Original

Project Galileo

Software Interface Specification

SSI Raw Experiment Data Record (REDR) for Phase 2

Mitchell White

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National Aeronautics and Space Administration

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PROJECT GALILEO

SOFTWARE INTERFACE SPECIFICATION

COVER SHEET

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SIS NAME:

SSI Raw Experiment Data Record (REDR) for Phase 2

DOMAIN:

System	Subsystem	Program	Make/Use
MIPS	Realtime	ADESPIKE, BADLABELS, , CATCD, CATLABEL, CDGEN, GALSOS, GEDRLIST, GLLBLEMCOR, GLLFILLIN, GLLMVLN, GLLTELEMPROC, SSIMERGE2, UNMOSAIC	Make

PURPOSE OF INTERFACE (SUMMARY):

This interface describes the format and delivery specifications of the SSI REDR.

INTERFACE MEDIUM:

Disk File

CD-ROM

SIS COORDINATOR:

H. Mortensen

SIGNATURES

APPROVAL

W. Sible
GLL Ground S/W System Engineer

M. Belton
SSI Team Leader

S. LaVoie
GLL IPS System Engineer

K. Klaasen
SSI Science Coordinator

J. Johnson
GLL SDT Chief

G. Yagi
MIPS Software Engineer

L. Preheim
MIPS Telemetry CDE

CONCURRENCE

R. Bambery
MIPS Operations Supervisor

T. Handley
MIPS System Engineer

Distribution

D. Alexander	168-514
R. Bambery	168-427
S.Braun	264-829
A. Culver	168-514
R. Davis	264-211
D. Jensen	168-514
J. Johnson	264-744
E. Kay-Im	168-414
K. Klaasen	306-438
D. Knight	168-414
S. LaVoie	168-527
H. Mortensen	168-514
S. Noland	168-427
Tina Pauro	168-514
W. Sible	264-419
C. Stanley	168-514
G. Stufflebeam	264-419
T. Thaller	168-514
T. Trong	168-414
Robin Vaughan	301-125L
Vellum Files (2)	111-B25
M. White	168-427
P. Woncik	168-514
G. Yagi	168-427
J. Yoshimizu	168-514

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Document Change Log

Change Order	Date	Affected Portions
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Version 2.0	September 10, 1997	All - Updated for GLL Phase II, including Phase I structure

TBD Items

Page	Closure Date	Item Description
		None

ACRONYMS AND ABBREVIATIONS

ANSI.....American National Standards Institute
APB.....Asynchronous Playback
ASCII.....American Standard Code for Information Interchange
BARC.....Block Adaptive Rate Controlled Compression
BPI.....Bits per inch
CD-ROM.....Compact Disc Read-Only Memory
CDWO.....Compact Disk Write Once media
COW.....Cut Out Window (same as ROI)
CPU.....Central Processing Unit
DN.....Data Number
DSN ID.....Deep Space Network Identification Number
EDR.....Experiment Data Record
EOF.....End of File
ERT.....Earth Receive Time
GCF.....Ground Control Facility
GLL.....Galileo Project
GMT.....Greenwich Mean Time
HIIPS.....Home Institute Image Processing System
ICT .....Integer Cosine Transform
IDR.....Intermediate Data Record
I/F.....Radiance/Solar Flux
ISS.....VGR Imaging Science Subsystem
ICT.....Integer Cosine Transform
JOI.....Jupiter Orbital Insertion
JPL.....Jet Propulsion Laboratory
LRS.....Low Rate Science
LSB.....Least Significant Bit
MIPL.....Multimission Image Processing Laboratory
MIPS.....Multimission Image Processing Subsystem
MOS.....Mission Operations Subsystem
MSEC.....Millisecond
N/A.....Not Applicable
OCM .....On-Chip Mosaic
OPNAV.....Optical Navigation
PDS.....Planetary Data Subsystem
PTM.....Proof Test Model (of SSI)
REDR.....Raw Experiment Data Record
RCT.....Record Creation Time
R/S.....Reed/Solomon
ROI .....Region of Interest (same as COW)
S/C.....Spacecraft
SCLK.....Spacecraft Clock
SDR.....System Data Record
SFDU.....Standard Formatted Data Unit
SIS.....Software Interface Specification
SNR.....Signal-to-Noise Ratio

ACRONYMS AND ABBREVIATIONS (CON'T)

SPICE.....Spacecraft, Planetary, Instrument, C-matrix & Event Kernels
SSI.....GLL Solid State Imaging Subsytem
STS.....Sensor Test Set
TBD.....To Be Determined
TDS.....Telemetry Delivery Subsystem
TIS.....Telemetry Input Subsystem
UDR.....Unprocessed Data Record
UTC.....Universal Time, Coordinated (same as GMT)
VICAR.....Video Image Communication and Retrieval
WBDL.....Wide Band Data Link

D-232-15
SSI Raw Experiment Data Record

1 INTRODUCTION

1.1 Content Overview

This Software Interface Specification describes the content, format, and method of transfer of the Solid State Imaging Subsystem (SSI) Raw Experiment Data Records (REDRs) supplied by the Multimission Image Processing Subsystem (MIPS) to the Galileo SSI team and the Planetary Data System (PDS).

1.2 Scope

This specification is applicable to all SSI REDRs generated during the Orbital Operations phase of the mission.

1.3 Applicable Documents

[1] MIPS Phase 2 Software Requirements for SSI, ***IOM Gary Yagi: March 2, 1994***

[2] Project Galileo Software Interface Specification; SSI CD-ROM, ***D-232-16***

[3] Project Galileo Software Interface Specification, SSI Image Catalog (Jupiter) Phase 2 ***D-3379***

[4] UNIX Porting Guide, D-9395, June 29, 1992, Bob Deen

1.4 Subsystem Siting

1.4.1 Interface Location, Medium

The REDR interface medium shall be digital, with the distribution of REDR files available electronically and on CD-ROM discs. Other media sources may be available with prior approval.

1.4.2 Data Source, Destinations, and Transfer Method

The SSI REDR shall be generated by MIPS procedures specifically developed or adapted for Galileo. The input to the REDR generation and validation

procedures shall be the Unprocessed Data Record (UDR) disk file generated by the MIPS Galileo realtime subsystem or the program UNMOSAIC which generates UDRs from On-Chip Mosaic UDRs or GLLMVLN which shifts bottom partial records and CCD line drop outs to their correct locations. The REDR will reside at MIPS and shall be available to appropriate project personnel.

1.4.3 Generation Method and Frequency

The REDR shall be generated on the MIPS computer system. During Jupiter orbital operations, the REDRs shall be completed by end of mission.

1.4.4 Pertinent Relationships with Other Interfaces

The REDR format is identical to that of the Unprocessed Data Record (UDR) except the REDR may have a bad data value header and more binary header values and VICAR label field values determined. Also, the data format in the REDR is byte.

The REDR header and line record formats are similar to those used by the MIPS EDR interface to the Voyager Imaging Science Subsystem (ISS); they differ in Voyager and Galileo specific fields.

1.4.5 Labeling and Identification (Internal/External)

The internal file labeling shall be as defined in section 4.2. The external labeling will conform to the file naming conventions found in reference [1].

1.5 Assumptions and Constraints

By design, the REDR files will not be radiometrically corrected.

2 INTERFACE CHARACTERISTICS

2.1 Hardware Characteristics and Limitations

N / A

2.1.1 Special Equipment and Device Interfaces

N / A

2.1.2 Special Setup Requirements

A premastered Write Once Compact disk (CDWO) will be generated and sent to a vendor for REDR CD-ROM disc mass production.

Blemish correction is optionally available for the REDR. If blemish correction is desired, access to the SSI blemish calibration files is necessary.

2.2 Volume and Size

Each REDR file contains a telemetry header record followed by zero or more bad-data value header records (Appendix E), followed by 800 line records, each containing one line of image data.

The length of the REDR line record is independent of the telemetry mode -- all have 1000 bytes. Each line record contains 200 bytes of binary data and 800 bytes of pixel data.

For summation mode (telemetry modes HIS and AI8), the line record is still 1000 bytes . Only the first 400 samples and the first 400 lines of the pixel area are used to store valid image data.

For other modes, see Table 4-4 for the expected number of lines and samples of the data.

2.3 Interface Medium Characteristics

The REDR pixel data and binary headers shall be written in VAX compatible (least significant byte first) format. For users running on hosts other than a VAX, all VICAR programs are capable of converting the pixel data into the current host's format automatically. The binary headers are also converted as needed by the MIPS VICAR programs. Any local VICAR programs must check the header format and convert the data format as necessary. Information about

host formats and converting between different formats can be found in the VICAR Porting Guide [4].

The distributed interface medium will be CD-ROM, accessible from standard Unix, VAX/VMS and VICAR commands. REDR header and data records will be organized as 8-bit bytes. The bits in each byte will be numbered from 0 to 7, with bit 0 being the least significant bit. All 2 and 4 byte integers have their least significant bit in the first byte.

The image histogram, which trails the REDR telemetry header, will be organized as 32-bit words.

A detached PDS label file will accompany each REDR file on the CD-ROM. The format of this PDS label is found in reference [2].

2.4 Failure Protection, Detection, and Recovery Features

2.4.1 File Backup Requirements

The backup to the primary medium shall be disk REDR files residing on the MIPS system. Additional copies of the CDROM may be redistributed if required.

2.4.2 Security/Integrity Measures

N/A

3 ACCESS

3.1 Programs Affecting the SSI Data

Table 3-1 lists programs pertaining to SSI data in the form of the Unprocessed Data Records (UDR), Raw Experiment Data Records (REDR), and Experiment Data Records (EDR).

Table 3-1. Programs Affecting SSI Data

Program	Input	Output	Description
ADESPIKE	UDR REDR EDR	REDR REDR EDR	Removes single-pixel spikes.
BADLABELS	UDR	REDR	Adds bad-data value headers and computer image entropy.
CATCD	REDR		Adds a catalog record to the SSIREDR table describing the CD-ROM location of the REDR.
CATLABEL	UDR REDR	UDR REDR	Updates VICAR label with information from SSI catalog and the SPICE kernels.
CDGEN	REDR EDR	REDR EDR	Creates the PDS label file and index file to be included on the CD-ROMs.
GALSOS	UDR, REDR	EDR	Radiometrically corrects; removes blemishes and performs a unit conversion of the pixel data.
GEDRLIST	UDR		Print binary labels and bad-data value headers.
GLLBLEMCOR	REDR	REDR	Removes camera blemishes.

Table 3-1. Programs Affecting SSI Data - Continued

Program	Input	Output	Description
GLLFILLIN	UDR REDR EDR	REDR REDR EDR	Fills in missing image lines due to data outage or data compression errors.
GLLMVLN	UDR	UDR	Shifts lines downward due to the CDS line dropout problem and bottom partial records.
GLLTELEMPROC	telemetry data	UDR	Generates UDR files.
SSIMERGE2	UDR	UDR	Merges two or more images to produce another image with less missing data.
UNMOSAIC	UDR	UDR	Accepts an on-chip mosaicked (OCM) UDR as input and outputs each mosaic element as a separate UDR.

3.2 Synchronization Considerations

N/A

3.3 Input/Output Protocols, Calling Sequences

N/A

3.4 Utility Programs

GEDRLIST displays binary header and prefix labels for verification purposes.

LABEL-LIST displays VICAR label information for verification purposes.

LABLIST displays VICAR label information in a compact format for verification purposes.

4 DETAILED INTERFACE SPECIFICATIONS

4.1 Structure and Organization Overview

Each REDR file will begin with a VICAR label, followed by the REDR telemetry header and a number of REDR bad-data value headers followed by REDR line records. Each line record will contain 200 bytes of line header information plus the pixel data (8 bits/pixel). See figure 4-1 for a diagram of the REDR file.

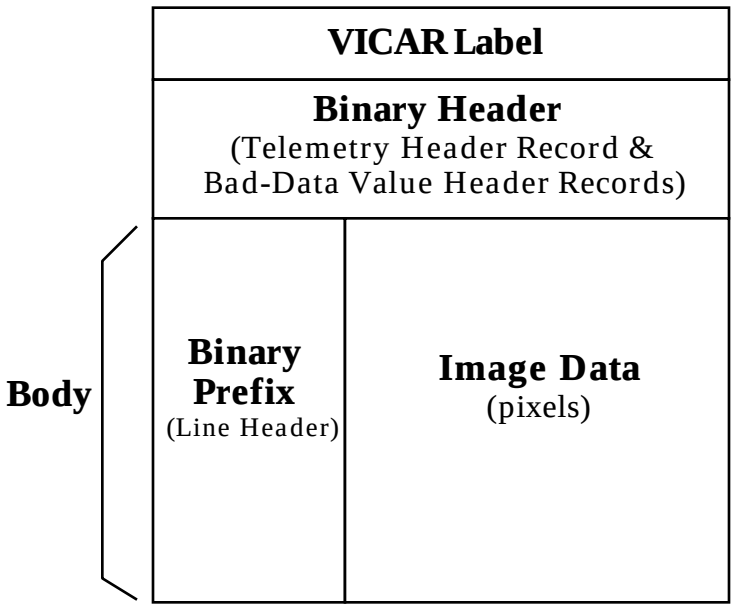

Figure 4-1. REDR/EDR File Diagram

All records have a fixed 1000-byte length within each REDR file. All formats have 1000-byte records. Note: Summation mode images occupy the first 400 lines and 400 samples of the 800 line by 800 sample REDR and UDR.

For all REDRs (including summation mode), the telemetry header is split into two physical records. The first 1000 bytes are placed in the first physical record after the VICAR label (the VICAR label may span more than one physical record), and the last 800 bytes are placed in the next physical record. The last 200 bytes of this record are zero filled.

There will be a one-to-one correspondence between line records and image lines (Excluding the header records, line record ***n*** will contain the data for image line ***n***). Missing data lines can be artificially filled by the GLLFILLIN program using interpolation. Missing ICT or Huffman compressed SSI packets will not be

interpolated over 8 line slices. The fill-in process will occur based on parameters given by the SSI Team. Certain fields of each line header containing data sequencing information will be maintained even during data gaps.

4.2 Substructure Definition and Format

All fields of the telemetry and line headers are unsigned integers unless specified otherwise. All real numbers are represented in ASCII as noted for each field. The record identifier, byte 0, of every physical record identifies the type of that record. Each 1800-byte telemetry header record is split into two 1000-byte records. The last 200 bytes of the second record contains filler. Bad-data value header records will not cross physical record boundaries.

4.2.1 Label Description

The VICAR label is an ASCII record intended for use by MIPS and VICAR programs; others may ignore this record. This label always appears at the beginning of an REDR file. Since the length of this label may exceed one physical record, non-VICAR programs should ignore all records with a "Record ID", byte 0, of 32 or more. See section 4.2.5 for more details about the VICAR label.

4.2.2 Telemetry Header Description

The REDR telemetry header record contains ancillary information specific to the image. It should not be confused with other binary header records, such as the bad-data value header records which are discussed later.

The REDR telemetry header record is described in Table 4-1.

Table 4-1. Telemetry Header

Byte	Bit	Item	Description	Valid For UDR	REDR	EDR
0		Record ID	ALWAYS = 0 for this header.	•	•	•
1		Reserved	Used during Phase One.			
2 - 11		Project	Project name, 10 ASCII characters = "GALILEO".	•	•	•
12 - 17		Instrument	Instrument name, 6 ASCII characters = "SSI".	•	•	•
18 - 19		Reserved	Used during Phase One.			
20 - 21		Log. Seq.	Logical sequence, binary count reset to zero for the first record of a file (header record) and incremented by one for each record in the file. Always = 0 for this record. Note For UDRs, REDRs, and summation-mode EDRs, the telemetry header record spans two physical records.	•	•	•
		First ERT	Earth Received Time (UTC) of the first packet received for this image.	•	•	•
22 - 23		YEAR	Year			
24 - 25		DAY	Day of year			
26		HOUR	Hour of day			
27		MIN	Minute of hour			
28		SEC	Second of minute			
29 - 30		MSEC	Millisecond of second			
		Last ERT	Earth Received Time (UTC) of the last packet received for this image.	•	•	•
31 - 32		YEAR	Year			
33 - 34		DAY	Day of year			
35		HOUR	Hour of day			
36		MIN	Minute of hour			
37		SEC	Second of minute			
38 - 39		MSEC	Millisecond of second			
		First SCLK	Spacecraft Clock of the first record in the file containing valid data.	•	•	•
40 - 43		RIM				
44		MOD91				
45		MOD10				
46		MOD8				

Table 4-1. Telemetry Header - Continued

Byte	Bit	Item	Description	Valid For UDR	REDR	EDR
47 - 50 51 52 53		Last SCLK RIM MOD91 MOD10 MOD8	Spacecraft Clock of the last record in the file containing valid data.	•	•	•
54 - 55 56 - 57 58 59 60 61 - 62		SCET YEAR DAY HOUR MIN SEC MSEC	Spacecraft Event Time (UTC) at the middle of shutter-open period. Year Day of year Hour of day Minute of hour Second of minute Millisecond of minute	•	•	•
63 - 121		MIPS PRD	MIPS Physical Recording Data of the first record of the file (ASCII). See Appendix D. Not used.		•	•
122-123		Telemetry Record Format ID	From predtelemfmtid field of ssioverview table of the database. See Section 4.2.6 for values.	•	•	•
124 - 127		Reserved	Used during Phase One.			
128		BOOM flag	Boom obscuration flag. 0: Boom present 1: Boom may be present 2: Boom not present Updated by BOOMFLAG and CATLABEL	•	•	•
129 - 130		Missing Lines	Number of expected line records in the file, excluding those lines not within the COW, with no valid pixels.	•	•	•
131 - 132		Partial Lines	Total number of expected line records in the file, excluding those lines not within the COW, which contain some valid pixels.	•	•	•
133 - 134		Reserved	Used during Phase One.			
135 - 136		Seq. Breaks	Total number of packet gaps (indicated by a discontinuity in the packet sequence number).	•	•	•

Table 4-1. Telemetry Header - Continued

Byte	Bit	Item	Description	Valid For UDR	REDR	EDR
137 - 142		Reserved	Used during Phase One.			
143 - 144		SFDUs	Total number of minor frames in this file which were derived from SFDU input. Also equal to the number of packets available for this file.	•	•	•
145 - 151		Pic. No.	Picture number. Seven-ASCII-character "XXYZZZZ" (See Appendix C).	•	•	•
152 - 163		Reserved	Used during Phase One.			
164 - 165		Flags		•	•	•
	0	Compression	BARC Compression 0=off 1=on			
	1	Comp Mode	BARC Compression Mode (Valid only if compression flag is set) 0= rate control 1= info preserv			
	2	Extended Exposure	Exposure Mode 0= normal 1= extended			
	3	Flood	Light Flood Status 0= off 1= on			
	4	Blemish	Blemish Protection 0= off 1= on			
	5	Clock	Parallel Clock State 0= normal 1= inverted			
	6	ICT Compression	0=off 1=on			
	7	Huffman Compression	0=off 1=on			
	8- 15	Reserved				
166 - 171		Mean DN	Mean DN level of all valid pixels in the expected image, excluding data not in the COW. Real number represented as ASCII string in the form "123.12".	•	•	•

Table 4-1. Telemetry Header - Continued

Byte	Bit	Item	Description	Valid For		
				UDR	REDR	EDR
172 - 177		Truncated bits	Mean number of truncated bits per pixel, excluding data not in the COW. Real number represented as ASCII string in the form "12.345" (for BARC compression only).	•	•	•
178 - 183		Truncated pixel	Mean number of truncated pixels per line. Real number represented as ASCII string in the form "123.12" (for BARC compression only).	•	•	•
184 - 195		I/F	Mean I over F level. Real number represented as ASCII string in the form "123.12". Added by GALSOS.			•
196 - 202		Entropy Average	Entropy level for the whole picture (bits per pixel). Real number represented as ASCII string in the form "12.1234". Added by GALSOS or BADLABELS.		•	•
203 - 307		Entropies	Entropy level for 15 lines. First line is 50, and incremented by 50 to line 750. 15 real numbers represented as ASCII strings in the form "12.1234" and null ternimated. Added by GALSOS or BADLABELS.		•	•
308 - 331		Pointing **Phase 1 Only**	Scan platform direction coordinates at middle of shutter-open period in J2000. Three real numbers for right ascension, declina-tion and twist angles represented as ASCII strings in the form "1234.123".			

Table 4-1. Telemetry Header - Continued

Byte	Bit	Item	Description	Valid For		
				UDR	REDR	EDR
332 - 347		Scale Factors	Radiometric calibration scale factors. Two real numbers in the form "123.1234". First number is reflectance / DN, the second is the radiance / DN scale factor. Added by GALSOS.			•
348 - 379		Slope-File	Radiometric file used for systematic processing. 32 ASCII characters. Added by GALSOS.			•
380 - 411		Offset-File	Radiometric file (dark current) used for systematic processing. 32 ASCII characters. Added by GALSOS.			•
412 - 431		Activity	20 ASCII characters of the form: "NNTIOOOOOOMM#SSSXXXX (See Appendix C).	•	•	•
432		Filler				
433		Filter	Filter position (See Appendix A).	•	•	•
434		Exposure	Exposure number (See Appendix A).	•	•	•
435		Imaging Mode or Instrument Frame Rate	0: 60-2 / 3 seconds (Low) 1: 8-2 / 3 secs (High) 2: 30-1 / 3 secs (Medium) 3: 2-1 / 3 secs (Radiation) 4: 15-1 / 6 secs (Summation)	•	•	•
436		Camera gain state	0: Gain 1 = 400K 1: Gain 2 = 100K 2: Gain 3 = 40 K 3: Gain 4 = 10 K	•	•	•
437- 440		Range	Target's range to sun in kilometers. Updated by CATLABEL.		•	•
441		Reserved	Used during Phase One.			
442 - 443		Version	MIPS catalog version number, reserved for MIPS use. Not used	•	•	•

Table 4-1. Telemetry Header - Continued

Byte	Bit	Item	Description	Valid For		
				UDR	REDR	EDR
444 - 447 448 449 450		Starting SCLK RIM MOD91 MOD10 MOD8	Spacecraft Clock of the start of image. This clock refers to the start of the SSI frame cycle.	•	•	•
451 - 454 455 456 457		Ending SCLK RIM MOD91 MOD10 MOD8	Spacecraft Clock at the end of image. This clock refers to the end of the SSI frame cycle.	•	•	•
458-465 466-473 474-481 482-489		SSI3_PKT when available. Platform RA Platform DEC Platform TWIST Platform CLOCK angle	Data portion for SSI3 telemetry packet containing AACS. Values will be represented as ASCII strings in the form 1234.12 and null terminated. RA and DEC are in the EME50 coordinate system	•	•	•
490 491 492		Standard Housekeeping Data Words 14, 19, and 22 for this image when available.	CCD Fine Temperature and CCD Coarse Temperature Values from 0 to 255. See Appendix A for temperature translation tables. Picture Count Increments every non-zero exposure and dark current calibration	•	•	•
493	0-4 5-6 7	Standard Housekeeping Data Word 23 for this image when available.	Exposure Number (See Appendix A) Commanded Gain 0=Gain 1 = 400 K 1=Gain 2 = 100 K 2=Gain 3 = 40 K 3=Gain 4 = 10 K Light Flood 0=on 1=off	•	•	•

Table 4-1. Telemetry Header - Continued

Byte	Bit	Item	Description	Valid For UDR	REDR	EDR
494	0-2	Standard Housekeeping Data Word 24 for this image when available.	Command Filter Pos. (See Appendix A)	•	•	•
	3		Commanded Filter step 0=absolute 1=step			
	4		Commanded Blem. Mode 0=off 1=on			
	5		Commanded Expos. Mode 0=normal 1=extended			
	6		Commanded Expos Cycle 0=cycle 1 1=cycle 2			
495	0-1	Standard Housekeeping Data Word 25 for this image when available.	Gain State used 0=Gain 1=400 K 1=Gain 2=100 K 2=Gain 3=40 K 3=Gain 4=10 K	•	•	•
	2-3		BARC Compressor Status (bit 2) and Compressor Mode (bit 3) 0=out 1=in & rate controlled 2=out 3=in & infopreserving			
	4		Long Exposure Cycle 0=cycle 1 1=cycle 2			
	5-7		Image Mode 0=60-2/3s 2=8-2/3s 4=30-1/3s 5=15-1/6s 6=2-1/3s			

Table 4-1. Telemetry Header - Continued

Byte	Bit	Item	Description	Valid For UDR	REDR	EDR
496	0	Standard	Odd Parity	•	•	•
	1-3	Housekeeping Data Word 26 for this image when available.	Actual Filter Position 0-7 (See Appendix A)			
	4		Blemish Protection 0=off 1=on			
	5		Watch Dog Timer 0=not tripped 1=tripped			
	6		Parallel Clock 0=normal 1=inverted			
	7		Memory Write Protect 0=write protect off 1=write protecton on			
497 - 775		Reserved				
776 -1799		Histogram	256 32-bit binary valued histogram of the pixels for this file, including fill data.	•	•	•

NOTE

Table 4-1 above defines the logical telemetry header structure. The physical structure is dependent upon the file structure, which is described in paragraph 4.1.

4.2.3 Bad-Data Value Header Records

These records describe several types of bad data values. Each record describes only one type of bad data values (dropouts, saturated pixels, Low-full-well pixels, and single spiked pixels). Depending on the number of bad pixels, each Bad-Data Value header may generate several physical records. Each record is independent of the other records and is identified by the "Record Id" field which is located at byte 0. The definition of these records is provided in Appendix E.

4.2.4 Body Description

The REDR body or image line record is described in the Table 4-2.

Table 4-2. Image Line Record

Byte	Bit	Item	Description	Valid For UDR	REDR	EDR
0		Record ID	Always = 2 for line records.	•	•	•
1 - 3		Reserved	Used during Phase One.			
4 - 5		Log. Seq.	Logical sequence, binary count reset to zero for the first record of a file (header record) and incremented by one for each record in the file.	•	•	•
		ERT	Earth Received Time (in UTC) of the first telemetry packet with first pixel located in this line. Obtained from the ERT in the GCF block containing this field.	•	•	•
6 - 7		YEAR	Year			
8 - 9		DAY	Day of year			
10		HOUR	Hour of day			
11		MIN	Minute of hour			
12		SEC	Second of minute			
13 - 14		MSEC	Millisecond of second			
		SCLK	Spacecraft clock readout of the 1st minor frame of this line.	•	•	•
15 - 18		RIM				
19		MOD91				
20		MOD10				
21		MOD8				
22 - 80		MIPS Physical Recording Words	59 ASCII characters which define the recording and validation devices, software version and CPU used to write this record and the data on which it was recorded. A detailed explanation of this field is provided in Appendix D. Not used.			•

Table 4-2. Image Line Record - Continued

Byte	Bit	Item	Description	Valid For UDR	REDR	EDR
81 - 82		Telemetry Record Format ID	Predict from ssioverview table of the database. See section 4.2.6 for values	•	•	•
83		Input Type	Decimal value: 0: S/C Flight Data MOS 1: PTM Data 2: Ext. Simulation 3: S/C Flight Data Test 4: Internal Simulation 5-255: Not used	•	•	•
84	 0 1 2 3 4 5 6 7	Input Source SFDU data WBDL SDR IDR EDR MIPS Realtime APB Not used	Bit will be set to 1 according to input data source.	•	•	•
85 -102		Reserved	Used during Phase One.			
103 - 106	 0 - 1 2 - 3 4 - 5 .... 24 - 25 26 - 31	Truncation BLOCK 0 BLOCK 1 BLOCK 2 .... BLOCK 12 Filler	Number of truncated bits per block due to data compression. 2 bits/block, 13 blocks/line. Each block contains 64 pixels except last one which contain 32 pixels (for BARC Compression only).	•	•	•
107 - 108		Truncated	Total number of pixels truncated at end of line due to BARC data compression.	•	•	•
109 - 110		Version	Catalog version for identical images. Not implemented		•	•
111 - 112		Reserved	Used during Phase One.			
113		DSN ID	Deep Space Network Station where packet was received. As defined in GLL-820-13/OPS-6-8.	•	•	•
114 - 115		Line Number	Image line number, 1-800.	•	•	•
116		Reserved	Used during Phase One.			

Table 4-2. Image Line Record - Continued

Byte	Bit	Item	Description	Valid For UDR	REDR	EDR
117-118 119-120 121-122 123-124		Segments ss1 es1 ss2 es2	The starting and ending samples for up to two segments of an image line identifying where data exist . OPNAVs with 3 segments will combine the first 2 segments together into ss1 and es1.	•	•	•
125	 0-3 4-7	Line Construction	Number of Telemetry packets used to create this image line. Full Packets Partial Packets	•	•	•
126		APID	Application packet ID. 30 for ssi1 and 31 for ssi2.	•	•	•
127 - 130		PKT_Sequence id	TIS packet sequence id. Packet sequence ids are for the purpose of maintaining proper order of packets. If more than one packet is used to reconstruct the line, only the packet id of the first telemetry packet is stored.	•	•	•
131 - 132		PKT_Pixel_Start	Starting sample location for the packet identified by the PKT_Sequence id.	•	•	•
 133 - 134 135 - 136		Truth Window Position Start Pixel Stop Pixel	The position of the Truth Window. 0,0 indicates no truth window on this line	•	•	•
 137 - 138 139 - 140 141 142 143 144 - 145		RCT YEAR DAY HOUR MIN SEC MSEC	The TIS Record Creation Time of packet. Year Day of year Hour of day Minute of hour Second of minute Millisecond of second	•	•	•

Table 4-2. Image Line Record - Continued

Byte	Bit	Item	Description	Valid For UDR	REDR	EDR
146		Decompression Status/Errors	Decompression status/errors. 0: No errors detected -1: Incomplete data for decompression	•	•	•
147 - 152		Compression Ratio	Compression ratio for entire line. Real number represented as an ASCII string in the form "123.12"	•	•	•
153 - 199			Reserved.			
200 - 599 600 - 999 or 200 - 999		Pixel Data Filler or Pixel Data	400 8-bit unsigned pixel values (summation mode only). Set to zero (summation mode only). or 800 8-bit unsigned pixel values.	• •	• •	
200 - 999 or 200 - 1799		Pixel Data or Pixel Data	Summation Mode: 400 16-bit signed pixel values, radiometrically corrected Full Frame Mode: 800 16-bit signed pixel values, radiometrically corrected			• •

4.2.5 VICAR Label

The SSI VICAR image label is created as each new image is received by MIPS real time. This section describes the label keywords initially included on the labels when the UDRs and REDRs are created or when the label keywords are added to the labels by the radiometric correction program GALSOS.

The SSI VICAR image label includes data which identify the mission, spacecraft, instrument, target, and frame, and various camera and image geometry data pertinent to the interpretation of the image. During systematic and science processing, individual programs may extract and use various image identifiers and camera parameters stored in the label. The image geometry

information included in the label is normally ignored during processing, since more accurate information is available from SPICE files.

As each new version of an image is produced, the VICAR system will automatically copy the image label and add the program name, user name, and date to the processing history. In addition, individual programs may add processing information to the label.

The flight label is in free format, with each label item stored in the form "keyword=value". Summation-mode frames can be identified by their 2-1/3 or 15-1/6 frame rate. The majority of the label items are generated by the Real-Time subsystem's Image-Builder program.

Below is a listing of a sample SSI flight label of a Phase 2 REDR with a spacecraft clock value of 349632000 and ICT compressed. MIPS VICAR program LABEL was used to produce this formatted version of the VICAR label.

```
        ************  File S0349632000.R ************
             3 dimensional IMAGE file
             File organization is BSQ
             Pixels are in BYTE format from a AXP-VMS host
             1 bands
             800 lines per band
             800 samples per line
             8 lines of binary header
             200 bytes of binary prefix per line
---- Task: SSIMERGE -- User: ADC040 -- Fri May  2 11:57:04 1997 ----
MISSION='GALILEO'
SENSOR='SSI'
PICNO='G1G0001'
RIM=3496320
MOD91=0
MOD10=0
MOD8=0
PARTITION=1
PA='G1GSGLOBAL01'
TCA='-001T08:45:50Z'
TARGET='GANYMEDE'
SCETYEAR=1996
SCETDAY=178
SCETHOUR=8
SCETMIN=45
SCETSEC=9
SCETMSEC=457
ERTYEAR=1996
ERTDAY=193
ERTHOUR=6
ERTMIN=58
ERTSEC=29
ERTMSEC=691
FILTER=2
EXP=62.5003
GAIN=2
RATE=4
TLMFMT='HIM'
BOOM='N'
MOFIBE='001000'
ICT_DESPIKE_THRESHOLD=255
ENCODING_TYPE='INTEGER COSINE TRANSFORM '
TBPPXL=0.0
TPPLNE=0.0
INA=30.309
```

EMA=0.0931004
HRA=10.3176
TWIST=68.3739
CONE=149.024
RA=251.639
DEC=-16.3465
SMEAR=0.1
SEQNO=0
CUT_OUT_WINDOW=(129, 1, 672, 784)
TRUTH_WINDOW=(801, 801, 96, 96)
HUFFMAN_TABLE_NAME='SKEWED'
QUANTIZATION_STEP_SIZE=6
QUANTIZATION_MATRIX_NAME='UNIFORM'
ZIGZAG_PATTERN='ZIGZAG'
COMPRESSION_RATIO=6.55417
MAXIMUM_COMPRESSION_RATIO=25.3927
MINIMUM_COMPRESSION_RATIO=4.25726
PHA=30.4014
HSCL=6738.28
VSCL=6738.84
LAT=-8.05967
LON=155.404
PLRANGE=1.6902e+06
SLRANGE=663734.0
SOLRANGE=7.78215e+08
SUB_SOLAR_LATITUDE=-1.87338
SUB_SOLAR_LONGITUDE=125.604
SUB_SPACECRAFT_LATITUDE=-8.06495
SUB_SPACECRAFT_LONGITUDE=155.497
SUNAZ=184.062
NORAZ=104.344
SCAZ=120.403
SMRAZ=-999.0
RAD=-999.0
SPICE_C_ID='M905'
TARGET_CENTER_DISTANCE=666368.0
SUB_SPACECRAFT_LINE=271.123
SUB_SPACECRAFT_SAMPLE=475.621
READOUTMODE='NOT APPLICABLE'
ENTROPY=3.72596
INTERCEPT_POINT_LINE=271.0
INTERCEPT_POINT_LINE_SAMPLE=475.0
---- Task: CATLABEL -- User: ADC040 -- Fri Jun 20 10:36:22 1997 ----
---- Task: BADLABEL -- User: ADC040 -- Fri Jun 20 10:36:31 1997 ----
REDR_EXT='1'
---- Task: CATLABEL -- User: DLC040 -- Thu Sep 11 12:40:36 1997 ----
---- Task: CATLABEL -- User: DLC040 -- Thu Sep 25 14:50:47 1997 ----
****

Table 4-3. VICAR Label Keywords and Descriptions

LABEL ITEM	DESCRIPTION	SOURCE
BLM=string	Blemish file name.	GALSOS
BOOM=string	Boom obscuration (P=possible,N=not possible, V=presence verified)	RAW
CAL=string	Radiometric file name	GALSOS
CNV=real	DN to radiance conversion factor	GALSOS
COMPRESSION_RATIO=real	ICT or lossless compression ratio	RTS

Table 4-3. VICAR Label Keywords and Descriptions - Continued

LABEL ITEM	DESCRIPTION	SOURCE
CONE=real	Cone angle (-90 to +210)	RAW
CUT_OUT_WINDOW=(sl,ss,nl,ns) sl=integer ss=integer nl=integer ns=integer	Cut-out window size field. See notes. (sl=starting line; ss=starting sample; nl=number of lines; ns=number of samples)	ICT SNIP
DC=string	Dark-current file name	GALSOS
DEC=real	Declination of pointing vector at shutter open. Valid is -90 to 90.	VIEW, SPICE
DIRBLM=string	Blemish file directory	GALSOS
DIRCAL=string	Radiometric file directory	GALSOS
DIRDC=string	Dark current file directory	GALSOS
DIROFF=string	Shutter-offset file directory	GALSOS
ERTDAY=integer	Earth received day of year of 1st packet received for this image	RTS
ERTHOUR=integer	Earth received hour of 1st packet received for this image	RTS
ERTMIN=integer	Earth received minute of 1st packet received for this image	RTS
ERTMSEC=integer	Earth received milli-second of 1st packet received for this image	RTS
ERTSEC=integer	Earth received second of 1st packet received for this image	RTS
ERTYEAR=integer	Earth received year of 1st packet received for this image	RTS
EMA=real	Emission angle (0-180)	VIEW, SPICE
ENCODING_TYPE=string	How the spacecraft compressed the image. (INTEGER COSINE TRANSFORM, HUFFMAN, BARC RATE CONTROL, BARC INFORMATION PRESERVING, or NONE).	RTS
ENTROPY=real	Average entropy level (bits / pixel)	GALSOS, BADLABELS
EXP=real	Exposure time (msec)	VIEW
FILTER=integer	Filter position (0=CLEAR, 1=GREEN, 2=RED, 3=VIOLET, 4=IR-7560, 5=IR-9680, 6=IR-7270, 7=IR-8890)	VIEW
GAIN=integer	Gain state code (1=400K, 2=100K, 3=40K, 4=10K)	VIEW, RTS
HRA=real	Hour angle (0-360)	VIEW, SPICE
HSCL=real	Horizontal picture scale (m / pixel)	VIEW, SPICE
HUFFMAN_TABLE_NAME=string	Name of Huffman table (7 characters) (SKEWED or UNIFORM). See notes.	ICT

Table 4-3. VICAR Label Keywords and Descriptions - Continued

LABEL ITEM	DESCRIPTION	SOURCE
ICT_DESPIKE_THRESHOLD=integer	ICT despike threshold. Defaulted to 255 for ENCODING_TYPE=HUFFMAN. See notes.	ICT
INA=real	Incidence angle (0-180)	VIEW, SPICE
IOF=real	DN to reflectance conversion factor	GALSOS
LAT=real	Latitude at which the picture scale and lighting geometry is calculated. See notes. (-90-+90)	VIEW, SPICE
INTERCEPT_POINT_LINE =real	The line in the image at which the picture scale and the lighting geometry is calculated.	SPICE
INTERCEPT_POINT_LINE_SAMPLE= real	The sample in the image at which the picture scale and the lighting geometry is calculated.	SPICE
LON=real	West longitude at which the picture scale and the lighting geometyr is calculated. See notes. (0-360)	VIEW, SPICE
MAXIMUM_COMPRESSION_RATIO= real	ICT or lossless maximum compression ratio. See notes.	RTS
MINIMUM_COMPRESSION_RATIO= real	ICT or lossless minimum compression ratio. See notes.	RTS
MISSION=string	Mission ID (GALILEO)	RTS
MOD10=integer	MOD10 count for the beginning of the frame cycle	RTS
MOD8=integer	MOD8 count for the beginning of the frame cycle	RTS
MOD91=integer	MOD91 count for the beginning of the frame cycle	RTS
MOFIBE=string	Camera flags (5 characters) M=on-chip mosaic (1=yes, 0=no) O=OPNAV image (1=OPNAV, 0=SSI) F=light flood (1=on, 0=off) I=clock (1=inverted, 0=non-inverted) B=blemish protect (1=on, 0=off) E=ext-exposure (1=extended, 0=normal)	 VIEW VIEW RTS RTS RTS RTS
NORAZ=real	North azimuth (0-360) of the target body (projected spin axis). See notes.	SPICE, VIEW
NSTARS=integer	Number of OPNAV star areas	OPNAV
PA=string	Profile Activity (20 characters) See Appendix C	VIEW
PARTITION=integer	Count of number of times RIM is reset	RTS
PHA=real	Phase angle (0-180)	VIEW, SPICE
PICNO=string	Picture number (7 characters) See Appendix B	VIEW
PLRANGE=real	Distance from spacecraft to planet (km)	VIEW, SPICE
QUANTIZATION_MATRIX_NAME =string	Name of ICT quantization matrix. (7 characters) UNIFORM (also called VG0. See notes.	ICT
QUANTIZATION_STEP_SIZE=integer	Integer value by which ICT transform is divided. Defaulted to 1 for ENCODING_TYPE=HUFFMAN. See notes.	ICT
RA=real	Right-ascension of pointing vector (0-360)	VIEW, SPICE

Table 4-3. VICAR Label Keywords and Descriptions - Continued

LABEL ITEM	DESCRIPTION	SOURCE
RAD=real	Ring radius of center of frame (km). Ring images only.	SPICE , VIEW
RATE=integer	Frame rate code (1=2-1/3 sec, 2=8-2/3, 3=30-1/3, 4=60-2/3, 5=15-1/6)	VIEW
READOUTMODE=string	Camera readout mode. (SAMPLE or CONTIGUOUS) for HMA or HCA else NOT APPLICABLE	VIEW
RIM=integer	RIM count for the beginning of the frame cycle	RTS
SCAZ=real	Spacecraft azimuth (0-360). See notes.	SPICE, VIEW
SCETDAY=integer	Spacecraft-Event-Time day-of-year for shutter center of the shutter event.	VIEW
SCETHOUR=integer	Spacecraft-Event-Time hour-of-day for shutter center of the shutter event.	VIEW
SCETMIN=integer	Spacecraft-Event-Time minute-of-hour for shutter center of the shutter event.	VIEW
SCETMSEC=integer	Spacecraft-Event-Time msec-of-second for shutter center of the shutter event.	VIEW
SCETSEC=integer	Spacecraft-Event-Time second-of-minute for shutter center of the shutter event.	VIEW
SCETYEAR=integer	Spacecraft-Event-Time year for shutter center of the shutter event.	VIEW
SENSOR=string	Sensor ID (SSI)	RTS
SEQNO=integer	ICT Image version sequence number	ICT
SLRANGE=real	S/C-to-target slant range (km)	VIEW, SPICE
SMEAR=real	Smear magnitude (pixels). Not calculated because angular velocity is not available in the SPICE CK. Will always be 0.1	VIEW
SMRAZ=real	Smear azimuth (0-360). See notes. Not calulated because angular velocity is not available in the SPICE CK. Will always be -999.0	SPICE, VIEW
SPICE_C_ID=string	4-char name of C-matrix source	SPICE, VIEW
SO=string	Shutter-offset file name	GALSOS
SOLRANGE=real	Distance from sun to target-body (km)	VIEW, SPICE
STAR1=(sl,ss,nl,ns) sl=integer ss=integer nl=integer ns=integer	Size field for first OPNAV star area. See notes. (sl=starting line; ss=starting sample; nl=number of lines; ns=number of samples)	OPNAV

Table 4-3. VICAR Label Keywords and Descriptions - Continued

LABEL ITEM	DESCRIPTION	SOURCE
STAR2=(sl,ss,nl,ns) sl=integer ss=integer nl=integer ns=integer	Size field for second OPNAV star area. See notes. (sl=starting line; ss=starting sample; nl=number of lines; ns=number of samples)	OPNAV
STAR3=(sl,ss,nl,ns) sl=integer ss=integer nl=integer ns=integer	Size field for third OPNAV star area. See notes. (sl=starting line; ss=starting sample; nl=number of lines; ns=number of samples)	OPNAV
STAR4=(sl,ss,nl,ns) sl=integer ss=integer nl=integer ns=integer	Size field for fourth OPNAV star area. See notes. (sl=starting line; ss=starting sample; nl=number of lines; ns=number of samples)	OPNAV
STAR5=(sl,ss,nl,ns) sl=integer ss=integer nl=integer ns=integer	Size field for fifth OPNAV star area. See notes. (sl=starting line; ss=starting sample; nl=number of lines; ns=number of samples)	OPNAV
SUB_SOLAR_LATITUDE=real	Planetocentric latitude of the sub-solar point	VIEW, SPICE
SUB_SOLAR_LONGITUDE=real	West longitude of the sub-solar point	VIEW, SPICE
SUB_SPACECRAFT_LATITUDE =real	Planetocentric latitude of the sub-spacecraft point (the target center)	VIEW, SPICE
SUB_SPACECRAFT_LINE=real	Sub-spacecraft line coordinate	SPICE, VIEW
SUB_SPACECRAFT_LONGITUDE =real	West longitude of the sub-spacecraft point (the target center)	VIEW, SPICE
SUB_SPACECRAFT_SAMP=real	Sub-spacecraft sample coordinate	SPICE, VIEW
SUNAZ=real	Sun azimuth (0-360). See notes	SPICE, VIEW
TARGET=string	Target-body name (12 characters)	VIEW
TARGET_CENTER_DISTANCE=real	Distance from spacecraft to target center(km)	SPICE
TBPPXL=real	Mean number of truncated bits/pixel, BARC only	RTS
TCA=string	Time from closest approach (13 chars) in the format + or - dddThh:mm:ssZ to Jupiter.	VIEW
TLMFMT=string	Telemetry format (3 characters)	VIEW
TPPLNE=real	Mean number of truncated pixels/line, BARC only	RTS

Table 4-3. VICAR Label Keywords and Descriptions - Continued

LABEL ITEM	DESCRIPTION	SOURCE
TRUTH_WINDOW=(sl,ss,nl,ns) sl,ss,nl,ns=integer	Starting line and starting sample, and number of lines and number of samples of an up to 96x96 pixel truth window; it's the area where no compression was performed. Defaulted to (801,801,96,96) when no truth window exist and when ENCODING_TYPE=HUFFMAN. See notes.	RTS
TWIST=real	Twist angle (0-360)	VIEW, SPICE
UBWC=string	Uneven-bit-weight correction (ON or OFF)	GALSOS
VSCL=real	Vertical picture scale (m / pixel)	VIEW, SPICE
ZIGZAG_PATTERN=string (7 characters)	Name of ICT zigzag coding pattern (ZIGZAG or ALT). Defaulted to ZIGZAG for ENCODING_TYPE=HUFFMAN. See notes.	ICT

Notes:

1) Sources are:
   RAW=ssiraw table of database
   RTS=real time system,
   VIEW=ssioverview table of database,
   ICT=ssiict table of database,
   OPNAV=ssiopnav table of database,
   GALSOS=radiometric correction program,
   SPICE=SPICE kernels, typically via the CATLABEL program.
2) If the target is the ring-plane of Jupiter, label items LAT and LON are replaced by RAD and LON.
3) Prior to JOI, MOFIBE was FIBE and ENCODING_TYPE was BARC.
4) TBPPXL, TPPLNE apply to BARC compression only.
5) QUANTIZATION_STEP_SIZE, QUANTIZATION_MATRIX_NAME, TRUTH_WINDOW, ICT_DESPIKE_THRESHOLD and ZIGZAG_PATTERN apply to ICT compression only and are defaulted for Huffman only (lossless) compression. MINIMUM_COMPRESSION_RATIO, MAX_COMPRESSION_RATIO, and COMPRESION_RATIO, apply to both ICT aand Huffman (lossless) compression. CUT_OUT_WINDOW applies to ICT, Huffman only (lossless), and BARC compression
6) HUFFMAN_TABLE applies to Huffman only (lossless) and ICT compression images. Note that ICT compressed images are also HUFFMAN compressed but are identified as ICT.
7) NSTARS,STAR1,STAR2,STAR3,STAR4 and STAR5 apply to OPNAV images only.
8) All azimuth angles are measured clockwise from right in the image.
9) An image "size field" defines the location and size of an image area. It consists of four numbers: starting line, starting sample, number of lines, and number of samples. The origin of the image coordinate system is at (LINE,SAMPLE)=(1,1) for the upper-left corner, with samples increasing to the right and lines increasing downwards.
10) INA, EMA, PHA, HRA, SMEAR, HSCL, VSCL, SLRANGE, LAT, and LON are calculated at the center of the image if all four corners lie on the target, other wise it is calculated at

the target center if visible, otherwise the image is scanned at 20 pixel intervals for a point at highest resolution.

11) The J2000 coordinate system is used for all orientation calculations.

Application program label interface: Label items may be stored, retrieved, or deleted via subroutines XLADD, XLGET, or XLDEL, respectively. Subroutine VIC1LAB may be used to retrieve all ground-calibration labels. The subroutine ABLE86 will extract data from either flight or ground-calibration labels and return the values in an array. Note that programs intended for multimission support should not call ABLE86 directly, but use GETLABCON.

When an image is map-projected, the following label items relating to image geometry are updated by MAP3: SUNAZ, SMRAZ, SCAZ, NORAZ, SMRAZ, LAT, LON, HSCL, VSCL. This is not yet implemented.

4.2.6 Phase 2 Telemetry Format IDs

Table 4-4 below lists the SSI telemetry formats, their Phase 2 downlink data rates and number of lines and samples.

Table 4-4. Phase 2 Telemetry Formats

Telemetry Format Number	Mnemonic	Downlink Data Rate	Number Lines and Samples	Comment
5	**HIS**	115.2 Kbps	400x400	Last 6 pixels are fill (800x394)
6	**HMA**	115.2 Kbps	400x800	Last 12 pixels are fill (400x788) Sample readout:800x800 every 2nd line
7	**HCA**	115.2 Kbps	200x800	Sample readout:800x800 every 4th line
17	**HIM**	115.2 Kbps	800x800	Last 12 pixels are fill (800x788)
22	**IM8**	806.4 Kbps	800x800	
23	**AI8**	806.4 Kbps	400x400	
25	**IM4**	403.2 Kbps	800x800	

Appendix A

CAMERA PARAMETERS

Table A-1 below describes SSI filters and Table A-2 gives exposure values. Table A-3 provides the correspondence for the gain state and frame mode between the VICAR label and the binary telemetry header. These values were obtained from reference [3].

Table A-1. SSI Filters

Filter No.	Filter name
0	CLEAR
1	GREEN
2	RED
3	VIOLET
4	IR-7560
5	IR-9680
6	IR-7270
7	IR-8890

Table A-2. SSI Exposure Intervals in Milliseconds
Note: All exposure times were returned low by 4-1/6 ms except for exposures 1, 2, and 4

Exposure No.	Expected Exposure Time	Actual Expos Time	Exposure No.	Expected Exposure Time	Actual Expos Time
0	0	0	10	100	95-5/6
1	4-1/6	4-1/6	11	133-1/3	129-1/6
2	6-1/4	6-1/4	12	200	195-5/6
3	8-1/3	4-1/6	13	266-2/3	262-1/2
4	12-1/2	12-1/2	14	400	395-5/6
5	16-2/3	12-1/2	15	533-1/3	529-1/6
6	25	20-5/6	16	800	795-5/6
7	33-1/3	29-1/6	17	1066-2/3	1062-1/2
8	50	45-5/6	18	1600	1595-5/6
9	66-2/3	62-1/3	19	2133-1/3	2129-1/6

Table A-2. SSI Exposure Intervals in Milliseconds - Continued

Exposure No.	Exposure Time	Actual Expos Time	Exposure No.	Exposure Time	Actual Expos. Time
20	3200	3195-5/6	26	25600	25595-5/6
21	4266-2/3	4262-1/2	27	34133-1/3	34129-1/6
22	6400	6395-5/6	28	51200	51195-5/6
23	8533-1/3	8529-1/6	29	0-Dark Current	0
24	12800	12795-5/6	30	0	0
25	17066-2/3	17062-1/2	31	0	0

Table A-3. SSI CCD Fine Temperature Translation Table in degrees Celsius

Temperature Value	Temperature Translation	Temperature Value	Temperature Translation	Temperature Value	Temperature Translation
0	-121.5	15	-120.037	30	-118.573
1	-121.402	16	-119.939	31	-118.476
2	-121.305	17	-119.841	32	-118.378
3	-121.207	18	-119.744	33	-118.28
4	-121.11	19	-119.646	34	-118.183
5	-121.012	20	-119.549	35	-118.085
6	-120.915	21	-119.451	36	-117.988
7	-120.817	22	-119.354	37	-117.89
8	-120.72	23	-119.256	38	-117.793
9	-120.622	24	-119.159	39	-117.695
10	-120.524	25	-119.061	40	-117.598
11	-120.427	26	-118.963	41	-117.5
12	-120.329	27	-118.866	42	-117.402
13	-120.232	28	-118.768	43	-117.305
14	-120.134	29	-118.671	44	-117.207

Table A-3. SSI CCD Fine Temperature Translation Table-Continued

Temperature Value	Temperature Translation	Temperature Value	Temperature Translation	Temperature Value	Temperature Translation
45	-117.11	71	-114.573	97	-112.037
46	-117.012	72	-114.476	98	-111.939
47	-116.915	73	-114.378	99	-111.841
48	-116.817	74	-114.28	100	-111.744
49	-116.72	75	-114.183	101	-111.646
50	-116.622	76	-114.085	102	-111.549
51	-116.524	77	-113.988	103	-111.451
52	-116.427	78	-113.89	104	-111.354
53	-116.329	79	-113.793	105	-111.256
54	-116.232	80	-113.695	106	-111.159
55	-116.134	81	-113.598	107	-111.061
56	-116.037	82	-113.5	108	-110.963
57	-115.939	83	-113.402	109	-110.866
58	-115.841	84	-113.305	100	-110.768
59	-115.744	85	-113.207	111	-110.671
60	-115.646	86	-113.11	112	-110.573
61	-115.549	87	-113.012	113	-110.476
62	-115.451	88	-112.915	114	-110.378
63	-115.354	89	-112.817	115	-110.28
64	-115.256	90	-112.72	116	-110.183
65	-115.159	91	-112.622	117	-110.085
66	-115.061	92	-112.524	118	-109.988
67	-114.963	93	-112.427	119	-109.89
68	-114.866	94	-112.329	120	-109.793
69	-114.768	95	-112.232	121	-109.695
70	-114.671	96	-112.134	122	-109.598

Table A-3. SSI CCD Fine Temperature Translation Table-Continued

Temperature Value	Temperature Translation	Temperature Value	Temperature Translation	Temperature Value	Temperature Translation
123	-109.5	149	-106.963	175	-104.427
124	-109.402	150	-106.866	176	-104.329
125	-109.305	151	-106.768	177	-104.232
126	-109.207	152	-106.671	178	-104.134
127	-109.11	153	-106.573	179	-104.037
128	-109.012	154	-106.476	180	-103.939
129	-108.915	155	-106.378	181	-103.841
130	-108.817	156	-106.28	182	-103.744
131	-108.72	157	-106.183	183	-103.676
132	-108.622	158	-106.085	184	-103.549
133	-108.524	159	-105.988	185	-103.451
134	-108.427	160	-105.89	186	-103.354
135	-108.329	161	-105.793	187	-103.256
136	-108.232	162	-105.695	188	-103.159
137	-108.134	163	-105.598	189	-103.061
138	-108.037	164	-105.5	190	-102.963
139	-107.939	165	-105.402	191	-102.866
140	-107.841	166	-105.305	192	-102.768
141	-107.744	167	-105.207	193	-102.671
142	-107.646	168	-105.11	194	-102.573
143	-107.549	169	-105.012	195	-102.476
144	-107.451	170	-104.915	196	-102.378
145	-107.354	171	-104.817	197	-102.28
146	-107.256	172	-104.72	198	-102.183
147	-107.159	173	-104.622	199	-102.085
148	-107.061	174	-104.524	200	-101.988

Table A-3. SSI CCD Fine Temperature Translation Table-Continued

Temperature Value	Temperature Translation	Temperature Value	Temperature Translation	Temperature Value	Temperature Translation
201	-101.89	220	-100.037	239	-98.1829
202	-101.793	221	-99.939	240	-98.0854
203	-101.695	222	-99.8415	241	-97.9878
204	-101.598	223	-99.7439	242	-97.8902
205	-101.5	224	-99.6463	243	-97.7927
206	-101.402	225	-99.5488	244	-97.6951
207	-101.305	226	-99.4512	245	-97.5976
208	-101.207	227	-99.3537	246	-97.5
209	-101.11	228	-99.2561	247	-97.4024
210	-101.012	229	-99.1585	248	-97.3049
211	-100.915	230	-99.061	249	-97.2073
212	-100.817	231	-98.9634	250	-97.1098
213	-100.72	232	-98.8659	251	-97.0
214	-100.622	233	-98.7683	252	-96.9
215	-100.524	234	-98.6707	253	-96.8
216	-100.427	235	-98.5732	254	-96.7
217	-100.329	236	-98.4756	255	-96.6
218	-100.232	237	-98.378		
219	-100.134	238	-98.2805		

Table A-4. SSI CCD Course Temperature Translation Table in degrees Celsius

Temperature Value	Temperature Translation	Temperature Value	Temperature Translation	Temperature Value	Temperature Translation
0	-152	26	-130.951	52	-109.903
1	-151.19	27	-130.142	53	-109.093
2	-150.381	28	-129.332	54	-108.283
3	-149.571	29	-128.523	55	-107.474
4	-148.762	30	-127.713	56	-106.664
5	-147.952	31	-126.903	57	-105.855
6	-147.143	32	-126.094	58	-105.045
7	-146.333	33	-125.284	59	-104.236
8	-145.523	34	-124.475	60	-103.426
9	-144.714	35	-123.665	61	-102.617
10	-143.904	36	-122.856	62	-101.807
11	-143.095	37	-122.046	63	-100.997
12	-142.285	38	-121.237	64	-100.188
13	-141.476	39	-120.427	65	-99.3783
14	-140.666	40	-119.617	66	-98.5687
15	-139.857	41	-118.808	67	-97.7591
16	-139.047	42	-117.998	68	-96.9496
17	-138.237	43	-117.189	69	-96.14
18	-137.428	44	-116.379	70	-95.3304
19	-136.618	45	-115.57	71	-94.5209
20	-135.809	46	-114.76	72	-93.7113
21	-134.999	47	-113.95	73	-92.9017
22	-134.19	48	-113.141	74	-92.0922
23	-133.38	49	-112.331	75	-91.2826
24	-132.57	50	-111.522	76	-90.473
25	-131.761	51	-110.712	77	-89.6635

Table A-4. SSI CCD Course Temperature Translation Table- Continued

Temperature Value	Temperature Translation	Temperature Value	Temperature Translation	Temperature Value	Temperature Translation
78	-88.8539	104	-67.8052	130	-46.7565
79	-88.0443	105	-66.9957	131	-45.947
80	-87.2348	106	-66.1861	132	-45.1374
81	-86.4252	107	-65.3765	133	-44.3278
82	-85.6157	108	-64.567	134	-43.5183
83	-84.8061	109	-63.7574	135	-42.7087
84	-83.9965	100	-62.9478	136	-41.8991
85	-83.187	111	-62.1383	137	-41.0896
86	-82.3774	112	-61.3287	138	-40.28
87	-81.5678	113	-60.5191	139	-39.4704
88	-80.7583	114	-59.7096	140	-38.6609
89	-79.9487	115	-58.9	141	-37.8513
90	-79.1391	116	-58.0904	142	-37.0417
91	-78.3296	117	-57.2809	143	-36.2322
92	-77.52	118	-56.4713	144	-35.4226
93	-76.7104	119	-55.6617	145	-34.613
94	-75.9009	120	-54.8522	146	-33.8035
95	-75.0913	121	-54.0426	147	-32.9939
96	-74.2817	122	-53.233	148	-32.1843
97	-73.4722	123	-52.4235	149	-31.3748
98	-72.6626	124	-51.6139	150	-30.5652
99	-71.853	125	-50.8043	151	-29.7557
100	-71.0435	126	-49.9948	152	-28.9461
101	-70.2339	127	-49.1852	153	-28.1365
102	-69.4243	128	-48.3757	154	-27.327
103	-68.6148	129	-47.5661	155	-26.5174

Table A-4. SSI CCD Course Temperature Translation Table- Continued

Temperature Value	Temperature Translation	Temperature Value	Temperature Translation	Temperature Value	Temperature Translation
156	-25.7078	182	-4.65913	208	16.3896
157	-24.8983	183	-3.84957	209	17.1991
158	-24.0887	184	-3.04	210	18.0087
159	-23.2791	185	-2.23043	211	18.8183
160	-22.4696	186	-1.42087	212	19.6278
161	-21.66	187	-0.611304	213	20.4374
162	-20.8504	188	0.198261	214	21.247
163	-20.0409	189	1.00783	215	22.0565
164	-19.2313	190	1.81739	216	22.8661
165	-18.4217	191	2.62696	217	23.6757
166	-17.6122	192	3.43652	218	24.4852
167	-16.8026	193	4.24609	219	25.2948
168	-15.993	194	5.05565	220	26.1043
169	-15.1835	195	5.86522	221	26.9139
170	-14.3739	196	6.67478	222	27.7235
171	-13.5643	197	7.48435	223	28.533
172	-12.7548	198	8.29391	224	29.3426
173	-11.9452	199	9.10348	225	30.1522
174	-11.1357	200	9.91304	226	30.9617
175	-10.3261	201	10.7226	227	31.7713
176	-9.51652	202	11.5322	228	32.5809
177	-8.70696	203	12.3417	229	33.3904
178	-7.89739	204	13.1513	230	34.2
179	-7.08783	205	13.9609	231	35.0096
180	-6.27826	206	14.7704	232	35.8191
181	-5.4687	207	15.58	233	36.6287

Table A-4. SSI CCD Course Temperature Translation Table- Continued

Temperature Value	Temperature Translation	Temperature Value	Temperature Translation	Temperature Value	Temperature Translation
234	37.4383	242	43.9148	250	50.3913
235	38.2478	243	44.7243	251	51.2
236	39.0574	244	45.5339	252	52.0
237	39.867	245	46.3435	253	52.8
238	40.6765	246	47.153	254	53.6
239	41.4861	246	47.9626	255	54.4
240	42.2957	248	48.7722		
241	43.1052	249	49.5817		

Appendix B

PICTURE NUMBER

The structure of the picture number field in the REDR header is a seven ASCII character string, of the form "XXYZZZZ"

where:

XX = Orbit. 00 is from 5 days before JOI to the periapse following JOI. Subsequent orbits increment normally. Approach images are separated into logical phases and designated A1, A2, A3 or similar. Cruise images are separated into calender periods of 3, 6, or 12 months and designated C1, C2,

Y = Target Body.

where:

J	Jupiter
A	Amalthea
I	Io
E	Europa
G	Ganymede
C	Callisto
S	Minor satellites
R	Ring
H	Star
L	Moon
W	Earth
V	Venus
U	Ida
P	Gaspra
N	Non-Science (Calibration)
etc.	etc.

ZZZZ = Picture Count. This count will be generated in the sequence generation process and will be incremented separately for each target body in each orbit. It will jump a few counts for each profile activity initialization to simplify subsequent sequence changes.

Appendix C

PROFILE ACTIVITY

Structure of the ACTIVITY field in the REDR header is a 20 ASCII character string of the form "NNTIOOOOOOMM#SSSXXXP" obtained from the operative SSI Profile Activity.

where:

NN	Orbit Number
T	Scan platform target body initial (if applicable).
I	Instrument
OOOOOO	Orbit planning guide objective mnemonic.
MM	Sequential OAPEL number for each value of NNTIOOOOOO.
#	Multiple observation flag symbol (- or *).
SSS	PA set number
XXXX	Remote sensing code

Appendix D

MIPS PHYSICAL RECORDING WORDS

Table D-1 below describes the structure of the MIPS physical recording words. All fields are in ASCII.

Table D-1. MIPS Physical Recording Words

Bytes	Item	Description
8	OS	Operating system version number "Vxxx.yyy". Eight ASCII characters
8	CPU	CPU name, "CODA1", CODA2", etc.
11	DATE	Generation date "DD-MMM-YYYY"
32	Filler	No description

Appendix E
BAD-DATA VALUE HEADER

This section defines the format and contents of the binary labels used to store SSI bad-data values.

There are two parts to the binary label: the binary header, and the binary prefix. The binary header precedes the image data (as do the ASCII labels) and contains information which pertain to the entire image. The binary prefix precedes each image line and contains information specific to each line. Binary labels are created by adding the U_NLB and U_NBB keywords to the XVOPEN call. Binary labels are accessed from a file already containing them by adding the CONDITION, BINARY keywords to the XVOPEN call. Note that since VICAR programs do not normally include these keywords in their XVOPEN calls, binary labels are usually ignored and disappear when new versions of an image are created. Binary labels were originally designed to support the generation of Voyager EDRs. The binary labels are written in VAX compatible (least significant byte first) format.

The binary header consists of an arbitrary number of records. The first record contains ancillary telemetry information. The remaining binary header records contain bad-data information,stored as a sequence of "objects" in 16-bit integer format for EDRs and 8-bit integers for REDRs. The following types of objects have been defined:

Object Type	Code	Format
Single Pixels	1	Line, sample
Line segments	2	line, starting-sample, number-of-samples
Column segments	3	sample, starting-line, number-of-lines

These objects are used to encode the following bad-data types:

Bad Data Type	Record ID	Created By
Data dropout	3	GALSOS or BADLABELS
Saturated pixels	4	GALSOS or BADLABELS
Low-full-well pixels	5	GALSOS or GLL BLEMCOR
Single-pixel spikes	6	ADESPIKE
Reed-Solomon overflow	7	GALSOS or BADLABELS

Single-pixel spikes are stored as single pixels, data drop-outs, saturated pixels, and Reed-Solomon overflow records are stored as line segments, and low-full-well pixels as column segments.

Note: For compressed image data, all pixels to the right of the first bit error will be corrupted. Since it is not possible to determine where this bit error occurs, the entire line is flagged as bad.

Each record will be in 16-bit integer data format and will contain only one type of object. The first three integers of each record contain the record ID, object code (CODE), and the number of objects in the record (N), respectively. The remainder of the record will contain a sequence of N objects. The maximum number of objects which can be stored on a record is a function of the EDR record length and object code. Full-frame and summation-mode EDRs have record lengths of 1800 bytes and 1000 bytes, respectively:

Code	Full-Frame Max. Objects	Summation-Mode Max. Objects
1	448	248
2	299	165
3	299	165

If more objects of a certain type exist, they are written on subsequent records. The records are not necessarily written in any particular order, although they must all precede the image line records.

Example 1: Let a binary header record contain the sequence of integers 6,1,3,211,104,322,111,401,233. The record contains single-pixel spikes (6) encoded as single-pixels (1). There are three objects encoded as line-sample coordinates: (211,104), (322,111), and (401,233).

Example 2: Let a binary header record contain the sequence of integers 4,2,2,110,216,105,789,420,381. The record contains saturated pixels (4) encoded as line segments (2). There are two objects. The first line segment is on line 110 and from sample 216 to 320. The second line segment is on line 789 and from sample 420 to 800.

Example 3: Let a binary header record contain the sequence of integers 5,3,2,299,710,91,521,72,729. The record contains low-full-well pixels (5) encoded as column segments (3). There are two objects. The first column segment is on sample 299 and from lines 710 to 800. The second column segment is on sample 521 and from lines 72 to 800.

The following is an example of a program which reads an image containing bad-data information, does something with this information, and outputs an image which does not contain any binary labels (all subroutines other than XV routines are fictitious):

```
COMMON / HDRREC / RECORDID,CODE,NOBJECTS,SPIX(2,448)!Binary
header record
```

```
INTEGER*2 RECORDID,CODE,NOBJECTS,SPIX
INTEGER*2 BUF(900),LSEG(3,299),CSEG(3,299)
EQUIVALENCE (BUF,RECORDID),(SPIX,LSEG,CSEG)

COMMON/IMGREC/LHDR(100),PIXELS(800) !Image line record
INTEGER*2 LHDR,PIXELS,LBUF(900)
EQUIVALENCE (LBUF,LHDR)

CALL XVUNIT(IUNIT,'INP',1,IND)
CALL XVOPEN(IUNIT,IND,'COND','BINARY')
CALL XVGET(IUNIT,IND,'NL',NL,'NS',NS,'NLB',NLB)

DO L=2,NLB !Loop through the binary header records
CALL XVREAD(IUNIT,BUF,IND,'LINE',L)
IF (CODE.EQ.1) CALL SINGLE_PIXEL(SPIX,RECORDID,NOBJECTS)
IF (CODE.EQ.2) CALL LINE_SEGMENT(LSEG,RECORDID,NOBJECTS)
IF (CODE.EQ.3) CALL COLUMN_SEGMENT(CSEG,RECORDID,NOBJECTS)
ENDDO

CALL XVUNIT(OUNIT,'OUT',1,IND)
CALL XVOPEN(OUNIT,IND,'OP','WRITE')

DO L=1,NL!Loop through each image line record
CALL XVREAD(IUNIT,LBUF,IND)!Read a line record
CALL PROCESS_LINE(PIXELS,NS)!Process the image line
CALL XVWRIT(OUNIT,PIXELS,IND)  !Write the image line
ENDDO
```

Appendix F
PHASE I EDR STRUCTURE

The basic structure of the Phase II EDR/REDR/UDR is identical to the Phase I structure. The only differences deal with the field content. In some instances the fields are still available but the meaning has changed slightly. In other cases the field is not applicable, or there is a new field entirely. For compatibility, the original Phase I field structures and definitions are described in this appendix.

F.1 Phase 1 Telemetry Header Record

Table F-1. Phase 1 Telemetry Header

Byte	Bit	Item	Description	Valid For		
				UDR	REDR	EDR
0		Record ID	ALWAYS = 0 for this header.	•	•	•
1		File Number	Binary count reset to zero for the first file on each physical product and incremented by one for each header record written. Valid for tape interface only.		•	•
2 - 11		Project	Project name, 10 ASCII characters = "GALILEO".	•	•	•
12 - 17		Instrument	Instrument name, 6 ASCII characters = "SSI".	•	•	•
18 - 19		Phys. Seq.	Physical sequence, binary count reset to zero for first record written on the physical product and incremented by one for each subsequent write (includes VICAR label records). Valid for tape interface only.		•	•

Table F-1. Phase 1 Telemetry Header -Continued

Byte	Bit	Item	Description	Valid For		
				UDR	REDR	EDR
20 - 21		Log. Seq.	Logical sequence, binary count reset to zero for the first record of a file (header record) and incremented by one for each record in the file. Always = 0 for this record. Note For UDRs, REDRs, and summation-mode EDRs, this header record spans two physical records.	•	•	•
		First ERT	Earth Received Time (UTC) of the first record containing valid data.	•	•	•
22 - 23		YEAR	Year			
24 - 25		DAY	Day of year			
26		HOUR	Hour of day			
27		MIN	Minute of hour			
28		SEC	Second of minute			
29 - 30		MSEC	Millisecond of second			
		Last ERT	Earth Received Time (UTC) of the last record containing valid data.	•	•	•
31 - 32		YEAR	Year			
33 - 34		DAY	Day of year			
35		HOUR	Hour of day			
36		MIN	Minute of hour			
37		SEC	Second of minute			
38 - 39		MSEC	Millisecond of second			
		First SCLK	Spacecraft Clock of the first record in the file containing valid data.	•	•	•
40 - 43		RIM				
44		MOD91				
45		MOD10				
46		MOD8				
		Last SCLK	Spacecraft Clock of the last record in the file containing valid data.	•	•	•
47 - 50		RIM				
51		MOD91				
52		MOD10				
53		MOD8				

Table F-1. Phase 1 Telemetry Header - Continued

Byte	Bit	Item	Description	Valid For		
				UDR	REDR	EDR
		SCET	Spacecraft Event Time (UTC) at the middle of shutter-open period.	•	•	•
54 - 55		YEAR	Year			
56 - 57		DAY	Day of year			
58		HOUR	Hour of day			
59		MIN	Minute of hour			
60		SEC	Second of minute			
61 - 62		MSEC	Millisecond of minute			
63- 121		MIPS PRD	MIPS Physical Recording Data of the first record of the file (ASCII). See Section F.3.		•	•
122 - 123		Format ID	The correct format ID for this image as derived from line records by a voting algorithm.	•	•	•
124 - 127		Sync Errors	The sum of all bad bits in the sync code contained in all the line records in the file which contain valid data.	•	•	•
128		BOOM flag	Boom obscuration flag. 0: Boom present 1: Boom may be present 2: Boom not present	•	•	•
129 - 130		Missing Lines	Number of line records in the file with no valid pixels in the raw version of the image.	•	•	•
131 - 132		Partial Lines	Total number of line records in the file which contain some valid pixels.	•	•	•
133 - 134		Unreadables	Total number of records from the IDR and/or SDR which were unreadable and which fell within a time period for which data was required for this file. Note For SDR input this does not necessarily result in data loss.	•	•	•

Table F-1. Phase 1 Telemetry Header - Continued

Byte	Bit	Item	Description	Valid For UDR	REDR	EDR
135 - 136		Seq. Breaks	Total number of IDR/SDR gaps (indicated by a discontinuity in the logical record numbers) which occurred during the time data was required for this file.	•	•	•
137 - 138		Source/Input	Logical sum (result of successive INCLUSIVE OR operations) of all source/input line records with valid data.	•	•	•
139 - 140		WBDLs	Total number of minor frames in this file which were derived from WBDL input.	•	•	•
141 - 142		SDRs	Total number of minor frames in this file which were derived from SDR input.	•	•	•
143 - 144		SFDUs	Total number of minor frames in this file which were derived from SFDU input.	•	•	•
145 - 151		Pic. No.	Picture number. Seven-ASCII-character "XXYZZZZ" (See Appendix C).	•	•	•
152 - 163		SSI LRS	First SSI LRS packet during this image.	•	•	•
164 - 165		Flags		•	•	•
	0	Compression	Compression 0=data not compressed 1=data compressed			
	1	Comp Mode	Compression Mode (Valid only if compression flag is set) 0= rate control 1= info preserv			
	2	Exposure	Exposure Mode 0= normal 1= extended			

Table F-1. Phase 1 Telemetry Header - Continued

Byte	Bit	Item	Description	Valid For UDR	REDR	EDR
164 - 165 (con't)	3	Flood	Light Flood Status 0= off 1= on	•	•	•
	4	Blemish	Blemish Protection 0= off 1= on			
	5	Clock	Parallel Clock State 0= normal 1= inverted			
	6 - 15	Reserved				
166 - 171		Mean DN	Mean DN level of all valid pixels. Real number represented as ASCII string in the form "123.12".	•	•	•
172 - 177		Truncated bits	Mean number of truncated bits / pixel. Real number represented as ASCII string in the form "12.345".	•	•	•
178 - 183		Truncated pixel	Mean number of truncated pixels / line. Real number represented as ASCII string in the form "123.12".	•	•	•
184 - 195		I/F	Mean I/F level. Real number represented as ASCII string in the from "123.12".			•
196 - 202		Entropy Average	Entropy level for the whole picture (bits / pixel). Real number represented as ASCII string in the form "12.1234".		•	•
203 - 307		Entropies	Entropy level for 15 lines. First line is 50, and incremented by 50 to line 750. 15 real numbers represented as ASCII strings in the form "12.1234".		•	•

Table F-1. Phase 1 Telemetry Header - Continued

Byte	Bit	Item	Description	Valid For UDR	REDR	EDR
308 - 331		Pointing	Scan platform coordinates at direction middle of shutter-open period in J2000. Three numbers for right ascension, declination and twist angles. Three real numbers represented as ASCII strings in the form of "1234.123".		•	•
332 - 347		Scale Factors	Radiometric calibration scale factors. Two real numbers in the form of "123.1234". First number is reflectance/DN, the second is the radiance/DN scale factor.			•
348 - 379		Slope-File	Radiometric file used for systematic processing. 32 ASCII characters.			•
380 - 411		Offset-File	Radiometric file (dark current) used for systematic processing. 32 ASCII characters.			•
412 - 431		Activity	20 ASCII characters of the form: "NNTIOOOOOOMM#SSSXXXX (See Appendix C).	•	•	•
432		Filler		•	•	•
433		Filter	Filter position (See Appendix A).	•	•	•
434		Exposure	Exposure number (See Appendix A).	•	•	•
435		Imaging Mode	0: 60-2/3 sec. (Low) 1: 8-2/3 sec. (High) 2: 30-1/3 sec. (Medium) 3: 2-1/3 sec. (Radiation)	•	•	•
436		Camera gain state	0: Gain 1 400K 1: Gain 2 100K 2: Gain 3 40K 3: Gain 4 10K	•	•	•
437 - 440		Range	Target's range to sun in kilometers.		•	•

Table F-1. Phase 1 Telemetry Header - Continued

Byte	Bit	Item	Description	Valid For UDR	REDR	EDR
441		Format	Telemetry format number (See Appendix B).	•	•	•
442 - 443		Version	MIPS catalog version number, reserved for MIPS use.	•	•	•
444 - 447 448 449 450		Starting SCLK RIM MOD91 MOD10 MOD8	Spacecraft Clock of the start of image. This clock refers to the start of the SSI frame cycle.	•	•	•
451 - 454 455 456 457		Ending SCLK RIM MOD91 MOD10 MOD8	Spacecraft Clock at the end of image. This clock refers to the end of the SSI frame cycle.	•	•	•
458 - 775		Reserved		•	•	•
776 -1799		Histogram	256 32-bit binary valued histogram of the pixels for this file, including fill data.	•	•	•

F.2 Phase 1 Image Line Record

Table F-2. Phase 1 Image Line Record

Byte	Bit	Item	Description	Valid For		
				UDR	REDR	EDR
0		Record ID	Always = 2 for line records.	•	•	•
1		File Number	Binary count reset to zero for the first file on physical product and incremented by one for each header record written. Always zero on disk.		•	•
2 - 3		Phys. Seq.	Physical sequence, binary count reset to zero for the first record written on a given physical product and incremented by one for each subsequent write.		•	•
4 - 5		Log. Seq.	Logical sequence, binary count reset to zero for the first record of a file (header record) and incremented by one for each record in the file.	•	•	•
		ERT	Earth Received Time (UTC) of the first bit of the telemetry frame which contained the first pixel of this line as interpolated from the ERT in the GCF block containing this bit. (The first bit of the frame is the first bit of the sync code).	•	•	•
6 - 7		YEAR	Year			
8 - 9		DAY	Day of year			
10		HOUR	Hour of day			
11		MIN	Minute of hour			
12		SEC	Second of minute			
13 - 14		MSEC	Millisecond of second			

Table F-2. Phase 1 Image Line Record - Continued

Byte	Bit	Item	Description	Valid For		
				UDR	REDR	EDR
15 - 18 19 20 21		SCLK RIM MOD91 MOD10 MOD8	SCLK readout of the 1st minor frame of this line.	•	•	•
22- 80		MIPS Physical Recording Words	59 ASCII characters which define the recording and validation devices, software version and CPU used to write this record and the data on which it was recorded. A detailed explanation of this field is provided in F.3.			•
81 - 82		Format ID	16-bit corrected telemetry format ID from the minor frame of this line.	•	•	•
83		Input Type	Decimal value: 0: S/C Flight Data MOS 1: PTM Data 2: Ext. Simulation 3: S/C Flight Data Test 4: Internal Simulation 5-255: Not used	•	•	•
84	 0 1 2 3 4 5 6 7	Input Source SFDU data WBDL data SDR tape IDR tape EDR Realtime APB Not used	=1 if present in record.	•	•	•
85		Allowed Sync Code Errors	The number of sync code errors allowed in frame synching.	•	•	•
86		Sync Code Err	The total number of bits in the sync code of the minor frame for this line which deviate from the standard sync code.	•	•	•

Table F-2. Phase 1 Image Line Record - Continued

Byte	Bit	Item	Description	Valid For UDR	REDR	EDR
87 - 98		SSI LRS	SSI LRS packet. Present only for the first line of each MOD91 count. Otherwise zero.	•	•	•
99 - 100		Last Pixel ID	Element position (1-800) of the last pixel in this line not artificially set to zeroes or interpolated by MIPS processing. Set to zero for missing lines.	•	•	•
101 - 102	0 - 13	Sync error	Total number of bits in the 64-bit frame id which deviate from the "correct" bits for that frame.			
		Sync Status	Sync status for each minor frame: 00= fully synched (leading and trailing frame ID) 01= partial sync (leading but no trailing frame ID) 11= unsynched	•	•	•
103- 106		Truncation	Number of truncated bits per block due to data compression. 2 bits/block, 13 blocks/line. Each contains 64 pixels except last one which contain 32 pixels.	•	•	•
	0 - 1	BLOCK 0				
	2 - 3	BLOCK 1				
	4 - 5	BLOCK 2				
	....	....				
	24 - 25	BLOCK 12				
	26 - 31	Filler				
107 - 108		Truncated	Total number of pixels truncated at end of line due to data compression.	•	•	•
109 - 110		Version	Catalog version for identical images.		•	•
111 - 112		SNR	GCF symbol signal to noise ratio	•	•	•
113		DSN ID	As defined in GLL-820-13/OPS-6-8.	•	•	•
114 - 115		Line Number	Image line number, 1-800.	•	•	•
116		R/S Overflow	Reed/Solomon overflow error flag. 1 = Overflow occurred	•	•	•
117 - 199			Reserved	•	•	•

Table F-2. Phase 1 Image Line Record - Continued

Byte	Bit	Item	Description	Valid For UDR	REDR	EDR
200 - 599		Pixel Data	400 8-bit unsigned pixel values (summation mode only).	•	•	
600 - 999 or 200 - 999		Filler Pixel Data	Set to zero (summation mode only). 800 8-bit unsigned pixel values.	•	•	
200 - 999 or		Pixel Data	400 16-bit signed pixel values, radiometrically corrected (summation mode only).			•
200 - 1799		Pixel Data	800 16-bit signed pixel values, radiometrically corrected.			•

F.3 MIPS Physical Recording WORDS

Table F-3 below describes the structure of the MIPS physical recording words. All fields are in ASCII.

Table F-3. MIPS Physical Recording Words

Bytes	Item	Description
8	OS	Operating system version number "Vxxx.yyy". Eight ASCII characters
6	G_TYPE	Generating device "_MTAO:", etc.
2	G_ID	Generating device "A0", "A1", etc.
8	G_VOL	Tape Label, ASCII
8		Reserved
2	V_ID	Validation ID, "A0", "A1", etc.
8	CPU	CPU name, "MIPL1", MIPL2", etc.
11	DATE	Generation date "DD-MMM-YYYY"

F.4 Phase 1 Telemetry Format ID

Table F-4 below lists the telemetry formats and their Phase 1 downlink data rates. Entries in boldface type indicate SSI data telemetry formats.

Table F-4. Phase 1 Telemetry Formats

Telemetry Format Number	Mnemonic	Downlink Data Rate	Telemetry Format Number	Mnemonic	Downlink Data Rate
0	LPB	7.68 Kbps	16	HPW	115.2 Kbps
1	EHR	1.2 K bps	17	**HIM**	115.2 Kbps
2	BPB	16.8 Kbps	18	**HCM**	115.2 Kbps
3	MPB	28.8 Kbps	19	LRS	7.68 Kbps
4	XPW	67.2 Kbps	20	MPW	28.8 Kbps
5	**XCM**	67.2 Kbps	21	PW8	806.4 Kbps
6	**XED**	67.2 Kbps	22	**IM8**	806.4 Kbps
7	XPB	80.64 Kbps	23	**AI8**	806.4 Kbps
8	XPN	80.64 Kbps	24	PW4	403.2 Kbps
9	XRW	115.2 Kbps	25	**IM4**	403.2 Kbps
10	HPB	134.4 Kbps	26	---	---
11	HPJ	134.4 Kbps	27	---	---
12	HPW	134.4 Kbps	28	---	---
13	**HCJ**	134.4 Kbps	29	ESS	40 bps
14	MPP	28.8 Kbps	30	ELS	10 bps
15	MPR	28.8 Kbps			

Appendix G
SSI GROUND CALIBRATION LABEL

The VICAR label has additional differences between Phase I and Phase II. For flight labels, the only difference is the addition of keyword/value pairs which relate to the new telemetry structure. Even for Phase I files, there was a distinction between Flight and Ground Calibration images. The Ground Calibration images have not been modified and retain their original format. That format is described in this appendix.

SSI ground calibration label: The ground-calibration label is generated by program VGLLOG, which reads tapes generated by the Galileo Sensor Test Set (STS) and converts the file to standard VICAR image format.

```
LAB01=GLL/SSI S/N=F29 LEVEL=SUBSYSTEM  10:59:15  MAY  19, 1985 FRAME61          C
LAB02=TEST=LIGHT TRANSFER C TARGET=TUNG L SOURCE=LC 70VR  FR.RATE=8 2/3  C
LAB03=EXP=0       MSEC(***) GAIN=1(400K) PNI=    BPM=OFF  FILTER=0(CLR)      C
LAB04=BARC=OUT(RAT) SUM=OFF     EXPAND=OFF  IN=GL0353/61 OUT=GC1109/61       C
LAB05= CCDTF=119  CCDTC=50    INN=**  +50VDC=**  +15VDC=**                    C
LAB06=-15VDC=**  +10VDC=**  +5VDC=**   -5VDC=**  CCDHEV=**  BLSCV=**          C
LAB07=ADCRFV=**    VDD=**   VREF=**    VCC=**    VEF=**   ROPT=**             C
LAB08=DESCRIPTOR=DARK FRAME, 8 C, 8 2/3 SEC, 100K, INVERTED                   L
NLABS=8
```

The ground calibration label follows a convention used to support old label formats originally used on the IBM (before 1984). The project labels are stored as label items LAB01, LAB02, LAB03, etc. Each LABXX item consists of a 72-character ASCII strings. The 71st character is a label type flag used by some programs (e.g. MASKV) to control which labels are displayed or printed. The last character in each string is a 'C' (for continue) or 'L' (for last). However, note that the additional label item NLABS should be used to indicate how many project labels are present.

LABEL ITEM	DESCRIPTION
S/N=F29	CCD identifier (F29=flight unit)
LEVEL=SUBSYSTEM	Test level (component or subsystem)
FRAME61	Frame number (0-99)
TEST=LIGHT TRANSFER	Test name (16 characters)
TARGET=TUNG	Target name (6 characters)
SOURCE=LC 70VR	Light source/veeder-root
FR.RATE=60 2/3	Frame rate (sec)
EXP=51200.00 MSEC(EXT)	Exposure time (msec), extended or normal
GAIN=1(400K)	Gain state (1-4)
PNI=NOR	Parallel clock (INV=inverted, NOR=normal)
BPM=OFF	Blem-protect (ON or OFF)
FILTER=3(VIO)	Filter position: 0(CLR), 1(GRN), 2(RED), 3(VLT), 4(756), 5(968), 6(727), 7(889)
BARC=OUT(RAT)	Data compressor ON or OUT, (RAT=rate control,IP=information preserving, OFF=compressor off)

SUM=OFF	Summation-mode (ON or OFF)
EXPAND=OFF	(obsolete field)
IN=GL0353/61	Input STS tape/filenumber
OUT=GC1109/61	Output VICAR tape/filenumber
CCDTF=119	CCD faceplate temperature
CCDTC=50	CCD camera temperature
DESCRIPTOR=...	Frame descriptor