

MHS Level 1 Product Format Specification

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Issue 6 Rev 2	02/05/2002		- moved field descriptions into main document from Annex - added flags and flag descriptions in coherence with PGS
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			- Updated use of VEADRs and GEADRs in line with latest issue of [AD-1] - Corrected reference in header from 97228 to 97229
Issue 6 Rev 4	13/11/2002	EUM.EPS.SYS.D CR.02.168	- Updated Annex - Removed SPHR from Section 5 occurrence information - Moved 3.1.1.1 INSTRUMENT_STATUS description to MDR field descriptions - Deleted Section 3.1.1 - Updated Section 3.1 and 4.1 to have no SPHR occurrence - Added Section 6 Record Format Version Control - Added MDR subclass values to create unique GRHs (as per GPFS) - CHANNEL_QUALITY renamed to CALIBRATION_QUALITY consistent with other ATOVS PFSS - Moved details for CHANNEL_VALID and GAIN_CODE from Annex to main text for clarity
	10/02/03	EUM.EPS.SYS.D CR.02.229	- Reversed bit orders to match GPFS in tables for STATUS_WORD, SWITCH_STATUS, TELECOM_ACKN_FAULT and MODE_SUBCOMM_CODE - Updated signature table - Updated Annex
Issue 6 Rev 5	12/03/04	EUM.EPS.SYS.D CR.04.014	- Added information for new record GIADR-ADCONV and for the fields within this record - Corrected definition of bits for MODE_SUBCOMM_MODE - Corrected definition of bits for TELECOMM_ACKN_FAULT

<i>Issue / Revision</i>	<i>Date</i>	<i>DCN. No</i>	<i>Changed Pages / Paragraphs</i>
			• Clarified definition of bits for SWITCH_STATUS • Added definition of THERMISTOR_CHANNELS bits • Added clarification of bits for STATUS_WORD • Added Lunar Contamination flags to SCAN_LINE_QUALITY • Extended definitions of bits for CALIBRATION_QUALITY • Corrected FOV_DATA_QUALITY bit definition for MDR-1A and added definition for MDR-1B • Extended defiend bits for NAVIGATION_STATUS • Deleted description for INSTRUMENT_STATUS • Corrected channel names for CHANNEL_VALID and GAIN_CODE • Added EARTH_VIEW_POSITION_FLAG definitions • Added SPACE_VIEW_POISITION_FLAG definitions • Added OBCT_VIEW_POISITION_FLAG definitions • Added TELEMETRY_UPDATE definitions • Added GIADR-ADCONV to Occurrence Table • Updated Record Subclass Version Numbers
v7A	22/07/08		Migrated into Hummingbird. Body contents copied into standard template. Editorial updates – formatting, signature table updated.
v7B	09/09/08		• Added Appendix A with hyperlink referring to Annex. • Section 1.1: deleted reference to AD-3 (no longer present since relevant information now in AD-1). • Editorial edits – typos, standardisation, use of auto referencing for document and section references.

<i>Issue / Revision</i>	<i>Date</i>	<i>DCN. No</i>	<i>Changed Pages / Paragraphs</i>
v7C	11/12/08	EPS_AB_DCR_EUM_77	• MODE_SUBCOMM_CODE - typo in table. • TELEMETRY_UPDATE - references to bit '15' replaced by '31'. • Bit order in tables for TELECOMM_ACKN_FAULT, STATUS WORD, CHANNEL_VALID, GAIN_CODE reordered high to low.
v7D	07/07/11	ODT_DCR_155	• Added record subclass info.
		ODT_DCR_240	• Annex: Worksheets MDR-1A & MDR-1B, field ANGULAR_RELATION: Added Description note on azimuth angle range.
		OPS_ECPD_299 to be approved, then make DOCET	• Field CALIBRATION_QUALITY replaced by compound data type DATA_CALIBRATION. Annex: Updates to MDR-1A & MDR-1B, and new worksheet COMPOUNDS (see Annex for full details).
v7E	11/04/13	EPS_DOCET_228	• Changed the specifications for the 16-bit field 'CALIBRATION_QUALITY' (old section 3.5.1.13). Subdivided this into an 8-bit unsigned integer (u-byte) called 'NEDT_VALUE' and an 8-bit bit string (bitst(8)) called 'CALIBRATION_QUALITY'.
	20/06/13		• New version of document created to maintain version continuity with previous document. Previous document 211326 given invalid document reference by DM tool.

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1 INTRODUCTION

1.1 Purpose and Scope

This document is the Microwave Humidity Sounder (MHS) Level 1 Product Format Specification.

The generic product format specification used by this document is defined in the EPS Generic Product Format Specification [AD 1].

1.2 Structure of the Document

The document is organised in the following sections, including the introduction:

Section 1	Provides the scope of the document.
Section 2	Details the product formats for Level 1 products.
Sections 3-4	Describe the instrument and level-specific records for Level 1a and 1b products.
Section 5	details the occurrence rates of the various records within Level 1 products
Sections 6	Provides a history of version numbers for records defined within the document.
Appendix A	Provides links to detailed tables describing the record formats.

1.3 Applicable Documents

AD 1	EPS Generic Product Format Specification	EPS/GGS/SPE/96167
AD 2	EPS Ground Segment AVHRR/3 Level 1 Product Generation Specification	EPS/SYS/SPE/990007

1.4 Acronyms and Abbreviations Used in this Document

Acronym	Meaning
AMSU-A	Advanced Microwave Sounding Unit-A
GEADR	Global External Auxiliary Data Record
GIADR	Global Internal Auxiliary Data Record
MHS	Microwave Humidity Sounder
MDR	Measurement Data Record
NEdT	Noise Equivalent Delta Temperature
VEADR	Variable External Auxiliary Data Records
VIADR	Variable Internal Auxiliary Data Records

2 FORMAT OF MHS LEVEL 1 PRODUCTS

2.1 Overview

The product format for both MHS Level 1a and 1b products is based on the generic product format as described in [AD 1]. This document details the instrument-specific and level-specific additions required for MHS Level 1 products.

2.2 Generic Record Header Fields

All generic record header fields of the instrument/level specific records defined in this document shall have an INSTRUMENT_GROUP value of MHS [AD 2].

3 LEVEL 1A

3.1 Secondary Product Header Record

There is no SPHR defined for the MHS Level 1a product.

3.2 Global External Auxiliary Data Record

The global auxiliary datasets that are used by the Level 1a PGF (described in [AD 1]) but not written into the product are referenced by GEADRs as specified in [AD 2].

3.2.1 Record Subclasses

The following subclasses of GEADR are present for the MHS Level 1a product.

<i>Subclass</i>	<i>Description</i>	<i>Subclass ID</i>
MHSx_CAL	Calibration and configuration parameters	1
xxxx_BIT	Land/sea/coast database	2
xxxx_TOP	Topography database	3

Table 1: GEADR Level 1a subclasses

3.3 Global Internal Auxiliary Data Record

There are three subclasses of GIADR for the Level 1a Product. These are detailed in Appendix A of this document.

3.3.1 Record Subclasses

Record subclass determines the type of auxiliary data referenced.

<i>Subclass</i>	<i>Description</i>	<i>Subclass ID</i>
GIADR NAVIGATION	Earth View Telemetry	1
GIADR RADIANCES	Radiance Conversion Telemetry	2
GIADR ADCONV	Conversion Coefficients for the Digital Telemetry	3

Table 2: GIADR subclasses

3.3.2 GIADR Fields

3.3.2.1 RFI_BIAS_CORRECTION

<i>Value</i>	<i>Meaning</i>
1	H1, FOV 1, STX_1
2	H2, FOV 1, STX_1
3	H3, FOV 1, STX_1
4	H4, FOV 1, STX_1
5	H5, FOV 1, STX_1
6	H1, FOV 5, STX_1
...	
...	(channel values for FOVs 5, 10, 15, 20, ... 90)
...	
95	H5, FOV 90, STX_1
96	H1, space view, STX_1
...	
100	H5, space view, STX_1
101	H1, OBCT view, STX_1
...	
105	H5, OBCT view, STX_1
106	H1, FOV 1, STX_2
...	
210	H5, OBCT view, STX_2
211	H1, FOV 1, STX_3
...	
315	H5, OBCT view, STX_3
316	H1, FOV 1, SARR
...	
420	H5, OBCT view, SARR

Table 3: RFI_BIAS_CORRECTION word definitions

3.3.2.2 TRANSMITTER_POWER

Mean power at the time bias corrections were derived. Range is 0-255, representing analogue voltages from 0-5.1 V.

<i>Value</i>	<i>Meaning</i>
1	STX_1
2	STX_2
3	STX_3
4	SARR

Table 4: TRANSMITTER_POWER word definitions

3.3.2.3 NEW_BIAS_CORRECTION

<i>Value</i>	<i>Meaning</i>
1	H1, FOV 1, cycle 1
2	H2, FOV 1, cycle 1
3	H3, FOV 1, cycle 1
4	H4, FOV 1, cycle 1
5	H5, FOV 1, cycle 1
6	H1, FOV 3, cycle 1
...	
...	(channel values for FOVs 3, 6, 9, 12, ..., 90)
...	
155	H5, FOV 90, cycle 1
156	H1, space view, cycle 1
...	
160	H5, space view, cycle 1
161	H1, OBCT view, cycle 1
...	
165	H5, OBCT view, cycle 1
166	H1, FOV 1, cycle 2
...	
330	H5, OBCT view, cycle 2
331	H1, FOV 1, cycle 3
...	
495	H5, OBCT view, cycle 3

Table 5: NEW_BIAS_CORRECTION word definitions

3.4 Variable External and Internal Auxiliary Data Records

There are no VEADRs or VIADRs defined for the MHS Level 1a product.

3.5 Measurement Data Record

The MDR contains, per scan line, scene counts and calibration counts from cold space and warm target views. The MDR is detailed in the Annex (Appendix A) to this document.

3.5.1 Record Subclasses

There is one subclass of MDR for the Level 1a product.

<i>Subclass</i>	<i>Description</i>	<i>Subclass ID</i>
MDR-1A	Level 1A MDR	1

Table 6: MDR Level 1a subclasses

3.5.2 MDR Fields

3.5.2.1 HK TELEMETRY

3.5.2.1.1 *MODE_SUBCOMM_CODE*

<i>Bit</i>	<i>Meaning</i>	
Bits 7-4	SD3	1 mode cod
	Power-on	0000
	Warm-up	0001
	Standby	0010
	Scan	0011
	Fixed-view	0100
	Self-test	0101
	Safeing	0110
	Fault	0111
	Unused	1000 and 1110
	Memory Data Packet ID	1111
Bit 3	SD3: 2 PIE ID 0: PIE A 1: PIE B	
Bit 2-0	SD3:3 Sub-commutation code (indicates which set of thermistor telemetry data is included in this scan)	

Table 7: *MODE_SUBCOMM_CODE* bit string definitions

3.5.2.1.2 TELECOMM_ACKN_FAULT

Word (bytes)	Bit	Meaning
1 (bytes 0 and 1)	15	SD4:1 TC Clean (set to 1 if a parity or checksum is not found in the packet)
	14	SD4:2 TC Conforms (Set to 1 if the header of the received command conforms to CCSDS format)
	13	SD4:3 TC recognised flag (Set to 1 if received command is recognised MHS command)
	12	SD4:4 TC Legal flag (set if received command is legal for execution in the current MHS operation mode)
	11	SD5:9 FDM Motor current Trip Status
	10-0	SD4:5 TC Application ID
2 (bytes 2 and 3)	15-2	SD4:TC packet sequence count
	1-0	SD4:7 TC Received count
Byte 4	7	SD5:1 Current Monitor Fault
	6	SD5:2 Thermistor Monitor Fault
	5	SD5:3 Switch fault
	4	SD5:4 Processor Fault
	3	SD5:8 RDM Motor Current Trip Status
	2	SD5:5 DC Offset Error
	1	SD5:6 Scan Control Error
	0	SD5:7 REF ck Error

Table 8: TELECOMM_ACKN_FAULT word/bit string definitions

3.5.2.1.3 SWITCH_STATUS

Word (bytes)	Bit	Meaning
Byte 0	bit 7	Receiver channel H4 backend (0=off,1=on)
	bit 6	Receiver channel H3 backend (0=off,1=on)
	bit 5	Receiver channel H3/H4 local oscillator (0=A,1=B)
	bit 4	Receiver channel H3/H4 front-end (0=off,1=on)
	bit 3	Receiver channel H2 local oscillator (0=A,1=B)
	bit 2	Receiver channel H2 (0=off,1=on)
	bit 1	Receiver channel H1 local oscillator (0=A,1=B)
	bit 0	Receiver channel H1 (0=off,1=on)
Byte 1	bit 7	PROM (1=a PROM segment switch has failed ON)
	bit 6	Signal processing electronics/scan control electronics (0=off, 1=on)
	bit 5	Auxiliary operational heaters (0=off, 1=on)
	bit 4	Scan mechanism operational heaters(0=off, 1=on)
	bit 3	Receiver operational heaters (0=off, 1=on)
	bit 2	Rx CV (0=off, 1=on)
	bit 1	Receiver channel H5 local oscillator (0=A,1=B)
	bit 0	Receiver channel H5 (0=off,1=on)
Byte 2	bit 7	FDM motor current trip status(0=enabled,1=disabled)
	bit 6	RDM motor current trip status(0=enabled,1=disabled)
	bit 5	FDM motor supply (0=off, 1=on)
	bit 4	RDM motor supply (0=off, 1=on)
	bit 3	FDM motor sensors selected (0=A, 1=B)
	bit 2	RDM motor sensors selected (0=A, 1=B)
	bit 1	FDM zero position sensors (0=A, 1=B)
	bit 0	RDM zero position sensors (0=A, 1=B)

Table 9: SWITCH_STATUS word/bit definitions

3.5.2.1.4 *THERMISTOR_TM_CHANNELS*

<i>Value</i>	<i>Meaning</i>
1	LO H1 temperature (used as instrument temperature for LO-B)
2	LO H2 temperature
3	LO H3/H4 temperature
4	LO H5 temperature (used as instrument temperature for LO-A)
5	Mixer/LNA/Multiplexer H1 temperature
6	Mixer/LNA/Multiplexer H2 temperature
7	Mixer/LNA/Multiplexer H3/H4 temperature
8	Mixer/LNA/Multiplexer H5 temperature
9	Quasi-optics baseplate temperature #1 [dichroic D1(A) or polarisator (B)]
10	Quasi-optics baseplate temperature #2 [dichroic D2(A) or mirror (B)]
11	IF baseplate temperature #1
12	IF baseplate temperature #2
13	Scan mechanism core temperature
14	Scan mechanism housing temperature
15	RDM SSHM temperature
16	FDM SSHM temperature
17	Structure 1 temperature (-A edge, next to baseplate cutout)
18	Structure 2 temperature (-A edge, in-between Rx and SM)
19	Structure 3 temperature (-V edge, in-between EE and SM)
20	Processor module temperature
21	Main DC/DC converter module temperature
22	SCE RDM module temperature
23	SCE FDM module temperature
24	RF DC/DC converter temperature

Table 10: THERMISTOR_TM_CHANNELS word definitions

3.5.2.2 STATUS_WORD

Bit	Meaning
bit 7	DC Offset Valid (1 when all channels calibration targets are within acceptable limits)
bit 6	Scan Control Valid (1 if all mid pixel positions of the reflector during Earth, Space OBCT views are within the limits for the Scan Mode profile)
bit 5-4	Profile 00: Profile 0 (nominal scan mode profile with nominal space view position) 01: Profile 1 (alternate space view position 1) 10: Profile 2 (alternate space view position 2) 11: No Profile calculated (profile will be manually loaded and modified)
bits 3-0	0 (unused)

Table 11: STATUS_WORD bit string definitions

3.5.2.2.1 QUALITY_INDICATOR

Bit	Meaning
31	Do not use scan line for product generation
30	Time sequence error detected for this scan
29	Data gap precedes this scan
28	No calibration
27	No Earth location
26	First good time following a clock update
25	Instrument status changed within this scan
24 - 0	Not used

Table 12: QUALITY_INDICATOR bit definitions

3.5.2.2.2 SCAN_LINE_QUALITY

Bit	Meaning
	Time Problem Code (all bits off implies the scan time is as expected)
31-24	Not used
23	Time field is bad but can probably be inferred from the previous good time
22	Time field is bad and can't be inferred from the previous good time
21	This record starts a sequence that is inconsistent with previous times (i.e., there is a time discontinuity). This may or may not be associated with a spacecraft clock update (See bit 26 in QUALITY_INDICATOR Field)
20	Start of a sequence that apparently repeats scan times that have been previously accepted
	Lunar Contamination Problem Code
19-18	Not used
17	Scan line contains one or more space views that are lunar contaminated

<i>Bit</i>	<i>Meaning</i>
16	Lunar-contaminated scan line was able to be calibrated (only applicable if the previous flag [bit 17] is 1; otherwise, zero)
	Calibration Code Problem (Note these bits complement the channel indicators; all bits set to 0 indicates normal calibration.)
15	Scan line was not calibrated because of bad time
14	Scan line was calibrated using fewer than the preferred number of scan lines because of proximity to start or end of data set or to a data gap
13	Scan line was not calibrated because of bad or insufficient PRT data
12	Scan line was calibrated but with marginal PRT data
11	Some uncalibrated channels on this scan. (See channel indicators.)
10	Uncalibrated due to instrument mode.
9	Questionable calibration because of antenna position error of space view
8	Questionable calibration because of antenna position error of black body view
	Earth Location Problem Code (all bits off indicates the Earth location was normal)
7	Not earth located because of bad time; earth location fields zero filled
6	Earth location questionable because of questionable time code. (See time problem flags above.)
5	Earth location questionable – only marginal agreement with reasonableness check.
4	Earth location questionable – fails reasonableness check
3	Earth location questionable because of antenna position check
2 - 0	Not used

Table 13: SCAN_LINE_QUALITY bit definitions

3.5.2.2.3 DATA_CALIBRATION

This is a compound data type. For each channel, it contains information about the actual value of the NEdT and the calibration quality:

<i>Field</i>	<i>Description</i>	<i>SF</i>	<i>Dimension</i>	<i>Type</i>	<i>Type Size</i>	<i>Field Size</i>
NEDT_VALUE	Value of the noise-equivalent temperature	2	1, 1, 1	u-byte	1	1
CALIBRATION_QUALITY	Channel Quality Flags	0	1, 1, 1	bitst(8)	1	1

Table 14: Structure of compound data type DATA_CALIBRATION

The content of the individual fields is defined below:

3.5.2.2.3.1 NEDT_VALUE**Type:** u-byte

There is one word for each channel, with H1 to H5 in order. Each word contains the actual channel-dependent value of NEdT with a scaling factor of 2; values corresponding to NEdTs larger than 2.55 K will be set to 255.

NEdT specifications:

Channel 1	1.0 K
Channel 2	1.0 K
Channel 3	1.0 K
Channel 4	1.0 K
Channel 5	1.0 K

3.5.2.2.4 CALIBRATION_QUALITY**Type:** bitst(8): All bits off implies a good calibration.

There is one word for each channel, with H1 to H5 in order. The meaning for one channel is listed below.

Bit	Meaning
7	Actual NEdT value exceeds specification
6	This scan line is either the last one before or the first one after a sudden, anomalous jump (or drop) in calibration counts
5	No good black body counts for scan line
4	No good space view counts for scan line
3	No good PRTs for this line
2	Some bad black body view counts for this scan line
1	Some bad space view counts for this scan line
0	Some bad PRT temps on this scan line

Table 15: CALIBRATION_QUALITY bit definitions

3.5.2.2.5 FOV_DATA_QUALITY

Bit	Meaning
31	Not used
30	Set if secondary calibration used
29	Moon glint correction done
28-6	Not used
5-1	If bit n set to 1, then counts in channel n are physically unreasonable.
0	Set if all channels are missing

Table 16: FOV_DATA_QUALITY bit definitions

3.5.2.2.6 NAVIGATION_STATUS

Bit	Meaning
31 – 17	Not used
16	Earth location corrected for Euler angles
15 – 12	Earth location indicator 0 = earth location available 1 = user ephemeris files older than 24 hours 2 = no earth location available
11 – 8	Spacecraft attitude control 0 = operating in YGC or NOMINAL mode 1 = operating in another mode 2 = attitude exceeds nominal tolerance 3 = both 1 and 2
7 – 4	Attitude SMODE 0 = NOMINAL mode 1 = rate nulling mode 2 = YGC mode 3 = search mode 4 = coast mode
3 – 0	Attitude mode 0 = NOMINAL mode/no test 1 = yaw axis test in progress 2 = roll axis test in progress 3 = pitch axis test in progress

Table 17: NAVIGATION_STATUS bit string definitions

3.5.2.3 CHANNEL_VALID

Bit	Meaning
7	Channel H1 validity
6	Channel H2 validity
5	Channel H3 validity
4	Channel H4 validity
3	Channel H5 validity (set to 1 when all samples of the channel for this scan revolution lie within the ADC dynamic range)
2-0	SPE Mux Code:
	000 Channel H1 to SPE 6
	001 Channel H2 to SPE 6
	010 Channel H3 to SPE 6
	011 SPE 6 not used
	100 Channel H4 to SPE 6
	101 Channel H5 to SPE 6
	110 and 111: SPE 6 not used

Table 18: CHANNEL_VALID bit string definitions

3.5.2.4 GAIN_CODE

000: 0 dB
001: 1 dB
010: 2 dB
011: 3 dB
1xx: not used

Bit	Meaning
	WORD 1
7-5	Channel H1 Gain
4-2	Channel H2 Gain
1-0	Unused
	WORD 2
7-5	Channel H3 Gain
4-2	Channel H4 Gain
1-0	Unused
	WORD 3
7-5	Channel H5 Gain
4-0	Unused

Table 19: GAIN_CODE bit string definitions

3.5.2.5 POSITION VALIDITY FLAGS

3.5.2.5.1 EARTH_VIEW_POSITION_FLAG

<i>Value</i>	<i>Meaning</i>
1	Position flags for FOV's 1-8 (bits 0-7)
2	Position flags for FOV's 9-16 (bits 0-7)
3	Position flags for FOV's 17-24 (bits 0-7)
4	Position flags for FOV's 25-32 (bits 0-7)
5	Position flags for FOV's 33-40 (bits 0-7)
6	Position flags for FOV's 41-48 (bits 0-7)
7	Position flags for FOV's 49-56 (bits 0-7)
8	Position flags for FOV's 57-64 (bits 0-7)
9	Position flags for FOV's 65-72 (bits 0-7)
10	Position flags for FOV's 73-80 (bits 0-7)
11	Position flags for FOV's 81-88 (bits 0-7)
12	Position flags for FOV's 89-90 (bits 0-1), zero fill (bits 2-7)

Table 20: EARTH_VIEW_POSITION_FLAG word definitions

3.5.2.5.2 SPACE_VIEW_POSITION_FLAG

<i>Bit</i>	<i>Meaning</i>
7-4	Zero fill
3	Position flag for space view 4
2	Position flag for space view 3
1	Position flag for space view 2
0	Position flag for space view 1

Table 21: SPACE_VIEW_POSITION_FLAG bit definitions

3.5.2.5.3 OBCT_VIEW_POSITION_FLAG

Bit	Meaning
7-4	Zero fill
3	Position flag for OBCT view 4
2	Position flag for OBCT view 3
1	Position flag for OBCT view 2
0	Position flag for OBCT view 1

Table 22: OBCT_VIEW_POSITION_FLAG bit definitions

3.5.2.6 TELEMETRY_UPDATE

If bit=0, associated telemetry item is up-to-date. If bit =1, associated telemetry item was not updated during most recent telemetry cycle, possibly due to lost frame. The bits 31 to 4 are filled with zeroes for Metop.

Bit	Meaning
31-13	Zero fill
12	SARR-B power
11	SARR-A power
10	STX-3 power
9	STX-2 power
8	STX-1 power
7	STX-4 status
6	STX-3 status
5	STX-2 status
4	STX-1 status
3	Scan mechanism temperature
2	Electronics equipment temperature
1	Receiver temperature
0	Main bus select status

Table 23: TELEMETRY_UPDATE bit definitions

4 LEVEL 1B

4.1 Secondary Product Header Record

There is no SPHR defined for the MHS Level 1b product.

4.2 Global External Auxiliary Data Record

The global auxiliary datasets that are used by the Level 1b PGF [AD 2] but not written into the product are referenced by GEADRs as specified in [AD 1].

4.2.1 Record Subclasses

The following subclasses of GEADR are present for the MHS Level 1b product.

<i>Subclass</i>	<i>Description</i>	<i>Subclass ID</i>
MHSx_CAL	Calibration and configuration parameters	1

Table 24: GEADR Level 1b subclasses

4.3 Global Internal Auxiliary Data Data Record

There are three subclasses of GIADR for the Level 1b Product. These are detailed in the Annex (Appendix A) to this document. They are identical to the ones defined in Level 1a.

4.4 Variable External and Internal Auxiliary Data Records

There are no VEADRs or VIADRs defined for the MHS Level 1b product.

4.5 Measurement Data Record

The MDR contains, per scan line, scene radiance for channels 16-20 (MHS channels 1 – 5; H1 – H5). The MDR is detailed in the Annex to this document.

4.5.1 Record Subclasses

There is one subclass of MDR for the Level 1b product.

<i>Subclass</i>	<i>Description</i>	<i>Subclass ID</i>
MDR-1B	Level 1B MDR	2

Table 25: MDR Level 1b subclasses

4.5.2 MDR Fields

See Level 1a MDR, apart from the following:

4.5.2.1 FOV_DATA_QUALITY

<i>Bit</i>	<i>Meaning</i>
31	Not used
30	Set if secondary calibration used
29	Moon glint correction done
28-6	Not used
5-1	If bit n set to 1, then radiance in channel n is physically unreasonable or has not been calculated due to calibration problems
0	Set if all channels are missing

Table 26: FOV_DATA_QUALITY bit definitions

5 OCCURRENCE INFORMATION

5.1 Level 1a

<i>Record</i>	<i>Occurrence</i>
MPHR	Once per product
SPHR	No occurrence
GIADR-NAVIGATION	Once per product
GIADR-ADCONV	Once per product
GIADR-RADIANCES	Once per product
MDR-1A	Once per scan line

5.2 Level 1b

<i>Record</i>	<i>Occurrence</i>
MPHR	Once per product
SPHR	No occurrence
GIADR-NAVIGATION	Once per product
GIADR-ADCONV	Once per product
GIADR-RADIANCES	Once per product
MDR-1B	Once per scan line

6 RECORD FORMAT VERSION CONTROL

This section provides version numbers for the records defined within this document.

<i>Record Subclass</i>	<i>Format Version Number</i>	<i>Issue Defined</i>
SPHR	DELETED	6.4
	1	6.3
GIADR-NAVIGATION	3	6.5
	2	6.4
	1	6.3 (CDR)
GIADR-RADIANCE	3	6.5
	2	6.4
	1	6.3 (CDR)
GIADR-ADCONV	1	6.5 (NEW)
MDR-1A	4	7D
	3	6.5
	2	6.4
	1	6.3 (CDR)
MDR-1B	4	7D
	3	6.5
	2	6.4
	1	6.3 (CDR)

Table 27: Record Format Version Numbers

APPENDIX A MHS LEVEL 1 DATA RECORDS DETAILED SPECIFICATIONS

In the following Annex, detailed format specifications for all the Variable Internal and Measurement Data Records in MHS Level 1 products are included:

- GIADR-NAVIGATION
- GIADR-RADIANCE
- GIADR-ADCONV
- MDR-1A
- MDR-1B

This Annex is available from the EUMETSAT help desk as an Excel Spread-sheet. Ask for document reference number:

EPS.MIS.SPE.97229.ANX

This Document	
Title	MHS LEVEL 1 PRODUCT FORMAT SPECIFICATION TABLES
Reference Number	EPS/MIS/SPE/97229
Change Record	
Issue 4 Draft A	Removed orbit vector data from SPH
	Removed ADR 1B - identical to ADR-1A. Renamed ADR-1a to ADR.
Issue 5 Revision 0	Issue for CGS PDR
Issue 5 Revision 1	Revised Issue for CGS PDR
Issue 6 Revision 0	Moved fields of ADR into MDR-1A and MDR 1-B
	Deleted VIADR. Moved contents into MDR-1A and MDR-1B
Issue 6 Revision 1	Deleted old GIADRs and VIADRs
	Completely rewritten MDR-1A and MDR-1B
	Modified SPHR
	Added GIADR_NAVIGATION and GIADR_RADIANCE
Issue 6 Rev 2	Moved long field descriptions into Text-part
Issue 6 Rev 3	Changes to main text
Issue 6 Rev 4	EUM.EPS.SYS.DCR.02.168
	Moved INSTRUMENT_STATUS_FLAG field from SPHR to MDR-1A and MDR-1B
	SPHR has no content. Record deleted.
	EARTH_LOCATION field in MDR-1A and MDR-1B: Scale factor increased to 4. Field type changed to integer4 from integer2
	PRIMARY_CALIBRATION_SECOND_TERM data type changed from integer2 to integer4
	PRIMARY_CALIBRATION_FIRST_TERM data type changed from integer2 to integer4
	PRIMARY_CALIBRATION_ZEROTH_TERM data type changed from integer2 to integer4
	SPARE_CALIBRATION_SECOND_TERM data type changed from integer2 to integer4
	SPARE_CALIBRATION_FIRST_TERM data type changed from integer2 to integer4
	SPARE_CALIBRATION_ZEROTH_TERM data type changed from integer2 to integer4

	EULER_ANGLE scale factor changed to 3 and data type changed to integer2
	TIME_ATTITUDE changed to u-integer4 data type
	SPACECRAFT_ALTITUDE changed to u-integer4 data type
	CALIBRATION_QUALITY array size corrected from 5 x 15 to 5 x 1
	Corrected various field types names from integer*2 to integer2 and integer*4 to integer4
	Corrected various field arrays so that they are ordered correctly
	Updated offset/field size calculations
	ANGULAR_RELATION scale factor changed to 2
	MDR-1A:CHANNEL_QUALITY field renamed to CALIBRATION_QUALITY consistent with other ATOVS PFSS
	MDR-1B: PRT Temps changed to units values of Kelvins consistent with MDR-1A
	MDR: changed instrument types for fields with units of counts, ohms and Kelvins to unsigned
	MDR-1B: Scene radiances data type changed to integer4 and scale factor to 7
	Corrected GAIN_CODE and CHANNEL_VALID field types to bit strings and corrected units to NA. Moved details to main text.
	Corrected array ordering for a number of fields to group channels per FOV and not FOVs per channel
	EUM.EPS.SYS.DCR.02.229
	MDR-1A/1B: Following fields changed scale factor from 0 to 2
	RESISTANCE_SLOPE
	RESISTANCE_OFFSET
	RESISTANCE_PRT_1
	RESISTANCE_PRT_2
	RESISTANCE_PRT_3
	RESISTANCE_PRT_4
	RESISTANCE_PRT_5
	TEMPERATURE_PRT_1
	TEMPERATURE_PRT_2
	TEMPERATURE_PRT_3
	TEMPERATURE_PRT_4
	TEMPERATURE_PRT_5
	GIADR-RADIANCE: Following fields supplied with units:
	NON_LINEAITY_COEFF_T1

	NON_LINEARITY_COEFF_T2
	NON_LINEARITY_COEFF_T3
	MDR-1B: FOV_DATA_QUALITY changed from bitst(16) to bitst(32)
	MDR-1B: SURFACE_PROPERTIES made enumerated type, and description amended in line with MDR-1A
Issue 6 Rev 5	EUM.EPS.SYS.DCR.04.014
	GIADR-NAVIGATION
	MID_PIX_POSITION_ZERO SF changed to 2
	IDEAL_POINTING_ANGLE SF changed to 4
	IDEAL_NADIR_PIXEL SF changed to 2
	IDEAL_OBCT_POSITION SF changed to 2
	IDEAL_SPACE_TGT_POSITION SF changed to 2
	IDEAL_EARTH_PIXEL_POS SF changed to 2
	GIADR-ADCONV
	New Record
	GIADR_RADIANCE
	PRIMARY_REF_RESISTANCES data type changed to integer4
	SECONDARY_REF_RESISTANCES data type changed to integer4
	Field PRIMARY_RES_POL_COEFF_PRT_1 split into 4 fields PRIMARY_RES_POL_COEFF_PRT_1_F0 to PRIMARY_RES_POL_COEFF_PRT_1_F3 with separately specified SF and Units
	Change above also applied to fields PRIMARY_RES_POL_COEFF_PRT_2 to PRIMARY_RES_POL_COEFF_PRT_5 and fields SECONDARY_RES_POL_COEFF_PRT_1 to SECONDARY_RES_POL_COEFF_PRT_5
	Added field INST_TEMPERATURE_SENSOR_ID
	Added field PRIMARY_REF_TEMPERATURES
	Added field BACKUP_REF_TEMPERATURES
	COLD_SPACE_BIAS_CORRECTION array changed to 5 x 3
	COLD_SPACE_BIAS_CORRECTION data type changed to integer2 and SF changed to 3
	Added field WARM_LOAD_BIAS_CORRECTION

	Renamed field NON_LINEARITY_COEFF_T1, T2 and T3 to NON_LINEARITY_COEFF_LOA_T1, T2, T3. Changed array sizes from 90 to 5. Change SF from 2 to 8.
	Added fields NON_LINEARITY_COEFF_LOB_T1 to NON_LINEARITY_COEFF_LOB_T3.
	Added field CENTRAL_WAVENUMBER_H1
	Added field TEMPERATURE_H1_INTERCEPT
	Added field TEMPERATURE_H1_SLOPE
	Added field CENTRAL_WAVENUMBER_H2
	Added field TEMPERATURE_H2_INTERCEPT
	Added field TEMPERATURE_H2_SLOPE
	Added field CENTRAL_WAVENUMBER_H3
	Added field TEMPERATURE_H3_INTERCEPT
	Added field TEMPERATURE_H3_SLOPE
	Added field CENTRAL_WAVENUMBER_H4
	Added field TEMPERATURE_H4_INTERCEPT
	Added field TEMPERATURE_H4_SLOPE
	Added field CENTRAL_WAVENUMBER_H5
	Added field TEMPERATURE_H5_INTERCEPT
	Added field TEMPERATURE_H5_SLOPE
	MDR-1A/1B
	Removed field FILLER
	Added field EARTH_VIEW_POSITION_FLAG
	Added field SPACE_VIEW_POSITION_FLAG
	Added field OBCT_VIEW_POSITION_FLAG
	Changed SF to 3 for fields TEMPERATURE_PRT_1 to TEMPERATURE_PRT_5
	Added field MAIN_BUS
	Added field MHS_SURVIVAL_HEATER
	Added field RF_CONVERTER_PROTECT_DISABLE
	Added field MHS_POWER_A
	Added field MHS_POWER_B
	Added field MAIN_CONVERTER_PROTECT_DISABLE
	Added field SURVIVAL_TEMPS
	Added field TRANSMITTER_TELEM
	Added field TELEMETRY_UPDATE

	Field NONLINEARITY_PARAMETER changed data type to u-integer4 and SF to 8.
	MEAN_WARM_TARGET_RAD changed data type to u-integer4 and SF to 7.
	MEAN_COLD_TARGET_RAD changed data type to u-integer4 and SF to 7.
	Changed data type of MODE_ASUBCOMM_CODE to bitst(8)
	Changed data type of TELECOMM_ACKN_FAULT to bitst(40) and made a scalar
	Changed data type of SWITCH_STATUS to bitst(24) and made a scalar
	Changed data type of STATUS_WORD to bitst(8)
	Added values for field to description of SURFACE_PROPERTIES
	Added link to descriptions of CHANNEL_VALID and GAIN_CODE
	Changed SF of RESISTANCE_SLOPE from 2 to 6
	Deleted field INSTRUMENT_STATUS_FLAG
	Deleted field SLOPE
	MDR-1A
	TIME_ATTITUDE changed array from 90 to scalar value
	NAVIGATION_STATUS changed array from 90 to scalar value
	SPACECRAFT_ALTITUDE changed array from 90 to scalar value
	EULER_ANGLE changed array from 3 x 90 to 3
	Corrected field name DATA_QUALITY_AT_FOV to FOV_DATA_QUALITY and changed array size to 90.
	Corrected description of SCENE_COUNTS, COLD_CALIBRATION_COUNTS and WARM_CALIBRATION_COUNTS
	MDR-1B
	Added field LUNAR_ANGLES
	Field NONLINEARITY_PARAMETER changed array size to 5.
	Corrected description of SCENE_RADIANCES
Version 7A 22/07/08	Migrated into Hummingbird. Contents identical with issue 6.5.
Version 7B 09/09/08	No changes to annex.
Version 7C 11/12/08	No changes to annex.
Version 7D 07/07/11	ODT DCR 240
	MDR-1A & MDR-1B, field ANGULAR_RELATION: Added Description note on azimuth angle range.
	TBD

	New worksheet to describe compound data type DATA_CALQUAL. Also added to Types sheet. MDR-1A & MDR-1B: Field CALIBRATION_QUALITY replaced by DATA_CALIBRATION.
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DATA_CALQUAL									
FIELD	DESCRIPTION	SF	UNITS	DIM1	DIM2	DIM3	TYPE	TYPE SIZE	FIELD SIZE
NEDT_VALUE	Value of the noise equivalent temperature	2	K	1	1	1	u-byte	1	1
CALIBRATION_QUALITY	Channel Quality Flags	0	N/A	1	1	1	bitst(8)	1	1
								SIZE	2

FIELD	DESCRIPTION	SF	UNITS	DIM1	DIM2	DIM3	TYPE	TYPE SIZE	FIELD SIZE	OFFSET
RECORD_HEADER	Generic Record Header	0		1	1	1	REC_HEAD	20	20	0
ANTENNA POSITION PARAMETRS										
MID_PIX_POSITION_INC	Mid Pixel position increment	3	deg	1	1	1	u-integer2	2	2	20
MID_PIX_POSITION_ZERO	Zero Mid Pixel Position equivalent 0 deg = centre of OBCT 180 deg = nadir	2	deg	1	1	1	u-integer2	2	2	22
OUT_OF_SCAN_PLANE_ERROR	tabulated mispointing data for each pixel - out of scan plane errors for 91 positions Earth pixel 1-90 and 118 -5 channels	3	deg	5	91	1	integer2	2	910	24
IN_SCAN_PLANE_ERROR	tabulated mispointing data for each pixel - in scan plane errors for 91 Boresight angles - 5 channels	3	deg	5	91	1	integer2	2	910	934
IDEAL_POINTING_ANGLE	Ideal pointing spacing between two pixels for MHS (nominal 1.1111 deg.)	4	deg	1	1	1	integer2	2	2	1844
MHS POINTING PARAMETERS										
IDEAL_NADIR_PIXEL	Ideal nadir pointing position (180 deg)	2	deg	1	1	1	u-integer2	2	2	1846
IDEAL_OBCT_POSITION	Ideal OBCT Position	2	deg	4	1	1	u-integer2	2	8	1848
IDEAL_SPACE_TGT_POSITION	Ideal Space Target Position	2	deg	4	1	1	u-integer2	2	8	1856

IDEAL_EARTH_PIXEL_POS	Ideal Earth View Position	2	deg	90	1	1	u-integer2	2	180	1864
SIZE OF THE RECORD										2044

FIELD	DESCRIPTION	SF	UNITS	DIM1	DIM2	DIM3	TYPE	TYPE SIZE	FIELD SIZE	OFFSET
RECORD_HEADER	Generic Record Header	0		1	1	1	REC_HEAD	20	20	0
THERMISTOR TELEMETRY CONVERSION										
THERM_TEMP_C0	Zeroth order coefficient for conversion of the 24 housekeeping thermistors	4	K	1	1	1	integer4	4	4	20
THERM_TEMP_C1	First order coefficient for conversion of the 24 housekeeping thermistors	7	K/count	1	1	1	integer4	4	4	24
THERM_TEMP_C2	Second order coefficient for conversion of the 24 housekeeping thermistors	10	K/count^2	1	1	1	integer4	4	4	28
THERM_TEMP_C3	Third order coefficient for conversion of the 24 housekeeping thermistors	12	K/count^3	1	1	1	integer4	4	4	32
THERM_TEMP_C4	Fourth order coefficient for conversion of the 24 housekeeping thermistors	15	K/count^4	1	1	1	integer4	4	4	36
RAW CURRENT CONSUMPTION CONVERSION										
EEANDSM_PLUS5_CURRENT_INTERCEPT	EE and SM +5V Current Intercept	6	A	1	1	1	integer4	4	4	40
EEANDSM_PLUS5_CURRENT_SLOPE	EE and SM +5V Current Slope	6	A/count	1	1	1	integer4	4	4	44
RECEIVER_PLUS8_CURRENT_INTERCEPT	Receiver +8V Current Intercept	6	A	1	1	1	integer4	4	4	48
RECEIVER_PLUS8_CURRENT_SLOPE	Receiver +8V Current Slope	6	A/count	1	1	1	integer4	4	4	52
RECEIVER_PLUS15_CURRENT_INTERCEPT	Receiver +15V Current Intercept	6	A	1	1	1	integer4	4	4	56
RECEIVER_PLUS15_CURRENT_SLOPE	Receiver +15V Current Slope	6	A/count	1	1	1	integer4	4	4	60
RECEIVER_MINUS15_CURRENT_INTERCEPT	Receiver -15V Current Intercept	6	A	1	1	1	integer4	4	4	64
RECEIVER_MINUS15_CURRENT_SLOPE	Receiver -15V Current Slope	6	A/count	1	1	1	integer4	4	4	68
RDM_MOTOR_CURRENT_INTERCEPT	RDM Motor Current Intercept	6	A	1	1	1	integer4	4	4	72
RDM_MOTOR_CURRENT_SLOPE	RDM Motor Current Slope	6	A/count	1	1	1	integer4	4	4	76
FDM_MOTOR_CURRENT_INTERCEPT	FDM Motor Current Intercept	6	A	1	1	1	integer4	4	4	80

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Worksheet: GIADR_RADIANCE

FIELD	DESCRIPTION	SF	UNITS	DIM1	DIM2	DIM3	TYPE	TYPE SIZE	FIELD SIZE	OFFSET
RECORD_HEADER	Generic Record Header	0		1	1	1	REC_HEAD	20	20	0
PRIMARY PRT TEMPERATURE PARAMETERS (PIE-A)										
PRIMARY_REF_RESISTANCES	Reference Resistances for the primary PRT Set (Three channels)	4	Ohms	3	1	1	Integer4	4	12	20
PRIMARY_RES_POL_COEFF_PRT_1_F0	PRT 1 zeroth order resistance-to - temperature conversion	6	K	1	1	1	integer4	4	4	32
PRIMARY_RES_POL_COEFF_PRT_1_F1	PRT 1 first order resistance-to - temperature conversion	6	K/Ohms	1	1	1	integer4	4	4	36
PRIMARY_RES_POL_COEFF_PRT_1_F2	PRT 1 second order resistance-to - temperature conversion	10	K/Ohms**2	1	1	1	integer4	4	4	40
PRIMARY_RES_POL_COEFF_PRT_1_F3	PRT 1 third order resistance-to - temperature conversion	13	K/Ohms**3	1	1	1	integer4	4	4	44
PRIMARY_RES_POL_COEFF_PRT_2_F0	PRT 2 zeroth order resistance-to - temperature conversion	6	K	1	1	1	integer4	4	4	48
PRIMARY_RES_POL_COEFF_PRT_2_F1	PRT 2 first order resistance-to - temperature conversion	6	K/Ohms	1	1	1	integer4	4	4	52
PRIMARY_RES_POL_COEFF_PRT_2_F2	PRT 2 second order resistance-to - temperature conversion	10	K/Ohms**2	1	1	1	integer4	4	4	56
PRIMARY_RES_POL_COEFF_PRT_2_F3	PRT 2 third order resistance-to - temperature conversion	13	K/Ohms**3	1	1	1	integer4	4	4	60
PRIMARY_RES_POL_COEFF_PRT_3_F0	PRT 3 zeroth order resistance-to - temperature conversion	6	K	1	1	1	integer4	4	4	64
PRIMARY_RES_POL_COEFF_PRT_3_F1	PRT 3 first order resistance-to - temperature conversion	6	K/Ohms	1	1	1	integer4	4	4	68
PRIMARY_RES_POL_COEFF_PRT_3_F2	PRT 3 second order resistance-to - temperature conversion	10	K/Ohms**2	1	1	1	integer4	4	4	72
PRIMARY_RES_POL_COEFF_PRT_3_F3	PRT 3 third order resistance-to - temperature conversion	13	K/Ohms**3	1	1	1	integer4	4	4	76
PRIMARY_RES_POL_COEFF_PRT_4_F0	PRT 4 zeroth order resistance-to - temperature conversion	6	K	1	1	1	integer4	4	4	80
PRIMARY_RES_POL_COEFF_PRT_4_F1	PRT 4 first order resistance-to - temperature conversion	6	K/Ohms	1	1	1	integer4	4	4	84

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Worksheet: GIADR_RADIANCE

PRIMARY_RES_POL_COEFF_PRT_4_F2	PRT 4 second order resistance-to - temperature conversion	10	K/Ohms**2	1	1	1	integer4	4	4	88
PRIMARY_RES_POL_COEFF_PRT_4_F3	PRT 4 third order resistance-to - temperature conversion	13	K/Ohms**3	1	1	1	integer4	4	4	92
PRIMARY_RES_POL_COEFF_PRT_5_F0	PRT 5 zeroth order resistance-to - temperature conversion	6	K	1	1	1	integer4	4	4	96
PRIMARY_RES_POL_COEFF_PRT_5_F1	PRT 5 first order resistance-to - temperature conversion	6	K/Ohms	1	1	1	integer4	4	4	100
PRIMARY_RES_POL_COEFF_PRT_5_F2	PRT 5 second order resistance-to - temperature conversion	10	K/Ohms**2	1	1	1	integer4	4	4	104
PRIMARY_RES_POL_COEFF_PRT_5_F3	PRT 5 third order resistance-to - temperature conversion	13	K/Ohms**3	1	1	1	integer4	4	4	108
PRIMARY_PRT_WEIGHTS	PRT weighting coefficients (1 = PRT ok, 0 = bad PRT, 2 = Central PRT ok)	0	NA	5	1	1	integer2	2	10	112
SECONDARY PRT TEMPERATURE PARAMETERS (PIE-B)										
SECONDARY_REF_RESISTANCES	Reference Resistances for the secondary PRT Set	4	Ohms	3	1	1	integer4	4	12	122
SECONDARY_RES_POL_COEFF_PRT_1_F0	PRT 1 zeroth order resistance-to - temperature conversion	6	K	1	1	1	integer4	4	4	134
SECONDARY_RES_POL_COEFF_PRT_1_F1	PRT 1 first order resistance-to - temperature conversion	6	K/Ohms	1	1	1	integer4	4	4	138
SECONDARY_RES_POL_COEFF_PRT_1_F2	PRT 1 second order resistance-to - temperature conversion	10	K/Ohms**2	1	1	1	integer4	4	4	142
SECONDARY_RES_POL_COEFF_PRT_1_F3	PRT 1 third order resistance-to - temperature conversion	13	K/Ohms**3	1	1	1	integer4	4	4	146
SECONDARY_RES_POL_COEFF_PRT_2_F0	PRT 2 zeroth order resistance-to - temperature conversion	6	K	1	1	1	integer4	4	4	150
SECONDARY_RES_POL_COEFF_PRT_2_F1	PRT 2 first order resistance-to - temperature conversion	6	K/Ohms	1	1	1	integer4	4	4	154
SECONDARY_RES_POL_COEFF_PRT_2_F2	PRT 2 second order resistance-to - temperature conversion	10	K/Ohms**2	1	1	1	integer4	4	4	158
SECONDARY_RES_POL_COEFF_PRT_2_F3	PRT 2 third order resistance-to - temperature conversion	13	K/Ohms**3	1	1	1	integer4	4	4	162
SECONDARY_RES_POL_COEFF_PRT_3_F0	PRT 3 zeroth order resistance-to - temperature conversion	6	K	1	1	1	integer4	4	4	166

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Worksheet: GIADR_RADIANCE

SECONDARY_RES_POL_COEFF_PRT_3_F1	PRT 3 first order resistance-to - temperature conversion	6	K/Ohms	1	1	1	integer4	4	4	170
SECONDARY_RES_POL_COEFF_PRT_3_F2	PRT 3 second order resistance-to - temperature conversion	10	K/Ohms**2	1	1	1	integer4	4	4	174
SECONDARY_RES_POL_COEFF_PRT_3_F3	PRT 3 third order resistance-to - temperature conversion	13	K/Ohms**3	1	1	1	integer4	4	4	178
SECONDARY_RES_POL_COEFF_PRT_4_F0	PRT 4 zeroth order resistance-to - temperature conversion	6	K	1	1	1	integer4	4	4	182
SECONDARY_RES_POL_COEFF_PRT_4_F1	PRT 4 first order resistance-to - temperature conversion	6	K/Ohms	1	1	1	integer4	4	4	186
SECONDARY_RES_POL_COEFF_PRT_4_F2	PRT 4 second order resistance-to - temperature conversion	10	K/Ohms**2	1	1	1	integer4	4	4	190
SECONDARY_RES_POL_COEFF_PRT_4_F3	PRT 4 third order resistance-to - temperature conversion	13	K/Ohms**3	1	1	1	integer4	4	4	194
SECONDARY_RES_POL_COEFF_PRT_5_F0	PRT 5 zeroth order resistance-to - temperature conversion	6	K	1	1	1	integer4	4	4	198
SECONDARY_RES_POL_COEFF_PRT_5_F1	PRT 5 first order resistance-to - temperature conversion	6	K/Ohms	1	1	1	integer4	4	4	202
SECONDARY_RES_POL_COEFF_PRT_5_F2	PRT 5 second order resistance-to - temperature conversion	10	K/Ohms**2	1	1	1	integer4	4	4	206
SECONDARY_RES_POL_COEFF_PRT_5_F3	PRT 5 third order resistance-to - temperature conversion	13	K/Ohms**3	1	1	1	integer4	4	4	210
SECONDARY_PRT_WEIGHTS	PRT weighting coefficients (1 = PRT ok, 0 = bad PRT, 2 = Central PRT ok)	0	NA	5	1	1	integer2	2	10	214
INSTRUMENT TEMPERATURE										
INST_TEMPERATURE_SENSOR_ID	Instrument sensor ID; 0=primary (H5 LO temperature [QBS5]), 1=backup (H1 LO temperature [QBS1])	0	NA	1	1	1	integer2	2	2	224
PRIMARY_REF_TEMPERATURES	Primary reference temperatures (from QBS5, minimum,nominal,and maximum)	2	K	3	1	1	integer2	2	6	226
BACKUP_REF_TEMPERATURES	Backup reference temperatures (from QBS1, minimum,nominal,and maximum)	2	K	3	1	1	integer2	2	6	232

COLD SPACE BIAS CORRECTION											
COLD_SPACE_BIAS_CORRECTION	Cold Space Bias correction term, due to spacecraft and limb contamination (5 channels, 3 profiles)	3	K	5	3	1	integer2	2	30	238	
WARM LOAD BIAS CORRECTION											
WARM_LOAD_BIAS_CORRECTION	Warm load correction term, (5 channels, 3 instrument temperatures [minimum, nominal, maximum])	3	K	5	3	1	integer2	2	30	268	
NON LINEARITY CORRECTION PARAMETERS (LO-A)											
NON_LINEARITY_COEFF_LOA_T1	a(n), scan dependent non linearity parameter at instrument temperature T1 (minimum temperature)	8	m**2 sr cm**-1/mW	5	1	1	integer4	4	20	298	
NON_LINEARITY_COEFF_LOA_T2	a(n), scan dependent non linearity parameter at instrument temperature T2 (nominal temperature)	8	m**2 sr cm**-1/mW	5	1	1	integer4	4	20	318	
NON_LINEARITY_COEFF_LOA_T3	a(n), scan dependent non linearity parameter at instrument temperature T3 (maximum temperature)	8	m**2 sr cm**-1/mW	5	1	1	integer4	4	20	338	
NON LINEARITY CORRECTION PARAMETERS (LO-B)											
NON_LINEARITY_COEFF_LOB_T1	a(n), scan dependent non linearity parameter at instrument backup temperature T1 (minimum temperature)	8	m**2 sr cm**-1/mW	5	1	1	integer4	4	20	358	
NON_LINEARITY_COEFF_LOB_T2	a(n), scan dependent non linearity parameter at instrument backup temperature T2 (nominal temperature)	8	m**2 sr cm**-1/mW	5	1	1	integer4	4	20	378	

NON_LINEARITY_COEFF_LOB_T3	a(n), scan dependent non linearity parameter at backup instrument temperature T3 (maximum temperature)	8	m**2 sr cm**-1/mW	5	1	1	integer4	4	20	398
TEMPERATURE-RADIANCE CONVERSION										
CENTRAL_WAVENUMBER_H1	Channel H1 Central wavenumber	6	cm**-1	1	1	1	integer4	4	4	418
TEMPERATURE_H1_INTERCEPT	Intercept for band correction channel H1	6	K	1	1	1	integer4	4	4	422
TEMPERATURE_H1_SLOPE	Slope for band correction channel H1	6	K/K	1	1	1	integer4	4	4	426
CENTRAL_WAVENUMBER_H2	Channel H2 Central wavenumber	6	cm**-1	1	1	1	integer4	4	4	430
TEMPERATURE_H2_INTERCEPT	Intercept for band correction channel H2	6	K	1	1	1	integer4	4	4	434
TEMPERATURE_H2_SLOPE	Slope for band correction channel H2	6	K/K	1	1	1	integer4	4	4	438
CENTRAL_WAVENUMBER_H3	Channel H3 Central wavenumber	6	cm**-1	1	1	1	integer4	4	4	442
TEMPERATURE_H3_INTERCEPT	Intercept for band correction channel H3	6	K	1	1	1	integer4	4	4	446
TEMPERATURE_H3_SLOPE	Slope for band correction channel H3	6	K/K	1	1	1	integer4	4	4	450
CENTRAL_WAVENUMBER_H4	Channel H4 Central wavenumber	6	cm**-1	1	1	1	integer4	4	4	454
TEMPERATURE_H4_INTERCEPT	Intercept for band correction channel H4	6	K	1	1	1	integer4	4	4	458
TEMPERATURE_H4_SLOPE	Slope for band correction channel H4	6	K/K	1	1	1	integer4	4	4	462
CENTRAL_WAVENUMBER_H5	Channel H5 Central wavenumber	6	cm**-1	1	1	1	integer4	4	4	466
TEMPERATURE_H5_INTERCEPT	Intercept for band correction channel H5	6	K	1	1	1	integer4	4	4	470
TEMPERATURE_H5_SLOPE	Slope for band correction channel H5	6	K/K	1	1	1	integer4	4	4	474
SIZE OF THE RECORD										478

FIELD	DESCRIPTION	SF	UNITS	DIM1	DIM2	DIM3	TYPE	TYPE SIZE	FIELD SIZE	OFFSET
RECORD_HEADER	Generic Record Header	0		1	1	1	REC_HEAD	20	20	0
GENERIC QUALITY INDICATORS										
DEGRADED_INST_MDR	Quality of MDR has been degraded from nominal due to an instrument degradation	NA	NA	1	1	1	boolean	1	1	20
DEGRADED_PROC_MDR	Quality of MDR has been degraded from nominal due to a processing degradation	NA	NA	1	1	1	boolean	1	1	21
SOURCE PACKET SECONDARY HEADER										
UTC_SL_TIME_DAY	UTC SL Time (# of days w.r.t. 171/2000 (day 0))	0	NA	1	1	1	u-integer2	2	2	22
UTC_SL_TIME_MS	Millisecond of the day	0	ms	1	1	1	u-integer4	4	4	24
UTC_SL_TIME_MICROSEC	Microseconds of the day	0	microsec.	1	1	1	u-integer2	2	2	28
MHS ANCILLARY DATA										
OB_ICU_TIME_INT	Onboard ICU Time Integer part	0	NA	1	1	1	bitst(24)	3	3	30
OB_ICU_TIME_FRAC	Onboard ICU Time Fractional Part	0	NA	1	1	1	byte	1	1	33
FULL HK DATA										
MODE_SUBCOMM_CODE	Mode and Sub-Commutation Code (see text part)	0	NA	1	1	1	bitst(8)	1	1	34
TELECOMM_ACKN_FAULT	Telecommand Acknowledgement and Fault-Code (see text)	0	NA	1	1	1	bitst(40)	5	5	35
SWITCH_STATUS	Switch Status (see text)	0	NA	1	1	1	bitst(24)	3	3	40
THERMISTOR_TM_CHANNELS	Thermistor TM Channels 1 to 24 (see text)	0	NA	24	1	1	byte	1	24	43
5V_SEC_CURRENT	(EE and SM +5V) Secondary Current	0	counts	1	1	1	u-byte	1	1	67
8V_RECEIVER_CURRENT	(+8V) Receiver Current	0	counts	1	1	1	u-byte	1	1	68
15V_RECEIVER_CURRENT	(+15V) Receiver Current	0	counts	1	1	1	u-byte	1	1	69
M15V_RECEIVER_CURRENT	(-15V) Receiver Current	0	counts	1	1	1	u-byte	1	1	70
RDM_MOTOR_CURRENT	RDM Motor Current	0	counts	1	1	1	u-byte	1	1	71
FDM_MOTOR_CURRENT	FDM Motor Current	0	counts	1	1	1	u-byte	1	1	72
STATUS WORD										

STATUS_WORD	(See text)	0	counts	1	1	1	bitst(8)	1	1	73
SIGNAL PROCESSING STATUS										
CHANNEL_H1_DC_OFFSET	Channel H1 DC offset word	0	counts	1	1	1	u-byte	1	1	74
CHANNEL_H2_DC_OFFSET	Channel H2 DC offset word	0	counts	1	1	1	u-byte	1	1	75
CHANNEL_H3_DC_OFFSET	Channel H3 DC offset word	0	counts	1	1	1	u-byte	1	1	76
CHANNEL_H4_DC_OFFSET	Channel H4 DC offset word	0	counts	1	1	1	u-byte	1	1	77
CHANNEL_H5_DC_OFFSET	Channel H5 DC offset word	0	counts	1	1	1	u-byte	1	1	78
CHANNEL_VALID	Channel Validity	0	N/A	1	1	1	bitst(8)	1	1	79
GAIN_CODE	Gain Settings of the Receiver	0	N/A	3	1	1	bitst(8)	1	3	80
MEASUREMENT DATA										83
EARTH_PIX_POSITION_COUNT	Mid Earth View Pixel Position Count (Field of View 1-90)	0	counts	90	1	1	u-integer2	2	180	83
SCENE_COUNTS	Scene counts (ch. H1-H5) - (Field of View 1-90)	0	counts	5	90	1	u-integer2	2	900	263
SPACE_PIX_POSITION_COUNT	Mid Space View Pixel Position Count (Field of View 1-4)	0	counts	4	1	1	u-integer2	2	8	1163
COLD_CALIBRATION_COUNTS	Cold space calibration counts (ch. H1-H5) - (View 1-4)	0	counts	5	4	1	u-integer2	2	40	1171
OBCT_PIX_POSITION_COUNT	Mid OBCT View Pixel Position Count (Field of View 1-4)	0	counts	4	1	1	u-integer2	2	8	1211
WARM_CALIBRATION_COUNTS	Warm target calibration counts (ch H1-H5) - (View 1-4)	0	counts	5	4	1	u-integer2	2	40	1219
POSITION VALIDITY FLAGS										
EARTH_VIEW_POSITION_FLAG	Earth view position validity flags (see text)	0	N/A	12	1	1	u-byte	1	12	1259
SPACE_VIEW_POSITION_FLAG	Space view position validity flags (see text)	0	N/A	1	1	1	u-byte	1	1	1271
OBCT_VIEW_POSITION_FLAG	Internal calibration target view position validity flag (see text)	0	N/A	1	1	1	u-byte	1	1	1272

OBCT TEMPERATURE DATA										
PRT1_TEMPERATURE	bit 0-3 : 0 (unused) bit 4-15: On Board Target Temperature 1 (PRT1)	0	counts	1	1	1	u-integer2	2	2	1273
PRT2_TEMPERATURE	bit 0-3 : 0 (unused) bit 4-15: On Board Target Temperature 2 (PRT2)	0	counts	1	1	1	u-integer2	2	2	1275
PRT3_TEMPERATURE	bit 0-3 : 0 (unused) bit 4-15: On Board Target Temperature 3 (PRT3)	0	counts	1	1	1	u-integer2	2	2	1277
PRT4_TEMPERATURE	bit 0-3 : 0 (unused) bit 4-15: On Board Target Temperature 4 (PRT4)	0	counts	1	1	1	u-integer2	2	2	1279
PRT5_TEMPERATURE	bit 0-3 : 0 (unused) bit 4-15: On Board Target Temperature 5 (PRT5)	0	counts	1	1	1	u-integer2	2	2	1281
CAL_CHAN_1	bit 0-3: 0 (unused) bit 4-15: PRT Calibration 1: 118 Ohms	0	counts	1	1	1	u-integer2	2	2	1283
CAL_CHAN_2	bit 0-3: 0 (unused) bit 4-15: PRT Calibration 2: 95.3 Ohms	0	counts	1	1	1	u-integer2	2	2	1285
CAL_CHAN_3	bit 0-3: 0 (unused) bit 4-15: PRT Calibration 3: 80.6 Ohms	0	counts	1	1	1	u-integer2	2	2	1287
RESISTANCE PARAMETERS										
RESISTANCE_SLOPE	Slope m of the resistance equation	6	Ohm/counts	1	1	1	u-integer4	4	4	1289
RESISTANCE_OFFSET	Offset Roff of the resistance equation	2	Ohm	1	1	1	u-integer4	4	4	1293
RESISTANCE_PRT_1	Resistance value of PRT 1	2	Ohm	1	1	1	u-integer4	4	4	1297
RESISTANCE_PRT_2	Resistance value of PRT 2	2	Ohm	1	1	1	u-integer4	4	4	1301
RESISTANCE_PRT_3	Resistance value of PRT 3	2	Ohm	1	1	1	u-integer4	4	4	1305
RESISTANCE_PRT_4	Resistance value of PRT 4	2	Ohm	1	1	1	u-integer4	4	4	1309
RESISTANCE_PRT_5	Resistance value of PRT 5	2	Ohm	1	1	1	u-integer4	4	4	1313
TEMPERATURE_PRT_1	Temperature of PRT 1	3	K	1	1	1	u-integer4	4	4	1317

TEMPERATURE_PRT_2	Temperature of PRT 2	3	K	1	1	1	u-integer4	4	4	1321
TEMPERATURE_PRT_3	Temperature of PRT 3	3	K	1	1	1	u-integer4	4	4	1325
TEMPERATURE_PRT_4	Temperature of PRT 4	3	K	1	1	1	u-integer4	4	4	1329
TEMPERATURE_PRT_5	Temperature of PRT 5	3	K	1	1	1	u-integer4	4	4	1333
DISCRETE TELEMETRY										
MAIN_BUS	Main bus select (indicates which main bus is used by MHS); 1 (0V)=A bus (relay closed), 0 (5V)=B bus (relay opened)	0	N/A	1	1	1	u-byte	1	1	1337
MHS_SURVIVAL_HEATER	1= on, 0 = off	0	N/A	1	1	1	u-byte	1	1	1338
RF_CONVERTER_PROTECT_DISABLE	1 = no, 0 = yes	0	N/A	1	1	1	u-byte	1	1	1339
MHS_POWER_A	1= on, 0 = off	0	N/A	1	1	1	u-byte	1	1	1340
MHS_POWER_B	1= on, 0 = off	0	N/A	1	1	1	u-byte	1	1	1341
MAIN_CONVERTER_PROTECT_DISABLE	1 = no, 0 = yes	0	N/A	1	1	1	u-byte	1	1	1342
SURVIVAL_TEMPS	Survival temperatures; Word 1: Receiver temperature, Word 2: Electronics equipment temperature, Word 3: Scan mechanism temperature	0	counts	3	1	1	u-byte	1	3	1343
TRANSMITTER_TELEM	Transmitter telemetry (zero filled for Metop); Word 1: STX-1 status, Word 2: STX-2 status, Word 3: STX-3 status, Word 4: STX-4 status, Word 5: STX-1 power, Word 6: STX-2 power, Word 7: STX-3 power, Word 8: SARR-A power, Word 9: SARR-B power	0	counts	9	1	1	u-integer2	2	18	1346
TELEMETRY_UPDATE	Discrete telemetry update (see text)	0	N/A	1	1	1	bitst(32)	4	4	1364
ASSOCIATED DATA										
QUALITY_INDICATOR	Quality Indicator Bit Field	0	N/A	1	1	1	bitst(32)	4	4	1368
SCAN_LINE_QUALITY	Scan Line Quality Flags	0	N/A	1	1	1	bitst(32)	4	4	1372
DATA_CALIBRATION	Noise-Equivalent Delta T and Channel Quality Flags	0	N/A	5	1	1	DATA_CALQUAL	2	10	1376
FOV_DATA_QUALITY	FOV data quality Flags	0	NA	90	1	1	bitst(32)	4	360	1386
CALIBRATION COEFFICIENTS										

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PRIMARY_CALIBRATION_SECOND_TERM	Primary Calibration Second Order Term a2 (H1-H5)	16	$\text{mW/m}^2/\text{sr/cm}^{-1}/\text{cnt}^2$	5	1	1	integer4	4	20	1746
PRIMARY_CALIBRATION_FIRST_TERM	Primary Calibration First Order Term a1 (H1-H5)	10	$\text{mW/m}^2/\text{sr/cm}^{-1}/\text{cnt}$	5	1	1	integer4	4	20	1766
PRIMARY_CALIBRATION_ZEROTH_TERM	Primary Calibration Zeroth Order Term a0 (H1-H5)	6	$\text{mW/m}^2/\text{sr/cm}^{-1}$	5	1	1	integer4	4	20	1786
SECONDARY_CALIBRATION_SECOND_TERM	Secondary Calibration Second Order Term a2 (H1-H5)	16	$\text{mW/m}^2/\text{sr/cm}^{-1}/\text{cnt}^2$	5	1	1	integer4	4	20	1806
SECONDARY_CALIBRATION_FIRST_TERM	Secondary Calibration First Order Term a1 (H1-H5)	10	$\text{mW/m}^2/\text{sr/cm}^{-1}/\text{cnt}$	5	1	1	integer4	4	20	1826
SECONDARY_CALIBRATION_ZEROTH_TERM	Secondary Calibration Zeroth Order Term a0 (H1-H5)	6	$\text{mW/m}^2/\text{sr/cm}^{-1}$	5	1	1	integer4	4	20	1846
CALIBRATION PARAMETERS										
AVERAGE_WARM_TARGET_CNT	Average warm target count	0	counts	5	1	1	u-integer2	2	10	1866
AVERAGE_COLD_TARGET_CNT	Average cold target count	0	counts	5	1	1	u-integer2	2	10	1876
ZERO_RADIANCE_CNT	Zero Radiance Count	0	counts	5	1	1	u-integer2	2	10	1886
MEAN_WARM_TARGET_RAD	Mean warm target radiance	7	$\text{mW/m}^2/\text{sr/cm}^{-1}$	5	1	1	u-integer4	4	20	1896
MEAN_COLD_TARGET_RAD	Mean cold target radiance	7	$\text{mW/m}^2/\text{sr/cm}^{-1}$	5	1	1	u-integer4	4	20	1916
NONLINEARITY_PARAMETER	Non linearity parameter u	8	$(\text{mW/m}^2/\text{sr/cm}^{-1})^{-1}$	5	1	1	u-integer4	4	20	1936
NAVIGATION DATA AT SCAN LINE										
TIME_ATTITUDE	Time Associated with Attitude Angles	0	s	1	1	1	integer4	4	4	1956
EULER_ANGLE	Euler Angles: Roll, Pitch, Yaw	3	deg	3	1	1	integer2	2	6	1960
NAVIGATION_STATUS	Navigation Status Bit Field	0	N/A	1	1	1	bitst(32)	4	4	1966
SPACECRAFT_ALTITUDE	Spacecraft Altitude Above Reference Geoid (MSL)	1	km	1	1	1	integer4	4	4	1970
ANGULAR_RELATION	Angular relationships: solar zenith angle, satellite zenith angle, solar azimuth angle, satellite azimuth angle - (points 1 to 90) . Note: azimuth angle range is -180 to +180, where minus is west and plus is east.	2	deg	4	90	1	integer2	2	720	1974
EARTH_LOCATION	Earth Location: latitude, longitude (point 1 to 90)	4	deg	2	90	1	integer4	4	720	2694

SURFACE_PROPERTIES	Surface property (0 = water, 1 = mixed/coast, 2 = land) (point 1 to 90)	0		90	1	1	enumerated	1	90	3414
TERRAIN_ELEVATION	Average terrain elevation (point 1 to 90)	0	m	90	1	1	integer2	2	180	3504
SIZE OF THE RECORD										3684

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FIELD	DESCRIPTION	SF	UNITS	DIM1	DIM2	DIM3	TYPE	TYPE SIZE	FIELD SIZE	OFFSET
RECORD_HEADER	Generic Record Header	0		1	1	1	REC_HEAD	20	20	0
GENERIC QUALITY INDICATORS										
DEGRADED_INST_MDR	Quality of MDR has been degraded from nominal due to an instrument degradation	NA	NA	1	1	1	boolean	1	1	20
DEGRADED_PROC_MDR	Quality of MDR has been degraded from nominal due to a processing degradation	NA	NA	1	1	1	boolean	1	1	21
SOURCE PACKET SECONDARY HEADER										
UTC_SL_TIME_DAY	UTC SL Time (# of days w.r.t. 171/2000 (day 0))	0	NA	1	1	1	u-integer2	2	2	22
UTC_SL_TIME_MS	Millisecond of the day	0	ms	1	1	1	u-integer4	4	4	24
UTC_SL_TIME_MICROSEC	Microseconds of the day	0	microsec.	1	1	1	u-integer2	2	2	28
MHS ANCILLARY DATA										
OB_ICU_TIME_INT	Onboard ICU Time Integer part	0	NA	1	1	1	bitst(24)	3	3	30
OB_ICU_TIME_FRAC	Onboard ICU Time Fractional Part	0	NA	1	1	1	byte	1	1	33
FULL HK DATA										
MODE_SUBCOMM_CODE	see MDR-1A	0	NA	1	1	1	bitst(8)	1	1	34
TELECOMM_ACKN_FAULT	see MDR-1A	0	NA	1	1	1	bitst(40)	5	5	35
SWITCH_STATUS	see MDR-1A	0	NA	1	1	1	bitst(24)	3	3	40
THERMISTOR_TM_CHANNELS	Thermistor TM Channels 1 to 24 (see MDR-1A)	0	NA	24	1	1	byte	1	24	43
5V_SEC_CURRENT	(EE and SM +5V) Secondary Current	0	counts	1	1	1	u-byte	1	1	67
8V_RECEIVER_CURRENT	(+8V) Receiver Current	0	counts	1	1	1	u-byte	1	1	68
15V_RECEIVER_CURRENT	(+15V) Receiver Current	0	counts	1	1	1	u-byte	1	1	69
M15V_RECEIVER_CURRENT	(-15V) Receiver Current	0	counts	1	1	1	u-byte	1	1	70
RDM_MOTOR_CURRENT	RDM Motor Current	0	counts	1	1	1	u-byte	1	1	71
FDM_MOTOR_CURRENT	FDM Motor Current	0	counts	1	1	1	u-byte	1	1	72
STATUS WORD										
STATUS_WORD	see MDR-1A	0	counts	1	1	1	bitst(8)	1	1	73
SIGNAL PROCESSING STATUS										
CHANNEL_H1_DC_OFFSET	Channel H1 DC offset word	0	counts	1	1	1	u-byte	1	1	74
CHANNEL_H2_DC_OFFSET	Channel H2 DC offset word	0	counts	1	1	1	u-byte	1	1	75

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CHANNEL_H3_DC_OFFSET	Channel H3 DC offset word	0	counts	1	1	1	u-byte	1	1	76
CHANNEL_H4_DC_OFFSET	Channel H4 DC offset word	0	counts	1	1	1	u-byte	1	1	77
CHANNEL_H5_DC_OFFSET	Channel H5 DC offset word	0	counts	1	1	1	u-byte	1	1	78
CHANNEL_VALID	Channel Validity	0	N/A	1	1	1	bitst(8)	1	1	79
GAIN_CODE	Gain Settings of the Receiver	0	N/A	3	1	1	bitst(8)	1	3	80
MEASUREMENT DATA										
SCENE_RADIANCES	Scene Radiances (Channels H1-H5) - (Fields of View 1 - 90)	7	mW/m ² /sr/c m ⁻¹	5	90	1	integer4	4	1800	83
FOV_DATA_QUALITY	FOV data quality Flags	0	NA	90	1	1	bitst(32)	4	360	1883
POSITION VALIDITY FLAGS										
EARTH_VIEW_POSITION_FLAG	Earth view position validity flags (see MDR-1A)	0	N/A	12	1	1	u-byte	1	12	2243
SPACE_VIEW_POSITION_FLAG	Space view position validity flags (see MDR-1A)	0	N/A	1	1	1	u-byte	1	1	2255
OBCT_VIEW_POSITION_FLAG	Internal calibration target view position validity flag (see MDR- 1A)	0	N/A	1	1	1	u-byte	1	1	2256
OBCT TEMPERATURE DATA										
PRT1_TEMPERATURE	bit 0-3 : 0 (unused) bit 4-15: On Board Target Temperature 1 (PRT1)	0	counts	1	1	1	u-integer2	2	2	2257
PRT2_TEMPERATURE	bit 0-3 : 0 (unused) bit 4-15: On Board Target Temperature 2 (PRT2)	0	counts	1	1	1	u-integer2	2	2	2259
PRT3_TEMPERATURE	bit 0-3 : 0 (unused) bit 4-15: On Board Target Temperature 3 (PRT3)	0	counts	1	1	1	u-integer2	2	2	2261
PRT4_TEMPERATURE	bit 0-3 : 0 (unused) bit 4-15: On Board Target Temperature 4 (PRT4)	0	counts	1	1	1	u-integer2	2	2	2263
PRT5_TEMPERATURE	bit 0-3 : 0 (unused) bit 4-15: On Board Target Temperature 5 (PRT5)	0	counts	1	1	1	u-integer2	2	2	2265

CAL_CHAN_1	bit 0-3: 0 (unused) bit 4-15: PRT Calibration 1: 118 Ohms	0	counts	1	1	1	u-integer2	2	2	2267
CAL_CHAN_2	bit 0-3: 0 (unused) bit 4-15: PRT Calibration 2: 95.3 Ohms	0	counts	1	1	1	u-integer2	2	2	2269
CAL_CHAN_3	bit 0-3: 0 (unused) bit 4-15: PRT Calibration 3: 80.6 Ohms	0	counts	1	1	1	u-integer2	2	2	2271
RESISTANCE PARAMETERS										
RESISTANCE_SLOPE	Slope m of the resistance equation	6	Ohm/counts	1	1	1	u-integer4	4	4	2273
RESISTANCE_OFFSET	Offset Roff of the resistance equation	2	Ohm	1	1	1	u-integer4	4	4	2277
RESISTANCE_PRT_1	Resistance value of PRT 1	2	Ohm	1	1	1	u-integer4	4	4	2281
RESISTANCE_PRT_2	Resistance value of PRT 2	2	Ohm	1	1	1	u-integer4	4	4	2285
RESISTANCE_PRT_3	Resistance value of PRT 3	2	Ohm	1	1	1	u-integer4	4	4	2289
RESISTANCE_PRT_4	Resistance value of PRT 4	2	Ohm	1	1	1	u-integer4	4	4	2293
RESISTANCE_PRT_5	Resistance value of PRT 5	2	Ohm	1	1	1	u-integer4	4	4	2297
TEMPERATURE_PRT_1	Temperature of PRT 1	3	K	1	1	1	u-integer4	4	4	2301
TEMPERATURE_PRT_2	Temperature of PRT 2	3	K	1	1	1	u-integer4	4	4	2305
TEMPERATURE_PRT_3	Temperature of PRT 3	3	K	1	1	1	u-integer4	4	4	2309
TEMPERATURE_PRT_4	Temperature of PRT 4	3	K	1	1	1	u-integer4	4	4	2313
TEMPERATURE_PRT_5	Temperature of PRT 5	3	K	1	1	1	u-integer4	4	4	2317
DISCRETE TELEMETRY										
MAIN_BUS	Main bus select (indicates which main bus is used by MHS); 1 (0V)=A bus (relay closed), 0 (5V)=B bus (relay opened)	0	N/A	1	1	1	u-byte	1	1	2321
MHS_SURVIVAL_HEATER	1= on, 0 = off	0	N/A	1	1	1	u-byte	1	1	2322
RF_CONVERTER_PROTECT_DISABLE	1 = no, 0 = yes	0	N/A	1	1	1	u-byte	1	1	2323
MHS_POWER_A	1= on, 0 = off	0	N/A	1	1	1	u-byte	1	1	2324
MHS_POWER_B	1= on, 0 = off	0	N/A	1	1	1	u-byte	1	1	2325
MAIN_CONVERTER_PROTECT_DISABLE	1 = no, 0 = yes	0	N/A	1	1	1	u-byte	1	1	2326

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Worksheet: MDR-1B

SURVIVAL_TEMPS	Survival temperatures; Word 1: Receiver temperature, Word 2: Electronics equipment temperature, Word 3: Scan mechanism temperature	0	counts	3	1	1	u-byte	1	3	2327
TRANSMITTER_TELEM	Transmitter telemetry (zero filled for Metop); Word 1: STX-1 status, Word 2: STX-2 status, Word 3: STX-3 status, Word 4: STX-4 status, Word 5: STX-1 power, Word 6: STX-2 power, Word 7: STX-3 power, Word 8: SARR-A power, Word 9: SARR-B power	0	counts	9	1	1	u-integer2	2	18	2330
TELEMETRY_UPDATE	Discrete telemetry update (see MDR-1A)	0	N/A	1	1	1	bitst(32)	4	4	2348
ASSOCIATED DATA										
QUALITY_INDICATOR	Quality Indicator Bit Field	0	N/A	1	1	1	bitst(32)	4	4	2352
SCAN_LINE_QUALITY	Scan Line Quality Flags	0	N/A	1	1	1	bitst(32)	4	4	2356
DATA_CALIBRATION	Noise-Equivalent Delta T and Channel Quality Flags	0	N/A	5	1	1	DATA_CALQUAL	2	10	2360
CALIBRATION COEFFICIENTS										
PRIMARY_CALIBRATION_SECOND_TERM	Primary Calibration Second Order Term a2 (H1-H5)	16	mW/m ² /sr/c m ⁻¹ /cnt ²	5	1	1	integer4	4	20	2370
PRIMARY_CALIBRATION_FIRST_TERM	Primary Calibration First Order Term a1(H1-H5)	10	mW/m ² /sr/c m ⁻¹ /cnt	5	1	1	integer4	4	20	2390
PRIMARY_CALIBRATION_ZEROTH_TERM	Primary Calibration Zeroth Order Term a0 (H1-H5)	6	mW/m ² /sr/c m ⁻¹	5	1	1	integer4	4	20	2410
SECONDARY_CALIBRATION_SECOND_TERM	Secondary Calibration Second Order Term a2 (H1-H5)	16	mW/m ² /sr/c m ⁻¹ /cnt ²	5	1	1	integer4	4	20	2430
SECONDARY_CALIBRATION_FIRST_TERM	Secondary Calibration First Order Term a1 (H1-H5)	10	mW/m ² /sr/c m ⁻¹ /cnt	5	1	1	integer4	4	20	2450
SECONDARY_CALIBRATION_ZEROTH_TERM	Secondary Calibration Zeroth Order Term a0 (H1-H5)	6	mW/m ² /sr/c m ⁻¹	5	1	1	integer4	4	20	2470
CALIBRATION PARAMETERS										
AVERAGE_WARM_TARGET_CNT	Average warm target count	0	counts	5	1	1	u-integer2	2	10	2490
AVERAGE_COLD_TARGET_CNT	Average cold target count	0	counts	5	1	1	u-integer2	2	10	2500
ZERO_RADIANCE_CNT	Zero Radiance Count	0	counts	5	1	1	u-integer2	2	10	2510
MEAN_WARM_TARGET_RAD	Mean warm target radiance	7	mW/m ² /sr/c m ⁻¹	5	1	1	u-integer4	4	20	2520

MEAN_COLD_TARGET_RAD	Mean cold target radiance	7	mW/m ² /sr/c m ⁻¹	5	1	1	u-integer4	4	20	2540
NONLINEARITY_PARAMETER	Non linearity parameter u	8	(mW/m ² /sr/c m ⁻¹)**-1	5	1	1	u-integer4	4	20	2560
NAVIGATION DATA AT SCAN LINE										
TIME_ATTITUDE	Time Associated with Attitude Angles	0	s	1	1	1	u-integer4	4	4	2580
EULER_ANGLE	Euler Angles: Roll, Pitch, Yaw	3	deg	3	1	1	integer2	2	6	2584
NAVIGATION_STATUS	Navigation Status Bit Field	0	N/A	1	1	1	bitst(32)	4	4	2590
SPACECRAFT_ALTITUDE	Spacecraft Altitude Above Reference Geoid (MSL)	1	km	1	1	1	u-integer4	4	4	2594
ANGULAR_RELATION	Angular relationships: solar zenith angle, satellite zenith angle, solar azimuth angle, satellite azimuth angle - (points 1 to 90). Note: azimuth angle range is -180 to +180, where minus is west and plus is east.	2	deg	4	90	1	integer2	2	720	2598
EARTH_LOCATION	Earth Location: latitude, longitude (point 1 to 90)	4	deg	2	90	1	integer4	4	720	3318
SURFACE_PROPERTIES	Surface property (0 = water, 1 = mixed/coast, 2 = land) (point 1 to 90)	0		90	1	1	enumerated	1	90	4038
TERRAIN_ELEVATION	Average terrain elevation (point 1 to 90)	0	m	90	1	1	integer2	2	180	4128
LUNAR_ANGLES	Angles between moon and individual space views (between 0 and 180 degrees, one word for each of the four space views)	2	deg	4	1	1	u-integer2	2	8	4308
SIZE OF THE RECORD										4316

Field Type	Size in Bytes
bitst(16)	2
bitst(24)	3
bitst(32)	4
bitst(40)	5
bitst(8)	1
boolean	1
byte	1
char(1)	1
char(2)	2
char(3)	3
char(4)	4
char(88)	88
DATA_CALQUAL	2
e-char(1)	1
e-char(2)	2
e-char(3)	3
enumerated	1
general time	15
integer2	2
integer4	4
integer8	8
long cds time	8
REC_HEAD	20
short cds time	6
u-byte	1
u-integer2	2
u-integer4	4
u-integer8	8

NOTE: Table must be sorted into ascending order