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Planetary Missions Division

VEX

Archive Conventions

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Prepared by: Error! Contact not defined.

Approved by:

Distribution List

Recipient	Organisation	Recipient	Organisation
VSOC			
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Change Record Sheet

Date	Iss.	Rev.	pp.	Description / Authority
20 July 2006	0	–		Draft
16 Aug 2006				Draft
18 August 2006				Draft : PHOBOS observation type deleted
28 August 2006	0	c		Draft: in label pointing_type replaced by spacecraft_pointing_mode in right_ascension and declination. Observation_type update
20 November 2006	0	d		Spacecraft orientation Science case id Pointing mode description Volume *set* name and id Digits in volume_set_id Voldesc.cat: medium_type and volume_format OBSERVATION_TYPE
18 January 2007	0	e		VOLUME_SET_NAME, ID, VOLUME_ID “N/A” for ORBIT_NUMBER value.
29 January 2007	0	f		(i) VIRTIS case: DATA_SET_ID and NAME (ii) TARGET_NAME and TYPE table update.
14 February 2007	0	g		VOLUME_SET_ID value for VIRTIS after discussion with PDS.
13 March 2007	1	0		Reference frame and coordinate systems.
11 May 2007	1	1		Typo in Table 11 (VOLUME_NAME was VOLUME_SET_NAME).
14 Feb 2008	2	0		Values of the VOLUME object for VeRa. Mission information for VeRa in DATA_SET_ID.
03 March 2008	2	1		INSTITUTION_NAME for ASPERA DATA_SET_NAME and ID for ASPERA (Table 5 and Table 8). Title and header for version number. Target name and type: Table 4 RYMDFYSIK in Table 16
21 May 2008	2	2		VOLUME_SET_NAME, VOLUME_ID values modified for MAG. Explanations added for VOLUME_SET_ID and

Date	Iss.	Rev.	pp.	Description / Authority
				VOLUME_ID formation rule.
30 May 2008	2	2		VOLUME_SET_NAME value for VeRa
21 April 2010	2	3		DATA_SET_ID: mission phase acronyms for nominal and extended mission phase.

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1. Introduction

1.1 Introduction

This document defines the conventions that apply to the VEX Science Data Archive. The conventions are agreements and rules in addition to the PDS Standards (AD1, AD2). Adoption of these conventions in all data sets will increase the consistency and the accessibility of the VEX archive.

1.2 Applicable Documents

AD1 Planetary Data System Standards Reference, JPL D-7669, Part 2, Version 3.7, 20 March 2006.

AD2 Planetary Science Data Dictionary Document, JPL D-7116, Revision E, 28 Aug 2002.

AD3 VEX-RSSD-TN-001, Issue 1, June 2004 http://www.rssd.esa.int/open/?AHI60BZFBp

AD4 VEX-ESC-IF-5005, Appendix D, Issue 2.2, 20 May 2005 http://www.rssd.esa.int/open/?qByi708vjG

AD5 VEX-RSSD-LI-009 Issue 1.0, 26 April 2006 http://www.rssd.esa.int/open/?tjNBeXqw1X

AD6 VEX-RSSD-LI-004 Issue 2, 7 June 2004 http://www.rssd.esa.int/open/?4c2BoNV6l5

AD7 RO-RSI-IGM-IS-3016 http://www.rssd.esa.int/open/?5uEb8biyz9

AD8 Report or the IAU/IAG working group on cartographic coordinates and rotational elements of the planets and satellites: 2000

AD9 SOP-RSSD-TN010.pdf Issue 3 Revision 5, Planetary Science Data Archive Technical Note Geometry and Position Information, 4 May 2005.

2. Delivery schedule

2.1 General

Delivery date	Data collection period	Public distribution
31 December 2006	Ground data + 9/11/2005 (Launch) to 26/05/2006 (with exceptions)	
February 2007	26/05/2006 to 31 August 2006	May 2007 (Peer review planned in March-April 2007)

2.2 ASPERA

Delivery date	Data collection period	End of proprietary period
June 2008 (for Peer Review)	9 November 2005 to end of Nov 2006	September 2008
September 2008	December 2006 to end of May 2008	End of November 2008 for the latest release
December 2008	June/July/August 2008	February 2009
M + 3 months	3 months	Last of the three due months + 6 months.

3. Strongly recommended Keywords and Standard Values

3.1 Data Product Labels

Table 1 lists the keywords strongly recommended to be used by VEX data producers. If a keyword is not applicable then “Not Applicable" shall be used for data elements of any type (see section 17.2 of AD1 for not applicable values that corresponds to the data type). A data producer might add other keyword to data labels or use mission specific keywords after having requested them from PSA.

In Table 1, SC stands for scalar and VEC for vector, ID for identifier, CHAR for character (i.e. “ “ are needed) INT for integer, PTR for pointer.

The date/time expression YYYY-MM-DDThh:mm:ss[.fff] (without "Z" is preferred) represents Universal Time Coordinated (UTC).

Keyword	SSE	Type	Description
PDS_VERSION_ID	SC	ID	Version of PDS standard used “PDS3”
/* FILE RELATED INFORMATION*/			
PRODUCT_ID	SC	CHAR	Current file name, with extension
RECORD_TYPE	SC	ID	File formatting info
RECORD_BYTES	SC	INT	Record length in bytes, constant
FILE_RECORDS	SC	INT	Total file length / RECORD_BYTES (closest integer greater than or equal to this value)
LABEL_RECORDS	SC	INT	only for attached label
/* DATA POINTER IDENTIFICATION */			
^DATA_POINTER	SC	PTR	pointer to your attached or detached data
/* PRODUCER IDENTIFICATION */			
PRODUCER_ID	SC	ID	
PRODUCER_FULL_NAME	SC	CHAR	
PRODUCER_INSTITUTION _NAME	SC	CHAR	
PRODUCT_CREATION_TIME	SC	TIME	
/* DATA DESCRIPTION AND IDENTIFICATION */			
DATA_SET_NAME	SC	CHAR	
DATA_SET_ID	SC	CHAR	
RELEASE_ID	SC	INT	
REVISION_ID	SC	INT	
PRODUCT_TYPE	SC	ID	
PROCESSING_LEVEL_ID	SC	INT	See Table 2.

MISSION NAME	SC	CHAR	“VENUS EXPRESS”
MISSION_ID	SC	ID	VEX
INSTRUMENT_HOST_NAME	SC	ID	“VENUS EXPRESS”
INSTRUMENT_HOST_ID	SC	ID	VEX
MISSION_PHASE_NAME	SC	CHAR	As defined in AD5
INSTRUMENT_NAME	SC	CHAR	(constant)
INSTRUMENT_ID	SC	CHAR	(constant)
INSTRUMENT_TYPE	SC	CHAR	(constant)
^INSTRUMENT_DESC	SC	CHAR	(constant)
/* TARGET IDENTIFICATION */			
TARGET_TYPE	SC	CHAR	
TARGET_NAME	SC	CHAR	
RIGHT_ASCENSION	SC	REAL	IF, SPACECRAFT_POINTING_MODE= INERTIAL & TARGET = “STAR”
DECLINATION	SC	REAL	IF, SPACECRAFT_POINTING_MODE = INERTIAL & TARGET=”STAR”
/* SCIENCE OPERATIONS INFORMATION */			
VEX:SCIENCE_CASE_ID	SC	INT	NUMBER TAKEN FROM THE VEX Science Case (AD3) Definition Document, the values are [1..10]
VEX:SCIENCE_CASE_ID _DESC (text)	SC	CHAR	Shall point to a text referring to the document “VEX_SCIENCE_CASE_ID_DESC.TXT”.
OBSERVATION_TYPE	VEC	CHAR	conform to the column “OBS_NR” in document AD6.
^OBSERVATION_TYPE_DESC	SC	CHAR	Shall point to TEXT file contained in the DOCUMENT directory: “OBSERVATION_TYPE_DESC.TXT”
/* TIME RELATED INFORMATION */			
START_TIME	SC	TIME	e.g. 2004-01-10T13:50:36.474
STOP_TIME	SC	TIME	
SPACECRAFT_CLOCK_	SC	CHAR	e.g. "1/0021822627.31247"

START_COUNT			
SPACECRAFT_CLOCK_ STOP_COUNT	SC	CHAR	
/* ORBITAL INFORMATION */			
ORBIT_NUMBER	SC	INT	
ORBITAL_ECCENTRICITY			
ORBITAL_INCLINATION			
ORBITAL_SEMIMAJOR_AXIS			
PERIAPSIS_ALTITUDE			
PERIAPSIS_ARGUMENT_ANG LE			
PERIAPSIS_TIME			
SPACECRAFT_ORIENTATION			(x,y,z) to specify the speed vector orientation
^SPACECRAFT_ ORIENTATION_DESC			Shall point to TEXT file contained in the DOCUMENT directory: "VEX_ORIENTATION_DESC.TXT"
SPACECRAFT_POINTING_ MODE	SC	CHAR	The pointing modes are defined in Science Operations Service Flight Dynamics Interface Control Document (SOIA) AD4,
SPACECRAFT_POINTING_ MODE_DESC	SC	CHAR	Element which describes the pointing mode and shall accompany the SPACECRAFT_POINTING_MODE element.

Table 1 Mandatory keywords for VEX data product labels.

PROCESSING_LEVEL_ID value = CODMAC level	PSA level	NASA level	PRODUCT_TYPE value	Description
1	1a		UDR	Unprocessed Data Record
2	1b	0	EDR	Experiment Data Record
3	2	1A	RDR	Reduced Data Record
4		1B	REFDR	Reformatted Data Record
5	3	2-5	DDR	Derived Data Record
6			ANCDR	Ancillary Data Record

Table 2: Standard values for PROCESSING_LEVEL_ID and PRODUCT_TYPE.

Starting date	ORBIT_NUMBER	MISSION_PHASE_NAME
2005-11-09	"N/A"	"CRUISE"
2006-04-11	0	"VOI"
2006-05-14	23	"PHASE 0"
2006-06-04	44	"PHASE 1"
2006-07-11	82	"PHASE 2"
2006-09-14	146	"PHASE 3"
2006-11-16	209	"PHASE 4"
2007-02-01	286	"PHASE 5"

Table 3: Standard values for MISSION_PHASE_NAME with starting date and orbit number.

TARGET_NAME	TARGET_TYPE
"VENUS"	"PLANET"
"STAR"	"STAR"
"SUN"	"SUN"
"SKY"	"CALIBRATION"
"COMET"	"COMET"
"SOLAR WIND"	"N/A"

Table 4: Standard values for TARGET_TYPE and TARGET_NAME.

3.1.1 DATA_SET_NAME Formation

```
DATA_SET_NAME =  "<INSTRUMENT_HOST_NAME> <TARGET> <INSTRUMENT_ID> <data
                 processing level number>
                 <description> <version>"
```

<INSTRUMENT_HOST_NAME>	VENUS EXPRESS	req
<TARGET>	see Table *3: Standard values for MISSION_PHASE_NAME with starting date and orbit number.* or use combination like VENUS/SKY	req
<INSTRUMENT_ID>	INSTRUMENT_ID	req
<data processing level number>	CODMAC level 1, 2, …, N from Table 2	req
<description>	free character string containing only A-Z, 0-9, -	opt
<version>	e.g. V1.0	req

Table 5 Elements for DATA_SET_NAME formation.

INSTR	DATA	DATA_SET_NAME
ASPERA	ELS	VENUS EXPRESS VENUS/SOLAR WIND ASPERA 2 ELS V1.0
ASPERA	IMA	VENUS EXPRESS VENUS/ SOLAR WIND ASPERA 2 IMA V1.0
ASPERA	NPD	VENUS EXPRESS VENUS/ SOLAR WIND ASPERA 2 NPD V1.0
ASPERA	NPI	VENUS EXPRESS VENUS/ SOLAR WIND ASPERA 2 NPI V1.0
MAG		VENUS EXPRESS OTHER/VENUS MAG 2 V1.0
PFS		VENUS EXPRESS VENUS PFS 2 V1.0
SPICAV	UV	VENUS EXPRESS SKY/VENUS SPICAV 2 UV V1.0
SPICAV	IR	VENUS EXPRESS SKY/VENUS SPICAV 2 IR V1.0
SPICAV	SOIR	VENUS EXPRESS SKY/VENUS SPICAV 3 SOIR V1.0
VIRTIS		VENUS EXPRESS VENUS VIRTIS 2/3 V1.0
VMC		VENUS EXPRESS VENUS VMC 2 V1.0
VeRa		VENUS EXPRESS VENUS VRA <MISSION> 2 NNNN V1.0

Table 6 DATA_SET_NAME values per data set

The maximum length of the DATA_SET_NAME element is of 60 characters. Multiple instrument hosts, targets and instruments are referenced by concatenation of the values with a "/", which is interpreted as "and".

3.1.2 DATA_SET_ID Formation

The DATA_SET_ID keyword identifies the corresponding component used in the DATA_SET_NAME.

DATA_SET_ID = "<INSTRUMENT_HOST_ID> - <target id> - <INSTRUMENT_ID>-

<data processing level number> - <mission phase abbreviation> - <description>-<version>"

<INSTRUMENT_HOST_ID>	VEX	req
<target id>	V/Y	req
<INSTRUMENT_ID>	INSTRUMENT_ID	req
<data processing level number>	CODMAC level 1, 2, …, N from Table 2	req
<mission phase abbreviation>	mission phase abbreviation from Table 3	opt
<description>	free character string containing only A-Z, 0-9	opt
<version>	e.g. V1.0	req

Table 7 Elements for the DATA_SET_ID formation.

INSTR	DATA	DATA_SET_ID
ASPERA	ELS	VEX-V/SW-ASPERA-2-ELS-V1.0
ASPERA	IMA	VEX-V/SW-ASPERA-2-IMA-V1.0
ASPERA	NPD	VEX-V/SW-ASPERA-2-NPD-V1.0
ASPERA	NPI	VEX-V/SW-ASPERA-2-NPI V1.0
MAG		VEX-X/V-MAG-2-V1.0
PFS		VEX-V-PFS-2-V1.0
SPICAV	UV	VEX-Y/V-SPICAV-2-UV V1.0
SPICAV	IR	VEX-Y/V-SPICAV-2-IR-V1.0
SPICAV	SOIR	VEX-Y/V-SPICAV-3-SOIR-V1.0
VIRTIS		VEX-V-VIRTIS-2/3-V1.0
VMC		VEX-V-VMC-2-V1.0
VeRa		VEX-V-VRA-1/2/3-?-NNNN-V1.0 [AD7]

Table 8 DATA_SET_ID values per data set.

The maximum length of the DATA_SET_ID values is of 40 characters. Multiple instrument hosts, targets and instruments are referenced by concatenation of the values with a "/", which is interpreted as "and".

The mission phase abbreviation is optional but recommended for the VEX mission, as it helps to identify the nominal mission from the extended mission phases. For VEX mission there is one data set per mission phase (NOMINAL, EXTENSIONs) – except for VeRa, which is a special case as they deliver several data sets through the mission duration independently from the

phases. The acronyms for extended mission phase with the dates of these phases are listed in Table 9.

Phase Name	Acronyms	Start Date	End Date
Nominal Mission Phase	NMP	9 Nov 2005	2 Oct 2007
First Extension	EXT1	3 Oct 2007	May 2009
Second Extension	EXT2	May 2009	?

Table 9 Mission Phase Acronyms for DATA_SET_ID.

The following example is from VMC:

Nominal mission VEX-V-VMC-3-RDR-V1.0

Extension one VEX-V-VMC-3-RDR-EXT1-V1.0

Extension two VEX-V-VMC-3-RDR-EXT2-V1.0

3.2 VOLUME Object

At the root level, two files must be present, namely VOLDESC.CAT and AAREADME.TXT. This section deals with the VOLDESC.CAT content. After PDS standards, it “gives a high-level description of the contents of the volume”. Despite the fact that there is no physical volume, VOLDESC.CAT must be created for PDS compliance. Table 10 lists the mandatory keywords for the VOLUME object of the VEX mission. Max stands for “maximum length of the keyword value”.

In agreement with PDS, the volumes for VEX are going to be organised in this way:

- The volume set (VOUME_SET_NAME and ID) will group all the data sets from one instrument, except for ASPERA4;
- The volume (VOLUME_NAME and ID) will group all levels from one channel/detector of the instrument.

Example: SPICAV has three channels (UV, IR, SOIR).

For the three channels, the VOLUME_SET_NAME will be the same “VENUS EXPRESS SPICAV DATA PRODUCTS”.

For each channel, we have a different VOLUME_NAME and ID (VOLUME_NAME=”VOLUME 1: SPICAV UV VENUS EXPRESS DATA” for UV channel). This volume groups the several data levels (EDR, RDR, …).

Keyword	**Req.**	**Max**	**Standard value(s)**
DATA_SET_ID	req.	40	see section 3.1.2
DESCRIPTION	req.	N/A	"This volume contains .."
MEDIUM_TYPE	req.	30	"ONLINE"

Keyword	Req.	Max	Standard value(s)
PUBLICATION_DATE	req.	10	YYYY-MM-DD
VOLUME_FORMAT	req.	20	"ISO-9660"
VOLUME_ID	req.	11	See 3.2.5
VOLUME_NAME	req.	60	See 3.2.3
VOLUME_SERIES_NAME	req.	60	"MISSION TO VENUS"
VOLUME_SET_NAME	req.	60	See 3.2.2
VOLUME_SET_ID	req.	40	See 3.2.4
VOLUME_VERSION_ID	req.	12	"VERSION 1"
VOLUMES	req.	N/A	1

Table 10: Mandatory keywords and standard values for the VOLUME object.

3.2.1 VOLDESC.CAT template

```
PDS_VERSION_ID                  = PDS3
RELEASE_ID                      = 0001
REVISION_ID                     = 0000

OBJECT                           = VOLUME
 DATA_SET_ID                    = " "
 DESCRIPTION                    = "This volume contains ..."
 MEDIUM_TYPE                   = "ONLINE"
 PUBLICATION_DATE               = 2006-10-31
 VOLUME_FORMAT                  = "ISO-9660"

 VOLUME_ID                       =
 VOLUME_NAME                    = " "
 VOLUME_SERIES_NAME             = "MISSION TO VENUS"
 VOLUME_SET_NAME                 = " "
 VOLUME_SET_ID                   =
 VOLUME_VERSION_ID               = “VERSION 1”
 VOLUMES                         = 1

 OBJECT                          = CATALOG
  ^DATA_SET_CATALOG              = "DATASET.CAT"
  ^INSTRUMENT_CATALOG            = "INST.CAT"
  ^INSTRUMENT_HOST_CATALOG       = "INSTHOST.CAT"
  ^MISSION_CATALOG               = "MISSION.CAT"
  ...
 END_OBJECT                      = CATALOG

 OBJECT                          = DATA_PRODUCER
  INSTITUTION_NAME               = " "
  FACILITY_NAME                  =
  FULL_NAME                      = " "
  ADDRESS_TEXT                   = " "
 END_OBJECT                      = DATA_PRODUCER

END_OBJECT                       = VOLUME
END
```

Figure 1 VOLDESC.CAT template

Figure 1 shows the template of VOLDESC.CAT file to be used. The template contains the mandatory keywords and mandatory objects.

3.2.2 VOLUME_SET_NAME

The volume set will group all the data sets from one instrument, except for ASPERA4. In Table 11, we propose the following values of VOLUME_SET_NAME keyword. The length of this character keyword should not exceed 60 characters.

INSTRUMENT	**DATA**	**VOLUME_SET_NAME**
ASPERA	ELS	VENUS EXPRESS ASPERA4 ELS DATA
ASPERA	IMA	VENUS EXPRESS ASPERA4 IMA DATA
ASPERA	NPI	VENUS EXPRESS ASPERA4 NPI DATA
ASPERA	NPD	VENUS EXPRESS ASPERA4 NPD DATA
MAG		VENUS EXPRESS MAG DATA PRODUCTS SET
PFS		VENUS EXPRESS PFS DATA PRODUCTS
SPICAV	UV	VENUS EXPRESS SPICAV DATA PRODUCTS
SPICAV	IR	VENUS EXPRESS SPICAV DATA PRODUCTS
SPICAV	SOIR	VENUS EXPRESS SPICAV DATA PRODUCTS
VIRTIS		VENUS EXPRESS VIRTIS DATA PRODUCTS
VMC		VENUS EXPRESS VMC DATA PRODUCTS
VeRa		VEX: RADIO SCIENCE OCCULTATION

Table 11 Proposed VOLUME_SET_NAME values

3.2.3 VOLUME_NAME

INSTRUMENT	**DATA**	**VOLUME_NAME**
ASPERA	ELS	VOLUME 1: VENUS EXPRESS ASPERA4 EDR ELS DATA VOLUME 2: VENUS EXPRESS ASPERA4 RDR ELS DATA
ASPERA	IMA	VOLUME 1: VENUS EXPRESS ASPERA4 EDR IMA DATA VOLUME 2: VENUS EXPRESS ASPERA4 RDR IMA DATA
ASPERA	NPI	VOLUME 1: VENUS EXPRESS ASPERA4 EDR NPI DATA VOLUME 2: VENUS EXPRESS ASPERA4 RDR NPI DATA
ASPERA	NPD	VOLUME 1: VENUS EXPRESS ASPERA4 EDR NPD DATA VOLUME 2: VENUS EXPRESS ASPERA4 RDR NPD DATA
MAG		VENUS-EXPRESS VENUS MAG 2 V1.0
PFS		?

SPICAV	UV	VOLUME 1: SPICAV UV VENUS EXPRESS DATA
SPICAV	IR	VOLUME 2: SPICAV IR VENUS EXPRESS DATA
SPICAV	SOIR	VOLUME 3: SPICAV SOIR VENUS EXPRESS DATA
VIRTIS		VOLUME 1: VIRTIS VENUS EXPRESS DATA
VMC		VOLUME 1: VMC VENUS EXPRESS DATA [TBC]
VeRa		?

Table 12 VOLUME_NAME table.

3.2.4 VOLUME_SET_ID

This keyword follows the formation rule:

<country abbreviation>_<government branch>_

<discipline>_<mission|spacecraft><instrument>_XXXX

The mission and instrument terms shall not exceed 6 characters altogether.

In the four digits "XXXX", the first one represents the volume set, the remaining digits contains "X" to define the range of volumes in the volume set. This digit is set to 0 in the VOLUME_SET_ID but is incremented in the VOLUME_ID.

INSTR	**DATA**	**CY**	**GOV**	**DISC**	**MIS/INST**	**4-DIGIT**
ASPERA	ELS	SE	IRF	IRFK	VEXASP	1000
ASPERA	IMA	SE	IRF	IRFK	VEXASP	2000
ASPERA	NPI	SE	IRF	IRFK	VEXASP	3000
ASPERA	NPD	SE	IRF	IRFK	VEXASP	4000
MAG	MAGIS MAGOS Only at level 2	AT	OEAW	IWF	VEXMAG	1000
PFS		IT	CNR	ISFI	VEXPFS	1000
SPICAV	UV	FR	IPSLCNRS	SA	VEXSPI	1000
SPICAV	IR	FR	IPSLCNRS	SA	VEXSPI	1000
SPICAV	SOIR	BE	BIRA	IASB	VEXSPI	1000
VIRTIS		FR/IT	CNRS/INAF	OBSPM/IASF	VEXVIR	1000
VMC		DE	DLR	PF	VEXVMC	1000
VeRa		DE	UNIBW	UNIBW	VEXVRA	1000

Table 13 Items values to form the VOLUME_SET_ID keyword value.

Table 13 lists the values for the items that form the VOLUME_SET_ID keyword.

Table 14 shows the values for the VOLUME_SET_ID keyword.

INSTR	DATA	VOLUME_SET_ID
ASPERA	ELS	SE_IRF_IRFK_VEXASP_1000
ASPERA	IMA	SE_IRF_IRFK_VEXASP_2000
ASPERA	NPI	SE_IRF_IRFK_VEXASP_3000
ASPERA	NPD	SE_IRF_IRFK_VEXASP_4000
MAG		AT_OAW_IWF_VEXMAG_1000
PFS		IT_CNR_ISFI_VEXPFS_1000
SPICAV	UV	FR_IPSLCNRS_SA_VEXSPI_1000
SPICAV	IR	FR_IPSLCNRS_SA_VEXSPI_1000
SPICAV	SOIR	BE_BIRA_IASB_VEXSPI_1000
VIRTIS		FR/IT_CNRS/INAF_OBSPM/IASF_VEXVIR_1000
VMC		DE_DLR_PF_VEXVMC_1000
VeRa		DE_UNIBW_UNIBW_VEXVRA_1000

Table 14 VOLUME_SET_ID values per data set.

3.2.5 VOLUME_ID

Following PDS standards: “it is formed using

- a mission, spacecraft, or campaign identifier, followed by
- an optional instrument or data type identifier (total of 6 characters), followed by
- an underscore character and 4 digit sequence number."

The VOLUME_ID keyword consists of the last two components of the VOLUME_SET_ID, with the last digits incremented for every new volume. It should not exceed 11 characters.

Table 15 lists the values for the VOLUME_ID keyword per data set.

INSTR	DATA	VOLUME_ID
ASPERA	ELS	VEXASP_1100 VEXASP_1200
ASPERA	IMA	VEXASP_2100 VEXASP_2200
ASPERA	NPI	VEXASP_3100 VEXASP_3200
ASPERA	NPD	VEXASP_4100 VEXASP_4200
MAG		VEXMAG_1001 VEXMAG_1002
PFS		VEXPFS_1001
SPICAV	UV	VEXSPI_1001
SPICAV	IR	VEXSPI_1002
SPICAV	SOIR	VEXSPI_1003
VIRTIS		VEXVIR_1001
VMC		VEXVMC_1001
VeRa		VEXVRA_1001

Table 15 VOLUME_ID keyword values per data set.

3.2.6 REQUIRED OBJECTS

Two objects are required on the VOLUME object:

- CATALOG
- DATA_PRODUCER

3.2.6.1 CATALOG

It lists the content of the CATALOG directory using pointers to the documents.

CATALOG object shall contain:

- DATA_SET
- INSTRUMENT
- INSTRUMENT_HOST
- MISSION

See Figure 1, for the presentation of this object inside the VOLUME object.

3.2.6.2 DATA_PRODUCER

The following keywords are required :

- INSTITUTION_NAME
- FACILITY_NAME
- FULL_NAME
- ADDRESS_TEXT

3.2.6.3 INSTITUTION_NAME

INSTR	**INSTITUTION_NAME**
ASPERA	“INSTITUTET FOR RYMDFYSIK”
MAG	“INSTITUT FUR WELTRAUMFORSCHUNG”
PFS	“INSTITUTO DI FISICA DELLO SPAZIO INTERPLANETARIO”
SPICAV	“SERVICE D’AERONOMIE”
SPICAV-SOIR	“BELGIAN SPACE INSTITUTE FOR SPACE AERONOMY”
VIRTIS	“OBSERVATOIRE DE PARIS/INSTITUTO DI ASTROFISICA SPAZIALE E FISICA COSMICA”
VMC	“MAX PLANCK INSTITUT”
VeRa	“UNIVERSITAT DER BUNDESWEHR”

Table 16 INSTITUTION_NAME values per instrument.

3.2.6.4 FACILITY_NAME

After the PDS dictionary: “The FACILITY_NAME element identifies a department, laboratory or subsystem that exists within an institution. “

Please, give me the value for this element (limited to 60 characters) or put “N/A”.

3.2.6.5 FULL_NAME

INSTR	FULL_NAME
ASPERA	"STANISLAV BARABASH"
MAG	"TIELONG ZHANG"
PFS	"VITTORIO FORMISANO"
SPICAV	"JEAN-LOUP BERTAUX"
SPICAV-SOIR	"EDDY NEEFS"
VIRTIS	"PIERRE DROSSART/GIUSEPPE PICCIONI"
VMC	"WOJCIECH MARKIEWICZ"
VeRa	"BERND HAUSLER"

Table 17 FULL_NAME values to be used in the DATA_PRODUCER object.

Unless you may propose something else in agreement with the PI, we suggest to use the PI name.

3.2.7 SCIENCE CASE

3.2.7.1 VEX:SCIENCE_CASE_ID

The value for this keyword is an integer between 1 and 10. This integer is taken from VEX Science Case (AD3) definition document.

3.2.7.2 VEX:SCIENCE_CASE_ID_DESC

This keyword is a mission specific keyword. Because of this, it cannot be a pointer to the ASCII file contained in the DOCUMENT directory named "VEX_SCIENCE_CASE_ID_DESC.TXT" as we would have liked.
To circumvent this constraint, the value for this keyword will be:
VEX:SCIENCE_CASE_ID_DESC= " Please refer to VEX_SCIENCE_CASE_ID_DESC.TXT in the DOCUMENT directory."
The VEX_SCIENCE_CASE_ID_DESC.TXT must be located in the DOCUMENT directory.

3.2.8 OBSERVATION_TYPE

Please refer to AD6. The document defining the values of the OBSERVATION_TYPE keyword is OBSERVATION_TYPE_DESC.TXT and should be included in the DOCUMENT directory. This keyword is under discussion at PI level. This information will be found in the ITL file.

3.2.9 SPACECRAFT ORIENTATION

```
spkezr_c("VENUS", et, "J2000","NONE", "VEX", starg, &lt);
 vel[0]=starg[3];
 vel[1]=starg[4];
 vel[2]=starg[5];
 pxform_c("J2000","VEX_SPACECRAFT",et,rot);
 mxv_c(rot,vel,vel);
 vhat_c(vel,vel)
```

Figure 2 SPICE routine for VEX orientation computation.

The keyword SPACECRAFT_ORIENTATION is defined as follows:
“The spacecraft orientation element provides the orientation of a spacecraft in orbit or cruise in respect to a given frame, (e.g. a non-spinning spacecraft might be flown in +Y or -Y direction in respect to the spacecraft mechanical build frame). This element shall be used in combination with the keyword spacecraft_orientation_desc that describes the convention used to describe the spacecraft orientation. The spacecraft orientation shall be given as a 3-tuple, one value for the x, y and z axes”
VEX may be traveling with an angle between the speed vector and the Y-axis of the spacecraft.
The SPACECRAFT_ORIENTATION keyword gives the position of the speed vector $\vec{v}$ in the spacecraft reference frame:
SPACECRAFT_ORIENTATION = (x,y,z)
Where x, y, z are the coordinates of the normalised speed vector $\vec{v}$ in the reference frame of the spacecraft.
The SPACECRAFT_ORIENTATION_DESC pointer, which points to the VEX_ORIENTATION_DESC.TXT file in the DOCUMENT directory, must accompany the keyword. This file describes the convention used to describe the spacecraft orientation. To compute this tuple, a SPICE routine may be used (written by Thomas Roatsch, VMC). This routine can be seen on Figure 2.

3.2.10 SPACECRAFT POINTING MODE

The pointing modes are defined in Science Operations Service Flight Dynamics Interface Control Document (SOIA) AD4. The keyword is always accompanied by the SPACECRAFT_POINTING_MODE_DESC pointer to the VEX_POINTING_MODE_DESC.TXT given in Table 18. The value of the keyword cannot exceed 12 characters.

SPACECRAFT_POINTING_MODE	**SPACECRAFT_POINTING_MODE_DESC**
NADIR	"This pointing mode is used for science observations normally around pericentre. The Z-axis of the sc points towards the Venus centre. The X axis of the s/c is perpendicular to the ground track."
ACROSSTRACK	"The ACROSSTRACK pointing mode is a derivative of the NADIR pointing mode. It is computed by applying a rotation around the s/c Y-axis. The rotational angle shall be computed such that the projection of the s/c Z axis onto the Venus surface is separated by a constant predefined angle from the sub-satellite point as seen from the Venus centre. The angle is measured in degrees and shall be specified in the data product label."
ALONGTRACK	"The ALONGTRACK pointing mode is a derivative of the NADIR pointing mode. It is computed by applying a rotation around the s/c X-axis. The rotational angle shall be computed such that the projection of the s/c Z axis onto the Venus surface is separated by a constant predefined angle from the sub-satellite point as seen from the Venus centre. The angle is measured in degrees and shall be specified in the data product label."
EARTH	"HGA boresight axis pointing to the Earth (either HGA 1 or 2), - Y-axis of the S/C (SA axis) is either closest to the ecliptic plane normal or perpendicular to the plane defined by the earth and sun directions. - In addition, in case of the Y axis ecliptic option, the direction of the Y axis (north/south) can be selected."
INERT	"Inertial attitude is used to point a payload towards a fix direction. The direction is given in right ascension and declination. The rotational degree of freedom around this direction can be used to optimise power/thermal conditions."

NADIR_POW	"The s/c Z-axis is pointing towards the Venus centre. The Y-axis is perpendicular to the Sun. The position of X axis is selected such that no sun illumination of the -X face occurs."
SPECULAR	"The HGA axis is pointing towards the Venus centre. The Y-axis is perpendicular to the Sun. The position of X axis is selected such that no sun illumination of the -X face occurs."
CUSTOM	"The SPEC mode pointing is a user custom pointing. It aimed at the implementation of user specific pointing requirements which cannot be accommodated via a specific interface."
MOSAIC	"The aim of mosaic pointing is to cover the full Venus disc from apocenter by performing a raster motion. For each of the raster points the attitude is computed based on the nadir pointing with yaw steering for power optimisation and applying one rotation along the S/C Y axis and one rotation along the S/C X axis (in this order). "

Table 18 SPACECRAFT_POINTING_MODE definitions.

4. GEOMETRY INFORMATION

4.1 Data product labels

If you wish to give more information on geometry using PDS keywords, you may wonder which reference frame and coordinate system to use.

4.1.1 Reference frame

Most of the PDS keywords dealing with geometry, such as SC_SUN_POSITION_VECTOR or SC_TARGET_POSITION_VECTOR, are defined in the J2000 reference frame.

NB: The J2000 reference system is the Earth Mean Equator and Equinox of Julian Date 2451545.0.
If you encounter any ambiguity, use this same reference frame: J2000.

4.1.2 Coordinate system

Trying to define geometry position by latitude and longitude, you will have to provide the coordinate system you are using.

On Venus Express mission, the coordinate system used to define latitude and longitude is the PLANETOCENTRIC one. It implies that longitude are counted positively to the East.

4.2 GEO_target index

In addition to the index located in the INDEX directory (INDEX.TAB and others), an index containing geometry information will be added to the data set in this INDEX directory.

This index serves the PSA map based interface, while it defines footprint of the observation on VEX surface.

Needed information to define this footprint can be found in AD9.