Standards Change Request

Change MAXIMUM_LENGTH for SPACECRAFT_POINTING_   **SCR3-1157.v1**
MODE to 25 characters and add new standard values requested
by Odyssey THEMIS.

Provenance:

Date: 2009-07-24
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Problem:

SPACECRAFT_POINTING_MODE values are currently limited to twelve (12) characters.

The Odyssey THEMIS team would like to use this keyword with several new values including some that will be devised in the future and aren't currently known.

Currently proposed additional values of the form, HGA_MITIGATION_[x+#] (values listed below) exceed the allowed length of twelve (12) characters.

SPACECRAFT_POINTING_MODE	AXIS	ANGLE	ORBIT_RANGE
HGA_MITIGATION_Y+5	YAW	+5	(15621-15791)
HGA_MITIGATION_Y+12	YAW	+12	(15791-16411)
HGA_MITIGATION_Y+5	YAW	+5	(16411-16559)
HGA_MITIGATION_R-10	ROLL	-10	(32867-TBD)
HGA_MITIGATION_R-20	ROLL	-20	(TBD)
HGA_MITIGATION_R-25	ROLL	-25	(TBD)
HGA_MITIGATION_R-20	ROLL	-20	(TBD)
HGA_MITIGATION_R-10	ROLL	-10	(TBD)

Current Urgency:

High. ODY THEMIS would like to use this keyword (with the requested changes) immediately and has begun to incorporate SPACECRAFT_POINTING_MODE and SPACECRAFT_PONTING_MODE_DESC into their latest products. Any additional required changes will necessitate the reprocessing of large amounts (tens of terabytes) of data by the THEMIS team.

Proposed Solution:

Increase the MAXIMUM_LENGTH to 25 characters and add in the currently known requested values listed below:

SPACECRAFT_POINTING_MODE = "OFF-NADIR"

The OFF-NADIR pointing mode is invoked when the spacecraft rotates
away from nadir to perform a Requested Off-nadir Targeted Observation \
(ROTO). Routine ROTO observations started in orbit 32214 for ODY; the value
of the SPACECRAFT_ORIENTATION keyword describes the ROTO rotation.

SPACECRAFT_POINTING_MODE = "HGA_MITIGATION_[x+#]"

In order to mitigate potential communication problems, the ODY spacecraft
has performed several rotation maneuvers to reorient the High Gain Antenna
(HGA). The last few characters [x+#] of the HGA_MITIGATION pointing_mode
value describe both the sense and the amount of rotation, where
x is P, R, or Y respectively for the Pitch, Roll, or Yaw rotation axes
+ is + for positive rotations, or - for negative rotations # is the angle of
rotation in degrees (5,10,12,20,25).

The value of the SPACECRAFT_ORIENTATION usually corresponds with the [x+#]
description; for example, when SPACECRAFT_POINTING_MODE =
"HGA_MITIGATION_Y+5", usually SPACECRAFT_ORIENTATION = (0,0,5). However,
when Requested Off-nadir Targeted Observations (ROTOs) are performed during an HGA
mitigation maneuver, these two values will appear to show a discrepancy. For example, a ROTO
which returns the spacecraft to true nadir during a HGA mitigation maneuver would be
represented by the keywords SPACECRAFT_POINTING_MODE = "HGA_MITIGATION_R-
10" and SPACECRAFT_ORIENTATION = (0,0,0).

The HGA mitigation solution usually involves a symmetrical series of
discrete rotations, first stepping away from true nadir, then returning.
The following table summarizes the known HGA mitigation maneuvers
throughout the ODY mission:

SPACECRAFT_POINTING_MODE	AXIS	ANGLE	ORBIT_RANGE
HGA_MITIGATION_Y+5	YAW	+5	(15621-15791)
HGA_MITIGATION_Y+12	YAW	+12	(15791-16411)
HGA_MITIGATION_Y+5	YAW	+5	(16411-16559)
HGA_MITIGATION_R-10	ROLL	-10	(32867-?)
HGA_MITIGATION_R-20	ROLL	-20	(?-?)
HGA_MITIGATION_R-25	ROLL	-25	(?-?)
HGA_MITIGATION_R-20	ROLL	-20	(?-?)
HGA_MITIGATION_R-10	ROLL	-10	(?-?)

This keyword requires the accompanying keyword SPACECRAFT_POINTING_MODE_DESC
that also lists and defines the standard values being used by a specific mission.

Impact Assessment:

PDS Standards Reference -- no impact

Archive Preparation Guide -- no impact

Proposer's Archive Guide -- no impact

Planetary Science Data Dictionary – will need to change the MAXIMUM_LENGTH to 25 characters and add the new standard values.

PDS tools – no impact

Existing archives -- no impact

Additional Information:

(none)

Requested Changes:

Update the Planetary Science Data Dictionary as follows:

PDS_VERSION_ID   = PDS3
LABEL_REVISION_NOTE   = "2003-12-16 CN:BJS;
   2009-07-24 IMG:PAG added new HGA* std vals, changed length"

OBJECT   = ELEMENT_DEFINITION
 ELEMENT_NAME   = "spacecraft_pointing_mode"
 BL_NAME   = "scpntngmode"
 DESCRIPTION   = "

The spacecraft_pointing_mode element provides the pointing mode of the
spacecraft. The definition of the modes and the standard values are given
via the SPACECRAFT_POINTING_MODE_DESC element, which shall always accompany
this keyword"

 GENERAL_DATA_TYPE   = "CHARACTER"
 MAXIMUM   = "N/A"
 MINIMUM   = "N/A"
 MAXIMUM_LENGTH   = "~~12~~ 25"
 MINIMUM_LENGTH   = "N/A"
 STANDARD_VALUE_TYPE   = "DYNAMIC"
 STANDARD_VALUE_SET_DESC = "

NADIR - This pointing mode is used to define a pointing to the center of
the target body defined by TARGET_NAME element.

ALONGTRACK - This pointing mode is a derivative of the NADIR pointing
mode but with an offset to the target body center point using an offset in
the flight direction of a spacecraft. The SPACECRAFT_POINTING_MODE_DESC
shall contain either information on the angle in respect to the spacecraft
to target body center line (POSITION_ANGLE, OFFSET_ANGLE) or in respect to
the center of the body (OFFSET_X/Y/Z). In the latter case the reference
frame and the epoch need to be specified.

ACROSSTRACK - This pointing mode is a derivative of the NADIR pointing mode
but with an offset to the target body center point using an offset
perpendicular to the flight direction of the spacecraft. The
SPACECRAFT_POINTING_MODE_DESC shall contain either information on the angle
in respect to the spacecraft to target body center line (POSITION_ANGLE,
OFFSET_ANGLE) or in respect to the center of the body (OFFSET_X/Y/Z). In
the latter case the reference frame and the epoch needs to be specified.

INERT - This pointing mode is used to define a pointing in an inertial
reference frame. In principle the pointing may be considered constant
during the observation. It is either possible to define an explicit
pointing direction or a celestial object. The
SPACECRAFT_POINTING_MODE_DESC shall contain information either on the
object that is pointed to or the position (RA,DEC). In the latter case the
reference frame and epoch of the celestial direction shall be given, e.g.
Earth Mean Equatorial (EME) at J2000.

LIMB - This pointing mode is used to specify a point on the limb of the
target body. The limb is defined as the contour of the target body as seen
from the spacecraft. To specify a position on the limb two methods may be
used. The first method computes the two limb points of a target object
using the rotation of the target body. To specify a single point it is
necessary to define if the ascending node or the descending node should be
used. The second method defines a point on the limb using a position angle.
One of these methods shall be described in the

OFF-NADIR - The OFF-NADIR pointing mode is invoked when the spacecraft rotates away
from nadir to perform a Requested Off-nadir Targeted Observation (ROTO). Routine ROTO
observations started in orbit 32214 for ODY; the value of the SPACECRAFT_ORIENTATION
keyword describes the ROTO rotation.

HGA_MITIGATION_[x+#] - In order to mitigate potential communication problems, the ODY
spacecraft has performed several rotation maneuvers to reorient the High Gain Antenna(HGA).
The last few characters [x+#] of the HGA_MITIGATION pointing_mode value describe both the
sense and the amount of rotation, where x is P, R, or Y respectively for the Pitch, Roll, or Yaw
rotation axes + is + for positive rotations, or - for negative rotations
is the angle of rotation in degrees (5,10,12,20,25).

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SPACECRAFT_POINTING_MODE element."

  KEYWORD_DEFAULT_VALUE             = "N/A"
  UNIT_ID                           = "N/A"
  SOURCE_NAME                       = "Joe Zender, ESA"
  FORMATION_RULE_DESC               = "N/A"
  OBJECT                            = ELEMENT_STANDARD_VALUE
    COLUMN_VALUE                    = "ACROSSTRACK"
    COLUMN_VALUE_TYPE               = "A"
    COLUMN_VALUE_NODE_ID            = "U"
    OUTPUT_FLAG                     = "Y"
  END_OBJECT                        = ELEMENT_STANDARD_VALUE

  OBJECT                            = ELEMENT_STANDARD_VALUE
    COLUMN_VALUE                    = "ALONGTRACK"
    COLUMN_VALUE_TYPE               = "A"
    COLUMN_VALUE_NODE_ID            = "U"
    OUTPUT_FLAG                     = "Y"
  END_OBJECT                        = ELEMENT_STANDARD_VALUE

  OBJECT                            = ELEMENT_STANDARD_VALUE
    COLUMN_VALUE                    = "HGA_MITIGATION_R-10"
    COLUMN_VALUE_TYPE               = "A"
    COLUMN_VALUE_NODE_ID            = "U"
    OUTPUT_FLAG                     = "Y"
  END_OBJECT                        = ELEMENT_STANDARD_VALUE

  OBJECT                            = ELEMENT_STANDARD_VALUE
    COLUMN_VALUE                    = "HGA_MITIGATION_R-20"
    COLUMN_VALUE_TYPE               = "A"
    COLUMN_VALUE_NODE_ID            = "U"
    OUTPUT_FLAG                     = "Y"
  END_OBJECT                        = ELEMENT_STANDARD_VALUE

  OBJECT                            = ELEMENT_STANDARD_VALUE
    COLUMN_VALUE                    = "HGA_MITIGATION_R-25"
    COLUMN_VALUE_TYPE               = "A"
    COLUMN_VALUE_NODE_ID            = "U"
    OUTPUT_FLAG                     = "Y"
  END_OBJECT                        = ELEMENT_STANDARD_VALUE

  OBJECT                            = ELEMENT_STANDARD_VALUE
    COLUMN_VALUE                    = "HGA_MITIGATION_Y+12"
    COLUMN_VALUE_TYPE               = "A"
    COLUMN_VALUE_NODE_ID            = "U"
    OUTPUT_FLAG                     = "Y"
  END_OBJECT                        = ELEMENT_STANDARD_VALUE

  OBJECT                            = ELEMENT_STANDARD_VALUE
    COLUMN_VALUE                    = "HGA_MITIGATION_Y+5"
    COLUMN_VALUE_TYPE               = "A"
    COLUMN_VALUE_NODE_ID            = "U"
    OUTPUT_FLAG                     = "Y"
  END_OBJECT                        = ELEMENT_STANDARD_VALUE
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OBJECT                         = ELEMENT_STANDARD_VALUE
  COLUMN_VALUE                 = "INERT"
  COLUMN_VALUE_TYPE            = "A"
  COLUMN_VALUE_NODE_ID         = "U"
  OUTPUT_FLAG                  = "Y"
END_OBJECT                     = ELEMENT_STANDARD_VALUE

OBJECT                         = ELEMENT_STANDARD_VALUE
  COLUMN_VALUE                 = "LIMB"
  COLUMN_VALUE_TYPE            = "A"
  COLUMN_VALUE_NODE_ID         = "U"
  OUTPUT_FLAG                  = "Y"
END_OBJECT                     = ELEMENT_STANDARD_VALUE

OBJECT                         = ELEMENT_STANDARD_VALUE
  COLUMN_VALUE                 = "NADIR"
  COLUMN_VALUE_TYPE            = "A"
  COLUMN_VALUE_NODE_ID         = "U"
  OUTPUT_FLAG                  = "Y"
END_OBJECT                     = ELEMENT_STANDARD_VALUE

OBJECT                         = ELEMENT_STANDARD_VALUE
  COLUMN_VALUE                 = "OFF_NADIR"
  COLUMN_VALUE_TYPE            = "A"
  COLUMN_VALUE_NODE_ID         = "U"
  OUTPUT_FLAG                  = "Y"
END_OBJECT                     = ELEMENT_STANDARD_VALUE

OBJECT                         = ELEMENT_STANDARD_VALUE
  COLUMN_VALUE                 = "TRACKING"
  COLUMN_VALUE_TYPE            = "A"
  COLUMN_VALUE_NODE_ID         = "U"
  OUTPUT_FLAG                  = "Y"
END_OBJECT                     = ELEMENT_STANDARD_VALUE

SYSTEM_CLASSIFICATION_ID       = "COMMON"
  GENERAL_CLASSIFICATION_TYPE  = "GEOMETRY"
  CHANGE_DATE                  = "2009-07-24"
  STATUS_TYPE                  = "APPROVED"
  STANDARD_VALUE_OUTPUT_FLAG   = "Y"
  TEXT_FLAG                    = "N"
  TERSE_NAME                   = "scpntngmode"
  SQL_FORMAT                   = "CHAR(25)"
  BL_SQL_FORMAT                = "char(25)"
  DISPLAY_FORMAT               = "JUSTLEFT"
  AVAILABLE_VALUE_TYPE         = "N"
END_OBJECT                     = ELEMENT_DEFINITION
END
```