

SIEMENS SPI ADDENDUM  
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Siemens Implementation of the SPI Data Object Format of Type Image  
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## 1. Scope of this Document

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The ACR-NEMA Standard as well as the SPI Document 4 allow a variety of possible conforming image data object formats. There is a need to have an efficient implementation of the ACR-NEMA/SPI Standard and there is also a need to have a common implementation of the Standard inside Siemens.

This document is intended to serve as a guideline to implement software which creates SPI conforming image data objects. The first part of this document shows the commonly agreed principles how the ACR-NEMA or SPI defined data elements should be used. This section is followed by the layout for the physical storage of the image data object. The main section is the dictionary of the data elements used in the Siemens implementation. The appendix contains a dump of an SPI defined image data object.

The Siemens implementation of the SPI Data Object Format of type image should result in an image file format that has the following attributes:

- ACR-NEMA standard conforming
- SPI standard conforming
  
- efficient access to the SPI Image File
- no loss of information against the existing image file formats.

## 2. Image Data Object's Format and Content

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### 2.1. Groups

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An ACR-NEMA conforming image file must contain the following groups:

8, 10, 18, 20, 28 and 7FE0

There must be a group 6000 to 601E for each ROI level in use, for Siemens CT/MR these are the groups:

6000, 6002, 6004 und 6006

SPI defines 2 subsets of elements: the Unique Identifier (UID) and the Descriptive Identifiers (DESC). The UID is defined mandatory. SPI defines the DESC elements as optional, but they must be in the data object if they are known.

An SPI conforming image file needs the additional shadow groups:

9 and 11.

### 2.2. Data Element Types

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All elements of the ACR-NEMA defined type 1 and 2 must be present in these groups. Elements of type 1 must have a value. Elements of type 2 may be coded with a length of 0, thus without a value, but they must be present.

1D Elements should not be present in the Data Object if the default is applicable. Although it is not a violation of the ACR-NEMA standard to have 1D elements with the default value in the Data Object.

2D Elements must be sent with a length of zero if the default is not to be used.

The SPI and SIEMENS made some minor changes to Data Element Type definitions to indicate the importance of those elements.

The UID element is of type 1, most SPI DESC elements are of their original ACR-NEMA type, SPI defined DESC elements are of type 3.

An image file conforming the Siemens SPI Image Data Object Format contains all data elements of the dictionary. Anyhow Data Elements of type 2 can be coded with a length of zero and Data Elements of type 1D and 2D are coded only if the default value does not fit. Each 2D element is listed in the Dictionary although most of them will be coded with a length of zero.

### 2.3. Storage Format of an Image Data Object

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The header of the image file (group 8 to 6006) is of variable length with an estimated maximum length of 2 Kbyte which is expected not to be really needed in the near future.

Because of the variability of the header length it seems to be less important to have fixed lengths for the individual elements. Furthermore there are different lengths for important elements as patient name and patient ID at CT/MR on one side and 404 on the other side. And at last it does not seem to be reasonable and possible to define lengths of certain data elements for the products of the future today.

==> The Siemens SPI Data Object Format of Type Image as well as the ACR-NEMA does not require defined lengths for data elements.

This rule does not prohibit the product groups to work with fixed lengths. In this case the ASCII data elements are stored left justified with right filled blanks (as ACR-NEMA). The dictionary shows the lengths which are in use today. They can be helpful to estimate sizes as well as to serve as an information for future implementations.

Since there is a need to have no loss of information against the existing image file formats, the original header is stored in the SPI Data Object image file as one ACR-NEMA data element in:

#### Group 7003

The resulting redundancy is acceptable for the near future, because the ACR-NEMA image file will be created, when the image will not be modified any more. E.g. when the image is archived on optical disc or transferred to another node in a network.

The access to an SPI conforming Image Data Object Files should be as sufficient as the access to the existing image formats. Important data shall be found very fast and the access must be efficient. Therefore

- the original header and the pixel matrix are stored on KByte boundaries.

The sizes were estimated to 4 to 6 Kbyte for the complete header, therefore

- the Standard Siemens SPI Image Data Object Header will have 8 KByte.
- whenever possible the original header will begin at the 2 Kbyte offset after the starting file address.

These addresses will be achieved by the definition of 2 dummy groups:  
Group 7001 and 7005.

The shadow group 9 includes a pointer list to the original header and the pixel matrix:

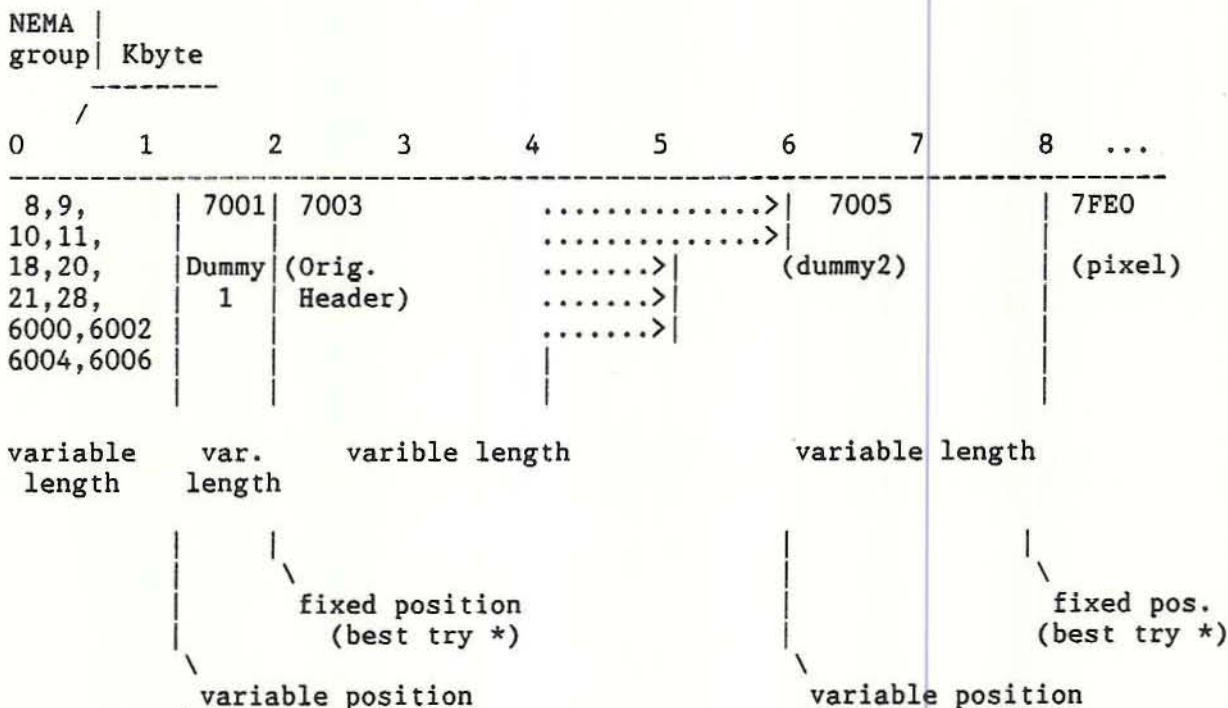
- Group 9 / Shadow Owner Code 'SIEMENS MED' /
- Element 30 : Byte Offset of Orig. Header = 2048
- 31 : Length of Or.He. in Bytes = 2048/3072/4096
- 40 : Byte Offset of the pixel matrix = 8192
- 41 : Length of the pixel matrix in Bytes = 131072/524288

These offsets should be used whenever possible.

If this is not possible the begin of the "real data" of group 7003 and 7FE0 has to be positioned at the next following 2Kbyte boundaries.

MR might have to store additional data following the pixel matrix in the future. This can be done in the same way with a dummy group 8001 and a data group 8003.

Storage Allocation For The SPI Image File Format Version SIEMENS MED.01



\*) If the ACR-NEMA groups 8 to 6006 occupy more than 2 Kbyte the Original Header starts at 4Kbyte and the Pixel Matrix starts at 10Kbyte...

## 2.4. Shadow Groups and Manufacturer Specific Groups

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The ACR-NEMA standard of today does not define a possibility to avoid collisions in the use of Shadow and Manufacturer Specific Groups. Therefore an ACR-NEMA Working Group made a proposal which will certainly be accepted and which is already included in the SPI document 4.

This proposal defines the elements 10 to FF to be used to point to the elements xx00 to xxFF. The creator of such a group searches the first free element 10 to FF, stores it's Owner Code in this element and stores his data elements in the elements with the resulting offset. The effective element 20 can be stored in element 1020, 1120, 1220 etc. The Shadow Owner Code gives the effective meaning of the element.

The Siemens ACR-NEMA Image File knows two kinds of Shadow Groups and Manufacturer Specific Groups: SPI defined and SIEMENS defined. In Group 9 both are existing:

```
Group 9/Element 10 : 'SPI RELEASE 1 ' ----> Elements 1000 to 10FF
Group 9/Element 11 : 'SIEMENS MED ' ----> Elements 1100 to 11FF
```

## 2.5. Recognition Codes

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Both the ACR-NEMA and the SPI have a Recognition Code which shows what format version is used. The Siemens product groups may store their own Recognition Code in the

```
Group 9 / 'SIEMENS MED '/ Element 10 : e.g. 'STCE V.1'
                                           'GTS.01'
```

## 2.6. Unique Identifier

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The SPI UID consists of 26 characters, the first 10 define the location and the next 16 characters define the time of the origination of the Data Object. The location consists of 6 characters network ID (the 4th character is always "S" to indicate the manufacturer Siemens) and 4 characters modality ID. This modality ID gives information about the type of modality (as ACR-NEMA Modality Data Element 0008/0060).

The UID must be present in each SPI conforming Data Object. Each modality can generate the second part of the UID, which represents the time. The first part of the UID requires configuration knowledge, which is not available by the modalities. Since this part of the UID is required for networking and not for the identification of Data Objects in only one node, the uid can be coded with default values for the network and the node ID:

```
default network: "000S00"  
default node:   "CT00"   for CT machines  
                "MR00"   for MR machines  
                "DR00"   for DR machines  
                "DS00"   for DSA machines
```

These defaults must be replaced, if the device is connected to a PACS network. In this case it is the responsibility of a PACS configuration management to assign network IDs and node IDs.

The location of origination is also stored in the element 0008/1010 Station ID, for network applications there are also the elements 0000/0200 and 0000/0300 sender and receiver.

The date of origination is stored in the element 0008/0020, the time of origination is stored (by the STCE implementation) in the element 0020/0012 (Acquisition).

Concerning the location of origination it must be considered very useful, especially for a future integration into a PACS, that there are not 3 different entries for the same matter.

## 2.7. Upgradeability

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The defined frame is open for extensions. These extensions could be implemented in the form of Shadow- and Manufacturer Specific Groups in a conforming manner.

The use of ACR-NEMA defined elements, which are not mentioned in the Dictionary does not seem to violate this common format.

## 3. Dictionary of the Image Data Object Version SIEMENS.01

Group-Number	Type of Information	Contents defined by
8	Identifying Information	NEMA
9	Shadow Identifying Information (SPI ID, Entry Table)	SPI/SIEMENS
10	Patient Information	NEMA
11	Shadow Patient Information	SPI
18	Aquisition Information	NEMA
20	Relationship Information	NEMA
21	Shadow Relationship	SIEMENS
28	Image Presentation	NEMA
6000	Overlay Group	NEMA
6002	Overlay Group	NEMA
6004	Overlay Group	NEMA
6006	Overlay Group	NEMA
7001	Dummy Shadow 1	SIEMENS
7003	Header Shadow Siemens Header Group	SIEMENS
7005	Dummy Shadow 2	SIEMENS
7FE0	Pixel Group	NEMA

Type	Explanation
1	ACR-NEMA Type 1.
1 S	SIEMENS defines this element as Type 1, although it has a lower classification in the ACR-NEMA Standard.
1 SPI	SPI defines this element as Type 1, although it has a lower classification in the ACR-NEMA Standard.
1D	ACR-NEMA Type 1D.
2	ACR-NEMA Type 2.
2 S	SIEMENS defines this element as Type 2, although it has a lower classification in the ACR-NEMA Standard.
2 SPI	SPI defines this element as Type 2, although it has a lower classification in the ACR-NEMA Standard.
3	ACR-NEMA Type 3.

Remark: 2/CT/MR/... as defined by the ACR-NEMA.

DEFINITION	TYPE	GROUP	ELEMENT	LENGTH
IDENTIFYING INFORMATION		8		
GROUP LENGTH	1	8	0	4
DATA OBJECT LENGTH	1	8	1	4
RECOGNITION CODE enumerated value: "ACR-NEMA 1.0"	1	8	10	12
STUDY DATE format: "YYYY.MM.DD"	2	8	20	10
STUDY TIME format: "HH.MM.SS.FFF"	2	8	30	12
DATA SET TYPE enumerated values: image = 0'X to be used for uncompressed images graphics = 2'X text = 3'X other = 100'X null = 101'X identifier = 102'X private image =8000'X to be used for compressed images private graphics =8002'X private text =8003'X	1	8	40	2
DATA SET SUBTYPE	2 SPI	8	41	8
MODALITY enumerated values: "CT", "NM", "MR", "DS", "DR", "US", "OT" (other)	2	8	60	2
MANUFACTURER enum. value for this document: "SIEMENS "	2	8	70	8
INSTITUTION ID recommodation: 'model and installation number' for non-PACS installations. 'first 10 characters of the UID' for PACS installations.	2	8	80	26
REFERRING PHYSICIAN	2	8	90	26
STATION ID recommodation: 'model and installation number' for non-PACS installations. 'first 10 characters of the UID' for PACS installations.	2	8	1010	10
PROCEDURE DESCRIPTION	3	8	1030	40
INSTITUTIONAL DEPARTMENT	3	8	1040	30
ATTENDING PHYSICIAN	3	8	1050	26
RADIOLOGIST	3	8	1060	26
ADMITTING DIAGNOSIS	3	8	1080	40



DEFINITION	TYPE	GROUP	ELEMENT	LENGTH
PATIENT INFORMATION		10		
GROUP LENGTH	1	10	0	4
PATIENT NAME	2	10	10	26
PATIENT ID	2	10	20	12
PATIENT'S BIRTHDATE format: "YYYY.MM.DD"	2	10	30	10
PATIENT'S SEX enumerated values: "F ", "M " or "O " (other)	2	10	40	2
PATIENT'S MAIDEN NAME	3	10	1005	26
PATIENT'S AGE	3	10	1010	4
SHADOW PATIENT INFORMATION		11		
SPI DEFINED SHADOW				
GROUP LENGTH	1	11	0	4
SHADOW OWNER CODE enumerated value: "SPI RELEASE 1 "	1	11	10	14
ORGAN	3	11	1010	12
ALLERGY INDICATION	3	11	1015	12
PREGNANCY	3	11	1020	4

DEFINITION	TYPE	GROUP	ELEMENT	LENGTH
ACQUISITION INFORMATION		18		
GROUP LENGTH	1	18	0	4
CONTRAST OR BOLUS AGENT default: "NONE"	2D	18	10	0
SCANNING SEQUENCE	2	18	20	2
SLICE THICKNESS	2/CT/MR	18	50	2
KV OUTPUT OF x-RAY GENERATOR	2/CT/DS/DR	18	60	6
REPETITION TIME	2/MR	18	80	6
ECHO TIME	2/MR	18	81	6
INVERSION TIME	2/MR	18	82	6
NUMBER OF AVERAGES	2/MR	18	83	6
IMAGING FREQUENCY	2/MR	18	84	6
IMAGED NUCLEUS	2/MR	18	85	8
RECONSTRUCTION DIAMETER	3/CT/MR	18	1100	4
GANTRY TILT	3/CT	18	1120	4
EXPOSURE	3/CT/DS	18	1152	4
RELATIONSHIP INFORMATION		20		
GROUP LENGTH	1	20	0	4
STUDY	2	20	10	6
SERIES	2 SPI	20	11	6
AQUISITION	2 SPI	20	12	6
IMAGE	2 SPI	20	13	6
PATIENT ORIENTATION format: "XY " enumerated values for x/y: "L" (left) "R" (right) "H" (head) "F" (feet)	2	20	20	4

"A" (anterior)				
"P"(posterior)				
IMAGE POSITION	2	20	30	0
IMAGE ORIENTATION default: (1,0,0;0,1,0)	2D	20	35	0
LOCATION / TABLE POSITION	2	20	50	6
LATERALITY default: not paired structure	2D	20	60	0
IMAGE GEOMETRY default: "PLANAR"	2D	20	70	6
MASKING IMAGE default: not subtraction image	2D	20	80	0
SOURCE IMAGE IDs	2D	20	3100	26
			:	
	2D	20	31FF	26
default: no composite				
MODIFYING DEVICE IDENTIFICATION default: not composite	2D	20	3401	10
MODIFIED IMAGED ID default: not composite	2D	20	3402	26
MODIFIED IMAGE DATE default: not composite	2D	20	3403	10
MODIFIED IMAGE TIME default: not composite	2D	20	3404	12
-----				
SHADOW RELATIONSHIP INFORMATION		21		
SIEMENS DEFINED SHADOW				
-----				
GROUP LENGTH	1	21	0	4
SHADOW OWNER CODE enumerated value: "SIEMENS MED "	1	21	11	12
ZOOM FACTOR format "xx.x"	2	21	1010	4
TARGET COORDINATES X/Y format "Oxxx\yyy"	2	21	1011	8
MASK FOR ROI LEVELS IN USE format : binary hexadecimal	2	21	1020	2
-----				

DEFINITION	TYPE	GROUP	ELEMENT	LENGTH
IMAGE PRESENTATION GROUP		28		
GROUP LENGTH	1	28	0	4
IMAGE DIMENSIONS default: 2	1D	28	5	2
ROWS	1	28	10	2
COLUMNS	1	28	11	2
PIXEL SIZE IN MM format: "00.xx\0.xx"	2	28	30	10
IMAGE FORMAT default: "RECT" (rectangular) enumerated value: "RECT"	1D	28	40	4
MANIPULATED IMAGE default: not altered	2D	28	50	0
COMPRESSION CODE default: "NONE" enumerated values: "NONE"	1D	28	60	4
BITS ALLOCATED default: 16	1D	28	100	2
BITS STORED SIEMENS default: 12	1D	28	101	2
HIGH BIT SIEMENS default: 11	1D	28	102	2
PIXEL REPRESENTATION SIEMENS default: 0 (unsigned integer)	1D	28	103	2
IMAGE LOCATION default: group 7FE0	1D	28	200	2
CENTER format: "0xxxx\00yyy" or "-xxxx\0yyyy"	2 S	28	1050	12
WIDTH format "xxxx\0yyyy"	2 S	28	1051	10
remark for CENTER and WIDTH: XXXX/YYYY may be identical if single window mode				
eg: "-01024", " RESCALE INTERCEPT 0" or "-02048"	2 S	28	1052	6
RESCALE SLOPE eg: "01" or "02"	2 S	28	1053	2

DEFINITION	TYPE	GROUP	ELEMENT	LENGTH
OVERLAY GROUP		6000		
GROUP LENGTH	1	6000	0	4
ROWS default: same as image in group 28	1D	6000	10	2
COLUMNS default: same as image in group 28	1D	6000	11	2
ROI default: "R " (= ROI) enumerated values: "G " (= GRAPHICS), "R " (= ROI)	1D	6000	40	2
ORIGIN default: "1\1 " (row 1, column 1)	1D	6000	50	4
COMPRESSION CODE default: "NONE" enumerated values: "NONE"	1D	6000	60	4
BITS ALLOCATED default: number of bits allocated for the pixel data (28,100) (=16)	1D	6000	100	2
BIT POSITION default: number of bits stored for the pixel data (28,101) (=12)	1 S	6000	102	2
OVERLAY FORMAT default: same as (0028,0040) enumerated value: "RECT" (rectangular)	1D	6000	110	4
OVERLAY LOCATION SIEMENS default: 7FE0'X (group 7FE0)	1 S	6000	200	2

DEFINITION	TYPE	GROUP	ELEMENT	LENGTH
OVERLAY GROUP		6002		
GROUP LENGTH	1	6002	0	4
ROWS default: same as image in group 28	1D	6002	10	2
COLUMNS default: same as image in group 28	1D	6002	11	2
ROI default: "R " (= ROI) enumerated values: "G " (= GRAPHICS), "R " (= ROI)	1D	6002	40	2
ORIGIN default: "1\1 " (row 1, column 1)	1D	6002	50	4
COMPRESSION CODE default: "NONE" enumerated values: "NONE"	1D	6002	60	4
BITS ALLOCATED default: number of bits allocated for the pixel data (28,100) (=16)	1D	6002	100	2
BIT POSITION SIEMENS default: D'x	1 S	6002	102	2
OVERLAY FORMAT default: same as (0028,0040) enumerated value: "RECT" (rectangular)	1D	6002	110	4
OVERLAY LOCATION SIEMENS default: 7FE0'X (group 7FE0)	1 S	6002	200	2

DEFINITION	TYPE	GROUP	ELEMENT	LENGTH
OVERLAY GROUP		6004		
GROUP LENGTH	1	6004	0	4
ROWS default: same as image in group 28	1D	6004	10	2
COLUMNS default: same as image in group 28	1D	6004	11	2
ROI default: "R " (= ROI) enumerated values: "G " (= GRAPHICS), "R " (= ROI)	1D	6004	40	2
ORIGIN default: "1\1 " (row 1, column 1)	1D	6004	50	4
COMPRESSION CODE default: "NONE" enumerated values: "NONE"	1D	6004	60	4
BITS ALLOCATED default: number of bits allocated for the pixel data (28,100) (=16)	1D	6004	100	2
BIT POSITION SIEMENS default: E'x	1 S	6004	102	2
OVERLAY FORMAT default: same as (0028,0040) enumerated value: "RECT" (rectangular)	1D	6004	110	4
OVERLAY LOCATION SIEMENS default: 7FE0'X (group 7FE0)	1 S	6004	200	2

DEFINITION	TYPE	GROUP	ELEMENT	LENGTH
OVERLAY GROUP		6006		
GROUP LENGTH	1	6006	0	4
ROWS default: same as image in group 28	1D	6006	10	2
COLUMNS default: same as image in group 28	1D	6006	11	2
ROI default: "R " (= ROI) enumerated values: "G " (= GRAPHICS), "R " (= ROI)	1D	6006	40	2
ORIGIN default: "1\1 " (row 1, column 1)	1D	6006	50	4
COMPRESSION CODE default: "NONE" enumerated values: "NONE"	1D	6006	60	4
BITS ALLOCATED default: number of bits allocated for the pixel data (28,100) (=16)	1D	6006	100	2
BIT POSITION SIEMENS default: F'x	1 S	6006	102	2
OVERLAY FORMAT default: same as (0028,0040) enumerated value: "RECT" (rectangular)	1D	6006	110	4
OVERLAY LOCATION SIEMENS default: 7FEO'X (group 7FEO)	1 S	6006	200	2

DEFINITION	TYPE	GROUP	ELEMENT	LENGTH
DUMMY SHADOW 1 SIEMENS defined shadow original siemens header at byte 2049		7001		
GROUP LENGTH	1	7001	0	4
SHADOW OWNER CODE enumerated value: "SIEMENS MED "	1	7001	10	12
DUMMY DATA TO REACH BLOCK BOUNDARIES	1	7001	1010	var.
HEADER SHADOW SIEMENS defined shadow		7003		
GROUP LENGTH	1	7003	0	4
SHADOW OWNER CODE enumerated value: "SIEMENS MED "	1	7003	10	12
ORIGINAL SIEMENS HEADER	2	7003	1010	var.
DUMMY SHADOW 2 SIEMENS defined shadow pixel matrix at byte 8193		7005		
GROUP LENGTH	1	7005	0	4
SHADOW OWNER CODE enumerated value: "SIEMENS MED "	1	7005	10	12
DUMMY DATA TO REACH BLOCK BOUNDARIES	1	7005	1010	var.
PIXEL GROUP		7FE0		
GROUP LENGTH	1	7FE0	0	4
PIXEL DATA	1	7FE0	10	var.

## A1. Dump of the SPI Header of an Image Data Object

data formats: 'D : decimal values  
 'X : hexa values  
 all other: ascii strings

GROUP	ELEMENT	LENGTH	VALUE	DEFINITION
8				identifying information
8	0	4	308'D	group length
8	1	4	81FE8'X	data object length
8	10	12	ACR-NEMA 1.0	recognition code
8	20	10	1988.01.29	study date
8	30	12	09:31:02.000	study time
8	40	2	0'X	data set type (image=0)
8	41	0		data set subtype
8	60	2	CT	modality
8	70	8	SIEMENS	manufacturer
8	80	26	UNIVKL.F.RADIOLOGIE GRAZ	institution id
8	90	26	ROENTGEN	referring physician
8	1010	10	AUS001GT01	station id (part of the uid, GT means Gateway)
8	1090	12	SOMATOM DR03	manufacturer model
8	4000	80	SCANNOTR.	comments
9				SPI shadow identifying information
9				SIEMENS defined Entry Table
9	0	4	142'D	group length
9	10	14	SPI RELEASE 1	shadow owner code
9	11	12	SIEMENS MED	shadow owner code
9	1015	26	AUSS01GT011988012909354247	uid
9	1110	6	GTS.01	recognition code
9	1130	4	800'X	byte offset of the original header
9	1131	4	800'X	length of original header in bytes
9	1140	4	2000'X	byte offset of pixel matrix
9	1141	4	80000'X	length of pixel matrix in bytes
10				patient information
10	0	4	82'D	group length
10	10	26	BEETHOVEN,LUDWIG	patient name
10	20	12	334455/A	patient id
10	30	10	1905.03.12	patient's birthdate
10	40	2	M	patient's sex

GROUP	ELEMENT	LENGTH	VALUE	DEFINITION
11				shadow patient information
11	0	4	42'D	group length
11	10	14	SPI RELEASE 1	shadow owner code
11	1010	12	ABDOMEN/A	organ
18				acquisition information
18	0	4	70'D	group length
18	10	0		contrast or bolus agent
18	20	2	ST	scanning sequence (standard scan)
18	50	2	08	slice thickness in mm
18	60	6	000125	KV output of x-ray generator
18	1120	6	000000	gantry tilt
18	1152	6	000350	exposure
20				relationship information
20	0	4	162'D	group length
20	10	6	334455	study (hospital defined)
20	11	6	1	series
20	12	6	18	aquisition (CT scan number)
20	13	6	1	image
20	20	4	A\L	patient orientation: Anterior\Left
20	30	0		image position
20	35	0		image orientation
20	50	6	000240	location/table position
20	60	0		laterality
20	70	0		image geometry (PLANAR, UNRAVE)
20	80	0		masking image
20	3100	0		source image IDs
20	3401	0		modifying device identification
20	3402	0		modified image id
20	3403	0		modified image date
20	3404	0		modified image time
21				shadow relationship inform.
21	0	4	50'D	group length
21	10	12	SIEMENS MED	shadow owner code
21	1010	4	78.0	zoom factor
21	1011	0		target coordinates x/y
21	1020	2	F	mask for roi levels in use

GROUP	ELEMENT	LENGTH	VALUE	DEFINITION
28				image presentation group
28	0	4	128'D	group length
28	10	2	200'X	rows
28	11	2	200'X	columns
28	30	10	00.57\0.57	pixel size in mm ( '00.xx\0.xx' )
28	50	0		manipulated image
28	101	2	C'X	bits stored (=12)
28	102	2	B'X	high bit (=11)
28	103	2	0'X	pixel representation (unsigned integer)
28	1050	12	-2/000000	center
28	1051	10	206/00000	width
28	1052	6	-01024	rescale intercept
28	1053	2	01	rescale slope
6000				overlay group
6000	0	4	20'X	group length
6000	102	2	C'X	bit position (=12)
6000	200	2	7FE0'X	overlay location (pixel group 7FE0)
6002				overlay group
6002	0	4	20'X	group length
6002	102	2	D'X	bit position (=13)
6002	200	2	7FE0'X	overlay location (pixel group 7FE0)
6004				overlay group
6004	0	4	20'X	group length
6004	102	2	E'X	bit position (=14)
6004	200	2	7FE0'X	overlay location (pixel group 7FE0)
6006				overlay group
6006	0	4	20'X	group length
6006	102	2	F'X	bit position (=15)
6006	200	2	7FE0'X	overlay location (pixel group 7FE0)

GROUP	ELEMENT	LENGTH	VALUE	DEFINITION
7001				dummy shadow 1
7001	0	4	788'D	group length
7001	10	12	SIEMENS MED	shadow owner code
7001	1010	760	....	dummy data to reach block boundaries
7003				header shadow
7003	0	4	2076'D	group length
7003	10	12	SIEMENS MED	shadow owner code
7003	1010	2048	....	original siemens CT header
7005				dummy shadow 2
7005	0	4	4064'D	group length
7005	10	12	SIEMENS MED	shadow owner code
7005	1010	4036	....	dummy data to reach block boundaries
7FE0				pixel group
7FE0	0	4	524296'X	group length
7FE0	10	524288	....	pixel data