

Digital Imaging and Communications in Medicine (DICOM)

Supplement 24: Stored Print Related SOP Classes

Prepared by:

DICOM Standards Committee, Working Group 6

1300 N. 17th Street

Rosslyn, Virginia 22209 USA

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Foreword

In 1983, the American College of Radiology (ACR) and the National Electrical Manufacturers Association (NEMA) formed the ACR-NEMA Standards Committee which developed a standard for Digital Imaging and Communications in Medicine (DICOM). This committee, now called the DICOM Standards Committee, has expanded its membership to include many other bio-medical professional societies, vendor companies, standards developing organizations, and government agencies.

DICOM is developed in liaison with other standardization organizations including CEN TC251 in Europe and JIRA in Japan, with review also by other organizations including IEEE, HL7 and ANSI in the USA.

This document is a Supplement to the DICOM Standard. It is an extension to the published DICOM Standard which consists of the following parts:

- PS: 3.1 - Introduction and Overview
- PS: 3.2 - Conformance
- PS: 3.3 - Information Object Definitions
- PS: 3.4 - Service Class Specifications
- PS: 3.5 - Data Structures and Encoding
- PS: 3.6 - Data Dictionary
- PS: 3.7 - Message Exchange
- PS: 3.8 - Network Communication Support for Message Exchange
- PS: 3.9 - Point-to-Point Communication Support for Message Exchange
- PS: 3.10 - Media Storage and File Format
- PS: 3.11 - Media Storage Application Profiles
- PS: 3.12 - Media Format and Physical Media for Media Interchange
- PS: 3.13 - Print Management Point-to-Point Communication Support

These parts are related but independent documents.

This Supplement includes the definition of the Stored Print Storage SOP Class and its usage by the Storage Service Class, the Query/Retrieve Service Class and Print Management Service Class.

Scope and Field of Application

The scope of this Supplement is to define services to store, query, retrieve and print one or more film pages.

This Supplement covers the following objectives :

- Storage of all the print parameters, that describe one film page in one IOD
- Query and retrieve one or more film pages.
- Print one or more film pages, using the mechanism of the Storage Service Class(es).

This Supplement is defined to cover the following set of applications (non-exhaustive list) :

- Store one or more film pages of a film session (e.g. to an archive, temporary storage).
- Retrieve one or more film pages of a film session
- Print one or more film pages with a similar appearance as the original print.
- Move a set of film pages from an archive to a printer

Since this document proposes changes to existing Parts of DICOM the reader should have a working understanding of the Standard.

This Supplement includes a number of Addenda to existing Parts of DICOM :

- PS 3.3 Addendum : Stored Print Information Object Definitions
- PS 3.4 Addendum : Stored Print Storage SOP Class, Print Request SOP Class
- PS 3.6 Addendum : Stored Print Data Dictionary

Digital Imaging and Communications In Medicine (DICOM)

Part 3 Addendum Print Storage Information Object Definition

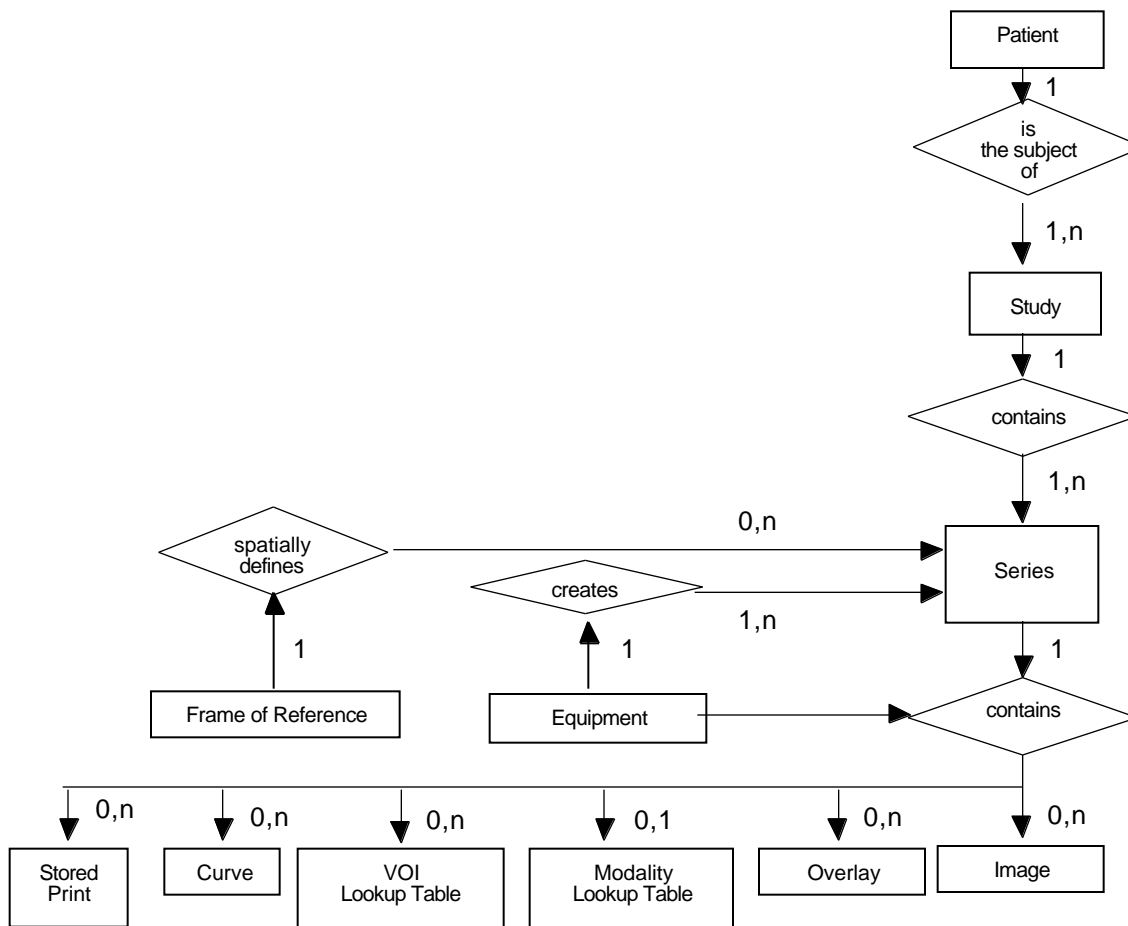
PS 3.3: 3.4, Add the following referenced Definitions

3.4 DICOM SERVICE CLASS SPECIFICATIONS

Preformatted Grayscale Image
Preformatted Color Image

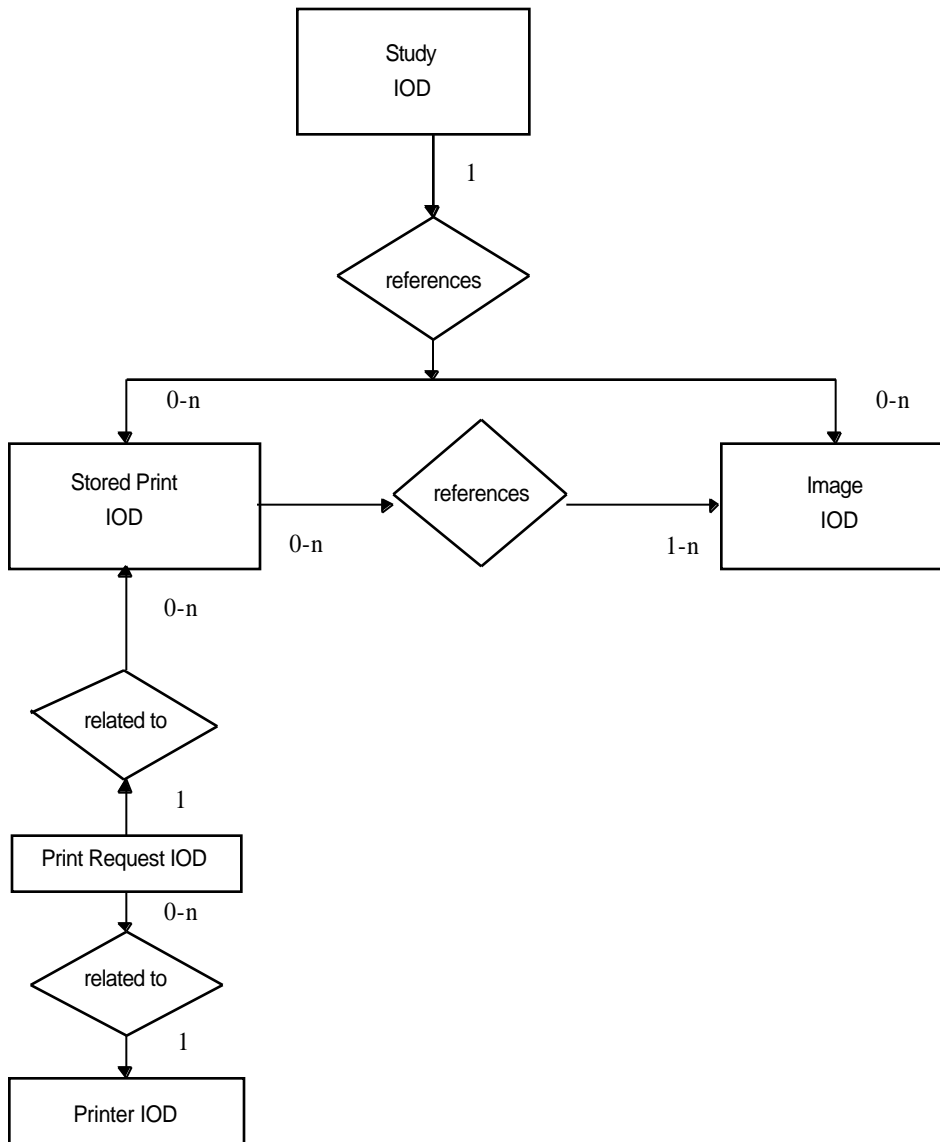
Add Stored Print to Figure 7-1: DICOM Model of the Real World and A.1-1 : DICOM COMPOSITE IMAGE IOD INFORMATION MODEL

A.1.2 IOD Entity-Relationship Model



**Figure A.1-1
DICOM COMPOSITE IMAGE IOD INFORMATION MODEL**

Expand Figure 7-2 DICOM INFORMATION MODEL to include references to Stored Print IOD



Add section A.17 : Print Storage Information Object Definition

A.17 STORED PRINT INFORMATION OBJECT DEFINITION

A.17.1 IOD Description

The Stored Print IOD describes all the print parameters to print a single film. The Stored Print IOD contains one or more references to Image SOP Instances. There is a many to one relationship between the Stored Print IOD and the Printer IOD.

Images referenced by the Stored Print IOD shall be Preformatted Grayscale or Preformatted Color Images or other grayscale where all grayscale transformations up and including VOI LUT have been applied .

A.17.2 Stored Print IOD Entity-Relationship Model

The E-R Model in Section A.1.2 depicts those components of the DICOM Information Model which directly reference the Stored Print IOD. The Frame of Reference IE, Overlay IE, Curve IE, VOI LUT IE, and Modality LUT IE are not components of the Stored Print IOD.

A.17.3 IOD Module Table

**Table A.17-1
PRINT STORAGE IOD MODULES**

IE	Module	Reference	Usage
Patient	Patient	C.7.1.1	M
Study	General Study	C.7.2.1	M
	Patient Study	C.7.2.2	U
Series	General Series	C.7.3.1	M
Equipment	General Equipment	C.7.5.1	M
	Printer Characteristics	C.15.1	M
Image	Film Box	C.15.2	M
	Image Box List	C.15.3	M
	Annotation List	C.15.4	U
	Image Overlay Box List	C.15.5	U
	Presentation LUT List	C.15.6	U
	SOP Common Information	C.12.1	M

Add section A.18 : Hardcopy Grayscale Information Object Definition

A.18 HARDCOPY GRAYSCALE IMAGE INFORMATION OBJECT DEFINITION

A.18.1 IOD Description

The Hardcopy Grayscale IOD is an abstraction of a printable 8 or 12 bit grayscale image where annotation, overlays, graphics may be burned in and where the LUT operations up to and including VOI LUT are already performed.

- Note s:
1. A hardcopy grayscale image corresponds with a Preformatted Grayscale Image (see PS 3.4) and is a specialization of the Secondary Capture Image.
 2. The optional Annotation List and Image Overlay Box Modules in the Stored Print IOD provide additional overlay, graphic, and annotation information that will be burnt into the printed image only if both the SCU and SCP support the Attributes in these Modules. See the Pull Print Request N-CREATE Behavior section in PS 3.4.

A.18.2 Hardcopy Grayscale Image IOD Entity-Relationship Model

The E-R Model in Section A.17.2 depicts those components of the DICOM Information Model which are related to the Hardcopy Grayscale Image IOD.

A.18.3 IOD Module Table

**Table A.18-1
HARDCOPY GRAYSCALE IMAGE IOD MODULES**

IE	Module	Reference	Usage
Patient	Patient	C.7-1	M
Study	General Study	C.7-2	M
	Patient Study	C.7-3	U
Series	General Series	C.7.3.1	M
Equipment	General Equipment	C.7.5.1	U
	Hardcopy Equipment	C.8.8.1	M
Image	General Image	C.7.6.1	M
	HC Grayscale Image	C.8.8.2	M
	Overlay Plane	C.9.2	U
	SOP Common Information	C.12.1	M

Add section A.19 : Hardcopy Color Information Object Definition

A.19 HARDCOPY COLOR IMAGE INFORMATION OBJECT DEFINITION

A.19.1 IOD Description

The Hardcopy Color IOD is an abstraction of a printable 8 bit color image where annotation, overlays, and graphics may be burned in.

Note : A hardcopy color image corresponds with a Preformatted Color Image (see PS 3.4) and is a specialization of the Secondary Capture Image.

A.19.2 Hardcopy Color Image IOD Entity-Relationship Model

The E-R Model in Section A.17.2 depicts those components of the DICOM Information Model which are related to the Hardcopy Color Image IOD.

A.19.3 IOD Module Table

**Table A.19-1
HARDCOPY COLOR IMAGE IOD MODULES**

IE	Module	Reference	Usage
Patient	Patient	C.7-1	M
Study	General Study	C.7-2	M
	Patient Study	C.7-3	U
Series	General Series	C.7.3.1	M
Equipment	General Equipment	C.7.5.1	U
	Hardcopy Equipment	C.8.8.1	M

Image	General Image	C.7.6.1	M
	HC Color Image	C.8.8.3	M
	Overlay Plane	C.9.2	U
	SOP Common Information	C.12.1	M

Add section B.16 : Print Request Information Object Definition

B.16 PULL PRINT REQUEST INFORMATION OBJECT DEFINITION

B.16.1 IOD description

The Pull Print Request IOD is an abstraction of a request to print one or more films, based on the information stored in the Stored Print IOD.

The Pull Print Request IOD contains print transaction related information (e.g. priority, number of copies) and a reference to the Stored Print IOD, which contains the print presentation parameters and references to images.

Note : The Film Session IOD is split into 2 IODs :

- Stored Print IOD, containing layout information and references to images. It contains information which remains invariant during subsequent re-prints (of the same film session). The Stored Print IOD may be archived.
- Print Request IOD, which contains information that may change during subsequent re-prints.

The E-R Model in Section A.17.2 depicts those components of the DICOM Information Model which are related to the Pull Print Request IOD.

B.16.2 IOD module table

**Table B.16-1
Print Request IOD modules**

Module	Reference	Usage
Print Request	C.13.12	M
SOP Common Information	C.12.1	M

Extend section C.7.3.1.1.1 : Modality Attribute Descriptions

Add the Modality Hard Copy device to the list of defined terms for Modality (0008,0060)

C.7.3.1.1.1 extension to Modality

HC = Hard Copy

Add section C.8.8 : Hardcopy

C.8.8 Hardcopy

C.8.8.1 Hardcopy Equipment Module

This Module describes equipment used to create Hardcopy Grayscale and Color Image IODs.

**Table C.8-33
HARDCOPY EQUIPMENT MODULE**

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Type of equipment that created this Hardcopy Image Enumerated Value: HC
Hardcopy Creation Device ID	(0018,1011)	3	User defined identification of the device that created this Hardcopy Image
Hardcopy Device Manufacturer	(0018,1017)	3	Manufacturer of the device that created this Hardcopy Image
Hardcopy Device Manufacturer's Model Name	(0018,101B)	3	Manufacturer's model number of the device that created this Hardcopy Image
Hardcopy Device Software Versions	(0018,101A)	3	Manufacturer's designation of the software of the device that created this Hardcopy Image

Note: The Attributes specified in the General Equipment Module (See Table C.7-6) describe the equipment which created the image that was the source for this Hardcopy Image. The Attributes of the Hardcopy Equipment Module define the equipment that created the Hardcopy Image.

C.8.8.2 Hardcopy Grayscale Image Module

This Module describes a printable 8 or 12 bit grayscale image. The Hardcopy Grayscale Image Pixel Module is a specialization of the Image Pixel Module defined in C.7.6.3 of this part.

**Table C.8-34
HARDCOPY GRAYSCALE IMAGE MODULE**

Attribute Name	Tag	Type	Attribute Description
Samples Per Pixel	(0028,0002)	1	See C.7.6.3 for description of Image Pixel Module; Enumerated Value: 1
Photometric Interpretation	(0028,0004)	1	See C.7.6.3 for description of Image Pixel Module; Enumerated Values: MONOCHROME1 MONOCHROME2
Rows	(0028,0010)	1	See C.7.6.3 for description of Image Pixel Module
Columns	(0028,0011)	1	See C.7.6.3 for description of Image Pixel Module
Pixel Aspect Ratio	(0028,0034)	1C	See C.7.6.3 for description of Image Pixel Module. Required if the aspect ratio is not 1\1.
Bits Allocated	(0028,0100)	1	See C.7.6.3 for description of Image Pixel Module. Enumerated Values: 8 (if Bits Stored = 8) 16 (if Bits Stored =12)
Bits Stored	(0028,0101)	1	See C.7.6.3 for description of Image Pixel Module. Enumerated Values: 8, 12
High Bit	(0028,0102)	1	See C.7.6.3 for description of Image Pixel Module. The value shall be Bits Stored (0028,0101) - 1.

Pixel Representation	(0028,0103)	1	See C.7.6.3 for description of Image Pixel Module. Enumerated Value: 0000H (unsigned integer)
Pixel Data	(7FE0,0010)	1	See C.7.6.3 for description of Image Pixel Module

C.8.8.3 Hardcopy Color Image Module

This Module describes a printable 8 bit RGB Color image. The Hardcopy Color Image Pixel Module is a specialization of the Image Pixel Module defined in C.7.6.3 of this part.

**Table C.13-35
HARDCOPY COLOR IMAGE MODULE**

Attribute Name	Tag	Type	Attribute Description
Samples Per Pixel	(0028,0002)	1	See C.7.6.3 for description of Image Pixel Module; Enumerated Value: 3
Photometric Interpretation	(0028,0004)	1	See C.7.6.3 for description of Image Pixel Module; Enumerated Value: RGB
Planar Configuration	(0028,0006)	1	See C.7.6.3 for description of Image Pixel Module; Enumerated Value: 0001H (frame interleave)
Rows	(0028,0010)	1	See C.7.6.3 for description of Image Pixel Module
Columns	(0028,0011)	1	See C.7.6.3 for description of Image Pixel Module
Pixel Aspect Ratio	(0028,0034)	1C	See C.7.6.3 for description of Image Pixel Module Required if the aspect ratio is not 1\1
Bits Allocated	(0028,0100)	1	See C.7.6.3 for description of Image Pixel Module; Enumerated Value: 8
Bits Stored	(0028,0101)	1	See C.7.6.3 for description of Image Pixel Module; Enumerated Value: 8
High Bit	(0028,0102)	1	See C.7.6.3 for description of Image Pixel Module; Enumerated Value: 7
Pixel Representation	(0028,0103)	1	See C.7.6.3 for description of Image Pixel Module; Enumerated Value: 0000H (unsigned integer)
Pixel Data	(7FE0,0010)	1	See C.7.6.3 for description of Image Pixel Module

PS 3.3 C.13.2 Add the following

C.13.2 Basic Film Session Relationship Module

extensions to Table C.13-2

BASIC FILM SESSION RELATIONSHIP MODULE

Attribute Name	Tag	Attribute Description
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Proposed Study Sequence	(2130,00A0)	Attributes that may be used to identify Stored Print Storage and Hardcopy Image SOP Instances created to store this Film Session
>Patient's Name	(0010,0010)	See C.2.2 for description.
>Patient ID	(0010,0020)	See C.2.2 for description.
>Patient's Birth Date	(0010,0030)	See C.2.3 for description.
>Patient's Sex	(0010,0040)	See C.2.3 for description.
>Patient's Birth Time	(0010,0032)	See C.2.3 for description.
>Other Patient ID	(0010,1000)	See C.2.2 for description.
>Other Patient Names	(0010,1001)	See C.2.2 for description.
>Ethnic Group	(0010,2160)	See C.2.2 for description.
>Patient Comments	(0010,4000)	See C.2.2 for description.
>Study Instance UID	(0020,000D)	See C.4.1 for description.
>Study Date	(0008,0020)	See C.4.5 for description.
>Study Time	(0008,0030)	See C.4.5 for description.
>Referring Physician's Name	(0008,0090)	See C.3.4 for description.
>Study ID	(0020,0010)	See C.4.2 for description.
>Accession Number	(0008,0050)	See C.4.1 for description.
>Study Description	(0008,1030)	See C.4.9 for description.
>Name of Physician(s) Reading Study	(0008,1060)	See C.7.2.1 for description.
>Admitting Diagnoses Description	(0008,1080)	See C.7.2.2 for description.
>Patient's Age	(0010,1010)	See C.2.3 for description.
>Patient's Size	(0010,1020)	See C.2.3 for description.
>Patient's Weight	(0010,1030)	See C.2.3 for description.
>Occupation	(0010,2180)	See C.2.3 for description.
>Additional Patient's History	(0010,21B0)	See C.2.4 for description.
>Series Number	(0020,0011)	See C.7.3.1 for description

PS 3.3 C.13.5 : Make the following changes

C.13.5 Image Box Pixel Presentation Module

**Table C.13.5-1
Image Box Pixel Presentation Module**

Preformatted Basic Grayscale Image Sequence	(2020,0110)	A sequence which provides the content of the <u>grayscale image pixel data to be printed</u> . Preformatted Grayscale Image Pixel Attributes. The Preformatted Grayscale Image Pixel Attributes-This is are a specialization of the Image Pixel Module defined in C.7.6.3 of this part. It is encoded as a sequence of Attributes of the Image Pixel Module. See C.13.5.2 <u>PS 3.4</u> for further description.
Preformatted Basic Color Image Sequence	(2020,0111)	A sequence which provides the content of the <u>color image pixel data to be printed</u> . Preformatted Color (RGB) image Pixel Attributes. The Preformatted Color Image (RGB) Pixel Attributes-are It is a specialization of the Image Pixel Module defined in C.7.6.3 of this part. It is encoded as a sequence of Attributes of the Image Pixel Module. See C.13.5.3 <u>PS 3.4</u> for further description.

C.13.5.2 Preformatted Grayscale Image

The Preformatted Grayscale Image is an abstraction of a 8/12 bit grayscale image where annotation, graphics, overlays are burned in and where the LUT operations are already performed (see Part 4 of the DICOM Standard). The preformatted grayscale image is a displayable image where the polarity of the intended display is specified by Photometric Interpretation (0028,0004).

C.13.5.3 ~~Preformatted Color Image~~

The Preformatted Color Image is an abstraction of a color image where annotation, graphics, overlays are burned. The color image is encoded by frame interleaving of the RGB components (see PS 3.4).

PS 3.3 C.13.6 Add the following

C.13.2 Image Box Relationship Module

extensions to Table C.13-6
IMAGE BOX RELATIONSHIP MODULE

Attribute Name	Tag	Attribute Description
Original Image Sequence	(2130,00C0)	Attributes of the original modality images to be printed in this Film Session.
>Study Instance UID	(0020,000D)	See C.7.2.1 for description.
>Series Instance UID	(0020,000E)	See C.7.3.1 for description.
>Patient ID	(0010,0020)	See C.7.1.1 for description.
>Referenced SOP Class UID	(0008,1150)	SOP Class UID of the original modality image used to create this Image Box.

>Referenced SOP Instance UID	(0008,1155)	SOP Instance UID of the original modality image used to create this Image Box.
>Referenced Frame Number	(0008,1160)	See C.7.3.1 for description.
>Image Number	(0020,0013)	See C.7.3.1 for description.

Add section C.13.12 : Print Request Module

C.13.12 Print Request Module

Table C.13-12 specifies the Attributes that identify the print request.

**Table C.13-12
Print Request Module**

Attribute Name	Tag	Description
Number of Copies	(2000,0010)	See C.13.1 for description
Print Priority	(2000,0020)	See C.13.1 for description.
Medium Type	(2000,0030)	See C.13.1 for description
Film Destination	(2000,0040)	See C.13.1 for description.
Film Session Label	(2000,0050)	See C.13.1 for description.
Memory Allocation	(2000,0060)	See C.13.1 for description.
Color Image Printing Flag	(2000,0062)	Flag, describing how grayscale printers shall print color images; Enumerated Values : BESTFIT = attempt to print color image pixel data on a grayscale printer REJECT = do not attempt to print color image pixel data on a grayscale printer Meaningful only for grayscale printers
Collation Flag	(2000,0063)	Flag, indicating that the films of the print request shall be collated; Enumerated Values : YES NO
Annotation Flag	(2000,0065)	Flag describing how printers that do not support Annotation Content Sequence (2130,0050) shall react if it is contained in the Stored Print IOD. Enumerated Values: BESTFIT = print images without Annotation REJECT = do not attempt to print images
Image Overlay Flag	(2000,0067)	Flag describing how printers that do not support Image Overlay Box Content Sequence (2130,0060) shall react if it is contained in the Stored Print IOD. Enumerated Values: BESTFIT = print images without the Overlay(s) REJECT = do not attempt to print images

Presentation LUT Flag	(2000,0069)	Flag describing how printers that do not support Presentation LUT Content Sequence (2130,0080) shall react if it is contained in the Stored Print IOD. Enumerated Values: BESTFIT = print images without a Presentation LUT REJECT = do not attempt to print images
Image Box Presentation LUT Flag	(2000,006A)	Flag describing how printers that do not support Presentation LUT Content Sequence (2130,0080) at the Image Box level shall react if a Presentation LUT is contained in Image Box Content Sequence (2130,0040). Enumerated Values: BESTFIT = print image with the Presentation LUT specified in Film Box Content Sequence (2130,0030). REJECT = do not attempt to print images
Configuration Information	(2010,0150)	See C.13.3 for description. Value overrides the corresponding attribute value in the referenced Stored Print Storage SOP Instance.
Illumination	(2010,015E)	See C.13.3 for description.
Reflected Ambient Light	(2010,0160)	See C.13.3 for description.
Owner ID	(2100,0160)	See C.13.3 for description
Referenced Stored Print Sequence	(2000,0510)	Reference to Stored Print Storage SOP Instance. Sequence contains one or more items
> Retrieve AE Title	(0008,0054)	Application Entity Title where the Stored Print Storage SOP Instance may be retrieved
>Referenced SOP Class UID	(0008,1150)	Uniquely identifies the referenced SOP Class
>Referenced SOP Instance UID	(0008,1155)	Uniquely identifies the referenced SOP Instance
>Study Instance UID	(0020,000D)	Unique identifier for the Study
>Series Instance UID	(0020,000E)	Unique identifier for the Series
>Patient ID	(0010,0020)	Primary hospital identification number or code for the patient

Add section C.15 : Stored Print Specific Modules

C.15 STORED PRINT SPECIFIC MODULES

The following Modules are used by the Stored Print IOD.

C.15.1 Printer Characteristics Module

Table C.15-1 specifies the Attributes that identify characteristics of a device that printed the Film Box.

**Table C.15-1
Printer Characteristics Module**

Attribute Name	Tag	Type	Description
Print Management Capabilities Sequence	(2130,0010)	1	A list of Print Management SOP Classes (e.g. Film Session SOP Class, Basic Annotation Box) and Image Storage SOP Classes (e.g. US Image, Hardcopy Grayscale Image) that the Stored Print IOD contains or refers to. One or more Items shall be included in this sequence. Encoded as a sequence of items (0008, 1150)
>Referenced SOP Class UID	(0008,1150)	1	SOP Class UID of the SOP Class, that the Stored Print IOD contains or refers to.
Printer Characteristics Sequence	(2130,0015)	2	Printer Characteristics information. Only valid if film session/box has been printed. One Item shall be included in this sequence. Encoded as a sequence of items.
>Creation Date	(2100, 0040)	3	Date of print job creation
>Creation Time	(2100, 0050)	3	Time of print job creation
>Originator	(2100, 0070)	2	DICOM Application Entity Title that issued the print operation
>Destination	(2100,0140)	2	DICOM Application Entity Title that performed the print operation
>Printer Name	(2110, 0030)	3	User defined name identifying the printer.
>Manufacturer	(0008,0070)	3	Manufacturer of the printer.
>Manufacturer Model Name	(0008,1090)	3	Manufacturer Model Name of the printer.
>Device Serial Number	(0018,1000)	3	Manufacturer's serial number of the printer.
>Software Version	(0018,1020)	3	Manufacturer's designation of software version of the printer.
>Date of Last Calibration	(0018,1200)	3	Date when the printer was last calibrated.
>Time of Last Calibration	(0018,1201)	3	Time when the printer was last calibrated.

C.15.2 Film Box Module

Table C.15-2 specifies the Attributes that identify characteristics of a Film Box.

**Table C.15-2
Film Box Module**

Attribute Name	Tag	Type	Description
Image Number	(0020,0013)	2	A number that identifies this film box.
Film Box Content Sequence	(2130,0030)	1	The content of the Film Box SOP Instance. One Item shall be included in this sequence.
> Image Display Format	(2010,0010)	1	See C.13.3 for description
> Annotation Display Format ID	(2010,0030)	3	See C.13.3 for description.
> Film Orientation	(2010,0040)	2	See C.13.3 for description.

> Film Size ID	(2010,0050)	2	See C.13.3 for description.
> Magnification Type	(2010,0060)	2	See C.13.3 for description.
> Smoothing Type	(2010,0080)	3	See C.13.3 for description.
> Border Density	(2010,0100)	3	See C.13.3 for description.
> Empty Image Density	(2010,0110)	3	See C.13.3 for description.
> Min Density	(2010,0120)	3	See C.13.3 for description.
> Max Density	(2010,0130)	2	See C.13.3 for description.
> Trim	(2010,0140)	3	See C.13.3 for description.
> Configuration Information	(2010,0150)	2	See C.13.3 for description.
> Illumination	(2010,015E)	2C	See C.13.3 for description. Required if Presentation SOP Class is present.
> Reflected Ambient Light	(2010,0160)	2C	See C.13.3 for description. Required if Presentation SOP Class is present.
>Referenced Presentation LUT Sequence	(2050,0500)	1C	Reference to a LUT Instance UID contained in this IOD in Presentation LUT Content Sequence (2130,0080). The referenced LUT is to be applied to all images on this film, unless overridden by another reference contained in Image Box Content Sequence (2130,0040). If included, this sequence shall contain a single item. Required if a Presentation LUT is to be applied to the image.
>>Referenced SOP Instance UID	(0008,1155)	1C	Uniquely identifies the referenced SOP Instance; Required if Referenced Presentation LUT Sequence is present.

C.15.3 Image Box List Module

**Table C.15-3
Image Box List Module**

Attribute Name	Tag	Type	Description
Image Box Content Sequence	(2130,0040)	1	The content of the Image Box SOP Instance. One or more Items shall be included in this sequence. Encoded as a sequence of items
>SOP Instance UID	(0008, 00181155)	1C	SOP Instance UID of the contained Image Box SOP Class. Required if Sequence is sent
> Image Position	(2020,0010)	1	See C.13.5 for description.
> Polarity	(2020,0020)	2	See C.13.5 for description.
> Magnification Type	(20120 ,0060)	3	See C.13.5 for description.
>Configuration Information	(2010,0150)	3	See C.13.3 for description. The This value overrides any Configuration Information in Film Box Content Sequence (2130,0030)
> Smoothing Type	(2010,0080)	3	See C.13.5 for description.
> Requested Image Size	(2020,0030)	3	See C.13.5 for description.

>Referenced Image Sequence	(0008,1140)	1	See C.13.6 for description. This sequence contains a single item
>> Retrieve AE Title	(0008,0054)	1	Application Entity Title where the Image Storage SOP Instance may be retrieved
>>Referenced SOP Class UID	(0008,1150)	1	See C.13.6 for description
>>Referenced SOP Instance UID	(0008,1155)	1	See C.13.6 for description
>>Study Instance UID	(0020,000D)	1	Unique identifier for the Study
>>Series Instance UID	(0020,000E)	1	Unique identifier for the Series
>> Referenced Frame Number	(0008,1160)	1C	See C.13.6 for description. Required if a Multi-frame Image is being referenced.
>>Patient ID	(0010,0020)	2	Primary hospital identification number or code for the patient
> Referenced Image Overlay Box Sequence	(20202130,01309990)	1C	Reference to an Overlay Instance UID contained in this IOD in Image Overlay Box Content Sequence (2130,0060). If included, this sequence shall contain a single item. Required if Image Overlay Box Content Sequence (2130,0060) is present.
>> Referenced SOP Instance UID	(0008,1155)	1C	Uniquely identifies the Referenced SOP Instance. Required if Referenced Image Overlay Box Sequence is sent.
>Referenced Presentation LUT Sequence	(2050,0500)	1C	Reference to a LUT Instance UID contained in this IOD in Presentation LUT Content Sequence (2130,0080). The referenced LUT overrides any LUT Instance contained in Film Box Content Sequence (2130,0030) If included, this sequence shall contain a single item. Required if a Presentation LUT which is different than any specified for the Film Box is to be applied to the image.
>>Referenced SOP Instance UID	(0008,1155)	1C	Uniquely identifies the referenced SOP Instance; Required if Referenced Presentation LUT Sequence is present.

C.15.4 Annotation List Module

**Table C.15-4
Annotation List Module**

Attribute Name	Tag	Type	Description
Annotation Content Sequence	(2130,0050)	3	The content of the Annotation SOP Instance. Zero or more Items shall be included in this sequence. Encoded as a sequence of items.
>SOP Instance UID	(0008,00184455)	1C	SOP Instance UID of the contained Annotation SOP Class. Required if Sequence is sent.
>Annotation Position	(2030,0010)	1C	See C.13.7 for description. Required if the Annotation Content Sequence is sent.
>Text String	(2030,0020)	1C	See C.13.7 for description. Required if the Annotation Content Sequence is sent.

C.15.5 Image Overlay Box List Module

**Table C.15-5
Image Overlay Box List Module**

Attribute Name	Tag	Type	Description
Image Overlay Box Content Sequence	(2130,0060)	3	The content of the Image Overlay Box SOP Instance. If sent, one or more Items shall be included in this sequence. Encoded as a sequence of items.
>SOP Instance UID	(0008,00184455)	1C	SOP Instance UID of the contained Image Overlay Box SOP Class. Required if Sequence is sent.
>Referenced Overlay Plane Sequence	(2040,0010)	1C	See C.13.10.1 for description. Overlay planes encoded as part of a Standalone Overlay IOD are not permitted. Required if Sequence is sent.
>>Referenced SOP Class UID	(0008,1150)	1C	See C.13.10 for description. Required if Referenced Overlay Plane Sequence is sent.
>>Referenced SOP Instance UID	(0008,1155)	1C	See C.13.10 for description. Required if Referenced Overlay Plane Sequence is sent.
>> Referenced Frame Number	(0008,1160)	1C	See C.13.6 for description. Required if Overlay Plane Sequence is sent and a Multi-frame Image is referenced.
>>Referenced Overlay Plane Groups	(2040,0011)	1C	See C.13.10 for description. Required if Referenced Overlay Plane Sequence is sent.
>Overlay Magnification Type	(2040,0060)	3	See C.13.10 for description.
>Overlay Smoothing Type	(2040,0070)	3	See C.13.10 for description.
>Overlay Foreground Density	(2040,0080)	3	See C.13.10 for description.
>Overlay Mode	(2040,0090)	3	See C.13.10 for description.
>Threshold Density	(2040,0100)	3	See C.13.10 for description.

C.15.6 Presentation LUT List Module

**Table C.15-6
Presentation LUT List Module**

Attribute Name	Tag	Type	Description
Presentation LUT Content Sequence	(2130,0080)	3	The content of the Presentation LUT SOP Instance. If sent, one or more Items shall be included in this sequence. Encoded as a sequence of items.
>SOP Instance UID	(0008,00184455)	1C	SOP Instance UID of the contained Presentation LUT SOP Class. Required if Sequence is sent
>Presentation LUT Sequence	(2050,0010)	1C	See C.11.3 for description; Required if Presentation LUT Shape (2050,0020) is not present. Not allowed otherwise.
>> LUT Descriptor	(0028,3002)	1C	See C.11.3 for description ; Required if Presentation LUT Sequence is sent.
>> LUT Explanation	(0028,3003)	3	See C.11.3 for description;
>> LUT Data	(0028,3006)	1C	See C.11.3 for description; Required if Presentation LUT Sequence is sent.
>Presentation LUT Shape	(2050,0020)	1C	See C.11.3 for description; Required if Presentation LUT Sequence (2050,0010) is not present. Not allowed otherwise. SCPs shall support the Enumerated Values IDENTITY and LIN OD

Digital Imaging and Communications In Medicine (DICOM)

Part 4 Addendum Stored Print Service Class

PS 3.4: 3.9, Add the following Definitions

3.9 DICOM SERVICE CLASS DEFINITIONS

Preformatted Grayscale Image: an image where all annotation, graphics, and grayscale transformations (up to and including the VOI LUT) expected in the printed image have been burnt in or applied before being sent to the SCP. It is a displayable image where the polarity of the intended display is specified by Photometric Interpretation (0028,0004).

Preformatted Color Image: an image where all annotation, graphics, and color transformations expected in the printed image have been burnt in or applied before being sent to the SCP.

PS 3.4 Section 7 Remove Figures and reference Part 3.

7 DICOM MODEL OF THE REAL WORLD

The DICOM view of the Real-World which identifies the relevant Real-World Objects and their relationships within the scope of the DICOM Standard is described in the DICOM Model of the Real-World Section of PS 3.3.

This section also describes the DICOM Information Model which identifies the various IODs specified by the DICOM Standard and their relationship.

Extend table B.5-1 - Standard SOP Classes

B.5 STANDARD SOP CLASSES

**Table B.5-1
extensions to Standard SOP Classes**

SOP Class Name	SOP Class UID
Stored Print Storage	1.2.840.10008.5.1.1.27
Hardcopy Grayscale Image Storage	1.2.840.10008.5.1.1.29
Hardcopy Color Image Storage	1.2.840.10008.5.1.1.30

Modify section H.3.1 Scope

H.3 PRINT MANAGEMENT CONFORMANCE

H.3.1 Scope

Print Management conformance is defined in terms of supported Meta SOP Classes, which correspond with the mandatory functionality, and of supported optional SOP Classes, which correspond with additional functionality.

A Meta SOP Class corresponds with a pre-defined group of SOP Classes. The following Print Management Meta SOP Classes ~~instances~~ are defined:

- Basic Grayscale Print Management Meta SOP Class
- Basic Color Print Management Meta SOP Class
- Referenced Grayscale Print Management Meta SOP Class
- Referenced Color Print Management Meta SOP Class
- Pull Stored Print Management Meta SOP Class

All SCUs and SCPs of the Print Management Service Class shall support at least one of the Basic Print Management Meta SOP Classes.

In addition, the other Meta SOP Classes or optional SOP Classes may be supported.

The Meta SOP Class level negotiation is used to define a minimum set of print functions; the SOP Class level negotiation is used to define additional functions.

At Association setup, the negotiation process between the Print Management SCU and SCP shall occur at the Meta SOP Class level. In addition, optional SOPs may be negotiated. If multiple Meta SOP Classes and one or more optional SOP Classes are negotiated, the SCP shall support all the optional SOP Classes in conjunction with all the Meta SOP Classes.

H.3.2 Print Management Meta SOP Classes

H.3.2.1 Description

The Basic Print Management Meta SOP Classes correspond with the minimum functionality that an implementation of the Print Management Service Class shall support. The Basic Print Management Meta SOP Classes support the following mandatory features:

- Preformatted Grayscale Images or Preformatted Color Images
- predefined film layouts (image display formats)
- basic presentation parameters on film session, film box and image box level
- basic device management.

The optional SOP Classes described in Section H.3.3 may be used with the Basic Print Management Meta SOP Classes.

~~NOTE: The functionality of the Basic Print Management Meta SOP Class corresponds with the print functionality of the ACR-NEMA 2.0 Standard.~~

The Referenced Print Management Meta SOP Classes provide additional functionality to support printing of modality specific images. This includes applying Lookup Tables to the image pixel data.

The optional SOP Classes described in Section H.3.3 may be used with the Referenced Print Management Meta SOP Classes.

The Pull Stored Print Management Meta SOP Class is an extension of the Basic Print Management Meta SOP Class. It supports the following mandatory features:

- Film box (page) level printing
- Printing of Hardcopy Grayscale/Color and other Preformatted Images
- Images are send separately from the print parameters
- Print parameters are stored in the Stored Print Storage SOP Instance
- Stored Print Storage SOP Instances and the Image SOP Instances are sent to the printer by the various Storage SOP Classes

The following features are optional for SCUs and SCPs:

- Film box annotation
- Separate image overlays
- Presentation LUT

One use of the Pull Stored Print Management Meta SOP Classes is to make an additional print of images originally printed with one of the Print Management Meta SOP Classes. It allows all the information originally sent to a printer to be sent to the same or another printer. The specific results on the second printer will depend on a number of factors including:

- Printer defaults used for Attributes not specified in the original print process
- Differences in capabilities of the original and subsequent printers

Especially when the subsequent print is made on a different model printer, there probably will be differences in the subsequent prints compared with the original prints. The magnitude of these differences and their acceptability in specific clinical circumstances is beyond the scope of the DICOM Standard.

H.3.2.2.5 Pull Stored Print Management Meta SOP Class

SOP Class Name	Reference	Usage SCU/SCP
Pull Print Request SOP Class	H.4.9	M/M
Printer SOP Class	H.4.6	M/M

SCPs shall also support the Hardcopy Grayscale Image Storage SOP Class or the Hardcopy Color Image Storage SOP Class as an SCU. They may support both of these SOP Classes.

SCPs may also support Other Image Storage SOP Classes.

Note: Other Image Storage SOP Classes referenced by the Stored Print IOD describe Preformatted Images. See PS 3.3.

SCPs shall also support the Study Root Query/Retrieve Information Model—MOVE SOP Class as an SCU.

[The Pull Stored Print Management Meta SOP Class UID has the value 1.2.840.10008.5.1.1.32.](#)

PS 3.4: H.3.3.1, Make the following changes

H.3.3 Optional SOP Classes

H.3.3.1 Description

The optional SOP Classes address functionality beyond the Print Management Meta SOP Classes. One or more optional SOP Classes may be used in addition to the Print Management Meta SOP Classes.

The following functionality is supported by the optional SOP Classes:

- annotation (text associated with a sheet of film)
- overlays (text or graphics associated with an image)
- tracking the printing of the print session

Use of these optional SOP Classes allows an SCU to provide information to be printed with or on an image without burning the information into the image pixels. If these optional SOP Classes are not supported by both the SCU and SCP, then only the information burnt in to the image pixels before they are sent to the SCP will be printed. If the optional SOP Classes are not supported, the SCU is responsible for burning all expected text or graphics into the image pixels.

H.3.3.2 List of Optional SOP Classes

The following optional SOP Classes may be used in conjunction with the Basic Print Management Meta SOP Classes and the Referenced Print Management Meta SOP Classes specified in Section H.3.2.2.

SOP Class Name	Reference	Usage SCU/SCP
Basic Annotation Box SOP Class	H.4.4	U/U
Print Job SOP Class	H.4.5	U/U
Image Overlay Box SOP Class	H.4.8	U/U
Presentation LUT SOP Class	H.4.9	U/U

The following optional SOP Class may be used in conjunction with the Pull Stored Print Management Meta SOP Class specified in Section H.3.2.2.

SOP Class Name	Reference	Usage SCU/SCP
Print Job SOP Class	H.4.5	U/U
Presentation LUT SOP Class	H.4.9	U/U

Modify section H.3.4 Conformance Statement

H.3.4 Conformance Statement

The implementation Conformance Statement of these SOP Classes shall follow PS 3.2.

The SCU Conformance Statement shall specify the following items:

- maximum number of supported Associations at the same time
- list of supported SOP Classes and Meta SOP Classes

- for each of the supported SOP and Meta SOP Classes:
 - list of supported optional SOP Class Attributes and DIMSE Service Elements
 - for each supported Attribute (mandatory and optional Attribute), the valid range of values

The SCP Conformance Statement shall specify the following items:

- maximum number of supported Associations at the same time
- list of supported SOP Classes and Meta SOP Classes
- minimum and maximum number of printable pixel matrix per supported film size
- for each of the supported SOP Classes:
 - list of supported optional SOP Class Attributes and DIMSE Service Elements
 - for each supported Attribute (mandatory and optional Attribute):
 - valid range of values
 - default value if no value is supplied by the SCU
 - status code (Failure or Warning) if SCU supplies a value which is out of range
 - for each supported DIMSE Service, the SCP behavior for all specific status codes
 - description of each supported custom Image Display Format (2010,0010) e.g., position and dimensions of each composing image box, numbering scheme of the image positions
 - description of each supported Annotation Display Format ID (2010,0030) e.g., position and dimensions of annotation box, font, number of characters
 - description of each supported configuration table (e.g. identification, content)
 - if the SCP supports N-ACTION for the Film Session SOP Class then the SCP shall specify the maximum number of collated films
 - for Referenced Meta SOP Class Implementations, the conditions under which stored Image SOP Instances are deleted.
 - in the case of grayscale printers that print color images, the behavior of printing color images
 - for Pull Print Request Meta SOP Class Implementors, behavior when Image Overlay, Annotation, and Presentation LUT options are contained in the Stored Print Storage SOP Class

Extend Annex H- table H.4-2 N-CREATE attribute list
--

H.4.1 Basic Film Session SOP Class

***extensions to Table H.4-2
N-CREATE Attribute List***

Attribute Name	Tag	Usage SCU/SCP
Proposed Study Sequence	(2130,00A0)	U/U
>Patient's Name	(0010,0010)	U/U
>Patient ID	(0010,0020)	U/U
>Patient's Birth Date	(0010,0030)	U/U
>Patient's Sex	(0010,0040)	U/U
>Patient's Birth Time	(0010,0032)	U/U
>Other Patient ID	(0010,1000)	U/U
>Other Patient Names	(0010,1001)	U/U
>Ethnic Group	(0010,2160)	U/U

>Patient Comments	(0010,4000)	U/U
>Study Instance UID	(0020,000D)	U/U
>Study Date	(0008,0020)	U/U
>Study Time	(0008,0030)	U/U
>Referring Physician's Name	(0008,0090)	U/U
>Study ID	(0020,0010)	U/U
>Accession Number	(0008,0050)	U/U
>Study Description	(0008,1030)	U/U
>Name of Physician(s) Reading Study	(0008,1060)	U/U
>Admitting Diagnoses Description	(0008,1080)	U/U
>Patient's Age	(0010,1010)	U/U
>Patient's Size	(0010,1020)	U/U
>Patient's Weight	(0010,1030)	U/U
>Occupation	(0010,2180)	U/U
>Additional Patient's History	(0010,21B0)	U/U
>Series Number	(0020,0011)	U/U

- Notes:
1. Proposed Study Sequence (2130,0040) may be used to identify Stored Print Storage and Hardcopy Image SOP Instances created to store this Film Session
 2. To meet requirements specified in PS 3.3, the Study Instance UID of the Stored Print Storage SOP Instance should be the same as the Study Instance UID in Proposed Study Sequence (2130,0040). New Series Instance and Image Instance UIDs will be supplied by the device that creates the Stored Print Storage SOP Instance.

Part 4, Change Attribute Names in the following Sections

Table .4-10 and Section H.4.3.1.2.1.3

Preformatted Basic Grayscale Image Sequence

Table H.4-11 and Section H.4.3.2.2.1.3

Preformatted Basic Color Image Sequence

Extend Annex H- section H.4.5.1. - last paragraph Print Job SOP Class IOD description

H.4.5.1. IOD Description

The Print Job SOP Class is created by an N-ACTION operation of the Film Session SOP Class, Film Box SOP Class, or Pull Print Request SOP Class. The Print JOB SOP Class is deleted after the films are printed or after a failure condition.

Extend Annex H Table H.4-10 and H.4-11

**Table H.4-10,11
N-SET ATTRIBUTES**

Attribute Name	Tag	Usage SCU/SCP
Original Image Sequence	(2130,00C0)	U/U
>Study Instance UID	(0020,000D)	MC/M Required if Sequence is present.
>Series Instance UID	(0020,000E)	MC/M Required if Sequence is present.
>Patient ID	(0010,0020)	MC/M Required if Sequence is present and value is known.
>Referenced SOP Class UID	(0008,1150)	MC/M Required if Sequence is present.
>Referenced SOP Instance UID	(0008,1155)	MC/M Required if Sequence is present.
>Referenced Frame Number	(0008,1160)	MC/M Required if Sequence is present and Original Image is a Multi-frame Image
>Image Number	(0020,0013)	MC/M Required if Sequence is present and value is known.

Add section H.4.9 Pull Print Request SOP Class

Note: This item contains references to section H.2.5 which was introduced in CP 80.

H.4.9 Pull Print Request SOP Class

H.4.9.1 IOD DESCRIPTION

The Pull Print Request SOP Class is based on the Pull Print Request IOD, which describes all the print parameters to print one or more film pages. The Pull Print Request SOP Instance contains print transaction related information (e.g. priority, number of copies) and a reference to the Stored Print Storage SOP Instance, which contains the print presentation parameters and references to images.

The SCP (printer) is responsible for retrieving all the print parameters and images. The SCU supplies the AE Title of device where the information is stored and the SOP Class and Instance UID of the SOPs to be retrieved.

Note : The normalized Film Session SOP Instance is split into 2 SOP Instances :

- Stored Print Storage SOP Instance, containing layout information and references to images. The Stored Print Storage SOP Instance contains information which remains invariant during subsequent re-prints (of the same film session). The Stored Print Storage SOP Instance may be archived.

- Pull Print Request SOP Instance, which contains information that may change during subsequent re-prints.

H.4.9.2 DIMSE Service Group

The following DIMSE Services are applicable to the IOD

DIMSE Service Element	Usage SCU/SCP
N-CREATE	M/M
N-ACTION	M/M
N-DELETE	U/M

The meaning of the Usage SCU/SCP is described in Section H.2.4.

This Section describes the behavior of the DIMSE Services which are specific for this IOD. The general behavior of the DIMSE Services is specified in PS 3.7

H.4.9.2.1 N-CREATE

The N-CREATE is used to create an instance of the Pull Print Request SOP Class.

H.4.9.2.1.1 Attributes

The Attribute list of the N-CREATE is defined as shown in Table H.4-2.

**Table H.4-2
N-CREATE ATTRIBUTE LIST**

Attribute Name	Tag	Usage SCU/SCP
Number of Copies	(2000,0010)	U/M
Print Priority	(2000,0020)	U/M
Medium Type	(2000,0030)	U/M
Film Destination	(2000,0040)	U/M
Film Session Label	(2000,0050)	U/U
Memory Allocation	(2000,0060)	U/U
Color Image Printing Flag	(2000,0062)	U/M
Collation Flag	(2000,0063)	U/U
Annotation Flag	(2000,0065)	U/M
Image Overlay Flag	(2000,0067)	U/M
Presentation LUT Flag	(2000,0069)	U/M
Image Box Presentation LUT Flag	(2000,006A)	U/M
Configuration Information	(2010,0150)	U/M
Illumination	(2010,015E)	U/U
Reflected Ambient Light	(2010,0160)	U/U
Owner ID	(2100,0160)	U/U
Referenced Stored Print Sequence	(2000, 0510)	M/M

> Retrieve AE Title	(0008,0054)	M/M
>Referenced SOP Class UID	(0008,1150)	M/M
>Referenced SOP Instance UID	(0008,1155)	M/M
>Study Instance UID	(0020,000D)	M/M
>Series Instance UID	(0020,000E)	M/M
>Patient ID	(0010,0020)	MC/M Required if value is known.

Note: The memory allocation Attribute allows the SCU to reserve sufficient memory to store the film page description, including images in order to prevent deadlock situations.

Within the print session, the allocated memory is consumed as SOP Instances are created and is freed for reuse as SOP Instances are deleted. All the allocated memory shall be released following termination of the Association or deletion of the Pull Print Request SOP Instance.

H.4.9.2.1.2 Status

The status values which are specific for this SOP Class are defined as follows.

Status	Meaning	Code
Success	Print Request successfully created	0000
Warning	Memory allocation not supported	B600

Note: The status code "0106H" (Invalid Attribute Value) indicates that the requested memory allocation can not be provided; the status code "0213H" (Resource limitation) indicates that the requested allocation can temporarily not be provided.

H.4.9.2.1.3 Behavior

The SCU uses the N-CREATE to request the SCP to create a Pull Print Request SOP Instance. The SCU shall initialize Attributes of the SOP Instance as specified in Section H.2.4.

The SCP shall create the SOP Instance and shall initialize Attributes of the SOP Class as specified in Section H.2.4.

The Stored Print Storage SOP Instance referenced may contain the optional Attributes Annotation Content Sequence (2130,0050) and/or Image Overlay Box Content Sequence (2130,0060). Use of these optional Attributes allows an SCU to provide information to be printed with or on an image without burning the information into the image pixels. If these optional Attributes are not supported by both the SCU and SCP, then only the information burnt in to the image pixels before they are sent to the SCP will be printed. If the optional Attributes are not supported, the SCU is responsible for burning all expected text or graphics into the image pixels.

The SCP shall return the status code of the requested SOP Instance creation. The meaning of success, warning, and failure status codes is defined in Section H.2.5.

At any time the SCU/SCP shall only support one Pull Print Request SOP Instance on an Association.

Note: Multiple print requests may be handled by establishing multiple Associations.

SCPs unable to collate films shall ignore Collation Flag (2000,0063).

Terminating the Association will effectively perform an N-DELETE on an opened print request. See Note in Section H.4.9.2.3.2.

H.4.9.2.2 N-ACTION

The N-ACTION is initiated by the SCU to request the SCP to retrieve the Stored Print Storage SOP Instance and Image SOP Instances from the specified AE title and to print one or more films, based on the information in the Print Request SOP Instance.

H.4.9.2.2.1 Attributes

The arguments of N-ACTION are defined as follows

N-ACTION ARGUMENTS

Action Type Name	Action Type ID	Attribute	Tag	Usage SCU/SCP
PRINT	1	Referenced Print Job Sequence	(2100,0500)	-/MC Required if Print Job SOP is supported
		> Referenced SOP Class UID	(0008,1150)	-/MC Required if Referenced Print Job Sequence is present
		> Referenced SOP Instance UID	(0008,1155)	-/MC Required if Referenced Print Job Sequence is present
		>Print Job ID	(2100,0010)	-/MC (Required if Print Queue Management SOP Class is supported)

The Action Reply argument is encoded as a DICOM Data Set. The Data Set only contains the Attribute Referenced Print Job Sequence (2100,0500) which includes the Referenced SOP Class UID (0008,1150) and the Referenced SOP Instance UID (0008,1155).

If the SCP does not support the Print Job SOP Instance, the Action Reply arguments is not contained in the N-ACTION response.

H.4.9.2.2.2 Status

The status values which are specific for this SOP Class are defined as follows.

SOP CLASS STATUS VALUES

Status	Meaning	Code
Success	Print request, accepted for printing; if supported Print Job SOP Instance is created	0000

Warning	Memory allocation not supported (see H.4.1.2.1.2)	B600
	Film session printing (collation) is not supported	B601
	Film Session does not contain Image Boxes (empty Page)	B602
	Film Box does not contain Image Boxes	B603
	Annotation Box not supported, image printed without annotation.	B604
	Image Overlay Box not supported, image printed without overlay.	B605
	Presentation LUT not supported, image printed without applying any Presentation LUT.	B606
	Presentation LUT not supported at Image Box level, image printed with Film Box Presentation LUT	B608
Failure	Stored Print Storage SOP Instance does not contain Film Boxes	C600
	Unable to create Print Job SOP Instance; print queue is full	C601
	Print queue is full	C602
	Image Size is larger than image box size (by using the specified magnification value)	C603
	Insufficient Memory to store image	C605
	Stored Print Storage SOP Instance not available from Retrieve AE	C607
	Image SOP Instance not available from Retrieve AE	C608
	Failure in retrieving Stored Print Storage SOP Instance	C609
	Failure in retrieving Image SOP Instance	C60A
	Unknown Retrieve AE title	C60B
	Print request rejected because printer cannot handle color images	C60C
	Stored Print Storage SOP Instance does not contain Image Boxes (empty page)	C60D
	Annotation Box not supported	C60E
	Image Overlay Box not supported	C60F
	Presentation LUT not supported	C610
Presentation LUT not supported at Image Box level	C614	
Unable to establish an Association with the Retrieve AE	C615	

H.4.9.2.2.3 Behavior

The SCU uses N-ACTION to request the SCP to retrieve the Stored Print Storage SOP Instances, the Image SOP Instances and to print the film session.

The SCU shall adhere to the following sequence of actions :

- SCU sends a Pull Print Request SOP Instance to the SCP using N-CREATE Service Element of Pull Print Request SOP Class.
- SCU issues N-ACTION of the Pull Print Request SOP Instance.

The SCP retrieves from the specified Application Entity the requested Stored Print Storage SOP Instance referenced by the Pull Print Request SOP Instance. It then retrieves the requested Image SOP Instances as referenced by the Stored Print Storage SOP Instance. After successful retrieval, the SCP creates a print job that contains the print parameters (of the Stored Print Storage SOP Instance) and images.

The values of Configuration Information (2010,0150), Illumination (2010,015E), and Reflected Ambient Light (2010,0160) contained in the N-CREATE of the Pull Print Request SOP Instance override any corresponding values in the Stored Print Storage SOP Instance.

If supported by the SCP, Referenced Presentation LUT Sequence (2050,0500) in the Stored Print Storage SOP Instance overrides grayscale transformation information contained in Configuration Information (2010,0150) in the Pull Print Request SOP Instance and/or the Stored Print Storage SOP Instance.

The SCP shall return the status code when it has validated the print request information. The meaning of success, warning, and failure status codes is defined in Section H.2.5.

The execution of the retrieval process and print process is monitored by the Print Job Instance (if supported) or by the Queue Management SOP Instance (if supported). If the SCP supports Queue Management SOP Class then the SCP shall create a Print Job SOP Instance and an entry in the Print Queue. The SCP shall return the Print Job SOP Class/Instance UID pair in the Action Reply argument.

H.4.9.2.3 N-DELETE

The N-DELETE is used to delete the Pull Print Request, including the referred Stored Print Storage SOP Instances and Image SOP Instances.

H.4.9.2.3.1 Status

There are no specific status codes

H.4.9.2.3.2 Behavior

The SCU uses N-DELETE to request the SCP to delete the Pull Print Request SOP Instance. The SCU shall specify the SOP Instance UID of the Pull Print Request SOP Instance.

The SCU shall only delete the last created Pull Print Request SOP Instance

The SCP shall delete the specified Pull Print Request SOP Instance, the referenced Stored Print Storage SOP Instance and referenced Image SOP Instances. The SCP shall return the status code.

Note : It is beyond the scope of the standard to specify when the SCP actually deletes the Image SOP Instances. See Note in section H.4.3.3.2.1.3

The SCP shall return the status code of the requested SOP Instance deletion. The meaning of success, warning, and failure status codes is defined in Section H.2.5. A Failure status code shall indicate that the SCP has not printed the print request.

A failure code shall indicate that the SCP has not deleted the specified SOP Instance.

H.4.9.4 SOP Class Definition and UID

The Pull Print Request SOP Class UID is “1.2.840.10008.5.1.1.31”.

Add section H.7.

H.7 EXAMPLE OF THE PULL PRINT REQUEST META SOP CLASS (INFORMATIVE)

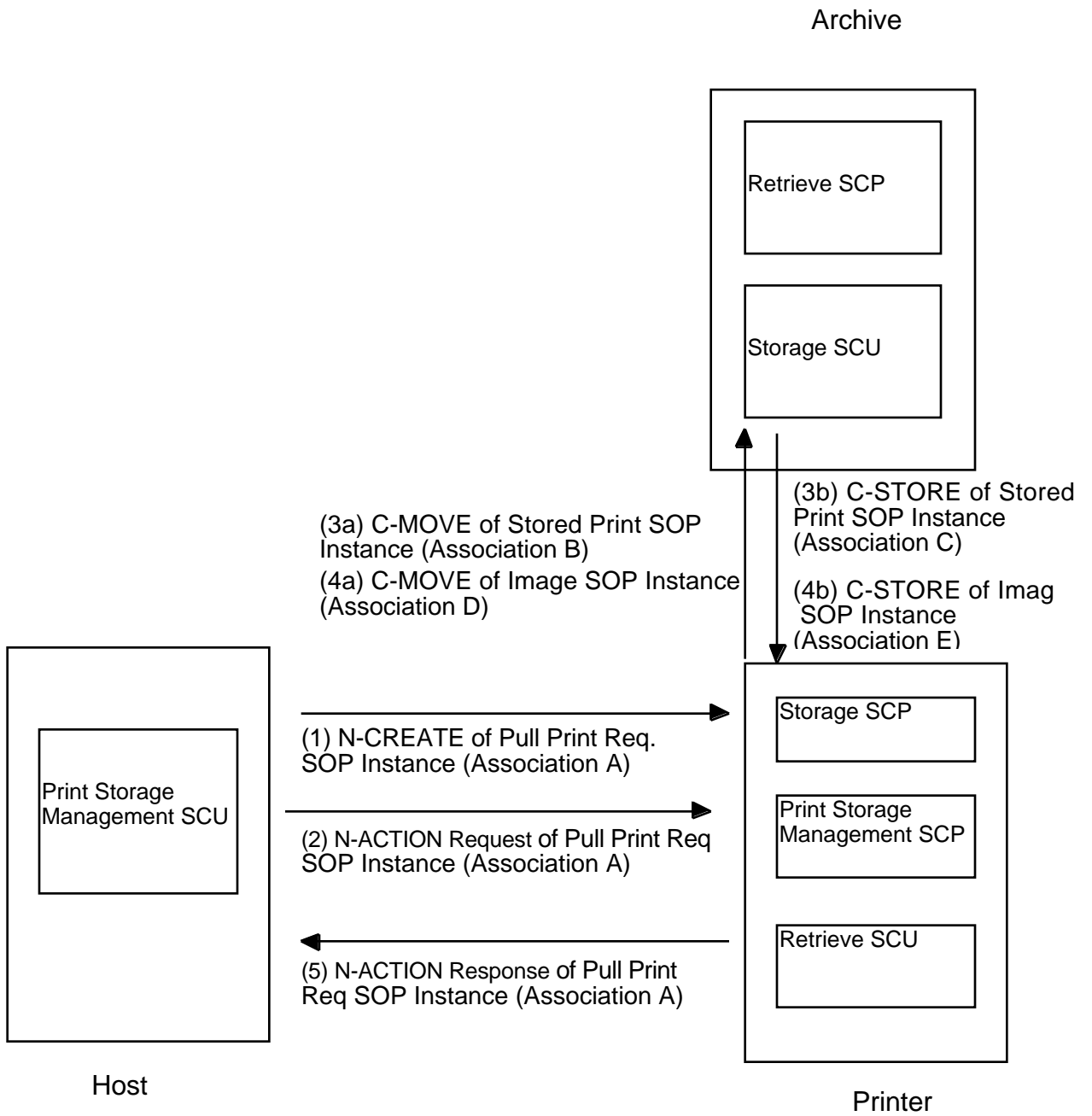
This example illustrates the relationship of commands of the Pull Print Request Meta SOP Class. Except for command 5, other command Responses are not shown. It assumes that storage of the Stored Print and Image SOP Instances has already occurred. Other combinations of devices are possible, for example, the Host device could also be the Archive device shown in the example.

Multiple Associations between the devices are required and are indicated by Association A, B, etc. Commands 1, 2 and 5 are required to be on the same Association. The time between commands 2 and 5 could be long since the Printer will retrieve and process the Stored Print Storage and Image SOP Instances after receiving the N-ACTION Request (2) and before issuing the N-ACTION Response (5).

Commands 3a and 4a could be on the same Association, but not Association A.

Commands 3b and 4b could be on the same Association only if Commands 3a and 4a are combined into a single C-MOVE Request.

See Annex C for Query/Retrieve SOP Class Specifications



Digital Imaging and Communications In Medicine (DICOM)

Part 6 Addendum Stored Print Data Dictionary

Part 6, Section 6, Change Attribute Names in the table

Preformatted Basic Grayscale Image Sequence (2020,0110)

Preformatted Basic Color Image Sequence (2020,0111)

Add the following entries to the table of PS 3.6 Section 6

Tag	Name	VR	VM
(0018,1011)	Hardcopy Creation Device ID	LO	1
(0018,1017)	Hardcopy Device Manufacturer	LO	1
(0018,101B)	Hardcopy Device Manufacturer's Model Name	LO	1
(0018,101A)	Hardcopy Device Software Version	LO	1-n
(2000,0062)	Color Image Printing Flag	CS	1
(2000,0063)	Collation Flag	CS	1
(2000,0065)	Annotation Flag	CS	1
(2000,0067)	Image Overlay Flag	CS	1
(2000,0069)	Presentation LUT Flag	CS	1
(2000,006A)	Image Box Presentation LUT Flag	CS	1
(2000,0510)	Referenced Stored Print Sequence	SQ	1
(2130,0010)	Print Management Capabilities Sequence	SQ	1
(2130,0015)	Printer Characteristics Sequence	SQ	1
(2130,0030)	Film Box Content Sequence	SQ	1
(2130,0040)	Image Box Content Sequence	SQ	1
(2130,0050)	Annotation Content Sequence	SQ	1
(2130,0060)	Image Overlay Box Content Sequence	SQ	1
(2130,0080)	Presentation LUT Content Sequence	SQ	1
(2130,00A0)	Proposed Study Sequence	SQ	1
(2130,00C0)	Original Image Sequence	SQ	1

Add the following entries to the table of PS 3.6 Annex A

UID Value	UID Name	UID Type	Part
1.2.840.10008.5.1.1.31	Pull Print Request SOP Class	SOP Class	PS 3.4
1.2.840.10008.5.1.1.29	Hardcopy Grayscale Image Storage SOP Class	SOP Class	PS 3.4

1.2.840.10008.5.1.1.30	Hardcopy Color Image Storage SOP Class	SOP Class	PS 3.4
1.2.840.10008.5.1.1.27	Stored Print Storage SOP Class	SOP Class	PS 3.4
1.2.840.10008.5.1.1.32	Pull Stored Print Management Meta SOP Class	Meta SOP Class	PS 3.4