DICOM Correction Item

Correction Number	CP 697
Log Summary: Frame Increment Pointer for single-frame images	

Type of Modification	Name of Standard
Clarification	PS 3.3 2007

Rationale for Correction
The Multiframe Module is mandatory in the ophthalmology objects, and it contains Frame Increment Pointer as Type 1; yet if the image does not also contain the Cine Module (conditional on a temporal relationship between frames), such as when it is a single frame only, then it is not obvious what should be the value encoded in Frame Increment Pointer. Since this is potentially a general problem inherent in all multi-frame images that might contain only one frame, it is suggested that a description be added to the Multiframe Module to make the use of Frame Time with a value of 0 the recommended choice in this situation. The only IOD that uses the Multiframe Module and in which the Cine Module is not mandatory, conditional or user optional is the NM IOD, for which alternative recommendations could be made.

Sections of documents affected
PS 3.3 C.7.6.5, C.7.6.6

Correction Wording:

C.7.6.5   Cine Module

Table C.7-13 specifies the Attributes of a Multi-frame Cine Image.

Table C.7-13
CINE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
…	…	…	…
Frame Time	(0018,1063)	1C	Nominal time (in msec) per individual frame. See C.7.6.5.1.1 for further explanation. Required if Frame Increment Pointer (0028,0009) points to Frame Time.
Frame Time Vector	(0018,1065)	1C	An array that contains the real time increments (in msec) between frames for a Multi-frame image. See C.7.6.5.1.2 for further explanation. Required if Frame Increment Pointer (0028,0009) points to Frame Time Vector. Note: Frame Time Vector arrays may not be properly encoded if Explicit-VR transfer syntax is used and the VL of this attribute exceeds 65534 bytes.
…	…	…	…

C.7.6.5.1   Cine Attribute Descriptions

C.7.6.5.1.1   Frame Time

Frame Time (0018,1063) is the nominal time (in milliseconds) between individual frames of a Multi-frame image. If the Frame Increment Pointer points to this Attribute, Frame Time shall be used in the following manner to calculate 'the relative time' for each frame:

Frame 'Relative Time' (n) = Frame Delay + Frame Time * (n-1)

where: n = number of frame within the Multi-frame image and the first frame number is one

> Note: When there is only one frame present, Frame Time (0018,1063) may have either a value of 0, or a nominal value that would apply if there were multiple frames.

C.7.6.5.1.2   Frame Time Vector

Frame Time Vector (0018,1065) is an array that contains the time increments (in milliseconds) between the nth frame and the previous frame for a Multi-frame image. The first frame always has a time increment of 0. If the Frame Increment Pointer points to this Attribute, the Frame Time Vector shall be used in the following manner to calculate 'relative time' *T(n)* for frame *n*:

$$T(n) = \sum_{i=1}^{n} \Delta t_i$$

where Δt_i is the ith Frame Time Vector component.

C.7.6.5.1.3   Multiplexed Audio

During a video acquisition, audio may be used for voice commentary of what is being observed, as well as to record sound-based physiological information such as Doppler audio.

Some Transfer Syntaxes allow for the multiplexing of interleaved audio with video data, and the Attributes of the Cine Module support this encoding paradigm. They are not intended to describe audio acquired simultaneously when it is encoded in other SOP Instances or within Attributes other than Pixel Data (7FE0,0010) of the same SOP Instance.

Synchronization between audio and video is assumed to be encoded at the Transfer Syntax level (i.e. within the encoded bit stream).

> Note: If no audio was recorded, the Multiplexed Audio Channels Description Code Sequence (003A,0300) will be present and contain no sequence items.

C.7.6.6   Multi-Frame Module

Table C.7-14 specifies the Attributes of a Multi-frame pixel data Image.

Table C.7-14
MULTI-FRAME MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Number of Frames	(0028,0008)	1	Number of frames in a Multi-frame Image. See C.7.6.6.1.1 for further explanation.
Frame Increment Pointer	(0028,0009)	1	Contains the Data Element Tag of the attribute that is used as the frame

			increment in Multi-frame pixel data. See C.7.6.6.1.1 for further explanation.

C.7.6.6.1   **Multi-Frame Attribute Descriptions**

C.7.6.6.1.1   **Number Of Frames And Frame Increment Pointer**

A Multi-frame Image is defined as a Image whose pixel data consists of a sequential set of individual Image Pixel frames. A Multi-frame Image is transmitted as a single contiguous stream of pixels. Frame headers do not exist within the data stream.

Each individual frame shall be defined (and thus can be identified) by the Attributes in the Image Pixel Module (see C.7.6.3). All Image IE Attributes shall be related to the first frame in the Multi-frame image.

The total number of frames contained within a Multi-frame Image is conveyed in the Number of Frames (0028,0008).

The frames within a Multi-frame Image shall be conveyed as a logical sequence. The information that determines the sequential order of the frames shall be identified by the Data Element Tag or tags conveyed by the Frame Increment Pointer (0028,0009). Each specific Image IOD that supports the Multi-frame Module specializes the Frame Increment Pointer (0028,0009) to identify the Attributes that may be used as sequences.

Even if only a single frame is present, Frame Increment Pointer (0028,0009) is still required to be present and have at least one value, each of which shall point to an attribute that is also present in the dataset and has a value.

> Note: For example, in single-frame instance of an IOD that is required to or may contain the Cine Module, it may be appropriate for Frame Time (0018,1063) to be present with a value of 0, and be the only target of Frame Increment Pointer (0028,0009).