

# TITAN DICOM Conformance Statement

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## Introduction

### About this document

This document describes the SonoSite Titan<sup>®</sup> Ultrasound System’s conformance to the ACR-NEMA DICOM (Digital Imaging and Communications in Medicine) standard and satisfies the DICOM requirement for a vendor conformance specification.

The Titan system is an ultrasound imaging device. The DICOM option of the Titan system provides a means to send images to DICOM printers and DICOM storage servers.

Throughout this document DICOM storage servers will be referred to as archivers. For a device to be classified as an archiver it must be capable of receiving DICOM store commands. Archivers are primarily comprised of PACS.

This document is written with respect to ACR-NEMA DICOM version number 3.0 - 2003.

### Changes in this version

| Revision | Description of Change                                                                                        |
|----------|--------------------------------------------------------------------------------------------------------------|
| C        | Added support for Modality Worklist (Associated with C2.2 Titan) – following final DICOM validation testing. |
| B        | Added support for Modality Worklist (Associated with C2.2 Titan) - Preliminary                               |
| A        | Initial release. (Associated with C2.1x Titan)                                                               |

### DICOM Background

The DICOM information exchange specification provides a definitive structure of commands and information that allow for the inter-communication of medical imaging devices. Developed by the American College of Radiology (ACR) and the National Electrical Manufacturers Association (NEMA), the DICOM standard strives to promote communication of image information through the use of a standardized set of command classes and information semantics.

The DICOM standard defines classes of information that are common to many modalities of medical imaging. However, to meet the specific needs of information content for such a diverse range of information, the DICOM specification defines structures for a multitude of medical data. To alleviate the need for applications to implement every aspect of the DICOM specification, a list of conformance tables for every modality was created to define the minimum set of information necessary for data exchanges. A requirement of the DICOM specification is to maintain a compliance document that outlines a subset of DICOM services and data classes that are supported by a device. The purpose of this document is to define a subset of DICOM for the exchange of information with the SonoSite Titan via its DICOM feature.

## Definitions

|        |                                                 |
|--------|-------------------------------------------------|
| AE     | Application Entity                              |
| ANSI   | American National Standards Institute           |
| CF     | Compact Flash                                   |
| CW     | Continuous Wave                                 |
| HL7    | Health Level 7                                  |
| DICOM  | Digital Imaging and Communications in Medicine  |
| DIMSE  | DICOM Message Service Element                   |
| HIS    | Hospital Information System                     |
| IE     | Information Entity                              |
| IOD    | Information Object Definition                   |
| KHz    | Kilohertz                                       |
| LUT    | Look Up Table                                   |
| PACS   | Picture Archive and Communication System        |
| PW     | Pulsed Wave                                     |
| PDU    | Protocol Data Unit                              |
| PPS    | Performed Procedure Step                        |
| RGB    | Red, Green, Blue                                |
| RIS    | Radiology Information System                    |
| SC     | Secondary Capture                               |
| SCU    | Service Class User (Client)                     |
| SCP    | Service Class Provider (Server)                 |
| SOP    | Service – Object Pair                           |
| SPS    | Scheduled Procedure Step                        |
| TCP/IP | Transmission Control Protocol/Internet Protocol |
| UID    | Unique Identifier                               |

|     |                            |
|-----|----------------------------|
| US  | Ultrasound                 |
| UTC | Coordinated Universal Time |
| VOI | Value Of Interest          |
| VR  | Value Representation       |

## Reference documents

ACR-NEMA DICOM Standard Version 3.0 – 2003





## Implementation Model

The Titan DICOM feature incorporates the DICOM 3.0 standard for networked image printing, image store and Modality Worklist functions. Images are transferred from the Titan ultrasound system using standard network connections to be processed on a centralized printer or stored on a DICOM compatible archiver. Scheduled Procedures are queried from the HIS/RIS Worklist SCP and presented to the operator for selection.

Titan allows up to four archivers, two printers and one Worklist server to be selected at any given time. The devices are selected using DICOM Setup mode with all selected archive and print devices being placed into a destination list.

A maximum of 200 Scheduled Procedures Steps may be queried from the selected Modality Worklist SCP. The Worklist is persisted to non-volatile memory so that it can be accessed during portable exams. Both manual and automatic queries are supported. Automatic queries are user configurable and are performed in the background at periodic intervals.

During an exam all saved images are written to compact flash. When the exam completes all images associated with it are marked as Archive Pending for transfer to each device in the current destination list. If a network connection is present then transfer begins immediately.

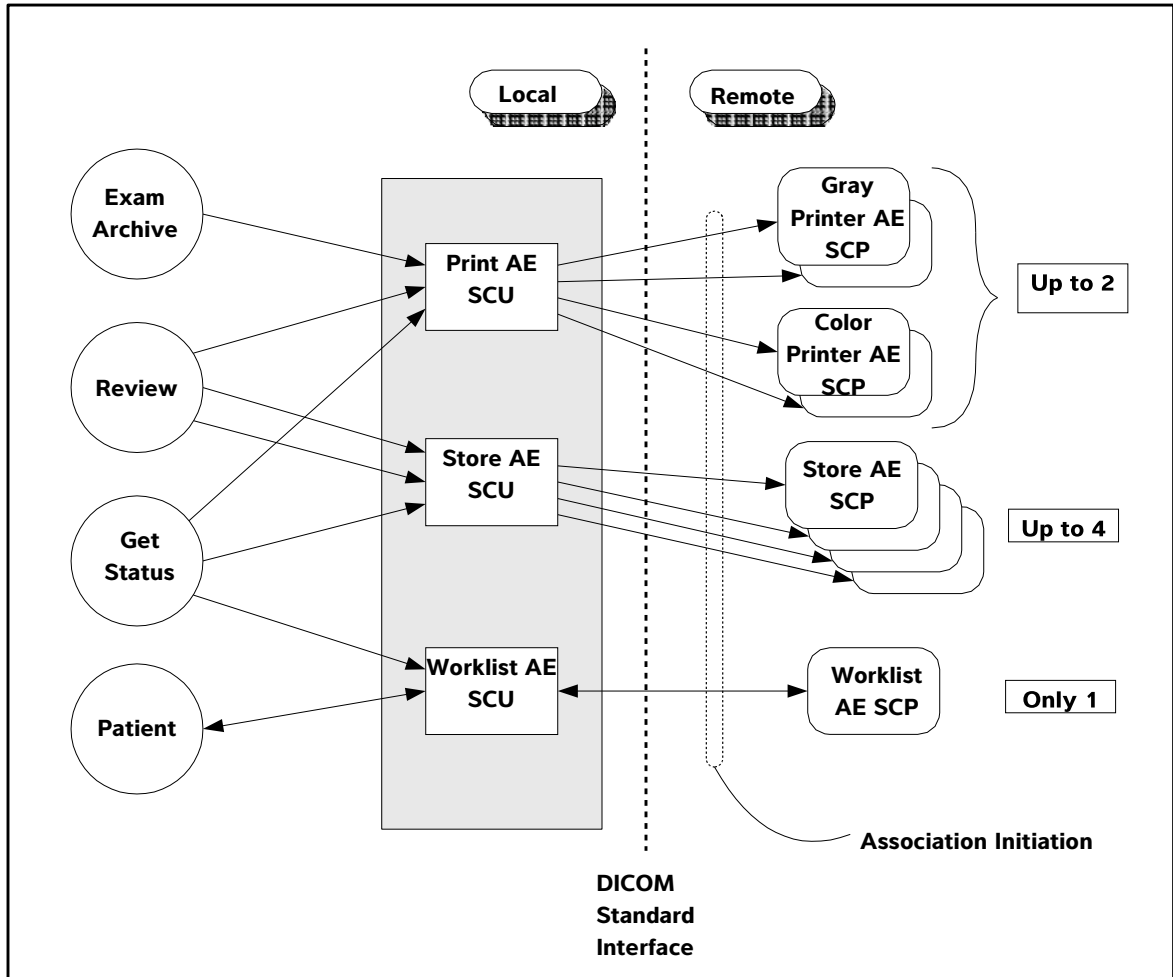
Exams are Archived to devices in the destination list sequentially, starting with the first selected archiver and ending with the last selected printer. Exam images are sent to each destination device in batch transfer mode; an association is opened, all exam images are transferred in acquisition order, and the association is closed. Once an exam is successfully transferred to a device then all images in the exam are marked as Archive Complete to that destination. Archiving then continues with the next device in the destination list. Once all devices in the destination list have successfully received each exam image then the Exam Archive is complete.

When a Get Status is performed the current destination list is used in the same manner as with Exam Archive. The devices are accessed sequentially, starting with the first selected archiver and ending with the last selected printer. For each device an association is opened, status is returned, and the association is closed. Status is obtained from printer devices using an N-Get Status, and from archiver and Worklist devices using DICOM Verify (C-Echo). Once status is successfully returned from all devices in the destination list then Get Status is complete.

## Application Data Flow Diagram

The diagram in **Figure 1** represents the relationship between the ultrasound system's real-world activities (circles on the left), the local AE's built into Titan (boxes in the center), and the remote AE's built into the devices Titan communicates with using DICOM (boxes on the right).

**Figure 2-1** Implementation Model



The following are the conditions that invoke real-world activities associated with AE's.

### Exam Archive

- ▶ End Exam with one or more images saved on CF card. Exam end occurs when the Delta key is pressed while configured to End Exam, or when Patient setup mode is entered and either End Exam is pressed or any of the patient fields are changed and the saves committed.
- ▶ System startup with an inserted CF card that contains one or more images with Archive Pending.

- ▶ Insertion of a CF card that contains one or more images with Archive Pending.

## Review

- ❖ User enters Review mode, selects one or more Patient Exams, and selects Archive.

## Get Status

- ❖ Operator Verify command in DICOM Setup mode.

## Patient

- ❖ User enters Patient Setup screen, enters search criteria, and presses the Query key. The Worklist screen is entered and a list of matching Scheduled Procedures Steps are returned and displayed.

## Functional Definition of AE's

### Print

This AE handles all aspects of the Print Management SCU.

Steps taken to Get Printer Status:

```
A-ASSOCIATE
N-CREATE Film Session
N-CREATE Film Box
N-GET Status
N-DELETE Film Box
N-DELETE Film Session
A-RELEASE
```

Steps taken to Send Exam to Printer:

```
A-ASSOCIATE
N-CREATE Film Session SOP Instance For each film sheet
{
    N-CREATE Film Box SOP Instance
    For each image on film sheet
    {
        N-SET Image Box SOP Instance
        If not last image on sheet
            N-GET PRINTER SOP Instance - Status
    }
    N-ACTION PRINT, Film Box SOP Instance
    N-DELETE Film Box SOP Instance
}
N-DELETE Film Sheet SOP Instance
A-RELEASE
```

## Store

This AE handles sending ultrasound images to an archiver using the DICOM store SCU services.

Steps taken to Get Archiver Status:

```
A-ASSOCIATE
C-ECHO command
A-RELEASE
```

Steps taken to Send Exam to Archiver:

```
A-ASSOCIATE
for each exam image
{
    C-STORE Image SOP Instance
}
A-RELEASE
```

## Worklist

This AE handles querying a Worklist SCP for a list of scheduled procedures using the DICOM Modality Worklist SCU services.

Steps taken to Get Worklist Status:

```
A-ASSOCIATE
C-ECHO command
A-RELEASE
```

Steps taken to Query a WorklistSCP:

```
A-ASSOCIATE
SEND C-FIND Requestcommand
{
    RECEIVE C-FIND Response
} While C-FIND status == pending AND response <= 200
A-RELEASE
```

## Sequencing of Real-World Activities

All real world activities that initiate communication to remote AE's operate asynchronously with respect to each other.

# AE Specifications

## Print AE Specification

The Print AE provides conformance to the following DICOM V3.0 SOP Classes as an SCU:

**Table 3-1: Print AE SOP Class Support**

| SOP Class Name                                  | SOP Class UID           | Conformance Level |
|-------------------------------------------------|-------------------------|-------------------|
| Basic Grayscale Print Management Meta SOP Class | 1.2.840.10008.5.1.1.9   | Standard          |
| Basic Color Print Management Meta SOP Class     | 1.2.840.10008.5.1.1.18  | Standard          |
| Basic Film Session SOP Class                    | 1.2.840.10008.5.1.1.1   | Standard          |
| Basic Film Box SOP Class                        | 1.2.840.10008.5.1.1.2   | Standard          |
| Basic Gray Image Box SOP Class                  | 1.2.840.10008.5.1.1.4   | Standard          |
| Basic Color Image Box SOP Class                 | 1.2.840.10008.5.1.1.4.1 | Standard          |
| Printer SOP Class                               | 1.2.840.10008.5.1.1.16  | Standard          |

## Association Establishment Policies

The Print AE will initiate an association to a device in response to the following real-world activities; Archive Exam, Review Archive and Get Status. The Grayscale and Color SOP Print Management Service Class connections will be done on separate associations, but the associations will never be concurrent.

### General

Maximum PDU size offered to SCP: 32,768 bytes

This is the maximum PDU size the Print AE can receive and is the value offered for the maximum PDU size in the Association Request command. Once the Association is open, if the Print AE receives a PDU that is larger than this value then the Association will be aborted.

Minimum PDU size accepted from SCP: 1,024 bytes

This is the minimum PDU size the Print AE can be configured to send. If the Print AE receives a maximum PDU size in the Association Accept response that is smaller than this value then the Association will be aborted immediately.

Maximum PDU size sent by SCU: 32,768 bytes

This is the maximum PDU size the Print AE can be configured to send. The maximum PDU size sent on any Print AE Association will be the smaller of the configured value and the maximum PDU size received in the Association Accept response.

### **Number of Associations**

Number of simultaneous associations for the Print AE: 1

### **Asynchronous Nature**

The Print AE does not use asynchronous operations.

### **Implementation Identifying Information**

Implementation Class UID: "1.2.840.114340.1"

Implementation Version name: "Tiller\_SV220"

#### **Note**

"114340" is registered by SonoSite with ANSI. Version name will be used initially as shown, but is subject to change with new versions of the DICOM capable application software.

## **Association Initiation by Real-World Activity**

The Print AE will open associations to the printers listed in the current destination list in response to the following real-world activities: Archive Exam, Review Archive, and Get Status.

### **Association Initiation by: Archive Exam**

The Archive Exam real-world activity will cause the Print AE to open associations to each printer listed in the current destination list.

### **Association Initiation by: Review Archive**

The Archive command real-world activity while in Review mode will cause the Print AE to open associations to each printer listed in the current destination list.

### **Association Initiation by: Get Status**

The Get Status real-world activity will cause the Print AE to open associations to each printer listed in the current destination list.

## Proposed Presentation Contexts

### Proposed Presentation Contexts to a Gray Print Server

**Table 3-2: Print AE Proposed Presentation Contexts to a Gray Print Server**

| Presentation Context Table                 |                       |                              |                   |      |                      |
|--------------------------------------------|-----------------------|------------------------------|-------------------|------|----------------------|
| Abstract Syntax                            |                       | Transfer Syntax              |                   | Role | Extended Negotiation |
| Name                                       | UID                   | Name List                    | UID List          |      |                      |
| Basic Gray Print Management Meta SOP Class | 1.2.840.10008.5.1.1.9 | Implicit VR<br>Little Endian | 1.2.840.10008.1.2 | SCU  | None                 |

### Proposed Presentation Contexts to a Color Print Server

**Table 3-3: Print AE Proposed Presentation Contexts to a Color Print Server**

| Presentation Context Table                  |                        |                              |                   |      |                      |
|---------------------------------------------|------------------------|------------------------------|-------------------|------|----------------------|
| Abstract Syntax                             |                        | Transfer Syntax              |                   | Role | Extended Negotiation |
| Name                                        | UID                    | Name List                    | UID List          |      |                      |
| Basic Color Print Management Meta SOP Class | 1.2.840.10008.5.1.1.18 | Implicit VR<br>Little Endian | 1.2.840.10008.1.2 | SCU  | None                 |

## Basic Print Management Meta SOP Classes

### Basic Grayscale Print Management Meta SOP Class

The Print AE provides Standard Conformance to the Basic Grayscale Print Management Meta SOP Class as an SCU. This implies standard conformance to the set of SOP classes in [Table 3-4](#).

DICOM Specified SCU Usage:

- M = Mandatory
- U = User option
- C = Conditional
- MC = Mandatory if Condition met

**Table 3-4: Basic Grayscale Print Management Meta SOP Class**

| SOP Class Name               | SCU Usage | Reference |
|------------------------------|-----------|-----------|
| Basic Film Session SOP Class | M         | 3.1.5     |
| Basic Film Box SOP Class     | M         | 3.1.6     |

**Table 3-4: Basic Grayscale Print Management Meta SOP Class**

| SOP Class Name                      | SCU Usage | Reference |
|-------------------------------------|-----------|-----------|
| Basic Grayscale Image Box SOP Class | M         | 3.1.7.1   |
| Printer SOP Class                   | M         | 3.1.8     |

**Basic Color Print Management Meta SOP Class**

The Print AE provides Standard Conformance to the Basic Grayscale Print Management Meta SOP Class as an SCU. This implies standard conformance to the set of SOP classes in [Table 3-5](#).

**Table 3-5: Basic Color Print Management Meta SOP Class**

| SOP Class Name                  | SCU Usage | Reference |
|---------------------------------|-----------|-----------|
| Basic Film Session SOP Class    | M         | 3.1.5     |
| Basic Film Box SOP Class        | M         | 3.1.6     |
| Basic Color Image Box SOP Class | M         | 3.1.7.2   |
| Printer SOP Class               | M         | 3.1.8     |

**Basic Film Session SOP Class**

The Basic Film Session IOD describes the presentation parameters which are common for all the films of a film session. The DIMSE services that are applicable to the IOD are shown in [Table 3-6](#). The attributes which apply to the N-Create DIMSE service are described in [Table 3-7](#). Attributes not listed are not used.

**Table 3-6: Basic Film Session DIMSE Service Group**

| DIMSE Service Element | SCU Usage | Description                                |
|-----------------------|-----------|--------------------------------------------|
| N-Create              | M         | Creates film session                       |
| N-Set                 | U         | Not used                                   |
| N-Delete              | U         | Deletes film session. Used at end of exam. |
| N-Action              | U         | Not used                                   |

**Table 3-7: Basic Film Session N-Create Attribute List**

| Attribute Name   | Tag         | SCU Usage | Description                                                                   |
|------------------|-------------|-----------|-------------------------------------------------------------------------------|
| Number of Copies | (2000,0010) | U         | Configurable in DICOM Setup mode<br>1-N, Default=1, N defined by printer type |
| Print Priority   | (2000,0020) | U         | Configurable in DICOM Setup mode LOW, MED,<br>HIGH, Default=MED               |



**Table 3-7: Basic Film Session N-Create Attribute List**

| Attribute Name   | Tag         | SCU Usage | Description                                                                                          |
|------------------|-------------|-----------|------------------------------------------------------------------------------------------------------|
| Medium Type      | (2000,0030) | U         | Configurable in DICOM Setup mode Valid settings defined by printer type PAPER, BLUE FILM, CLEAR FILM |
| Film Destination | (2000,0040) | U         | Configurable in DICOM Setup mode Valid settings defined by printer type MAGAZINE, PROCESSOR          |

## Basic Film Box SOP Class

The Basic Film Box IOD is an abstraction of the presentation of one film of the film session. It describes the presentation parameters which are common for all images on a given sheet of film. The DIMSE services that are applicable to the IOD are shown in [Table 3-8](#). The attributes which apply to the N-Create DIMSE service are described in [Table 3-9](#). Attributes not listed are not used.

**Table 3-8: Basic Film Box DIMSE Service Group**

| DIMSE Service Element | SCU Usage | Description                                                                             |
|-----------------------|-----------|-----------------------------------------------------------------------------------------|
| N-Create              | M         | Creates film box                                                                        |
| N-Action              | M         | Print. Used when film box is full and at end of exam if one or more images in film box. |
| N-Delete              | U         | Deletes film box. Used after each film is printed.                                      |
| N-Set                 | U         | Not used                                                                                |

**Table 3-9: Basic Film Box N-Create Attribute List**

| Attribute Name                   | Tag         | SCU Usage | Description                                                                                                                                                                                                                                                                           |
|----------------------------------|-------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Image Display Format             | (2010,0010) | M         | Configurable in DICOM Setup mode Valid settings defined by printer type<br>STANDARD\1,1<br>STANDARD\1,2 STANDARD\2,1<br>STANDARD\2,3 STANDARD\3,2<br>STANDARD\3,3<br>STANDARD\3,4 STANDARD\4,3<br>STANDARD\3,5 STANDARD\5,3<br>STANDARD\4,5 STANDARD\5,4<br>STANDARD\5,6 STANDARD\6,5 |
| Referenced Film Session Sequence | (2010,0500) | M         | Used                                                                                                                                                                                                                                                                                  |
| >Referenced SOP Class UID        | (0008,1150) | M         | 1.2.840.10008.5.1.1.1                                                                                                                                                                                                                                                                 |

**Table 3-9: Basic Film Box N-Create Attribute List**

| Attribute Name               | Tag         | SCU Usage | Description                                                                                                                                                                                                                                                                                  |
|------------------------------|-------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| >Referenced SOP Instance UID | (0008,1155) | M         | Provided by SCP (Printer)                                                                                                                                                                                                                                                                    |
| Film Orientation             | (2010,0040) | U         | Configurable in DICOM Setup mode Valid settings defined by printer type PORTRAIT, LANDSCAPE                                                                                                                                                                                                  |
| Film Size ID                 | (2010,0050) | U         | Configurable in DICOM Setup mode Valid settings defined by printer type<br>8INX 10IN            24CMX24CM<br>8_5INX 11IN        24CMX30CM<br>10INX 12IN          A3<br>10INX 14IN          A4<br>11INX 14IN          12INX 18IN<br>11INX 17IN          35CMX43CM<br>14INX 14IN<br>14INX 17IN |
| Magnification Type           | (2010,0060) | U         | Configurable in DICOM Setup mode NONE, BILINEAR, CUBIC, REPLICATE, and 'Do not send tag'                                                                                                                                                                                                     |
| Max Density                  | (2010,0130) | U         | Configurable in DICOM Setup mode Valid values defined by printer type                                                                                                                                                                                                                        |
| Configuration Information    | (2010,0150) | U         | Configurable in DICOM Setup mode Valid strings defined by printer type                                                                                                                                                                                                                       |
| Border Density               | (2010,0100) | U         | Configurable in DICOM Setup mode Min Density to Max Density                                                                                                                                                                                                                                  |
| Empty Image Density          | (2010,0110) | U         | Configurable in DICOM Setup mode Min Density to Max Density                                                                                                                                                                                                                                  |
| Min Density                  | (2010,0120) | U         | Configurable in DICOM Setup mode Valid values defined by printer type                                                                                                                                                                                                                        |

## Basic Image Box SOP Classes

### Basic Grayscale Image Box SOP Class

The Basic Grayscale Image Box IOD is an abstraction of the presentation of an image and image related data in the image area of a film. It describes the presentation parameters and image pixel data which apply to a single image on a sheet of film. The DIMSE services that are applicable to the IOD are shown in [Table 3-10](#). The attributes which apply to the N-Set DIMSE service are described in [Table 3-11](#).

Attributes not listed are not used.

**Table 3-10: Basic Grayscale Image Box DIMSE Service Group**

| DIMSE Service Element | SCU Usage | Description       |
|-----------------------|-----------|-------------------|
| N-Set                 | M         | Updates Image Box |

**Table 3-11: Basic Grayscale Image Box N-Set Attribute List**

| Attribute Name                 | Tag         | SCU Usage | Description                 |
|--------------------------------|-------------|-----------|-----------------------------|
| Image Position                 | (2020,0010) | M         | 1-N, N=Film Box Image Count |
| Basic Grayscale Image Sequence | (2020,0110) | M         | Used                        |
| >Samples Per Pixel             | (0028,0002) | M         | 1                           |
| >Photometric Interpretation    | (0028,0004) | M         | MONOCHROME2                 |
| >Rows                          | (0028,0010) | M         | 480                         |
| >Cols                          | (0028,0011) | M         | 640                         |
| >Bits Allocated                | (0028,0100) | M         | 8                           |
| >Bits Stored                   | (0028,0101) | M         | 8                           |
| >High Bit                      | (0028,0102) | M         | 7                           |
| >Pixel Representation          | (0028,0103) | M         | 0                           |
| >Pixel Data                    | (7FE0,0010) | M         | Grayscale Pixel Data        |

### Basic Color Image Box SOP Class

The Basic Color Image Box IOD is an abstraction of the presentation of an image and image related data in the image area of a film. It describes the presentation parameters and image pixel data which apply to a single image on a sheet of film. The DIMSE services that are applicable to the IOD are shown in [Table 3-12](#). The attributes which apply to the N-Set DIMSE service are described in [Table 3-13](#).

**Table 3-12: Basic Color Image Box DIMSE Service Group**

| DIMSE Service Element | SCU Usage | Description       |
|-----------------------|-----------|-------------------|
| N-Set                 | M         | Updates Image Box |

**Table 3-13: Basic Color Image Box N-Set Attribute List**

| Attribute Name                 | Tag         | SCU Usage | Description                 |
|--------------------------------|-------------|-----------|-----------------------------|
| Image Position                 | (2020,0010) | M         | 1-N, N=Film Box Image Count |
| Basic Grayscale Image Sequence | (2020,0110) | M         | Used                        |
| >Samples Per Pixel             | (0028,0002) | M         | 3                           |
| >Photometric Interpretation    | (0028,0004) | M         | RGB                         |
| >Planar Configuration          | (0028,0006) | M         | 1=Color-by-plane            |

**Table 3-13: Basic Color Image Box N-Set Attribute List**

| Attribute Name        | Tag         | SCU Usage | Description    |
|-----------------------|-------------|-----------|----------------|
| >Rows                 | (0028,0010) | M         | 480            |
| >Cols                 | (0028,0011) | M         | 640            |
| >Bits Allocated       | (0028,0100) | M         | 8              |
| >Bits Stored          | (0028,0101) | M         | 8              |
| >High Bit             | (0028,0102) | M         | 7              |
| >Pixel Representation | (0028,0103) | M         | 0              |
| >Pixel Data           | (7FE0,0010) | M         | RGB Pixel Data |

## Printer SOP Class

The Printer IOD is an abstraction of the hard copy printer and is the basic Information Entity to monitor the status of the printer. The DIMSE services that are applicable to the IOD are shown in [Table 3-14](#). The attributes which apply to the N-Get DIMSE service are described in [Table 3-15](#). Attributes not listed are not used.

**Table 3-14: Printer SOP Class DIMSE Service Group**

| DIMSE Service Element | SCU Usage | Description              |
|-----------------------|-----------|--------------------------|
| N-Event-Report        | M         | Ignored and not handled. |
| N-Get                 | U         | Get Printer Status       |

**Table 3-15: Printer SOP Class N-Get Attribute List**

| Attribute Name      | Tag         | SCU Usage | Description                                                        |
|---------------------|-------------|-----------|--------------------------------------------------------------------|
| Printer Status      | (2110,0010) | U         | NORMAL, WARNING, FAILURE WARNING, and FAILURE are reported to user |
| Printer Status Info | (2110,0020) | U         | Reported to user                                                   |

## Store AE Specification

The Store AE provides conformance to the following DICOM V3.0 SOP Classes as an SCU:

**Table 3-16: Store AE SOP Class Support**

| SOP Class Name                     | SOP Class UID               | Conformance Level |
|------------------------------------|-----------------------------|-------------------|
| Verification                       | 1.2.840.10008.1.1           | Standard          |
| Ultrasound Image Storage           | 1.2.840.10008.5.1.4.1.1.6.1 | Standard          |
| Ultrasound Image Storage (Retired) | 1.2.840.10008.5.1.4.1.1.6   | Standard          |
| Secondary Capture Image Storage    | 1.2.840.10008.5.1.4.1.1.7   | Standard          |

### Association Establishment Policies

The Store AE will initiate an association to a device in response to the following real-world activities; Archive Exam, Review Archive, and Get Status.

#### General

Maximum PDU size offered to SCP: 32,768 bytes

This is the maximum PDU size the Store AE can receive and is the value offered for the maximum PDU size in the Association Request command. Once the Association is open, if the Store AE receives a PDU that is larger than this value then the Association will be aborted.

Minimum PDU size accepted from SCP: 1,024 bytes

This is the minimum PDU size the Store AE can be configured to send. If the Store AE receives a maximum PDU size in the Association Accept response that is smaller than this value then the Association will be aborted immediately.

Maximum PDU size sent by SCU: 32,768 bytes

This is the maximum PDU size the Store AE can be configured to send. The maximum PDU size sent on any Store AE Association will be the smaller of the configured value and the maximum PDU size received in the Association Accept response.

#### Number of Associations

Number of simultaneous associations for the Store AE: 1

#### Asynchronous Nature

The Store AE will not use asynchronous operations.

## Implementation Identifying Information

Implementation Class UID: "1.2.840.114340.1"

Implementation Version name: "Tiller\_SV220"

### Note

"114340" is registered by SonoSite with ANSI. Version name will be used initially as shown, but is subject to change with new versions of the DICOM capable application software.

## Association Initiation by Real-World Activity

The Store AE will open associations to the storage devices listed in the current destination list in response to the following real-world activities; Archive Exam, Review Archive, and Get Status.

### Association Initiation by: Archive Exam

The Archive Exam real-world activity will cause the Store AE to open associations to each storage device listed in the current destination list.

### Association Initiation by: Review Archive

The Archive command real-world activity while in Review mode will cause the Store AE to open associations to each storage device listed in the current destination list.

### Association Initiation by: Get Status

The Get Status real-world activity will cause the Store AE to open associations to each archiver listed in the current destination list.

## Proposed Presentation Contexts to an Archiver

**Table 3-17: Store AE Proposed Presentation Contexts to an Archiver**

| Presentation Context Table |                                 |                                                        |                                          |      |                      |
|----------------------------|---------------------------------|--------------------------------------------------------|------------------------------------------|------|----------------------|
| Abstract Syntax            |                                 | Transfer Syntax                                        |                                          | Role | Extended Negotiation |
| Name                       | UID                             | Name List                                              | UID List                                 |      |                      |
| Verification               | 1.2.840.10008.1.1               | Implicit VR Little Endian                              | 1.2.840.10008.1.2                        | SCU  | None                 |
| Ultrasound Image Storage   | 1.2.840.10008.5.1.4<br>.1.1.6.1 | Implicit VR Little Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1 | SCU  | None                 |
| Ultrasound Image Storage   | 1.2.840.10008.5.1.4<br>.1.1.6   | Implicit VR Little Endian<br>Explicit VR Little        | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1 | SCU  | None                 |

**Table 3-17: Store AE Proposed Presentation Contexts to an Archiver**

| Presentation Context Table      |                               |                                                        |                                          |      |                      |
|---------------------------------|-------------------------------|--------------------------------------------------------|------------------------------------------|------|----------------------|
| Abstract Syntax                 |                               | Transfer Syntax                                        |                                          | Role | Extended Negotiation |
| Name                            | UID                           | Name List                                              | UID List                                 |      |                      |
| (Retired)                       |                               | Endian                                                 |                                          |      |                      |
| Secondary Capture Image Storage | 1.2.840.10008.5.1.4<br>.1.1.7 | Implicit VR Little Endian<br>Explicit VR Little Endian | 1.2.840.10008.1.2<br>1.2.840.10008.1.2.1 | SCU  | None                 |

### Verification SOP Class

The Store AE provides standard conformance to the Verification SOP Class as an SCU. The remote SCP must support Verification in the same association as the Store Command (C-Store).

### Ultrasound Image Storage SOP Class

The Ultrasound Image Storage SOP Class uses the Common Composite Image IOD Modules as shown in [Table 3-18](#).

**Table 3-18: US Image IOD Modules**

| IE                 | Module                 | Reference | Usage |
|--------------------|------------------------|-----------|-------|
| Patient            | Patient                | 3.2.4.1   | M     |
|                    | Clinical Trial Subject | Not Used  | U     |
| Study              | General Study          | 3.2.4.2   | M     |
|                    | Patient Study          | 3.2.4.3   | U     |
|                    | Clinical Trial Study   | Not Used  | U     |
| Series             | General Series         | 3.2.4.4   | M     |
|                    | Clinical Trial Series  | Not Used  | U     |
| Frame Of Reference | Frame Of Reference     | Not Used  | U     |
|                    | US Frame Of Reference  | Not Used  | C     |
|                    | Synchronization        | Not Used  | U     |
| Equipment          | General Equipment      | 3.2.4.5   | M     |
| Image              | General Image          | 3.2.4.7   | M     |
|                    | Image Pixel            | 3.2.4.8   | M     |

**Table 3-18: US Image IOD Modules**

| IE    | Module                     | Reference | Usage |
|-------|----------------------------|-----------|-------|
| Image | Contrast/Bolus             | Not Used  | C     |
|       | Palette Color Lookup Table | Not Used  | C     |
|       | US Region Calibration      | Not Used  | U     |
|       | US Image                   | 3.2.4.9   | M     |
|       | Overlay Plane              | Not Used  | U     |
|       | VOI LUT                    | 3.2.4.10  | U     |
|       | SOP Common                 | 3.2.4.11  | M     |

**Ultrasound Image Storage SOP Class (Retired)**

The Ultrasound Image Storage SOP Class (Retired) uses the Common Composite Image IOD Modules as shown in [Table 3-18](#).

**Secondary Capture Image Storage SOP Class (Retired)**

The Secondary Capture Image Storage SOP Class uses the Common Composite Image IOD Modules as shown in [Table 3-19](#).

**Table 3-19: SC Image IOD Modules**

| IE        | Module                 | Reference | Usage |
|-----------|------------------------|-----------|-------|
| Patient   | Patient                | 3.2.4.1   | M     |
|           | Clinical Trial Subject | Not Used  | U     |
| Study     | General Study          | 3.2.4.2   | M     |
|           | Patient Study          | 3.2.4.3   | U     |
|           | Clinical Trial Study   | Not Used  | U     |
| Series    | General Series         | 3.2.4.4   | M     |
|           | Clinical Trial Series  | Not Used  | U     |
| Equipment | General Equipment      | 3.2.4.5   | M     |
|           | SC Equipment           | 3.2.4.6   | M     |
| Image     | General Image          | 3.2.4.7   | M     |
|           | Image Pixel            | 3.2.4.8   | M     |
|           | SC Image               | Not Used  | M     |
|           | Overlay Plane          | Not Used  | U     |
|           | Modality LUT           | Not Used  | U     |
|           | VOI LUT                | 3.2.4.10  | U     |



**Table 3-19: SC Image IOD Modules**

| IE | Module     | Reference | Usage |
|----|------------|-----------|-------|
|    | SOP Common | 3.2.4.11  | M     |

### Common Composite Image IOD Modules

The section defines the Modules that are common to the Ultrasound, Ultrasound (Retired), and Secondary Capture Store SOP Classes.

#### Patient Module

[Table 3-20](#) specifies the attributes used from the Patient Module. These attributes are used by the Ultrasound, Ultrasound (Retired), and Secondary Capture Image Storage SOP Classes. Attributes not listed are not used.

**Table 3-20: Patient Module Attributes**

| Attribute Name       | Tag         | Type | Attribute Description                                                                     |
|----------------------|-------------|------|-------------------------------------------------------------------------------------------|
| Patient's Name       | (0010,0010) | 2    | From Worklist or manually entered on Patient Setup screen (Last, First and Middle fields) |
| Patient ID           | (0010,0020) | 2    | From Worklist or manually entered on Patient Setup screen (ID field)                      |
| Patient's Birth Date | (0010,0030) | 2    | From Worklist or manually entered on Patient Setup screen (Date of birth fields)          |
| Patient's Sex        | (0010,0040) | 2    | From Worklist or manually entered on Patient Setup screen (Gender pick list)              |

#### General Study Module

[Table 3-21](#) specifies the attributes used from the General Study Module. These attributes are used by the Ultrasound, Ultrasound (Retired), and Secondary Capture Image Storage SOP Classes. Attributes not listed are not used.

**Table 3-21: General Study Module Attributes**

| Attribute Name             | Tag         | Type | Attribute Description                                                                                                                                        |
|----------------------------|-------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Study Instance UID         | (0020,000D) | 1    | From Worklist or automatically generated                                                                                                                     |
| Study Date                 | (0008,0020) | 2    | Procedure start date                                                                                                                                         |
| Study Time                 | (0008,0030) | 2    | Procedure start time                                                                                                                                         |
| Referring Physician's Name | (0008,0090) | 2    | From Worklist or manually entered on Patient Setup screen (Referring Dr. field)<br><b>Note:</b> Only last name component will be sent when manually entered. |

**Table 3-21: General Study Module Attributes**

| Attribute Name                                                                                                                                                                                                                                                                                                                                          | Tag         | Type | Attribute Description                                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------|---------------------------------------------------------------------------------------------------------------------------------------|
| Study ID                                                                                                                                                                                                                                                                                                                                                | (0020,0010) | 2    | From Worklist (mapped from Requested Procedure ID attribute) or "1"                                                                   |
| Accession Number                                                                                                                                                                                                                                                                                                                                        | (0008,0050) | 2    | From Worklist or manually entered on Patient Setup screen (Accession field)                                                           |
| Study Description                                                                                                                                                                                                                                                                                                                                       | (0008,1030) | 3    | From Worklist* or selected manually on Patient Setup screen (Procedure Type pick list)                                                |
| Referenced Study Sequence                                                                                                                                                                                                                                                                                                                               | (0008,1110) | 3    | From Worklist.<br>Not sent if procedure was unscheduled.                                                                              |
| >Referenced SOP Class UID                                                                                                                                                                                                                                                                                                                               | (0008,1150) | 1C   |                                                                                                                                       |
| >Referenced SOP Instance UID                                                                                                                                                                                                                                                                                                                            | (0008,1155) | 1C   |                                                                                                                                       |
| Procedure Code Sequence                                                                                                                                                                                                                                                                                                                                 | (0008,1032) | 3    | Mapped from Worklist Requested Procedure Code Sequence, if performed. Otherwise sent as zero length sequence.                         |
| >Code Value                                                                                                                                                                                                                                                                                                                                             | (0008,0100) | 1C   |                                                                                                                                       |
| >Coding Scheme Designator                                                                                                                                                                                                                                                                                                                               | (0008,0102) | 1C   |                                                                                                                                       |
| >Code Meaning                                                                                                                                                                                                                                                                                                                                           | (0008,0104) | 1C   |                                                                                                                                       |
| Name of Physician(s) Reading Study                                                                                                                                                                                                                                                                                                                      | (0008,1060) | 3    | Entered on Patient Setup screen. (Reading Dr. field)<br><br><b>Note:</b> Only last name component will be sent when manually entered. |
| *Mapped from Scheduled Procedure Step Description (0040,0007) if it exists. Otherwise, Study Description is set to value of Requested Procedure Description (0032,1060) if it exists. If Requested Procedure Description (0032,1060) is also empty, Study Description is set to Requested Procedure Code Sequence (0032,1064) Code Meaning (0008,0104). |             |      |                                                                                                                                       |

## Patient Study Module

**Table 3-22** specifies the attributes used from the Patient Study Module. These attributes are used by the Ultrasound, Ultrasound (Retired), and Secondary Capture Image Storage SOP Classes. Attributes not listed are not used.

**Table 3-22: Patient Study Module Attributes**

| Attribute Name               | Tag         | Type | Attribute Description                                                         |
|------------------------------|-------------|------|-------------------------------------------------------------------------------|
| Additional Patient's History | (0010,21B0) | 3    | From Worklist or manually entered on Patient Setup screen (Indications field) |

## General Series Module

**Table 3-23** specifies the attributes used from the General Series Module. These attributes are used by the Ultrasound, Ultrasound (Retired), and Secondary Capture Image Storage SOP Classes. Attributes not listed are not used.

**Table 3-23: General Series Module Attributes**

| Attribute Name                        | Tag         | Type | Attribute Description                                                                                                         |
|---------------------------------------|-------------|------|-------------------------------------------------------------------------------------------------------------------------------|
| Modality                              | (0008,0060) | 1    | "US"                                                                                                                          |
| Series Instance UID                   | (0020,000E) | 1    | Automatically generated                                                                                                       |
| Series Number                         | (0020,0011) | 2    | " 1"                                                                                                                          |
| Laterality                            | (0020,0060) | 2C   | Zero Length                                                                                                                   |
| Series Date                           | (0008,0021) | 3    | Procedure start date                                                                                                          |
| Series Time                           | (0008,0031) | 3    | Procedure start time                                                                                                          |
| Protocol Name                         | (0018,1030) | 3    | Zero length                                                                                                                   |
| Series Description                    | (0008,103E) | 3    | Same as Performed Procedure Step Description                                                                                  |
| Operator's Name                       | (0008,1070) | 3    | Entered on Patient Setup screen (Sonographer field).<br>The Sonographer's initials are transmitted in the last name component |
| Request Attributes Sequence           | (0040,0275) | 3    | Only sent if the procedure originated from a Worklist Scheduled Procedure Step                                                |
| >Requested Procedure ID               | (0040,1001) | 1C   |                                                                                                                               |
| >Scheduled Procedure Step ID          | (0040,0009) | 1C   |                                                                                                                               |
| >Scheduled Procedure Step Description | (0040,0007) | 3    |                                                                                                                               |
| >Scheduled Protocol Code Sequence     | (0040,0008) | 3    |                                                                                                                               |
| >>Code Value                          | (0008,0100) | 1C   |                                                                                                                               |
| >>Coding Scheme Designator            | (0008,0102) | 1C   |                                                                                                                               |
| >>Code Meaning                        | (0008,0104) | 1C   |                                                                                                                               |
| Performed Procedure Step ID           | (0040,0253) | 3    | From Worklist (mapped from Scheduled Procedure Step ID) or Generated by TITAN                                                 |
| Performed Procedure Step Start Date   | (0040,0244) | 3    | Procedure start date                                                                                                          |
| Performed Procedure Step Start Time   | (0040,0245) | 3    | Procedure start time                                                                                                          |
| Performed Procedure Step Description  | (0040,0254) |      | Mapped from Worklist SPS description,                                                                                         |

**Table 3-23: General Series Module Attributes**

| Attribute Name                   | Tag         | Type | Attribute Description                                                                                        |
|----------------------------------|-------------|------|--------------------------------------------------------------------------------------------------------------|
|                                  |             | 3    | if performed, or selected manually on Patient Setup screen (Procedure Type pick list)                        |
| Performed Protocol Code Sequence | (0040,0260) | 3    | Mapped From Worklist Scheduled Protocol Code sequence, if performed. Otherwise sent as zero length sequence. |
| >Code Value                      | (0008,0100) | 1C   |                                                                                                              |
| >Coding Scheme Designator        | (0008,0102) | 1C   |                                                                                                              |
| >Code Meaning                    | (0008,0104) | 1C   |                                                                                                              |

### General Equipment Module

**Table 3-24** specifies the attributes used from the General Equipment Module. These attributes are used by the Ultrasound, Ultrasound (Retired), and Secondary Capture Image Storage SOP Classes. Attributes not listed are not used.

**Table 3-24: General Equipment Module Attributes**

| Attribute Name            | Tag         | Type | Attribute Description                        |
|---------------------------|-------------|------|----------------------------------------------|
| Manufacturer              | (0008,0070) | 2    | "SonoSite"                                   |
| Institution Name          | (0008,0080) | 3    | Entered on Patient Setup screen(Institution) |
| Station Name              | (0008,1010) | 3    | Host Name for current location               |
| Manufacturer's Model Name | (0008,1090) | 3    | "Titan"                                      |

### SC Equipment Module

**Table 3-25** describes the attributes used from the SC Equipment Module. These attributes are used by the Secondary Capture Image Storage SOP Class. Attributes not listed are not used.

**Table 3-25: SC Equipment Module Attributes**

| Attribute Name  | Tag         | Type | Attribute Description |
|-----------------|-------------|------|-----------------------|
| Conversion Type | (0008,0064) | 1    | "WSD"                 |
| Modality        | (0008,0060) | 3    | "US"                  |

### General Image Module

**Table 3-26** specifies the attributes used from the General Image Module. These attributes are used by the Ultrasound, Ultrasound (Retired), and Secondary Capture Image Storage SOP Classes.

Attributes not listed are not used.

**Table 3-26: General Image Module Attributes**

| Attribute Name                | Tag         | Type | Attribute Description                                               |
|-------------------------------|-------------|------|---------------------------------------------------------------------|
| Instance Number               | (0020,0013) | 2    | Image number in exam                                                |
| Patient Orientation           | (0020,0020) | 2C   | Zero Length                                                         |
| Content Date                  | (0008,0023) | 2C   | Image acquisition date                                              |
| Content Time                  | (0008,0033) | 2C   | Image acquisition time                                              |
| Derivation Description        | (0008,2111) | 3    | “RGB to MONOCHROME2 conversion”<br>Only sent for MONOCHROME2 images |
| Lossy Image Compression       | (0028,2110) | 3    | 01=Lossy Compressed<br>Only sent for MONOCHROME2 images             |
| Lossy Image Compression Ratio | (0028,2112) | 3    | 3<br>Only sent for MONOCHROME2 images                               |

### Image Pixel Module

Table 3-27 specifies the attributes used from the Image Pixel Module. These attributes are used by the Ultrasound, Ultrasound (Retired), and Secondary Capture Image Storage SOP Classes. Attributes not listed are not used.

**Table 3-27: Image Pixel Module Attributes**

| Attribute Name             | Tag         | Type | Attribute Description                                                                       |
|----------------------------|-------------|------|---------------------------------------------------------------------------------------------|
| Samples per Pixel          | (0028,0002) | 1    | MONOCHROME2=1, RGB=3                                                                        |
| Photometric Interpretation | (0028,0004) | 1    | Configurable in DICOM Setup mode Valid settings defined by archiver type MONOCHROME2 or RGB |
| Rows                       | (0028,0010) | 1    | 480                                                                                         |
| Columns                    | (0028,0011) | 1    | 640                                                                                         |
| Bits Allocated             | (0028,0100) | 1    | MONOCHROME2=8, RGB=8                                                                        |
| Bits Stored                | (0028,0101) | 1    | MONOCHROME2=8, RGB=8                                                                        |
| High Bit                   | (0028,0102) | 1    | MONOCHROME2=7, RGB=7                                                                        |
| Pixel Representation       | (0028,0103) | 1    | 0                                                                                           |
| Pixel Data                 | (7FE0,0010) | 1    | Used                                                                                        |
| Planar Configuration       | (0028,0006) | 1C   | 0=Color-by-pixel - Only sent for RGB                                                        |

### US Image Module

Table 3-28 specifies the attributes used from the US Image Module. These attributes are used by

the Ultrasound, Ultrasound (Retired), and Secondary Capture Image Storage SOP Classes. Attributes not listed are not used.

**Table 3-28: US Image Module Attributes**

| Attribute Name                | Tag         | Type | Attribute Description                                                                                                                                                                                |
|-------------------------------|-------------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Samples Per Pixel             | (0028,0002) | 1    | MONOCHROME2=1, RGB=3                                                                                                                                                                                 |
| Photometric Interpretation    | (0028,0004) | 1    | Configurable in DICOM Setup mode Valid settings defined by archiver type MONOCHROME2, RGB                                                                                                            |
| Bits Allocated                | (0028,0100) | 1    | MONOCHROME2=8, RGB=8                                                                                                                                                                                 |
| Bits Stored                   | (0028,0101) | 1    | MONOCHROME2=8, RGB=8                                                                                                                                                                                 |
| High Bit                      | (0028,0102) | 1    | MONOCHROME2=7, RGB=7                                                                                                                                                                                 |
| Planar Configuration          | (0028,0006) | 1C   | 0=Color-by-pixel - Only sent for RGB                                                                                                                                                                 |
| Pixel Representation          | (0028,0103) | 1    | 0                                                                                                                                                                                                    |
| Image Type                    | (0008,0008) | 2    | RGB = "ORIGINAL\PRIMARY\lnnnn"<br>MONOCHROME2="DERIVED\PRIMARY\lnnnn"<br>nnnn=bit map designating the image mode:<br>0001 = 2D Imaging<br>0002 = M-Mode<br>0008 = PW Doppler<br>0010 = Color Doppler |
| Lossy Image Compression       | (0028,2110) | 1C   | 01=Lossy Compressed<br>Only sent for MONOCHROME2 images                                                                                                                                              |
| Ultrasound Color Data Present | (0028,0014) | 3    | 00=Color data not present in image 01=Color data is present in image<br>Not sent with Ultrasound (Retired) Images.                                                                                   |

### VOI LUT Module

**Table 3-29** specifies the attributes used from the VOI LUT Module. These attributes are used by the Ultrasound, Ultrasound (Retired), and Secondary Capture Image Storage SOP Classes. Attributes not listed are not used.

**Table 3-29: VOI LUT Module Attributes**

| Attribute Name | Tag         | Type | Attribute Description            |
|----------------|-------------|------|----------------------------------|
| Window Center  | (0028,1050) | 3    | 128 - Only sent with Monochrome2 |
| Window Width   | (0028,1051) | 1C   | 256 - Only sent with Monochrome2 |

## SOP Common Module

**Table 3-30** specifies the attributes used from the SOP Common Module. These attributes are used by the Ultrasound, Ultrasound (Retired), and Secondary Capture Image Storage SOP Classes. Attributes not listed are not used.

**Table 3-30: SOP Common Module Attributes**

| Attribute Name         | Tag         | Type | Attribute Description   |
|------------------------|-------------|------|-------------------------|
| SOP Class UID          | (0008,0016) | 1    | Automatically generated |
| SOP Instance UID       | (0008,0018) | 1    | Automatically generated |
| Specific Character Set | (0008,0005) | 1C   | ISO_IR 100              |
| Instance Number        | (0020,0013) | 3    | Image number in exam    |

## Store AE Behavior to C Store Status

**Table 3-31: Store AE Behavior to C-Store Status**

| Service Status | Further Meaning                   | Status Codes | Store AE Behavior                      |
|----------------|-----------------------------------|--------------|----------------------------------------|
| Success        |                                   | 0000         | Continue without user notification     |
| Refused        | Out of Resources                  | A7xx         | Association terminated. User notified. |
| Error          | Data Set does not match SOP Class | A9xx         | Association terminated. User notified. |
|                | Cannot understand                 | Cxxx         | Association terminated. User notified. |
| Warning        | Coercion of data elements         | B000         | Ignored - Message logged.              |
|                | Data set does not match SOP class | B007         | Ignored - Message logged.              |
|                | Elements discarded                | B006         | Ignored - Message logged.              |

## Modality Worklist AE Specification

**Table 3-32: Modality Worklist AE SOP Class Support**

| SOP Class Name                            | SOP Class UID           | Conformance Level |
|-------------------------------------------|-------------------------|-------------------|
| Verification                              | 1.2.840.10008.1.1       | Standard          |
| Modality Worklist Information Model -FIND | 1.2.840.10008.5.1.4.3.1 | Standard          |

## Association Establishment Practices

The Modality Worklist AE will initiate an association to a device in response to the following real-world activities:

- ▶ The user initiates a manual Update Worklist (Broad Query).
- ▶ The user initiates a specific Worklist Query (Patient Based Query).
- ▶ The system initiates an Automatic Worklist Query (Broad Query).

In all cases a C-FIND command is issued to the Modality Worklist server. After the requested data is returned, the association is closed.

### General

Maximum PDU size offered to SCP: 32,768 bytes

This is the maximum PDU size the Modality Worklist AE can receive and is the value offered for the maximum PDU size in the Association Request command. Once the Association is open, if the Modality Worklist AE receives a PDU that is larger than this value then the Association will be aborted.

Minimum PDU size accepted from SCP: 1,024 bytes

This is the minimum PDU size the Modality Worklist AE can be configured to send. If the Modality Worklist AE receives a maximum PDU size in the Association Accept response that is smaller than this value then the Association will be aborted immediately.

Maximum PDU size sent by SCU: 32,768 bytes

This is the maximum PDU size the Modality Worklist AE can be configured to send. The maximum PDU size sent on any Modality Worklist AE Association will be the smaller of the configured value and the maximum PDU size received in the Association Accept response.

### Number of Associations

Number of simultaneous associations for the Modality Worklist AE: 1

### Asynchronous Nature

The Modality Worklist AE will not use asynchronous operations.

### Implementation Identifying Information

Implementation Class UID: "1.2.840.114340.1"

Implementation Version name: "Tiller\_SV220"

#### Note

"114340" is registered by SonoSite with ANSI. Version name will be used initially as shown, but is subject to change with new versions of the DICOM capable application software.



## Association Initiation by Real-World Activity

The Modality Worklist AE will open associations to the configured Worklist SCP in response to the following real-world activities: Update Worklist, Query Worklist, Automatic Worklist Query, and Get Status.

### Association Initiation by: Update Worklist

The Update Worklist real-world activity initiated in Worklist screen will cause the Modality Worklist AE to open an association with the Worklist SCP, configured in the current Location.

### Association Initiation by: Worklist Query

The Query Worklist command real-world activity initiated in Patient Setup screen will cause the Modality Worklist AE to open an association with the Worklist SCP, configured in the current Location.

### Association Initiation by: Automatic Worklist Query

The Automatic Worklist Query real-world activity initiated by the system at periodic intervals will cause the Modality Worklist AE to open an association with the Worklist SCP, configured in the current Location.

### Association Initiation by: Get Status

The Get Status real-world activity will cause the Modality Worklist AE to open an association to the Modality Worklist SCP configured in the current Location.

## Proposed Presentation Contexts to a Worklist Server

**Table 3-33: Modality Worklist AE Proposed Presentation Contexts to a Worklist Server**

| Presentation Context Table                 |                        |                           |                   |      |                      |
|--------------------------------------------|------------------------|---------------------------|-------------------|------|----------------------|
| Abstract Syntax                            |                        | Transfer Syntax           |                   | Role | Extended Negotiation |
| Name                                       | UID                    | Name List                 | UID List          |      |                      |
| Verification SOP Class                     | 1.2.840.10008.1.1      | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU  | None                 |
| Modality Worklist Information Model - FIND | 1.2.840.10008.5.1.4.31 | Implicit VR Little Endian | 1.2.840.10008.1.2 | SCU  | None                 |

### Modality Worklist Information Model - FIND SOP Class

The Modality Worklist AE provides standard conformance to the Modality Worklist Information

Model - FIND SOP Class as an SCU.

## Verification SOP Class

The Modality Worklist AE provides standard conformance to the Verification SOP Class as an SCU.

## Modality Worklist Attributes

### Broad Worklist Query Matching Key Attributes

**Table 3-34** specifies the Matching Key attributes used by Automatic Worklist C-FIND requests and manual Update Worklist C-FIND requests for Broad queries initiated by the user from the Worklist screen.

**Table 3-34: Broad Worklist Query Matching Key Attributes**

| Attribute Name                      | Tag         | Type | Notes                                                                                                                                                                             |
|-------------------------------------|-------------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Modality                            | (0008,0060) | R    | Always US                                                                                                                                                                         |
| Scheduled Station AE-Title          | (0040,0001) | R    | Configurable – Sent as either: <ul style="list-style-type: none"> <li>▶ TITAN’s AE Title</li> <li>▶ Universal Matching</li> </ul>                                                 |
| Scheduled Procedure Step Start Date | (0040,0002) | R    | Configurable – Sent as either: <ul style="list-style-type: none"> <li>▶ Today’s date</li> <li>▶ Yesterday, Today and Tomorrow date range</li> <li>▶ Universal Matching</li> </ul> |

### Patient Based Query Matching Key Attributes

**Table 3-35** specifies the Matching Key attributes used for Worklist C-FIND requests for Patient Based queries initiated by the user from the Patient Setup screen.

**Table 3-35: Patient Based Query Matching Key Attributes**

| Attribute Name         | Tag         | Type | Notes                                                                                              |
|------------------------|-------------|------|----------------------------------------------------------------------------------------------------|
| Modality               | (0008,0060) | R    | Always “US” (Ultrasound)                                                                           |
| Patient's Name         | (0010,0010) | R    | Entered on Patient Setup screen. A wild card is appended to Last, First and Middle name component. |
| Patient ID             | (0010,0020) | R    | Entered on Patient Setup screen. Single value matching only.                                       |
| Accession Number       | (0008,0050) | O    | Entered on Patient Setup screen.                                                                   |
| Requested Procedure ID | (0040,1001) | O    | Entered on Patient Setup screen.                                                                   |

## Return Key Attributes

Table 3-36 specifies the Return Key attributes that are included in all Worklist C-FIND requests.

**Table 3-36: Return Key Attributes**

| Attribute Name                        | Tag         | Type | Notes                                                                                           |
|---------------------------------------|-------------|------|-------------------------------------------------------------------------------------------------|
| Study Instance UID                    | (0020,000D) | 1    |                                                                                                 |
| Accession Number                      | (0008,0050) | 2    | Displayed on Patient Setup screen                                                               |
| Referring Physician's Name            | (0008,0090) | 2    | Displayed on Patient Setup screen                                                               |
| Patient's Name                        | (0010,0010) | 1    | Displayed on Patient Setup screen                                                               |
| Patient ID                            | (0010,0020) | 1    | Displayed on Patient Setup screen                                                               |
| Patients Birth Date                   | (0010,0030) | 2    | Displayed on Patient Setup screen                                                               |
| Patient's Sex                         | (0010,0040) | 2    | Displayed on Patient Setup screen                                                               |
| Additional Patient History            | (0010,21B0) | 3    | Displayed on Patient Setup screen as Indications                                                |
| Admitting Diagnoses Description       | (0008,1080) | 3    | Displayed on Patient Setup screen as Indications if Additional Patient History is not returned. |
| Last Menstrual Date                   | (0010,21D0) | 2    | Displayed on Patient Setup screen with OB/GYN exam type only.                                   |
| Scheduled Procedure Step Sequence     | (0040,0100) | 1    |                                                                                                 |
| >Modality                             | (0008,0060) | 1    |                                                                                                 |
| >Scheduled Station AE Title           | (0040,0001) | 1    |                                                                                                 |
| >Scheduled Procedure Step Start Date  | (0040,0002) | 1    |                                                                                                 |
| >Scheduled Procedure Step Start Time  | (0040,0003) | 1    |                                                                                                 |
| >Scheduled Procedure Step Description | (0040,0007) | 1C   | Displayed in UI as Procedure Type <sup>1</sup>                                                  |
| >Scheduled Protocol Code Sequence     | (0040,0008) | 1C   |                                                                                                 |
| >>Code Value                          | (0008,0100) | 1C   |                                                                                                 |
| >>Coding Scheme Designator            | (0008,0102) | 1C   |                                                                                                 |
| >>Code Meaning                        | (0008,0104) | 3    |                                                                                                 |
| >Scheduled Procedure Step ID          | (0040,0009) | 1    |                                                                                                 |
| Requested Procedure ID                | (0040,1001) | 1    | Displayed on Patient Setup screen.                                                              |
| Requested Procedure Description       | (0032,1060) | 1C   | Displayed on Patient Setup screen as Procedure Type <sup>2</sup>                                |

**Table 3-36: Return Key Attributes**

| Attribute Name                    | Tag         | Type | Notes                                                            |
|-----------------------------------|-------------|------|------------------------------------------------------------------|
| Requested Procedure Code Sequence | (0032,1064) | 1C   |                                                                  |
| >Code Value                       | (0008,0100) | 1C   |                                                                  |
| >Coding Scheme Designator         | (0008,0102) | 1C   |                                                                  |
| >Code Meaning                     | (0008,0104) | 3    | Displayed on Patient Setup screen as Procedure Type <sup>3</sup> |
| Referenced Study Sequence         | (0008,1110) | 2    |                                                                  |
| >Referenced SOP Class UID         | (0008,1150) | 1C   |                                                                  |
| >Referenced SOP Instance UID      | (0008,1155) | 1C   |                                                                  |

<sup>1</sup> If a value exists for Scheduled Procedure Step Description (0040,0007). Otherwise, Procedure Type is set to value of <sup>2</sup> Requested Procedure Description (0032,1060) if it exists. If Requested Procedure Description (0032,1060) is also empty, Procedure Type is set to <sup>3</sup> Requested Procedure Code Sequence (0032,1064) Code Meaning (0008,0104).

## Worklist AE Behavior to C-FIND Status

**Table 3-37** specifies the response status codes, which an SCP may return following the SCU's C-FIND request, along with the Worklist AE's associated behavior. Only those status responses that indicate some form of error condition are presented to the user. Related fields are not used.

**Table 3-37: Worklist AE Behavior to C-FIND Status**

| Service Status | Further Meaning                                                                                                              | Status Codes | Worklist AE Behavior                                                               |
|----------------|------------------------------------------------------------------------------------------------------------------------------|--------------|------------------------------------------------------------------------------------|
| Refused        | Out of resources                                                                                                             | A700         | The association is terminated. The user is notified of the failure.                |
| Failed         | Identifier does not match SOP Class                                                                                          | A900         | The association is terminated. The user is notified of the failure.                |
|                | Unable to process                                                                                                            | Cxxx         | The association is terminated. The user is notified of the failure.                |
| Cancel         | Matching terminated due to Cancel request                                                                                    | FE00         | The association is terminated. The user is notified that the query was incomplete. |
| Success        | Matching is complete - No final Identifier is supplied.                                                                      | 0000         | The Modality Worklist AE will continue operation without user notification.        |
| Pending        | Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys. | FF00         | The Modality Worklist AE will continue operation without user notification.        |

**Table 3-37: Worklist AE Behavior to C-FIND Status**

| Service Status | Further Meaning                                                                                                       | Status Codes | Worklist AE Behavior                                                        |
|----------------|-----------------------------------------------------------------------------------------------------------------------|--------------|-----------------------------------------------------------------------------|
|                | Matches are continuing - Warning that one or more Optional Keys were not supported for existence for this Identifier. | FF01         | The Modality Worklist AE will continue operation without user notification. |

# CHAPTER 4

## Communication Profiles

### TCP/IP Stack

The TCP/IP protocol is used.



# CHAPTER 5

## Extensions/Specializations/Privatizations

### Standard Extended/Specialized/Private SOPs

None.

### Private Transfer Syntaxes

None.





# CHAPTER 6

## Configuration

### AE Title/Presentation Address Mapping

The Titan AE Title and Titan networking parameters are configurable in DICOM Setup Mode. Port number 104 is used for DICOM communication with the Titan.

### Configurable Parameters

#### Titan Configurable Parameters per Network Location

The Titan system can be configured to operate in multiple network locations. The Titan local device settings and remote device settings (e.g. Printers/Archivers/Worklist) can be configured for each location. These parameters are intended to be configured by a network/DICOM administrator.

Configurable Titan Networking and DICOM parameters:

- ▶ DHCP (default = disabled)
- ▶ Hostname (Name field)
- ▶ DICOM AE Title
- ▶ IP Address (disabled if DHCP is selected)
- ▶ Subnet Mask (disabled if DHCP is selected)
- ▶ Default Gateway (disabled if DHCP is selected)
- ▶ Alternate Gateway (disabled if DHCP is selected)
- ▶ Network Write Timeout
- ▶ Network Read Timeout
- ▶ Network speed (Auto, 100Mb/10Mb, Full/Half duplex)

#### Configurable Parameters per Remote Device Instance

Every printer and archiver device that Titan is setup to communicate with has a set of parameters that are configurable in Setup mode. These parameters are intended to be configured by a network/DICOM administrator.

Configurable parameters for each device instance:

- ▶ DICOM AE Title
- ▶ Hostname (Name field)
- ▶ IP Address
- ▶ Port Number



## Support of Extended Character Sets

The Titan system supports the ISO 8859 Latin 1 (ISO-IR 100) character set family.

The Specific Character Set key attribute (0008,0005), a type 1C attribute, may be returned by an SCP if that device supports any character set encodings beyond the ISO\_IR 6. If the tag is not present in the Worklist query result, the default (i.e. ISO\_IR 6, i.e. ASCII) is assumed. If the tag is present, only ISO\_IR 6 (ASCII) or ISO\_IR 100 (Latin Alphabet # 1) are supported by the Titan system. All other character set encodings are unsupported and will cause the system to issue a C-Find Cancel. All query results data acquired up to the first detection of an unsupported character set encoding are retained and presented to the user.

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