

---

# DICOM Conformance Statement

**i.Profiler *plus***

**Version 3.0**

**Carl Zeiss Vision GmbH**

**Turnstrasse 27**

**73430 Aalen**

**Germany**

[www.zeiss.com/vision-care](http://www.zeiss.com/vision-care)

# 1 Conformance Statement Overview

The i.Profiler<sup>plus</sup> is a diagnostic device for the measurement and analysis of imaging errors in the human eye. It offers two basic measurement options:

- Precision wavefront measurement with Shack-Hartmann technology
- Placido disc-based corneal topography with central and peripheral keratometry

This document is structured as specified in the DICOM Standard (PS3.2: Conformance).

**Table 1-1 Network Services Supported**

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
<b>Transfer</b>		
Autorefracton Measurements Storage	Yes	No
Keratometry Measurements Storage	Yes	No
Encapsulated PDF Storage	Yes	No
<b>Workflow Management</b>		
Modality Worklist Information Model – FIND	Yes	No
<b>Query / Retrieve</b>		
Patient Root Query/Retrieve Information Model – FIND	Yes	No

The i.Profiler<sup>plus</sup> does not support Media Interchange.

## 2 Table of Contents

<b>1</b>	<b>Conformance Statement Overview</b>	<b>2</b>
<b>2</b>	<b>Table of Contents</b>	<b>3</b>
<b>3</b>	<b>Introduction</b>	<b>5</b>
3.1	Revision History	5
3.2	Audience	5
3.3	Remarks	5
3.4	Definitions and Terms	5
3.5	Abbreviations	7
3.6	References	8
<b>4</b>	<b>Networking</b>	<b>9</b>
4.1	Implementation Model	9
4.1.1	Application Data Flow	9
4.1.2	Functional Definition of AEs	9
4.1.2.1	Functional Definition of IPROFILER	9
4.1.3	Sequencing of Real-World Activities	10
4.1.3.1	IPROFILER Activities	10
4.1.3.2	Scheduled Case	11
4.1.3.3	Unscheduled Case	12
4.2	AE Specifications	13
4.2.1	IPROFILER AE Specification	13
4.2.1.1	SOP Classes	13
4.2.1.2	Associations Policies	14
4.2.1.3	Association Initiation Policy	14
4.2.1.4	Association Acceptance Policy	37
4.3	Network Interfaces	37
4.3.1	Physical Network Interface	37
4.3.2	Additional Protocols	37
4.3.3	IPv4 and IPv6 Support	37
4.4	Configuration	37
4.4.1	AE Title/Presentation Address Mapping	37
4.4.1.1	Local AE Titles	37
4.4.1.2	Remote AE Titles/Presentation Address Mapping	38
4.4.2	Parameters	38
4.4.2.1	General Parameters	38
<b>5</b>	<b>Media Interchange</b>	<b>39</b>
<b>6</b>	<b>Support of Character Sets</b>	<b>40</b>
<b>7</b>	<b>Security</b>	<b>41</b>

7.1	Security Profiles .....	41
7.2	Association Level Security .....	41
7.3	Application Level Security .....	41
<b>8</b>	<b>Annexes.....</b>	<b>42</b>
8.1	IOD Contents.....	42
8.1.1	Created SOP Instance(s) .....	42
8.1.1.1	Autorefracton Measurements Information Object Definition	43
8.1.1.2	Keratometry Measurements Information Object Definition	43
8.1.1.3	Encapsulated PDF Information Object Definition	44
8.1.1.4	Common Modules	45
8.1.1.5	Autorefracton Measurements IOD Modules	47
8.1.1.6	Keratometry Measurements IOD Modules	49
8.1.1.7	Encapsulated PDF IOD Modules	50
8.1.2	Usage of Attributes from Received IODs.....	53
8.1.3	Attribute Mapping .....	53
8.1.4	Coerced/Modified Fields.....	54
8.2	Data Dictionary of Private Attributes .....	55
8.3	Coded Terminology and Templates .....	55
8.3.1	Context Groups.....	55
8.3.2	Template Specifications.....	55
8.3.3	Private Code Definitions .....	55
8.4	Grayscale Image Consistency .....	55
8.5	Standard Extended/Specialized/Private SOP Classes .....	55
8.6	Private Transfer Syntaxes .....	56

## 3 Introduction

### 3.1 Revision History

Table 3-1 Revision History

Document Version	Date	Changes
01	2022-03-11	Initial version of DICOM Conformance Statement for i.Profiler <sup>plus</sup> Application Software

### 3.2 Audience

This document is written for the people that need to understand how i.Profiler<sup>plus</sup> will integrate into their healthcare facility. This includes both those responsible for overall imaging network policy and architecture, as well as integrators who need to have a detailed understanding of the DICOM features of the product. This document contains some basic DICOM definitions so that any reader may understand how this product implements DICOM features. However, integrators are expected to fully understand all the DICOM terminology, how the tables in this document relate to the product's functionality, and how that functionality integrates with other devices that support compatible DICOM features.

### 3.3 Remarks

The scope of this DICOM Conformance Statement is to facilitate integration between i.Profiler<sup>plus</sup> and other DICOM products. The Conformance Statement should be read and understood in conjunction with the DICOM Standard. DICOM by itself does not guarantee interoperability. The Conformance Statement does, however, facilitate a first-level comparison for interoperability between different applications supporting compatible DICOM functionality.

This Conformance Statement is not supposed to replace validation with other DICOM equipment to ensure proper exchange of intended information. In fact, the user should be aware of the following important issues:

- The comparison of different Conformance Statements is just the first step towards assessing interconnectivity and interoperability between the product and other DICOM conformant equipment.
- Test procedures should be defined and executed to validate the required level of interoperability with specific compatible DICOM equipment, as established by the healthcare facility.

### 3.4 Definitions and Terms

Informal definitions are provided for the following terms used in this Conformance Statement.

The DICOM Standard is the authoritative source for formal definitions of these terms.

#### Abstract Syntax

The information agreed to be exchanged between applications, generally equivalent to a Service/Object Pair (SOP) Class.

Examples: Verification SOP Class, Modality Worklist Information Model Find SOP Class, Computed Radiography Image Storage SOP Class.

#### Application Entity (AE)

An end point of a DICOM information exchange, including the DICOM network or media interface software; i.e., the software that sends or receives DICOM information objects or messages. A single device may have multiple Application Entities.

**Application Entity Title**

The externally known name of an Application Entity, used to identify a DICOM application to other DICOM applications on the network.

**Application Context**

The specification of the type of communication used between Application Entities.

Example: DICOM network protocol.

**Association**

A network communication channel set up between Application Entities.

**Attribute**

A unit of information in an object definition; a data element identified by a tag. The information may be a complex data structure (Sequence), itself composed of lower level data elements.

Examples: Patient ID (0010,0020), Accession Number (0008,0050), Photometric Interpretation (0028,0004), Procedure Code Sequence (0008,1032).

**Information Object Definition (IOD)**

The specified set of Attributes that comprise a type of data object; does not represent a specific instance of the data object, but rather a class of similar data objects that have the same properties. The Attributes may be specified as Mandatory (Type 1), Required but possibly unknown (Type 2), or Optional (Type 3), and there may be conditions associated with the use of an Attribute (Types 1C and 2C).

Examples: MR Image IOD, CT Image IOD, Print Job IOD.

**Joint Photographic Experts Group (JPEG)**

A set of standardized image compression techniques, available for use by DICOM applications.

**Media Application Profile**

The specification of DICOM information objects and encoding exchanged on removable media (e.g., CDs)

**Matching Key**

A Query Key that is used for matching (criteria to be used in the C-FIND request to determine whether an entity matches the query).

**Module**

A set of Attributes within an Information Object Definition that are logically related to each other.

Example: Patient Module includes Patient Name, Patient ID, Patient Birth Date, and Patient Sex.

**Negotiation**

First phase of Association establishment that allows Application Entities to agree on the types of data to be exchanged and how that data will be encoded.

**Presentation Context**

The set of DICOM network services used over an Association, as negotiated between Application Entities; includes Abstract Syntaxes and Transfer Syntaxes.

**Protocol Data Unit (PDU)**

A packet (piece) of a DICOM message sent across the network. Devices must specify the maximum size packet they can receive for DICOM messages.

**Query Key**

An input value for a query process. Query Keys denote the set of DICOM Attributes that are sent from the SCU to SCP and thus control the query result.

**Return Key**

A Query Key that may be used to specify desired return Attributes (what information in addition to the Matching Key Attributes has to be returned in the C-FIND response).

### Security Profile

A set of mechanisms, such as encryption, user authentication, or digital signatures, used by an Application Entity to ensure confidentiality, integrity, and/or availability of exchanged DICOM data

### Service Class Provider (SCP)

Role of an Application Entity that provides a DICOM network service; typically, a server that performs operations requested by another Application Entity (Service Class User).

Examples: Picture Archiving and Communication System (image storage SCP, and image query/retrieve SCP), Radiology Information System (modality worklist SCP).

### Service Class User (SCU)

Role of an Application Entity that uses a DICOM network service; typically, a client.

Examples: imaging modality (image storage SCU, and modality worklist SCU), imaging workstation (image query/retrieve SCU)

### Service/Object Pair (SOP) Class

The specification of the network or media transfer (service) of a particular type of data (object); the fundamental unit of DICOM interoperability specification.

Examples: Ultrasound Image Storage Service, Basic Grayscale Print Management.

### Service/Object Pair (SOP) Instance

An information object; a specific occurrence of information exchanged in a SOP Class.

Examples: a specific x-ray image.

### Tag

A 32-bit identifier for a data element, represented as a pair of four digit hexadecimal numbers, the "group" and the "element". If the "group" number is odd, the tag is for a private (manufacturer-specific) data element.

Examples: (0010,0020) [Patient ID], (07FE,0010) [Pixel Data], (0019,0210) [private data element]

### Transfer Syntax

The encoding used for exchange of DICOM information objects and messages.

Examples: JPEG compressed (images), little endian explicit value representation.

### Unique Identifier (UID)

A globally unique "dotted decimal" string that identifies a specific object or a class of objects; an ISO-8824 Object Identifier.

Examples: Study Instance UID, SOP Class UID, SOP Instance UID.

### Value Representation (VR)

The format type of an individual DICOM data element, such as text, an integer, a person's name, or a code. DICOM information objects can be transmitted with either explicit identification of the type of each data element (Explicit VR), or without explicit identification (Implicit VR); with Implicit VR, the receiving application must use a DICOM data dictionary to look up the format of each data element.

## 3.5 Abbreviations

Table 3-2 Abbreviations Used in this Document

Abbreviation	Definition
ACSE	Association Control Service Element
AE	Application Entity
AET	Application Entity Title
ANAP	Attribute Not Always Present

AR	Autorefraction
AUTO	Automatically generated, cannot be modified by the user
CONFIG	Configurable parameter
CZM	Carl Zeiss Meditec
DICOM	Digital Imaging and Communications in Medicine
DIMSE	DICOM Message Service Element
ELE	Explicit VR Little Endian
ID	Identifier
ILE	Implicit VR Little Endian
IM	Information Model
IOD	Information Object Definition
IP	Internet Protocol
ISO	International Organization for Standardization
KER	Keratometry
MWL	Modality Worklist
NEMA	National Electrical Manufacturers Association
NIM	Network Integration Manager
PDF	Portable Document Format
PDU	Protocol Data Unit
PL	Pick list
PoV	Presence of Value
PRQ	Patient Root Query
SCP	Service Class Provider
SCU	Service Class User
SOP	Service Object Pair, union of a specific DICOM service and related IOD
TCP/IP	Transmission Control Protocol / Internet Protocol
UCS	Universal Coded Character Set
UID	Unique Identifier
USER	User input
UTF	UCS Transformation Format
VNAP	Value Not Always Present
VPN	Virtual Private Network
VR	Value Representation

### 3.6 References

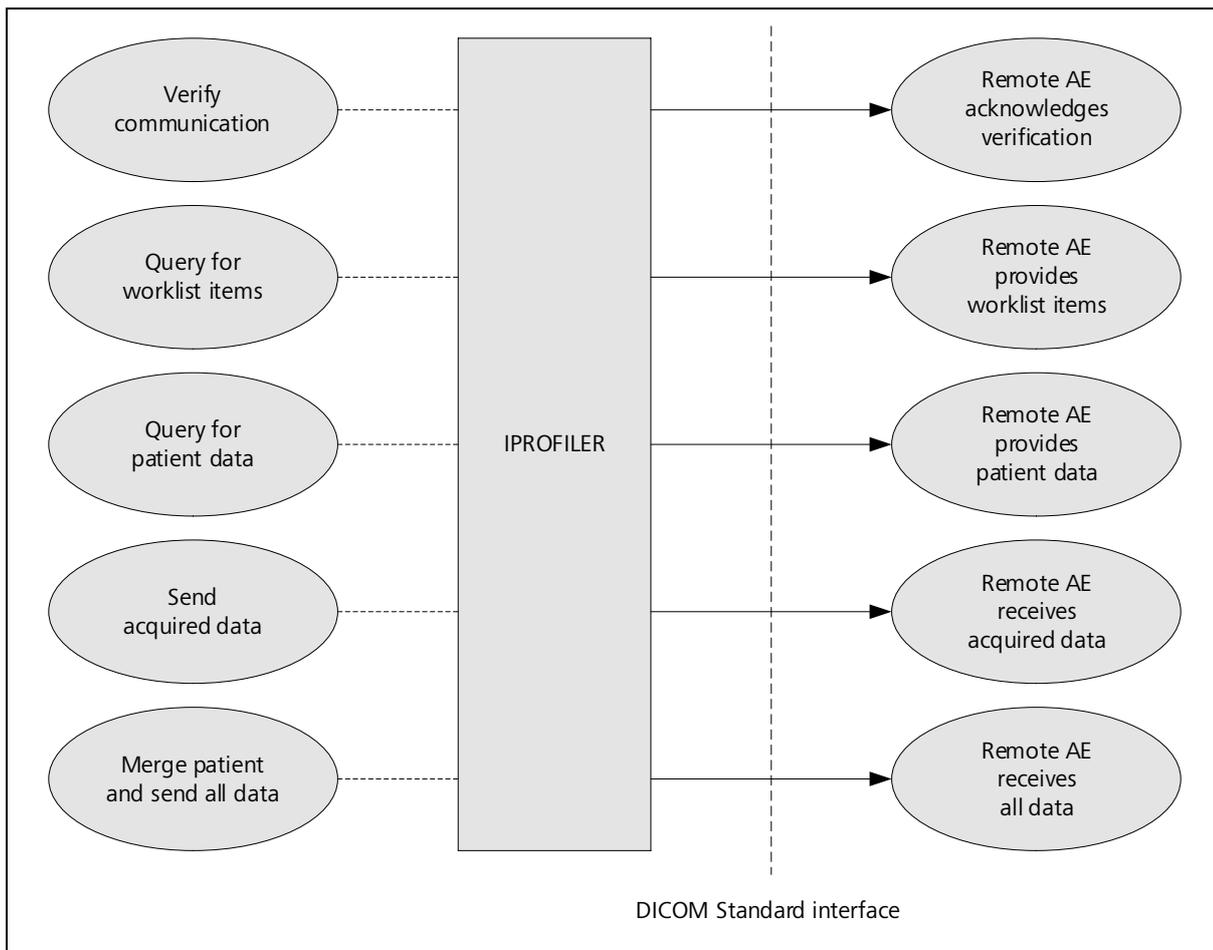
NEMA PS3 / ISO 12052, Digital Imaging and Communications in Medicine (DICOM) Standard, National Electrical Manufacturers Association, Rosslyn, VA, USA (available free at <http://medical.nema.org/>).

## 4 Networking

### 4.1 Implementation Model

#### 4.1.1 Application Data Flow

Figure 4-1 Functional Overview



#### 4.1.2 Functional Definition of AEs

Conceptually, the networking services that are implemented by the i.Profiler<sup>plus</sup> Application Software may be modeled as a single Application Entity (AE).

##### 4.1.2.1 Functional Definition of IPROFILER

The i.Profiler<sup>plus</sup> is a diagnostic device for the measurement and analysis of imaging errors in the human eye. It offers two basic measurement options:

- Precision wavefront measurement with Shack-Hartmann technology
- Placido disc-based corneal topography with central and peripheral keratometry

The IPROFILER Application Entity allows for:

- Verifying the communication with a remote AE
- Querying a remote AE for worklist items
- Querying a remote AE for patient data
- Sending acquired data to a remote AE
- Merging a patient and sending all data to a remote AE

In order to achieve this, the IPROFILER Application Entity implements a Service Class User (SCU) for the following DICOM services:

- Verification
- Modality Worklist Information Model – FIND
- Patient Root Query/Retrieve Information Model – FIND
- Autorefraction Measurements Storage
- Keratometry Measurements Storage
- Encapsulated PDF Storage

Most of the DICOM functionality has been integrated into the usual application user interface and will not require any manual invocation of DICOM-specific operations.

The i.Profiler<sup>plus</sup> Application Software logs extensive information about the DICOM operations to its log file.

### 4.1.3 Sequencing of Real-World Activities

#### 4.1.3.1 IPROFILER Activities

##### Verify communication

When at least one remote AE is configured on the “FORUM” screen of the “Network Settings” and the “Connect” button is pressed, the IPROFILER Application Entity issues a single verification request to each configured remote AE. If the verification fails to any of the remote AEs, an error message is shown. A verification request is also issued during startup, if the device is configured to connect to a FORUM server.

##### Query for worklist items

If configured accordingly, the IPROFILER Application Entity queries the remote Modality Worklist SCP for worklist items. A query is issued automatically when the i.Profiler<sup>plus</sup> Application Software is started and also each time when the “Patient” screen is activated. The resulting worklist items of a query are shown on the user interface in a pick list (Patient Schedule). Details on the requested and displayed DICOM Attributes can be found in Table 4-11.

This activity generates a Scheduled Case. Table 8-24 defines the corresponding Attribute Mapping, i.e. specifies those Attributes that are copied from the selected worklist item to the created SOP Instances.

##### Query for patient data

Alternatively to querying for worklist items, the user can search for patient data stored at a remote AE, provided that a Query SCP has been configured. A query is issued when a text is entered in the input field and the “Search” button is pressed on the “Patient” screen. All matching results are shown on the user interface in a pick list (Search Results). Details on the requested and displayed DICOM Attributes can be found in Table 4-15.

This activity generates an Unscheduled Case. Table 8-25 defines the corresponding Attribute Mapping, i.e. specifies those Attributes that are copied from the selected result dataset to the created SOP Instances.

### **Send acquired data**

After a measurement has been performed and the user pressed the "Save" button, the acquired measurement data is converted, enriched with data from the currently selected item of the pick list and stored in DICOM format. Depending on the type of measurement, SOP Instances of various SOP Classes are created. If configured accordingly, the IPROFILER Application Entity then transfers the created SOP Instances to the remote Storage SCP.

### **Merge patient and send all data**

When a measurement has been performed for a local patient, the data that has been acquired and stored locally can later be sent to the remote Storage SCP. For this purpose, the local patient must first be merged with a corresponding entry in the remote system. After that, all locally stored data for this patient is sent automatically to the remote Storage SCP or, if an error occurred during this activity and the connection has been re-established.

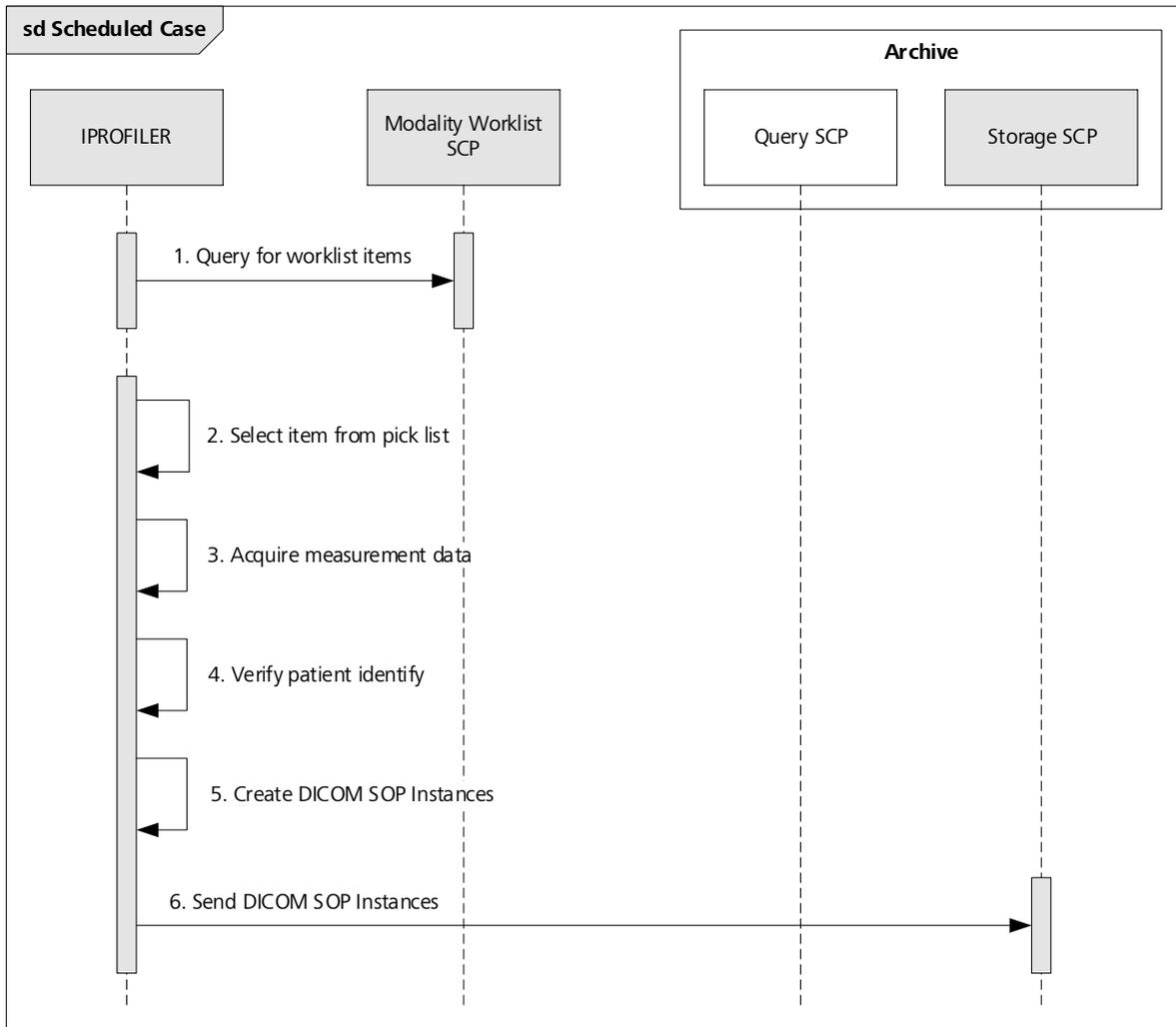
#### **4.1.3.2 Scheduled Case**

Usually, the patient arrives at the front desk and the examination has either been scheduled in advance or can be scheduled directly. In any case, all patient- and study-related information is available at the Modality Worklist SCP and can, therefore, be queried by the IPROFILER Application Entity.

The procedure is as follows: After the current work list has been received, the user selects the appropriate item from the pick list, acquires the measurement data and verifies the identity of the patient displayed on the user interface. Finally, the DICOM SOP instances are created with data from the selected worklist item and sent to the Storage SCP.

Figure 4-2 shows the sequence of activities for this "Scheduled Case".

Figure 4-2 Scheduled Case

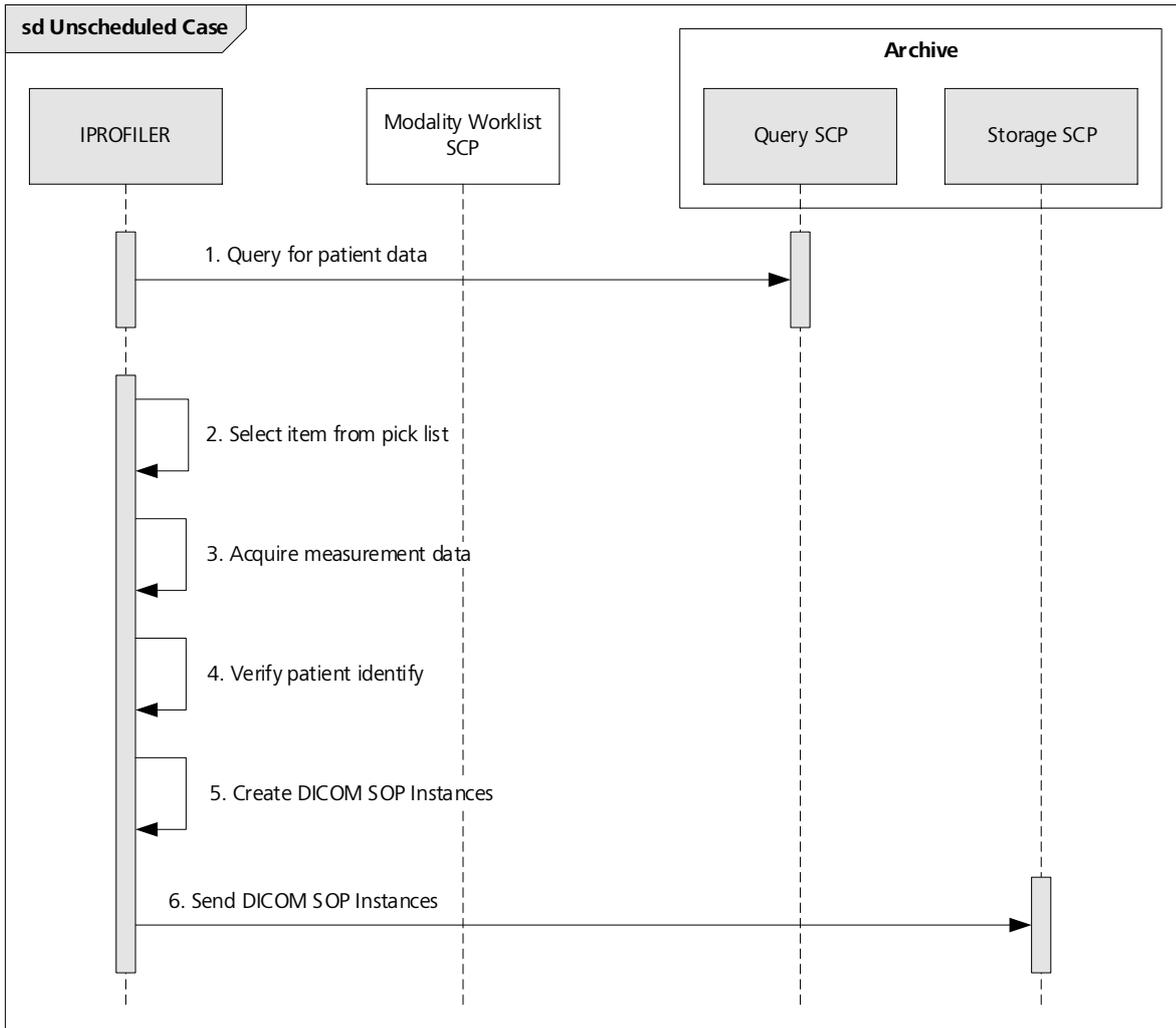


#### 4.1.3.3 Unscheduled Case

If the patient arrives directly at the instrument, so that the patient was not registered at the front desk, or if there is no Modality Worklist SCP available, the examination could not be scheduled or the current worklist cannot be requested, respectively. Since no patient-related data can be entered manually to the instrument (if it is configured to connect to a FORUM server), a query for patient data has to be issued to the configured Query SCP. The IPROFILER Application Entity does not support storing measurement data for an "anonymous patient". The procedure is as follows: After the user sent the query and selected the desired item from the resulting pick list (Search Results), the user acquires the measurement data and verifies the identity of the patient displayed on the user interface. Finally, the DICOM SOP Instances are created with the selected patient data and sent to the Storage SCP.

Figure 4-3 shows the sequence of activities for this "Unscheduled Case".

Figure 4-3 Unscheduled Case



## 4.2 AE Specifications

### 4.2.1 IPROFILER AE Specification

#### 4.2.1.1 SOP Classes

The IPROFILER Application Entity provides Standard Conformance to the following SOP Classes:

**Table 4-1 SOP Classes for IPROFILER**

SOP Class Name	SOP Class UID	SCU	SCP
Verification	1.2.840.10008.1.1	Yes	No
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Yes	No
Keratometry Measurements Storage	1.2.840.10008.5.1.4.1.1.78.3	Yes	No
Patient Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.1.1	Yes	No
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31	Yes	No

#### 4.2.1.2 Associations Policies

##### 4.2.1.2.1 General

The DICOM standard Application Context Name for DICOM 3.0 is always proposed:

**Table 4-2 DICOM Application Context**

Application Context Name	1.2.840.10008.3.1.1.1
--------------------------	-----------------------

##### 4.2.1.2.2 Number of Associations

**Table 4-3 Number of Associations as an Association Initiator for IPROFILER**

Maximum number of simultaneous Associations in total	1
--	---

##### 4.2.1.2.3 Asynchronous Nature

The IPROFILER Application Entity does not support asynchronous communication (multiple outstanding transactions over a single Association).

##### 4.2.1.2.4 Implementation Identifying Information

**Table 4-4 DICOM Implementation Class and Version**

Implementation Class UID	1.2.276.0.75.2.5.20
Implementation Version Name	NIM-2.12.0

#### 4.2.1.3 Association Initiation Policy

##### 4.2.1.3.1 Activity – Verify communication

###### 4.2.1.3.1.1 Description and Sequencing of Activities

The activity “Verify communication” is used during the DICOM configuration phase and during system startup.

###### **DICOM configuration:**

After completing the configuration of the local DICOM Application Entity and the remote DICOM Application Entities, the user triggers the test of the application-level communication between the IPROFILER Application Entity and the configured remote DICOM Application Entities. During a single call, all remote DICOM Application Entities are contacted one after the other.

###### **System startup:**

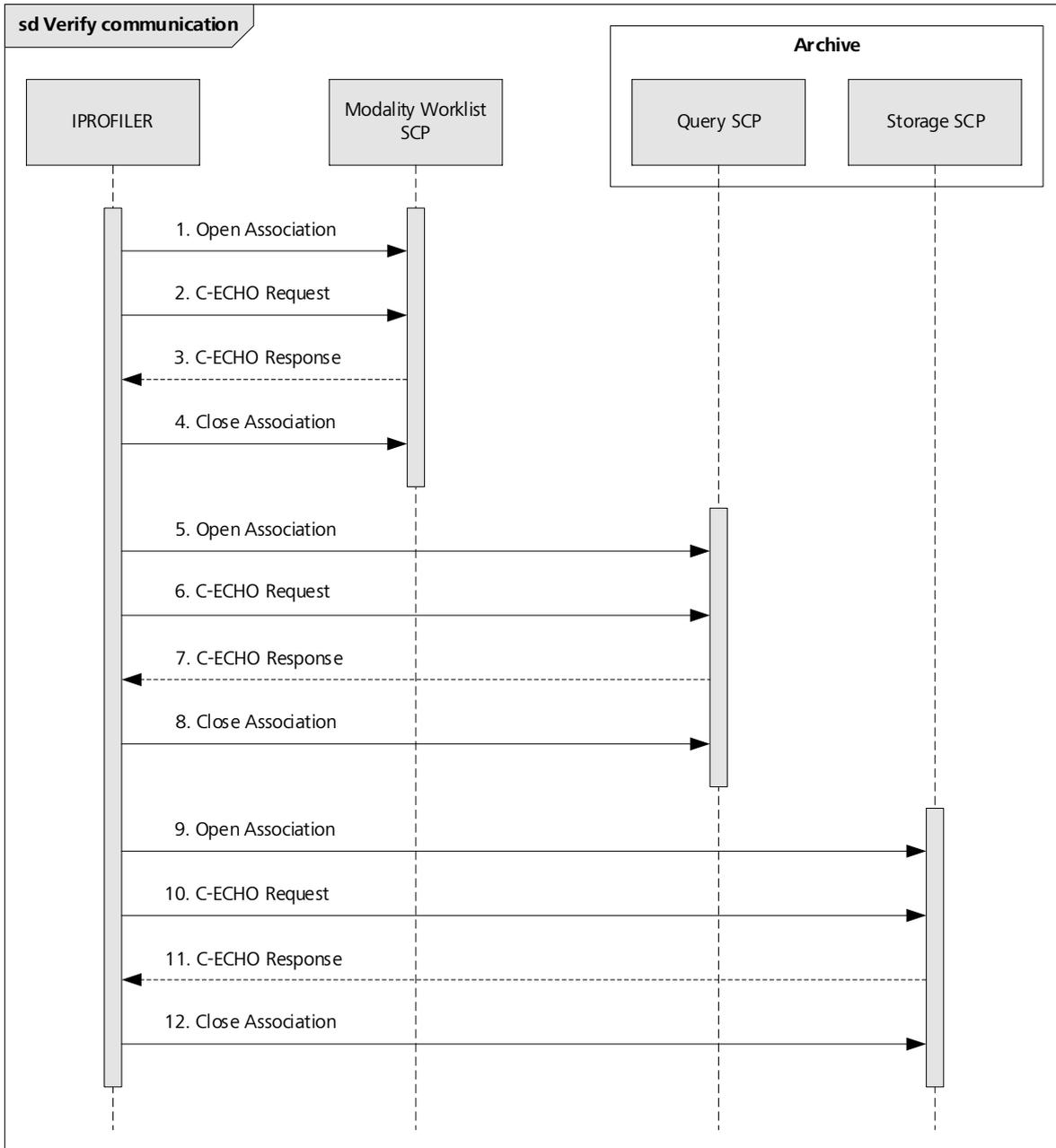
During system startup, the i.Profiler<sup>plus</sup> Application Software automatically initiates the DICOM Verification between the IPROFILER Application Entity and the configured remote DICOM Application Entities.

The results of the “Verify communication” activity are displayed in the “Remote Application Entities” configuration section for each separately configured DICOM service. E.g. for a Storage SCP not only the Verification information is evaluated, but also the acceptance of the proposed Presentation Contexts comprising the respective Storage SOP Classes. If one of the Storage SOP Classes actually used by the IPROFILER Application Entity is not supported or available by the remote Application Entity, the status of all services changes to “offline” and the entire DICOM interface is disabled.

If the verification fails, no retry will be performed.

Table 4-4 shows the basic sequence of activities for “Verify communication”.

**Figure 4-4 Sequencing of Activity “Verify communication”**



#### 4.2.1.3.1.2 Proposed Presentation Contexts

All of the Presentation Contexts listed in in Table 4-5 are offered for each Association that is initiated, but during this activity the IPROFILER uses only:

- Verification with Transfer Syntax ILE as SCU

Each row in Table 4-5 represents one of the proposed Presentation Contexts, i.e. if multiple Transfer Syntaxes are proposed for a single SOP Class, they are proposed in separate Presentation Contexts.

**Table 4-5 Proposed Presentation Contexts for Activity "Verify communication"**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID 1.2.840.10008. ...	Name List	UID List 1.2.840.10008. ...		
Verification	1.1	ILE	1.2	BOTH	None
Storage Commitment Push Model	1.20.1	ILE	1.2	SCU	None
Raw Data Storage	5.1.4.1.1.66	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Encapsulated PDF Storage	5.1.4.1.1.104.1	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Lensometry Measurements Storage	5.1.4.1.1.78.1	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Autorefractometry Measurements Storage	5.1.4.1.1.78.2	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Keratometry Measurements Storage	5.1.4.1.1.78.3	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Subjective Refraction Measurements Storage	5.1.4.1.1.78.4	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Patient Root Query/Retrieve Information Model – FIND	5.1.4.1.2.1.1	ILE	1.2	SCU	See Note <sup>1</sup>
Study Root Query/Retrieve Information Model – FIND	5.1.4.1.2.2.1	ILE	1.2	SCU	See Note <sup>1</sup>
Modality Worklist Information Model – FIND	5.1.4.31	ILE	1.2	SCU	None

Note<sup>1</sup>: Extended negotiation is used to indicate that the SCU supports relational queries. However, relational queries are not used by the IPROFILER Application Entity.

Note<sup>2</sup>: The IPROFILER Application Entity never acts as an SCP.

#### 4.2.1.3.1.3 SOP Specific Conformance for Verification SOP Class

The IPROFILER Application Entity provides Standard Conformance to the Verification SOP Class as an SCU.

The IPROFILER Application Entity will behave as described in Table 4-6 when receiving the C-ECHO response command message.

**Table 4-6 C-ECHO Response Status Handling Behavior for Activity “Verify communication”**

Service Status	Further Meaning	Status Code	Behavior
Success	Success	0000	The requested Verification was confirmed by the remote AE. No message is displayed on the user interface but details are reported to a log file that is available to administrators.
Unknown	All other responses with unknown code meaning	xxxx	An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.

**Table 4-7 Communication Failure Behavior for Activity “Verify communication”**

Exception	Behavior
TCP/IP connection could not be established within the specified time range (configurable parameter).	An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.
Data could not be sent or received on a network socket within the specified time range (non-configurable parameter).	An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.
ACSE response message could not be received within the specified time range (configurable parameter).	An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.
DIMSE response message could not be received within the specified time range (configurable parameter).	An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.
Association aborted by the SCP using A-ABORT or the network layers indicate communication loss (i.e. low-level TCP/IP socket closure).	An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.

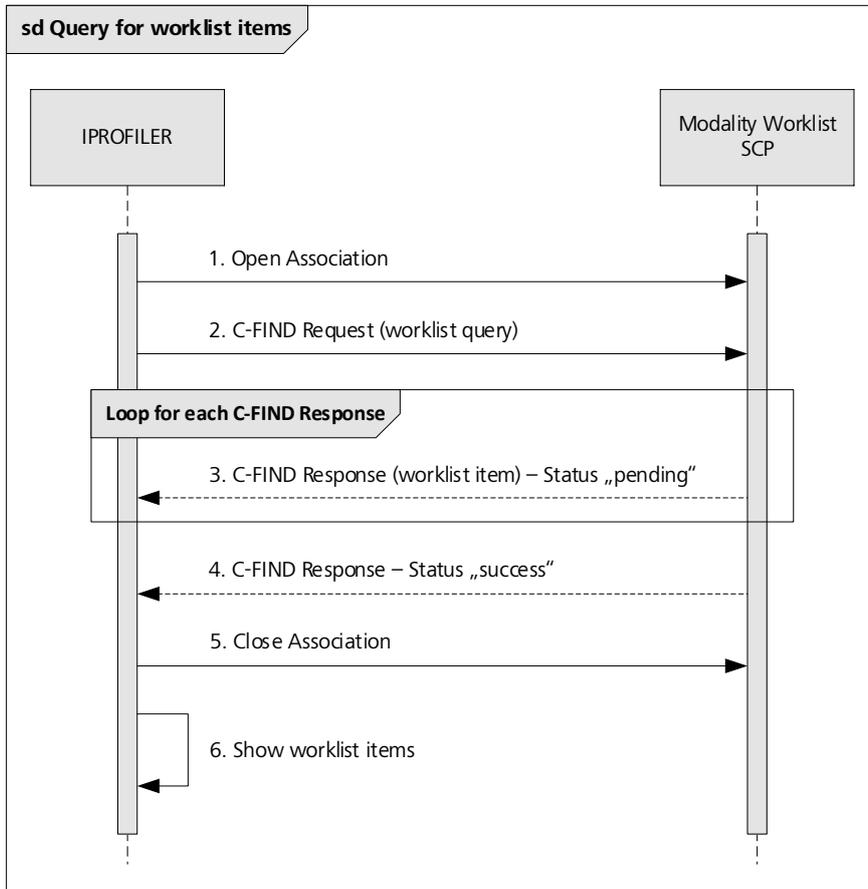
#### 4.2.1.3.2 Activity – Query for worklist items

##### 4.2.1.3.2.1 Description and Sequencing of Activities

The activity “Query for worklist items” is used to query a remote Modality Worklist SCP for worklist items. Such a query is issued automatically when the i.Profiler<sup>plus</sup> Application Software is started and also each time when the “Patient” screen is activated. The resulting worklist items of a query are shown on the user interface in a pick list (Patient Schedule). If no worklist items are returned since there are no matches, the pick list is cleared, and the Unscheduled Case applies (see Section 4.1.3.3). If a query fails, no retry will be performed.

Figure 4-5 shows the basic sequence of activities for “Query for worklist items”.

Figure 4-5 Sequencing of Activity “Query for worklist items”



4.2.1.3.2.2 Proposed Presentation Contexts

All of the Presentation Contexts listed in Table 4-8 are offered for each Association that is initiated, but during this activity the IPROFILER uses only:

- Modality Worklist Information Model – FIND with Transfer Syntax ILE as SCU

Each row in Table 4-8 represents one of the proposed Presentation Contexts, i.e. if multiple Transfer Syntaxes are proposed for a single SOP Class, they are proposed in separate Presentation Contexts.

Table 4-8 Proposed Presentation Contexts for Activity “Query for worklist items”

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID 1.2.840.10008. ...	Name List	UID List 1.2.840.10008. ...		
Verification	1.1	ILE	1.2	BOTH	None
Storage Commitment Push Model	1.20.1	ILE	1.2	SCU	None
Raw Data Storage	5.1.4.1.1.66	ILE	1.2	BOTH <sup>2</sup>	None

		ELE	1.2.1	BOTH <sup>2</sup>	None
Encapsulated PDF Storage	5.1.4.1.1.104.1	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Lensometry Measurements Storage	5.1.4.1.1.78.1	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Autorefractometry Measurements Storage	5.1.4.1.1.78.2	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Keratometry Measurements Storage	5.1.4.1.1.78.3	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Subjective Refraction Measurements Storage	5.1.4.1.1.78.4	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Patient Root Query/Retrieve Information Model – FIND	5.1.4.1.2.1.1	ILE	1.2	SCU	See Note <sup>1</sup>
Study Root Query/Retrieve Information Model – FIND	5.1.4.1.2.2.1	ILE	1.2	SCU	See Note <sup>1</sup>
Modality Worklist Information Model – FIND	5.1.4.31	ILE	1.2	SCU	None

Note<sup>1</sup>: Extended negotiation is used to indicate that the SCU supports relational queries. However, relational queries are not used by the IPROFILER Application Entity.

Note<sup>2</sup>: The IPROFILER Application Entity never acts as an SCP.

#### 4.2.1.3.2.3 SOP Specific Conformance to Modality Worklist Information Model – FIND SOP Class

The IPROFILER Application Entity provides Standard Conformance to the Modality Worklist Information Model – FIND SOP Class as an SCU.

The IPROFILER Application Entity will behave as described in Table 4-9 when receiving the C-FIND response command message.

**Table 4-9 C-FIND Response Status Handling Behavior for Activity “Query for worklist items”**

Service Status	Further Meaning	Status Code	Behavior
Failure	Refused: Out of Resources	A700	No error message is displayed on the user interface, but details are reported to a log file that is available to administrators.
	Error: Data Set does not match SOP Class	A900	No error message is displayed on the user interface, but details are reported to a log file that is available to administrators.
	Failed: Unable to process	C000-CFFF	No error message is displayed on the user interface, but details are reported to a log file that is available to administrators.

	Refused: SOP Class not supported	0122	No error message is displayed on the user interface, but details are reported to a log file that is available to administrators.
Cancel	Matching terminated due to Cancel request	FE00	No message is displayed on the user interface, but details are reported to a log file that is available to administrators.
Success	Matching is complete – No final identifier is supplied	0000	The current query is completed successfully. The pick list on the user interface is updated with the received worklist items. Details are reported to a log file that is available to administrators.
Pending	Matches are continuing – Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Current worklist item is added to an internal list but not yet presented to the user. If a maximum number of responses has been received, a cancel request is sent to the remote AE. Details are reported to a log file that is available to administrators.
	Matches are continuing – Warning that one or more Optional Keys were not supported for existence and/or matching for this Identifier	FF01	Current worklist item is added to an internal list but not yet presented to the user. If a maximum number of responses has been received, a cancel request is sent to the remote AE. Details are reported to a log file that is available to administrators.
Unknown	All other responses with unknown code meaning	xxxx	No error message is displayed on the user interface, but details are reported to a log file that is available to administrators.

**Table 4-10 Communication Failure Behavior for Activity “Query for worklist items”**

Exception	Behavior
TCP/IP connection could not be established within the specified time range (configurable parameter).	An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.
Data could not be sent or received on a network socket within the specified time range (non-configurable parameter).	An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.
ACSE response message could not be received within the specified time range (configurable parameter).	An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.
DIMSE response message could not be received within the specified time range (configurable parameter).	An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.
Association aborted by the SCP using A-ABORT or the network layers indicate communication loss (i.e. low-level TCP/IP socket closure).	An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.

Unexpected Attributes returned in a C-FIND response are ignored in the same manner as requested (optional) Attributes not returned by the SCP. Non-matching responses returned by the SCP due to unsupported Matching Key Attributes are not filtered locally by the IPROFILER Application Entity and thus will still be shown in the pick list. Furthermore, duplicate responses are not filtered out. However, the C-FIND response dataset is checked for "compatibility" with the application before being further processed, i.e. it is checked whether the value field length is within the specified limits and whether all required Attributes are actually present.

The Attribute Specific Character Set (0008,0005) will always be included in the query (with a value of "ISO\_IR 192"). If present in the response, its element value will be used to identify character sets other than the default character set. If the character set is supported (see Section 6), the response dataset is automatically converted to UTF-8. If the character set is not supported or undefined, the response dataset might not be processed correctly (see Section 6 for details).

A cancel request is issued after a maximum number of C-FIND responses has been received (see Section 4.4.2).

The IPROFILER Application Entity uses a broad matching scheme that consists of the Attributes Modality (0008,0060) and Scheduled Procedure Step Start Date (0040,0002). Patient-based queries are not supported.

Table 4-11 lists the Attributes that are requested from the remote AE. It also shows in detail which of these Attributes are used as Matching Keys (with one of the given types of matching), required as Return Keys, might be specified by the user as interactive Query Keys, imported into the application, displayed on the user interface and copied to the created SOP Instance.

**Table 4-11 Attributes involved in Modality Worklist C-FIND Request and Response**

Tag	Tag Name	Query Keys Matching	Mandatory Query Keys Return	Interactive Query Key	Imported	Displayed	Copied to SOP Instance
<b>Scheduled Procedure Step (SPS)</b>							
(0040,0100)	Scheduled Procedure Step Sequence		X				
>(0040,0001)	Scheduled Station Application Entity Title						
>(0040,0002)	Scheduled Procedure Step Start Date	AUTO <sup>1</sup> , S	X		X		
>(0040,0003)	Scheduled Procedure Step Start Time		X		X		
>(0008,0060)	Modality	AUTO <sup>2</sup> , S	X		X		
>(0040,0006)	Scheduled Performing Physicians Name						
>(0040,0007)	Scheduled Procedure Step Description		X <sup>1</sup>		X		X
>(0040,0010)	Scheduled Station Name						
>(0040,0011)	Scheduled Procedure Step Location						
>(0040,0008)	Scheduled Protocol Code Sequence				X		X
>>(0008,0100)	Code Value		X*		X		X
>>(0008,0102)	Coding Scheme Designator		X*		X		X
>>(0008,0103)	Coding Scheme Version				X		X
>>(0008,0104)	Code Meaning		X*		X		X
>(0040,0012)	Pre-Medication						
>(0040,0009)	Scheduled Procedure Step ID		X		X		X

>(0032,1070)	Requested Contrast Agent						
>(0040,0020)	Scheduled Procedure Step Status						
<b>Requested Procedure</b>							
(0040,1001)	Requested Procedure ID		X		X		X
(0032,1060)	Requested Procedure Description		X <sup>2</sup>		X		X
(0032,1064)	Requested Procedure Code Sequence		X <sup>2</sup>		X		
>(0008,0100)	Code Value		X*		X		X
>(0008,0102)	Coding Scheme Designator		X*		X		X
>(0008,0103)	Coding Scheme Version				X		X
>(0008,0104)	Code Meaning		X*		X		X
(0020,000D)	Study Instance UID		X		X		X
(0008,0020)	Study Date						
(0008,0030)	Study Time						
(0008,1110)	Referenced Study Sequence				X		X
>(0008,1150)	Referenced SOP Class UID		X*		X		X
>(0008,1155)	Referenced SOP Instance UID		X*		X		X
(0040,1003)	Requested Procedure Priority						
(0040,1004)	Patient Transport Arrangements						
(0040,1400)	Requested Procedure Comments						
<b>Imaging Service Request</b>							
(0008,0050)	Accession Number				X		X
(0032,1032)	Requesting Physician						
(0008,0090)	Referring Physician's Name				X		X
<b>Visit Identification</b>							
(0038,0010)	Admission ID						
<b>Visit Status</b>							
(0038,0300)	Current Patient Location						
<b>Visit Relationship</b>							
(0008,1120)	Referenced Patient Sequence						
>(0008,1150)	Referenced SOP Class UID						
>(0008,1155)	Referenced SOP Instance UID						
<b>Patient Identification</b>							
(0010,0010)	Patient's Name <sup>1</sup>		X		X	PL	X
(0010,0020)	Patient ID		X		X	PL	X
(0010,0021)	Issuer of Patient ID				X		X
(0010,1000)	Other Patient IDs				X		X
<b>Patient Demographics</b>							
(0010,0030)	Patients Birth Date				X	PL	X

(0010,0040)	Patients Sex				X		X
(0010,1030)	Patients Weight						
(0040,3001)	Confidentiality Constraint on Patient Data Description						
(0010,2160)	Ethnic Group				X		X
(0010,4000)	Patients Comments				X		X
<b>Patient Medical</b>							
(0038,0500)	Patient State						
(0010,2110)	Allergies						
(0010,21C0)	Pregnancy Status						
(0010,2000)	Medical Alerts						
(0038,0050)	Special Needs						

Note <sup>1</sup>: For the patient's name, only the first and last name of the alphabetic component group is displayed on the user interface. However, the entire name including all five components of all three component groups is imported and copied to the SOP Instance.

**Values of column "Query Keys Matching":**

**AUTO**

The value is determined automatically and cannot be modified by the user.

**AUTO<sup>1</sup>**

The value of Scheduled Procedure Step Start Date (0040,0002) is set to the current system date. It cannot be modified by the user.

**AUTO<sup>2</sup>**

The value of Modality (0008,0060) is set to "AR". It cannot be modified by the user.

**S**

The type of matching is Single Value Matching.

**Values of column "Mandatory Query Keys Return":**

**X**

The Attribute shall be present in the Modality Worklist C-FIND response. If any required Attribute is missing, the corresponding response dataset (Scheduled Procedure Step) will be ignored and not imported by the Application Software.

**X\***

The Attribute shall be present in the Modality Worklist C-FIND response if its enclosing sequence is present. If any required Attribute is missing, the corresponding C-FIND response dataset (Scheduled Procedure Step) will be ignored and not imported by the Application Software.

**X<sup>1</sup>**

Either the Scheduled Procedure Step Description (0040,0007) or the Scheduled Protocol Code Sequence (0040,0008) or both shall be present in the Modality Worklist C-FIND response.

**X<sup>2</sup>**

Either the Requested Procedure Description (0032,1060) or the Requested Procedure Code Sequence (0032,1064) or both shall be present in the Modality Worklist C-FIND response.

**Values of column "Imported":****X**

The value gets imported into the application. Thus, this value may affect SOP Instances that are created as a result of the performed examination.

**Values of column "Displayed":****PL**

Values of this Attribute are visible in the pick list.

**Values of column "Copied to SOP Instance":****X**

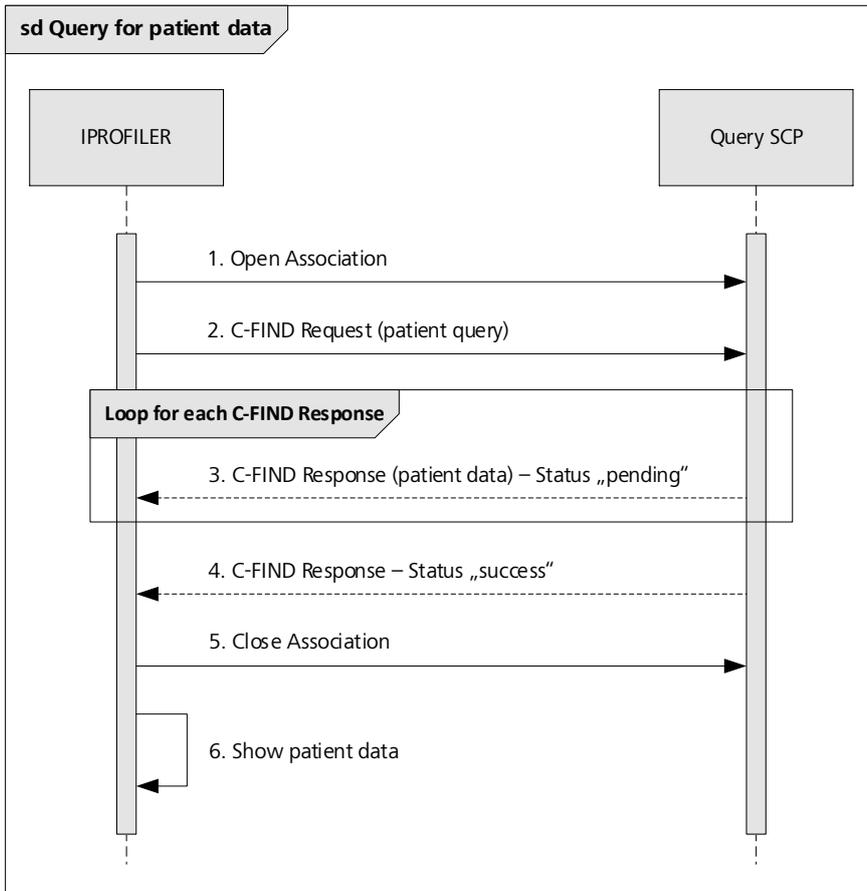
Values of marked Attributes will be stored in created SOP Instances (see Section 8.1.3).

**4.2.1.3.3 Activity - Query for patient data****4.2.1.3.3.1 Description and Sequencing of Activities**

The activity "Query for patient data" is used by the IPROFILER Application Entity to query a remote Query SCP for patient data. If no patient data is available from the worklist during normal operation, the user can query manually for patient data (using one or more supported Matching Key Attributes). If successful, the resulting patient data is shown on the user interface in a pick list. If no patient data is returned since there are no matches, the pick list is cleared. The user could then perform another query using different Matching Key Attributes or different values. If a query fails, no retry will be performed.

Figure 4-6 shows the basic sequence of activities for "Query for patient data".

**Figure 4-6 Sequencing of Activity “Query for patient data”**



**4.2.1.3.3.2 Proposed Presentation Contexts**

All of the Presentation Contexts listed in Table 4-12 are offered for each Association that is initiated, but during this activity the IPROFILER uses only:

- Patient Root Query/Retrieve Information Model – FIND with Transfer Syntax ILE as SCU

Each row in Table 4-12 represents one of the proposed Presentation Contexts, i.e. if multiple Transfer Syntaxes are proposed for a single SOP Class, they are proposed in separate Presentation Contexts.

**Table 4-12 Proposed Presentation Contexts for Activity “Query for patient data”**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID 1.2.840.10008. ...	Name List	UID List 1.2.840.10008. ...		
Verification	1.1	ILE	1.2	BOTH	None
Storage Commitment Push Model	1.20.1	ILE	1.2	SCU	None
Raw Data Storage	5.1.4.1.1.66	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None

Encapsulated PDF Storage	5.1.4.1.1.104.1	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Lensometry Measurements Storage	5.1.4.1.1.78.1	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Autorefractometry Measurements Storage	5.1.4.1.1.78.2	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Keratometry Measurements Storage	5.1.4.1.1.78.3	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Subjective Refraction Measurements Storage	5.1.4.1.1.78.4	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Patient Root Query/Retrieve Information Model – FIND	5.1.4.1.2.1.1	ILE	1.2	SCU	See Note <sup>1</sup>
Study Root Query/Retrieve Information Model – FIND	5.1.4.1.2.2.1	ILE	1.2	SCU	See Note <sup>1</sup>
Modality Worklist Information Model – FIND	5.1.4.31	ILE	1.2	SCU	None

Note<sup>1</sup>: Extended negotiation is used to indicate that the SCU supports relational queries. Although relational queries are not used by the IPROFILER Application Entity, it is required that the SCP supports them.

Note<sup>2</sup>: The IPROFILER Application Entity never acts as an SCP.

#### 4.2.1.3.3.3 SOP Specific Conformance for Patient Root Query/Retrieve Information Model – FIND SOP Class as SCU

The IPROFILER Application Entity provides Standard Conformance to the Patient Root Query/Retrieve Information Model – FIND SOP Class as an SCU.

The IPROFILER Application Entity will behave as described in Table 4-13 when receiving the C-FIND response command message.

**Table 4-13 C-FIND Response Status Handling Behavior for Activity “Query for patient data”**

Service Status	Further Meaning	Status Code	Behavior
Failure	Refused: Out of Resources	A700	No error message is displayed on the user interface, but details are reported to a log file that is available to administrators.
	Error: Data Set does not match SOP Class	A900-A9FF	No error message is displayed on the user interface, but details are reported to a log file that is available to administrators.
	Failed: Unable to process	C000-CFFF	No error message is displayed on the user interface, but details are reported to a log file that is available to administrators.

	Refused: SOP Class not supported	0122	No error message is displayed on the user interface, but details are reported to a log file that is available to administrators.
Cancel	Matching terminated due to Cancel request	FE00	No message is displayed on the user interface, but details are reported to a log file that is available to administrators.
Success	Matching is complete – No final Identifier is supplied	0000	The current query is completed successfully. The pick list on the user interface is updated with the received worklist items. Details are reported to a log file that is available to administrators.
Pending	Matches are continuing – Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Current patient data is added to an internal list but not yet presented to the user. If a maximum number of responses has been received, a cancel request is sent to the remote AE. Details are reported to a log file that is available to administrators.
	Matches are continuing – Warning that one or more Optional Keys were not supported for existence and/or matching for this Identifier	FF01	Current patient data is added to an internal list but not yet presented to the user. If a maximum number of responses has been received, a cancel request is sent to the remote AE. Details are reported to a log file that is available to administrators.
Unknown	All other responses with unknown code meaning	xxxx	No error message is displayed on the user interface, but details are reported to a log file that is available to administrators.

**Table 4-14 Communication Failure Behavior for Activity “Query for patient data”**

Exception	Behavior
TCP/IP connection could not be established within the specified time range (configurable parameter).	An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.
Data could not be sent or received on a network socket within the specified time range (non-configurable parameter).	An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.
ACSE response message could not be received within the specified time range (configurable parameter).	An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.
DIMSE response message could not be received within the specified time range (configurable parameter).	An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.
Association aborted by the SCP using A-ABORT or the network layers indicate communication loss (i.e. low-level TCP/IP socket closure).	An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.

All queries are performed on PATIENT level. Other query/retrieve levels are not supported.

Unexpected Attributes returned in a C-FIND response are ignored in the same manner as requested (optional) Attributes not returned by the SCP. Non-matching responses returned by the SCP due to unsupported Matching Key Attributes are not filtered locally by the IPROFILER Application Entity and thus will still be shown in the pick list. Furthermore, duplicate responses are not filtered out. However, the C-FIND response dataset is checked for "compatibility" with the application before being further processed, i.e. it is checked whether the value field length is within the specified limits and whether all required Attributes are actually present.

The Attribute Specific Character Set (0008,0005) will always be included in the query (with a value of "ISO\_IR 192"). If present in the response, its element value will be used to identify character sets other than the default character set. If the character set is supported (see Section 6), the response dataset is automatically converted to UTF-8. If the character set is not supported or undefined, the response dataset might not be processed correctly (see Section 6 for details).

A cancel request is issued after a maximum number of C-FIND responses has been received (see Section 4.4.2).

The IPROFILER Application Entity uses a flexible matching scheme that consists of the Attributes Patient's Name (0010,0010) and Patient's Birth Date (0010,0030). At least one of these Attributes has to be specified by the user with a non-empty value but also a combination of Attributes is allowed. The resulting responses are collected to fill the pick list on the user interface.

Table 4-15 lists the Attributes that are requested from the remote AE. It also shows in detail which of these Attributes are used as Matching Keys (with one of the given types of matching), required to be returned with a value, might be specified by the user as interactive Query Keys, imported into the application, displayed on the user interface and copied to the created SOP Instance.

**Table 4-15 Attributes involved in Patient Root Query/Retrieve C-FIND Request and Response**

Tag	Tag Name	Query Keys Matching	Mandatory Query Keys Return	Interactive Query Key	Imported	Displayed	Copied to SOP Instance
<b>Query/Retrieve Level PATIENT</b>							
(0010,0010)	Patient's Name <sup>1</sup>	W	X	X	X	X	X
(0010,0020)	Patient ID	U			X		X
(0010,0021)	Issuer of Patient ID	U			X		X
(0010,0030)	Patient's Birth Date	S, U		X	X	X	X
(0010,0040)	Patient's Sex	U			X		X
(0010,1000)	Other Patient IDs	U			X		
(0010,2160)	Ethnic Group	U			X		X
(0010,4000)	Patient Comments	U			X		X

Note<sup>1</sup>: For the patient's name, only the first and last name of the of the alphabetic component group is displayed on the user interface. However, the entire name including all five components of all three component groups is imported and copied to the SOP Instance.

**Values of Column "Query Keys Matching":**

**S**

The type of matching is Single Value Matching.

**U**

The type of matching is Universal Matching.

**W**

The type of matching is Wild Card Matching.

**Values of Column "Mandatory Query Keys Return":****X**

The Attribute shall be present in the Patient Root Query/Retrieve C-FIND response. If any required Attribute is missing, the corresponding C-FIND response dataset will be ignored and not imported by the Application Software.

**Values of Column "Imported":****X**

The value gets imported into the application. Thus, this value may affect SOP Instances that are created as a result of the performed examination.

**Values of Column "Displayed":****X**

Values of this Attribute are visible in the pick list.

**Values of Column "Copied to SOP Instance":****X**

Values of marked Attributes will be stored in created SOP Instances (see Section 8.1.3).

**Table 4-16 Query Key Details for Patient Root Query/Retrieve C-FIND Request**

Tag	Tag Name	Description
(0010,0010)	Patient's Name	The default value is an empty string. Only family name and given name can be used for matching. This is a Required Key Attribute on PATIENT level, i.e. every implementation of an SCP must support it.
(0010,0030)	Patient's Birth Date	The default value is an empty string. The user can enter a specific value that conforms to the Value Representation "DA". This is an Optional Key Attribute on PATIENT level, i.e. the support of this Attribute depends on the implementation of the SCP.

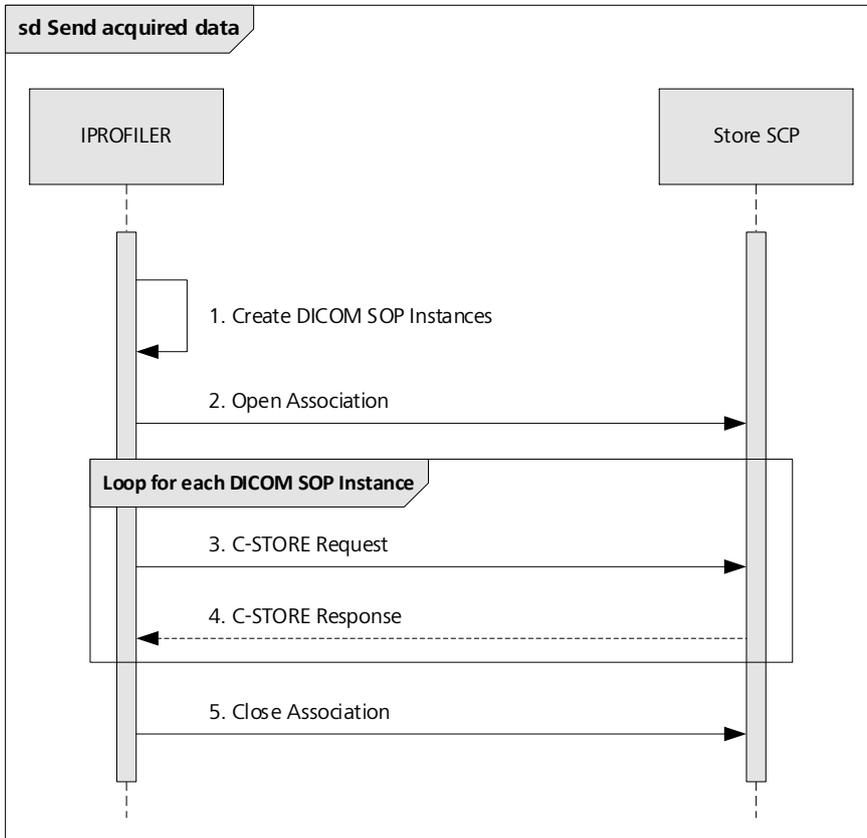
#### 4.2.1.3.4 Activity – Send acquired data

##### 4.2.1.3.4.1 Description and Sequencing of Activities

The activity "Send acquired data" is used by the IPROFILER Application Entity to transfer acquired data to a remote Storage SCP. After a measurement has been made and the user pressed the "Save" button, the acquired measurement data is converted, enriched with data from the currently selected item of the pick list and stored in DICOM format. Depending on the type of measurement, SOP Instances of various SOP Classes are created. Finally, the created SOP Instances are transferred to the remote Storage SCP using the appropriate

Storage SOP Class. If sending of an SOP Instance fails, no automatic retry will be performed. However, when a new Association has been established, an attempt will be made to send the remaining SOP Instances. Figure 4-7 shows the basic sequence of activities for "Send acquired data".

**Figure 4-7 Sequencing of Activity "Send acquired data"**



#### 4.2.1.3.4.2 Proposed Presentation Contexts

All of the Presentation Contexts listed in Table 4-17 are offered for each Association that is initiated, but during this activity the IPROFILER uses only:

- Autorefractometry Measurements Storage with Transfer Syntax ELE (Transfer Syntax ILE as fallback) as SCU
- Keratometry Measurements Storage with Transfer Syntax ELE (Transfer Syntax ILE as fallback) as SCU
- Encapsulated PDF Storage with Transfer Syntax ELE (Transfer Syntax ILE as fallback) as SCU

Each row in Table 4-17 represents one of the proposed Presentation Contexts, i.e. if multiple Transfer Syntaxes are proposed for a single SOP Class, they are proposed in separate Presentation Contexts.

**Table 4-17 Proposed Presentation Contexts for Activity “Send acquired data”**

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID 1.2.840.10008. ...	Name List	UID List 1.2.840.10008. ...		
Verification	1.1	ILE	1.2	BOTH	None
Storage Commitment Push Model	1.20.1	ILE	1.2	SCU	None
Raw Data Storage	5.1.4.1.1.66	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Encapsulated PDF Storage	5.1.4.1.1.104.1	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Lensometry Measurements Storage	5.1.4.1.1.78.1	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Autorefractometry Measurements Storage	5.1.4.1.1.78.2	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Keratometry Measurements Storage	5.1.4.1.1.78.3	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Subjective Refraction Measurements Storage	5.1.4.1.1.78.4	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Patient Root Query/Retrieve Information Model – FIND	5.1.4.1.2.1.1	ILE	1.2	SCU	See Note <sup>1</sup>
Study Root Query/Retrieve Information Model – FIND	5.1.4.1.2.2.1	ILE	1.2	SCU	See Note <sup>1</sup>
Modality Worklist Information Model – FIND	5.1.4.31	ILE	1.2	SCU	None

Note<sup>1</sup>: Extended negotiation is used to indicate that the SCU supports relational queries. However, relational queries are not used by the IPROFILER Application Entity.

Note<sup>2</sup>: The IPROFILER Application Entity never acts as an SCP.

If offered a choice of Transfer Syntaxes in the accepted Presentation Contexts, the IPROFILER Application Entity will prefer the Transfer Syntax Explicit VR Little Endian (ELE).

**4.2.1.3.4.3 SOP Specific Conformance to Storage SOP Classes**

The IPROFILER Application Entity provides Standard Conformance to the respective Storage SOP Class as an SCU.

The IPROFILER Application Entity will behave as described in Table 4-18 when receiving the C-STORE response command message.

**Table 4-18 C-STORE Response Status Handling Behavior for Activity "Send acquired data"**

Service Status	Further Meaning	Status Code	Behavior
Failure	Refused: Out of Resources	A700-A7FF	Two retries are made before this is treated as a permanent failure. The error status is displayed on the user interface. Details are reported to a log file that is available to administrators.
	Error: Data Set does not match SOP Class	A900-A9FF	This is treated as a permanent failure. No retries are made. The error status is displayed on the user interface. Details are reported to a log file that is available to administrators.
	Error: Cannot understand	C000-CFFF	This is treated as a permanent failure. No retries are made. The error status is displayed on the user interface. Details are reported to a log file that is available to administrators.
	Refused: SOP Class not supported	0122	This is treated as a permanent failure. No retries are made. The error status is displayed on the user interface. Details are reported to a log file that is available to administrators.
Warning	Coercion of Data Elements	B000	This is treated as an error. No retries are made and the remaining SOP Instances are not sent. The error status is displayed on the user interface. Details are reported to a log file that is available to administrators.
	Data Set does not match SOP Class	B007	This is treated as an error. No retries are made and the remaining SOP Instances are not sent. The error status is displayed on the user interface. Details are reported to a log file that is available to administrators.
	Elements Discarded	B006	This is treated as an error. No retries are made and the remaining SOP Instances are not sent. The error status is displayed on the user interface. Details are reported to a log file that is available to administrators.
Success	Success	0000	The SOP Instance was received successfully by the remote AE. The success status is displayed on the user interface. Details are reported to a log file that is available to administrators.
Unknown	All other responses with unknown code	xxxx	This is treated as a permanent failure. An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.

**Table 4-19 C-STORE Communication Failure Behavior for Activity “Send acquired data”**

Exception	Behavior
TCP/IP connection could not be established within the specified time range (configurable parameter).	An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.
Data could not be sent or received on a network socket within the specified time range (non-configurable parameter).	An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.
ACSE response message could not be received within the specified time range (configurable parameter).	An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.
DIMSE response message could not be received within the specified time range (configurable parameter).	An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.
Association aborted by the SCP using A-ABORT or the network layers indicate communication loss (i.e. low-level TCP/IP socket closure).	An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.

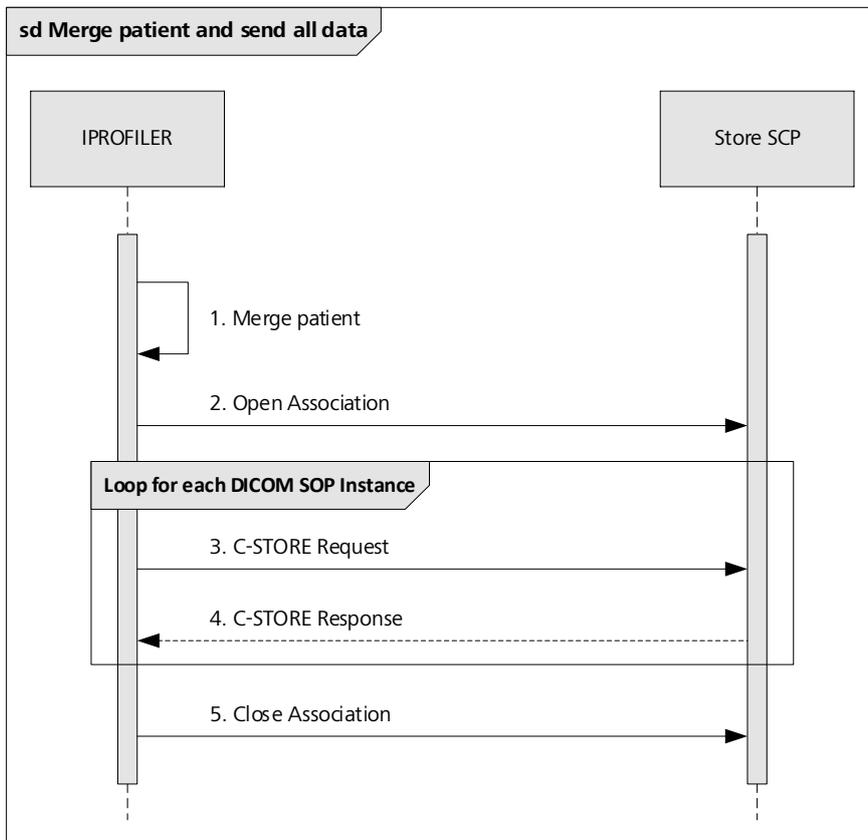
**4.2.1.3.1 Activity – Merge patient and send all data**

**4.2.1.3.1.1 Description and Sequencing of Activities**

The activity “Merge patient and send all data” is used by the IPROFILER Application Entity when a measurement has been performed for a local patient and the user later wants to send the data that has been acquired and stored locally to the remote Storage SCP. For this purpose, the local patient must first be merged with a corresponding entry in the remote system. After that, all locally stored data for this patient is transferred automatically to the remote Storage SCP. If sending of an SOP Instance fails, no automatic retry will be performed. However, when a new Association has been established, an attempt will be made to send the remaining SOP Instances.

Figure 4-8 shows the basic sequence of activities for “Merge patient and send all data”.

Figure 4-8 Sequencing of Activity “Merge patient and send all data”



4.2.1.3.1.2 Proposed Presentation Contexts

All of the Presentation Contexts listed in Table 4-20 are offered for each Association that is initiated, but during this activity the IPROFILER uses only:

- Autorefraction Measurements Storage with Transfer Syntax ELE (Transfer Syntax ILE as fallback) as SCU
- Keratometry Measurements Storage with Transfer Syntax ELE (Transfer Syntax ILE as fallback) as SCU
- Encapsulated PDF Storage with Transfer Syntax ELE (Transfer Syntax ILE as fallback) as SCU

Each row in Table 4-20 represents one of the proposed Presentation Contexts, i.e. if multiple Transfer Syntaxes are proposed for a single SOP Class, they are proposed in separate Presentation Contexts.

Table 4-20 Proposed Presentation Contexts for Activity “Merge patient and send all data”

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID 1.2.840.10008. ...	Name List	UID List 1.2.840.10008. ...		
Verification	1.1	ILE	1.2	BOTH	None
Storage Commitment Push Model	1.20.1	ILE	1.2	SCU	None

Raw Data Storage	5.1.4.1.1.66	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Encapsulated PDF Storage	5.1.4.1.1.104.1	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Lensometry Measurements Storage	5.1.4.1.1.78.1	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Autorefractometry Measurements Storage	5.1.4.1.1.78.2	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Keratometry Measurements Storage	5.1.4.1.1.78.3	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Subjective Refraction Measurements Storage	5.1.4.1.1.78.4	ILE	1.2	BOTH <sup>2</sup>	None
		ELE	1.2.1	BOTH <sup>2</sup>	None
Patient Root Query/Retrieve Information Model – FIND	5.1.4.1.2.1.1	ILE	1.2	SCU	See Note <sup>1</sup>
Study Root Query/Retrieve Information Model – FIND	5.1.4.1.2.2.1	ILE	1.2	SCU	See Note <sup>1</sup>
Modality Worklist Information Model – FIND	5.1.4.31	ILE	1.2	SCU	None

Note<sup>1</sup>: Extended negotiation is used to indicate that the SCU supports relational queries. However, relational queries are not used by the IPROFILER Application Entity.

Note<sup>2</sup>: The IPROFILER Application Entity never acts as an SCP.

If offered a choice of Transfer Syntaxes in the accepted Presentation Contexts, the IPROFILER Application Entity will prefer the Transfer Syntax Explicit VR Little Endian (ELE).

#### 4.2.1.3.1.3 SOP Specific Conformance to Storage SOP Classes

The IPROFILER Application Entity provides Standard Conformance to the respective Storage SOP Class as an SCU.

The IPROFILER Application Entity will behave as described in Table 4-21 when receiving the C-STORE response command message.

**Table 4-21 C-STORE Response Status Handling Behavior for Activity “Merge patient and send all data”**

Service Status	Further Meaning	Status Code	Behavior
Failure	Refused: Out of Resources	A700-A7FF	Two retries are made before this is treated as a permanent failure. The error status is displayed on the user interface. Details are reported to a log file that is available to administrators.

	Error: Data Set does not match SOP Class	A900-A9FF	This is treated as a permanent failure. No retries are made. The error status is displayed on the user interface. Details are reported to a log file that is available to administrators.
	Error: Cannot understand	C000-CFFF	This is treated as a permanent failure. No retries are made. The error status is displayed on the user interface. Details are reported to a log file that is available to administrators.
	Refused: SOP Class not supported	0122	This is treated as a permanent failure. No retries are made. The error status is displayed on the user interface. Details are reported to a log file that is available to administrators.
Warning	Coercion of Data Elements	B000	This is treated as an error. No retries are made and the remaining SOP Instances are not sent. The error status is displayed on the user interface. Details are reported to a log file that is available to administrators.
	Data Set does not match SOP Class	B007	This is treated as an error. No retries are made and the remaining SOP Instances are not sent. The error status is displayed on the user interface. Details are reported to a log file that is available to administrators.
	Elements Discarded	B006	This is treated as an error. No retries are made and the remaining SOP Instances are not sent. The error status is displayed on the user interface. Details are reported to a log file that is available to administrators.
Success	Success	0000	The SOP Instance was received successfully by the remote AE. The success status is displayed on the user interface. Details are reported to a log file that is available to administrators.
Unknown	All other responses with unknown code	xxxx	This is treated as a permanent failure. An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.

**Table 4-22 C-STORE Communication Failure Behavior for Activity "Merge patient and send all data"**

Exception	Behavior
TCP/IP connection could not be established within the specified time range (configurable parameter).	An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.
Data could not be sent or received on a network socket within the specified time range (non-configurable parameter).	An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.

ACSE response message could not be received within the specified time range (configurable parameter).	An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.
DIMSE response message could not be received within the specified time range (configurable parameter).	An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.
Association aborted by the SCP using A-ABORT or the network layers indicate communication loss (i.e. low-level TCP/IP socket closure).	An error message is displayed on the user interface. Details are reported to a log file that is available to administrators.

#### 4.2.1.4 Association Acceptance Policy

The IPROFILER Application Entity does not accept Associations.

### 4.3 Network Interfaces

#### 4.3.1 Physical Network Interface

The physical network interface is not visible for the i.Profiler<sup>plus</sup> Application Software. It uses the communication stack offered by the operating system.

#### 4.3.2 Additional Protocols

The i.Profiler<sup>plus</sup> supports DHCP (Dynamic Host Configuration Protocol) as a client in order to automatically assign an IP address and other network configuration parameters to the device. In general, the entire network configuration is managed by the operating system.

#### 4.3.3 IPv4 and IPv6 Support

The i.Profiler<sup>plus</sup> only supports IPv4 connections.

### 4.4 Configuration

The network-related configuration is usually specified at the time of installation by service personnel. The following settings are available on the "FORUM" screen in the network configuration of the i.Profiler<sup>plus</sup>.

#### 4.4.1 AE Title/Presentation Address Mapping

The mapping from AE Titles to IP addresses and TCP/IP ports is configurable as described in the following subsections. Both local and remote AEs are assigned a logical name that is used to describe them in the user interface.

##### 4.4.1.1 Local AE Titles

The local IP address is administered by the operating system. Changes to the network configuration can only be done by service personnel. The local AE Title is configurable. Table 4-23 shows the default values.

**Table 4-23 AE Title Configuration Table**

Application Entity	Default AE Title	Default TCP/IP Port
IPROFILER	iPP FORUM	–

#### 4.4.1.2 Remote AE Titles/Presentation Address Mapping

The remote AE Titles, IP addresses and TCP/IP ports can be configured individually for the following services in the "Network" section of the "Settings" screen.

##### 4.4.1.2.1 Workflow Management

The IPROFILER Application Entity allows for specifying a single remote Modality Worklist SCP. After the AE Title, IP address and TCP/IP port of the remote AE have been configured, the settings can be checked by pressing the "Test connection" button.

##### 4.4.1.2.1 Storage

The IPROFILER Application Entity allows for specifying a single remote Storage SCP. After the AE Title, IP address and TCP/IP port of the remote AE have been configured, the settings can be checked by pressing the "Test connection" button.

##### 4.4.1.2.1 Query/Retrieve

The IPROFILER Application Entity allows for specifying a single remote Query SCP. After the AE Title, IP address and TCP/IP port of the remote AE have been configured, the settings can be checked by pressing the "Test connection" button.

#### 4.4.2 Parameters

##### 4.4.2.1 General Parameters

The IPROFILER Application Entity allows for configuring a number of parameters. Table 4-24 only shows those configuration parameters that are relevant to DICOM communication.

**Table 4-24 Configuration Parameters**

Parameter	Configurable (Yes/No)	Default Value
<b>General Parameters</b>		
DIMSE RSP timeout	Yes <sup>1</sup> (10 – 60 sec)	20 sec
Network timeout	Yes <sup>1</sup> (5-20 sec)	20 sec
Max. Association idle time	Yes <sup>1</sup> (10 – 60 sec)	30 sec
Max. PDU size the AE can receive	No	16,384 bytes
Network log level	Yes	Error
<b>Modality Worklist SCU Parameters</b>		
Maximum number of query responses	No	999
<b>Query/Retrieve SCU Parameters</b>		
Maximum number of query responses	No	999

Note<sup>1</sup>: This parameter is only configurable by service personnel.

## 5 Media Interchange

Media Interchange is not supported by the i.Profiler<sup>plus</sup> Application Software.

## 6 Support of Character Sets

The IPROFILER Application Entity fully supports the character set listed in Table 6-1.

**Table 6-1 Supported Character Set**

Supported Specific Character Set	
Character Set Description	Defined Term
UTF-8 encoded Unicode	ISO_IR 192

For the activities “Query for worklist items” and “Query for patient data”, the Specific Character Set (0008,0005) Attribute is always added to the C-FIND request dataset with a value of “ISO\_IR 192” (UTF-8). In the C-FIND response dataset, all character sets that are listed in Table 6-2 can be processed. Internally, the response dataset is automatically converted to UTF-8. If an unsupported or undefined specific character set is received with a C-FIND response dataset, it might result in special characters not being displayed correctly and not being stored correctly in the created SOP Instances.

**Table 6-2 Supported Character Sets in C-FIND Response Dataset**

Character Set Description	Defined Term	Defined Term (with Code Extensions)
Default repertoire (ASCII)		ISO 2022 IR 6
Latin alphabet No. 1	ISO_IR 100	ISO 2022 IR 100
Latin alphabet No. 2	ISO_IR 101	ISO 2022 IR 101
Latin alphabet No. 3	ISO_IR 109	ISO 2022 IR 109
Latin alphabet No. 4	ISO_IR 110	ISO 2022 IR 110
Latin alphabet No. 5	ISO_IR 148	ISO 2022 IR 148
Cyrillic	ISO_IR 144	ISO 2022 IR 144
Arabic	ISO_IR 127	ISO 2022 IR 127
Greek	ISO_IR 126	ISO 2022 IR 126
Hebrew	ISO_IR 138	ISO 2022 IR 138
Japanese	ISO_IR 13	ISO 2022 IR 13
Thai	ISO_IR 166	ISO 2022 IR 166
Japanese	–	ISO 2022 IR 87
Japanese	–	ISO 2022 IR 159
Korean	–	ISO 2022 IR 149
Chinese	GB18030	–
UTF-8 encoded Unicode	ISO_IR 192	–

For the activity “Send acquired data”, the value of the Specific Character Set (0008,0005) Attribute in the created SOP Instances is always set to “ISO\_IR 192”, so the character strings are encoded with UTF-8. The user interface supports the display of all characters of the UTF-8 character set.

## 7 Security

### 7.1 Security Profiles

The i.Profiler<sup>plus</sup> does not support any security profiles.

### 7.2 Association Level Security

The i.Profiler<sup>plus</sup> does not support any association level security.

### 7.3 Application Level Security

The DICOM capabilities of the i.Profiler<sup>plus</sup> Application Software do not support any specific security measures.

- It is assumed that i.Profiler<sup>plus</sup> Application Software is used within a secured environment. It is assumed that a secured environment includes at a minimum Firewall or router protections to ensure that only approved external hosts have network access to i.Profiler<sup>plus</sup> Application Software.
- Firewall or router protections to ensure that i.Profiler<sup>plus</sup> Application Software only has network access to approve external hosts and services.
- Any communication with external hosts and services outside the locally secured environment use appropriate secure network channels (e.g. such as a Virtual Private Network (VPN)).

Other network security procedures such as automated intrusion detection may be appropriate in some environments. Additional security features may be established by the local security policy and are beyond the scope of this conformance statement.

The basic configuration of the system can only be changed by service personnel.

## 8 Annexes

### 8.1 IOD Contents

#### 8.1.1 Created SOP Instance(s)

##### Abbreviations used for Presence of Values (PoV):

**VNAP**

Value Not Always Present (Attribute sent zero length if no value is present)

**ANAP**

Attribute is not always present

**ALWAYS**

Attribute is always present with a value

**EMPTY**

Attribute is sent without a value

##### Abbreviations used for Sources of Data (Source):

**USER**

The Attribute value source is from User input

**AUTO**

The Attribute value is generated automatically

**CONFIG**

The Attribute value source is a configurable parameter

**ACQUISITION**

The Attribute value is generated from data acquisition/measurement process

**ANALYSIS**

The Attribute value is generated from a post-acquisition data analysis/calculation

**MWL**

The Attribute value is the same as the value received using the DICOM Modality Worklist service

**PRQ**

The Attribute value is same as the value received using the DICOM Patient Root Query service

### 8.1.1.1 Autorefractometry Measurements Information Object Definition

Table 8-1 Autorefractometry Measurements IOD – Module Overview

IE	Module	Reference	Presence of Module
Patient	Patient	Table 8-4	ALWAYS
	Clinical Trial Subject		NEVER
Study	General Study	Table 8-5	ALWAYS
	Patient Study		NEVER
	Clinical Trial Study		NEVER
Series	General Series	Table 8-6	ALWAYS
	Autorefractometry Measurements Series	Table 8-9	ALWAYS
	Clinical Trial Series		NEVER
Equipment	General Equipment	Table 8-7	ALWAYS
	Enhanced General Equipment	Table 8-8	ALWAYS
Measurements	General Ophthalmic Refractive Measurements	Table 8-10	ALWAYS
	Autorefractometry Measurements	Table 8-11	ALWAYS
	CZM NIM Internal ( <i>private</i> )	Table 8-12	ALWAYS
	SOP Common	Table 8-13	ALWAYS

### 8.1.1.2 Keratometry Measurements Information Object Definition

Table 8-2 Keratometry Measurements IOD – Module Overview

IE	Module	Reference	Presence of Module
Patient	Patient	Table 8-4	ALWAYS
	Clinical Trial Subject		NEVER
Study	General Study	Table 8-5	ALWAYS
	Patient Study		NEVER
	Clinical Trial Study		NEVER
Series	General Series	Table 8-6	ALWAYS
	Keratometry Measurements Series	Table 8-14	ALWAYS
	Clinical Trial Series		NEVER
Equipment	General Equipment	Table 8-7	ALWAYS
	Enhanced General Equipment	Table 8-8	ALWAYS
Measurements	General Ophthalmic Refractive Measurements	Table 8-15	ALWAYS
	Keratometry Measurements	Table 8-16	ALWAYS
	CZM NIM Internal ( <i>private</i> )	Table 8-17	ALWAYS
	SOP Common	Table 8-18	ALWAYS

### 8.1.1.3 Encapsulated PDF Information Object Definition

**Table 8-3 Encapsulated PDF IOD – Module Overview**

IE	Module	Reference	Presence of Module
Patient	Patient	Table 8-4	ALWAYS
	Clinical Trial Subject		NEVER
Study	General Study	Table 8-5	ALWAYS
	Patient Study		NEVER
	Clinical Trial Study		NEVER
Series	Encapsulated Document Series	Table 8-19	ALWAYS
	Clinical Trial Series		NEVER
	CZM Encapsulated PDF Series Extension ( <i>private</i> )		NEVER
Equipment	General Equipment	Table 8-7	ALWAYS
	SC Equipment	Table 8-20	ALWAYS
Encapsulated Document	Encapsulated Document	Table 8-21	ALWAYS
	CZM NIM Internal ( <i>private</i> )	Table 8-22	ALWAYS
	CZM Encapsulated PDF Instance Extension ( <i>private</i> )		NEVER
	SOP Common	Table 8-23	ALWAYS

### 8.1.1.4 Common Modules

**Table 8-4 Module "Patient" of Created SOP Instances**

Attribute Name	Tag	VR	Value	PoV	Source
Patient's Name	(0010,0010)	PN		ALWAYS	MWL, PRQ
Patient ID	(0010,0020)	LO		ALWAYS	MWL, PRQ
Issuer of Patient ID	(0010,0021)	LO		ANAP	MWL, PRQ
Patient's Birth Date	(0010,0030)	DA		VNAP	MWL, PRQ
Patient's Sex	(0010,0040)	CS		VNAP	MWL, PRQ
Other Patient IDs	(0010,1000)	LO		ANAP	MWL
Ethnic Group	(0010,2160)	SH		ANAP	MWL, PRQ
Patient Comments	(0010,4000)	LT		ANAP	MWL, PRQ

**Table 8-5 Module "General Study" of Created SOP Instances**

Attribute Name	Tag	VR	Value	PoV	Source
Study Instance UID	(0020,000D)	UI	Copied from selected worklist entry if MWL is used. If MWL is not used, i.Profiler <i>plus</i> generates a new unique identifier with a constant prefix of "1.2.276.0.75.2.1.65.1.1." followed by a date/time stamp and machine specific identifier.	ALWAYS	MWL, AUTO
Study Date	(0008,0020)	DA	Current system date	ALWAYS	AUTO
Study Time	(0008,0030)	TM	Current system time	ALWAYS	AUTO
Referring Physician's Name	(0008,0090)	PN		VNAP	MWL
Study ID	(0020,0010)	SH	Copied from Requested Procedure ID (0040,1001) if MWL is used. If MWL is not used, i.Profiler <i>plus</i> generates a numeric value (number of seconds since beginning of the year).	ALWAYS	MWL, AUTO
Accession Number	(0008,0050)	SH		VNAP	MWL
Study Description	(0008,1030)	LO	Copied from Requested Procedure Description (0032,1060) if available.	ANAP	MWL
Referenced Study Sequence	(0008,1110)	SQ		ANAP	MWL
> Referenced SOP Class UID	(0008,1150)	UI		ALWAYS	MWL
> Referenced SOP Instance UID	(0008,1155)	UI		ALWAYS	MWL
Procedure Code Sequence	(0008,1032)	SQ	Copied from Requested Procedure Code Sequence (0032,1064) if available.	ANAP	MWL

> Code Value	(0008,0100)	SH		ALWAYS	MWL
> Coding Scheme Designator	(0008,0102)	SH		ALWAYS	MWL
> Coding Scheme Version	(0008,0103)	SH		ANAP	MWL
> Code Meaning	(0008,0104)	LO		ALWAYS	MWL

**Table 8-6 Module "General Series" of Created SOP Instances**

Attribute Name	Tag	VR	Value	PoV	Source
Series Instance UID	(0020,000E)	UI	i.Profiler <sup>plus</sup> uses a constant prefix of "1.2.276.0.75.2.1.65.1.2." followed by a date/time stamp and machine specific identifier.	ALWAYS	AUTO
Series Number	(0020,0011)	IS	Consecutive number starting with 1	ALWAYS	AUTO
Series Date	(0008,0021)	DA		ALWAYS	AUTO
Series Time	(0008,0031)	TM		ALWAYS	AUTO
Protocol Name	(0018,1030)	LO	Routine diagnostics measurement	ALWAYS	AUTO
Series Description	(0008,103E)	LO	Routine diagnostics measurement	ALWAYS	AUTO
Request Attributes Sequence	(0040,0275)	SQ		ANAP	MWL
> Requested Procedure ID	(0040,1001)	SH		ALWAYS	MWL
> Requested Procedure Description	(0032,1060)	LO		ANAP	MWL
> Scheduled Procedure Step ID	(0040,0009)	SH		ALWAYS	MWL
> Scheduled Procedure Step Description	(0040,0007)	LO		ANAP	MWL
> Scheduled Protocol Code Sequence	(0040,0008)	SQ		ANAP	MWL
>> Code Value	(0008,0100)	SH		ALWAYS	MWL
>> Coding Scheme Designator	(0008,0102)	SH		ALWAYS	MWL
>> Coding Scheme Version	(0008,0103)	SH		ANAP	MWL
>> Code Meaning	(0008,0104)	LO		ALWAYS	MWL
Performed Procedure Step ID	(0040,0253)	SH	Numeric value (number of seconds since beginning of the year)	ALWAYS	AUTO

Performed Procedure Step Start Date	(0040,0244)	DA		ALWAYS	AUTO
Performed Procedure Step Start Time	(0040,0245)	TM		ALWAYS	AUTO
Performed Procedure Step Description	(0040,0254)	LO	Routine diagnostics measurement	ALWAYS	AUTO

**Table 8-7 Module "General Equipment" of Created SOP Instances**

Attribute Name	Tag	VR	Value	PoV	Source
Manufacturer	(0008,0070)	LO	Carl Zeiss Meditec	ALWAYS	AUTO
Manufacturer's Model Name	(0008,1090)	LO	iProfiler	ALWAYS	AUTO
Device Serial Number	(0018,1000)	LO		ALWAYS	AUTO
Software Versions	(0018,1020)	LO	Four values specifying the version number of the individual components: <ul style="list-style-type: none"> <li>RD Connectivity Driver 2.7.0.0</li> <li>CZM NIM version: 2.12.0</li> <li>Software version: 1.1.8</li> <li>Firmware version: 1.6.0</li> </ul>	ALWAYS	AUTO

**Table 8-8 Module "Enhanced General Equipment" of Created SOP Instances**

Attribute Name	Tag	VR	Value	PoV	Source
Manufacturer	(0008,0070)	LO	Carl Zeiss Meditec	ALWAYS	AUTO
Manufacturer's Model Name	(0008,1090)	LO	iProfiler	ALWAYS	AUTO
Device Serial Number	(0018,1000)	LO		ALWAYS	AUTO
Software Versions	(0018,1020)	LO	Four values specifying the version number of the individual components: <ul style="list-style-type: none"> <li>RD Connectivity Driver 2.7.0.0</li> <li>CZM NIM version: 2.12.0</li> <li>Software version: 1.1.8</li> <li>Firmware version: 1.6.0</li> </ul>	ALWAYS	AUTO

### 8.1.1.5 Autorefracton Measurements IOD Modules

**Table 8-9 Autorefracton Measurements IOD - Module "Autorefracton Measurements Series" of Created SOP Instances**

Attribute Name	Tag	VR	Value	PoV	Source
Modality	(0008,0060)	CS	AR	ALWAYS	AUTO

**Table 8-10 Autorefracton Measurements IOD - Module "General Ophthalmic Refractive Measurements" of Created SOP Instances**

Attribute Name	Tag	VR	Value	PoV	Source
Instance Number	(0020,0013)	IS	1	ALWAYS	AUTO
Content Date	(0008,0023)	DA		ALWAYS	ACQUISITION
Content Time	(0008,0033)	TM		ALWAYS	ACQUISITION
Measurement Laterality	(0024,0113)	CS	R, L or B	ALWAYS	ACQUISITION
Image Comments	(0020,4000)	LT	new Measurement ==> connectivity	ALWAYS	AUTO

**Table 8-11 Autorefracton Measurements IOD - Module "Autorefracton Measurements" of Created SOP Instances**

Attribute Name	Tag	VR	Value	PoV	Source
Autorefracton Right Eye Sequence	(0046,0050)	SQ	Only present if right eye has been measured.	ANAP	ACQUISITION
> Sphere Power	(0046,0146)	FD		ALWAYS	ACQUISITION
> Cylinder Sequence	(0046,0018)	SQ		ANAP	ACQUISITION
>> Cylinder Power	(0046,0147)	FD		ALWAYS	ACQUISITION
>> Cylinder Axis	(0022,0009)	FL		ALWAYS	ACQUISITION
Autorefracton Left Eye Sequence	(0046,0052)	SQ	Only present if left eye has been measured.	ANAP	ACQUISITION
> Sphere Power	(0046,0146)	FD		ALWAYS	ACQUISITION
> Cylinder Sequence	(0046,0018)	SQ		ANAP	ACQUISITION
>> Cylinder Power	(0046,0147)	FD		ALWAYS	ACQUISITION
>> Cylinder Axis	(0022,0009)	FL		ALWAYS	ACQUISITION
Distance Pupillary Distance	(0046,0060)	FD		ALWAYS	ACQUISITION

**Table 8-12 Autorefracton Measurements IOD - Module "CZM NIM Internal" (private) of Created SOP Instances**

Attribute Name	Tag	VR	Value	PoV	Source
Private Creator	(2201,0010)	LO	99CZM_NIM_INTERNAL_01	ALWAYS	AUTO
IOD Name Meta Info	(2201,1000)	LT	AutorefractonMeasurements	ALWAYS	AUTO
CZM XML Version	(2201,1001)	LT	2.14	ALWAYS	AUTO

**Table 8-13 Autorefracton Measurements IOD - Module "SOP Common" of Created SOP Instances**

Attribute Name	Tag	VR	Value	PoV	Source
SOP Class UID	(0008,0016)	UI	1.2.840.10008.5.1.4.1.1.78.2	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UI	i.Profiler <sup>plus</sup> uses a constant prefix of "1.2.276.0.75.2.1.65.1.3." followed by a date/time stamp and machine specific identifier.	ALWAYS	AUTO

Specific Character Set	(0008,0005)	CS	ISO_IR 192	ALWAYS	AUTO
Instance Creation Date	(0008,0012)	DA	Current system date	ALWAYS	AUTO
Instance Creation Time	(0008,0013)	TM	Current system time	ALWAYS	AUTO
Timezone Offset From UTC	(0008,0201)	SH		ALWAYS	CONFIG

### 8.1.1.6 Keratometry Measurements IOD Modules

**Table 8-14 Keratometry Measurements IOD - Module "Keratometry Measurements Series" of Created SOP Instances**

Attribute Name	Tag	VR	Value	PoV	Source
Modality	(0008,0060)	CS	KER	ALWAYS	AUTO

**Table 8-15 Keratometry Measurements IOD - Module "General Ophthalmic Refractive Measurements" of Created SOP Instances**

Attribute Name	Tag	VR	Value	PoV	Source
Instance Number	(0020,0013)	IS	1	ALWAYS	AUTO
Content Date	(0008,0023)	DA		ALWAYS	ACQUISITION
Content Time	(0008,0033)	TM		ALWAYS	ACQUISITION
Measurement Laterality	(0024,0113)	CS	R, L or B	ALWAYS	ACQUISITION

**Table 8-16 Keratometry Measurements IOD - Module "Keratometry Measurements" of Created SOP Instances**

Attribute Name	Tag	VR	Value	PoV	Source
Keratometry Right Eye Sequence	(0046,0070)	SQ	Only present if right eye has been measured.	ANAP	ACQUISITION
> Steep Keratometric Axis Sequence	(0046,0074)	SQ		ALWAYS	ACQUISITION
>> Radius of Curvature	(0046,0075)	FD		ALWAYS	ACQUISITION
>> Keratometric Power	(0046,0076)	FD		ALWAYS	ACQUISITION
>> Keratometric Axis	(0046,0077)	FD		ALWAYS	ACQUISITION
> Flat Keratometric Axis Sequence	(0046,0080)	SQ		ALWAYS	ACQUISITION
>> Radius of Curvature	(0046,0075)	FD		ALWAYS	ACQUISITION
>> Keratometric Power	(0046,0076)	FD		ALWAYS	ACQUISITION
>> Keratometric Axis	(0046,0077)	FD		ALWAYS	ACQUISITION
Keratometry Left Eye Sequence	(0046,0071)	SQ	Only present if left eye has been measured.	ANAP	ACQUISITION

> Steep Keratometric Axis Sequence	(0046,0074)	SQ		ALWAYS	ACQUISITION
>> Radius of Curvature	(0046,0075)	FD		ALWAYS	ACQUISITION
>> Keratometric Power	(0046,0076)	FD		ALWAYS	ACQUISITION
>> Keratometric Axis	(0046,0077)	FD		ALWAYS	ACQUISITION
> Flat Keratometric Axis Sequence	(0046,0080)	SQ		ALWAYS	ACQUISITION
>> Radius of Curvature	(0046,0075)	FD		ALWAYS	ACQUISITION
>> Keratometric Power	(0046,0076)	FD		ALWAYS	ACQUISITION
>> Keratometric Axis	(0046,0077)	FD		ALWAYS	ACQUISITION

**Table 8-17 Keratometry Measurements IOD - Module "CZM NIM Internal" (private) of Created SOP Instances**

Attribute Name	Tag	VR	Value	PoV	Source
Private Creator	(2201,0010)	LO	99CZM_NIM_INTERNAL_01	ALWAYS	AUTO
IOD Name Meta Info	(2201,1000)	LT	KeratometryMeasurements	ALWAYS	AUTO
CZM XML Version	(2201,1001)	LT	2.14	ALWAYS	AUTO

**Table 8-18 Keratometry Measurements IOD - Module "SOP Common" of Created SOP Instances**

Attribute Name	Tag	VR	Value	PoV	Source
SOP Class UID	(0008,0016)	UI	1.2.840.10008.5.1.4.1.1.78.3	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UI	i.Profiler <sup>plus</sup> uses a constant prefix of "1.2.276.0.75.2.1.65.1.3." followed by a date/time stamp and machine specific identifier.	ALWAYS	AUTO
Specific Character Set	(0008,0005)	CS	ISO_IR 192	ALWAYS	AUTO
Instance Creation Date	(0008,0012)	DA	Current system date	ALWAYS	AUTO
Instance Creation Time	(0008,0013)	TM	Current system time	ALWAYS	AUTO
Timezone Offset From UTC	(0008,0201)	SH		ALWAYS	CONFIG

### 8.1.1.7 Encapsulated PDF IOD Modules

**Table 8-19 Encapsulated PDF IOD - Module "Encapsulated Document Series" of Created SOP Instances**

Attribute Name	Tag	VR	Value	PoV	Source
Modality	(0008,0060)	CS	DOC	ALWAYS	AUTO
Series Instance UID	(0020,000E)	UI	i.Profiler <sup>plus</sup> uses a constant prefix of "1.2.276.0.75.2.1.65.1.2." followed by a date/time stamp and machine specific identifier.	ALWAYS	AUTO

Series Number	(0020,0011)	IS	Consecutive number starting with 1	ALWAYS	AUTO
Series Date	(0008,0021)	DA		ALWAYS	AUTO
Series Time	(0008,0031)	TM		ALWAYS	AUTO
Protocol Name	(0018,1030)	LO	Routine diagnostics measurement	ALWAYS	AUTO
Series Description	(0008,103E)	LO	Routine diagnostics measurement	ALWAYS	AUTO
Request Attributes Sequence	(0040,0275)	SQ		ANAP	MWL
> Requested Procedure ID	(0040,1001)	SH		ALWAYS	MWL
> Requested Procedure Description	(0032,1060)	LO		ANAP	MWL
> Scheduled Procedure Step ID	(0040,0009)	SH		ALWAYS	MWL
> Scheduled Procedure Step Description	(0040,0007)	LO		ANAP	MWL
> Scheduled Protocol Code Sequence	(0040,0008)	SQ		ANAP	MWL
>> Code Value	(0008,0100)	SH		ALWAYS	MWL
>> Coding Scheme Designator	(0008,0102)	SH		ALWAYS	MWL
>> Coding Scheme Version	(0008,0103)	SH		ANAP	MWL
>> Code Meaning	(0008,0104)	LO		ALWAYS	MWL
Performed Procedure Step ID	(0040,0253)	SH	Numeric value (number of seconds since beginning of the year)	ALWAYS	AUTO
Performed Procedure Step Start Date	(0040,0244)	DA		ALWAYS	AUTO
Performed Procedure Step Start Time	(0040,0245)	TM		ALWAYS	AUTO
Performed Procedure Step Description	(0040,0254)	LO	Routine diagnostics measurement	ALWAYS	AUTO

**Table 8-20 Encapsulated PDF IOD - Module "SC Equipment" of Created SOP Instances**

Attribute Name	Tag	VR	Value	PoV	Source
Conversion Type	(0008,0064)	CS	SYN	ALWAYS	AUTO

**Table 8-21 Encapsulated PDF IOD - Module "Encapsulated Document" of Created SOP Instances**

Attribute Name	Tag	VR	Value	PoV	Source
----------------	-----	----	-------	-----	--------

Instance Number	(0020,0013)	IS	1	ALWAYS	AUTO
Content Date	(0008,0023)	DA		ALWAYS	AUTO
Content Time	(0008,0033)	TM		ALWAYS	AUTO
Acquisition DateTime	(0008,002A)	DT		ALWAYS	ACQUISITION
Image Laterality	(0020,0062)	CS	R, L or B	ANAP	ACQUISITION
Burned In Annotation	(0028,0301)	CS	YES	ALWAYS	AUTO
Source Instance Sequence	(0042,0013)	SQ		ALWAYS	AUTO
> Referenced SOP Class UID	(0008,1150)	UI		ALWAYS	AUTO
> Referenced SOP Instance UID	(0008,1155)	UI		ALWAYS	AUTO
Document Title	(0042,0010)	ST	iProfilerReport	ALWAYS	AUTO
Concept Name Code Sequence	(0040,A043)	SQ		EMPTY	AUTO
MIME Type of Encapsulated Document	(0042,0012)	LO	application/pdf	ALWAYS	AUTO
Encapsulated Document	(0042,0011)	OB		ALWAYS	AUTO

**Table 8-22 Encapsulated PDF IOD - Module "CZM NIM Internal" (private) of Created SOP Instances**

Attribute Name	Tag	VR	Value	PoV	Source
Private Creator	(2201,0010)	LO	99CZM_NIM_INTERNAL_01	ALWAYS	AUTO
IOD Name Meta Info	(2201,1000)	LT	EncapsulatedPdf	ALWAYS	AUTO
CZM XML Version	(2201,1001)	LT	2.14	ALWAYS	AUTO

**Table 8-23 Encapsulated PDF IOD - Module "SOP Common" of Created SOP Instances**

Attribute Name	Tag	VR	Value	PoV	Source
SOP Class UID	(0008,0016)	UI	1.2.840.10008.5.1.4.1.1.104.1	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UI	i.Profiler <sup>plus</sup> uses a constant prefix of "1.2.276.0.75.2.1.65.1.3." followed by a date/time stamp and machine specific identifier.	ALWAYS	AUTO
Specific Character Set	(0008,0005)	CS	ISO_IR 192	ALWAYS	AUTO
Instance Creation Date	(0008,0012)	DA	Current system date	ALWAYS	AUTO
Instance Creation Time	(0008,0013)	TM	Current system time	ALWAYS	AUTO
Timezone Offset From UTC	(0008,0201)	SH		ALWAYS	CONFIG

## 8.1.2 Usage of Attributes from Received IODs

The usage of Attributes received via Modality Worklist is described in Section 4.2.1.3.2. The usage of Attributes received via Patient Root Query is described in Section 4.2.1.3.3.

## 8.1.3 Attribute Mapping

In Scheduled Case, the value of the following Attributes are copied from the selected worklist item (column "Modality Worklist") to the created SOP Instances (column "Instance IOD"). None of the Attributes can be edited by the user.

**Table 8-24 Attribute Mapping between Modality Worklist and Instance IOD**

Modality Worklist		Instance IOD		Editable
(0010,0010)	Patient's Name	(0010,0010)	Patient's Name	No
(0010,0020)	Patient ID	(0010,0020)	Patient ID	No
(0010,0021)	Issuer of Patient ID	(0010,0021)	Issuer of Patient ID	No
(0010,1000)	Other Patient IDs	(0010,1000)	Other Patient IDs	No
(0010,0030)	Patient's Birth Date	(0010,0030)	Patient's Birth Date	No
(0010,0040)	Patient's Sex	(0010,0040)	Patient's Sex	No
(0010,2160)	Ethnic Group	(0010,2160)	Ethnic Group	No
(0010,4000)	Patient Comments	(0010,4000)	Patient Comments	No
(0008,0050)	Accession Number	(0008,0050)	Accession Number	No
(0008,0090)	Referring Physician's Name	(0008,0090)	Referring Physician's Name	No
(0040,1001)	Requested Procedure ID	(0020,0010)	Study ID	No
		(0040,0275) >(0040,1001)	Request Attributes Sequence > Requested Procedure ID	No
(0032,1060)	Requested Procedure Description	(0008,1030)	Study Description	No
		(0040,0275) >(0032,1060)	Request Attributes Sequence > Requested Procedure Description	No
		(0040,0254)	Performed Procedure Step Description	No
(0032,1064)	Requested Procedure Code Sequence	(0008,1032)	Procedure Code Sequence	No
>(0008,0100)	Code Value	>(0008,0100)	Code Value	No
>(0008,0102)	Coding Scheme Designator	>(0008,0102)	Coding Scheme Designator	No
>(0008,0103)	Coding Scheme Version	>(0008,0103)	Coding Scheme Version	No
>(0008,0104)	Code Meaning	>(0008,0104)	Code Meaning	No
(0020,000D)	Study Instance UID	(0020,000D)	Study Instance UID	No

(0008,1110)	Referenced Study Sequence	(0008,1110)	Referenced Study Sequence	No
>(0008,1150)	Referenced SOP Class UID	>(0008,1150)	Referenced SOP Class UID	No
>(0008,1155)	Referenced SOP Instance UID	>(0008,1155)	Referenced SOP Instance UID	No
(0040,0100)	Scheduled Procedure Step Sequence	(0040,0275)	Request Attributes Sequence	No
>(0040,0007)	Scheduled Procedure Step Description	>(0040,0007)	Scheduled Procedure Step Description	No
>(0040,0008)	Scheduled Protocol Code Sequence	>(0040,0008)	Scheduled Protocol Code Sequence	No
>>(0008,0100)	Code Value	>>(0008,0100)	Code Value	No
>>(0008,0102)	Coding Scheme Designator	>>(0008,0102)	Coding Scheme Designator	No
>>(0008,0103)	Coding Scheme Version	>>(0008,0103)	Coding Scheme Version	No
>>(0008,0104)	Code Meaning	>>(0008,0104)	Code Meaning	No
>(0040,0009)	Scheduled Procedure Step ID	>(0040,0009)	Scheduled Procedure Step ID	No

In Unscheduled Case, if a Patient Root Query has been issued, the values of the following Attributes are copied from the selected result dataset (column "Patient Query") to the created SOP Instances (column "Instance IOD"). None of the Attributes can be edited by the user.

**Table 8-25 Attribute Mapping between Patient Query and Instance IOD**

Patient Query		Instance IOD		Editable
(0010,0010)	Patient's Name	(0010,0010)	Patient's Name	No
(0010,0020)	Patient ID	(0010,0020)	Patient ID	No
(0010,0021)	Issuer of Patient ID	(0010,0021)	Issuer of Patient ID	No
(0010,0030)	Patient's Birth Date	(0010,0030)	Patient's Birth Date	No
(0010,0040)	Patient's Sex	(0010,0040)	Patient's Sex	No
(0010,2160)	Ethnic Group	(0010,2160)	Ethnic Group	No
(0010,4000)	Patient Comments	(0010,4000)	Patient Comments	No

#### 8.1.4 Coerced/Modified Fields

The i.Profiler <sup>plus</sup> does not coerce or modify any fields

## 8.2 Data Dictionary of Private Attributes

The Private Attributes added to created SOP Instances are listed in the tables below. The i.Profiler<sup>plus</sup> reserves blocks of private Attributes in group 2201. Further details on the use of these private Attributes are described in Section 8.1.1.

**Table 8-26 Private Dictionary Group (2201,00xx) = "99CZM\_NIM\_INTERNAL\_01"**

Occurs in: Autorefraction Measurements SOP Instance, Keratometry Measurements SOP Instance and Encapsulated PDF SOP Instance

Tag	Attribute Name	VR	VM
(2201,00xx)	Private Creator	LO	1
(2201,xx00)	IOD Name Meta Info	LT	1
(2201,xx01)	CZM XML Version	LT	1

## 8.3 Coded Terminology and Templates

Coded terminology is used for the created SOP Instances as described in Section 8.1.1.

The contents of Requested Procedure Code Sequence (0032,1064) and Scheduled Protocol Code Sequence (0040,0008) supplied in worklist items will be mapped to Attributes of the respective Instance IOD as described in Table 8-24.

### 8.3.1 Context Groups

The i.Profiler<sup>plus</sup> does not use or support any Context Groups.

### 8.3.2 Template Specifications

The i.Profiler<sup>plus</sup> does not use or support any Templates.

### 8.3.3 Private Code Definitions

The i.Profiler<sup>plus</sup> does not use or support any private codes.

## 8.4 Grayscale Image Consistency

The i.Profiler<sup>plus</sup> does not make use of the DICOM Grayscale Standard Display Function.

## 8.5 Standard Extended/Specialized/Private SOP Classes

The i.Profiler<sup>plus</sup> uses Standard Extended SOP Classes by adding the following private Modules to created SOP Instances (see Section 8.1.1 for details):

- CZM NIM Internal Module (Table 8-12) is added to the Autorefraction Measurements IOD.
- CZM NIM Internal Module (Table 8-17) is added to the Keratometry Measurements IOD.
- CZM NIM Internal Module (Table 8-22) is added to the Encapsulated PDF IOD.

The i.Profiler<sup>plus</sup> does not use or support any Specialized SOP Class or Private SOP Class.

## 8.6 Private Transfer Syntaxes

The i.Profiler<sup>plus</sup> does not use or support any private Transfer Syntax.



**Carl Zeiss Vision GmbH**  
Turnstrasse 27  
73430 Aalen  
Germany