
Section 5

Telemetry

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5 TELEMETRY

5.1 General Description

The SUMER telemetry data layout complies with the telemetry protocol of Section 3.3.3 in: ESA Noordwijk, "SOHO Experiment Interface Document Part A", PLP/410S/EID A, Issue 1.

The SUMER data are delivered to the SOHO spacecraft on two virtual channels. A special set of housekeeping data is transferred via virtual channel 0 while both science and housekeeping data are transmitted via virtual channel 1.

Table 5-1

SUMER Telemetry Source Packets per Format									
data rate	SOHO Spacecraft OBDH				SUMER				
	TM mode	virt. channel	no. of packets	packet header (bytes)	packet time (bytes)	packet time (bytes)	data type	packet data (bytes)	transm. total (bytes)
low	-	0	1	6	6	0	HK	188	≈50
	-	1	-	-	-	-	science+HK	-	-
medium	-	0	1	6	6	0	HK	188	188
	1	1	48	6	0	6	science+HK	410	19968
/	2	1	0	0	0	0	science+HK	0	0
high	3	1	0	0	0	0	science+HK	0	0
	4	1	96	6	0	6	science+HK	410	39936

Annotations

While in low data rate, the spacecraft will collect all 188 bytes housekeeping (HK) data but will transmit to ground the first 50 bytes only. Consequently,

the housekeeping bytes are ordered according to their importance.

The data will be collected by the spacecraft as a fixed sequence of packets of fixed length. The amount of data collected by the spacecraft depends on the spacecraft telemetry mode (see Table 5-1).

The transfer of data packets is initiated by BCP1 (i.e. the telemetry major frame pulse with a periodicity of 14.98828 sec). The time between two BCP1 defines one format.

Every data packet that is transmitted to ground is supplied with leading 6-byte header and 6-byte time information. The science data packet time information has to be written by the experiment itself and is therefore included in the budget in Table 5-1. The time information for the housekeeping data packets will be added by the spacecraft OBDH. The header information for all packets will be written by the OBDH only.

Table 5-1 contains the number of housekeeping and science data packets that are transmitted to and collected by the spacecraft in the different spacecraft telemetry modes.

5.2 Housekeeping Data Packets

Once per format, i.e. once per 14.98828 seconds, the SOHO spacecraft will collect 188 bytes of housekeeping data from SUMER and transport them to the spacecraft OBDH on virtual channel 0.

While all 188 bytes will be transmitted whenever telemetry is in the high data rate, only the first 50 bytes will be transmitted in the low data rate telemetry mode.

Consequently, the housekeeping bytes are ordered according to their

importance. Chapter 5.4.2 contains a detailed list of these HK data delivered by SUMER.

5.3 Science Data Packets

The science data packets, transmitted to the spacecraft OBDH on virtual channel 1, are the basis for the transport of SUMER science and housekeeping data. In TM mode 1, 48 packets, in TM mode 4, 96 packets of 410 bytes each are transferred during one format.

The SUMER housekeeping and science data are embedded consecutively in the remaining 404 bytes of the data packets. Due to the different structure of the SUMER data layout and the spacecraft OBDH packets, the SUMER data are embedded floating in the science data packets, i.e. SUMER synchronization (sync) words cannot be found at fixed places of the science data packets.

The SUMER science and housekeeping data are logically divided into records. The two types of records, image and housekeeping records, are of even length. Every record starts with the 2-byte sync word and is followed by the 2-byte record type word. Table 5-2 gives an example of the SUMER telemetry data layout.

Image records are subdivided into blocks. The leading image record header block contains the sync word, continues with the type word, and is followed by the image descriptor data. After the image record header block, a number of data blocks may follow. Data blocks consist of the leading 2-byte sync word and the 2-byte block counter and are followed by the image data.

Housekeeping records consist of single data blocks. These blocks contain, in addition to the 2-byte sync word and the 2-byte record type word, the

housekeeping data words. The total length of the data records may be derived from Table 5-3.

5.3.1 SUMER Synchronization Word

Every data record and every data block is initiated by a synchronization (sync) word. The sync word is of 2-byte length with the following pattern: EB90 (hex)

5.3.2 Record Type Word

Every data record starts with the SUMER sync word. The sync word is followed by a 2-byte type word, the first of which contains 80 (hex) for image records and 81 (hex) for housekeeping records. The second byte contains the record type byte and may be derived from Table 5-3 for image records and from Table 5-4 for housekeeping records.

The record type byte for image records is a positive number while the record type byte for housekeeping records is negative. With the knowledge of the record type byte, the length of the respective record/block may be obtained.

5.3.3 Image Records

A SUMER image record is subdivided into blocks, the first of which is the record header block, followed by 0 to 2048 record data blocks.

Image record header blocks start with the 2-byte sync word, followed by the 2-byte record type word and the image descriptor data. The image descriptor data contain all the information necessary for a correct image interpretation. The length of the image record header block is 92 bytes.

Data blocks are introduced by a 2-byte sync word and a 2-byte block counter. The block counter of the first data block contains 0.

5.3.4 Housekeeping Records

A housekeeping record consists of the sync word, the record type word, and the housekeeping words. The length of the record depends on the record type (cf. table 5-4). Housekeeping records may be transmitted directly before another record (housekeeping or image) or after the transmission of at least four image data blocks.

Seven different housekeeping records are defined: One housekeeping record (HK record 255) will be transmitted periodically once per second. Five housekeeping records will be transmitted on request or related to special actions in the experiment. One housekeeping record (HK record 200) is an idle frame of 404 bytes that will be transmitted whenever no other record is available. It contains a test pattern consisting of consecutive byte sized values (00 (hex) .. FF (hex), 00 (hex) .. 8B (hex)).

Table 5-2 SUMER Data Record Layout

SUMER data record layout											
image record header block											
sync word (EB)	(90)	type word (80)	(type)	1	2	3	4	...	k-2	k-1	k
image record data blocks											
sync word (EB)	(90)	block counter (00)	(00)	1	2	3	4	...	m-2	m-1	m
sync word (EB)	(90)	block counter (00)	(01)	1	2	3	4	...	m-2	m-1	m
sync word (EB)	(90)	block counter (00)	(02)	1	2	3	4	...	m-2	m-1	m
sync word (EB)	(90)	block counter (00)	(03)	1	2	3	4	...	m-2	m-1	m
interleaved housekeeping record											
sync word (EB)	(90)	type word (81)	(type)	1	2	3	4	...	h-2	h-1	h
image record data blocks (continued)											
sync word (EB)	(90)	block counter (00)	(04)	1	2	3	4	...	m-2	m-1	m
.											
.											
sync word (EB)	(90)	block counter (n-2)		1	2	3	4	...	m-2	m-1	m
sync word (EB)	(90)	block counter (n-1)		1	2	3	4	...	m-2	m-1	m
next image record header block											
sync word (EB)	(90)	type word (80)	(type)	1	2	3	4	...	k-2	k-1	k
image record data blocks											
sync word (EB)	(90)	block counter (00)	(00)	1	2	3	4	...	m-2	m-1	m
.											
.											

Annotations

a)The length information for h (housekeeping data), k (image descriptor), m

(data block data) and n (data block counter) may be derived from the respective tables in this chapter.

b)A housekeeping record may occur only before one other record (housekeeping or science) or after the transmission of at least four image record data blocks.

Table 5-3 SUMER Image Records

SUMER Image Records							
type c)	contents	size	arrangement	res. d)	n a)	m b) [bytes]	Tx e) [s]
2	spatial spectrum	1024 x 360	spec x spat	B1	1024	360	281
3	spatial spectrum	1024 x 360	spec x spat	B2	1024	720	562
4	spatial spectrum	1024 x 120	spec x spat	B1	1024	120	94
5	spatial spectrum	1024 x 120	spec x spat	B2	1024	240	187
8	spatial line	50 x 360	line x spat	B1	50	360	14
9	spatial line	50 x 360	line x spat	B2	50	720	28
10	spatial line	50 x 120	line x spat	B1	50	120	4.6
11	spatial line	50 x 120	line x spat	B2	50	240	9.2
12	spatial line	25 x 360	line x spat	B1	25	360	7
13	spatial line	25 x 360	line x spat	B2	25	720	14
14	spatial line	25 x 120	line x spat	B1	25	120	2.3
15	spatial line	25 x 120	line x spat	B2	25	240	4.6
18	spatial parameter	1 x 360	scal x spat	I2	1	720	0.6
19	spatial parameter	1 x 360	scal x spat	R4	1	1440	0.8
20	spatial parameter	1 x 120	scal x spat	I2	1	240	0.2
21	spatial parameter	1 x 120	scal x spat	R4	1	480	0.3
24	scanned image	300 x 360	spat x spat	I2	300	720	165
25	scanned image	300 x 360	spat x spat	R4	300	1440	247
26	scanned image	300 x 120	spat x spat	I2	300	240	55
27	scanned image	300 x 120	spat x spat	R4	300	480	83
30	section line	25 x 24	line x spat	B1	1	600	0.5
31	section line	50 x 24	line x spat	B1	1	1200	1.0
34	rear slit	1 x 512	spatial	B1	1	512	0.5
35	rear slit scan	50 x 512	spat x spat	B1	50	512	20
36	history memory	512 x 20	spec x spat	B4	512	80	32
37	calibrat. format	256 x 360	spec x spat	B2	256	720	141
38	half detector	512 x 360	spec x spat	B1	512	360	141
39	half detector	512 x 360	spec x spat	B2	512	720	281
40	celestial objects	1024 x 12	spec x spat	B1	1024	12	9
41	spatial parameter	2 x 360	scal x spat	I2	2	720	1.2
42	spatial parameter	2 x 120	scal x spat	I2	2	240	0.4
43	spatial parameter	4 x 360	scal x spat	I2	4	720	2.4
44	spatial parameter	4 x 120	scal x spat	I2	4	240	0.8
45	spatial parameter	5 x 360	scal x spat	B1	5	360	1.5

Annotations

a)n is the number of image record data blocks per image record.

b)m is the length of one image record data block (not including 2-byte sync word and 2-byte block counter).

c)Image formats 32 and 33 have been deleted.

Image format 36 is only used by the DPU to dump the history memory.

Image formats to be used by spectrohelio, see Section 8 (SCL functions), p. 8-52.

d) Bx is an unsigned integer with x bytes.

e) Tx is the estimated telemetry transmission time in seconds at 10.5 kBaud, overhead by HK records neglected.

Table 5-4 SUMER Housekeeping Records

SUMER Housekeeping Records			
type	length	description	frequency
255	26	data set transmitted cyclically	1 / s
252	56	detector electronics data	on request
251	26	motor controller electronics data	on request
250	38	power converter electronics data	on request
249	72	telecommand result	on request
248	72	software parameter list	on request
200	404	idle frame	if TM idle

5.4 Housekeeping Data Channels

This section consists of the description of the SUMER telemetry housekeeping data channels and the SUMER image record header block.

Definition:

The least significant bit (LSB) is represented by bit 0.

Data Representation

B1 unsigned character (1 byte)

7	6	5	4	3	2	1	0

I1 signed character (1 byte)

7	6	5	4	3	2	1	0

sign
bit

B2 unsigned short integer (2 bytes)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

I2 signed short integer (2 bytes)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

sign
bit

B4 unsigned integer (4 bytes)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

first word

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16

second word

I4 signed integer (4 bytes)

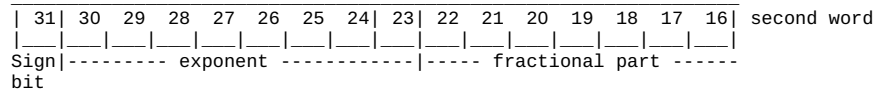
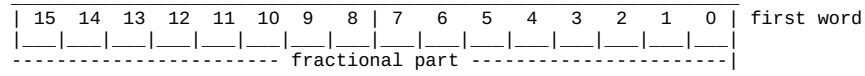
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

first word

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16

second word

sign
bit



The value is positive if the sign bit is 0, negative if the sign bit is 1.
The magnitude of the value is:

$$(2^{(\text{exponent}-127)}) * 1.\text{fraction} \text{ if } 0 < \text{exponent} < 255$$

$$0 \text{ if } \text{exponent} = 0 \text{ and } \text{fraction} = 0$$

$$(2^{-126}) * 0.\text{fraction} \text{ (i.e. practically 0) if } \text{exponent} = 0 \text{ and } \text{fraction} \neq 0$$

$$\text{infinite if } \text{exponent} = 255$$

5.4.1 SUMER Housekeeping Data Sources List

This section lists the housekeeping (HK) data channels grouped together according to their sources. Since the SUMER DPU swaps the bytes, the SUMER TM data shows a different layout.

This list does not reflect the TM layout!

In this chapter, the following abbreviations are used to represent the housekeeping channels used and the image record header block :

HK:xxx SOHO SUMER Housekeeping Data Packet, location xxx
 POW:yy SUMER Housekeeping Record 250, location yy
 MC:zz SUMER Housekeeping Record 251, location zz
 DET:aa SUMER Housekeeping Record 252, location aa
 CY:bb SUMER Housekeeping Record 255, location bb

5.4.1.1 HK Data from SPU, ECP, and Boot Controller

type	tmname	contents	transmitted in	
B1	SSECPBSR	ECP Bank Select Register	HK:45	
B1	SSECPB	ECP Bank Registers	HK:44	
B1	SSECPERR	ECP Error Status Register	HK:47	CY:14
B1	SSSPUBSR	SPU Bank Select Register	HK:46	
B1	SSSPUB	SPU Bank Registers	HK:49	
B1	SSSPUERR	SPU Error Status Register	HK:48	CY:15
B2	SSCU1	CU1 Config Register	HK:50	
B2	SSCU2	CU2 Config Register	HK:52	
B2	SSBCREG	Boot Controller Configuration Register Actual BC	HK:54	
B2	SSBCVAL	Boot Controller Configuration Value Actual BC	HK:56	

14 bytes

5.4.1.2 HK Data from Spacecraft Interface

type	tmname	contents	transmitted in	
------	--------	----------	----------------	--

SOHO SUMER Housekeeping Data Packet – Detailed Description (cont.)

B1	SSTCCNT	TC block counter	HK:59
B1	SSSCSTAT	inter-instrument mode bit, non-valid TC block cntr	HK:58
B1	SSEVCNT	valid solar event coordinates counter	HK:61
B1	(SSTCTOGN)	toggle flag	HK:60
B2	SSTMREPO	TM reporting file 0	HK:62
B2	SSTMREP1	TM reporting file 1	HK:64
B2	SSTMREP2	TM reporting file 2	HK:66
B2	SSTMREP3	TM reporting file 3	HK:68
2B2	SSIIDMM	inter-instrument master message	HK:70

16 bytes

SOHO SUMER Housekeeping Data Packet – Detailed Description (cont.)

5.4.1.3 HK Data from Power Converter Unit

type	tmname	contents	transmitted in	
B1	SSPOW0	Status 0	power converter ch 0	HK: 1 POW: 9
B1	SSPOW1	Status 1	power converter ch 1	HK: 0 POW: 8
B1	SSPOW2	Status 2	power converter ch 2	HK: 3 POW:11
B1	SSPOW3	Status 3	power converter ch 3	HK: 2 POW:10
B1	SSPOW4	STATUS 4	power converter ch 4	HK: 5 POW:13
B1		spare	power converter ch 5	HK:-- POW:--
B1		spare	power converter ch 6	HK:-- POW:--
B1		spare	power converter ch 7	HK:-- POW:--
B1	SIDETA	IDetA	power converter ch 8	HK: 9 POW:17
B1	SIDETB	IDetB	power converter ch 9	HK: 8 POW:16
B1	SIHEATR	IHeaterD	power converter ch 10	HK:11 POW:19
B1		spare	power converter ch 11	HK:10 POW:18
B1	SIDEFL	IDefl	power converter ch 12	HK:13 POW:21
B1	SIWAXMOT	IWaxMotor Door	power converter ch 13	HK:12 POW:20
B1	SIBRD+28	IBoard +28V	power converter ch 14	HK:15 POW:23
B1	S+28VBRD	VBoard +28V	power converter ch 15	HK:14 POW:22
B1	SICC+5	ICC +5V	power converter ch 16	HK:17 POW:25
B1	S+5VCC	VCC +5V	power converter ch 17	HK:16 POW:24
B1	SIDD1+18	IDD1 +18V	power converter ch 18	HK:19 POW:27
B1	S+18VDD1	VDD1 +18V	power converter ch 19	HK:18 POW:26
B1	SIDD2+18	IDD2 +18V	power converter ch 20	HK:21 POW:29
B1	S+18VDD2	VDD2 +18V	power converter ch 21	HK:20 POW:28
B1	SIBB1-18	IBB1 -18V	power converter ch 22	HK:23 POW:32
B1	S-18VBB1	VBB1 -18V	power converter ch 23	HK:22 POW:31
B1	SIBB2-18	IBB2 -18V	power converter ch 24	HK:25 POW:34
B1	S-18VBB2	VBB2 -18V	power converter ch 25	HK:24 POW:33
B1	SIRSC+15	IDDRSC +15V	power converter ch 26	HK:27 POW:36
B1	S+15VRSC	VDDRSC +15V	power converter ch 27	HK:26 POW:35
B1	SIRSC-15	IBBRSC -15V	power converter ch 28	HK: 4 POW:12
B1	S-15VRSC	VBBRSC -15V	power converter ch 29	HK: 7 POW:15
B1		spare	power converter ch 30	HK:-- POW:--
B1	STSUMER4	temperature SUMER4	power converter ch 31	HK: 6 POW:14

32 bytes

5.4.1.4 HK Data from Motor Controller Electronics

type	tmname	contents (MCx: MC1|MC2|MC3|MC4|MC5|MC6|MC8)	transmitted in	
B1	SIMC+18M	MCx +18V supply current / during motion	HK:--	MC: 9
B1	SIMC-18M	MCx -18V supply current / during motion	HK:--	MC: 8
B1	SIMC+18R	MCx +18V supply current / on request	HK:--	MC:11
B1	SIMC-18R	MCx -18V supply current / on request	HK:--	MC:10
B1	S+15MC	MCx +15V	HK:75 + 6*n (n=0..6)	MC:13
B1	S-15MC	MCx -15V	HK:74 + 6*n (n=0..6)	MC:12
B1	S+5MC	MCx +5V	HK:78 + 6*n (n=0..6)	MC:15
B1	STMCT1	MCx temperature 1 (motor driver stage)	HK:30 .. 37	MC:14
B1	STMCT2	MCx temperature 2 (motor)	HK:30 .. 37	MC:17
B1	STMCT3	MCx temperature 3 (external temperature)	HK:30 .. 37	MC:16
B2	SSMCP	MCx position (LVDT, RVDC, digital position encoder)	HK:76 + 6*n (n=0..6)	MC:18
B1	SSMCINDX	MCx index of motor bit pattern	HK:--	MC:20
B1	SSMC	MCx status	HK:79 + 6*n (n=0..6)	MC:21
B1	SE21	spare	HK:--	MC:23

SOHO SUMER Housekeeping Data Packet – Detailed Description (cont.)

B2 (SE22) raw value of ADC output of external temperature 3 HK:--

MC:24

17 bytes per MC = 119 bytes

SOHO SUMER Housekeeping Data Packet – Detailed Description (cont.)

5.4.1.5 HK Data from Rear Slit Camera Electronics

type	tmname	contents	transmitted in
B1	SE3	spare	HK:122
I1	SSRSC	result from level 4 command RSC_ReadImage	HK:123

2 bytes

5.4.1.6 HK Data from Image Integration Memory

type	tmname	contents	transmitted in
B2	SSIIM	IIM status register	HK:124 CY:16
B1	SE 7	spare	HK:126
I1	SSIIMRES	result from level 4 commands IIMxxxx	HK:127

4 bytes

SOHO SUMER Housekeeping Data Packet – Detailed Description (cont.)

5.4.1.7 HK Data from Detector Electronics

type	tmname	contents	transmitted in	
B1	SIXLVPI	LVPS Current Monitor	HK:129	DET:09
B1	SYXPHAX	XDL X PHA Data	HK:128	DET:08
B1	SSXACCEL	Post Accel HV Status	HK:131	DET:11
B1	SYXPHAY	XDL Y PHA Data	HK:130	DET:10
B1	S+XMCPV	MCP Voltage Monitor	HK:133	DET:13
B1	SYXPHAX	XDL X PHA Data	HK:132	DET:12
B1	SIXMCPI	MCP Current Monitor	HK:135	DET:15
B1	SYXPHAY	XDL Y PHA Data	HK:134	DET:14
B1	S+XTDC5	+5V Monitor for TDC Box Supply	HK:137	DET:17
B1	SYXPHAX	XDL X PHA Data	HK:136	DET:16
B1	S-XTDC5	-5V Monitor for TDC Box Supply	HK:139	DET:19
B1	SYXPHAY	XDL Y PHA Data	HK:138	DET:18
B1	S+XTDC10	+10V Monitor for TDC Box Supply	HK:141	DET:21
B1	SYXPHAX	XDL X PHA Data	HK:140	DET:20
B1	S-XTDC15	-15V Monitor for TDC Box Supply	HK:143	DET:23
B1	SYXPHAY	XDL Y PHA Data	HK:142	DET:22
B1	S+XM0N13	+13V Monitor for Monitor Box Supply	HK:145	DET:25
B1	SYXPHAX	XDL X PHA Data	HK:144	DET:24
B1	S-XM0N13	-13V Monitor for Monitor Box Supply	HK:147	DET:27
B1	SYXPHAY	XDL Y PHA Data	HK:146	DET:26
B1	S+XM0N5	+5V Monitor for Monitor Box Supply	HK:149	DET:29
B1	SYXPHAX	XDL X PHA Data	HK:148	DET:28
B1	S+XTIMX	X Timing Threshold	HK:151	DET:31
B1	SYXPHAY	XDL Y PHA Data	HK:150	DET:30
B1	S+XCHX	X Charge Threshold	HK:153	DET:33
B1	SYXPHAX	XDL X PHA Data	HK:152	DET:32
B1	S+XTIMY	Y Timing Threshold	HK:155	DET:35
B1	SYXPHAY	XDL Y PHA Data	HK:154	DET:34
B1	S+XCHY	Y Charge Threshold	HK:157	DET:37
B1	SYXPHAX	XDL X PHA Data	HK:156	DET:36
B1	STXDL	Temperature Channel (defined by SSXSID)	HK:159	DET:39
B1	SYXPHAY	XDL Y PHA Data	HK:158	DET:38
B1	SSXDEF	(contains SSXSID)	HK:161	DET:41
B1	SYXPHAX	XDL X PHA Data	HK:160	DET:40
B1	SSXCECHO	Command Echo (defined by SSXSID)	HK:163	DET:43
B1	SYXPHAY	XDL Y PHA Data	HK:162	DET:42
B1	SSXHVCMD	HV Command Level (command addr 11)	HK:165	DET:45
B1	SYXPHAX	XDL X PHA Data	HK:164	DET:44
B1	SSXHVSTA	HV Status Register	HK:167	DET:47
B1	SYXPHAY	XDL Y PHA Data	HK:166	DET:46
B1	SSXMXEV	X Event Counter MSByte	HK:169	DET:49
B1	SYXPHAX	XDL X PHA Data	HK:168	DET:48
B1	SSXLXEV	X Event Counter LSByte	HK:171	DET:51
B1	SYXPHAY	XDL Y PHA Data	HK:170	DET:50
B1	SSXMYEV	Y Event Counter MSByte	HK:173	DET:53
B1	SYXPHAX	XDL X PHA Data	HK:172	DET:52
B1	SSXLYEV	Y Event Counter LSByte	HK:175	DET:55
B1	SYXPHAY	XDL Y PHA Data	HK:174	DET:54

48 bytes

5.4.1.8 HK Data from Telecommands

In reaction to any level 4 command and in case a level 3 or level 2 command resulted in an error, a HK record 249 is returned that contains the command sent and adds a result value to it. Unused values are filled with zeroes.

HK data requested by certain commands will be transmitted in additional HK records (e.g. in HK records 252, 251, or 250).

5.4.1.9 HK Data from Software Parameter Lists

HK record 248 is used as a container for software parameter lists. As the length of HK record #248 is 72 bytes, it will provide 64 bytes for software parameters. If a software parameter list needs more space, additional HK records 248 will be transmitted.

5.4.1.10 HK Data from DPU

type	tmname	contents	transmitted in
B1	STDPUDCC	HK1 temperature DC/DC conv.	DPU AnalogInput ch 1 HK:39
B1	STDPUCU1	HK2 temperature DPU-RAM CU1	DPU AnalogInput ch 2 HK:38
B1	STDPUCU2	HK3 temperature DPU-RAM CU2	DPU AnalogInput ch 3 HK:41
B1	STDPUEBX	HK4 temperature E-Box	DPU AnalogInput ch 4 HK:40
B1	S+5VDPU	DC/DC converter +5V/voltage	DPU AnalogInput ch 5 HK:43
B1	SIDPU+5V	DC/DC converter +5V/current	DPU AnalogInput ch 6 HK:42

6 bytes

5.4.1.11 HK Data from DPU Software

type	tmname	contents	transmitted in
------	--------	----------	----------------

SOHO SUMER Housekeeping Data Packet – Detailed Description (cont.)

B1	SSHMHIT	HK monitor emergency switch-off index	HK:120	
B1	SSHMMODE	emergency switch-on config mode	HK:121	
B2	SKAFTRES	AFT result (transmitted after the AFT has ended)	HK:146	
9B1	SSCONFIG	experiment configuration (as defined by TC)	HK:178	
B1	SKEXPSTA	experiment software status	HK:187	CY: 8
B1	SKCMDNR	number of commands in command list		CY: 9
B2	SKUNCOMP	number of uncompressed files in RAM disk		CY:10
B2	SKCOMP	number of compressed files in RAM disk		CY:12
B2	SKL3ID	L3 function identifier (MLB1)		CY:18
B1	SKL3RES	L3 result		CY:20
B1	SKCMDLST	command list disabled/enabled		CY:21

23 bytes

5.4.2 SOHO SUMER Housekeeping Data Packet

The SOHO SUMER housekeeping data packet is generated once per format and is transported to the spacecraft OBDH on virtual channel 0.

The length of the SOHO SUMER Housekeeping Data Packet is 188 bytes. It is transmitted once per format, i.e. every 15 seconds. The values are updated at several different intervals that are indicated in the subheaders in the detailed description.

5.4.2.1 Synopsis

loc	source	type	tmname	contents
0	B1	SSPOW1	Status 1	power converter channel 1
1	B1	SSPOW0	Status 0	power converter channel 0
2	B1	SSPOW3	Status 3	power converter channel 3
3	B1	SSPOW2	Status 2	power converter channel 2
4	B1	SIRSC-15	IBBRSC -15V	power converter channel 28
5	B1	SSPOW4	STATUS 4	power converter channel 4
6	B1	STSUMER4	temperature SUMER4	power converter channel 31
7	B1	S-15VRSC	VBBRSC -15V	power converter channel 29
8	B1	SIDETB	IDetB	power converter channel 9
9	B1	SIDETA	IDetA	power converter channel 8
10	B1		---obsolete---	power converter channel 11
11	B1	SIHEATRD	IHeaterD	power converter channel 10
12	B1	SIWAXMOT	IWaxMotor Door	power converter channel 13
13	B1	SIDEFL	IDefl	power converter channel 12
14	B1	S+28VBRD	VBoard +28V	power converter channel 15
15	B1	SIBRD+28	IBoard +28V	power converter channel 14
16	B1	S+5VCC	VCC +5V	power converter channel 17
17	B1	SICC+5	ICC +5V	power converter channel 16
18	B1	S+18VDD1	VDD1 +18V	power converter channel 19
19	B1	SIDD1+18	IDD1 +18V	power converter channel 18
20	B1	S+18VDD2	VDD2 +18V	power converter channel 21
21	B1	SIDD2+18	IDD2 +18V	power converter channel 20
22	B1	S-18VBB1	VBB1 -18V	power converter channel 23
23	B1	SIBB1-18	IBB1 -18V	power converter channel 22
24	B1	S-18VBB2	VBB2 -18V	power converter channel 25
25	B1	SIBB2-18	IBB2 -18V	power converter channel 24
26	B1	S+15VRSC	VDDRSC +15V	power converter channel 27
27	B1	SIRSC+15	IDDRSC +15V	power converter channel 26
28	B1	SSMCMC	Motor Controller	Motor Controller Electronics
29	B1	SE1	spare	
<hr/> if byte 28 (SSMCMC) bit 0 (SSMC1MC) is 1				<hr/> if SSMC1MC is

SOHO SUMER Housekeeping Data Packet – Detailed Description (cont.)

1	30	B1	STMC2T1	MC2-Azimuth	temp1 motor driver stage	
	31	B1	STMC1T1	MC1-Door	temp1 motor driver stage	
	32	B1	STMC4T1	MC4-Slit select	temp1 motor driver stage	
	33	B1	STMC3T1	MC3-Elevation	temp1 motor driver stage	
	34	B1	STMC6T1	MC6-Grating	temp1 motor driver stage	
	35	B1	STMC5T1	MC5-Slit focus	temp1 motor driver stage	
	36	B1	SMHEATA	Heater A duty cycle		
	37	B1	STMC8T1	MC8-Scan	temp1 motor driver stage	
<hr/>						
	<u>if byte 28 (SSMCMC) bit 1 (SSMC2MC) is 1</u>					<u>if SSMC2MC is</u>
1	30	B1	STMC2T2	MC2-Azimuth	temp2 motor	
	31	B1	STMC1T2	MC1-Door	temp2 motor	
	32	B1	STMC4T2	MC4-Slit select	temp2 motor	
	33	B1	STMC3T2	MC3-Elevation	temp2 motor	
	34	B1	STMC6T2	MC6-Grating	temp2 motor	
	35	B1	STMC5T2	MC5-Slit focus	temp2 motor	
	36	B1	SMHEATB	Heater B duty cycle		
	37	B1	STMC8T2	MC8-Scan	temp2 motor	
<hr/>						
	<u>if byte 28 (SSMCMC) bit 2 (SSMC3MC) is 1</u>					<u>if SSMC3MC is</u>
1	30	B1	STMC2T3	MC2-Azimuth	temp3 telescope assembly	
	31	B1	STMC1T3	MC1-Door	temp3 spacer (redundant)	
	32	B1	STMC4T3	MC4-Slit select	temp3 front	
	33	B1	STMC3T3	MC3-Elevation	temp3 rear	
	34	B1	STMC6T3	MC6-Grating	temp3 spacer	
	35	B1	STMC5T3	MC5-Slit focus	temp3 front (redundant)	
	36	B1	SMHEATC	Heater C duty cycle		
	37	B1	STMC8T3	MC8-Scan	temp3 rear (redundant)	
<hr/>						
38	B1	STDPUCU1	HK2 (temperature DPU-RAM CU1)	Channel 2		DPU Interface
39	B1	STDPUDCC	HK1 (temperature DC/DC converter)	Channel 1		
40	B1	STDPUEBX	HK4 (temperature E-Box)	Channel 4		
41	B1	STDPUCU2	HK3 (temperature DPU-RAM CU2)	Channel 3		
42	B1	SIDPU+5V	DC/DC converter +5V/current	Channel 6		
43	B1	S+5VDPV	DC/DC converter +5V/voltage	Channel 5		
<hr/>						
44	B1	SSECPB	ECP bank registers			ECP/SPU
45	B1	SSECPBSR	ECP bank select register			
46	B1	SSSPUBSR	SPU bank select register			
47	B1	SSECPERR	ECP error status register			
48	B1	SSSPUERR	SPU error status register			
49	B1	SSSPUB	SPU bank registers			
<hr/>						
50	] B2	SSCU1	CU1 config register			Config Register/Boot Controller
51]					
52	] B2	SSCU2	CU2 config register			
53]					
54	] B2	SSBCREG	boot controller configuration register actual BC			
55]					
56	] B2	SSBCVAL	boot controller configuration value actual BC			
57]					
<hr/>						
58	B1	SSSCSTAT	inter-instrument mode / nonvalid TC block counter			Spacecraft Interface
59	B1	SSTCCNT	TC block counter			
60	B1		Toggle flag byte			
61	B1	SSEVCNT	valid solar event coordinates counter			
62	] B2	SSTMREPO	TM reporting file 0			
63]					
64	] B2	SSTMREP1	TM reporting file 1			
65]					
66	] B2	SSTMREP2	TM reporting file 2			
67]					
68	] B2	SSTMREP3	TM reporting file 3			

SOHO SUMER Housekeeping Data Packet – Detailed Description (cont.)

69	↓					
70	2B2	SSIIDMM	inter-instrument master message			
71	↓					
72	↓					
73	↓					
<hr/>						
74	B1	S-15MC1	MC1-Door -15V	Motor Controller Electronics (cont.)		MC1
75	B1	S+15MC1	MC1-Door +15V			
76	B2	SSMC1POS	MC1-Door encoder value			
77	↓					
78	B1	S+5MC1	MC1-Door +5V			
79	B1	SSMC1	MC1-Door status			
<hr/>						
80	B1	S-15MC2	MC2-Azimuth -15V			MC2
81	B1	S+15MC2	MC2-Azimuth +15V			
82	B2	SSMC2POS	MC2-Azimuth encoder value			
83	↓					
84	B1	S+5MC2	MC2-Azimuth +5V			
85	B1	SSMC2	MC2-Azimuth status			
<hr/>						
86	B1	S-15MC3	MC3-Elevation -15V			MC3
87	B1	S+15MC3	MC3-Elevation +15V			
88	B2	SSMC3POS	MC3-Elevation encoder value			
89	↓					
90	B1	S+5MC3	MC3-Elevation +5V			
91	B1	SSMC3	MC3-Elevation status			
<hr/>						
92	B1	S-15MC4	MC4-Slit select -15V			MC4
93	B1	S+15MC4	MC4-Slit select +15V			
94	B2	SSMC4POS	MC4-Slit select encoder value			
95	↓					
96	B1	S+5MC4	MC4-Slit select +5V			
97	B1	SSMC4	MC4-Slit select status			
<hr/>						
98	B1	S-15MC5	MC5-Slit focus -15V			MC5
99	B1	S+15MC5	MC5-Slit focus +15V			
100	B2	SSMC5POS	MC5-Slit focus encoder value			
101	↓					
102	B1	S+5MC5	MC5-Slit focus +5V			
103	B1	SSMC5	MC5-Slit focus status			
<hr/>						
104			B1	S-15MC6	MC6-Grating	-15V
MC6						
105	B1	S+15MC6	MC6-Grating +15V			
106	B2	SSMC6POS	MC6-Grating encoder value			
107	↓					
108	B1	S+5MC6	MC6-Grating +5V			
109	B1	SSMC6	MC6-Grating status			
<hr/>						
110			B1	S-15MC8	MC8-Scan	-15V
MC8						
111	B1	S+15MC8	MC8-Scan +15V			
112	B2	SSMC8POS	MC8-Scan IAS encoder value			
113	↓					
114	B1	S+5MC8	MC8-Scan +5V			
115	B1	SSMC8	MC8-Scan status			
116	B1		spare			
117	B1	SMHEAMOD	Heater mode			
118	B1	SSHEATKS	Heater ticks			
119	B1		spare			
<hr/>						
120	B1	SSHKM HIT	HK monitor emergency switch-off index		Emergency Switch-Off and	
-On						
121	B1	SSHKM MODE	emergency switch-on config mode			
<hr/>						
122	B1	SE3	spare			Rear Slit

SOHO SUMER Housekeeping Data Packet – Detailed Description (cont.)

Camera

123 I1 SSRSC result from level 4 command RSC_ReadImage

124 B2 SSIIM IIM status register

Image Integration

Memories

125

126 B1 SE 7 spare

127 I1 SSIIMRES result from level 4 commands IIM...

128...175 48*B1 SYXDL XDL data channels

128 12*B1 SYXPXAX XDL X PHA data (2nd byte in 132, 3rd in 136 etc.)

130 12*B1 SYXPXAY XDL Y PHA data (2nd byte in 134, 3rd in 138 etc.)

128 B1 SYXPXAX XDL X PHA Data

Detector

Electronics

129 B1 SIXLVPI LVPS Current Monitor

130 B1 SYXPXAY XDL Y PHA Data

131 B1 SXXACCEL Post Accel HV Status

132 B1 SYXPXAX XDL X PHA Data

133 B1 S+X MCPV MCP Voltage Monitor

134 B1 SYXPXAY XDL Y PHA Data

135 B1 SIXMCPI MCP Current Monitor

136 B1 SYXPXAX XDL X PHA Data

137 B1 S+XTDC5 +5V Monitor for TDC Box supply

138 B1 SYXPXAY XDL Y PHA Data

139 B1 S-XTDC5 -5V Monitor for TDC Box supply

140 B1 SYXPXAX XDL X PHA Data

141 B1 S+XTDC10 +10V Monitor for TDC Box supply

142 B1 SYXPXAY XDL Y PHA Data

143 B1 S-XTDC15 -15V Monitor for TDC Box supply

144 B1 SYXPXAX XDL X PHA Data

145 B1 S+XMON13 +13V Monitor for Monitor Box supply

146 B1 SYXPXAY XDL Y PHA Data

147 B1 S-XMON13 -13V Monitor for Monitor Box supply

148 B1 SYXPXAX XDL X PHA Data

149 B1 S+XMON5 +5V Monitor for Monitor Box supply

150 B1 SYXPXAY XDL Y PHA Data

151 B1 S+XTIMX X Timing Threshold

152 B1 SYXPXAX XDL X PHA Data

153 B1 S+XCHX X Charge Threshold

154 B1 SYXPXAY XDL Y PHA Data

155 B1 S+XTIMY Y Timing Threshold

156 B1 SYXPXAX XDL X PHA Data

157 B1 S+XCHY Y Charge Threshold

158 B1 SYXPXAY XDL Y PHA Data

159 B1 STXDL Temperature Channel (defined by SSXSID)

160 B1 SYXPXAX XDL X PHA Data

161 B1 SXXDEF (contains SSXSID)

162 B1 SYXPXAY XDL Y PHA Data

163 B1 SXXCECHO Command Echo (defined by SSXSID)

164 B1 SYXPXAX XDL X PHA Data

165 B1 SXXHVCMD HV Command Level (command addr 11)

166 B1 SYXPXAY XDL Y PHA Data

167 B1 SXXHVSTA HV Status Register

168 B1 SYXPXAX XDL X PHA Data

169 B1 SXXMXEV X Event Counter MSByte

170 B1 SYXPXAY XDL Y PHA Data

171 B1 SXXLXEV X Event Counter LSByte

172 B1 SYXPXAX XDL X PHA Data

173 B1 SXXMYEV Y Event Counter MSByte

174 B1 SYXPXAY XDL Y PHA Data

175 B1 SXXLYEV Y Event Counter LSByte

B2 SXXEVE X Event Counter

SOHO SUMER Housekeeping Data Packet – Detailed Description (cont.)

B2 SSXYEV SSXMXEV * 255 + SSXLXEV
 Y Event Counter
 SSXMYEV * 255 + SSXLYEV

176 ┐ B2 SKAFTRES AFT result

DPU

Software

177 ┘

178 B1 SSCONF00 to SSCONF07
 179 B1 SSCONF08 to SSCONF15
 180 B1 SSCONF16 to SSCONF23
 181 B1 SSCONF24 to SSCONF31
 182 B1 SSCONF32 to SSCONF39
 183 B1 SSCONF40 to SSCONF47
 184 B1 SSCONF48 to SSCONF55
 185 B1 SSCONF56 to SSCONF63
 186 B1 SSCONF64 to SSCONF71
 187 B1 SKEXPSTA Experiment Software Status

SOHO SUMER Housekeeping Data Packet – Detailed Description (cont.)

5.4.2.2 Detailed Description

Power Control Unit				
all values are updated every 15 seconds				
0	B1	SSPOW1	Status 1	power converter channel 1
bit 7	SSP1B7	s14 converter 2 VBB		1 = on, 0 = off
bit 6	SSP1B6	s13 converter 1 VBB		1 = on, 0 = off
bit 5	SSP1B5	s12 wax motor (door)		1 = on, 0 = off
bit 4	SSP1B4	s11 deflector		1 = on, 0 = off
bit 3	SSP1B3	s10 ---obsolete---		1 = on, 0 = off
bit 2	SSP1B2	s09 converter 2 VCC		1 = on, 0 = off
bit 1	SSP1B1	s08 converter 1 VCC		1 = on, 0 = off
bit 0	SSP1B0	s07 VBB1 to VBB2		1 = connected, 0 = not connected
1	B1	SSPOW0	Status 0	power converter channel 0
bit 7	SSP0B7	s06 VDD1 to VDD2		1 = connected, 0 = not connected
bit 6	SSP0B6	s05 converter 2 VDD		1 = on, 0 = off
bit 5	SSP0B5	s04 converter 1 VDD		1 = on, 0 = off
bit 4	SSP0B4	s03 converter 2		1 = on, 0 = off
bit 3	SSP0B3	s02 converter 1		1 = on, 0 = off
bit 2	SSP0B2	s01 converter		1 = main, 0 = redundant
bit 1	SSP0B1	s00 converter emergency (main switch)		1 = on, 0 = off
bit 0	SSP0B0	command transmission error		1 = error, 0 = no error
2	B1	SSPOW3	Status 3	power converter channel 3
bit 7	SSP3B7	s30 VCC rear slit camera		1 = on, 0 = off
bit 6	SSP3B6	s29 VCC scan mirror		1 = on, 0 = off
bit 5	SSP3B5	-- obsolete --		
bit 4	SSP3B4	s27 VCC grating		1 = on, 0 = off
bit 3	SSP3B3	s26 VCC slit focus		1 = on, 0 = off
bit 2	SSP3B2	s25 VCC slit select		1 = on, 0 = off
bit 1	SSP3B1	s24 VCC telescope elevat.		1 = on, 0 = off
bit 0	SSP3B0	s23 VCC telescope azimuth		1 = on, 0 = off
3	B1	SSPOW2	Status 2	power converter channel 2
bit 7	SSP2B7	s22 VCC entrance door		1 = on, 0 = off
bit 6	SSP2B6	s21 heater D		1 = on, 0 = off
bit 5	SSP2B5	s20 heater D		1 = on, 0 = off
bit 4	SSP2B4	s19 operational heater C		1 = on, 0 = off
bit 3	SSP2B3	s18 operational heater B		1 = on, 0 = off
bit 2	SSP2B2	s17 operational heater A		1 = on, 0 = off
bit 1	SSP2B1	s16 detector B converter		1 = on, 0 = off
bit 0	SSP2B0	s15 detector A converter		1 = on, 0 = off
4	B1	SIRSC-15	IBBRSC -15V range: 0 .. 12.75 mA (00 .. FF hex), I(max): 10 mA, resolution: 50 µA	power converter channel 28
5	B1	SSPOW4	STATUS 4	power converter channel 4
bit 7	SSP4B7	sp4 flight/safety plug 4		1 = connected, 0 = not connected
bit 6		spare		
bit 6		spare		
bit 4	SSP4B4	sp1 test/safety plug 1		1 = connected, 0 = not connected
bit 3	SSP4B3	s34 VBB2		1 = on, 0 = off
bit 2	SSP4B2	s33 VBB1		1 = on, 0 = off
bit 1	SSP4B1	s32 VDD2		1 = on, 0 = off
bit 0	SSP4B0	s31 VDD1		1 = on, 0 = off
6	B1	STSUMER4	temperature SUMER4 range: -19 .. +70.25 °C (00 .. FF hex), T(max): 40 °C, resolution: 0.35 K	power converter channel 31
7	B1	S-15VRSC	VBBRSC -15V range: 0 .. -18.36 V (00 .. FF hex), U(max): -15.3 V, resolution: -72 mV	power converter channel 29
8	B1	SIDETB	IDetB	power converter channel 9

SOHO SUMER Housekeeping Data Packet – Detailed Description (cont.)

			range: 0 .. 1020 mA (00 .. FF hex), I(max): 833 mA, resolution: 4 mA	
9	B1	SIDETA	IDeta range: 0 .. 1020 mA (00 .. FF hex), I(max): 833 mA, resolution: 4 mA	power converter channel 8
10	B1		---obsolete---	power converter channel 11
11	B1	SIHEATRD	IHeaterD range: 0 .. 892.5 mA (00 .. FF hex), I(max): 740 mA, resolution: 3.5 mA	power converter channel 10
12	B1	SIWAXMOT	IWaxMotor Door range: 0 .. 459 mA (00 .. FF hex), I(max): 380 mA, resolution: 1.8 mA	power converter channel 13
13	B1	SIDEFL	IDefl range: 0 .. 51mA (00 .. FF hex), I(max): 40 mA, resolution: 0.2 mA	power converter channel 12
14	B1	S+28VBRD	VBoard +28V range: 0 .. 35.7 V (00 .. FF hex), U(max): 28.3 V, resolution: 140 mV	power converter channel 15
15	B1	SIBRD+28	IBoard +28V range: 0 .. 3315mA (00 .. FF hex), I(max): 2700 mA, resolution: 13 mA	power converter channel 14
16	B1	S+5VCC	VCC +5V range: 0 .. 7.14 V (00 .. FF hex), U(max): 5.05 V, resolution: 28 mV	power converter channel 17
17	B1	SICC+5	ICC +5V range: 0 .. 1530 mA (00 .. FF hex), I(max): 1200 mA, resolution: 6 mA	power converter channel 16
18	B1	S+18VDD1	VDD1 +18V range: 0 .. 22.95 V (00 .. FF hex), U(max): 18.9 V, resolution: 90 mV	power converter channel 19
19	B1	SIDD1+18	IDD1 +18V range: 0 .. 1275 mA (00 .. FF hex), I(max): 1050 mA, resolution: 5 mA	power converter channel 18
20	B1	S+18VDD2	VDD2 +18V range: 0 .. 22.95 V (00 .. FF hex), U(max): 18.9 V, resolution: 90 mV	power converter channel 21
21	B1	SIDD2+18	IDD2 +18V range: 0 .. 1275 mA (00 .. FF hex), I(max): 1050 mA, resolution: 5 mA	power converter channel 20
22	B1	S-18VBB1	VBB1 -18V range: 0 .. -22.95 V (00 .. FF hex), U(max): -18.9 V, resolution: -90 mV	power converter channel 23
23	B1	SIBB1-18	IBB1 -18V range: 0 .. 1275 mA (00 .. FF hex), I(max): 1050 mA, resolution: 5 mA	power converter channel 22
24	B1	S-18VBB2	VBB2 -18V range: 0 .. -22.9 V (00 .. FF hex), U(max): -18.9 V, resolution: -90 mV	power converter channel 25
25	B1	SIBB2-18	IBB2 -18V range: 0 .. 1275 mA (00 .. FF hex), I(max): 1050 mA, resolution: 5 mA	power converter channel 24
26	B1	S+15VRSC	VDDRSC +15V range: 0 .. 18.36 V (00 .. FF hex), U(max): 15.3 V, resolution: 72 mV	power converter channel 27
27	B1	SIRSC+15	IDDRSC +15V range: 0 .. 12.75 mA (00 .. FF hex), I(max): 10 mA, resolution: 50 µA	power converter channel 26

SOHO SUMER Housekeeping Data Packet – Detailed Description (cont.)

Motor Controller Electronics

all values are updated every 15 seconds and after every `SYS_GetHKrecord` command

28	B1	SSMCMC	Motor Controller monitor condition parameter for locations 30-37	
bits 7-3		spare		
bit 2	SSMC3MC	1 = bytes 30-35 and 37 contain temp3 of all motor controllers, byte 36 contains heater C duty cycle		
bit 1	SSMC2MC	1 = bytes 30-35 and 37 contain temp2 of all motor controllers, byte 36 contains heater B duty cycle		
bit 0	SSMC1MC	1 = bytes 30-35 and 37 contain temp1 of all motor controllers, byte 36 contains heater A duty cycle		
29	B1	SE1	spare	
		<u>if byte 28 (SSMCMC) bit 0 (SSMC1MC) is 1</u> <u>if SSMC1MC is 1</u> (due to the subcommutation of these channels, the values are transmitted every 45 seconds only)		
30	B1	STMC2T1	MC2-Azimuth	temp1 motor driver stage range: 0 .. 127 °C (00 .. FF hex), resolution: 0.5 K
31	B1	STMC1T1	MC1-Door	temp1 motor driver stage description: see location 30 above
32	B1	STMC4T1	MC4-Slit select	temp1 motor driver stage description: see location 30 above
33	B1	STMC3T1	MC3-Elevation	temp1 motor driver stage description: see location 30 above
34	B1	STMC6T1	MC6-Grating	temp1 motor driver stage description: see location 30 above
35	B1	STMC5T1	MC5-Slit focus	temp1 motor driver stage description: see location 30 above
36	B1	SMHEATA	Heater A duty cycle heater on-time in ticks as set by commands <code>HEA_Manual</code> / <code>HEA_Interval</code> or as set by the automatic heater control	
37	B1	STMC8T1	MC8-Scan	temp1 motor driver stage description: see location 30 above
		<u>if byte 28 (SSMCMC) bit 1 (SSMC2MC) is 1</u> <u>if SSMC2MC is 1</u> (due to the subcommutation of these channels, the values are transmitted every 45 seconds only)		
30	B1	STMC2T2	MC2-Azimuth	temp2 motor range: 0 .. 127 °C (00 .. FF hex), resolution: 0.5 K
31	B1	STMC1T2	MC1-Door	temp2 motor description: see location 30 above
32	B1	STMC4T2	MC4-Slit select	temp2 motor description: see location 30 above
33	B1	STMC3T2	MC3-Elevation	temp2 motor description: see location 30 above
34	B1	STMC6T2	MC6-Grating	temp2 motor description: see location 30 above

SOHO SUMER Housekeeping Data Packet – Detailed Description (cont.)

35	B1	STMC5T2	MC5-Slit focus	temp2 motor	description: see location 30 above
36	B1	SMHEATB	Heater B duty cycle heater on-time in ticks as set by commands HEA_Manual / HEA_Interval or as set by the automatic heater control		
37	B1	STMC8T2	MC8-Scan	temp2 motor	description: see location 30 above
<p><u>if byte 28 (SSMCMC) bit 2 (SSMC3MC) is 1</u> <u>if SSMC3MC is 1</u> (due to the subcommutation of these channels, the values are transmitted every 45 seconds only)</p>					
30	B1	STMC2T3	MC2-Azimuth	temp3 telescope assembly	temperature 3 (STMC2T3) is computed from - rawt3: the ADC 16-bit output value (see HK record 251, location 24) - fk : the calibration factor (stored in calibration table 1) - ak : the calibration offset (stored in calibration table 1) by calculating: $STMC2T3 = rawt3 * fk + ak$ range: -0.960 .. +80.940 °C, resolution: 0.320 K
31	B1	STMC1T3	MC1-Door	temp3 spacer (redundant)	temperature 3 (STMC1T3) is computed from - rawt3: the ADC 16-bit output value (see HK record 251, location 24) - fk : the calibration factor (stored in calibration table 1) - ak : the calibration offset (stored in calibration table 1) by calculating: $STMC1T3 = rawt3 * fk + ak$ range: +15.000 .. +25.200 °C, resolution: 0.040 K
32	B1	STMC4T3	MC4-Slit select	temp3 front	description: see location 31 above
33	B1	STMC3T3	MC3-Elevation	temp3 rear	description: see location 31 above
34	B1	STMC6T3	MC6-Grating	temp3 spacer	description: see location 31 above
35	B1	STMC5T3	MC5-Slit focus	temp3 front (redundant)	description: see location 31 above
36	B1	SMHEATC	Heater C duty cycle heater on-time in ticks as set by commands HEA_Manual / HEA_Interval or as set by the automatic heater control		
37	B1	STMC8T3	MC8-Scan	temp3 rear (redundant)	description: see location 31 above

SOHO SUMER Housekeeping Data Packet – Detailed Description (cont.)

DPU Interface		
all values are updated every 15 seconds		

38	B1	STDPUCU1	HK2 (temperature DPU-RAM CU1)	Channel 2
range: -30 .. +97.5 °C, resolution: 0.5 K				
39	B1	STDPUDCC	HK1 (temperature DC/DC converter)	Channel 1
range: -30 .. +97.5 °C, resolution: 0.5 K				
40	B1	STDPUEBX	HK4 (temperature E-Box)	Channel 4
range: -30 .. +97.5 °C, resolution: 0.5 K				
41	B1	STDPUCU2	HK3 (temperature DPU-RAM CU2)	Channel 3
range: -30 .. +97.5 °C, resolution: 0.5 K				
42	B1	SIDPU+5V	DC/DC converter +5V/current	Channel 6
range: 0 .. 4.98 A, resolution: 19.53 mA				
43	B1	S+5VDPU	DC/DC converter +5V/voltage	Channel 5
range: 0 .. 9.96 V, resolution: 39.06 mV				

SOHO SUMER Housekeeping Data Packet – Detailed Description (cont.)

ECP / SPU

all values are updated every second and after every SYS command concerning these values

44	B1	SSECPB	ECP Bank Registers bits 7-4: common control bus status bits 3-0: bank status register
bit 7	SSECPCLK		0 = clock generator 1 selected 1 = clock generator 2 selected
bit 6	SSECPDET		0 = detector B selected 1 = detector A selected
bit 5	SSECPIMB		0 = CU1 connected to IIM bus 1 = CU2 connected to IIM bus
bit 4	SSECPIOS		0 = CU2 connected to I/O 1 = CU1 connected to I/O
bit 3			0 = RAM bank 3 power is off 1 = RAM bank 3 power is on
bit 2			0 = RAM bank 2 power is off 1 = RAM bank 2 power is on
bit 1			0 = RAM bank 1 power is off 1 = RAM bank 1 power is on
bit 0			0 = RAM bank 0 power is off 1 = RAM bank 0 power is on
<hr/>			
45	B1	SSECPBSR	ECP Bank Select Register Allocation of virtual to physical memory banks on ECP
bits 7-6			00 = physical bank 3 allocated to virtual bank 3 01 = physical bank 2 allocated to virtual bank 3 10 = physical bank 1 allocated to virtual bank 3 11 = physical bank 0 allocated to virtual bank 3
bits 5-4			00 = physical bank 2 allocated to virtual bank 2 01 = physical bank 3 allocated to virtual bank 2 10 = physical bank 0 allocated to virtual bank 2 11 = physical bank 1 allocated to virtual bank 2
bits 3-2			00 = physical bank 1 allocated to virtual bank 1 01 = physical bank 0 allocated to virtual bank 1 10 = physical bank 3 allocated to virtual bank 1 11 = physical bank 2 allocated to virtual bank 1
bits 1-0			00 = physical bank 0 allocated to virtual bank 0 01 = physical bank 1 allocated to virtual bank 0 10 = physical bank 2 allocated to virtual bank 0 11 = physical bank 3 allocated to virtual bank 0
<hr/>			
46	B1	SSSPUBSR	SPU Bank Select Register Allocation of virtual to physical memory banks on SPU description: see location 45 above

SOHO SUMER Housekeeping Data Packet – Detailed Description (cont.)

47	B1	SSECPERR	<p>ECP Error Status Register bits 7-4: powerfail at physical memory banks bits 3-0: double bit errors in data words</p>
bit 7			0 = no powerfail at physical memory bank 3 1 = powerfail at physical memory bank 3
bit 6			0 = no powerfail at physical memory bank 2 1 = powerfail at physical memory bank 2
bit 5			0 = no powerfail at physical memory bank 1 1 = powerfail at physical memory bank 1
bit 4			0 = no powerfail at physical memory bank 0 1 = powerfail at physical memory bank 0
bit 3			0 = no error in data word D16-D31 1 = double bit error in data word D16-D31
bit 2			0 = no error in data word D00-D15 1 = double bit error in data word D00-D15
bit 1			0 = no error in data word D16-D31 1 = double bit error in data word D16-D31
bit 0			0 = no error in data word D00-D15 1 = double bit error in data word D00-D15

48	B1	SSSPUERR	<p>SPU Error Status Register bits 7-4: powerfail at physical memory banks bits 3-0: double bit errors in data words description: see location 47 above</p>
-----------	-----------	-----------------	--

49	B1	SSSPUB	<p>SPU Bank Registers bits 7-4: spare bits 3-0: SSSPUB bank status register</p>
bits 7-4			spare
bit 3			0 = RAM bank 3 power is off 1 = RAM bank 3 power is on
bit 2			0 = RAM bank 2 power is off 1 = RAM bank 2 power is on
bit 1			0 = RAM bank 1 power is off 1 = RAM bank 1 power is on
bit 0			0 = RAM bank 0 power is off 1 = RAM bank 0 power is on

SOHO SUMER Housekeeping Data Packet – Detailed Description (cont.)

Config Register / Boot Controller

all values are updated every 15 seconds,
SSCU1 and SSCU2 are updated after every write access to the CU1 and CU2 config registers

50 } B2 SSCU1 CU1 Config Register
51 }

- bits 15-10 spare, must be set to 0
- bit 9 SSCU1PR3 0 = switch RAM bank 3 power off
1 = switch RAM bank 3 power on
- bit 8 SSCU1PR2 0 = switch RAM bank 2 power off
1 = switch RAM bank 2 power on
- bit 7 SSCU1PR1 0 = switch RAM bank 1 power off
1 = switch RAM bank 1 power on
- bit 6 SSCU1PRO 0 = switch RAM bank 0 power off
1 = switch RAM bank 0 power on
- bit 5 SSCU1PM 0 = switch power monitoring on
1 = switch power monitoring off

bits 4-0 SSCU1P2V Allocation of virtual to physical memory banks

		— bit —				virtual bank						
dec	hex	4	3	2	1	0	0	1	2	3		
0	0x00	0	0	0	0	0	0	1	2	3	physical memory banks allocated to the to the virtual banks identified in the table's header	
1	0x01	0	0	0	0	1	0	1	3	2		
2	0x02	0	0	0	1	0	0	2	1	3		
3	0x03	0	0	0	1	1	0	2	3	1		
4	0x04	0	0	1	0	0	0	3	2	1		
5	0x05	0	0	1	0	1	0	3	1	2		
6	0x06	0	0	1	1	0	1	0	2	3		
7	0x07	0	0	1	1	1	1	1	0	3		2
8	0x08	0	1	0	0	0	1	2	0	3		
9	0x09	0	1	0	0	1	1	2	3	0		
10	0x0a	0	1	0	1	0	1	3	0	2		
11	0x0b	0	1	0	1	1	1	3	2	0		
12	0x0c	0	1	1	0	0	2	0	1	3		
13	0x0d	0	1	1	0	1	2	0	3	1		
14	0x0e	0	1	1	1	0	2	1	0	3		
15	0x0f	0	1	1	1	1	2	1	3	0		
16	0x10	1	0	0	0	0	2	3	0	1		
17	0x11	1	0	0	0	1	2	3	1	0		
18	0x12	1	0	0	1	0	3	0	1	2		
19	0x13	1	0	0	1	1	3	0	2	1		
20	0x14	1	0	1	0	0	3	1	0	2		
21	0x15	1	0	1	0	1	3	1	2	0		
22	0x16	1	0	1	1	0	3	2	0	1		
23	0x17	1	0	1	1	1	3	2	1	0		

52 } B2 SSCU2 CU2 config register
53 } description: see locations 50-51 above
replace designations SSCU1xxx by SSCU2xxx

SOHO SUMER Housekeeping Data Packet – Detailed Description (cont.)

54 } B2	SSBCREG	Boot Controller Configuration Register	Actual BC
55 }		(value does not change after booting)	
bit 15		CU1 latch up detected in bank 3	1 = yes, 0 = no
bit 14		CU1 latch up detected in bank 2	1 = yes, 0 = no
bit 13		CU1 latch up detected in bank 1	1 = yes, 0 = no
bit 12		CU1 latch up detected in bank 0	1 = yes, 0 = no
bit 11		CU2 latch up detected in bank 3	1 = yes, 0 = no
bit 10		CU2 latch up detected in bank 2	1 = yes, 0 = no
bit 9		CU2 latch up detected in bank 1	1 = yes, 0 = no
bit 8		CU2 latch up detected in bank 0	1 = yes, 0 = no
bit 7		always 0	
bit 6	SSBCBSRC	boot from: 1 = EPROM, 0 = link	
bit 5	SSBCRSRC	reset source: 1 = any other reset, 0 = power on reset	
bit 4	SSBCCMD	1 = commanded configuration, 0 = automatic configuration	
bits 3-2	SSBCMODE	boot controller mode 00 = normal mode, CU1 is ECP 01 = normal mode, CU2 is ECP 10 = emergency mode on CU1 11 = emergency mode on CU2	
bit 1	SSBCCLCK	clock generator (CG): 1 = CG2, 0 = CG1	
bit 0	SSBC	boot controller (BC): 1 = BC2, 0 = BC1	
56 } B2	SSBCVAL	boot controller configuration value	actual BC
57 }		(value does not change after booting)	
bit 15		always 0	
bit 14		always 0	
bit 13	SSCU2BNK	CU2 on-board RAM test failed	1 = yes, 0 = no
bit 12	SSCU1BNK	CU1 on-board RAM test failed	1 = yes, 0 = no
bit 11	SSCU2CU1	linktest CU2 CU1 failed	1 = yes, 0 = no
bit 10	SSCU2RAM	on-board RAM test CU2 failed	1 = yes, 0 = no
bit 9	SSCU2MEM	peek/poke memtest CU2 failed	1 = yes, 0 = no
bit 8	SSCU2LNK	link CU2 bad	1 = yes, 0 = no
bit 7	SSCU1CU2	link test CU1 CU2 failed	1 = yes, 0 = no
bit 6	SSCU1RAM	on-board RAM test CU1 failed	1 = yes, 0 = no
bit 5	SSCU1MEM	peek/poke memtest CU1 failed	1 = yes, 0 = no
bit 4	SSCU1LNK	link CU1 bad	1 = yes, 0 = no
bit 3	SSEMRGSW	EPROM-CRC emergency SW failed	1 = yes, 0 = no
bit 2	SSSPUSW	EPROM-CRC SPU SW failed	1 = yes, 0 = no
bit 1	SSECPUSW	EPROM-CRC ECP SW failed	1 = yes, 0 = no
bit 0	SSBCSW	EPROM-CRC BC SW failed	1 = yes, 0 = no

Spacecraft Interface

all values are updated every 15 seconds, volatile values whenever they change

58	B1	SSSCSTAT	inter-instrument mode / nonvalid TC block counter
	bit 7		spare
	bits 6-5	SSIIDBIT	inter-instrument mode bit: 00 = standby, 01 = master, 10 = receiver
	bit 4		spare
	bits 3-0	SSTCNONV	nonvalid TC block counter (0 .. 15)
<hr/>			
59	B1	SSTCCNT	TC block counter 0 .. 255, wraps over to 0
<hr/>			
60	B1		Toggle flag byte
	bit 0	SSTCTOGN	toggle flag bit, range 0 .. 1
<hr/>			
61	B1	SSEVCNT	valid solar event coordinates counter 0 .. 255, wraps over to 0, is reset to 0 in stand-by mode
<hr/>			
62 .. 69: 4*B2 SSTMREPF TM reporting file *****			
62	B2	SSTMREPO	TM reporting file 0
63]		
bits 15-5 bits 10-0 of the respective MLA-word			
bits 4-0 error code: 01000 = block command length is not between 2 and 32 words 00100 = block command identifier is not valid 10001 = checksum is not correct 00010 = block command destination is not correct 10010 = new MLA received before the last word of the current block command 10100 = delay > 1 s occurred between the reception of the MLA header and the following MLB word or between two successive words			
<hr/>			
64	B2	SSTMREP1	TM reporting file 1
65]		
description: see locations 62-63 above			
<hr/>			
66	B2	SSTMREP2	TM reporting file 2
67]		
description: see locations 62-63 above			
<hr/>			
68	B2	SSTMREP3	TM reporting file 3
69]		
description: see locations 62-63 above			
<hr/>			
70 .. 73: 2*B2 SSIIDMM inter-instrument master message *****			
70	B2		master ID and solar coordinate y
71]		
	bit 15		validity bit: 1 = invalid, 0 = valid
	bits 14-11		master ID
	bit 10		always 0
	bits 9-0		solar coordinate y, resolution: 2 arcsec
<hr/>			
72	B2		solar event ID and solar coordinate z
73]		
	bit 15		validity bit: 1 = invalid, 0 = valid
	bits 14-11		solar event ID
	bit 10		always 1
	bits 9-0		solar coordinate z, resolution: 2 arcsec

SUMER HK Record 250 – Voltages and Currents (cont.)

Motor Controller Electronics (cont.)

all values are updated every 15 seconds and after every **SYS_GetHKrecord** command,
the status values after every command addressing a motor controller

74	B1	S-15MC1	MC1-Door -15V range: 0 .. -20.40 V (00 .. FF hex), resolution: 80 mV
75	B1	S+15MC1	MC1-Door +15V range: 0 .. 20.40 V (00 .. FF hex), resolution: 80 mV
76 77	B2	SSMC1POS	MC1-Door encoder value
78	B1	S+5MC1	MC1-Door +5V range: 0 .. 10.20 V (00 .. FF hex), resolution: 40 mV
79	B1	SSMC1	MC1-Door status bit 7 SSMC1ERR 1 = error bit 6 SSMC1CMD 1 = command executed bit 5 SSMC1EPO 1 = encoder power off bit 4 SSMC1ETO 1 = encoder timeout bit 3 SSMC1RES 1 = reset bit 2 SSMC1ADC 1 = ADC power off bits 1-0 spare
80	B1	S-15MC2	MC2-Azimuth -15V range: 0 .. -20.40 V (00 .. FF hex), resolution: 80 mV
81	B1	S+15MC2	MC2-Azimuth +15V range: 0 .. 20.40 V (00 .. FF hex), resolution: 80 mV
82 83	B2	SSMC2POS	MC2-Azimuth encoder value
84	B1	S+5MC2	MC2-Azimuth +5V range: 0 .. 10.20 V (00 .. FF hex), resolution: 40 mV
85	B1	SSMC2	MC2-Azimuth status bit 7 SSMC2ERR 1 = error bit 6 SSMC2CMD 1 = command executed bit 5 SSMC2EPO 1 = encoder power off bit 4 SSMC2ETO 1 = encoder timeout bit 3 SSMC2RES 1 = reset bit 2 SSMC2ADC 1 = ADC power off bits 1-0 spare
86	B1	S-15MC3	MC3-Elevation -15V range: 0 .. -20.40 V (00 .. FF hex), resolution: 80 mV
87	B1	S+15MC3	MC3-Elevation +15V range: 0 .. 20.40 V (00 .. FF hex), resolution: 80 mV
88 89	B2	SSMC3POS	MC3-Elevation encoder value
90	B1	S+5MC3	MC3-Elevation +5V range: 0 .. 10.20 V (00 .. FF hex), resolution: 40 mV

SUMER HK Record 250 – Voltages and Currents (cont.)

91	B1	SSMC3	MC3-Elevation status
	bit 7	SSMC3ERR	1 = error
	bit 6	SSMC3CMD	1 = command executed
	bit 5	SSMC3EPO	1 = encoder power off
	bit 4	SSMC3ETO	1 = encoder timeout
	bit 3	SSMC3RES	1 = reset
	bit 2	SSMC3ADC	1 = ADC power off
	bits 1-0		spare
92	B1	S-15MC4	MC4-Slit select -15V range: 0 .. -20.40 V (00 .. FF hex), resolution: 80 mV
93	B1	S+15MC4	MC4-Slit select +15V range: 0 .. 20.40 V (00 .. FF hex), resolution: 80 mV
94 95	B2	SSMC4POS	MC4-Slit select encoder value
96	B1	S+5MC4	MC4-Slit select +5V range: 0 .. 10.20 V (00 .. FF hex), resolution: 40 mV
97	B1	SSMC4	MC4-Slit select status
	bit 7	SSMC4ERR	1 = error
	bit 6	SSMC4CMD	1 = command executed
	bit 5	SSMC4EPO	1 = encoder power off
	bit 4	SSMC4ETO	1 = encoder timeout
	bit 3	SSMC4RES	1 = reset
	bit 2	SSMC4ADC	1 = ADC power off
	bits 1-0		spare
98	B1	S-15MC5	MC5-Slit focus -15V range: 0 .. -20.40 V (00 .. FF hex), resolution: 80 mV
99	B1	S+15MC5	MC5-Slit focus +15V range: 0 .. 20.40 V (00 .. FF hex), resolution: 80 mV
100 101	B2	SSMC5POS	MC5-Slit focus encoder value
102	B1	S+5MC5	MC5-Slit focus +5V range: 0 .. 10.20 V (00 .. FF hex), resolution: 40 mV
103	B1	SSMC5	MC5-Slit focus status
	bit 7	SSMC5ERR	1 = error
	bit 6	SSMC5CMD	1 = command executed
	bit 5	SSMC5EPO	1 = encoder power off
	bit 4	SSMC5ETO	1 = encoder timeout
	bit 3	SSMC5RES	1 = reset
	bit 2	SSMC5ADC	1 = ADC power off
	bits 1-0		spare
104	B1	S-15MC6	MC6-Grating -15V range: 0 .. -20.40 V (00 .. FF hex), resolution: 80 mV
105	B1	S+15MC6	MC6-Grating +15V range: 0 .. 20.40 V (00 .. FF hex), resolution: 80 mV
106 107	B2	SSMC6POS	MC6-Grating encoder value
108	B1	S+5MC6	MC6-Grating +5V range: 0 .. 10.20 V (00 .. FF hex), resolution: 40 mV

109	B1	SSMC6	MC6-Grating status
bit 7	SSMC6ERR	1 = error	
bit 6	SSMC6CMD	1 = command executed	
bit 5	SSMC6EPO	1 = encoder power off	
bit 4	SSMC6ETO	1 = encoder timeout	
bit 3	SSMC6RES	1 = reset	
bit 2	SSMC6ADC	1 = ADC power off	
bits 1-0		spare	
110	B1	S-15MC8	MC8-Scan -15V range: 0 .. -20.40 V (00 .. FF hex), resolution: 80 mV
111	B1	S+15MC8	MC8-Scan +15V range: 0 .. 20.40 V (00 .. FF hex), resolution: 80 mV
112 113	B2	SSMC8POS	MC8-Scan IAS encoder value bits 15-0 only, bits 17-16 in bits 1-0 of location 115 (MC8-Scan status)
114	B1	S+5MC8	MC8-Scan +5V range: 0 .. 10.20 V (00 .. FF hex), resolution: 40 mV
115	B1	SSMC8	MC8-Scan status
bit 7	SSMC8ERR	1 = error	
bit 6	SSMC8CMD	1 = command executed	
bit 5	SSMC8EPO	1 = encoder power off	
bit 4	SSMC8ETO	1 = encoder timeout	
bit 3	SSMC8RES	1 = reset	
bit 2	SSMC8ADC	1 = ADC power off	
bits 1-0	SSMC8IAS	1 = IAS encoder bits 17 and 16 (bits 15-0 in location 112-113)	
116	B1		spare
117	B1	SMHEAMOD	Heater mode
118	B1	SSHEATKS	Heater ticks
119	B1		spare

SUMER HK Record 251 – Motor Controller Data (cont.)

Emergency Switch-Off and -On

all values are updated every 15 seconds

120 B1 SSKMHIT HK monitor emergency switch-off index
indicates the cause of the emergency switch-off:
(1 .. 12: power converter, 13 .. 26: motor controller)

0 = no switch-off performed
1 = VDD1
2 = VCC
3 = VBB1
4 = VDD2
5 = VBB2
6 = IDD1
7 = ICC
8 = IBB1
9 = IDD2
10 = IBB2
11 = TSUM4
12 = IDEFL

13 = MC1T1
14 = MC1T2
15 = MC2T1
16 = MC2T2
17 = MC3T1
18 = MC3T2
19 = MC4T1
20 = MC4T2
21 = MC5T1
22 = MC5T2
23 = MC6T1
24 = MC6T2
25 = MC8T1
26 = MC8T2

121 B1 SSKMMODE emergency switch-on config mode
0 = no emergency switch-on
1 .. 5 = emergency switch-on phases
255 = emergency switch-on disabled

Rear Slit Camera

the value is updated after every RSC command

122 B1 SE3 spare

123 I1 SSRSC result from level 4 command RSC_ReadImage

SSRSCANS 0 = ANSOK : answer ok
SSRSCCF -3 = COMERR: communication error
SSRSCPER -5 = PARERR: parameter range error
SSRSCTOE -7 = CTOERR: timeout error
SSRSCPWE -11 = POWERR: power alert
-13 = RSCTI1: RSC time out on first half full flag after power on
-14 = RSCTI2: RSC time out on read out

(SSRSCPXE -12 = PIXERR: first pixel error -- obsolete --)

Image Integration Memories

all values are updated every second and after every IIM command

124]	B2	SSIIM	IIM status register	
125]				
bit 15	SSIIMCRM	1 = clear DPU channel		0 = random access to DPU channel
bit 14	SSIIMSCR	1 = selected channel ready		0 = selected channel not ready
bit 13	SSIIMPSB	1 = power status ch B on		0 = power status ch B off
bit 12	SSIIMPSA	1 = power status ch A on		0 = power status ch A off
bit 11	SSIIMDEB	1 = double bit error ch B		0 = no double bit errors ch B
bit 10	SSIIMSEB	1 = single bit error ch B		0 = no single bit errors ch B
bit 9	SSIIMDEA	1 = double bit error ch A		0 = no double bit errors ch A
bit 8	SSIIMSEA	1 = single bit error ch A		0 = no single bit errors ch A
bit 7	SSIIMLSB	1 = latch up strobe ch B (low threshold)		0 = high LU trigger threshold ch B
bit 6	SSIIMLSA	1 = latch up strobe ch A (low threshold)		0 = high LU trigger threshold ch A
bit 5	SSIIMPCB	1 = power command ch B on		0 = power command ch B off
bit 4	SSIIMPCA	1 = power command ch A on		0 = power command ch A off
bit 3	SSIIMSTP	1 = set power		0 = hold power status
bit 2	SSIIMCHS	1 = channel B to DPU		0 = channel A to DPU
bit 1	SSIIMING	1 = input gate open		0 = input gate closed
bit 0	SSIIMACR	1 = auto clear on		0 = auto clear off
<hr/>				
126	B1	SE 7	spare	
<hr/>				
127	I1	SSIIMRES	result from level 4 commands IIMxxxx	
		SSIIMANS	0 = ANSOK : answer ok	
		SSIIMPER	-5 = PARERR: parameter range error	
<hr/>				

SUMER HK Record 255 – Cycle Time 1 s (cont.)

Detector Electronics
 (changed due to new detector model)
 all values are updated every 15 seconds

128...175	48*B1	SYXDL	XDL data channels
128	12*B1	SYXPAX	XDL X PHA data (2nd byte in 132, 3rd in 136 etc.)
130	12*B1	SYXPAY	XDL Y PHA data (2nd byte in 134, 3rd in 138 etc.)

128	B1	SYXPAX	XDL X PHA Data
<hr/>			
129	B1	SIXLVPI	LVPS Current Monitor 0.113 W * SIXLVPI
<hr/>			
130	B1	SYXPAY	XDL Y PHA Data
<hr/>			
131	B1	SSXACCEL	Post Accel HV Status N = 0.044 * SSXPOST - 0.156 0<N<1 for normal operation, when on
<hr/>			
132	B1	SYXPAX	XDL X PHA Data
<hr/>			
133	B1	S+XMCPV	MCP Voltage Monitor -22.18 V * S+XMCPV
<hr/>			
134	B1	SYXPAY	XDL Y PHA Data
<hr/>			
135	B1	SIXMCPI	MCP Current Monitor 0.98 * SIXMCPI - 0.668 * S+XMCPV + 81.02 (uA)
<hr/>			
136	B1	SYXPAX	XDL X PHA Data
<hr/>			
137	B1	S+XTDC5	+5V Monitor for TDC Box supply 0.0366V * S+XTDC5
<hr/>			
138	B1	SYXPAY	XDL Y PHA Data
<hr/>			
139	B1	S-XTDC5	-5V Monitor for TDC Box supply 0.0816V * S-XTDC5 - 15.826
<hr/>			
140	B1	SYXPAX	XDL X PHA Data
<hr/>			
141	B1	S+XTDC10	+10V Monitor for TDC Box supply 0.088V * S+XTDC10
<hr/>			
142	B1	SYXPAY	XDL Y PHA Data
<hr/>			
143	B1	S-XTDC15	-15V Monitor for TDC Box supply 0.202V * S-XTDC15 - 46.49
<hr/>			
144	B1	SYXPAX	XDL X PHA Data
<hr/>			
145	B1	S+XMON13	+13V Monitor for Monitor Box supply 0.0853V * S+XMON13
<hr/>			
146	B1	SYXPAY	XDL Y PHA Data
<hr/>			
147	B1	S-XMON13	-13V Monitor for Monitor Box supply 0.178V * S-XMON13 - 40.28
<hr/>			
148	B1	SYXPAX	XDL X PHA Data
<hr/>			
149	B1	S+XMON5	+5V Monitor for Monitor Box supply 0.0392V * S+XMON5
<hr/>			
150	B1	SYXPAY	XDL Y PHA Data
<hr/>			
151	B1	S+XTIMX	X Timing Threshold 0.0196V * S+XTIMX
<hr/>			
152	B1	SYXPAX	XDL X PHA Data

SUMER HK Record 255 – Cycle Time 1 s (cont.)

153	B1	S+XCHX	X Charge Threshold 0.0196V * S+XCHX																																																
154	B1	SYXPWAY	XDL Y PHA Data																																																
155	B1	S+XTIMY	Y Timing Threshold 0.0196V * S+XTIMY																																																
156	B1	SYXPWAY	XDL X PHA Data																																																
157	B1	S+XCHY	Y Charge Threshold 0.0196V * S+XCHY																																																
158	B1	SYXPWAY	XDL Y PHA Data																																																
159	B1	STXDL	Temperature Channel (defined by SSXSID) -40deg=250 30deg=144 -20deg=237 40deg=119 0 deg=214 50deg=95 10deg=195 60deg=73 20deg=170 70deg=56 80deg=44																																																
160	B1	SYXPWAY	XDL X PHA Data																																																
161	B1	SSXDEF	(contains SSXSID) bit 7 SSXSTIM Stim pulser, 1=enabled, 0=disabled bit 3 SSXCERR If 1=Cmd error during last 8 readout cycles bit 6-4 SSXSID Defines content of STXDL and SSXCECHO bit 2-0 SSXSID Defines content of STXDL and SSXCECHO (redundant)																																																
<table border="0"> <tr> <td>conditioned </td> <td colspan="3">Content of the channels</td> </tr> <tr> <td>by content </td> <td colspan="3"></td> </tr> <tr> <td>of SSXSID </td> <td>SSXDECHO</td> <td></td> <td>STXDL</td> </tr> <tr> <td></td> <td colspan="3">-----</td> </tr> <tr> <td>111 </td> <td>SSXCUTY</td> <td>Y Charge Up Thresh</td> <td>S+XUTY Y UP Thresh</td> </tr> <tr> <td>110 </td> <td>SSXCUTX</td> <td>X Charge Up Thresh</td> <td>S+XUTX X Up Thresh</td> </tr> <tr> <td>101 </td> <td>SSXHVON</td> <td>HV On/Off</td> <td>STXMONBX Monitor Box</td> </tr> <tr> <td>100 </td> <td>SSXHVEN</td> <td>HV Enable/Disable</td> <td>STXTDCBX TDC Box</td> </tr> <tr> <td>011 </td> <td>SSXCTY</td> <td>Y Charge Threshold</td> <td>STXDET Detector</td> </tr> <tr> <td>010 </td> <td>SSXCTX</td> <td>X Charge Threshold</td> <td>STXHVPSPB HVPS Box</td> </tr> <tr> <td>001 </td> <td>SSXTTY</td> <td>Y Time Threshold</td> <td>STXAMPBX Amp Box</td> </tr> <tr> <td>000 </td> <td>SSXTTX</td> <td>X Time Threshold</td> <td>STXLVPSB LVPS Box</td> </tr> </table>				conditioned	Content of the channels			by content				of SSXSID	SSXDECHO		STXDL		-----			111	SSXCUTY	Y Charge Up Thresh	S+XUTY Y UP Thresh	110	SSXCUTX	X Charge Up Thresh	S+XUTX X Up Thresh	101	SSXHVON	HV On/Off	STXMONBX Monitor Box	100	SSXHVEN	HV Enable/Disable	STXTDCBX TDC Box	011	SSXCTY	Y Charge Threshold	STXDET Detector	010	SSXCTX	X Charge Threshold	STXHVPSPB HVPS Box	001	SSXTTY	Y Time Threshold	STXAMPBX Amp Box	000	SSXTTX	X Time Threshold	STXLVPSB LVPS Box
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162	B1	SYXPWAY	XDL Y PHA Data																																																
163	B1	SSXCECHO	Command Echo (defined by SSXSID)																																																
164	B1	SYXPWAY	XDL X PHA Data																																																
165	B1	SSXHVCMDB	HV Command Level (command addr 11)																																																
166	B1	SYXPWAY	XDL Y PHA Data																																																
167	B1	SSXHVSTA	HV Status Register D7, D3: 1=Cmd HV on, 0=Cmd HV off D6, D2: 1=Cmd Enabled, 0=Cmd disabled D5, D1: 1=Plug Enabled, 0=Plug disabled D4, D0; 1=HVPS is on (programmed voltage) 0=HVPS is off (0V) bit 7 SSXCHVON (1) CMD HV on bit 3 SSXCHVON (1) CMD HV on (redundant) bit 6 SSXCEN (1) CMD Enabled bit 2 SSXCEN (1) CMD Enabled (redundant) bit 5 SSXPLUG (1) Plug Enabled bit 1 SSXPLUG (1) Plug Enabled (redundant) bit 4 SSXHVPS (1) HVPS is on bit 0 SSXHVPS (1) HVPS is on (redundant)																																																
168	B1	SYXPWAY	XDL X PHA Data																																																

SUMER Image Record Header Block – Synopsis (cont.)

169	B1	SSXMXEV	X Event Counter MSByte
170	B1	SYXPHAY	XDL Y PHA Data
171	B1	SSXLXEV	X Event Counter LSByte
172	B1	SYXPHAX	XDL X PHA Data
173	B1	SSXMYEV	Y Event Counter MSByte
174	B1	SYXPHAY	XDL Y PHA Data
175	B1	SSXLYEV	Y Event Counter LSByte

	B2	SSXXEV	X Event Counter SSXMXEV * 255 + SSXLXEV
	B2	SSXYEV	Y Event Counter SSXMYEV * 255 + SSXLYEV

SKAFTRES is updated after every AFT command
SSCONF00 .. SSSCONF71 are updated after every **SYS_Config** command
SKEXPSTA is updated whenever level 2 and 3 commands start and end

176] B2 SKAFTRES AFT result (transmitted after the AFT has ended)
177] The end of an AFT is indicated by the transition of the SKOPERAT mode bit from 1 to 0.

bit 15	SKAFTDET	Detector	0 = success, 1 = error
bit 14	SKAFTM8	MC8-Scan	0 = success, 1 = error
bit 13	SKAFTM6	MC6-Grating	0 = success, 1 = error
bit 12	SKAFTM5	MC5-Slit focus	0 = success, 1 = error
bit 11	SKAFTM4	MC4-Slit select	0 = success, 1 = error
bit 10	SKAFTM3	MC3-Elevation	0 = success, 1 = error
bit 9	SKAFTM2	MC2-Azimuth	0 = success, 1 = error
bit 8	SKAFTM1	MC1-Door	0 = success, 1 = error
bit 7	SKAFTIMA	IIM A	0 = success, 1 = error
bit 6	SKAFTIMB	IIM B	0 = success, 1 = error
bit 5	SKAFTRSC	Rear Slit Camera	0 = success, 1 = error
bit 4	SKAFTPOW	Power Converter	0 = success, 1 = error
bit 3	SKAFTWAX	Wax Motor bit	0 = success, 1 = error
bit 2	SKAFTHC	Heater C	0 = success, 1 = error
bit 1	SKAFTHB	Heater B	0 = success, 1 = error
bit 0	SKAFTHA	Heater A	0 = success, 1 = error

178 .. 186 9*B1 SKCONFIG Experiment configuration (as defined by TC)
allocation of TC entries and TM channels corresponds
for more detailed information, please refer to: section 6.8.7, **SYS_Config**

*

178 B1 SSSCONF00 to SSSCONF07

bit 7	SSCONF07	[7] emergency connection VBB1 to VBB2/-18V	1 = enable,	0 = disable
bit 6	SSCONF06	[6] emergency connection VDD1 to VDD2/+18V	1 = enable,	0 = disable
bit 5	SSCONF05	[5] Converter 2 VDD/+18V output	1 = enable,	0 = disable
bit 4	SSCONF04	[4] Converter 1 VDD/+18V output	1 = enable,	0 = disable
bit 3	SSCONF03	[3] Converter 2 input	1 = enable,	0 = disable
bit 2	SSCONF02	[2] Converter 1 input	1 = enable,	0 = disable
bit 1	SSCONF01	[1] Converter main - redundant	1 = enable,	0 = disable
bit 0	SSCONF00	[0] Converter on/off - emergency off	1 = enable,	0 = disable

179 B1 SSSCONF08 to SSSCONF15

bit 7	SSCONF15	[15] detector A converter	1 = enable,	0 = disable
bit 6	SSCONF14	[14] converter 2 VBB/-18V output	1 = enable,	0 = disable
bit 5	SSCONF13	[13] converter 1 VBB/-18V output	1 = enable,	0 = disable
bit 4	SSCONF12	[12] wax motor	1 = enable,	0 = disable
bit 3	SSCONF11	[11] deflector	1 = enable,	0 = disable
bit 2	SSCONF10	[10] ---obsolete---	1 = enable,	0 = disable
bit 1	SSCONF00	[9] converter 2 VCC/+5V output	1 = enable,	0 = disable
bit 0	SSCONF08	[8] converter 1 VCC/+5V output	1 = enable,	0 = disable

180 B1 SSSCONF16 to SSSCONF23

bit 7	SSCONF23	[23] VCC/+5V MC2 telescope azimuth	1 = enable,	0 = disable
bit 6	SSCONF22	[22] VCC/+5V MC1 entrance door	1 = enable,	0 = disable
bit 5	SSCONF21	[21] heater D	1 = enable,	0 = disable
bit 4	SSCONF20	[20] Heater D	1 = enable,	0 = disable
bit 3	SSCONF19	[19] operational heater C	1 = enable,	0 = disable

SUMER Image Record Header Block – Detailed Description (cont.)

bit 2	SSCONF18	[18]	operational heater B	1 = enable,	0 = disable
bit 1	SSCONF17	[17]	operational heater A	1 = enable,	0 = disable
bit 0	SSCONF16	[16]	detector B converter	1 = enable,	0 = disable

SUMER Image Record Header Block – Detailed Description (cont.)

181 B1 SSCONF24 to SSCONF31

bit 7	SSCONF31	[31]	VDD2/+18V line 2	1 = enable,	0 = disable
bit 6	SSCONF30	[30]	VDD1/+18V line 1	1 = enable,	0 = disable
bit 5	SSCONF29	[29]	VCC/+5V rear slit camera	1 = enable,	0 = disable
bit 4	SSCONF28	[28]	VCC/+5V MC8 scan mirror	1 = enable,	0 = disable
bit 3	SSCONF27	[27]	VCC/+5V MC6 focus	1 = enable,	0 = disable
bit 2	SSCONF26	[26]	VCC/+5V MC5 slit focus	1 = enable,	0 = disable
bit 1	SSCONF25	[25]	VCC/+5V MC4 slit select	1 = enable,	0 = disable
bit 0	SSCONF24	[24]	VCC/+5V MC3 telescope elevation	1 = enable,	0 = disable

182 B1 SSCONF32 to SSCONF39

bit 7	SSCONF39	[39]	MC6 LVDT	1 = enable,	0 = disable
bit 6	SSCONF38	[38]	MC5 LVDT	1 = enable,	0 = disable
bit 5	SSCONF37	[37]	MC4 LVDT	1 = enable,	0 = disable
bit 4	SSCONF36	[36]	MC3 LVDT	1 = enable,	0 = disable
bit 3	SSCONF35	[35]	MC2 LVDT	1 = enable,	0 = disable
bit 2	SSCONF34	[34]	MC1 LVDT	1 = enable,	0 = disable
bit 1	SSCONF33	[33]	VBB2/-18V line 2	1 = enable,	0 = disable
bit 0	SSCONF32	[32]	VBB1/-18V line 1	1 = enable,	0 = disable

183 B1 SSCONF40 to SSCONF47

bit 7	SSCONF47	[47]	MC8 operation	1 = enable,	0 = disable
bit 6	SSCONF46	[46]	MC6 operation	1 = enable,	0 = disable
bit 5	SSCONF45	[45]	MC5 operation	1 = enable,	0 = disable
bit 4	SSCONF44	[44]	MC4 operation	1 = enable,	0 = disable
bit 3	SSCONF43	[43]	MC3 operation	1 = enable,	0 = disable
bit 2	SSCONF42	[42]	MC2 operation	1 = enable,	0 = disable
bit 1	SSCONF41	[41]	MC1 operation	1 = enable,	0 = disable
bit 0	SSCONF40	[40]	MC8 LVDT	1 = enable,	0 = disable

184 B1 SSCONF48 to SSCONF55

bit 7	SSCONF55	[55]	MC1 ADC	1 = enable,	0 = disable
bit 6	SSCONF54	[54]	MC8 current	1 = enable,	0 = disable
bit 5	SSCONF53	[53]	MC6 current	1 = enable,	0 = disable
bit 4	SSCONF52	[52]	MC5 current	1 = enable,	0 = disable
bit 3	SSCONF51	[51]	MC4 current	1 = enable,	0 = disable
bit 2	SSCONF50	[50]	MC3 current	1 = enable,	0 = disable
bit 1	SSCONF49	[49]	MC2 current	1 = enable,	0 = disable
bit 0	SSCONF48	[48]	MC1 current	1 = enable,	0 = disable

185 B1 SSCONF56 to SSCONF63

bit 7	SSCONF63	[63]	B Thermistor main/redundant	1 = redundant,	0 = main
bit 6	SSCONF62	[62]	A Thermistor main/redundant	1 = redundant,	0 = main
bit 5	SSCONF61	[61]	MC8 ADC	1 = enable,	0 = disable
bit 4	SSCONF60	[60]	MC6 ADC	1 = enable,	0 = disable
bit 3	SSCONF59	[59]	MC5 ADC	1 = enable,	0 = disable
bit 2	SSCONF58	[58]	MC4 ADC	1 = enable,	0 = disable
bit 1	SSCONF57	[57]	MC3 ADC	1 = enable,	0 = disable
bit 0	SSCONF56	[56]	MC2 ADC	1 = enable,	0 = disable

186 B1 SSCONF64 to SSCONF71

bit 7	SSCONF71	[71]	spare	1 = enable,	0 = disable
bit 6	SSCONF70	[70]	spare	1 = enable,	0 = disable
bit 5	SSCONF69	[69]	close door on ESR warning	1 = yes,	0 = no
bit 4	SSCONF68	[68]	enable watchdog	1 = enable,	0 = disable
bit 3	SSCONF67	[67]	enable HK monitor	1 = enable,	0 = disable
bit 2	SSCONF66	[66]	only VDD / VBB present	1 = one,	0 = both
bit 1	SSCONF65	[65]	enable moving 2 MC	1 = enable,	0 = disable

SUMER Image Record Header Block – Detailed Description (cont.)

bit 0 SSCONF64 [64] C Thermistor main/redundant 1 = redundant, 0 = main

SUMER Image Record Header Block – Detailed Description (cont.)

187	B1	SKEXPSTA	Experiment Software Status
bit 1	SKOPERAT	SUMER SW status: operational	1 = level 2 function is executing
bit 0	SKOBSERV	SUMER SW status: observational	1 = level 3 function is executing
both bits = 0: SUMER SW status: standby			

SUMER Image Record Header Block – Detailed Description (cont.)

5.4.3 SUMER Housekeeping Records

5.4.3.1 SUMER HK Record 200 – Idle Frame

The length of HK record 200 is 404 bytes. It is transmitted whenever no other record is available.

loc	type	tmname	contents
0 1]	B2	SSYNC	SUMER sync word (EB 90 hex)
2 3]	B2	SSTYP200	image record type word (81 C8 hex)
4 5 6 7]	2B2	SSTIM200	record compilation time (resolution: 1 s)
8	B1		contains 01 hex (1)
9	B1		contains 00 hex (0)
10	B1		contains 03 hex (3)
11	B1		contains 02 hex (2)
:	:	:	:
:	:	:	:
262	B1		contains FF hex (255)
263	B1		contains FE hex (254)
264	B1		contains 01 hex (1)
265	B1		contains 00 hex (0)
:	:	:	:
:	:	:	:
400	B1		contains 89 hex (137)
401	B1		contains 88 hex (136)
402	B1		contains 8B hex (139)
403	B1		contains 8A hex (138)

SUMER Image Record Header Block – Detailed Description (cont.)

5.4.3.2 SUMER HK Record 248 – Software Parameter List

The length of HK record 248 is 72 bytes. It is sent on request only (telecommands `dump_cmd_list`, `dump_calib_tbl`, `dump_global_param`, `dump_POP_param`, `dump_UDP`, `dump_UDP_param`). The values are acquired just prior to transmission.

If a software parameter list is too long to fit into a single HK record 248, as many additional HK records 248 as required will follow the first one.

loc	type	tmname	contents
0 1]	B2	SSYNC	SUMER sync word (EB 90 hex)
2 3]	B2	SSTYP248	image record type word (81 F8 hex)
4 5 6 7]	2B2	SSTIM248	record compilation time (resolution: 1 s)
8	B1		block ID of information transmitted HKID_COMMLIST 0: command list HKID_GLOB 1: global params HKID_POP_PAR 2: POP-Params HKID_UDP 3: UDP HKID_UDP_PAR 4: UDP-params HKID_CALIB 5: calibration table
9	B1		block count range: 1 .. 255
10 11	B1 B1		UDP/POP/calibration-table number spare always 0
12 13 14 15]	4B1|2B2|B4|R4		data value/s data format (4*B1, 2*B2, B4, or R4) depends on type of list dumped
16 17 18 19]	4B1|2B2|B4|R4		data value/s data format (4*B1, 2*B2, B4, or R4) depends on type of list dumped
:	:		:
:	:		:
68 69 70 71]	4B1|2B2|B4|R4		data value/s data format (4*B1, 2*B2, B4, or R4) depends on type of list dumped

The records are mapped continuously onto HK248 records. The records dumped consist of:

SUMER Image Record Header Block – Detailed Description (cont.)

HKID_COMMLIST 64 command list entries of the following structure are transmitted consecutively:

- 1*B4 LOBT start time of command (4 most significant bytes)
- 1*B2 MLA word of the command loaded
- 1*B2 MLB1 word of the command loaded
- 30*B2 MLB words of the command loaded

HKID_GLOB global parameter array (refer to section 8.2, functions **SystemR**, **SystemS**, **SystemU**). All parameters are of type B4, I4, or R4, so high and low words are swapped.

SUMER Image Record Header Block – Detailed Description (cont.)

HKID_POP_PAR	POP parameter; refer to listing of POP parameters. All parameters are of type B4, I4, or R4, so high and low words are swapped.
HKID_UDP	UDP as byte dump; please note that bytes are swapped during the dump.
HKID_UDP_PAR	UDP parameters are dumped. All parameters are of type B4, I4, or R4, so high and low words are swapped.
HKID_CALIB	calibration parameters are dumped. All parameters are of type R4, so high and low words are swapped.

SUMER Image Record Header Block – Detailed Description (cont.)

5.4.3.3 SUMER HK Record 249 – Telecommand Result

The length of HK record 249 is 72 bytes. It is sent in reaction to a level 4 command or in case a level 3 or level 2 command resulted in an error.

Whenever a level 4 routine is supplied with a result value, this value is placed at the end of the HK record 249 regardless of the length of the level 4 routine basic answer. This is done to allow easy access to this result value. Unused TM channels are filled with zeroes.

loc	type	tmname	contents
0 1	B2	SSYNC	SUMER sync word (EB 90 hex)
2 3	B2	SSTYP249	image record type word (81 F9 hex)
4 5 6 7	2B2	SSTIM249	record compilation time (resolution: 1 s)
8 .. 67	2B2|2I2|B4|I4|R4	SSL4RES	level 2, 3, or 4 command word *****
8 9 10 11	2B2|2I2|B4|I4|R4		level 2, 3, or 4 command word data format (2*B2, 2*I2, B4, I4, or R4) depends on type of command sent
12 13 14 15	2B2|2I2|B4|I4|R4		level 2, 3, or 4 command word data format (2*B2, 2*I2, B4, I4, or R4) depends on type of command sent
:	:	:	:
64 65 66 67	2B2|2I2|B4|I4|R4		level 2, 3, or 4 command word data format (2*B2, 2*I2, B4, I4, or R4) depends on type of command sent
68 69 70 71	I2|I4	SSL4ANS	level 2, 3, or 4 command result value data format (2*B2, 2*I2, B4, I4, or R4) depends on type of command sent

For a full list of error codes and level 4 results, please refer to chapters 6.9.1 and 6.9.2.

SUMER Image Record Header Block – Detailed Description (cont.)

SUMER Image Record Header Block – Detailed Description (cont.)

5.4.3.4 SUMER HK Record 250 – Voltages and Currents

The length of HK record 250 is 38 bytes. It is sent on request only (telecommand `sys_GetHKrecord`). The values are acquired just prior to transmission.

loc	type	tmname	contents	
0 1	B2	SSYNC	SUMER sync word (EB 90 hex)	
2 3	B2	SSTYP250	image record type word (81 FA hex)	
4 5 6 7	2B2	SSTIM250	record compilation time (resolution: 1 s)	
8	B1	SSPOW1	Status 1	power converter channel 1
bit 7	SSP1B7	s14 converter 2 VBB	1 = on, 0 = off	
bit 6	SSP1B6	s13 converter 1 VBB	1 = on, 0 = off	
bit 5	SSP1B5	s12 wax motor (door)	1 = on, 0 = off	
bit 4	SSP1B4	s11 deflector	1 = on, 0 = off	
bit 3	SSP1B3	s10 ---obsolete---	1 = on, 0 = off	
bit 2	SSP1B2	s09 converter 2 VCC	1 = on, 0 = off	
bit 1	SSP1B1	s08 converter 1 VCC	1 = on, 0 = off	
bit 0	SSP1B0	s07 VBB1 to VBB2	1 = connected, 0 = not connected	
9	B1	SSPOW0	Status 0	power converter channel 0
bit 7	SSP0B7	s06 VDD1 to VDD2	1 = connected, 0 = not connected	
bit 6	SSP0B6	s05 converter 2 VDD	1 = on, 0 = off	
bit 5	SSP0B5	s04 converter 1 VDD	1 = on, 0 = off	
bit 4	SSP0B4	s03 converter 2	1 = on, 0 = off	
bit 3	SSP0B3	s02 converter 1	1 = on, 0 = off	
bit 2	SSP0B2	s01 converter	1 = main, 0 = redundant	
bit 1	SSP0B1	s00 converter emergency (main switch)	1 = on, 0 = off	
bit 0	SSP0B0	command transmission error	1 = error, 0 = no error	
10	B1	SSPOW3	Status 3	power converter channel 3
bit 7	SSP3B7	s30 VCC rear slit camera	1 = on, 0 = off	
bit 6	SSP3B6	s29 VCC scan mirror	1 = on, 0 = off	
bit 5	SSP3B5	-- obsolete --		
bit 4	SSP3B4	s27 VCC grating	1 = on, 0 = off	
bit 3	SSP3B3	s26 VCC slit focus	1 = on, 0 = off	
bit 2	SSP3B2	s25 VCC slit select	1 = on, 0 = off	
bit 1	SSP3B1	s24 VCC telescope elevat.	1 = on, 0 = off	
bit 0	SSP3B0	s23 VCC telescope azimuth	1 = on, 0 = off	
11	B1	SSPOW2	Status 2	power converter channel 2
bit 7	SSP2B7	s22 VCC entrance door	1 = on, 0 = off	
bit 6	SSP2B6	s21 heater D	1 = on, 0 = off	
bit 5	SSP2B5	s20 heater D	1 = on, 0 = off	
bit 4	SSP2B4	s19 operational heater C	1 = on, 0 = off	
bit 3	SSP2B3	s18 operational heater B	1 = on, 0 = off	

SUMER Image Record Header Block – Detailed Description (cont.)

bit 2	SSP2B2	s17 operational heater A	1 = on, 0 = off
bit 1	SSP2B1	s16 detector B converter	1 = on, 0 = off
bit 0	SSP2B0	s15 detector A converter	1 = on, 0 = off

12 B1 SIRSC-15 IBBRSC -15V power converter channel 28
range: 0 .. 12.75 mA (00 .. FF hex), I(max): 10 mA, resolution: 50 μ A

SUMER Image Record Header Block – Detailed Description (cont.)

13	B1	SSPOW4	STATUS 4	power converter channel 4
bit 7	SSP4B7	sp4 flight/safety plug 4	1 = connected, 0 = not connected	
bit 6		spare		
bit 6		spare		
bit 4	SSP4B4	sp1 test/safety plug 1	1 = connected, 0 = not connected	
bit 3	SSP4B3	s34 VBB2	1 = on, 0 = off	
bit 2	SSP4B2	s33 VBB1	1 = on, 0 = off	
bit 1	SSP4B1	s32 VDD2	1 = on, 0 = off	
bit 0	SSP4B0	s31 VDD1	1 = on, 0 = off	
14	B1	STSUMER4	temperature SUMER4	power converter channel 31
range: -19 .. +70.25 °C (00 .. FF hex), T(max): 40 °C, resolution: 0.35 K				
15	B1	S-15VRSC	VBBRSC -15V	power converter channel 29
range: 0 .. -18.36 V (00 .. FF hex), U(max): -15.3 V, resolution: -72 mV				
16	B1	SIDETB	IDetB	power converter channel 9
range: 0 .. 1020 mA (00 .. FF hex), I(max): 833 mA, resolution: 4 mA				
17	B1	SIDETA	IDetA	power converter channel 8
range: 0 .. 1020 mA (00 .. FF hex), I(max): 833 mA, resolution: 4 mA				
18	B1		---obsolete---	power converter channel 11
19	B1	SIHEATRD	IHeaterD	power converter channel 10
range: 0 .. 892.5 mA (00 .. FF hex), I(max): 740 mA, resolution: 3.5 mA				
20	B1	SIWAXMOT	IWaxMotor Door	power converter channel 13
range: 0 .. 459 mA (00 .. FF hex), I(max): 380 mA, resolution: 1.8 mA				
21	B1	SIDEFL	IDefl	power converter channel 12
range: 0 .. 51 mA (00 .. FF hex), I(max): 40 mA, resolution: 0.2 mA				
22	B1	S+28VBRD	VBoard +28V	power converter channel 15
range: 0 .. 35.7 V (00 .. FF hex), U(max): 28.3 V, resolution: 140 mV				
23	B1	SIBRD+28	IBoard +28V	power converter channel 14
range: 0 .. 3315mA (00 .. FF hex), I(max): 2700 mA, resolution: 13 mA				
24	B1	S+5VCC	VCC +5V	power converter channel 17
range: 0 .. 7.14 V (00 .. FF hex), U(max): 5.05 V, resolution: 28 mV				
25	B1	SICC+5	ICC +5V	power converter channel 16
range: 0 .. 1530 mA (00 .. FF hex), I(max): 1200 mA, resolution: 6 mA				
26	B1	S+18VDD1	VDD1 +18V	power converter channel 19
range: 0 .. 22.95 V (00 .. FF hex), U(max): 18.9 V, resolution: 90 mV				
27	B1	SIDD1+18	IDD1 +18V	power converter channel 18
range: 0 .. 1275 mA (00 .. FF hex), I(max): 1050 mA, resolution: 5 mA				
28	B1	S+18VDD2	VDD2 +18V	power converter channel 21
range: 0 .. 22.95 V (00 .. FF hex), U(max): 18.9 V, resolution: 90 mV				
29	B1	SIDD2+18	IDD2 +18V	power converter channel 20
range: 0 .. 1275 mA (00 .. FF hex), I(max): 1050 mA, resolution: 5 mA				
30	B1	S-18VBB1	VBB1 -18V	power converter channel 23
range: 0 .. -22.95 V (00 .. FF hex), U(max): -18.9 V, resolution: -90 mV				
31	B1	SIBB1-18	IBB1 -18V	power converter channel 22
range: 0 .. 1275 mA (00 .. FF hex), I(max): 1050 mA, resolution: 5 mA				

SUMER Image Record Header Block – Detailed Description (cont.)

32	B1	S-18VBB2	VBB2 -18V range: 0 .. -22.9 V (00 .. FF hex), U(max): -18.9 V, resolution: -90 mV	power converter channel 25
33	B1	SIBB2-18	IBB2 -18V range: 0 .. 1275 mA (00 .. FF hex), I(max): 1050 mA, resolution: 5 mA	power converter channel 24
34	B1	S+15VRSC	VDDRSC +15V range: 0 .. 18.36 V (00 .. FF hex), U(max): 15.3 V, resolution: 72 mV	power converter channel 27
35	B1	SIRSC+15	IDDRSC +15V range: 0 .. 12.75 mA (00 .. FF hex), I(max): 10 mA, resolution: 50 μ A	power converter channel 26

SUMER Image Record Header Block – Detailed Description (cont.)

5.4.3.5 SUMER HK Record 251 – Motor Controller Data

The length of HK record 251 is 26 bytes. It is sent on request only (telecommand `sys_GetHKrecord`). The values are acquired just prior to transmission.

loc	type	tmname	contents
0 1]	B2	SSYNC	SUMER sync word (EB 90 hex)
2 3]	B2	SSTYP251	image record type word (81 FB hex)
4 5] 6] 7]	2B2	SSTIM251	record compilation time (resolution: 1 s)
8	B1	SIMC-18M	MCx -18V supply current / during motion measured during motion, i.e. current of motor, LVDT, and ADC range: 0 .. 1020 mA (00 .. FF hex), resolution: 4 mA
9	B1	SIMC+18M	MCx +18V supply current / during motion measured during motion, i.e. current of motor, LVDT, and ADC range: 0 .. 1020 mA (00 .. FF hex), resolution: 4 mA
10	B1	SIMC-18R	MCx -18V supply current / on request measured on request, i.e. current of LVDT and ADC range: 0 .. 1020 mA (00 .. FF hex), resolution: 4 mA
11	B1	SIMC+18R	MCx +18V supply current / on request measured on request, i.e. current of LVDT and ADC range: 0 .. 1020 mA (00 .. FF hex), resolution: 4 mA
12	B1	S-15MC	MCx -15V range: 0 .. -20.40 V (00 .. FF hex), resolution: 80 mV
13	B1	S+15MC	MCx +15V range: 0 .. 20.40 V (00 .. FF hex), resolution: 80 mV
14	B1	STMCT1	MCx temperature 1 (motor driver stage) range: 0 .. 127 °C (00 .. FF hex), resolution: 0.5 K
15	B1	S+5MC	MCx +5V range: 0 .. 10.20 V (00 .. FF hex), resolution: 40 mV
16	B1	STMCT3	MCx temperature 3 (external temperature) temperature 3 (STMCT3) is computed from - rawt3: the ADC 16-bit output value (stored in locations 24-25) - fk : the calibration factor (stored in calibration table 1) - ak : the calibration offset (stored in calibration table 1) by calculating: $STMCT3 = rawt3 * fk + ak$ MC2: range: -0.960 .. +80.940 °C, resolution: 0.320 K MC1, MC3 .. MC6, MC8: range: +15.000 .. +25.200 °C, resolution: 0.040 K
17	B1	STMCT2	MCx temperature 2 (motor) range: 0 .. 127 °C (00 .. FF hex), resolution: 0.5 K

SUMER Image Record Header Block – Detailed Description (cont.)

18	B2	SSMCPOS	MCx position (LVDT, RVDC, digital position encoder)
20	B1	SSMCINDX	MCx index of motor bit pattern range: 0 .. 7

SUMER Image Record Header Block – Detailed Description (cont.)

21	B1	SSMC	MCx status
bit 7		SSMCxERR	1 = error
bit 6		SSMCxCMD	1 = command executed
bit 5		SSMCxEPO	1 = encoder power off
bit 4		SSMCxETO	1 = encoder timeout
bit 3		SSMCxRES	1 = reset
bit 2		SSMCxADC	1 = ADC power off
<u>MC0 .. MC6:</u>			
bits 1-0			spare
<u>MC8:</u>			
bits 1-0		SSMC8IAS	IAS encoder bits 17 and 16
22	B1	SSMCN	motor control processor number
			0 = MC1-Door
			1 = MC2-Azimuth
			2 = MC3-Elevation
			3 = MC4-Slit select
			4 = MC5-Slit focus
			5 = MC6-Grating
			6 = MC8-Scan
23	B1	SE21	spare
24]	B2	(SE22)	raw value of ADC output of temperature 3 (external temperature)
25]			range: -0.960 .. +80.940 °C (0000 hex .. FFFF hex), resolution: 0.020 K

SUMER Image Record Header Block – Detailed Description (cont.)

5.4.3.6 SUMER HK Record 252 – Detector Data

The length of HK record 252 is 56 bytes. It is sent on request only (telecommand `sys_GetHKrecord`). The values are acquired just prior to transmission.

loc	type	tmname	contents
0 1]	B2	SSYNC	SUMER sync word (EB 90 hex)
2 3]	B2	SSTYP252	image record type word (81 FC hex)
4 5 6 7]	2B2	SSTIM252	record compilation time (resolution: 1 s)
8...55	48*B1	SYXDL	XDL data channels
8	12*B1	SYXPAX	XDL X PHA data (2nd byte in 12, 3rd in 16 etc.)
10	12*B1	SYXPAY	XDL Y PHA data (2nd byte in 14, 3rd in 18 etc.)

8	B1	SYXPAX	XDL X PHA Data
9	B1	SIXLVPI	LVPS Current Monitor 0.113 W * SIXLVPI
10	B1	SYXPAY	XDL Y PHA Data
11	B1	SSXACCEL	Post Accel HV Status N = 0.044 * SSXPOST - 0.156 0<N<1 for normal operation, when on
12	B1	SYXPAX	XDL X PHA Data
13	B1	S+XMCPV	MCP Voltage Monitor -22.18 V * S+XMCPV
14	B1	SYXPAY	XDL Y PHA Data
15	B1	SIXMCPI	MCP Current Monitor 0.98 * SIXMCPI - 0.668 * S+XMCPV + 81.02 (uA)
16	B1	SYXPAX	XDL X PHA Data
17	B1	S+XTDC5	+5V Monitor for TDC Box supply 0.0366V * S+XTDC5

SUMER Image Record Header Block – Detailed Description (cont.)

18	B1	SYXPWAY	XDL Y PHA Data
19	B1	S-XTDC5	-5V Monitor for TDC Box supply 0.0816V * S-XTDC5 - 15.826
20	B1	SYXPWAY	XDL X PHA Data
21	B1	S+XTDC10	+10V Monitor for TDC Box supply 0.088V * S+XTDC10
22	B1	SYXPWAY	XDL Y PHA Data
23	B1	S-XTDC15	-15V Monitor for TDC Box supply 0.202V * S-XTDC15 - 46.49
24	B1	SYXPWAY	XDL X PHA Data
25	B1	S+XMON13	+13V Monitor for Monitor Box supply 0.0853V * S+XMON13
26	B1	SYXPWAY	XDL Y PHA Data
27	B1	S-XMON13	-13V Monitor for Monitor Box supply 0.178V * S-XMON13 - 40.28
28	B1	SYXPWAY	XDL X PHA Data
29	B1	S+XMON5	+5V Monitor for Monitor Box supply 0.0392V * S+XMON5
30	B1	SYXPWAY	XDL Y PHA Data
31	B1	S+XTIMX	X Timing Threshold 0.0196V * S+XTIMX
32	B1	SYXPWAY	XDL X PHA Data
33	B1	S+XCHX	X Charge Threshold 0.0196V * S+XCHX
34	B1	SYXPWAY	XDL Y PHA Data
35	B1	S+XTIMY	Y Timing Threshold 0.0196V * S+XTIMY
36	B1	SYXPWAY	XDL X PHA Data

SUMER Image Record Header Block – Detailed Description (cont.)

37 B1 S+XCHY Y Charge Threshold
 0.0196V * S+XCHY

38 B1 SYXPWAY XDL Y PHA Data

39 B1 STXDL Temperature Channel (defined by SSXSID)
 -40deg=250 30deg=144
 -20deg=237 40deg=119
 0 deg=214 50deg=95
 10deg=195 60deg=73
 20deg=170 70deg=56
 80deg=44

40 B1 SYXPWAY XDL X PHA Data

41 B1 SSXDEF (contains SSXSID)
 bit 7 SSXSTIM Stim pulser, 1=enabled, 0=disabled
 bit 3 SSXCERR If 1=Cmd error during last 8 readout cycles
 bit 6-4 SSXSID Defines content of STXDL and SSXCECHO
 bit 2-0 SSXSID Defines content of STXDL and SSXCECHO (redundant)

conditioned		Content of the channels			
by content					
of	SSXSID	SSXDECHO		STXDL	
111	SSXCUTY	Y Charge Up Thresh	|	S+XUTY	Y UP Thresh
110	SSXCUTX	X Charge Up Thresh	|	S+XUTX	X Up Thresh
101	SSXHVON	HV On/Off	|	STXMONBX	Monitor Box
100	SSXHVEN	HV Enable/Disable	|	STXTDCBX	TDC Box
011	SSXCTY	Y Charge Threshold	|	STXDET	Detector
010	SSXCTX	X Charge Threshold	|	STXHVPSB	HVPS Box
001	SSXTTY	Y Time Threshold	|	STXAMPBX	Amp Box
000	SSXTTX	X Time Threshold	|	STXLVPSB	LVPS Box

42 B1 SYXPWAY XDL Y PHA Data

43 B1 SSXCECHO Command Echo (defined by SSXSID)

44 B1 SYXPWAY XDL X PHA Data

45 B1 SSXHVCMO HV Command Level (command addr 11)

46 B1 SYXPWAY XDL Y PHA Data

47 B1 SSXHVSTA HV Status Register
 D7, D3: 1=Cmd HV on, 0=Cmd HV off
 D6, D2: 1=Cmd Enabled, 0=Cmd disabled
 D5, D1: 1=Plug Enabled, 0=Plug disabled
 D4, D0; 1=HVPS is on (programmed voltage)
 0=HVPS is off (0V)

SUMER Image Record Header Block – Detailed Description (cont.)

bit 7	SSXCHVON	(1) CMD HV on
bit 3	SSXCHVON	(1) CMD HV on (redundant)
bit 6	SSXCEN	(1) CMD Enabled
bit 2	SSXCEN	(1) CMD Enabled (redundant)
bit 5	SSXPLUG	(1) Plug Enabled
bit 1	SSXPLUG	(1) Plug Enabled (redundant)
bit 4	SSXHVPS	(1) HVPS is on
bit 0	SSXHVPS	(1) HVPS is on (redundant)

48	B1	SYXPHAX	XDL X PHA Data
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49	B1	SSXMXEV	X Event Counter MSByte
-----------	-----------	----------------	-------------------------------

50	B1	SYXPHAY	XDL Y PHA Data
-----------	-----------	----------------	-----------------------

51	B1	SSXLXEV	X Event Counter LSByte
-----------	-----------	----------------	-------------------------------

52	B1	SYXPHAX	XDL X PHA Data
-----------	-----------	----------------	-----------------------

53	B1	SSXMYEV	Y Event Counter MSByte
-----------	-----------	----------------	-------------------------------

54	B1	SYXPHAY	XDL Y PHA Data
-----------	-----------	----------------	-----------------------

55	B1	SSXLYEV	Y Event Counter LSByte

	B2	SSXXEV	X Event Counter
			SSXMXEV * 255 + SSXLXEV
	B2	SSXYEV	Y Event Counter
			SSXMYEV * 255 + SSXLYEV

SUMER Image Record Header Block – Detailed Description (cont.)

5.4.3.7 SUMER HK Record 255 – Cycle Time 1 s

The length of HK record 255 is 26 bytes. It is sent every second. The values are acquired just prior to transmission.

loc	type	tmname	contents
0 1]	B2	SSYNC	SUMER sync word (EB 90 hex)
2 3]	B2	SSTYP255	image record type word (81 FF hex)
4 5 6 7]	2B2	SSTIM255	record compilation time (resolution: 1 s)
8	B1	SKEXPSTA	Experiment Software Status
bit 1	SKOPERAT	SUMER SW status: operational	1 = level 2 function is executing
bit 0	SKOBSERV	SUMER SW status: observational	1 = level 3 function is executing
		both bits 0: SUMER SW status: standby	
9	B1	SKCMDNR	number of commands in command list range: 0 .. 63
10 11]	B2	SKUNCOMP	number of uncompressed files in RAM disk
12 13]	B2	SKCOMP	number of compressed files in RAM disk
14	B1	SSECPERR	ECP error status register bits 7-4: powerfail at physical memory banks bits 3-0: double bit errors in data words
bit 7			0 = no powerfail at physical memory bank 3 1 = powerfail at physical memory bank 3
bit 6			0 = no powerfail at physical memory bank 2 1 = powerfail at physical memory bank 2
bit 5			0 = no powerfail at physical memory bank 1 1 = powerfail at physical memory bank 1
bit 4			0 = no powerfail at physical memory bank 0 1 = powerfail at physical memory bank 0
bit 3			0 = no error in data word D16-D31 1 = double bit error in data word D16-D31
bit 2			0 = no error in data word D00-D15 1 = double bit error in data word D00-D15
bit 1			0 = no error in data word D16-D31 1 = double bit error in data word D16-D31
bit 0			0 = no error in data word D00-D15 1 = double bit error in data word D00-D15

SUMER Image Record Header Block – Detailed Description (cont.)

15	B1	SSSPUERR	SPU Error Status Register bits 7-4: powerfail at physical memory banks bits 3-0: double bit errors in data words description: see location 14 above
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SUMER Image Record Header Block – Detailed Description (cont.)

16]	B2	SSIIM	IIM status register	
17]				
bit 15	SSIIMCRM	1 = clear DPU channel		0 = random access to DPU channel
bit 14	SSIIMSCR	1 = selected channel ready		0 = selected channel not ready
bit 13	SSIIMPSB	1 = power status ch B on		0 = power status ch B off
bit 12	SSIIMPSA	1 = power status ch A on		0 = power status ch A off
bit 11	SSIIMDEB	1 = double bit error ch B		0 = no double bit errors ch B
bit 10	SSIIMSEB	1 = single bit error ch B		0 = no single bit errors ch B
bit 9	SSIIMDEA	1 = double bit error ch A		0 = no double bit errors ch A
bit 8	SSIIMSEA	1 = single bit error ch A		0 = no single bit errors ch A
bit 7	SSIIMLSB	1 = latch up strobe ch B (low threshold)		0 = high LU trigger threshold ch B
bit 6	SSIIMLSA	1 = latch up strobe ch A (low threshold)		0 = high LU trigger threshold ch A
bit 5	SSIIMPCB	1 = power command ch B on		0 = power command ch B off
bit 4	SSIIMPCA	1 = power command ch A on		0 = power command ch A off
bit 3	SSIIMSTP	1 = set power		0 = hold power status
bit 2	SSIIMCHS	1 = channel B to DPU		0 = channel A to DPU
bit 1	SSIIMING	1 = input gate open		0 = input gate closed
bit 0	SSIIMACR	1 = auto clear on		0 = auto clear off

18]	B2	SKL3ID	L3 function identifier (MLB1)	
19]				for a full list of L3 function identifiers, please refer to section 6.1

20]	I2	SKL3RES	L3 result	
21]				for a full list of L3 result values, please refer to section 6.9.1

22	B1	SKCMDLST	command list disabled/enabled	
				1 = enabled, 0 = disabled

23	B1	SKMCID	MC number of MC position	
24]	I2		MC position in units of motor half steps	
25]			-1: not initialized	
			if SKMCID = 0: MC1-Door	default range: 0 .. 18000
			if SKMCID = 1: MC2-Azimuth	default range: 0 .. 10000
			if SKMCID = 2: MC3-Elevation	default range: 0 .. 10000
			if SKMCID = 3: MC4-Slit select	default range: -2100 .. 2000
			if SKMCID = 4: MC5-Slit focus	default range: 0 .. 3200
			if SKMCID = 5: MC6-Grating	default range: 200 .. 20440
			if SKMCID = 6: MC8-Scan	default range: 250 .. 12400

SUMER Image Record Header Block – Detailed Description (cont.)

5.4.4 SUMER Image Record Header Block

The length of the image record header block is 92 bytes. Transmitted as a preamble to the SUMER science image data, the image header's values represent the SUMER system state at the time the image acquisition started.

5.4.4.1 Synopsis

loc	type	tmname	contents
0	] B2	SSYNC	SUMER sync word (EB90 hex)
1			
2	] B2	SSTYPIMG	image record type word (8002 - 802d hex)
3			
4	] 3B2	SSEXPSTA	start of exposure time
5			
6			
7			
8			
9			
10	B1	SSOPCNT	operations counter
11	B1	SSPOPUDP	POP/UDP number
12	] B2	SSIMGCNT	image counter
13			
14	B1	SSLOC etc	location/scientist
15	B1	SSTARGET	target
16	] B2	SSFLDATE	flight operation request date
17			
18	] B2	SSFLREQN	flight operation request number
19			
20	] B2	SSREFPIX	reference pixel
21			
22	B1	SSSTAT	status
23	B1	SSEDETSTA	detector status
24	] B2	SSSUNY	sun coordinate y
25			
26	] B2	SSSUNZ	sun coordinate z
27			
28	] R4	SSEXPTIM	exposure time
29			
30			
31			
32	] B2	SSIIDZ	inter instrument z sun coordinate
33			
34	] B2	SSIIDY	inter instrument y sun coordinate
35			
36	] B2	SSBPADDY	brightest pixel address y
37			
38	] B2	SSBPADDZ	brightest pixel address z
39			
40	] B4	SSIMGTOT	total count in image

SUMER Image Record Header Block – Detailed Description (cont.)

41	|		
42	|		
43	|		
44	] R4	SSROTCOMP	rotation compensation time
45	|		
46	|		
47	|		
48	] B2	SSBPCNTS	brightest pixel counts
49	|		
50	] B2	SSACIMGC	accumulative image counter
51	|		

SUMER Image Record Header Block – Detailed Description (cont.)

52	]	I2	SSSTEPN	number of raster steps
53				
54		I1	SSSTEPSZ	raster step size in elementary motor steps
55		B1	SSSLITN	number of slit selected
56	]	B2	SSBINNY	binning y_D
57				
58	]	B2	SSBINNZ	binning z_D
59				
60	]	B2	SSXCNT	x event count
61				
62	]	B2	SSYCNT	y event count
63				
64		B1	S-MCPV	MCP high voltage
65		B1	SIMCPI	MCP current
66	]	I2	SSMC2POS	MC2-Azimuth position
67				
68	]	I2	SSMC3POS	MC3-Elevation position
69				
70	]	I2	SSMC4POS	MC4-Slit select position
71				
72	]	I2	SSMC8POS	MC8-Scan Mirror position
73				
74		B1	SSMCERR	motor controller error
75		B1	SSCOMPRM	method of data compression
76		R4	SSWAVEL	wavelength at reference pixel
77]			
78				
79				
80	]	B2	SSCOMPP1	compression parameter 1
81				
82	]	B2	SSCOMPP2	compression parameter 2
83				
84	]	B2	SSCOMPP3	compression parameter 3
85				
86	]	B2		administration counter
87				
88	]	I2	SSMC6POS	MC6-Grating position
89				
90		B1		spare
91		B1		spare

SUMER Image Record Header Block – Detailed Description (cont.)

5.4.4.2 Detailed Description

loc	type	tmname	contents
0 1]	B2	SSYNC	SUMER sync word (EB 90 hex)
2 3]	B2	SSTYPIMG	image record type word (80 02 .. 80 2D hex)
4 5] 6] 7] 8] 9]	3B2	SSEXSTA	start of exposure time The OBT and LOBT use the CCSDS format (1958 January 1 epoch). It is an unsegmented time code with a basic time equal to 1 second. The time field will be constituted of 6 bytes: 4 bytes for course time (2^0 to 2^{31} seconds), 2 bytes for fine time. The resolution of the fine time is 2^{-11} seconds: $|2^{31}...2^{24}|2^{23}...2^{16}|2^{15}...2^8|2^7...2^0|2^{-1}...2^{-8}|2^{-9}...2^{-11}$ 0 0 0 0 0
10	B1	SSOPCNT	operations counter 0 after switch on, increased by one with every new operation (POP or UDP)
11	B1	SSPOPUDP	POP/UDP number no POP/UDP executing: 0, range: POPs 1 .. 36, UDPs 1 .. 16
12 13]	B2	SSIMGCNT	image counter reset at start of operation and by spectrohelio, incremented for every image
14	B1	SSLOC etc	location/scientist as set by telecommand SYS_Operator location (id number of the place of order) bits 7-6 SSLOC bits 5-0 SSSCIENT scientist (id number of the originator of the observation)
15	B1	SSTARGET	target as set by telecommand SYS_Operator identification for the location of a specific event, range: 0 .. 63
16 17]	B2	SSFLDATE	flight operation request date as set by telecommand SYS_Operator date is indicated in units of days, start day is 1, counts up to 11 years range: 0 .. 2047 as set by telecommand SYS_Operator
18 19]	B2	SSFLREQN	flight operation request number as set by telecommand SYS_Operator range: 0 .. 2047
20 21]	B2	SSREFPIX	reference pixel reference pixel where to set lambda1, range: 0 .. 1023
22	B1	SSSTAT	status bit 7 SSEETRIG explosive event trigger bit 6 SSFF flat field correction: 1 = on, 0 = off bits 5-4 SSDETTYP detector: 01 = B, 10 = A, 11 = RSC (for S-MCPV and SIMCPI) bits 3-2 SSINTSTA IIF/TC spectrohelio interrupt status: 00 = no interrupts allowed 01 = IIF interrupts allowed 10 = TC interrupts allowed 11 = IIF and TC interrupts allowed bits 1-0 always 0
23	B1	SSDETSTA	detector status

SUMER Image Record Header Block – Detailed Description (cont.)

			D7, D3: 1=Cmd HV on, 0=Cmd HV off
			D6, D2: 1=Cmd Enabled, 0=Cmd disabled
			D5, D1: 1=Plug Enabled, 0=Plug disabled
			D4, D0; 1=HVPS is on (programmed voltage) 0=HVPS is off (0V)
bit 7	SSXCHVON	(1)	CMD HV on
bit 3	SSXCHVON	(1)	CMD HV on (redundant)
bit 6	SSXCEN	(1)	CMD Enabled
bit 2	SSXCEN	(1)	CMD Enabled (redundant)
bit 5	SSXPLUG	(1)	Plug Enabled
bit 1	SSXPLUG	(1)	Plug Enabled (redundant)
bit 4	SSXHVPS	(1)	HVPS is on
bit 0	SSXHVPS	(1)	HVPS is on (redundant)
<hr/>			
24]	I2	SSSUNY	sun coordinate y
25]			in units of 0.0625 arcsecs computed from the motor step position SSMC2POS (P) and the global parameters #35 MC2TelAzim pointing center (C) and #36 MC2TelAzim pointing slope (S): $y = (P - C) / S$
<hr/>			
26]	I2	SSSUNZ	sun coordinate z
27]			in units of 0.0625 arcsecs computed from the motor step position SSMC3POS (P) and the global parameters #37 MC3TelElev pointing center (C) and #38 MC3TelElev pointing slope (S): $z = (P - C) / S$
<hr/>			
28]	R4	SSEXPTIM	exposure time in seconds
29]			measured integration time may be different from commanded time.
30]			
31]			
<hr/>			
32]	B2	SSIIDZ	inter instrument z sun coordinate
33]			with solar event ID and validity bit information available only if SUMER in IIF receiver mode
	bit 15		validity bit: 1 = invalid, 0 = valid
	bits 14-11		solar event ID
	bit 10		always 1
	bits 9-0		solar coordinate z, resolution: 2 arcsec
<hr/>			
34]	B2	SSIIDY	inter instrument y sun coordinate
35]			with master ID and validity bit information available only if SUMER in IIF receiver mode
	bit 15		validity bit: 1 = invalid, 0 = valid
	bits 14-11		master ID
	bit 10		always 0
	bits 9-0		solar coordinate y, resolution: 2 arcsec
<hr/>			
36]	B2	SSBPADDY	brightest pixel address y
37]			(spectral direction, y = 0 .. 1023)
<hr/>			
38]	B2	SSBPADDZ	brightest pixel address z
39]			(spatial direction, z = 0 .. 359)
<hr/>			
40]	B4	SSIMGTOT	total count in image
41]			
42]			
43]			
<hr/>			
44]	R4	SSROTCOMP	rotation compensation time
45]			time in s between two rotation compensation steps by 1 px
46]			

SUMER Image Record Header Block – Detailed Description (cont.)

47]

48] B2 SSBPCNTS brightest pixel counts
49]

50] B2 SSACIMGC accumulative image counter
51] (starts at 0 after booting, is never reset, will wrap over from 65535 to 0)

52] I2 SSSTEPN number of raster steps
53] if positive: telescope scans E->W, if negative: telescope scans W->E

SUMER Image Record Header Block – Detailed Description (cont.)

54	I1	SSSTEPSZ	raster step size in elementary motor steps if negative: "Schmierschritt" (cf. ch. 8.2, spectrohelio)
55	B1	SSSLITN	number of slit selected 0: no slit selected, 1 .. 9: slit # selected
56	] B2	SSBINNY	binning y_D binning factor in spectral direction, min: 1, max: 1024, possible values depend on image and transmission formats
57			
58	] B2	SSBINNZ	binning z_D binning factor in spatial direction, min: 1, max: 360, possible values depend on image and transmission formats
59			
60	] B2	SSXCNT	x event count
61			
62	] B2	SSYCNT	y event count
63			
64	B1	S-MCPV	MCP high voltage -22.18 V * S-MCPV
65	B1	SIMCPI	MCP current $0.98 * SIMCPI - 0.668 * S-MCPV + 81.02$ (µA)
66	] I2	SSMC2POS	MC2-Azimuth position in units of motor half steps (0.38 arcsec) -1: not initialized, default range: 0 .. 10000,
67			
68	] I2	SSMC3POS	MC3-Elevation position in units of motor half steps (0.38 arcsec) -1: not initialized, default range: 0 .. 10000
69			
70	] I2	SSMC4POS	MC4-Slit select position in units of motor half steps -1: not initialized, default range: -2100 .. +2000
71			
72	] I2	SSMC8POS	MC8-Scan Mirror position in units of motor half steps -1: not initialized, default range: 250 .. 12400
73			
74	B1	SSMCERR	motor controller error motor controller error bits from MC1 .. MC8 status information bit 7 spare bit 6 SSMC8ERR MC8-Scan bit 5 SSMC6ERR MC6-Grating bit 4 SSMC5ERR MC5-Slit Focus bit 3 SSMC4ERR MC4-Slit Select bit 2 SSMC3ERR MC3-Elevation bit 1 SSMC2ERR MC2-Azimuth bit 0 SSMC1ERR MC1-Door
75	B1	SSCOMPXM	method of data compression range: -17 .. +17
76	] R4	SSWAVEL	wavelength at reference pixel range: 400 Å .. 1600 Å
77			
78			
79			

SUMER Image Record Header Block – Detailed Description (cont.)

80] B2 SSCOMPP1 compression parameter 1
81] for the compression scheme (cmp) found in location 75 (SSCOMPRM)

- cmp = 0: 0
- cmp = ±1: 13
- cmp = ±2: 16
- cmp = ±3: 23
- cmp = ±4: 26
- cmp = ±5: 33
- cmp = ±6: 53
- cmp = ±7: 61
- cmp = ±8: 62
- cmp = ±9: 64
- cmp = ±10: 71
- cmp = ±11: 72
- cmp = ±12: 74
- cmp = ±13: 81
- cmp = ±14: 82
- cmp = ±15: 84
- cmp = ±16: 0
- cmp = ±17: maximum line 1

82] B2 SSCOMPP2 compression parameter 2
83] for the compression scheme (cmp) found in location 75 (SSCOMPRM)

- cmp = 0: 0
- cmp = ±1: brightest pixel count (SSBPCNTS)
- cmp = ±2: 0
- cmp = ±3: brightest pixel count (SSBPCNTS)
- cmp = ±4: 0
- cmp = ±5: brightest pixel count (SSBPCNTS)
- cmp = ±6: brightest pixel count corrected for background values
- cmp = ±7: averaged width
- cmp = ±8: averaged width
- cmp = ±9: 0
- cmp = ±10: averaged width
- cmp = ±11: averaged width
- cmp = ±12: 0
- cmp = ±13: 0
- cmp = ±14: 0
- cmp = ±15: 0
- cmp = ±16: 0
- cmp = ±17: maximum line 2

84] B2 SSCOMPP3 compression parameter 3
85] for the compression scheme (cmp) found in location 75 (SSCOMPRM)

- cmp = 0: 0
- cmp = ±1: minimum pixel count in image
- cmp = ±2: 0
- cmp = ±3: minimum pixel count in image
- cmp = ±4: 0
- cmp = ±5: minimum pixel count in image
- cmp = ±6: 0
- cmp = ±7: averaged centroid
- cmp = ±8: 0
- cmp = ±9: 0
- cmp = ±10: averaged centroid
- cmp = ±11: 0
- cmp = ±12: 0
- cmp = ±13: 0
- cmp = ±14: 0
- cmp = ±15: 0
- cmp = ±16: 0
- cmp = ±17: maximum line 3

SUMER Image Record Header Block – Detailed Description (cont.)

86	]	B2	administration counter
87			as set by telecommand SYS_Operator
<hr/>			
88	]	I2 SSMC6POS	MC6-Grating position
89			in units of motor half steps
			-1: not initialized, default range: 200 .. 20440
<hr/>			
90		B1	spare
91		B1	spare

SUMER Image Record Header Block – Detailed Description (cont.)