

## 9 Working With DICOM

DICOM (Digital Imaging and Communications in Medicine) is a format created by NEMA (National Electrical Manufacturers Association) to aid in the distribution and viewing of medical images such as ultrasound scans.

If you have the DICOM option installed on your Terason Ultrasound System, you can:

- [Send studies to a DICOM server](#) where they can be used by other applications that support DICOM files
- [Use DICOM Worklist](#) to search the archive of patient studies on the DICOM server, and copy patient info sets to the Terason Ultrasound system so that exams on the system are identified with the correct patients.

Before you can use the Terason DICOM option, you must purchase and configure the DICOM option. If the DICOM option is not installed, the DICOM menu items are not accessible.

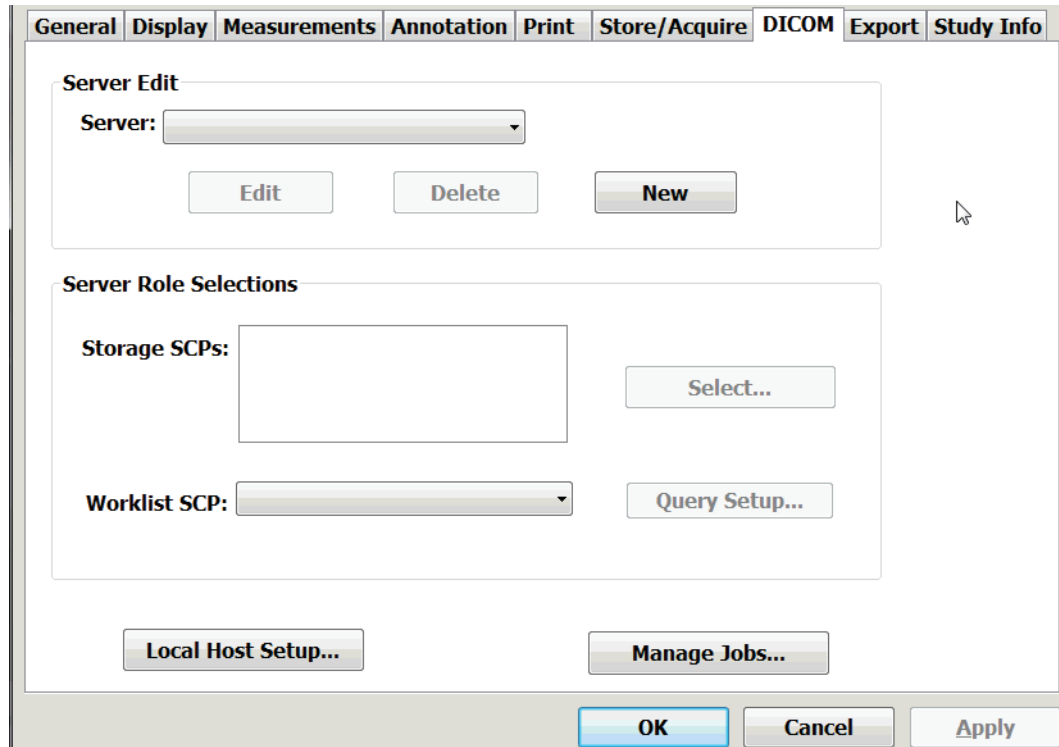
### Configuring the DICOM Option

Your facility's DICOM Administrator has the information required to configure the DICOM option. Either obtain the information from the administrator, or ask the administrator to do the configuration.

**To configure the DICOM utility**, complete these steps:

1. Press the **Setup key**.
2. Click the **DICOM** tab.

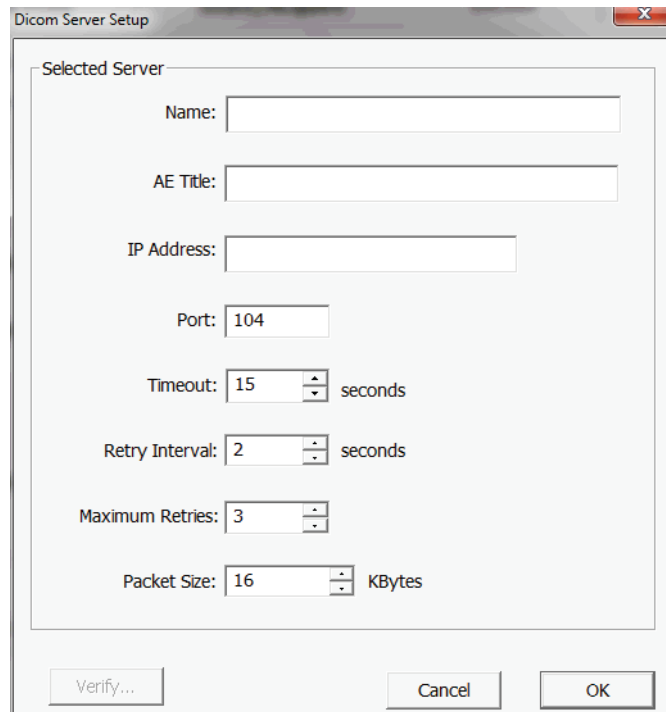
The Setup DICOM window opens.



**Setup DICOM Window**

3. Click the **New** button in the Server Edit section.

The DICOM Server Setup window opens.



**DICOM Server Setup Window**

4. Enter the **server name**, **AE title**, and **IP address** in the appropriate fields.

5. Make any required **changes** to the other fields.
6. Click **Verify...**

The software tests the connection to the DICOM server. If the connection is good, a message box that says **Connect Valid** appears
7. Click **OK** in the message box.
8. Click **OK** in the DICOM Server Setup window.
9. Enter any **Storage SCPs** in that field.
10. Enter the **DICOM Worklist SCP** in that field.
11. Click **OK**.

To see the ultrasound system's Host Name, AE title, SCP IP address, or SCP port, click **Local Host Setup...** on the Setup DICOM window.

## Using Studies with a DICOM Server

When you send a study to a DICOM server, the Terason software saves the study in a temporary location on your computer. The studies are then sent to the server.

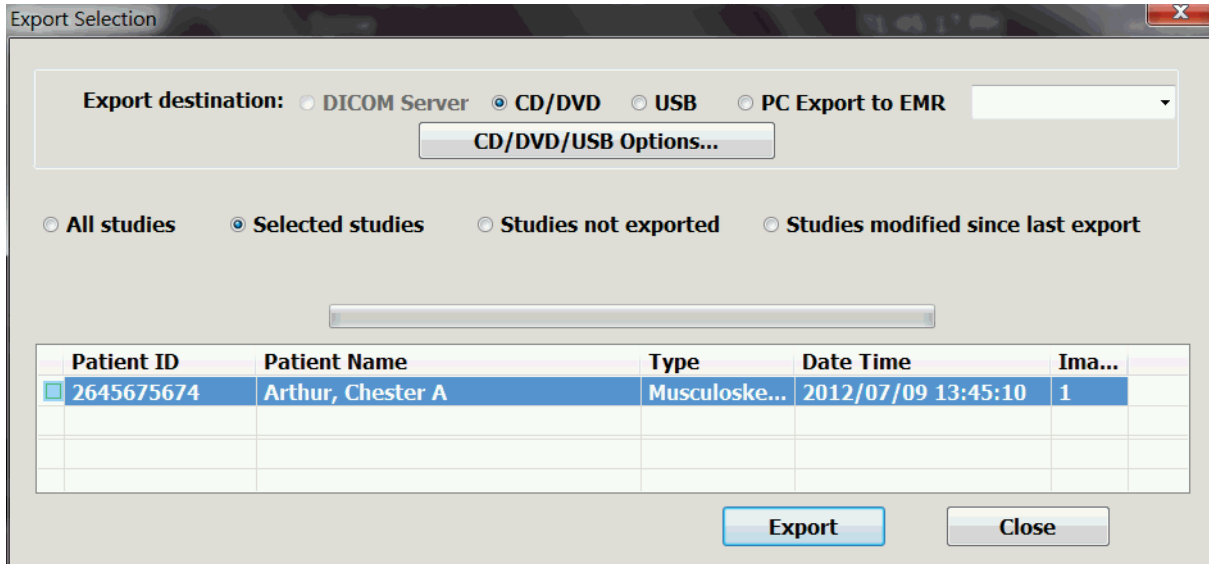
**To view log messages** about studies exported to a DICOM server, open the DICOM utility (select **Start > Programs > TerasonDICOM > Terason**) and click the **Communications Log** tab.

## Sending Studies to a DICOM Server

**To send a study to a DICOM server**, complete these steps:

1. Load the **study** (if it was previously saved) or obtain and save a new scan.
2. Press the **Export** softkey.

The Export Selection window opens.



### Export Selection Window

3. In the Export destination: section, make sure the **DICOM Server** radio button is selected.
4. Click the **name of the study** you want to send.
5. Click **Export**.


The Terason application sends the study to the configured DICOM server.

### Study Status Indicator

In the Study List and Export Selection windows, the color of a small square to the left of the Patient ID for each study indicates the status of that study:

- An **empty** square indicates that no export of that study was attempted.
- A **yellow** square indicates that export of the study is pending.
- A **black** square indicates that the study was modified after it was sent to the DICOM server.
- A **red** square indicates that export of the study failed.

## DICOM Status Indicator

The DICOM option starts when the computer is powered on, and an icon  is added to the Status bar. The icon color indicates one of three conditions:

- **Green** indicates that the system is connected to the DICOM server, and that any studies sent to the server have reached it successfully.
- **Red** indicates that the system is not connected to the DICOM server.
- **Yellow** indicates that there has been a failure sending to the DICOM server.

**To identify the failure that caused a yellow indicator**, complete these steps:

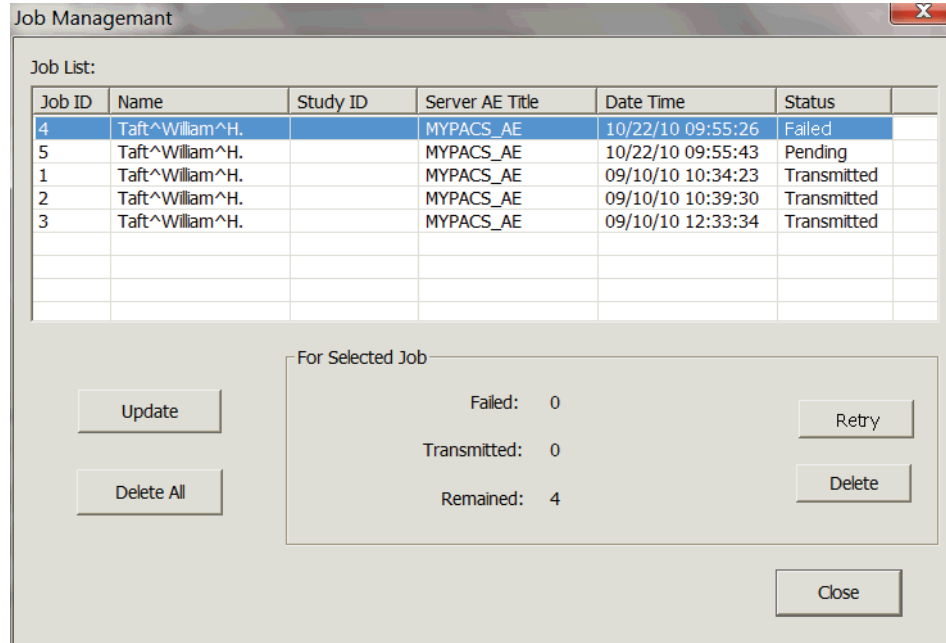
1. Press the **Setup** key.

2. Click the **DICOM** tab.

The Setup DICOM window opens.

3. Click the **Manage Jobs** button.

The Job Management window opens, showing a list of studies sent to the DICOM server. The Status column shows whether each job was transmitted or if the sending failed.



#### Job Management Window

4. To clear the yellow failure notification, click either **Retry** to send the study again, or **Delete**, to cancel sending of the study.

You may have to correct the reason for the failure before resending the study.

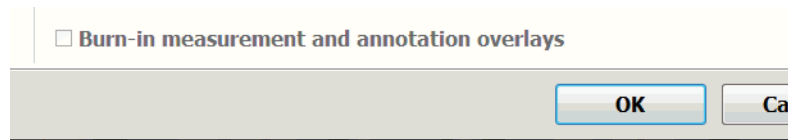
5. Click **Close**.

## Using the DICOM Image Viewer on a CD or DVD

When you export studies to a CD or DVD (see [Exporting Studies](#) on page 108), you have the option to include a viewer for DICOM files on the disc.

**To include the DICOM image viewer on a CD or DVD:**

1. Press the **Setup** key.
2. Click the **Export** tab.



### Include Viewer Button on Export Window

The Setup Export window opens.

3. Make sure the **Include Viewer on CD/DVD** checkbox is checked.
4. Click **OK**.

When you export studies to a CD or DVD with the Include Viewer on CD/DVD checkbox checked, the viewer is also included on the disc.

When the disc is inserted in a computer, the image viewer may launch automatically, or Windows may display a menu of choices. If the menu appears, the user should select Run Show.Studies.exe.

The viewer includes a Help file that explains how to use it. To access the viewer Help file, click Help on the viewer window.

## Using DICOM Worklist

DICOM Worklist is a function of the Terason Ultrasound software that connects to a DICOM server using a network service, and generates a list of patient information sets that meet chosen criteria. Worklist finds patient records based on parameters set in the Setup > DICOM > Query window.

To prepare for an ultrasound exam, the ultrasound technician queries Worklist using parameters that include the patient's information. The query reruns a worklist of all the patient information sets that meet the criteria. The ultrasound technician selects a patient's record on the worklist, and the exam is automatically attached to that patient's information (the Patient Info window is populated with the selected patient's information.) The technician can also use Worklist to obtain the patient information from the DICOM server and apply the information to a current exam.

To use DICOM Worklist, see:

- [Worklist Queries](#); see page 134
- [Configuring Worklist](#); see page 135
- [Configuring Broad Queries](#); see page 136
- [Making a Query](#); see page 137
- [Applying a Patient Info Set](#); see page 139
- [Customizing the Worklist](#); see page 140
- [DICOM Network Service](#); see page 141

## Worklist Queries

There are two available types of Worklist queries: *auto* queries and *manual* queries.

Auto queries run periodically when the ultrasound system is on, and return a list of patient info sets that match the criteria set in the Query window as a broad query (see [Configuring Broad Queries](#) on page 136.) For example, an auto query can be set up to return a list of ultrasound exams that are scheduled on the current date. The facility's scheduling administrator enters an ultrasound exam for a patient into DICOM, and when the scheduled date arrives, the Worklist auto query collects the patient info and adds it to the worklist.

Manual queries can take two forms: *broad* queries, and *patient-based* queries.

Broad queries search all records on the DICOM server, using the parameters chosen in the Options window. Broad queries are preset groups of parameters. They can be used as they are, or modified with different parameters, or applied to patient-based queries. See [Configuring Broad Queries](#) on page 136, and [Making a Broad Query](#) on page 137.

Patient-based queries search the records using a patient name, accession number, or Patient ID. They can be further limited to the parameters in a broad query. See [Making a Patient-Specific Query](#) on page 139.

## Configuring Worklist

To configure Worklist to communicate with a DICOM server:

1. With the Terason software running, press the **Setup** key.
2. Click the **DICOM** tab.

The Setup/DICOM window opens.

The screenshot shows the 'Setup/DICOM Window' with the following elements:

- Tabbed interface: General, Display, Measurements, Annotation, Print, Store/Acquire, **DICOM**, Export, Study Info.
- Server Edit** section:
  - Server: [Dropdown menu]
  - Buttons: Edit, Delete, New
- Server Role Selections** section:
  - Storage SCPs: [Text box] [Select... button]
  - Worklist SCP: [Dropdown menu] [Query Setup... button]
- Buttons at the bottom: Local Host Setup..., Manage Jobs...
- Buttons at the very bottom: OK, Cancel, Apply

Setup/DICOM Window

3. Click **Select...**, and make sure the Storage SCP is in the right-hand pane of the DICOM Server Selection window. If it is in the left-hand pane, click it, then click the right arrow > and click OK.
4. Click **Worklist SCP:**, and select the worklist SCP designated by your site administrator.
5. Click **OK**.

## Configuring Broad Queries

To configure a query so that it is available in the **Broad Query** menu on the Worklist window:

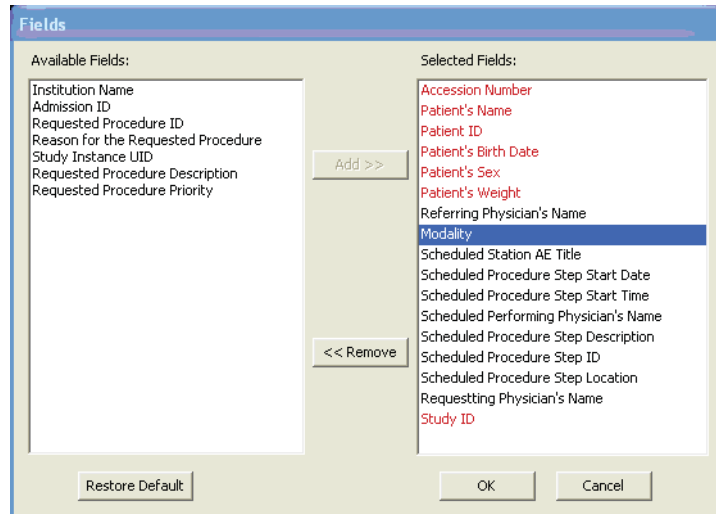
1. In the Setup/DICOM window, click **Query Setup....**

The Query window opens.

### Query Window

2. Select one of the preconfigured queries in the **Select Query:** menu, or if you want to create a new query, select New Query Item.
3. Enter the **AE Title:**.
4. Choose the **Modality:**.
5. Choose the **Date:** - either All Dates, Today or Date Range. If you chose Date Range, choose the start and end dates in the from: and to: fields.
6. To change the parameters that are selectable for queries:
  - a. Click Fields....

The Fields window opens.



### Fields Window

- b. To add a search parameter to the Selected Fields: list, click its name in the Available Fields: list, then click **Add >>**.
- c. To remove a search parameter from the Selected Fields: list, click its name in the Available Fields: list, then click **<< Remove**.



**Note:** Parameters in red are defaults that cannot be removed from the Selected Fields: list.

- d. Click **OK**.
7. Choose whether you want Worklist to run **auto queries**, by checking or unchecking the Auto Query checkbox. If you do want auto queries to run, choose the frequency for auto queries from the Query Interval menu.
8. When all the values are entered, click **OK**.  
The new or modified query is saved, and is available in the Broad Query: menu of the Worklist window.

## Making a Query

You can make a broad query that searches all the patient records and returns all the patient info sets that match the criteria, or a patient-specific query that searches for a specific patient's info set. A patient-specific query can use the same criteria as a broad query, returning only those info sets that match both the criteria in the broad query and some data specific to the patient.

### Making a Broad Query

**To make a broad Worklist query:**

1. Press the **Patient key**.
2. Click **Worklist**.

The Worklist window opens.

The screenshot shows the 'Worklist' window with a table of patient information and query controls. The table has columns for Accession Number, Patient's Name, Patient ID, Patient's Birth Date, Patient's Sex, Patient's Age, Institution Name, and Referral. The first three rows contain data for Edward Mills, Carol Norris, and Oliver Thomas. Below the table are query options: 'Broad Query' (set to 'All Date match with US modality for TERASON\_3000'), 'AE Title' (TERASON\_3000), 'Modality' (US - Ultrasound), 'Date Type' (All Dates), and date range (5/31/2006 to 5/31/2006). There is also a 'Patient Based Query' section with fields for Patient Name, Accession Number, and Patient ID, and a 'Use Broad Query Criteria' checkbox. Buttons for 'Query', 'Restore Default', 'Customize List...', 'Select', and 'Cancel' are also visible.

Accessi...	Patient's Name	Patient ...	Patient's Bi...	P..	Pati...	Pati...	Institution N...	Referr
3016	EDWARD MILLS	678	09/16/1976	M	144			
244	CAROL NORRIS	PID52132	06/23/1968	F	152.5			
235	OLIVER THOMAS	PID00100	09/02/1970	M	140			

### Worklist Window

3. Pull down the **Broad Query:** menu, and select the query that uses the parameters you want.

If there is no appropriate query in the menu, create one, using the procedure described in [Configuring Broad Queries](#) on page 136.

4. To search for info sets of patients who have not had an ultrasound exam before, pull down the **Modality:** menu and choose an exam type.
5. If the patient you are searching for has not had an ultrasound exam before, pull down the **Modality:** menu and select All.

If the patient's information was saved to the DICOM server during a previous exam of any type, the query will return that information.

6. To limit the search to specific dates, pull down the **Date:** menu, and choose All Dates, Today, or Date Range to search.
7. In the Broad Query section, click **Query**.

Worklist searches the DICOM server, and lists the results in the top part of the Worklist window.

## Making a Patient-Specific Query

### To make a patient-specific query:

1. In the Patient window, click **Worklist**.  
The Worklist window opens.
2. Enter the patient's name, Patient ID, or accession number in the **appropriate field**.
3. To apply the parameters in a broad query to the patient-specific query (this further narrows the query results):
  - a. Click **Use Broad Query Criteria** so the box is checked.
  - b. Pull down the **Broad Query:** menu, and select the query that uses the parameters you want.  
If there is no appropriate query in the menu, create one, using the procedure described in [Configuring Broad Queries](#) on page 136.
  - c. You can also search using different **modality and date** parameters, using those functions in the Broad Query section.
4. In the Patient Based Query section, click **Query**.  
Worklist searches the DICOM server, and lists the results in the top part of the Worklist window.

## Applying a Patient Info Set

Worklist makes it easy to apply a patient info set to an exam.

### To apply a patient info set to a new exam:

1. Press the **Patient key**.
2. Click the **Worklist** tab.
3. Either click **Query** in the Broad Query section, or enter the patient name in the Patient Based Query section, and click Query in that section.
4. Click the appropriate **patient info set** to select it.
5. Click **Select**.

Worklist populates the Patient Info window fields with the data in the selected info set. The current exam is associated with that patient.



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**Note:** When a patient info set is applied to an exam, and the exam is saved, that exam is permanently associated with that patient. If the wrong patient info set was selected, a new exam is required for the correct patient association.

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## Customizing the Worklist

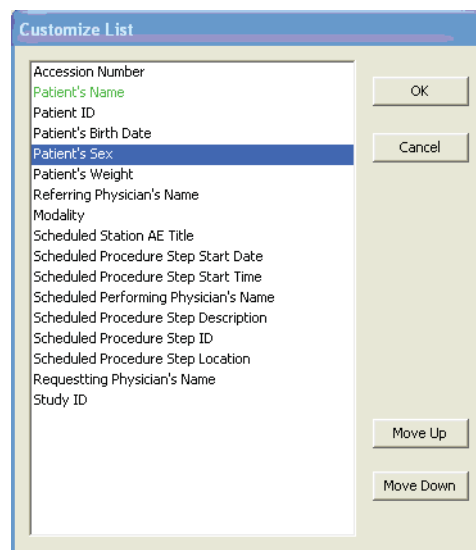
The categories-of-patient-information header on the worklist is wider than the Worklist window. To see all the categories, you must use the scroll bar at the bottom of the list area. You can set the left-to-right listing order of the patient info values, to reduce the amount of left-to-right scrolling required to read information you commonly use. See [Setting the Value List Order](#), below.

### Setting the Value List Order

**To set the left-to-right listing order** of the patient info values:

1. On the Worklist window, click **Customize List...**

The Customize List window opens.



#### Customize List Window

2. To move a value type to the left on the worklist, select the name of the field in the list and click **Move Up** until the name is in the desired place on the vertical list in the Customize List window.

The top of the list in the Customize List window corresponds to the left side of the patient-information header on the Worklist window. The bottom of the list in the Customize List window corresponds to the right side of the patient-information header on the Worklist window.

3. To move a value type to the right on the worklist, select the name of the field in the list and click **Move Down** until the name is in the desired place.
4. **Repeat** with any other fields you want to move.
5. Click **OK**.

Worklist displays the values in the patient info sets in the order you specified. When you make a new query, the worklist displays the values in the order you set with this procedure.

## DICOM Network Service

When the computer starts, a network service called DcmNetService.exe runs automatically. This service allows automatic worklist queries to execute on schedule, even if the Terason software is stopped. If the service stops or does not start automatically, you can launch it manually. You can also stop the network service manually.

### Starting the Network Service Manually

#### To start the network service manually:

1. Press **alt-tab** to change to the Windows screen.
2. Open Windows Explorer and navigate to the **Teratech directory**.
3. Double-click **DcmNetService.exe**.

The network service launches and connects to the DICOM server.





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**Note:** Only one instance of the network service can run at a time.

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### Stopping the Network Service

#### To stop the network service:

1. Press **alt-tab** to change to the Windows screen.
2. If necessary, press **tab** again to show the Windows taskbar.
3. Right-click the **network service icon**  on the Windows status bar at the lower right corner of the screen. If the icon is not visible, click the up arrow at the left end of the right-hand group of icons in the taskbar.

A dialog box opens.

4. Click **Exit** in the dialog box.

The network service stops.

### Checking the Connection Status

When you hover the Windows pointer over the network service icon, a tooltip appears that describes the network connection status. There are six possible messages:

- **Connect Valid** - Successfully connected to the server
- **Connect Failed** - Did not connect to the server
- **Query Error** - Error in query and retrieve
- **Verify Failed** - Failed to verify the connection to the server (for manual query only)
- **Timeout** - Communication timeout
- **Undefined** - There is no server defined

If the icon is red, not blue, there is no connection to the DICOM server.

## 10 Working With Setup Tools

The **Setup** window allows you to set defaults and control various functions of the Terason software. The Setup window tabs display sets of controls for defaults and other settings.

The controls are described in these sections:

- [Using General Setup Controls](#), see page 143
- [Setting Export Defaults](#), see page 146
- [Setting Display Defaults](#), see page 149
- [Setting Measurement Defaults](#), see page 151
- [Using Annotation Setup Controls](#) on page 151
- [Setting Print Defaults](#) on page 152
- [Setting Storage and Acquisition Defaults](#) on page 153
- [Setting DICOM Defaults](#) on page 155