Planetary and Space Sciences Research Institute (PSSRI)

Huygens-SSP

Experimenter to Archive Interface Control Document

PY-SSP-OU-PR-100-00

Draft 1

15-May-2003

_____(***Still To be Reviewed Internally)***____
Prepared by: Instrument Archive Responsible

_____
Approved by: Principal Investigator

Table Of Contents

DISTRIBUTION LIST **4**

CHANGE LOG **5**

OPEN ISSUES **6**

ACRONYMS AND ABBREVIATIONS **7**

INTRODUCTION **7**

PURPOSE AND SCOPE 7
CONTENTS 7
INTENDED READERSHIP 8
APPLICABLE DOCUMENTS 8
RELATIONSHIPS TO OTHER INTERFACES 8
CONTACT NAMES AND ADDRESSES 8

OVERVIEW OF PROCESS AND PRODUCT GENERATION **8**

MEASUREMENTS SUMMARY 9
EXPERIMENT OVERVIEW 9
SUBSYSTEM OVERVIEW 10
Accelerometer External (ACC-E) *10*
Accelerometer Internal (ACC-I) *11*
Acoustic Properties Instrument – Sonar (API-S) *11*
Acoustic Properties Instrument – Velocity sensor (API-V) *11*
Density Sensor (DEN) *12*
Permittivity Sensor (PER) *12*
Refractive Index Sensor (REF) *12*
Thermal Properties Sensor (THP) *13*
Tiltmeter (TIL) *13*
DEFINITION OF SSP OPERATING MODES 14

ARCHIVE FORMAT AND CONTENT **14**

FORMAT AND CONVENTIONS 14
Deliveries and Archive Volume Format *14*
Data Set ID Formation *14*
Data Directory Naming Convention *14*
File naming Convention *15*
STANDARDS USED IN DATA PRODUCT GENERATION 15
PDS Standards *15*
Time Standards *15*
Reference Systems *15*
Other Applicable Standards *15*
DATA VALIDATION 15
CONTENT 16
Volume Set *16*
Data Set *16*
DIRECTORIES 18
SOFTWARE 20

DOCUMENTATION 20
DERIVED AND OTHER DATA PRODUCTS 20

DETAILED INTERFACE SPECIFICATIONS 21

SAMPLE LABELS 21
ACCE - Data Label 1 (see 'ACCE_MODE5_TABLE' data product, page) 21
ACCE - Data Label 2 (see 'ACCE_MODE123_DN_SERIES' data product, page =) 22
ACCI - Data Label 1 (see 'ACCI_MODE5_TABLE' data product, page =) 23
ACCI - Data Label 2 (see 'ACCI_MODE1236_TABLE' data product, page =) 24
APIS - Data Label 1 (see 'APIS_MODE23_TABLE' data product, page =) 25
APIS - Data Label 2 (see 'APIS_MODE4_TABLE' data product, page =) 26
APIS - Data Label 3 (see 'APIS_MODE6_TABLE' data product, page =) 27
APIV - Data Label (see 'APIV_MODE123456_TABLE' data product, page =) 28
DEN Data Label (see 'DEN_MODE123456_TABLE' data product, page =) 29
PER Data Label 30
REF - Data Label 31
THP – Data Label 32
TIL Data Label 33
HK - Data Label 1 34
HK - Data Label 2 35
Data Product Design - ACCE Sensor 37
Data Product Design - ACCI Sensor 40
Data Product Design - APIS Sensor 43
Data Product Design - APIV Sensor 46
Data Product Design of DEN Sensor 47
Data Product Design of TIL Sensor 48
Data Product Design of PER Sensor 53
Data Product Design of REF Sensor 56
Data Product Design of THP Sensor 61

APPENDIX 1: AVAILABLE SOFTWARE TO READ PDS FILES 65

APPENDIX 2: AUXILIARY DATA USAGE 65

APPENDIX 3: EXAMPLE OF DIRECTORY LISTING OF DATA SET X 65

Distribution List

(TBD)

Recipient	Organisation	Recipient

Change Log

Date	Sections Changed	Reasons for Change

Open Issues

Section	Description
	Are there any other requirements on the SSP archive from other working groups, e.g. the DTWG (Descent Trajectory Working Group)
	Do we need keywords that describe the position of the sensors during the descent? What will these keywords be? Can we assume that the reference frame used is the one proposed by the DTWG and be used by all other instruments too?
	Do all instruments use the same mode definition? Mode 1, 2, 3 are the same for all instruments, but which other instrument team is using a mode on top of this, e.g. Mode 4,5,6 ?

Acronyms and Abbreviations

EAICD - Experimenter to (Science) Archive Interface Control Document

SSP – Surface Science Package

ACCI – Accelerometer (Internal) sub-system

ACCE – Accelerometer / Force Transducer (External) sub-system

APIS – Acoustic sounder sub-system

APIV – Acoustic velocity sub-system

DEN – Density sub-system

PER – Relative permittivity and conductivity sub-system

REF – Refractive index sub-system

THP – Thermal properties sub-system

TIL – 2 axis tilt angle measuring sub-system

HK – Housekeeping data

PDS – Planetary Data System

PSA – Planetary Science Archive

TBW – to be written

DDID – ESOC's Data Delivery Interface Document

ESOC – European Space Operations Centre

DN – A/D converters output in 'counts' (PDS term = Digital Number)

DL – PDS term 'Detached Label'

Introduction

Purpose and Scope

The primary objective of this EAICD document is to provide the readers of this document, a detailed explanation of the SSP data available at the archive. The intention is to define all SSP data products accurately. The secondary objective of this document is to provide a formal interface for communication between SSP PI and the archiving authority.

The methods used for interpreting SSP data any further than given in the archive or a detailed description of the SSP experiment is beyond the scope of this document. Please refer to reference section for some further details.

Contents

This document describes the SSP data as presented to the PDS data archive. It includes information on how the data is processed, formatted, labeled, and uniquely identified. The document discusses general naming schemes for data volumes, data sets, data, and label files. Standards used to generate the product are explained.

The design of the data set structure and the data product is given. Examples of these are given in the appendix.

Intended Readership

The staff of archiving authority (Planetary Data System for NASA, Planetary Science Archive for ESA) design team and any potential user of the SSP final archive.

Applicable Documents

[1] Planetary Data System Preparation Workbook, February 1, 1995, Version 3.1, JPL, D-7669, Part 1
[2] Planetary Data System Standards Reference, October 30, 2002, Version 3.5, JPL, D-7669, Part 2
[3] PY-SSP-RAL-xxxx, Huygens Surface Science Package, On-board Software Users Guide, Issue 1, 22 October 1997
[4] HY-ESC-IF-XXXX, Huygens DDID, Detailed Data Interface Document, XX XXX 19XX
[5] PY-SSP-UKC-EID-001, SSP-EID-B, Experiment Interface Control Document, 23 February 1995

Relationships to Other Interfaces

[state what products, software and documents would be affected by a change in this EAICD. Refer to any other documents that describe the interfaces.]. ?? TBD (or N/A)

Contact Names and Addresses

Brijen Hathi, Open University, b.hathi@open.ac.uk, phone: +44 (0)1908 659593

Mark Leese, Open University, m.r.leese@open.ac.uk, phone: +44 (0)1908 652561

John Zarnecki, Open University, j.zarnecki@open.ac.uk, phone: +44 (0)1908 659599

Overview of Process and Product Generation

[list here the involved teams, physical locations, names with responsibilities, who are involved to process the data.
Indicate data levels as defined in the archive plan.
Indicate software that is used to process the data
Include in this overview any or all of the following sections (avoiding redundancy with parts of section 3)

(TBD – after agreement between SSP team and data archiving team)

Measurements Summary

Table 1 (below) summarises the measurements made by the SSP experiment.

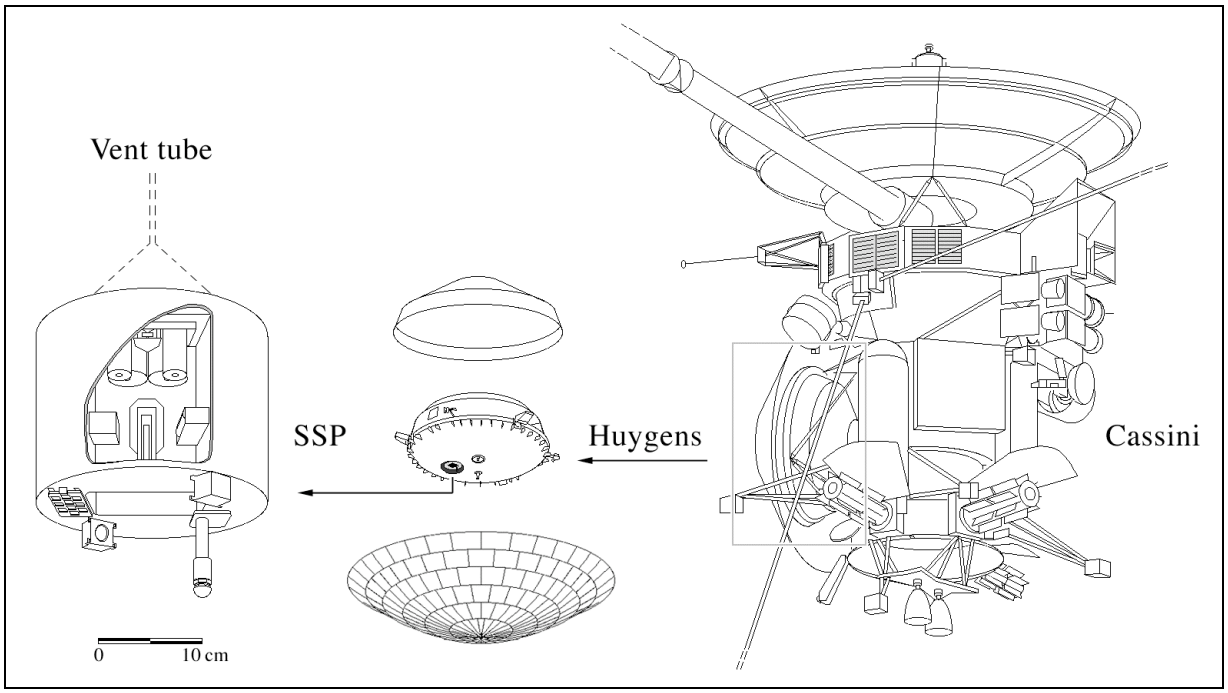
sensor	Measured parameters	Derived parameters
ACC-E	Impact force	Impact force
ACC-I	Acceleration	Acceleration
API-V	Time delay in milli seconds	Speed of sound and Mean molecular mass
API-S	Acoustic excitation	Sounding information
DEN	Strain (of buoyancy float)	Density
PER	Capacitance	Permittivity and conductivity
REF	Light intensities	Refractive index
THP	Resistance	Temperature and thermal conductivity
TIL	2-axis tilt angles	Tilt angles
HK	Temperatures, and other engineering information	Temperatures, and other engineering information
STATUS	Experiment and mission status summary	Experiment and mission status summary

Table 1: SSP experiment – measured and derived parameters summary

Experiment Overview

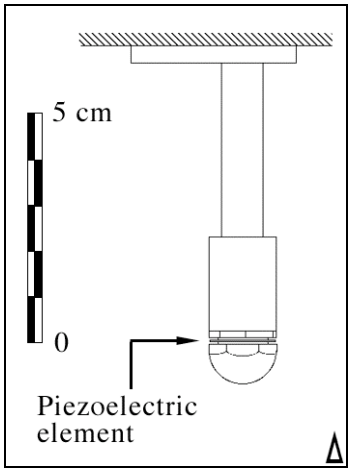
The SSP experiment consists of nine separate sensors that are designed to measure a wide range of physical properties of Titan's lower atmosphere, surface, and sub-surface. By measuring a number of physical properties of the surface it is expected that the SSP will be able to constrain the inferred composition and structure of the moon's near-surface environment. Although the SSP is primarily designed to sense properties of the surface, some of its sensors will also make measurements of the atmosphere along the probe's entry path and will complement the data gathered by other experiments on the Huygens probe.

Please refer to the publication list for further details.



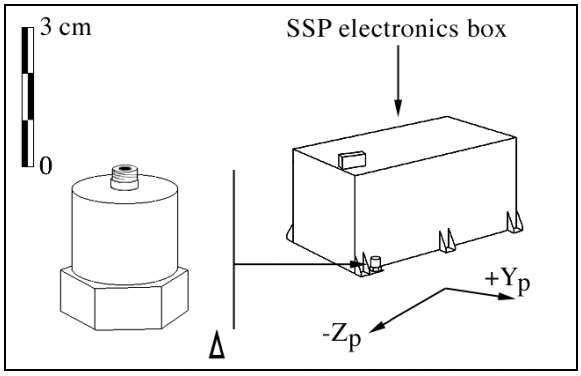
Subsystem Overview

Accelerometer External (ACC-E)



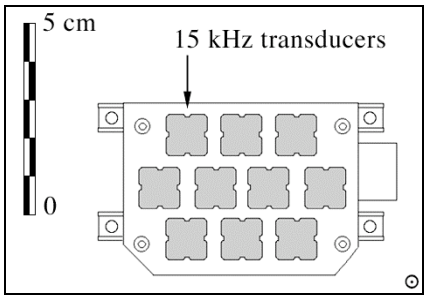
The accelerometer subsystem is designed to characterise the immediate surface of the landing site by recording the dynamic response of two devices mounted in different positions on the probe. The sensor is designed to sense the force exerted on a pylon that protrudes from the foredome aperture. The force is sensed by a piezoelectric ceramic element that is mounted between a hemispherical titanium alloy head and the pylon shaft. If Huygens lands on a relatively uniform surface the ACC-E penetrometer will be smoothly driven into the surface material until the probe's fore-dome strikes the surface, bringing it to a halt. During the impact process the ACC-E is sampled at a rate of 10 kHz, giving it an effective depth resolution of 1 mm for a nominal mission impact speed of 5 m s^{-1}.

Accelerometer Internal (ACC-I)



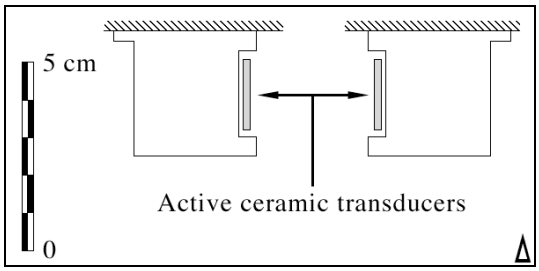
The ACC-I sensor provides information about the vertical non-static accelerations experienced by the entire probe. The primary role of ACC-I is to determine the probe impact (this gives the landing time as well as a measure of local surface compressive properties). The sensor is operational throughout the mission, measuring changes in acceleration during descent phase and returning an impact trace of about 1 second duration after the impact sampled at 500 Hz.

Acoustic Properties Instrument – Sonar (API-S)



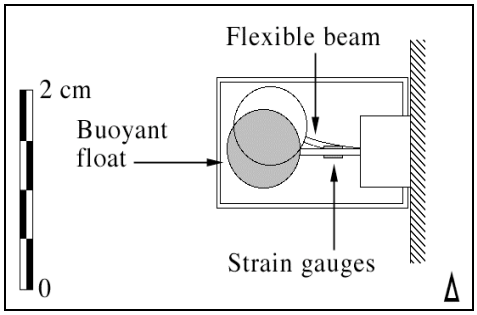
The API-S sensor will measure the effective acoustic cross-section of the medium within its field of view at a wavelength of around 13 mm. Each echo is sampled at a rate of 1kHz, and during the final section of the probe's descent this sensor may be able to provide information about the topography of the landing site.

Acoustic Properties Instrument – Velocity sensor (API-V)



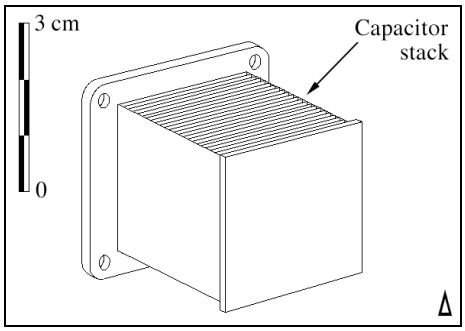
The API-V consists of a pair of piezoelectric transducers mounted at the front surface of the Top Hat on either side of the cavity. These sensors measure the speed of sound by transmitting, and subsequently receiving, a brief 1 MHz acoustic signal. The time interval between transmission and reception is measured with a precision of 250 nanoseconds and the separation of 0.125 m gives a speed resolution of 8 cm s^{-1} when operating in gas at Titan's surface.

Density Sensor (DEN)



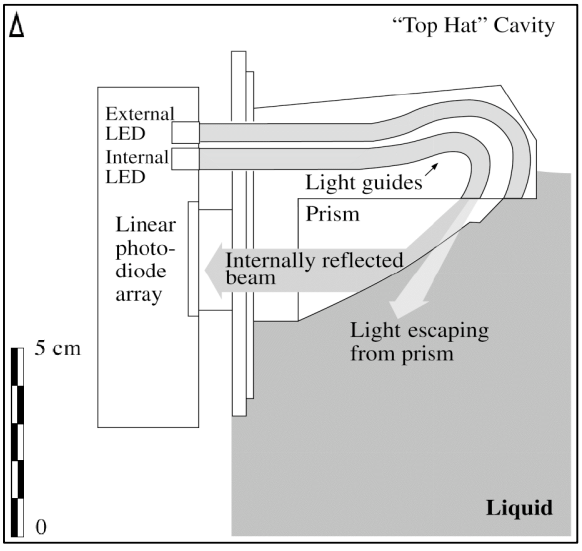
The Density sensor is designed to measure the deflection of the float (in terms of changes in the strain gauge response) in the case of a liquid landing. Also during the descent, any condensation on the float may be detectable. Therefore the sensor operates throughout the mission.

Permittivity Sensor (PER)



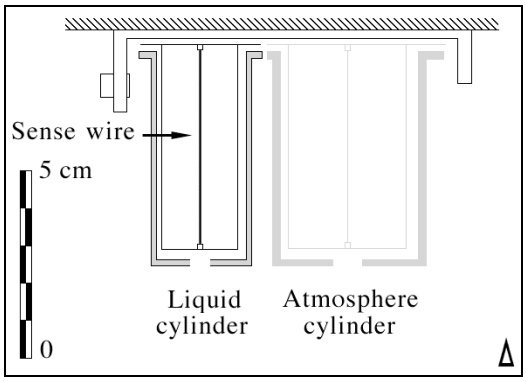
In the event of a liquid landing the SSP will also be able to determine a number of electrical properties of the fluid. The PER device consists of 22 stacked parallel plates, the capacitance of which is measured at a number of different frequencies. By briefly pulsing the sensor with DC voltages the conductivity of the surrounding liquid may also be ascertained

Refractive Index Sensor (REF)



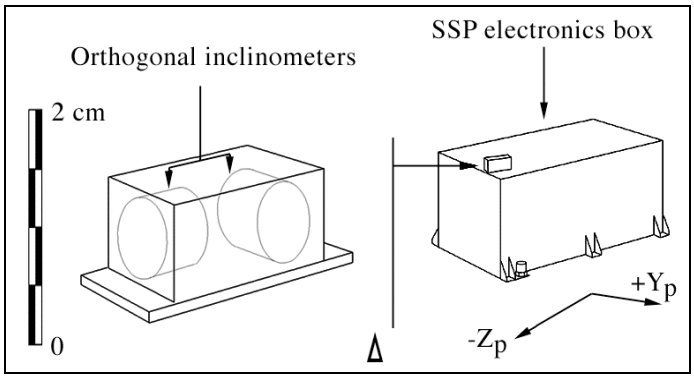
The REF sensor measures the refractive index of a liquid by using a linear critical angle method. A fraction of light reflected/refracted onto the photodiode array is used to derive the refractive index. This sensor is capable of measuring refractive index in the range 1.250 to 1.450 .

Thermal Properties Sensor (THP)



The THP sensor is designed to measure Thermal conductivity and diffusivity of both liquid and gaseous media. Sensor consists of two separate sets of redundant hot wire sensors enclosed in cylindrical canisters. The thermal conductivity is derived from heat loss measurements by studying the rate of loss from a known heat input.

Tiltmeter (TIL)



The TIL sensor measures angles in 2 axes as shown in the figure. The sensor operates throughout the mission. Angle measurements are made from the fluid displacement in each of the 'orthogonal inclinometers' cells.

Definition of SSP Operating Modes

The SSP operating modes are defined as follows:

M0: Checkout / Diagnostic mode – not used during the real descent

M1: upper atmosphere mode

M2: mid atmosphere mode

M3: lower atmosphere mode

M4: proximity mode

M5: surface mode

M6: extended surface mode

M7: Checkout / Diagnostic mode – not used during the real descent

Archive Format and Content

Format and Conventions

Deliveries and Archive Volume Format

The individual logical archive volumes delivered are likely to contain

- the data from ALL sensors
- the raw data, calibrated data and the calibration data and software

The logical archive volumes should contain one data set per volume. Potentially, three logical archive volumes are identified:

- Descent data
- In -Flight (cruise) checkout data
- Selected laboratory data

The SSP sensor housekeeping data and the SSP status data is likely to be archived in a similar way to other sensor data within the appropriate data sets.

Data Set ID Formation

The following 3 data sets are provisionally foreseen:

- HP-STI-SSP-3/4-DESCENT-V1.0
- HP-CRU-SSP-3/4-FLIGHT-CHECK-OUTS-V1.0
- HP-CAL-SSP-3-LABORATORY-V1.0

Data Directory Naming Convention

For all data sets the following directory naming scheme will be used:

/data/{type}/{dpl}/{sensor}/filename, with

- type = {FLIGHT_CHECK_OUT_n, DESCENT, LABORATORY}, with n=1..12
- dpl = {RAW, CALIBRATED}, with dpl standing for data processing level

- sensor = {ACCI, ACCE, APIS, APIV, DEN, PER, REF, THP, TIL, HK, STATUS}

The calibration data will be archived in the **calib** directory below the root directory, as

- /calib/{sensor}/filename

File naming Convention

The following file naming scheme will be used for all data sets:

HP_SSP_{sensor}_{mode}_{data processing level}_{spec}, with

- sensor = {ACCI, ACCE, APIS, APIV, DEN, PER, REF, THP, TIL, HK, STATUS}
- mode = {M0, M1, M2, M3, M4, M5, M6, M7, M123, M1236, M12356}, these modes represent the SSP mode as defined in [3]. If the data from different modes is grouped in the same table, then this is indicated by multiple numbers after 'M' - e.g. a data set representing modes 1 to 6 (i.e. entire mission) is represented by M123456. Similarly M123, represents data from SSP atmosphere modes 1, 2 and 3.
- data processing level = {R, C}, for raw and calibrated data respectively
- spec = {ATMOS, PROX, SURF, EXTD, IMPACT, METHAN, ETHAN, ….}, the specs give additional information on the mission phase or the laboratory conditions.

Standards Used in Data Product Generation

PDS Standards

PDS Standard version 3 was used for the design of the SSP archive.

Time Standards

The timing information used in all SSP data is derived from the Huygens Probe clock. This clock starts at zero (defined by Probe's entry into Titan's atmosphere) and has resolution of 2 milliseconds. The format used to represent SSP time is a REAL number consisting of seconds (integer part) and milliseconds (fractional part of the number) . Examples of the time format are given by the parameters: SC_CLOCK_START_TIME and SC_CLOCK_STOP_TIME.

These timer values will be processed in addition to UTC times, as specified in the DDID, see [4] TBC.

Reference Systems

TBD by the DTWG

Other Applicable Standards

No other applicable standards are used.

Data Validation

TBW – by the DAWG?

Content

Volume Set

SSP team will aim to deliver three logical archive volumes. Each of these volumes will contain one data set only. The **volumes names** and **volume ids** are the following (TBC):

Volume Name	Volume ID	Data Set ID
HUYGENS PROBE DESCENT SSP DATA RECORD	UK_ESA_PSA_HP_1001	HP-STI-SSP-3/4-DESCEND-V1.0
HUYGENS PROBE FLIGHT CHECK OUTS SSP DATA RECORD	UK_ESA_PSA_HP_1002	HP-CRU-SSP-3/4-FLIGHT-CHECK-OUTS-V1.0
HUYGENS PROBE LABORATORY SSP DATA RECORD	UK_ESA_PSA_HP_1003	HP-CAL-SSP-3-LABORATORY-V1.0

Table 2: Proposed SSP Data (or 'logical archive volumes') for PDS archive

Data Set

Table 3 gives the definition of the **data set name** and **data set id**:

Data Set ID	Data Set Name
HP-STI-SSP-3/4-DESCENT-V1.0	HUYGENS DESCENT RAW AND CALIBRATED DATA V1.0
HP-CRU-SSP-3/4-FLIGHT-CHECK-OUTS-V1.0	HUYGENS FLIGHT CHECK OUTS RAW AND CALIBRATED DATA V1.0
HP-CAL-SSP-3-LABORATORY-V1.0	HUYGENS LABORATORY RAW DATA V1.0

Table 3: SSP Data sets description

Table 4 describes the data types used for the raw data, data processing level 3 in the PDS standard. The raw data will contain the DN of the A/D converters from the individual sensors and for some of these DN, the data sets will contain the corresponding voltages in addition. DL is used to identify Detached Label. N X 2 stands for a table with n rows and two columns, (512) indicated the length of an array. N ususally represents the column in a table filled with time tags.
The IMPACT packets will not be part of the raw and calibrated archive and will be separately handled TBD.

Sensor	HP-STI-SSP-3/4-DESCENT		HP-CRU-SSP-3/4-FLIGHT-CHECK-OUTS	HP-CAL-SSP-3-LABORATORY
ACC-E	DL + table(column,timeseries)	5 (impact)	Same as 'HP-STI-SSP-3/4-DESCENT'	TBD
	DL + table(column,timeseries)	1,2,3 (stimulus)		
ACC-I	DL+ table	5	Same as 'HP-STI-SSP-3/4-DESCENT'	TBD
	DL + table +hktable	1,2,3,5,6		
API-V	DL + table (n x 3) (all modes)		Same as 'HP-STI-SSP-3/4-DESCENT'	TBD
API-S	DL + table + array (mode 2,3) DL + table + array (mode 4,5) DL + table + array (mode 6)		Same as 'HP-STI-SSP-3/4-DESCENT'	TBD
DEN	DL + table + array (all modes) (n x 2) (118)		Same as 'HP-STI-SSP-3/4-DESCENT'	TBD
PER	Dl + table + hktable (n x 3) (all modes)		Same as 'HP-STI-SSP-3/4-DESCENT'	TBD
REF	DL+ table + array/image + hktable (all modes) (n x 3) (512)		Same as 'HP-STI-SSP-3/4-DESCENT'	TBD
THP	DL + table + array + hktable(all modes) (n x 5) (60)		Same as 'HP-STI-SSP-3/4-DESCENT'	TBD
TIL	DL + table (all modes) (n x 12)		Same as 'HP-STI-SSP-3/4-DESCENT'	TBD
HK	DL + table (all modes) (n x 11+)		Same as 'HP-STI-SSP-3/4-DESCENT'	TBD
STATUS	DL + table (TBD)		Same as 'HP-STI-SSP-3/4-DESCENT'	TBD

Table 4: SSP data types and presentation to the PDS archive – data processing level 3

Table 5 contains the data types for the calibrated data, data processing level 4 in PDS standard.

Sensor	HP-STI-SSP-3/4-DESCENT	HP-CRU-SSP-3/4-FLIGHT-CHECK-OUTS	HP-CAL-SSP-3-LABORATORY
ACC-E	No data (publication)	TBD	No (calibration report)
ACC-I	No data, (publication)	TBD	No (calibration report)
API-V	Table (TBC) (speed of sound)	TBD	No (calibration report)
API-S	No data (publication)	TBD	No (calibration report)
DEN	No data (publication)	TBD	No (calibration report)
PER	No data (publication)	TBD	No (calibration report)
REF	No data (publication)	TBD	No (calibration report)

THP	Table (TBC) (temperatures, diffusivity)	TBD	No (calibration report)
TIL	Table (TBC) (angles)	TBD	No (calibration report)
HK	Table (TBC) (temperatures)	TBD	No (calibration report)
STATUS	TBD	TBD	No (calibration report)
			No (calibration report)

Table 5: SSP data – submitting initial analysis and interpretation to the PDS archive – data processing level 4

Directories

Root Directory

The following directory structure is found under the Root directory.

Calibration Directory

The calibration data will be archived in the 'calib' directory below the root directory, as

- /calib/{sensor}/filename

  with sensor = {ACCI, ACCE, APIS, APIV, DEN, PER, REF, THP, TIL, HK, (STATUS TBC)}

The content of the calibration directory will be organised in similar way to the HP-STI-SSP-3/4-DESCENT and the HP-CRU-SSP-3/4-FLIGHT-CHECK-OUTS data sets. As the HP-CRU-SSP-3/4-FLIGHT-CHECK-OUTS data set will be finished before the delivery of the descent data sets, the calibration information will not be updated in this data set. A note will be put in the catalog files to explicitely warn future users of this fact and point them to the calibration information that will be delivered with the descent data set that might have been updated and improved.

Catalog Directory

The catalog directory is likely to contain a catalog file for each of the sensors (TBD):

- HP-SSP-ACC-E.CAT
- HP-SSP-ACC-I.CAT
- HP-SSP-API-V.CAT
- HP-SSP-API-S.CAT
- HP-SSP-DEN.CAT
- HP-SSP-PER.CAT
- HP-SSP-REF.CAT
- HP-SSP-THP.CAT
- HP-SSP-TIL.CAT
- HP-SSP-HK.CAT
- HP-SSP-STATUS.CAT

Further a data set catalogue, mission catalogue, instrument host catalogue, reference catalogue and personnel catalogue may be be provided (TBC).

Index Directory

[The basic assumption for this subchapter is that information

- likely to be updated shall be stored in index files,
- likely to be used in database designs shall be stored in index files,
- not clearly known during the design phase (e.g. cross-instrument information, environmental conditions)

belongs here.
An example is the information on FOV (field of view) of an imaging instrument. The information may also go into a data product label. If however after the official data delivery an update is required, only the index files will be updated.]
Dataset Index File, index.lbl and index.tab
Geometric Index File, geoindex.lbl and geoindex.tab]
other Index Files]

Browse Directory and Browse Files

Not envisaged for the time being.

Geometry Directory

TBD by the DTWG.

Software Directory

[this directory contains software for data calibration and for data visualisation; subdirectories shall be named in such a way that it is easy to understand what kind of software, what release and for which operating system it is intended; if the content of this directory was distributed identically on a previous data set, you can point to the former data set. How to point to the former data set needs to be defined.].

No software to be archived (TBC).

Gazetteer Directory

TBD by the HSWT.

Label Directory

The label directory will not be used for SSP.

Document Directory

Extras Directory

Digital images of test equipment, sensors etc will be put on this directory. Types and sizes is TBD.

Data Directory

see pages 10 to 13 for details on data directory naming conventions and formats. The Directory structure may consist of the two top level data directories called ‘pre-flight’ and ‘in-flight’ data. Within each top level directory, the SSP sensor data will be archived. The type of data most likely to be contained in the pre-flight and in-flight is listed below.

Pre-Flight Data

The following pre-flight data are likely to be made available (TBC):

Pre-Flight Data	Status	Expected Data Volume
Laboratory data	Selected data will be archived	TBD

Campaign data	Not available	n/a
EMC data	Included in laboratory data	n/a

In-Flight Data

In-Flight Data	**Status**	**Expected Data Volume**
In-flight check-outs	will be archived	14 * ~50Mbytes
Descent data	Will be archived	< 1Mbyte

Cross-Instrument Calibration - TBD

Software

No software is required to read the data as all SSP data is in ASCII format.

Documentation

The documentation directory will contain at least the following documents:
(1) On-board Software User Guide
(2) EID-B
(3) SP-1177, SSP
(4) Publication in scientific journals
The format of the documentation may vary and may be very old. Reformatting is done on a best effort basis. The conversion to ASCII format will also be done on a best effort basis. Documents that cause a format problem will be provided as they are in the extras directory. Important images and diagrams will be converted to the PNG or JPG format.

Derived and other Data Products

The dervied data products will be in the form of publications and on a longer time scale - therefore no plans exist at te time of writing this document to archive such higher order data products (TBC).

Detailed Interface Specifications

Structure and Organization Overview
see section x.y

Sample Labels

ACCE - Data Label 1 (see 'ACCE_MODE5_TABLE' data product, page 37)

```
PDS_VERSION_ID                  = PDS3

/* FILE CHARACTERISTICS DATA ELEMENTS */
RECORD_TYPE                     = FIXED_LENGTH
RECORD_BYTES                    = NULL
FILE_RECORDS                    = NULL

/* DATA OBJECT POINTER IDENTIFICATION ELEMENTS */
^ACCE_MODE5_TABLE               = "HP-SSP-ACCE-M5-R-IMPACT.TAB"


/* INSTRUMENT AND DETECTOR DESCRIPTIVE DATA ELEMENTS */
FILE_NAME                       = "HP-SSP-ACCE-M5-R-IMPACT.LBL"
DATA_SET_ID                     = HP-STI-SSP-3/4-DESCENT-V1.0
DATA_SET_NAME                   = "HUYGENS DESCENT RAW AND CALIBRATED
DATA V1.0"
PRODUCT_ID                      = "HP-SSP-ACCE-M5-R-IMPACT.LBL"
PRODUCT_CREATION_TIME           = 2001-12-24T00:00:00
MISSION_NAME                    = "CASSINI-HUYGENS"
INSTRUMENT_HOST_NAME            = "HUYGENS PROBE"
INSTRUMENT_HOST_ID              = HP
MISSION_PHASE_NAME              = "MODE-5(impact profile)"
PRODUCT_TYPE                    = EDR  /* EDR for RAW, RDR for
calibrated data, TBC */
START_TIME                      = NULL /* in UTC, e.g. 2004-11-
12T00:00:00.000Z */
STOP_TIME                       = NULL
SPACECRAFT_CLOCK_T0_START_TIME    = NULL /* seconds.milliseconds */
SPACECRAFT_CLOCK_STOP_ T0_TIME     = NULL
PRODUCER_ID                     = "HP-SSP-OU"
PRODUCER_FULL_NAME              = "BRIJEN HATHI"
PRODUCER_INSTITUTION_NAME       = "OPEN UNIVERSITY, PSSRI"
TARGET_NAME                     = "TITAN"

/* INSTRUMENT DESCRIPTION */
```

```
INSTRUMENT_ID                   = "SSP"
INSTRUMENT_NAME                 = "SURFACE SCIENCE PACKAGE"
INSTRUMENT_TYPE                 = NULL /* SEE TABLE BELOW */

DATA_QUALITY_ID                 = NULL /* NEEDS DEFINITION
IN_QUALITY.CAT, SEE TABLE BELOW */
INSTRUMENT_MODE_ID              = MODE5 /* NEEDS DEFINITION IN
SSP_MODES.CAT */

/* DATA OBJECT DEFINITION */
```

ACCE - Data Label 2 (see 'ACCE_MODE123_DN_SERIES' data product, page 38)

```
PDS_VERSION_ID                  = PDS3

/* FILE CHARACTERISTICS DATA ELEMENTS */
RECORD_TYPE                     = FIXED_LENGTH
RECORD_BYTES                    = NULL
FILE_RECORDS                    = NULL

/* DATA OBJECT POINTER IDENTIFICATION ELEMENTS */
^ACCE_MODE123_DN_SERIES                 = "HP-SSP-ACCE-M123-R.TAB"


/* INSTRUMENT AND DETECTOR DESCRIPTIVE DATA ELEMENTS */
FILE_NAME                       = "HP-SSP-ACCE-M123-R.LBL"
DATA_SET_ID                     = HP-STI-SSP-3/4-DESCENT-V1.0
DATA_SET_NAME                   = "HUYGENS DESCENT RAW AND CALIBRATED
DATA V1.0"
PRODUCT_ID                      = "HP-SSP-ACCE-M123-R.LBL"
PRODUCT_CREATION_TIME           = 2001-12-24T00:00:00
MISSION_NAME                    = "CASSINI-HUYGENS"
INSTRUMENT_HOST_NAME            = "HUYGENS PROBE"
INSTRUMENT_HOST_ID              = HP
MISSION_PHASE_NAME              = "MODES-1,2,3(Atoms)"
PRODUCT_TYPE                    = EDR  /* EDR for RAW, RDR for
calibrated data, TBC */
START_TIME                      = NULL /* in UTC, e.g. 2004-11-
12T00:00:00.000Z */
STOP_TIME                       = NULL
SPACECRAFT_CLOCK_T0_START_TIME    = NULL /* seconds.milliseconds */
SPACECRAFT_CLOCK_STOP_ T0_TIME     = NULL
PRODUCER_ID                     = "HP-SSP-OU"
PRODUCER_FULL_NAME              = "BRIJEN HATHI"
PRODUCER_INSTITUTION_NAME       = "OPEN UNIVERSITY, PSSRI"
TARGET_NAME                     = "TITAN"

/* INSTRUMENT DESCRIPTION */
INSTRUMENT_ID                   = "SSP"
INSTRUMENT_NAME                 = "SURFACE SCIENCE PACKAGE"
INSTRUMENT_TYPE                 = NULL /* SEE TABLE BELOW */
```

```
DATA_QUALITY_ID                = NULL /* NEEDS DEFINITION
IN_QUALITY.CAT, SEE TABLE BELOW */
INSTRUMENT_MODE_ID             = MODE123 /* NEEDS DEFINITION IN
SSP_MODES.CAT */

/* DATA OBJECT DEFINITION */
```

ACCI - Data Label 1 (see 'ACCI_MODE5_TABLE' data product, page 39)

```
PDS_VERSION_ID                 = PDS3

/* FILE CHARACTERISTICS DATA ELEMENTS */
RECORD_TYPE                    = FIXED_LENGTH
RECORD_BYTES                   = NULL
FILE_RECORDS                   = NULL

/* DATA OBJECT POINTER IDENTIFICATION ELEMENTS */
^ACCI_MODE5_TABLE                = "HP-SSP-ACCI-M5-R-IMPACT.TAB"


/* INSTRUMENT AND DETECTOR DESCRIPTIVE DATA ELEMENTS */
FILE_NAME                      = "HP-SSP-ACCI-M5-R-IMPACT.LBL"
DATA_SET_ID                    = HP-STI-SSP-3/4-DESCENT-V1.0
DATA_SET_NAME                  = "HUYGENS DESCENT RAW AND CALIBRATED
DATA V1.0"
PRODUCT_ID                     = "HP-SSP-ACCI-M5-R-IMPACT.LBL"
PRODUCT_CREATION_TIME          = 2001-12-24T00:00:00
MISSION_NAME                   = "CASSINI-HUYGENS"
INSTRUMENT_HOST_NAME           = "HUYGENS PROBE"
INSTRUMENT_HOST_ID             = HP
MISSION_PHASE_NAME             = "MODE-5(impact profile)"
PRODUCT_TYPE                   = EDR  /* EDR for RAW, RDR for
calibrated data, TBC */
START_TIME                     = NULL /* in UTC, e.g. 2004-11-
12T00:00:00.000Z */
STOP_TIME                      = NULL
SPACECRAFT_CLOCK_T0_START_TIME    = NULL /* seconds.milliseconds */
SPACECRAFT_CLOCK_STOP_ T0_TIME     = NULL
PRODUCER_ID                    = "HP-SSP-OU"
PRODUCER_FULL_NAME             = "BRIJEN HATHI"
PRODUCER_INSTITUTION_NAME      = "OPEN UNIVERSITY, PSSRI"
TARGET_NAME                    = "TITAN"

/* INSTRUMENT DESCRIPTION */
INSTRUMENT_ID                  = "SSP"
```

```
INSTRUMENT_NAME                = "SURFACE SCIENCE PACKAGE"
INSTRUMENT_TYPE                = NULL /* SEE TABLE BELOW */

DATA_QUALITY_ID                = NULL /* NEEDS DEFINITION
IN_QUALITY.CAT, SEE TABLE BELOW */
INSTRUMENT_MODE_ID             = MODE5 /* NEEDS DEFINITION IN
SSP_MODES.CAT */

/* DATA OBJECT DEFINITION */
```

ACCI - Data Label 2 (see 'ACCI_MODE1236_TABLE' data product, page 40)

```
PDS_VERSION_ID                 = PDS3

/* FILE CHARACTERISTICS DATA ELEMENTS */
RECORD_TYPE                    = FIXED_LENGTH
RECORD_BYTES                   = NULL
FILE_RECORDS                   = NULL

/* DATA OBJECT POINTER IDENTIFICATION ELEMENTS */
^ACCI_MODE1236_TABLE             = "HP-SSP-ACCI-M1236-R.TAB"
^HK_TEMP_TABLE                  = "HP-SSP-HK-M123456-R.TAB"


/* INSTRUMENT AND DETECTOR DESCRIPTIVE DATA ELEMENTS */
FILE_NAME                      = "HP-SSP-ACCI-M1236-R.LBL"
DATA_SET_ID                    = HP-STI-SSP-3/4-DESCENT-V1.0
DATA_SET_NAME                  = "HUYGENS DESCENT RAW AND CALIBRATED
DATA V1.0"
PRODUCT_ID                     = "HP-SSP-ACCI-M1236-R.LBL"
PRODUCT_CREATION_TIME          = 2001-12-24T00:00:00
MISSION_NAME                   = "CASSINI-HUYGENS"
INSTRUMENT_HOST_NAME           = "HUYGENS PROBE"
INSTRUMENT_HOST_ID             = HP
MISSION_PHASE_NAME             = "MODES-123(ATMOS) and 6(surface)"
PRODUCT_TYPE                   = EDR  /* EDR for RAW, RDR for
calibrated data, TBC */
START_TIME                     = NULL /* in UTC, e.g. 2004-11-
12T00:00:00.000Z */
STOP_TIME                      = NULL
SPACECRAFT_CLOCK_T0_START_TIME    = NULL /* seconds.milliseconds */
SPACECRAFT_CLOCK_STOP_ T0_TIME     = NULL
PRODUCER_ID                    = "HP-SSP-OU"
```

```
PRODUCER_FULL_NAME              = "BRIJEN HATHI"
PRODUCER_INSTITUTION_NAME       = "OPEN UNIVERSITY, PSSRI"
TARGET_NAME                     = "TITAN"

/* INSTRUMENT DESCRIPTION */
INSTRUMENT_ID                   = "SSP"
INSTRUMENT_NAME                 = "SURFACE SCIENCE PACKAGE"
INSTRUMENT_TYPE                 = NULL /* SEE TABLE BELOW */

DATA_QUALITY_ID                 = NULL /* NEEDS DEFINITION
IN_QUALITY.CAT, SEE TABLE BELOW */
INSTRUMENT_MODE_ID              = MODE1236 /* NEEDS DEFINITION IN
SSP_MODES.CAT */

/* DATA OBJECT DEFINITION */
```

APIS - Data Label 1 (see 'APIS_MODE23_TABLE' data product, page 42)

```
PDS_VERSION_ID                  = PDS3

/* FILE CHARACTERISTICS DATA ELEMENTS */
RECORD_TYPE                     = FIXED_LENGTH
RECORD_BYTES                    = NULL
FILE_RECORDS                    = NULL

/* DATA OBJECT POINTER IDENTIFICATION ELEMENTS */
^APIS_MODE23_DATA_TABLE       = "HP-SSP-APIS-M23-R-ATMOS.TAB"


/* INSTRUMENT AND DETECTOR DESCRIPTIVE DATA ELEMENTS */
FILE_NAME                       = "HP-SSP-APIS-M23-R-ATMOS.LBL"
DATA_SET_ID                     = HP-STI-SSP-3/4-DESCENT-V1.0
DATA_SET_NAME                   = "HUYGENS DESCENT RAW AND CALIBRATED
DATA V1.0"
PRODUCT_ID                      = "HP-SSP-APIS-M23-R-ATMOS.LBL"
PRODUCT_CREATION_TIME           = 2001-12-24T00:00:00
MISSION_NAME                    = "CASSINI-HUYGENS"
INSTRUMENT_HOST_NAME            = "HUYGENS PROBE"
INSTRUMENT_HOST_ID              = HP
MISSION_PHASE_NAME              = "ATMOSPHERE MODES - 2, and 3"
PRODUCT_TYPE                    = EDR  /* EDR for RAW, RDR for
calibrated data, TBC */
START_TIME                      = NULL /* in UTC, e.g. 2004-11-
12T00:00:00.000Z */
STOP_TIME                       = NULL
SPACECRAFT_CLOCK_T0_START_TIME    = NULL /* seconds.milliseconds */
SPACECRAFT_CLOCK_STOP_ T0_TIME     = NULL
```

```
PRODUCER_ID                     = "HP-SSP-OU"
PRODUCER_FULL_NAME              = "BRIJEN HATHI"
PRODUCER_INSTITUTION_NAME       = "OPEN UNIVERSITY, PSSRI"
TARGET_NAME                     = "TITAN"

/* INSTRUMENT DESCRIPTION */
INSTRUMENT_ID                   = "SSP"
INSTRUMENT_NAME                 = "SURFACE SCIENCE PACKAGE"
INSTRUMENT_TYPE                 = NULL /* SEE TABLE BELOW */

DATA_QUALITY_ID                 = NULL /* NEEDS DEFINITION
IN_QUALITY.CAT, SEE TABLE BELOW */
INSTRUMENT_MODE_ID              = MODE23 /* NEEDS DEFINITION IN
SSP_MODES.CAT */

/* DATA OBJECT DEFINITION */
```

APIS - Data Label 2 (see 'APIS_MODE4_TABLE' data product, page 43)

```
PDS_VERSION_ID                  = PDS3

/* FILE CHARACTERISTICS DATA ELEMENTS */
RECORD_TYPE                     = FIXED_LENGTH
RECORD_BYTES                    = NULL
FILE_RECORDS                    = NULL

/* DATA OBJECT POINTER IDENTIFICATION ELEMENTS */
^APIS_MODE4_TABLE               = "HP-SSP-APIS-M4-R-PROX.TAB"


/* INSTRUMENT AND DETECTOR DESCRIPTIVE DATA ELEMENTS */
FILE_NAME                       = "HP-SSP-APIS-M4-R-PROX.LBL"
DATA_SET_ID                     = HP-STI-SSP-3/4-DESCENT-V1.0
DATA_SET_NAME                   = "HUYGENS DESCENT RAW AND CALIBRATED
DATA V1.0"
PRODUCT_ID                      = "HP-SSP-APIS-M123-R-ATMOS.LBL"
PRODUCT_CREATION_TIME           = 2001-12-24T00:00:00
MISSION_NAME                    = "CASSINI-HUYGENS"
INSTRUMENT_HOST_NAME            = "HUYGENS PROBE"
INSTRUMENT_HOST_ID              = HP
MISSION_PHASE_NAME              = "PROXIMITY MODE - 4"
PRODUCT_TYPE                    = EDR  /* EDR for RAW, RDR for
calibrated data, TBC */
START_TIME                      = NULL /* in UTC, e.g. 2004-11-
12T00:00:00.000Z */
STOP_TIME                       = NULL
```

```
SPACECRAFT_CLOCK_T0_START_TIME    = NULL /* seconds.milliseconds */
SPACECRAFT_CLOCK_STOP_ T0_TIME     = NULL
PRODUCER_ID                      = "HP-SSP-OU"
PRODUCER_FULL_NAME               = "BRIJEN HATHI"
PRODUCER_INSTITUTION_NAME        = "OPEN UNIVERSITY, PSSRI"
TARGET_NAME                      = "TITAN"

/* INSTRUMENT DESCRIPTION */
INSTRUMENT_ID                    = "SSP"
INSTRUMENT_NAME                  = "SURFACE SCIENCE PACKAGE"
INSTRUMENT_TYPE                  = NULL /* SEE TABLE BELOW */

DATA_QUALITY_ID                  = NULL /* NEEDS DEFINITION
IN_QUALITY.CAT, SEE TABLE BELOW */
INSTRUMENT_MODE_ID               = MODE4 /* NEEDS DEFINITION IN
SSP_MODES.CAT */

/* DATA OBJECT DEFINITION */
```

APIS - Data Label 3 (see 'APIS_MODE6_TABLE' data product, page 44)

```
PDS_VERSION_ID                   = PDS3

/* FILE CHARACTERISTICS DATA ELEMENTS */
RECORD_TYPE                      = FIXED_LENGTH
RECORD_BYTES                     = NULL
FILE_RECORDS                     = NULL

/* DATA OBJECT POINTER IDENTIFICATION ELEMENTS */
^APIS_MODE6_TABLE                  = "HP-SSP-APIS-M6-R-SURF.TAB"


/* INSTRUMENT AND DETECTOR DESCRIPTIVE DATA ELEMENTS */
FILE_NAME                        = "HP-SSP-APIS-M6-R-SURF.LBL"
DATA_SET_ID                      = HP-STI-SSP-3/4-DESCENT-V1.0
DATA_SET_NAME                    = "HUYGENS DESCENT RAW AND CALIBRATED
DATA V1.0"
PRODUCT_ID                       = "HP-SSP-APIS-M6-R-SURF.LBL"
PRODUCT_CREATION_TIME            = 2001-12-24T00:00:00
MISSION_NAME                     = "CASSINI-HUYGENS"
INSTRUMENT_HOST_NAME             = "HUYGENS PROBE"
INSTRUMENT_HOST_ID               = HP
MISSION_PHASE_NAME               = "SURFACE MODE - 6"
```

```
PRODUCT_TYPE                    = EDR  /* EDR for RAW, RDR for
calibrated data, TBC */
START_TIME                      = NULL /* in UTC, e.g. 2004-11-
12T00:00:00.000Z */
STOP_TIME                       = NULL
SPACECRAFT_CLOCK_T0_START_TIME    = NULL /* seconds.milliseconds */
SPACECRAFT_CLOCK_STOP_ T0_TIME     = NULL
PRODUCER_ID                     = "HP-SSP-OU"
PRODUCER_FULL_NAME              = "BRIJEN HATHI"
PRODUCER_INSTITUTION_NAME       = "OPEN UNIVERSITY, PSSRI"
TARGET_NAME                     = "TITAN"

/* INSTRUMENT DESCRIPTION */
INSTRUMENT_ID                   = "SSP"
INSTRUMENT_NAME                 = "SURFACE SCIENCE PACKAGE"
INSTRUMENT_TYPE                 = NULL /* SEE TABLE BELOW */

DATA_QUALITY_ID                 = NULL /* NEEDS DEFINITION
IN_QUALITY.CAT, SEE TABLE BELOW */
INSTRUMENT_MODE_ID              = MODE6 /* NEEDS DEFINITION IN
SSP_MODES.CAT */

/* DATA OBJECT DEFINITION */
```

APIV - Data Label (see 'APIV_MODE123456_TABLE' data product, page 45)

```
PDS_VERSION_ID                  = PDS3

/* FILE CHARACTERISTICS DATA ELEMENTS */
RECORD_TYPE                     = FIXED_LENGTH
RECORD_BYTES                    = NULL
FILE_RECORDS                    = NULL

/* DATA OBJECT POINTER IDENTIFICATION ELEMENTS */
^APIV_MODE123456_TABLE          = "HP-SSP-APIV-M123456-R.TAB"
^HK_TEMPS_TABLE                 = "HP-SSP-HK-M123456-R.TAB"


/* INSTRUMENT AND DETECTOR DESCRIPTIVE DATA ELEMENTS */
FILE_NAME                       = "HP-SSP-APIV-M123456-R.LBL"
DATA_SET_ID                     = HP-STI-SSP-3/4-DESCENT-V1.0
DATA_SET_NAME                   = "HUYGENS DESCENT RAW AND CALIBRATED
DATA V1.0"
PRODUCT_ID                      = "HP-SSP-APIV-M123456-R.LBL"
PRODUCT_CREATION_TIME           = 2001-12-24T00:00:00
MISSION_NAME                    = "CASSINI-HUYGENS"
```

```
INSTRUMENT_HOST_NAME            = "HUYGENS PROBE"
INSTRUMENT_HOST_ID              = HP
MISSION_PHASE_NAME              = "ALL MODES"
PRODUCT_TYPE                    = EDR  /* EDR for RAW, RDR for
calibrated data, TBC */
START_TIME                      = NULL /* in UTC, e.g. 2004-11-
12T00:00:00.000Z */
STOP_TIME                       = NULL
SPACECRAFT_CLOCK_T0_START_TIME    = NULL /* seconds.milliseconds */
SPACECRAFT_CLOCK_STOP_ T0_TIME     = NULL
PRODUCER_ID                     = "HP-SSP-OU"
PRODUCER_FULL_NAME              = "BRIJEN HATHI"
PRODUCER_INSTITUTION_NAME       = "OPEN UNIVERSITY, PSSRI"
TARGET_NAME                     = "TITAN"

/* INSTRUMENT DESCRIPTION */
INSTRUMENT_ID                   = "SSP"
INSTRUMENT_NAME                 = "SURFACE SCIENCE PACKAGE"
INSTRUMENT_TYPE                 = NULL /* SEE TABLE BELOW */

DATA_QUALITY_ID                 = NULL /* NEEDS DEFINITION
IN_QUALITY.CAT, SEE TABLE BELOW */
INSTRUMENT_MODE_ID              = MODE123456 /* NEEDS DEFINITION IN
SSP_MODES.CAT */

/* DATA OBJECT DEFINITION */
```

DEN Data Label (see 'DEN_MODE123456_TABLE' data product, page 46)

```
PDS_VERSION_ID                  = PDS3

/* FILE CHARACTERISTICS DATA ELEMENTS */
RECORD_TYPE                     = FIXED_LENGTH
RECORD_BYTES                    = NULL
FILE_RECORDS                    = NULL

/* DATA OBJECT POINTER IDENTIFICATION ELEMENTS */
^DEN_MODE123456_TABLE                = "HP-SSP-DEN-M123456-R.TAB"


/* INSTRUMENT AND DETECTOR DESCRIPTIVE DATA ELEMENTS */
FILE_NAME                       = "HP-SSP-DEN-M123456-R.LBL"
DATA_SET_ID                     = HP-STI-SSP-3/4-DESCENT-V1.0
DATA_SET_NAME                   = "HUYGENS DESCENT RAW AND CALIBRATED
DATA V1.0"
PRODUCT_ID                      = "HP-SSP-DEN-M123456-R.LBL"
```

```
PRODUCT_CREATION_TIME          = 2001-12-24T00:00:00
MISSION_NAME                   = "CASSINI-HUYGENS"
INSTRUMENT_HOST_NAME           = "HUYGENS PROBE"
INSTRUMENT_HOST_ID             = HP
MISSION_PHASE_NAME             = "ALL MODES-1(descent)to 6(surface)"
PRODUCT_TYPE                   = EDR  /* EDR for RAW, RDR for
calibrated data, TBC */
START_TIME                     = NULL /* in UTC, e.g. 2004-11-
12T00:00:00.000Z */
STOP_TIME                      = NULL
SPACECRAFT_CLOCK_T0_START_TIME    = NULL /* seconds.milliseconds */
SPACECRAFT_CLOCK_STOP_ T0_TIME     = NULL
PRODUCER_ID                    = "HP-SSP-OU"
PRODUCER_FULL_NAME             = "BRIJEN HATHI"
PRODUCER_INSTITUTION_NAME      = "OPEN UNIVERSITY, PSSRI"
TARGET_NAME                    = "TITAN"

/* INSTRUMENT DESCRIPTION */
INSTRUMENT_ID                  = "SSP"
INSTRUMENT_NAME                = "SURFACE SCIENCE PACKAGE"
INSTRUMENT_TYPE                = NULL /* SEE TABLE BELOW */

DATA_QUALITY_ID                = NULL /* NEEDS DEFINITION
IN_QUALITY.CAT, SEE TABLE BELOW */
INSTRUMENT_MODE_ID             = MODE123456 /* NEEDS DEFINITION IN
SSP_MODES.CAT */

/* DATA OBJECT DEFINITION */
```

PER Data Label (see 'PER_MODE123456_TABLE' data product, pages 52 to 54)

```
PDS_VERSION_ID                 = PDS3

/* FILE CHARACTERISTICS DATA ELEMENTS */
RECORD_TYPE                    = FIXED_LENGTH
RECORD_BYTES                   = NULL
FILE_RECORDS                   = NULL

/* DATA OBJECT POINTER IDENTIFICATION ELEMENTS */
^PER_MODE123456_TABLE1         = "HP-SSP-PER-M123456-R.TAB"
^PER_MODE123456_TABLE2         = "HP-SSP-PERHK-M123456-R.TAB"


/* INSTRUMENT AND DETECTOR DESCRIPTIVE DATA ELEMENTS */
FILE_NAME                      = "HP-SSP-PER-M123456-R.LBL"
DATA_SET_ID                    = HP-STI-SSP-3/4-DESCENT-V1.0
```

```
DATA_SET_NAME                    = "HUYGENS DESCENT RAW AND CALIBRATED
DATA V1.0"
PRODUCT_ID                       = "HP-SSP-PER-M123456-R.LBL"
PRODUCT_CREATION_TIME            = 2001-12-24T00:00:00
MISSION_NAME                     = "CASSINI-HUYGENS"
INSTRUMENT_HOST_NAME             = "HUYGENS PROBE"
INSTRUMENT_HOST_ID               = HP
MISSION_PHASE_NAME               = "ALL MODES-1(descent)to 6(surface)"
PRODUCT_TYPE                     = EDR  /* EDR for RAW, RDR for
calibrated data, TBC */
START_TIME                       = NULL /* in UTC, e.g. 2004-11-
12T00:00:00.000Z */
STOP_TIME                        = NULL
SPACECRAFT_CLOCK_T0_START_TIME    = NULL /* seconds.milliseconds */
SPACECRAFT_CLOCK_STOP_ T0_TIME     = NULL
PRODUCER_ID                      = "HP-SSP-OU"
PRODUCER_FULL_NAME               = "BRIJEN HATHI"
PRODUCER_INSTITUTION_NAME        = "OPEN UNIVERSITY, PSSRI"
TARGET_NAME                      = "TITAN"

/* INSTRUMENT DESCRIPTION */
INSTRUMENT_ID                    = "SSP"
INSTRUMENT_NAME                  = "SURFACE SCIENCE PACKAGE"
INSTRUMENT_TYPE                  = NULL /* SEE TABLE BELOW */

DATA_QUALITY_ID                  = NULL /* NEEDS DEFINITION
IN_QUALITY.CAT, SEE TABLE BELOW */
INSTRUMENT_MODE_ID               = MODE123456 /* NEEDS DEFINITION IN
SSP_MODES.CAT */

/* DATA OBJECT DEFINITION */

PDS_VERSION_ID                   = PDS3

/* FILE CHARACTERISTICS DATA ELEMENTS */
RECORD_TYPE                      = FIXED_LENGTH
RECORD_BYTES                     = NULL
FILE_RECORDS                     = NULL
```

REF - Data Label (see 'REF_MODE123456_TABLE' data product, pages)

```
PDS_VERSION_ID                   = PDS3

/* FILE CHARACTERISTICS DATA ELEMENTS */
RECORD_TYPE                      = FIXED_LENGTH
RECORD_BYTES                     = NULL
FILE_RECORDS                     = NULL

/* DATA OBJECT POINTER IDENTIFICATION ELEMENTS */
^PER_DATA_TABLE                  = "HP-SSP-REF-M123456-R.TAB"
^PER_HK_TABLE                    = "HP-SSP-REFHK-M123456-R.TAB"
```

```
/* INSTRUMENT AND DETECTOR DESCRIPTIVE DATA ELEMENTS */
FILE_NAME                       = "HP-SSP-REF-M123456-R.LBL"
DATA_SET_ID                     = HP-STI-SSP-3/4-DESCENT-V1.0
DATA_SET_NAME                   = "HUYGENS DESCENT RAW AND CALIBRATED
DATA V1.0"
PRODUCT_ID                      = "HP-SSP-REF-M123456-R.LBL"
PRODUCT_CREATION_TIME           = 2001-12-24T00:00:00
MISSION_NAME                    = "CASSINI-HUYGENS"
INSTRUMENT_HOST_NAME            = "HUYGENS PROBE"
INSTRUMENT_HOST_ID              = HP
MISSION_PHASE_NAME              = "ALL MODES-1(descent)to 6(surface)"
PRODUCT_TYPE                    = EDR  /* EDR for RAW, RDR for
calibrated data, TBC */
START_TIME                      = NULL /* in UTC, e.g. 2004-11-
12T00:00:00.000Z */
STOP_TIME                       = NULL
SPACECRAFT_CLOCK_T0_START_TIME    = NULL /* seconds.milliseconds */
SPACECRAFT_CLOCK_STOP_ T0_TIME     = NULL
PRODUCER_ID                     = "HP-SSP-OU"
PRODUCER_FULL_NAME              = "BRIJEN HATHI"
PRODUCER_INSTITUTION_NAME       = "OPEN UNIVERSITY, PSSRI"
TARGET_NAME                     = "TITAN"

/* INSTRUMENT DESCRIPTION */
INSTRUMENT_ID                   = "SSP"
INSTRUMENT_NAME                 = "SURFACE SCIENCE PACKAGE"
INSTRUMENT_TYPE                 = NULL /* SEE TABLE BELOW */

DATA_QUALITY_ID                 = NULL /* NEEDS DEFINITION
IN_QUALITY.CAT, SEE TABLE BELOW */
INSTRUMENT_MODE_ID              = MODE123456 /* NEEDS DEFINITION IN
SSP_MODES.CAT */

/* DATA OBJECT DEFINITION */
```

THP – Data Label (see 'THP_MODE123456_TABLE' data product, page =)

```
PDS_VERSION_ID                  = PDS3

/* FILE CHARACTERISTICS DATA ELEMENTS */
RECORD_TYPE                     = FIXED_LENGTH
RECORD_BYTES                    = NULL
FILE_RECORDS                    = NULL

/* DATA OBJECT POINTER IDENTIFICATION ELEMENTS */
^THP_DATA_TABLE                 = "HP-SSP-THP-M123456-R.TAB"
^THP_HK_TABLE                   = "HP-SSP-THPHK-M123456-R.TAB"
```

```
/* INSTRUMENT AND DETECTOR DESCRIPTIVE DATA ELEMENTS */
FILE_NAME                       = "HP-SSP-THP-M123456-R.LBL"
DATA_SET_ID                     = HP-STI-SSP-3/4-DESCENT-V1.0
DATA_SET_NAME                   = "HUYGENS DESCENT RAW AND CALIBRATED
DATA V1.0"
PRODUCT_ID                      = "HP-SSP-THP-M123456-R.LBL"
PRODUCT_CREATION_TIME           = 2001-12-24T00:00:00
MISSION_NAME                    = "CASSINI-HUYGENS"
INSTRUMENT_HOST_NAME            = "HUYGENS PROBE"
INSTRUMENT_HOST_ID              = HP
MISSION_PHASE_NAME              = "ALL MODES-1(descent)to 6(surface)"
PRODUCT_TYPE                    = EDR  /* EDR for RAW, RDR for
calibrated data, TBC */
START_TIME                      = NULL /* in UTC, e.g. 2004-11-
12T00:00:00.000Z */
STOP_TIME                       = NULL
SPACECRAFT_CLOCK_T0_START_TIME    = NULL /* seconds.milliseconds */
SPACECRAFT_CLOCK_STOP_ T0_TIME     = NULL
PRODUCER_ID                     = "HP-SSP-OU"
PRODUCER_FULL_NAME              = "BRIJEN HATHI"
PRODUCER_INSTITUTION_NAME       = "OPEN UNIVERSITY, PSSRI"
TARGET_NAME                     = "TITAN"

/* INSTRUMENT DESCRIPTION */
INSTRUMENT_ID                   = "SSP"
INSTRUMENT_NAME                 = "SURFACE SCIENCE PACKAGE"
INSTRUMENT_TYPE                 = NULL /* SEE TABLE BELOW */

DATA_QUALITY_ID                 = NULL /* NEEDS DEFINITION
IN_QUALITY.CAT, SEE TABLE BELOW */
INSTRUMENT_MODE_ID              = MODE123456 /* NEEDS DEFINITION IN
SSP_MODES.CAT */

/* DATA OBJECT DEFINITION */
```

TIL Data Label (see 'TIL_MODE123456_TABLE' data product, page =)

```
/* DATA OBJECT POINTER IDENTIFICATION ELEMENTS */
^TIL_DATA_TABLE                 = "HP-SSP-TIL-M123456-R.TAB"
^TIL_HK_TABLE                   = "HP-SSP-TILHK-M123456-R.TAB"


/* INSTRUMENT AND DETECTOR DESCRIPTIVE DATA ELEMENTS */
FILE_NAME                       = "HP-SSP-TIL-M123456-R.LBL"
```

```
DATA_SET_ID                     = HP-STI-SSP-3/4-DESCENT-V1.0
DATA_SET_NAME                   = "HUYGENS DESCENT RAW AND CALIBRATED
DATA V1.0"
PRODUCT_ID                      = "HP-SSP-TIL-M123456-R.LBL"
PRODUCT_CREATION_TIME           = 2001-12-24T00:00:00
MISSION_NAME                    = "CASSINI-HUYGENS"
INSTRUMENT_HOST_NAME            = "HUYGENS PROBE"
INSTRUMENT_HOST_ID              = HP
MISSION_PHASE_NAME              = "ALL MODES-1(descent)to 6(surface)"
PRODUCT_TYPE                    = EDR  /* EDR for RAW, RDR for
calibrated data, TBC */
START_TIME                      = NULL /* in UTC, e.g. 2004-11-
12T00:00:00.000Z */
STOP_TIME                       = NULL
SPACECRAFT_CLOCK_T0_START_TIME    = NULL /* seconds.milliseconds */
SPACECRAFT_CLOCK_STOP_ T0_TIME     = NULL
PRODUCER_ID                     = "HP-SSP-OU"
PRODUCER_FULL_NAME              = "BRIJEN HATHI"
PRODUCER_INSTITUTION_NAME       = "OPEN UNIVERSITY, PSSRI"
TARGET_NAME                     = "TITAN"

/* INSTRUMENT DESCRIPTION */
INSTRUMENT_ID                   = "SSP"
INSTRUMENT_NAME                 = "SURFACE SCIENCE PACKAGE"
INSTRUMENT_TYPE                 = NULL /* SEE TABLE BELOW */

DATA_QUALITY_ID                 = NULL /* NEEDS DEFINITION
IN_QUALITY.CAT, SEE TABLE BELOW */
INSTRUMENT_MODE_ID              = MODE123456 /* NEEDS DEFINITION IN
SSP_MODES.CAT */

/* DATA OBJECT DEFINITION */
```

HK - Data Label 1

```
PDS_VERSION_ID                  = PDS3

/* FILE CHARACTERISTICS DATA ELEMENTS */
RECORD_TYPE                     = FIXED_LENGTH
RECORD_BYTES                    = NULL
FILE_RECORDS                    = NULL
```

```
/* DATA OBJECT POINTER IDENTIFICATION ELEMENTS */
^ HK_TEMPS_TABLE                  = "HP-SSP-HKTEMPS-M123456-R.TAB"


/* INSTRUMENT AND DETECTOR DESCRIPTIVE DATA ELEMENTS */
FILE_NAME                       = "HP-SSP-HKTEMPS-M123456-R.LBL"
DATA_SET_ID                     = HP-STI-SSP-3/4-DESCENT-V1.0
DATA_SET_NAME                   = "HUYGENS DESCENT RAW AND CALIBRATED
DATA V1.0"
PRODUCT_ID                      = "HP-SSP-HKTEMPS-M123456-R.LBL"
PRODUCT_CREATION_TIME           = 2001-12-24T00:00:00
MISSION_NAME                    = "CASSINI-HUYGENS"
INSTRUMENT_HOST_NAME            = "HUYGENS PROBE"
INSTRUMENT_HOST_ID              = HP
MISSION_PHASE_NAME              = "ALL MODES -1 to 6"
PRODUCT_TYPE                    = EDR  /* EDR for RAW, RDR for
calibrated data, TBC */
START_TIME                      = NULL /* in UTC, e.g. 2004-11-
12T00:00:00.000Z */
STOP_TIME                       = NULL
SPACECRAFT_CLOCK_T0_START_TIME    = NULL /* seconds.milliseconds */
SPACECRAFT_CLOCK_STOP_ T0_TIME     = NULL
PRODUCER_ID                     = "HP-SSP-OU"
PRODUCER_FULL_NAME              = "BRIJEN HATHI"
PRODUCER_INSTITUTION_NAME       = "OPEN UNIVERSITY, PSSRI"
TARGET_NAME                     = "TITAN"

/* INSTRUMENT DESCRIPTION */
INSTRUMENT_ID                   = "SSP"
INSTRUMENT_NAME                 = "SURFACE SCIENCE PACKAGE"
INSTRUMENT_TYPE                 = NULL /* SEE TABLE BELOW */

DATA_QUALITY_ID                 = NULL /* NEEDS DEFINITION
IN_QUALITY.CAT, SEE TABLE BELOW */
INSTRUMENT_MODE_ID              = MODE123456 /* NEEDS DEFINITION IN
SSP_MODES.CAT */

/* DATA OBJECT DEFINITION */
```

HK - Data Label 2

```
PDS_VERSION_ID                  = PDS3

/* FILE CHARACTERISTICS DATA ELEMENTS */
RECORD_TYPE                     = FIXED_LENGTH
RECORD_BYTES                    = NULL
```

```
FILE_RECORDS                    = NULL

/* DATA OBJECT POINTER IDENTIFICATION ELEMENTS */
^ HK_TABLE                   = "HP-SSP-HK-M123456-R.TAB"

/* INSTRUMENT AND DETECTOR DESCRIPTIVE DATA ELEMENTS */
FILE_NAME                       = "HP-SSP-HK-M123456-R.LBL"
DATA_SET_ID                     = HP-STI-SSP-3/4-DESCENT-V1.0
DATA_SET_NAME                   = "HUYGENS DESCENT RAW AND CALIBRATED
DATA V1.0"
PRODUCT_ID                      = "HP-SSP-HK-M123456-R.LBL"
PRODUCT_CREATION_TIME           = 2001-12-24T00:00:00
MISSION_NAME                    = "CASSINI-HUYGENS"
INSTRUMENT_HOST_NAME            = "HUYGENS PROBE"
INSTRUMENT_HOST_ID              = HP
MISSION_PHASE_NAME              = "ALL MODES -1 to 6"
PRODUCT_TYPE                    = EDR  /* EDR for RAW, RDR for
calibrated data, TBC */
START_TIME                      = NULL /* in UTC, e.g. 2004-11-
12T00:00:00.000Z */
STOP_TIME                       = NULL
SPACECRAFT_CLOCK_T0_START_TIME    = NULL /* seconds.milliseconds */
SPACECRAFT_CLOCK_STOP_ T0_TIME     = NULL
PRODUCER_ID                     = "HP-SSP-OU"
PRODUCER_FULL_NAME              = "BRIJEN HATHI"
PRODUCER_INSTITUTION_NAME       = "OPEN UNIVERSITY, PSSRI"
TARGET_NAME                     = "TITAN"

/* INSTRUMENT DESCRIPTION */
INSTRUMENT_ID                   = "SSP"
INSTRUMENT_NAME                 = "SURFACE SCIENCE PACKAGE"
INSTRUMENT_TYPE                 = NULL /* SEE TABLE BELOW */

DATA_QUALITY_ID                 = NULL /* NEEDS DEFINITION
IN_QUALITY.CAT, SEE TABLE BELOW */
INSTRUMENT_MODE_ID              = MODE123456 /* NEEDS DEFINITION IN
SSP_MODES.CAT */

/* DATA OBJECT DEFINITION */
```

The following table gives the used values for the keyword INSTRUMENT_TYPE:

Sensor	INSTRUMENT_TYPE

ACCE	PENETRATOR (TO BE ADDED TO DICTIONARY)
ACC-I	ACCELEROMETER
API-V	ACOUSTIC SENSOR
API-S	ACOUSTIC SENSOR
DEN	DENSITOMETER (TO BE ADDED TO DICTIONARY)
PER	PERMITTIVITY SENSOR (TO BE ADDED TO DICT)
REF	REFRACTOMETER (TO BE ADDED TO DICT)
THP	THERMAL PROPERTIES SENSOR (TO BE ADDED TO DICT)
TIL	TILTMETER (TO BE ADDED TO DICT)
HK	REFERENCE DATA (TBC)
STATUS	REFERENCE DATA

The following table gives the definition of the data_quality_flag: (TBW)

DATA QUALITY FLAG	RAW DATA	CALIBRATED DATA

Data Product Design - ACCE Sensor

This section contains detailed information on the layout and presentation of each of the SSP data sets.

Data Object Definition ACCE_MODE5_TABLE

The ACCE data packets consist of one time-tagged time series of 512 values that represent the ACCE impact event. The data is represented as time (s), ACCE measurements (raw ADC counts), ACCE (V).

The third column ACCE(V) is directly reduced from the digital numbers (raw ADC counts) by: Voltage = DN / 256.0 * (VOLTAGE_MAX – VOLTAGE-MIN), with VOLTAGE_MAX =+5V and VOLTAGE_MIN=0 V .

```
/* DATA OBJECT DEFINITIION FOR THE ACCE_MODE 5_Table */
OBJECT                        = ACCE_MODE5_TABLE
 INTERCHANGE_FORMAT  = ASCII
 ROWS                         = 512
 COLUMNS                     = 3
 ROW_BYTES                 = TBD
 DESCRIPTION                = " "

 OBJECT                      = COLUMN
    COLUMN_NUMBER     = 1
    NAME                      = ACCE_SAMPLE_TIME
    DATA_TYPE              =  ASCII_REAL
    START_BYTE            = 0
    BYTES                     = 8
    DESCRIPTION           = " "
 END_OBJECT                = COLUMN

 OBJECT                      = COLUMN
    COLUMN_NUMBER     = 2
    NAME                      = ACCE_OUTPUT (Raw A/D Values)
    DATA_TYPE              =  ASCII_INTEGER
    START_BYTE            = 0
    BYTES                     = 8
    DESCRIPTION           = " "
 END_OBJECT                = COLUMN

OBJECT                      = COLUMN
    COLUMN_NUMBER     = 3
    NAME                      = ACCE_OUTPUT (V)
    DATA_TYPE              =  ASCII_REAL
    START_BYTE            = 0
    BYTES                     = 5
    DESCRIPTION           = " "
 END_OBJECT                = COLUMN
END_OBJECT                 = ACCE_MODE5_TABLE
```

Data Object Definition ACCE_MODE123_DN_SERIES

The ACCE_MODE123_DN_SERIES is used for the data acquired during instrument modes 1, 2 and 3. There are 3 time series in total that will be archived in one file. The length of each time series is 110 values.

```
/* DATA OBJECT DEFINITIION FOR THE ACCE  MODE 1, 2, 3, DIGITAL NUMBERS */
OBJECT                        = ACCE_MODE123_DN_SERIES
 INTERCHANGE_FORMAT  = ASCII
 ROWS                        = 1
 COLUMNS                    = 2
 ROW_BYTES                = TBD
 DESCRIPTION                = " "

 OBJECT                      = COLUMN
    NAME                    = ACCE_SELFTEST_TIME
    DATA_TYPE               =  ASCII_REAL
    START_BYTE              = 0
    BYTES                   = 8
     ITEMS                  = 1
 END_OBJECT                 =  COLUMN

 OBJECT                     = TIME_SERIES
   NAME                     = ACCE-SELFTEST-DN
   INTERCHANGE_FORMAT = ASCII_INTEGER
   ROWS                     = 1
   COLUMNS                  = 110
   ROW_BYTES                =
   SAMPLING_PARAMETER_NAME = TIME
   SAMPLING_PARAMETER_UNIT   =  MICROSECONDS
   SAMPLING_PARAMETER_INTERVAL =  100
   DESCRIPTION              = " "
 END_OBJECT                  = TIME_SERIES
END_OBJECT                  = ACCE_MODE123_DN_SERIES
```

Data Object Definition ACCE Calibrated Data

N/A – As with all SSP calibrated data, the results will be available in some form of a publication.

Data Product Design - ACCI Sensor

Data Product Design of ACCI Sensor ACCI-MODE5_TABLE

The ACCI data packets consist of one time-tagged time series of 512 values that represent the ACCI impact event. The data is represented as time (s), ACCI measurements (raw ADC counts), ACCI (V). The third column ACCI(V) is directly reduced from the digital numbers (raw ADC counts) by: Voltage = DN / 4096 * (VOLTAGE_MAX – VOLTAGE-MIN), with VOLTAGE_MAX = +5V and VOLTAGE_MIN= -5 V.

```
/* DATA OBJECT DEFINITIION FOR THE ACCI, MODE 5, */
OBJECT                      = ACCI_MODE5_TABLE
 INTERCHANGE_FORMAT  = ASCII
 ROWS                       = 512
 COLUMNS                    = 3
 ROW_BYTES                  = TBD
 DESCRIPTION                = " "

 OBJECT                    = COLUMN
    COLUMN_NUMBER    = 1
    NAME                   = ACCI_SAMPLE_TIME
    DATA_TYPE           =  ASCII_REAL
    START_BYTE          = 0
    BYTES                  = 8
    DESCRIPTION         = " "
 END_OBJECT             = COLUMN

 OBJECT                    = COLUMN
    COLUMN_NUMBER    = 2
    NAME                   = ACCI_OUTPUT (Raw A/D Values)
    DATA_TYPE           =  ASCII_INTEGER
    START_BYTE          = 0
    BYTES                  = 4
    DESCRIPTION          = " "
 END_OBJECT             = COLUMN

OBJECT                   = COLUMN
    COLUMN_NUMBER    = 3
    NAME                   = ACCE_OUTPUT (V)
    DATA_TYPE           =  ASCII_REAL
    START_BYTE          = 0
    BYTES                  = 6
    DESCRIPTION          = " "
 END_OBJECT             = COLUMN
END_OBJECT              = ACCI_MODE5_TABLE
```

Data Product Design of ACCI_MODE1236_TABLE

The ACCI sensor is sampled continuously at 500Hz through the mission. One set of values in these data packets consist of Mean, Variance, and Maximum values taken over 200 ACCI samples . The data is represented by 7 columns as: TIME (s), ACCI_MEAN (raw ADC counts), ACCI_MEAN (V), ACCI_VAR (raw ADC counts), ACCI_VAR (V), ACCI_MAX (raw ADC counts), ACCI_MAX (V).
The voltages ACCI (V) values are reduced from the digital numbers (raw ADC counts) by:
Voltage = DN / 4096 * (VOLTAGE_MAX – VOLTAGE-MIN), with VOLTAGE_MAX = +5V and VOLTAGE_MIN= -5 V.

```
/* DATA OBJECT DEFINITIION FOR THE ACCI, MODES 1236 , */
OBJECT                      = ACCI_MODE1236_TABLE
 INTERCHANGE_FORMAT  = ASCII
 ROWS                       = TBD
 COLUMNS                    = 7
 ROW_BYTES                  = TBD
 DESCRIPTION                = " "

 OBJECT                    = COLUMN
    COLUMN_NUMBER    = 1
    NAME                   = ACCI_SAMPLE_TIME
    DATA_TYPE              =  ASCII_REAL
    START_BYTE             = 0
    BYTES                  = 8
    DESCRIPTION            = " "
 END_OBJECT                = COLUMN

 OBJECT                    = COLUMN
    COLUMN_NUMBER    = 2
    NAME                   = ACCI_MEAN (Raw A/D Values)
    DATA_TYPE              =  ASCII_INTEGER
    START_BYTE             = 0
    BYTES                  = 4
    DESCRIPTION            = " "
 END_OBJECT                = COLUMN

OBJECT                     = COLUMN
    COLUMN_NUMBER    = 3
    NAME                   = ACCI_MEAN (V)
    DATA_TYPE              =  ASCII_REAL
    START_BYTE             = 0
    BYTES                  = 6
    DESCRIPTION            = " "
 END_OBJECT                = COLUMN

OBJECT                     = COLUMN
    COLUMN_NUMBER    = 4
    NAME                   = ACCI_VAR (Raw A/D Values)
    DATA_TYPE              =  ASCII_INTEGER
    START_BYTE             = 0
    BYTES                  = 4
    DESCRIPTION            = " "
 END_OBJECT                = COLUMN

OBJECT                     = COLUMN
    COLUMN_NUMBER    = 5
    NAME                   = ACCI_VAR (V)
    DATA_TYPE              =  ASCII_REAL
    START_BYTE             = 0
    BYTES                  = 6
    DESCRIPTION            = " "
 END_OBJECT                = COLUMN
/* Continued */
```

```
/* DATA OBJECT DEFINITIION FOR THE ACCI, MODES 1236  - Continued, */

 OBJECT                  = COLUMN
    COLUMN_NUMBER    = 6
    NAME                  = ACCI_MAX (Raw A/D Values)
    DATA_TYPE           =  ASCII_INTEGER
    START_BYTE          = 0
    BYTES                 = 4
    DESCRIPTION          = " "
 END_OBJECT             = COLUMN

OBJECT                  = COLUMN
    COLUMN_NUMBER    = 3
    NAME                  = ACCI_MAX (V)
    DATA_TYPE           =  ASCII_REAL
    START_BYTE          = 0
    BYTES                 = 6
    DESCRIPTION          = " "
 END_OBJECT             = COLUMN

END_OBJECT              = ACCI_MODE1236_TABLE
```

Data Product Design - APIS Sensor

Data Product Design of APIS_MODE23_TABLE

The APIS sensor operates from mode2 to the end of mission. The acoustic return signal is formed by 1000 samples measured at 1 millisecond interval. In modes 2 and 3, the data is reduced by selecting a window from the1000 sample acoustic return signal 40th sample to 560th sample and sending an average of 20 samples as 1 value (called bin). Therefore one return signal is represented by 26 such bins.
The data is represented by 4 columns as: time (s), bin number, APIS (raw ADC counts), APIS (V).
The third column ACCI(V) is directly reduced from the digital numbers (raw ADC counts) by:

```
/* DATA OBJECT DEFINITIION FOR THE APIS, MODES 2, 3 */
OBJECT                    = APIS_MODE23_TABLE
 INTERCHANGE_FORMAT  = ASCII
 ROWS                     = TBD
 COLUMNS                  = 4
 ROW_BYTES                = TBD
 DESCRIPTION              = " "

 OBJECT                   = COLUMN
    COLUMN_NUMBER    = 1
    NAME                  = APIS_SAMPLE_TIME
    DATA_TYPE             =  ASCII_REAL
    START_BYTE            = 0
    BYTES                 = 8
    DESCRIPTION           = " "
 END_OBJECT               = COLUMN

 OBJECT                   = COLUMN
    COLUMN_NUMBER    = 2
    NAME                  = APIS_BIN_NUM ()
    DATA_TYPE             =  ASCII_INTEGER
    START_BYTE            = 0
    BYTES                 = 2
    DESCRIPTION           = " "
 END_OBJECT               = COLUMN

OBJECT                    = COLUMN
    COLUMN_NUMBER    = 3
    NAME                  = APIS_OUTPUT (raw ADC counts)
    DATA_TYPE             =  ASCII_INTEGER
    START_BYTE            = 0
    BYTES                 = 3
    DESCRIPTION           = " "
 END_OBJECT               = COLUMN

OBJECT                    = COLUMN
    COLUMN_NUMBER    = 4
    NAME                  = APIS_OUTPUT (V)
    DATA_TYPE             =  ASCII_REAL
    START_BYTE            = 0
    BYTES                 = 6
    DESCRIPTION           = " "
 END_OBJECT               = COLUMN

END_OBJECT                = APIS_MODE23_TABLE
```

Data Product Design of APIS_MODE4_TABLE

The APIS sensor operates from mode2 to the end of mission. The acoustic return signal is formed by 1000 samples measured at 1 millisecond interval. In mode 4, the data is reduced by transmitting the 60 samples around the peak as uncompressed, and further 140 samples are averaged by 4 with remaining samples averaged by 20. Therefore one return signal is represented by 136 such bins.
The data is represented by 5 columns as: time (s), bin number, APIS (raw ADC counts), APIS (V), APIS_PEAK_POS.

```
/* DATA OBJECT DEFINITIION FOR THE APIS, MODE 4 */
OBJECT                    = APIS_MODE4_TABLE
 INTERCHANGE_FORMAT  = ASCII
 ROWS                     = TBD
 COLUMNS                  = 5
 ROW_BYTES                = TBD
 DESCRIPTION              = " "

 OBJECT                   = COLUMN
    COLUMN_NUMBER    = 1
    NAME                  = APIS_SAMPLE_TIME
    DATA_TYPE             =  ASCII_REAL
    START_BYTE            = 0
    BYTES                 = 8
    DESCRIPTION           = " "
 END_OBJECT               = COLUMN

 OBJECT                   = COLUMN
    COLUMN_NUMBER    = 2
    NAME                  = APIS_BIN_NUM ()
    DATA_TYPE             =  ASCII_INTEGER
    START_BYTE            = 0
    BYTES                 = 3
    DESCRIPTION           = " "
 END_OBJECT               = COLUMN

OBJECT                   = COLUMN
    COLUMN_NUMBER    = 3
    NAME                  = APIS_OUTPUT (raw ADC counts)
    DATA_TYPE             =  ASCII_INTEGER
    START_BYTE            = 0
    BYTES                 = 3
    DESCRIPTION           = " "
 END_OBJECT               = COLUMN

OBJECT                   = COLUMN
    COLUMN_NUMBER    = 4
    NAME                  = APIS_OUTPUT (V)
    DATA_TYPE             =  ASCII_REAL
    START_BYTE            = 0
    BYTES                 = 6
    DESCRIPTION           = " "
 END_OBJECT               = COLUMN

OBJECT                   = COLUMN
    COLUMN_NUMBER    = 5
    NAME                  = APIS_PEAK_POS ()
    DATA_TYPE             =  ASCII_INTEGER
    START_BYTE            = 0
    BYTES                 = 4
    DESCRIPTION           = " "
 END_OBJECT               = COLUMN

END_OBJECT                = APIS_MODE4_TABLE
```

Data Product Design of APIS_MODE6_TABLE

The APIS sensor operates from mode2 to the end of mission. The acoustic return signal is formed by 1000 samples measured at 1 millisecond interval, in surface mode (6), the sensor output is taken from 10 pulses separated by 1 second listening interval. In mode 6, the data is reduced by transmitting 10x50 bins (where each bin contains average value of 20 samples) = 500 bins and also the highest return signal is transmitted as mode4 (i.e. compression centred on the peak).
The data is represented by 5 columns as: time (s), bin number, APIS (raw ADC counts), APIS (V), APIS_PEAK_POS.

```
/* DATA OBJECT DEFINITIION FOR THE APIS, MODE 6 */
OBJECT                    = APIS_MODE6_TABLE
 INTERCHANGE_FORMAT  = ASCII
 ROWS                     = TBD
 COLUMNS                  = 5
 ROW_BYTES                = TBD
 DESCRIPTION              = " "

 OBJECT                   = COLUMN
    COLUMN_NUMBER    = 1
    NAME                  = APIS_SAMPLE_TIME
    DATA_TYPE          =  ASCII_REAL
    START_BYTE         = 0
    BYTES                 = 8
    DESCRIPTION        = " "
 END_OBJECT             = COLUMN

 OBJECT                   = COLUMN
    COLUMN_NUMBER    = 2
    NAME                  = APIS_BIN_NUM ()
    DATA_TYPE          =  ASCII_INTEGER
    START_BYTE         = 0
    BYTES                 = 3
    DESCRIPTION         = " "
 END_OBJECT             = COLUMN

OBJECT                   = COLUMN
    COLUMN_NUMBER    = 3
    NAME                  = APIS_OUTPUT (raw ADC counts)
    DATA_TYPE          =  ASCII_INTEGER
    START_BYTE         = 0
    BYTES                 = 3
    DESCRIPTION         = " "
 END_OBJECT             = COLUMN

OBJECT                   = COLUMN
    COLUMN_NUMBER    = 4
    NAME                  = APIS_OUTPUT (V)
    DATA_TYPE          =  ASCII_REAL
    START_BYTE         = 0
    BYTES                 = 6
    DESCRIPTION         = " "
 END_OBJECT             = COLUMN

OBJECT                   = COLUMN
    COLUMN_NUMBER    = 5
    NAME                  = APIS_PEAK_POS ()
    DATA_TYPE          =  ASCII_INTEGER
    START_BYTE         = 0
    BYTES                 = 4
    DESCRIPTION         = " "
 END_OBJECT             = COLUMN

END_OBJECT              = APIS_MODE6_TABLE
```

Data Product Design - APIV Sensor

Data Product Design of APIV_MODE123456_TABLE

The APIV sensor is sampled at 1Hz through the mission. One set of values in these data packets consist of two speed of sound measurements (APIV1 and APIV2). The data is represented by 4 columns as: TIME (s), APIV_MEAN (raw ADC counts), APIV1 (raw ADC counts), APIV2 (raw ADC counts).

```
/* DATA OBJECT DEFINITIION FOR THE APIV, MODE 123456 */
OBJECT                    = APIV_MODE123456_TABLE
 INTERCHANGE_FORMAT  = ASCII
 ROWS                     = TBD
 COLUMNS                  = 4
 ROW_BYTES                = TBD
 DESCRIPTION              = " "

 OBJECT                   = COLUMN
    COLUMN_NUMBER    = 1
    NAME                  = APIV_SAMPLE_TIME
    DATA_TYPE          = ASCII_REAL
    START_BYTE         = 0
    BYTES                 = 8
    DESCRIPTION        = " "
 END_OBJECT              = COLUMN

 OBJECT                   = COLUMN
    COLUMN_NUMBER    = 2
    NAME                  = APIV_MEAN (raw ADC counts)
    DATA_TYPE          =  ASCII_INTEGER
    START_BYTE         = 0
    BYTES                 = 7
    DESCRIPTION         = " "
 END_OBJECT              = COLUMN

OBJECT                   = COLUMN
    COLUMN_NUMBER    = 3
    NAME                  = APIV1 (raw ADC counts)
    DATA_TYPE          =  ASCII_INTEGER
    START_BYTE         = 0
    BYTES                 = 7
    DESCRIPTION         = " "
 END_OBJECT              = COLUMN

OBJECT                   = COLUMN
    COLUMN_NUMBER    = 4
    NAME                  = APIV2 (raw ADC counts)
    DATA_TYPE          = ASCII_INTEGER
    START_BYTE         = 0
    BYTES                 = 7
    DESCRIPTION          = " "
 END_OBJECT              = COLUMN

END_OBJECT               = APIV_MODE123456_TABLE
```

Data Product Design of DEN Sensor

Data Product Design of DEN_MODE123456_TABLE

The DEN sensor is sampled at 1Hz through the mission and the data is acquired by a 12 bit A/D converter with +5V to –5V range. The data is represented by 3 columns as: TIME (s), DEN (raw ADC counts), and DEN (V).

The voltages, DEN (V) values are reduced from the digital numbers (raw ADC counts) by:
Voltage = DN / 4096 * (VOLTAGE_MAX – VOLTAGE-MIN), with VOLTAGE_MAX = +5V and VOLTAGE_MIN= -5 V.

```
/* DATA OBJECT DEFINITIION FOR THE DEN, MODE 123456 */
OBJECT                        = DEN_MODE123456_TABLE
 INTERCHANGE_FORMAT  = ASCII
 ROWS                         = TBD
 COLUMNS                      = 4
 ROW_BYTES                    = TBD
 DESCRIPTION                  = " "

 OBJECT                      = COLUMN
    COLUMN_NUMBER    = 1
    NAME                     = DEN_SAMPLE_TIME
    DATA_TYPE             = ASCII_REAL
    START_BYTE           = 0
    BYTES                    = 8
    DESCRIPTION           = " "
 END_OBJECT                = COLUMN

 OBJECT                      = COLUMN
    COLUMN_NUMBER    = 2
    NAME                     = DEN (raw ADC counts)
    DATA_TYPE             =  ASCII_INTEGER
    START_BYTE           = 0
    BYTES                    = 4
    DESCRIPTION            = " "
 END_OBJECT                = COLUMN

OBJECT                     = COLUMN
    COLUMN_NUMBER    = 3
    NAME                     = DENV (Volts)
    DATA_TYPE             =  ASCII_REAL
    START_BYTE           = 0
    BYTES                    = 6
    DESCRIPTION            = " "
 END_OBJECT                = COLUMN

END_OBJECT                 = DEN_MODE123456_TABLE
```

Data Product Design of TIL Sensor

Data Product Design of TIL_MODE123456_TABLE

The TIL sensor is sampled at 1Hz during the descent phase (i.e. all atmosphere modes) and at 2 Hz post landing (surface modes). The data is acquired by a 12 bit A/D converter with +5V to –5V range. and is represented by 2 tables. The first table contains 9 columns : TIME (s), TILXH(raw ADC counts), TILXH(V) , TILXL(raw ADC counts), TILXL(V), TILYH(raw ADC counts), TILYH(V), TILYL(raw ADC counts), and TILYL(V).

The second table contains the values of TIL sensor's input voltages and offsets as a function of time. These values are transmitted in the SSP housekeeping packet. The columns are; TIME (s), TOPXH(raw ADC counts), TOPXH(V) , TOPXL(raw ADC counts), TOPXL(V) , TOPYH(raw ADC counts), TOPYH(V) , TOPYL(raw ADC counts), TOPYL(V), TLXO(raw ADC counts), TLXO (V), TLYO(raw ADC counts), TLYO (V), TOPXO(raw ADC counts), TOPXO (V), TOPYO(raw ADC counts), and TOPYO (V).

```
/* DATA OBJECT DEFINITIION FOR THE TIL, MODE 123456 */
OBJECT                        = TIL_MODE123456_TABLE_1
 INTERCHANGE_FORMAT  = ASCII
 ROWS                         = TBD
 COLUMNS                      = 9
 ROW_BYTES                    = TBD
 DESCRIPTION                  = " "

 OBJECT                      = COLUMN
    COLUMN_NUMBER    = 1
    NAME                     = TIL_SAMPLE_TIME
    DATA_TYPE                = ASCII_REAL
    START_BYTE               = 0
    BYTES                    = 8
    DESCRIPTION              = " "
 END_OBJECT                  = COLUMN

 OBJECT                      = COLUMN
    COLUMN_NUMBER    = 2
    NAME                     = TILXH (raw ADC counts)
    DATA_TYPE                =  ASCII_INTEGER
    START_BYTE               = 0
    BYTES                    = 4
    DESCRIPTION               = " "
 END_OBJECT                  = COLUMN

OBJECT                       = COLUMN
    COLUMN_NUMBER    = 3
    NAME                     = TILXHV (Volts)
    DATA_TYPE                =  ASCII_REAL
    START_BYTE               = 0
    BYTES                    = 6
    DESCRIPTION               = " "
 END_OBJECT                  = COLUMN
```

```
/* TIL_MODE123456_TABLE_1…. contd */

OBJECT                  = COLUMN
   COLUMN_NUMBER    = 4
   NAME                 = TILYH (raw ADC counts)
   DATA_TYPE            = ASCII_ INTEGER
   START_BYTE           = 0
   BYTES                = 4
   DESCRIPTION          = " "
END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   COLUMN_NUMBER    = 5
   NAME                 = TILYHV (Volts)
   DATA_TYPE            = ASCII_REAL
   START_BYTE           = 0
   BYTES                = 6
   DESCRIPTION          = " "
END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   COLUMN_NUMBER    = 6
   NAME                 = TILXL (raw ADC counts)
   DATA_TYPE            =  ASCII_INTEGER
   START_BYTE           = 0
   BYTES                = 4
   DESCRIPTION          = " "
END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   COLUMN_NUMBER    = 7
   NAME                 = TILXLV (Volts)
   DATA_TYPE            =  ASCII_REAL
   START_BYTE           = 0
   BYTES                = 6
   DESCRIPTION          = " "
END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   COLUMN_NUMBER    = 8
   NAME                 = TILYL (raw ADC counts)
   DATA_TYPE            = ASCII_ INTEGER
   START_BYTE           = 0
   BYTES                = 4
   DESCRIPTION          = " "
END_OBJECT              = COLUMN

OBJECT                  = COLUMN
   COLUMN_NUMBER    = 9
   NAME                 = TILYLV (Volts)
   DATA_TYPE            = ASCII_REAL
   START_BYTE           = 0
   BYTES                = 6
   DESCRIPTION          = " "
END_OBJECT              = COLUMN
END_OBJECT              = TIL_MODE123456_TABLE_1
```

```
/* DATA OBJECT DEFINITIION FOR THE TIL, MODE 123456 */
OBJECT                      = TIL_MODE123456_TABLE_2
 INTERCHANGE_FORMAT  = ASCII
 ROWS                       = TBD
 COLUMNS                    = 17
 ROW_BYTES                  = TBD
 DESCRIPTION                = " "

 OBJECT                    = COLUMN
    COLUMN_NUMBER    = 1
    NAME                   = TIL_HK_SAMPLE_TIME
    DATA_TYPE              = ASCII_REAL
    START_BYTE             = 0
    BYTES                  = 8
    DESCRIPTION            = " "
 END_OBJECT                = COLUMN

 OBJECT                    = COLUMN
    COLUMN_NUMBER    = 2
    NAME                   = TOPXH (raw ADC counts)
    DATA_TYPE              =  ASCII_INTEGER
    START_BYTE             = 0
    BYTES                  = 4
    DESCRIPTION            = " "
 END_OBJECT                = COLUMN

OBJECT                     = COLUMN
    COLUMN_NUMBER    = 3
    NAME                   = TOPXHV (Volts)
    DATA_TYPE              =  ASCII_REAL
    START_BYTE             = 0
    BYTES                  = 6
    DESCRIPTION            = " "
 END_OBJECT                = COLUMN

OBJECT                     = COLUMN
    COLUMN_NUMBER    = 4
    NAME                   = TOPXL (raw ADC counts)
    DATA_TYPE              =  ASCII_INTEGER
    START_BYTE             = 0
    BYTES                  = 4
    DESCRIPTION            = " "
 END_OBJECT                = COLUMN

OBJECT                     = COLUMN
    COLUMN_NUMBER    = 5
    NAME                   = TOPXLV (Volts)
    DATA_TYPE              =  ASCII_REAL
    START_BYTE             = 0
    BYTES                  = 6
    DESCRIPTION            = " "
 END_OBJECT                = COLUMN

OBJECT                     = COLUMN
    COLUMN_NUMBER    = 6
    NAME                   = TOPYH (raw ADC counts)
    DATA_TYPE              =  ASCII_INTEGER
    START_BYTE             = 0
    BYTES                  = 4
    DESCRIPTION            = " "
 END_OBJECT                = COLUMN
```

```
/* TIL_MODE123456_TABLE_2…. contd */

OBJECT                  = COLUMN
   COLUMN_NUMBER   = 7
   NAME                 = TOPYHV (Volts)
   DATA_TYPE          =  ASCII_REAL
   START_BYTE         = 0
   BYTES                = 6
   DESCRIPTION         = " "
END_OBJECT            = COLUMN

OBJECT                  = COLUMN
   COLUMN_NUMBER   = 8
   NAME                 = TOPYL (raw ADC counts)
   DATA_TYPE          = ASCII_ INTEGER
   START_BYTE         = 0
   BYTES                = 4
   DESCRIPTION         = " "
END_OBJECT            = COLUMN

OBJECT                  = COLUMN
   COLUMN_NUMBER   = 9
   NAME                 = TOPYL (Volts)
   DATA_TYPE          = ASCII_REAL
   START_BYTE         = 0
   BYTES                = 6
   DESCRIPTION         = " "
END_OBJECT            = COLUMN

OBJECT                  = COLUMN
   COLUMN_NUMBER   = 10
   NAME                 = TLXO (raw ADC counts)
   DATA_TYPE          =  ASCII_INTEGER
   START_BYTE         = 0
   BYTES                = 4
   DESCRIPTION         = " "
END_OBJECT            = COLUMN

OBJECT                  = COLUMN
   COLUMN_NUMBER   = 11
   NAME                 = TLXOV (Volts)
   DATA_TYPE          =  ASCII_REAL
   START_BYTE         = 0
   BYTES                = 6
   DESCRIPTION         = " "
END_OBJECT            = COLUMN

OBJECT                  = COLUMN
   COLUMN_NUMBER   = 12
   NAME                 = TLYO (raw ADC counts)
   DATA_TYPE          = ASCII_ INTEGER
   START_BYTE         = 0
   BYTES                = 4
   DESCRIPTION         = " "
END_OBJECT            = COLUMN

OBJECT                  = COLUMN
   COLUMN_NUMBER   = 13
   NAME                 = TLYOV (Volts)
   DATA_TYPE          = ASCII_REAL
   START_BYTE         = 0
   BYTES                = 6
   DESCRIPTION         = " "
END_OBJECT            = COLUMN
```

```
/* TIL_MODE123456_TABLE_2…. contd */

OBJECT                  = COLUMN
   COLUMN_NUMBER    = 14
   NAME                  = TOPXO (raw ADC counts)
   DATA_TYPE           = ASCII_ INTEGER
   START_BYTE          = 0
   BYTES                 = 4
   DESCRIPTION         = " "
END_OBJECT             = COLUMN

OBJECT                  = COLUMN
   COLUMN_NUMBER    = 15
   NAME                  = TOPXOV (Volts)
   DATA_TYPE           = ASCII_REAL
   START_BYTE          = 0
   BYTES                 = 6
   DESCRIPTION         = " "
END_OBJECT             = COLUMN

OBJECT                  = COLUMN
   COLUMN_NUMBER    = 16
   NAME                  = TOPYO (raw ADC counts)
   DATA_TYPE           = ASCII_ INTEGER
   START_BYTE          = 0
   BYTES                 = 4
   DESCRIPTION         = " "
END_OBJECT             = COLUMN

OBJECT                  = COLUMN
   COLUMN_NUMBER    = 17
   NAME                  = TOPYOV (Volts)
   DATA_TYPE           = ASCII_REAL
   START_BYTE          = 0
   BYTES                 = 6
   DESCRIPTION         = " "
END_OBJECT             = COLUMN
END_OBJECT              = TIL_MODE123456_TABLE_2
```

Data Product Design of PER Sensor

Data Product Design of PER_MODE123456_TABLE

The PER sensor is sampled at 0.1Hz during the mission (i.e. all modes). The data is acquired by a 12 bit A/D converter with +5V to –5V range. and is represented by 2 tables. The first table contains 5 columns : TIME (s), PER(raw ADC counts), PER(V) , CON(raw ADC counts), and CON(V).

The second table contains the values of PER sensor's offsets and temperatures a function of time. These values are transmitted in the SSP housekeeping packet. The columns are; TIME (s), PEROFF(raw ADC counts), PEROFF(V) , CONOFF(raw ADC counts), CONOFF(V) , PERT(raw ADC counts), and PERT(V).

```
/* DATA OBJECT DEFINITIION FOR THE PER, MODE 123456 */
OBJECT                      = PER_MODE123456_TABLE_1
 INTERCHANGE_FORMAT  = ASCII
 ROWS                       = TBD
 COLUMNS                    = 5
 ROW_BYTES                  = TBD
 DESCRIPTION                = " "

 OBJECT                     = COLUMN
    COLUMN_NUMBER    = 1
    NAME                    = PER_SAMPLE_TIME
    DATA_TYPE               = ASCII_REAL
    START_BYTE              = 0
    BYTES                   = 8
    DESCRIPTION             = " "
 END_OBJECT                 = COLUMN

 OBJECT                     = COLUMN
    COLUMN_NUMBER    = 2
    NAME                    = PER (raw ADC counts)
    DATA_TYPE               =  ASCII_INTEGER
    START_BYTE              = 0
    BYTES                   = 4
    DESCRIPTION             = " "
 END_OBJECT                 = COLUMN

OBJECT                      = COLUMN
    COLUMN_NUMBER    = 3
    NAME                    = PERV (Volts)
    DATA_TYPE               =  ASCII_REAL
    START_BYTE              = 0
    BYTES                   = 6
    DESCRIPTION             = " "
 END_OBJECT                 = COLUMN

OBJECT                      = COLUMN
    COLUMN_NUMBER    = 4
    NAME                    = CON (raw ADC counts)
    DATA_TYPE               =  ASCII_INTEGER
    START_BYTE              = 0
    BYTES                   = 4
    DESCRIPTION             = " "
 END_OBJECT                 = COLUMN

OBJECT                      = COLUMN
    COLUMN_NUMBER    = 5
    NAME                    = CONV (Volts)
    DATA_TYPE               =  ASCII_REAL
    START_BYTE              = 0
    BYTES                   = 6
    DESCRIPTION             = " "
 END_OBJECT                 = COLUMN
END_OBJECT                  = PER_MODE123456_TABLE_1
```

```
/* DATA OBJECT DEFINITIION FOR THE PER, MODE 123456 */
OBJECT                      = PER_MODE123456_TABLE_2
 INTERCHANGE_FORMAT  = ASCII
 ROWS                       = TBD
 COLUMNS                    = 5
 ROW_BYTES                  = TBD
 DESCRIPTION                = " "

 OBJECT                     = COLUMN
    COLUMN_NUMBER    = 1
    NAME                    = PER_HK_SAMPLE_TIME
    DATA_TYPE           = ASCII_REAL
    START_BYTE          = 0
    BYTES                   = 8
    DESCRIPTION         = " "
 END_OBJECT             = COLUMN

 OBJECT                     = COLUMN
    COLUMN_NUMBER    = 2
    NAME                    = PEROFF (raw ADC counts)
    DATA_TYPE           =  ASCII_INTEGER
    START_BYTE          = 0
    BYTES                   = 4
    DESCRIPTION          = " "
 END_OBJECT             = COLUMN

OBJECT                    = COLUMN
    COLUMN_NUMBER    = 3
    NAME                    = PEROFFV (Volts)
    DATA_TYPE           =  ASCII_REAL
    START_BYTE          = 0
    BYTES                   = 6
    DESCRIPTION          = " "
 END_OBJECT             = COLUMN

OBJECT                    = COLUMN
    COLUMN_NUMBER    = 4
    NAME                    = CONOFF (raw ADC counts)
    DATA_TYPE           =  ASCII_INTEGER
    START_BYTE          = 0
    BYTES                   = 4
    DESCRIPTION          = " "
 END_OBJECT             = COLUMN

OBJECT                    = COLUMN
    COLUMN_NUMBER    = 5
    NAME                    = CONOFFV (Volts)
    DATA_TYPE           =  ASCII_REAL
    START_BYTE          = 0
    BYTES                   = 6
    DESCRIPTION          = " "
 END_OBJECT             = COLUMN
```

```
/* PER_MODE123456_TABLE_2…. contd */

 OBJECT                  = COLUMN
    COLUMN_NUMBER   = 6
    NAME                  = PERT (raw ADC counts)
    DATA_TYPE           =  ASCII_INTEGER
    START_BYTE          = 0
    BYTES                 = 4
    DESCRIPTION          = " "
 END_OBJECT             = COLUMN

OBJECT                  = COLUMN
    COLUMN_NUMBER   = 7
    NAME                  = PERTV (Volts)
    DATA_TYPE           =  ASCII_REAL
    START_BYTE          = 0
    BYTES                 = 6
    DESCRIPTION          = " "
 END_OBJECT             = COLUMN

END_OBJECT              = PER_MODE123456_TABLE_2
```

Data Product Design of REF Sensor

Data Product Design of REF_MODE123456_TABLE

The REF sensor is sampled at 0.005Hz (or every 3 minutes) during modes 2, 3, 5, and 6 and sampled only once during mode 4. The data is acquired by an 8 bit A/D converter with 0V to 5V range and is represented by 3 tables containing data for REF Internal, external and dark (or background) illuminations. Each table contains four columns: TIME (s), PIXEL_NUM, PIXEL_INTENSITY (Raw ADC counts), PIXEL_INTENSITY (V). In addition, the temperature data is available in a separate file.

```
/* DATA OBJECT DEFINITIION FOR THE REF, MODE 23456 */
OBJECT                        = REF_MODE23456_INTERNAL
 INTERCHANGE_FORMAT  = ASCII
 ROWS                        = TBD
 COLUMNS                     = 4
 ROW_BYTES                   = TBD
 DESCRIPTION                 = " "

 OBJECT                     = COLUMN
    COLUMN_NUMBER    = 1
    NAME                    = REF_SAMPLE_TIME
    DATA_TYPE             = ASCII_REAL
    START_BYTE           = 0
    BYTES                    = 8
    DESCRIPTION          = " "
 END_OBJECT               = COLUMN

 OBJECT                     = COLUMN
    COLUMN_NUMBER   = 2
    NAME                    = PIX_NO (1 to 512 pixels)
    DATA_TYPE             =  ASCII_INTEGER
    START_BYTE           = 0
    BYTES                    = 3
    DESCRIPTION           = " "
 END_OBJECT               = COLUMN

OBJECT                    = COLUMN
    COLUMN_NUMBER   = 3
    NAME                    = PIX_INTENSITY (raw ADC counts)
    DATA_TYPE             =  ASCII_INTEGER
    START_BYTE           = 0
    BYTES                    = 3
    DESCRIPTION           = " "
 END_OBJECT               = COLUMN

OBJECT                    = COLUMN
    COLUMN_NUMBER   = 4
    NAME                    = PIX_INTENSITYV (Volts)
    DATA_TYPE             =  ASCII_REAL
    START_BYTE           = 0
    BYTES                    = 6
    DESCRIPTION           = " "
 END_OBJECT               = COLUMN

 END_OBJECT                 = REF_MODE23456_INTERNAL
```

```
/* DATA OBJECT DEFINITIION FOR THE REF, MODE 23456 */
OBJECT                        = REF_MODE23456_EXTERNAL
 INTERCHANGE_FORMAT  = ASCII
 ROWS                         = TBD
 COLUMNS                      = 4
 ROW_BYTES                    = TBD
 DESCRIPTION                  = " "

 OBJECT                      = COLUMN
    COLUMN_NUMBER    = 1
    NAME                     = REF_SAMPLE_TIME
    DATA_TYPE                = ASCII_REAL
    START_BYTE               = 0
    BYTES                    = 8
    DESCRIPTION              = " "
 END_OBJECT                  = COLUMN

 OBJECT                      = COLUMN
    COLUMN_NUMBER    = 2
    NAME                     = PIX_NO (1 to 512 pixels)
    DATA_TYPE                =  ASCII_INTEGER
    START_BYTE               = 0
    BYTES                    = 3
    DESCRIPTION               = " "
 END_OBJECT                  = COLUMN

OBJECT                       = COLUMN
    COLUMN_NUMBER    = 3
    NAME                     = PIX_INTENSITY (raw ADC counts)
    DATA_TYPE                =  ASCII_INTEGER
    START_BYTE               = 0
    BYTES                    = 3
    DESCRIPTION               = " "
 END_OBJECT                  = COLUMN

OBJECT                       = COLUMN
    COLUMN_NUMBER    = 4
    NAME                     = PIX_INTENSITYV (Volts)
    DATA_TYPE                =  ASCII_REAL
    START_BYTE               = 0
    BYTES                    = 6
    DESCRIPTION               = " "
 END_OBJECT                  = COLUMN

 END_OBJECT                   = REF_MODE23456_EXTERNAL
```

```
/* DATA OBJECT DEFINITIION FOR THE REF, MODE 23456 */
OBJECT                        = REF_MODE23456_DARK
 INTERCHANGE_FORMAT  = ASCII
 ROWS                         = TBD
 COLUMNS                      = 4
 ROW_BYTES                    = TBD
 DESCRIPTION                  = " "

 OBJECT                      = COLUMN
    COLUMN_NUMBER     = 1
    NAME                      = REF_SAMPLE_TIME
    DATA_TYPE             = ASCII_REAL
    START_BYTE            = 0
    BYTES                     = 8
    DESCRIPTION           = " "
 END_OBJECT                = COLUMN

 OBJECT                      = COLUMN
    COLUMN_NUMBER     = 2
    NAME                      = PIX_NO (1 to 512 pixels)
    DATA_TYPE             =  ASCII_INTEGER
    START_BYTE            = 0
    BYTES                     = 3
    DESCRIPTION            = " "
 END_OBJECT                = COLUMN

OBJECT                      = COLUMN
    COLUMN_NUMBER     = 3
    NAME                      = PIX_INTENSITY (raw ADC counts)
    DATA_TYPE             =  ASCII_INTEGER
    START_BYTE            = 0
    BYTES                     = 3
    DESCRIPTION            = " "
 END_OBJECT                = COLUMN

OBJECT                      = COLUMN
    COLUMN_NUMBER     = 4
    NAME                      = PIX_INTENSITYV (Volts)
    DATA_TYPE             =  ASCII_REAL
    START_BYTE            = 0
    BYTES                     = 6
    DESCRIPTION            = " "
 END_OBJECT                = COLUMN

 END_OBJECT                  = REF_MODE23456_DARK
```

```
/* DATA OBJECT DEFINITIION FOR THE REF TEMPERATURE SENSORS, MODE 123456 */
OBJECT                        = REF_MODE123456_TEMP
 INTERCHANGE_FORMAT  = ASCII
 ROWS                         = TBD
 COLUMNS                      = 4
 ROW_BYTES                    = TBD
 DESCRIPTION                  = " "

 OBJECT                      = COLUMN
    COLUMN_NUMBER     = 1
    NAME                     = REF_HK_SAMPLE_TIME
    DATA_TYPE              = ASCII_REAL
    START_BYTE             = 0
    BYTES                     = 8
    DESCRIPTION           = " "
 END_OBJECT                = COLUMN

 OBJECT                      = COLUMN
    COLUMN_NUMBER     = 2
    NAME                     = REFBASET (raw ADC counts)
    DATA_TYPE              =  ASCII_INTEGER
    START_BYTE             = 0
    BYTES                     = 4
    DESCRIPTION           = " "
 END_OBJECT                = COLUMN

OBJECT                      = COLUMN
    COLUMN_NUMBER     = 3
    NAME                     = REFBASETV (Volts)
    DATA_TYPE              =  ASCII_REAL
    START_BYTE             = 0
    BYTES                     = 6
    DESCRIPTION           = " "
 END_OBJECT                = COLUMN

OBJECT                      = COLUMN
    COLUMN_NUMBER     = 4
    NAME                     = REFSENT(raw ADC counts)
    DATA_TYPE              =  ASCII_INTEGER
    START_BYTE             = 0
    BYTES                     = 4
    DESCRIPTION           = " "
 END_OBJECT                = COLUMN

OBJECT                      = COLUMN
    COLUMN_NUMBER     = 5
    NAME                     = REFSENTV (Volts)
    DATA_TYPE              =  ASCII_REAL
    START_BYTE             = 0
    BYTES                     = 6
    DESCRIPTION           = " "
 END_OBJECT                = COLUMN
```

```
/* REF_MODE123456_TEMP…. contd */

 OBJECT                    = COLUMN
    COLUMN_NUMBER    = 6
    NAME                    = REFTIPT (raw ADC counts)
    DATA_TYPE             =  ASCII_INTEGER
    START_BYTE           = 0
    BYTES                    = 4
    DESCRIPTION           = " "
 END_OBJECT               = COLUMN

OBJECT                    = COLUMN
    COLUMN_NUMBER    = 5
    NAME                    = REFTIPTV (Volts)
    DATA_TYPE             =  ASCII_REAL
    START_BYTE           = 0
    BYTES                    = 6
    DESCRIPTION           = " "
 END_OBJECT               = COLUMN

END_OBJECT                = REF_MODE123456_TEMP
```

Data Product Design of THP Sensor

Data Product Design of THP_MODE123456_TABLE

The THP sensor is sampled at approximately 0.016Hz (or every 1 minute) during modes 2, 3, 4, and 6. The data is acquired by a 16-bit A/D converter with -5V to +5V range and is represented by 4 tables containing data for each of the four THP subsystems. Each table contains 6 columns: TIME (s), SAMPLE_NO (1 to 60 samples), THP_OUTPUT (Raw ADC counts), THP (V), THP_INITIAL_TEMP (Raw ADC counts), THP_INITIAL_TEMP (V). In addition, the housekeeping temperature data is available in a separate file.

```
/* DATA OBJECT DEFINITIION FOR THP, MODE 123456 */
OBJECT                    = THP_MODE123456_WIRE1
 INTERCHANGE_FORMAT  = ASCII
 ROWS                     = TBD
 COLUMNS                  = 6
 ROW_BYTES                = TBD
 DESCRIPTION              = " "

 OBJECT                   = COLUMN
    COLUMN_NUMBER    = 1
    NAME                  = THP_SAMPLE_TIME
    DATA_TYPE             = ASCII_REAL
    START_BYTE            = 0
    BYTES                 = 8
    DESCRIPTION           = " "
 END_OBJECT               = COLUMN

 OBJECT                   = COLUMN
    COLUMN_NUMBER    = 2
    NAME                  = THP_SAMPLE_NO (1 to 60 samples)
    DATA_TYPE             =  ASCII_INTEGER
    START_BYTE            = 0
    BYTES                 = 2
    DESCRIPTION           = " "
 END_OBJECT               = COLUMN

OBJECT                    = COLUMN
    COLUMN_NUMBER    = 3
    NAME                  = THP_OUTPUT (raw ADC counts)
    DATA_TYPE             =  ASCII_INTEGER
    START_BYTE            = 0
    BYTES                 = 5
    DESCRIPTION           = " "
 END_OBJECT               = COLUMN

OBJECT                    = COLUMN
    COLUMN_NUMBER    = 4
    NAME                  = THP_OUTPUTV (Volts)
    DATA_TYPE             =  ASCII_REAL
    START_BYTE            = 0
    BYTES                 = 7
    DESCRIPTION           = " "
 END_OBJECT               = COLUMN

OBJECT                    = COLUMN
    COLUMN_NUMBER    = 5
    NAME                  = THP_INITIAL_TEMP (raw ADC counts)
    DATA_TYPE             =  ASCII_INTEGER
    START_BYTE            = 0
    BYTES                 = 5
    DESCRIPTION           = " "
 END_OBJECT               = COLUMN

OBJECT                    = COLUMN
    COLUMN_NUMBER    = 6
    NAME                  = THP_ INITIAL_TEMPV (Volts)
    DATA_TYPE             =  ASCII_REAL
    START_BYTE            = 0
    BYTES                 = 7
    DESCRIPTION           = " "
 END_OBJECT               = COLUMN

END_OBJECT                = THP_MODE123456_WIRE1
```

```
/* DATA OBJECT DEFINITIION FOR THP, MODE 123456 */
OBJECT                        = THP_MODE123456_WIRE2
 INTERCHANGE_FORMAT  = ASCII
 ROWS                         = TBD
 COLUMNS                      = 6
 ROW_BYTES                    = TBD
 DESCRIPTION                  = " "

 OBJECT                      = COLUMN
    COLUMN_NUMBER    = 1
    NAME                     = THP_SAMPLE_TIME
    DATA_TYPE             = ASCII_REAL
    START_BYTE           = 0
    BYTES                     = 8
    DESCRIPTION           = " "
 END_OBJECT                = COLUMN

 OBJECT                      = COLUMN
    COLUMN_NUMBER    = 2
    NAME                     = THP_SAMPLE_NO (1 to 60 samples)
    DATA_TYPE             =  ASCII_INTEGER
    START_BYTE           = 0
    BYTES                     = 2
    DESCRIPTION           = " "
 END_OBJECT                = COLUMN

OBJECT                      = COLUMN
    COLUMN_NUMBER    = 3
    NAME                     = THP_OUTPUT (raw ADC counts)
    DATA_TYPE             =  ASCII_INTEGER
    START_BYTE           = 0
    BYTES                     = 5
    DESCRIPTION           = " "
 END_OBJECT                = COLUMN

OBJECT                      = COLUMN
    COLUMN_NUMBER    = 4
    NAME                     = THP_OUTPUTV (Volts)
    DATA_TYPE             =  ASCII_REAL
    START_BYTE           = 0
    BYTES                     = 7
    DESCRIPTION           = " "
 END_OBJECT                = COLUMN

OBJECT                      = COLUMN
    COLUMN_NUMBER    = 5
    NAME                     = THP_INITIAL_TEMP (raw ADC counts)
    DATA_TYPE             =  ASCII_INTEGER
    START_BYTE           = 0
    BYTES                     = 5
    DESCRIPTION           = " "
 END_OBJECT                = COLUMN

OBJECT                      = COLUMN
    COLUMN_NUMBER    = 6
    NAME                     = THP_ INITIAL_TEMPV (Volts)
    DATA_TYPE             =  ASCII_REAL
    START_BYTE           = 0
    BYTES                     = 7
    DESCRIPTION           = " "
 END_OBJECT                = COLUMN

END_OBJECT                = THP_MODE123456_WIRE2
```

```
/* DATA OBJECT DEFINITIION FOR THP, MODE 123456 */
OBJECT                        = THP_MODE123456_WIRE3
 INTERCHANGE_FORMAT  = ASCII
 ROWS                         = TBD
 COLUMNS                      = 6
 ROW_BYTES                    = TBD
 DESCRIPTION                  = " "

 OBJECT                      = COLUMN
    COLUMN_NUMBER    = 1
    NAME                     = THP_SAMPLE_TIME
    DATA_TYPE                = ASCII_REAL
    START_BYTE               = 0
    BYTES                    = 8
    DESCRIPTION              = " "
 END_OBJECT                  = COLUMN

 OBJECT                      = COLUMN
    COLUMN_NUMBER    = 2
    NAME                     = THP_SAMPLE_NO (1 to 60 samples)
    DATA_TYPE                =  ASCII_INTEGER
    START_BYTE               = 0
    BYTES                    = 2
    DESCRIPTION               = " "
 END_OBJECT                  = COLUMN

OBJECT                      = COLUMN
    COLUMN_NUMBER    = 3
    NAME                     = THP_OUTPUT (raw ADC counts)
    DATA_TYPE                =  ASCII_INTEGER
    START_BYTE               = 0
    BYTES                    = 5
    DESCRIPTION               = " "
 END_OBJECT                  = COLUMN

OBJECT                      = COLUMN
    COLUMN_NUMBER    = 4
    NAME                     = THP_OUTPUTV (Volts)
    DATA_TYPE                =  ASCII_REAL
    START_BYTE               = 0
    BYTES                    = 7
    DESCRIPTION               = " "
 END_OBJECT                  = COLUMN

OBJECT                      = COLUMN
    COLUMN_NUMBER    = 5
    NAME                     = THP_INITIAL_TEMP (raw ADC counts)
    DATA_TYPE                =  ASCII_INTEGER
    START_BYTE               = 0
    BYTES                    = 5
    DESCRIPTION               = " "
 END_OBJECT                  = COLUMN

OBJECT                      = COLUMN
    COLUMN_NUMBER    = 6
    NAME                     = THP_ INITIAL_TEMPV (Volts)
    DATA_TYPE                =  ASCII_REAL
    START_BYTE               = 0
    BYTES                    = 7
    DESCRIPTION               = " "
 END_OBJECT                  = COLUMN
```

```
/* DATA OBJECT DEFINITIION FOR THP, MODE 123456 */
OBJECT                      = THP_MODE123456_WIRE4
 INTERCHANGE_FORMAT  = ASCII
 ROWS                       = TBD
 COLUMNS                    = 6
 ROW_BYTES                  = TBD
 DESCRIPTION                = " "

 OBJECT                    = COLUMN
    COLUMN_NUMBER    = 1
    NAME                    = THP_SAMPLE_TIME
    DATA_TYPE            = ASCII_REAL
    START_BYTE           = 0
    BYTES                    = 8
    DESCRIPTION           = " "
 END_OBJECT               = COLUMN

 OBJECT                    = COLUMN
    COLUMN_NUMBER    = 2
    NAME                    = THP_SAMPLE_NO (1 to 60 samples)
    DATA_TYPE            =  ASCII_INTEGER
    START_BYTE           = 0
    BYTES                    = 2
    DESCRIPTION           = " "
 END_OBJECT               = COLUMN

OBJECT                    = COLUMN
    COLUMN_NUMBER    = 3
    NAME                    = THP_OUTPUT (raw ADC counts)
    DATA_TYPE            =  ASCII_INTEGER
    START_BYTE           = 0
    BYTES                    = 5
    DESCRIPTION           = " "
 END_OBJECT               = COLUMN

OBJECT                    = COLUMN
    COLUMN_NUMBER    = 4
    NAME                    = THP_OUTPUTV (Volts)
    DATA_TYPE            =  ASCII_REAL
    START_BYTE           = 0
    BYTES                    = 7
    DESCRIPTION           = " "
 END_OBJECT               = COLUMN

OBJECT                    = COLUMN
    COLUMN_NUMBER    = 5
    NAME                    = THP_INITIAL_TEMP (raw ADC counts)
    DATA_TYPE            =  ASCII_INTEGER
    START_BYTE           = 0
    BYTES                    = 5
    DESCRIPTION           = " "
 END_OBJECT               = COLUMN

OBJECT                    = COLUMN
    COLUMN_NUMBER    = 6
    NAME                    = THP_ INITIAL_TEMPV (Volts)
    DATA_TYPE            =  ASCII_REAL
    START_BYTE           = 0
    BYTES                    = 7
    DESCRIPTION           = " "
```

Appendix 1: Available Software to read PDS files

No software is to be archived, as all data is in ASCII format. Data processing / further interpretation is beyond the scope of this document.

Appendix 2: Auxiliary Data Usage

TBD

Appendix 3: Example of Directory Listing of Data Set X

TBD? Is this required?.