



# Fluoroscans InSight V2.1 DICOM Conformance Statement

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## 1. Introduction

### 1.1. Purpose of the Document

This document is the DICOM Conformance Statement for Fluoroscanner InSight mini C-Arms, version 2.1. It describes its DICOM capabilities and how it conforms to the DICOM 3.0 standard.

### 1.2. References

1. American College of Radiology - National Electrical Manufacturers Association (ACR-NEMA) Digital Imaging and Communications in Medicine V3.0-2000.

### 1.3. Definitions

This section provides the definitions of terms, acronyms, and abbreviations that are used throughout the document.

|        |   |
|--------|---|
| DICOM  | Digital Imaging and Communication in Medicine, a standard on image communications in medical applications                                     |
| HIS    | Hospital Information System   |
| RIS    | Radiology Information System  |
| AE     | Application Entity  |
| SCU    | Service Class User  |
| SCP    | Service Class Provider  |
| SOP    | Service-Object Pair, a definition of an information object (like an image) and of service (like storage) that can be performed for the object |
| VR     | Value Representation, a data encoding method in DICOM   |
| VM     | Value Multiplicity, number of values in a DICOM attribute   |
| UID    | Unique Identifier   |
| DIMSE  | DICOM Message Service Element   |
| TCP/IP | Transmission Control Protocol / Internet Protocol, a widely used computer networking protocol   |
| UI     | Application's User Interface  |
| GUI    | Graphical User Interface  |

## 2. Implementation Model

### 2.1. Application Data Flow Diagram

There are six Real-World Activities that occur in the InSight: Storage, Storage Commitment, Modality Worklist, Modality Performed Procedure Step, Print, and Verification. The Application Data Flow Diagram shown on Figure 1 represents the Application Entity of the InSight application, and graphically depicts the relationship of the AE's use of DICOM to Real-World Activities.

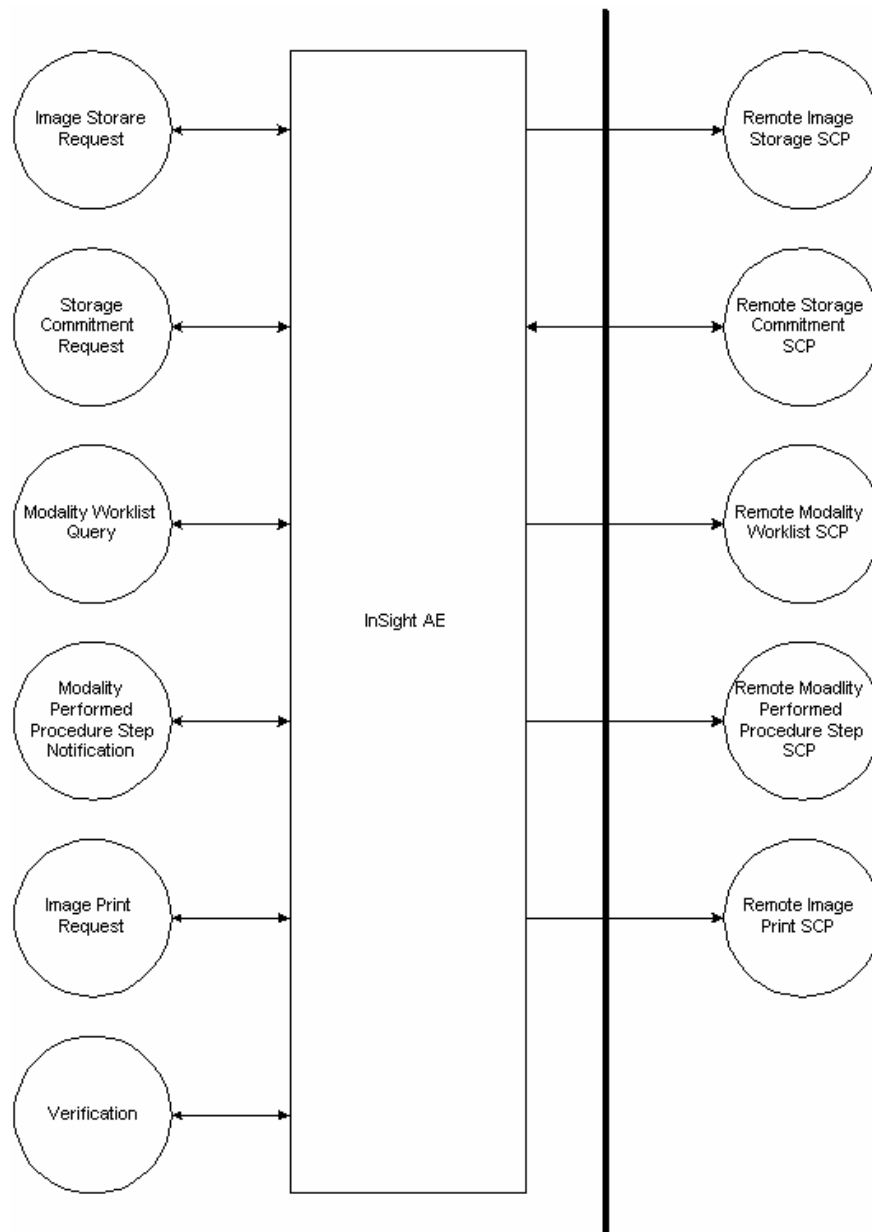


Figure 1. Application Data Flow Diagram

### 2.1.1. Storage

1. The InSight application generates DICOM files and stores them locally.
2. The InSight application initiates an association with remote Storage SCP.
3. The InSight application pushes files to the remote Storage SCP using C-STORE command, and then closes the association.

### 2.1.2. Storage Commitment

1. The InSight application initiates an association with remote Storage Commitment SCP.
2. The InSight application sends a Storage Commitment request to remote Storage Commitment SCP using the N-ACTION command.
3. The InSight application waits for the N-EVENT-REPORT command from remote Storage Commitment SCP with a notification about Storage Commitment results, and then closes the association.
4. If remote Storage Commitment SCP has not sent the N-EVENT-REPORT command in the same association, it initiates an association with the InSight application and uses the N-EVENT-REPORT command to send a notification about Storage Commitment results, and then closes the association.

### 2.1.3. Modality Worklist

1. The InSight application initiates an association with remote Modality Worklist SCP.
2. The InSight application queries the Modality Worklist SCP to obtain Modality Worklist information using the C-FIND command, and then closes the association.

### 2.1.4. Modality Performed Procedure Step

1. The InSight application initiates an association with remote Modality Performed Procedure Step SCP.
2. The InSight application notifies the MPPS SCP about started procedure using the N-CREATE command, and then closes the association.
3. The InSight application initiates an association with remote MPPS SCP.
4. The InSight application notifies the MPPS SCP about a completed procedure using the N-SET command, and then closes the association.

### 2.1.5. Image Print

1. The InSight application initiates an association with remote Print SCP.
2. The InSight application queries the remote printer status using the N-GET command.
3. The InSight application sends images for printing using a series of N-CREATE commands and an N-ACTION command, and then closes the association.

### 2.1.6. Verification

1. The InSight application initiates an association with remote SCP.
2. The InSight application verifies the remote SCP status by using the C-ECHO command, and then closes the association.

## **2.2. Functional Definitions of AE**

### **2.2.1. Image Storage**

The InSight application provides a UI to select images to store. It then generates DICOM files for the selected images, stores them into a designated local queue directory, and performs an attempt to send the files immediately. It opens associations with remote SCPs, and pushes the images using the C-STORE command. In case of failure, the application keeps the files for further retry attempts.

A background process runs according to a configured time interval, reads the files present in the queue directory, opens associations with remote SCPs, and pushes the images using the C-STORE command.

In case of successful status received from SCP, the InSight application deletes the corresponding DICOM file. In case of failure status, the application keeps the file and retries to store the image when the queue is next processed.

### **2.2.2. Storage Commitment**

Upon successfully sending an image to a remote archive device, the InSight application issues a Storage Commitment request to the SCP using the N-ACTION command, in the same association. It waits for the N-EVENT-REPORT notification from the SCP for a specified time interval and then closes the association.

If the N-EVENT-REPORT notification has not been received during the same association as Image Storage, then the InSight application waits for an incoming association request from the Storage Commitment SCP.

The InSight application does not delete a DICOM file corresponding to the image until it receives a notification from the SCP with status indicating successful storage commitment.

### **2.2.3. Modality Worklist**

Worklist query may start either by user request or automatically according to the configured schedule. In either case, the InSight application opens an association with the Worklist SCP, queries for the Worklist using the C-FIND command, stores the Worklist data locally, and closes the association.

### **2.2.4. Modality Performed Procedure Step**

The InSight application maintains the MPPS queue. Upon starting an image acquisition session, the application puts a procedure-started entry into the queue. Upon ending the session, the application puts a corresponding entry into the queue.

A background process runs according to a configured time interval and reads the queue entries. It initiates associations with the MPPS SCPs and sends N-CREATE requests for the queue entries corresponding to procedure status “In Progress”, and N-SET requests for the queue entries corresponding to procedure status “Completed”.

## 2.2.5. Image Print

The InSight application provides a UI to select images for DICOM Print. It initiates an association with a remote Image Print SCP and queries for a printer status using the N-GET command.

Upon receiving the N-GET response indicating that the printer is ready, it creates an instance of Basic Film Session SOP class using the N-CREATE command.

The InSight application then calculates the number of films, dividing total number of selected images by the number of images per film, and creates the corresponding number of instances of Basic Film Box SOP class using the N-CREATE command.

For each film box, the InSight application creates a set of instances of Basic Grayscale Image Box SOP class, one for each image, using the N-CREATE command.

The InSight application then prints the images using the N-ACTION command on each film box. Film boxes are printed one at a time (i.e., the application creates one film box and then prints it). It then creates and prints the second one and so on.

After sending the N-ACTION request for the last selected image, the application closes the association with the SCP.

## 2.2.6. Verification

The InSight application initiates an association with a corresponding remote SCP when the user requests to verify the DICOM connection.

The InSight application uses the C-ECHO command to verify the connection with the SCP.

## 2.3. Sequencing of Real World Activities

### 2.3.1. Storage Commitment

A Storage Commitment Request for a specific study and SCP may be sent only after the successful completion of a Storage Request for the same study and SCP.

### 2.3.2. Modality Performed Procedure Step

MPPS notifications for a specific procedure will be sent only if the procedure was previously retrieved using the Modality Worklist service (i.e. not entered manually).

## 3. AE Specifications

The InSight application provides Standard Conformance for the following DICOM V3.0 SOP Classes as an SCU:

| SOP Class Name                             | SOP Class UID                |
|--|------------------------------|
| X-Ray Radiofluoroscopic Image Storage      | 1.2.840.10008.5.1.4.1.1.12.2 |
| Storage Commitment Push Model              | 1.2.840.10008.1.20.1         |
| Modality Worklist Information Model - FIND | 1.2.840.10008.5.1.4.31       |



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| Modality Performed Procedure Step               | 1.2.840.10008.3.1.2.3.3 |
| Basic Grayscale Print Management Meta SOP Class | 1.2.840.10008.5.1.1.9   |
| Verification                                    | 1.2.840.10008.1.1       |

### **3.1. Association Establishment Policies**

#### **3.1.1. General**

The maximum PDU length is 28,672 bytes.  
 The SOP Class Extended Negotiation is not supported.

#### **3.1.2. Number of Associations**

The InSight application initiates only one association at a time for each SOP class.

#### **3.1.3. Asynchronous Nature**

The InSight application does not support asynchronous communications.

#### **3.1.4. Implementation Identifying Information**

The InSight provides an implementation class UID of 1.2.840.113830.

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

#### **3.2.1. Real World-Activity - Image Storage**

##### **3.2.1.1. Associated Real-World Activity**

The InSight application initiates an association with a Storage SCP and sends DICOM images using the C-STORE command.

##### **3.2.1.2. Proposed Presentation Contexts**

| Abstract Syntax                       |                                  | Transfer Syntax           |                     | Role | Extended Negotiation |
|---------------------------------------|----------------------------------|---------------------------|---------------------|------|----------------------|
| Name                                  | UID                              | Name List                 | UID List            |      |                      |
| X-Ray Radiofluoroscopic Image Storage | 1.2.840.10008.5.1.4.1.1<br>.12.2 | Implicit VR Little Endian | 1.2.840.10008.1.2   | SCU  | None                 |
|                                       |                                  | Explicit VR Little Endian | 1.2.840.10008.1.2.1 |      |                      |

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|---|------------------------------|---------------------------|---------------------|-----|------|
|   |                              | Explicit VR Big Endian    | 1.2.840.10008.1.2.2 |     |      |
| Grayscale Softcopy Presentation State Storage | 1.2.840.10008.5.1.4.1.1.11.1 | Implicit VR Little Endian | 1.2.840.10008.1.2   | SCU | None |
|   |                              | Explicit VR Little Endian | 1.2.840.10008.1.2.1 |     |      |
|   |                              | Explicit VR Big Endian    | 1.2.840.10008.1.2.2 |     |      |

### 3.2.1.3. SOP Specific Conformance

#### 3.2.1.3.1. Image file

| Module              | Attribute Name               | Type   | Value      | Tag        | VR |
|---------------------|------------------------------|--------|------------|------------|----|
| Patient             | Patient's Name               | 2      |            | 0010, 0010 | PN |
|                     | Patient ID                   | 2      |            | 0010, 0020 | LO |
|                     | Patient's Birth Date         | 2      |            | 0010, 0030 | DA |
|                     | Patient's Sex                | 2      |            | 0010, 0040 | CS |
| General Study       | Study Instance UID           | 1      | Note 1     | 0020, 000D | UI |
|                     | Study ID                     | 2      |            | 0020, 0010 | SH |
|                     | Study Date                   | 2      |            | 0008, 0020 | DA |
|                     | Study Time                   | 2      |            | 0008, 0030 | TM |
|                     | Referring Physician          | 2      | Note 6     | 0008, 0090 | PN |
|                     | Accession Number             | 2      | Note 5     | 0008, 0050 | SH |
|                     | Study Description            | 3      |            | 0008, 1030 | LO |
|                     | Modality                     | 1      | "RF"       | 0008, 0060 | CS |
| General Series      | Series Instance UID          | 1      | Note 2     | 0020, 000E | UI |
|                     | Series Number                | 2      |            | 0020, 0011 | IS |
|                     | Protocol Name                | 3      | Note 6     | 0018, 1030 | LO |
|                     | Performing Physician's Name  | 3      |            | 0008, 1050 | PN |
|                     | Request Attribute Sequence   | 3      | Note 6     | 0040, 0275 | SQ |
|                     | >Requested Procedure ID      | 1C     | Note 6     | 0040, 1001 | SH |
|                     | >Scheduled Procedure Step ID | 1C     | Note 6     | 0040, 0009 | SH |
| Scheduled Procedure | 3                            | Note 6 | 0040, 0007 | LO         |    |

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|                          | Step Description                     |              |             |            |            |
|--------------------------|--------------------------------------|--------------|-------------|------------|------------|
|                          | Performed Procedure Step ID          | 3            | Note 7      | 0040,0253  | SH         |
|                          | Performed Procedure Step Start Date  | 3            |             | 0040,0244  | DA         |
|                          | Performed Procedure Step Start Time  | 3            |             | 0040,0245  | TM         |
|                          | Performed Procedure Step Description | 3            |             | 0040,0254  | LO         |
|                          | Referenced Study Component Sequence  | 3            |             | 0008,1111  | SQ         |
|                          | >Referenced SOP Class UID            | 1C           | Note 8      | 0008,1150  | UI         |
|                          | >Referenced SOP Instance UID         | 1C           | Note 9      | 0008,1155  | UI         |
| General Equip.           | Manufacturer                         | 2            | “Hologic”   | 0008, 0070 | LO         |
|                          | Institution Name                     | 3            |             | 0008, 0080 | LO         |
|                          | Station Name                         | 3            | Note 6      | 0008, 1010 | SH         |
|                          | Manfr’s Model Name                   | 3            | “InSight”   | 0008, 1090 | LO         |
|                          | Device S/N                           | 3            |             | 0018, 1000 | LO         |
|                          | S/W Versions                         | 3            |             | 0018, 1020 | LO         |
|                          | General Image                        | Image Number | 2           | “1”        | 0020, 0013 |
| Image Pixel              | Samples per pixel                    | 1            | “1”         | 0028, 0002 | US         |
|                          | Photometric Interpretation           | 1            | MONOCHROME2 | 0028, 0004 | CS         |
|                          | Rows                                 | 1            |             | 0028, 0010 | US         |
|                          | Columns                              | 1            |             | 0028, 0011 | US         |
|                          | Bits Allocated                       | 1            | 8           | 0028, 0100 | US         |
|                          | Bits Stored                          | 1            | 8           | 0028, 0101 | US         |
|                          | High Bit                             | 1            | 7           | 0028, 0102 | US         |
|                          | Pixel Representation                 | 1            | 0           | 0028, 0103 | US         |
|                          | Pixel Data                           | 1            |             | 7FE0, 0010 | OB         |
|                          | X-Ray Image Module                   | Image Type   | 1           | Note 10    | 0008,0008  |
|                          | Pixel Intensity Relationship         | 1            | “DISP”      | 0028,1040  | CS         |
|                          | KVP                                  | 2            |             | 0018,0060  | DS         |
| X-Ray Acquisition Module | Radiation Setting                    | 1            | “SC”        | 0018,1155  | CS         |
| SOP Common               | SOP Class UID                        | 1            | Note 4      | 0008, 0016 | UI         |
|                          | SOP Instance UID                     | 1            | Note 3      | 0008, 0018 | UI         |
|                          | Instance Number                      | 1            |             | 0020,0013  | IS         |
| Private Study            | Private Creator Data                 |              | “Hologic”   | 0035,0010  | LO         |

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| Information Group | Element                                 |  |        |           |    |
|-------------------|---|--|--------|-----------|----|
|                   | Scheduled Station AE Title              |  | Note 6 | 0035,1000 | AE |
|                   | Scheduled Procedure Start Date          |  | Note 6 | 0035,1001 | DA |
|                   | Scheduled Procedure Start Time          |  | Note 6 | 0035,1002 | TM |
|                   | Scheduled Procedure Location            |  | Note 6 | 0035,1003 | SH |
|                   | Scheduled Performing Physician          |  | Note 6 | 0035,1004 | PN |
|                   | Scheduled Procedure Code                |  | Note 6 | 0035,1005 | SH |
|                   | Scheduled Procedure Coding Scheme       |  | Note 6 | 0035,1006 | SH |
|                   | Scheduled Procedure Code Meaning        |  | Note 6 | 0035,1007 | LO |
|                   | Requested Procedure Comments            |  | Note 6 | 0035,1008 | LT |
|                   | Requested Procedure Description         |  | Note 6 | 0035,1009 | LO |
|                   | Requested Procedure Code                |  | Note 6 | 0035,100a | SH |
|                   | Requested Procedure Coding Scheme       |  | Note 6 | 0035,100b | SH |
|                   | Requested Procedure Code Meaning        |  | Note 6 | 0035,100c | LO |
|                   | Names Of Intended Recipients of Results |  | Note 6 | 0035,100d | PN |
|                   | Imaging Service Request Comments        |  | Note 6 | 0035,100e | LT |
|                   | Requesting Physician                    |  | Note 6 | 0035,100f | PN |
|                   | Requesting Service                      |  | Note 6 | 0035,1010 | LO |
|                   | Current Patient Location                |  | Note 6 | 0035,1011 | LO |
|                   | Other Patient Ids                       |  | Note 6 | 0035,1012 | LO |
|                   | Ethnicity                               |  | Note 6 | 0035,1013 | SH |
|                   | Patient Comment                         |  | Note 6 | 0035,1014 | LT |
|                   | Pregnancy Status                        |  | Note 6 | 0035,1015 | SH |
|                   | Medical Alerts                          |  | Note 6 | 0035,1016 | LO |
|                   | Additional Patient History              |  | Note 6 | 0035,1017 | LT |
|                   | X-ray KV                                |  |        | 0035,1018 | FL |

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|                                 | X-ray MA                     |  |           | 0035,1019 | FL |
|                                 | X-ray Dose                   |  |           | 0035,1020 | FL |
|                                 | X-ray Time                   |  |           | 0035,1021 | UL |
|                                 | Collimator                   |  |           | 0035,1022 | UL |
|                                 | Legacy flag                  |  | Note 11   | 0035,1023 | CS |
|                                 | X-ray DAP                    |  |           | 0035,1024 | FL |
| Private Image Information Group | Private Creator Data Element |  | “Hologic” | 0071,0010 | LO |
|                                 | Horizontal Flip              |  |           | 0071,1000 | CS |
|                                 | Image Rotation               |  |           | 0071,1001 | US |
|                                 | Presentation LUT Shape       |  |           | 0071,1002 | CS |
|                                 | Edge Enhancement             |  |           | 0071,1003 | CS |
|                                 | AOI Rows                     |  |           | 0071,1004 | US |
|                                 | AOI Columns                  |  |           | 0071,1005 | US |
|                                 | AOI Origin X                 |  |           | 0071,1006 | US |
|                                 | AOI Origin Y                 |  |           | 0071,1007 | US |
|                                 | Dark Fluoro Threshold        |  |           | 0071,1008 | US |
|                                 | Use Dark Fluoro              |  |           | 0071,1009 | CS |
|                                 | Rotation Offset              |  |           | 0071,1010 | US |
|                                 | Raw Image Rows               |  |           | 0071,1080 | US |
|                                 | Raw Image Columns            |  |           | 0071,1081 | US |
|                                 | Raw Bits Allocated           |  | 16        | 0071,1082 | US |
|                                 | Raw Bits Stored              |  | 12        | 0071,1083 | US |
|                                 | Raw High Bit                 |  | 11        | 0071,1084 | US |
|                                 | Raw Image Data               |  | Note 12   | 0071,1099 | OW |
| Private Annotations Group       | Private Creator Data Element |  | “Hologic” | 9001,0010 | LO |
|                                 | Annotations                  |  |           | 9001,1000 | LT |

### 3.2.1.3.2.Presentation State file

| Module        | Attribute Name       | Type | Value  | Tag        | VR |
|---------------|----------------------|------|--------|------------|----|
| Patient       | Patient’s Name       | 2    |        | 0010, 0010 | PN |
|               | Patient ID           | 2    |        | 0010, 0020 | LO |
|               | Patient’s Birth Date | 2    |        | 0010, 0030 | DA |
|               | Patient’s Sex        | 2    |        | 0010, 0040 | CS |
| General Study | Study Instance UID   | 1    | Note 1 | 0020, 000D | UI |
|               | Study ID             | 2    |        | 0020, 0010 | SH |
|               | Study Date           | 2    |        | 0008, 0020 | DA |
|               | Study Time           | 2    |        | 0008, 0030 | TM |

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|   | Referring Physician               | 2  | Note 6                             | 0008, 0090 | PN |
|   | Accession Number                  | 2  | Note 5                             | 0008, 0050 | SH |
| General Series                                  | Modality                          | 1  | “PR”                               | 0008, 0060 | CS |
|   | Series Instance UID               | 1  | Note 2                             | 0020, 000E | UI |
|   | Series Number                     | 2  |                                    | 0020, 0011 | IS |
| General Equip.                                  | Manufacturer                      | 2  | “Hologic”                          | 0008, 0070 | LO |
|   | S/W Versions                      | 3  |                                    | 0018, 1020 | LO |
| SOP Common                                      | SOP Class UID                     | 1  | Note 4                             | 0008, 0016 | UI |
|   | SOP Instance UID                  | 1  | Note 3                             | 0008, 0018 | UI |
| Presentation State Identification               | Instance Number                   | 1  |                                    | 0020, 0013 | IS |
|   | Content Label                     | 1  | “HOLOGIC”                          | 0070, 0080 | CS |
|   | Content Description               | 2  | "Fluoroscan InSight Display Flags" | 0070, 0081 | LO |
|   | Presentation Creation Date        | 1  |                                    | 0070, 0082 | DA |
|   | Presentation Creation Time        | 1  |                                    | 0070, 0083 | TM |
|   | Content Creator's Name            | 2  | “HOLOGIC”                          | 0070, 0084 | PN |
| Presentation State Relationship Macro Attribute | Referenced Series Sequence        | 1  |                                    | 0008, 1115 | SQ |
|   | >Series Instance UID              | 1  |                                    | 0020, 000E | UI |
|   | >References Image Sequence        | 1  |                                    | 0008, 1140 | SQ |
|   | >>SOP Class UID                   | 1  | Note 4                             | 0008, 1150 | UI |
|   | >>SOP Instance UID                | 1  |                                    | 0008, 1155 | UI |
| Graphic Annotation                              | Graphic Annotation Sequence       | 1  |                                    | 0070, 0001 | SQ |
|   | >Graphic Layer                    | 1  | “1”                                | 0070, 0002 | CS |
|   | >Text Object Sequence             | 1C |                                    | 0070, 0008 | SQ |
|   | >>Anchor Point Annotation Units   | 1C | “PIXEL”                            | 0070, 0004 | CS |
|   | >>Unformatted Text Value          | 1  |                                    | 0070, 0006 | ST |
|   | >>Anchor Point                    | 1C |                                    | 0070, 0014 | FL |
|   | >>Anchor Visibility               | 1C | “N”                                | 0070, 0015 | CS |
| Graphic Layer                                   | Graphic Layer Sequence            | 1  |                                    | 0070, 0060 | SQ |
|   | >Graphic Layer                    | 1  | “1”                                | 0070, 0002 | CS |
|   | >Graphic Layer Order              | 1  | “1”                                | 0070, 0062 | IS |
| Displayed Area                                  | Displayed Area Selection Sequence | 1  |                                    | 0070, 005A | SQ |

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|                           |                                  |    |                |            |    |
|---------------------------|----------------------------------|----|----------------|------------|----|
|                           | >Presentation Size Mode          | 1  | "SCALE TO FIT" | 0070, 0100 | CS |
|                           | >Presentation Pixel Aspect Ratio | 1C | "1\1"          | 0070, 0102 | IS |
| Softcopy Presentation LUT | Presentation LUT Shape           | 1C | "IDENTITY"     |            |    |

**Note 1.** If the Study Instance UID is obtained from Modality Worklist, this value will be used. Otherwise, it will be generated using following algorithm: the initial string will be formatted as "1.2.840.113830.[Unique Part] ". The unique part is generated by applying the RSA Data Security, Inc. MD5 Message-Digest Algorithm to an input string constructed as "[Serial number]\_[Patient ID]\_[Accession number]". If the Accession Number field is blank, it will be replaced with current date and time in UNIX format. Each character of the MD5 output will be converted into its hexadecimal numeric representation, and leading '0' characters will be removed from the resulting string.

**Note 2.** The Series Instance UID has the format "1.2.840.113830.[Unique Part]". The unique part is generated by applying the RSA Data Security, Inc. MD5 Message-Digest Algorithm to an input string constructed as "[Study Instance UID].[Series Number].[Current Time]", where the Series Number is an ordinal number of the series within a study, and the Current Time is a current time in UNIX format. Each character of the MD5 output will be converted into its hexadecimal numeric representation, and leading '0' characters will be removed from the resulting string.

**Note 3.** The SOP Instance UID has format "1.2.840.113830.[Unique Part]". The unique part is generated by applying the RSA Data Security, Inc. MD5 Message-Digest Algorithm to an input string constructed as "[Series Instance UID].1". Each character of the MD5 output will be converted into its hexadecimal numeric representation, and leading '0' characters will be removed from the resulting string.

**Note 4.** SOP Class UID for the X-Ray Radiofluoroscopic Image Storage SOP Class is 1.2.840.10008.5.1.4.1.1.12.2, and for the Grayscale Softcopy Presentation State Storage SOP Class is 1.2.840.10008.5.1.4.1.1.11.1.

**Note 5.** If an Accession Number is not supplied from Modality Worklist and not entered by the user, the current date and time in UNIX format will be used. In this case, the same accession number is used for all images within one acquisition session.

**Note 6.** The value is always obtained from Modality Worklist. If a procedure is not obtained from the Worklist, the field will be blank.

**Note 7.** Has the same value as Scheduled Procedure Step ID field.

**Note 8.** Has the same value as SOP Class UID field.

**Note 9.** Has the same value as Study Instance UID field.

**Note 10.** Multivalue attribute: “ORIGINAL”/“PRIMARY”/“SINGLE PLANE”.

**Note 11.** If the image has been acquired with one of the previous versions of Fluoroscan mini C-arm devices and then imported to the InSight, then the value of this field is “Y”, otherwise “N”.

**Note 12.** The field contains raw unprocessed image data.

### **3.2.2. Real-World Activity – Storage Commitment**

#### ***3.2.2.1. Associated Real-World Activity***

The InSight application initiates an association with a Storage Commitment SCP and sends a Storage Commitment request using N-ACTION command.

#### ***3.2.2.2. Proposed Presentation Contexts***

| Abstract Syntax               |                      | Transfer Syntax           |                     | Role | Extended Negotiation |
|-------------------------------|----------------------|---------------------------|---------------------|------|----------------------|
| Name                          | UID                  | Name List                 | UID List            |      |                      |
| Storage Commitment Push Model | 1.2.840.10008.1.20.1 | Implicit VR Little Endian | 1.2.840.10008.1.2   | SCU  | None                 |
|                               |                      | Explicit VR Little Endian | 1.2.840.10008.1.2.1 |      |                      |
|                               |                      | Explicit VR Big Endian    | 1.2.840.10008.1.2.2 |      |                      |

#### ***3.2.2.3. SOP Specific Conformance***

| Attribute Name               | Attribute Tag |
|------------------------------|---------------|
| Transaction UID              | 0008,1195     |
| Retrieve AE Title            | 0008,0054     |
| Referenced SOP Sequence      | 0008,1199     |
| >Referenced SOP Class UID    | 0008,1150     |
| >Referenced SOP Instance UID | 0008,1155     |



**3.2.3. Real-World Activity – Modality Worklist**

**3.2.3.1. Associated Real-World Activity**

The InSight application initiates an association with a Modality Worklist SCP and sends a Worklist query using C-FIND command.

**3.2.3.2. Proposed Presentation Contexts**

| Abstract Syntax        |                         | Transfer Syntax           |                     | Role | Extended Negotiation |
|------------------------|-------------------------|---------------------------|---------------------|------|----------------------|
| Name                   | UID                     | Name List                 | UID List            |      |                      |
| Modality Worklist Find | 1.2.840.10008.5.1.4.3.1 | Implicit VR Little Endian | 1.2.840.10008.1.2   | SCU  | None                 |
|                        |                         | Explicit VR Little Endian | 1.2.840.10008.1.2.1 |      |                      |
|                        |                         | Explicit VR Big Endian    | 1.2.840.10008.1.2.2 |      |                      |

**3.2.3.3. SOP Specific Conformance**

Matching keys:

| Matching Key Attribute              | Tag        | Matching Type            |
|-------------------------------------|------------|--------------------------|
| Scheduled Procedure Step Start Date | 0040, 0002 | Wild Card                |
| Modality                            | 0008, 0060 | One of enumerated values |
| Scheduled Station AE Title          | 0040, 0001 | Wild Card                |
| Accession Number                    | 0008,0050  | Single Value             |
| Requested Procedure ID              | 0040,1001  | Single Value             |

Return Keys:

| Attribute Name                         | Tag       | Type |
|--|-----------|------|
| Scheduled Procedure Step               |           |      |
| Scheduled Procedure Step Sequence      | 0040,0010 | 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 Location     | 0040,0011 | 2    |
| >Modality                              | 0008,0060 | 1    |
| >Scheduled Performing Physician's Name | 0040,0006 | 2    |

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|   |           |    |
|---|-----------|----|
| >Scheduled Procedure Step Description   | 0040,0007 | 1C |
| >Scheduled Procedure Step ID            | 0040,0009 | 1  |
| >Scheduled Protocol Code Sequence       | 0040,0008 | 3  |
| >>Code Value                            | 0008,0100 | 1C |
| >>Coding Scheme Designator              | 0008,0102 | 1C |
| >>Code Meaning                          | 0008,0104 | 3  |
| <b>Requested Procedure</b>              |           |    |
| Requested Procedure Description         | 0032,1060 | 1C |
| Requested Procedure ID                  | 0040,1001 | 1  |
| Requested Procedure Comments            | 0040,1400 | 3  |
| Requested Procedure Code Sequence       | 0032,1064 | 1C |
| >Code Value                             | 0008,0100 | 1C |
| >Coding Scheme Designator               | 0008,0102 | 1C |
| >Code Meaning                           | 0008,0104 | 3  |
| Study Instance UID                      | 0020,000D | 1  |
| Names of Intended Recipients of Results | 0040,1010 | 3  |
| <b>Imaging Service Request</b>          |           |    |
| Imaging Service Request Comments        | 0040,2400 | 3  |
| Accession Number                        | 0008,0050 | 2  |
| Requesting Physician                    | 0032,1032 | 2  |
| Requesting Service                      | 0032,1033 | 3  |
| Referring Physician's Name              | 0008,0090 | 2  |
| <b>Visit Status</b>                     |           |    |
| Current Patient Location                | 0038,0300 | 2  |
| <b>Patient Identification</b>           |           |    |
| Patient's Name                          | 0010,0010 | 1  |
| Patient ID                              | 0010,0020 | 1  |
| Other Patient ID's                      | 0010,1000 | 3  |
| <b>Patient Demographic</b>              |           |    |
| Patients Birth Date                     | 0010,0030 | 2  |
| Patient's Sex                           | 0010,0040 | 2  |
| Ethnic Group                            | 0010,2160 | 3  |
| Patient Comment                         | 0010,4000 | 3  |
| <b>Patient Medical</b>                  |           |    |
| Pregnancy Status                        | 0010,21C0 | 2  |
| Medical Alerts                          | 0010,2000 | 2  |
| Additional Patient History              | 0010,21B0 | 3  |

### 3.2.3.4. Status Codes

The following table describes the InSight behavior dependent on Status Codes of messages received from the Worklist SCP.

## Fluoroscan InSight V2.1 DICOM Conformance Statement

| Status                            | Status Code | Meaning   | QDR Behavior  |
|-----------------------------------|-------------|---|---|
| Success                           | 0000        | Matching is complete – No final Identifier is supplied  | Completes retrieving of matches   |
| Pending                           | FF00        | Matches are continuing – Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys | Receiving of matches continues  |
| Pending (No Optional Key Support) | FF01        | Matches are continuing – Warning that one or more Optional Keys were not supported for existence for this Identifier        | Receiving of matches continues without any warnings or errors   |
| Other                             | Other       | All other Status Codes  | Terminates receiving of matches and logs a failure message. The matches received prior to this code are handled normally. |

### 3.2.4. Real-World Activity – Modality Performed Procedure Step

#### 3.2.4.1. Associated Real-World Activity

The InSight application initiates an association with the Modality Performed Procedure Step SCP and sends reports about started procedure using N-CREATE command, or about completed or discontinued procedure with N-SET command.

#### 3.2.4.2. Proposed Presentation Contexts

| Abstract Syntax                             |                         | Transfer Syntax           |                     | Role | Extended Negotiation |
|---|-------------------------|---------------------------|---------------------|------|----------------------|
| Name  | UID                     | Name List                 | UID List            |      |                      |
| Modality Performed Procedure Step SOP Class | 1.2.840.10008.3.1.2.3.3 | Implicit VR Little Endian | 1.2.840.10008.1.2   | SCU  | None                 |
|   |                         | Explicit VR Little Endian | 1.2.840.10008.1.2.1 |      |                      |
|   |                         | Explicit VR Big Endian    | 1.2.840.10008.1.2.2 |      |                      |

## FluorSCAN InSight V2.1 DICOM Conformance Statement

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### 3.2.4.3. SOP Specific Conformance

Following attributes are included in an N-CREATE request:

| Attribute Name                        | Tag       | Type |
|---------------------------------------|-----------|------|
| Scheduled Step Attribute Sequence     | 0040,0270 | 1    |
| >Study Instance UID                   | 0020,000D | 1    |
| >Referenced Study Sequence            | 0008,1110 | 2    |
| >Accession Number                     | 0008,0050 | 2    |
| >Requested Procedure ID               | 0040,1001 | 2    |
| >Requested Procedure Description      | 0032,1060 | 2    |
| >Scheduled Procedure Step ID          | 0040,0009 | 2    |
| >Scheduled Procedure Step Description | 0040,0007 | 2    |
| >Scheduled Action Item Code Sequence  | 0040,0008 | 2    |
| Patient's Name                        | 0010,0010 | 2    |
| Patient ID                            | 0010,0020 | 2    |
| Patient's Birth Date                  | 0010,0030 | 2    |
| Patient's Sex                         | 0010,0040 | 2    |
| Referenced Patient Sequence           | 0008,1120 | 2    |
| Performed Procedure Step ID           | 0040,0253 | 1    |
| Performed Station AE Title            | 0040,0241 | 1    |
| Performed Station Name                | 0040,0242 | 2    |
| Performed Location                    | 0040,0243 | 2    |
| Performed Procedure Step Start Date   | 0040,0244 | 1    |
| Performed Procedure Step Start Time   | 0040,0245 | 1    |
| Performed Procedure Step Status       | 0040,0252 | 1    |
| Performed Procedure Step Description  | 0040,0254 | 2    |
| Performed Procedure Type Description  | 0040,0255 | 2    |
| Procedure Code Sequence               | 0008,1032 | 2    |
| Performed Procedure Step End Date     | 0040,0250 | 2    |
| Performed Procedure Step End Time     | 0040,0251 | 2    |
| Modality                              | 0008,0060 | 1    |
| Study ID                              | 0020,0010 | 2    |
| Performed Action Item Code Sequence   | 0040,0260 | 2    |
| Performed Series Sequence             | 0040,0340 | 2    |

All of the type 2 attributes will not be populated with values.

The InSight application expects to receive the attribute “Affected SOP Instance UID” (0000,1000) filled out by the SCP during the N-CREATE response.

Following attributes are included in an N-SET request:

| Attribute Name | Tag |
|----------------|-----|
|----------------|-----|

## Fluoroscan InSight V2.1 DICOM Conformance Statement

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|                                   |           |
|-----------------------------------|-----------|
| Requested SOP Instance UID        | 0000,1001 |
| Performed Procedure Step End Date | 0040,0250 |
| Performed Procedure Step End Time | 0040,0251 |
| Performed Procedure Step Status   | 0040,0252 |

The “Requested SOP Instance UID” attribute (0000,1001) will be populated with a value received from the SCP along with the N-CREATE response in the “Affected SOP Instance UID” attribute (0000,1000).

### 3.2.5. Real-World Activity – Image Print

#### 3.2.5.1. Associated Real-World Activity

The InSight application will request that an image be printed on a remote DICOM printer.

#### 3.2.5.2. Proposed Presentation Contexts

| Abstract Syntax                                 |                       | Transfer Syntax           |                     | Role | Extended Negotiation |
|---|-----------------------|---------------------------|---------------------|------|----------------------|
| Name  | UID                   | Name List                 | UID List            |      |                      |
| Basic Grayscale Print Management Meta SOP Class | 1.2.840.10008.5.1.1.9 | Implicit VR Little Endian | 1.2.840.10008.1.2   | SCU  | None                 |
|   |                       | Explicit VR Little Endian | 1.2.840.10008.1.2.1 |      |                      |
|   |                       | Explicit VR Big Endian    | 1.2.840.10008.1.2.2 |      |                      |

#### 3.2.5.3. SOP Specific Conformance

The Basic Grayscale Print Management Meta SOP Class is defined by the following set of supported SOP classes.

| SOP Class Name                      | SOP Class UID          |
|-------------------------------------|------------------------|
| Basic Film Session SOP Class        | 1.2.840.10008.5.1.1.1  |
| Basic Film Box SOP Class            | 1.2.840.10008.5.1.1.2  |
| Basic Grayscale Image Box SOP Class | 1.2.840.10008.5.1.1.4  |
| Printer SOP Class                   | 1.2.840.10008.5.1.1.16 |

## Fluoroscan InSight V2.1 DICOM Conformance Statement

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### 3.2.5.3.1. Basic Film Session SOP Class

For Basic Film Session SOP Class, InSight supports the N-CREATE command.

Supported attributes:

| Attribute Name   | Tag       | Attribute Description  |
|------------------|-----------|--|
| Number of Copies | 2000,0010 | Number of copies to be printed for each film of the film session. User configurable. |
| Print Priority   | 2000,0020 | Medium ("MED")   |
| Medium Type      | 2000,0030 | Medium type. User configurable.  |

Status Codes:

| Service Status         | Status Code | Meaning                                   | Application Behavior         |
|------------------------|-------------|---|------------------------------|
| Success                | 0x0000      | Film session successfully created         | Continue                     |
| Warning                | 0xB600      | Memory allocation is not supported        | Write error log and continue |
|                        | 0xB605      | Requested Min or Max Density out of range |                              |
|                        | 0x0116      | Attribute Value Out of Range              |                              |
|                        | 0x0107      | Attribute List Error                      |                              |
| All other status codes |             | Warning or Failure                        | Stop and report an error.    |

### 3.2.5.3.2. Basic Film Box SOP Class

For Basic Film Box SOP Class, InSight supports both the N-CREATE and N-ACTION commands.

Supported Attributes:

| Attribute Name       | Tag       | Attribute Description                           |
|----------------------|-----------|---|
| Image Display Format | 2010,0010 | STANDARD\C,R.<br>C and R are user configurable. |
| Film Orientation     | 2010,0040 | PORTRAIT /LANDSCAPE, user configurable          |
| Film Size ID         | 2010,0050 | User configurable                               |

Status Codes:

| Service Status | Status Code | Meaning | Application Behavior |
|----------------|-------------|---------|----------------------|
|----------------|-------------|---------|----------------------|

## FluorSCAN InSight V2.1 DICOM Conformance Statement

|                        |        |   |                              |
|------------------------|--------|---|------------------------------|
| Success                | 0x0000 | Film box successfully created             | Continue                     |
| Warning                | 0xB600 | Memory allocation is not supported        | Write error log and continue |
|                        | 0xB605 | Requested Min or Max Density out of range |                              |
|                        | 0x0116 | Attribute Value Out of Range              |                              |
|                        | 0x0107 | Attribute List Error                      |                              |
| All other status codes |        | Warning or Failure                        | Stop and report an error.    |

### 3.2.5.4. Basic Grayscale Image Box SOP Class

For Basic Grayscale Image Box SOP Class, InSight supports the N-SET command.

Supported attributes:

| Attribute Name                   | Tag       | Attribute Description  |
|----------------------------------|-----------|--|
| Image Position                   | 2020,0010 | The position of the image on the film  |
| Requested Image Size             | 2020,0030 | Used to prevent the image from being magnified.                              |
| Requested Decimate/Crop Behavior | 2020,0040 | DECIMATE/CROP, user configurable   |
| Basic Grayscale Image Sequence   | 2020,0110 | A sequence which provides the content of the image pixel data to be printed. |
| >Samples Per Pixel               | 0028,0002 | 1  |
| >Photometric Interpretation      | 0028,0004 | MONOCHROME2  |
| >Rows                            | 0028,0010 | Number of pixel rows   |
| >Columns                         | 0028,0011 | Number of pixel columns  |
| >Pixel Aspect Ratio              | 0028,0034 | 1/1  |
| >Bits Allocated                  | 0028,0100 | 8  |
| >Bits Stored                     | 0028,0101 | 8  |
| >High Bit                        | 0028,0102 | 7  |
| >Pixel Representation            | 0028,0103 | 0  |
| >Pixel Data                      | 7FE0,0010 | Actual image pixels  |

Status Codes:

| Service Status | Status Code | Meaning                                   | Application Behavior         |
|----------------|-------------|---|------------------------------|
| Success        | 0000        | Image successfully stored in Image Box    | Continue                     |
| Warning        | 0xB600      | Memory allocation is not supported        | Write error log and continue |
|                | 0xB605      | Requested Min or Max Density out of range |                              |
|                | 0xB609      | Image Cropped To Fit                      |                              |

## Fluoroscan InSight V2.1 DICOM Conformance Statement

|                        |        |                              |                           |
|------------------------|--------|------------------------------|---------------------------|
|                        | 0xB60A | Image Decimated To Fit       |                           |
|                        | 0x0116 | Attribute Value Out of Range |                           |
|                        | 0x0107 | Attribute List Error         |                           |
| All other status codes |        | Warning or Failure           | Stop and report an error. |

### 3.2.5.5. Printer SOP Class

For Printer SOP Class, InSight supports the N-GET command.

Supported Attributes:

| Attribute Name      | Tag       | Attribute Description  |
|---------------------|-----------|--|
| Printer Status      | 2110,0010 | Printer status returned by the Printer. NORMAL, WARNING, or FAILURE. |
| Printer Status Info | 2110,0020 | Info about the problem in case of warning or failure.                |

In case of Printer Status NORMAL, the InSight will continue the printing flow.

In case of Printer Status WARNING, the InSight will write a log record concerning the problem and continue the flow.

In case of Printer Status FAILURE, the InSight will write a log record concerning the problem and stop the printing flow.

Status Codes

| Service Status         | Status Code | Meaning                             | Application Behavior         |
|------------------------|-------------|-------------------------------------|------------------------------|
| Success                | 0x0000      | Film box successfully created       | Continue                     |
| Warning                | 0x0001      | Optional attribute is not supported | Write error log and continue |
|                        | 0x0107      | Attribute List Error                |                              |
| All other status codes |             | Warning or Failure                  | Stop and report an error.    |

### 3.2.6. Real-World Activity – Verification

#### 3.2.6.1. Associated Real-World Activity

The InSight application initiates an association with a SCP and sends a verification request using the C-ECHO command.

#### 3.2.6.2. Proposed Presentation Contexts

| Abstract Syntax |     | Transfer Syntax |          | Role | Extended Negotiation |
|-----------------|-----|-----------------|----------|------|----------------------|
| Name            | UID | Name List       | UID List |      |                      |
|                 |     |                 |          |      |                      |



## Fluoroscan InSight V2.1 DICOM Conformance Statement

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|                        |                   |                           |                     |     |      |
|------------------------|-------------------|---------------------------|---------------------|-----|------|
| Verification SOP Class | 1.2.840.10008.1.1 | Implicit VR Little Endian | 1.2.840.10008.1.2   | SCU | None |
|                        |                   | Explicit VR Little Endian | 1.2.840.10008.1.2.1 |     |      |
|                        |                   | Explicit VR Big Endian    | 1.2.840.10008.1.2.2 |     |      |

### 3.3. Association Acceptance Policy

#### 3.3.1. Storage Commitment

##### 3.3.1.1. Associated Real-World Activity

The InSight application waits for a N-EVENT-REPORT request messages from the SCP. Upon receiving such a request, it accepts the association and sends back a N-EVENT-REPORT response message.

##### 3.3.1.2. Proposed Presentation Contexts

| Abstract Syntax               |                      | Transfer Syntax           |                     | Role | Extended Negotiation |
|-------------------------------|----------------------|---------------------------|---------------------|------|----------------------|
| Name                          | UID                  | Name List                 | UID List            |      |                      |
| Storage Commitment Push Model | 1.2.840.10008.1.20.1 | Implicit VR Little Endian | 1.2.840.10008.1.2   | SCU  | None                 |
|                               |                      | Explicit VR Little Endian | 1.2.840.10008.1.2.1 |      |                      |
|                               |                      | Explicit VR Big Endian    | 1.2.840.10008.1.2.2 |      |                      |

##### 3.3.1.3. SOP Specific Conformance

| Attribute Name  | Attribute Tag |
|-----------------|---------------|
| Transaction UID | 0008,1195     |

|                              |           |
|------------------------------|-----------|
| Retrieve AE Title            | 0008,0054 |
| Referenced SOP Sequence      | 0008,1199 |
| >Referenced SOP Class UID    | 0008,1150 |
| >Referenced SOP Instance UID | 0008,1155 |
| Failed SOP Sequence          | 0008,1198 |
| >Referenced SOP Class UID    | 0008,1150 |
| >Referenced SOP Instance UID | 0008,1155 |

## 4. Communication Profiles

### 4.1. Supported Communication Stacks

DICOM Upper Layer (PS 3.8.) is supported using TCP/IP.

### 4.2. TCP/IP Stack

The TCP/IP stack is inherited from the operating system on which it is running.

## 5. Configuration

### 5.1. AE Title / Presentation Address Mapping

The AE Title is configurable via the User Interface.

### 5.2. Configurable Parameters

#### 5.2.1. Network Parameters

The following parameters are required and are configurable for each InSight DICOM service:

1. Called Application Entity Title
2. Called Application Entity Port
3. Called Application Entity IP address

#### 5.2.2. Image Storage

The user may configure the options:

1. Whether to send a presentation state file along with an image file
2. Whether to include the raw image data into the image file

#### 5.2.3. Storage Commitment

The user may select one or more existing Image Storage SCPs to serve as a Storage Commitment SCP.

#### **5.2.4. Modality Worklist**

##### **5.2.4.1. Worklist Query Parameters**

The user may configure the Worklist query parameters:

1. Scheduled Procedure Step Start Date
2. Modality
3. Scheduled Station AE Title
4. Accession Number
5. Requested Procedure ID

##### **5.2.4.2. Worklist Maintenance**

The user may configure the automatic Worklist query schedule and the maximum number of hits per query.

##### **5.2.4.3. Attribute Mapping**

The user may map the following InSight data fields to Worklist attributes:

1. Patient Name
2. Patient ID
3. Patient Sex
4. Procedure ID
5. Study Name
6. Start Date

#### **5.2.5. Modality Performed Procedure Step**

The user may turn the Performed Procedure Step service on and off.

#### **5.2.6. Image Print**

The user may configure following print parameters:

1. Number of copies
2. Image display format
3. Orientation
4. Film size
5. Medium type
6. Decimate/crop behavior

#### **5.2.7. Verification**

There are no configurable parameters.

## **6. Support of Extended Character Set**

No Extended Character sets are supported.