

JET PROPULSION LABORATORY**INTEROFFICE MEMORANDUM**

TO: Distribution DFM 96-XXX
FROM: Donald Meyer October 11, 1996
SUBJECT: EDL Packet Telemetry Formats
REFERENCE: Salvo, C. "Revision to 11/10 Baseline EDL Telemetry Content",
IOM 313-CGS-95-N.117 Rev.A, November 16, 1995.

Introduction:

This memo defines the packet telemetry formats dedicated to the Mars Pathfinder Entry, Descent, and Landing (EDL) mission phases. "EDL" includes the autonomous deployment of petals and airbags.

The Reference specifies in detail the data items to be captured and their rates (if appropriate). This memo specifies in detail the packets' formats for those data items.

Telemetry Phases:

The EDL packet telemetry is collected during six sequential, non-overlapping, time intervals as follows:

- **Freefall Data Capture**

Commences as a timed event exactly 15 minutes after Cruise Stage separation, at an altitude in excess of 160 kilometers.

- **Entry Data Capture**

Commences as a timed event exactly 29 minutes and 30 seconds after Cruise Stage separation (hence 30 seconds before the defined time of atmospheric entry) coincident with the start of the accelerometer-based algorithm to determine the parachute mortar firing time.

- **Descent Data Capture**

Commences as a timed event exactly 20 seconds after parachute mortar firing, coincident with the firing of the group 2 heatshield separation nuts pyros.

- **Terminal Data Capture**

Commences as a timed event exactly 48 seconds after parachute mortar firing, coincident with the enabling of the radar altimeter transmitter.

- **Landing Data Capture**

Commences as a timed event exactly one half second after bridle cut pyro firing, coincident with powering off the radar altimeter.

- **Deployment Data Capture**

Commences as a timed event exactly 60 seconds after bridle cut pyro firing, coincident with the start-roll-stop-algorithm event, and terminates with the end-of-surface-deployment event.

Telemetry Packet Formats:

EDL data is returned in normal CCSDS packets. The maximum packet data size of 2176 bytes (17408 bits) is chosen in conformance with the guideline to not have packets exceed two downlink transfer frames.

Packets are grouped according to five Application Process Identifiers (APIDs) as follows:

APID 27: The full set of Atmospheric Structure Instrument (Experiment) data from RAM.

APID 31: The first-to-be-transmitted Critical EDL data from EEPROM.

APID 33: Engineering data from EEPROM.

APID 38: A subset of Atmospheric Structure Instrument (Experiment) data from EEPROM.

APID 39: Engineering data from RAM.

For each APID, there are Packet IDs which specify the exact contents. For each APID/Packet ID there may be several packets which are further labeled by a Packet Number. The final Packet Number of a set is marked by adding the value 1000. The Packet ID and Packet Number constitute the data header for all packets. Only packets which contain periodically sampled data have a meaningful Packet Number (not for APID 31, Packet IDs 0 and 1.)

Periodically sampled packet data is organized into records. All records are physically contiguous, following the Packet ID and Packet Number words. Record formats are described at the end of this memo.

All packets which contain periodically sampled data have the time of the first record recorded in the packet's Secondary Header. Within each such packet the records are time-contiguous at the indicated rate. Periodic data received from the LREU with a "bad data" indication will be recorded as having value zero. Recording of these values maintains the time-continuity of the data stream so that only time-tagging the start of the stream is necessary.

The four-byte "EDL time" consists of the two low-order bytes of the seconds portion of spacecraft time followed by the two bytes of the subseconds portion of spacecraft time (14-bit precision for subseconds, left-justified).

The following discussion relates **only** to the **data** portion of an EDL packet.

- **CRITICAL EDL DATA PACKET (APID 31)**

Twenty-one packets are produced for this APID. All recorded items were captured in EEPROM, and then upon uplink command transferred to RAM for formatting into packets. All values are integers which are either scaled converted values, or direct sensor measurements. Packet IDs 0 and 1 contain discrete (non-periodic) data items.

For the packets containing periodically sampled data, the time of the first record is recorded in the packet's Secondary Header. If a processor reset occurs during data-taking, the data resumes after reset in a subsequent packet whose Secondary Header time is that of the first value.

Critical EDL Data Packet Names (APID 31)

<u>Packet ID</u>	<u>Name</u>	<u>Phase</u>	<u>Record</u>	
			<u>Size Bytes</u>	<u>Interval Seconds</u>
0	Discrete / Event Data	All		
1	Surface Deployment Trace	Deployment	24	---
2	Low Rate Surface Deployment Time Series	Deployment	17	600
3	ASI Z Acceleration	Freefall	2	32
4	ASI Accelerometer Support Data (Short)	Freefall	4	32
5	AEA +YZ Acceleration	Freefall	2	32
6	AEA Accelerometer Support Data (Short)	Freefall	4	32
7	AIP (High Rate)	Freefall	4	32
8	AIP (Low Rate)	Freefall	20	32
9	ASI Z Acceleration	Entry	2	1
10	ASI Accelerometer Support Data (Short)	Entry	4	32
11	AEA +YZ Acceleration	Entry 2	1	
12	AEA Accelerometer Support Data (Short)	Entry	4	32
13	AIP (High Rate)	Entry	4	4
14	AIP (Low Rate)	Entry	20	8
15	ASI Z Acceleration	Descent	2	8
16	AEA +YZ Acceleration	Descent	2	8
<u>Packet ID</u>	<u>Name</u>	<u>Phase</u>	<u>Size Bytes</u>	<u>Record Interval Seconds</u>
17	ASI Z Acceleration	Terminal	2	8

18	AEA +YZ Acceleration	Terminal	2	8
19	ASI Z Acceleration	Landing	2	4
20	AEA +YZ Acceleration	Landing	2	4

Critical EDL Data Packet (APID 31, Packet ID 0)

----- Discrete / Event Data

The time appearing in the packet's Secondary Header is the mission time of the completion of the first timed event, i.e. "Set Spacecraft Mode Commander (SCM) to Pre-separation State" (at exactly one hour before Cruise Stage separation). It consists of 4 bytes of whole seconds and one byte of subseconds set to value zero.

Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 0.
2	2	Packet Number. Set to 0.
2	4	Final algorithm-estimated height above surface at RAD firing, in decimeters.
2	6	Final algorithm-estimated velocity at RAD firing, in centimeters/second.
1	8	Number of variable-length intervals during which no per-RTI RAS data was available.
1	9	Number of RAD firing solutions obtained.
2	10	Algorithm-estimated height at start of telecommunications semaphore which indicates that a RAD firing solution was obtained below 600 meters from surface, in decimeters.
2	12	Algorithm-estimated velocity at start of telecommunications semaphore which indicates that a RAD firing solution was obtained below 600 meters from surface, in centimeters/second.
4	14	EDL time of the first surface impact.
4	18	EDL time of the second surface impact.
4	22	EDL time of the third surface impact.
2	26	Acceleration, in x-axis, of the first surface impact, signed value in Earth centigs.
2	28	Acceleration, in y-axis, of the first surface impact, signed value in Earth centigs.

2	30	Acceleration, in z-axis, of the first surface impact, signed value in Earth centigs.
2	32	Acceleration, in x-axis, of the second surface impact, signed value in Earth centigs.
2	34	Acceleration, in y-axis, of the second surface impact, signed value in Earth centigs.
2	36	Acceleration, in z-axis, of the second surface impact, signed value in Earth centigs.
2	38	Acceleration, in x-axis, of the third surface impact, signed value in Earth centigs.
2	40	Acceleration, in y-axis, of the third surface impact, signed value in Earth centigs.
2	42	Acceleration, in z-axis, of the third surface impact, signed value in Earth centigs.
2	44	Second z-axis acceleration value obtained upon successfully detecting heatshield release, in Earth milligs.
4	46	EDL time of second z-axis acceleration value obtained upon successfully detecting heatshield release.
1	50	Battery state of charge at the conclusion of autonomous surface deployment, signed value.
2	51	Acceleration, in x-axis, at the beginning of autonomous surface deployment, signed value in Earth milligs.
2	53	Acceleration, in y-axis, at the beginning of autonomous surface deployment, signed value in Earth milligs.
2	55	Acceleration, in z-axis, at the beginning of autonomous surface deployment, signed value in Earth milligs.
1	57	Maximum RAS temperature.
2	58	Time at which largest RAS temperature occurred, mission time in seconds truncated to produce the two low-order bytes.
1	60	Minimum RAS temperature.
2	61	Time at which lowest RAS temperature occurred, mission time in seconds truncated to produce the two low-order bytes.
1	63	Maximum IEM temperature.
2	64	Time at which largest IEM temperature occurred, mission time in seconds truncated to produce the two low-order bytes.
1	66	Minimum IEM temperature.

2	67	Time at which lowest IEM temperature occurred, mission time in seconds truncated to produce the two low-order bytes.
1	69	Maximum bus voltage.
2	70	Time at which largest bus voltage occurred, mission time in seconds truncated to produce the two low-order bytes.
1	72	Minimum bus voltage.
2	73	Time at which lowest bus voltage occurred, mission time in seconds truncated to produce the two low-order bytes.
1	75	High-order three bits: Count of number of EDL-code initializations once "EDL" has begun. Low-order five bits: Count of number of timed-events discovered as being past-due.
8	76	EDL-time of last two EDL-code initializations once "EDL" has begun, not necessarily in time-order.
2	84	Maximum deceleration, in z-axis, during parachute deployment algorithm, in Earth milligs.
4	86	EDL-time at z-axis maximum deceleration during parachute deployment algorithm.
2	90	Time value loaded into parachute backup hardware timer upon successful parachute deployment algorithm completion.
1	92	Bit-packed word containing petal and airbag encoder status at end of surface deployment. Value 0 indicates broken (or perhaps stalled) and value 1 indicates functioning. Bits 0, 1, 2 are for petal 1, 2, and 3 respectively. Bits 3, 4, 5, and 6 are for airbag 1, 2, 3, and 4 (base) respectively.

----- **Event Times**

In each case the value is the EDL-time at which the event occurred, except for those events in which a backup hardware timer performed the associated pyro firing(s) during a processor outage. In these cases the event occurred at an unknown time in which case the entry will contain the hexadecimal value "deaddead".

"Event time" means the time at which relay pulse began (assumed 50 milliseconds before it ended) for those events which have such information available, marked by "*" below.

Otherwise, "event time" means the time at which the event was completed by EDL flight software, which for events marked "***" means that one or more hardware events were initiated to complete at an unknown time.

Events Timed Relative to Cruise Stage Separation:

4	93	Set Spacecraft Mode Commander (SCM) to "Pre-separation State". **
4	97	Vent HRS Coolant. *
4	101	Set Spacecraft Mode Commander (SCM) to "EDL Control State". **
4	105	Set Shunt Control Relay to 28.8 Volts. *
4	109	Open Cruise Stage Power Bus Deadfaces. *
4	113	Set Shunt Control Relay to 33.3 Volts. *
4	117	Fire Cruise Stage Cable Cutters. *
4	121	Fire Cruise Stage Separation Release Nuts. *
4	125	Open Main Pyro Bus Enable Relays. *
4	129	Setup Telecom for Event Semaphores and Start Telemetry Capture. **
4	133	Do Calibration Semaphore.
4	137	Start Parachute Deployment Algorithm.
4	141	Load Backup Hardware Timers.

Events Timed Relative to Parachute Deployment Mortar Firing:

4	145	Close Main Pyro Bus Enable Relays. *
4	149	Turn Backshell Thermal Batteries On. *
4	153	Turn Lander Thermal Batteries On. *
4	157	Open Main Pyro Bus Enable Relays. *
4	161	Close Chassis Ground Capacitor Relay. *

4	165	Open Main Pyro Bus Backshell Deadface Relays. *
4	169	Fire Parachute Deployment Mortar. *
4	173	Start Heatshield Separation Detection Algorithm. **
4	177	Fire Heatshield Cable Cutter. *
4	181	Fire Heatshield Separation Nuts, Set 1. *
4	185	Fire Heatshield Separation Nuts, Set 2. *
4	189	Switch ASI Accelerometer Sensitivity. **
4	193	Turn Radar Altimeter (RAS) On. **
4	197	Start Bridle Deployment Detection Algorithm.
4	201	Fire Lander-Backshell Cable Cutter. *
4	205	Fire Lander-Backshell Release Nuts, Set 1. *
4	209	Fire Lander-Backshell Release Nuts, Set 2. *
4	213	Turn Radar Altimeter (RAS) Transmitter On. **
4	217	Start RAD Ignition and Bridle-cut Algorithm.
4	221	Switch Waveguide Transfer Switch (WTS) from Low Gain Antenna (LGA) to Descent Antenna (DEA). **

Events Timed Relative to RAD Firing:

4	225	RAD Ignition Algorithm Stop and Switch ASI Accelerometers to Maximum Range. **
4	229	Fire Airbag Retainer Release Strap Cutter. *
4	233	Fire Airbag Gas Generator Igniters. *
4	237	Fire RAD Igniters. *

Events Timed Relative to Bridle Cut:

4	241	Fire Bridle Cable Cutter. *
4	245	Turn Radar Altimeter (RAS) Off. **
4	249	Start Roll Stop Algorithm.

Events Timed Relative to Roll Stop:

4	253	Roll Stopped.
4	257	Start Petal and Airbag Deployment Algorithm.

Petal Latch Opening Events:

4	261	Open Chassis Ground Capacitor Relay. **
4	265	Close Main Pyro Bus Enable Relays. **
4	269	Fire Petal Top Latches. **
4	273	Fire Petal Bottom Latches. **
4	277	Open Main Pyro Bus Enable Relays. **
4	281	Close Chassis Ground Capacitor Relay. **

Critical EDL Data Packet (APID 31, Packet ID 1)

----- Surface Deployment Trace

This packet contains salient values in records at specified trace points in the autonomous petal and airbag deployment process. All records in the packet are physically contiguous, following the Packet Number. Only one packet is produced, allowing for a maximum of the first 90 trace points (less than 10 are expected).

The time appearing in the packet's Secondary Header is the mission time at which the first trace point occurred. It consists of 4 bytes of whole seconds and one byte of subseconds set to value zero.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 1.
2	2	Packet Number. Set to 0.
24	4	Surface Deployment Trace Data Record 1.
24	28	Surface Deployment Trace Data Record 2.
.....	

Critical EDL Data Packet (APID 31, Packet ID 2)

----- Low Rate Surface Deployment Time Series

This packet contains analog measurement values taken every 10 minutes during the autonomous petal and airbag deployment process. One record is recorded for each instance. Within each packet the records are time-contiguous at the 10 minute rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 2.
2	2	Packet Number. Starts with 1.
17	4	Low Rate Surface Deployment Time Series Data Record 1.
17	21	Low Rate Surface Deployment Time Series Data Record 2.
.....	

Critical EDL Data Packet (APID 31, Packet ID 3)

----- ASI z-Accelerometer during Freefall Data Capture

This packet contains ASI z-axis accelerometer measurement values taken every 32 seconds (256 RTIs) during the Freefall Data Capture telemetry phase.

Note that the start of sampling precedes by a 32 seconds (128 RTIs) the AEA +YZ axis acceleration in APID 31, Packet ID 5. This allows for these two data sets to be combined, in effect doubling the z-axis sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 3.
2	2	Packet Number. Starts with 1.
2	4	ASI Z-axis Accelerometer Data Record 1.
2	6	ASI Z-axis Accelerometer Data Record 2.
.....	

Critical EDL Data Packet (APID 31, Packet ID 4)

----- ASI Accelerometer Support Short Data during Freefall Data Capture

This packet contains a subsample of the ASI accelerometer support measurement values taken every 32 seconds (256 RTIs) during the Freefall Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 4.
2	2	Packet Number. Starts with 1.
4	4	ASI Accelerometer Support Short Data Record 1.
4	8	ASI Accelerometer Support Short Data Record 2.
.....	

Critical EDL Data Packet (APID 31, Packet ID 5)

----- AEA +YZ Accelerometer during Freefall Data Capture

This packet contains AEA +YZ axis Accelerometer measurement values taken every 32 seconds (256 RTIs) during the Freefall Data Capture telemetry phase.

Note that the start of sampling is delayed 32 seconds (128 RTIs) with respect to the ASI z-axis acceleration in APID 31, Packet ID 3. This allows for these two data sets to be combined, in effect doubling the z-axis sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 5.
2	2	Packet Number. Starts with 1.
2	4	AEA +YZ-axis Accelerometer Data Record 1.
2	6	AEA +YZ-axis Accelerometer Data Record 2.
.....	

Critical EDL Data Packet (APID 31, Packet ID 6)

----- AEA Accelerometer Support Short Data during Freefall Data Capture

This packet contains a subset of AEA Accelerometer support measurement values taken every 32 seconds (256 RTIs) during the Freefall Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 6
2	2	Packet Number. Starts with 1.
4	4	AEA Accelerometer Support Short Data Record 1.
4	8	AEA Accelerometer Support Short Data Record 2.
.....	

Critical EDL Data Packet (APID 31, Packet ID 7)

----- AIP High-rate Data during Freefall Data Capture

This packet contains a subset of 2 of the 12 Aeroshell Instrumentation Package (AIP) sensors, taken every 32 seconds (256 RTIs) during the Freefall Data Capture telemetry phase. The other AIP measurements are captured at a lower rate (in the Entry Data Capture telemetry phase).

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 7.
2	2	Packet Number. Starts with 1.
4	4	AIP High-rate Data Record 1.
4	8	AIP High-rate Data Record 2.
.....	

Critical EDL Data Packet (APID 31, Packet ID 8)

----- AIP Low-rate Data during Freefall Data Capture

This packet contains a subset of the Aeroshell Instrumentation Package (AIP) sensors, taken every 32 seconds (256 RTIs) during the Freefall Data Capture telemetry phase. The other AIP measurements are captured at a faster rate (in the Entry Data Capture telemetry phase).

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 8.
2	2	Packet Number. Starts with 1.
20	4	AIP Low-rate Data Record 1.
20	24	AIP Low-rate Data Record 2.

.....

Critical EDL Data Packet (APID 31, Packet ID 9)

----- ASI z-Accelerometer during Entry Data Capture

This packet contains ASI z-axis accelerometer measurement values taken every second (8 RTIs) during the Entry Data Capture telemetry phase.

Note that the start of sampling precedes by a half second (4 RTIs) the AEA +YZ axis acceleration in APID 31, Packet ID 11. This allows for these two data sets to be combined, in effect doubling the z-axis sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 9.
2	2	Packet Number. Starts with 1.
2	4	ASI Z-axis Accelerometer Data Record 1.
2	6	ASI Z-axis Accelerometer Data Record 2.

.....

Critical EDL Data Packet (APID 31, Packet ID 10)

----- ASI Accelerometer Support Short Data during Entry Data Capture

This packet contains ASI accelerometer support measurement values taken every 32 seconds (256 RTIs) during the Entry Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 10.
2	2	Packet Number. Starts with 1.
4	4	ASI Accelerometer Support Short Data Record 1.
4	8	ASI Accelerometer Support Short Data Record 2.
.....	

Critical EDL Data Packet (APID 31, Packet ID 11)

----- AEA +YZ Accelerometer during Entry Data Capture

This packet contains AEA +YZ axis Accelerometer measurement values taken every second (8 RTIs) during the Entry Data Capture telemetry phase.

Note that the start of sampling is delayed a half second (4 RTIs) with respect to the ASI z-axis acceleration in APID 31, Packet ID 9. This allows for these two data sets to be combined, in effect doubling the z-axis sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 11.
2	2	Packet Number. Starts with 1.
2	4	AEA +YZ-axis Accelerometer Data Record 1.
2	6	AEA +YZ-axis Accelerometer Data Record 2.
.....	

Critical EDL Data Packet (APID 31, Packet ID 12)

----- AEA Accelerometer Support Short Data during Entry Data Capture

This packet contains AEA Accelerometer support measurement values taken every 32 seconds (256 RTIs) during the Entry Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 12
2	2	Packet Number. Starts with 1.
4	4	AEA Accelerometer Support Short Data Record 1.
4	8	AEA Accelerometer Support Short Data Record 2.
.....	

Critical EDL Data Packet (APID 31, Packet ID 13)

----- AIP High-rate Data during Entry Data Capture

This packet contains a subset of the Aeroshell Instrumentation Package (AIP) sensors, taken every 4 seconds (32 RTIs) during the Entry Data Capture telemetry phase. The other AIP measurements are captured at a lower rate (in the Entry Data Capture telemetry phase).

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 13.
2	2	Packet Number. Starts with 1.
4	4	AIP High-rate Data Record 1.
4	8	AIP High-rate Data Record 2.
.....	

Critical EDL Data Packet (APID 31, Packet ID 14)

----- AIP Low-rate Data during Entry Data Capture

This packet contains a subset of the Aeroshell Instrumentation Package (AIP) sensors, taken every 8 seconds (64 RTIs) during the Entry Data Capture telemetry phase. The other AIP measurements are captured at a faster rate (in the Entry Data Capture telemetry phase).

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 14.
2	2	Packet Number. Starts with 1.
20	4	AIP Low-rate Data Record 1.
20	24	AIP Low-rate Data Record 2.
.....	

Critical EDL Data Packet (APID 31, Packet ID 15)

----- ASI z-Accelerometer during Descent Data Capture

This packet contains ASI z-axis accelerometer measurement values taken every 8 seconds (64 RTIs) during the Descent Data Capture telemetry phase.

Note that the start of sampling precedes by 4 seconds (32 RTIs) the AEA +YZ axis acceleration in APID 31, Packet ID 16. This allows for these two data sets to be combined, in effect doubling the z-axis sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 15.
2	2	Packet Number. Starts with 1.
2	4	ASI Z-axis Accelerometer Data Record 1.
2	6	ASI Z-axis Accelerometer Data Record 2.
.....	

Critical EDL Data Packet (APID 31, Packet ID 16)

----- AEA +YZ Accelerometer during Descent Data Capture

This packet contains AEA +YZ axis Accelerometer measurement values taken every 8 seconds (64 RTIs) during the Descent Data Capture telemetry phase.

Note that the start of sampling is delayed 4 seconds (32 RTIs) with respect to the ASI z-axis acceleration in APID 31, Packet ID 15. This allows for these two data sets to be combined, in effect doubling the z-axis sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 16.
2	2	Packet Number. Starts with 1.
2	4	AEA +YZ-axis Accelerometer Data Record 1.
2	6	AEA +YZ-axis Accelerometer Data Record 2.
.....	

Critical EDL Data Packet (APID 31, Packet ID 17)

----- ASI z-Accelerometer during Terminal Data Capture

This packet contains ASI z-axis accelerometer measurement values taken every 8 seconds (64 RTIs) during the Terminal Data Capture telemetry phase.

Note that the start of sampling precedes by 4 seconds (32 RTIs) the AEA +YZ axis acceleration in APID 31, Packet ID 18. This allows for these two data sets to be combined, in effect doubling the z-axis sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 17.
2	2	Packet Number. Starts with 1.
2	4	ASI Z-axis Accelerometer Data Record 1.
2	6	ASI Z-axis Accelerometer Data Record 2.
.....	

Critical EDL Data Packet (APID 31, Packet ID 18)

----- AEA +YZ Accelerometer during Terminal Data Capture

This packet contains AEA +YZ axis Accelerometer measurement values taken every 8 seconds (64 RTIs) during the Terminal Data Capture telemetry phase.

Note that the start of sampling is delayed 4 seconds (32 RTIs) with respect to the ASI z-axis acceleration in APID 31, Packet ID 17. This allows for these two data sets to be combined, in effect doubling the z-axis sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 18.
2	2	Packet Number. Starts with 1.
2	4	AEA +YZ-axis Accelerometer Data Record 1.
2	6	AEA +YZ-axis Accelerometer Data Record 2.
.....	

Critical EDL Data Packet (APID 31, Packet ID 19)

----- ASI z-Accelerometer during Landing Data Capture

This packet contains ASI z-axis accelerometer measurement values taken every 4 seconds (32 RTIs) during the Landing Data Capture telemetry phase.

Note that the start of sampling precedes by 2 seconds (16 RTIs) the AEA +YZ axis acceleration in APID 31, Packet ID 20. This allows for these two data sets to be combined, in effect doubling the z-axis sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 19.
2	2	Packet Number. Starts with 1.
2	4	ASI Z-axis Accelerometer Data Record 1.
2	6	ASI Z-axis Accelerometer Data Record 2.
.....	

Critical EDL Data Packet (APID 31, Packet ID 20)

----- AEA +YZ Accelerometer during Landing Data Capture

This packet contains AEA +YZ axis Accelerometer measurement values taken every 4 seconds (32 RTIs) during the Landing Data Capture telemetry phase.

Note that the start of sampling is delayed 2 seconds (16 RTIs) with respect to the ASI z-axis acceleration in APID 31, Packet ID 19. This allows for these two data sets to be combined, in effect doubling the z-axis sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 20.
2	2	Packet Number. Starts with 1.
2	4	AEA +YZ-axis Accelerometer Data Record 1.
2	6	AEA +YZ-axis Accelerometer Data Record 2.
.....	

- **ASI EEPROM EDL DATA PACKET (APID 38)**

Eighteen packets are produced for this APID. All recorded items were captured in EEPROM, and then upon uplink command transferred to RAM for formatting into packets. All values are integers which are direct sensor measurements.

All packets contain periodically sampled data, with the time of the first record recorded in the packet's Secondary Header. If a processor reset occurs during data-taking the data disruption is marked in EEPROM. A detected disruption during packet production causes the creation of a new packet whose Secondary Header time is that of the packet's first record.

ASI EEPROM EDL Data Packet Names (APID 38)

<u>Packet ID</u>	<u>Name</u>	<u>Phase</u>	<u>Record</u>	
			<u>Size Bytes</u>	<u>Interval Seconds</u>
0	ASI Three-axis Acceleration	Freefall	6	2
1	ASI Accelerometer Support Data (Long)	Freefall	26	16
2	ASI Science Data (Short)	Freefall	8	8
3	ASI Three-axis Acceleration	Entry	6	1/8
4	ASI Accelerometer Support Data (Long)	Entry	26	16
5	ASI Science Data (Short)	Entry	8	8
6	ASI Three-axis Acceleration	Descent	6	1/2
7	ASI Accelerometer Support Data (Long)	Descent	26	16
8	ASI Science Data (Short)	Descent	8	1
9	ASI Housekeeping Data	Descent	24	8
10	ASI Three-axis Acceleration	Terminal	6	1/2
11	ASI Accelerometer Support Data (Long)	Terminal	26	16
12	ASI Science Data (Short)	Terminal	8	1
13	ASI Housekeeping Data	Terminal	24	8
14	ASI Three-axis Acceleration	Landing	6	1/8
15	ASI Accelerometer Support Data (Long)	Landing	26	16
16	ASI Science Data (Short)	Landing	8	8
17	ASI Housekeeping Data	Landing	24	8

ASI EEPROM EDL Data Packet (APID 38, Packet ID 0)

----- ASI Accelerometer during Freefall Data Capture

This packet contains ASI 3-axis accelerometer measurement values taken every 2 seconds (16 RTIs) during the Freefall Data Capture telemetry phase.

Note that the start of sampling preceeds by a second (8 RTIs) the AEA 3- axis accelerometer measurement values in APID 33, Packet ID 0. This allows for these two data sets to be combined, in effect doubling the sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 0.
2	2	Packet Number. Starts with 1.
6	4	ASI Accelerometer Short Data Record 1.
6	10	ASI Accelerometer Short Data Record 2.
.....	

ASI EEPROM EDL Data Packet (APID 38, Packet ID 1)

----- ASI Accelerometer Support Data during Freefall Data Capture

This packet contains ASI accelerometer support measurement values taken every 16 seconds (128 RTIs) during the Freefall Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 1.
2	2	Packet Number. Starts with 1.
26	4	ASI Accelerometer Support Long Data Record 1.
26	30	ASI Accelerometer Support Long Data Record 2.
.....	

ASI EEPROM EDL Data Packet (APID 38, Packet ID 2)

----- ASI Science Data Subsample during Freefall Data Capture

This packet contains a subset of four of the twelve ASI science measurement values, taken every 8 seconds (64 RTIs) during the Freefall Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 2.
2	2	Packet Number. Starts with 1.
8	4	ASI Science Short Data Record 1.
8	12	ASI Science Short Data Record 2.
.....	

ASI EEPROM EDL Data Packet (APID 38, Packet ID 3)

----- ASI Accelerometer during Entry Data Capture

This packet contains ASI 3-axis accelerometer measurement values taken every eighth of a second (1 RTI) during the Entry Data Capture telemetry phase.

Note that the start of sampling precedes by a sixteenth of a second the AEA 3- axis accelerometer measurement values in APID 33, Packet ID 7. This allows for these two data sets to be combined, in effect doubling the sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 3.
2	2	Packet Number. Starts with 1.
6	4	ASI Accelerometer Short Data Record 1.
6	10	ASI Accelerometer Short Data Record 2.
.....	

ASI EEPROM EDL Data Packet (APID 38, Packet ID 4)

----- ASI Accelerometer Support Data during Entry Data Capture

This packet contains ASI accelerometer support measurement values taken every 16 seconds (128 RTIs) during the Entry Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 4.
2	2	Packet Number. Starts with 1.
26	4	ASI Accelerometer Support Long Data Record 1.
26	30	ASI Accelerometer Support Long Data Record 2.
.....	

ASI EEPROM EDL Data Packet (APID 38, Packet ID 5)

----- ASI Science Data Subsample during Entry Data Capture

This packet contains a subset of four of the twelve ASI science measurement values, taken every 8 seconds (64 RTIs) during the Entry Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 5.
2	2	Packet Number. Starts with 1.
8	4	ASI Science Short Data Record 1.
8	12	ASI Science Short Data Record 2.
.....	

ASI EEPROM EDL Data Packet (APID 38, Packet ID 6)

----- ASI Accelerometer during Descent Data Capture

This packet contains ASI 3-axis accelerometer measurement values taken every half second (4 RTIs) during the Descent Data Capture telemetry phase.

Note that the start of sampling precedes by a quarter second (2 RTIs) the AEA 3- axis accelerometer measurement values in APID 33, Packet ID 16. This allows for these two data sets to be combined, in effect doubling the sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 6.
2	2	Packet Number. Starts with 1.
6	4	ASI Accelerometer Short Data Record 1.
6	10	ASI Accelerometer Short Data Record 2.
.....	

ASI EEPROM EDL Data Packet (APID 38, Packet ID 7)

----- ASI Accelerometer Support Data during Descent Data Capture

This packet contains ASI accelerometer support measurement values taken every 16 seconds (128 RTIs) during the Descent Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 7.
2	2	Packet Number. Starts with 1.
26	4	ASI Accelerometer Support Long Data Record 1.
26	30	ASI Accelerometer Support Long Data Record 2.
.....	

ASI EEPROM EDL Data Packet (APID 38, Packet ID 8)

----- ASI Science Data Subsample during Descent Data Capture

This record contains a subset of two of the twelve ASI science measurement values and two of the twelve ASI housekeeping measurement values, taken every second (8 RTIs) during the Descent Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 8.
2	2	Packet Number. Starts with 1.
8	4	ASI Science Short Data Record 1.
8	12	ASI Science Short Data Record 2.
.....	

ASI EEPROM EDL Data Packet (APID 38, Packet ID 9)

----- ASI Science Housekeeping during Descent Data Capture

This packet contains the twelve ASI housekeeping measurement values, taken every 8 seconds (64 RTIs) during the Descent Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 9.
2	2	Packet Number. Starts with 1.
24	4	ASI Science Housekeeping Data Record 1.
24	28	ASI Science Housekeeping Data Record 2.
.....	

ASI EEPROM EDL Data Packet (APID 38, Packet ID 10)

----- ASI Accelerometer during Terminal Data Capture

This packet contains ASI 3-axis accelerometer measurement values taken every half second (4 RTIs) during the Terminal Data Capture telemetry phase.

Note that the start of sampling precedes by a quarter second (2 RTIs) the AEA 3- axis accelerometer measurement values in APID 33, Packet ID 22. This allows for these two data sets to be combined, in effect doubling the sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 10.
2	2	Packet Number. Starts with 1.
6	4	ASI Accelerometer Short Data Record 1.
6	10	ASI Accelerometer Short Data Record 2.
.....	

ASI EEPROM EDL Data Packet (APID 38, Packet ID 11)

----- ASI Accelerometer Support Data during Terminal Data Capture

This packet contains ASI accelerometer support measurement values taken every 16 seconds (128 RTIs) during the Terminal Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 11.
2	2	Packet Number. Starts with 1.
26	4	ASI Accelerometer Support Long Data Record 1.
26	30	ASI Accelerometer Support Long Data Record 2.
.....	

ASI EEPROM EDL Data Packet (APID 38, Packet ID 12)

----- ASI Science Data Subsample during Terminal Data Capture

This packet contains a subset of four of the twelve ASI science measurement values, taken every second (8 RTIs) during the Terminal Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 12.
2	2	Packet Number. Starts with 1.
8	4	ASI Science Short Data Record 1.
8	12	ASI Science Short Data Record 2.

.....

ASI EEPROM EDL Data Packet (APID 38, Packet ID 13)

----- ASI Science Housekeeping during Terminal Data Capture

This packet contains the twelve ASI housekeeping measurement values, taken every 8 seconds (64 RTIs) during the Terminal Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 13.
2	2	Packet Number. Starts with 1.
24	4	ASI Science Housekeeping Data Record 1.
24	28	ASI Science Housekeeping Data Record 2.

.....

ASI EEPROM EDL Data Packet (APID 38, Packet ID 14)

----- ASI Accelerometer during Landing Data Capture

This packet contains ASI 3-axis accelerometer measurement values taken every eighth of a second (1 RTI) during the Landing Data Capture telemetry phase.

Note that the start of sampling precedes by a sixteenth second the AEA 3- axis accelerometer measurement values in APID 33, Packet ID 29. This allows for these two data sets to be combined, in effect doubling the sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 14.
2	2	Packet Number. Starts with 1.
6	4	ASI Accelerometer Short Data Record 1.
6	10	ASI Accelerometer Short Data Record 2.
.....	

ASI EEPROM EDL Data Packet (APID 38, Packet ID 15)

----- ASI Accelerometer Support Data during Landing Data Capture

This packet contains ASI accelerometer support measurement values taken every 16 seconds (128 RTIs) during the Landing Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 15.
2	2	Packet Number. Starts with 1.
26	4	ASI Accelerometer Support Long Data Record 1.
26	30	ASI Accelerometer Support Long Data Record 2.
.....	

ASI EEPROM EDL Data Packet (APID 38, Packet ID 16)

----- ASI Science Data Subsample during Landing Data Capture

This packet contains a subset of four of the twelve ASI science measurement values, taken every 8 seconds (64 RTIs) during the Landing Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 16.
2	2	Packet Number. Starts with 1.
8	4	ASI Science Short Data Record 1.
8	12	ASI Science Short Data Record 2.

.....

ASI EEPROM EDL Data Packet (APID 38, Packet ID 17)

----- ASI Science Housekeeping during Landing Data Capture

This packet contains the twelve ASI housekeeping measurement values, taken every 8 seconds (64 RTIs) during the Landing Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 17.
2	2	Packet Number. Starts with 1.
24	4	ASI Science Housekeeping Data Record 1.
24	28	ASI Science Housekeeping Data Record 2.

.....

- **ENGINEERING EEPROM EDL DATA PACKET (APID 33)**

Forty-two packets are produced for this APID. All recorded items were captured in EEPROM, and then upon uplink command transferred to RAM for formatting into packets. There are more data record types represented here than for Engineering RAM EDL Packets (ADID 39), but for those record types in common, those here are captured at a slower rate. All values are integers which are either scaled converted values, or direct sensor measurements.

All packets contain periodically sampled data, with the time of the first record recorded in the packet's Secondary Header. If a processor reset occurs during data-taking the data disruption is marked in EEPROM. A detected disruption during packet production causes the creation of a new packet whose Secondary Header time is that of the packet's first record.

ENGINEERING EEPROM EDL Data Packet Names (APID 33)

<u>Packet ID</u>	<u>Name</u>	<u>Phase</u>	<u>Record</u>	
			<u>Size Bytes</u>	<u>Interval Seconds</u>
0	AEA Three-axis Acceleration	Freefall	6	2
1	AEA Accelerometer Support Data (Long)	Freefall	26	16
2	AIP (High Rate)	Freefall	4	8
3	AIP (Low Rate)	Freefall	20	8
4	Electrical Data	Freefall	3	16
5	Temperature Data	Freefall	23	32
6	RAD Firing Backup Timer Value	Freefall	2	32
7	AEA Three-axis Acceleration	Entry	6	1/8
8	AEA Accelerometer Support Data (Long)	Entry	26	16
9	AIP (High Rate)	Entry	4	1/2
10	AIP (Low Rate)	Entry	20	1
11	Electrical Data	Entry	3	16
12	Temperature Data	Entry	23	16
13	Parachute Algorithm Acceleration	Entry	2	1
14	Parachute Mortar Backup Timer Value	Entry 2	2	
15	RAD Firing Backup Timer Value	Entry	2	32
16	AEA Three-axis Acceleration	Descent	6	1/2

<u>Packet ID</u>	<u>Name</u>	<u>Phase</u>	<u>Record</u>	
			<u>Size Bytes</u>	<u>Interval Seconds</u>
17	AEA Accelerometer Support Data (Long)	Descent	26	16
18	Electrical Data	Descent	3	16
19	Temperature Data	Descent	23	16
20	RAD Firing Backup Timer Value	Descent	2	32
21	RAS Hardware Word	Descent	2	32
22	AEA Three-axis Acceleration	Terminal	6	1/2
23	AEA Accelerometer Support Data (Long)	Terminal	26	16
24	Electrical Data	Terminal	3	16
25	Temperature Data	Terminal	23	16
26	RAD Algorithm Data	Terminal	4	1
27	RAD Firing Backup Timer Value	Terminal	2	2
28	RAS Hardware Word	Terminal	2	1
29	AEA Three-axis Acceleration	Landing	6	1/8
30	AEA Accelerometer Support Data (Long)	Landing	26	16
31	Electrical Data	Landing	3	16
32	Temperature Data	Landing	23	16
33	AEA Three-axis Acceleration	Deployment	6	32
34	AEA Accelerometer Support Data (Long)	Deployment	26	32
35	Electrical Data	Deployment	3	32
36	Temperature Data	Deployment	23	32
37	Deployment Algorithm Acceleration	Deployment	6	32
38	Airbag Motor Counts	Deployment	8	32
39	Airbag Motor Temperature	Deployment	4	32
40	Petal Actuator Counts	Deployment	6	32
41	Petal Actuator Temperature	Deployment	3	32

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 0)

----- AEA Accelerometer during Freefall Data Capture

This packet contains AEA 3-axis accelerometer measurement values taken every two seconds (16 RTIs) during the Freefall Data Capture telemetry phase.

Note that the start of sampling lags by one second (8 RTIs) the ASI 3- axis accelerometer measurement values in APID 38, Packet ID 0. This allows for these two data sets to be combined, in effect doubling the sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 0.
2	2	Packet Number. Starts with 1.
6	4	AEA Accelerometer Short Data Record 1.
6	10	AEA Accelerometer Short Data Record 2.
.....	

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 1)

----- AEA Accelerometer Support Data during Freefall Data Capture

This packet contains AEA accelerometer support measurement values taken every 16 seconds (128 RTIs) during the Freefall Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 1.
2	2	Packet Number. Starts with 1.
26	4	AEA Accelerometer Support Long Data Record 1.
26	30	AEA Accelerometer Support Long Data Record 2.
.....	

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 2)

----- AIP High-rate Data during Freefall Data Capture

This packet contains a subset of the Aeroshell Instrumentation Package (AIP) sensors, taken every 8 seconds (64 RTIs) during the Freefall Data Capture telemetry phase. The other AIP measurements are captured at a lower rate (in the Entry Data Capture telemetry phase).

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 2.
2	2	Packet Number. Starts with 1.
4	4	AIP High-rate Data Record 1.
4	8	AIP High-rate Data Record 2.
.....	

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 3)

----- AIP Low-rate Data during Freefall Data Capture

This packet contains a subset of the Aeroshell Instrumentation Package (AIP) sensors, taken every 8 seconds (64 RTIs) during the Freefall Data Capture telemetry phase. The other AIP measurements are captured at a faster rate (in the Entry Data Capture telemetry phase).

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 3.
2	2	Packet Number. Starts with 1.
20	4	AIP Low-rate Data Record 1.
20	24	AIP Low-rate Data Record 2.
.....	

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 4)

----- Electrical Sensors Data during Freefall Data Capture

This packet contains electrical sensor values, taken every 16 seconds (128 RTIs) during the Freefall Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 4.
2	2	Packet Number. Starts with 1.
3	4	Electrical Sensors Data Record 1.
3	7	Electrical Sensors Data Record 2.

.....

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 5)

----- Temperature Sensors Data during Freefall Data Capture

This packet contains electrical sensor values, taken every 32 seconds (256 RTIs) during the Freefall Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 5.
2	2	Packet Number. Starts with 1.
23	4	Temperature Sensors Data Record 1.
23	27	Temperature Sensors Data Record 2.

.....

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 6)

----- RAD Firing Backup Timer Value during Freefall Data Capture

This packet contains the contents of the backup firing register holding the time-to-go to RAD firing recorded every 32 seconds (256 RTIs) during the Freefall Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 6.
2	2	Packet Number. Starts with 1.
2	4	RAD-firing Backup Timer Value Data Record 1.
2	6	RAD-firing Backup Timer Value Data Record 2.
.....	

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 7)

----- AEA Accelerometer during Entry Data Capture

This packet contains AEA 3-axis accelerometer measurement values taken every eighth of a second (1 RTI) during the Entry Data Capture telemetry phase.

Note that the start of sampling lags by a sixteenth of a second the ASI 3- axis accelerometer measurement values in APID 38, Packet ID 3. This allows for these two data sets to be combined, in effect doubling the sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 7.
2	2	Packet Number. Starts with 1.
6	4	AEA Accelerometer Short Data Record 1.
6	10	AEA Accelerometer Short Data Record 2.
.....	

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 8)

----- AEA Accelerometer Support Data during Entry Data Capture

This packet contains AEA accelerometer support measurement values taken every 16 seconds (128 RTIs) during the Entry Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 8.
2	2	Packet Number. Starts with 1.
26	4	AEA Accelerometer Support Long Data Record 1.
26	30	AEA Accelerometer Support Long Data Record 2.
.....	

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 9)

----- AIP High-rate Data during Entry Data Capture

This packet contains a subset of the Aeroshell Instrumentation Package (AIP) sensors, taken every half second (4 RTIs) during the Entry Data Capture telemetry phase. The other AIP measurements are captured at a lower rate (in the Entry Data Capture telemetry phase).

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 9.
2	2	Packet Number. Starts with 1.
4	4	AIP High-rate Data Record 1.
4	8	AIP High-rate Data Record 2.
.....	

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 10)

----- AIP Low-rate Data during Entry Data Capture

This packet contains a subset of the Aeroshell Instrumentation Package (AIP) sensors, taken every second (8 RTIs) during the Entry Data Capture telemetry phase. The other AIP measurements are captured at a faster rate (in the Entry Data Capture telemetry phase).

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 10.
2	2	Packet Number. Starts with 1.
20	4	AIP Low-rate Data Record 1.
20	24	AIP Low-rate Data Record 2.

.....

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 11)

----- Electrical Sensors Data during Entry Data Capture

This packet contains electrical sensor values, taken every 16 seconds (128 RTIs) during the Entry Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 11.
2	2	Packet Number. Starts with 1.
3	4	Electrical Sensors Data Record 1.
3	7	Electrical Sensors Data Record 2.

.....

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 12)

----- Temperature Sensors Data during Entry Data Capture

This packet contains electrical sensor values, taken every 16 seconds (128 RTIs) during the Entry Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 12.
2	2	Packet Number. Starts with 1.
23	4	Temperature Sensors Data Record 1.
23	27	Temperature Sensors Data Record 2.

.....

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 13)

----- Parachute Algorithm Acceleration Value during Entry Data Capture

This packet contains the magnitude of the z-axis acceleration, as supplied to the parachute Mortar-firing algorithm recorded every second (8 RTI) during the Entry Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 13.
2	2	Packet Number. Starts with 1.
2	4	Parachute Algorithm Acceleration Data Record 1.
2	6	Parachute Algorithm Acceleration Data Record 2.

.....

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 14)

----- Parachute Mortar Backup Timer Value during Entry Data Capture

This packet contains the contents of the backup firing register holding the time-to-go to parachute Mortar firing recorded every two seconds (16 RTIs) during the Entry Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 14.
2	2	Packet Number. Starts with 1.
2	4	Parachute Mortar Backup Timer Value Data Record 1.
2	6	Parachute Mortar Backup Timer Value Data Record 2.
.....	

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 15)

----- RAD Firing Backup Timer Value during Entry Data Capture

This packet contains the contents of the backup firing register holding the time-to-go to RAD firing recorded every 32 seconds (256 RTIs) during the Entry Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 15.
2	2	Packet Number. Starts with 1.
2	4	RAD-firing Backup Timer Value Data Record 1.
2	6	RAD-firing Backup Timer Value Data Record 2.
.....	

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 16)

----- AEA Accelerometer during Descent Data Capture

This packet contains AEA 3-axis accelerometer measurement values taken every half second (4 RTIs) during the Descent Data Capture telemetry phase.

Note that the start of sampling lags by a quarter second (2 RTIs) the ASI 3- axis accelerometer measurement values in APID 38, Packet ID 6. This allows for these two data sets to be combined, in effect doubling the sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 16.
2	2	Packet Number. Starts with 1.
6	4	AEA Accelerometer Short Data Record 1.
6	10	AEA Accelerometer Short Data Record 2.
.....	

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 17)

----- AEA Accelerometer Support Data during Descent Data Capture

This packet contains AEA accelerometer support measurement values taken every 16 seconds (128 RTIs) during the Descent Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 17.
2	2	Packet Number. Starts with 1.
26	4	AEA Accelerometer Support Long Data Record 1.
26	30	AEA Accelerometer Support Long Data Record 2.
.....	

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 18)

----- Electrical Sensors Data during Descent Data Capture

This packet contains electrical sensor values, taken every 16 seconds (128 RTIs) during the Descent Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 18.
2	2	Packet Number. Starts with 1.
3	4	Electrical Sensors Data Record 1.
3	7	Electrical Sensors Data Record 2.

.....

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 19)

----- Temperature Sensors Data during Descent Data Capture

This packet contains electrical sensor values, taken every 16 seconds (128 RTIs) during the Descent Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 19.
2	2	Packet Number. Starts with 1.
23	4	Temperature Sensors Data Record 1.
23	27	Temperature Sensors Data Record 2.

.....

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 20)

----- RAD Firing Backup Timer Value during Descent Data Capture

This packet contains the contents of the backup firing register holding the time-to-go to RAD firing recorded every 32 seconds (256 RTIs) during the Descent Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 20.
2	2	Packet Number. Starts with 1.
2	4	RAD-firing Backup Timer Value Data Record 1.
2	6	RAD-firing Backup Timer Value Data Record 2.
.....	

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 21)

----- RAS Hardware Word Value during Descent Data Capture

This packet contains the contents of the RAS hardware output hardware word recorded every 32 seconds (256 RTIs) during the Descent Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 21.
2	2	Packet Number. Starts with 1.
2	4	RAS Hardware Output Word Data Record 1.
2	6	RAS Hardware Output Word Data Record 2.
.....	

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 22)

----- AEA Accelerometer during Terminal Data Capture

This packet contains AEA 3-axis accelerometer measurement values taken every half second (4 RTIs) during the Terminal Data Capture telemetry phase.

Note that the start of sampling lags by a quarter second (2 RTIs) the ASI 3- axis accelerometer measurement values in APID 38, Packet ID 10. This allows for these two data sets to be combined, in effect doubling the sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 22.
2	2	Packet Number. Starts with 1.
6	4	AEA Accelerometer Short Data Record 1.
6	10	AEA Accelerometer Short Data Record 2.
.....	

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 23)

----- AEA Accelerometer Support Data during Terminal Data Capture

This packet contains AEA accelerometer support measurement values taken every 16 seconds (128 RTIs) during the Terminal Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 23.
2	2	Packet Number. Starts with 1.
26	4	AEA Accelerometer Support Long Data Record 1.
26	30	AEA Accelerometer Support Long Data Record 2.
.....	

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 24)

----- Electrical Sensors Data during Terminal Data Capture

This packet contains electrical sensor values, taken every 16 seconds (128 RTIs) during the Terminal Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 24.
2	2	Packet Number. Starts with 1.
3	4	Electrical Sensors Data Record 1.
3	7	Electrical Sensors Data Record 2.

.....

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 25)

----- Temperature Sensors Data during Terminal Data Capture

This packet contains electrical sensor values, taken every 16 seconds (128 RTIs) during the Terminal Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 25.
2	2	Packet Number. Starts with 1.
23	4	Temperature Sensors Data Record 1.
23	27	Temperature Sensors Data Record 2.

.....

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 26)

----- RAD Algorithm Data during Terminal Data Capture

This packet contains height and velocity algorithm estimated values taken every second (8 RTI) during the Terminal Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 26.
2	2	Packet Number. Starts with 1.
4	4	RAD Algorithm Values Data Record 1.
4	8	RAD Algorithm Values Data Record 2.

.....

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 27)

----- RAD Firing Backup Timer Value during Terminal Data Capture

This packet contains the contents of the backup firing register holding the time-to-go to RAD firing recorded every 2 seconds (16 RTIs) during the Terminal Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 27.
2	2	Packet Number. Starts with 1.
2	4	RAD-firing Backup Timer Value Data Record 1.
2	6	RAD-firing Backup Timer Value Data Record 2.

.....

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 28)

----- RAS Hardware Word Value during Terminal Data Capture

This packet contains the contents of the RAS hardware output hardware word recorded every second (8 RTIs) during the Terminal Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 28.
2	2	Packet Number. Starts with 1.
2	4	RAS Hardware Output Word Data Record 1.
2	6	RAS Hardware Output Word Data Record 2.
.....	

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 29)

----- AEA Accelerometer during Landing Data Capture

This packet contains AEA 3-axis accelerometer measurement values taken every eighth of a second (1 RTI) during the Landing Data Capture telemetry phase.

Note that the start of sampling lags by a sixteenth of a second the ASI 3- axis accelerometer measurement values in APID 38, Packet ID 14. This allows for these two data sets to be combined, in effect doubling the sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 29.
2	2	Packet Number. Starts with 1.
6	4	AEA Accelerometer Short Data Record 1.
6	10	AEA Accelerometer Short Data Record 2.
.....	

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 30)

----- AEA Accelerometer Support Data during Landing Data Capture

This packet contains AEA accelerometer support measurement values taken every 16 seconds (128 RTIs) during the Landing Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 30.
2	2	Packet Number. Starts with 1.
26	4	AEA Accelerometer Support Long Data Record 1.
26	30	AEA Accelerometer Support Long Data Record 2.
.....	

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 31)

----- Electrical Sensors Data during Landing Data Capture

This packet contains electrical sensor values, taken every 16 seconds (128 RTIs) during the Landing Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 31.
2	2	Packet Number. Starts with 1.
3	4	Electrical Sensors Data Record 1.
3	7	Electrical Sensors Data Record 2.
.....	

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 32)

----- Temperature Sensors Data during Landing Data Capture

This packet contains electrical sensor values, taken every 16 seconds (128 RTIs) during the Landing Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 32.
2	2	Packet Number. Starts with 1.
23	4	Temperature Sensors Data Record 1.
23	27	Temperature Sensors Data Record 2.
.....	

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 33)

----- AEA Accelerometer during Deployment Data Capture

This packet contains AEA 3-axis accelerometer measurement values taken every 32 seconds (256 RTIs) during the Deployment Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 33.
2	2	Packet Number. Starts with 1.
6	4	AEA Accelerometer Short Data Record 1.
6	10	AEA Accelerometer Short Data Record 2.
.....	

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 34)

----- AEA Accelerometer Support Data during Deployment Data Capture

This packet contains AEA accelerometer support measurement values taken every 32 seconds (256 RTIs) during the Deployment Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 34.
2	2	Packet Number. Starts with 1.
26	4	AEA Accelerometer Support Long Data Record 1.
26	30	AEA Accelerometer Support Long Data Record 2.
.....	

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 35)

----- Electrical Sensors Data during Deployment Data Capture

This packet contains electrical sensor values, taken every 32 seconds (256 RTIs) during the Deployment Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 35.
2	2	Packet Number. Starts with 1.
3	4	Electrical Sensors Data Record 1.
3	7	Electrical Sensors Data Record 2.
.....	

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 36)

----- Temperature Sensors Data during Deployment Data Capture

This packet contains electrical sensor values, taken every 32 seconds (256 RTIs) during the Deployment Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 36.
2	2	Packet Number. Starts with 1.
23	4	Temperature Sensors Data Record 1.
23	27	Temperature Sensors Data Record 2.

.....

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 37)

----- Deployment Algorithm Acceleration Values during Deployment Data Capture

This packet contains the 3-axis acceleration, as supplied to the airbag and petal surface deployment algorithm recorded every 32 seconds (256 RTIs) during the Deployment Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 37.
2	2	Packet Number. Starts with 1.
6	4	Deployment Algorithm Acceleration Data Record 1.
6	10	Deployment Algorithm Acceleration Data Record 2.

.....

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 38)

----- Airbag Actuator Counts Values during Deployment Data Capture

This packet contains the airbag actuator counts as recorded by the flight software taken every 32 seconds (256 RTIs) during the Deployment Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 38.
2	2	Packet Number. Starts with 1.
8	4	Airbag Actuator Counts Data Record 1.
8	12	Airbag Actuator Counts Data Record 2.

.....

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 39)

----- Airbag Actuator Temperature Values during Deployment Data Capture

This packet contains the airbag actuator temperatures taken every 32 seconds (256 RTIs) during the Deployment Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 39.
2	2	Packet Number. Starts with 1.
4	4	Airbag Actuator Temperature Data Record 1.
4	8	Airbag Actuator Temperature Data Record 2.

.....

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 40)

----- Petal Actuator Counts Values during Deployment Data Capture

This packet contains the petal actuator counts as recorded by the flight software taken every 32 seconds (256 RTIs) during the Deployment Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 40.
2	2	Packet Number. Starts with 1.
6	4	Petal Actuator Counts Data Record 1.
6	10	Petal Actuator Counts Data Record 2.

.....

ENGINEERING EEPROM EDL Data Packet (APID 33, Packet ID 41)

----- Petal Actuator Temperature Values during Deployment Data Capture

This packet contains the petal actuator temperatures taken every 32 seconds (256 RTIs) during the Deployment Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 41.
2	2	Packet Number. Starts with 1.
3	4	Petal Actuator Temperature Data Record 1.
3	7	Petal Actuator Temperature Data Record 2.

.....

- **ASI RAM EDL DATA PACKET (APID 27)**

Eighteen packets are produced for this APID. All values are unsigned integers which are direct sensor measurements formatted directly into packets in RAM. As such, these packets are subject to loss in the event of RAM power loss.

All packets contain periodically sampled data, with the time of the first record recorded in the packet's Secondary Header. If a processor reset occurs during data-taking all RAM packets that have been produced are lost, and data taking resumes in a subsequent packet whose Secondary Header time is that of the first record.

ASI RAM EDL Data Packet Names (APID 27)

<u>Packet ID</u>	<u>Name</u>	<u>Phase</u>	<u>Record</u>	
			<u>Size</u> Bytes	<u>Interval</u> Seconds
0	ASI Three-axis Acceleration	Freefall	6	1
1	ASI Accelerometer Support Data (Long)	Freefall	26	8
2	ASI Science Data (Long)	Freefall	24	8
3	ASI Three-axis Acceleration	Entry	24	1/32
4	ASI Accelerometer Support Data (Long)	Entry	26	8
5	ASI Science Data (Long)	Entry	24	8
6	ASI Three-axis Acceleration	Descent	6	1/8
7	ASI Accelerometer Support Data (Long)	Descent	26	8
8	ASI Science Data (Long)	Descent	24	1/2
9	ASI Housekeeping Data	Descent	24	4
10	ASI Three-axis Acceleration	Terminal	6	1/8
11	ASI Accelerometer Support Data (Long)	Terminal	26	8
12	ASI Science Data (Long)	Terminal	24	1/2
13	ASI Housekeeping Data	Terminal	24	4
14	ASI Three-axis Acceleration	Landing	6	1/8
15	ASI Accelerometer Support Data (Long)	Landing	26	8
16	ASI Science Data (Long)	Landing	24	1
17	ASI Housekeeping Data	Landing	24	8

ASI RAM EDL Data Packet (APID 27, Packet ID 0)

----- ASI Accelerometer during Freefall Data Capture

This packet contains ASI 3-axis accelerometer measurement values taken every second (8 RTIs) during the Freefall Data Capture telemetry phase.

Note that the start of sampling precedes by half a second (4 RTIs) the AEA 3-axis accelerometer measurement values in APID 39, Packet ID 0. This allows for these two data sets to be combined, in effect doubling the sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 0.
2	2	Packet Number. Starts with 1.
6	4	ASI Accelerometer Short Data Record 1.
6	10	ASI Accelerometer Short Data Record 2.
.....	

ASI RAM EDL Data Packet (APID 27, Packet ID 1)

----- ASI Accelerometer Support Data during Freefall Data Capture

This packet contains ASI accelerometer support measurement values taken every 8 seconds (64 RTIs) during the Freefall Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 1.
2	2	Packet Number. Starts with 1.
26	4	ASI Accelerometer Support Long Data Record 1.
26	30	ASI Accelerometer Support Long Data Record 2.
.....	

ASI RAM EDL Data Packet (APID 27, Packet ID 2)

----- ASI Science Data during Freefall Data Capture

This packet contains the twelve ASI science measurement values, taken every 8 seconds (64 RTIs) during the Freefall Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 2.
2	2	Packet Number. Starts with 1.
24	4	ASI Science Long Data Record 1.
24	28	ASI Science Long Data Record 2.
.....	

ASI RAM EDL Data Packet (APID 27, Packet ID 3)

----- ASI Accelerometer during Entry Data Capture

This packet contains ASI 3-axis accelerometer measurement values taken at the full rate of every thirty-second of a second during the Entry Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 3.
2	2	Packet Number. Starts with 1.
24	4	ASI Accelerometer Long Data Record 1.
24	28	ASI Accelerometer Long Data Record 2.
.....	

ASI RAM EDL Data Packet (APID 27, Packet ID 4)

----- ASI Accelerometer Support Data during Entry Data Capture

This packet contains ASI accelerometer support measurement values taken every 8 seconds (64 RTIs) during the Entry Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 4.
2	2	Packet Number. Starts with 1.
26	4	ASI Accelerometer Support Long Data Record 1.
26	30	ASI Accelerometer Support Long Data Record 2.
.....	

ASI RAM EDL Data Packet (APID 27, Packet ID 5)

----- ASI Science Data during Entry Data Capture

This packet contains the twelve ASI science measurement values, taken every 8 seconds (64 RTIs) during the Entry Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 5.
2	2	Packet Number. Starts with 1.
24	4	ASI Science Long Data Record 1.
24	28	ASI Science Long Data Record 2.
.....	

ASI RAM EDL Data Packet (APID 27, Packet ID 6)

----- ASI Accelerometer during Descent Data Capture

This packet contains ASI 3-axis accelerometer measurement values taken every eighth of a second (1 RTI) during the Descent Data Capture telemetry phase.

Note that the start of sampling precedes by a sixteenth of a second the AEA 3- axis accelerometer measurement values in APID 39, Packet ID 8. This allows for these two data sets to be combined, in effect doubling the sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 6.
2	2	Packet Number. Starts with 1.
6	4	ASI Accelerometer Short Data Record 1.
6	10	ASI Accelerometer Short Data Record 2.
.....	

ASI RAM EDL Data Packet (APID 27, Packet ID 7)

----- ASI Accelerometer Support Data during Descent Data Capture

This packet contains ASI accelerometer support measurement values taken every 8 seconds (64 RTIs) during the Descent Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 7.
2	2	Packet Number. Starts with 1.
26	4	ASI Accelerometer Support Long Data Record 1.
26	30	ASI Accelerometer Support Long Data Record 2.
.....	

ASI RAM EDL Data Packet (APID 27, Packet ID 8)

----- ASI Science Data during Descent Data Capture

This record contains the twelve ASI science measurement values and two of the twelve ASI housekeeping measurement values, taken every half second (4 RTIs) during the Descent Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 8.
2	2	Packet Number. Starts with 1.
24	4	ASI Science Long Data Record 1.
24	28	ASI Science Long Data Record 2.
.....	

ASI RAM EDL Data Packet (APID 27, Packet ID 9)

----- ASI Science Housekeeping during Descent Data Capture

This packet contains the twelve ASI housekeeping measurement values, taken every 4 seconds (32 RTIs) during the Descent Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 9.
2	2	Packet Number. Starts with 1.
24	4	ASI Science Housekeeping Data Record 1.
24	28	ASI Science Housekeeping Data Record 2.
.....	

ASI RAM EDL Data Packet (APID 27, Packet ID 10)

----- ASI Accelerometer during Terminal Data Capture

This packet contains ASI 3-axis accelerometer measurement values taken every eighth of a second (1 RTI) during the Terminal Data Capture telemetry phase.

Note that the start of sampling precedes by a sixteenth of a second the AEA 3- axis accelerometer measurement values in APID 39, Packet ID 12. This allows for these two data sets to be combined, in effect doubling the sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 10.
2	2	Packet Number. Starts with 1.
6	4	ASI Accelerometer Short Data Record 1.
6	10	ASI Accelerometer Short Data Record 2.
.....	

ASI RAM EDL Data Packet (APID 27, Packet ID 11)

----- ASI Accelerometer Support Data during Terminal Data Capture

This packet contains ASI accelerometer support measurement values taken every 8 seconds (64 RTIs) during the Terminal Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 11.
2	2	Packet Number. Starts with 1.
26	4	ASI Accelerometer Support Long Data Record 1.
26	30	ASI Accelerometer Support Long Data Record 2.
.....	

ASI RAM EDL Data Packet (APID 27, Packet ID 12)

----- ASI Science Data during Terminal Data Capture

This packet contains a subset of four of the twelve ASI science measurement values, taken every half second (4 RTIs) during the Terminal Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 12.
2	2	Packet Number. Starts with 1.
24	4	ASI Science Long Data Record 1.
24	28	ASI Science Long Data Record 2.
.....	

ASI RAM EDL Data Packet (APID 27, Packet ID 13)

----- ASI Science Housekeeping during Terminal Data Capture

This packet contains the twelve ASI housekeeping measurement values, taken every 4 seconds (32 RTIs) during the Terminal Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 13.
2	2	Packet Number. Starts with 1.
24	4	ASI Science Housekeeping Data Record 1.
24	28	ASI Science Housekeeping Data Record 2.
.....	

ASI RAM EDL Data Packet (APID 27, Packet ID 14)

----- ASI Accelerometer during Landing Data Capture

This packet contains ASI 3-axis accelerometer measurement values taken every eighth of a second (1 RTI) during the Landing Data Capture telemetry phase.

Note that the start of sampling precedes by a sixteenth second the AEA 3- axis accelerometer measurement values in APID 39, Packet ID 17. This allows for these two data sets to be combined, in effect doubling the sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 14.
2	2	Packet Number. Starts with 1.
6	4	ASI Accelerometer Short Data Record 1.
6	10	ASI Accelerometer Short Data Record 2.
.....	

ASI RAM EDL Data Packet (APID 27, Packet ID 15)

----- ASI Accelerometer Support Data during Landing Data Capture

This packet contains ASI accelerometer support measurement values taken every 8 seconds (64 RTIs) during the Landing Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 15.
2	2	Packet Number. Starts with 1.
26	4	ASI Accelerometer Support Long Data Record 1.
26	30	ASI Accelerometer Support Long Data Record 2.
.....	

ASI RAM EDL Data Packet (APID 27, Packet ID 16)

----- ASI Science Data during Landing Data Capture

This packet contains a subset of four of the twelve ASI science measurement values, taken every second (8 RTIs) during the Landing Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 16.
2	2	Packet Number. Starts with 1.
24	4	ASI Science Long Data Record 1.
24	28	ASI Science Long Data Record 2.

.....

ASI RAM EDL Data Packet (APID 27, Packet ID 17)

----- ASI Science Housekeeping during Landing Data Capture

This packet contains the twelve ASI housekeeping measurement values, taken every 8 seconds (64 RTIs) during the Landing Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 17.
2	2	Packet Number. Starts with 1.
24	4	ASI Science Housekeeping Data Record 1.
24	28	ASI Science Housekeeping Data Record 2.

.....

- **ENGINEERING RAM EDL DATA PACKET (APID 39)**

Nineteen packets are produced for this APID. All values were formatted directly into packets in RAM, and are integers which are either scaled converted values, or direct sensor measurements.

All packets contain periodically sampled data, with the time of the first record recorded in the packet's Secondary Header. If a processor reset occurs during data-taking all RAM packets that have been produced are lost, and data taking resumes in a subsequent packet whose Secondary Header time is that of the first record.

ENGINEERING RAM EDL Data Packet Names (APID 39)

<u>Packet ID</u>	<u>Name</u>	<u>Phase</u>	<u>Record</u>	
			<u>Size Bytes</u>	<u>Interval Seconds</u>
0	AEA Three-axis Acceleration	Freefall	6	1
1	AEA Accelerometer Support Data (Long)	Freefall	26	8
2	RAD Firing Backup Timer Value	Freefall	2	32
3	AEA Three-axis Acceleration	Entry	24	1/32
4	AEA Accelerometer Support Data (Long)	Entry	26	8
5	Parachute Algorithm Acceleration Value	Entry	2	1/8
6	Parachute Mortar Backup Timer Value	Entry 2	1	
7	RAD Firing Backup Timer Value	Entry	2	32
8	AEA Three-axis Acceleration	Descent	6	1/8
9	AEA Accelerometer Support Data (Long)	Descent	26	8
10	RAD Firing Backup Timer Value	Descent	2	32
11	RAS Hardware Word	Descent	2	32
12	AEA Three-axis Acceleration	Terminal	6	1/8
13	AEA Accelerometer Support Data (Long)	Terminal	26	8
14	RAD Algorithm Data	Terminal	4	1/8
15	RAD Firing Backup Timer Value	Terminal	2	1
16	RAS Hardware Word	Terminal	2	1/8
17	AEA Three-axis Acceleration	Landing	6	1/8
18	AEA Accelerometer Support Data (Long)	Landing	26	8

ENGINEERING RAM EDL Data Packet (APID 39, Packet ID 0)

----- AEA Accelerometer during Freefall Data Capture

This packet contains AEA 3-axis accelerometer measurement values taken every second (8 RTIs) during the Freefall Data Capture telemetry phase.

Note that the start of sampling lags by half a second (4 RTIs) the ASI 3- axis accelerometer measurement values in APID 27, Packet ID 0. This allows for these two data sets to be combined, in effect doubling the sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 0.
2	2	Packet Number. Starts with 1.
6	4	AEA Accelerometer Short Data Record 1.
6	10	AEA Accelerometer Short Data Record 2.
.....	

ENGINEERING RAM EDL Data Packet (APID 39, Packet ID 1)

----- AEA Accelerometer Support Data during Freefall Data Capture

This packet contains AEA accelerometer support measurement values taken every 8 seconds (64 RTIs) during the Freefall Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 1.
2	2	Packet Number. Starts with 1.
26	4	AEA Accelerometer Support Long Data Record 1.
26	30	AEA Accelerometer Support Long Data Record 2.
.....	

ENGINEERING RAM EDL Data Packet (APID 39, Packet ID 2)

----- RAD Firing Backup Timer Value during Freefall Data Capture

This packet contains the contents of the backup firing register holding the time-to-go to RAD firing recorded every 32 seconds (256 RTIs) during the Freefall Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 2.
2	2	Packet Number. Starts with 1.
2	4	RAD-firing Backup Timer Value Data Record 1.
2	6	RAD-firing Backup Timer Value Data Record 2.
.....	

ENGINEERING RAM EDL Data Packet (APID 39, Packet ID 3)

----- AEA Accelerometer during Entry Data Capture

This packet contains AEA 3-axis accelerometer measurement values taken at the full rate of every thirty-second of a second during the Entry Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 3.
2	2	Packet Number. Starts with 1.
24	4	AEA Accelerometer Long Data Record 1.
24	28	AEA Accelerometer Long Data Record 2.
.....	

ENGINEERING RAM EDL Data Packet (APID 39, Packet ID 4)

----- AEA Accelerometer Support Data during Entry Data Capture

This packet contains AEA accelerometer support measurement values taken every 8 seconds (64 RTIs) during the Entry Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 4.
2	2	Packet Number. Starts with 1.
26	4	AEA Accelerometer Support Long Data Record 1.
26	30	AEA Accelerometer Support Long Data Record 2.
.....	

ENGINEERING RAM EDL Data Packet (APID 39, Packet ID 5)

----- Parachute Algorithm Acceleration Value during Entry Data Capture

This packet contains the magnitude of the z-axis acceleration, as supplied to the parachute Mortar-firing algorithm recorded every eighth of a second (1 RTI) during the Entry Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 5.
2	2	Packet Number. Starts with 1.
2	4	Parachute Algorithm Acceleration Data Record 1.
2	6	Parachute Algorithm Acceleration Data Record 2.
.....	

ENGINEERING RAM EDL Data Packet (APID 39, Packet ID 6)

----- Parachute Mortar Backup Timer Value during Entry Data Capture

This packet contains the contents of the backup firing register holding the time-to-go to parachute Mortar firing recorded every second (8 RTIs) during the Entry Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 6.
2	2	Packet Number. Starts with 1.
2	4	Parachute Mortar Backup Timer Value Data Record 1.
2	6	Parachute Mortar Backup Timer Value Data Record 2.
.....	

ENGINEERING RAM EDL Data Packet (APID 39, Packet ID 7)

----- RAD Firing Backup Timer Value during Entry Data Capture

This packet contains the contents of the backup firing register holding the time-to-go to RAD firing recorded every 32 seconds (256 RTIs) during the Entry Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 7.
2	2	Packet Number. Starts with 1.
2	4	RAD-firing Backup Timer Value Data Record 1.
2	6	RAD-firing Backup Timer Value Data Record 2.
.....	

ENGINEERING RAM EDL Data Packet (APID 39, Packet ID 8)

----- AEA Accelerometer during Descent Data Capture

This packet contains AEA 3-axis accelerometer measurement values taken every eighth of a second (1 RTI) during the Descent Data Capture telemetry phase.

Note that the start of sampling lags by a sixteenth of a second the ASI 3- axis accelerometer measurement values in APID 27, Packet ID 6. This allows for these two data sets to be combined, in effect doubling the sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 8.
2	2	Packet Number. Starts with 1.
6	4	AEA Accelerometer Short Data Record 1.
6	10	AEA Accelerometer Short Data Record 2.
.....	

ENGINEERING RAM EDL Data Packet (APID 39, Packet ID 9)

----- AEA Accelerometer Support Data during Descent Data Capture

This packet contains AEA accelerometer support measurement values taken every 8 seconds (64 RTIs) during the Descent Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 9.
2	2	Packet Number. Starts with 1.
26	4	AEA Accelerometer Support Long Data Record 1.
26	30	AEA Accelerometer Support Long Data Record 2.
.....	

ENGINEERING RAM EDL Data Packet (APID 39, Packet ID 10)

----- RAD Firing Backup Timer Value during Descent Data Capture

This packet contains the contents of the backup firing register holding the time-to-go to RAD firing recorded every 32 seconds (256 RTIs) during the Descent Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 10.
2	2	Packet Number. Starts with 1.
2	4	RAD-firing Backup Timer Value Data Record 1.
2	6	RAD-firing Backup Timer Value Data Record 2.
.....	

ENGINEERING RAM EDL Data Packet (APID 39, Packet ID 11)

----- RAS Hardware Word Value during Descent Data Capture

This packet contains the contents of the RAS hardware output hardware word recorded every 32 seconds (256 RTIs) during the Descent Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 11.
2	2	Packet Number. Starts with 1.
2	4	RAS Hardware Output Word Data Record 1.
2	6	RAS Hardware Output Word Data Record 2.
.....	

ENGINEERING RAM EDL Data Packet (APID 39, Packet ID 12)

----- AEA Accelerometer during Terminal Data Capture

This packet contains AEA 3-axis accelerometer measurement values taken every eighth of a second (1 RTI) during the Terminal Data Capture telemetry phase.

Note that the start of sampling lags by a sixteenth of a second the ASI 3- axis accelerometer measurement values in APID 27, Packet ID 10. This allows for these two data sets to be combined, in effect doubling the sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 12.
2	2	Packet Number. Starts with 1.
6	4	AEA Accelerometer Short Data Record 1.
6	10	AEA Accelerometer Short Data Record 2.
.....	

ENGINEERING RAM EDL Data Packet (APID 39, Packet ID 13)

----- AEA Accelerometer Support Data during Terminal Data Capture

This packet contains AEA accelerometer support measurement values taken every 8 seconds (64 RTIs) during the Terminal Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 13.
2	2	Packet Number. Starts with 1.
26	4	AEA Accelerometer Support Long Data Record 1.
26	30	AEA Accelerometer Support Long Data Record 2.
.....	

ENGINEERING RAM EDL Data Packet (APID 39, Packet ID 14)

----- RAD Algorithm Data during Terminal Data Capture

This packet contains height and velocity algorithm estimated values taken every eighth of a second (1 RTI) during the Terminal Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 14.
2	2	Packet Number. Starts with 1.
4	4	RAD Algorithm Values Data Record 1.
4	8	RAD Algorithm Values Data Record 2.

.....

ENGINEERING RAM EDL Data Packet (APID 39, Packet ID 15)

----- RAD Firing Backup Timer Value during Terminal Data Capture

This packet contains the contents of the backup firing register holding the time-to-go to RAD firing recorded every second (8 RTIs) during the Terminal Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 15.
2	2	Packet Number. Starts with 1.
2	4	RAD-firing Backup Timer Value Data Record 1.
2	6	RAD-firing Backup Timer Value Data Record 2.

.....

ENGINEERING RAM EDL Data Packet (APID 39, Packet ID 16)

----- RAS Hardware Word Value during Terminal Data Capture

This packet contains the contents of the RAS hardware output hardware word recorded every eighth of a second (1 RTI) during the Terminal Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 16.
2	2	Packet Number. Starts with 1.
2	4	RAS Hardware Output Word Data Record 1.
2	6	RAS Hardware Output Word Data Record 2.
.....	

ENGINEERING RAM EDL Data Packet (APID 39, Packet ID 17)

----- AEA Accelerometer during Landing Data Capture

This packet contains AEA 3-axis accelerometer measurement values taken every eighth of a second (1 RTI) during the Landing Data Capture telemetry phase.

Note that the start of sampling lags by a sixteenth of a second the ASI 3- axis accelerometer measurement values in APID 27, Packet ID 14. This allows for these two data sets to be combined, in effect doubling the sampling rate.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 17.
2	2	Packet Number. Starts with 1.
6	4	AEA Accelerometer Short Data Record 1.
6	10	AEA Accelerometer Short Data Record 2.
.....	

ENGINEERING RAM EDL Data Packet (APID 39, Packet ID 18)

----- AEA Accelerometer Support Data during Landing Data Capture

This packet contains AEA accelerometer support measurement values taken every 8 seconds (64 RTIs) during the Landing Data Capture telemetry phase.

Packet Format:

Byte Size	Byte Offset	Contents
2	0	Packet ID. Set to 18.
2	2	Packet Number. Starts with 1.
26	4	AEA Accelerometer Support Long Data Record 1.
26	30	AEA Accelerometer Support Long Data Record 2.
.....	

Telemetry Record Names

Byte Size

24	Surface Deployment Trace Data Record
17	Low Rate Surface Deployment Time Series Data Record
6	ASI Accelerometer Short Data Record
24	ASI Accelerometer Long Data Record
2	ASI Z-axis Accelerometer Data Record
26	ASI Accelerometer Support Long Data Record
4	ASI Accelerometer Support Short Data Record
6	AEA Accelerometer Short Data Record
24	AEA Accelerometer Long Data Record
2	AEA +YZ-axis Accelerometer Data Record
26	AEA Accelerometer Support Long Data Record
4	AEA Accelerometer Support Short Data Record
24	ASI Science Long Data Record
8	ASI Science Short Data Record
4	AIP High-rate Data Record
20	AIP Low-rate Data Record
24	ASI Science Housekeeping Data Record
3	Electrical Sensors Data Record
23	Temperature Sensors Data Record
2	Parachute Algorithm Acceleration Data Record
2	Parachute Mortar Backup Timer Value Data Record
4	RAD Algorithm Values Data Record
2	RAD-firing Backup Timer Value Data Record
2	RAS Hardware Output Word Data Record

Telemetry Record Names (cont.)

Byte Size

6	Deployment Algorithm Acceleration Data Record
8	Airbag Actuator Counts Data Record
4	Airbag Actuator Temperature Data Record
6	Petal Actuator Counts Data Record
3	Petal Actuator Temperature Data Record

Telemetry Record Formats:

- **Surface Deployment Trace Data Record**

One trace record is recorded for each trace point encountered in this surface deployment process, as defined by the "Control Flow For Airbag Retraction & Petal Deployment V06" flowchart of March 22, 1996.

Record Format:

Byte Size	Byte Offset	Contents
2	0	Trace point ID, two-digit values.
2	2	Spacecraft time at which the trace point was encountered, the two low-order bytes of seconds portion of spacecraft time.
2	4	Acceleration, x-axis, signed value in Earth milligs.
2	6	Acceleration, y-axis, signed value in Earth milligs.
2	8	Acceleration, z-axis, signed value in Earth milligs.
2	10	Petal 1 (+Y) actuator pulse count as recorded by the flight software, signed value.
2	12	Petal 2 (+X) actuator pulse count as recorded by the flight software, signed value.
2	14	Petal 3 (-X) actuator pulse count as recorded by the flight software, signed value.
2	16	Airbag 1 (+Y) actuator pulse count as recorded by the flight software.
2	18	Airbag 2 (+X) actuator pulse count as recorded by the flight software.
2	20	Airbag 3 (-X) actuator pulse count as recorded by the flight software.
2	22	Airbag 4 (Base) actuator pulse count as recorded by the flight software.

- **Low Rate Surface Deployment Time Series Data Record**

This record contains analog measurement 8-bit values recorded during the autonomous petal and airbag deployment process.

Record Format:

Byte Size	Byte Offset	Contents
1	0	IEM temperature sensor value.
1	1	Shelf number 1 temperature sensor value.
1	2	SSPA temperature sensor value.
1	3	AgZn battery temperature average value number 1.
1	4	AgZn battery temperature average value number 2.
1	5	Auxiliary Oscillator temperature sensor value.
1	6	Side petal number 1 temperature sensor value.
1	7	RAS receiver antenna temperature sensor value.
1	8	Airbag 1 (+Y) motor temperature sensor value.
1	9	Airbag 2 (+X) motor temperature sensor value.
1	10	Airbag 3 (-X) motor temperature sensor value.
1	11	Airbag 4 (Base) motor temperature sensor value.
1	12	Petal 1 (+Y) motor temperature sensor value.
1	13	Petal 2 (+X) motor temperature sensor value.
1	14	Petal 3 (-X) motor temperature sensor value.
1	15	Bus voltage average value.
1	16	Bus current high average value.

- **ASI Accelerometer Short Data Record**

This record contains ASI 3-axis accelerometer measurement values. One 3-value set is written for each record, and is the first of the four 3-value sets delivered each RTI. The values are as-delivered by the LREU. The low-order 14 bits contain the accelerometer value, and the two high-order bits indicate one of three sensitivity ranges for the value:

0 indicates ± 0.016 Earth gs,
 1 indicates ± 0.800 Earth gs,
 2 indicates ± 40.00 Earth gs.

Record Format:

Byte Size	Byte Offset	Contents
2	0	ASI x-axis accelerometer sensor value.
2	2	ASI y-axis accelerometer sensor value.
2	4	ASI z-axis accelerometer sensor value.

6

- **ASI Accelerometer Long Data Record**

This record contains ASI 3-axis accelerometer measurement values. The four 3-value sets delivered each RTI is written for each record. The values are as-delivered by the LREU. The low-order 14 bits contain the accelerometer value, and the two high-order bits indicate one of three sensitivity ranges for the value:

0 indicates ± 0.016 Earth gs,
 1 indicates ± 0.800 Earth gs,
 2 indicates ± 40.00 Earth gs.

Record Format:

Byte Size	Byte Offset	Contents
2	0	ASI x-axis accelerometer sensor value.
2	2	ASI y-axis accelerometer sensor value.
2	4	ASI z-axis accelerometer sensor value.
2	6	ASI x-axis accelerometer sensor value.
2	8	ASI y-axis accelerometer sensor value.
2	10	ASI z-axis accelerometer sensor value.
2	12	ASI x-axis accelerometer sensor value.
2	14	ASI y-axis accelerometer sensor value.
2	16	ASI z-axis accelerometer sensor value.

2	18	ASI x-axis accelerometer sensor value.
2	20	ASI y-axis accelerometer sensor value.
2	22	ASI z-axis accelerometer sensor value.

24

- **ASI Z-axis Accelerometer Data Record**

This record contains ASI z-axis accelerometer measurement values. One value is written for each instance, and is the first of the four ASI z-axis accelerometer measurement values delivered each RTI. The value is as-delivered by the LREU. The low-order 14 bits contain the accelerometer value, and the two high-order bits indicate one of three sensitivity ranges for the value:

- 0 indicates ± 0.016 Earth gs,
- 1 indicates ± 0.800 Earth gs,
- 2 indicates ± 40.00 Earth gs.

Record Format:

Byte Size	Byte Offset	Contents
2	0	ASI z-axis accelerometer sensor value.

2

- **ASI Accelerometer Support Long Data Record**

This record contains the ASI accelerometer support measurement values. Thirteen values are written for each instance. The 14-bit values are as-delivered by the LREU, with the two high-order bits not used.

Record Format:

Byte Size	Byte Offset	Contents
2	0	ASI accelerometer +2.5 voltage reference sensor value.
2	2	ASI accelerometer -2.5 voltage reference sensor value.
2	4	ASI accelerometer x-axis head temperature sensor value.
2	6	ASI accelerometer y-axis head temperature sensor value.
2	8	ASI accelerometer z-axis head temperature sensor value.
2	10	ASI accelerometer reference (ground) voltage sensor value.
2	12	ASI accelerometer hygrometer sensor value.

2	14	ASI accelerometer sensor value.	2.5	voltage	reference	temperature
2	16	ASI accelerometer sensor value.	x-axis	first	amplifier	temperature
2	18	ASI accelerometer sensor value.	y-axis	first	amplifier	temperature
2	20	ASI accelerometer sensor value.	z-axis	first	amplifier	temperature
2	22	ASI accelerometer sensor value.	analog-to-digital	converter		temperature
2	24	ASI accelerometer multiplexer temperature sensor value.				

26

- **ASI Accelerometer Support Short Data Record**

This record contains a subset of the ASI accelerometer support measurement values. Two values are written for each instance. The 14-bit values are as-delivered by the LREU, with the two high-order bits not used.

Record Format:

Byte Size	Byte Offset	Contents
2	0	ASI z-axis accelerometer head temperature sensor value.
2	2	ASI accelerometer reference (ground) voltage sensor value.

4

- **AEA Accelerometer Short Data Record**

This record contains AEA 3-axis accelerometer measurement values. One 3-value set is written for each record, and is the first of the four 3-value sets delivered each RTI. The values are as-delivered by the LREU. The low-order 14 bits contain the accelerometer value, and the two high-order bits indicate one of three sensitivity ranges for the value:

- 0 indicates ± 0.016 Earth gs,
- 1 indicates ± 0.800 Earth gs,
- 2 indicates ± 40.00 Earth gs.

Record Format:

Byte Size	Byte Offset	Contents
2	0	AEA x-axis accelerometer sensor value.
2	2	AEA +yz-axis accelerometer sensor value.
2	4	AEA -yz-axis accelerometer sensor value.

6

- **AEA Accelerometer Long Data Record**

This record contains AEA 3-axis accelerometer measurement values. The four 3-value sets delivered each RTI is written for each record. The values are as-delivered by the LREU. The low-order 14 bits contain the accelerometer value, and the two high-order bits indicate one of three sensitivity ranges for the value:

- 0 indicates ± 0.016 Earth gs,
- 1 indicates ± 0.800 Earth gs,
- 2 indicates ± 40.00 Earth gs.

Record Format:

Byte Size	Byte Offset	Contents
2	0	AEA x-axis accelerometer sensor value.
2	2	AEA +yz-axis accelerometer sensor value.
2	4	AEA -yz-axis accelerometer sensor value.
2	6	AEA x-axis accelerometer sensor value.
2	8	AEA +yz-axis accelerometer sensor value.
2	10	AEA -yz-axis accelerometer sensor value.
2	12	AEA x-axis accelerometer sensor value.
2	14	AEA +yz-axis accelerometer sensor value.
2	16	AEA -yz-axis accelerometer sensor value.
2	18	AEA x-axis accelerometer sensor value.
2	20	AEA +yz-axis accelerometer sensor value.
2	22	AEA -yz-axis accelerometer sensor value.

- **AEA +YZ-axis Accelerometer Data Record**

This record contains AEA +yz-axis accelerometer measurement values. One value is written for each instance, and is the first of the four AEA +yz-axis accelerometer measurement values delivered each RTI. The value is as-delivered by the LREU. The low-order 14 bits contain the accelerometer value, and the two high-order bits indicate one of three sensitivity ranges for the value:

- 0 indicates ± 0.016 Earth gs,
- 1 indicates ± 0.800 Earth gs,
- 2 indicates ± 40.00 Earth gs.

Record Format:

Byte Size	Byte Offset	Contents
2	0	AEA +yz-axis accelerometer sensor value.

- **AEA Accelerometer Support Long Data Record**

This record contains the AEA accelerometer support measurement values. Thirteen values are written for each instance. The 14-bit values are as-delivered by the LREU, with the two high-order bits not used.

Record Format:

Byte Size	Byte Offset	Contents
2	0	AEA accelerometer +2.5 voltage reference sensor value.
2	2	AEA accelerometer -2.5 voltage reference sensor value.
2	4	AEA accelerometer x-axis head temperature sensor value.
2	6	AEA accelerometer +yz-axis head temperature sensor value.
2	8	AEA accelerometer -yz-axis head temperature sensor value.
2	10	AEA accelerometer reference (ground) voltage sensor value.
2	12	AEA accelerometer hygrometer sensor value.
2	14	AEA accelerometer 2.5 voltage reference temperature sensor value.
2	16	AEA accelerometer x-axis first amplifier temperature sensor value.
2	18	AEA accelerometer +yz-axis first amplifier temperature sensor value.

2	20	AEA accelerometer -yz-axis first amplifier temperature sensor value.
2	22	AEA accelerometer analog-to-digital converter temperature sensor value.
2	24	AEA accelerometer multiplexer temperature sensor value.

26

- **AEA Accelerometer Support Short Data Record**

This record contains a subset of the AEA accelerometer support measurement values. Two values are written for each instance. The 14-bit values are as-delivered by the LREU, with the two high-order bits not used.

Record Format:

Byte Size	Byte Offset	Contents
2	0	AEA +yz-axis accelerometer head temperature sensor value.
2	2	AEA accelerometer reference (ground) voltage sensor value.

4

- **ASI Science Long Data Record**

This record contains two different sets of twelve ASI science measurement values, differing according to telemetry phase. Three of the entries have one set of meanings for the Freefall and Entry phases, and another for the Descent, Terminal, and Landing phases. During Freefall and Entry, "ASI science" consists of the 12 values in the non-AIP multiplexer half. During subsequent phases the "ASI science" set consists of selected items from the 24 ASI (non-AIP) measurements.

The 14-bit values are as-delivered by the LREU. The two high-order bits are not used.

(F, E) Indicates measurement value for Freefall and Entry phases.

(D, T, L) Indicates measurement value for Descent, Terminal, and Landing phases.

Record Format:

Byte Size	Byte Offset	Contents
2	0	(F, E) ASI wind sensor current sensor value. (D, T, L) ASI top mast thermocouple sensor value.
2	2	ASI mid mast thermocouple sensor value.
2	4	(F, E) ASI mast base isothermal block PRT 4 sensor value. (D, T, L) ASI bottom mast thermocouple sensor value.
2	6	ASI descent thermocouple sensor value.
2	8	(F, E) ASI pressure transducer PRT 5 sensor value. (D, T, L) ASI 6-10 millibar range pressure sensor value.
2	10	ASI 0-12 millibar range pressure sensor value.
2	12	ASI wind sensor 1 value.
2	14	ASI wind sensor 2 value.
2	16	ASI wind sensor 3 value.
2	18	ASI wind sensor 4 value.
2	20	ASI wind sensor 5 value.
2	22	ASI wind sensor 6 value.

24

- **ASI Science Short Data Record**

This record contains a subset consisting of two of the twelve ASI science measurement values and two of the twelve ASI housekeeping measurement values. The 14-bit values are as-delivered by the LREU. The two high-order bits are not used.

Record Format:

Byte Size	Byte Offset	Contents
2	0	ASI mast base isothermal block PRT4 sensor value.
2	2	ASI pressure transducer PRT5 sensor value.
2	4	ASI 0-12 millibar range pressure sensor value.
2	6	ASI descent thermocouple sensor value.
<hr/>		
8		

- **AIP High-rate Data Record**

This packet contains a subset consisting of 2 of the 12 Aeroshell Instrumentation Package (AIP) values. The 14-bit values are as-delivered by the LREU, with the two high order bits unused.

Record Format:

Byte Size	Byte Offset	Contents
2	0	AIP aeroshell temperature sensor 1 value.
2	2	AIP aeroshell temperature sensor 5 value.
<hr/>		
4		

- **AIP Low-rate Data Record**

This packet contains a subset consisting of 10 of the 12 Aeroshell Instrumentation Package (AIP) values. The 14-bit values are as-delivered by the LREU, with the two high order bits unused.

Record Format:

Byte Size	Byte Offset	Contents
2	0	AIP aeroshell temperature sensor 2 value.
2	2	AIP aeroshell temperature sensor 3 value.
2	4	AIP aeroshell temperature sensor 4 value.
2	6	AIP aeroshell temperature sensor 6 value.
2	8	AIP top plug temperature sensor 1 value.
2	10	AIP top plug temperature sensor 2 value.
2	12	AIP top plug temperature sensor 3 value.
2	14	AIP backshell PRT1 sensor value.
2	16	AIP aeroshell isothermal block PRT2 sensor value.
2	18	AIP top plug isothermal block PRT3 sensor value.

20

- **ASI Science Housekeeping Data Record**

This packet contains the twelve ASI housekeeping measurement values. The 14-bit values are as-delivered by the LREU. The two high-order bits are not used.

Record Format:

Byte Size	Byte Offset	Contents
2	0	ASI +5 voltage motherboard reference sensor value.
2	2	ASI +12 voltage reference sensor value.
2	4	ASI +5 voltage to analog-to-digital converter sensor value.
2	6	ASI -5 voltage to analog-to-digital converter sensor value.
2	8	ASI PRT 4 sense voltage sensor value.
2	10	ASI mast base isothermal block PRT 4 sensor value.
2	12	ASI PRT 4 drive current sensor value.

2	14	ASI PRT 5 drive current sensor value.
2	16	ASI wind sensor thermocouple sensor value.
2	18	ASI wind sensor current sensor value.
2	20	ASI pressure transducer PRT 5 sensor value.
2	22	ASI circuit board temperature sensor value.
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24		

- **Electrical Sensors Data Record**

This packet contains three electrical measurement values. The 8-bit values are as-delivered by the LREU.

Record Format:

Byte Size	Byte Offset	Contents
1	0	Power bus high current sensor value.
1	1	Silver-zinc battery voltage sensor value.
1	2	Bus voltage sensor value.
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3		

- **Temperature Sensors Data Record**

This packet contains 23 temperature measurement values. The 8-bit values are as-delivered by the LREU.

Record Format:

Byte Size	Byte Offset	Contents
1	0	IEM (electronics module) temperature sensor value.
1	1	MFC (flight computer) temperature sensor value.
1	2	DST (transponder) temperature sensor value.
1	3	VCXO temperature sensor value.
1	4	Auxillary oscillator temperature sensor value.
1	5	SSPA temperature sensor value.
1	6	Silver-zinc temperature sensor 1 value.
1	7	Silver-zinc temperature sensor 2 value.
1	8	Shelf temperature sensor 1 value.
1	9	Shelf temperature sensor 2 value.
1	10	Base petal temperature sensor value.
1	11	Side petal 1 temperature sensor value.
1	12	Thermal battery mounting plate temperature sensor value.
1	13	RAD 1 temperature sensor value.
1	14	RAD 2 temperature sensor value.
1	15	RAD 3 temperature sensor value.
1	16	Gas generator 1 temperature sensor value.
1	17	Gas generator 2 temperature sensor value.
1	18	Gas generator 3 temperature sensor value.
1	19	Gas generator 4 temperature sensor value.

1	20	RAS temperature sensor value.
1	21	RAS transmit antenna temperature sensor value.
1	22	RAS receiver antenna temperature sensor value.

23

- **Parachute Algorithm Acceleration Data Record**

This packet contains the computed magnitude of the z-axis acceleration, as supplied to the parachute Mortar-firing algorithm.

Record Format:

Byte Size	Byte Offset	Contents
2	0	Parachute algorithm acceleration value, Earth milligs.

2

- **Parachute Mortar Backup Timer Value Data Record**

This record contains the contents of the backup firing register holding the time-to-go to parachute mortar firing. The low-order 15 bits are the count value, each representing 10 milliseconds. The high-order bit is load status, containing 1 when the timer is programmed, and 0 otherwise.

Record Format:

Byte Size	Byte Offset	Contents
2	0	Parachute mortar backup timer value.

2

- **RAD Algorithm Values Data Record**

This record contains the computed current RAD-firing algorithm estimated distance-to-ground and velocity.

Record Format:

Byte Size	Byte Offset	Contents
2	0	RAD-firing algorithm estimated distance-to-ground value, in decimeters.
2	2	RAD-firing algorithm estimated velocity value, in centimeters/second.
<hr/>		
4		

- **RAD-firing Backup Timer Value Data Record**

This record contains the contents of the backup firing register holding the time-to-go to RAD firing. The low-order 15 bits are the count value, each representing 10 milliseconds. The high-order bit is load status, containing 1 when the timer is programmed, and 0 otherwise.

Record Format:

Byte Size	Byte Offset	Contents
2	0	RAD-firing backup timer value.
<hr/>		
2		

- **RAS Hardware Output Word Data Record**

This record contains the first unmodified or interpreted contents of the RAS Altitude Data register delivered each RTI. The format is:

- Bit 15 (most significant): Initialization bit; 0 = data valid, 1 = initialization.
- Bit 14 : Not used.
- Bit 13 : Reliability bit; 0 = no track, 1 = track.
- Bit 12-0 : Altitude value, in feet.

Record Format:

Byte Size	Byte Offset	Contents
2	0	RAS hardware output word value.
<hr/>		
2		

- **Deployment Algorithm Acceleration Data Record**

This record contains the computed 3-axis acceleration, as supplied to the airbag and petal surface deployment algorithm.

Record Format:

Byte Size	Byte Offset	Contents
2	0	Deployment algorithm x-axis acceleration value, signed value, Earth milligs.
2	2	Deployment algorithm y-axis acceleration value, signed value, Earth milligs.
2	4	Deployment algorithm z-axis acceleration value, signed value, Earth milligs.
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6		

- **Airbag Actuator Counts Data Record**

This record contains the airbag actuator position counts as recorded by the flight software and stored in EEPROM, for the four ARAs (Airbag Retraction Actuators).

The value 30000 is added to a actuator position count when it is determined that the corresponding encoder is broken (or stalled).

Record Format:

Byte Size	Byte Offset	Contents
2	0	Petal 1 ARA position counts.
2	2	Petal 2 ARA position counts.
2	4	Petal 3 ARA position counts.
2	6	Petal 4 (base) ARA position counts.
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8		

- **Airbag Actuator Temperature Data Record**

This record contains the temperature sensor value for each ARA (Airbag Retraction Actuator).

Record Format:

Byte Size	Byte Offset	Contents
1	0	Petal 1 ARA temperature sensor value.
1	1	Petal 2 ARA temperature sensor value.
1	2	Petal 3 ARA temperature sensor value.
1	3	Petal 4 (base) ARA temperature sensor value.
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4		

- **Petal Actuator Counts Data Record**

This record contains the petal actuator position counts as recorded by the flight software and stored in EEPROM, for the three LPAs (Lander Petal Actuators).

The value 15000 is added to a actuator position count when it is determined that the corresponding encoder is broken (or stalled).

Record Format:

Byte Size	Byte Offset	Contents
2	0	Petal 1 LPA position counts.
2	2	Petal 2 LPA position counts.
2	4	Petal 3 LPA position counts.
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6		

- **Petal Actuator Temperature Data Record**

This record contains the temperature sensor value for each LPA (Lander Petal Actuator).

Record Format:

Byte Size	Byte Offset	Contents
1	0	Petal 1 LPA temperature sensor value.
1	1	Petal 2 LPA temperature sensor value.
1	2	Petal 3 LPA temperature sensor value.
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3		