Digital Ultrasound Diagnostic System

DICOM Quick Guide FAQ Manual

Intellectual Property Statement

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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 Wireless Network Connection

1. Click icon in the lower right corner of the screen to open the Wireless Network Connection dialog box, as shown in Figure 1 Wireless Network Connection. Select the right network and input password to connect.
2. Click IP Config to set IP Address, Subnet Mask and so on, as shown in Figure 2 Wireless Network Connection IP Config.

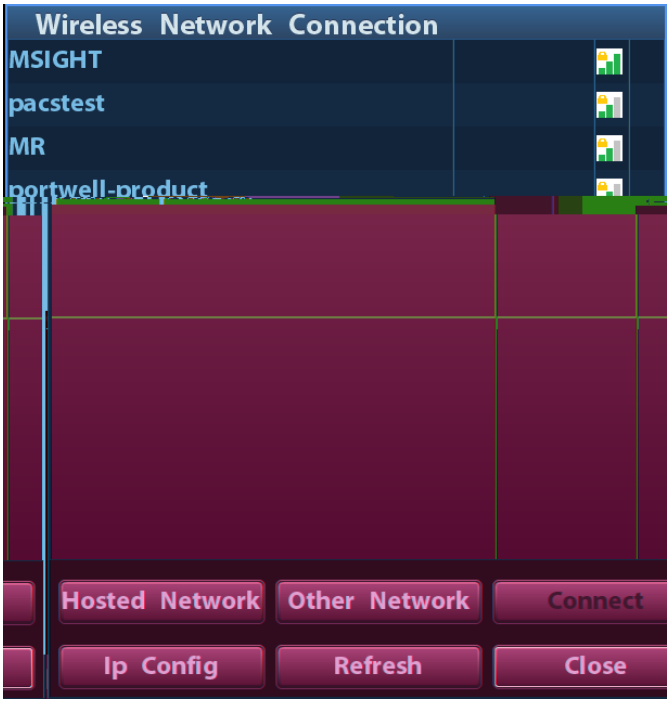


Figure 1 Wireless Network Connection

Note IP address be the same as other IP of LAN, otherwise it will affect DICOM performance.

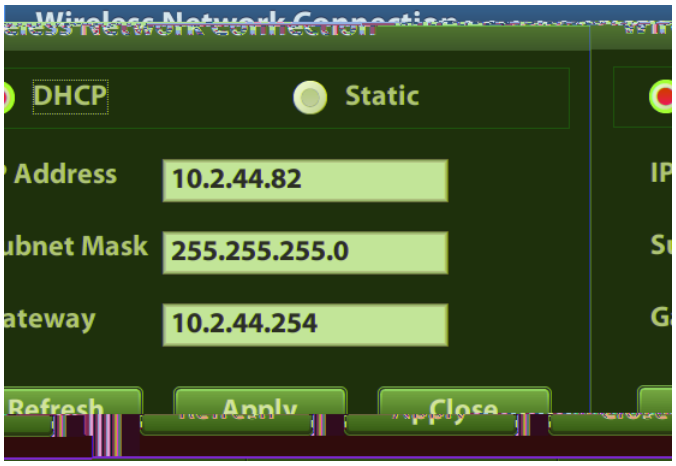


Figure 2 Wireless Network Connection IP Config

1.2 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 3 DICOM Preset Screen:

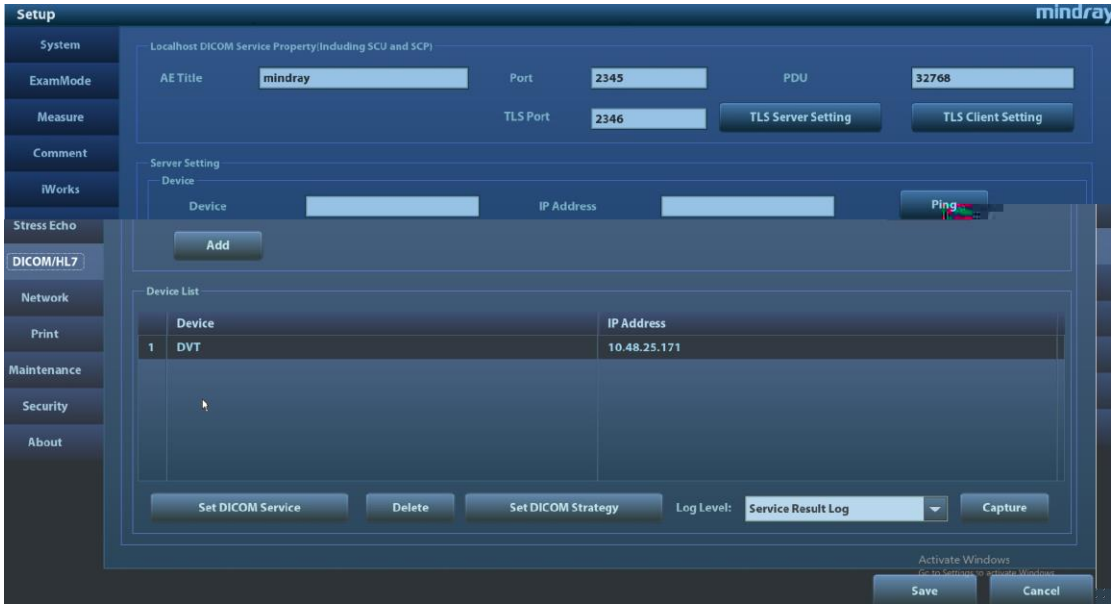


Figure 3 DICOM Preset Screen

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

Name	Description
AE Title	Application Entity title.
Port	DICOM communication port, 2345 is default.
PDU	Maximum PDU data package size, ranging from 16384 to 65536; if the value is less than 16384 or greater than 65536, the system automatically sets it to the value 32768.

TLS port	DICOM TLS communication port,2346 is default.
TLS Server Settting	Sever-side certificate management.
TLS Client Settting	**Verify Certificate**: The precondition of the DICOM TLS services. The Dicom services checked TLS will Verify Certificate in **Import** the Type combox value have PEM and CER. **Delete** Delete the imported TLS certificates.
Device	Name of the device supporting DICOM services.
IP Address	IP address of the server.
Ping	Check whether IP Address can connect normally or not.
Add	Click to add server (s) to the Device List.
Set DICOM Service	Set the attributes of DICOM Storage, Print, Worklist, MPPS, Storage Commitment and Q/R.
Delete	Click to delete the selected server (s) in the device list.
Set DICOM Strategy	Set DICOM strategy for doppler to be compatible with other
Log Level	Sets the log level.
Capture	Capture the dicom network packet.

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.
- The device name can be entered to your preference. If the currently entered name

  [OK] to enter another name.
- Port must not be set as 4001, 6000, 3001, 6555.
- IP address must be the actual IP address of the server.
- Set DICOM Strategy
  a. The DICOM strategy must be configured by qualified personnel with good knowledge of DICOM standards.
  b. The qualified personnel must ensure the validity of the DICOM strategy.
  c. Dicom strategy supports export and import.
- Capture Mainly used for engineer positioning problem.

1.3 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.

1.3.1 DICOM Storage Preset

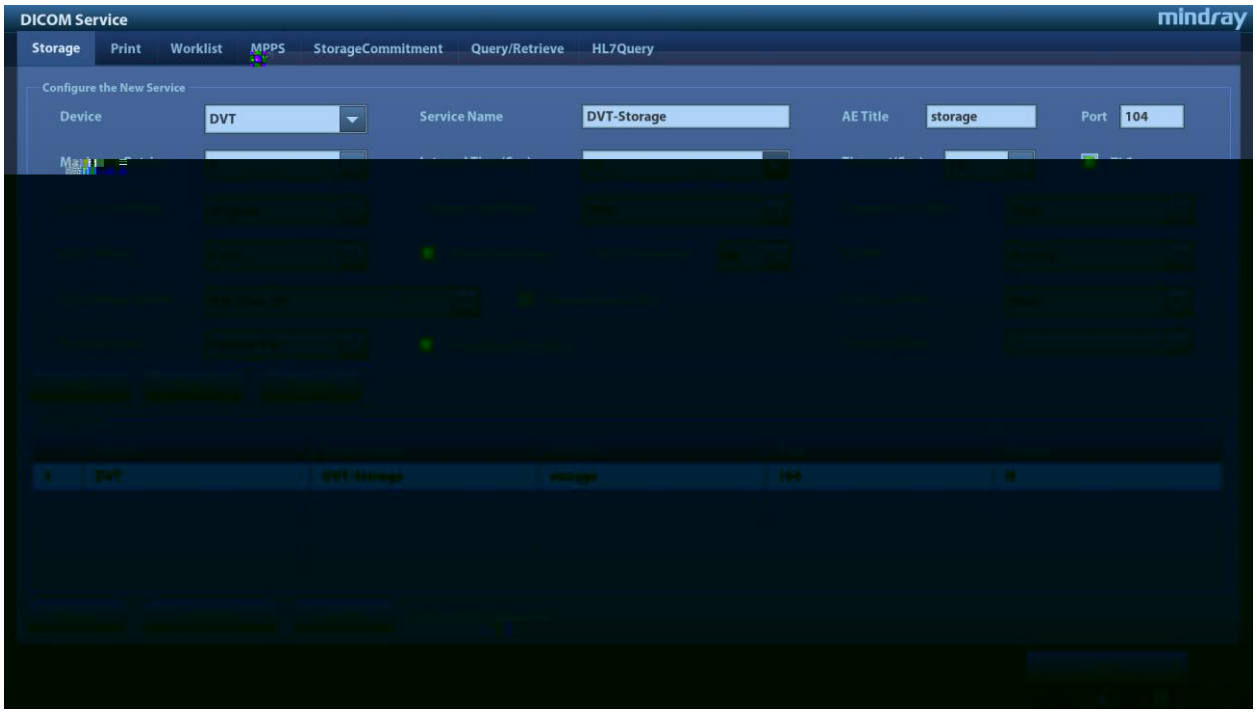


Figure 4 DICOM Storage Preset Screen

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)
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.

TLS	Transmission encryption when it is selected.
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
Strategy Name	Set dicom Strategy for chosen dicom services.
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	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.

1.3.2 DICOM Print Preset

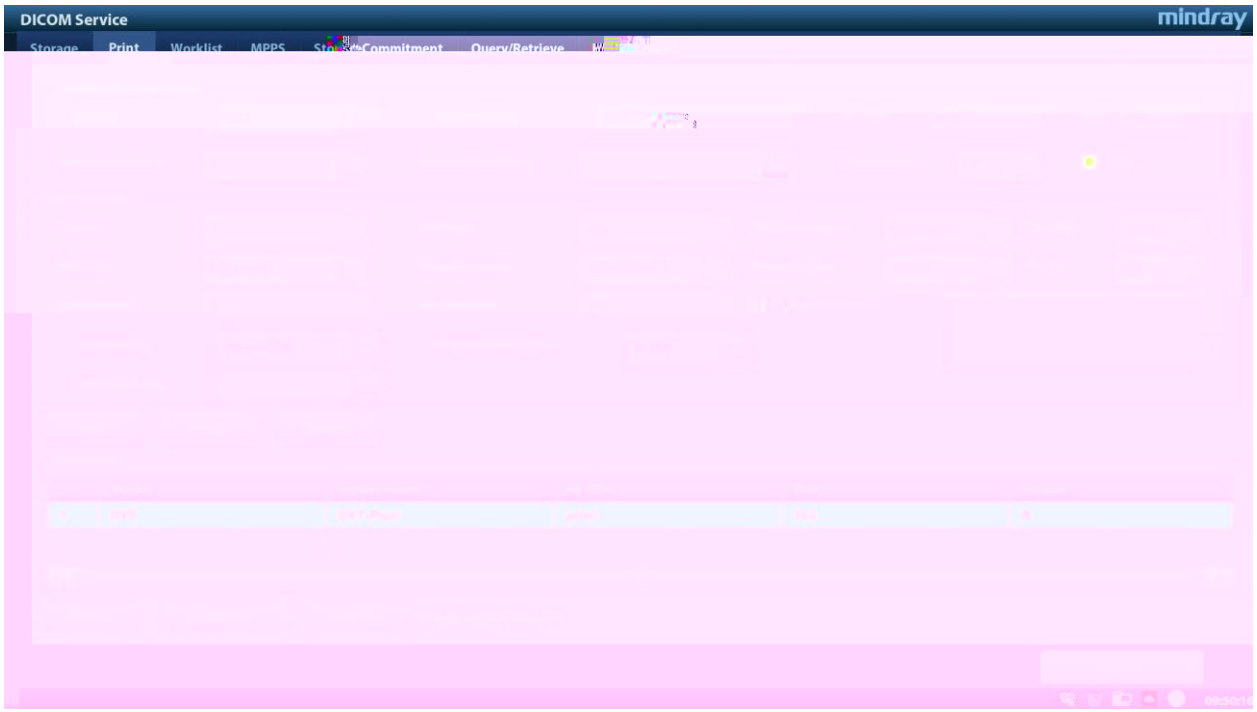


Figure 5 DICOM Print Preset Screen

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	Transmission encryption when it is selected.
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. STANDARD\2, 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.
Strategy Name	Set dicom Strategy for chosen dicom services.
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	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.

1.3.3 Worklist Preset

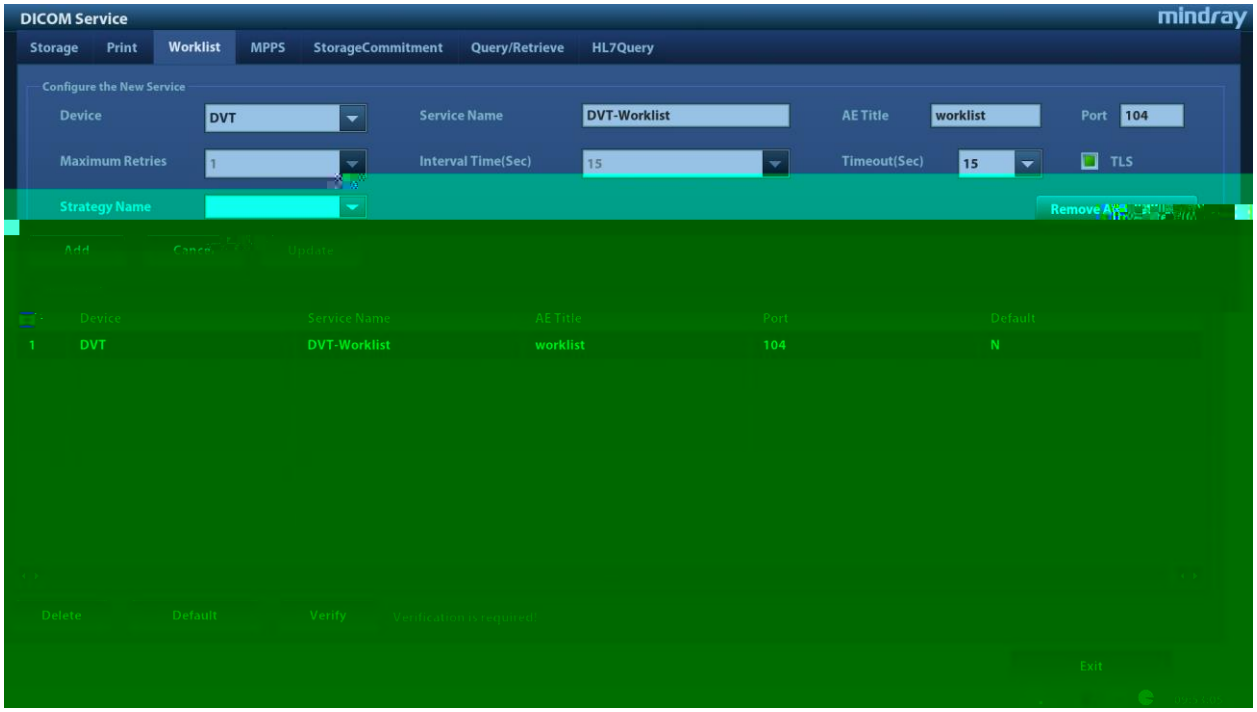


Figure 6 DICOM Worklist Preset Screen

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	Transmission encryption when it is selected.
Strategy Name	Set dicom Strategy for chosen dicom services.
Remove Attributes(0)	Manage the data elements within the worklist message,unchecked elements in the list will not be sent.
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
Exit	Click to exit the setup screen.

1.3.4 MPPS Preset

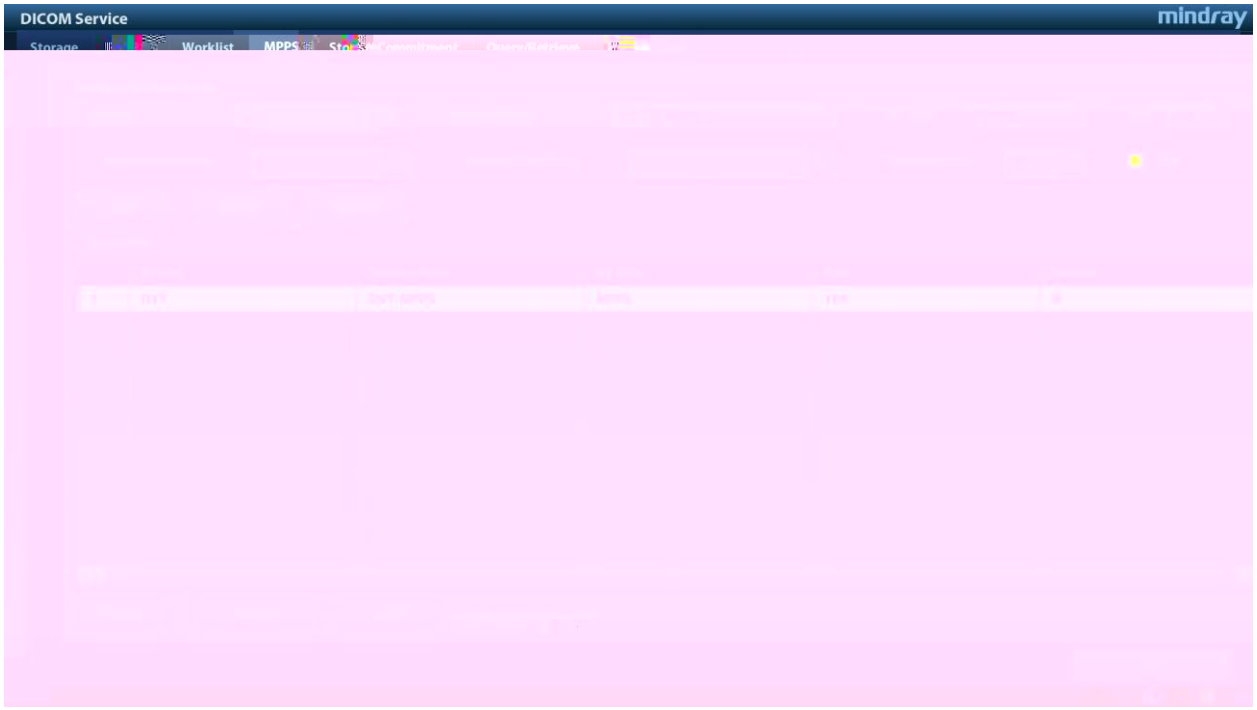


Figure 7 DICOM MPPS Preset Screen

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)
TLS	Transmission encryption when it is selected.
Timeout Sec	5-60s, in increments of 5s, and 15 is default. After user sending MPPS for 15 seconds, the connection will be closed.
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	Default column.
Exit	Click to exit the preset screen.

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

1.3.5 Storage Commitment Preset

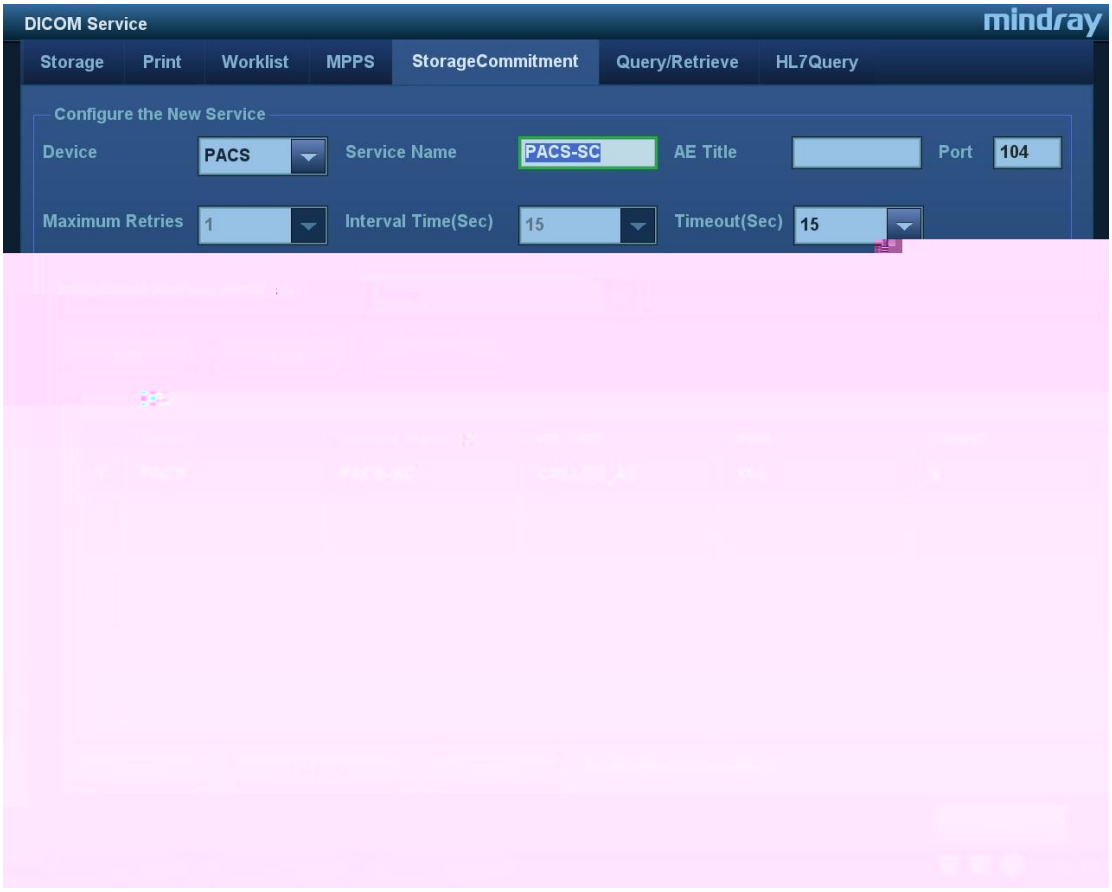


Figure 8 DICOM Commitment Preset Screen

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)
TLS	Transmission encryption when it is selected.
Timeout	Value: 5-60s, in increments of 5s, and 15 is default. After user sending storage commitment for 15 seconds, the connection is closed.
Associated Storage	The associated storage server is preset before storage

Service	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.

name	
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	Transmission encryption when it is selected.
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	the Default column.
Exit	Click to exit the preset screen.

1.3.7 HL7Query Preset

Figure 10 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 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 connectation. 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
Exit	Click to exit the setup screen.

2 Services

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

, which means the connection is wrong. Please reconfirm it.

Tip:

Not all the SCPs can support verification; please consult SCP belongings to confirm

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).

2.2.1 Storage Operation

The system supports automatic and manual storage.

The operations for manual storage service are described below:

DICOM storage

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 11 iStation Screen.

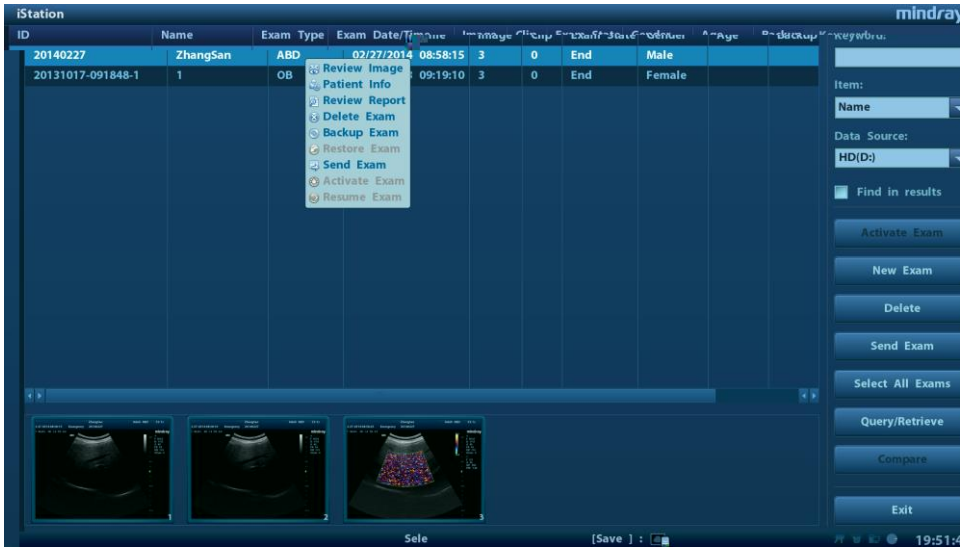


Figure 11 iStation Screen

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 12 DICOM Send To Screen.

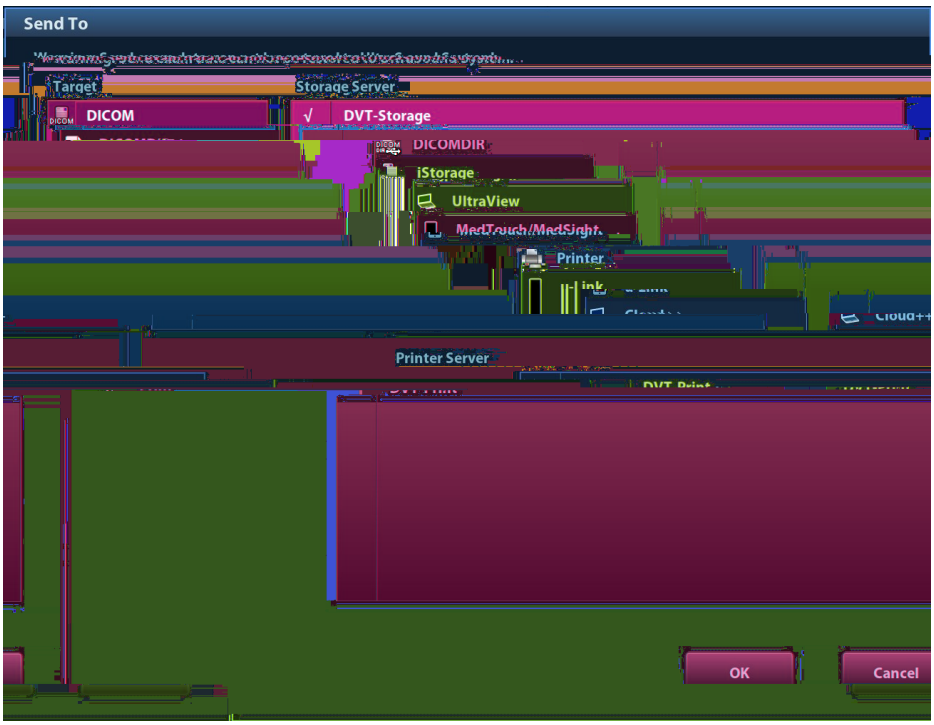


Figure 12 DICOM Send To Screen

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 13 Task Management.

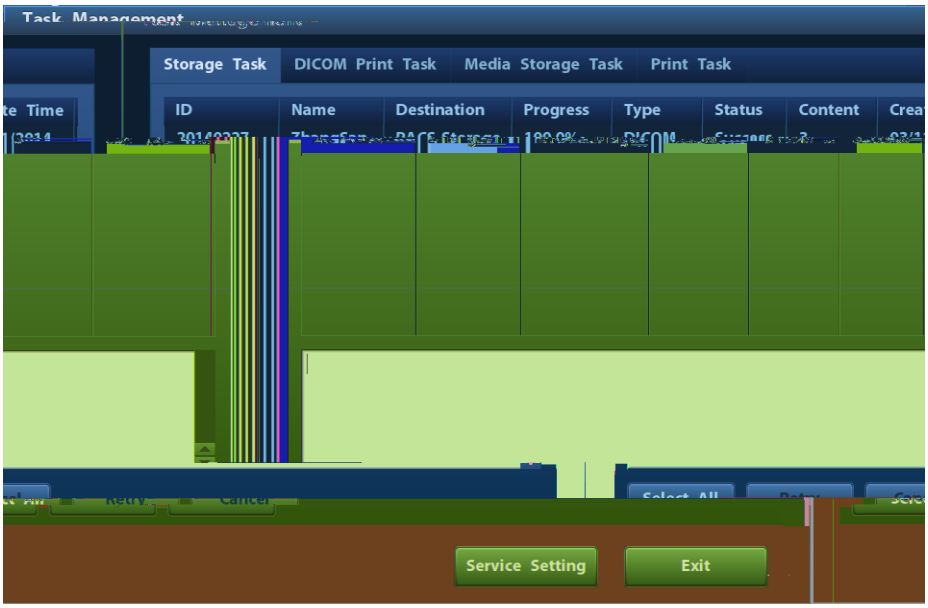


Figure 13 Task Management

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:

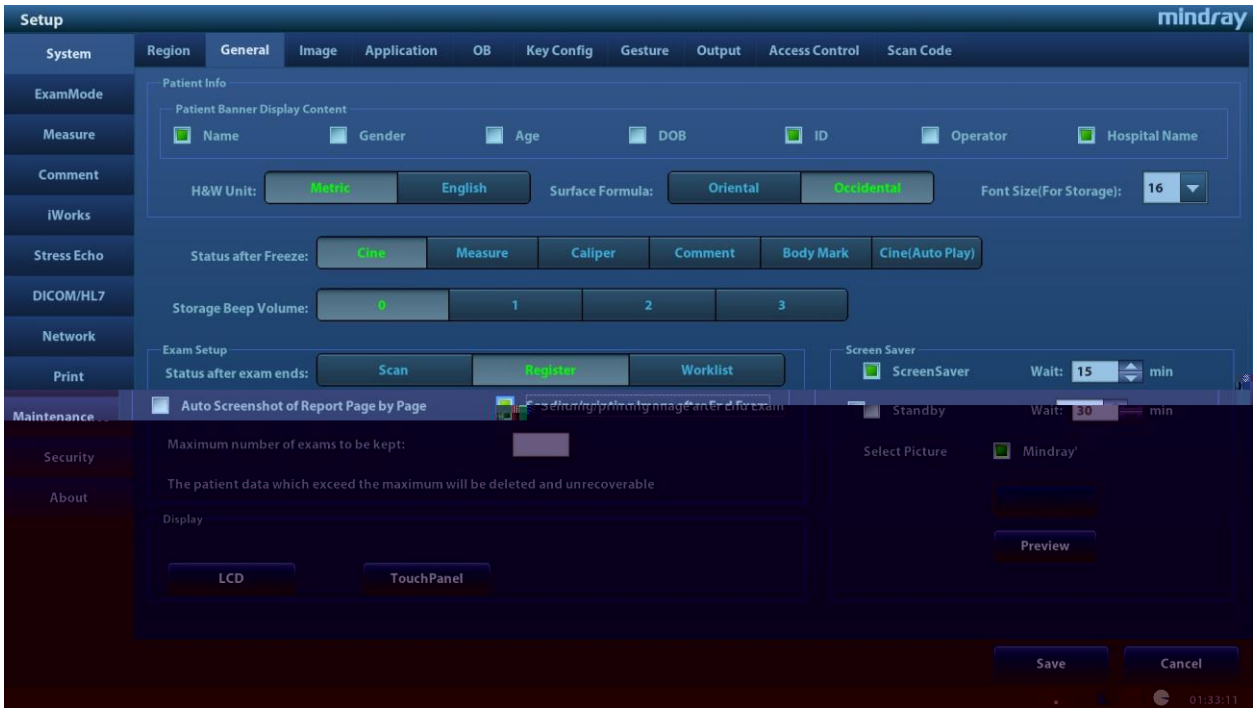


Figure 14 Send Image after End Exam

Steps:

1. In System Preset -> General, select, as shown in Figure 14 Send Image after End Exam.

2. In DICOM Preset -> Storage Service, 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 System Preset -> Key Config, the NULL key can be set as Send Image to DICOM storage as shown in Figure 15 Send to DICOM Storage by User-defined Key.

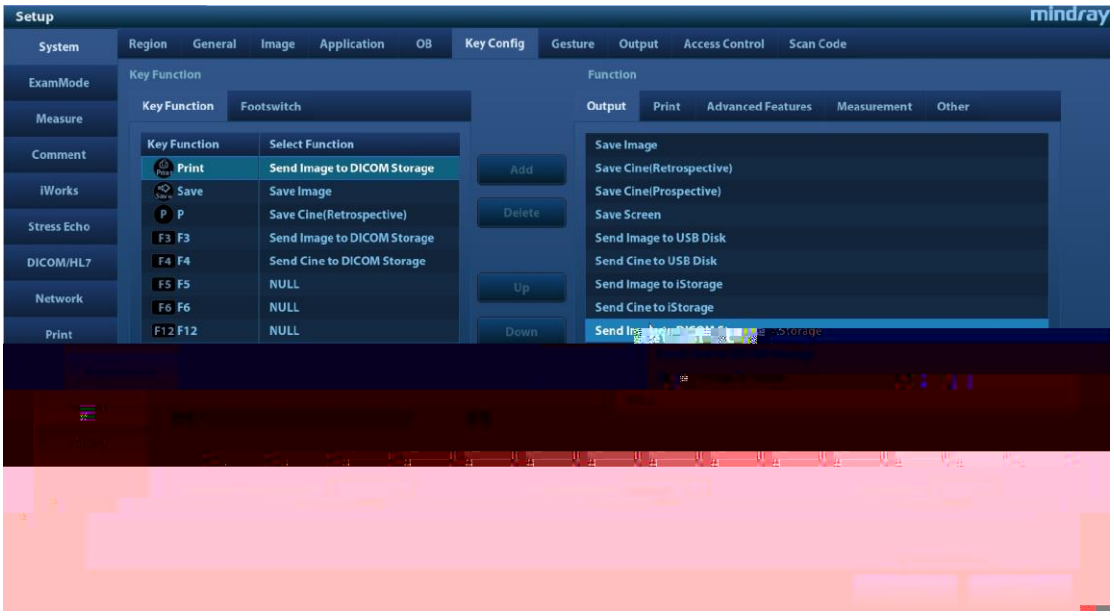


Figure 15 Send to DICOM Storage by User-defined Key

2. In Storage Preset -> DICOM Service, set the default storage server (one or more).
3. In current exam, press <F5> (according to the user preset), the system will send a single-frame image to remote DICOM storage automatically. When pressing <F6>, the system will send a multi-frame image to remote DICOM storage

2.2.2 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 Abdmen SR abdomen exam (The abdmen SR contains the abdmen measurements, abdominal and kidney vascular

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 "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 abdmen SR) in iStation screen:

1. Attach SR when Store Images Storage Preset -> SR Storage Option(See 1.3.1)
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 16 Send To.

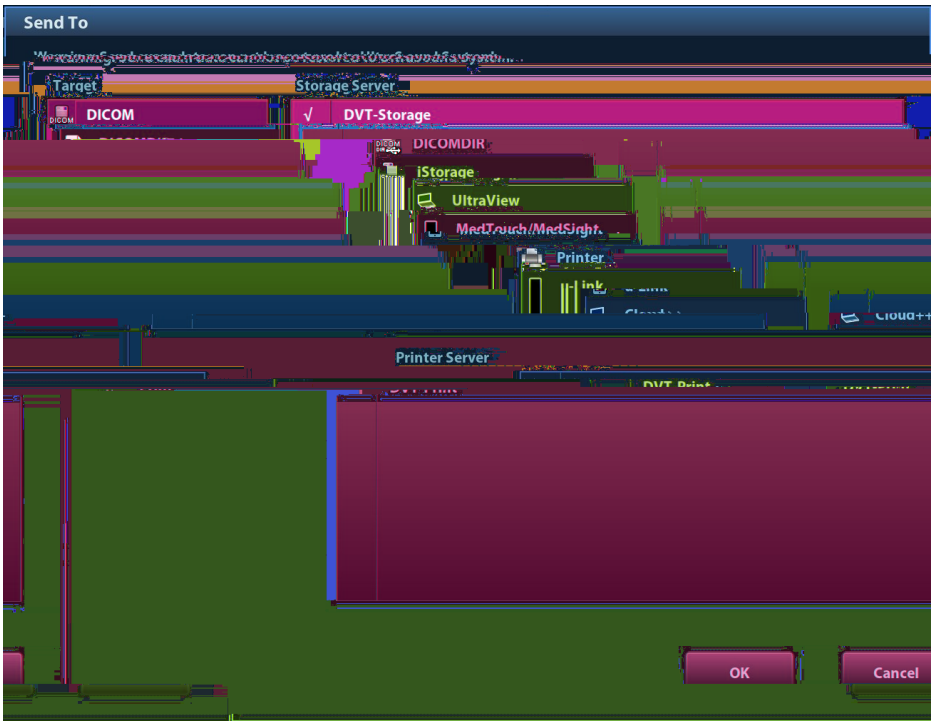


Figure 16 Send To

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 2.2.1 Storage Operation.

B. Only Storage SR

Only Store SR DICOM Storage Preset -> SR Store Option (See 1.3.1). The procedures are as the same as Attach SR when Store Images .

2.2.3 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 2.2.1.

2.2.4 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, thus the Storage SCP received the image could not review it. 4DViewer or DC-70 Series Diagnostic Ultrasound System could retrieve the file and review it.

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 2.2.1.

2.2.5 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 17 Save as DCM Format.

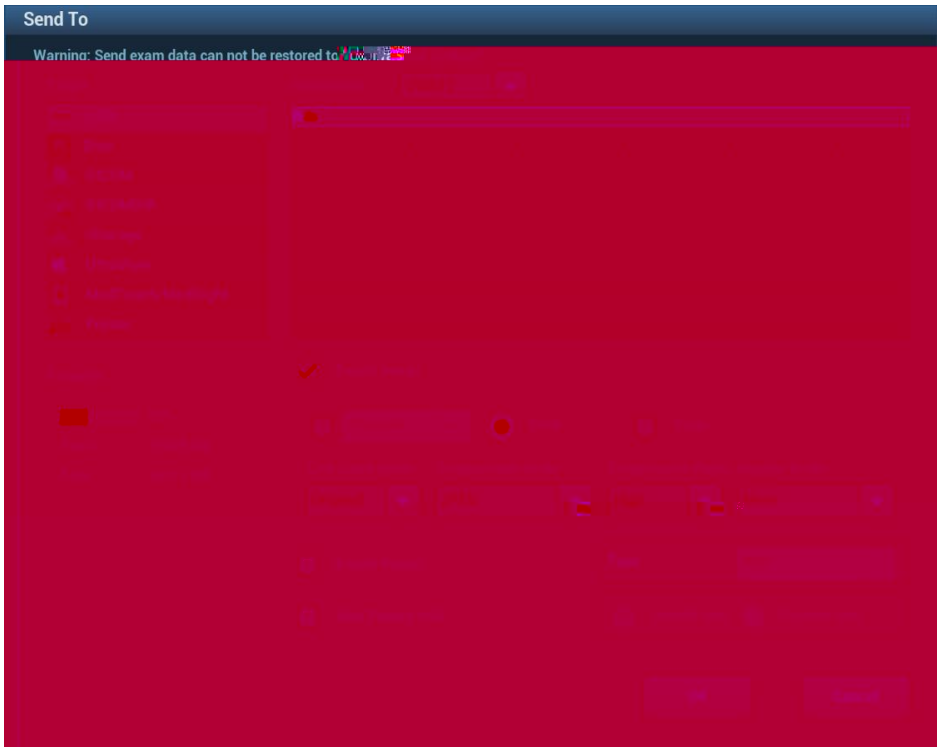


Figure 17 Save as DCM Format

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 [Network Preset] / [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) of the exam can be sent to the specified iStorage server with the format of DCM, as shown in Figure 18 Send to iStorage.

The wireless network is disconnected during transmission.

- Troubleshooting:

Ensure normal wireless netnetwork.

■ Failure:

Multi-frame transmission is failed, but single frame is succeeded.

- Potential Reasons:

Enable multi-frame image storage is not selected in the dialog box of Storage preset.

- Troubleshooting:

Enable multi-frame image storage is selected in the dialog box of Storage preset.

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

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. System Preset -> General Preset, se
  2. In DICOM Preset -> 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 System Preset - ave ,Press add to combine this key with function of end Image to DICOM Printer .
  2. as shown in Figure 19 Send to DICOM print when pressing user-defined key.

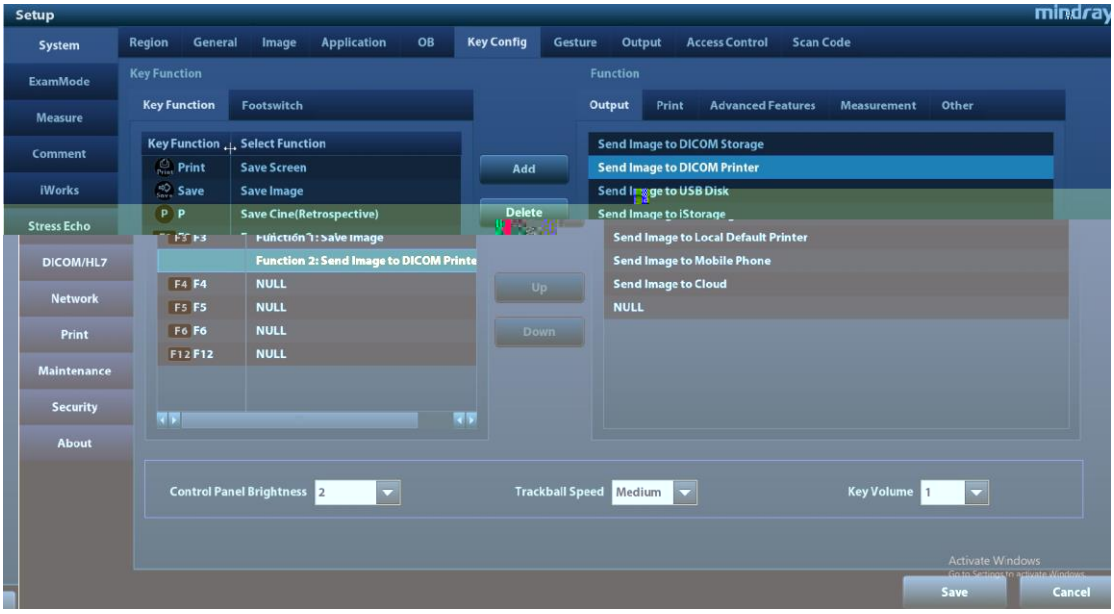


Figure 19 Send to DICOM print when pressing user-defined key

3. In DICOM Preset -> Print Service, set the default print server.
4. In current exam, press <F4> (according to the user preset), the system will save and send a single-frame imagFe 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 listed after clicking [Query].

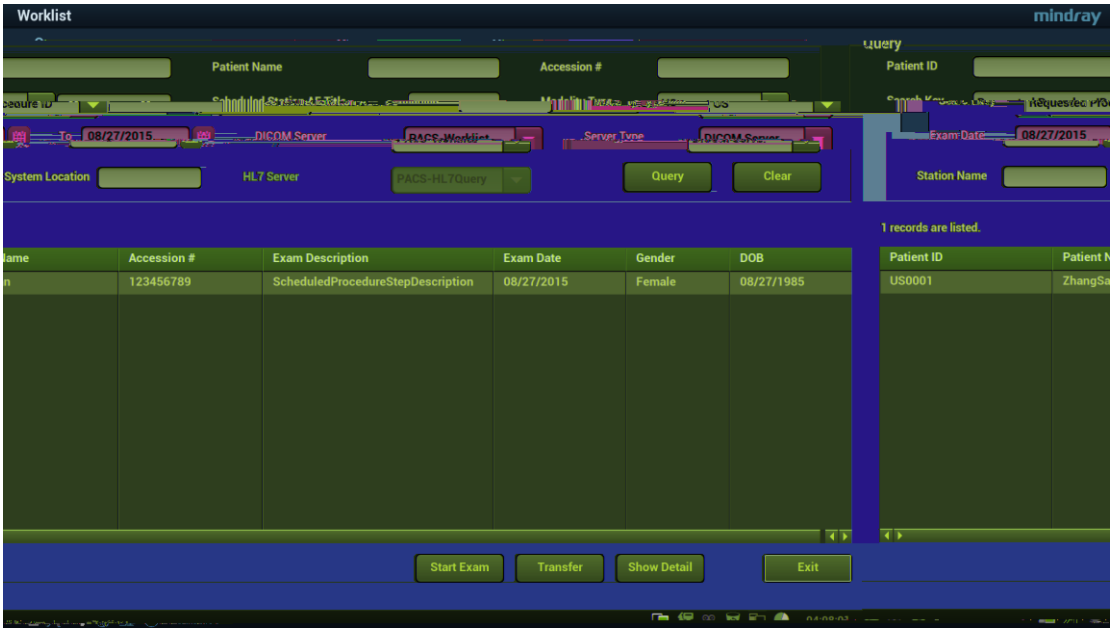


Figure 20 Query in WorkList

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 21 Detailed Information

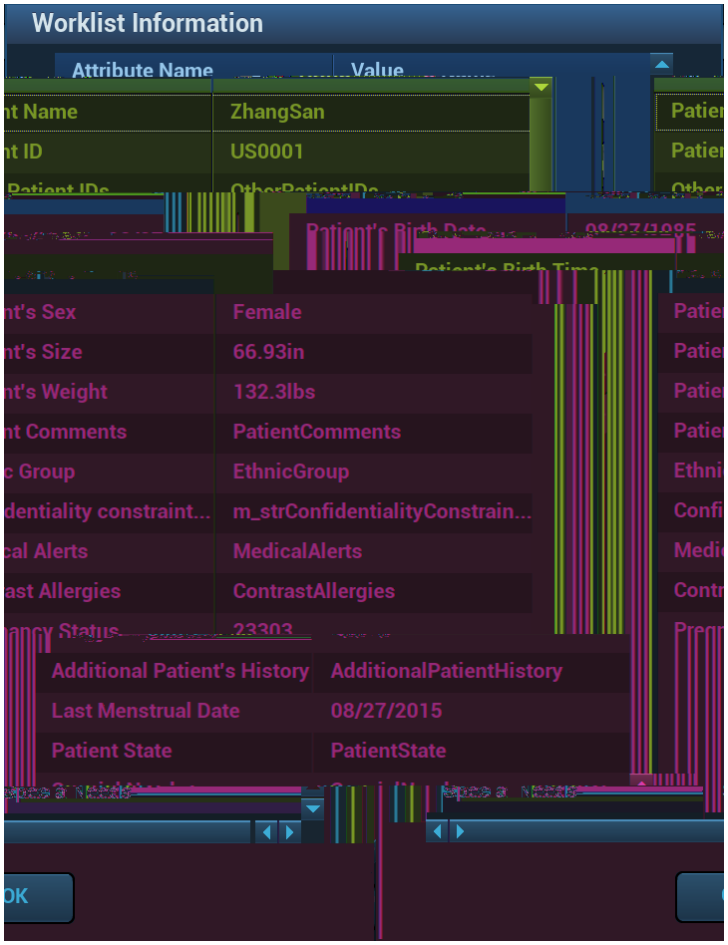


Figure 21 Detailed Information

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

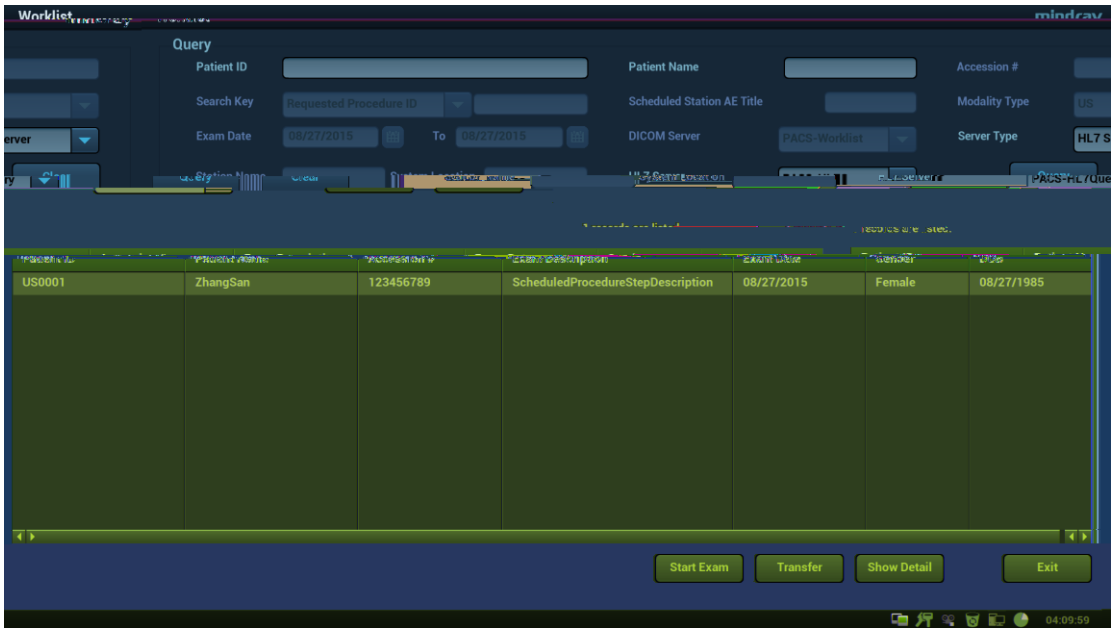
Check the DICOM preset and network connection if a query error occurs.

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 Query the patient information by setting conditions such as Patient ID, Name or combination of them. Patient records will be listed after clicking [Query].


Worklist
mindray
Query
Patient ID
Patient Name
Accession #
Search Key
Requested Procedure ID
Scheduled Station AE Title
Modality Type
Exam Date
08/27/2015
To
08/27/2015
DICOM Server
PACS-Worklist
Server Type
HL7 S
Clear
PACS-HL7Que
US0001
ZhangSan
123456789
ScheduledProcedureStepDescription
08/27/2015
Female
08/27/1985
Start Exam
Transfer
Show Detail
Exit
04:09:59

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.

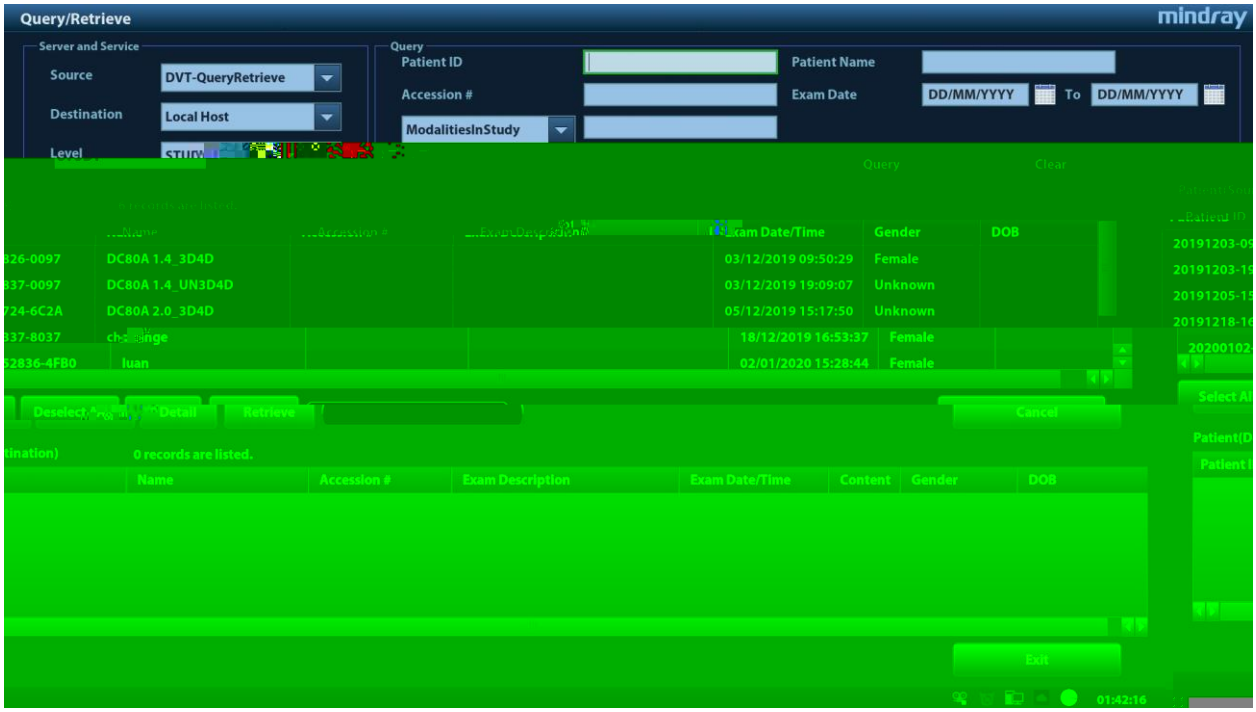


Figure 23 Query

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

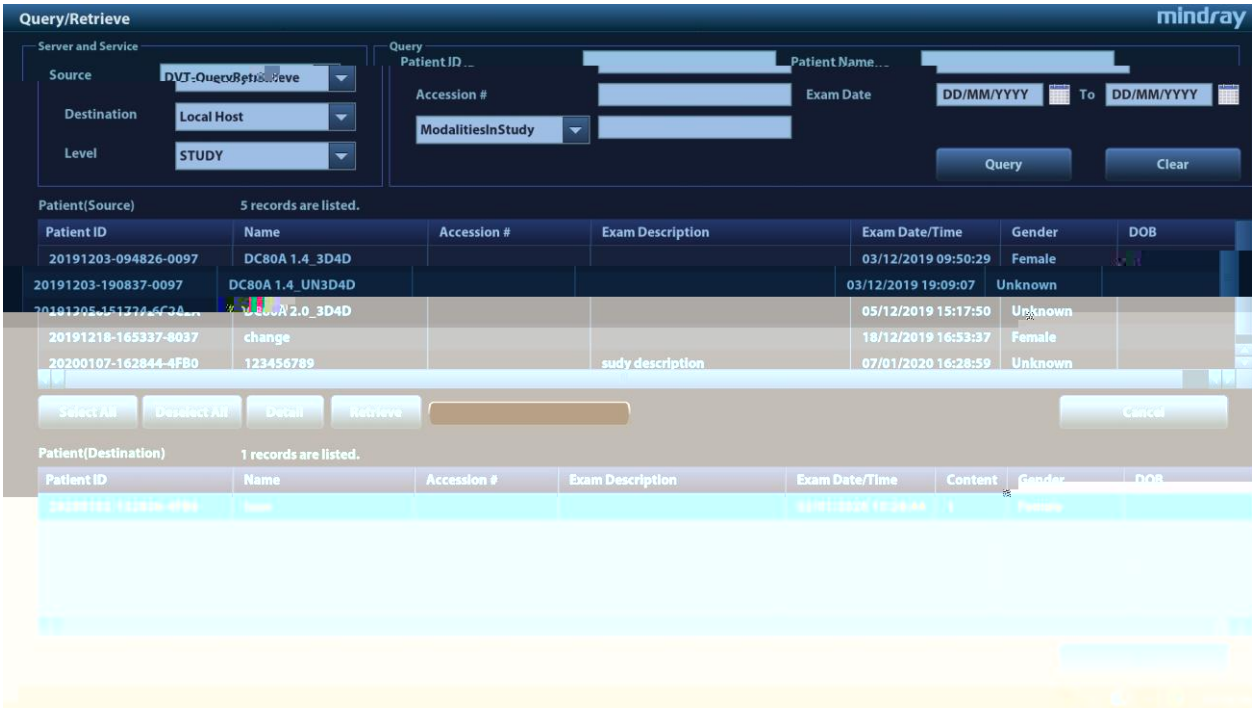


Figure 24 Retrieve

6. 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.

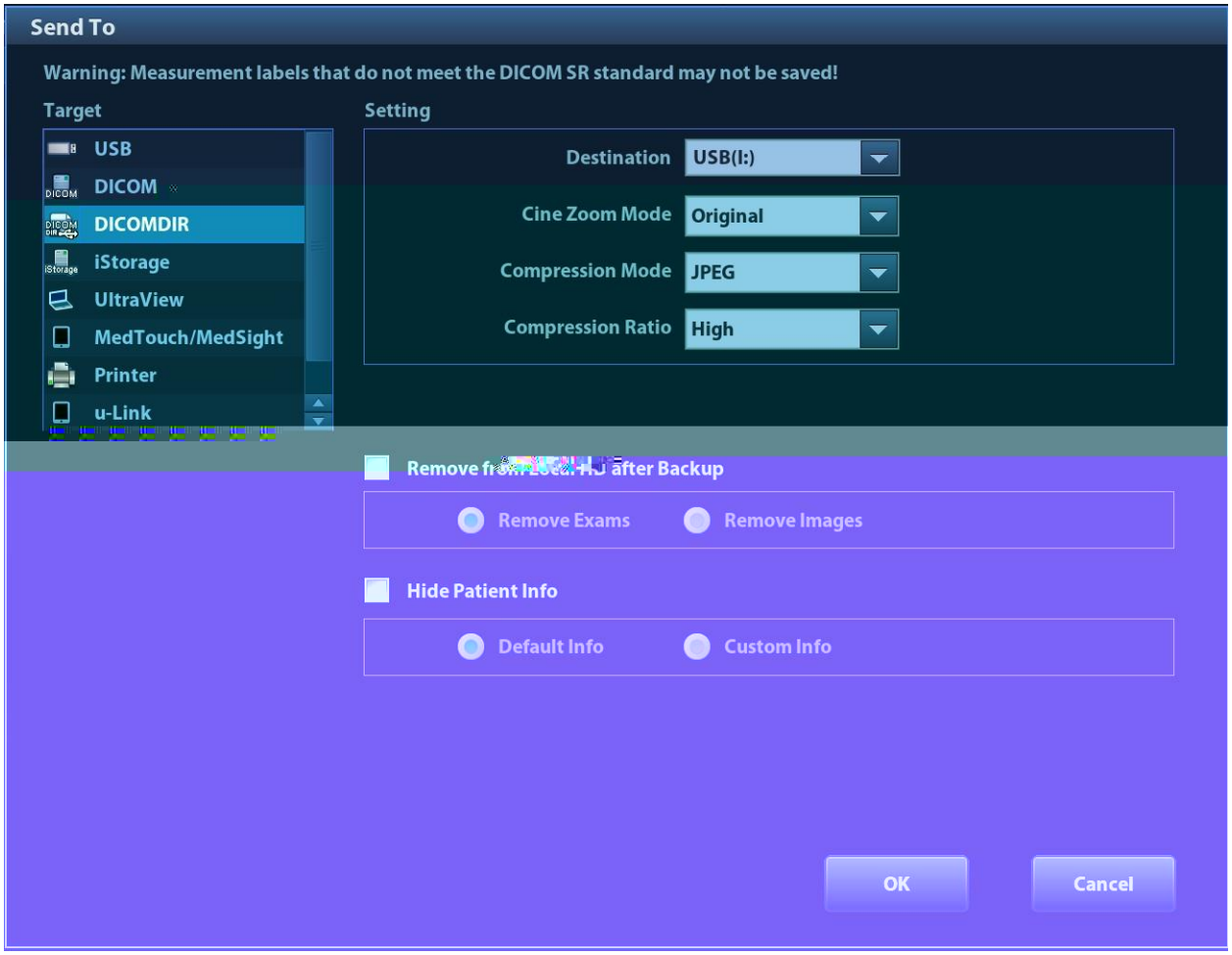


Figure 25 DICOM MediaStorage

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.
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 12 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 .

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 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:

- -> 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:

- inting which is performed by the ultrasound system;
-

Troubleshooting:

- Check the printer conformance statement if the printer can support color printing; if not, Print Preset Screen -> Print to B/W type (MONOCHROME2);
-

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.BT/F1 10.56 T9t5sC a5sC a5st6 Tfa5st6 Tfa5st6 Tfa5st6 Tfa5st6 Tfa5

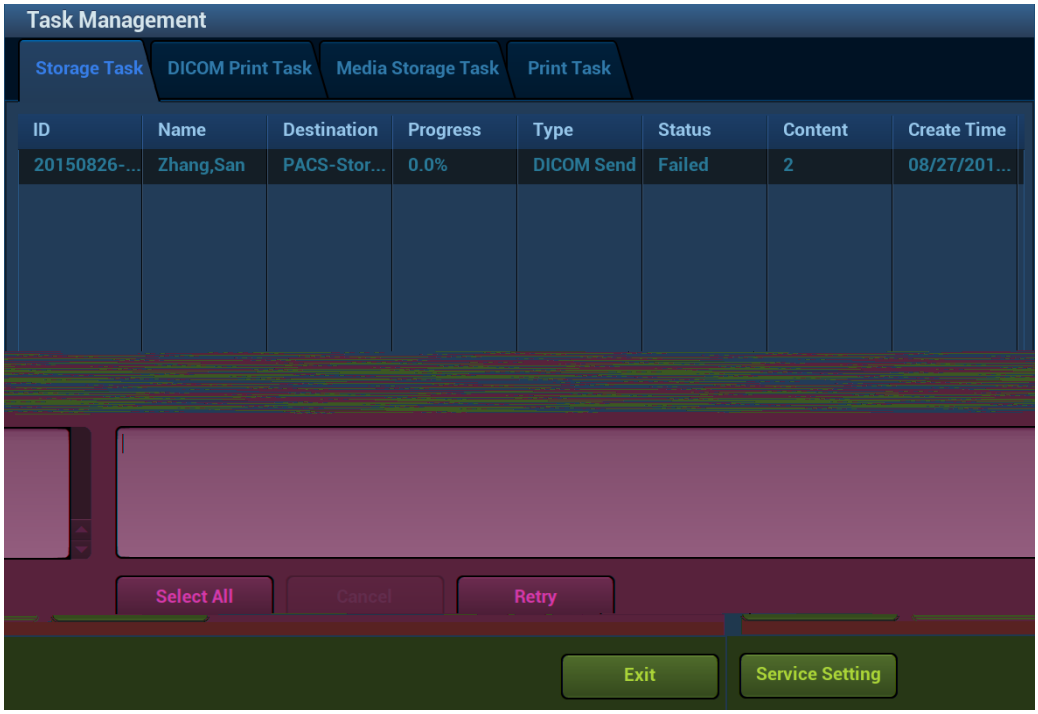

Task Management
Storage Task
DICOM Print Task
Media Storage Task
Print Task
ID
Name
Destination
Progress
Type
Status
Content
Create Time
20150826-...
Zhang,San
PACS-Stor...
0.0%
DICOM Send
Failed
2
08/27/201...
Select All
Cancel
Retry
Exit
Service Setting

Figure 27

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 *BICUBIC* *MITCHELL* *LANCZOS* *SHARP1* *SHARP2* *SHARP3*

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

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

14"·17" Landscape	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