625-610: SIS 224-04, Rev A
Galileo Experiment Data Record
Software Interface Specification

SECTION 1

GENERAL DESCRIPTION

1.1 OVERVIEW

This Software Interface Specification (SIS) provides the content of the Experiment Data Record (EDR) required by the Galileo Principal Investigators.

1.2 SCOPE

This specification covers the detailed format of the Low Rate Science (LRS) EDR and of the Orbiter Radio Science System (ORS) EDR for all phases of the Galileo mission from System Test through the End of Mission, including the format of EDRs being delivered by GSOC during the Cruise Science Phase.

1.3 APPLICABLE DOCUMENTS

MOS-GLL-3-280 Functional Requirement, Galileo Orbiter Telemetry Measurements and Data Formats

MOS-GLL-4-140 GSOC Operations Team

MOS-GLL-4-224 Functional Requirement, Galileo Data Management System

MOS-GLL-4.224.2 Ground Data System, Data Management System, Master Data Records/Experiment Data Records Generation/EDR Validation Subsystem (MDR/EDR/VAL)

SIS 221-01 System Data Record (SDR) from MTS to DMS and GSOC; MTS Interface Specification Document (1814-05)

SIS 224-01 SCLK/SCET Coefficient File

SIS 224-09 Fields and Particles SEDR

SIS 224-03 Orbiter Engineering Data File Access Routine (OEDA)

1.4 REQUIREMENTS

1.4.1 Interface Medium

The LRS EDRs and ORS EDRs shall be a magnetic tape which is written at 9-track in EBCDIC with odd parity. Recording density shall be 800bpi, 1600bpi or 6250bpi at the choice of the receiving institute.

1.4.2 Data Source, QQC Requirements

Each individual science ORS EDR shall be created from either the EDRGEN program via the SDR (required as a System Test capability) or from the EDRSTR program via the MDR (required as a Launch capability). The EDR shall be of "Final" quality unless a "Quicklook" EDR is requested.

QQC requirements shall require the delivery of 95% of the receiver-in-lock data received at any DSS during a floating 4 hour period. This is the equivalent to no more than 12 minutes of outages during any 4 hour period. There shall be no QQC requirements for Quicklook EDRs or for EDRs made for System Test and interplanetary cruise data.

GSOC delivered EDRs shall contain 90% of the station in-lock data. GSOC shall deliver EDRs generated from Weilheim received LRS data during the Cruise Science Phase for the following six field and particle experiments: DDS, EPD, HIC, MAG, PLS, and PWS. In addition, GSOC shall add SEDR records as an additional file at the end of the science EDR according to the format specified in SIS 224-09 (Fields and Particles SEDR). GSOC shall deliver a Master Fields & Particles EDR (MEDR) to JPL which shall be in ERT time order with records for the same time period in record order (AACS followed by DDS, EPD, HIC, MAG, PLS and PWS). The SEDR records may be added as a second file to the MEDR or as a separate type.

SECTION 2

INTERFACE CHARACTERISTICS

2.1 INTERFACE MEDIUM

The individual science EDR shall be written onto magnetic tape in EBCDIC format. The magnetic tapes shall be 9-track with odd parity with a density of 1600 bpi or 6250 bpi at the choice of the receiving institution. In addition there shall be printed summaries and logs as to the tape start and stop times and number of records by type. Other logs will be provided as needed.

2.2 VOLUME AND SIZE

Each individual science EDR is a tape consisting of LRS experiment records which vary from 2720 bytes (DDS) to 10180 bytes (UVS) depending upon experiment and AACS Position and Rate records which are each 2252 bytes long. Each ORS EDR shall contain Engineering records, AACS Position and Rate records, Variable Decom Maps and Ground Monitor records. Each record except Monitor and Variable Decom Map Records corresponds to a RIM cycle ($60^2/_3$ seconds) or a fraction thereof. The tape shall contain from a few minutes of data to several days worth of data depending on the mission phase and product type, e.g., "quicklook" or "final". Printed summaries shall be one (1) page in length per tape.

2.3 FAILURE PROTECTION, DETECTION AND RECOVERY PROCEDURES

2.3.1 File Backup Requirements

The EDR shall have as a backup the Mission Telemetry Subsystem (MTS) System Data Record (SDR) tapes used as input into EDRGEN during System Test and shall have the Master Data Record (MDR) tapes/files as backup from Launch through the End of Mission.

2.3.2 Security/Integrity Measures

No formal security is currently planned, rather an operational security system in which only instrument prime data related to a particular instrument and related engineering and pointing information is supplied to an individual user. No additional instrument prime data for another instrument shall be provided without prior project approvals.

SECTION 3

DETAILED INTERFACE SPECIFICATIONS

3.1 STRUCTURE AND ORGANIZATION OVERVIEW

Each individual experiment EDR shall consist of an IBM magnetic label consisting of a Standard Volume Label (VOL1) and two Standard Data Set Labels (HDR1 and HDR2) followed by a tape mark. Following the tape label is the telemetry data file containing AACS and science records or engineering and monitor records. (GSOC shall add a second data file to the EDR consisting of SEDR information). At the end of the last data file there shall be a tape mark followed by a trailer label. The trailer label shall be followed by a single tape mark if data is to follow onto an additional reel of tape or a double tape mark if this is the last tape produced. Refer to Figure 3-1 for an EDR data file recorded on multiple volumes.

3.2 MAGNETIC LABEL SUBSTRUCTURE DEFINITION

The magnetic label consists of three physical records which are:

1) the standard volume label (VOL1),

2) the standard data set label (HDR1) and

3) a second standard data set label (HDR2).

3.2.1 VOL1 Definition

The VOL1 record contains 80 EBCDIC characters for a total of 20 32-bit words. The VOL1 record gives information on the tape number according to Table 3-1.

3.2.2 HDR1 Definition

The HDR1 record contains 80 EBCDIC characters for a total of 20 32-bit words. The HDR1 record gives information on data set name, tape number of first volume in series of volume(s), tape creation date and block count according to Table 3-2.

3.2.3 HDR2 Definition

The HDR2 record contains 80 EBCDIC characters for a total of 20 32-bit words. The HDR2 record gives record format, block length, record length, tape density and related information according to Table 3-3.

3.3 SCIENCE DATA FILE DEFINITION

The science data file consists of experiment data as well as AACS Position and Rate data in time order. These records shall each contain a standard EDR header, a subheader consisting of engineering data records and a data block. The header is described in Section 4 while the subheader and data block formats are described in Section 5. (GSOC shall add an additional file to EDRs they produce providing SEDR information corresponding to the instrument data according to document 625-610: SIS 224-09).

3.4 TRAILER LABEL DEFINITION

The trailer label consists of either

1) a pair of end of volume labels (EOV1 and EOV2) or

2) a pair of end of file labels (EOF1 and EOF2).

The EOV1 and EOV2 labels are used in the case where a data set cannot be completed on the current tape and must continue on an additional reel of tape; the EOF1 and EOF2 are used in the case where a data set completes on the current tape, whether the first tape or nth tape created. The formats of EOV1 and EOF1 are indicated in Table 3-2; the formats of EOV2 and EOF2 are indicated in Table 3-3.

```
  VOL1 OF n              VOL2 OF n             VOLn OF n

 |----------|           |----------|          |----------|
 |   VOL1   |           |   VOL1   |          |   VOL1   |
 |----------|           |----------|          |----------|
 |   HDR1   |           |   HDR1   |          |   HDR1   |
 |----------|           |----------|          |----------|
 |   HDR2   |           |   HDR2   |          |   HDR2   |
 |----------|           |----------|          |----------|
 |          |           |          |          |          |
 |          |           |          |          |          |
 |          |           |          |          |          |
 |  AACS &  |           |  AACS &  |          |  AACS &  |
 | SCIENCE  |           | SCIENCE  |          | SCIENCE  |
 |  DATA    |           |  DATA    |          |  DATA    |
 |          |           |          |          |          |
 |          |           |          |          |          |
 |          |           |          |          |          |
 |----------|           |----------|          |----------|
 |    TM    |           |    TM    |          |    TM    |
 |----------|           |----------|          |----------|
 |   EOV1   |           |   EOV1   |          |   EOF1   |
 |----------|           |----------|          |----------|
 |   EOV2   |           |   EOV2   |          |   EOF2   |
 |----------|           |----------|          |----------|
 |    TM    |           |    TM    |          |    TM    |
 |__________|           |__________|          |----------|
                                              |    TM    |
                                              |__________|
```

Figure 3-1. EDR File Structure

Table 3-1. VOL1 Label Contents

LABEL TYPE	CHARACTER POSITION	NAME	DESCRIPTION
VOL1	1-4	Label Identifier	Will be "VOL1"
	5-10	Volume Serial #	Six character volume serial #
	11	Reserved	Will be zero
	12-41	Reserved/Not Used	Will be blanks
	42-51	Owner Identifier	Will be controlled by DMS OPS
	52-80	Reserved	Will be blanks

Table 3-2. HDR1, EOV1, EOF1 Label Contents

LABEL TYPE	CHARACTER POSITION	NAME	DESCRIPTION
HDR1 EOV1 EOF1	1-4	Label Identifier	Will be HDR1 or EOV1 or EOF1
	5-21	File Identifier	Data set name with rightmost 17 bytes right justified
	22-27	File Serial #	Serial number of first volume
	28-31	Volume Sequence #	Will be a number (0001-9999)
	32-35	File Sequence #	Will be 0001
	36-39	Generation Number	Will be 0001
	40-41	Version Number	Will be 00
	42-47	Creation Date	A blank followed by 2 char. for the year (00-99) followed by 3 char. for the day (001-366)
	48-53	Expiration Date	Same format as creation date
	54	Accessibility	Will be zero
	55-60	Block Count	Will be zero if header label or block count if trailer label
	61-73	System Code	May be null (binary zero)
	74-80	Reserved	Will be blanks

Table 3-3. HDR2, EOV2, EOF2 Label Contents

LABEL TYPE	CHARACTER POSITION	NAME	DESCRIPTION
HDR2 EOV2 EOF2	1-4	Label Identifier	Will be HDR2 or EOV2 or EOF2
	5	Record Format	Will be U (unblocked records)
	6-10	Block Length	Will be max. block length
	11-15	Record Length	Will be max. record length
	16	Tape Density	Will be tape density code
	17	Multi-vol. Switch	A code indicating a vol. switch
	18-34	Job/Job Step Ident.	8 character job name, / , 8 character step name
	35-36	Not Used	Will be blanks
	37	Control Character	Will be a blank
	38	Reserved	Will be a blank
	39	Block Attributes	A code indicating blocking attributes
	40-80	Reserved	Will be blanks

SECTION 4

STANDARD EXPERIMENT DATA RECORD HEADER

4.1 OVERVIEW

The Standard Record Header diagrammed in figure 4-1 and described in detail on the following pages is designed to be utilized as the record header for all low rate science and engineering records written to the science EDR tapes and to the Engineering EDR and MDR tape/file.

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION
1	0	0-3	Primary Label Version - The version of the JPL Standard Formatted Data Unit (SFDU) in use for this record. Only the first 6 bytes of the JPL SFDU are used. 0000=Reserved 0001=Base Version (current version for GLL) XXX-=Unassigned
2	0	4-5	Character Set - Indicates the character representations used within this record. 00=Binary (used for all GLL LRS EDRs) 01=Undefined 10=Extended ASCII 11=Undefined
3	0	6-7	Data Unit Structure - Globally defines the gross structural characteristics of the data unit which is described by the Primary Label. 00=Logical Record (set for GLL EDRs) 01=Undefined 10=Physical Record (Multiple Logical Records) 11=Undefined
4	0	8-15	Start of Message Contents Pointer - Number of bytes to the start of the data block.
5	0	16-21	Control Authority - Part of the SFDU which defines the institution or "Local Control Authority" which has the responsibility to define and control the contents of the remainder of this record. 000101=NASA-JPL (always for GLL EDRs)
6	0	22-26	System Classification - Local system of control authority. 00011=Telemetry (tentatively used for EDRs)

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION
7	0	27-31	<u>Secondary Label ID</u> - Contains the identification tag which identifies the specific instance of the Secondary Label structure. 00000=no predefined secondary label
8	1	0-15	<u>Message Data Unit Total Length</u> - Total length of this record in bytes.
9	1	16	<u>80 Byte MRO Flag</u> - If Memory Readout is present (word 3, bit 5 is set to 1), this flag indicates whether it is an 80 or a 32 Byte MRO. 0 - 32 Byte MRO is present 1 - 80 Byte MRO is present
10	1	17-31	Spares - Binary Zeros
11	2	0-7	<u>S/C ID</u> - Identifies the spacecraft identification number assigned by NASA. <u>HEX</u> <u>DECIMAL</u> <u>IDENTIFIER</u> 4D 77 Galileo Orbiter 57 87 Galileo Orbiter - SIM
12	2	8-15	<u>Record Type</u> - Identifies the experiment and data subgroup to which this record pertains. <u>HEX</u> / <u>HEX</u> 00=Unknown / 08=PLS 01=Fixed Decom / 09=PPR 02=Variable Decom / 0A=PWS 03=AACS / 0B=SSI Status 04=DDS / 0C=UVS 05=EPD / 0D=Monitor 5-9 06=MAG / 0E=ENGE 07=NIMS Status / 0F=ENGS 10=HIC/EUV 11=Monitor 5-11
13	2	16-31	<u>Logical Record Sequence Number</u> - Sequential binary count of all logical records by record type written on this tape/file. The count is incremented by one after each successful write. This number is initially set to one (1).

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION
14	3	0-4	<u>Realtime Format ID</u> - Indicates the realtime downlink rate and format from the spacecraft.(Extracted from bits 0-4, word 23 of SDR header.) 00000=LPB - LRS playback @7.68kbps 00001=EHR - Engineering @1.2kbps 00010=BPB - Playback @7.68 + LRS 00011=MPB - Playback @19.2 + LRS + fill @.48 00100=XPW - PWS @46.56 + NIMS + LRS 00101=XCM - SSI compressed to 38.88 + NIMS + LRS + R/S @7.68 00110=XED - SSI edited and compressed to 38.88 + NIMS + LRS + R/S @7.68 00111=XPB - P/B @57.6 + LRS + fill @.48 01000=XPN - P/B @57.6 + NIMS + LRS + fill @2.4 01001=XRW - PWS @46.56 + NIMS + LRS + fill @13.44 01010=HPB - P/B @100.8 + LRS + fill @5.28 01011=HPJ - P/B @100.8 + PWS @12.96 + NIMS + LRS 01100=HRW - PWS @94.56 + NIMS + LRS + fill @19.2 01101=HCJ - SSI compressed to 77.76 + PWS @12.96 + NIMS + LRS + fill @7.68 + R/S @15.36 01110=MPP - PWS @19.2 + LRS + fill @.48 01111=MPR - Probe @6.48 + NIMS + LRS + fill @1.68 10000=HPW - PWS @94.56 + NIMS + LRS 10001=HIM - SSI @94.56 + NIMS + LRS 10010=HCM - SSI compressed to 77.76 + NIMS + LRS + R/S @15.36 + fill @1.44 10011=LRS - LRS @7.68 10100=MPW - PWS @7.68 + NIMS + LRS + fill @.48 10101=spare 10110=spare 10111=spare 11000=spare 11001=spare 11010=spare 11011=spare 11100=EVS - Engineering @ 8bps 11101=ESS - Engineering @40bps 11110=ELS - Engineering @10bps 11111=EMS - Engineering @16bps

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION
15	3	5	Memory Readout - Identifies whether the first 7 variable engineering packets have been replaced with memory readout data. (Extracted from bit 5, word 23 of SDR header.) 0=Variable engineering data is present 1=Memory readout data is present
16	3	6-7	Commutation Map Identifier - Identifies the commutation map currently being used to sample the S/C engineering subsystem data. In the event any onboard detected anomaly occurs which is permitted to cause automatic changing of commutation maps, the change shall be to Map 0. (Extracted from bits 6-7, word 23 of SDR header.) 00=Map 0 10=Map 2 01=Map 1 11=Map 3 This field is also used for Monitor data with the bits defined as follows: 00=Block 1 10=Block 3 01=Block 2 11=Block 4
17	3	8-10	Map Sequence Number - Binary count which represents the number of times the specified commutation map (item 15 above) has changed since the map was loaded in the S/C memory. (Extracted from bits 8-10, word 23 of SDR header.)
18	3	11-15	Recorder Identifier - Identifies rate and format of data being placed onto the spacecraft's recorder (Extracted from bits 11-15, word 23 of SDR header) HEX DESCRIPTION 00000=NONE - no data being recorded 00001=spare 00010=spare 00011=spare 00100=spare 00101=spare 00110=spare 00111=spare 01000=spare 01001=spare 01010=spare

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION

			HEX DESCRIPTION 01011=spare 01100=spare 01101=spare 01110=MPP - PWS @19.2 + fill @.48 01111=MPR - Probe/RHH @6.48 + NIMS + LRS + fill @1.68 10000=HPW - PWS @94.56 + NIMS + LRS 10001=HIM - SSI @94.56 + NIMS + LRS 10010=HCM - SSI compressed to 77.76 + NIMS + LRS + R/S @15.36 + fill @1.44 10011=LRS - LRS @7.68 10100=MPW - PWS @7.68 + NIMS + LRS + fill @.48 10101=PW8 - PWS @7.68 + NIMS + LRS + fill @7.68 10110=IM8 - SSI @7.68 + NIMS + LRS + fill @7.68 10111=AI8 - Averaged SSI @7.68 + NIMS + LRS + fill @7.68 11000=PW4 - PWS @372.48 + NIMS + LRS 11001=IM4 - SSI compressed to 311.04 + NIMS + LRS + R/S @61.44 11010=spare - LPR 6.48Kbps Probe RRH + 1200bps ENG 11011=spare - LPW - LRS w/o Golay + PWS @2.68Kbps 11100=spare 11101=spare 11110=spare 11111=spare
19	3	16-23	Input Telemetry Rate - Contains a code that describes the effective input telemetry rate from the spacecraft. (Extracted from bits 0-7, word 24 of SDR header.)

Input Rate Code HEX	Input Rate Code DECIMAL	Effective Bit Rate (bps)
00	00	N/A
04	04	40
1C	28	1,200
29	41	7,680
38	56	9,600
2E	46	16,800
2F	47	19,200
31	49	28,800
32	50	57,600
33	51	67,200
39	57	80,640
34	52	100,800
35	53	115,200
3A	58	134,400
43	67	10
51	81	16
58	88	8

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION
20	3	24-31	<u>Computed Telemetry Rate</u> - Contains a code indicating the effective bit rate of this telemetry frame. It is computed based on the indicated input telemetry rate and the ratio of this frame's bit rate to the total input telemetry rate. (Extracted from bits 8-15, word 24 of SDR header.)

Computed Rate HEX	Computed Rate DEC	Effective Bit Rate (BPS)	Computed Rate HEX	Computed Rate DEC	Effective Bit Rate (BPS)
00	00	N/A	01	01	11.4
02	02	22.8	03	03	28.6
04	04	40.4	05	05	57.2
06	06	73.1	07	07	80.0
08	08	85.7	09	09	137.1
0A	10	146.3	0B	11	150.0
OC	12	171.4	0D	13	182.9
0E	14	200.0	0F	15	300.0
10	16	320.0	11	17	342.9
12	18	365.7	13	19	512.0
14	20	548.6	15	21	600.0
16	22	800.0	17	23	877.7
18	24	960.0	19	25	1028.6
1A	26	1050.0	1B	27	1097.1
1C	28	1200.0	1D	29	1280.0
1E	30	1800.0	1F	31	1920.0
20	32	2048.0	21	33	2194.3
22	34	2400.0	23	35	3000.0
24	36	3840.0	25	37	4200.0
26	38	5120.0	27	39	6582.9
28	40	6720.0	29	41	7680.0
2A	42	9000.0	2B	43	11520.0
2C	44	15360.0	2D	45	15750.0
2E	46	16800.0	2F	47	19200.0
30	48	26880.0	31	49	28800.0
32	50	57600.0	33	51	67200.0
34	52	100800.0	35	53	115200.0
36	54	403200.0	37	55	806400.0
38	56	9600.0	39	57	80640.0
3A	58	134400.0	3B	59	6480.0
3C	60	1728.0	3D	61	4320.0
3E	62	12960.0	3F	63	22680.0
40	64	16200.0	41	65	48600.0
42	66	85050.0	43	67	10.0

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION
21	4	0-7	DSN Station - Contains the identification number of the DSN station originating the data contained in the first minor frame received of this record. (Extracted from bits 8-15, word 25 of SDR header.)

DSN	HEX Code	Station
04	53	CTA21-SPC04
05	55	CTA21,DSS05 (34-M STD)
06	5B	CTA21,DSS06 (70-M)
07	5F	CTA21,DSS07 (34-M HEF)
08	66	CTA21,DSS08 (26-M)
10	57	SPC-10 Goldstone
12	81/E9	DSS-12
14	82/19	DSS-14
15	83	DSS-15
16	84	DSS-16
17	DB	DSS-17 (no antenna)
20	7F/C8	DSN GCF Test or Filler
29	7C	GCF Test
40	90	SPC-40 Canberra
42	92/49	DSS-42
43	93/86	DSS-43
45	94	DSS-45
46	95	DSS-46
49	2D	Parks, Australia
51	97	30 meter station, Weilheim
60	D7	SPC-60, Madrid
61	F3/D6	DSS-61
63	F4/7A	DSS-63
65	FD	DSS-65
66	F6	DSS-66
70	02	MIL 71 SPC 70
72	03	MIL 71 DSS 72
78	BD	GLL TLM Blocker (BTG)
79	7D	Merrit Island Launch Area (MILA)
81	13	Simulation
82	64	Internal MCCC
84	14	Internal MCCC
98	A4	SOSC Sunnyvale, DSN/MCCC

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION
			Record Creation Date - The actual date, in decimal, this data record was written (created). This value is taken from the system clock.
22	4	8-15	Write Date - Year - Year, in decimal, minus 1900 that this data was produced (from system clock).
23	4	16-31	Write Date - Day - Day, in decimal, of year that this data was produced (from system clock).
			Starting Earth Received Time (ERT) - Greenwich Mean Time (GMT) of the first PN bit of the first minor frame (MF) contained in this record from which this record's prime data is extracted.
24	5	0	ERT is Valid - Status bit as to validity of ERT start time. (Extracted from bit 0, word 7 of SDR header.) 0=ERT present and valid 1=ERT invalid
25	5	1	ERT Computed - Status bit as to whether ERT start time has been computed by upstream processors. (Extracted from bit 15, word 21 of SDR header.) 0=ERT has been passed through without change 1=ERT has been computed by the Mission Telemetry System (MTS) based on extraction from a larger frame which contained some filler or has otherwise been corrected.
26	5	2-7	Spare - Binary Zeros.
27	5	8-15	Start ERT - Year - Binary year minus 1900. (Extracted from bits 8-15, word 11 of SDR header. This value is manually entered into the MTS computer by the computer operator so is subject to error.)
28	5	16-31	Start ERT - Hour of Current Year - Binary hours since the beginning of the current year. 24 hours is defined as January 1, 00 hours. Valid values are 24 --8807. (Extracted from bits 0-15, word 12 of SDR header.)

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION
29	6	0-15	Start ERT - Seconds of Current Hour - Binary seconds since the beginning of the current hour. Valid values are 0 -- 3599. (Extracted from bits 0-15,word 13 of SDR header.)
30	6	16-31	Start ERT - Milliseconds of Current Second - The binary milliseconds since the beginning of the current second. Valid values are 0 -- 999. (Extracted from bits 0-15, word 14 of SDR header.)
			Spacecraft Clock Count (SCLK) - The SCLK value of the first minor frame from which this record's prime data is extracted.
31	7	0-23	RIM - Binary count of the corrected spacecraft clock's RIM counter. Increments by one (1) every $60^2/_3$ seconds. (Extracted from bits 0-15, word 15 and bits 0-7, word 16 of SDR header.)
32	7	24-31	MOD91 - Binary count of the corrected spacecraft clock's MOD91 counter. Increments by one (1) every $^2/_3$ second. Valid values are 0 -- 90. (Extracted from bits 8-15, word 16 of SDR header.)
33	8	0-7	MOD10 - Binary count of the corrected spacecraft clock's MOD10 counter. Increments by one (1) every $66^2/_3$ milliseconds. Valid values are 0 -- 9. (Extracted from bits 0-7, word 17 of SDR header.)
34	8	8-15	MOD8 - Binary count of the corrected spacecraft clock's MOD8 counter. Increments by one (1) every $8^1/_3$ milliseconds. Valid values are 0 -- 7. (Extracted from bits 8-15, word 17 of SDR header.)

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION
			SCLK Status Flags - Status bits reflecting whether SCLK value has been corrected by the realtime telemetry system (MTS) during frame syncing.
35	8	16	Corrected RIM Flag - Status of RIM count corrector (Extracted from bit 0, word 21 of SDR header.) 0=RIM not corrected 1=RIM corrected
36	8	17	Corrected MOD91 Flag - Status of MOD91 counter. (Extracted from bit 1, word 21 of SDR header.) 0=MOD91 not corrected 1=MOD91 corrected
37	8	18	Corrected MOD10 Flag - Status of MOD10 counter. (Extracted from bit 2, word 21 of SDR header.) 0=MOD10 not corrected 1=MOD10 corrected
38	8	19	Corrected MOD8 Flag - Status of MOD8 counter. (Extracted from bit 3, word 21 of SDR header.) 0=MOD8 not corrected 1=MOD8 corrected
39	8	20	SCLK Valid Flag - Status of whether spacecraft clock (SCLK) value is valid for this data mode. (Extracted from bit 4, word 21 of SDR header.) 0=The corrected SCLK is valid for this mode. 1=The corrected SCLK is invalid for the current frame format or it deviates from the established SCLK sync.

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION
40	8	21	SCLK Reference Flag - Status as to whether SCLK reference has been established. (Extracted from bit 5, word 21 of SDR header.) 0=2 or more successive frames with compatible SCLK values have been encountered (or N/A). 1=No successive frames with compatible SCLK values have been encountered.
41	8	22	Parent Frame SCLK Corrected Flag - Status of whether SCLK has been corrected based on extraction from higher order module. (Extracted from bit 6, word 21 of SDR header.) 0=Parent frame SCLK not corrected. 1=Parent frame SCLK corrected.
42	8	23	SCLK Computed Flag - Status of the SCLK value being computed. (Extracted from bit 7, word 21 of the SDR header.) 0=SCLK processed as is from the S/C 1=SCLK value has been computed
43	8	24-31	Spares - Binary Zeros.

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION
			<u>Spacecraft</u> <u>Event</u> <u>Time</u> <u>(SCET)</u> - GMT that corresponds to the spacecraft time of the first MF from which this record's prime data was extracted.
44	9	0	<u>SCET</u> <u>Flag</u> - Status of where SCET tag derived. 0=Input SCET from Data Base 1=Input SCET calculated by EDRGEN
45	9	1-7	Spares - Binary Zeros.
46	9	8-15	<u>SCET</u> <u>-</u> <u>YEAR</u> - Binary year minus 1900.
47	9	16-31	<u>SCET</u> <u>-</u> <u>Hour</u> <u>of</u> <u>Current</u> <u>Year</u> - Binary hours since the beginning of the current year. Valid values are 24 -- 8807.
48	10	0-15	<u>SCET</u> <u>-</u> <u>Seconds</u> <u>of</u> <u>Current</u> <u>Hour</u> - Binary seconds since the beginning of the current hour. Valid values are 0 -- 3599.
49	10	16-31	<u>SCET</u> <u>-</u> <u>Milliseconds</u> <u>of</u> <u>Current</u> <u>Second</u> - Binary milliseconds since the beginning of the current second. Valid values are 0 -- 999.

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION
50	11	0-31	Data Present Indicators - 32 status flags as to whether MF 1 - 32 respectively are present in this record. 0=Data present 1=All or part of MF is missing
51	12	0-31	Data Present Indicators - Status flags for MF's 33 - 64 respectively. 0=Data present 1=All or part of MF is missing
52	13	0-26	Data Present Indicators - Status flags for MF's 65 - 91 respectively. 0=Data present 1=All or part of MF is missing.
53	13	27-31	Spares - Binary Zeros.
54	14	0-31	Golay Correction Flags - Status flags for MF's 1 - 32 respectively. (Extracted from bit 14, word 21 of SDR header.) 0=No golay correction algorithm applied or no golay block pairs exist. 1=Golay correction algorithm applied.
55	15	0-31	Golay Correction Flags - Status flags for MF's 33 - 64 respectively. (Extracted from bit 14, word 21 of SDR header.) 0=No golay correction algorithm applied or N/A. 1=Golay correction algorithm applied.

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION
56	16	0-26	Golay Correction Flags - Status flags for MF's 65 - 91 respectively. (Extracted from bit 14, word 21 of SDR header.) 0=No golay correction algorithm applied or N/A. 1=Golay correction algorithm applied.
57	16	27-30	Spares - Binary Zeros.
58	16	31	S/C Playback - indicates that the data in this record is spacecraft tape recorder playback data. 0=Realtime data 1=Playback data

SECTION 4

STANDARD EXPERIMENT DATA RECORD HEADER

4.1 OVERVIEW

The Standard Record Header diagrammed in figure 4-1 and described in detail on the following pages is designed to be utilized as the record header for all low rate science and engineering records written to the science EDR tapes and to the Engineering EDR and MDR tape/file.

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION
1	0	0-3	Primary Label Version - The version of the JPL Standard Formatted Data Unit (SFDU) in use for this record. Only the first 6 bytes of the JPL SFDU are used. 0000=Reserved 0001=Base Version (current version for GLL) XXX-=Unassigned
2	0	4-5	Character Set - Indicates the character representations used within this record. 00=Binary (used for all GLL LRS EDRs) 01=Undefined 10=Extended ASCII 11=Undefined
3	0	6-7	Data Unit Structure - Globally defines the gross structural characteristics of the data unit which is described by the Primary Label. 00=Logical Record (set for GLL EDRs) 01=Undefined 10=Physical Record (Multiple Logical Records) 11=Undefined
4	0	8-15	Start of Message Contents Pointer - Number of bytes to the start of the data block.
5	0	16-21	Control Authority - Part of the SFDU which defines the institution or "Local Control Authority" which has the responsibility to define and control the contents of the remainder of this record. 000101=NASA-JPL (always for GLL EDRs)
6	0	22-26	System Classification - Local system of control authority. 00011=Telemetry (tentatively used for EDRs)

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION
7	0	27-31	Secondary Label ID - Contains the identification tag which identifies the specific instance of the Secondary Label structure. 00000=no predefined secondary label
8	1	0-15	Message Data Unit Total Length - Total length of this record in bytes.
9	1	16	80 Byte MRO Flag - If Memory Readout is present (word 3, bit 5 is set to 1), this flag indicates whether it is an 80 or a 32 Byte MRO. 0 - 32 Byte MRO is present 1 - 80 Byte MRO is present
10	1	17-31	Spares - Binary Zeros
11	2	0-7	S/C ID - Identifies the spacecraft identification number assigned by NASA. HEX / DECIMAL / IDENTIFIER 4D / 77 / Galileo Orbiter 57 / 87 / Galileo Orbiter - SIM
12	2	8-15	Record Type - Identifies the experiment and data subgroup to which this record pertains. HEX 00=Unknown 01=Fixed Decom 02=Variable Decom 03=AACS 04=DDS 05=EPD 06=MAG 07=NIMS Status 08=PLS 09=PPR 0A=PWS 0B=SSI Status 0C=UVS 0D=Monitor 5-9 0E=ENGE 0F=ENGS 10=HIC/EUV 11=Monitor 5-11
13	2	16-31	Logical Record Sequence Number - Sequential binary count of all logical records by record type written on this tape/file. The count is incremented by one after each successful write. This number is initially set to one (1).

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION
14	3	0-4	Realtime Format ID - Indicates the realtime downlink rate and format from the spacecraft.(Extracted from bits 0-4, word 23 of SDR header.) 00000=LPB - LRS playback @7.68kbps 00001=EHR - Engineering @1.2kbps 00010=BPB - Playback @7.68 + LRS 00011=MPB - Playback @19.2 + LRS + fill @.48 00100=XPW - PWS @46.56 + NIMS + LRS 00101=XCM - SSI compressed to 38.88 + NIMS + LRS + R/S @7.68 00110=XED - SSI edited and compressed to 38.88 + NIMS + LRS + R/S @7.68 00111=XPB - P/B @57.6 + LRS + fill @.48 01000=XPN - P/B @57.6 + NIMS + LRS + fill @2.4 01001=XRW - PWS @46.56 + NIMS + LRS + fill @13.44 01010=HPB - P/B @100.8 + LRS + fill @5.28 01011=HPJ - P/B @100.8 + PWS @12.96 + NIMS + LRS 01100=HRW - PWS @94.56 + NIMS + LRS + fill @19.2 01101=HCJ - SSI compressed to 77.76 + PWS @12.96 + NIMS + LRS + fill @7.68 + R/S @15.36 01110=MPP - PWS @19.2 + LRS + fill @.48 01111=MPR - Probe @6.48 + NIMS + LRS + fill @1.68 10000=HPW - PWS @94.56 + NIMS + LRS 10001=HIM - SSI @94.56 + NIMS + LRS 10010=HCM - SSI compressed to 77.76 + NIMS + LRS + R/S @15.36 + fill @1.44 10011=LRS - LRS @7.68 10100=MPW - PWS @7.68 + NIMS + LRS + fill @.48 10101=spare 10110=spare 10111=spare 11000=spare 11001=spare 11010=spare 11011=spare 11100=EVS - Engineering @ 8bps 11101=ESS - Engineering @40bps 11110=ELS - Engineering @10bps 11111=EMS - Engineering @16bps

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION
15	3	5	Memory Readout - Identifies whether the first 7 variable engineering packets have been replaced with memory readout data. (Extracted from bit 5, word 23 of SDR header.) 0=Variable engineering data is present 1=Memory readout data is present
16	3	6-7	Commutation Map Identifier - Identifies the commutation map currently being used to sample the S/C engineering subsystem data. In the event any onboard detected anomaly occurs which is permitted to cause automatic changing of commutation maps, the change shall be to Map 0. (Extracted from bits 6-7, word 23 of SDR header.) 00=Map 0 10=Map 2 01=Map 1 11=Map 3 This field is also used for Monitor data with the bits defined as follows: 00=Block 1 10=Block 3 01=Block 2 11=Block 4
17	3	8-10	Map Sequence Number - Binary count which represents the number of times the specified commutation map (item 15 above) has changed since the map was loaded in the S/C memory. (Extracted from bits 8-10, word 23 of SDR header.)
18	3	11-15	Recorder Identifier - Identifies rate and format of data being placed onto the spacecraft's recorder (Extracted from bits 11-15, word 23 of SDR header) HEX DESCRIPTION 00000=NONE - no data being recorded 00001=spare 00010=spare 00011=spare 00100=spare 00101=spare 00110=spare 00111=spare 01000=spare 01001=spare 01010=spare

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION

			HEX DESCRIPTION 01011=spare 01100=spare 01101=spare 01110=MPP - PWS @19.2 + fill @.48 01111=MPR - Probe/RHH @6.48 + NIMS + LRS + fill @1.68 10000=HPW - PWS @94.56 + NIMS + LRS 10001=HIM - SSI @94.56 + NIMS + LRS 10010=HCM - SSI compressed to 77.76 + NIMS + LRS + R/S @15.36 + fill @1.44 10011=LRS - LRS @7.68 10100=MPW - PWS @7.68 + NIMS + LRS + fill @.48 10101=PW8 - PWS @7.68 + NIMS + LRS + fill @7.68 10110=IM8 - SSI @7.68 + NIMS + LRS + fill @7.68 10111=AI8 - Averaged SSI @7.68 + NIMS + LRS + fill @7.68 11000=PW4 - PWS @372.48 + NIMS + LRS 11001=IM4 - SSI compressed to 311.04 + NIMS + LRS + R/S @61.44 11010=spare - LPR 6.48Kbps Probe RRH + 1200bps ENG 11011=spare - LPW - LRS w/o Golay + PWS @2.68Kbps 11100=spare 11101=spare 11110=spare 11111=spare
19	3	16-23	Input Telemetry Rate - Contains a code that describes the effective input telemetry rate from the space-craft. (Extracted from bits 0-7, word 24 of SDR header.)

Input Rate Code HEX	DECIMAL	Effective Bit Rate (bps)
00	00	N/A
04	04	40
1C	28	1,200
29	41	7,680
38	56	9,600
2E	46	16,800
2F	47	19,200
31	49	28,800
32	50	57,600
33	51	67,200
39	57	80,640
34	52	100,800
35	53	115,200
3A	58	134,400
43	67	10
51	81	16
58	88	8

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION
20	3	24-31	Computed Telemetry Rate - Contains a code indicating the effective bit rate of this telemetry frame. It is computed based on the indicated input telemetry rate and the ratio of this frame's bit rate to the total input telemetry rate. (Extracted from bits 8-15, word 24 of SDR header.)

Computed Rate HEX	Computed Rate DEC	Effective Bit Rate (BPS)	Computed Rate HEX	Computed Rate DEC	Effective Bit Rate (BPS)
00	00	N/A	01	01	11.4
02	02	22.8	03	03	28.6
04	04	40.4	05	05	57.2
06	06	73.1	07	07	80.0
08	08	85.7	09	09	137.1
0A	10	146.3	0B	11	150.0
OC	12	171.4	0D	13	182.9
0E	14	200.0	0F	15	300.0
10	16	320.0	11	17	342.9
12	18	365.7	13	19	512.0
14	20	548.6	15	21	600.0
16	22	800.0	17	23	877.7
18	24	960.0	19	25	1028.6
1A	26	1050.0	1B	27	1097.1
1C	28	1200.0	1D	29	1280.0
1E	30	1800.0	1F	31	1920.0
20	32	2048.0	21	33	2194.3
22	34	2400.0	23	35	3000.0
24	36	3840.0	25	37	4200.0
26	38	5120.0	27	39	6582.9
28	40	6720.0	29	41	7680.0
2A	42	9000.0	2B	43	11520.0
2C	44	15360.0	2D	45	15750.0
2E	46	16800.0	2F	47	19200.0
30	48	26880.0	31	49	28800.0
32	50	57600.0	33	51	67200.0
34	52	100800.0	35	53	115200.0
36	54	403200.0	37	55	806400.0
38	56	9600.0	39	57	80640.0
3A	58	134400.0	3B	59	6480.0
3C	60	1728.0	3D	61	4320.0
3E	62	12960.0	3F	63	22680.0
40	64	16200.0	41	65	48600.0
42	66	85050.0	43	67	10.0

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION
21	4	0-7	DSN Station - Contains the identification number of the DSN station originating the data contained in the first minor frame received of this record. (Extracted from bits 8-15, word 25 of SDR header.)

DSN	HEX Code	Station
04	53	CTA21-SPC04
05	55	CTA21,DSS05 (34-M STD)
06	5B	CTA21,DSS06 (70-M)
07	5F	CTA21,DSS07 (34-M HEF)
08	66	CTA21,DSS08 (26-M)
10	57	SPC-10 Goldstone
12	81/E9	DSS-12
14	82/19	DSS-14
15	83	DSS-15
16	84	DSS-16
17	DB	DSS-17 (no antenna)
20	7F/C8	DSN GCF Test or Filler
29	7C	GCF Test
40	90	SPC-40 Canberra
42	92/49	DSS-42
43	93/86	DSS-43
45	94	DSS-45
46	95	DSS-46
49	2D	Parks, Australia
51	97	30 meter station, Weilheim
60	D7	SPC-60, Madrid
61	F3/D6	DSS-61
63	F4/7A	DSS-63
65	FD	DSS-65
66	F6	DSS-66
70	02	MIL 71 SPC 70
72	03	MIL 71 DSS 72
78	BD	GLL TLM Blocker (BTG)
79	7D	Merrit Island Launch Area (MILA)
81	13	Simulation
82	64	Internal MCCC
84	14	Internal MCCC
98	A4	SOSC Sunnyvale, DSN/MCCC

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION
			Record Creation Date - The actual date, in decimal, this data record was written (created). This value is taken from the system clock.
22	4	8-15	Write Date - Year - Year, in decimal, minus 1900 that this data was produced (from system clock).
23	4	16-31	Write Date - Day - Day, in decimal, of year that this data was produced (from system clock).
			Starting Earth Received Time (ERT) - Greenwich Mean Time (GMT) of the first PN bit of the first minor frame (MF) contained in this record from which this record's prime data is extracted.
24	5	0	ERT is Valid - Status bit as to validity of ERT start time. (Extracted from bit 0, word 7 of SDR header.) 0=ERT present and valid 1=ERT invalid
25	5	1	ERT Computed - Status bit as to whether ERT start time has been computed by upstream processors. (Extracted from bit 15, word 21 of SDR header.) 0=ERT has been passed through without change 1=ERT has been computed by the Mission Telemetry System (MTS) based on extraction from a larger frame which contained some filler or has otherwise been corrected.
26	5	2-7	Spare - Binary Zeros.
27	5	8-15	Start ERT - Year - Binary year minus 1900. (Extracted from bits 8-15, word 11 of SDR header. This value is manually entered into the MTS computer by the computer operator so is subject to error.)
28	5	16-31	Start ERT - Hour of Current Year - Binary hours since the beginning of the current year. 24 hours is defined as January 1, 00 hours. Valid values are 24 --8807. (Extracted from bits 0-15, word 12 of SDR header.)

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION
29	6	0-15	Start ERT - Seconds of Current Hour - Binary seconds since the beginning of the current hour. Valid values are 0 -- 3599. (Extracted from bits 0-15,word 13 of SDR header.)
30	6	16-31	Start ERT - Milliseconds of Current Second - The binary milliseconds since the beginning of the current second. Valid values are 0 -- 999. (Extracted from bits 0-15, word 14 of SDR header.)
			Spacecraft Clock Count (SCLK) - The SCLK value of the first minor frame from which this record's prime data is extracted.
31	7	0-23	RIM - Binary count of the corrected spacecraft clock's RIM counter. Increments by one (1) every $60^2/_3$ seconds. (Extracted from bits 0-15, word 15 and bits 0-7, word 16 of SDR header.)
32	7	24-31	MOD91 - Binary count of the corrected spacecraft clock's MOD91 counter. Increments by one (1) every $^2/_3$ second. Valid values are 0 -- 90. (Extracted from bits 8-15, word 16 of SDR header.)
33	8	0-7	MOD10 - Binary count of the corrected spacecraft clock's MOD10 counter. Increments by one (1) every $66^2/_3$ milliseconds. Valid values are 0 -- 9. (Extracted from bits 0-7, word 17 of SDR header.)
34	8	8-15	MOD8 - Binary count of the corrected spacecraft clock's MOD8 counter. Increments by one (1) every $8^1/_3$ milliseconds. Valid values are 0 -- 7. (Extracted from bits 8-15, word 17 of SDR header.)

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION
			SCLK Status Flags - Status bits reflecting whether SCLK value has been corrected by the realtime telemetry system (MTS) during frame syncing.
35	8	16	Corrected RIM Flag - Status of RIM count corrector (Extracted from bit 0, word 21 of SDR header.) 0=RIM not corrected 1=RIM corrected
36	8	17	Corrected MOD91 Flag - Status of MOD91 counter. (Extracted from bit 1, word 21 of SDR header.) 0=MOD91 not corrected 1=MOD91 corrected
37	8	18	Corrected MOD10 Flag - Status of MOD10 counter. (Extracted from bit 2, word 21 of SDR header.) 0=MOD10 not corrected 1=MOD10 corrected
38	8	19	Corrected MOD8 Flag - Status of MOD8 counter. (Extracted from bit 3, word 21 of SDR header.) 0=MOD8 not corrected 1=MOD8 corrected
39	8	20	SCLK Valid Flag - Status of whether spacecraft clock (SCLK) value is valid for this data mode. (Extracted from bit 4, word 21 of SDR header.) 0=The corrected SCLK is valid for this mode. 1=The corrected SCLK is invalid for the current frame format or it deviates from the established SCLK sync.

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION
40	8	21	SCLK Reference Flag - Status as to whether SCLK reference has been established. (Extracted from bit 5, word 21 of SDR header.) 0=2 or more successive frames with compatible SCLK values have been encountered (or N/A). 1=No successive frames with compatible SCLK values have been encountered.
41	8	22	Parent Frame SCLK Corrected Flag - Status of whether SCLK has been corrected based on extraction from higher order module. (Extracted from bit 6, word 21 of SDR header.) 0=Parent frame SCLK not corrected. 1=Parent frame SCLK corrected.
42	8	23	SCLK Computed Flag - Status of the SCLK value being computed. (Extracted from bit 7, word 21 of the SDR header.) 0=SCLK processed as is from the S/C 1=SCLK value has been computed
43	8	24-31	Spares - Binary Zeros.

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION
			Spacecraft Event Time (SCET) - GMT that corresponds to the spacecraft time of the first MF from which this record's prime data was extracted.
44	9	0	SCET Flag - Status of where SCET tag derived. 0=Input SCET from Data Base 1=Input SCET calculated by EDRGEN
45	9	1-7	Spares - Binary Zeros.
46	9	8-15	SCET - YEAR - Binary year minus 1900.
47	9	16-31	SCET - Hour of Current Year - Binary hours since the beginning of the current year. Valid values are 24 -- 8807.
48	10	0-15	SCET - Seconds of Current Hour - Binary seconds since the beginning of the current hour. Valid values are 0 -- 3599.
49	10	16-31	SCET - Milliseconds of Current Second - Binary milliseconds since the beginning of the current second. Valid values are 0 -- 999.

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION
50	11	0-31	Data Present Indicators - 32 status flags as to whether MF 1 - 32 respectively are present in this record. 0=Data present 1=All or part of MF is missing
51	12	0-31	Data Present Indicators - Status flags for MF's 33 - 64 respectively. 0=Data present 1=All or part of MF is missing
52	13	0-26	Data Present Indicators - Status flags for MF's 65 - 91 respectively. 0=Data present 1=All or part of MF is missing.
53	13	27-31	Spares - Binary Zeros.
54	14	0-31	Golay Correction Flags - Status flags for MF's 1 - 32 respectively. (Extracted from bit 14, word 21 of SDR header.) 0=No golay correction algorithm applied or no golay block pairs exist. 1=Golay correction algorithm applied.
55	15	0-31	Golay Correction Flags - Status flags for MF's 33 - 64 respectively. (Extracted from bit 14, word 21 of SDR header.) 0=No golay correction algorithm applied or N/A. 1=Golay correction algorithm applied.

STANDARD EXPERIMENT DATA RECORD HEADER

ITEM	WORD	BITS	DESCRIPTION
56	16	0-26	Golay Correction Flags - Status flags for MF's 65 - 91 respectively. (Extracted from bit 14, word 21 of SDR header.) 0=No golay correction algorithm applied or N/A. 1=Golay correction algorithm applied.
57	16	27-30	Spares - Binary Zeros.
58	16	31	S/C Playback - indicates that the data in this record is spacecraft tape recorder playback data. 0=Realtime data 1=Playback data

SECTION 5

SCIENCE SUBHEADER AND DATA BLOCK FORMAT

5.1 DATA OVERVIEW

EDRGEN shall accept frame synchronized Low Rate Science (LRS) data which has been golay corrected. EDRGEN shall extract the proper science experiment data from the LRS frame and place it into the appropriate location of the data block for the experiment record. EDRGEN shall extract the AACS data in a like manner from the LRS frame and place it into the appropriate location of the AACS record. In addition, EDRGEN shall decommutate the fixed engineering data within each LRS frame for selected engineering channels and place them into the appropriate location of the experiment record subheader.

Filler and spare bits in the EDR formats shall be binary zeros at all times.

Each instrument shall have a common EDR header (refer to Section 4), a common subheader where appropriate, and a unique science data section containing its' own instrument record structure. Each of the following subsections shall define processing, instrument record structure and from which bits of the LRS frame (golay corrected) data is to be acquired.

5.2 EDR PROCESSING

EDRGEN shall extract the AACS, science and science related engineering channels from each LRS minor frame. EDRGEN shall then build individual experiment records and AACS records by combining all minor frames corresponding to a RIM cycle (91 minor frame) placing the start time of the first minor frame into the record header and appending SCET, golay correction flags and data presence indicator flags as indicated in Section 4. An accumulation of summary data shall be performed with the summary of each EDR tape being provided.

EDRGEN shall extract data from the LRS frames using the spacecraft clock (SCLK) count to control the extraction process. The following criteria are to be applied to the SCLK count for each LRS minor frame:

1) When the SCLK count increments by a value equal to a minor frame (MOD91 count), the program will continue building the current major frame (corresponds to a RIM count).

2) When the SCLK is greater than one MOD91 count, but in the same RIM count, the program will locate the data by minor frame location within the record and update the current major frame, flagging filler blocks.

3) When the SCLK count equals or is less than the previous SCLK count, the program shall flag the remainder of the current major frame as containing filler, output the major frame, and begin updating a new major frame with the current major frame, flagging filler blocks as appropriate.

4) When the SCLK count increments the RIM count, the program will output the current major frame, flagging filler blocks as necessary. The program will then begin constructing a new major frame with the current minor frame, flagging filler blocks as necessary.

5) When any LRS frame, from which data is extracted, contains filler, the extraction function will flag the affected minor frame within the record as containing filler.

5.3 STANDARD EDR SUBHEADER

All low rate science records which require a subheader shall receive a standard subheader. This standard subheader shall contain selected engineering measurements in raw DN values extracted from the engineering area of the LRS data block using a fixed decommutation map. Engineering data from the standalone engineering records shall not be processed for inclusion in the standard science subheaders. Refer to Figure 5-1 for the block format of the standard subheader.

EDR WORD	BITS 0–7	BITS 8–15	BITS 16–23	BITS 24–31
0	SPARE	E-0001	E-1740	E-1790
1	E-1690	E-1691	E-1692	E-1693
2	E-1715	E-1716	E-1675	E-1676
3	E-1750	E-1751	E-1752	E-1753
4	E-1860	E-1861	E-1862	E-1863
5	E-0082(1)	E-0083(1)	E-1204(1)	
6	E-1205(1)		E-1206(1)	
7	E-1207(1)		E-1217(1)	
8	E-1218(1)		E-1219(1)	
9	E-1220(1)		E-1230(1)	
10	E-1231(1)		E-1232(1)	
11	E-1233(1)		SPARE	
12	THE ABOVE PATTERN FOR WORDS 5 THRU 11 REPEATS 5 MORE TIMES FOR SUBCOM 2 THRU 6			
47	E-0082(7)	E-0083(7)	E-1204(7)	
48	E-1205(7)		E-1206(7)	
49	E-1207(7)		E-1217(7)	
50	E-1218(7)		E-1219(7)	
51	E-1220(7)		E-1230(7)	
52	E-1231(7)		E-1232(7)	
53	E-1233(7)		SPARE	

Figure 5-1. Standard Subheader Format
SUBHEADER CHANNEL LISTING

CHANNEL	TITLE
E-0001	BAY 2 TEMPERATURE
E-0082(N)*	DC BUS CURRENT A.
E-0083(N)*	DC BUS CURRENT B.
E-1204(N)*	-Z1A 11 MS COUNT (LS)
E-1205(N)*	-Z2A 11 MS COUNT (LS)
E-1206(N)*	-Z1B 11 MS COUNT (LS)
E-1207(N)*	-Z2B 11 MS COUNT (LS)
E-1217(N)*	+P1A 11 MS COUNT (LS)
E-1218(N)*	+L1B 11 MS COUNT (LS)
E-1219(N)*	-S1A 11 MS COUNT (LS)
E-1220(N)*	+S2A 11 MS COUNT (LS)
E-1230(N)*	+P2A 11 MS COUNT (LS)
E-1231(N)*	+L2B 11 MS COUNT (LS)
E-1232(N)*	-S1B 11 MS COUNT (LS)
E-1233(N)*	+S2B 11 MS COUNT (LS)
E-1675	PWS SEARCH COIL PREAMPLIFIER TEMPERATURE
E-1676	PWS MAIN ELECTRONICS TEMPERATURE
E-1690	EPD LEMMS TELESCOPE TEMPERATURE
E-1691	EPD CMS TELESCOPE TEMPERATURE
E-1692	EPD ANALOG ELECTRONICS TEMPERATURE
E-1693	EPD POWER SUPPLY TEMPERATURE
E-1715	PPR PRISM/DETECTOR ASSEMBLY TEMPERATURE
E-1716	PPR MAIN ELECTRONICS TEMPERATURE
E-1740	DDS SENSOR TEMPERATURE
E-1750	PLS VELOCITY DISTRIBUTION ANALYZER TEMPERATURE
E-1751	PLS COMPOSITION ANALYZER TEMPERATURE
E-1752	PLS HIGH VOLTAGE POWER SUPPLY TEMPERATURE
E-1753	PLS DATA HANDLING AND CONTROL TEMPERATURE
E-1790	UVS TC-TRANSDUCER TEMPERATURE
E-1860	MAG INBOARD SENSOR TEMPERATURE
E-1861	MAG OUTBOARD SENSOR TEMPERATURE
E-1862	MAG ADC TEMPERATURE
E-1863	MAG ANALOG ELECTRONICS TEMPERATURE

* "(N)" REPRESENTS AN 8-2/3 SECOND (13 MINOR FRAME) SEGMENT IN WHICH THIS CHANNEL IS SAMPLED WHERE:

N=1 REPRESENTS MOD91 COUNTS OF 0 THRU 12
N=2 REPRESENTS MOD91 COUNTS OF 13 THRU 25
N=3 REPRESENTS MOD91 COUNTS OF 26 THRU 38
N=4 REPRESENTS MOD91 COUNTS OF 39 THRU 51
N=5 REPRESENTS MOD91 COUNTS OF 52 THRU 64
N=6 REPRESENTS MOD91 COUNTS OF 65 THRU 77
N=7 REPRESENTS MOD91 COUNTS OF 78 THRU 90

5.4 AACS POSITION AND RATE DATA

The AACS Position and Rate data record is designed to a RIM cycle containing 91 minor frames. Each minor frame corresponds to a MOD91 count.

The AACS record shall be placed onto each Science EDR as well as the Engineering EDR in time order. The logical record structure is diagrammed in Figure 5-2.

Processing Start/Stop

Refer to Subsection 5.2.

Record Buildup

AACS record buildup shall proceed with the extraction from the appropriate bit locations from minor frames 1 through 91 of each RIM cycle. Subsection 5.2 defines the basic data extraction procedure.

Record Header

The AACS record shall receive a standard record header (refer to Section 4).

Record Subheader

The AACS record shall not receive a subheader.

Data Block

The AACS data block contains data extracted from bits 3200 through bits 3391 of each of the 91 minor frames of a RIM cycle from the golay compressed LRS data block of the input SDR record. Specified word locations shall be maintained within the data block. Refer to Figure 5-3 for data block format and GLL-3-280 Appendix A for detailed definitions.

STANDARD HEADER (17 - 32 BIT WORDS)	AACS POSITION AND RATE DATA (546 - 32 BIT WORDS)

Figure 5-2. AACS Record

```
EDR     BITS
WORD    0              15 16             31 0              15 16                31
       |-----------------|-----------------|-----------------|-------------------|
  0    | ROTOR ATTITUDE  | ROTOR ATTITUDE  | ROTOR ATTITUDE  | PLATFORM A        |
       |     RA          |      DEC        |     TWIST       |        RA         |
       |    (MF-1)       |    (MF-1)       |    (MF-1)       |      (MF-1)       |
       |-----------------|-----------------|-----------------|-------------------|
  2    |  PLATFORM ATT.  |  PLATFORM ATT.  | PLATFORM RATE   | PLATFORM RATE     |
       |     DEC         |     TWIST       |     CONE        |    CROSS CONE     |
       |    (MF-1)       |     (MF-1)      |    (MF-1)       |      (MF-1)       |
       |-----------------|-----------------|-----------------|-------------------|
  4    |   ROTOR SPIN    |   ROTOR SPIN    |  S/C RELATIVE   |  S/C RELATIVE     |
       |  MOTION DELTA   |  POSITION ANGLE|     CONE        |     CLOCK         |
       |    (MF-1)       |     (MF-1)      |    (MF-1)       |      (MF-1)       |
       |-----------------|-----------------|-----------------|-------------------|
       |                                                                         |
       |                                                                         |
       |                                                                         |
       |                                                                         |
       |            THE ABOVE STRUCTURE IS REPEATED 90 MORE TIMES                |
       |                                                                         |
       |             TO COMPLETE THE RECORD OF 546  32-BIT WORDS                 |
       |                                                                         |
       |                                                                         |
       |                                                                         |
544    |                                                                         |
       |-----------------|-----------------|-----------------|-------------------|
```

Figure 5-3. AACS Data Block Format

5.5 DUST DETECTOR SUBSYSTEM (DDS) EXPERIMENT

The DDS EDR science record is designed to a RIM cycle containing 91 minor frames. Each minor frame corresponds to a MOD 91 count. The DDS record shall be placed onto the DDS science EDR along with AACS records in time order. The logical record structure is diagrammed in Figure 5-4.

Processing Start/Stop
Refer to Subsection 5.2.

Record Buildup
DDS science record buildup shall proceed with the extraction from the appropriate bit locations from minor frames 1 through 91 of each RIM cycle. Subsection 5.2 defines the basic data extraction procedure.

Record Header
The DDS record shall receive a standard record header (refer to Section 4).

Record Subheader
The DDS record contains a standard subheader which contains selected engineering measurements in raw DN values extracted from the engineering packet of the LRS data block (channels from the fixed engineering data). Refer to Figure 5-1 on page 5-3.

Data Block
The DDS data block contains data extracted from bits 2096 through bits 2111 of each minor frame from the golay compressed LRS data block of the input SDR record. Specified word locations shall be maintained within the data block. Refer to Figure 5-5 for data block format and GLL-3-280 Appendix A for detailed definition of the data fields.

The DDS data block shall consist of seven (7) DDS packets each consisting of thirteen (13) minor frames.

DDS PACKET #	MINOR FRAME #	MOD 91
1st packet	1 - 13	0 - 12
2nd packet	14 - 26	13 - 25
3rd packet	27 - 39	26 - 38
4th packet	40 - 52	39 - 51
5th packet	53 - 65	52 - 64
6th packet	66 - 78	65 - 77
7th packet	79 - 91	78 - 90

STANDARD HEADER	STANDARD SUBHEADER	DDS DATA
(17 32-BIT WORDS)	(54 32-BIT WORDS)	(46 32-BIT WORDS)

Figure 5-4. DDS Record

EDR WORD	BITS 0 15	16 31	0 15	16 31
0	MF-1	MF-2	MF-3	MF-4
2	MF-5	MF-6	MF-7	MF-8
4	MF-9	MF-10	MF-11	MF-12
6	MF-13	MF-14	MF-15	MF-16
8	MF-17	MF-18	MF-19	MF-20
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
42	MF-85	MF-86	MF-87	MF-88
44	MF-89	MF-90	MF-91	FILLER

Figure 5-5. DDS Data Block

5.6 ENERGETIC PARTICLE DETECTOR SUBSYSTEM (EPD) EXPERIMENT

The EPD EDR science record is designed to a RIM cycle containing 91 minor frames. Each minor frame corresponds to a MOD 91 count. The EPD record shall be placed onto the EPD science EDR along with MAG and AACS records in time order. The logical record structure is diagrammed in Figure 5-6.

Processing Start/Stop
Refer to Subsection 5.2.

Record Buildup
EPD science record buildup shall proceed with the extraction from the appropriate bit locations from minor frames 1 through 91 of each RIM cycle. Subsection 5.2 defines the basic data extraction procedure.

Record Header
The EPD record shall receive a standard record header (refer to Section 4).

Record Subheader
The EPD subheader contains a standard subheader containing selected engineering measurements in DN extracted from the engineering packet of the LRS data block (channels from the fixed engineering data). Refer to Figure 5-1 on page 5-3.

Data Block
The EPD data block contains data extracted from bits 2128 through bits 2735 of each minor frame from the golay compressed LRS data block of the input SDR record. Specified word locations shall be maintained within the data block. Refer to Figure 5-7 for the data block format and GLL-3-280 Appendix A for detailed definition of the data fields.

STANDARD HEADER (17 32-BIT WORDS)	STANDARD SUBHEADER (54 32-BIT WORDS)	EPD DATA (1729 32-BIT WORDS)

Figure 5-6. EPD Record

EDR WORD	BITS 0 — 7	8 — 15	16 — 23	24 — 31
0	BYTE 1 ANALOG HSKP.	BYTE 2 DIGITAL STATUS	BYTE 3 DIGITAL STATUS	BYTE 4 DIGITAL STATUS
1	BYTE 5 DIGITAL STATUS	BYTE 6 DIGITAL STATUS	BYTE 7 DIGITAL STATUS	BYTE 8 DIGITAL STATUS
2	BYTE 9 DIGITAL STATUS	BYTE 10 CMS/PHA LEMMS	BYTE 11 CMS/PHA LEMMS	BYTE 12 CMS/PHA LEMMS
3	BYTE 13 CMS/PHA LEMMS	BYTE 14 CMS/PHA LEMMS	BYTE 15 CMS/PHA LEMMS	BYTE 16 CMS/PHA LEMMS
4	BYTE 17 CMS/PHA LEMMS	BYTE 18 CMS/PHA LEMMS	BYTE 19 CMS/PHA LEMMS	BYTE 20 CMS/PHA LEMMS
5	BYTE 21 CMS/PHA LEMMS	BYTE 22 LEMMS PHA DATA	BYTE 23 LEMMS PHA DATA	BYTE 24 LEMMS PHA DATA
6	BYTE 25 LEMMS PHA DATA	BYTE 26 LEMMS PHA DATA	BYTE 27 RATE CHANNEL	BYTE 28 RATE CHANNEL
7	BYTE 29 RATE CHANNEL	BYTE 30 RATE CHANNEL	BYTE 31 RATE CHANNEL	BYTE 32 RATE CHANNEL
. . .	. . .	. . .	. . .	. . .
18	BYTE 73 RATE CHANNEL	BYTE 74 RATE CHANNEL	BYTE 75 RATE CHANNEL	BYTE 76 RATE CHANNEL
. . .	. . .	. . .	. . .	. . .
1728	THE ABOVE 76 BYTE (19 32-BIT WORDS) STRUCTURE IS REPEATED 90 MORE TIMES TO COMPLETE 1729 32-BIT WORDS			

Figure 5-7. EPD Data Block Format

5.7 MAGNETOMETER SUBSYSTEM (MAG) EXPERIMENT

The MAG EDR science record is designed to a RIM cycle containing 91 minor frames. Each minor frame corresponds to a MOD 91 count. The Mag record shall be placed onto the MAG science EDR along with AACS records in time order. The logical record structure is diagrammed in Figure 5-8.

Processing Start/Stop

Refer to Subsection 5.2.

Record Buildup

Mag science record buildup shall proceed with the extraction from the appropriate bit locations from minor frames 1 through 91 of each RIM cycle. Subsection 5.2 defines the basic data extraction procedure.

Record Header

The MAG record shall receive a standard record header (refer to Section 4).

Record Subheader

The Mag subheader contains a standard subheader which contains selected engineering measurements in DN extracted from the engineering packet of the LRS data block (channels from the fixed engineering data). Refer to Figure 5-1 on page 5-3.

Data Block

The MAG data block contains data extracted from bits 2880 through bits 3039 of each minor frame from the golay compressed LRS data block of the input SDR record. Specified word locations shall be maintained within the data block. Refer to Figure 5-9 for data block format and GLL-3-280 Appendix A for detailed definition of the data fields.

STANDARD HEADER (17 32-BIT WORDS)	STANDARD SUBHEADER (54 32-BIT WORDS)	MAG DATA (455 32-BIT WORDS)

Figure 5-8. MAG Record

EDR WORD	BITS 0 – 15	16 – 31	0 – 15	16 – 31
0	INSTR. STATUS MF-1	1st SCI. SAMPLE MF-1	1st SCI. SAMPLE MF-1	1st SCI. SAMPLE MF-1
2	2nd SCI. SAMPLE MF-1	2nd SCI. SAMPLE MF-1	2nd SCI. SAMPLE MF-1	3nd SCI. SAMPLE MF-1
4	3rd SCI. SAMPLE MF-1	3rd SCI. SAMPLE MF-1	INSTR. STATUS MF-2	1st SCI. SAMPLE MF-2
6	1st SCI. SAMPLE MF-2	1ST SCI. SAMPLE MF-2	2nd SCI. SAMPLE MF-2	2nd SCI. SAMPLE MF-2
8	2nd SCI. SAMPLE MF-2	3rd SCI. SAMPLE MF-2	3rd SCI. SAMPLE MF-2	3rd SCI. SAMPLE MF-2
	THE ABOVE STRUCTURE REPEATS 44 MORE TIMES			
450	INSTR. STATUS MF-91	1st SCI. SAMPLE MF-91	1st SCI. SAMPLE MF-91	1st SCI. SAMPLE MF-91
452	2nd SCI. SAMPLE MF-91	2nd SCI. SAMPLE MF-91	2nd SCI. SAMPLE MF-91	3rd SCI. SAMPLE MF-91
454	3rd SCI. SAMPLE MF-91	3rd SCI. SAMPLE MF-91		

Figure 5-9. MAG Data Block Format

5.8 PLASMA SUBSYSTEM (PLS) EXPERIMENT

The PLS EDR science record is designed to a RIM cycle containing 91 minor frames. Each minor frame corresponds to a MOD 91 count. The PLS record shall be placed onto the PLS science EDR along with AACS records in time order. The logical record structure is diagrammed in Figure 5-10.

<u>Processing Start/Stop</u>
Refer to Subsection 5.2.

<u>Record Buildup</u>
The PLS record buildup shall proceed with the extraction from the appropriate bit locations from minor frames 1 through 91 of each RIM cycle. Subsection 5.2 defines the basic data extraction procedure.

<u>Record Header</u>
The PLS record shall receive a standard record header (refer to Section 4).

<u>Record Subheader</u>
The PLS subheader contains selected engineering measurements in DN extracted from the engineering packet of the LRS data block (channels from the fixed engineering data). Refer to Figure 5-1 on page 5-3.

<u>Data Block</u>
The PLS data block contains data extracted from bits 1664 through bits 2071 of each minor frame from the golay compressed LRS data block of the input SDR record. Specified word locations shall be maintained within the data block. Refer to Figure 5-11 for data block format and GLL-3-280 Appendix A for detailed definition of the data fields.

STANDARD HEADER	STANDARD SUBHEADER	PLS DATA
(17 32-BIT WORDS)	(54 32-BIT WORDS)	(1162 32-BIT WORDS)

Figure 5-10. PLS Record

-!-----!--------!--------!--------!--------!--------!--------!--------!--------

EDR BITS

```
WORD   0       7 8      15 16     23 24     31 0       7 8      15 16     23 24     31
       |--------|--------|--------|--------|--------|--------|--------|--------
|
  0    | BYTE-1 | BYTE-1 | BYTE-1 | BYTE-1 | BYTE-1 | BYTE-1 | BYTE-1 | BYTE-1
|
       |  MF-1  |  MF-2  |  MF-3  |  MF-4  |  MF-5  |  MF-6  |  MF-7  |  MF-8
|
       |--------|--------|--------|--------|--------|--------|--------|--------
|
  2    | BYTE-1 | BYTE-1 | BYTE-1 | BYTE-1 | BYTE-1 | BYTE-1 | BYTE-1 | BYTE-1
|
       |  MF-9  |  MF-10 |  MF-11 |  MF-12 |  MF-13 |  MF-14 |  MF-15 |  MF-16
|
       |--------|--------|--------|--------|--------|--------|--------|--------
|
  .    |    .   |    .   |    .   |    .   |    .   |    .   |    .   |    .
|
  .    |    .   |    .   |    .   |    .   |    .   |    .   |    .   |    .
|
  .    |    .   |    .   |    .   |    .   |    .   |    .   |    .   |    .
|
       |--------|--------|--------|--------|--------|--------|--------|--------
|
  22   | BYTE-1 | BYTE-1 | BYTE-1<|>BYTE-2 | BYTE-2 | BYTE-2 | BYTE-2 | BYTE-2
|
       |  MF-89 |  MF-90 |  MF-91<|> MF-1  |  MF-2  |  MF-3  |  MF-4  |  MF-5
|
       |--------|--------|--------|--------|--------|--------|--------|--------
|
  24   | BYTE-2 | BYTE-2 | BYTE-2 | BYTE-2 | BYTE-2 | BYTE-2 | BYTE-2 | BYTE-2
|
       |  MF-6  |  MF-7  |  MF-8  |  MF-9  |  MF-10 |  MF-11 |  MF-12 |  MF-13
|
       |--------|--------|--------|--------|--------|--------|--------|--------
|
  .    |    .   |    .   |    .   |    .   |    .   |    .   |    .   |    .
|
  .    |    .   |    .   |    .   |    .   |    .   |    .   |    .   |    .
|
  .    |    .   |    .   |    .   |    .   |    .   |    .   |    .   |    .
|
       |--------|--------|--------|--------|--------|--------|--------|--------
|
  44   | BYTE-2 | BYTE-2 | BYTE-2 | BYTE-2 | BYTE-2 | BYTE-2<|>BYTE-3 | BYTE-4
|
       |  MF-86 |  MF-87 |  MF-88 |  MF-89 |  MF-90 |  MF-91<|> MF-1  |  MF-1
|
       |--------|--------|--------|--------|--------|--------|--------|--------
|
  46   | BYTE-5 | BYTE-6 | BYTE-7 | BYTE-8 | BYTE-9 | BYTE-10| BYTE-11| BYTE-
12|
       |  MF-1  |  MF-1  |  MF-1  |  MF-1  |  MF-1  |  MF-1  |  MF-1  |  MF-1
|
```

```
      |--------|--------|--------|--------|--------|--------|--------|--------|
  .   |   .    |   .    |   .    |   .    |   .    |    .    |    .    |    .  |
  .   |   .    |   .    |   .    |   .    |   .    |    .    |    .    |    .  |
  .   |   .    |   .    |   .    |   .    |   .    |    .    |    .    |    .  |
      |--------|--------|--------|--------|--------|--------|--------|--------|
 56   | BYTE-45| BYTE-46| BYTE-47| BYTE-48| BYTE-49| BYTE-50|BYTE-51<|>BYTE-3 |
      |  MF-1  |  MF-1  |  MF-1  |  MF-1  |  MF-1  |  MF-1  |  MF-1 <|> MF-2  |
      |--------|--------|--------|--------|--------|--------|--------|--------|
 58   | BYTE-4 | BYTE-5 | BYTE-6 | BYTE-7 | BYTE-8 | BYTE-9 | BYTE-10| BYTE-11|
      |  MF-2  |  MF-2  |  MF-2  |  MF-2  |  MF-2  |  MF-2  |  MF-2  |  MF-2  |
      |--------|--------|--------|--------|--------|--------|--------|--------|
  .   |   .    |   .    |   .    |   .    |   .    |    .    |    .    |    .  |
  .   |   .    |   .    |   .    |   .    |   .    |    .    |    .    |    .  |
  .   |   .    |   .    |   .    |   .    |   .    |    .    |    .    |    .  |
      |--------|--------|--------|--------|--------|--------|--------|--------|
```

Figure 5-11. PLS Data Block Format

```
EDR   BITS
WORD   0       7 8      15 16     23 24     31 0       7 8      15 16     23 24     31
      |--------|--------|--------|--------|--------|--------|--------|--------
|
  70   | BYTE-44| BYTE-45| BYTE-46| BYTE-47| BYTE-48| BYTE-49| BYTE-50|BYTE-
51<|
      |  MF-2  |  MF-2  |  MF-2  |  MF-2  |  MF-2  |  MF-2  |  MF-2  |  MF-2
<|
      |--------|--------|--------|--------|--------|--------|--------|--------
|
  72  |>BYTE-3 | BYTE-4 | BYTE-5 | BYTE-6 | BYTE-7 | BYTE-8 | BYTE-9 | BYTE-
10|
      |> MF-3  |  MF-3  |  MF-3  |  MF-3  |  MF-3  |  MF-3  |  MF-3  |  MF-3
|
      |--------|--------|--------|--------|--------|--------|--------|--------
|
  .   |    .   |    .   |    .   |    .   |    .   |    .   |    .   |    .
|
  .   |    .   |    .   |    .   |    .   |    .   |    .   |    .   |    .
|
  .   |    .   |    .   |    .   |    .   |    .   |    .   |    .   |    .
|
      |--------|--------|--------|--------|--------|--------|--------|--------
|
  80   | BYTE-43| BYTE-44| BYTE-45| BYTE-46| BYTE-47| BYTE-48| BYTE-49| BYTE-
50|
      |  MF-3  |  MF-3  |  MF-3  |  MF-3  |  MF-3  |  MF-3  |  MF-3  |  MF-3
|
      |--------|--------|--------|--------|--------|--------|--------|--------
|
  82  |BYTE-51<|>BYTE-3 | BYTE-4 | BYTE-5 | BYTE-6 | BYTE-7 | BYTE-8 | BYTE-9
|
      |  MF-3 <|> MF-4  |  MF-4  |  MF-4  |  MF-4  |  MF-4  |  MF-4  |  MF-4
|
      |--------|--------|--------|--------|--------|--------|--------|--------
|
  .   |    .   |    .   |    .   |    .   |    .   |    .   |    .   |    .
|
  .   |    .   |    .   |    .   |    .   |    .   |    .   |    .   |    .
|
  .   |    .   |    .   |    .   |    .   |    .   |    .   |    .   |    .
|
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|
  .   |    .   |    .   |    .   |    .   |    .   |    .   |    .   |    .
|
  .   |    .   |    .   |    .   |    .   |    .   |    .   |    .   |    .
|
      |--------|--------|--------|--------|--------|--------|--------|--------
|
1146   | BYTE-44| BYTE-45| BYTE-46| BYTE-47| BYTE-48| BYTE-49| BYTE-50|BYTE-
51<|
```

```
      |  MF-90 |  MF-90 |  MF-90 |  MF-90 |  MF-90 |  MF-90 |  MF-90 |  MF-
90<|
      |--------|--------|--------|--------|--------|--------|--------|--------
|
1148  |>BYTE-3 | BYTE-4 | BYTE-5 | BYTE-6 | BYTE-7 | BYTE-8 | BYTE-9 | BYTE-
10|
      |> MF-91 |  MF-91 |  MF-91 |  MF-91 |  MF-91 |  MF-91 |  MF-91 |  MF-91
|
      |--------|--------|--------|--------|--------|--------|--------|--------
|
  .   |    .   |    .   |    .   |    .   |    .   |    .   |    .   |    .
|
  .   |    .   |    .   |    .   |    .   |    .   |    .   |    .   |    .
|
  .   |    .   |    .   |    .   |    .   |    .   |    .   |    .   |    .
|
      |--------|--------|--------|--------|--------|--------|--------|--------
|
1158   | BYTE-43| BYTE-44| BYTE-45| BYTE-46| BYTE-47| BYTE-48| BYTE-49| BYTE-
50|
      |  MF-91 |  MF-91 |  MF-91 |  MF-91 |  MF-91 |  MF-91 |  MF-91 |  MF-91
|
      |--------|--------|--------|--------|--------|--------|--------|--------
|
1160  |BYTE-51<| SPARES | SPARES | SPARES | SPARES | SPARES | SPARES | SPARES
|
      |  MF-91<|        |        |        |        |        |        |
|
      |--------|--------|--------|--------|--------|--------|--------|--------
|
```

Figure 5-11. PLS Data Block Format (Cont'd)

5.9 PHOTOPOLARIMETER RADIOMETER SUBSYSTEM (PPR) EXPERIMENT

The PPR EDR science record is designed to a RIM cycle containing 91 minor frames. Each minor frame corresponds to a MOD 91 count. The PPR record shall be placed onto the PPR science EDR along with AACS records in time order. The logical record structure is diagrammed in Figure 5-12.

Processing Start/Stop

Refer to Subsection 5.2.

Record Buildup

PPR science record buildup shall proceed with the extraction from the appropriate bit locations from minor frames 1 through 91 of each RIM cycle. Subsection 5.2 defines the basic data extraction procedure.

Record Header

The PPR record shall receive a standard record header (refer to Section 4).

Record Subheader

The PPR subheader contains engineering measurements in DN extracted from the engineering packet of the LRS data block (channels from the fixed engineering data). Refer to Figure 5-1 on pages 5-3.

Data Block

The PPR data block contains data extracted from bits 2736 through bits 2879 of each minor frame from the golay compressed LRS data block of the input SDR record. Specified word locations shall be maintained within the data block. Refer to Figure 5-13 for data block format and GLL-3-280 Appendix A for detailed definition of the data fields.

STANDARD HEADER	STANDARD SUBHEADER	PPR DATA
(17 32-BIT WORDS)	(54 32-BIT WORDS)	(410 32-BIT WORDS)

Figure 5-12. PPR Record

EDR WORD	BITS 0 7	8 15	16 23	24 31	0 7	8 15	16 23	24 31
0	INSTR. STATUS MF-1	INSTR. STATUS MF-1	INSTR. STATUS MF-1	INSTR. STATUS MF-1	INSTR. STATUS MF-1	INSTR. STATUS MF-1	STAT & SCI. 1 MF-1	PPR SCI DATA 1A MF-1
2	PPR SCI 1A / 1B MF-1	PPR SCI 1B MF-1	STAT & SCI. 2 MF-1	PPR SCI 2A MF-1	PPR SCI 2A / 2B MF-1	PPR SCI 2B MF-1	STAT & SCI. 3 MF-1	PPR SCI 3A MF-1
4	PPR SCI 3A / 3B MF-1	PPR SCI 3B MF-1	INSTR. STATUS MF-2	INSTR. STATUS MF-2	INSTR. STATUS MF-2	INSTR. STATUS MF-2	INSTR. STATUS MF-2	INSTR. STATUS MF-2
6	STAT & SCI. 1 MF-2	PPR SCI 1A MF-2	PPR SCI 1A / 1B MF-2	PPR SCI 1B MF-2	STAT & SCI. 2 MF-2	PPR SCI 2A MF-2	PPR SCI 2A / 2B MF-2	PPR SCI 2B MF-2
8	STAT & SCI. 3 MF-2	PPR SCI 3A MF-2	PPR SCI 3A / 3B MF-2	PPR SCI 3B MF-2				
	THE ABOVE STRUCTURE CONTINUES FOR MINOR FRAMES 3 THROUGH 90							
404					INSTR. STATUS MF-91	INSTR. STATUS MF-91	INSTR. STATUS MF-91	INSTR. STATUS MF-91
406	INSTR. STATUS MF-91	INSTR. STATUS MF-91	STAT & SCI. 1 MF-91	PPR SCI 1A MF-91	PPR SCI 1A / 1B MF-91	PPR SCI 1B MF-91	STAT & SCI. 2 MF-91	PPR SCI 2A MF-91
408	PPR SCI 2A / 2B MF-91	PPR SCI 2B MF-91	STAT & SCI. 3 MF-91	PPR SCI 3A MF-91	PPR SCI 3A /3B MF-91	PPR SCI 3B MF-91	FILLER	FILLER

Figure 5-13. PPR Data Block Format

5.10 PLASMA WAVE SUBSYSTEM (PWS) LRS EXPERIMENT

The LRS PWS EDR science record is designed to a RIM cycle containing 91 minor frames. Each minor frame corresponds to a MOD 91 count. The LRS PWS record shall be placed onto the PWS science EDR along with AACS records in time order. The logical record structure is diagrammed in Figure 5-14.

Processing Start/Stop

Refer to Subsection 5.2.

Record Buildup

LRS PWS science record buildup shall proceed with the extraction from the appropriate bit locations from minor frames 1 through 91 of each RIM cycle. Subsection 5.2 defines the basic data extraction procedure.

Record Header

The LRS PWS record shall receive a standard record header (refer to Section 4).

Record Subheader

The LRS PWS subheader contains measurements in DN extracted from the engineering packet of the LRS data block (channels from the fixed engineering data). Refer to Figure 5-1 on page 5-3.

Data Block

The LRS PWS data block contains data extracted from bits 3040 through bits 3199 of each minor frame from the golay compressed LRS data block of the input SDR record. Specified word locations shall be maintained within the data block. Refer to Figure 5-15 for data block format and GLL-3-280 Appendix A for detailed definition of the data fields.

STANDARD HEADER	STANDARD SUBHEADER	PWS DATA (FROM LRS FRAME)
(17 32-BIT WORDS)	(54 32-BIT WORDS)	(455 32-BIT WORDS)

Figure 5-14. PWS Record (LRS)

EDR WORD	BITS 0 7	8 15	16 23	24 31
0	DIGITAL STATUS MF-1	ANALOG ENG. MF-1	FILTER CHANNEL MF-1	FILTER CHANNEL MF-1
1	FILTER CHANNEL MF-1	FILTER CHANNEL MF-1	FILTER CHANNEL MF-1	FILTER CHANNEL MF-1
2	FILTER CHANNEL MF-1	DATA QUALITY MF-1	WAVEFORM SURVEY MF-1	WAVEFORM SURVEY MF-1
3	WAVEFORM SURVEY MF-1	WAVEFORM SURVEY MF-1	WAVEFORM SURVEY MF-1	WAVEFORM SURVEY MF-1
4	WAVEFORM SURVEY MF-1	WAVEFORM SURVEY MF-1	WAVEFORM SURVEY MF-1	WAVEFORM SURVEY MF-1
	. . .	. . .	. . .	. . .

THE ABOVE STRUCTURE REPEATS 90 MORE

TIMES FOR A TOTAL OF 455 (32-BIT) WORDS

Figure 5-15. PWS Data Block Format (LRS)

5.11 ULTRAVIOLET SPECTROMETER SUBSYSTEM (UVS) EXPERIMENT

The UVS EDR science record is designed to a RIM cycle containing 91 minor frames. Each minor frame corresponds to a MOD 91 count. The UVS record shall be placed onto the UVS science EDR along with AACS records in time order. The logical structure is diagrammed in Figure 5–16.

Processing Start/Stop

Refer to Subsection 5.2.

Record Buildup

UVS science record buildup shall proceed with the extraction from the appropriate bit locations from minor frames 1 through 91 of each RIM cycle. Subsection 5.2 defines the basic data extraction procedure.

Record Header

The UVS record shall receive a standard record header (refer to Section 4).

Record Subheader

The UVS subheader contains a standard subheader which contains selected engineering measurements extracted from the engineering packet of the LRS data frame (channels from the fixed engineering data). Refer to Figure 5–1 on page 5–3.

Data Block

The UVS data block contains data extracted from bits 800 through bits 1471 of each minor frame from the LRS data block of the SDR record. Specified word locations shall be maintained within the data block. Refer to Figure 5–17 for data block format and GLL–3–280 Appendix A for detailed definition of the data fields.

STANDARD HEADER	STANDARD SUBHEADER	UVS DATA
(17 32–BIT WORDS)	(54 32–BIT WORDS)	(1911 32–BIT WORDS)

Figure 5–16. UVS Record

EDR WORD	BITS 0 - 7	8 - 15	16 - 23	24 - 31
0	SYNC CODE	SYNC CODE	SYNC CODE	SYNC CODE
1	SYNC CODE	SYNC CODE	SYNC CODE	DIGITAL STATUS
2	DIGITAL STATUS	DIGITAL STATUS	ANALOG ENGR.	ANALOG ENGR.
3	ANALOG ENGR.	ANALOG ENGR.	ANALOG ENGR.	ANALOG ENGR.
4	ANALOG ENGR.	ANALOG ENGR.	UVS DATA	UVS DATA
5	UVS DATA	UVS DATA	UVS DATA	UVS DATA
6	UVS DATA	UVS DATA	UVS DATA	UVS DATA
7	UVS DATA	UVS DATA	UVS DATA	UVS DATA
8	UVS DATA	UVS DATA	UVS DATA	UVS DATA
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
135	UVS DATA	UVS DATA	UVS DATA	UVS DATA
136	UVS DATA	UVS DATA		

THE ABOVE STRUCTURE OF 6.5 MINOR FRAMES

(21 WORDS PER FRAME) REPEATS

13 MORE TIMES FOR A TOTAL OF 1911 WORDS

Figure 5–17. UVS Data Block Format

5.12 ORBITER RADIO SCIENCE EDR

5.12.1 Data Overview

EDRGEN/EDRSTRAN program shall output an ORS (Orbiter Radio Science) EDR tape/file for use by the Galileo Radio Science Team. EDRGEN shall accept frame synchronized engineering data, frame synchronized Low Rate Science (LRS) data, Variable Decom Maps and Ground Monitor (MON) data. EDRGEN shall extract the proper engineering data from the frame synchronized engineering frame or the LRS frame and place into the appropriate location of the data block for the engineering record. EDRGEN shall extract the AACS data in a like manner from the LRS frame and place into the appropriate location of the AACS record. In addition, EDRGEN shall pass Variable Decom Maps and Ground Monitor without change except for the replacement of the record header.

Filler and spare bits in the EDR formats shall be binary zeros at all times.

5.12.2 EDR Processing

EDRGEN shall extract the AACS, engineering, decom maps and ground monitor data from the appropriate records. See Section 5.4 for a description of AACS data, Section 5.14 for engineering data, Section 5.15 for decom maps and Section 5.16 for monitor data.

5.13 HEAVY ION COUNTER SUBSYSTEM/EXTREME ULTRAVIOLET SUBSYSTEM (HIC/EUV) EXPERIMENT

The HIC/EUV EDR science record is designed to a RIM cycle containing 91 minor frames. Each minor frame corresponds to a MOD 91 count. The HIC/EUV record shall be placed onto the HIC or EUV science EDR along with AACS records in time order. The logical record structure is diagrammed in Figure 5-18..

Processing Start/Stop

Refer to Subsection 5.2.

Record Buildup

HIC/EUV science records shall proceed with the extraction from the appropriate bit locations from minor frames 1 through 91 of each RIM cycle. Subsection 5.2 defines the basic data extraction procedure.

Record Header

The HIC/EUV record shall receive a standard record header (refer to Section 4).

Record Subheader

The HIC/EUV record contains a unique subheader which contains the two HIC engineering measurements in raw DN values extracted from the engineering packet of the LRS data block (channels from the fixed engineering data) using a fixed decommutation map. Engineering data from standalone engineering records shall not be processed for inclusion in the HIC science subheader. Refer to Figure 5-19 for the block format of the subheader.

Data Block

The HIC/EUV data block contains data extracted from bits 1472 through bits 1567 of each minor frame from the LRS data block of the input SDR record. Specified word locations shall be maintained within the data block. Refer to Figure 5-20 for the block format and GLL-3-280 Appendix A for detailed definition of the data fields.

STANDARD HEADER (17 32-BIT WORDS)	HIC SUBHEADER (4 32-BIT WORDS)	HIC DATA (273 32-BIT WORDS)_

Figure 5-18. HIC/EUV Record Format

CHANNEL	TITLE
E-1720 (N) *	HIC ANALOG MULTIPLEXED HOUSEKEEPING
E-1722	HIC TELESCOPE TEMPERATURE

* "(N)" REPRESENTS AN 4-2/3 SECOND (7 MINOR FRAME) SEGMENT IN WHICH THIS CHANNEL IS SAMPLED WHERE:

N=1 REPRESENTS CHANNEL SAMPLED BETWEEN MOD91 COUNTS OF 0 THRU 6
N=2 REPRESENTS CHANNEL SAMPLED BETWEEN MOD91 COUNTS OF 7 THRU 13
N=3 REPRESENTS CHANNEL SAMPLED BETWEEN MOD91 COUNTS OF 14 THRU 20
N=4 REPRESENTS CHANNEL SAMPLED BETWEEN MOD91 COUNTS OF 21 THRU 27
N=5 REPRESENTS CHANNEL SAMPLED BETWEEN MOD91 COUNTS OF 28 THRU 34
N=6 REPRESENTS CHANNEL SAMPLED BETWEEN MOD91 COUNTS OF 35 THRU 41
N=7 REPRESENTS CHANNEL SAMPLED BETWEEN MOD91 COUNTS OF 42 THRU 48
N=8 REPRESENTS CHANNEL SAMPLED BETWEEN MOD91 COUNTS OF 49 THRU 55
N=9 REPRESENTS CHANNEL SAMPLED BETWEEN MOD91 COUNTS OF 56 THRU 62
N=10 REPRESENTS CHANNEL SAMPLED BETWEEN MOD91 COUNTS OF 63 THRU 69
N=11 REPRESENTS CHANNEL SAMPLED BETWEEN MOD91 COUNTS OF 70 THRU 76
N=12 REPRESENTS CHANNEL SAMPLED BETWEEN MOD91 COUNTS OF 77 THRU 83
N=13 REPRESENTS CHANNEL SAMPLED BETWEEN MOD91 COUNTS OF 84 THRU 90

EDR WORD	BITS 0–7	8–15	16–23	24–31
0	E-1720(1)	E-1720(2)	E-1720(3)	E-1720(4)
1	E-1720(5)	E-1720(6)	E-1720(7)	E-1720(8)
2	E-1720(9)	E-1720(10)	E-1720(11)	E-1720(12)
3	E-1720(13)	SPARE	SPARE	E-1722

Figure 5-19. HIC/EUV Subheader Format

EDR WORD	BITS 0–7	8–15	16–23	24–31
0	BYTE 1 MF-1	BYTE 2 MF-1	BYTE 3 MF-1	BYTE 4 MF-1
1	BYTE 5 MF-1	BYTE 6 MF-1	BYTE 7 MF-1	BYTE 8 MF-1
2	BYTE 9 MF-1	BYTE 10 MF-1	BYTE 11 MF-1	BYTE 12 MF-1
. . .	. . .	. . .	. . .	. . .

THE ABOVE 12 BYTE (3 32-BIT WORDS) STRUCTURE IS REPEATED 90 MORE TIMES TO COMPLETE 273 32-BIT WORDS

Figure 5-20. HIC/EUV Data Block Format

5.14 Engineering Data

EDRGEN shall be capable of accepting either raw frame synchronized engineering data or frame synchronized LRS data. EDRGEN will reformat the input engineering data and generate engineering records. The reformat process will include the extraction of engineering data from the LRS data streams and the frame synchronized engineering data and placed in appropriate locations of the Engineering records.

Extracted and stand-alone engineering records covering a like time period will be placed on the same EDR tape as separate records.

5.14.1 Engineering Extraction from LRS

Data Source

The engineering extractor shall operate on the LRS streams.

Extraction Start/Stop

Extraction start is dependent on the occurrence of two events:

1) Execution of the processing start logic defined in Subsection 5.2.

2) Satisfying the extraction start condition as defined in Subsection 5.2.

Extraction stop will occur with processing stop logic.

Frame Buildup

Engineering frame buildup shall proceed with the extractions from the appropriate bit locations of the required number of consecutive LRS frames. Engineering data shall be extracted from bits 96 through bits 799 of each LRS frame (bits 96 through bits 799 of the LRS data block of the SDR record). (See Subsection 5.14.3 for proper format).

Extracted Filler

If any of the LRS frames, from which engineering data are extracted, contain filler in the engineering bit locations, the extractor shall flag the affected minor frame or minor frame segment in the engineering record as containing filler. All locations of the data block not containing engineering data shall contain binary zeros.

SCLK Count Regression

A regression in the corrected SCLK count based on two consecutively received LRS minor frames (engineering subcommutation indexes) shall cause the engineering extractor to flush. The SCLK in successive ENG frames shall increment as shown in Table 5-1. The Table is organized by Subcommutation Index (SI).

Table 5-1. 1200 BPS Engineering Subcommutation Index Progression

SI	RIM	MOD91	MOD10	MOD8
0	i	0	0	0
1	i	1	0	0
2	i	2	0	0
3	i	3	0	0
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
90	i	90	0	0

5.14.2 Standalone Engineering

<u>Data Source</u>

The standalone engineering data shall be extracted from the raw frame synchronized engineering record from the MTS SDR.

<u>Extracted Start/Stop</u>

Same as for extracted engineering described above.

<u>Frame Buildup</u>

Engineering frame buildup shall proceed with the extractions from bits 96 through 799 of the SDR engineering data block of the required number of minor frames according to Table 5-1 for 1200 bps engineering, according to Table 5-2 for 40 bps snapshot data, according to Table 5-3 for 16 bps data, according to Table 5-4 for 10 bps data and according to Table 5-5 for 8 bps data. (See Subsection 5.14.3 for proper output record format.)

<u>Extracted Filler</u>

Same as for extracted engineering described above.

<u>SCLK Count Regression</u>

Same as for extracted engineering described above.

5.14.3 Engineering Record Format

The engineering record is designed to the RIM cycle. The logical and physical record are the same and correspond to a RIM count (1 cycle through the MOD91 counter). The engineering record will be ERT time ordered along with AACS records, Monitor records and Variable Decommutation Maps. The engineering EDR record format is shown in Figure 5–21.

Table 5–2. 40 bps Engineering SCLK Clock Progression

RIM (MODULO 30)	MOD91	MOD10	MOD8
0	0,30,60,90	0	0
1	29,59,89	0	0
2	28,58,88	0	0
3	27,57,87	0	0
4	26,56,86	0	0
5	25,55,85	0	0
6	24,54,84	0	0
7	23,53,83	0	0
8	22,52,82	0	0
9	21,51,81	0	0
10	20,50,80	0	0
11	19,49,79	0	0
12	18,48,78	0	0
13	17,47,77	0	0
14	16,46,76	0	0
15	15,45,75	0	0
16	14,44,74	0	0
17	13,43,73	0	0
18	12,42,72	0	0
19	11,41,71	0	0
20	10,40,70	0	0
21	9,39,69	0	0
22	8,38.68	0	0
23	7,37,67	0	0
24	6,36,66	0	0
25	5,35,65	0	0
26	4,34,64	0	0
27	3,33,63	0	0
28	2,32,62	0	0
29	1,31,61	0	0

Table 5–3. Spacecraft Clock (SCLK) Progression (16 bps TLM)

Minor Frame Time	Telemetry Rate (kb/s)	Real-Time	Record	RIM (Modulo 75)	MOD91	MOD10	MOD8
50 sec	0.016	Yes	No	n + 0*	0	0	0
				n + 0	75	0	0
				n + 1	59	0	0
				n + 2	43	0	0
				n + 3	27	0	0
				n + 4	11,86	0	0
				n + 5	70	0	0
				n + 6	54	0	0
				n + 7	38	0	0
				n + 8	22	0	0
				n + 9	6,81	0	0
				n + 10	65	0	0
				n + 11	49	0	0
				n + 12	33	0	0
				n + 13	17	0	0
				n + 14	1,76	0	0
				n + 15	60	0	0
				n + 16	44	0	0
				n + 17	28	0	0
				n + 18	12,87	0	0
				n + 19	71	0	0
				n + 20	55	0	0
				n + 21	39	0	0
				n + 22	23	0	0
				n + 23	7,82	0	0
				n + 24	66	0	0
				n + 25	50	0	0
				n + 26	34	0	0
				n + 27	18	0	0
				n + 28	2,77	0	0
				n + 29	61	0	0
				n + 30	45	0	0
				n + 31	29	0	0
				n + 32	13,88	0	0
				n + 33	72	0	0
				n + 34	56	0	0
				n + 35	40	0	0
				n + 36	24	0	0
				n + 37	8,83	0	0
				n + 38	67	0	0
				n + 39	51	0	0
				n + 40	35	0	0
				n + 41	19	0	0
				n + 42	3,78	0	0
				n + 43	62	0	0
				n + 44	46	0	0

* 'n' is defined as the RIM count when the MOD 91 count =0. This is an asynchronous process so that RIM number can not be predetermined.

Table 5-3. Spacecraft Clock (SCLK) Progression (16 bps TLM) (Con't)

Minor Frame Time	Telemetry Rate (kb/s)	Real-Time	Record	RIM (Modulo 75)	MOD91	MOD10	MOD8
50 sec (cont.)	0.016	Yes	No	n + 45	30	0	0
				n + 46	14,89	0	0
				n + 47	73	0	0
				n + 48	57	0	0
				n + 49	41	0	0
				n + 50	25	0	0
				n + 51	9,84	0	0
				n + 52	68	0	0
				n + 53	52	0	0
				n + 54	36	0	0
				n + 55	20	0	0
				n + 56	4,79	0	0
				n + 57	63	0	0
				n + 58	47	0	0
				n + 59	31	0	0
				n + 60	15,90	0	0
				n + 61	74	0	0
				n + 62	58	0	0
				n + 63	42	0	0
				n + 64	26	0	0
				n + 65	10,85	0	0
				n + 66	69	0	0
				n + 67	53	0	0
				n + 68	37	0	0
				n + 69	21	0	0
				n + 70	5,80	0	0
				n + 71	64	0	0
				n + 72	48	0	0
				n + 73	32	0	0
				n + 74	16	0	0

Table 5-4. Spacecraft Clock (SCLK) Progression (10 bps TLM)

Minor Frame Time	Telemetry Rate (kb/s)	Real-Time	Record	RIM (Modulo 120)	MOD91	MOD10	MOD8
80 sec	0.010	Yes	No	n + 0*	0	0	0
				n + 1	29	0	0
				n + 2	58	0	0
				n + 3	87	0	0
				n + 5	25	0	0
				n + 6	54	0	0
				n + 7	83	0	0
				n + 9	21	0	0
				n + 10	50	0	0
				n + 11	79	0	0
				n + 13	17	0	0
				n + 14	46	0	0
				n + 15	75	0	0
				n + 17	13	0	0
				n + 18	42	0	0
				n + 19	71	0	0
				n + 21	9	0	0
				n + 22	38	0	0
				n + 23	67	0	0
				n + 25	5	0	0
				n + 26	34	0	0
				n + 27	63	0	0
				n + 29	1	0	0
				n + 30	30	0	0
				n + 31	59	0	0
				n + 32	88	0	0
				n + 34	26	0	0
				n + 35	55	0	0
				n + 36	84	0	0
				n + 38	22	0	0
				n + 39	51	0	0
				n + 40	80	0	0
				n + 42	18	0	0
				n + 43	47	0	0
				n + 44	76	0	0
				n + 46	14	0	0
				n + 47	43	0	0
				n + 48	72	0	0
				n + 50	10	0	0
				n + 51	39	0	0
				n + 52	68	0	0
				n + 54	6	0	0
				n + 55	35	0	0
				n + 56	64	0	0
				n + 58	2	0	0
				n + 59	31	0	0

* 'n' is defined as the RIM count when the MOD 91 count =0. This is an asynchronous process so that RIM number can not be predetermined.

Table 5-4. Spacecraft Clock (SCLK) Progression (10 bps TLM) (Con't)

Minor Frame Time	Telemetry Rate (kb/s)	Real-Time	Record	RIM (Modulo 120)	MOD91	MOD10	MOD8
80 sec (cont.)	0.010	Yes	No	n + 60	60	0	0
				n + 61	89	0	0
				n + 63	27	0	0
				n + 64	56	0	0
				n + 65	85	0	0
				n + 67	23	0	0
				n + 68	52	0	0
				n + 69	81	0	0
				n + 71	19	0	0
				n + 72	48	0	0
				n + 73	77	0	0
				n + 75	15	0	0
				n + 76	44	0	0
				n + 77	73	0	0
				n + 79	11	0	0
				n + 80	40	0	0
				n + 81	69	0	0
				n + 83	7	0	0
				n + 84	36	0	0
				n + 85	65	0	0
				n + 87	3	0	0
				n + 88	32	0	0
				n + 89	61	0	0
				n + 90	90	0	0
				n + 92	28	0	0
				n + 93	57	0	0
				n + 94	86	0	0
				n + 96	24	0	0
				n + 97	53	0	0
				n + 98	82	0	0
				n + 100	20	0	0
				n + 101	49	0	0
				n + 102	78	0	0
				n + 104	16	0	0
				n + 105	45	0	0
				n + 106	74	0	0
				n + 108	12	0	0
				n + 109	41	0	0
				n + 110	70	0	0
				n + 112	8	0	0
				n + 113	37	0	0
				n + 114	66	0	0
				n + 116	4	0	0
				n + 117	33	0	0
				n + 118	62	0	0

Table 5-5. Spacecraft Clock (SCLK) Progression (8 bps TLM)

Minor Frame Time	Telemetry Rate (kb/s)	Real-Time	Record	RIM (Modulo 150)	MOD91	MOD10	MOD8
100 sec	0.008	Yes	No	n + 0*	0	0	0
				n + 1	59	0	0
				n + 3	27	0	0
				n + 4	86	0	0
				n + 6	54	0	0
				n + 8	22	0	0
				n + 9	81	0	0
				n + 11	49	0	0
				n + 13	17	0	0
				n + 14	76	0	0
				n + 16	44	0	0
				n + 18	12	0	0
				n + 19	71	0	0
				n + 21	39	0	0
				n + 23	7	0	0
				n + 24	66	0	0
				n + 26	34	0	0
				n + 28	2	0	0
				n + 29	61	0	0
				n + 31	29	0	0
				n + 32	88	0	0
				n + 34	56	0	0
				n + 36	24	0	0
				n + 37	83	0	0
				n + 39	51	0	0
				n + 41	19	0	0
				n + 42	78	0	0
				n + 44	46	0	0
				n + 46	14	0	0
				n + 47	73	0	0
				n + 49	41	0	0
				n + 51	9	0	0
				n + 52	68	0	0
				n + 54	36	0	0
				n + 56	4	0	0
				n + 57	63	0	0
				n + 59	31	0	0
				n + 60	90	0	0
				n + 62	58	0	0
				n + 64	26	0	0
				n + 65	85	0	0
				n + 67	53	0	0
				n + 69	21	0	0
				n + 70	80	0	0
				n + 72	48	0	0
				n + 74	16		

* 'n' is defined as the RIM count when the MOD 91 count =0. This is an asynchronous process so that RIM number can not be predetermined.

Table 5–5. Spacecraft Clock (SCLK) Progression (8 bps TLM) (Cont’d)

Minor Frame Time	Telemetry Rate (kb/s)	Real-Time	Record	RIM (Modulo 150)	MOD91	MOD10	MOD8
100 sec (cont)	0.008	Yes	No	n + 75	75	0	0
				n + 77	43	0	0
				n + 79	11	0	0
				n + 80	70	0	0
				n + 82	38	0	0
				n + 84	6	0	0
				n + 85	65	0	0
				n + 87	33	0	0
				n + 89	1	0	0
				n + 90	60	0	0
				n + 92	28	0	0
				n + 93	87	0	0
				n + 95	55	0	0
				n + 97	23	0	0
				n + 98	82	0	0
				n + 100	50	0	0
				n + 102	18	0	0
				n + 103	77	0	0
				n + 105	45	0	0
				n + 107	13	0	0
				n + 108	72	0	0
				n + 110	40	0	0
				n + 112	8	0	0
				n + 113	67	0	0
				n + 115	35	0	0
				n + 117	3	0	0
				n + 118	62	0	0
				n + 120	30	0	0
				n + 121	89	0	0
				n + 123	57	0	0
				n + 125	25	0	0
				n + 126	84	0	0
				n + 128	52	0	0
				n + 130	20	0	0
				n + 131	79	0	0
				n + 133	47	0	0
				n + 135	15	0	0
				n + 136	74	0	0
				n + 138	42	0	0
				n + 140	10	0	0
				n + 141	69	0	0
				n + 143	37	0	0
				n + 145	5	0	0
				n + 146	64	0	0
				n + 148	32	0	0

Data Source

The requirement defined below are applicable to all engineering modes and formats.

Start/Stop Processing

Refer to Subsection 5.2.

Record Buildup

For extracted engineering, see Subsection 5.14.1; for standalone engineering, see subsection 5.14.2; for data block, see subsequent paragraph in this section.

Record Header

The engineering record is to receive a standalone EDR header as defined in Section 4, with the exception that the GOLAY indicator fields will be binary zeros.

Subheader

The Engineering EDR shall not contain a subheader.

Data Block

The engineering data block contains 91 engineering subcommutation index (SI) frames (MOD91 counts 0 - 90) which correspond to LRS minor frames. Subcommutation index locations will be maintained within the data block in sequential order. Buildup will commence with the receipt of any complete SI frame of data and continue until the completion of the record. Mission SIs will be flagged and their data block locations will be zero filled (binary zeros).

Note: SI = MOD91 counter

SCLK regressions will be handled as follows:

One regression will cause the remainder of the engineering record to be flagged as missing, the remainder of the record to be zero filled, and the engineering record to be output. A new engineering record will be started with the current SI with appropriate flags and filler.

Engineering measurements are 7,8 and 16 bits long and will be placed in the data block within 8 bit or 16 bit boundaries within the downlink telemetry data. Word locations will be maintained as specified in Figure 5-22 with detailed bit descriptions as defined in GLL-3-280.

STANDARD HEADER (17 32-BIT WORDS)	ENGINEERING DATA (2002 32-BIT WORDS)

Figure 5-21. Engineering Record Structure

EDR WORD	BITS 0 7	8 15	16 23	24 31	0 7	8 15	16 23	24 31
0	EXECUTING SEQUENCE			DOWNLINK COMMAND				SPARES
2	SPARES			HLM 1A DATA		HLM 1B DATA		LLM 1A
4	LLM 1A DATA (CON'T)					LLM 1B DATA		
6	LLM 1B DATA (CON'T)			LLM 2A DATA		LLM 2B DATA		AACS
8	AACS (CON'T)							
10	AACS (CON'T)			PACKET 1				
12			PACKET 2			PACKET 3		
14	PACKET 3		PACKET 4					PACKETS
16		PACKET 5 (CON'T)			PACKET 6			
18	PACKET 6	PACKET 7					PACKET 8	
20	PACKET 8 (CON'T)			PACKET 9				

.
.
.

THE ABOVE 22 32-BIT WORD STRUCTURE IS
REPEATED FOR MINOR FRAMES 2 THROUGH 91
FOR A TOTAL OF 2002 32-BIT WORDS.

Figure 5-22. Engineering Data Block Format

5.15 Decom Maps

EDRGEN shall accept decom map records in SDR format via the MTS SDR, DRS NORT file or DRS SNORT tape, reformat this data and then place it on the EDR tapes/files. The reformat process shall only include the removal of the SDR record header to replace it with the standard EDR header (see Section 4) and the adding of filler data to complete an integral number of 32-bit words. This requires the adding of 16 bits of filler data (binary zeros) for the variable decom map only.

EDRGEN is required to output decom map records at the start of each EDR tape/file and upon change of any decom map. Decom map changes are based upon "commutation map identifier" number and "map sequence number" changes along with SCLK values in accordance with MTS decom map processing. Decom map data shall be processed and formatted by EDRGEN as follows:

Record Buildup

Decom maps shall be the first records of each EDR corresponding to the last good MTS decom maps less than or equal to the telemetry/engineering processing start in the case of processor startup and the last good MTS decom maps upon tape switch. New decom maps shall be output to the EDR upon decom map change. The decom maps shall precede the engineering data for which it pertains.

Record Header

The decom map records shall receive a standard EDR header (refer to section 4).

Record Subheader

The decom map records shall not contain a subheader.

Data Block

The decom map shall contain the data block of the decom maps as output by the MTS. The format of each data block (minus filler bits) shall be as defined in subsection 2.1.3.5 of the System Data Record (SDR) from MTS to DMS and GSOC (SIS 221-01).

5.16 Monitor Data

EDRGEN shall accept monitor records in SDR format via the MTS SDR, DRS NORT file or DRS SNORT tape, reformat this data per the following subsections and place it on the Radio Science EDR tape/files. The reformat process shall only include the removal of the SDR header for the standard EDR header (Refer to section 4) and the adding of filler to the data block as necessary.

Monitor data records occur at 15 second (MON 5-9) and 5 second (MON 5-11) intervals and shall be output to the appropriate EDR. The logical record structure is diagrammed in Figure 5-23. Monitor data shall be processed by EDRGEN and formatted as follows:

Processing Start/Stop

Refer to Subsection 4.1.

Record Buildup

Monitor record buildup shall consist of the extraction from the appropriate bit locations from the input SDR records on a one by one basis. The monitor records are time (ERT) interleaved with the engineering records, AACS records, NIMS status and variable decom map records and output to the Radio Science EDR. SCET will be appended to the records by subtracting downleg one-way light time (from Light Time File) from the ERT start time tag. The monitor records are to be received in real-time once each 15 seconds for MON 5-9 records and once each 5 seconds for MON 5-11 records by MTS.

Record Header

The Monitor record shall receive a standard EDR record header (refer to section 4). Records shall have Record Type of the record header set to hexadecimal value of "OD" for MON 5-9 records and "11" for MON 5-11 records.

Record Subheader

The Monitor record shall not contain a subheader.

Data Block

The Monitor data blocks contain data extracted from bits 512 through 1711 of the input monitor SDR record. Specified word locations shall be maintained within the data block. Refer to SIS 1001-08 for data block format and for detailed field definitions. The last 16 bits of Monitor data blocks will contain filler bits (binary zeros).

STANDARD EDR HEADER	MONITOR DATA BLOCK
(17 32-BIT WORDS)	(38 32-BIT WORDS)

Figure 5-23. Monitor Record