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EXPERIMENT DATA RECORDS GENERATION
— EDRGEN —

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1.0 PURPOSE AND SCOPE

The purpose of this document is to define the requirements for the production of Experiment Data Records (EDR) for the magnetometer (MAG) and Celestial Mechanics-Radio Science (CMRS) experiments supported by the Mariner Venus/Mercury 1973 (MVM'73) Project. In addition, the requirements for a Scan Platform Telemetry (SPT) tape shall be provided. The requirements contained herein reflect our understanding of the data recording specifications by the MVM'73 Mission and Test Computer Capability for Mission Operations as per PD-615-45 of 15 Feb 1973.

2.0 APPLICABLE DOCUMENTS

Jet Propulsion Laboratory

MVM'73-3-100	Mariner Venus/Mercury 1973 Spacecraft Characteristics and Restraints
MVM'73-3-270	Functional Requirement, Mariner Venus/Mercury 1973 Spacecraft Data System Measurements
MVM'73-2006-1	Mariner Venus/Mercury 1973 Flight Equipment Flight Data Subsystem
PD-615-45	MVM'73 Mission and Test Computer Facility Capability Description for Mission Operations
915.85/07	Preliminary EDRGEN Output Tape Formats – Scan Platform Telemetry Tape
3396-72-220	CMRS EDR Format

3.0 FUNCTIONAL DESCRIPTION

The prime objective of Experimenter Data Record Generation (EDR GEN) is to produce an individual Experimenter Data Record (EDR) on magnetic tape for the MAG and CMRS experiments plus a Scan Platform Telemetry (SPT) magnetic tape. Their input source is the science data acquired by the instruments on board the spacecraft plus the engineering data which are transmitted to earth by the flight data subsystem (FDS) via Telemetry streams. The Mission and Test Computer (MTC) formats the in-sync science and engineering data and records it on magnetic tape.

The MAG PI/EDR shall consist of science data records and engineering data records. The CMRS EDR and the SPT tape shall consist solely of decommutated engineering data records.

The capability to merge a series of individual CMRS EDR's onto one tape or a series of individual SPT tapes onto one logical tape shall be required.

4.0 INPUT REQUIREMENTS

4.1 MTC Tape Characteristics and Record Structure

All science and engineering data recorded on MTC tapes are in the form of logical records. They have the following general characteristics:

1) All tapes are 7-track with an odd-parity bit
2) All tapes are written with a density of 556 bytes/inch (BPI)
3) There is only one end-of-file mark per tape located after the last record.
4) All records contain (Nx20) words, where N is a positive integer, and each word is 18 bits (right adjusted).
5) All records are written in a standard format: Each record contains a 20-word header, a 30-word subheader, a data block and filler words as necessary to provide N X 20 words per record. Figure 4.1 depicts the record structure for the six experiments.

4.2 Record Blocking and Segmenting

For efficient tape recording, logical records may be either segmented or blocked. When a logical record is too large, as in cases of the MAG science records (MTC), it is segmented into several physical reocrds which may be interspersed with records from different streams. On the other hand, when a logical record is too small, several of them may be blocked into one physical record so that the size of all physical records falls within acceptable limits; this blocking is used on the Engineering data records for the experiments. Segmenting and blocking are illustrated in Figure 4.2.

When a logical records is segmented into several physical records, each physical record will have a header, a subheader, a data block and filler block. The physical record will be sequentially identified in the subheader with respects to segment of the logical record.

HEADER	20 WORDS
SUBHEADER	30 WORDS
DATA BLOCK	X WORDS
FILLER	Y WORDS
	TOTAL = 20 + 30 + X + Y WORDS

EXP.	PHYSICAL RECORDS/ LOGICAL RECORD	X	Y	TOTAL	NIS-1 FRAMES*/ PHYS. RECORD	NIS-2 FRAMES*/ PHYS. RECORD
MAG	7/1	610	0	660	25	5
ENG	1/5	25	5	400		

* DATA FROM EITHER NIS-1 OR NIS-2, NOT BOTH.

** SEE APPENDIX A FOR ILLUSTRATIONS OF RECORD STRUCTURES FOR MAG AND ENG DATA.

Figure 4.1. Experiment Record Structure**

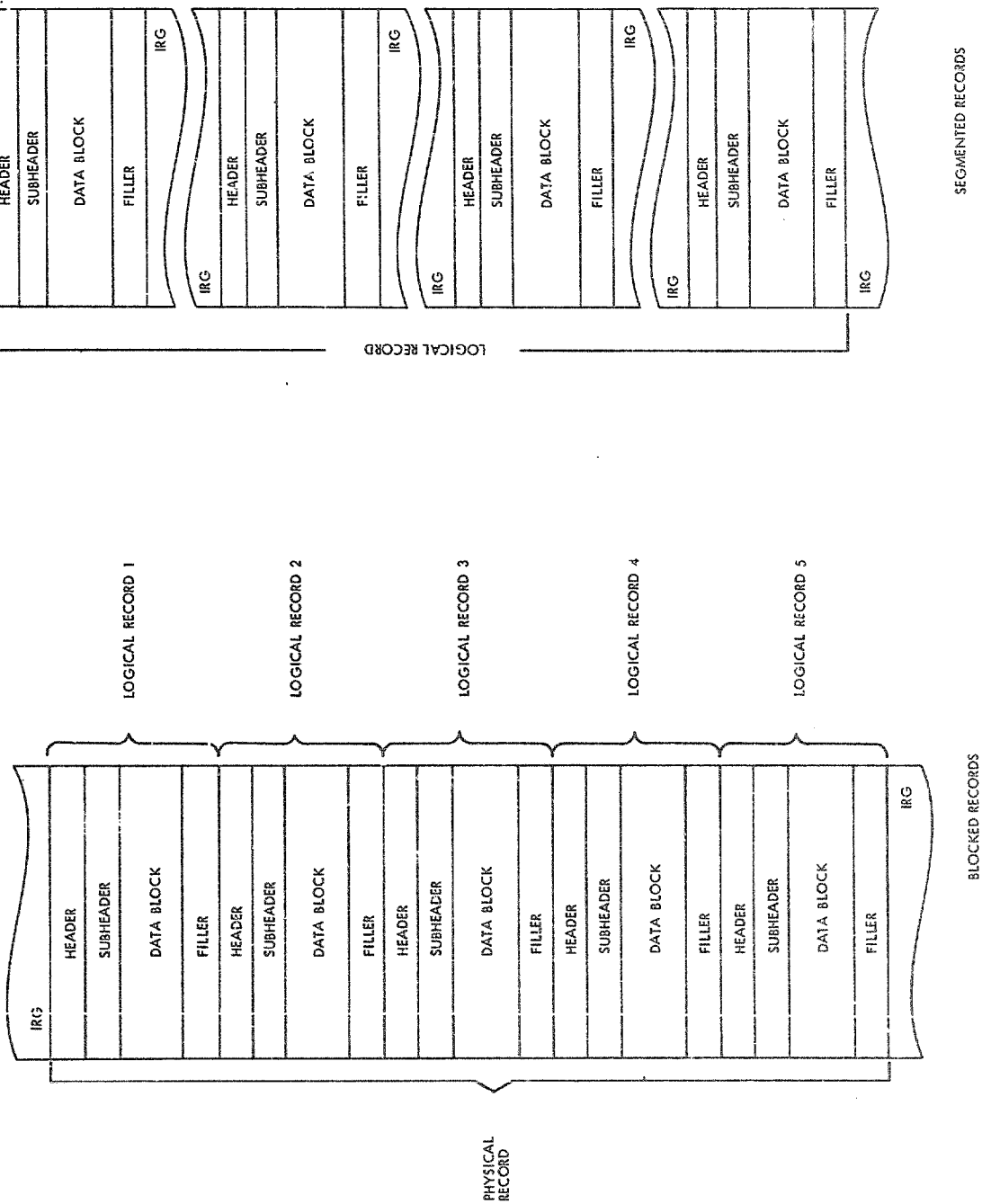

Figure 4.2. Record Blocking and Segmenting

4.3 Record Formats

The contents of the standard 20-word header and the 30-word subheaders are given in Appendix-A, Table 4.3-A1 and Table 4.3-A2 (Experiment Data)/4.3-A2.1 (Engineering Data), respectively. The individual record structures and record data blocks for the MAG experiment and the engineering data records are given in Figure 4.3-A3 and Table 4.3-A3 through Figure 4.3-A4 and Table 4.3-A4 of Appendix-A, respectively.

All MAG science records will be written in a time ordered sequence per record ID. All ENG records will be written in a time ordered sequence per record ID. The relationship between different record ID's may not be time ordered.

The MAG MTC/EDR shall contain all ENG data even for periods when the MAG instrument is off. The MAG MTC/EDR shall be used to obtain the complete ENG data stream which is required by the Celestial Mechanics-Radio Science (CMRS) and the Scan Platform Telemetry (SPT) users.

The capability to use other than the MAG MTC/EDR input tapes shall be required (SDR or MDR). If this is the case, the MTC input tapes shall contain MAG science data records, ENG data records and other extraneous data records not required by the output MAG PI/EDR, CMRS EDR or SPT tape. These extraneous data records shall be ignored during processing.

5.0 OUTPUT REQUIREMENTS

The capability to produce either a MAG PI/EDR or a CMRS EDR or a SPT tape or any combination of the three shall be required.

5.1.0 Output MAG PI/EDR

The required output MAG PI/EDR shall be generated by reformatting MAG data records and ENG data records from the MTC input tapes to an IBM 360/75 magnetic tape format. The ENG data required on the output MAG PI/EDR shall be only the ENG-B data unless modified via input control card. Data records which are not MAG science or ENG records shall be ignored in the processing.

5.1.1 360/75 Tape Characteristics for MAG PI/EDR

The general output requirement on the MAG PI/EDR is that it will be an IBM 360/75 magnetic tape with the following characteristics:

1) All tapes are 9-track with odd parity.
2) All tapes are written with a density of 800 BPI.
3) Each tape will contain one data day of data (24 hours) and there will be a EDR-file descriptor record, the Tape Label, on every output tape.
4) A blocking factor of four logical records per physical record will be used on the MAG data records; the Engineering Data records will not be blocked.
5) All logical records (except the Tape Label) are written in a standard structure of having a Header and a Data Block.
6) All physical records including the Tape Label shall contain a Block Descriptor Word.

7) All logical records including the Tape Label shall contain a Record Descriptor Word.

Figure 5.1.1-B1 of Appendix-B illustrates the MAG PI/EDR records structure.

5.1.2 Record Formats for MAG PI/EDR

5.1.2.1 Tape Label Format for MAG PI/EDR

The Tape Label is always the first record of a MAG PI/EDR tape. The content and format of the Tape Label is illustrated in Table 5.1.2.1-B1.2 of Appendix B.

5.1.2.2 MAG Record Header Format

The record header for MAG data will always be the first 46 words of a MAG logical record. Table 5.1.2.2-B2 gives the format of the MAG record header.

5.1.2.3 MAG Record Data Block

The MAG record data block will contain the science, status subcom and HK subcom data from either the NIS-1 Stream or the NIS-2 Stream. When direct NIS-1 data is not available, it shall contain IM-1 (Extracted NIS-1 data), IM-1 playback data or NIS-1 playback, and this is identified in the Record-ID word of the header. The data-block formats are as follows:

Word#	Title	Function	Type	Unit
(NIS-1)	(NIS-2)		I	
1 thru 1575	1-315	NIS-1: 175 minor frames, 9 words each	I	
		NIS-2: 35 minor frames 9 words each	I	
	316-336	NIS-2: Prime MAG direct readout, 42 halfwords	H	
1576-1581	337-342	Status subcom and housekeeping subcom data	H	

Figure 5.1.2.3-B2.1, Figure 5.1.2.3-B3, Table 5.1.2.3-B4 and Table 5.1.2.3-B5 of Appendix B illustrates the MAG record data block format for NIS-1 or NIS-2 for a MAG logical record.

5.1.2.4 ENG Record Header Format

The record header for ENG data will always be the first 19 words of an ENG logical record. One ENG logical record will occur for every 32 MAG logical records. This will result in one ENG logical record being written for every 8 MAG physical records (MAG has four logicals/physical).

Table 5.1.2.4-B6 gives the format of the ENG record header.

5.1.2.5 ENG Record Data Block

The ENG record data block shall contain a full sweep through all subcommutated engineering data which consists of 128 ENG logical records from the MTC tape covering a period of 22.4 minutes. This is equivalent to 8 MAG physical records or 32 MAG logical records on the MAG PI/EDR output tape. The EDR generator will output one ENG physical record (which consists of only one logical record) after 8 MAG physical records have been output. (See Figure 5.1.1-B1 of Appendix B.) The subcom index word in the ENG records on the MTC tape will be used to position the engineering data in the appropriate position in the ENG record data block as follows,

Subcom Index	Output Position
0	First 50 engineering data samples
1	Second 50 engineering data samples
↓	↓
127	Last 50 engineering data samples

Only the ENG data records which are identified with a rate code of ENG-B in the Engineering Data Record Subheader (Table 4.3-A2.1) shall be used in the output MAG PI/EDR. Whenever the rate code changes the current ENG logical record being formed shall be considered complete and filler data (all zeros) will be used for the balance of the ENG logical record.

Table 5.1.2.5-B7 gives the format of the ENG record data block.

5.1.2.6 Descriptor Words

A block descriptor word shall be the first word of all physical records starting with the Tape Label record.

A record descriptor word shall precede each logical record (Tape Label record is one logical record).

Figure 5.1.1-B1 of Appendix B illustrates the descriptor word positions in the MAG EDR records structure. The content of the descriptor words is illustrated in Table 5.1.2.6-B1.1 of Appendix B.

5.2.0 Output CMRS EDR

The required output CMRS EDR shall be generated by decommutating only the required parameters from the ENG data on the MTC input tapes. The decommutated data shall be arranged in a variable format; that is, the decommutated data values for a particular parameter can occur in any word position in the output data block. The variable format is used because most of the required parameters are a mixture of the different data rates. The decommutated ENG data shall be accumulated on a magnetic tape on a data day basis (24 hours). A capability to accumulate several data days of ENG data onto one magnetic shall be required.

Accumulation of the decommutated ENG data records on a magnetic tape shall be done such that a new magnetic tape is written which shall contain the previously accumulated data plus the new decommutated ENG data. The tape containing accumulated decommutated ENG data shall never be written on.

5.2.1 Tape Characteristics for CMRS EDR

The general output requirement on the CMRS EDR is that it will be an IBM 360/75 magnetic tape with the following characteristics:

1) All tapes are 7-track with odd parity.

2) All tapes are written with a density of 556 BPI.

3) Each tape will contain from one to several data days of data (data day = 24 hours).

4) There will be an EDR-file descriptor record, the Tape Label, as the first record of every output tape.

5) All data records (except the Tape Label) are written in a standard structure of having a Header and a Data Block.

Figure 5.2.1-B8 of Appendix-B illustrates the CMRS EDR records structure.

5.2.2 Record Formats for CMRS EDR

5.2.2.1 Tape Label Format for CMRS EDR

The Tape Label is always the first record of a CMRS EDR tape. The content and format of the Tape Label is illustrated in Table 5.2.2.1-B8.1 of Appendix B.

5.2.2.2 CMRS Record Header Format

The record header for CMRS data will always be the first 35 words of a CMRS data record. The record header shall contain the required ground data. Table 5.2.2.2-B9 gives the format of the CMRS record header.

5.2.2.3 CMRS Record Data Block

The CMRS record data block shall contain the decommutated engineering data from one ENG logical record on the MTC input tape. Only those parameters selected for decommutation shall appear in the data block. The data block shall be the last 65 words of a CMRS data record. Each word in the data block shall contain the original position of the data value in the ENG minor frame (MTC ENG logical record), data identification number and the data value. Table 5.2.2.3-B10 gives the format of the CMRS record data block.

5.3.0 Output SPT Tape

The required output SPT tape shall be generated by decommutating only the required parameters from the ENG data on the MTC input tapes. The decommutated data shall be arranged in fixed format, that is, the decommutated data values for a particular parameter shall always be in the same word position in the output data block. The fixed format is used because most of the required parameters have the same data rate. The decommutated ENG data shall be accumulated on a magnetic tape on a data day basis (24 hours). A capability to accumulate several data days of ENG data shall be required.

Accumulation of the decommutated ENG data records on a magnetic tape shall be done such that a new magnetic tape is written which shall contain the previously accumulated data plus the new decommutated ENG data. The tape containing the accumulated decommutated ENG data shall never be written on.

5.3.1 360/75 Tape Characteristics for SPT Tape

1) All tapes are 7-track with odd parity.

2) All tapes are written with a density of 800 BPI.

3) There will be tape-file descriptor record, the Tape Label, as the first record of every output tape.

4) All data records (except the Tape Label) are written in a standard structure of having a Header and a Data Block.

Figure 5.31-B11 of Appendix B illustrates the SPT tape records structure.

5.3.2 Record Formats for SPT Tape

5.3.2.1 Tape Label Format for SPT Tape

The Tape Label is always the first record of a SPT tape. The content and format of the Tape Label is illustrated in Table 5.3.2.1-B11.1 of Appendix B.

5.3.2.2 SPT Record Header Format

The record header for SPT data will always be the first 15 words of a SPT data record. The record header shall contain the required ground data. Table 5.3.2.2-B12 gives the format of the SPT recorder header.

5.3.2.3 SPT Record Data Block

The SPT record data block shall contain the decommutated engineering data from one ENG logical record on the MTC input tape. Only those parameters selected for decommutation shall appear in the data block. The data block shall be the last 15 words of a SPT data record. Each item in the data block shall contain the original position of the data value in the ENG minor frame (MTC ENG logical record) and the data value. Table 5.3.2.3-B13 gives the format of the SPT record data block.

6.0 PROCESSING REQUIREMENTS

The generation of the MAG PI/EDR consists mainly of a tape I/O process reformatting data records of the input MTC tape(s) to produce a 360 magnetic tape output. The generation of the CMRS EDR and the SPT tape consists mainly of a tape I/O and decommutation process which extracts the required parameters from the ENG data records on the input MTC tape(s). The decommutated data shall be accumulated on a magnetic tape on a data day basis. Several data days of decommutated ENG data shall be accumulated on one tape. The user of this program is given certain options in controlling the process, and this is done via a card-input specification deck. The following sections describe briefly these options and requirements.

6.1.0 Processing Control Specifications

6.1.1 MAG PI/EDR

The following processing control information is to be specified by the user along with each request for a MAG PI/EDR generation:

1)	Input MTC tape(s) ID	(Required)
2)	Start and Stop times of records (SCE, ERT or FDSC time)	(Optional)
3)	Output MAG PI/EDR tape ID	(Required)
4)	Experimenter ID and Satellite ID	(Required)
5)	Record ID's to Process	(Optional)
6)	Reports	(Optional)

Items (1) and (2) are used in selecting input tape and data records range, items (3) and (4) will be written into the Tape Label record of the MAG EDR output tape. Item (5) is used in selecting the data streams (Record ID's) to process. Item (6) is used to generate reports beyond the normal inventory report. The requirements and defaults on these items are given in Section 6.3.

6.1.2 CMRS EDR

The following processing control information is to be specified by the user along with each request for a CMRS EDR generation:

1)	Input MTC tape(s) ID	(Required)
2)	Start and stop time of records (SCE, ERT or FDSC time)	(Optional)
3)	CMRS EDR tape ID	(Required)
4)	Experimenter ID and Satellite ID	(Required)
5)	Record ID's (E1, E2, ..., E7) to process	(Optional)
6)	Update decommutation tables for full run	(Optional)
7)	Start and stop times of records for using additional updates to decommutation table (time in FDSC)	(Optional)
8)	Updates to decommutation tables for 7 above	(Optional)

Items (1) and (2) are used in selecting input tape and data records range, items (3) and (4) will be written into the Tape Label record of the CMRS EDR output tape, item (5) identifies the types of ENG data records to process, item (6) is used to update the standard decommutation tables for the complete program run, items (7) and (8) are used to specify a time period and updates to the decommutation table for that time period. The requirements and defaults on these items are given in Section 6.3.

6.1.3 SPT Tape

The following processing control information is to be specified by the user along with each request for a SPT tape generation:

1)	Input MTC tape(s) ID	(Required)
2)	Start and stop time of records (SCE, ERT or FDSC time)	(Optional)
3)	SPT tape ID	(Required)
4)	Experimenter ID and Satellite ID	(Required)
5)	Record ID's (E1, E2, ..., E7) to process	(Optional)

6)	Update for full run decommutation tables	(Optional)
7)	Start and stop times of records for using additional updates to decommutation table (time in FDSC)	(Optional)
8)	Updates to decommutation table for 7 above	(Optional)

Items 1) and 2) are used in selecting input tape and data records range, items 3) and 4) will be written into the Tape Label record of the SPT output tape, item 5) identifies the types of ENG data records to process, item 6) is used to update the standard decommutation tables for the complete program run, items 7) and 8) are used to specify a time period and updates to the decommutation table for that time period. The requirements and defaults on the items are given in Section 6.3.

6.1.4 CMRS EDR and SPT Tape Accumulation

The following processing control information shall be specified by the user along with each request for stacking either CMRS EDR tapes or SPT tapes onto one output tape:

1)	Input CMRS EDR tape(s) ID or Input SPT tape(s) ID	(Required)
2)	Output CMRS EDR tape ID or output SPT tape ID	(Required)
3)	Experimenter ID and Satellite ID	(Required)

Item 1) is used in selecting input tapes which are to be combined onto one output tape and Items 2) and 3) will be written into the Tape Label record of the CMRS output tape. The requirement for these items is given in paragraph 6.3. Only one type of input tape (CMRS EDR or SPT tape) shall be merged on one run of the program.

6.2 EDR Generation Report

For each EDR output tape generated, there will be an inventory type report produced to inform the user of the processing results which will include the following:

1) Input MTC or CMRS EDR or SPT tape(s) ID
2) Output EDR tape ID

3) Total number of physical and logical records on this EDR output tape.
4) Start and stop times of the output tape (ERT, SCE, FDSC)
5) All information on the Tape Label record (See Section 5.1.2.1)
6) List of breaks and gaps (i.e., missing data) with ERT, SCE FDSC and sequence numbers.
7) List number of each type of record ID on input and output tape.

The user may also specify the following optional features to be included in the report:

8. Selective information from the record headers
9. Selective information from the record subheaders
10. List of records

6.3 Specification Deck Setup

Following is a guideline to the setup of the processing control specification deck. Optional cards and/or specifications are given in brackets, and braces are used to indicate selective fields.

Card Sequence	Card Contents
[1]*	FILE = MAG
2 thru ℓ	MTC = a_1 [EDR = a_2]
	[EXPERIMENTOR = x_1 SATELLITE = y_1]
	[START = HH:MM:SS.MMM DDD YY]
	[STOP = HH:MM:SS.mm DDD YY]

[ℓ + 1 thru m] .REPORT : [HEADER = {ALL / (record #'s)}]

[SUBHEADER = {ALL / (record #'s)}]

[RECORDS = {ALL / (record #'s)}]

[m + 1]* File = CMRS [ENGID = E1, E2]

m + 2 thru n MTC = a_1 [EDR = a_2]

[EXPERIMENTER = x_2 SATELLITE = y_2]

[START = HH:MM:SS. MMM DDD YY]

[STOP = HH:MM:SS. mm DDD YY]

[UPDATE: FORMAT, ID_1, $Word_1$, $Bits_1$, $Word_2$, $Bits_2$ ...]

.

.

.

[UPDATE: FORMAT, ID_K, $Word_K$, $Bits_K$, $Word_{K+1}$, $Bits_{K+1}$, ...]

.

.

.

[STARTD = FDSC]

[STOPD = FDSC]

[UPDATE: FORMAT, Out_1, $Word_1$, $Bits_1$]

.

.

.

[UPDATE: FORMAT, Out_K, $Word_K$, $Bits_K$]

[n + 1 thru p] REPORT : [HEADER = {ALL / (record #'s)}]

[SUBHEADER = {ALL / (record #'s)}]

[RECORDS = {ALL / (record #'s)}]

[p + 1]* File = SPT [ENGID = E1, E2]

p + 2 thru q MTC = a_1 [TAP = a_3]

[EXPERIMENTER = X_3 SATELLITE = Y_3]

[START = FDSC]

[STOP = FDSC]

[UPDATE: FORMAT, Out_1, $Word_1$, $Bits_1$]

.

.

.

[UPDATE: FORMAT, Out_K, $Word_K$, $Bits_K$]

[STARTD = FDSC]

[STOPD = FDSC]

[NEWTAB: FORMAT, Out_1, $Word_1$, $Bits_1$]

.

.

.

[NEWTAB: FORMAT, Out_K, $Word_K$, $Bits_K$]

[q + 1 and on] REPORT : [HEADER = {ALL / (record #'s)}]

[SUBHEADER = {ALL / (record #'s)}]

[RECORDS = {ALL / (record #'s)}]

*If no card-1 specification (FILE=MAG) input, it is assumed that no MAG PI/EDR output is required and hence no cards 2 thru m shall be input, i.e., card m+1 should be the first input card. On the other hand, if there is no card m+1 specification (FILE=CMRS), no CMRS EDR will be generated and hence no cards m+2 thru p shall be input, i.e., card p+1 should be the first input card. If there is no card p+1 specification (FILE=SPT), no SPT tape will be generated and hence cards p+2 and on, if any, are ignored.

The separate run for merging either CMRS EDR's or SPT tapes is as follows:

Card Sequence	Card Contents
1	FILE = MERGE
2 thru m	CMRS or SPT = a_4
	.
	.
	. = a_k
m + 1 thru n	REPORT : [RECORDS = {ALL / record #'s}]

where:

$a_1 - a_k$, $x_1 - x_3$, $y_1 - y_3$ are 1-8 numeric EBCDIC Characters;

HH (hours), MM (minutes), SS (seconds), mmm (milliseconds), DDD (days), and YY (last two digits of year) are EBCDIC numeric characters; FDSC is spacecraft 42-second counter (integer).

when START is not specified, processing will start with first record of MTC tape; when STOP not specified, it is default to process through the last record; and when both are omitted, the default is to process the entire MTC tape(s) file;

when there are no cards specifying REPORT options, the report will contain only items (1) through (7) of Section 6.2; when specified, an ALL indicates the printout of all headers and/or subheaders and/or records, or else use record #'s (in ascending order and enclosed in parentheses) to indicate selective headers and/or subheaders and/or records.

When UPDATE or STARTD, STOPD and NEWTAB is not specified, decommutation will be done using the standard decom table with no changes.

when FILE is not specified for MAG, the output MAG EDR will not be generated.

when FILE is not specified for CMRS, the output CMRS EDR will not be generated.

when FILE is not specified for SPT, the output SPT tape will not be generated.

when ENGID for CMRS EDR or SPT tape is not specified all ENG data shall be used for the CMRS EDR and the SPT tape.

6.4 Decommutation of ENG Data

It shall be required to decommutate the ENG data for the CMRS EDR and the SPT tape. The decommutated data shall be output in a fixed format for the SPT tape and in a variable format for the CMRS EDR.

6.4.1 Standard Decommutation Tables

There are four standard ENG data configurations two of which can be identified by the format code in the ENG data subheader. The other two configurations can be identified by the format code plus the block control ID in the ENG data stream. The block code ID occurs in the sixth 7-bit word of each ENG minor frame and is the right 6 bits of that word. The identification for each type of format is as follows:

Format Code	Block Control ID	Format
1	1	Fixed
2	1	Primary
2	73_8	Primary Star
3	1	Maneuver

The standard decommutation table for extracting the desired SPT tape or CMRS EDR parameters shall be available as a data table external to the program and decommutation shall be done using the format code and the block control ID. For illegal or missing codes the data shall be ignored. The parameters included in this decommutation table is illustrated in Table 6.4.1-B14.

6.4.2 Non-Standard Decommutation Tables

The configuration of the ENG data stream can be altered to any desired arrangement. The capability to update via card input the decommutation table for a specific range of FDSC shall be required. The decommutation of the required ENG parameters within the specified FDSC range shall be done using the non-standard decommutation table.

6.4.3 CMRS EDR Decommutation

The decommutation of the ENG data parameters shall satisfy the following requirements:

1) Up to a maximum of 65 individual parameters shall be decommutated from any one ENG minor frame and a capability to process up to a maximum of 200 measurements shall be required.
2) Each parameter decommutated shall be 7 bits or less.
3) Each parameter decommutated shall be tagged with an ID which identifies the parameter plus a word (7 bits/word) displacement from the beginning of the ENG minor frame.
4) Each decommutated parameter shall be identified by its ID and not by its position in the output record.
5) The decommutated parameters plus their associated ID and word displacement shall be readable by FORTRAN (that is; no item shall be in less than 1 byte (8 bits) and the output record shall be of fixed length with the unused portion filled with zeros).

6.4.4 SPT Decommutation

The decommutation of the ENG data parameters shall satisfy the following requirement:

1) Up to 30 individual parameters shall be decommutated from each ENG minor frame.
2) Each parameter decommutated shall be 7 bits.
3) Each parameter decommutated shall be placed in a specific position in the output record (see Figure 6.4.4-B14) and be tagged with its word displacement (7 bits/word) from the beginning of the ENG minor frame.
4) If a parameter value should exist for a ENG minor frame, the word displacement shall be set to the correct value. If the parameter value is missing, the output parameter value shall be set to 255. Whenever a data value should not be available for a ENG minor frame, the word displacement and the output parameter value shall be set to 255.
5) The decommutated parameters plus their associated word displacement shall be readable by FORTRAN (that is; no item shall be in less than 1 byte (8 bits) and the output record shall be of fixed length).

6.5 Validation Checks on Input Tapes

A capability to validate the input records shall be required. The user shall determine whether validation of the input records is to be done or not via card input control. Validation shall be universal, that is, selective validation for the various outputs shall not be done. The validation shall consist of checking certain items in the header and subheader to verify the record sequence. Records which do not satisfy the record sequence checks shall not be used. No checks of the ENG decommutated data shall be made to validate the record.

Whenever validation is requested the following checks shall be made:

1) Record ID sequence number is increasing for each ID being processed (greater than or equal).
2) FDSC is increasing for each Record ID being processed (greater than or equal).

6.6 General Data Handling Capabilities

The following paragraphs give a general overview of the type of processing that shall be required for each type of output.

6.6.1 MAG PI/EDR Overview

6.6.1.1 Science Records

The general processing procedure for MAG science data is as follows:

1) All science data on the input tape will be reformatted and output in the desired format. When verification is used invalid input records (such as individual record ID's not in a FDSC time sequence) will be ignored.
2) The science data from each record ID (NIS-1, NIS-2, Playback NIS-1, etc.) will be in an FDSC time ordered sequence unless deletion of the verification procedure was requested.
3) All data will be handled on a 42-second (one FDSC) logical record basis.
4) Logical records from different record ID's (when available) may be written in one physical record. If a physical record contains records for more than one record ID, then all 4 logical records in this physical record might not be in an FDSC time-ordered sequence.
5) The record ID's are selectable if desired but are not planned to be used.

6) Selection of record ID's for this output is controllable and independent from any other output product.

6.6.1.2 Engineering Records

The general processing procedure for ENG data is as follows:

1) Engineering B data will be provided whenever available from the input tape. When verification is used invalid input records (such as individual record ID's not in a FDSC time sequence) will be ignored.
2) Data will be reformatted and a physical record written to include one complete cycle (128 minor frames) of engineering data.
3) Each record ID will be in an FDSC time ordered sequence unless deletion of the verification procedure was requested.
4) Different record ID's will not necessarily be in an FDSC time ordered sequence.
5) Each physical record will contain data from only one record ID.
6) The record ID's are selectable if desired but are not planned to be used.
7) Selection of record ID's for this output is controllable and independent from any other output product.

6.6.2 CMRS EDR Overview

The general processing procedure for the ENG data used for the CMRS EDR is as follows:

1) ENG data (pre-defined parameters) from the input tape will be decommutated and written on the output tape in the desired format. When verification is used invalid input records (such as individual record ID's not in a FDSC time sequence) will be ignored.

2) The data will be written as one physical record per logical record.
3) Each record ID will be in an FDSC time ordered sequence unless deletion of the verification procedure was requested.
4) Different record ID's will not necessarily be in an FDSC time ordered sequence.
5) Each physical record will contain data from only one record ID.
6) The record ID's are selectable if desired but are not planned to be used.
7) Selection of record ID's for this output is controllable and independent from any other output product.

6.6.3 SPT Tape Overview

The general processing procedure for the ENG data used for the SPT tape is as follows:

1) ENG data (pre-defined parameters) from the input tape will be decommutated and written on the output tape in the desired format. When verification is used invalid input records (such as individual record ID's not in a FDSC time sequence) will be ignored.
2) Each record ID will be in an FDSC time ordered sequence unless deletion of the verification procedure was requested.
3) Different record ID's will not necessarily be in an FDSC time ordered sequence.
4) Each physical record may contain logical records from different record ID's (when available). If a physical record contains records from more than one record ID, then all 16 logical records in this physical output record may not be in an FDSC time-ordered sequence.
5) The record ID's are selectable and are planned to be used to produce data records from real-time data. Playback data will be used only when gaps in real-time data is present.
6) Selection of record ID's for this output is controllable and independent from any other output product.

APPENDIX – A

MTC – TAPE
RECORD STRUCTURE AND FORMATS

Table 4.3-A1	Standard Header Format
Table 4.3-A2	Subheader Format of MAG Experiment Data Record on MVM-MTC Tapes
Table 4.3-A2.1	Engineering Data Records Subheader Format
Figure 4.3-A3	MAG Record Structure
Table 4.3-A3	MAG Record Data Block
Table 4.3-A3.1	Relationship of NIS-1 Minor Frame to Value of N and Physical Record Number
Table 4.3-A3.2	Relationship of NIS-2 Minor Frame to Value of N and Physical Record Number
Figure 4.3-A4	Engineering Data Records Structure
Table 4.3-A4	Engineering Record Data Block Format

Table 4.3-A1. Standard Header Format

Item	Word	Bits	MSB	Title/Function
1				Record ID. Identifies data in record. (octal) 730115 = NIS-1 from IM-1 (T1) 730215 = NIS-1 from IM-1 Play Back (T2) 730315 = NIS-1 Play Back (T3) 730415 = NIS-1 (T4) 730515 = NIS-2 (U5) 730105 = ENG-B from IM-1 (F1, M1, P1) 730205 = ENG-B from IM-1 Play Back (F2,M2,P2) 730305 = ENG-B from NIS-1 Play Back (F3,M3,P3) 730405 = ENG-B from NIS-1 (F4, M4, P4) 730505 = ENG-B from NIS-2 (F5, M5, P5) 730605 = ENG-A, B or C (F6, M6, P6) 730705 - ENG-A Play Back (F7, M7, P7) Other ID's are possible but are ignored by EDR GEN.
2	2	17-0	17	Record Sequence Number. A count of all Physical tape records written. The counter is incremented by one only after a good write on this tape. Sequence number
3	3	17-0	17	Record ID Sequence Number. A count of all logical tape records written for each record ID. The counter is incremented by one for each record generated. Sequence number
4	4	17-8	17	First Time. GMT of first data bit of first sync word of first NIS minor frame for which data has been extracted for MAG record. (ERT) GMT of first data bit in this record for ENG record. (ERT) Number of milliseconds since the beginning of the current second.

Table 4.3-A1. Standard Header Format (contd)

Item	Word	Bits	MSB	Title/Function
4	4	7-0	7	Eight most significant bits of the number of days since the beginning of the current year.
	5	17	17	Least significant bit of the number of days since the beginning of the current year.
	5	16-0	16	Number of seconds since the beginning of the current day.
5				Last Time. GMT of last bit of last NIS minor frame for which data has been extracted for MAG record. (ERT) GMT of last data bit in this record for ENG record. (ERT)
	6	17-8	17	Number of milliseconds since the beginning of the current second.
	6	7-0	7	Eight most significant bits of the number of days since the beginning of the current year.
	7	17	7	Least significant bit of the number of days since the beginning of the current year.
	7	16-0	16	Number of seconds since the beginning of the current day.
6				Spare
	8	17-0	17	
7				FDS Count
	9	17-2	17	00000_8
	9	1-0	1	Two most significant bits of FDS count right adjusted.
	10	17-0	17	Eighteen least significant bits of FDS count
	11	17-10	17	Unused

Table 4.3-A1. Standard Header Format (contd)

Item	Word	Bits	MSB	Title/Function
8				Data Rate and Bit Count.
	12	17-0	17	To be defined.
	13	17-14	17	Rate code. Rate of transmitted data.
	13			1 = 117.6 kbps (X1)
	13			2 = 22.05 kbps (E7, Z1, X2, T3)
	13			3 = 7.35 kbps (E7, X2, T3)
	13			4 = 2.45 kbps (T1, T4, E6)
	13			5 = 490. bps (U5)
	13			6 = 33 1/3 bps (E1, E4, E5, E6)
	13			7 = 8 1/3 bps (E6)
	13			8 = $\frac{33\ 1/3}{5\ 1/3}$ bps (E2)
	13			9 = $\frac{33\ 1/3}{3 \times 5\ 1/3}$ (E2)
	13			10 = 9 x 33 1/3" (E3)
	13			11 = 3 x 33 1/3" (E3)
	13			12 = $\frac{2450}{5\ 1/3}$ (T2)
	13			13 = $\frac{2450}{3 \times 5\ 1/3"}$ (T2)
	13	13-0	13	Number of data bits in this record.
9				Frame Count for record ID's 730105-730505 and 730115-730515 Number of in-sync NIS minor frames used to generate this record. OR Lock Count for record ID's 73065 and 730705 number of consecutive in-sync frames. Resets to 0 when stream goes out of sync. Counts to 99999 max.
	14	17-0	17	Count

Table 4.3-A1. Standard Header Format (contd)

Item	Word	Bits	MSB	Title/Function
10				MDR Status Word for record ID's 73105-730505 and 730115-730515. Provides status data related to several data processing systems and functions affecting the quality of the data in this record. Bits 17 thru 7 contain OR'd data from all MDR status words of all NIS frame records used to generate this record.
	15	17-12	17	DSIF lock status. RCVR status ——— Bit 17 SDA status ——— Bit 16 TCP status ——— Bit 15 SSA status ——— Bit 14 DDA status ——— Bit 13 BDA status ——— Bit 12 0 = In lock, 1 = Out of lock/not in use.
		11	11	Corrected FDS count/minor frame count/SCI. 0 = Not corrected, 1 = Corrected.
		10	10	Corrected earth received GMT. 0 = Not corrected, 1 = Corrected.
		9	9	Errors in sync words of NIS frames. 0 = No errors, 1 = Errors within BET.
		8	8	Bad leading or trailing sync word of NIS frames. 0 = No bad words, 1 = Bad word(s).
		7	7	GCF block error flag status. 0 = No errors, 1 = Error flag was set.
		6	6	Not used.
		5	5	Complete frame flag. Indicates if any of the words in the data block of this record do not contain valid data. 0 = Complete frame, 1 = Data missing.
		4-0	4	Not used. OR

Table 4.3-A1. Standard Header Format (contd)

Item	Word	Bits	MSB	Title/Function
10				MDR Status Word for record ID's 730605 and 730705. Provides status data related to several data processing systems and functions affecting the quality of the data in this record.
	15	17-12	17	DSIF lock status. Latest available data from last GCF block from which this data record was derived. RCVR status ——— Bit 17 SDA status ——— Bit 16 TCP status ——— Bit 15 SSA status ——— Bit 14 DDA status ——— Bit 13 BDA status ——— Bit 12 0 = In lock, 1 = Out of lock/not in use.
		11	11	Corrected FDS Count/Minor Frame Count/SCI 0 = Not corrected, 1 = Corrected.
		10	10	Corrected earth received GMT 0 = Not corrected, 1 = Corrected
		9	9	Errors in leading or trailing sync words. 0 = No errors, 1 = Errors within BET.
		8	8	Bad leading or trailing sync word. (Bit errors exceed bit error tolerance in use) 0 = Neither word bad, 1 = One word bad.
		7	7	GCF block error. Indicates whether or not the error flag was set on GCF data block containing data for this frame. 0 = No errors, 1 = Error flag was set.
		6-0	6	Not used.

Table 4.3-A1. Standard Header Format (contd)

Item	Word	Bits	MSB	Title/Function
11				DSIF Station ID. Identifies DSIF station which received first NIS frame used to generate this record for record ID's 730105-730505 and 730115-730515. OR Identifies DSIF station which received this frame of data for record ID's 730605 and 730705.
	16	17-4	17	0
		3-0	3	Station code 0 = DSS 27 6 = DSS 21 11 = DSS 61 1 = DSS 51 7 = DSS 62 12 = DSS 12 2 = DSS 14 8 = DSS 63 13 = Other 3 = DSS 71 9 = DSS 43 14 = Other 4 = DSS 11 10 = DSS 41 15 = Other 5 = DSS 42
12				SNR. Value from header of first NIS frame used to generate this record for record ID's 730105-730505 and 730115-730515. OR Latest available SNR at DSIF station which received this frame of data for record ID's 730605 and 730705. (From GCF block.)
	17	17-12	17	0
		11-0	11	SNR in two's complement with binary point between bits five and four. (bit 11 used as sign bit) Units = dB.

Table 4.3-A1. Standard Header Format (contd)

Item	Word	Bits	MSB	Title/Function
13				DSIF Configuration. Configuration status of DSIF station from header of first NIS frame used to generate this record for record ID's 730105-730505 and 730115-730515. OR Latest abailable configuration status of DSIF station which received this frame of data for record ID's 730605 and 730705. (From GCF block.)
	18	17-15	17	0
		14-0	14	Bits 14-11 001 = RCVR 1 010 = RCVR 2 011 = RCVR 3 100 = RCVR 4 101 = RCVR 5 110 = RCVR 6
				Bits 10-8 000 = SDA 8 001 = SDA 1 010 = SDA 2 011 = SDA 3 100 = SDA 4 101 = SDA 5 110 = SDA 6 111 = SDA 7
				Bits 7-6 00 = TCP Alpha 01 = TCP Beta 10 = TCP Gamma 11 = Not Used
				Bit 5 0 = Bit Loop ON 1 = Bit Loop OFF 00 = Not Used

Table 4.3-A1. Standard Header Format (contd)

Item	Word	Bits	MSB	Title/Function
13 (cont)				Bits 4-3: 01 = SSA 1; 10 = SSA 2; 11 = Not Used
				Bit 2: 0 = BDA ON; 1 = BDA OFF/Not Used
				Bit 1: 0 = DDA 1 ON; 1 = DDA 1 OFF/Not Used
				Bit 0: 0 = DDA 2 ON; 1 = DDA 2 OFF/Not Used
14				DSIF AGC. AGC from header of first NIS frame used to generate this record for record ID's 730105-730505 and 730115-730515. OR Latest available AGC at DSIF station which received this frame for record ID's 730605 and 730705. (From GCF block.)
	19	17-12	17	0
		11-0	11	AGC magnitude in binary with binary point between bits four and three. (No sign bit); Units = dBm or volts. Values ≤ -50 = dBm, Values > -50 = volts.
15				Composite Bit Errors. Number of errors detected in 10^5 sync word bits from header of first NIS frame used to generate this record for record ID's 730105-730505 and 730115-730515. OR

Table 4.3-A1. Standard Header Format (contd)

Item	Word	Bits	MSB	Title/Function
				Latest available calculation of number of errors detected in 10^5 sync word bits for record ID's 730605 and 730705.
	20	17	17	0
		16-0	16	Number of errors detected in 10^5 sync word bits.

Table 4.3-A2. Subheader Format of MAG Experiment Data Record on MVM-MTC Tapes

Item	Word	Bits	MSB	Title/Function
1				Record ID. Identifies data stream source of data for the record.
	1	17-0	17	T1 = 730103_8 = NIS-1 from IM-1 T2 = 730203_8 = NIS-1 from IM-1 Playback T3 = 730303_8 = NIS-1 Playback T4 = 730403_8 = NIS-1 U5 = 730104_8 = NIS-2
2				Physical Record ID. Identifies physical logical record sequence number.
	2	17-3	17	00000_8
		2-0	2	Physical record sequence number of this record (steps from 1 to 7, then recycles)
3	3 thru 7			Spare
4				SCE Time. The GMT that the first data bit of the first NIS frame, used to generate this record, was transmitted by the spacecraft. (Calculated by MTC in MDR's only)
	8	17-8	17	Number of milliseconds since the beginning of the current second.
	8	7-0	7	Eight most significant bits of the number of days since the beginning of the current year.
	9	17	17	Least significant bit of the number of days since the beginning of the current year.
	9	16-0	16	Number of seconds since the beginning of the current day.

Table 4.3-A2. Subheader Format of MAG Experiment Data Record on MVM-MTC Tapes (contd)

Item	Word	Bits	MSB	Title/Function
5				Data Quality. Bits in words 10 through 19 are used to identify the NIS-1 or 2 frames, used to generate this record, which were missing or for which the MDR status word was non-zero. 0 = good frame, 1 = missing frame or non-zero MDR status word.
				NIS-1
	10	17-0	17	Flags for minor frames 1 through 18.
	11	17-0	17	Flags for minor frames 19 through 36.
	12	17-0	17	Flags for minor frames 37 through 54.
	13	17-0	17	Flags for minor frames 55 through 72.
	14	17-0	17	Flags for minor frames 73 through 90.
	15	17-0	17	Flags for minor frames 91 through 108.
	16	17-0	17	Flags for minor frames 109 through 126.
	17	17-0	17	Flags for minor frames 127 through 144.
	18	17-0	17	Flags for minor frames 145 through 162.
	19	17-5	17	Flags for minor frames 163 through 175.
		4-0	4	Set = 00_8.
				NIS-2
	10	17	17	Flag for minor frame 1.
		16-13	16	Set = 0.
		12	12	Flag for minor frame 2.
		11-8	11	Set = 0.
		7	7	Flag for minor frame 3.
		6-3	6	Set = 0.
		2	2	Flag for minor frame 4.
		1-0	1	Set = 0.
	11	17-16	17	Set = 0.
		15	15	Flag for minor frame 5.

Table 4.3-A2. Subheader Format of MAG Experiment Data Record on MVM-MTC Tapes (contd)

Item	Word	Bits	MSB	Title/Function
5 (cont)		14-11	14	Set = 0.
		10	10	Flag for minor frame 6.
		9-6	9	Set = 0.
		5	5	Flag for minor frame 7.
		4-1	4	Set = 0.
		0	0	Flag for minor frame 8.
	12	17-14	17	Set = 0.
		13	13	Flag for minor frame 9.
		12-9	12	Set = 0.
		8	8	Flag for minor frame 10.
		7-4	7	Set = 0.
		3	3	Flag for minor frame 11.
		2-0	2	Set = 0.
	13	17	17	Set = 0.
		16	16	Flag for minor frame 12.
		15-12	15	Set = 0.
		11	11	Flag for minor frame 13.
		10-7	10	Set = 0.
		6	6	Flag for minor frame 14.
		5-2	5	Set = 0.
		1	1	Flag for minor frame 15.
		0	0	Set = 0.
	14	17-15	17	Set = 0.
		14	14	Flag for minor frame 16.
		13-10	13	Set = 0.
		9	9	Flag for minor frame 17.
		8-5	8	Set = 0.
		4	4	Flag for minor frame 18.
		3-0	3	Set = 0.
	15	17	17	Flag for minor frame 19.

Table 4.3-A2. Subheader Format of MAG Experiment Data Record on MVM-MTC Tapes (contd)

Item	Word	Bits	MSB	Title/Function
5 (cont)		16-13	16	Set = 0.
		12	12	Flag for minor frame 20.
		11-8	11	Set = 0.
		7	7	Flag for minor frame 21.
		6-3	6	Set = 0.
		2	2	Flag for minor frame 22.
		1-0	1	Set = 0.
	16	17-16	17	Set = 0.
		15	15	Flag for minor frame 23.
		14-11	14	Set = 0.
		10	10	Flag for minor frame 24.
		9-6		Set = 0.
		5		Flag for minor frame 25.
		4-1		Set = 0.
		0		Flag for minor frame 26.
	17	17-14	17	Set = 0.
		13	13	Flag for minor frame 27.
		12-9	12	Set = 0.
		8	8	Flag for minor frame 28.
		7-4	7	Set = 0.
		3	3	Flag for minor frame 29.
		2-0	2	Set = 0.
	18	17	17	Set = 0.
		16	16	Flag for minor frame 30.
		15-12	15	Set = 0.
		11	11	Flag for minor frame 31.
		10-7	10	Set = 0.
		6	6	Flag for minor frame 32.
		5-2	5	Set = 0.
		1	1	Flag for minor frame 33.

Table 4.3-A2. Subheader Format of MAG Experiment Data Record on MVM-MTC Tapes (contd)

Item	Word	Bits	MSB	Title/Function
5 (cont)		0	0	Set = 0.
	19	17-15	17	Set = 0.
		14	14	Flag for minor frame 34.
		13-10	13	Set = 0.
		9	9	Flag for minor frame 35.
		8-0	8	Set = 0.
				Note: For segmented records, only the flag bits representing the 25 NIS-1 or five NIS-2 frames related to the record will be used. All others will be set to zero.
6				MAG Housekeeping Measurements. Eight housekeeping measurements are extracted from the NIS-1 or NIS-2 data stream.
	20	17	17	Data Flag
		16-10	16	0
		9-0*	9	MAG HK Word-1 LAD
				NIS-1 minor frame 1, bits 295-304, or
				NIS-2 minor frame 1, bits 295-304
				(Updated in physical record #1)
	21	17	17	Data Flag
		16-10	16	0
		9-0*	9	MAG HK Word-2 LAD
				NIS-1 minor frame 6, bits 295-304, or
				NIS-2 minor frame 2, bits 295-304
				(Updated in physical record #1)
	22	17	17	Data Flag
		16-10	16	0
		9-0*	9	MAG HK Word-3 LAD
				NIS-1 minor frame 26, bits 295-304, or
				*Set to ZERO if no data are available.

Table 4.3-A2. Subheader Format of MAG Experiment Data Record on MVM-MTC Tapes (contd)

Item	Word	Bits	MSB	Title/Function
6 (cont)				NIS-2 minor frame 6, bits 295-304 (Updated in physical record #2)
	23	17	17	Data Flag
		16-10	16	0
		9-0*	9	MAG HK Word-4 LAD NIS-1 minor frame 51, bits 295-304, or NIS-2 minor frame 11, bits 295-304 (Updated in physical record #3)
	24	17	17	Data Flag
		16-10	16	0
		9-0*	9	MAG HK Word-5 LAD NIS-1 minor frame 76, bits 295-304, or NIS-2 minor frame 16, bits 295-304 (Updated in physical record #4)
	25	17	17	Data Flag
		16-10	16	0
		9-0*	9	MAG HK Word-6 LAD NIS-1 minor frame 101, bits 295-304, or NIS-2 minor frame 21, bits 295-304 (Updated in physical record #5)
	26	17	17	Data Flag
		16-10	16	0
		9-0*	9	MAG HK Word-7 LAD NIS-1 minor frame 126, bits 295-304, or NIS-2 minor frame 26, bits 295-304 (Updated in physical record #6)
	27	17	17	Data Flag
		16-10	16	0

*Set to ZERO if no data are available.

Table 4.3-A2. Subheader Format of MAG Experiment Data Record on MVM-MTC Tapes (contd)

Item	Word	Bits	MSB	Title/Function
6 (cont)		9-0*	9	MAG HK Word-8 LAD NIS-1 minor frame 151, bits 295-304, or NIS-2 minor frame 31, bits 295-304 (Updated in physical record #7)
7				Magnetometer Commands. Three magnetometer commands are extracted from the NIS-1 or NIS-2 data.
	28	17	17	Data flag, 0 = data, 1 = no data
		16-13	16	0
		12-0*	12	CC-5-5 coded command LAD, NIS-1 minor frame 27, bits 303-315 or NIS-2 minor frame 6, bits 111-123 (Updated in physical record #2)
	29	17	17	Data flag
		16-13	16	0
		12-0*	12	CC-5-6 coded command LAD, NIS-1 minor frame 32, bits 303-315 or NIS-2 minor frame 7, bits 111-123. (Updated in physical record #2)
	30	17	17	Data flag
		16-13	16	0
		12-0*	12	CC-5-7 coded command LAD, NIS-1 minor frame 37, bits 303-315, or NIS-2 minor frame 8, bits 111-123. (Updated in physical record #2)

*Set to ZERO if no data are available.

Table 4.3-A2.1. Engineering Data Record Subheader Format

Item	Word Number	Bits	MSB	Title/Function
1				Engineering Housekeeping Data. These data are extracted from the data block of each Engineering Data record. The data flags are set to 1 when no data are available.
	1	17 16-7 6-0	17 16 6	Data flag 0 Subcom Index word
	2	17 16-2 1-0	17 16 1	Data flag 0 Rate code: 01 = ENG-A 10 = ENG-B 11 = ENG-C
	3	17 16-2 1-0	17 16	Data flag 0 Format code: 01 = Fixed 10 = Primary 11 = Maneuver
	4	17 16-6 5-0	17 16	Data flag 0 Block Control ID
2	5 through 8	17-0	17	Unused
3				SCE Time. The GMT that the first data bit of this record was transmitted by the spacecraft. (Calculated by MTC in MDR's only)
	9	17-8	17	Number of milliseconds since the beginning of the current second.
	9	7-0	7	Eight most significant bits of the number of days since the beginning of the current year.
	10	17	17	Least significant bit of the number of days since the beginning of the current year.
	10	16-0	16	Number of seconds since the beginning of the current day.

Table 4.3-A2.1. Engineering Data Record Subheader Format

Item	Word Number	Bits	MSB	Title/Function
				DSIF Monitor Data Words 11 through 20 contain data from the latest available DSIF Monitor/Status GCF block.
4				Time of year and day associated with data contained in Monitor/Status block.
	11*	17-16	17	Most significant digit of day-of-year.
		15-12	15	Middle significant digit of day-of-year.
		11-8	11	Least significant digit of day-of-year.
		7-4	7	Most significant digit of hours.
		3-0	3	Least significant digit of hours.
	12	17-16	17	0
		15-12	15	Most significant digit of minutes.
		11-8	11	Least significant digit of minutes.
		7-4	7	Most significant digit of seconds.
		3-0	3	Least significant digit of seconds.
5				Block 3 Receiver 1 AGC
	13	17-15	17	0
		14	14	Sign bit, + = 0
		13-0	13	Magnitude in binary with binary point located between bits 6 and 5; Units = dBm
6				Block 3 Receiver 2 AGC
	14	17-15	17	0
		14	14	Sign bit, + = 0
		13-0	13	Magnitude in binary with binary point located between bits 6 and 5; Units = dBm

Table 4.3-A2.1. Engineering Data Record Subheader Format (contd)

Item	Word Number	Bits	MSB	Title/Function
7				Block 4 S-Band Receiver AGC
	15	17-15	17	0
		14	14	Sign bit, + = 0
		13-0	13	Magnitude in binary with binary point located between bits 6 and 5; Units = dBm
8				Block 4 X-Band Receiver AGC
	16	17-15	17	0
		14	14	Sign bit, + = 0
		13-0	13	Magnitude in binary with binary point located between bits 6 and 5; Units = dBm
9				TCP A SNR
	17	17-12	17	0
		11	11	Sign bit, + = 0
		10-0	10	Magnitude in binary with binary point located between bits 5 and 4; units = dB
10				TCP B SNR
	18	17-12	17	0
		11	11	Sign bit, + = 0
		10-0	10	Magnitude in binary with binary point located between bits 5 and 4; units = dB
11				Transmitter Power
	19	17-15	17	0
		14-0	14	Magnitude in binary with binary point located between bits 9 and 10; units = kilowatts

Table 4.3-A2.1. Engineering Data Record Subheader Format (contd)

Item	Word Number	Bits	MSB	Title/Function
12				DSIF Status
	20	17-10	17	0
		9-6	9	Receiver Lock Status, Logical OR of five samples in monitor block. Bit 9 - Receiver 1 8 - Receiver 2 7 - Receiver 3 6 - Receiver 4 0 = In Lock, 1 = out-of-lock
		5-2	5	Modulation Status Logical OR of five samples in monitor block Bit 5 = Ranging Bit 4 = Test Bit 3 = CMA 2 Bit 2 = CMA 1 0 = Off, 1 = On.
		1-0	1	Transmitter Drive Status Logical OR of five samples in monitor block Bit 1 - Block 3 Exciter Bit 0 - Block 4 Exciter 0 = ON 1 = OFF
13 thru 21	21 thru 30			Words 21 through 30 contain data from the next to latest available Monitor Status block. The description

Table 4.3-A2.1. Engineering Data Record Subheader Format (contd)

Item	Word Number	Bits	MSB	Title/Function
				of items 13 through 21 in words 21 through 30 is identical to the description of items 4 through 12 in words 11 through 20.

*The day-of-year code also serves as a data flag for all of the monitor block items contained in words 11 through 20 or 21 through 30. If the day-of-year code in word 11 or 21 is zero, then the corresponding data words 11 through 20 or 21 through 30 will contain filler.

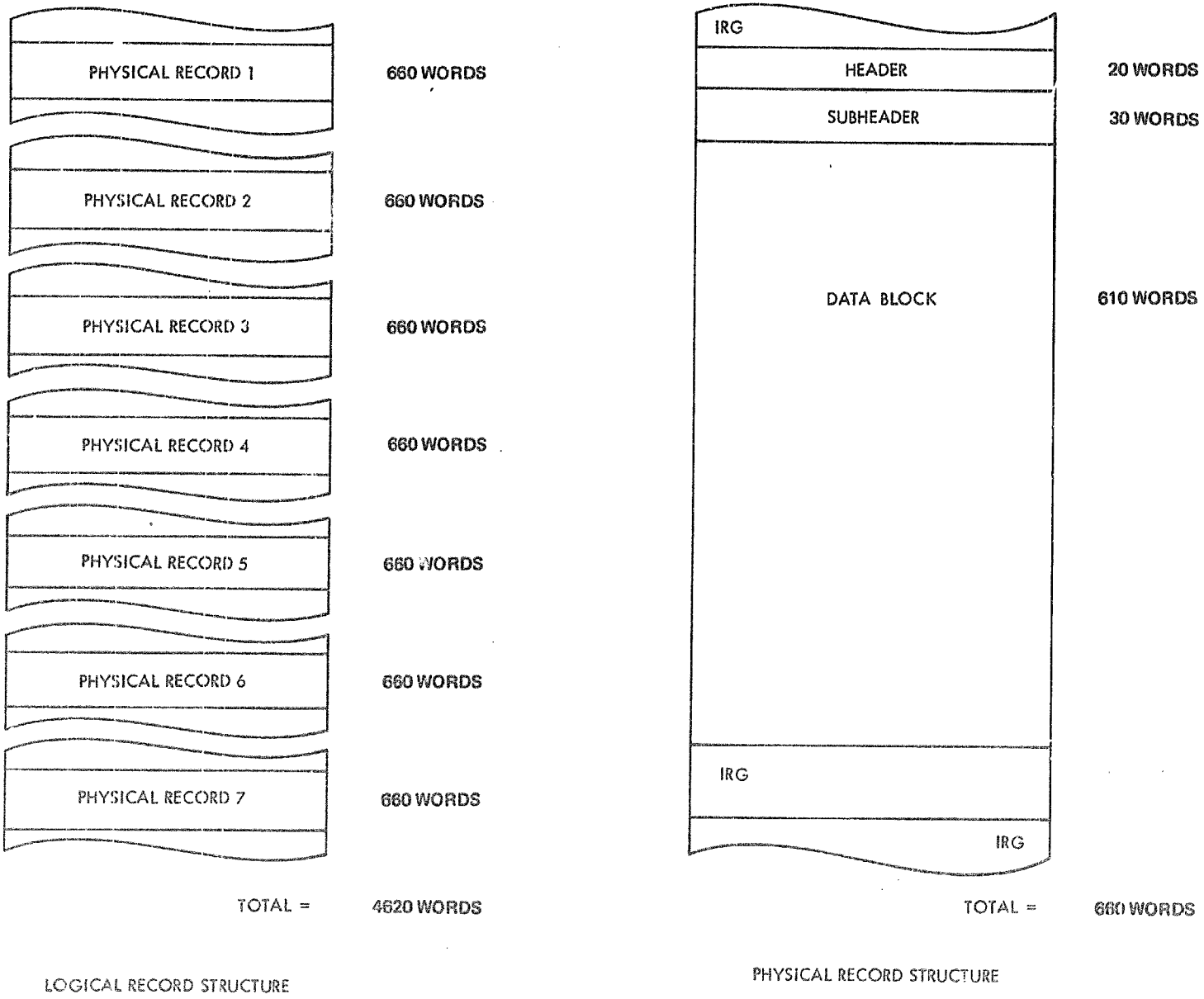

Figure 4.3-A3. MAG Record Structure

Table 4.3-A3. MAG Record Data Block

Item	Word Number [2]	Bits	MSB	Title/Function
				MAG RECORD DATA BLOCK The 610 MAG data record words which are written in each of the 7 MAG Physical Records are defined herein.
	1+(N)120	17	17	Data Flag [1]
		16-10	16	000_8
		9-0	9	FIRST PRIME X-AXIS DATA NIS-1 or NIS-2; Bits 57-66
	2+(N)120	17	17	DATA FLAG
		16-10	16	000_8
		9-0	9	FIRST PRIME Y-AXIS DATA NIS-1 or NIS-2; Bits 67-76
	3+(N)120	17	17	DATA FLAG
		16-10	16	000_8
		9-0	9	FIRST PRIME Z-AXIS DATA NIS-1 or NIS-2; Bits 77-86
	4+(N)120	17	17	DATA FLAG
		16-12	16	00_8
		11-0	11	SECONDARY X-AXIS DATA NIS-1 or NIS-2: Bits 87-98
	5+(N)120	17	17	DATA FLAG
		16-10	16	000_8
		9-0	9	SECOND PRIME X-AXIS DATA NIS-1 or NIS-2; Bits 155-164
	6+(N)120	17	17	DATA FLAG
		16-10	16	000_8
		9-0	9	SECOND PRIME Y-AXIS DATA NIS-1 or NIS-2; Bits 165-174

[1] DATA FLAG - The data flag is set to a "1" when data is not available; it is set to "0" when data is present and has been recorded in the following Bits 16-0.

[2] See Table 4.3-A3.1 for NIS-1 or 4.3-A3-2 for NIS-2. Tables relate minor frame numbers to physical record and value of N.

Table 4.3-A3. MAG Record Data Block (contd)

Item	Word Number (2)	Bits	MSB	Title/Function
	7+(N)120	17	17	DATA FLAG
		16-10	16	000_8
		9-0	9	SECOND PRIME Z-AXIS DATA NIS-1 or NIS-2; Bits 175-184
	8+(N)120	17	17	DATA FLAG
		16-12	16	00_8
		11-0	11	SECONDARY Y-AXIS DATA NIS-1 or NIS-2; Bits 185-196
	9+(N)120	17	17	DATA FLAG
		16-10	16	000_8
		9-0	9	THIRD PRIME X-AXIS DATA NIS-1 or NIS-2; Bits 253-262
	10+(N)120	17	17	DATA FLAG
		16-10	16	000_8
		9-0	9	THIRD PRIME Y-AXIS DATA NIS-1 or NIS-2; Bits 263-272
	11+(N)120	17	17	DATA FLAG
		16-10	16	000_8
		9-0	9	THIRD PRIME Z-AXIS DATA NIS-1 or NIS-2; Bits 273-282
	12+(N)120	17	17	DATA FLAG
		16-12	16	00_8
		11-0	11	SECONDARY Z-AXIS DATA NIS-1 or NIS-2; Bits 283-294
	13+(N)120	17	17	DATA FLAT
		16-10	16	000_8
		9-0	9	FOURTH PRIME X-AXIS DATA NIS-1 or NIS-2; Bits 351-360
	14+(N)120	17	17	DATA FLAG
		16-10	16	000_8
		9-0	9	FOURTH PRIME Y-AXIS DATA NIS-1 or NIS-2; Bits 361-370

Table 4.3-A3. MAG Record Data Block (contd)

Item	Word Number	Bits	MSB	Title/Function
	15+(N)120	17	17	DATA FLAG
		16-10	16	000_8
		9-0	9	FOURTH PRIME Z-AXIS DATA NIS-1 or NIS-2; Bits 371-380
	16+(N)120	17	17	DATA FLAG
		16-12	16	00_8
		11-0	11	SECOND SECONDARY X-AXIS DATA NIS-1 or NIS-2; Bits 381-392
	17+(N)120	17	17	DATA FLAG
		16-10	16	000_8
		9-0	9	FIFTH PRIME X-AXIS DATA NIS-1 or NIS-2; Bits 449-458
	18+(N)120	17	17	DATA FLAG
		16-10	16	000_8
		9-0	9	FIFTH PRIME Y-AXIS DATA NIS-1 or NIS-2; Bits 459-468
	19+(N)120	17	17	DATA FLAG
		16-10	16	000_8
		9-0	9	FIFTH PRIME Z-AXIS DATA NIS-1 or NIS-2; Bits 469-478
	20+(N)120	17	17	DATA FLAG
		16-12	16	00_8
		11-0	11	SECOND SECONDARY Y-AXIS DATA NIS-1 or NIS-2; Bits 479-490
	21+(N)120	17	17	DATA FLAG
		16-10	16	000_8
			9	SIXTH PRIME X-AXIS DATA NIS-1 or NIS-2; Bits 547-556
	22+(N)120	17	17	DATA FLAG
		16-10	16	000_8
		9-0	9	SIXTH PRIME Y-AXIS DATA NIS-1 or NIS-2; Bits 557-566

Table 4.3-A3. MAG Record Data Block (contd)

Item	Word Number	BITS	MSB	Title/Function
	23+(N)120	17 16-10 9-0	17 16 9	DATA FLAG 000_8 SIXTH PRIME Z-AXIS DATA NIS-1 or NIS-2; Bits 567-576
	24+(N)120	17 16-12 11-0	17 16 11	DATA FLAG 00_8 SECOND SECONDARY Z-AXIS DATA NIS-1 or NIS-2; Bits 577-588
	25+(N)120 through 48+(N)120			The bit sources for words 25+(N)120 through 48+(N)120 correspond to those of words 1+(N)120 through 24+(N)120 respectively. Only the NIS minor frame numbers are different as specified by flag note 2.
	49+(N)120 through 72+(N)120			The bit sources for words 49+(N)120 through 72+(N)120 correspond to those of words 1+(N)120 through 24+(N)120 respectively only the NIS minor frame numbers are different as specified by flag note 2.
	73+(N)120 through 96+(N)120			The bit sources for words 73+(N)120 through 96+(N)120 correspond to those of words 1+(N)120 through 24+(N)120 respectively only the NIS minor frame numbers are different as specified by flag note 2.
	97+(N)120 through 120+(N)120			The bit sources for words 97+(N)120 through 120+(N)120 correspond to those of words 1+(N)120 through 24+(N)120 respectively only the NIS minor frame numbers are different as specified by flag note 2.

Table 4.3-A3. MAG Record Data Block (contd)

Item	Word Number	Bits	MSB	Title/Function
	601-610			NIS-1: All Blank 000000_8
				Nis-2:
	601	17	17	Data Flag
		16-10	16	000_8
		9-0	9	MAG X-AXIS FULL WORD MINOR FRAME, (1+5K), bits 101-110*
	602	17	17	Data Flag
		16-10	16	000_8
		9-0	9	MAG Y-AXIS FULL WORD MINOR FRAME, (2+5K), bits 101-110*
	603	17	17	Data Flag
		16-10	16	MAG Z-AXIS FULL WORD
		9-0	9	MINOR FRAME, (3+5K), bits 101-110*
	604	17	17	Data Flag
		16-10	16	000_8
		9-0	9	MAG X-AXIS FULL WORD MINOR FRAME, (3+5K), bits 395-404*
	605	17	17	Data Flag
		16-10	16	000_8
		9-0	9	MAG Y-AXIS FULL WORD MINOR FRAME, (4+5K), bits 395-404*
	606	17	17	Data Flag
		16-10	16	000_8
		9-0	9	MAG Z-AXIS FULL WORD MINOR FRAME, (5+5K), bits 395-404*
	607 through 610	17-0	17	Unused

* K=0 for physical record 1, 1 for record 2, ... through 6 for physical record 7.

Table 4.3-A3.1. Relationship of NIS-1 Minor Frame to Value of N and Physical Record Number

Phys Rec No. \ N	0	1	2	3	4
1	1-5	6-10	11-15	16-20	21-25
2	26-30	31-35	36-40	41-45	46-50
3	51-55	56-60	61-65	66-70	71-75
4	76-80	81-85	86-90	91-95	96-100
5	101-105	106-110	111-115	116-120	121-125
6	126-130	131-135	136-140	141-145	146-150
7	151-155	156-160	161-165	166-170	171-175

Table 4.3-A3.2. Relationship of NIS-2 Minor Frame to Value of N and Physical Record Number

Phys Rec No. \ N	0	1	2	3	4
1	1	2	3	4	5
2	6	7	8	9	10
3	11	12	13	14	15
4	16	17	18	19	20
5	21	22	23	24	25
6	26	27	28	29	30
7	31	32	33	34	35

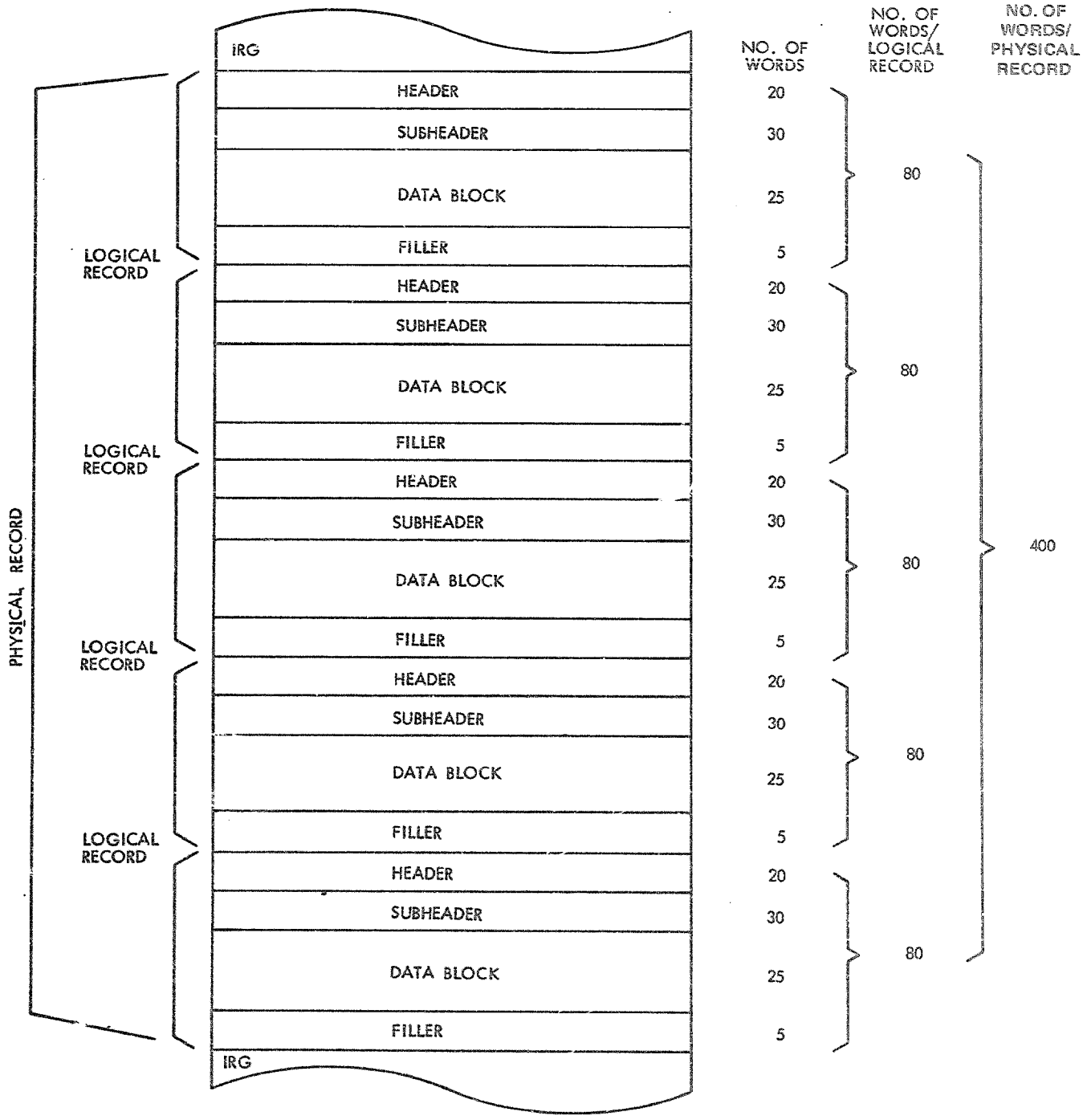

Figure 4.3-A4 Engineering Data Records Structure

Table 4.3-A4. Engineering Record Data Block Format

Word 1	Bits	MSB	Title
1	17	17	Data Flag for 1st ENG word 0 = data 1 = no data
1	16	16	Data Flag for 2nd ENG word 0 = data 1 = no data
1	13-7	13	1st Word of ENG minor frame
	6-0	6	2nd Word of ENG minor frame
2	17	17	Data Flag for 3rd ENG word 0 = data 1 = no data
2	16	16	Data Flag for 4th ENG word 0 = data 1 = no data
2	13-7	13	3rd Word of ENG minor frame
	6-0	6	4th Word of ENG minor frame
25	17	17	Data Flag for 49th ENG word 0 = data 1 = no data
25	16	16	Data Flag for 50th ENG word 0 = data 1 = no data
25	13-7	13	49th Word of ENG minor frame
	6-0	6	50th Word of ENG minor frame

APPENDIX B

EDR RECORDS STRUCTURE AND FORMATS

Figure 5.1.1-B1	Magnetometer EDR Records Structure
Table 5.1.2.6-B1.1	Block Descriptor Word and Record Descriptor Word
Table 5.1.2.1-B1.2	Mag Tape Label Format
Table 5.1.2.2-B2	MAG Data Record Header Format
Figure 5.1.2.3-B2.1	MAG Data Block Layout
Figure 5.1.2.3-B3	MAG Data Record Science Data Format
Table 5.1.2.3-B4	MAG Data Record NIS-2 Prime MAG Direct Readout for Delta Modulation
Table 5.1.2.3-B5	MAG Data Record Status Subcom and HK Subcom
Table 5.1.2.4-B6	MAG Engineering Record Header Format
Figure 5.1.2.5-B7	MAG Engineering Data Record Data Block Format
Figure 5.2.1-B8	CMRS EDR Records Structure
Table 5.2.2.1-B8.1	CMRS Tape Label Format
Table 5.2.2.2-B9	CMRS Record Header Format
Table 5.2.2.3-B10	CMRS Record Data Block Format
Figure 5.3.1-B11	SPT Records Structure
Table 5.3.2.1-B11.1	SPT Tape Label Format
Table 5.3.2.2-B12	SPT Record Header Format
Table 5.3.2.3-B13	SPT Record Data Block Format
Table 6.4.1-B14	CMRS and SPT Data Parameters
Figure 6.4.4-B15	SPT Channel Titles for Output Words

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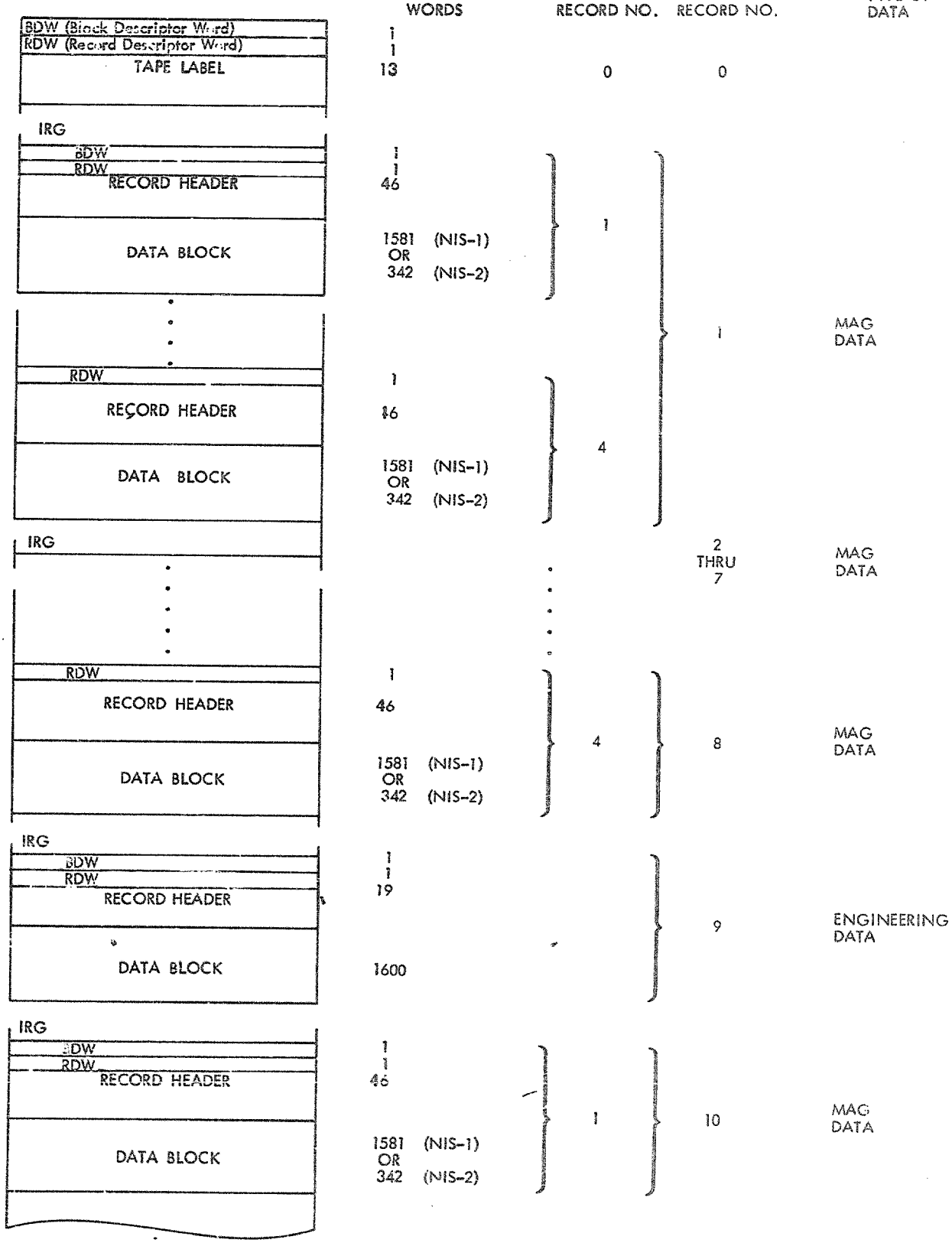
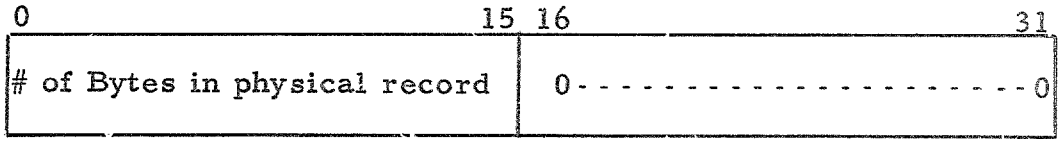


Figure 5.1.1-B1. Magnetometer EDR Records Structure

Table 5.1.2.6-B1.1. Block Descriptor Word and Record Descriptor Word

Block Descriptor Word



Record Descriptor Word

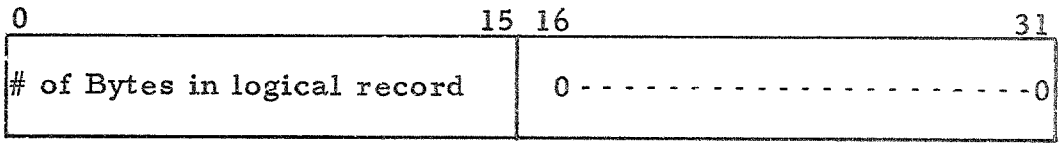


Table 5.1.2.1-B1.2 MAG Tape Label Format

Word No.	Title/Function	Type	Unit
1	Experimentor ID	I (Integer)	———
2	Satellite ID	I	———
3	EDR Tape ID Sequence Number	I	———
4	Year the tape was generated	I	
5	Day the tape was generated	I	Jan. 1 = 1
6	Millisecond of day the tape was generated	I	
7	Year of first record on tape (SCE)	I	
8	Day of first record on tape (SCE)	I	Jan. 1 = 1
9	Number of milliseconds since beginning of the current day of first record on tape (SCE)	I	
10	Record ID of first data record (MAG or ENG) on tape	I	
11-13	Same as 7-9 (ERT)		

Table 5.1.2.2-B2. MAG Data Record Header Format

Item	Word No.	Bits*	Title/Function
1			Record ID Identifies data stream for MAG data
	1	0-31	730115_{16} = T1 Stream, NIS-1 from IM-1 730215_{16} = T2 Stream, NIS-1 from IM-1 Playback 730315_{16} = T3 Stream, NIS-1 Playback 730415_{16} = T4 Stream, NIS-1 730515_{16} = U5 Stream, NIS-2
2			Record ID Sequence Number A count of all logical tape records written for each record ID
	2	0-31	The counter is incremented by one for each logical record generated
3			First Time GMT of first data bit of first NIS minor frame from which data has been extracted for this record.
	3	0-31	Number of milliseconds since beginning of the current day (ERT)
	4	0-31	Number of days since beginning of the current year (ERT)
	5	0-31	Same as Word 3 (SCE Time)
	6	0-31	Same as Word 4 (SCE Time)
4	4		Last Time GMT of last data bit in this record
	7	0-31	Same as Word 3 (ERT)
	8	0-31	Same as Word 4 (ERT)
	9	0-31	Same as Word 3 (SCE Time)
	10	0-31	Same as Word 4 (SCE Time)

*All words (32 bits) or half-words are right-adjusted; i.e., values are extended with leading binary zeros on the left. MSB is bit zero for full words and bits zero and 16 for half-words. Leftmost bit is bit zero.

Table 5.1.2.2-B2. MAG Data Record Header Format (contd)

Item	Word No.	Bits*	Title/Function
5			FDS Count
	11		A count of 42-second intervals
6			Frame Count Number of consecutive in-sync NIS-1 or NIS-2 minor frames, one per 25 NIS-1 minor frames or one per 5 NIS-2 minor frames:
	12 thru 18	0-31	Equals 25 for NIS-1 or 5 for NIS-2 for all in-sync data
7			MDR Status Word The logical sum (OR operation) of the MDR Status Words of the 7 physical records in an MTC logical record
	19	0-13	Unused DSIF Lock Status
		14	_____ RCVR
		15	_____ SDA
		16	_____ TCP
		17	_____ SSA
		18	_____ DDA
		19	_____ BDA
			0 = IN LOCK; 1 = OUT OF LOCK
		20	Corrected FDS count/minor frame count/SCI. 0 = Not corrected, 1 = Corrected.
		21	Corrected earth received GMT. 0 = Not corrected, 1 = Corrected.
		22	Errors in sync words of NIS frames. 0 = No errors, 1 = Errors within BET.
		23	Bad leading or trailing sync word of NIS frames. 0 = No bad words, 1 = Bad word(s).

*All words (32 bits) or half-words are right-adjusted; i.e., values are extended with leading binary zeros on the left. MSB is bit zero for full words and bits zero and 16 for half-words. Leftmost bit is bit zero.

Table 5.1.2.1-32. MAG Data Record Header Format (cont)

Item	Word No.	Bits*	Title Function
		24	GCF block error flag status. 0 = No errors. 1 = Error flag was set.
		25	Not used.
		26	Complete frame flag. Indicates if any of the words in the data block of this record do not contain valid data. 0 = Complete frame. 1 = Data missing.
		27-31	Not used.
8	20	0-31	First DSIF Station Code Station which received data for first NIS frame in first physical record of logical record

Value	Sta	Value	Sta
0	27	8	63
1	51	9	43
2	14	10	41
3	71	11	61
4	11	12	12
5	42	13	Other
6	21	14	Other
7	62	15	Other

*All words (32 bits) or half-words are right-adjusted; i.e., values are extended with leading binary zeros on the left. MSB is bit zero for full words and bits zero and 16 for half-words. Leftmost bit is bit zero.

Table 5.1.2.2-B2. MAG Data Record Header Format (contd)

Item	Word No.	Bits*	Title/Function
9	21	0-31	Last DSIF Station Code Station which received data for the first NIS frame in last physical record of logical record (see table in Item 8)
10		0-31	SNR SNR value from header of first NIS frame used to generate a physical record. Value in two's complement with binary point between bits 26 and 27. Units = dB
	22 thru 28	0-31	One from each of the 7 physical records/logical record of the MTC tape.
11			Composite Bit Errors Number of errors detected in 10^5 sync word bits from header of first NIS frame used to generate a physical record.
	29 thru 35		One from each of the 7 physical records/logical record of the MTC tape
12			DSIF Configuration Latest available configuration status
	36	18-31	Configuration from first physical record of logical record Bits 18-20: 001 = RCVR 1; 010 = RCVR 2; 011 = RCVR 3; 100 = RCVR 4; 101 = RCVR 5; 110 = RCVR 6 Bits 21-23: 000 = SDA 8; 001 = SDA 1; 010 = SDA 2; 011 = SDA 3; 100 = SDA 4; 101 = SDA 5; 110 = SDA 6; 111 = SDA 7

*All words (32 bits) or half-words are right-adjusted; i.e., values are extended with leading binary zeros on the left. MSB is bit zero for full words and bits zero and 16 for half-words. Leftmost bit is bit zero.

Table 5.1.2.2-B2. MAG Data Record Header Format (contd)

Item	Word No.	Bits*	Title/Function
			Bits 24-25 00 = TCP Alpha 01 = TCP Beta 10 = TCP Gamma 11 = Not Used
			Bit 26 0 = Bit Loop ON 1 = Bit Loop OFF
			Bits 27-28 00 = Not Used 01 = SSA 1 10 = SSA 2 11 = Not Used
			Bit 29 0 = BDA ON 1 = BDA OFF/Not Used Bit 30 0 = DDA 1 ON 1 = DDA 1 OFF/Not Used Bit 31 0 = DDA 2 ON 1 = DDA 2 OFF/Not Used
13			Data Quality. Bits in words 10 through 19 are used to identify the NIS-1 or 2 frames, used to generate this record, which were missing or for which the MDR status word was non-zero. 0 = good frame, 1 = missing frame or non-zero MDR status word. Note: For segmented records, only the flag bits representing the 25 NIS-1 or five NIS-2 frames related to the record will be used. All others will be set to zero.
			NIS-1
	37	14-31	Flags for minor frames 1 through 18.
	38	14-31	Flags for minor frames 19 through 36.
	39	14-31	Flags for minor frames 37 through 54.
	40	14-31	Flags for minor frames 55 through 72.
	41	14-31	Flags for minor frames 73 through 90.

*All words (32 bits) or half-words are right-adjusted; i.e., values are extended with leading binary zeros on the left. MSB is bit zero for full words and bits zero and 16 for half-words. Leftmost bit is bit zero.

Table 5.1.2.2-B2. MAG Data Record Header Format (contd)

Item	Word No.	Bits*	Title/Function
13 (contd)	42	14-31	Flags for minor frames 91 through 108.
	43	14-31	Flags for minor frames 109 through 126.
	44	14-31	Flags for minor frames 127 through 144.
	45	14-31	Flags for minor frames 145 through 162.
	46	14-26	Flags for minor frames 163 through 175.
		27-31	Set = 0
			NIS-2
	37	14	Flag for minor frame 1.
		15-18	Set = 0.
		19	Flag for minor frame 2.
		20-23	Set = 0.
		24	Flag for minor frame 3.
		25-28	Set = 0.
		29	Flag for minor frame 4.
		30-31	Set = 0.
	38	14-15	Set = 0.
		16	Flag for minor frame 5.
		17-20	Set = 0.
		21	Flag for minor frame 6.
		22-25	Set = 0.
		26	Flag for minor frame 7.
		27-30	Set = 0.
		31	Flag for minor frame 8.
	39	14-17	Set = 0.
		18	Flag for minor frame 9.
		19-22	Set = 0.
		23	Flag for minor frame 10.
		24-27	Set = 0.
		28	Flag for minor frame 11.

*All words (32 bits) or half-words are right-adjusted; i.e., values are extended with leading binary zeros on the left. MSB is bit zero for full words and bits zero and 16 for half-words. Leftmost bit is bit zero.

Table 5.1.2.2-B2. MAG Data Record Header Format (contd)

Item	Word No.	Bits*	Title/Function
13 (contd)		29-31	Set = 0.
	40	14	Set = 0.
		15	Flag for minor frame 12.
		16-19	Set = 0.
		20	Flag for minor frame 13.
		21-24	Set = 0.
		25	Flag for minor frame 14.
		26-29	Set = 0.
		30	Flag for minor frame 15.
		31	Set = 0.
	41	14-16	Set = 0.
		17	Flag for minor frame 16.
		18-21	Set = 0.
		22	Flag for minor frame 17.
		23-26	Set = 0.
		27	Flag for minor frame 18.
		28-31	Set = 0.
	42	14	Flag for minor frame 19.
		15-18	Set = 0.
		19	Flag for minor frame 20.
		20-23	Set = 0.
		24	Flag for minor frame 21.
		25-28	Set = 0.
		29	Flag for minor frame 22.
		30-31	Set = 0.
	43	14-15	Set = 0.
		16	Flag for minor frame 23.
		17-20	Set = 0.
		21	Flag for minor frame 24.

*All words (32 bits) or half-words are right-adjusted; i.e., values are extended with leading binary zeros on the left. MSB is bit zero for full words and bits zero and 16 for half-words. Leftmost bit is bit zero.

Table 5.1.2.2-B2. MAG Data Record Header Format (contd)

Item	Word No.	Bits*	Title/Function
13 (contd)		22-25	Set = 0.
		26	Flag for minor frame 25.
		27-30	Set = 0.
		31	Flag for minor frame 26.
	44	14-17	Set = 0.
		18	Flag for minor frame 27.
		19-22	Set = 0.
		23	Flag for minor frame 28.
		24-27	Set = 0.
		28	Flag for minor frame 29.
		29-31	Set = 0.
	45	14	Set = 0.
		15	Flag for minor frame 30.
		16-19	Set = 0.
		20	Flag for minor frame 31.
		21-24	Set = 0.
		25	Flag for minor frame 32.
		26-29	Set = 0.
		30	Flag for minor frame 33.
		31	Set = 0.
	46	14-16	Set = 0.
		17	Flag for minor frame 34.
		18-21	Set = 0.
		22	Flag for minor frame 35.
		23-31	Set = 0.

*All words (32 bits) or half-words are right-adjusted; i.e., values are extended with leading binary zeros on the left. MSB is bit zero for full words and bits zero and 16 for half-words. Leftmost bit is bit zero.

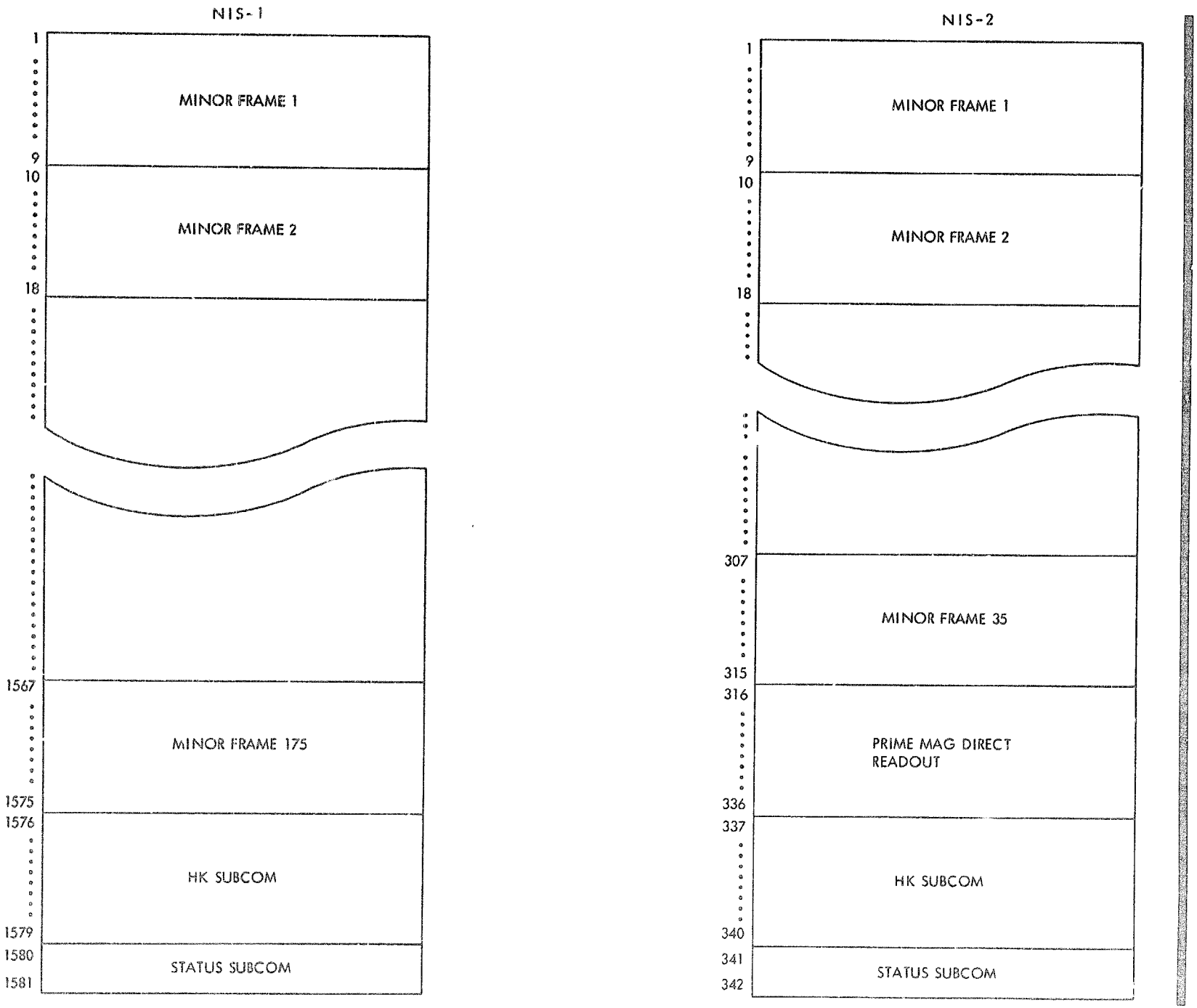


Figure 5.1.2.3-B2.1. MAG Data Block Layout

9 WORD DATA FORMAT FOR MAG NON-IMAGING SCIENCE 1 (NIS-1) OF ONE MINOR FRAME (WORDS 1-1575 OF DATA BLOCK)

(2) FLAG	PRIME MAG X-AXIS (10)	PRIME MAG Y-AXIS (10)	PRIME MAG Z-AXIS (10)	(2) FLAG	PRIME MAG X-AXIS (10)	PRIME MAG Y-AXIS (10)	PRIME MAG Z-AXIS (10)	(2) FLAG	PRIME MAG X-AXIS (10)	PRIME MAG Y-AXIS (10)	PRIME MAG Z-AXIS (10)
(2) FLAG	PRIME MAG X-AXIS (10)	PRIME MAG Y-AXIS (10)	PRIME MAG Z-AXIS (10)	(2) FLAG	PRIME MAG X-AXIS (10)	PRIME MAG Y-AXIS (10)	PRIME MAG Z-AXIS (10)	(2) FLAG	PRIME MAG X-AXIS (10)	PRIME MAG Y-AXIS (10)	PRIME MAG Z-AXIS (10)
(2) FLAG	2ND MAG X (12)	2ND MAG Y (12)	2ND MAG Z (12)	(2) FLAG	2ND MAG X (12)	2ND MAG Y (12)	2ND MAG Z (12)	SPARE (12)	FRAME COUNT (8)		

9 WORD DATA FORMAT FOR MAG NON-IMAGING SCIENCE 2 (NIS-2) OF ONE MINOR FRAME (WORDS 1-315 OF DATA BLOCK)

(2) FLAG	PRIME MAG (30) (FIVE 6-BIT DM SAMPLES) X Y Z X Y Z X Y Z X Y Z X Y Z	(2) FLAG	PRIME MAG (30) (FIVE 6-BIT DM SAMPLES) X Y Z X Y Z X Y Z X Y Z X Y Z	(2) FLAG	PRIME MAG (30) (FIVE 6-BIT DM SAMPLES) X Y Z X Y Z X Y Z X Y Z X Y Z						
(2) FLAG	PRIME MAG (30) (FIVE 6-BIT DM SAMPLES) X Y Z X Y Z X Y Z X Y Z X Y Z	(2) FLAG	PRIME MAG (30) (FIVE 6-BIT DM SAMPLES) X Y Z X Y Z X Y Z X Y Z X Y Z	(2) FLAG	PRIME MAG (30) (FIVE 6-BIT DM SAMPLES) X Y Z X Y Z X Y Z X Y Z X Y Z						
(2) FLAG	2ND MAG X (12)	2ND MAG Y (12)	2ND MAG Z (12)	(2) FLAG	2ND MAG X (12)	2ND MAG Y (12)	2ND MAG Z (12)	SPARE (12)	FRAME COUNT (8)		

FLAG = 0 DATA FLAG = 1 NO DATA

Figure 5.1.2.3-B3. MAG Data Record Science Data Format

Table 5.1.2.3-B4. MAG Data Record NIS-2 Prime MAG Direct Readout for Delta Modulation

Data Type	Minor Frame No.	Output Word No. (NIS-2 Only)	Bits*
Direct Readout X	1	316	0 - 15
Direct Readout Y	2	316	16 - 31
Direct Readout Z	3	317	0 - 15
Direct Readout X	3	317	16 - 31
Direct Readout Y	4	318	0 - 15
Direct Readout Z	5	318	16 - 31
Direct Readout X	6	319	0 - 15
Direct Readout Y	7	319	16 - 31
Direct Readout Z	8	320	0 - 15
Direct Readout X	8	320	16 - 31
Direct Readout Y	9	321	0 - 15
Direct Readout Z	10	321	16 - 31
⋮	⋮	⋮	⋮
Direct Readout X	31	334	0 - 15
Direct Readout Y	32	334	16 - 31
Direct Readout Z	33	335	0 - 15
Direct Readout X	33	335	16 - 31
Direct Readout Y	34	336	0 - 15
Direct Readout Z	35	336	16 - 31

*10 bit data is right adjusted in each 16 bits.

Bit 0 or 16 is used for a data flag 0 = data, 1 = no data. Leftmost bit is bit zero.

Table 5.1.2.3-B5. MAG Data Record Status Subcom and HK Subcom

Status Subcom and HK Subcom Data for NIS-1 Stream

Data Type	Minor Frame No.	Output Word No.	Bits*
HK Subcom	1	1576	0-15
HK Subcom	6	1576	16-31
HK Subcom	26	1577	0-15
HK Subcom	51	1577	16-31
HK Subcom	76	1578	0-15
HK Subcom	101	1578	16-31
HK Subcom	126	1579	0-15
HK Subcom	151	1579	16-31
Status Subcom	27	1580	0-15
Status Subcom	32	1580	16-31
Status Subcom	37	1581	0-15
Filler	---	1581	16-31

Status Subcom and HK Subcom Data for NIS-2 Stream

HK Subcom	1	337	0-15
HK Subcom	2	337	16-31
HK Subcom	6	338	0-15
HK Subcom	11	338	16-31
HK Subcom	16	339	0-15
HK Subcom	21	339	16-31
HK Subcom	26	340	0-15
HK Subcom	31	340	16-31
Status Subcom	6	341	0-15
Status Subcom	7	341	16-31
Status Subcom	8	342	0-15
Filler	---	342	16-31

*HK and Status data is right adjusted in each 16 bits. Bit 0 or 16 is used for a data flag; 0 = data, 1 = no data. Leftmost bit is bit zero.

Table 5.1.2.4-B6. MAG Engineering Record Header Format

Item	Word No.	Bits*	Title/Function
1			Record ID Identifies data as Engineering frame
	1	0 - 31	E1 = 00730105_{16} E5 = 00730505_{16} E2 = 00730205_{16} E6 = 00730605_{16} E3 = 00730305_{16} E7 = 00730705_{16} E4 = 00730405_{16}
2			First Time GMT of first sync bit in this record
	2	0 - 31	No. of milliseconds since beginning of the current day (ERT)
	3	0 - 31	No. of days since beginning of the current year (ERT)
	4	0 - 31	Same as Word 2 (SCE Time)
	5	0 - 31	Same as Word 3 (SCE Time)
3			Last Time GMT of last data bit in this record
	6	0 - 31	Same as Word 2 (ERT)
	7	0 - 31	Same as Word 3 (ERT)
	8	0 - 31	Same as Word 2 (SCE Time)
	9	0 - 31	Same as Word 3 (SCE Time)
4	10	0 - 31	First FDS count A count of 42-second intervals at the time of first minor frame of this record
5			Last FDS Count
	11	0 - 31	A count of 42-second intervals at the time of last minor frame of this record

*All words (32 bits) or half-words are right-adjusted; i.e., values are extended with leading binary zeros on the left. MSB is bit zero for full words and bits zero and 16 for half-words. Leftmost bit is bit zero.

Table 5.1.2.4-B6. MAG Engineering Record Header Format (contd)

Item	Word No.	Bits*	Title/Function
6			Frame Count. Number of in-sync frames. Sum of frame counts for records used in collecting 128 minor frames.
	12	0-31	
7			MDR Status Word. (Logical sum (ORed) of the MDR status words of all 128 (MTC-tape) ENG data records.
		0-13	Unused.
			DSIF Lock Status
	13**	14	RCVR
		15	SDA
		16	TCP
		17	SSA
		18	DDA
		19	BDA
			0 = In Lock; 1 = Out of Lock
		20	Corrected FDS count/minor frame count/SCI.
			0 = Not corrected, 1 = Corrected.
		21	Corrected earth received GMT.
			0 = Not corrected, 1 = Corrected.
		22	Errors in sync words of NIS frames.
			0 = No errors, 1 = Errors within BET.
		23	Bad leading or trailing sync word of NIS frames.
			0 = No bad words, 1 = Bad word(s).

*All words (32 bits) or half-words are right-adjusted; i.e., values are extended with leading binary zeros on the left. MSB is bit zero for full words and bits zero and 16 for half-words. Leftmost bit is bit zero.

**Words 13 through 17 are not used for spacecraft system test data records.

Table 5.1.2.4-B6. MAG Engineering Record Header Format (contd)

Item	Word No.	Bits*	Title/Function
		24	GCF block error flag status. 0 = No errors, 1 = Error flag was set.
		25	Not used.
		26	Complete frame flag. Indicates if any of the words in the data block of this record do not contain valid data. 0 = Complete frame, 1 = Data missing.
		27-31	Not used.
8	14	0-31	First DSIF Station Code. Station which received data for first NIS frame used for forming first ENG minor frame.

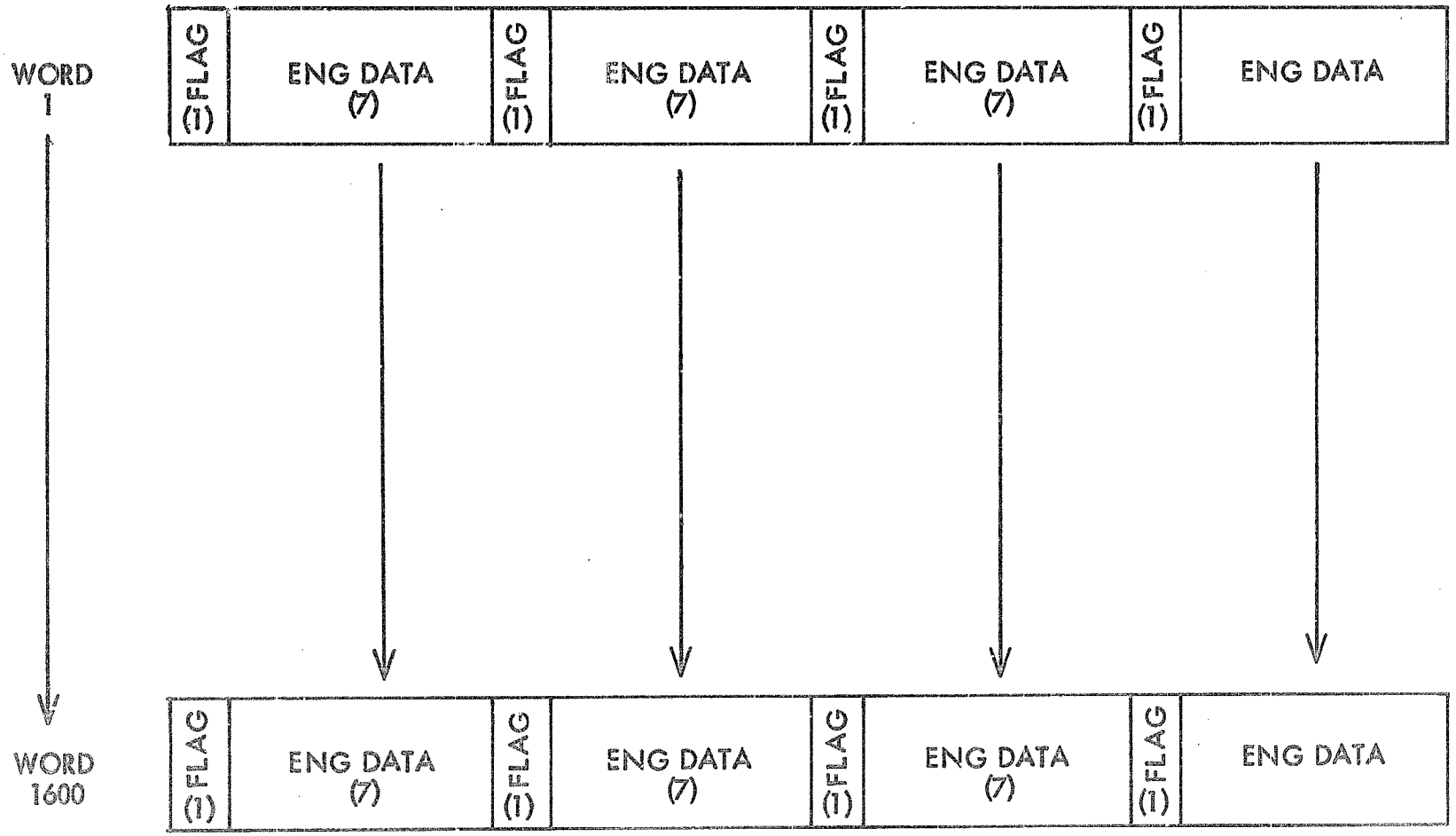
Valve	Sta	Valve	Sta
0	27	8	63
1	51	9	43
2	14	10	41
3	71	11	61
4	11	12	12
5	42	13	Other
6	21	14	Other
7	62	15	Other

*All words (32 bits) or half-words are right-adjusted; i.e., values are extended with leading binary zeros on the left. MSB is bit zero for full words and bits zero and 16 for half-words. Leftmost bit is bit zero.

Table 5.2.4-B6. MAG Engineering Record Header Format (contd)

Item	Word No.	Bits*	Title/Function
9	15	0 - 31	Last DSIF Station Code. Station which received data for the last NIS frame used for forming last ENG minor frame. (See table for item 8)
10			Spare
	16	0 - 31	
11			Spare
	17	0 - 31	
12			Engineering Housekeeping Data. Extracted from the data block.
	18 and 19	0 - 31	Format Code: 01 = Fixed 10 = Primary 11 = Maneuver 2-bit Format Code from every 4th ENG minor frame starting with minor frame 0. (i.e., 0, 4, 8, ----, 124)

*All words (32 bits) or half-words are right-adjusted; i.e., values are extended with leading binary zeros on the left. MSB is bit zero for full words and bits zero and 16 for half-words. Leftmost bit is bit zero.



12-1/2 WORDS = 1 ENG MINOR FRAME

*FLAG IS USED TO INDICATE DATA MISSING OR PRESENT 0 = DATA, 1 = NO DATA

Figure 5.1.2.5-B7. MAG Engineering Record Data Block Format

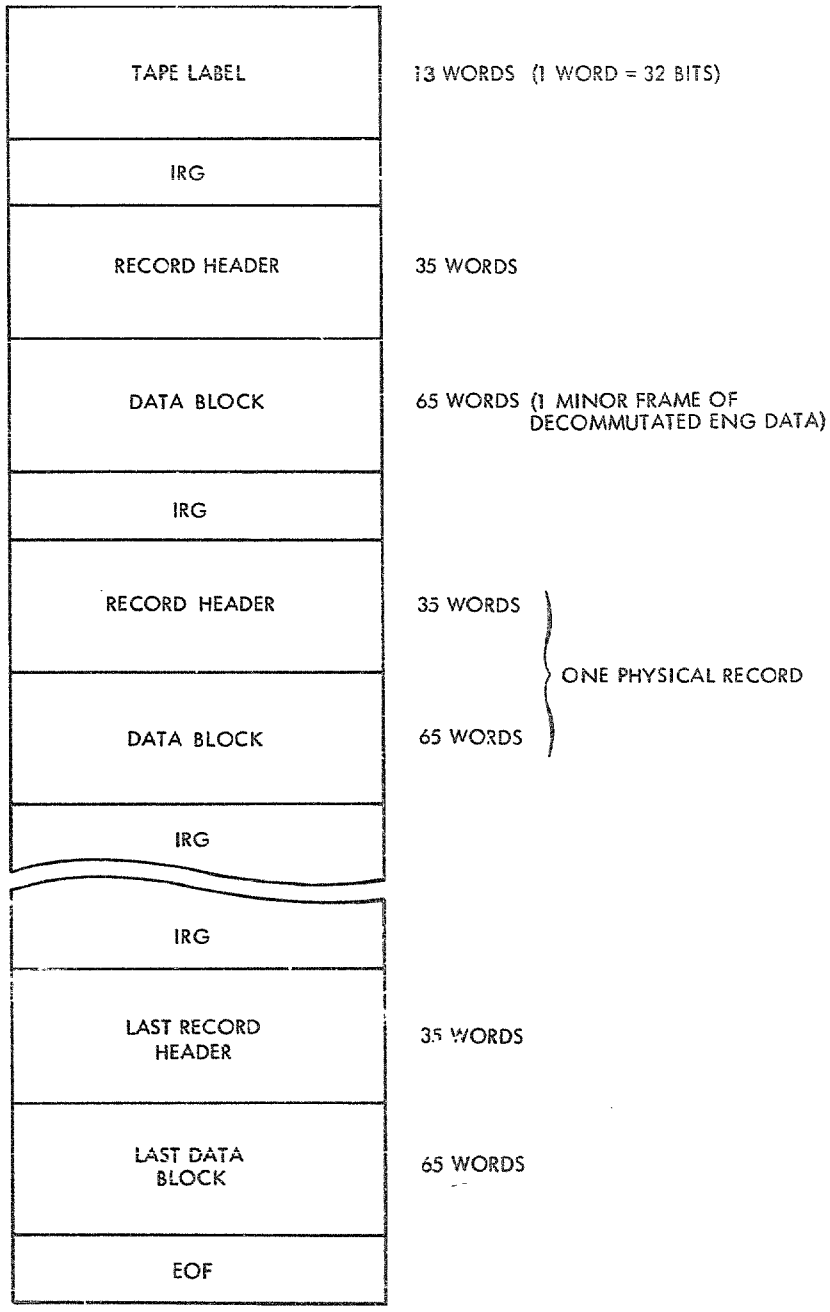


Figure 5.2.1-B8. CMRS EDR Records Structure

Table 5.2.2.1-BS.1 CMRS Tape Label Format

Word No.	Title/Function	Type	Unit
1	Experimentor ID	I (Integer)	
2	Satellite ID	I	
3	EDR Tape ID and Sequence Number	I	
4	Year the tape was generated	I	
5	Day the tape was generated	I	Jan. 1 = 1
6	Millisecond of day the tape was generated	I	
7	Year of first record on tape (SCE)	I	
8	Day of first record on tape (SCE)	I	Jan. 1 = 1
9	Number of milliseconds since beginning of the current day of first record on tape (SCE)	I	
10	Record ID of first data record decommutated	I	
11-13	Same as 7-9 (ERT)		

*All words (32 bits) or half-words are right-adjusted; i.e., values are extended with leading binary zeros on the left. MSB is bit zero for full words and bits zero and 16 for half-words. Leftmost bit is bit zero.

Table 5.2.2.2-B9. CMRS Record Header Format

Item	Word No.	Bits*	Title/Function
1			FDS Count
	1	0-31	A count of 42-second intervals
2			First Time GMT of first bit of sync word of ENG minor frame (ERT)
	2	0-15	Number of days since beginning of the current year (ERT)
	2	16-31	Number of milliseconds since beginning of the current second (ERT)
	3	0-31	Number of seconds since beginning of the current day (ERT)
	4	0-15	Same as Word 2 bits 0-15 (SCE Time)
	4	16-31	Same as Word 2 bits 16-31 (SCE Time)
	5	0-31	Same as Word 3 (SCE Time)
3			Data Rate and Bit Count
	6	0-15	Spare
	6	16-31	Spare
	7	0-15	Rate code. Rate of transmitted data. 1 = 117.6 kbps (X1) 2 = 22.05 kbps (E7, Z1, X2, T3) 3 = 7.35 kbps (E7, X2, T3) 4 = 2.45 kbps (T1, T4, E6) 5 = 490 kbps (U5)

*All words (32 bits) or half-words are right-adjusted; i.e., values are extended with leading binary zeros on the left. MSB is bit zero for full words and bits zero and 16 for half-words. Leftmost bit is bit zero.

Table 5.2.2.2-B9. CMRS Record Header Format (contd)

Item	Word No.	Bits*	Title/Function
	7	0-15	(contd) 6 = 33 1/3 bps (E1, E4, E5, E6) 7 = 8 1/3 bps (E6) 8 = $\frac{33\ 1/3}{5\ 1/3}$ bps (E2) 9 = $\frac{33\ 1/3}{3 \times 5\ 1/3}$ (E2) 10 = 9 x 33 1/3" (E3) 11 = 3 x 33 1/3" (E3) 12 = $\frac{2450}{5\ 1/3}$ (T2) 13 = $\frac{2450}{3 \times 5\ 1/3"}$ (T2)
	7	16-31	Number of data bits in this record.
4			MDR Status Word, for record ID's 730105-730505. Provides status data related to several data processing systems and functions affecting the quality of the data in this record. Bits 17 thru 7 contain OR'd data from all MDR status words of all NIS frame records used to generate this record.
	8	0-13	Unused
			DSIF lock status.
		14	RCVR status
		15	SDA status
		16	TCP status
		17	SSA status
		18	DDA status
		19	BDA status
			0 = In lock, 1 = Out of lock/not in use.

*All words (32 bits) or half-words are right-adjusted; i.e., values are extended with leading binary zeros on the left. MSB is bit zero for full words and bits zero and 16 for half-words. Leftmost bit is bit zero.

B-9

Table 5.2.2.2-B9. CMRS Record Header Format (contd)

Item	Word No.	Bits*	Title/Function
		20	Corrected FDS count/minor frame count/SCI. 0 = Not corrected, 1 = Corrected.
		21	Corrected earth received GMT. 0 = Not corrected, 1 = Corrected.
		22	Errors in sync words of NIS frames. 0 = No errors, 1 = Errors within BET.
		23	Bad leading or trailing sync word of NIS frames. 0 = No bad words, 1 = Bad word(s).
		24	GCF block error flag status. 0 = No errors, 1 = Error flag was set.
		25	Not used.
		26	Complete frame flag. Indicates if any of the words in the data block of this record do not contain valid data. 0 = Complete frame, 1 = Data missing.
		27-31	Not used. OR MDR Status Word, for record ID's 730605 and 730705. Provides status data related to several data processing systems and functions affecting the quality of the data in this record. DSIF lock status. Latest available data from last GCF block from which this data record was derived.
	8	0-13	Unused
		14	RCVR status
		15	SDA status
		16	TCP status

*All words (32 bits) or half-words are right-adjusted; i.e., values are extended with leading binary zeros on the left. MSB is bit zero for full words and bits zero and 16 for half-words. Leftmost bit is bit zero.

Table 5.2.2.2-B9. CMRS Record Header Format (contd)

Item	Word No.	Bits*	Title/Function
		17	SSA status
		18	DDA status
		19	BDA status 0 = In lock, 1 = Out of lock/not in use.
		20	Corrected FDS Count/Minor Frame Count/SCI 0 = not corrected, 1 = corrected.
		21	Corrected earth received GMT 0 = not corrected, 1 = corrected.
		22	Errors in leading or trailing sync words. 0 = no errors, 1 = errors within BET.
		23	Bad leading or trailing sync word. (Bit errors exceed bit error tolerance in use) 0 = neither word bad, 1 = one word bad.
		24	GCF block error. Indicates whether or not the error flag was set on GCF data block containing data for this frame. 0 = no errors, 1 = error flag was set.
		25-31	Not used.
5			DSIF Station Code Identifies DSIF station which received first NIS frame used to generate this record for record ID's 730105-730505. OR Identifies DSIF station which received this frame of data for record ID's 730605 and 730705.

*All words (32 bits) or half-words are right-adjusted; i.e., values are extended with leading binary zeros on the left. MSB is bit zero for full words and bits zero and 16 for half-words. Leftmost bit is bit zero.

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Table 5.2.2.2-B9. CMRS Record Header Format (contd)

Item	Word No.	Bits*	Title/Function
	9	0-31	Valve / Sta / Valve / Sta 0 / 27 / 8 / 63 1 / 51 / 9 / 43 2 / 14 / 10 / 41 3 / 71 / 11 / 61 4 / 11 / 12 / 12 5 / 42 / 13 / Other 6 / 21 / 14 / Other 7 / 62 / 15 / Other
6			SNR SNR from header of first NIS frame used to generate this record for record ID's 730105-730505. OR Latest available SNR at DSIF station which received this frame of data for record ID's 730605 and 730705.
	10	0-31	SNR in two's complement with binary point between bits 26 and 27. Units = dB
7			DSIF AGC AGC from header of first NIS frame used to generate this record for record ID's 730105-730505. OR Latest available AGC at DSIF station which received this frame for record ID's 730605-730705. (From GCF block)
	11	0-15	DSIF AGC with binary point between bits 27 and 28 (no sign bit); units = dBm or volts Values ≤ -50 = dBm, Values > -50 = volts

*All words (32 bits) or half-words are right-adjusted; i.e., values are extended with leading binary zeros on the left. MSB is bit zero for full words and bits zero and 16 for half-words. Leftmost bit is bit zero.

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Table 5.2.2.2-B9. CMRS Record Header Format (contd)

Item	Word No.	Bits*	Title/Function
8			DSIF Configuration Configuration status of DSIF station from header of first NIS frame used to generate this record for record ID's 730105-730505. OR Latest available configuration status of DSIF station which received this frame of data for record ID's 730605 and 730705. Configuration status
	11	16-31	RCVR 1 = 1 RCVR 2 = 2 RCVR 3 = 3 RCVR 4 = 4 RCVR 5 = 5 RCVR 6 = 6
	12	0-15	Bits 11-13 000 = SDA 8 001 = SDA 1 010 = SDA 2 011 = SDA 3 100 = SDA 4 101 = SDA 5 110 = SDA 6 111 = SDA 7
			Bits 14-15 00 = TCP Alpha 01 = TCP Beta 11 = Not Used
		16-31	Bit 26 0 = Bit Loop ON 1 = Bit Loop OFF
			Bit 27-28 00 = Not Used 01 = SSA 1 10 = SSA 2 11 = Not Used

*All words (32 bits) or half-words are right-adjusted; i.e., values are extended with leading binary zeros on the left. MSB is bit zero for full words and bits zero and 16 for half-words. Leftmost bit is bit zero.

Table 5.2.2.2-B9. CMRS Record Header Format (contd)

Item	Word No.	Bits*	Title/Function
			Bit 29 0 = BDA ON 1 = BDA OFF/Not Used
			Bit 30 0 = DDA 1 ON 1 = DDA 1 OFF/Not Used
			Bit 31 0 = DDA 2 ON DDA 2 OFF/Not Used
9			Composite Bit Error Number of errors detected in 10^5 sync word bits from header of first NIS frame used to generate this record for record ID's 730105-730505. OR Latest available calculation of number of errors detected in 10^5 sync word bits for record ID's 730605 and 730705.
	13	0-31	Number of errors detected
10			Engineering Housekeeping Data
	14	0-31	Subcom Index Word (0-127) Bit 0 is a data flag; 0 = Data, 1 = No Data
	15	0-31	Rate Code: 1 = ENG-A 2 = ENG-B 3 = ENG-C Bit 0 is a data flag; 0 = Data, 1 = No Data

*All words (32 bits) or half-words are right-adjusted; i.e., values are extended with leading binary zeros on the left. MSB is bit zero for full words and bits zero and 16 for half-words. Leftmost bit is bit zero.

Table 5.2.2.2-B9. CMRS Record Header Format (contd)

Item	Word No.	Bits*	Title/Function
	16	0-31	Record ID (Stream ID) E1 = 730105 E5 = 730505 E2 = 730205 E6 = 730605 E3 = 730305 E7 = 730705 E4 = 730405 Item 11 and on are Monitor data items obtained from the Monitor Status Block.
11			Time of year and day associated with data contained in monitor status block.
	17	0-15	Integer days (If day is zero, then the monitor data for this time is only filler data.)
	17	16-31	Integer hours
	18	0-15	Integer minutes
	18	16-31	Integer seconds
12			Block 3 Receiver 1 AGC
	19	0-15	Two's complement data with binary point located between bits 9 and 10; Units = dBm
13			Block 3 Receiver 2 AGC
	19	16-31	Two's complement data with binary point located between bits 25 and 26; Units = dBm
14			Block 4 S-Band Receiver AGC
	20	0-15	Two's complement data with binary point located between bits 9 and 10; Units = dBm
15			Block 4 X-Band Receiver AGC
	20	16-31	Two's complement data with binary point located between bits 25 and 26; Units = dBm

*All words (32 bits) or half-words are right-adjusted; i.e., values are extended with leading binary zeros on the left. MSB is bit zero for full words and bits zero and 16 for half-words. Leftmost bit is bit zero.

Table 5.2.2.2-B9. CMRS Record Header Format (contd)

Item	Word No.	Bits*	Title/Function
16			TCP A SNR
	21	0-15	Two's complement data with binary point located between bits 10 and 11; Units = dB
17			TCP B SNR
	21	16-31	Two's complement data with binary point located between bits 26 and 27; Units = dB
18			Transmitter Power
	22	0-15	Magnitude (no sign) data in binary with binary point located between bits 5 and 6; Units = Kilowatts
19			Receiver Lock Status
	22	16-31	Logical OR of five samples in monitor block Bit 28 = Receiver 1 Bit 29 = Receiver 2 Bit 30 = Receiver 3 Bit 31 = Receiver 4 0 = In Lock, 1 = Out-of-Lock
20			Modulation Status
	23	0-15	Logical OR of five samples in monitor block Bit 12 = Ranging Bit 13 = Test Bit 14 = CMA 2 Bit 15 = CMA 1 0 = Off, 1 = On

*All words (32 bits) or half-words are right-adjusted; i.e., values are extended with leading binary zeros on the left. MSB is bit zero for full words and bits zero and 16 for half-words. Leftmost bit is bit zero.

Table 5.2.2.2-B9. CMRS Record Header Format (contd)

Item	Word No.	Bits*	Title/Function
21			Transmitter Drive Status
	23	16-31	Logical OR of five samples in monitor block Bit 30 – Block 3 Exciter Bit 31 – Block 4 Exciter 0 = ON, 1 = OFF Items 22 through 32 contain time and data from the next to latest available Monitor Status block. The description of items 22 through 32 is identical to the description of items 11 through 21.
22			Time of year and day associated with next to latest available data contained in monitor status block.
	24	0-15	Integer days (If day is zero, then the monitor data for this time is only filler data.)
	24	16-31	Integer hours
	25	0-15	Integer minutes
	25	16-31	Integer seconds
23			Block 3 Receiver 1 AGC
	26	0-15	Two's complement data with binary point located between bits 9 and 10; Units = dBm
24			Block 3 Receiver 2 AGC
	26	16-31	Two's complement data with binary point located between bits 25 and 26; Units = dBm
25			Block 4 S-Band Receiver AGC
	27	0-15	Two's complement data with binary point located between bits 9 and 10; Units = dBm

*All words (32 bits) or half-words are right-adjusted; i.e., values are extended with leading binary zeros on the left. MSB is bit zero for full words and bits zero and 16 for half-words. Leftmost bit is bit zero.

Table 5.2.2.2-B9. CMRS Record Header Format (contd)

Item	Word No.	Bits*	Title/Function
26			Block 4 X-Band Receiver AGC
	27	16-31	Two's complement data with binary point located between bits 25 and 26; Units = dBm
27			TCP A SNR
	28	0-15	Two's complement data with binary point located between bits 10 and 11; Units = dB
28			TCP B SNR
	28	16-31	Two's complement data with binary point located between bits 26 and 27; Units = dB
29			Transmitter Power
	29	0-15	Magnitude (no sign) data in binary with binary point located between bits 5 and 6; Units = Kilowatts
30			Receiver Lock Status
	29	16-31	Logical OR of five samples in monitor block Bit 28 = Receiver 1 Bit 29 = Receiver 2 Bit 30 = Receiver 3 Bit 31 = Receiver 4 0 = In Lock, 1 = Out-of-Lock
31			Modulation Status
	30	0-15	Logical OR of five samples in monitor block Bit 12 = Ranging Bit 13 = Test Bit 14 = CMA 2 Bit 15 = CMA 1 0 = Off, 1 = On.

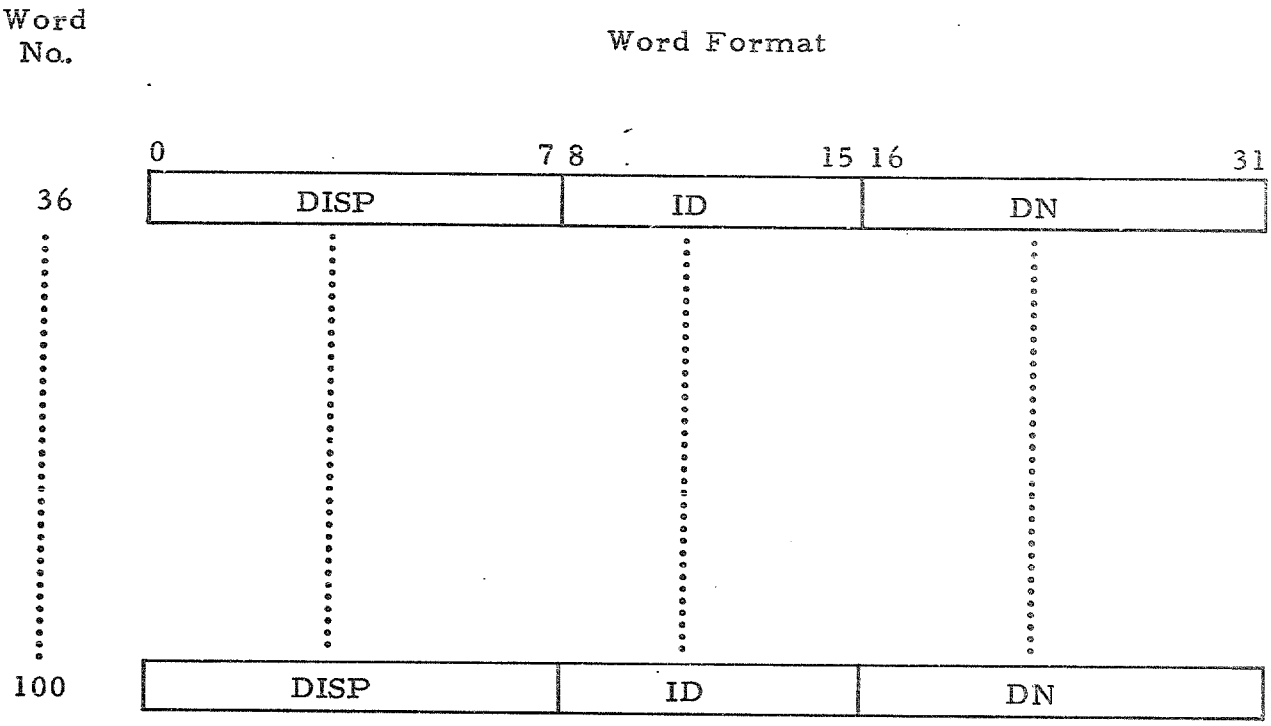
*All words (32 bits) or half-words are right-adjusted; i.e., values are extended with leading binary zeros on the left. MSB is bit zero for full words and bits zero and 16 for half-words. Leftmost bit is bit zero.

Table 5.2.2.2-B9. CMRS Record Header Format (contd)

Item	Word No.	Bits*	Title/Function
32			Transmitter Drive Status
	30	16-31	Logical OR of five samples in monitor block Bit 30 – Block 3 Exciter Bit 31 – Block 4 Exciter 0 = ON, 1 = OFF
33	31 thru 35		Spares

*All words (32 bits) or half-words are right-adjusted; i.e., values are extended with leading binary zeros on the left. MSB is bit zero for full words and bits zero and 16 for half-words. Leftmost bit is bit zero.

Table 5.2.2.3-B10. CMRS Record Data Block Format



DISP = Word displacement of data number (DN) from beginning of ENG minor frame (range 0 thru 49)

ID = Identification number assigned to a measurement (source is the decommutation tables)

DN = 7 bit or less data reading

All unused words at the end of record shall be zero

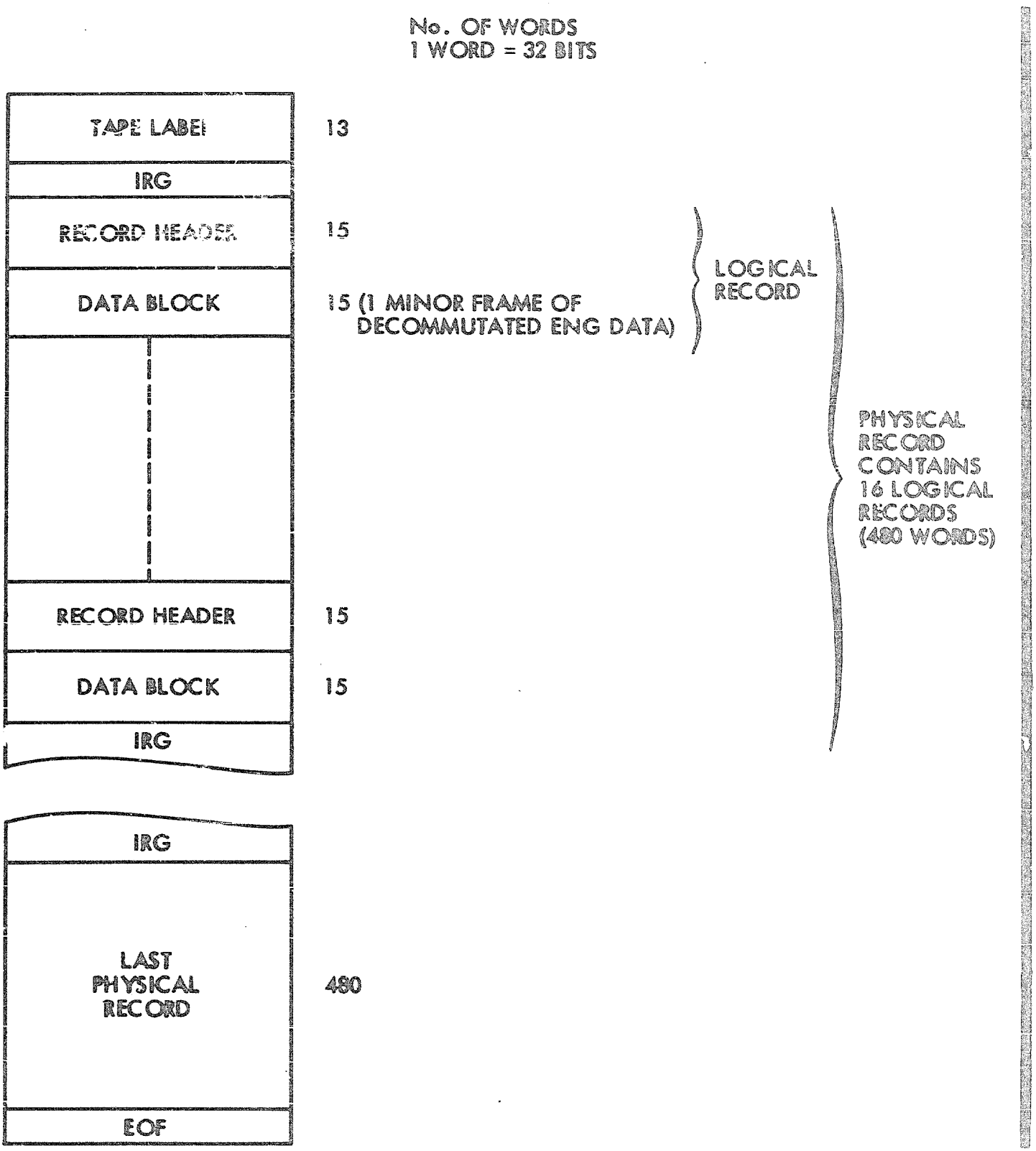


Figure 5.3.1-B11. SPT Records Structure

Table 5.3.2.1-B11.1. SPT Tape Label Format

Word No.	Title/Function	Type	Unit
1	Experimentor ID	I (Integer)	
2	Satellite ID	I	
3	EDR Tape ID and Sequence Number	I	
4	Year the tape was generated	I	
5	Day the tape was generated	I	Jan. 1 = 1
6	Millisecond of day the tape was generated	I	
7	Year of first record on tape (SCE)	I	
8	Day of first record on tape (SCE)	I	Jan. 1 = 1
9	Number of milliseconds since beginning of the current day of first record on tape (SCE)	I	
10	Record ID of first data record decommutated	I	
11-13	Same as 7-9 (ERT)		

Table 5.3.2.2-B12. SPT Record Header Format

Item	Word No.	Bits*	Title/Function
1			FDS Count
	1	0-31	A count of 42-second intervals
2			First Time GMT of first bit of sync word of ENG minor frame (SCE)
	2	0-15	Number of days since beginning of the current year (SCE Time)
	2	16-31	Number of milliseconds since beginning of the current second (SCE Time)
	3	0-31	Number of seconds since beginning of the current day (SCE Time)
3	4	0-31	Subcom Index word (0-127)
4	5	0-31	Rate Code: 01 = ENG-A 10 = ENG-B 11 = ENG-C
5	6	0-31	Record ID (Stream ID)
6			Time associated with latest available Monitor data
	7	0-15	Integer days**
	7	16-31	Integer hours
	8	0-15	Integer minutes
	8	16-31	Integer seconds
7			Time associated with next to latest available Monitor data

*All words (32 bits) or half-words are right-adjusted; i.e., values are extended with leading binary zeros on the left. MSB is bit zero for full words and bits zero and 16 for half-words. Leftmost bit is bit zero.

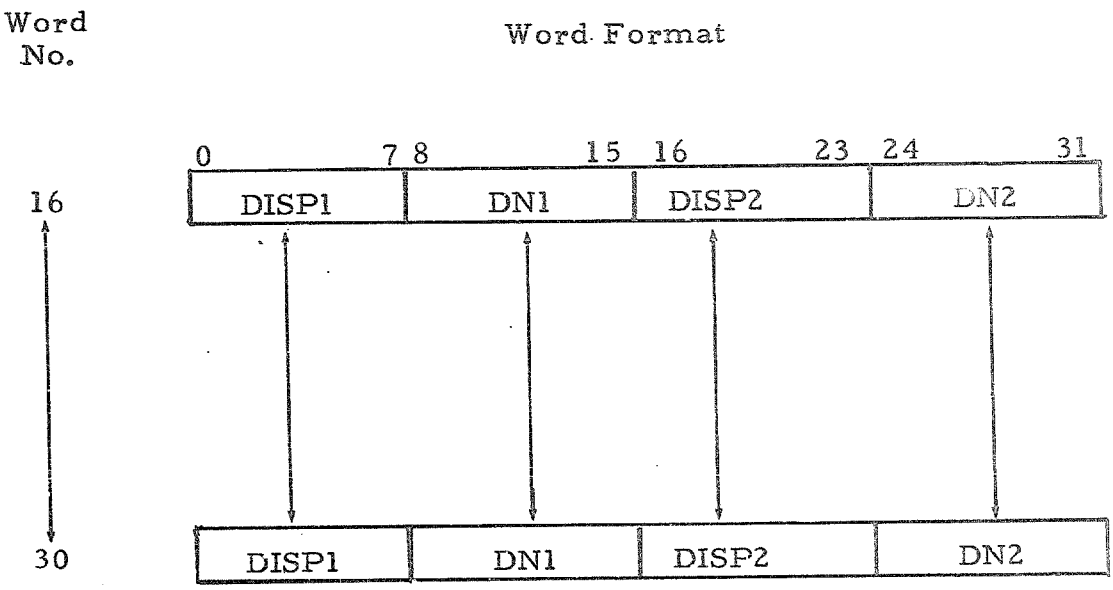
**If day is zero then the monitor data for this time is only filler data.

Table 5.3.2.2-B12. SPT Record Header Format (Contd)

Item	Word No.	Bits*	Title/Function
	9	0-15	Integer days**
	9	16-31	Integer hours
	10	0-15	Integer minutes
	10	16-31	Interger seconds
8			Latest available Block 4 S and X-band Receiver AGC
	11	0-15	Two's complement S-band data. Binary point between bits 6 and 5; units = dbm
	11	16-31	Two's complement X-band data. Binary point located between bits 6 and 5 units = dbm
9			Next to latest available block 4 S and X-band Receiver AGC
	12	0-15	Same as S-band data in word 11
	12	16-31	Same as X-band data in word 11
10	13 thru 15		Spare

*All words (32 bits) or half-words are right-adjusted; i.e., values are extended with leading binary zeros on the left. MSB is bit zero for full words and bits zero and 16 for half-words. Leftmost bit is bit zero.
**If day is zero then the monitor data for this time is only filler data.

Table 5.3.2.3-B13. SPT Record Data Block Format



DISP1 = Word displacement of data number (DN1) from beginning of ENG minor frame (range 0 to 49)

DN1 = Data reading (nominally 7 bits)

DISP2 = Word displacement of data number (DN2) from beginning of ENG minor frame (range 0 to 49)

DN2 = Data reading (nominally 7 bits)

Data is not available whenever a displacement or a data reading is equal to 255.

Table 6.4.1-B14. CMRS and SPT Data Parameters

Parameter Description	Used By
PITCH GYRO/F	CMRS and SPT
PITCH GYRO/F	CMRS and SPT
PITCH GYRO/F	CMRS and SPT
PITCH GYRO/F	CMRS and SPT
PITCH POS	CMRS and SPT
PITCH POS	CMRS and SPT
YAW GYRO/F	CMRS and SPT
YAW GYRO/F	CMRS and SPT
YAW GYRO/F	CMRS and SPT
YAW GYRO/F	CMRS and SPT
YAW POS	CMRS and SPT
YAW POS	CMRS and SPT
ROLL GYRO	CMRS and SPT
ROLL GYRO	CMRS and SPT
ROLL GYRO	CMRS and SPT
ROLL GYRO	CMRS and SPT
ROLL POS	CMRS and SPT
ROLL POS	CMRS and SPT
SCAN CLOCK C	CMRS and SPT
SCAN CLOCK C	CMRS and SPT
SCAN CLOCK F	CMRS and SPT
SCAN CLOCK F	CMRS and SPT
SCAN CONE C	CMRS and SPT
SCAN CONE C	CMRS and SPT
SCAN CONE F	CMRS and SPT
SCAN CONE F	CMRS and SPT
HGA CLOCK C	CMRS and SPT
HGA CLOCK F	CMRS and SPT
HGA CONE C	CMRS and SPT
HGA CONE F	CMRS and SPT
LGA DEPLOYED	CMRS only
.X PANEL C	CMRS only
.X PANEL F	CMRS only
-X PANEL C	CMRS only
-X PANEL F	CMRS only

Table 6.4.1-B14. CMRS and SPT Data Parameters (contd)

Parameter Description	Used By
DSS MODE STS	CMRS only
BIT SYNC LOP	CMRS only
DET IN-LOCK	CMRS only
DET VCO FREQ	CMRS only
TMU 1 ENABLE	CMRS only
TMU MODE STS	CMRS only
FCU CMD EVEN	CMRS only
EXCIT OUT DR	CMRS only
EXCIT IN OP	CMRS only
EXCIT IN OP	CMRS only
EXCIT VOLTAGE	CMRS only
EXCIT VOLTAGE	CMRS only
HGA DRIVE	CMRS only
LGA DRIVE	CMRS only
LOCAL OSC DR	CMRS only
TWT IN OPER	CMRS only
TWT IN OPER	CMRS only
TWT ANODE V	CMRS only
TWT ANODE V	CMRS only
TWT HELIX I	CMRS only
RECEVR AGC C	CMRS only
RECEVR AGC C	CMRS only
RECEVR SPE C	CMRS only
RECEVR SPE C	CMRS only
RECEVR SPE F	CMRS only
RECEVR SPE F	CMRS only
X-TX CURRENT	CMRS only
X-TX INPUT W	CMRS only
X-TX OUT	CMRS only
AUX OSC TEMP	CMRS only
TWT 1 B TEMP	CMRS only
TWT 2 B TEMP	CMRS only
VCO TEMP	CMRS only

Table 6.4.1-B14. CMRS and SPT Data Parameters (contd)

Parameter Description	Used By
HGA TEMP 1	CMRS only
HGA TEMP 2	CMRS only
HGA TEMP 3	CMRS only
SX FEED TEMP	CMRS only
X-TX CASE T	CMRS only
CCS SEQ EVEN	CMRS only
CCS COMP EVT	CMRS only
BAY 2 TEMP	CMRS only
BAY 3 TEMP	CMRS only
BAY 5 TEMP	CMRS only
30V REG VOLT	CMRS only
30V REG CURR	CMRS only
400HZ INVERT	CMRS only
BATT OUT CUR	CMRS only
BATT VOLTAGE	CMRS only
BOOST/REG I	CMRS only
PS+L OUT VOL	CMRS only
CC+S WORD 1	CMRS only
CC+S WORD 1	CMRS only
CC+S WORD 2	CMRS only
CC+S WORD 2	CMRS only
CC+S WORD 3	CMRS only
CC+S WORD 3	CMRS only
CC+S WORD 4	CMRS only
CC+S WORD 4	CMRS only
.X-Y N2 PRES	CMRS only
-X.Y N2 PRES	CMRS only
.X-Y N2 TEMP	CMRS only
-X.Y N2 TEMP	CMRS only
SCAN LATCH P	CMRS only
TAPE TRANS P	CMRS only
N2 PRESSURE	CMRS only

Table 6.4.1-B14. CMRS and SPT Data Parameters (contd)

Parameter Description	Used By
N2 EXP SCALE	CMRS only
N2 EXP SCALE	CMRS only
N2 EXP SC ALE	CMRS only
N2 TEMP	CMRS only
PROPEL PRESS	CMRS only
CHAMBER PRES	CMRS only
CHAMBER PRES	CMRS only
CHAMBER PRES	CMRS only
CHAMBER PRES	CMRS only
PROPEL TEMP	CMRS only
VALVE TEMP	CMRS only
THRUST PLT T	CMRS only
S/C TIME 1	CMRS only
S/C TIME 2	CMRS only
S/C TIME 3	CMRS only
TWT POWER	CMRS only
S-BAND RANGE	CMRS only
S/X BAND RGE	CMRS only
PSE BOOM	CMRS only
SUN ACQRD	CMRS only
CANP INTENSY	CMRS only
CANP TR CONE	CMRS only
ADAPTIV GATE	CMRS only
CANOP T TEMP	CMRS only
RL GYRO TEMP	CMRS only
SUN SEN TEMP	CMRS only
-X SOLAR PAN	CMRS only
.X SOLAR PAN	CMRS only
HGA DEPLOYED	CMRS only

Word	Title
16	Pitch Gyro Rate/Pitch Position (Fine)
16	Pitch Gyro Rate/Pitch Position (Fine)
17	Pitch Gyro Rate/Pitch Position (Fine)
17	Pitch Gyro Rate/Pitch Position (Fine)
18	Pitch Position
18	Pitch Position
19	Yaw Gyro Rate/Yaw Position (Fine)
19	Yaw Gyro Rate/Yaw Position (Fine)
20	Yaw Gyro Rate/Yaw Position (Fine)
20	Yaw Gyro Rate/Yaw Position (Fine)
21	Yaw Position
21	Yaw Position
22	Roll Gyro Rate
22	Roll Gyro Rate
23	Roll Gyro Rate
23	Roll Gyro Rate
24	Roll Position
24	Roll Position
25	Scan Clock Position (Coarse)
25	Scan Clock Position (Coarse)
26	Scan Clock Position (Fine)
26	Scan Clock Position (Fine)
27	Scan Cone Position (Coarse)
27	Scan Cone Position (Coarse)
28	Scan Cone Position (Fine)
28	Scan Cone Position (Fine)
29	HGA Boom Position (Coarse)
29	HGA Boom Position (Fine)
30	HGA Dish Position (Coarse)
30	HGA Dish Position (Fine)

Figure 6.4.4-B15. SPT Channel Titles for Output Words 16-30

MARINER VENUS MERCURY 1973 615-73, Rev B
SOFTWARE CONFIGURATION CONTROL BOARD
SOFTWARE CHANGE REQUEST

DATE: 8 August 1972
PROGRAM: EDR GEN
REQUESTER: J. Tupman
APPLICABLE COMPUTER: 360/75 [X]
PROPOSED IMPLEMENTATION DATE: ASAP

CHANGE REQUEST NUMBER: 4
SRD, SDD PARAGRAPHS AFFECTED: 5.2.0+Additions
DIVISION: 29 EXTENSION: 2633
1108 [ ] MTC [ ] 6050 [ ] TCP [ ]
INTERFACE AFFECTED BY CHANGE: YES NO

	YES	NO
SPACECRAFT		X
GDS HARDWARE		X
MOS PROCEDURES	X	
GDS SOFTWARE	X	

List specific programs below

SPOP
FIP
GPAP
RT TLM

PROPOSED CHANGE:

1. Provide a decommutated FORTRAN readable 360/75 tape in a fixed format containing only the engineering data needed for the CMRS PI. For compatibility to the 1108 this tape will be a 7 track tape. The purpose of this change is to provide a formatted EDR that the PI can read.

2. Provide an additional tape containing the Scan Platform and HGA Telemetry (SPT) data required by SPOP, FIP, and GPAP. The data will be in a decommutated format on a 7 track tape.

   The purpose of adding this requirement is to perform decommutation in only one program, not three (SPOP, FIP, and GPAP).

3. Include the capability to read an SDR.

   This provides the capability to perform scan calibrations using the SPT tape in a short turn around time. This requires SPOP to have only one interface regardless of its use--Scan Calibration or SEDR Generation.

JUSTIFICATION FOR CHANGE/REMARKS:
The EDR-GEN SRD, as presented in PD 615-73, defines the CMRS-EDR output tape to be in an MTC format. After discussions with the users of this tape (CMRS Principal Investigator and Division 34) a set of requirements evolved that could not be accommodated by the CMRS-EDR tape as currently defined.

PROPOSED PROGRAM TEST CASES:

No change other than to have PI verify EDR compatibility.

RESOURCES REQUIRED: 3-1/3 MAN MONTHS
N/A COMPUTER TIME (MIN)
TOTAL ESTIMATED: See below

1. $4K
2. $4K
3. $2K

TOTAL: $10 K

REQUESTER APPROVED: J. Tupman
Cognizant Engineer

Project Representative

(For CCB Use Only)

BOARD MEMBERS:

R. Polansky, Chairman	J. Ekelund
M. Arker	J. McKinney
J. Dunne	W. Purdy
R. Conover	G. Squibb

615-73, Rev B

CONFIGURATION CONTROL BOARD ACTION

DATE: 15 August 1972

BOARD MEMBERS: R. Polansky Chairman CCB ACTION NUMBER: 4

M. Afker

J. Dunne

R. Conover

J. Ekelund

J. McKinney

W. Purdy

G. Squibb

DISCUSSION:

1. SRD changes almost completed. No impact on telemetry system output formats. Decommutation and formatting for Fortran done once vs assembly language coding in three separate places. Capability to use SDR instead of MDR allows faster (more reasonable) turn around time for EDR generation.
2. N. Sirri will provide the $4K needed to accomplish item 1. Items 2 and 3 will be done for Division 29 by Division 91 who will cross charge the other $6K to Division 34. J. Tupman will modify the Implementation Plan to reflect this.

RECOMMENDATION: [X] APPROVED PROGRAM DELIVERY DATE: 1 April 1972

[ ] DISAPPROVED

[ ] APPROVED AS FOLLOWS:

ATTESTED: Robert B. Polansky
CCB Chairman

CONCURRED: N. Sirri
MOS Manager

NASA — JPL — Comm., L.A., Calif.