Ray Arvidson
TWT

PROJECT MAGELLAN
SOFTWARE INTERFACE SPECIFICATION
Cover Sheet

NUMBER: SES-112
REVISION: A
DATE: 09-01-89

SIS NAME: SCLK/SCET Coefficient File

DOMAIN:

System	Subsystem	Program Description	Program	Make/Use
GDS	SES	N/A	(EDITOR)	Make
GDS	SGS	Sequence Generation	SEQGEN	Use
		Sequence Translation	SEQTRAN	Use
GDS	CMD	MCCC Multimission Command	Interpreter	Use
		Command Planning		Use
GDS	TPS	Telemetry Input System	TIS	Use
		Magellan High Rate	MHR	Use
GDS	IDPS	(ON EDR)	RCBR	Use
GDS	SDPS	(ON EDR)	Control	Use
GDS	RES	(ON EDR)	RAS	Use
GDS	Science	(ON EDR)	EDRs	Use

Computer System(s): IBM PC, UNISYS, MODCOMP, SUN (TPS)

PURPOSE OF INTERFACE: This file provides the information necessary to derive the relationship between the onboard Spacecraft CDS Clock (SCLK) and Spacecraft Event Time (SCET) in UTC.

INTERFACE MEDIUM:
Disk File: [X]
Magnetic Tape: [X] Tracks: 9, Dens: 800 or 1600 bpi, Parity: Odd, DataCode: ASCII

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630-610

PROJECT MAGELLAN

SOFTWARE INTERFACE SPECIFICATION

SCLK/SCET Coefficient File

SIS SES-112

September 1, 1989

ABSTRACT: This SIS describes the detailed format, contents, medium and access methods for the Magellan SCLK/SCET Coefficient File. This file is maintained by the SCT which provides the coefficient information necessary to determine the relationship between the Magellan Spacecraft CDS Clock (SCLK) and Spacecraft Event Time (SCET).

CHANGE CONTROL: The MGN change control procedures specified in MGN 630-82 apply to this document.

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DOCUMENT CHANGE LOG

Status	Date	Affected Portions
Original	05/12/87	All
Revision A	09/01/89	All SCR 145 only editorial changes

LIST OF TBD ITEMS

Page	Resolution Date	Item

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SECTION 1

GENERAL DESCRIPTION

1.1 CONTENT OVERVIEW

This Software Interface Specification (SIS) provides the content of the SCLK/SCET Coefficient File required by the Sequence Generation Subsystem (SGS), the Command Subsystem and the MGN Telemetry Processing Subsystem (TPS). This file allows correlation of spacecraft clock time to spacecraft event time.

A new SCLK/SCET Coefficient file will be generated and a file release form will be delivered to all affected teams (SGS and TPS) each time a new coefficient data set is added to the file. The file delivered to the two subsystems will be identical with the exception that the file delivered to the TPS will contain a Standard Formatted Data Unit (SFDU) header and trailer for file identification.

1.2 SCOPE

This specification covers the detailed format of the SCLK/SCET Coefficient File for all phases of the Magellan mission from Launch through to the End of Mission. The format of the file is also provided for any users who require this knowledge for development of their software prior to Launch or during System Test.

1.3 APPLICABLE DOCUMENTS

MGN-MOS-4-240	Spacecraft Engineering Subsystem Functional Requirements
UP 4144.31	Sperry Unisys 1100 Series Executive Vol 3, Section 11.2.3 System Data Formats

1.4 SUBSYSTEM SITING

1.4.1 Interface Location, Medium

The SGS SCLK/SCET Coefficient File shall reside on the Information Processing Center (IPC) computer (UNISYS 1100/81) designated to support Magellan mission operations. The file shall be maintained as a permanently catalogued data file in the Standard Data File Format (SDFF).

The other delivery of the SCLK/SCET Coefficient file shall be a disk file and will reside on the TPS SUN designated to support Magellan Mission Operations. This file shall also be made available to the Science team for archival on the Science Experiment Data Records (EDRs).

1.4.2 Data Source, Destinations, and Transfer Method

The SCLK/SCET Coefficient File shall be generated and maintained by the SCT who shall be responsible for the content and timely delivery or release of the SCLK/SCET Coefficient File to users during mission operations.

Many users of the SCLK/SCET Coefficient File are co-hosted on the UNISYS 1100/81 and a file release method to be documented by interteam agreements shall be used to notify those users each time the file has been modified or updated. The internal form of the file on the UNISYS shall be character data.

Additional users, namely, the Command System, and the Telemetry Processing Subsystem (TPS) are hosted on computers external to the IPC. For these users, access shall be via either a magnetic tape or an SFOC provided LAN each time the file is modified or updated.

1.4.3 Generation Method and Frequency

The SCT shall be able to create, update or modify the file using any of the several text editors available on the UNISYS 1100/81 computer. The file shall be created at Launch and shall be updated and/or modified as required during mission operations up to a nominal maximum of once per day. For the TPS interface the SCLK/SCET file shall have a Standard Formatted Data Unit (SFDU) header and trailer as specified in section 4.5

1.4.4 Pertinent Relationships with other Interfaces

The file has a similar structure to the Light Time File which can be used in conjunction with the SCLK/SCET Coefficient File to derive ERT. As an ancillary operation this file will be included on the Science Experiment Data Record (EDR).

1.4.5 Labeling and Identification (Internal/External)

The external file name of the SCLK/SCET Coefficient File on the UNISYS 1100/81 shall be as follows:

VRM*SCLKSCETCOEF(n).SCLKSCET/nnnn

Where,

VRM =	UNISYS file qualifier,
SCLKSCETCOEF =	UNISYS file name,
n =	file cycle number,
SCLKSCET =	UNISYS element name, and
nnnn =	unique version number of the file.

The external file name of the SCLK/SCET Coefficient File for other (non-UNISYS) users shall be as follows:

SCLK_SCETnnnn.COF

Where,

nnnn =	unique version number of the file.

1.5 ASSUMPTIONS AND CONSTRAINTS

NONE.

SECTION 2

INTERFACE CHARACTERISTICS

2.1 HARDWARE CHARACTERISTICS AND LIMITATIONS

2.1.1 Special Equipment and Device Interfaces

Users that are remotely located from the UNISYS host must arrange for file transfer either via ILAN, LAN or other means (e.g. tape).

2.1.2 Special Setup Requirements

None identified.

2.2 VOLUME AND SIZE

The SCLK/SCET Coefficient File is a fixed-record-length (80 characters per record) file. The physical size of the file will continually grow throughout the mission as the file is updated to maintain the required accuracy between SCLK and SCET. The nominal expected growth of the file is one record per day.

2.3 INTERFACE MEDIUM CHARACTERISTICS

UNISYS Standard Data File Format (SDFF) for internal IPC users. Normal disk or tape file for all other users.

2.4 FAILURE PROTECTION, DETECTION, AND RECOVERY PROCEDURES

2.4.1 File Backup Requirements

The SCLK/SCET Coefficient File shall reside on the UNISYS 1100/81 computer as a permanently catalogued file and on a TPS SUN as a permanent disk file. The SCT will retain the original file and any backups used to generate data for this interface.

2.4.2 Security/Integrity Measures

None Planned.

2.5 END-OF-FILE (OR MEDIUM) CONVENTIONS

The SCLK/SCET Coefficient File shall contain an internal End-of-File (EOF) record as the last record in the file. The format of this record is defined in Section 4 of this SIS. In addition, the resident file on the UNISYS 1100/81 shall be terminated as specified for UNISYS SDFF files.

SECTION 3

ACCESS

3.1 PROGRAMS USING THE INTERFACE DATA

Refer to the cover page of this SIS.

3.2 SYNCHRONIZATION CONSIDERATIONS

3.2.1 Timing and Sequencing Characteristics

The SCLK/SCET Coefficient File consists of a series of record images containing linear coefficients which provide the relationship between the onboard spacecraft or CDS clock (SCLK) and spacecraft event time (SCET). The records are in ascending SCET order and cover the time period from Launch to the current GMT day in the mission. The last record in the file prior to the internal EOF record image may have an SCET earlier than the current GMT day, it normally provides the relationship between SCLK and SCET to the current GMT day within science accuracy requirements. This last set of coefficients may also be used to predict the SCLK/SCET relationship with an accuracy which is largely dependent upon the stability of the SCLK.

3.2.2 Effective Duration

The SCLK/SCET Coefficient File provides the relationship between SCLK and SCET within science accuracy requirements from Launch to the current GMT day in the mission.

3.2.3 Priority Interrupts

N/A

SECTION 4

DETAILED INTERFACE SPECIFICATIONS

4.1 STRUCTURE AND ORGANIZATION OVERVIEW

The SCLK/SCET Coefficient File consists of a header and a coefficient data section. The header section contains information concerning the identification of the project, file and spacecraft, the last date and time the file was updated, the current SCLK time period between RIM counts (referred to hereafter as rate) and information on how the coefficient data is partitioned if significant SCLK regressions have occurred. (A SCLK regression is defined as any event that may cause the S/C Clock to assume a "non-time-ascending" value. For example, a 6LDCLK command, a Power-On Reset (POR), or any other S/C related error that may halt nominal CDS flight software operation.) The header also contains annotation information which is useful in identifying the coefficient data types when the file is displayed on hard copy. The coefficient data section contains the coefficient information necessary to derive Universal Time Constant (UTC) or Ephemeris Time (ET) based SCET from SCLK or vice versa. All records in the coefficient data section have the same format and contain the effective SCLK, UTC SCET, UTC to ET correction factor (DUT) and SCLK rate. The values in each record are effective until the SCLK/SCET of the next record. The file is always in time-ascending order. The DUT factor represents the difference between Ephemeris Time and Universal Time such that DUT = SCET(ET) - SCET(UTC). The last coefficient record in the file can be used to predict the SCLK/SCET relationship into the future with reasonable accuracy as that record contains the most current SCLK rate derived from the most recently obtained SCLK/ERT correlations and accurate light time information.

4.2 SUBSTRUCTURE DEFINITION AND FORMAT

The detailed format of the SCLK/SCET Coefficient File is presented in Figure 4-1 on page 4-5 and specified in Table 4-1 on page 4-7. The following discussions show a character by character representation of the SCLK/SCET Coefficient file. All white-space contained within the file consists of ASCII blanks. Each line is also terminated by a carriage-return and a line feed (<CR><LF>). The file will be created and modified with an editor.

4.3 USAGE OF THE FILE

A brief description of how to use the file and suggested algorithms for computing SCET in both UTC and ET base and SCLK are provided below.

4.3.1 Header Processing

Enough processing of header information should be performed to insure that the correct file is being processed and the correct partition is accessed. The amount of checking, if any, is left to the discretion of the individual cognizant engineer/programmer.

The partition records define the start of each file partition in both UTC based SCET and relative file address. In order to determine which file partition to use, the approximate (or exact) user initialization SCET time must be known. The proper file partition can then be determined by finding the partition record which has an SCET less than or equal to the user initialization time while either the next partition record SCET is greater than the user initialization time or there are no more partition records. After the proper partition record is determined, the absolute partition address (record number) can be computed by the following algorithm:

1) Determine the Length of the Header - The header contains 13 standard records plus n partition records. After the partition records are processed and counted, the length of the header is 13 + n. This length can also be determined, of course, by counting all records through "$$EOH" (end of header)

2) Convert Relative to Absolute Address - The relative file address on each partition record is expressed as a sequence number corresponding to the sequence number of the first record in the file partition. These sequence numbers do <u>not</u> increase monotonically with each record from the start of the file since the header size is variable depending upon the number of partitions present. Monotonic numbering does begin with the first coefficient data record in the file and continues throughout the remainder of the file up to but not including the $$EOF record. The first coefficient data record in the file will always be sequence number 100 and all subsequent coefficient data records will increase by one (1) over the previous record. Therefore, the absolute address or record number in the file of the start of a partition can be computed as follows:

Absolute Address = Partition Address - 99 + 13 + n

Where, Absolute Address is the absolute record number from the start of the file, Partition Address is the sequence number from the partition record, 99 is the constant offset to normalize the numbering of coefficient data records, 13 is the fixed number of records in the header portion of the file, and n is the number of partitions present.

4.3.2 File Positioning

After the proper file partition has been accessed, the file can be positioned to the correct coefficient data set either by SCET or SCLK.

To position by SCET, find the coefficient data set which has an A0 coefficient less than or equal to the user requested SCET value while either the A0 coefficient of the next coefficient data set is greater than the user SCET value or there are no more coefficient data sets (next record is the $$EOF record) in the file.

To position by SCLK, the same criteria for SCET positioning are used except that the user requested SCLK value is compared against the SCLK0 coefficient of the coefficient data sets.

4.3.3 SCET/SCLK Response Calculations

Once the file has been positioned and the proper coefficient data set has been accessed, the following equations can be used to calculate SCET in either UTC or ET base and SCLK. In order to use these equations SCET, A0, SCLK and SCLK0 must be converted to common computational numbers (base 10). For purposes of these equations, assume that SCET and A0 are converted from GMT to seconds from some arbitrary reference time and SCLK and SCLK0 are converted to floating point numbers with RIM count being the integer portion and MOD91 and MOD10 or RTI (real time increment) forming the fractional portion (SCLK or SCLK0 = RIM + MOD91/91 + RTI/910).

SCET in UTC Base

SCET(UTC) = A0 + A1*(SCLK - SCLK0)

Where, SCET(UTC) is the computed UTC base spacecraft event time response; SCLK0, A0 and A1 are coefficients from the coefficient data set; and SCLK is the user requested spacecraft clock value.

SCET in ET Base

SCET(ET) = SCET(UTC) + DUT

Where, SCET(ET) is the computed ET base spacecraft event time response; SCET(UTC) is the UTC base spacecraft event time as computed above; and DUT is the difference between ET and UTC obtained from the coefficient data set.

SCLK

SCLK = SCLK0 + (SCET - A0)/A1

Where, SCLK is the computed spacecraft clock response; SCLK0, A0 and A1 are coefficients from the coefficient data set; and SCET is the user requested spacecraft event time in UTC base. Note that A1 will equal zero during periods of leap second adjustment.

```
         1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890  DESCRIPTION

$$MGN       SCLK/SCET COEFFICIENT FILE                                        1    Project Identification
*SCID       MAGELLAN                                                          2    S/C Identifier
*FILE       VRM*SCLKSCETCOEF(n).                                              3    File Identification
*CREATION   YY-DDD/HH:MM:SS                                                   4    File Creation Time
*UPDATE     YY-DDD/HH:MM:SS                                                   5    Last File Update Time
*RATE       SS.FFFFFFFFF                                                      6    Current SCLK Rate
*PART n     YY-DDD/HH:MM:SS.FFF @ SSSSSSSS                                    kk   File Partition Address
*                                                                             50   Spacer
*           SCET(UTC) = A0 + A1*(SCLK - SCLK0)                                51   Informational Comment
*                                                                             52   Spacer
*    SCLK0            A0            DUT       A1            ENTRY      ENTRY 53   Title Comment 1
* EFFECT. SCLK  EFFECT. SCET(UTC)  ET-UTC EFFECT. RATE       EPOCH       SEQ  54   Title Comment 2
*RIM:MOD91:RTI YY-DDD/HH:MM:SS.FFF  SECS   SECONDS/RIM     LOCAL TIME    NUM  55   Title Comment 3
$$EOH                                                                         99   End of Header
 RRRRRRRR:MM:N YY-DDD/HH:MM:SS.FFF SS.FFF SS.FFFFFFFFF YY-DDD/HH:MM:SS  SSSSSSSS  Coefficient Data Image
$$EOF                                                                     99999999  End of File
         1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
```

Figure 4-1. SCLK/SCET Coefficient File Record Formats

4.4 EXAMPLE OF SCLK/SCET COEFFICIENT FILE

Figure 4-2 on the following page presents an example of the SCLK/SCET Coefficient File. The example file covers a sample time period from May 20, 1986 to December 27, 1990. Significant attributes of the example are delineated below.

1) Creation, Update and Entry Epoch times are local time either PST or PDT whichever is in effect at the time the file is created or updated. All other times in the file are GMT. Local times are expressed to the nearest second while GMT times are to the nearest millisecond.

2) The file contains three partitions which handle simulated SCLK discontinuity. Partition 2 simulates an SCLK jump while partition 3 represents an SCLK regression. Note that for each partition, a coefficient data set is inserted into the file for the last valid MOD91 count in the partition to indicate readily to human users what the clock value was just prior to the clock discontinuity.

3) Data records 116 and 117 in the file simulate a leap second adjustment to the UTC clock. In these instances, which occur about once per year, the UTC clock is held for one second to correct for cumulative errors in the rotational rate of the earth. During the one second period that the UTC clock is held, SCLK advances 15 RTI and the SCLK rate (A1 coefficient) is zero. Note that for users making calculations in the UTC base, the zero rate is correct since the UTC clock will read exactly the same time for one second. However, for users making calculations in the ET base, the A1 coefficient from the previous or next coefficient data set must be used if correct responses during this one second interval are to be obtained. Also, the A0 coefficients are offset by one millisecond (subtracted from the first A0 coefficient) to avoid having two A0 coefficients with the same value.

Table 4-1 SCLK/SCET Coefficient File Record Format Specifications

Record	Columns	Type*	Display Value (Literals are in quotes)
Project-File Title	1-5	A	"$$MGN"
	13-38	A	"SCLK/SCET COEFFICIENT FILE"
	80	A	"1"
Space-craft Ident.	1-5	A	"*SCID"
	13-19	A	"MAGELLAN"
	80	A	"2"
File Ident.	1-5	A	"*FILE"
	13-32	A	"VRM*SCLKSCETCOEF(n). (see para. 1.4.5)
	80	A	"3"
File Creation Time	1-9	A	"*CREATION"
	13-27	A	YY-DDD/HH:MM:SS
	80	A	"4"
Last Update Time	1-7	A	"*UPDATE"
	13-27	A	YY-DDD/HH:MM:SS
	80	A	"5"
Current SCLK Rate	1-5	A	"*RATE"
	13-24	A	SS.FFFFFFFFF where SS is the number of seconds and FFFFFFFFF is the fraction of a second between SCLK RIM counts. If the SCLK rate is ever greater than 99 seconds, the decimal place will be shifted to the right with the resulting loss of the least significant decimal places.
	80	A	"6"

* A = ALPHANUMERIC DATA, FIELDATA FOR IPC USERS, ASCII FOR EXTERNAL USERS

Table 4-1 SCLK/SCET Coefficient File Record Format Specifications

Record	Columns	Type*	Display Value (Literals are in quotes)
File Partition Address	1-7	A	"*PART n" where n = 1,2,3,...,n for n partitions in the file. Initially, the file has one partition. New partition records are added to the header whenever a large enough regression in SCLK occurs to cause repeated SCLK values
	13-31	A	YY-DOY/HH:MM:SS.FFF where YY is the last two digits of the year (00-99), DOY is the day of year (001-366), HH is the hour (00-23), MM is the minute (00-59), SS is the second (00-59) and FFF is the millisecond (000-999) of the SCET at which partition n is effective. The partition will remain effective until the SCET of the next partition record. The last partition in the file is used to obtain predict relationships
	33	A	"@"
	35-42	A	SSSSSSSS where SSSSSSSS is the sequence number of the first record in the partition
	79-80	A	kk where kk = n + 6 and n is defined above
Spacer	1	A	"*"
	79-80	A	"50"
Inform. Comment	1	A	"*"
	13-46	A	"SCET(UTC) = A0 + A1*(SCLK - SCLK0)"
	79-80	A	"51"
Spacer	1	A	"*"
	79-80	A	"52"

* A = ALPHANUMERIC DATA, FIELDATA FOR IPC USERS, ASCII FOR EXTERNAL USERS

Table 4-1 SCLK/SCET Coefficient File Record Format Specifications

Record	Columns	Type*	Display Value (Literals are in quotes)
Title Comment 1	1	A	"*"
	6-10	A	"SCLK0"
	24-25	A	"A0"
	38-40	A	"DUT"
	48-49	A	"A1"
	61-65	A	"ENTRY"
	73-77	A	"ENTRY"
	79-80	A	"53"
Title Comment 2	1	A	"*"
	3-14	A	"EFFECT. SCLK"
	17-33	A	"EFFECT. SCET(UTC)"
	36-41	A	"ET-UTC"
	43-54	A	"EFFECT. RATE"
	61-65	A	"EPOCH"
	74-76	A	"SEQ"
	79-80	A	"54"
Title Comment 3	1-14	A	"*RIM:MOD91:RTI"
	16-34	A	"YY-DOY/HH:MM:SS.FFF"
	37-40	A	"SECS"
	44-54	A	"SECONDS/RIM"
	59-68	A	"LOCAL TIME"

* A = ALPHANUMERIC DATA, FIELDATA FOR IPC USERS, ASCII FOR EXTERNAL USERS

Table 4-1 SCLK/SCET Coefficient File Record Format Specifications

Record	Columns	Type*	Display Value (Literals are in quotes)
	74-76	A	"NUM"
	79-80	A	"55"
End of Header	1-5	A	"$$EOH"
	79-80	A	"99"
Coefficient Data	2-14	A	RRRRRRRR:MM:N is the SCLK0 coefficient and RRRRRRRR indicates the RIM count, MM indicates the MOD91 count and N indicates the MOD10 count or RTI at which this coefficient data set becomes effective.
	16-34	A	YY-DDD/HH:MM:SS.FFF is the A0 coefficient and YY are the last two digits of the year (00-99), DOY is the day of year (001-366), HH is the hour (00-23), MM is the minute (00-59), SS is the second (00-59) and FFF is the millisecond (000-999) at which this coefficient data set becomes effective. The A0 coefficient represents SCET in the UTC time base.
	36-41	A	SS.FFF is the UTC to ET correction factor, DUT, where DUT = ET - UTC and SS are seconds and FFF are milliseconds of DUT corresponding to the SCET of the A0 coefficient. To convert A0 to ET base, add A0 and DUT. If DUT is ever greater than 99 seconds, the decimal place will be shifted to the right to accomodate the larger number with the resulting loss of the least significant decimal places.

* H = HEXADECIMAL DATA, D = DECIMAL DATA, T = TITLE DATA
B = BINARY DATA, A = ALPHANUMERIC DATA

Table 4-1 SCLK/SCET Coefficient File Record Format Specifications

Record	Columns	Type*	Display Value (Literals are in quotes)
	43-54	A	SS.FFFFFFFFF is the A1 coefficient and SS is the seconds (nominally 60 seconds) and FFFFFFFFF is the fraction of a second (nominally .6666666666 second) between successive SCLK RIM counts beginning at the SCLK count and SCET specified by the SCLK0 and A0 coefficients of this coefficient data set. If A1 is ever greater than 99, the decimal place will be shifted to the right to accommodate the larger number with the resulting loss of the least significant decimal places.
	56-70	A	YY-DDD/HH:MM:SS is the GMT local time that this coefficient data set was inserted into the file
	73-80	A	SSSSSSSS where SSSSSSSS is the sequence number of the coefficient data set
End of File	1-5	A	"$$EOF"
	73-80	A	"99999999"

* H = HEXADECIMAL DATA, D = DECIMAL DATA, T = TITLE DATA
B = BINARY DATA, A = ALPHANUMERIC DATA

```
        1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
-------------------------------------------------------------------------------

$$MGN       SCLK/SCET COEFFICIENT FILE                                          1
*SCID       MAGELLAN                                                            2
*FILE       VRM*SCLKSCETCOEF(1).                                                3
*CREATION   85-127/15:36:42                                                     4
*UPDATE     85-207/15:45:35                                                     5
*RATE       60.666666667                                                        6
*PART 1     86-140/07:28:22.667 @     100                                       7
*PART 2     90-118/17:46:10.000 @     114                                       8
*PART 3     90-256/10:57:49.667 @     119                                       9
*                                                                              50
*           SCET(UTC) = A0 + A1*(SCLK - SCLK0)                                 51
*                                                                              52
*    SCLK0              A0              DUT       A1           ENTRY        ENTRY 53
* EFFECT. SCLK  EFFECT. SCET(UTC)  ET-UTC EFFECT. RATE     EPOCH          SEQ  54
*RIM:MOD91:RTI YY-DDD/HH:MM:SS.FFF  SECS   SECONDS/RIM   LOCAL TIME      NUM  55
$$EOH                                                                         99
        0:00:0 86-140/07:28:22.667 58.000 60.666666667 85-127/15:36:42        100
   140000:00:0 86-238/14:43.56.000 58.000 60.666666667 85-207/15:08:11        101
   280000:00:0 86-336/21:59:29.333 58.000 60.666666669 85-207/15:23:03        102
   420000:00.0 87-070/05:15:02.667 58.000 60.666666667 85-207/15:23:03        103
   700000:00:0 87-266/19:46:09.333 58.000 60.666666669 85-207/15/26:07        104
   840000:00:0 87-365/03:01:42.667 58.000 60.666666667 85-207/15:26:07        105
  1120000:00:0 88-196/17:32:49.333 58.000 60.666666669 85-207/15:29:21        106
  1260000:00:0 88-295/00:48:22.667 58.000 60.666666667 85-207/15:29:21        107
  1330000:00:0 88-344/04:26:09.333 58.000 60.666666668 85-127/15:49:51        108
  1333000:00:0 88-346/06:59:29.333 58.000 60.666666667 85-127/15:49:51        109
  1540000:00:0 89-125/15:19:29.333 58.000 60.666666669 85-207/15:39:01        110
  1680000:00:0 89-223/22:35:02.667 58.000 60.666666667 85-207/15:39:01        111
  1960000:00:0 90-055/13:06:09.334 58.000 60.666666662 85-207/15:45:35        112
  2050000:00:0 90-118/17:46:09.333 58.000 60.666666663 85-127/16:01:27        113
  2150050:00:0 90-118/17:46:10.000 58.000 60.666666663 85-127/16:01:27        114
  2200000:00:0 90-153/19:31:10.000 58.000 60.666666667 85-207/15:45:35        115
  2240000:00:0 90-181/21:35:36.666 58.000  0.000000000 85-207/15:45:35        116
  2240000:01:5 90-181/21:35:36.667 59.000 60.666666667 85-207/15:45:35        117
  2359000:00:0 90-256/10:57:49.000 59.000 60.666666667 85-207/15:45:35        118
        0:00:0 90-256/10:57:49.667 59.000 60.666666667 85-207/15:45:35        119
   150000:00:0 90-361/18:44:29.667 59.000 60.666666667 85-207/15:45:35        120
$$EOF                                                                  99999999
        1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
```

Figure 4-2. Example of the SCLK/SCET Coefficient File

4.5 SFDU Header and Trailer

The SCLK_SCET file delivered to the TPS will include a Standard Formatted Data Unit (SDFU) header and trailer for file identification. This SFDU will be structured as shown below and will contain the standard project defined SFDU information plus the following information unique to the SCLK_SCET file:

PROCESS_TIME is the Last Update Time, which should also be equal to the Entry Time for the last coefficient data set in the file.

DATA_SET_NAME is the filename SCLK_SCETnnnn.COF, and nnnn is a version number which increments by one each time the file is updated. This number will also equal the sequence number (cols. 73-80) of the last coefficient data set in the file.

VERSION_NUMBER is the same as nnnn in the filename (see above).

SCLK_START_VALUE is the SCLK value (SCLKO) at which the last coefficient data set in the file became effective.

[Note: SCLK values in SFDU headers must include values for MOD10 and MOD8 counters (even if they are zero) in order to be compatible with the SFOC CDB loader for ancillary files.]

SCET_START_TIME is the SCET (AO) at which the last coefficient data set in the file became effective.

NOTE: All other fields are fixed.

NOTE: The SFDU header and trailer will only be used on files delivered to the TPS. Files delivered to other groups (UPG/UNISYS) will not contain an SFDU header and trailer.

TABLE 4-2 SFDU Header and Trailer

SFDU Header Data

Bytes 00-11	CCSD1Z000001
Bytes 12-19	00000393
Bytes 20-31	NJPL1K00KL00
Bytes 32-39	00000276
Bytes 40-53	MISSION_ID=4<CR><LF>
Bytes 54-79	SPACECRAFT_NAME=MAGELLAN<CR><LF>
Bytes 80-97	SPACECRAFT_ID=18<CR><LF>
Bytes 98-120	MISSION_NAME=MAGELLAN<CR><LF>
Bytes 121-158	PROCESS_TIME=yyyy-mm-ddThh:mm:ss.fff<CR><LF>
Bytes 159-191	DATA_SET_NAME=SCLK_SCETnnnn.COF<CR><LF>
Bytes 192-219	DATA_OBJECT_TYPE=SCLK_SCET<CR><LF>
Bytes 220-240	VERSION_NUMBER=nnnn<CR><LF>
Bytes 241-274	SCLK_START_VALUE=ddddddddd:dd:d:d<CR><LF>
Bytes 275-315	SCET_START_TIME=yyyy-mm-ddThh:mm:ss.fff<CR><LF>
Bytes 316-327	CCSD1R000003
Bytes 328-335	00000077
Bytes 336-354	DELIMITER=SMARKER<CR><LF>
Bytes 355-378	PRODUCT_NAME=SCLK_SCET<CR><LF>
Bytes 379-397	TYPE=NJPL1I000128<CR><LF>
Bytes 398-412	PROTOCOL=NONE<CR><LF>

SCLK vs SCET DATA FILE (see Table 4-1)

SFDU Trailer Data

Bytes 00-11	CCSD1R000003
Bytes 12-19	00000043
Bytes 20-38	DELIMETER=EMARKER<CR><LF>
Bytes 39-62	PRODUCT_NAME=SCLK_SCET<CR><LF>

APPENDIX A

GLOSSARY

A0	Effective SCET coefficient in UTC (YY-DDD/HH:MM:SS.FFF)
A1	Effective clock rate coefficient in seconds/RIM
CDS	Command and Data Subsystem of the Magellan Orbiter Spacecraft
CMD	Command System
DMS	Data Management System
DUT	Universal Time to Ephemeris Time Correction Factor
ERT	Earth Receive Time
ICW	Image Control Word
IPC	Information Processing Center
MOD10	Counter of the CDS SCLK which increments every 66 2/3 milliseconds
MOD91	Counter of the CDS SCLK which increments every 2/3 seconds
RIM	Real Time Image Counter of the CDS SCLK which increments every 60 2 /3 seconds
RTI	Real Time Increment (same as MOD10)
SCET	Spacecraft Event Time
SCLK	Spacecraft Clock
SCLK0	Effective SCLK value in RIM:MOD91:RTI
SCT	Spacecraft Team
SDFF	UNISYS 1100/81 Standard Data Format File
SES	Spacecraft Engineering Subsystem
SGS	Sequence Generation Subsystem
TPS	Telemetry Processing Subsystem
UTC	Universal Time Coordinated