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Digital Imaging and Communications in Medicine (DICOM)

Supplement 87 – USB and Flash Memory Devices

Prepared by:

DICOM Standards Committee, Working Group 5

1300 N. 17th Street

Rosslyn, Virginia 22209 USA

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69

Scope and Field

70 This supplement adds support for a variety of similar removable media devices. These devices are:

- 71 a. Removable devices that are connected by means of USB. These are often flash memory devices,
72 but can also include other forms of storage.
- 73 b. Compact Flash compliant devices.
- 74 c. MultiMedia Cards
- 75 d. Secure Digital Cards
- 76

77 To date, interchange media has been restricted to optical and magnetic media. With the dramatic increase
78 in capacity of flash-RAM-based cards and devices that are commonly used for storage in laptops, digital
79 cameras, PDAs and similar hand-held devices there is an increasing demand from users to exchange
80 DICOM information on such forms of media.

81 Though hand-held devices are often connected to networks, either physically or via some wireless form of
82 transmission such as infrared or radio, the communication bandwidth is extremely limited and the
83 exchange of bulk data such as images or waveforms time consuming. Accordingly, there exist use-cases
84 for the exchange of bulk data and accompanying reports on flash media:

- 85 a. A physician working away from the imaging site needs images for reference or display to
86 colleagues or patients, so he loads them onto exchangeable media for use in his PDA when “off-
87 site”. The ability to use multiple exchangeable media increases the available capacity, as the
88 internal storage of the PDA or of a single medium may not be sufficient for his needs.
- 89 b. Ad-hoc exchange of images between a PDA and suitably equipped presentation systems could be
90 used for clinical meetings. Whilst wireless networking would be an alternative, the simplicity of
91 media exchange would enable exchange to happen where network setup was not technically or
92 politically possible.
- 93 c. Portable, especially hand-held, ultrasound devices may be physically too small to use
94 conventional interchange media such as MODs or CDs, and RAM media may be an alternative.
- 95

96 This kind of media is also frequently used in other devices like digital cameras. The format specified in this
97 supplement does not interfere with shared use by such other devices.

98 This supplement defines removable media, their partitioning, and the file system format for these media.

99 This supplement also defines generic media profiles that utilize these media.

100

PS 3.11: Add new abbreviations to Section 4:

101

The following symbols and abbreviations are used in this part of the standard.

102

CF Compact Flash card

103

MMC Multimedia Card

104

SD Secure Digital card

105

USB Universal Serial Bus

106

107

PS 3.11: Add new General Purpose USB and Flash Memory Application Profiles with compression:

108

Annex Y (Normative) - General Purpose USB and Flash Memory with Compression Interchange Profiles

109

110

Y.1 PROFILE IDENTIFICATION

111

This Annex defines an Application Profile Class potentially inclusive of all defined Media Storage SOP Classes. This class is intended to be used for the interchange of Composite SOP Instances via USB, CF, MMC or SD media for general-purpose applications. Objects from multiple modalities may be included on the same media. Images may be compressed with or without loss using either JPEG or JPEG 2000; all readers shall support compression.

116

A detailed list of the Media Storage SOP Classes that may be supported is defined in PS 3.4.

117

Table Y.1-1 STD-GEN-USB, STD-GEN-SEC-USB, STD-GEN-MMC, STD-GEN-SEC-MMC, STD-GEN-CF, STD-GEN-SEC-CF, STD-GEN-SD and STD-GEN-SEC-SD Profiles

118

Application Profile	Identifier	Description
General Purpose USB Media Interchange with JPEG	STD-GEN-USB-JPEG	Handles interchange of Composite SOP Instances such as Images (optionally compressed with either lossless or lossy JPEG), Structured Reports, Presentation States and Waveforms.
General Purpose USB Media Interchange with JPEG-2000	STD-GEN-USB-J2K	Handles interchange of Composite SOP Instances such as Images (optionally compressed with either reversible or irreversible JPEG 2000), Structured Reports, Presentation States and Waveforms.
General Purpose Secure USB Media Interchange with JPEG	STD-GEN-SEC-USB-JPEG	Handles interchange of Composite SOP Instances such as Images (optionally compressed with either lossless or lossy JPEG), Structured Reports, Presentation States and Waveforms. Offers confidentiality, integrity and, depending on

		the File-set creator's choice, data origin authentication.
General Purpose Secure USB Media Interchange with JPEG-2000	STD-GEN-SEC-USB-J2K	Handles interchange of Composite SOP Instances such as Images (optionally compressed with either reversible or irreversible JPEG 2000), Structured Reports, Presentation States and Waveforms. Offers confidentiality, integrity and, depending on the File-set creator's choice, data origin authentication.
General Purpose MultiMedia Card Interchange with JPEG	STD-GEN-MMC-JPEG	Handles interchange of Composite SOP Instances such as Images (optionally compressed with either lossless or lossy JPEG), Structured Reports, Presentation States and Waveforms.
General Purpose MultiMedia Card Interchange with JPEG-2000	STD-GEN-MMC-J2K	Handles interchange of Composite SOP Instances such as Images (optionally compressed with either reversible or irreversible JPEG 2000), Structured Reports, Presentation States and Waveforms.
General Purpose Secure MultiMedia Card Interchange with JPEG	STD-GEN-SEC-MMC-JPEG	Handles interchange of Composite SOP Instances such as Images (optionally compressed with either lossless or lossy JPEG), Structured Reports, Presentation States and Waveforms. Offers confidentiality, integrity and, depending on the File-set creator's choice, data origin authentication.
General Purpose Secure MultiMedia Card Interchange with JPEG-2000	STD-GEN-SEC-MMC-J2K	Handles interchange of Composite SOP Instances such as Images (optionally compressed with either reversible or irreversible JPEG 2000), Structured Reports, Presentation States and Waveforms. Offers confidentiality, integrity and, depending on the File-set creator's choice, data origin authentication.
General Purpose CompactFlash Interchange with JPEG	STD-GEN-CF-JPEG	Handles interchange of Composite SOP Instances such as Images (optionally compressed with either lossless or lossy JPEG), Structured Reports, Presentation States and Waveforms.
General Purpose CompactFlash Interchange with JPEG-2000	STD-GEN-CF-J2K	Handles interchange of Composite SOP Instances such as Images (optionally compressed with either reversible or irreversible JPEG 2000), Structured Reports, Presentation States and Waveforms.

General Purpose Secure CompactFlash Interchange with JPEG	STD-GEN-SEC-CF-JPEG	Handles interchange of Composite SOP Instances such as Images (optionally compressed with either lossless or lossy JPEG), Structured Reports, Presentation States and Waveforms. Offers confidentiality, integrity and, depending on the File-set creator's choice, data origin authentication.
General Purpose Secure CompactFlash Interchange with JPEG-2000	STD-GEN-SEC-CF-J2K	Handles interchange of Composite SOP Instances such as Images (optionally compressed with either reversible or irreversible JPEG 2000), Structured Reports, Presentation States and Waveforms. Offers confidentiality, integrity and, depending on the File-set creator's choice, data origin authentication.
General Purpose Digital Card Interchange with JPEG	STD-GEN-SD-JPEG	Handles interchange of Composite SOP Instances such as Images (optionally compressed with either lossless or lossy JPEG), Structured Reports, Presentation States and Waveforms.
General Purpose Digital Card Interchange with JPEG-2000	STD-GEN-SD-J2K	Handles interchange of Composite SOP Instances such as Images (optionally compressed with either reversible or irreversible JPEG 2000), Structured Reports, Presentation States and Waveforms.
General Purpose Secure Digital Card Interchange with JPEG	STD-GEN-SEC-SD-JPEG	Handles interchange of Composite SOP Instances such as Images (optionally compressed with either lossless or lossy JPEG), Structured Reports, Presentation States and Waveforms. Offers confidentiality, integrity and, depending on the File-set creator's choice, data origin authentication.
General Purpose Secure Digital Card Interchange with JPEG-2000	STD-GEN-SEC-SD-J2K	Handles interchange of Composite SOP Instances such as Images (optionally compressed with either reversible or irreversible JPEG 2000), Structured Reports, Presentation States and Waveforms. Offers confidentiality, integrity and, depending on the File-set creator's choice, data origin authentication.

119

120 Equipment claiming conformance to this Application Profile shall list the subset of Media Storage SOP
121 Classes that it supports in its Conformance Statement.

122 Note: Since it is not required to support all Media Storage Classes the user should carefully consider the
123 subset of supported Media Storage SOP Classes in the Conformance Statements of such equipment to
124 establish effective object interchange.
125

126 **Y.2 CLINICAL CONTEXT**

127 This Application Profile Class facilitates the interchange of images and related data on USB, CF, MMC or
128 SD media. Typical interchange would be between acquisition devices, archives and workstations.

129 This Application Profile Class facilitates the creation of a multi-modality medium for image interchange,
130 useful for clinical, patient record, teaching and research applications, within and between institutions.

131 This profile is intended only for general-purpose applications. It is not intended as a replacement for
132 specific Application Profiles that may be defined for a particular clinical context.

133

134 **Y.2.1 Roles and Service Class Options**

135 This Application Profile Class uses the Media Storage Service Class defined in PS3.4 with the Interchange
136 Option.

137 The Application Entity shall support one or more of the roles of File Set Creator (FSC) or File Set Reader
138 (FSR), or File Set Updater (FSU) defined in PS 3.10.

139 **Y.2.1.1 File Set Creator**

140 The role of File Set Creator shall be used by Application Entities that generate a File Set under this
141 Interchange Class of Application Profiles.

142 File Set Creators shall be able to generate the Basic Directory SOP Class in the DICOMDIR file with all the
143 subsidiary Directory Records related to the Image SOP Classes stored in the File Set. The Application
144 Entity acting as a File Set Creator generates a File Set under a STD-GEN-USB, STD-GEN-SEC-USB
145 STD-GEN-MMC, STD-GEN-SEC-MMC, STD-GEN-CF, STD-GEN-SEC-CF, STD-GEN-SD or STD-GEN-
146 SEC-SD Application Profile.

147 Note: A multiple volume (i.e. a logical volume that can cross multiple physical media) is not supported by this
148 class of Application profile. If a set of Files, e.g., a Study, cannot be written entirely on one physical volume
149 (side of one piece of media), the FSC will create multiple independent DICOM File Sets such that each File
150 Set can reside on a single physical volume (side of a single piece of media) controlled by its individual
151 DICOMDIR file. The user of the FSC can opt to use written labels on the physical volumes to indicate that
152 there is more than one physical volume for this set of files (e.g., a study).
153

154 **Y.2.1.2 File Set Reader**

155 The role of File Set Reader shall be used by Application Entities that receive a transferred File Set under
156 this Interchange Class of Application Profiles. Typical entities using this role would include image
157 generating systems, display workstations, and archive systems that receive a patient record; e.g.
158 transferred from another institution.

159 File Set Readers shall be able to read the DICOMDIR directory file and all the SOP Instance files defined
160 for this Application Profile, for which a Conformance Statement is made, using all the defined Transfer
161 Syntaxes for the Profile.

162 Note: All Transfer Syntaxes defined in the profile must be supported by the FSR. It is not permissible to only
163 support one or other of the uncompressed or the compressed Transfer Syntaxes.
164

165 **Y.2.1.3 File Set Updater**

166 The role of File Set Updater is used by Application Entities that receive a transferred File Set under this
167 Interchange Class of Application Profiles and update it by the addition (or deletion) of images or
168 information to (or from) the medium. Typical entities using this role would include image generating
169 systems and workstations that process or modify images.

170 File Set Updaters shall be able to generate one or more of the SOP Instances defined for this Application
171 Profile, for which a Conformance Statement is made, and to read and update the DICOMDIR file.

172 **Y.3 STD-GEN-USB, STD-GEN-SEC-USB, STD-GEN-MMC, STD-GEN-SEC-MMC, STD-
173 GEN-CF, STD-GEN-SEC-CF, STD-GEN-SD AND STD-GEN-SEC-SD PROFILE CLASSES**

174 **Y.3.1 SOP Classes and Transfer Syntaxes**

175 This Application Profile is based on the Media Storage Service Class with the Interchange Option (see PS
176 3.4).

177 **Table Y.3-1**
178 **STD-GEN-USB, STD-GEN-SEC-USB, STD-GEN-MMC, STD-GEN-SEC-MMC, STD-GEN-CF, STD-GEN-
179 SEC-CF, STD-GEN-SD and STD-GEN-SEC-SD SOP Classes and Transfer Syntaxes**

Information Object Definition	Service Object Pair Class UID	Transfer Syntax and UID	FSC Requirement	FSR Requirement	FSU Requirement
Basic Directory	1.2.840.10008.1.3.10	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	Mandatory	Mandatory	Mandatory
Composite IODs for which a Media Storage SOP Class is defined in PS 3.4	See PS 3.4	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	Defined in Conformance Statement	Mandatory for all SOP Classes defined in Conformance Statement	Defined in Conformance Statement
Composite IODs for which a Media Storage SOP Class is defined in PS 3.4	See PS 3.4	JPEG Lossless Process 14 (selection value 1) 1.2.840.10008.1.2.4.70	Defined in Conformance Statement	Mandatory for JPEG profiles for all SOP Classes defined in Conformance Statement	Defined in Conformance Statement
Composite IODs for which a Media Storage SOP Class is defined in PS 3.4	See PS 3.4	JPEG Lossy, Baseline Sequential with Huffman Coding (Process 1) 1.2.840.10008.1.2.4.50	Defined in Conformance Statement	Mandatory for JPEG profiles for all SOP Classes defined in Conformance Statement	Defined in Conformance Statement

Composite IODs for which a Media Storage SOP Class is defined in PS 3.4	<i>See PS 3.4</i>	JPEG Extended (Process 2 & 4): Default Transfer Syntax for Lossy JPEG 12 Bit Image Compression (Process 4 only) 1.2.840.10008.1.2.4.51	Defined in Conformance Statement	Mandatory for JPEG profiles for all SOP Classes defined in Conformance Statement	Defined in Conformance Statement
Composite IODs for which a Media Storage SOP Class is defined in PS 3.4	<i>See PS 3.4</i>	JPEG 2000 Image Compression (Lossless Only) 1.2.840.10008.1.2.4.90	Defined in Conformance Statement	Mandatory for J2K profiles for all SOP Classes defined in Conformance Statement	Defined in Conformance Statement
Composite IODs for which a Media Storage SOP Class is defined in PS 3.4	<i>See PS 3.4</i>	JPEG 2000 Image Compression 1.2.840.10008.1.2.4.91	Defined in Conformance Statement	Mandatory for J2K profiles for all SOP Classes defined in Conformance Statement	Defined in Conformance Statement

180
181 The SOP Classes and corresponding Transfer Syntax supported by this Application Profile are specified in
182 the Table Y.3-1. The supported Storage SOP Class(es) shall be listed in the Conformance Statement
183 using a table of the same form.

184 **Y.3.2 Physical Medium And Medium Format**

185 The STD-GEN-USB-JPEG, STD-GEN-SEC-USB-JPEG, STD-GEN-USB-J2K and STD-GEN-SEC-USB-
186 J2K application profiles require any of the USB Connected Removable Devices, as defined in PS 3.12.

187 The STD-GEN-MMC-JPEG, STD-GEN-SEC-MMC-JPEG, STD-GEN-MMC-J2K and STD-GEN-SEC-
188 MMC-J2K application profiles require any of the MultiMedia Card Removable Devices, as defined in PS
189 3.12.

190 The STD-GEN-CF-JPEG, STD- GEN-SEC-CF-JPEG, STD-GEN-CF-J2K and STD-GEN-SEC-CF-J2K
191 application profiles require any of the Compact Flash Removable Devices, as defined in PS 3.12.

192 The STD-GEN-SD-JPEG, STD-GEN-SEC-SD-JPEG, STD-GEN-SD-J2K and STD-GEN-SEC-SD-J2K
193 application profiles require any of the Secure Digital Card Removable Devices, as defined in PS 3.12.

194 **Y.3.3 Directory Information in DICOMDIR**

195 Conformant Application Entities shall include in the DICOMDIR File the Basic Directory IOD containing
196 Directory Records at the Patient and the subsidiary Study and Series levels, appropriate to the SOP
197 Classes in the File Set.

198 All DICOM files in the File Set incorporating SOP Instances defined for the specific Application Profile shall
199 be referenced by Directory Records.

200 Note: DICOMDIRs with no directory information are not allowed by this Application Profile.

201

202 All implementations shall include the DICOM Media Storage Directory in the DICOMDIR file. There shall
203 only be one DICOMDIR file per File Set. The DICOMDIR file shall be in the root directory of the medium.
204 The Patient ID at the patient level shall be unique for each patient directory record in one File Set.

205 **Y.3.3.1 Additional Keys**

206 File Set Creators and Updaters are required to generate the mandatory elements specified in PS 3.3.

207 Table H.3-2 in Annex H STD-GEN-DVD and STD-GEN-SEC-DVD Additional DICOMDIR Keys specifies
208 the additional associated keys that shall also be applicable to the profiles defined in this Annex. At each
209 directory record level other additional data elements can be added, but it is not required that File Set
210 Readers be able to use them as keys. Refer to the Basic Directory IOD in PS 3.3.

211 **Y.3.4 Other Parameters**

212 **Y.3.4.2 Multiframe JPEG Format**

213 The JPEG encoding of pixel data shall use Interchange Format (with table specification) for all frames.

214 **Y.3.5 Security Parameters**

215 The STD-GEN-SEC-USB-JPEG, STD-GEN-SEC-MMC-JPEG, STD-GEN-SEC-CF-JPEG, STD-GEN-SEC-
216 SD-JPEG, STD-GEN-SEC-USB-J2K, STD-GEN-SEC-MMC-J2K, STD-GEN-SEC-CF-J2K and STD-GEN-
217 SEC-SD-J2K application profiles require that all DICOM Files in the File-set including the DICOMDIR be
218 Secure DICOM Files encapsulated in accordance with the requirements of the Basic DICOM Media
219 Security Profile as defined in PS 3.15.

220 Note: These Application Profiles do not place any consistency restrictions on the use of the Basic DICOM
221 Media Security Profile with different DICOM Files of one File-set. For example, readers should not
222 assume that all Files in the File-set can be decoded by the same set of recipients. Readers should also
223 not assume that all secure Files use the same approach (hash key or digital signature) to ensure Integrity
224 or carry the same originators' signatures.

225

226

227 **Add to PS 3.12, Section 2 Normative References**

228

229	Universal Serial Bus Specification Revision 2.0	USB Implementors Forum
230	Universal Serial Bus, Mass Storage Class, Specification Overview	USB Implementors Forum
231	CF+ and CompactFlash Specification, Revision 1.4 or later	CompactFlash Association
232	MMCA System Specification version 3.3.1	MultiMedia Card Association
233	SD Card specification version 1.0	CD Card Association

234

235 **PS 3.12: Add new abbreviations to Section 4:**

236 The following symbols and abbreviations are used in this part of the standard.

237	CF	Compact Flash card
238	MMC	Multimedia Card
239	SD	Secure Digital card
240	USB	Universal Serial Bus

241

242 **Add to PS 3.12, a new annex W for USB connected removable devices**

243

Annex W – USB Connected Removable Devices

W.1 DICOM MAPPING TO MEDIA FORMATS

244 Only one DICOM file set shall be stored in the first partition of a partitioned device. If the device is not
245 partitioned, only one DICOM file set shall be stored on the device.

W.1.1 File System

248 The file system employed on these media shall be the FAT16 file system. The cluster, sector, head, and
249 related information obtained from the boot sector of this partition shall be utilized by the file system to
250 determine proper access to this media (see Annex A).

251 Filenames shall be further restricted to be in compliance with the File ID rules specified in Part 10. The
252 File ID shall be the same as the filename.

253 Note:

- 254 1. These rules limit the character set to being a subset of the DICOM default G0 character set, limit the
255 filenames to be no more than 8 characters, and limit the directory tree to be no more than 8 levels deep.
256 All of these restrictions are needed to comply with the most limited of the removable media. The
257 selection of FAT16 reflects the actual usage of these newer media.

- 258 2. Some operating systems default their format command for larger capacity media to use FAT32. FAT32
259 is not always compatible with FAT16 and should not be used.
260

261

262 **W.2 MEDIA FORMATS**

263 **W.2.1 Partitioning**

264 These media may be partitioned or unpartitioned. The more common usage is partitioned.

265 Note: Operating system support for unpartitioned media varies. Most current operating systems expect
266 partitioned media. Some restrict their support further and only support access to the first partition of this
267 media. These support decisions are being driven by the high volume consumer items that utilize these
268 mechanisms, such as digital cameras.
269

270

271 **W.3 PHYSICAL MEDIA INTERFACE**

272 These devices may have a wide variety of overall physical characteristics. They shall provide a connector
273 that complies with the USB 1.1 or 2.0 specifications for physical, electrical, signaling, and communications
274 protocol. The electrical signaling and lower level USB protocol support shall comply with the USB 1.1 or
275 2.0 specifications. The device shall act as a Mass Storage Device, in accordance with the USB Mass
276 Storage Class, as described in the Universal Serial Bus Mass Storage Class, Specification Overview and
277 its subordinate and referenced documents.

278 Note:

- 279 1. The USB base standard and the USB mass storage device standard includes specification for
280 management of device addition and removal, and for negotiation of device command protocol
281 capabilities. Support for these is normally part of the functions provided by the USB Mass Storage
282 driver in an operating system.
- 283 2. The USB 2.0 specification specifies 3 speeds of operation, “low-speed”, “full-speed” and “high-
284 speed” which are fully interoperable, and this profile does not distinguish between the speeds.
- 285 3. The intent is to allow removable 1.1 and 2.0 USB media to interoperate with 1.1 and 2.0 USB
286 devices.

287

288

289

Add to Part 12, a new annex X for compact flash

290

Annex X – Compact Flash Removable Devices

291 **X.1 DICOM MAPPING TO MEDIA FORMATS**

292 Only one DICOM file set shall be stored in the first partition of a partitioned device. If the device is not
293 partitioned, only one DICOM file set shall be stored on the device.

294 **X.1.1 File System**

295 The file system employed on these media shall be the FAT16 file system. The cluster, sector, head, and
296 related information obtained from the boot sector of this partition shall be utilized by the file system to
297 determine proper access to this media (see Annex A).

298 Filenames shall be further restricted to be in compliance with the File ID rules specified in Part 10. The
299 File ID shall be the same as the filename.

300 Notes:

- 301 1. These rules limit the character set to being a subset of the DICOM default G0 character set, limit the
302 filenames to be no more than 8 characters, and limit the directory tree to be no more than 8 levels deep.
303 All of these restrictions are needed to comply with the most limited of the removable media. The
304 selection of FAT16 reflects the actual usage of these newer media.
- 305 2. Some operating systems default their format command for larger capacity media to FAT32. FAT32 is not
306 always compatible with FAT16 and should not be used.
307

308
309 **X.2 MEDIA FORMATS**

310 **X.2.1 Partitioning**

311 These media may be partitioned or unpartitioned. The more common usage is partitioned.

312 Note: Operating system support for unpartitioned media varies. Most current operating systems expect
313 partitioned media. Some restrict their support further and only support access unpartitioned media or to
314 the first partition of partitioned media.
315

316
317 **X.3 Physical Media interface**

318 The physical, electrical, signaling, and software interface shall comply with the CF+ and CompactFlash
319 Specification.

320 **Add to Part 12, a new annex Y for MMC devices**

321 **Annex Y – MultiMedia Card Removable Devices**

322 **Y.1 DICOM MAPPING TO MEDIA FORMATS**

323 Only one DICOM file set shall be stored in the first partition of a partitioned device. If the device is not
324 partitioned, only one DICOM file set shall be stored on the device.

325 **Y.1.1 File System**

326 The file system employed on these media shall be the FAT16 file system. The cluster, sector, head, and
327 related information obtained from the boot sector of this partition shall be utilized by the file system to
328 determine proper access to this media (see Annex A).

329 Filenames shall be further restricted to be in compliance with the File ID rules specified in Part 10. The
330 File ID shall be the same as the filename.

331 Notes:

- 332 1. These rules limit the character set to being a subset of the DICOM default G0 character set, limit the
333 filenames to be no more than 8 characters, and limit the directory tree to be no more than 8 levels deep.
334 All of these restrictions are needed to comply with the most limited of the removable media. The
335 selection of FAT16 reflects the actual usage of these newer media.
- 336 2. Some operating systems default their format command for larger capacity media to FAT32. FAT32 is not
337 always compatible with FAT16 and should not be used.
338
339

340 **Y.2 MEDIA FORMATS**

341 **Y.2.1 Partitioning**

342 These media may be partitioned or unpartitioned. The more common usage is partitioned.

343 Note: Operating system support for unpartitioned media varies. Most current operating systems expect
344 partitioned media. Some restrict their support further and only support access unpartitioned media or to
345 the first partition of partitioned media.
346
347

348 **Y.3 Physical Media interface**

349 The physical, electrical, signaling, and software interface shall comply with the MMCA System
350 Specification 3.31, and shall in addition have the following characteristics:

- 351 a. The size shall be a “normal” MMC card (24mm x 32mm x 1.4mm)
352 b. The card shall be of the RW (Read/Write) class
353
354

355 ***Add to Part 12, a new annex Z for SD devices***

356 **Annex Z – Secure Digital Card Removable Devices**

357 **Z.1 DICOM MAPPING TO MEDIA FORMATS**

358 Only one DICOM file set shall be stored in the first partition of a partitioned device. If the device is not
359 partitioned, only one DICOM file set shall be stored on the device.

360 **Z.1.1 File System**

361 The file system employed on these media shall be the FAT16 file system. The cluster, sector, head, and
362 related information obtained from the boot sector of this partition shall be utilized by the file system to
363 determine proper access to this media (see Annex A).

364 Filenames shall be further restricted to be in compliance with the File ID rules specified in Part 10. The
365 File ID shall be the same as the filename.

366 Notes:

- 367 1. These rules limit the character set to being a subset of the DICOM default G0 character set, limit the
368 filenames to be no more than 8 characters, and limit the directory tree to be no more than 8 levels deep.

369 All of these restrictions are needed to comply with the most limited of the removable media. The
370 selection of FAT16 reflects the actual usage of these newer media.
371 2. Some operating systems default their format command for larger capacity media to FAT32. FAT32 is not
372 always compatible with FAT16 and should not be used.
373

374

375 **Z.2 MEDIA FORMATS**

376 **Z.2.1 Partitioning**

377 These media may be partitioned or unpartitioned. The more common usage is partitioned.

378 Note: Operating system support for unpartitioned media varies. Most current operating systems expect
379 partitioned media. Some restrict their support further and only support access unpartitioned media or to
380 the first partition of partitioned media.
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383 **Z.3 Physical Media interface**

384 The physical, electrical, signaling, and software interface shall comply with the SD Card Specification 1.0
385 and shall in addition have the following characteristics:

386 a. The size shall be a “normal” SD card (24mm x 32mm x 2.1mm)
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