



*DICOM System*

***VK-2***

DICOM CONFORMANCE STATEMENT

US

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# *Table of Contents*

- 1 Introduction**
  - 1.1 Definitions Used**
- 2 Implementation Model**
  - 2.1 Application Dataflow Diagram**
  - 2.2 Functional Definition of Application Entities**
- 3 AE Specifications**
  - 3.1 Association Establishment Policies**
    - 3.1.1 General**
    - 3.1.2 Number of Associations**
    - 3.1.3 Asynchronous Nature**
    - 3.1.4 Implementation Identifying Information**
  - 3.2 Association Initiation Policies**
    - 3.2.1 Verification**
      - 3.2.1.1 Real World Activity**
      - 3.2.1.2 Proposed Presentation Contexts**
    - 3.2.2 Modality Worklist**
      - 3.2.2.1 Real World Activity**
      - 3.2.2.2 Proposed Presentation Contexts**
      - 3.2.2.3 SOP Specific Conformance**
    - 3.2.3 Modality Performed Procedure Step Service**
      - 3.2.3.1 Real World Activity**
      - 3.2.3.2 Proposed Presentation Contexts**
      - 3.2.3.3 SOP Specific Conformance**
    - 3.2.4 Storage**
      - 3.2.4.1 Real World Activity**
      - 3.2.4.2 Proposed Presentation Contexts**
      - 3.2.4.3 SOP Specific Conformance**
    - 3.2.5 Storage Commitment**
      - 3.2.5.1 Real World Activity**
      - 3.2.5.2 Proposed Presentation Contexts**
  - 3.3 Association Acceptance Policies**
- 4 Communication Profiles**
- 5 Extensions/Specializations/Privatizations**
- 6 Configuration**
- 7 Support of Extended Character Sets**

## **1 Introduction**

This document is a DICOM Conformance Statement that describes the implementation of DICOM version 3.0 for the VK2 DICOM System (for VK2 version 5.0.0.0 or later).

### **1.1 Definitions Used**

DICOM: Digital Imaging and Communications in Medicine

SCU: Service Class User

SCP: Service Class Provider

SOP: Service-Object Pair

AE: Application Entity

UID: Unique Identifier

MWL: Modality Worklist

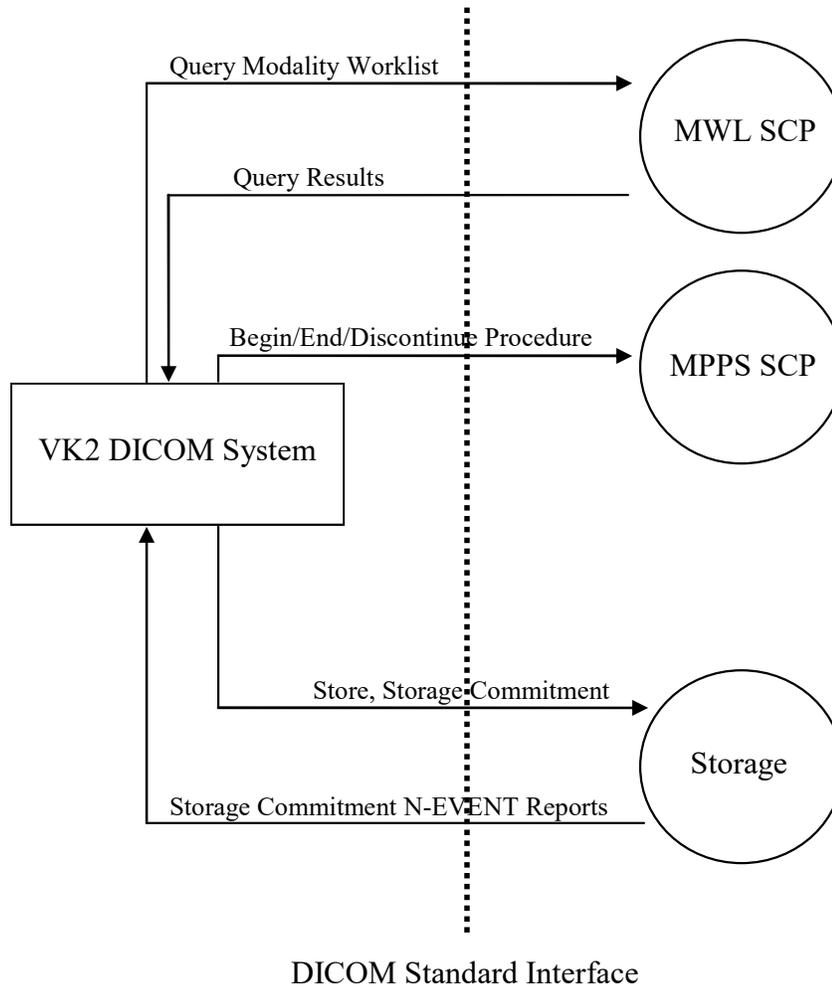
MPPS: Modality Performed Procedure Step

PDU: Protocol Data Unit

TCP/IP: Transmission Control Protocol/Internet Protocol

## 2 Implementation Model

### 2.1 Application Data Flow Diagram



### 2.2 Functional Definition of Application Entities

- The VK2 DICOM System queries for and retrieves study and patient information from a MWL SCP.
- The VK2 DICOM System sends N-CREATE and N-SET messages to an MPPS SCP when beginning/ending/discontinuing procedures.
- The VK2 DICOM System requests to store images on an SC, VL, or Ophthalmic Photography 8-Bit Image Storage SCP.
- The VK2 DICOM System requests storage commitment on stored images to a Storage Commitment SCP.
- The VK2 DICOM System listens for N-EVENT Reports from a Storage Commitment SCP.

### 3 AE Specifications

The VK2 DICOM System provides Standard Conformance to the following DICOM version 3.0 SOP Classes as an SCU.

SOP Class UID	SOP Class Name
1.2.840.10008.5.1.4.3.1	Modality Worklist Information Model - FIND
1.2.840.10008.3.1.2.3.3	Modality Performed Procedure Step
1.2.840.10008.5.1.4.1.1.77.1.4	VL Photographic Image Storage
1.2.840.10008.5.1.4.1.1.7	Secondary Capture Image Storage
1.2.840.10008.5.1.4.1.1.77.1.5.1	Ophthalmic Photography 8-Bit Image Storage
1.2.840.10008.1.20.1	Storage Commitment Push Model

#### 3.1 Association Establishment Policies

##### 3.1.1 General

The VK2 DICOM System initiates associations as an SCU of MWL, MPPS, VL Image Storage, SC Image Storage, Ophthalmic Photography 8-Bit Image Storage, and Storage Commitment.

The maximum PDU size is 32768 bytes.

##### 3.1.2 Number of Associations

The practical maximum number of associations depends on system resource availability.

##### 3.1.3 Asynchronous Nature

The VK2 DICOM System does not support asynchronous communication.

##### 3.1.4 Implementation Identifying Information

Implementation UID: 1.2.392.200036.9135.5000.1.aaaaa.bbbbb.ccccc.ddddd

*1.2.392.200036.9135.5000.1:*            *Root*  
*aaaaa:*                                    *System Serial Number*  
*bbbb:*                                      *UID Type*  
    *Study Instance UID: 1500*  
    *Series Instance UID: 2500*  
    *Image Instance UID: 3500*  
    *MPPS Instance UID: 4500*  
*cccc:*                                      *Date Based Value*  
*dddd:*                                      *Counter Based Value*

Implementation Version: DCF 3.0.3a

## 3.2 Association Initiation Policies

### 3.2.1 Verification

#### 3.2.1.1 Real World Activity

To troubleshoot DICOM connectivity, the VK2 DICOM System can send a C-ECHO to an SCP. An association will be made only upon the user's request.

#### 3.2.1.2 Proposed Presentation Context

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

### 3.2.2 Modality Worklist

#### 3.2.2.1 Real World Activity

The MWL module of the VK2 DICOM System can be enabled or disabled. If the MWL module is enabled, then an association with an MWL SCP is attempted in the following cases (if the MWL module is disabled, no association with an MWL SCP will ever be attempted):

- a. When VK2 enters "DICOM Mode", an automatic initial broad worklist query is executed to initialize the displayed list.
- b. After case (a), the user can select to refresh the list (which will execute another broad worklist query).
- c. After case (a), the user can select to execute a single patient query.

#### 3.2.2.2 Proposed Presentation Contexts

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

### 3.2.2.3 SOP Specific Conformance

A broad worklist query is performed when VK2 first enters “DICOM mode” (to initialize the displayed list). A broad worklist query is also made when the user selects to refresh the list. Within the VK2 software settings, the user can specify default values to be used for a specific set of keys for the broad worklist query. Those keys are listed below:

Matching Key Attributes	Tag
Scheduled Procedure Step Start Date	(0040,0002)
Modality	(0008,0060)
Scheduled Station AE Title	(0040,0001)

On the displayed list, the user can select to make a single patient query. A dialog window is displayed for the user to enter specific keys for the single patient query. Those keys are listed below:

Matching Key Attributes	Tag
Patient Name	(0010,0010)
Patient ID	(0010,0020)
Accession Number	(0008,0050)
Requested Procedure ID	(0040,1001)

In either query case above, values for the following keys will be requested to be returned.

Requested Key Attributes	Tag
<a href="#">Scheduled Procedure Step Sequence</a>	<a href="#">(0040,0100)</a>
Scheduled Station AE Title	(0040, 0001)
Scheduled Procedure Step Start Date	(0040, 0002)
Scheduled Procedure Step Start Time	(0040, 0003)
Modality	(0008, 0060)
Scheduled Procedure Step ID	(0040, 0009)
<a href="#">Scheduled Protocol Code Sequence</a>	<a href="#">(0040, 0008)</a>
Code Value	(0008, 0100)
Coding Scheme Designator	(0008, 0102)
Code Meaning	(0008, 0104)
Scheduled Procedure Step Description	(0040, 0007)
Requested Procedure Description	(0032, 1060)
<a href="#">Requested Procedure Code Sequence</a>	<a href="#">(0032, 1064)</a>
Code Value	(0008, 0100)
Coding Scheme Designator	(0008, 0102)
Code Meaning	(0008, 0104)
Requested Procedure ID	(0040, 1001)
Study Instance UID	(0020, 000D)
<a href="#">Referenced Study Sequence</a>	<a href="#">(0008, 1110)</a>
Referenced SOP Class UID	(0008, 1150)
Referenced SOP Instance UID	(0008, 1155)
Accession Number	(0008, 0050)
Referring Physician Name	(0008, 0090)

Patient Name	(0010, 0010)
Patient ID	(0010, 0020)
Patient Birth Date	(0010, 0030)
Patient Sex	(0010, 0040)

After the user selects a patient from the worklist results, the VK2 DICOM System will verify that the selected patient information (patient name, ID, birth date, and sex) and study instance UID have been received from the MWL SCP. If any of those patient information values are missing, the VK2 DICOM System will flag an error and the user will not be able to continue with the patient selection. If the MWL module is disabled, VK2 will load/create its own study instance UID.

### 3.2.3 Modality Performed Procedure Step

#### 3.2.3.1 Real World Activity

The MPPS module of the VK2 DICOM System can be enabled or disabled. If the MPPS module is enabled, then an association with an MPPS SCP is attempted in the following cases (if the MPPS module is disabled, no association with an MPPS SCP will ever be attempted):

- a. After the user selects and confirms a patient from the worklist (in which case, an MPPS N-CREATE message is sent to the MPPS SCP).
- b. When the user selects to cancel the current procedure (VK2 has a “CANCEL” button to explicitly instruct the VK2 system to cancel the current procedure; thereby sending an MPPS N-SET message to the MPPS SCP).
- c. When the user selects to end the current procedure (VK2 has an “END” button to explicitly instruct the VK2 system to end the current procedure; thereby sending an MPPS N-SET message to the MPPS SCP).

#### 3.2.3.2 Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

### 3.2.3.3 SOP Specific Conformance

After the user selects and confirms a patient from the worklist, an MPPS N-CREATE message is sent to the MPPS SCP with the following tags:

Attribute Tag	Description	Remarks	
		MWL Enabled	MWL Disabled
(0010, 0010)	Patient Name	MWL	Manual
(0010, 0020)	Patient ID	MWL	Manual
(0010, 0030)	Patient Birth Date	MWL	Manual
(0010, 0040)	Patient Sex	MWL	Manual
(0008, 1120)	Referenced Patient Sequence	Null	
(0040, 0270)	Scheduled Step Attributes Sequence		
(0020, 000D)	Study Instance UID	MWL	VK2
(0008, 0050)	Accession Number	MWL	Null
(0040, 1001)	Requested Procedure ID	MWL	Null
(0032, 1060)	Requested Procedure Description	MWL	Null
(0040, 0009)	Scheduled Procedure Step ID	MWL	Null
(0040, 0007)	Scheduled Procedure Step Description	MWL	Null
(0008, 1110)	Referenced Study Sequence		Null
(0008, 1150)	Referenced SOP Class UID	MWL	-
(0008, 1155)	Referenced SOP Instance UID	MWL	-
(0040, 0008)	Scheduled Protocol Code Sequence		Null
(0008, 0100)	Code Value	MWL	-
(0008, 0102)	Coding Scheme Designator	MWL	-
(0008, 0104)	Code Meaning	MWL	-
(0040, 0241)	Performed Station AE Title		VK2
(0040, 0242)	Performed Station Name		Null
(0040, 0243)	Performed Location		Null
(0040, 0244)	Performed Procedure Step Start Date		VK2
(0040, 0245)	Performed Procedure Step Start Time		VK2
(0040, 0253)	Performed Procedure Step ID		VK2
(0040, 0250)	Performed Procedure Step End Date		Null
(0040, 0251)	Performed Procedure Step End Time		Null
(0040, 0252)	Performed Procedure Step Status		VK2
(0040, 0254)	Performed Procedure Step Description		Null
(0040, 0255)	Performed Procedure Type Description		Null
(0008, 1032)	Procedure Code Sequence		Null
(0008, 0100)	Code Value	MWL	-
(0008, 0102)	Coding Scheme Designator	MWL	-
(0008, 0104)	Code Meaning	MWL	-
(0008, 0060)	Modality		VK2
(0020, 0010)	Study ID	MWL	Null
(0040, 0260)	Performed Protocol Code Sequence		
(0008, 0100)	Code Value		VK2
(0008, 0102)	Coding Scheme Designator		VK2
(0008, 0104)	Code Meaning		VK2
(0040, 0340)	Performed Series Sequence		Null

If the user selects to end or cancel the current procedure, an MPPS N-SET message is sent to the MPPS SCP with the following tags:

Attribute Tag	Description	Remarks	
		MWL Enabled	MWL Disabled
(0040, 0250)	Performed Procedure Step End Date		VK2
(0040, 0251)	Performed Procedure Step End Time		VK2
(0040, 0252)	Performed Procedure Step Status		VK2
(0040, 0281)	Performed Procedure Step Discontinuation Reason Code Sequence		
(0008, 0100)	Code Value		VK2
(0008, 0102)	Coding Scheme Designator		VK2
(0008, 0104)	Code Meaning		VK2
(0040, 0340)	Performed Series Sequence		
(0008, 1050)	Performing Physician Name		Null
(0018, 1030)	Protocol Name		VK2
(0008, 1070)	Operator Name		Null
(0020, 000E)	Series Instance UID		VK2
(0008, 103E)	Series Description		Null
(0008, 0054)	Retrieve AE Title		Null
(0008, 1140)	Referenced Image Sequence		
(0008, 1150)	Referenced SOP Class UID		VK2
(0008, 1155)	Referenced SOP Instance UID		VK2
(0040, 0220)	Referenced Non-Image Composite SOP Instance Sequence		Null

### 3.2.4 Storage

#### 3.2.4.1 Real World Activity

The VK2 DICOM System will attempt to establish an association with a VL, SC, or Ophthalmic Photography 8-Bit Image Storage SCP when the user selects images and requests to send the selected images to a DICOM storage server.

### 3.2.4.2 Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		JPEG Baseline	1.2.840.10008.1.2.4.50		
		JPEG Lossless	1.2.840.10008.1.2.4.70		
SC Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		JPEG Baseline	1.2.840.10008.1.2.4.50		
		JPEG Lossless	1.2.840.10008.1.2.4.70		
Ophthalmic Photography 8-Bit Image Storage	1.2.840.10008.5.1.4.1.1.77.1.5.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		JPEG Baseline	1.2.840.10008.1.2.4.50		
		JPEG Lossless	1.2.840.10008.1.2.4.70		

### 3.2.4.3 SOP Specific Conformance

#### 3.2.4.3.1 Tags used by all Storage SOP Classes supported:

Attribute Tag	Description	Remarks	
		MWL Enabled	MWL Disabled
(0010, 0010)	Patient Name	MWL	Manual
(0010, 0020)	Patient ID	MWL	Manual
(0010, 0030)	Patient Birth Date	MWL	Manual
(0010, 0040)	Patient Sex	MWL	Manual
(0020, 000D)	Study Instance UID	MWL	VK2
(0008, 0020)	Study Date	VK2	
(0008, 0030)	Study Time	VK2	
(0008, 0090)	Referring Physician Name	MWL	Null
(0020, 0010)	Study ID	MWL	Null

(0008, 0050)	Accession Number	MWL	Null
(0008, 1110)	Referenced Study Sequence		Null
(0008, 1150)	Referenced SOP Class UID	MWL	
(0008, 1155)	Referenced SOP Instance UID	MWL	
(0008, 1032)	Procedure Code Sequence		Null
(0008, 0100)	Code Value	MWL	
(0008, 0102)	Coding Scheme Designator	MWL	
(0008, 0104)	Code Meaning	MWL	
(0008, 0060)	Modality		VK2
(0020, 000E)	Series Instance UID		VK2
(0020, 0011)	Series Number		Null
(0020, 0060)	Laterality		VK2
(0040, 0275)	Request Attributes Sequence		
(0040, 1001)	Requested Procedure ID	MWL	Null
(0032, 1060)	Requested Procedure Description	MWL	Null
(0040, 0009)	Scheduled Procedure Step ID	MWL	Null
(0040, 0007)	Scheduled Procedure Step Description	MWL	Null
(0040, 0008)	Scheduled Protocol Code Sequence		
(0008, 0100)	Code Value	MWL	Null
(0008, 0102)	Coding Scheme Designator	MWL	Null
(0008, 0104)	Code Meaning	MWL	Null
(0020, 0013)	Instance Number		VK2
(0020, 0020)	Patient Orientation		VK2
(0028, 0002)	Samples Per Pixel		VK2
(0028, 0004)	Photometric Interpretation		VK2
(0028, 0010)	Rows		VK2
(0028, 0011)	Columns		VK2
(0028, 0100)	Bits Allocated		VK2
(0028, 0101)	Bits Stored		VK2
(0028, 0102)	High Bit		VK2
(0028, 0103)	Pixel Representation		VK2
(7FE0, 0010)	Pixel Data		VK2
(0028, 0006)	Planar Configuration		VK2

### 3.2.4.3.2 Tags used by VL Photographic Image Storage

Attribute Tag	Description	Remarks	
		MWL Enabled	MWL Disabled
(0008, 0070)	Manufacturer		VK2
(0040, 0555)	Acquisition Context Sequence		Null
(0008, 0008)	Image Type		VK2
(0008, 0033)	Content Time		VK2
(0028, 2110)	Lossy Image Compression		VK2

### 3.2.4.3.3 Tags used by SC Image Storage

Attribute Tag	Description	Remarks	
		MWL Enabled	MWL Disabled
(0008, 0064)	Conversion Type	VK2	
(0028, 0030)	Pixel Spacing	VK2	

### 3.2.4.3.3 Tags used by Ophthalmic 8-Bit Image Storage

Attribute Tag	Description	Remarks	
		MWL Enabled	MWL Disabled
(0020, 0200)	Synchronization Frame of Reference	VK2	
(0018, 106A)	Synchronization Trigger	VK2	
(0018, 1800)	Acquisition Time Synchronized	VK2	
(0008, 0070)	Manufacturer	VK2	
(0028, 0008)	Number of Frames	VK2	
(0028, 0009)	Frame Increment Pointer	VK2	
(0018, 1063)	Frame Time Vector	VK2	
(0008, 0008)	Image Type	VK2	
(0028, 0030)	Pixel Spacing	VK2	
(0008, 0033)	Content Time	VK2	
(0008, 0023)	Content Date	VK2	
(0008, 002A)	Acquisition Date Time	VK2	
(0028, 2110)	Lossy Image Compression	VK2	
(0028, 2112)	Lossy Image Compression Ratio	VK2	
(0028, 2114)	Lossy Image Compression Method	VK2	
(0028, 0301)	Burned in Annotation	VK2	
(0020, 0062)	Image Laterality	VK2	
(0008, 2218)	Anatomic Region Sequence		
(0008, 0100)	Code Value	VK2	
(0008, 0102)	Coding Scheme Designator	VK2	
(0008, 0104)	Code Meaning	VK2	
(0022, 0005)	Patient Eye Movement Commanded	Null	
(0022, 001B)	Refractive State Sequence	Null	
(0022, 000A)	Emmetropic Magnification	Null	
(0022, 000B)	Intra Ocular Pressure	Null	
(0022, 000C)	Horizontal Field of View	VK2	
(0022, 000D)	Pupil Dilated	Null	
(0022, 0015)	Acquisition Device Type Code Sequence		
(0008, 0100)	Code Value	VK2	
(0008, 0102)	Coding Scheme Designator	VK2	
(0008, 0104)	Code Meaning	VK2	
(0022, 0016)	Illumination Type Code Sequence	Null	
(0022, 0017)	Light Path Filter Type Stack Code Sequence	Null	
(0022, 0018)	Image Path Filter Type Stack Code Sequence	Null	
(0022, 0019)	Lenses Code Sequence	Null	
(0018, 7004)	Detector Type	VK2	

### 3.2.5 Storage Commitment

#### 3.2.5.1 Real World Activity

The Storage Commitment module of the VK2 DICOM System can be enabled or disabled. If the Storage Commitment module is enabled, then an association with a Storage Commitment SCP is attempted in the following cases (if the Storage Commitment module is disabled, no association with a Storage Commitment SCP will ever be attempted):

- a. After selected images (by the user) are successfully sent to a DICOM Storage SCP, a request for Storage Commitment will be made to the DICOM Storage SCP for the sent images.

#### 3.2.5.2 Proposed Presentation Contexts

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name	UID		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

## **4 Communication Profiles**

The VK2 DICOM System uses the TCP/IP stack from the Windows (XP, Vista) Operating System.

## **5 Extensions, Specializations, Privatizations**

Not applicable.

## **6 Configuration**

### **6.1 AE Title/Presentation Address Mapping**

Presentation address mapping can be configured from within the VK2 software.

### **6.2 Configurable Parameters**

1. MWL SCP IP Address
2. MWL SCP Port Number
3. MWL SCP AE Title
4. MWL SCU AE Title
5. MPPS SCP IP Address
6. MPPS SCP Port Number
7. MPPS SCP AE Title
8. MPPS SCU AE Title
9. STORE SCP IP Address
10. STORE SCP Port Number
11. STORE SCP AE Title
12. STORE SCU AE Title
13. Image IOD: VL, SC, Ophthalmic Photography 8-Bit Image
14. Image Format: Uncompressed, JPEG Baseline, JPEG Lossless
15. Storage Commitment SCP IP Address
16. Storage Commitment SCP Port Number
17. Storage Commitment SCP AE Title
18. Storage Commitment SCU AE Title
19. Storage Commitment SCU Port Number (for N-EVENT reports)
20. Storage Commitment SCU Listening Time Out
21. Verification SCP IP Address
22. Verification SCP Port Number
23. Verification SCP AE Title
24. Verification SCU AE Title

## **7 Support for Extended Character Sets**

The VK2 DICOM System does not support extended character sets.