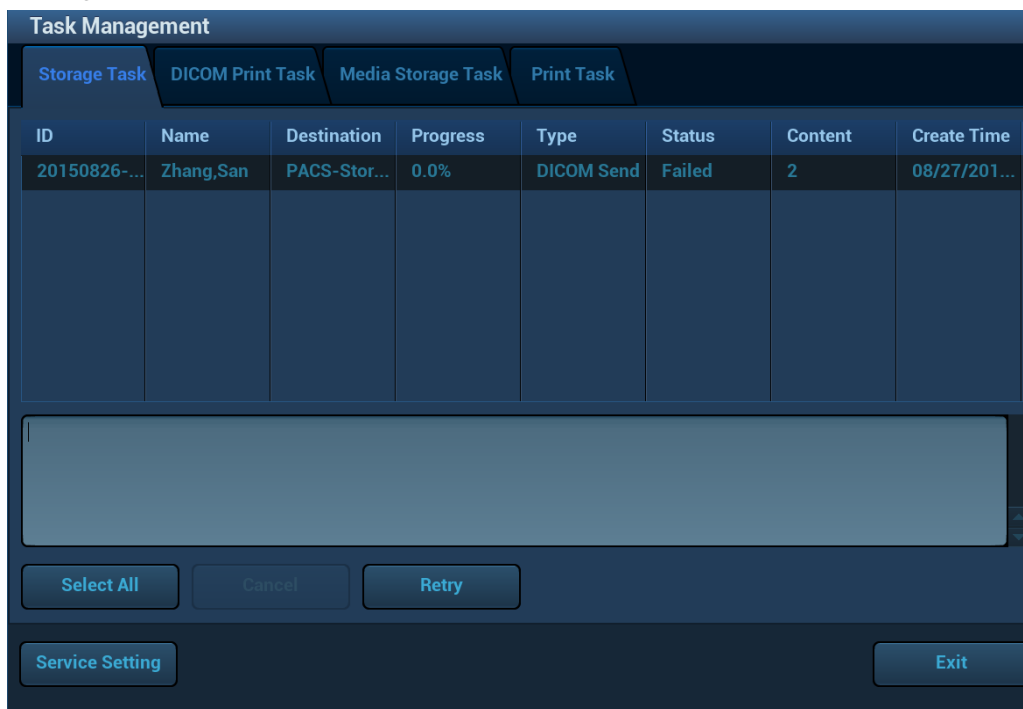


Figure 28 Association aborts

3.12.2 Network error: Socket sending error

Potential Reasons: Network cable unplugged or network equipment is failed during data transmission. See Figure 29 Network error.

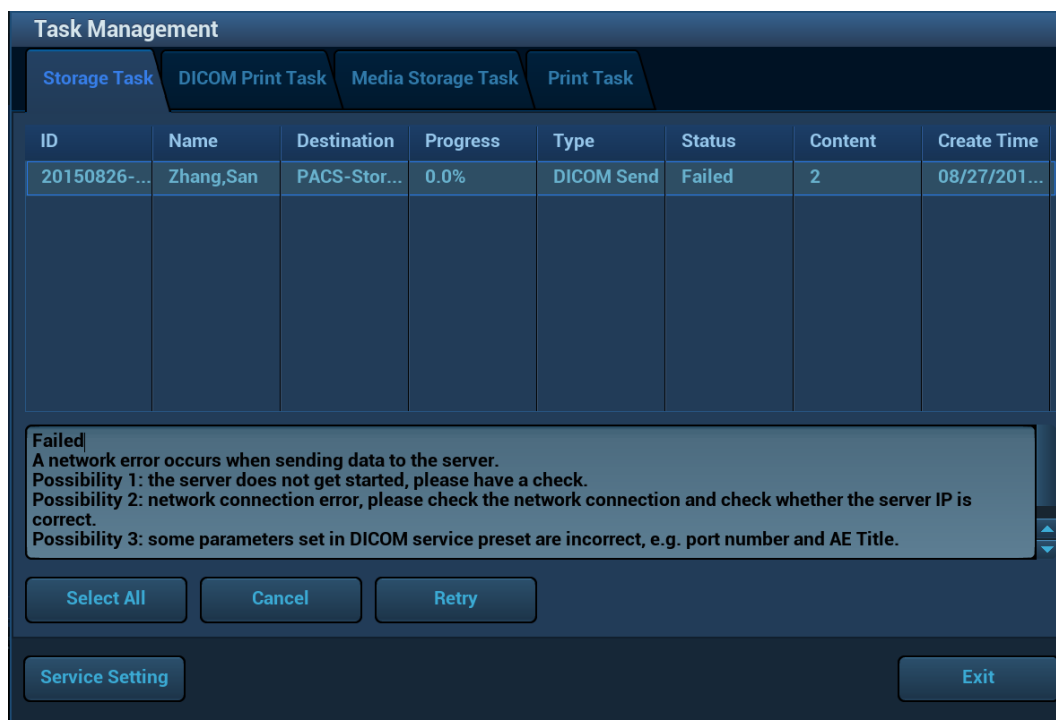


Figure 29 Network error

3.13 Print Service Examples

Whether the printing will be succeeded is determined by:

1. Printer settings on local ultrasound system should consist with that specified on printer conformance statement;
2. The operations being performed are supported by the printer.

The following are two examples.

3.13.1 Example 1

The medium type supported by the Horizon CI DICOM printer in color and B/W printing is shown in table below:

Medium Type (standard values)	Grayscale PMM SOP negotiated	Color PMM SOP negotiated
PAPER	DV Paper	CV Paper
Blue Film	DV Blue Film	CV Film (clear)
CLEAR FILM	DV Clear Film	CV Film (clear)

The MAGNIFICATION Types supported by Horizon CI DICOM printer conformance statement are listed in table below:

MAGNIFICATION TYPE	NONE REPLICATE BILINEAR CUBIC <i>BICUBIC</i> <i>MITCHELL</i> <i>LANCZOS</i>
--------------------	---

	<p><i>SHARP1</i></p> <p><i>SHARP2</i></p> <p><i>SHARP3</i></p>
--	--

AE TITLE settings that specified in Horizon CI DICOM printer conformance statement are listed in table below:

System Job Settings File	Corresponding Use
Print_SCP	Used for DICOM. Does not contain any print parameter settings. If the media type or size is not included in the DICOM attributes sent to the imager, the imager detects the image type and selects the media type and size as follows: For grayscale images, uses the media set for Grayscale in the Default Media menu at the control panel. For color images, uses the media set for Color in the Default Media menu at the control panel.
Default Grayscale	Imager uses the media set for Grayscale in the Default Media menu at the control panel
Default Color	Imager uses the media set for Color in the Default Media menu at the control panel
8x10-dvf	8x10 DirectVista film (blue)
8x10-dvfb	8x10 DirectVista film (blue)
8x10-dvfc	8x10 DirectVista film (clear)
8x10-dvp	8x10 DirectVista paper
8x10-cvf	8x10 ChromaVista film
8x10-cvt	8x10 ChromaVista film
11x14-dvf	11x14 DirectVista film (blue)
11x14-dvfb	11x14 DirectVista film (blue)
11x14-dvfc	11x14 DirectVista film (clear)
11x14-dvp	11x14 DirectVista paper
11x14-dvp	11x14 DirectVista paper
14x17-dvf	14x17 DirectVista film (blue)
14x17-dvfb	14x17 DirectVista film (blue)
14x17-dvfc	14x17 DirectVista film (clear)
14x17-dvp	14x17 DirectVista paper
a-dvp	A-size DirectVista paper
a-cvf	A-size ChromaVista film
a-cvt	A-size ChromaVista film
a4-dvp	A4-size DirectVista paper
a4-cvp	A4-size ChromaVista paper
a4-cvf	A4-size ChromaVista film
a4-cvt	A4-size ChromaVista film

priority-high	Sets print job priority to high
priority-medium	Sets print job priority to medium
priority-low	Sets print job priority to low
receive-1	Forces sheet output to receive tray 1
receive-2	Forces sheet output to receive tray 2
receive-3	Forces sheet output to receive tray 3
syngofilm	Special OEM-specific job settings

The Horizon CI DICOM printer screen displays:

A4 CV PAPER

8X10 DV Blue

14X17 DV Blue

● **The following are the correct settings of the ultrasound system DICOM print preset:**

■ Color printing:

- (1) Settings: RGB
- (2) Medium Type: Paper
- (3) Film Size: A4
- (4) MAGNIFICATION TYPE: NONE/CUBIC/ REPLICATE/BILINEAR
- (5) AE Title: Print_Scp (Recommended)

■ B/W printing

1. Method 1

- (1) Settings: MONOCHROME2
- (2) Medium Type: Blue Film
- (3) Film Size: 8X10
- (4) MAGNIFICATION TYPE: NONE/CUBIC/ REPLICATE/BILINEAR
- (5) AE Title: Print_Scp (recommended)

2. Method 2

- (1) Settings: MONOCHROME2
- (2) Medium Type: Blue Film
- (3) Film Size: 14X17
- (4) MAGNIFICATION TYPE: NONE/CUBIC/ REPLICATE/BILINEAR
- (5) AE Title: Print_Scp (recommended)

● **The following are the incorrect settings of the ultrasound system DICOM print preset:**

■ Color printing:

- 1) Settings: MONOCHROME2
Incorrect.
"RGB" should be selected in color printing while "MONOCHROME2" for B/W printing
- 2) Medium Type: Blue Film
Incorrect.
Paper and Clear file are supported by color printer according to the printer conformance statement; but only Paper is available as displayed in the printer screen.

- Incorrect.
Only three film size are available according to printer screen display:
- 3) Film Size: A3
A4
14X17
8X10
- 4) MAGNIFICATION TYPE
Can be set as: NONE/ CUBIC/ REPLICATE/
BILINEAR
- Incorrect.
- 5) AE Title: 14x17-dvfb
Setting AE Title as "14x17-dvfb" will enforce the 14x17 Direct Vista film (blue) printing.

3.13.2 Example 2

This example is being performed with FUJI Film drypix4000 printer connected with the ultrasound system.

■ DICOM print settings on ultrasound system:

- 1) Settings: MONOCHROME2
- 2) Medium Type: Blue Film
- 3) Film Size: 14X17
- 4) FORMAT: STANDARD\3, 5
- 5) Film Orientation: Landscape

Result: failed

■ Modify the DICOM print settings:

- 1) Settings: MONOCHROME2
- 2) Medium Type: Blue Film
- 3) Film Size: 14X17
- 4) FORMAT: STANDARD\3, 5
- 5) Film Orientation: Portrait

Result: succeeded.

■ Reasons:

Settings of Film orientation along with the FORMAT that supported by FUJI Film drypix4000 printer are specified in the conformance statement. The print setting of 14X17 Landscape STANDARD\3,5 is unavailable.

According to the printer conformance statement, Film orientation and FORMAT table supported by FUJI Film drypix4000 are listed in table below

Film Size and Orientation	FORMAT
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14"·17" Portrait	STANDARD\1,1 STANDARD\1,2 STANDARD\1,3 STANDARD\2,1 STANDARD\2,2 STANDARD\2,3 STANDARD\2,4 STANDARD\3,3 STANDARD\3,4 STANDARD\3,5 STANDARD\3,6 STANDARD\4,4 STANDARD\4,5 STANDARD\4,6 STANDARD\4,7 STANDARD\4,8 STANDARD\5,5 STANDARD\5,6 STANDARD\5,7 STANDARD\5,8 STANDARD\6,6 STANDARD\6,7 STANDARD\6,8 STANDARD\6,9 STANDARD\6,10 STANDARD\7,7 STANDARD\7,8 STANDARD\7,9 STANDARD\7,10 STANDARD\8,8 STANDARD\8,9 STANDARD\8,10
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<p>14"·17" Landscape</p>	<p>STANDARD\1,1 STANDARD\2,1 STANDARD\3,1 STANDARD\1,2 STANDARD\2,2 STANDARD\3,2 STANDARD\4,2 STANDARD\3,3 STANDARD\4,3 STANDARD\5,3 STANDARD\6,3 STANDARD\4,4 STANDARD\5,4 STANDARD\6,4 STANDARD\7,4 STANDARD\8,4 STANDARD\5,5 STANDARD\6,5 STANDARD\7,5 STANDARD\8,5 STANDARD\6,6 STANDARD\7,6 STANDARD\8,6 STANDARD\9,6 STANDARD\10,6 STANDARD\7,7 STANDARD\8,7 STANDARD\9,7 STANDARD\10,7 STANDARD\8,8 STANDARD\9,8 STANDARD\10,8</p>
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