UPPER ATMOSPHERE RESEARCH SATELLITE

MICROWAVE LIMB SOUNDER

FILE DESCRIPTION DOCUMENT

VERSION 3.3

September 5, 1991

DRAFT

Custodian: C. Voge

TABLE OF CONTENTS

1.0 INTRODUCTION.

This document describes the contents and file structures of all of the files used or produced by Version 3.3 of the MLS production programs MLS_LEVEL1, MLS_TANTRAK, and MLS_RETRIV. Each of the Level 0 input files used by MLS_LEVEL1 are already described in Appendix D of the UCSS PROGRAMMER'S GUIDE TO PRODUCTION SOFTWARE SERVICES (March 1989); the discussion of those files in this document will be brief. For each output file there is an overview giving the purpose of the file, which program generates it, which program uses it, and which UCSS routine (if any) assigns the file, and how the file is opened. Following the overview, each record type is described by a data dictionary (alphabetized) giving a brief description of each item in the data record. Certain files have header and trailer records in addition to their data records; these will be described as well.

There are two appendices: (1) a data dictionary containing every item used in the MLS production programs, and (2) an alphabetical cross reference showing which item is written to which file. Some data items are written to more than one file.

Most files written and read using data structures defined in configured include blocks. These configured include blocks are the basic source of information on file structure and take precedence over this document. Any program that reads these files should use the include block defining the record structure to read the file. For example, the read the Level 1 Radiance file, include the structure in MLS_INC:LVL1_RAD.INC where MLS_INC points to the disk and directory containing the include block. The actual read statement would be READ(UNIT=xx, RECORD=yy) LVL1_RAD. Then to obtain data from this structure, say the major frame number (MMAFNO), do the following: MMAFNO = LVL1_RAD.MMAFNO.

Because most files are binary files that need to exist on both VAX VMS and UNIX machines, most file structures have been padded so that fields begin on four byte boundaries. This allows for easier file translation between the two machine types.

1.1 REFERENCES

1. UARS MLS Level 1 Data Process Theoretical Basis, Version 1.0, 4 October 1989, Gordon E. Peckham, Joe W. Waters, Robert F. Jarnot.

2. UARS Programmers' Guide for Orbit/Attitude Services, 30 November 1988.

3. MLS Design and Verification Requirements Telemetry Assignments and Formats. MLS_3_280 Rev. B. 1-20-88.

2.0 UARS LEVEL0 DATA FILE

This is the major input data file to the MLS_LEVEL1 program. The UARS observatory telemetry data is decommutated into 15 Level 0 files, one of which is the MLS Level 0 data. This file consists of fixed length (length= 2576 Level 0 longwords) records. The first record is a file label record containing ASCII data which identifies the type of file and its contents. Next follow data records each containing a standard 64 byte record header followed by one UARS Engineering Major Frame (EMAF) of telemetry. Each UARS EMAF contains data for a 65.536 second time period. A UARS engineering time period is the same as a MLS major frame (MMAF).

The file structure is fully documented in Appendix D of the UCSS Programmer's Guide to Production Software Support Services. The contents of the MLS telemetry contained in the data records is described in the Jet Propulsion Laboratory MLS Design and Verification Requirements Telemetry Assignments & Formats (November 13, 1986).

To open the file, the UCSS routine OPENL0 is called. The file is read by the UCSS routine READL0.

3.0 UARS LEVEL0 DATA QUALITY FILE

This file contains information describing the quality of the input data to the MLS_LEVEL1 program. It is another of the 15 Level 0 files decommutated from UARS telemetry data.

The file structure is fully documented in Appendix D of the UCSS Programmer's Guide to Production Software Support Services.

To open the file, the UCSS routine OPENL0 is called. The file is read by QUALRD.

4.0 UARS LEVEL0 SPACECRAFT ENGINEERING FILE

This file contains UARS observatory engineering information about the satellite carrying the MLS. From this file is obtained the instrument survial data including the POWER_RELAY_STATUS. It is also one of the 15 files decomutated from UARS telemetry data.

The file structure is fully documented in Appendix D of the UCSS Programmer's Guide to Production Software Support Services.

To open the file, the UCSS routine OPENL0 is called. The file is read by READL0.

5.0 UARS LEVEL0 ON-BOARD COMPUTER FILE

This file contains information from the on-board computer of the UARS. From this file is obtained data on Maneuver status and High Gain Antenna Gimbal angles (used for antenna interference calculaions). It is another of the 15 files decomutated from UARS telemetry data.

The file structure is documented in Appendix D of the UCSS Programmer's Guide to Production Software Support Services. More information on the content of this file can be found in GE PIR 403b.

To open the file, the UCSS routine OPENL0 is called. The file is read by READL0.

6.0 LEVEL 1 USER INPUT FILE

There are three ways user inputs can be made to MLS_LEVEL1. The first in via the program parameters listed in the Users Guide. Those parameters appear in the command file and mainly are used to specify what calibraion files or which orbit/attitude files to use. The second method is via this Level 1 Users Input File. The third is via the Level 1 Default Data File (Section 8.0).

The Level 1 Users Input File file contains user input parameters for the MLS_LEVEL1 program. It is an ASCII file consisting of variable length records of up to 80 characters. The file is read using free format. Although an include file defines a structure simular to the Level 1 Users Input File, it cannot be used to read this file.

The user input file is assigned with the UCSS routine ASGCAL with the following attributes:

```
DATA_TYPE  = 'MLS'
LEVEL      = '1'
LID        = 'USER_LID'
PDMATCH    = 'PREV'
TEMP_DAY   = UARS_DAY.
USER_CALID = input parameter USER_CALID
```

The User Input File is opened in readonly access as an 'old' file, since it was created by the user prior to running the program. If a Users Input File is not available for the current day (the usual condition), then the most recent file preceding file will be use

The file size is 1240 longwords

FILE CONTENTS:

ANT_RAD_OFFSET
ANT_XMISSION
ATT_TYP_VER
BAD_CHANNEL_L1
CAL_RADIANCE_RNG
CAL_REF
CAL_TYPE
CONSTRAINT_ORDER
FC
FILE_COMMENT
GAIN_RNG
HGA_INTERFER_RNG
HGA_INTERFER_RNG_NUM
MAFA
MIN_FIT_SIGMA
MIN_GAIN_PTS
MU
OBJECT_FOV
OBJECT_SPV
ORB_TYP_VER
OVERRIDE
PTG_FOV_AZIM_REF
PTG_FOV_AZIM_WDTH
PTG_FOV_BO_MAP
PTG_FOV_BO_NUM
PTG_FOV_ELEV_REF
PTG_FOV_ELEV_WDTH
PTG_FOV_TABLE
PTG_INST2MACS_ELEV_ERR
PTG_SPV_AZIM
PTG_SPV_AZIM_WDTH
PTG_SPV_BO_MAP
PTG_SPV_BO_NUM
PTG_SPV_ELEV
PTG_SPV_ELEV_WDTH
QUALIFIER
REC_NOISE_RNG
REF_MMIF
REJECT_LK_AHEAD
STD_SPV_RNG
STD_TAR_RNG
STD_ZER_RNG
S_TEMP
THEORETIC_ZERO_VAR
THERMAL_H_MATRIX
TRANS_INST2OBS
TRANS_OBS2MACS
WD_100_MASK
WD_101_QUAL
WD_102_MASK
WD_103_QUAL
WD_104_QUAL
WD_96_QUAL
WD_98_QUAL
WD_99_QUAL
WINDOW_SZ

FORMAT

This file follows a general pattern of the parameter name on one line followed by its value on the next line. The first ten lines are reserved for comments giving the pedigree of the file.

Name	Data Type	Comments
COMMENTS	C*80	Ten lines are required
'ANT_RAD_OFFSET'	C*14	
Values of ANT_RAD_OFFSET	R*4(3)	Not used.
'ANT_XMISSION'	C*12	
Values of ANT_XMISSION	R*4(3)	Not used.
'ATT_TYP_VER'	C*11	
Value of ATT_TYP_VER	C*12	Over written by values from PROG_PRAMS.
'BAD_CHANNEL_L1'	C*14	
Values of BAD_CHANNEL_L1	L*1(90,2)	
'CAL_RADIANCE_RNG'	C*16	

```
   Values of CAL_RADIANCE_RNG       R*4(2)
'CAL_REF'                           C*7
   Value of CAL_REF                 C*3
'CAL_TYPE'                          C*8
   Value of CAL_TYPE                C*3
'CONSTRAINT_ORDER'                  C*16
   Value of CONSTRAINT_ORDER        I*4
'FC'                                C*2
   Values of FC                     R*4(90,2)
'FILE_COMMENT'                      C*12
   Value of FILE_COMMENT            C*80
'GAIN_RNG'                          C*8
   Values of GAIN_RNG               R*4(2)
'HGA_INTERFER_RNG'                  C*16
   Value of HGA_INTERFER_RNG        R*4(2,40)
'HGA_INTERFER_RNG_NUM'              C18
   Value of HGA_INTERFER_RNG_NUM    I*4
'MAFA'                              C*4
   Value of MAFA                    I*4
'MIN_FIT_SIGMA'                     C*13
   Value of MIN_FIT_SIGMA           R*4
'MIN_GAIN_PTS'                      C*12
   Value of MIN_GAIN_PTS            I*4
'MU'                                C*2
   Value of MU                      R*4(90,2)
'OBJECT_FOV'                        C*10
   Value of OBJECT_FOV              R*4
'OBJECT_SPV'                        C*10
   Value of OBJECT_SPV              R*4
'ORB_TYP_VER'                       C*11
   Value of ORB_TYP_VER             C*12      Over written by
                                              values from
                                              PROG_PRAMS.
'OVERRIDE'                          C*8
   Values of OVERRIDE               C*1(32)
'PTG_FOV_AZIM_REF'                  C*16
   Values of PTG_FOV_AZIM_REF       R*4(2)
'PTG_FOV_AZIM_WDTH'                 C*17
   Value of PTG_FOV_AZIM_WDTH       R*4
'PTG_FOV_BO_MAP'                    C*14
   Values of PTG_FOV_BO_MAP         I*4(7)
'PTG_FOV_BO_NUM'                    C*14
   Value of PTG_FOV_BO_NUM          I*4
'PTG_FOV_ELEV_REF'                  C*23
   Values of PTG_FOV_ELEV_REF       R*4(2)
'PTG_FOV_ELEV_WDTH'                 C*17
   Value of PTG_FOV_ELEV_WDTH       R*4
'PTG_FOV_TABLE'                     C*13
   PTG_FOV_TABLE                    RECORD(5)
   Includes Values of .AZIM         R*4       Repeat pattern of
            Values of .ELEV         R*4       three real values
            Values of .ENCR         I*4       five times.
'PTG_INST2MACS_ELEV_ERR'            C*18
   Value of PTG_INST2MACS_ELEV_ERR  R*4
```

```
'PTG_SPV_AZIM'                          C*12
   Value of PTG_SPV_AZIM                R*4
'PTG_SPV_AZIM_WDTH'                     C*17
   Value of PTG_SPV_AZIM_WDTH           R*4
'PTG_SPV_BO_MAP'                        C*14
   Values of PTG_SPV_BO_MAP             I*4(7)
'PTG_SPV_BO_NUM'                        C*14
   Value of PTG_SPV_BO_NUM              I*4
'PTG_SPV_ELEV'                          C*12
   Value of PTG_SPV_ELEV                R*4
'PTG_SPV_ELEV_WDTH'                     C*17
   Value of PTG_SPV_ELEV_WDTH           R*4
'QUALIFIER'                             C*9
   Value of QUALIFIER                   C*1
'REC_NOISE_RNG'                         C*13
   Values of REC_NOISE_RNG              R*4(2,90)
'REF_MMIF'                              C*8
   Value of REF_MMIF                    I*4
'REJECT_LK_AHEAD'                       C*15
   Value of REJECT_LK_AHEAD             I*4
'STD_SPV_RNG'                           C*11
   Values of STD_SPV_RNG                R*4(2)
'STD_TAR_RNG'                           C*11
   Values of STD_TAR_RNG                R*4(2)
'STD_ZER_RNG'                           C*11
   Values of STD_ZER_RNG                R*4(2)
'S_TEMP'                                C*6
   Value of S_TEMP                      R*4
'THEORETIC_ZERO_VAR'                    C*18
   Value of THEORETIC_ZERO_VAR          R*4
'THERMAL_H_MATRIX'                      C*16
   Value of THERMAL_H_MATRIX            R*4(2,16)
'TRANS_INST2OBS'                        C*14
   Values of TRANS_INST2OBS             R*4(3,3)
'TRANS_OBS2MACS'                        C*14
   Values of TRANS_OBS2MACS             R*4(3,3)
'WD_100_MASK'                           C*11
   Values of WD_100_MASK                I*4(2)
'WD_101_QUAL'                           C*11
   Values of WD_101_QUAL                L*1(32)
'WD_102_MASK'                           C*11
   Values of WD_102_MASK                I*4(2)
'WD_103_QUAL'                           C*11
   Values of WD_103_QUAL                L*1(32)
'WD_104_QUAL'                           C*11
   Values of WD_104_QUAL                L*1(32)
'WD_96_QUAL'                            C*10
   Values of WD_96_QUAL                 L*1(32)
'WD_98_QUAL'                            C*10
   Values of WD_98_QUAL                 L*1(32)
'WD_99_QUAL'                            C*10
   Values of WD_99_QUAL                 L*1(32)
'WINDOW_SZ'                             C*9
   Value of WINDOW_SZ                   I*4
```

7.0 LEVEL 1 STANDARD HEADER

All Level 1 output files except for the Level 1 Log File have the same header. The contents and format of that header is described here.

The header record contains bookkeeping information and the contents of the User Input File. Except for the Defaults File, the header record is physically broken into three records so that the physical record size is smaller than the smallest Level 1 output data record. This is done so that the header record size does not drive the data record size. For the Defaults File, the header record is just one record.

CONTENTS

LVL1_HDR
LVL1_UIP

FORMAT

PHYSICAL RECORD 1

Name	Data type	Comments
LVL1_HDR	RECORD	
.REC_TYPE	C*1	Always 'H'.
.QUALIFIER	C*1	
.qualifier_pad	B*1(2)	
.RECORDNO	I*4	
.WRITE_TIME	I*4(2)	
.LVL1_VERSIONNO	C*4	
.NUMMMAF	I*4	
.UARS_DAY	I*4	
.START_TIME	I*4(2)	
.STOP_TIME	I*4(2)	
.MLS_STATUS_DAY	I*4	
ANT_RAD_OFFSET	R*4(3)	
ANT_XMISSION	R*4(3)	
ATT_TYP_VER	C*12	
BAD_CHANNEL_L1	L*1(90,2)	
CAL_RADIANCE_RNG	R*4(2)	
CAL_REF	C*3	
cal_ref_pad	B*1	
CAL_TYPE	C*3	
cal_type_pad	B*1	
CONSTRAINT_ORDER	I*4	
FC	R*4(90,2)	
FILE_COMMENT	C*80	
GAIN_RNG	R*4(2)	
HGA_INTERFER_RNG	R*4(2,40)	
HGA_INTERFER_RNG_NUM	I*4	

record size = 1416 bytes

PHYSICAL RECORD 2

Name	Data type	Comments
LVL1_HDR	RECORD	
.REC_TYPE	C*1	Always 'H'.
.QUALIFIER	C*1	
.qualifier_pad	B*1(2)	
.RECORDNO	I*4	
.WRITE_TIME	I*4(2)	
.LVL1_VERSIONNO	C*4	
.NUMMMAF	I*4	
.UARS_DAY	I*4	
.START_TIME	I*4(2)	
.STOP_TIME	I*4(2)	
.MLS_STATUS_DAY	I*4	
MAFA	I*4	
MIN_FIT_SIGMA	R*4	
MIN_GAIN_PTS	I*4	
MU	R*4(90,2)	
OBJECT_FOV	R*4	
OBJECT_SPV	R*4	
ORB_TYP_VER	C*12	
OVERRIDE	C*1(32)	
PTG_FOV_AZIM_REF	R*4(2)	
PTG_FOV_AZIM_WDTH	R*4	
PTG_FOV_BO_MAP	I*4(7)	
PTG_FOV_BO_NUM	I*4	
PTG_FOV_ELEV_REF	R*4(2)	
PTG_FOV_ELEV_WDTH	R*4	
PTG_FOV_TABLE	RECORD(5)	
Includes .AZIM	R*4	
.ELEV	R*4	
.ENCR	I*4	
PTG_INST2MACS_ELEV_ERR	R*4	
PTG_SPV_AZIM	R*4	
PTG_SPV_AZIM_WDTH	R*4	
PTG_SPV_BO_MAP	I*4(7)	
PTG_SPV_BO_NUM	I*4	
PTG_SPV_ELEV	R*4	
PTG_SPV_ELEV_WDTH	R*4	
QUALIFIER	C*1	
qualifier_pad	B*1(3)	

record size = 1004 bytes

PHYSICAL RECORD 3

Name	Data type	Comments
LVL1_HDR	RECORD	
.REC_TYPE	C*1	Always 'H'.
.QUALIFIER	C*1	
.qualifier_pad	B*1(2)	
.RECORDNO	I*4	
.WRITE_TIME	I*4(2)	
.LVL1_VERSIONNO	C*4	
.NUMMMAF	I*4	
.UARS_DAY	I*4	
.START_TIME	I*4(2)	
.STOP_TIME	I*4(2)	
.MLS_STATUS_DAY	I*4	
REC_NOISE_RNG	R*4(2,90)	
REF_MMIF	I*4	
REJECT_LK_AHEAD	I*4	
STD_SPV_RNG	R*4(2)	
STD_TAR_RNG	R*4(2)	
STD_ZER_RNG	R*4(2)	
S_TEMP	R*4	
THEORETIC_ZERO_VAR	R*4	
THERMAL_H_MATRIX	R*4(2,16)	
TRANS_INST2OBS	R*4(3,3)	
TRANS_OBS2MACS	R*4(3,3)	
WD_100_MASK	I*2(2)	
WD_101_QUAL	L*1(32)	
WD_102_MASK	I*2(2)	
WD_103_QUAL	L*1(32)	
WD_104_QUAL	L*1(32)	
WD_96_QUAL	L*1(32)	
WD_98_QUAL	L*1(32)	
WD_99_QUAL	L*1(32)	
WINDOW_SZ	I*4	

record size = 1212 bytes

8.0 LEVEL 1 DEFAULT DATA FILE

The Level 1 Default Data File is used to transfer information regarding the instrument status, and the time to MMAFNO relationship from one daily run to the next. This information is required to initialize the program and provide continuity from one daily run to the next. In each execution of the program, the Default Data File from the previous day is read during program initialization and a new Default Data File is created during termination with data relevant for beginning the next day's job. Both files have the same structure.

The total file size is about 40.86 Kbytes.

The Level 1 Default Data File is a binary file containing two parts:

(1.) The Level 1 Header consisting of one physical record (see section 7.0)

(2.) One physical default data record.

The input Default Data file is assigned by the UCSS routine ASGCAT with the following data attributes:

```
DATA_TYPE  = 'MLS'
SUBTYPE    = input parameter DEFLT_CALID
LEVEL      = '1'
BLOCK_SIZE = 78
LID        = 'DEFLT_LID'
TEMP_DAY   = UARS_DAY - 1.
```

The input Default Data file is opened as an unformatted, read only file with a status of 'old'.

The output Default Data file is assigned by the UCSS routine ASGCAT with the following data attributes;

```
DATA_TYPE  = 'MLS'
SUBTYPE    = input parameter DEFLT_CALID
LEVEL      = '1'
BLOCK_SIZE = 78
LID        = 'DEFLT_LID'
TEMP_DAY   = UARS_DAY.
```

The output Default Data file is opened as an unformatted file with a status of 'new'.

8.1 LEVEL 1 DEFAULT DATA HEADER RECORD

See section 7.0

8.2 LEVEL 1 DEFAULT DATA RECORD

CONTENTS

FORMAT

Name	Data Type	Comments
OLD_FILT_BANK_SWTCH	B*1	
pad_filt_BANK_SWTCH	B*1(3)	
OLD_MIX_BIAS	I*2(2)	
OLD_MULT_BIAS	I*2(2)	
OLD_RECEIVER_GAIN	I*2(6)	
MLS_STATUS	I*4	
MMAFNO	I*4	
MMAFNO_TIME	I*4(2)	
MOST_RECENT_Z(90)	I*4(90)	
REC_NOISE_TEMP	R*4(90)	
TAU	R*4	
TRANS_INST2ECI	R*4(3,3)	Stores last computed transformation between the instrument and ECI reference frames. Used when the the current transformation cannot be calculated due to lack of attitude data.
QUAD_FIT_TYPES.SPV	RECORD(90)	
.AVE_X	R*4	
.AVE_X2	R*4	
.AVE_Y	R*4	
.COEFF_A	R*4	

```
.COEFF_B                    R*4
.COEFF_C                    R*4
.QUAD_MMAF                  I*4
.QUAD_MMIF                  I*4
.VAR_A                      R*4
.VAR_B                      R*4
.VAR_C                      R*4
.VAR_D                      R*4
.VAR_Y                      R*4
.QUAD_TYPE                  C*1
.WALL_ON_LEFT               L*1
.pad                        B*1(2)
QUAD_FIT_TYPES.TAR          RECORD(90)
.AVE_X                      R*4
.AVE_X2                     R*4
.AVE_Y                      R*4
.COEFF_A                    R*4
.COEFF_B                    R*4
.COEFF_C                    R*4
.QUAD_MMAF                  I*4
.QUAD_MMIF                  I*4
.VAR_A                      R*4
.VAR_B                      R*4
.VAR_C                      R*4
.VAR_D                      R*4
.VAR_Y                      R*4
.QUAD_TYPE                  C*1
.WALL_ON_LEFT               L*1
.pad                        B*1(2)
QUAD_FIT_TYPES.ZER          RECORD(90)
.AVE_X                      R*4
.AVE_X2                     R*4
.AVE_Y                      R*4
.COEFF_A                    R*4
.COEFF_B                    R*4
.COEFF_C                    R*4
.QUAD_MMAF                  I*4
.QUAD_MMIF                  I*4
.VAR_A                      R*4
.VAR_B                      R*4
.VAR_C                      R*4
.VAR_D                      R*4
.VAR_Y                      R*4
.QUAD_TYPE                  C*1
.WALL_ON_LEFT               L*1
.pad                        B*1(2)
QUAD_FIT_TYPES.GAIN         RECORD(90)
.AVE_X                      R*4
.AVE_X2                     R*4
.AVE_Y                      R*4
.COEFF_A                    R*4
.COEFF_B                    R*4
.COEFF_C                    R*4
.QUAD_MMAF                  I*4
```

```
   .QUAD_MMIF                      I*4
   .VAR_A                          R*4
   .VAR_B                          R*4
   .VAR_C                          R*4
   .VAR_D                          R*4
   .VAR_Y                          R*4
   .QUAD_TYPE                      C*1
   .WALL_ON_LEFT                   L*1
   .pad                            B*1(2)
   RAD_PARAMS_REC                  RECORD(3)
   .BAFFLE_RAD_LIM                 I*4
   .BAFFLE_RAD_SPV                 I*4
   .BAFFLE_RAD_TAR                 I*4
   .ANT_OHMIC_REF                  R*4
   .ANT_OHMIC_RAD                  R*4
   .ANT_SCAT_EFF                   R*4
   .ANT_SCAT_RAD                   R*4
   .BAFFLE_XMIT_LIM                R*4
   .BAFFLE_XMIT_SPV                R*4
   .BAFFLE_XMIT_TAR                R*4

Record size = 5279 longwords.
```

9.0 LEVEL 1 LIMB RADIANCE FILE

This is a binary file produced by MLS_LEVEL1 which contains the calibrated limb radiances plus related quantities required by the Level 2 software set. This file is the main input for the MLS_TANTRAK program in the Level 2 software. It consists of fixed length records of 3584 longwords which include three record types:

(1.) The standard Level 1 Header records.

(2.) Data records. One data record is produced for each major frame of data. There are currently 60 bytes of unused pad at the end so that the record size will be a multiple of 512 bytes.

(3.) A trailer record with more bookkeeping information. The trailer record, like the header, has a standard format.

The estimated file size for one day's run (1330 MMAFs) is about 18.2 Mbytes.

The Limb Radiance File is assigned by the UCSS routine ASGCAT with the following data attributes:

```
DATA_TYPE  = 'MLS'
SUBTYPE    = MLSRAD
LEVEL      = '1'
BLOCK_SIZE = 37296
LID        = 'LIMB_LID'
TEMP_DAY   = UARS_DAY.
OLD_NEW    = set to 'NEW' when created by MLS_LEVEL1,
             set to 'OLD' otherwise.
```

When it is first generated, the Limb Radiance File is opened as an unformatted, direct access file with a status of 'NEW'. When the Limb Radiance File is read by the MLS TANTRAK program, it is opened as a read-only, direct access file, with a status of 'OLD'.

9.1 LEVEL 1 LIMB RADIANCE HEADER RECORD

See section 7.0

9.2 LEVEL 1 LIMB RADIANCE DATA RECORD

CONTENTS

FORMAT

Name	Data Type	Comments
REC_TYPE	C*1	'D'
BAND_BANK	B*1	
band_bank_pad	B*2	
RECORDNO	I*4	
MMAF_TIME	I*4(2)	
MMAFNO	I*4	
PRD_TEMPS	R*4(16)	
DGAP_MMAF	I*4	
MANEUVER_STAT	I*4	
MLS_STATUS	I*4	
WALL_MMAF	I*2(90)	
WINDOW_RED_REFS	I*2(90)	
WINDOW_RED_SZ	I*2(90)	
MMIF_STAT	C*1(32)	
MMAF_STAT	C*1	
HGA_INTERFER	L*1	
hga_pad	B*1(2)	
RAD_L1	I*2(90,2,32)	
OA_BUFFER	RECORD	
.PTG_FOV_BO_DIAG_MAP	L*1(7)	
.ptg_fov_pad	B*1	
.OA_ATT_RETRN	C*12	
.OA_ORB_RETRN	C*12	
.OA_EPHEM_STATUS	I*4	
.OA_LIMB_CALC_STATUS	I*4(32)	
.OA_SAT_ATT_STATUS	I*4(32)	
.OA_SAT_ORB_STATUS	I*4(32)	
.PTG_FOV_BO_DIAG_MMIF_FST	I*4	
.PTG_FOV_BO_DIAG_MMIF_LST	I*4	
.PTG_FOV_BO_DIAG_MMIF_NUM	I*4	
.REF_MMIF	I*4	
.REF_SOLAR_ILLUM	I*4	
.REF_TIME	I*4(2)	
.SAT_GEOD_STATUS	I*4	
.EARTH_GEOD_RAD	R*4(32)	
.GRNW_SID_TIME	R*4	
.PTG_FOV_AZIM_OFFSET	R*4(32)	
.PTG_FOV_AZIM_THM	R*4(2)	
.PTG_FOV_BO_DIAG_AZIMDIF	R*4	
.PTG_FOV_BO_DIAG_ELEVDIF	R*4	
.PTG_FOV_BO_DIAG_MMAF	R*4(7)	
.PTG_FOV_ELEV_OFFSET	R*4(32)	
.PTG_FOV_ELEV_THM	R*4(2)	
.PTG_INST2MACS_ELEV	R*4(2)	
.PTG_LIMB_PT	R*4(3)	
.REF_EARTH_RADIUS	R*4	
.REF_LAT	R*4	
.REF_LONG	R*4	

.REF_SOLAR_TIME	R*4
.REF_SOLAR_ZEN	R*4
.ROLLRATE_UARS	R*4(32)
.ROLL_UARS	R*4(32)
.SAT_GCRAD	R*4(32)
.SAT_GEOD_ALT	R*4
.SAT_GEOD_LAT	R*4
.SAT_LONG	R*4
.SAT_VEL	R*4(3)
.TNGT_GEOD_ALT	R*4(32)
.TNGT_GEOD_LAT	R*4(32)
.TNGT_LONG	R*4(32)
.TRANS_INST2ECI	R*4(3,3)
.YPR	R*4(3)
.YPR_RATE	R*4(3)
pad	B*1(60)

Record size = 3584 longwords.

9.3 LEVEL 1 LIMB RADIANCE TRAILER RECORD

CONTENTS

REC_TYPE
RECORDNO
TRAILER_TIME

FORMAT

Name	Data Type	Comments
REC_TYPE	C*1	Always 'T'
pad	B*1(3)	
RECORDNO	I*4	
TRAILER_TIME	I*4(2)	

Record size = 3584 longwords.

10.0 LEVEL 1 ENGINEERING FILE

This is a binary file produced by MLS_LEVEL1 containing instrument engineering data. This file consists of fixed length records of 384 longwords which include three record types:

(1.) The standard Level 1 Header.

(2.) Data records. One data record is produced for each major frame of data. There are twenty-six 'spare' longwords at the end of each data record.

(3.) A trailer record with more bookkeeping information. The trailer record, like the header, has a standard format.

The file size for one day's run (1330 MMAF's) is about 2.0 Mbytes.

The Engineering File is assigned by the UCSS routine ASGCAT with the following data attributes:

```
DATA_TYPE  = 'MLS'
SUBTYPE    = 'MLSENG
LEVEL      = '1'
BLOCK_SIZE = 3996
LID        = 'ENG_LID'
TEMP_DAY   = UARS_DAY.
```

The Engineering File is opened as an unformatted, direct access file with a status of 'new' since it is created by the program. There is not an include block which definies this file.

10.1 LEVEL 1 ENGINEERING HEADER RECORD

See section 7.0.

10.2 LEVEL 1 ENGINEERING DATA RECORD

CONTENTS

ANT_POS	RAD_CNTL
BAND_BANK	RECORDNO
DATA_PRESENT	REC_TYPE
INST_ON	REF_LAT
INST_SOLAR_AZIM	REF_LONG
INST_SOLAR_ELEV	REF_SOLAR_ILLUM
MMAFNO	SAT_GEOD_LAT
MMAF_TIME	SAT_LONG
MUX_DATA	SURVIVAL_DATA
PHASE_LOCK	SW_MIRROR
PR_STATUS	

FORMAT

Name	Data Type	Comments
REC_TYPE	C*1	'D'
BAND_BANK	B*1	
DATA_PRESENT	L*1	
INST_ON	L*1	
RECORDNO	I*4	
MMAF_TIME	I*4(2)	
MMAFNO	I*4	
ANT_POS	I*4(2,32)	
PHASE_LOCK	I*4(32)	
RAD_CNTL	I*4(16)	
REF_SOLAR_ILLUM	I*4	
SW_MIRROR	I*4(32)	
INST_SOLAR_AZIM	R*4	
INST_SOLAR_ELEV	R*4	
MUX_DATA	R*4(6,32)	
REF_LAT	R*4	
REF_LONG	R*4	
SAT_GEOD_LAT	R*4	
SAT_LONG.	R*4	
PR_STATUS	I*4	
SURVIVAL_DATA	R*4(10)	
pad	B*1(100)	

Record size = 384 longwords.

10.3 LEVEL 1 ENGINEERING TRAILER RECORD

CONTENTS

FORMAT

Name	Data Type	Comments
REC_TYPE	C*1	Always 'T'
pad	B*1(3)	
RECORDNO	I*4	
TRAILER_TIME	I*4	

Record size = 384 longwords.

11.0 · LEVEL1 DIAGNOSTICS

This is a random access binary file produced by MLS_LEVEL1 containing Level 1 diagnostic quantities, and a summary of various quantities calculated by the Level 1 program, including the average chi_square for data interpolation per band; average gain and receiver noise per band; and the values of the quadratic coefficients used in interpolation. This file consists of fixed length records of 2048 longwords which include three record types:

(1.) The standard Level 1 Header.

(2.) Data records. One data record is produced for each major frame of data.

(3.) A trailer record with more bookkeeping information. The trailer record, like the header, has a standard format.

The file size for one day's run (1330 MMAF's) is about 10.4 M bytes.

The Diagnostics File is assigned by the UCSS routine ASGCAT with the following data attributes:

```
DATA_TYPE  = 'MLS'
SUBTYPE    = 'MLSDIAG
LEVEL      = '1'
BLOCK_SIZE = 21312
LID        = 'DIAG_LID'
TEMP_DAY   = UARS_DAY.
```

The Diagnostics File is opened as an unformatted, direct access file with a status of 'new' since it is created by the program.

11.1 LEVEL 1 DIAGNOSTICS HEADER RECORD

See section 7.0.

11.2 LEVEL 1 DIAGNOSTICS DATA RECORD

CONTENTS

BAND_AVG_CHI_SQ	RAD_L1_MINMAX
BAND_AVG_GAIN	RECORDNO
BAND_AVG_REC_NOISE	REC_NOISE_BAD_FLAG
BAND_BANK	REC_NOISE_TEMP
CHI_SQUARE_REF	REC_TYPE
DGAP_MMAF	REF_LAT
GAIN_BAD_FLAG	REF_LONG

GAIN_COEFF_A
GAIN_COEFF_B
GAIN_COEFF_C
GAIN_DELTA
GAIN_SIGMA
INST_SOLAR_AZIM
INST_SOLAR_ELEV
MLS_STATUS
MMAFNO
MMAF_TIME
NUM_D_MMAF
NUM_L_MMAF
NUM_S_MMAF
NUM_T_MMAF
NUM_Z_MMAF
OPT_CAL_USED
REF_SOLAR_ILLUM
SAT_GEOD_LAT
SAT_LONG
SPV_BAD_FLAG
SPV_COEFF_A
SPV_COEFF_B
SPV_COEFF_C
TAR_BAD_FLAG
TAR_COEFF_A
TAR_COEFF_B
TAR_COEFF_C
WALL_MMAF
WINDOW_RED_REFS
WINDOW_RED_SZ
ZER_BAD_FLAG

FORMAT

Name	Data Type	Comments
REC_TYPE	C*1	'D'
rec_type_pad	B*1(3)	
RECORDNO	I*4	
MMAF_TIME	I*4(2)	
MMAFNO	I*4	
GAIN_BAD_FLAG	L*1(90)	
REC_NOISE_BAD_FLAG	L*1(90)	
SPV_BAD_FLAG	L*1(90)	
TAR_BAD_FLAG	L*1(90)	
ZER_BAD_FLAG	L*1(90)	
OPT_CAL_USED	L*1(90)	
BAND_AVG_CHI_SQ	R*4(6)	
BAND_AVG_GAIN	R*4(6)	
BAND_AVE_REC _NOISE	R*4(6)	
CHI_SQUARE_REF	R*4(90)	
WINDOW_RED_REFS	I*2(90)	
WINDOW_RED_SZ	I*2(90)	
GAIN_COEFF_A	R*4(90)	
GAIN_COEFF_B	R*4(90)	
GAIN_COEFF_C	R*4(90)	
SPV_COEFF_A	R*4(90)	
SPV_COEFF_B	R*4(90)	
SPV_COEFF_C	R*4(90)	
TAR_COEFF_A	R*4(90)	
TAR_COEFF_B	R*4(90)	
TAR_COEFF_C	R*4(90)	
REC_NOISE_TEMP	R*4(90)	
GAIN_DELTA	R*4(4,90)	
GAIN_SIGMA	R*4(90)	
DGAP_MMAF	I*4	
INST_SOLAR_AZIM	R*4	
INST_SOLAR_ELEV	R*4	

```
MLS_STATUS                      I*4
WALL_MMAF                       I*2(90)
REF_LAT                         R*4
REF_LONG                        R*4
REF_SOLAR_ILLUM                 I*4
SAT_GEOD_LAT                    R*4
SAT_LONG                        R*4
NUM_D_MMAF                      I*2(90)
NUM_L_MMAF                      I*2(90)
NUM_S_MMAF                      I*2(90)
NUM_T_MMAF                      I*2(90)
NUM_Z_MMAF                      I*2(90)
RAD_LI_MINMAX                   R*4(2,6)
BAND_BANK                       B*1
BAND_BANK_PAD                   B*1(3)
PAD                             B*1(272)

Record length = 2048 longwords.
```

11.3 LEVEL 1 DIAGNOSTICS TRAILER RECORD

CONTENTS

```
REC_TYPE
RECORDNO
TRAILER_TIME
```

FORMAT

Name	Data Type	Comments
REC_TYPE	C*1	Always 'T'
pad	B*1(3)	
RECORDNO	I*4	
TRAILER_TIME	I*4	

Record size = 2048 longwords.

12.0 LEVEL 1 LOG FILE

This is an ASCII formatted sequential file. Failure of the Level 1 Log File to open and write errors are not fatal to the MLS_LEVEL1 program; the program can run without producing a Log File. Unlike other files produced by the Level 1 program, the Log File is not assigned by any UCSS routine; it is opened as an ordinary ASCII file on a disk and directory specified by 'logicals' in the runstream. During production runs on the CDHF, the file will be created in the MLS working space (the logical AUX_DIRECTORY points to the disk and directory containing these log files). The MLS team is responsible for ensuring that enough space exists to create these files.

Since this file is an ASCII file, it can be displayed directly on the screen or printed. However, since 199 columns are used, screen display is not advised. When printing the file, compress mode must be used to obtain all columns. The file has three distinct parts. The first part, page one, contains header, data hit summary data, and a list of the program parameters input via the command file. Part two, the next three pages, list the contents of the Level 1 User Input file that was used. The last part contains the data records which come in three types. Each page of this last part contains a header giving the UARS_DAY and time in milliseconds of the first type one data record and column headers for the type one data records. The three data record types are:

(1) Summary of the information in the Diagnostics File.

(2) Changes in the Engineering File quantities; if any engineering quantity changes, both the old and the new values with those quantities that have changed flagged by asterisks above and below.

(3) Warning messages that quality hits, data hits, 'bad' data, or walls were detected. Only a limited number of these messages will be output. The limiting number for each message type is a Level 1 parameter currently set to 100. A quality hit is declared when the Level 0 data indicates that fill data was present or parity errors occurred, it is not determined by MLS. A data hit is determined by MLS when a value is outside its expected range. Data hits are check for in the following data: encoder counts, PRD_TEMPS, space counts, and target counts.

A data of record type one is output every MMAF (during data gaps the record will contain zeros except for a few fields that can be calculated without data). Record type two is output only if there is a change in the engineering file quantities. Records of type two are output immediately after the record type one for the corresponding MMAF. Type three

records are output only when data hits, 'bad' data, or 'wall' events are detected. Type three records will generally appear about WINDOW_SZ major frames before the other record types.

All records are blank filled to be 199 columns long. (The first character is a non-printing carriage-control character.) All values are integers unless otherwise stated. Where applicable the units are shown.

12.1 LEVEL 1 LOG FILE HEADER SECTION:

CONTENTS

LVL1_VERSIONNO
MLS_STATUS_DAY
NUMMMAF
NUM_ENCODER_HITS
NUM_PRD_HITS
NUM_RANGE_HITS
NUM_TGT_TEMP_HITS
NUM_UNFORCED_WALLS
QUALIFIER
RECORDNO
REC_TYPE
START_TIME
STOP_TIME
UARS_DAY
WRITE_TIME

FORMAT

Line 1 contains UARS_DAY and WRITE_TIME.
Line 2 contains START_TIME and REC_TYPE.
Line 3 contains STOP_TIME and QUALIFIER.
Line 4 contains NUMMMAF and MLS_STATUS_DAY.
Line 5 contains MLS_VERSIONNO
Line 6 contains NUM_PRD_HITS, NUM_TGT_TEMP_HITS, NUM_ENCODER_HITS, NUM_UNFORCED_WALLS, and NUM_RANGE_HITS

These six lines are followed by a nine blank lines then a table of the program input parameters. This table gives the program parameter name and its value. A page break follows this table.

12.2 LEVEL 1 LOG FILE UIP SECTION

This section lists the contents of the User Input file that was used and takes 3 pages. It is followed by another page break.

12.3 LEVEL 1 LOG FILE DATA SECTION

Level 1 Log File Data Record Type 1 contents summary:

```
BAND_AVG_CHI_SQ
BAND_AVG_GAIN
BAND_AVG_REC_NOISE
EQUATOR_CROSS_FLAG
MMAFNO
MMAF_TIME
NUM_D_VIEWS
NUM_L_VIEWS
NUM_S_VIEWS
NUM_T_VIEWS
NUM_Z_VIEWS
PTG_FOV_ELEV_OFFSET
RAD_L1_MINMAX
TGT_TEMP
```

Level 1 Log File data "Record 1" format:

EQUATOR_CROSS_FLAG: A character flag set as follows:

E	equator crossed South to North
e	equator crossed North to South
blank	equator not crossed during MMAF.

MMAFNO: A integer number in the range 0 to 2^27-1 representing the 27 bit MMAF number. The field requires 9 digits.

TIME: UT at the start of the MMAF, in the format HHMMSS.

MIN and MAX ELEVATION: These two entries give the minimum and maximum depressions of the Band 1 (63 GHZ) FOV below the -Y axis, in units of degrees, that occurred during the current MMAF. These units, rather than encoder readings, have been chosen for clarity. These fields each require five columns (format F5.2), with a blank column between them.

VIEW_TYPES: Five integer numbers, usually adding to 32, indicate the number of MMIF's of Discard, Limb, Space, Target, and Zero view types. These numbers may not add to 32 since view type is channel dependent. These numbers are a summary over all channels giving the minimum number of discard views, and the maximum number of limb, space, target, and zero views. Format 5(I2,1X)

NOISE TEMPERATURES: The weighted band-averaged noise temperatures, in Kelvin, recorded by the 6 filter banks. Since the band to bank mapping performed by the IF switch

network is not taken into account for this, or any of the following log entries, it is up to the user to perform the band to bank mapping. Whenever the band to bank mapping changes, a 'special' log output is generated (ie a record of type 2 is output). Format 6(I4,1X)

GAINS: The weighted band-averaged gains of the radiometers analyzed by each filter bank, in units of Counts/K. Format 6(F3.1,1X)

MIN and MAX LIMB RADIANCES: The minimum and maximum weighted band-averaged limb radiance limits observed by each band bank in this MMAF in units of 0.1K. Format 2(6(I4,1X),1X.

SPACE VIEW CHI_SQUARES: The observed Space view Chi-square statistic for each filter bank, for the time interval defined by the current window used by Level 1 processing. Format 6(F4.2,1X).

TGT_TEMP: The average Calibration Target temperature in units of degrees Celsius. Format F4.1.

Level 1 Log File data Record Type 2 contents summary:

CURR_PREV
ERRORS
FBSW
MUX_PSU
MUX_SENS
MUX_SPECT
OB_ENABLE
OB_INV
PH_LOCK
POWER_RELAY_STATUS
RAD_CNTL
SCAN_BIAS
SCAN_BIAS_ENABLE

Level 1 Log File data Record Type 2 format:

Whenever a change in instrument status is noted, a 'special' log entry which takes 5 lines is entered in the log. This 'special' record is output whenever a status change is noted, potentially 32 times per MMAF. Since it is triggered mainly by command actions, this should not result in excessive printed output. The phase lock monitors are an exception, and these should only trigger a log output at the end of an MMAF if any significant change of phase-lock status was noted during the interval.

The first and last lines are 'flag' lines containing 'markers' (eg *****) over and under all fields containing status changes.

The second line is a column header line with contents as follows:

STATUS CHANGE: ERRORS PH-LOCK RAD0 RAD1 RAD2 RAD3 RAD4 RAD5 RAD6 RAD7 RAD8 RAD9 RADA RADB RADC RADE RADF FBSW FBSW_CRPT SENS SPEC PSU BIAS BIAS_ENABLE OB_ENABLE OB_INV POWER_RELAY_STATUS

The third and forth lines contain the previous and new values of the following:

TYPE: " PREVIOUS:" for line 3 or " CURRENT:" for line 4.

ERRORS: The 16 bit error flag word generated by the C&DH, in HEX format (4 digits).

PH_LOCK: Nine digits, one for each phase-lock detector output, indicating the number of times that each particular output indicated a loss of lock. Each digit can be encoded as

0123456789ABCDEFGHIJKLMNOPQRSTUVW to represent a count of 0 to 32.

RAD0 to RADF: Four, four digit, Hex numbers indicating the contents of each Radiometer Control register. These govern the mixer, multiplier and Gunn biases, the IF gains, and Gunn loop closures.

FBSW: A four digit Hex number indicating the Filter Bank Switch setting. An asterisk follows the number if it is an illegal value.

FBSW_CRPT: A logical flag specifying whether the Filter Bank Switch has been corrupted. Set to true if engineering word 102 contains fill data or has been marked at Level 0 as having bad quality. It is also set to true if more than one bit has been set for filter bank 3.

SENS, SPEC, PSU: Each are two.four digit, HEX numbers indicating the engineering data multiplexer status bytes.

SCAN_BIAS: A four digit HEX number indicating the current Antenna Scan Bias.

SCAN_BIAS_ENABLE: A logical flag indicating whether or not the Antenna Scan Bias word is being used to offset the Antenna pointing.

OB_ENABLE: A logical flag indicating whether or not UARS Oblateness commands are being used in controlling the antenna scan.

OB_INV: A logical flag indicating whether or not the Oblateness commands are being inverted before being processed by the C&DH.

POWER_RELAY_STATUS: Twenty flags (0 or 1) indicating the power status for all 20 MLS power blocks.

Level 1 Log File data Record Type 3 contents summary:

NUM_ENCODER_HITS
NUM_PRD_HITS
NUM_RANGE_HITS
NUM_TGT_TEMP_HITS
NUM_UNFORCED_WALLS

Level 1 Log File data Record Type 3 format:

Basically there are five types of warning messages.

Encoder hit for MMAF: yyy MMIF: zzz

n quality hit(s) to param_name in MMAF # yyy

n data hit(s), n quality hit(s), to param_name in MMAF # yyy

view_label data hit in CHANNEL cc at MMAF yyy

Unforced view_label WALL in CHANNEL cc at MMAF yyy, MMIF zzz

Where:

n = number of hits
cc = channel number
param_name is the name of the parameter that the message refers to.
yyy = major frame number
zzz = minor frame number
view_label = SPACE or TARGET

13.0 LEVEL 2T USER INPUT (UIPT) FILE

The Level 2 UIPT File is a ASCII file containing user-changeable values for pointing azimuth and elevation angles and errors for the 183 and 205 GHZ radiometers, Earth and Satellite radii standard deviations number of state-vector components, and state vector identifiers. The file will consist of a field descriptor followed by the values of the item whose identifier name is in the field descriptor. This file is variable in length as different parameters may be used in different runs. The Level 2T User Input File is assigned with ASGCAL with the following data attributes:

```
SUBTYPE     = 'MLS'
LEVEL       = '2'
LID         = 'TT_UIPT'
TEMP_DAY    = UARS_DAY
DMATCH      = 'PREV'
CALID       = 'UIPT_CAL'
```

The file is opened as an 'old' (preexisting) read-only file.

LEVEL 2T USER INPUT FILE

CONTENTS

```
NSV
SV_INFO.IDSV
UPDATE_OA_OPTION
```

TYPICAL FORMAT (order is not fixed)

LINE	NAME	TYPE	COMMENTS
1-10	Comments	C*80	
11	'UPDATE_OA_OPTION'	C*16	
12	Value of UPDATE_OA_OPTION	C*1	
13	'NSV'	C*3	
14	Value of NSV	I*4	
15	'SV_INFO'	C*7	
16	Value for SV_INFO(1).IDSV	C*8	
.	.	.	
.	.	.	
.	.	.	
	Value for SV_INFO(NSV).IDSV	C*8	

14.0 LEVEL 2T DEFAULT CLIMATOLOGY INPUT FILE

The Level 2 Default Climatology File contains climatology data for different chemical species at different times of the day, plus the standard deviations of the data. The data are based on the CIT photochemical one dimensional model atmosphere. It is an ASCII file with a minimum of 5 lines and with the following format: the first line will be a page header and will always have the following form: "MLS ATMOSPHERIC CLIMATOLOGY FILE (VERSION 2); (descriptor)". The descriptor will always be one of the following: "SDEV (Standard Deviation)"; "NOON"; "NITE"; or "TWLT (AVG. OF DAY & NIGHT)". The second line is two numbers separated by three spaces: "66 9". The fourth line is a heading describing the quantities listed beneath it: "SURFACE PRESSURE ALTITUDE TEMPERATURE O3 H20 CLO HNO3 H202 O3_18_A O3_18_S H20_18 O_18_O". The fourth line contains the units for (some of) the quantities: [-Log10(mb)] [km] [K]". The subsequent lines contain the numeric values for each pressure surface; surface number; total pressure; altitude; temperature; and partial pressure of the particular gas species (except for that section marked "SDEV" which contains the standard deviation of the partial pressure). This file contains initial climatology parameters that are used when UARS Climatology data are not available.

The file contains about 36 Kbytes.

Here is what a portion of the File looks like:

```
MLS ATMOSPHERIC CLIMATOLOGY FILE (VERSION 1); COVA   (Diag. of
covar.)
  66   3
SURFACE   PRESSURE ALTITUDE  TEMP     O3        H2O        CLO
      [-Log10(mb)] [km]      [K]
     1     -3.0077  0.0      15.0   1.13E-08  9.72E-03 4.16E-13
     2     -2.8995  2.0      15.0   1.58E-08  4.95E-03 3.75E-13
     3     -2.7876  4.0      15.0   2.05E-08  2.20E-03 2.77E-13
```

The file is assigned by ASGCAL and has the following data attributes:

```
SUBTYPE     = 'MLS'
LEVEL       = '2'
LID         = 'DEFLT_LID'
TEMP_DAY    = UARS_DAY.
CALID       = 'CLI_PROF_CAL'
DMATCH      = 'PREV'
```

The file is opened as an 'old' (preexisting) read_only ASCII file. It is a free formatted file.

15.0 UARS CLIMATOLOGY FILE

The trace gas climatology file, provided by the UARS project, contains data derived from a variety of sources and is used as a priori parameters for processing of each major frame. It is a direct access binary file with record numbers corresponding to parameters and local time.

The file is assinged by ASGCAL and has the following data attributes:

```
SUBTYPE     = 'CLIM'
LEVEL       = '    '
LID         = 'UARS_CLI_LID'
TEMP_DAY    = 0
CALID       = 'ZONALMEAN'
DMATCH      = 'EXCT'
```

The file is opened as an 'old' (preexistin) read_only, direct access unformatted file.

16.0 LEVEL 2 PROCESSING COEFFICIENTS (L2PC) INPUT FILE

The L2PC file contains processing coefficients used in the MLS_RETRIV program.

Further information to be supplied by Bill Read.

17.0 LEVEL 2T TTDU FILE

The Tangent Track Data Unvarying quantities file contains constant quantities such as the Level 1 Limb Radiance File header including the Level 1 User Inputs, and other quantities that are constant for the duration of the program execution. The file consists of a header section and five data records. It is assigned as a new scratch file by ASGSCR. The OLD_NEW parameter is set to 'NEW' for TANTRAK and 'HELD' for RETRIV; and the LID to 'TTDU'. The file is opened as an unformatted sequential access file with five records. Record size is not specified in the OPEN statement.

The file size is about 10.5 Kbytes.

17.1 LEVEL 2T TTDU FILE HEADER SECTION

CONTENTS

LVL1_HDR.QUALIFIER
LVL1_HDR.REC_TYPE
LVL1_HDR.UARS_DAY
NSV
SV_INFO.FST_ELE_INDX
SV_INFO.IDSV
SV_INFO.NO_SV_COEFF
SV_INFO.TRI_BASE_PSG
UTIME1
UTIME2
VERSION_TTD
WRITE_TIME_TTD

FORMAT

Name	Data Type	Comments
VERSION_TTD	C*4	
LVL1_HDR.REC_TYPE	C*1	Always 'H'.
LVL1_HDR.QUALIFIER	C*1	
WRITE_TIME_TTD	I*4(2)	
LVL1_HDR.UARS_DAY	I*4	
UTIME1	I*4(2)	
UTIME2	I*4(2)	
NSV	I*4	
SV_INFO(1).IDSV	C*8	
SV_INFO(1).FST_ELE_INDX	I*4	
SV_INFO(1).TRI_BASE_PSG	R*4(43)	
SV_INFO(1).NO_SV_COEFF	C*8	
.		
.		
.		
SV_INFO(NSV).IDSV	C*8	
SV_INFO(NSV).FST_ELE_INDX	I*4	
SV_INFO(NSV).TRI_BASE_PSG	R*4(43)	
SV_INFO(NSV).NO_SV_COEFF	C*8	

17.2.2 LEVEL 2T TTDU FILE DATA SECTION--RECORD 2

CONTENTS

L2PCQ_HEADER1

FORMAT

Name	Data Type	Comments
L2PCQ_HEADER1	RECORD	
.L2PCQ_LINE1	C*80	
.L2PCQ_LINE2	C*80	
.AVAIL_KEYS	C*8(48)	
.SV_COMPONENTS	C*8(32)	
.SV_RTRVL_BY_BAND	L*1(32,6)	
.NO_POINTINGS	I*4	
.NO_AVAIL_KEYS	I*4	
.NO_SV_COMPONENTS	I*4	
.NO_MAG_FIELDS	I*4	
.POINTINGS	R*4(43)	
.B_FIELDS	R*4(4)	

17.2.3 LEVEL 2T TTDU FILE DATA SECTION--RECORD 3

CONTENTS

L2PCQ_HEADER2

FORMAT

Name	Data Type	Comments
L2PCQ_HEADER2	RECORD	
.L2PCQ_LINE3	C*80	
.NO_SV_COMPONENTS	I*4	
.NO_SV_ELMNTS	I*4	
.NO_ELMNTS_PER_SV_COMPONENT	I*4(32)	
.SV_COMPONENT_FST_ELMNT_INDEX	I*4(32)	
.TRI_BASIS_VERT_GRID	R*4(242)	

17.2.4 LEVEL 2T TTDU FILE DATA SECTION--RECORD 4

CONTENTS

LVL1_HDR
LVL1_UIP

FORMAT

Name	Data Type	Comments
LVL1_HDR	RECORD	
.REC_TYPE	C*1	Always 'H'.
.QUALIFIER	C*1	
.qualifier_pad	B*1(2)	
.RECORDNO	I*4	
.WRITE_TIME	I*4(2)	
.LVL1_VERSIONNO	C*4	
.NUMMMAF	I*4	
.UARS_DAY	I*4	
.START_TIME	I*4(2)	
.STOP_TIME	I*4(2)	
.MLS_STATUS_DAY	I*4	
LVL1_UIP	RECORD.	
.ANT_RAD_OFFSET	R*4(3)	
.ANT_XMISSION	R*4(3)	
.ATT_TYP_VER	C*12	
.BAD_CHANNEL_L1	L*1(90,2)	
.CAL_RADIANCE_RNG	R*4(2)	
.CAL_REF	C*3	
.cal_ref_pad	C*1	
.CAL_TYPE	C*3	
.cal_type_pad	C*1	
.CONSTRAINT_ORDER	I*4	
.FC	R*4(90,2)	
.FILE_COMMENT	C*80	
.GAIN_RNG	R*4(2)	
.HGA_INTERFER_RNG	R*4(2,40)	
.HGA_INTERFER_RNG_NUM	I*4	
.MAFA	I*4	
.MIN_FIT_SIGMA	R*4	
.MIN_GAIN_PTS	I*4	
.MU	R*4(90,2)	
.OBJECT_FOV	R*4	
.OBJECT_SPV	R*4	
.ORB_TYP_VER	C*12	
.OVERRIDE	C*1(32)	
.PTG_FOV_AZIM_REF	R*4(2)	
.PTG_FOV_AZIM_WDTH	R*4	
.PTG_FOV_BO_MAP	I*4(7)	
.PTG_FOV_BO_NUM	I*4	

```
.PTG_FOV_ELEV_REF          R*4(2)
.PTG_FOV_ELEV_WDTH         R*4
.PTG_FOV_TABLE             RECORD(5)
   .AZIM                   R*4
   .ELEV                   R*4
   .ENCR                   I*4
.PTG_INST2MACS_ELEV_ERR    R*4
.PTG_SPV_AZIM              R*4
.PTG_SPV_AZIM_WDTH         R*4
.PTG_SPV_BO_MAP            I*4(7)
.PTG_SPV_BO_NUM            I*4
.PTG_SPV_ELEV              R*4
.PTG_SPV_ELEV_WDTH         R*4
.QUALIFIER                 C*1
.qualifier_pad             B*1(3)
.REC_NOISE_RNG             R*4(2,90)
.REF_MMIF                  I*4
.REJECT_LK_AHEAD           I*4
.STD_SPV_RNG               R*4(2)
.STD_TAR_RNG               R*4(2)
.STD_ZER_RNG               R*4(2)
.S_TEMP                    R*4
.THEORETIC_ZERO_VAR        R*4
.THERMAL_H_MATRIX          R*4(2,16)
.TRANS_INST2OBS            R*4(3,3)
.TRANS_OBS2MACS            R*4(3,3)
.WD_100_MASK               I*2(2)
.WD_101_QUAL               L*1(32)
.WD_102_MASK               I*2(2)
.WD_103_QUAL               L*1(32)
.WD_104_QUAL               L*1(32)
.WD_96_QUAL                L*1(32)
.WD_98_QUAL                L*1(32)
.WD_99_QUAL                L*1(32)
.WINDOW_SZ                 I*4
```

17.2.5 LEVEL 2T TTDU FILE DATA SECTION--RECORD 5

CONTENTS

UPDATE_OA_OPTION
PARAM_COUNT
PARAM_TABLE_TANTRAK

FORMAT

Name	Data Type	Comments
UPDATE_OA_OPTION	C*1	
PARAM_COUNT	I*4	
PARAM_TABLE_TANTRAK	C*20(2,20)	

18.0 LEVEL 2T TTDA FILE

The Tangent Track Data Atmospheric Coefficients (TTDA) File contains climatology and correlative data interpolated to the retrieval grid and correlative height and pressure levels for each minor frame. The file size (for 1330 MMAF's) is about 5.9 Mbytes. The file is assigned as a new scratch file by ASGSCR with data attributes:

```
LID        = 'TTDA'
OLD_NEW    = 'NEW' when created by TANTRAK,
             'HELD' when used by RETRIV.
```

18.1 LEVEL 2T TTDA FILE HEADER SECTION

CONTENTS

```
NSV                          TTD_LST_REC
QUALIFIER                    TYPE
RECORDNO_TTD                 UARS_DAY
SV_INFO(*).FST_ELE_INDX      UTIME1
SV_INFO(*).IDSV              UTIME2
SV_INFO(*).NO_SV_COEFF       VERSION_TTD
SV_INFO(*).TRI_BASE_PSG      WRITE_TIME_TTD
```

FORMAT

Name	Data Type
RECORDNO_TTD	I*4
TTD_LST_REC	I*4
VERSION_TTD	C*4
TYPE	C*1
QUALIFIER	C*1
WRITE_TIME_TTD	I*4(2)
UARS_DAY	I*4
UTIME1	I*4(2)
UTIME2	I*4(2)
NSV	I*4
SV_INFO(1).IDSV	C*8
SV_INFO(1).FST_ELE_INDX	I*4
SV_INFO(1).TRI_BASE_PSG	R*4(43)
SV_INFO(1).NO_SV_COEFF	C*8
.	
.	
.	
SV_INFO(NSV).IDSV	C*8
SV_INFO(NSV).FST_ELE_INDX	I*4
SV_INFO(NSV).TRI_BASE_PSG	R*4(43)
SV_INFO(NSV).NO_SV_COEFF	C*8

Record size = 1152 longwords.

18.2 LEVEL 2T TTDA FILE DATA SECTION

CONTENTS

FORMAT

Name	Data Type
RECORDNO_TTD	I*4
MMAF_TIME	I*4(2)
REF_TIME	I*4(2)
CLOUT	R*4(STATE_SIZE)
CLOUT_VAR	R*4(STATE_SIZE)
CORR_GRID	I*4
P_CORR	R*4(CORR_GRID)
HT_CORR	R*4(CORR_GRID)
STATE_CORR	R*4(STATE_SIZE)
STATE_CORR_VAR	R*4(STATE_SIZE)

Record size = 1152longwords.

19.0 LEVEL 2T TTDR FILE

The Tangent Track Data Radiance (TTDR) File is a direct access binary file containing the contents of the Level 1 Limb Radiance File data records that are within the start and stop times specified by the user runstream. There is one limb radiance record in the data section for each major frame. The file is assigned as a new scratch file by ASGSCR with data attributes

```
LID        = 'TTDR
OLD_NEW    = 'NEW' when created by TANTRAK,
             'HELD' when used by RETRIV.
```

The file is opened as an unformatted direct access file.

The files size (1330 MMAF's) is about 18.2 Mbytes.

19.1 LEVEL 2T TTDR FILE HEADER SECTION

CONTENTS

```
NSV                          TTD_LST_REC
QUALIFIER                    TYPE
RECORDNO_TTD                 UARS_DAY
SV_INFO(*).FST_ELE_INDX      UTIME1(2)
SV_INFO(*).IDSV              UTIME2(2)
SV_INFO(*).NO_SV_COEFF       VERSION_TTD
SV_INFO(*).TRI_BASE_PSG      WRITE_TIME_TTD(2)
```

FORMAT

Name	Data Type
RECORDNO_TTD	I*4
TTD_LST_REC	I*4
VERSION_TTD	C*4
TYPE	C*1
QUALIFIER	C*1
WRITE_TIME_TTD	I*4(2)
UARS_DAY	I*4
UTIME1	I*4(2)
UTIME2	I*4(2)
NSV	I*4
SV_INFO(1).IDSV	C*8
SV_INFO(1).FST_ELE_INDX	I*4
SV_INFO(1).TRI_BASE_PSG	R*4(43)
SV_INFO(1).NO_SV_COEFF	C*8
.	
.	

```
SV_INFO(NSV).IDSV                C*8
SV_INFO(NSV).FST_ELE_INDX        I*4
SV_INFO(NSV).TRI_BASE_PSG        R*4(43)
SV_INFO(NSV).NO_SV_COEFF         C*8
```

Record Size = 3584 longwords

19.2 LEVEL 2T TTDR FILE DATA SECTION

CONTENTS

LVL1_DATA (contents of Level1 Radiance Data record)
OA_STATUS1
OA_STATUS2
RECORDNO_TTD

FORMAT

Name	Data Type	Comments
RECORDNO_TTD	I*4	
OA_STATUS1	I*4	
OA_STATUS2	I*4	
LVL1_DATA	RECORD	
.REC_TYPE	C*1	'D'
.BAND_BANK	B*1	
.band_bank_pad	B*2	
.RECORDNO	I*4	
.MMAF_TIME	I*4(2)	
.MMAFNO	I*4	
.PRD_TEMPS	R*4(16)	
.DGAP_MMAF	I*4	
.MANEUVER_STAT	I*4	
.MLS_STATUS	I*4	
.WALL_MMAF	I*2(90)	
.WINDOW_RED_REFS	I*2(90)	
.WINDOW_RED_SZ	I*2(90)	
.MMIF_STAT	C*1(32)	
.MMAF_STAT	C*1	
.HGA_INTERFER	L*1	
.RAD_L1	I*2(90,2,32)	
.OA_BUFFER	RECORD	
. .PTG_FOV_BO_DIAG_MAP	L*1(7)	
. .ptg_fov_pad	B*1	
. .OA_ATT_RETRN	C*12	
. .OA_ORB_RETRN	C*12	
. .OA_EPHEM_STATUS	I*4	
. .OA_LIMB_CALC_STATUS	I*4(32)	

```
. .OA_SAT_ATT_STATUS            I*4(32)
. .OA_SAT_ORB_STATUS            I*4(32)
. .PTG_FOV_BO_DIAG_MMIF_FST     I*4
. .PTG_FOV_BO_DIAG_MMIF_LST     I*4
. .PTG_FOV_BO_DIAG_MMIF_NUM     I*4
. .REF_MMIF                     I*4
. .REF_SOLAR_ILLUM              I*4
. .REF_TIME                     I*4(2)
. .SAT_GEOD_STATUS              I*4
. .EARTH_GEOD_RAD               R*4(32)
. .GRNW_SID_TIME                R*4
. .PTG_FOV_AZIM_OFFSET          R*4(32)
. .PTG_FOV_AZIM_THM             R*4(2)
. .PTG_FOV_BO_DIAG_AZIMDIF      R*4
. .PTG_FOV_BO_DIAG_ELEVDIF      R*4
. .PTG_FOV_BO_DIAG_MMAF         R*4(7)
. .PTG_FOV_ELEV_OFFSET          R*4(32)
. .PTG_FOV_ELEV_THM             R*4(2)
. .PTG_INST2MACS_ELEV           R*4(2)
. .PTG_LIMB_PT                  R*4(3)
. .REF_EARTH_RADIUS             R*4
. .REF_LAT                      R*4
. .REF_LONG                     R*4
. .REF_SOLAR_TIME               R*4
. .REF_SOLAR_ZEN                R*4
. .ROLLRATE_UARS                R*4(32)
. .ROLL_UARS                    R*4(32)
. .SAT_GCRAD                    R*4(32)
. .SAT_GEOD_ALT                 R*4
. .SAT_GEOD_LAT                 R*4
. .SAT_LONG                     R*4
. .SAT_VEL                      R*4(3)
. .TNGT_GEOD_ALT                R*4(32)
. .TNGT_GEOD_LAT                R*4(32)
. .TNGT_LONG                    R*4(32)
. .TRANS_INST2ECI               R*4(3,3)
. .YPR                          R*4(3)
. .YPR_RATE                     R*4(3)
 pad                            B*1(346)

Record size = 3584 longwords.
```

20.0 LEVEL 2R LAST MAJOR FRAME QUANTITIES (LMFQ) FILE

This is a sequential, two record file, created by MLS_RETRIV. It contains a set of quantities that will be used as a priori information in setting up the next day's retrievals. It is assigned by ASGCAT with the following data attributes:

```
DATA_TYPE  = 'MLS'
SUBTYPE    = MLS_LMFQ
LEVEL      = '2'
LID        = 'MLSL2_LMFQ'
TEMP_DAY   = UARS_DAY.
```

The file is opened as an unformatted, sequential, new file.

20.1 LMFQ FILE - RECORD 1

CONTENTS

UARS_FLYING_DIR
UARS_YAW_PERIOD

FORMAT

Name	Data Type
UARS_YAW_PERIOD	C*2
UARS_FLYING_DIR	C*1

20.2 LMFQ FILE - RECORD 2

CONTENTS

Forward Only	Forward and Backward processing
BAND_BANK	BAND_BANK
MLS_VIEW_ANGLE	MLS_VIEW_ANGLE
MMAF_STAT	MMAF_STAT
MMAF_TIME	MMAF_TIME
MMIF_STAT	MMIF_STAT
PTAN63_FRD	PTAN63_L2
PTAN63_FRD_VAR	PTAN63_L2_VAR
PTG_FOV_ELEV_OFFSET	PTG_FOV_ELEV_OFFSET
STATE_FRD	COMB_EST
STATE_FRD_COV	COMB_COV
SV_INFO	SV_INFO
TNGT_GEOD_ALT_REFR	TNGT_GEOD_ALT_REFR

FORMAT

Name	Data Type	
MLS_VIEW_ANGLE	R*4(32)	
PTG_FOV_ELEV_OFFSET	R*4(32)	
PTAN63_FRD	R*4(32)	or PTAN63_L2
PTAN63_FRD_VAR	R*4(32)	or PTAN63_L2_VAR
STATE_FRD	R*4(STATE_SIZE)	or COMB_EST
STATE_FRD_COV	R*4(STATE_SIZE, STATE_SIZE)	or COMB_COV
TNGT_GEOD_ALT_REFR		
MMAF_TIME	I*4(2)	
SV_INFO	RECORD(NSV)	
.KMR	R*4(43)	
.TRI_BASE_PSG	I*4(43)	
.FST_ELE_INDX	I*4(43)	
.NO_SV_COEFF	I*4	
.PROFILE_INDX	I*4	
.IDSV	C*8	
.STATE_CHAN_RETRIV	L*1(90)	
.RETRIV	L*1	
.retriv_pad	B*1	
.STATE_CHAN_CNSTRN	L*1(90)	
.CNSTRN	L*1	
.cnstrn_pad	B*1	
BAND_BANK	B*1	
MMAF_STAT	C*1	
MMIF_STAT	C*1(32)	

21.0 LEVEL 2R PREVIOUS MAJOR FRAME QUANTITIES (PMFQ) FILE

This file is the Level 2R Last Major Frame Quantities File created during a previous run of the MLS_RETRIV program. Therefore, it differs only in that its UARS_DAY is one less than that of the 'LMFQ' file, and it is opened as an 'old' (preexisting) file.

22.0 LEVEL 2R USER INPUT FILE

The Level 2R User Input File, like the other user input files, is an ASCII formatted file containing user selectable input parameters, in this case, for the program MLS_RETRIV. It is assigned by the routine ASGCAL with data attributes:

```
SUBTYPE     = 'MLS'
LEVEL       = '2'
LID         = 'LVL2_UIPR'
UARS_DAY    = UARS_DAY from PGINIT.
DMATCH      = 'PREV'
CALID       = 'UIPR_CALID'
```

It is opened as a read-only, file with a status of 'old'.

Its size is about 20.5 Kbytes.

CONTENTS

```
A_PRIORI_TYPE
BAD_CHANNEL_L2
BAND_WING_CHAN
BANK_SWITCH_NOMINAL
BSL_APR_METHOD
BSL_LNT_VAR
BSL_LNT_VAR_M3
BSL_OFF_VAR
BSL_OFF_VAR_M3
BSL_QDT_VAR
CHISQ_LIMIT
CLI_FACTOR
CLI_OFFSET_TEMP
CLI_PRESS_THRESHOLD
COMB_O3
C_ORDER
DELTA_W
DETAIL_OUTPUT
FILE_COMMENT_L2
KMR
K_CUT_OFF
LAT_DMAX
LIMB_RAD_LIMIT
MMIF_BAD_MAX
OPT_DEPTH_LIN_MAX
OPT_DEPTH_LIN_MIN
OPT_DEPTH_MAX
PREF_NOMINAL
PROC_DIR_OPT
PTAN63_APR_METHOD
PTAN_CHISQ_THRESHOLD
RAD_ERR_FACTOR
ROLLRATE_VAR_MULT
SIGMA_CRITERION
STATE_CHAN_CNSTRN
STATE_CHAN_RETRIV
SV_INFO
THRESHOLD_K_PTAN
THRESHOLD_K_TEMP
```

FORMAT

Name	Data Type	Comments
COMMENTS	C*80	First ten lines.
'DETAIL_OUTPUT'	C*13	
'OPTION'	C*6	
Value of DETAIL_OUTPUT	C*1	
'MMAF_RANGE'	C*10	
Value of MMAF_NUM1	I*4	
Value of MMAF_NUM2	I*4	
'A_PRIORI_TYPE'	C*13	
Value of A_PRIORI_TYPE	C*18	
'BAD_CHANNEL_L2'	C*14	
Value of BAD_CHANNEL_L2	L*1(90,2)	
'BAND_WING_CHAN'	C*14	
Value of BAND_WING_CHAN	I*(6,2)	
'BANK_SWITCH_NOMINAL'	C*19	
Value of BANK_SWITCH_NOMINAL	L*1	
'BSL_APR_METHOD'	C*14	
Value of BSL_APR_METHOD	I*4	
'BSL_LNT_VAR'	C*11	
Value of BSL_LNT_VAR	R*4	
'BSL_LNT_VAR_M3'	C*14	
Value of BSL_LNT_VAR_M3	R*4	
'BSL_OFF_VAR'	C*11	
Value of BSL_OFF_VAR	R*4	
'BSL_OFF_VAR_M3'	C*14	
Value of BSL_OFF_VAR_M3	R*4	
'BSL_QDT_VAR'	C*11	
Value of BSL_QDT_VAR	R*4	
'C_ORDER'	C*7	
Values of C_ORDER	I*4(90,2)	
'CHISQ_LIMIT'	C*11	
Value of CHISQ_LIMIT	R*4(6)	
'CLI_FACTOR'	C*10	
Value of CLI_FACTOR	R*4	
'CLI_PRESS_THRESHOLD'	C*19	
Value of CLI_PRESS_THRESHOLD	R*4	
'CLI_OFFSET_TEMP'	C*16	
Value of CLI_OFFSET_TEMP	R*4	
'COMB_O3'	C*7	
Value of COMB_O3	L*1	
'DELTA_W'	C*7	
Value of DELTA_W	R*4	
'FILE_COMMENT_L2'	C*15	
Value of FILE_COMMENT_L2	C*80	
'K_CUT_OFF'	C*9	
Value of K_CUT_OFF	R*4	
'LAT_DMAX'	C*8	
Value of LAT_DMAX	R*4	
'LIMB_RAD_LIMIT'	C*14	
Value of LIMB_RAD_LIMIT	R*4	
'MMIF_BAD_MAX'	C*12	

```
 Value of MMIF_BAD_MAX                R*4
'OPT_DEPTH_LIN_MAX'                   C*17
 Value of OPT_DPTH_LIN_MAX            R*4
'OPT_DEPTH_LIN_MIN'                   C*17
 Value of OPT_DPTH_LIN_MIN            R*4
'OPT_DEPTH_MAX'                       C*13
 Value of OPT_DPTH_MAX                R*4
'PREF_NOMINAL'                        C*12
 Value of PREF_NOMINAL                R*4
'PROC_DIR_OPT'                        C*12
 Value of PROC_DIR_OPT                I*4
'PTAN63_APR_METHOD'                   C*17
 Value of PTAN63_APR_METHOD           I*4
'PTAN_CHISQ_THRESHOLD'                C*20
 Value of PTAN_CHISQ_THRESHOLD        R*4
'RAD_ERR_FACTOR'                      C*14
 Value of RAD_ERR_FACTOR              R*4(90)
'ROLLRATE_VAR_MULT'                   C*17
 Value of ROLLRATE_VAR_MULT           R*4
'SIGMA_CRITERION'                     C*15
 Value of SIGMA_CRITERION             R*4
'SV_INFO'                             C*7
 Value of SV_INFO.IDSV(i)             C*8        ..
'STATE_CHAN_RETRIV'                   C*17        .
 Value of SV_INFO(i).                             . Where i runs
     STATE_CHAN_RETRIV                L*1         . from 1to NSV ,
'STATE_CHAN_CNSTRN'                   C*17        . where NSV is a
 Value of SV_INFO(i).                             . user input to
     STATE_CHAN_CNSTRN                L*1         . TANTRAK
'KMR'                                 C*3         .
 Value of SV_INFO(i).KMR(j)           R*4        .. Where j runs
                                                    from 1 to
                                                NO_SV_COEFF, where
                                                NO_SV_COEFF comes from
                                                the header of the
                                                L2PCQ file.
                                                     C*16
'SV_INFO_NON_L2PC'
 Value of SV_INFO.IDSV(i)             C*8        .. .
 Value of SV_INFO(i).                             . Repeat this
     STATE_CHAN_RETRIV                L*1         . set until
 Value of SV_INFO(i).                             . IDSV = 'END'
     STATE_CHAN_CNSTRN                L*1         .
                                                  .
 Value of SV_INFO(i).KMR(j)           R*4        .. Where j runs
                                                    from 1 to
                                                NO_SV_COEFF, where
                                                NO_SV_COEFF comes from
                                                the header of the
                                                L2PCQ file.

'END SV_INFO_NON_L2PC'
'THRESHOLD_K_PTAN'                    C*16
 Value of THRESHOLD_K_PTAN            R*4
'THRESHOLD_K_TEMP'                    C*16
 Value of THRESHOLD_K_TEMP            R*4
```

23.0 LEVEL 2R FORWARD SCRATCH FILE

This is scratch file used to save estimates and calculated quantities made during the first (or forward) pass for use during the second (or backward) pass.

The file is opened with the routine ASGSCR with th following data attributes:

```
LID         = 'FRD_L2T'
OLD_NEW     = 'NEW'
```

This file is opened as a direct access, unformatted scratch file, with a fixed record type and length. Each logical record contains a number of physical record having a record length of 8191 longwords. The file size for a full day (1330 MMAF's) is about 124.7 Mbytes.

CONTENTS

```
LVL2_DATA
PTAN63_SAV
PTAN63_SAV_COV
STATE
STATE_COV_TRI
```

FORMAT First record

Name	Data Type	Comments
BAND_INFO_MMAF	RECORD(6)	
.CHISQ	R*4	
.CHISQ_APR_BRD	R*4	
.CHISQ_APR_FRD	R*4	
.LIMB_RAD_GOOD	R*4	
.PROBLTY	R*4	
.BANK	I*4	
.NDATA	I*4	
.NUM_ELE	I*4	
.QUALITY	L*1	
BAND_INFO_MMIF	RECORD(6)	
.CHISQ_MMIF	R*4(32)	
.NUM_CHAN	I*2(32)	
BSL_OFF1	R*4(32)	
BSL_LNT1	R*4(32)	
BSL_QDT1	R*4(32)	
BSL_OFF2	R*4(32)	
BSL_LNT2	R*4(32)	
BSL_QDT2	R*4(32)	
BSL_OFF3	R*4(32)	
BSL_LNT3	R*4(32)	
BSL_QDT3	R*4(32)	
BSL_OFF4	R*4(32)	

BSL_LNT4	R*4(32)
BSL_QDT4	R*4(32)
BSL_OFF5	R*4(32)
BSL_LNT5	R*4(32)
BSL_QDT5	R*4(32)
BSL_OFF6	R*4(32)
BSL_LNT6	R*4(32)
BSL_QDT6	R*4(32)
BSL_OFF1_SDEV	R*4(32)
BSL_LNT1_SDEV	R*4(32)
BSL_QDT1_SDEV	R*4(32)
BSL_OFF2_SDEV	R*4(32)
BSL_LNT2_SDEV	R*4(32)
BSL_QDT2_SDEV	R*4(32)
BSL_OFF3_SDEV	R*4(32)
BSL_LNT3_SDEV	R*4(32)
BSL_QDT3_SDEV	R*4(32)
BSL_OFF4_SDEV	R*4(32)
BSL_LNT4_SDEV	R*4(32)
BSL_QDT4_SDEV	R*4(32)
BSL_OFF5_SDEV	R*4(32)
BSL_LNT5_SDEV	R*4(32)
BSL_QDT5_SDEV	R*4(32)
BSL_OFF6_SDEV	R*4(32)
BSL_LNT6_SDEV	R*4(32)
BSL_QDT6_SDEV	R*4(32)
EARTH_VEL_Z	R*4
GRNW_SID_TIME	R*4
MAG_FIELD_NOM	R*4
MAG_UNIT_VEC	R*4(3)
PREF	R*4
PROFILE	R*4(MAX_NPRFL_ELE)
PROFILE_ERRRED	R*4(MAX_NPRFL_ELE)
PROFILE_SDEV	R*4(MAX_NPRFL_ELE)
PTAN63	R*4(32)
PTAN63_SDEV	R*4(32)
PTG_FOV_AZIM_183	R*4(2)
PTG_FOV_AZIM_205	R*4(2)
PTG_FOV_AZIM_OFFSET	R*4(32)
PTG_FOV_AZIM_THM	R*4(2)
PTG_FOV_BO_DIAG_AZIMDIF	R*4
PTG_FOV_BO_DIAG_ELEVDIF	R*4
PTG_FOV_BO_DIAG_MMAF	R*4(7)
PTG_FOV_ELEV_183	R*4(2)
PTG_FOV_ELEV_205	R*4(2)
PTG_FOV_ELEV_OFFSET	R*4(32)
PTG_FOV_ELEV_THM	R*4
PTG_INST2MACS_ELEV	R*4(2)
PTG_LIMB_PT	R*4(3)
REF_EARTH_RADIUS	R*4
REF_LAT	R*4
REF_LONG	R*4
REF_SOLAR_TIME	R*4
REF_SOLAR_ZEN	R*4

ROLLRATE_UARS	R*4(32)
ROLLRATE_MLS	R*4(32)
ROLLRATE_MLS_VAR	R*4(32)
ROLL_MLS	R*4(32)
ROLL_MLS_VAR	R*4(32)
ROLL_UARS	R*4(32)
SAT_GCRAD	R*4(32)
SAT_GEOD_ALT	R*4
SAT_GEOD_LAT	R*4
SAT_LONG	R*4
SAT_VEL_Z	R*4
TNGT_GEOD_ALT	R*4(32)
TNGT_GEOD_ALT_REFR	R*4(32)
TNGT_GEOD_ALT_REFR_MAX	R*4
TNGT_GEOD_ALT_REFR_MIN	R*4
TNGT_GEOD_ALT_MLS	R*4(32)
TNGT_GEOD_ALT_MLS_VAR	R*4(32)
TRANS_INST2ECI	R*4(3,3)
YPR	R*4(3)
YPR_RATE	R*4(3)
ZREF_GEOM	R*4
ZREF_GEOPOT	R*4
CHAN_STAT	I*4(90)
DGAP_MMAF	I*4
MANEUVER_STAT	I*4
MLS_STATUS	I*4
MMAFNO	I*4
MMAF_TIME	I*4(2)
OA_STATUS1	I*4
OA_STATUS2	I*4
PTG_FOV_BO_DIAG_MMIF_FST	I*4
PTG_FOV_BO_DIAG_MMIF_LST	I*4
PTG_FOV_BO_DIAG_MMIF_NUM	I*4
QUALITY_4_MMAF	I*4
QUALITY_3_MMAF	I*4
QUALITY_2_MMAF	I*4
QUALITY_1_MMAF	I*4
RECORDNO	I*4
REF_MMIF	I*4
REF_SOLAR_ILLUM	I*4
REF_TIME	R*4(2)
FLAG_AP_FST_CHAN	I*2(45,2)
FLAG_AP_FST_ELMNT	I*2(45,2)
FLAG_AP_FST_MMIF	I*2(45,2)
FLAG_AP_NUMMMIF	I*2(45,2)
FLAG_CHISQ_SPIKE_NUM	I*2(32,2)
FLAG_CHISQ_SPIKE_NUM_FST_CHAN	I*2(32,2)
FLAG_NEG	I*2(45,2)
FLAG_NEG_FST_CHAN	I*2(45,2)
FLAG_NEG_FST_ELMNT	I*2(45,2)
FLAG_NEG_FST_MMIF	I*2(45,2)
FLAG_NEG_NUMMMIF	I*2(45,2)
FLAG_PTAN	I*2(32,2)
WALL_MMAF	I*2(90)

WINDOW_RED_REFS	I*2(90)
MMAF_STAT	C*1
MMIF_STAT	C*1(32)
OA_ATT_RETRN	C*12
OA_ORB_RETRN	C*12
TYPE	C*1
FLAG_AP	L*1(45,2)
FLAG_ASCEND	L*1
FLAG_CHISQ_SPIKE	L*1(32,2)
FLAG_CLI	L*1(45,2)
SCAN_PATTERN_CHANGE	L*1
PTG_FOV_BO_DIAG_MAP	L*1(7)
BAND_BANK	B*1
PTAN63_SAV	R*4(32)
PTAN63_SAV_COV	R*4(32)
STATE	I*4(STATE_SIZE)
STATE_COV_TRI	I*4( ) First STATE_COV_TRI_SZ elements of STATE_COV_TRI.

FORMAT Second record and remaining records

Name	Data Type	Comments
STATE_COV_TRI	I*4( )	Next STATE_COV_TRI_SZ elements of STATE_COV_TRI.

24.0 LEVEL 2R OUTPUT PRODUCT FILE

This is the main Level 2 output file. It contains: all the retrieved quantities, orbit/attitude data relevant to the retrievals, some diagnostic and log information, and user inputs to all programs that transformed the data from Level 0 to Level 2.

This file is assigned by ASGCAT with the following data attributes:

```
DATA_TYPE   = 'MLS'
SUBTYPE     = 'L2OUT'
LEVEL       = '2'
SIZE        = 17160
LID         = 'MLSL2_L2OUT'
UARS_DAY    = UARS_DAY from PGINIT.
```

The file is opened as an unformatted, new, direct access file. There is one record in this file for each MMAF. The record length of this file is 3456 longword; one day's processing (1330 MMAF's plus 3 header/trailer records) is thus about 17.6 Mbytes.

24.1 LEVEL 2R OUTPUT PRODUCT FILE HEADER RECORD

CONTENTS

```
BAND_INFO_DAY
BANK3_NUM_SWITCH
BANK3_SWITCH_TIMES
BANK6_NUM_SWITCH
BANK6_SWITCH_TIMES
CSFDU1
CSFDU2
DATA_GAP_TIMES
END_TIME
FLAG_AP_FST_REF_TIME
FLAG_AP_NUMMMAF
FLAG_CLI_NUMMMAF
FLAG_NEG_FST_REF_TIME
FLAG_NEG_NUMMMAF
L2PCQ_LINE1
L2PCQ_LINE2
L2PCQ_LINE3
LVL1_UIP
LVL1_VERSIONNO
LVL2_UIP
MANEUVER_NUM_ORB
MANEUVER_NUM_ROLL
MANEUVER_NUM_UNDEF
MANEUVER_NUM_YAW
MANEUVER_NUM_ZERO
MLS_STATUS_DAY
NPRFL
NPRFL_ELE
NSV
NUMMMAF
NUMMMAF_GOOD_STATUS
PARAM_TABLE_RETRIV
PARAM_TABLE_TANTRAK
QUALIFIER
QUALITY4_DAY
RECORDNO
REC_SZ
REF_TIME_FIRST
SCAN_CHANGE_NUM
SFDU1
SFDU2
START_TIME
TYPE
UARS_DAY
VERSIONNO_RETRIV
VERSIONNO_TANTRAK
WRITE_TIME
```

FORMAT

Name	Data Type	Comments
SFDU1	C*12	
CSFDU1	C*8	
SFDU2	C*12	
CSFDU2	C*8	
LVL1_UIP	RECORD.	
.ANT_RAD_OFFSET	R*4(3)	
.ANT_XMISSION	R*4(3)	
.ATT_TYP_VER	C*12	
.BAD_CHANNEL_L1	L*1(90)	
.CAL_RADIANCE_RNG	R*4(2)	
.CAL_REF	C*3	
.cal_ref_pad	C*1	
.CAL_TYPE	C*3	
.cal_type_pad	C*1	
.CONSTRAINT_ORDER	I*4	
.FC	R*4(90,2)	
.FILE_COMMENT	C*80	
.GAIN_RNG	R*4(2)	
.HGA_INTERFER_RNG	R*4(2,40)	
.HGA_INTERFER_RNG_NUM	I*4	
.MAFA	R*4	
.MIN_FIT_SIGMA	R*4	
.MIN_GAIN_PTS	I*4	
.MU	R*4(90,2)	
.OBJECT_FOV	R*4	
.OBJECT_SPV	R*4	
.ORB_TYP_VER	C*12	
.OVERRIDE	C*1(32)	
.PTG_FOV_AZIM_REF	R*4(2)	
.PTG_FOV_AZIM_WDTH	R*4	
.PTG_FOV_BO_MAP	I*4(7)	
.PTG_FOV_BO_NUM	I*4	
.PTG_FOV_ELEV_REF	R*4(2)	
.PTG_FOV_ELEV_WDTH	R*4	
.PTG_FOV_TABLE	RECORD(5)	
Includes .AZIM	R*4	
.ELEV	R*4	
.ENCR	I*4	
.PTG_INST2MACS_ELEV_ERR	R*4	
.PTG_SPV_AZIM	R*4	
.PTG_SPV_AZIM_WDTH	R*4	
.PTG_SPV_BO_MAP	I*4(7)	
.PTG_SPV_BO_NUM	I*4	
.PTG_SPV_ELEV	R*4	
.PTG_SPV_ELEV_WDTH	R*4	
.QUALIFIER	C*1	
.qualifier_pad	C*3	
.REC_NOISE_RNG	R*4(2,90)	
.REF_MMIF	I*4	

```
   .REJECT_LK_AHEAD              I*4
   .STD_SPV_RNG                  R*4(2)
   .STD_TAR_RNG                  R*4(2)
   .STD_ZER_RNG                  R*4(2)
   .S_TEMP                       R*4
   .THEORETIC_ZERO_VAR           R*4
   .THERMAL_H_MATRIX             R*4(2,16)
   .TRANS_INST2OBS               R*4(3,3)
   .TRANS_OBS2MACS               R*4(3,3)
   .WD_100_MASK                  I*2(2)
   .WD_101_QUAL                  L*1(32)
   .WD_102_MASK                  I*2(2)
   .WD_103_QUAL                  L*1(32)
   .WD_104_QUAL                  L*1(32)
   .WD_96_QUAL                   L*1(32)
   .WD_98_QUAL                   L*1(32)
   .WD_99_QUAL                   L*1(32)
   .WINDOW_SZ                    I*4
LVL2_UIP                         RECORD
   .BSL_LNT_VAR                  R*4
   .BSL_LNT_VAR_M3               R*4
   .BSL_OFF_VAR                  R*4
   .BSL_OFF_VAR_M3               R*4
   .BSL_QDT_VAR                  R*4
   .CHISQ_LIMIT                  R*4(6)
   .CLI_PRESS_THRESHOLD          R*4
   .CLI_OFFSET_TEMP              R*4
   .DELTA_W                      R*4
   .K_CUT_OFF                    R*4
   .LAT_DMAX                     R*4
   .LIMB_RAD_LIMIT               R*4
   .OPT_DEPTH_LIN_MAX            R*4
   .OPT_DEPTH_LIN_MIN            R*4
   .OPT_DEPTH_MAX                R*4
   .PREF_NOMINAL                 R*4
   .PTAN_CHISQ_THRESHOLD         R*4
   .RAD_ERR_FACTOR               R*4
   .ROLLRATE_VAR_MULT            R*4
   .SIGMA_CRITERION              R*4
   .THRESHOLD_K_PTAN             R*4
   .THRESHOLD_K_TEMP             R*4
   .A_PRIORI_TYPE                I*4
   .BAND_WING_CHAN               I*4(6,2)
   .BSL_APR_METHOD               I*4
   .C_ORDER                      I*4(90,2)
   .MMIF_BAD_MAX                 R*4
   .PROC_DIR_OPT                 I*4
   .PTAN63_APR_METHOD            I*4
   .FILE_COMMENT_L2              C*80
   .UPDATE_OA_OPTION             C*1
   .BAD_CHANNEL_L2               L*1(90,2)
   .BANK_SWITCH_NOMINAL          L*1
   .COMB_O3                      L*1
   .pad                          B*1(1)
```

```
BAND_INFO_DAY                   RECORD(6)
  .AVG_PROBLTY                  R*4
  .BAD_FRACTION                 R*4
  .QUALITY1                     R*4
  .QUALITY2                     R*4
  .QUALITY3                     R*4
  .QUALITY4                     R*4
  .NUM_BAD_MMAF                 I*4
QUALITY4_DAY                    R*4
BANK3_NUM_SWITCH                I*4
BANK3_SWITCH_TIMES              I*4(2,6)
BANK6_NUM_SWITCH                I*4
BANK6_SWITCH_TIMES              I*4(2,2)
DATA_GAP_TIMES                  I*4(2,2,16)
END_TIME                        I*4(2)
FLAG_AP_FST_REF_TIME            I*4(45,2)
FLAG_NEG_FST_REF_TIME           I*4(45,2)
MLS_STATUS_DAY                  I*4
NPRFL                           I*4
NPRFL_ELE                       I*4
NSV                             I*4
NUMMMAF                         I*4
NUMMMAF_GOOD_STATUS             I*4
RECORDNO                        I*4
REC_SZ                          I*4
REF_TIME_FIRST                  I*4(2)
START_TIME                      I*4(2)
UARS_DAY                        I*4
WRITE_TIME                      I*4(2)
FLAG_AP_NUMMMAF                 I*2(45,2)
FLAG_NEG_NUMMMAF                I*2(45,2)
FLAG_CLI_NUMMMAF                I*2(45)
MANEUVER_NUM_ORB                I*2
MANEUVER_NUM_ROLL               I*2
MANEUVER_NUM_UNDEF              I*2
MANEUVER_NUM_YAW                I*2
MANEUVER_NUM_ZERO               I*2
SCAN_CHANGE_NUM                 I*2
LVL1_VERSIONNO                  C*4
VERSIONNO_TANTRAK               C*4
VERSIONNO_RETRIV                C*4
L2PCQ_LINE1                     C*80
L2PCQ_LINE2                     C*80
L2PCQ_LINE3                     C*80
PARAM_TABLE_TANTRAK             C*20(2,20)
PARAM_TABLE_RETRIV              C*20(2,20)
QUALIFIER                       C*1
TYPE                            C*1
pad
```

Record size = 3456 longwords.

24.2 LEVEL 2 OUTPUT PRODUCT FILE NSV RECORD

CONTENTS

RECORDNO
SV_INFO
TYPE_12

FORMAT

Name	Data Type	Comments
RECORDNO	I*4	
TYPE_L2	C*1	
SV_INFO	RECORD(NSV)	
.KMR	R*4(43)	
.TRI_BASE_PSG	I*4(43)	
.FST_ELE_INDX	I*4(43)	
.NO_SV_COEFF	I*4	
.PROFILE_INDX	I*4	
.IDSV	C*8	
.STATE_CHAN_RETRIV	L*1(90)	
.RETRIV	L*1	
.retriv_pad	B*1	
.STATE_CHAN_CNSTRN	L*1(90)	
.CNSTRN	L*1	
.cnstrn_pad	B*1	
pad	B*1(	

24.3 LEVEL2 OUTPUT PRODUCT DATA RECORD(S)

CONTENTS

FLAG_CHISQ_SPIKE_NUM_FST_CHAN
FLAG_CLI
FLAG_NEG
FLAG_NEG_FST_CHAN
FLAG_NEG_FST_ELMNT
FLAG_NEG_FST_MMIF
FLAG_NEG_NUMMMIF
FLAG_PTAN
GRNW_SID_TIME
MAG_FIELD_NOM
MAG_UNIT_VEC
MANEUVER_STAT
MLS_STATUS
MMAFNO
MMAF_STAT
MMAF_TIME
MMIF_STAT
TNGT_GEOD_ALT_MLS
TNGT_GEOD_ALT_MLS_VAR
TNGT_GEOD_ALT_REFR
TNGT_GEOD_ALT_REFR_MAX
TNGT_GEOD_ALT_REFR_MIN
TRANS_INST2ECI
TYPE
WALL_MMAF
WINDOW_RED_REFS
YPR
YPR_RATE
ZREF

FORMAT

Name	Data Type	Comments
BAND_INFO_MMAF	RECORD(6)	
.CHISQ	R*4	
.CHISQ_APR_BRD	R*4	
.CHISQ_APR_FRD	R*4	
.LIMB_RAD_GOOD	R*4	
.PROBLTY	R*4	
.BANK	I*4	
.NDATA	I*4	
.NUM_ELE	I*4	
.QUALITY	L*1	
BAND_INFO_MMIF	RECORD(6)	
.CHISQ_MMIF	R*4(32)	
.NUM_CHAN	I*2(32)	
BSL_OFF1	R*4(32)	
BSL_LNT1	R*4(32)	
BSL_QDT1	R*4(32)	
BSL_OFF2	R*4(32)	
BSL_LNT2	R*4(32)	
BSL_QDT2	R*4(32)	
BSL_OFF3	R*4(32)	
BSL_LNT3	R*4(32)	
BSL_QDT3	R*4(32)	
BSL_OFF4	R*4(32)	
BSL_LNT4	R*4(32)	
BSL_QDT4	R*4(32)	
BSL_OFF5	R*4(32)	
BSL_LNT5	R*4(32)	
BSL_QDT5	R*4(32)	
BSL_OFF6	R*4(32)	
BSL_LNT6	R*4(32)	
BSL_QDT6	R*4(32)	
BSL_OFF1_SDEV	R*4(32)	
BSL_LNT1_SDEV	R*4(32)	
BSL_QDT1_SDEV	R*4(32)	
BSL_OFF2_SDEV	R*4(32)	
BSL_LNT2_SDEV	R*4(32)	
BSL_QDT2_SDEV	R*4(32)	
BSL_OFF3_SDEV	R*4(32)	
BSL_LNT3_SDEV	R*4(32)	
BSL_QDT3_SDEV	R*4(32)	
BSL_OFF4_SDEV	R*4(32)	
BSL_LNT4_SDEV	R*4(32)	
BSL_QDT4_SDEV	R*4(32)	
BSL_OFF5_SDEV	R*4(32)	
BSL_LNT5_SDEV	R*4(32)	
BSL_QDT5_SDEV	R*4(32)	
BSL_OFF6_SDEV	R*4(32)	
BSL_LNT6_SDEV	R*4(32)	
BSL_QDT6_SDEV	R*4(32)	
EARTH_VEL_Z	R*4	

GRNW_SID_TIME	R*4
MAG_FIELD_NOM	R*4
MAG_UNIT_VEC	R*4(3)
PREF	R*4
PROFILE	R*4(MAX_NPRFL_ELE)
PROFILE_ERRRED	R*4(MAX_NPRFL_ELE)
PROFILE_SDEV	R*4(MAX_NPRFL_ELE)
PTAN63	R*4(32)
PTAN63_SDEV	R*4(32)
PTG_FOV_AZIM_183	R*4(2)
PTG_FOV_AZIM_205	R*4(2)
PTG_FOV_AZIM_OFFSET	R*4(32)
PTG_FOV_AZIM_THM	R*4(2)
PTG_FOV_BO_DIAG_AZIMDIF	R*4
PTG_FOV_BO_DIAG_ELEVDIF	R*4
PTG_FOV_BO_DIAG_MMAF	R*4(7)
PTG_FOV_ELEV_183	R*4(2)
PTG_FOV_ELEV_205	R*4(2)
PTG_FOV_ELEV_OFFSET	R*4(32)
PTG_FOV_ELEV_THM	R*4
PTG_INST2MACS_ELEV	R*4(2)
PTG_LIMB_PT	R*4(3)
REF_EARTH_RADIUS	R*4
REF_LAT	R*4
REF_LONG	R*4
REF_SOLAR_TIME	R*4
REF_SOLAR_ZEN	R*4
ROLLRATE_UARS	R*4(32)
ROLLRATE_MLS	R*4(32)
ROLLRATE_MLS_VAR	R*4(32)
ROLL_MLS	R*4(32)
ROLL_MLS_VAR	R*4(32)
ROLL_UARS	R*4(32)
SAT_GCRAD	R*4(32)
SAT_GEOD_ALT	R*4
SAT_GEOD_LAT	R*4
SAT_LONG	R*4
SAT_VEL_Z	R*4
TNGT_GEOD_ALT	R*4(32)
TNGT_GEOD_ALT_REFR	R*4(32)
TNGT_GEOD_ALT_REFR_MAX	R*4
TNGT_GEOD_ALT_REFR_MIN	R*4
TNGT_GEOD_ALT_MLS	R*4(32)
TNGT_GEOD_ALT_MLS_VAR	R*4(32)
TRANS_INST2ECI	R*4(3,3)
YPR	R*4(3)
YPR_RATE	R*4(3)
ZREF_GEOM	R*4
ZREF_GEOPOT	R*4
CHAN_STAT	I*4(6)
DGAP_MMAF	I*4
MANEUVER_STAT	I*4
MLS_STATUS	I*4
MMAFNO	I*4

MMAF_TIME	I*4(2)
OA_STATUS1	I*4
OA_STATUS2	I*4
PTG_FOV_BO_DIAG_MMIF_FST	I*4
PTG_FOV_BO_DIAG_MMIF_LST	I*4
PTG_FOV_BO_DIAG_MMIF_NUM	I*4
QUALITY_4_MMAF	I*4
QUALITY_3_MMAF	I*4
QUALITY_2_MMAF	I*4
QUALITY_1_MMAF	I*4
RECORDNO	I*4
REF_MMIF	I*4
REF_SOLAR_ILLUM	I*4
REF_TIME	R*4(2)
FLAG_AP_FST_CHAN	I*2(45,2)
FLAG_AP_FST_ELMNT	I*2(45,2)
FLAG_AP_FST_MMIF	I*2(45,2)
FLAG_AP_NUMMMIF	I*2(45,2)
FLAG_CHISQ_SPIKE_NUM	I*2(32,2)
FLAG_CHISQ_SPIKE_NUM_FST_CHAN	I*2(32,2)
FLAG_NEG	I*2(45,2)
FLAG_NEG_FST_CHAN	I*2(45,2)
FLAG_NEG_FST_ELMNT	I*2(45,2)
FLAG_NEG_FST_MMIF	I*2(45,2)
FLAG_NEG_NUMMMIF	I*2(45,2)
FLAG_PTAN	I*2(32,2)
WALL_MMAF	I*2(90)
WINDOW_RED_REFS	I*2(90)
MMAF_STAT	C*1
MMIF_STAT	C*1(32)
OA_ATT_RETRN	C*12
OA_ORB_RETRN	C*12
TYPE	C*1
FLAG_AP	L*1(45,2)
FLAG_ASCEND	L*1
FLAG_CHISQ_SPIKE	L*1(32,2)
FLAG_CLI	L*1(45,2)
SCAN_PATTERN_CHANGE	L*1
PTG_FOV_BO_DIAG_MAP	L*1(7)
BAND_BANK	B*1
pad	

Record size = 3456 longwords.

25.0 LEVEL 2 LOG FILE

The Log File for Level 2 (&3) Processing provides a running account of some of the "events" which occurred during each major frame, as well as user input information for the run, and summary diagnostics. This file is not meant to be used other that to be printed (in compress mode). The discription will be given refering to the printed product.

Some of the information procided in this file is self-explanatory or can be found as duplicate information in the Level 2 User Input File description, the Level 2 Output File description, and the Data Dictionary. A brief description of the contents of the Log file is given below.

25.1 LEVEL 2 LOG FILE - HEADER

The two page Header is made up of two parts, a six line abstract, and a copy of the User Input File contents. The abstract contains general information on Year & UARS Day, date/time of file production, start & stop times for run, qualifier for data (see Level 2 Output file definition), and software versions used for RETRIV, TANTRAK and Level 1 runs.

25.2 LEVEL 2 LOG FILE - DATA

This section (about 27 pages in length) consists of informational records and warning messages. At the top of each page is a page header conatining column headers for the informational records. Each informational record consist of one line per MMAF, up to 50 such lines per page. The warning messages are dispursed thoughout the data section and occur when the appriate situation develop. The warning messages appear after the information record for the MMAF in which they arise.

25.2.1 LEVEL 2 LOG FILE - DATA - INFRMATIONAL LINE

A description of the information provided under each header is now given, reading from left to right on the printout.

Colume Header — Definition

- MM

ST — Gives the value of MMAF_STAT. If blank, then the major frame was 'GOOD', otherwise, a value of 'B' ('Bad' Major Frame Status) or a 'P' ('Pointing Error').

- MMAF Major Frame Number

- GMT
hhmmss Greenwich Meridian Time, in hours, minutes, seconds

- Ref
lat
deg Reference latitude, in degrees (for REF_MMIF)

- Ref
long
deg Reference longitude, in degrees (for REF_MMIF)

- Ref
sza
deg Reference solar zenith angle, in degrees

- Sat
lat
deg Satellite latitude, in degrees

- Sat
lon
deg Satellite longitude, in degrees

- MA
ST Maneuver status for satellite. Set to O (oh) for Orbit adjust, Y for yaw, R for roll, U for undefined. Blank if no maneuver in progress.

- SP Scan Pattern change indicator. Left blank if no change from previous MMAF. Set to 'Y' (yes) if there was a change.

- Min
ztan
km Minimum tangent height during the current major frame (km units)

- Max
ztan
km Maximum tangent height during the current major frame (km units)

- BO
F# Flag for Bright Object in FOV. This gives the first minor frame # during which this condition occurred. Blank if no flag set.

- BO
Flags for Bright Object in FOV. These two fields give the numbers corresponding to Bright Objects which were in the FOV at some time during this major frame (if only one object - sun, moon, or planet, if checked by

Level 1 program -, one field only will be filled). See the Data Dictionary description of PTG_FOV_BO_MAP for meaning of numbers. Fields are blank if no flags are set.

- OA
  L1 Value of OA_STATUS1 (see Data Dictionary), indicating the number of times a warning status was returned from the Orbit/Attitude Services called during Level 1 run preceding the Level 2 run. Blank if no warnings were returned.

- OA
  L2 Value of OA_STATUS2 (see Data Dictionary), indicating the number of times a warning status was returned from the Orbit/Attitude Services called during Level 2 run produced with an updated Orbit or Attitude version. Blank if no warnings were returned or if Level 2 did not update Orbit/Attitude.

- Fl
  pt Flag corresponding to a non-zero value of FLAG_PTAN (see Data Dictionary). This field is set to 'T' (true) if there was an out-of-range condition for tangent pressure. Blank if no such condition occurred.

- BN DIAGNOSTICS There are 7 diagnostic fields for each of the 6 MLS radiometer retrievals (N = 1 to 6). These diagnostics are:

  - ch
    us Number of channels used during the retrievals involving band N. The maximum number is based on the number of channels used for each good limb view (taking into account the fact that retrievals don't generally start at the first (highest in altitude) minor frame and the fact that some channels are getting optically thick as the scan goes down to the troposphere).

  - LR 'P' (pass) or 'F' (fail) field, indicating whether or not the Limb Radiance test passed or failed. This is based on the total number of 'bad' limb radiances, compared to the value of LIMB_RAD_GOOD (see Data Dictionary).

  - CL 'P' or 'F' test for climatology check. This is based on value FLAG_CLI for the main profile retrieved by band N (T for B1, ClO for B2 - & B3 -, O3_205 for B4, H2O for B5, and O3_183 for B6). See Data Dictionary for details on this crude check on climatology versus retrieved profiles (below the stratopause Negative values

are flagged as part of another test (see ES NG field below).

- CHISQ SP — This field gives the number of 'spikes' encountered during the retrieval process, based on the value of FLAG_CHISQ_SPIKE_NUM (see Data Dictionary for details). This test is based on the values of measured and a priori radiances, compared to a multiple of the estimated error sources, and is performed for each update (once per channel) during the sequential estimation. See Data Dictionary for a more detailed description of FLAG_CHISQ_SPIKE flag.

- CHISQ T — 'P' or 'F' test, based on the result of the chi squared test for band N, from all radiances used during the major frame, and for the retrieved profiles at end of major frame. See Data Dictionary for more details on BAND_INFO_MMAF.CHISQ, to be compared with CHISQ_LIMIT values, as a test of 'goodness of fit'.

- ES AP — 'P' or 'F' test based on value of FLAG_AP for main profile retrieved by band N. This test checks for consistency between the a priori estimate and the retrieval during the sequential estimation -compared to a multiple of the a priori error-, and fails if there was an inconsistency at any time during the major frame.

- ES NG — 'P' or 'F' test based on check for negative (unphysical) profile values below the stratopause. Note however, that negative values can be expected under poor signal-to-noise conditions (and loose a priori constraints), but that enough data averaging should produce physical (positive) results.

25.2.2 LEVEL 2 LOG FILE - DATA - WARNINGS

There are four types of warning messages that can occur during the processing. Each warning message succeeds the line corresponding to the MMAF during which warning situation occurred. These messages are self explanatory:

- A priori tangent pressure calculation did not converge.
- NMC data not available until further notice.
- NMC available again.
- FB switched; old band-bank i-I;j-J;k-K;l-L;m-M;n-N;
  new i-K;j-J;k-0;l-L;m-M;n-N

(where small letters denote band numbers and capitals bank numbers).

25.3 LEVEL 2 LOG FILE - SUMMARY

This page contains summary diagnostics for the day's run. It is largely based on information for each major frame, as discussed above, and should therefore be self-explanatory, once the rest of the Log File is understood. For a definition of quality values (1 through 4), see Data Dictionary definition of BAND_INFO_MMAF.QUALITY.

In case of a fatal error, the last message in the log file describes the cause of the abnormal program termination.

26.0 LEVEL 3APT PARAMETER FILE

MLS_RETRIV outputs a Level 3AT parameter file with a record for each major frame. This file contains non profile data that are desired at Level 3AT (other types of Level 3AT data files contain only profile data).

The file follows the Level 3A File Format from Appendix E of the "UCSS PROGRAMMER'S GUIDE TO PRODUCTION SOFTWARE SUPPORT SERVICES". They are created using OPENL3A and WRITEL3A UCSS routines.

The parameters included in this file are:

COLUMN_O3	R*4
COLUMN_O3_SDEV	R*4
COLUMN_O3_183	R*4
COLUMN_O3_183_SDEV	R*4
COLUMN_O3_205	R*4
COLUMN_O3_205_SDEV	R*4
PREF	R*4
QUALITY_CLO	R*4
QUALITY_H2O	R*4

QUALITY_O3	R*4
QUALITY_O3_183	R*4
QUALITY_O3_205	R*4
QUALITY_TEMP	R*4
TNGT_GEOD_ALT_REFR_MAX	R*4
TNGT_GEOD_ALT_REFR_MIN	R*4
ZREF_GEOPOT	R*4
ZREF_GEOM	R*4
MANEUVER_STAT	I*4
MMAFNO	I*4
REF_SOLAR_ILLUM	I*4
FLAG_ASCEND	L*1
SCAN_CHANGE	L*1
MMAF_STAT	C*1
PAD	C*1

27.0 LEVEL 3APL PARAMETER FILE

MLS_RETRIV outputs a Level 3AL parameter file with a record for each major frame in which a Level 3 latitude grid crossing occurred. This file contains the same data as that in the Level 3APT Parameter File.

28.0 LEVEL 3AT FILE

MLS_RETRIV creates a L3AT file for each retrieved specie. The data set is a subset of the combined Level 2 retrievals. The files follow the Level 3A File Format from Appendix E of the "UCSS PROGRAMMER'S GUIDE TO PRODUCTION SOFTWARE SUPPORT SERVICES". They are created using OPENL3A and WRITEL3A UCSS routines.

29.0 LEVEL 3AL FILE

The Level 3AL files are identical from the point of view of format to the Level 3AT ones, except for the fact that the retrieved quantities correspond to a different time than for Level 3AT here, the retrievals are given in terms of a regularly spaced latitude grid rather than a regularly spaced time one.

Appendix A. DATA DICTIONARY

This appendix is the alphabetized data dictionary for the MLS Production Software. The data type is given in the file definition section where the quantity is used. See appendix B for a cross reference showing all files that a quantity appears in. Note, data types are not necessarily the same in all files, see File Format for data types. Also note that not all quantities defined here are used in files.

QUANTITY	DEFINITION
ANT_OHMIC_RAD	The radiance from the antenna system due to ohmic losses. Part of data structure RAD_PARAMS_REC.
ANT_OHMIC_REF	The transmission coefficient of the antenna system due to ohmic losses. Part of data structure RAD_PARAMS_REC.
ANT_POS(2,32)	Commanded antenna position from words 130, 131 of Level 0 data frame. Physical and logical motor steps from home for each MMIF.
ANT_RAD_OFFSET(3)	A user input to the Level 1 program, however, it is no longer used by the program as it has been replaced by quantities in the structure RAD_PARAMS_REC. Antenna radiance offset for the three MLS radiometers. In Kelvins. These factors account for antenna radiation offsets when the antenna is viewing 'space'. Part of this offset is due to the combined effects of ohmic loss, diffraction and scattering. See section 3.3 of reference 1.
ANT_SCAT_EFF	The transmission coefficient of the antenna system due of scattering losses. Part of data structure RAD_PARAMS_REC.
ANT_SCAT_RAD	The radiance from the antenna system due to scattered radiation. Part of data structure RAD_PARAMS_REC.
ANT_XMISSION(3)	A user input to the Level 1 program, however, it is no longer used by the program as it has been replaced by quantities in the structure RAD_PARAMS_REC. Antenna transmission factor for each of the three MLS radiometers. These factors account for the net effect of antenna transmission losses due to ohmic loss, diffraction, scattering and others. See section 3.3 of reference 1. Valid values are between 0.94 and 1.00.

ATT_TYP_VER Type or specific version of attitude data to be used. If blank, the best currently available data is obtained from the attitude read routines. Other values can yield test simulation data or quick look data. See reference 2. This quantity is a user input to Level 1 through both the Program Parameters and the Level 1 User Input File. The value in the Users Input File is overwritten by the value obtained from the Program Parameters.

AUX_DIR Name of variable holding AUX_DIRECTORY.

AUX_DIRECTORY Logical pointer to disk and directory on the CDHF where production log files are written. MLS controls this space and room for these files is the responsibility of MLS.

???AVAIL_KEYS(48) Set of keys used as indices in the L2PC file. What binning or attributes do the keys select?

AVE_X Average value of independent variable used in Level 1 quadratic fit of radiance data. In units of MMIF's from start of minor frame number QUAD_FIT.QUAD_MMIF of major frame number QUAD_FIT.QUAD_MMAF. Part of structure QUAD_FIT.

AVE_X2 Average value of square of independent variable used in Level 1 quadratic fit of radiance data. Part of structure QUAD_FIT.

AVE_Y Average value of dependent variable used in Level 1 quadratic fit of radiance data. Part of structure QUAD_FIT.

AVG_PROBLTY Average probability (for the daily data set) of exceeding the MMAF reduced Chi-square values for a random Gaussian distribution. Specifically, the average of BAND_INF_MMAF.PROBLTY over all 'good' MMAF's in the data set. Part of structure BAND_INFO_DAY.

AZIM A user input to the Level 1 program. Azimuth offset in degrees of 63 GHz radiometer FOV with respect to PTG_FOV_AZIM_REF(1) corresponding to encoder count in ENCR. Used to interpolate encoder counts to degrees. Part of structure PTG_FOV_TABLE.

A_PRIORI_TYPE A user input to the RETRIV program. The data type is Character*18 in the Level 2 User Input file and I*4 elsewhere. Type of a priori estimate used in Level 2 processing as specified by:

STANDARD A PRIORI = 1 : A priori estimate is calculated using auxiliary data and the previous estimate weighted by KMR
COMBINED A PRIORI = 2 : A priori estimate is calculated by combining correlative data (if it exists) with the standard a priori estimate
REAL TIME A PRIORI = 3 : A priori estimate is calculated from correlative data alone (if correlative data does not exist in this case, the standard a priori is used).

Otherwise = not allowed, error.

B-B-B-B-B-B-B-B-B-B-B-B-B-B-B-B-B-B-B-B-B-B-B-B-B-B-B-B-B-B-B

BAD_CHANNEL_L1(90,2) A user input to the Level 1 program. A logical array which specifies whether data from a channel is to be used or not. A value of TRUE means the channel is 'bad' and is to be ignored. Second index is for nominal and non-nominal filter-bank switches.

BAD_CHANNEL_L2(90,2) A user input to the Level 2 retrieval program. A logical array which specifies whether data from a channel is to be used or not. A value of TRUE means the channel is 'bad' and is to be ignored. First index is channel, second index is for nominal and non-nominal filter-bank switches (in that order). It is used to mark as 'bad' those channels that may for some reason yield poor retrievals but yet are not considered 'bad' by Level 1. Channels may be marked as 'bad' during reprocessing without the need to run the Level 1 program.

BAD_FRACTION Daily fraction of 'good MMAF's' as specified by MMAF_STAT, whose BAND_INFO_MMAF.CHISQ is greater than the Level 2 user input CHISQ_LIMIT. That is, the fraction of major frames (with good data) for which the Level 2 processing produced poor fits to the data as measured by a reduced Chi-squared criterion. Part of structure BAND_INFO_DAY.

BAFFLE_RAD_LIM The radiance contributions for those portions of the beams which intercept the Limb port. Part of data structure RAD_PARAMS_REC.

BAFFLE_RAD_SPV The radiance contributions for those portions of the beams which intercept the Space port. Part of data structure RAD_PARAMS_REC.

BAFFLE_RAD_TAR The radiance contributions for those portions of the beams which intercept the Target port. Part of data structure RAD_PARAMS_REC.

BAFFLE_XMIT_LIM The fractional transmissions of the radiometer beams through the ports in the radiometer chassis to the internal Limb (antenna) views. Part of data structure RAD_PARAMS_REC.

BAFFLE_XMIT_SPV The fractional transmissions of the radiometer beams through the ports in the radiometer chassis to the internal Space (antenna) views. Part of data structure RAD_PARAMS_REC.

BAFFLE_XMIT_TAR The fractional transmissions of the radiometer beams through the ports in the radiometer chassis to the internal Target (antenna) views. Part of data structure RAD_PARAMS_REC.

BAND_AVG_CHI_SQ(6) Band-averaged Chi-square over all channels within each band for reference views within a MMAF. The Chi-square values are calculated from the sum of the squares of the differences between reference counts and interpolated reference counts all divided by a noise term that depends on the calibration type used.

BAND_AVG_GAIN(6) Band-averaged gain for each of the six bands over all 'good' channels within the band and for all MMIFs within a MMAF. In units of counts/mK.

BAND_AVG_REC_NOISE(6) Bandwidth weighted average receiver noise temperature over all 'good' channels within the band, and for all MMIFs within a MMAF, for each of the six bands.

BAND_BANK A single byte which indicates the state of the MLS Filter Bank Switch Network at the end of a MMAF (if the Filter Bank Switch changed during a MMAF, that MMAF is marked as bad.) Bits 0 to 2 of this byte form a 3 bit integer which indicates the Band to which Filter Bank 3 is connected. Bit 3 is set to a '0' if Band 6 is connected to Filter Bank 6, and a '1' if Band 3 is connected to Filter Bank 6. Thus, a value of 3 indicates the 'nominal' state in which each Filter Bank is connected to the corresponding Band number.

BAND_INFO_DAY(6) Structure containing AVG_PROBLTY, BAD_FRACTION, QUALITY1, QUALITY2, QUALITY3, QUALITY4, and NUM_BAD_MMAF values for each band.

BAND_INFO_MMAF(6) Structure containing BANK, CHISQ, CHISQ_APR_BRD, CHISQ_APR_FRD, LIMB_RAD_GOOD, NDATA, NUM_ELE, PROBLTY, and QUALITY values for each band.

BAND_INFO_MMIF(6) Structure containing CHISQ_MMIF, and NUM_CHAN values, for each band.

BAND_WING_CHAN(6,2) A user input to the Level 2 retrieval program. Array containing pairs of wing channel numbers for each array. Used for Baseline removal.

BANK Bank number connected to each band. Part of structure BAND_INFO_MMAF which is an array containing information for each band.

BANK3_NUM_SWITCH Number of switches made in Filter band 3 during the day.

BANK3_SWITCH_TIMES(2,6) Values of REF_TIME at which Filter bank 3 was switched (for up to six switches). In UDTF format.

BANK6_NUM_SWITCH Number of switches made in Filter bank 6 during the day.

BANK6_SWITCH_TIMES(2,2) Values of REF_TIME at which filter bank 6 was switched (for up to six switches per day). In UDTF format.

BANK_SWITCH_NOMINAL A user input to the RETRIV program. A logical flag specifying which filter bank to use when two filter banks are connected to the same band. True means use only the nominal filter band (i.e. number of filter bank and number of band are the same). False means use only the non-nominal filter bank.

BSL_APR_METHOD A user input to the Level 2 retrieval program. Method used to obtained the a priori values for baseline vector components.

1 = Baseline is zero.
2 = Use Baseline from previous MMIF, zero for the first MMIF.
3 = Use using channels to calculate offset and linear terms and set quadratic terms to zero.

BSL_LNT#(32) Baseline linear term for band # for each MMIF, for # between 1 and 6 inclusive.

BSL_LNT#_SDEV(32) Baseline linear term standard deviation for band # for each MMIF, for # between 1 and 6 inclusive.

BSL_LNT_VAR A priori Baseline linear term variance for BSL_APR_METHODs 1 and 2.

BSL_LNT_VAR_M3 A priori Baseline linear term variance muliplicative factor applied to a priori BSL)LNT# for BSL_APR_METHOD 3.

BSL_OFF#(32) Baseline offset for band # for each MMIF, for # between 1 and 6 inclusive.

BSL_OFF#_SDEV(32) Baseline offset standard deviation for band # for each MMIF, for # between 1 and 6 inclusive.

BSL_OFF_VAR A priori Baseline offset variance, for BSL_APR_METHODs 1 and 2.

BSL_OFF_VAR_M3 A priori Baseline offset variance, for BSL_APR_METHOD 3. See BSL_LNT#_VAR_M3.

BSL_QDT#(32) Baseline quadratic term for band # for each MMIF, for # between 1 and 6 inclusive.

BSL_QDT#_SDEV(32) Baseline quadratic term standard deviation for band # for each MMIF, for # between 1 and 6 inclusive.

BSL_QDT_VAR Baseline quadratic term variance.

???B_FIELDS(4) Array of magnetic field linearization values in Gauss. Why four components? Units??

C-C-C-C-C-C-C-C-C-C-C-C-C-C-C-C-C-C-C-C-C-C-C-C-C-C-C-C-C-C-C-C-C-C-C-C-C

CAL_RADIANCE_RNG(2) A user input to the Level 1 program. Lower and upper limits on the allowed range of the calibrated radiance in Kelvin. If calibrated radiance lies outside this range, the error term of the calibrated radiance [RAD_L1(I,2,J)] is set to -1000. Allowed values can cover the range -10.0 to 327.67. The upper limit is due to use of I*2 integer numbers.

CAL_REF A user input to the Level 1 program. Calibration reference. Valid values are:

"TAR"=target
"SPV"=space (Nominal value).

CAL_TYPE A user input to the Level 1 program. Desired calibration type; Valid values are:
"OPT" = optimal filter,
"POL" = quadratic polynomial filter.
"ONE" = one pass, i.e. optimal filter coefficients are calculated once for a particular pattern of view-types, if pattern changes then the quadratic filter is used.
"ALL" = optimal filter coefficients are calculated every MMAF. To be used for testing only.

CHAN_STAT(90) Array of bit flags set (1) if the radiance from a channel has been used for retrievals for every MMIF, unset (0) otherwise. First 32 bits correspond to the first channel, next 32 bits correspond to the second, and so on.

CHISQ Value from the reduced Chi-square test (fitting linearized model radiances to observed radiances) for one band over the MMAF. Model radiances are calculated for the retrieved state vector components. Part of structure BAND_INFO_MMAF which is an array containing data for each band.

CHISQ_APR_BRD Backward retrieval reduced Chi-squared value (fitting a priori radiances to observed radiances) over the MMAF. Part of structure BAND_INFO_MMAF.

CHISQ_APR_FRD Forward retrieval reduced Chi-squared value (fitting a priori radiances to observed radiances) over the MMAF. Part of structure BAND_INFO_MMAF.

CHISQ_LIMIT(6) A user input to the RETRIV program. Limiting value, for each band, of CHISQ above which QUALITY is set to false to show a poor fit to the data.

CHISQ_MMIF(32) Value from the reduced Chi-square test (fitting linearized model radiances to observed radiances) for one band over each MMIF. Model radiances are calculated for the retrieved state vector components. Part of structure BAND_INFO_MMIF which is an array containing data for each band.

CHI_SQUARE_REF(90) The Chi_squared statistic for the radiometer reference views - i.e. the ratio of measured variance in the reference views to the expected value. A negative value (-1.0) is used for a bad MMAF, i.e. when a value cannot be calculated.

CLI_FACTOR Factor used to determine if the differences between mixing ratio estimates and climatology exceed the threshold (CLI_PRESS_THRESHOLD). A flag (FLAG_CLI) is set when estimate minus climatology is outside the range defined by this factor times climatology, and climatology divided by this factor.

CLI_OFFSET_TEMP Temperature offset which when exceed by the difference between estimated temperature and climatology sets the flag FLAG_CLI.

CLI_PRESS_THRESHOLD Threshold above which the climatology criterion is not checked. See CLI_FACTOR.

CLI_PROF_CALID Calibration ID for the Default Climatological Atmosphere Profile file.

CLOUT(203) Auxiliary state vector coefficient values. Climatological atmospheric profiles interpolated to the state vector coefficient pressure grid, indexed according to the state vector addressing system (see SV_INFO).

CLOUT_VAR(203) Main diagonal of variance of CLOUT.

CNSTRN The logical OR of all STATE_CHAN_CNSTRN values. When TRUE, this flag indicates that a particular state vector component is being constrained for at least one channel model radiance calculation. Part of structure SV_INFO which contains information on each state vector component.

COEFF_A Interpolation quadratic coefficient, constant term. Part of structure QUAD_FIT.

COEFF_B Interpolation quadratic coefficient, linear term. Part of structure QUAD_FIT.

COEFF_C Interpolation quadratic coefficient, second order term. Part of structure QUAD_FIT.

COLUMN_O3 If COMB_O3 is true, the integrated ozone (combined 183 and 205) abundance over height (pressure) in Dobson units. Otherwise set to the 'flag' value of -99.99.

COLUMN_O3_SDEV Standard deviation of COLUMN_O3.

COLUMN_O3_183 Integrated ozone abundance, as measured by the 183 GHz radiometer, over height (pressure) in Dobson units. If not retrieved, set to flag' value of -99.99.

COLUMN_O3__183SDEV Standard deviation of COLUMN_O3_183.

COLUMN_O3_205 Integrated ozone abundance, as measured by the 205 GHz radiometer, over height (pressure) in Dobson units. If not retrieved, set to flag' value of -99.99.

COLUMN_O3__205SDEV Standard deviation of COLUMN_O3_205.

COMB_COV(203,203) Covariance of COMB_EST.1

COMB_EST(203) The combined froward and forward/backward state vectors.

COMB_O3 A user input to the RETRIV program. If TRUE, ozone abundances retrieved from both radiometers are to be combined for output to Level 3A. Otherwise, Output two Level 3A files. Note, this parameter is meaningful only if Ozone is being retrieved from both the 183 and 205 GHz radiometers (this can be determined from SV_INFO).

CONSTRAINT_ORDER A user input to the Level 1 program. Degree of interpolation polynomial for the optimal calibration method. Valid value is restricted to 2 for this version.

CONTROL_AUTH A user input to the RETRIV program via PARAM_TABLE_RETRIV. Responsible authority for SFDU configuration control. This quantity is currently specified by, and controlled by, the UARS project. Later control will pass to a documentation and control center charged with archiving UARS data.

CORR_CALID Calibration ID for the NMC data richness file. Optional if NUM_CORR_PARAMS is zero.

CORR_ERROR_FACTOR Factor by which the standard deviation associated with profiles obtained from the NMC data are multiplied to account for error propagation.

CORR_GRID Maximum number of grid points in the (NMC) correlative atmospheric profiles.

CORR_SUBTYPE1 Subtype of first correlative data file. Optional if NUM_CORR_PARAMS is zero and will be used if is greater than zero. Allowed subtypes are:

TEMP
HEIGHT
MOISTURE

CORR_SUBTYPE2 Subtype of second correlative data file. Required only if NUM_CORR_PARAMS equals two or three.

CORR_SUBTYPE3 Subtype of third correlative data file. Required only if NUM_CORR_PARAMS equals three.

CSFDU1 First length field of Level 2 product Standard Formatted Data Unit header; an eight character sting containing the Level 2 Output File size in bytes minus 20, zero filled from the left to make eight characters.

CSFDU2 Second length field of Level 2 product Standard Formatted Data Unit header; an eight character string containing the Level 2 Output File size in bytes minus 40, zero filled from the left to make eight characters.

CURR_PREV Flag in the Level 1 log set to 'PREVIOUS' or 'CURRENT' indicating whether record 2 data was from previous or current MMIF.

C_ORDER(90,2) A user input to the RETRIV program. Array specifying the order that the channels are to be processed in the Level 2 RETRIV program for the forward and backward directions. For example, if C_ORDER(5,1) = 10, then during the forward pass the fifth channel processed is channel 10.

D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D-D

DATA_GAP_TIMES(2,2,16) Reference start and end times for up to sixteen periods of 'bad' data of one MMAF or more. In this case, bad data includes data gaps, MMAFs during which a filter bank switch occurred, periods where Level 0 data quality flags indicate bad data, and major frames that have less than MMIF_BAD_MAX good minor frames. First index selects time part (day and ms of day, second index selects start, end of gap, and third index selects data gap number. Array is initialized so that the start times are all set to the start of the day, and the end times set to the start of the next day. If this array is unchanged from its initialized values, then either no gaps occurred or there was a gap for the entire day. To determine which, look at NUM_GOOD_MMAF. If it is greater then zero, then there were no data gaps. Otherwise, the number of data gaps will be one less than the index of the first regressive start time.

DATA_PRESENT Flag specifying whether Level 0 data was obtained. True means yes.

DEFAULTS_BUFF Defaults buffer record structure which is written to Level 1 Defaults file. These data are use in the transition from one day to the next. Contains:

MLS_STATUS	OLD_RECEIVER_GAIN
MMAFNO	QUAD_FIT_TYPES
MMAFNO_TIME	RAD_PARAMS_REC
MOST_RECENT_Z	REC_NOISE_TEMP
OLD_FILT_BANK_SWTCH	TAU
OLD_MIX_BIAS	TRANS_INST2ECI.
OLD_MULT_BIAS	

DEFLT_CALID Calibration ID for the Defaults File.

DELTA_W A user input to the RETRIV program. Accuracy criterion, in km, for a priori tangent pressure determination. Note, convergence is generally achieved to a much better accuracy than this value with only a small number of iterations.

DERIVATIVES(43,15) Part of the K_STAR record in the L2PC file containing derivatives of the radiances. Partial derivative of the radiance with respect to the variable whose name is given by DI_DSV_COMPONENT. The '15' refers to a set of channels within a band. The '43' refers to each element within the state vector component.

DETAIL_OUTPUT A user input to the MLS_RETRIV program that is used to specify if the detailed output file should be generated. Set to 'DETAIL OUTPUT' if detailed output is desired. Must also set TEST_FLAG to 'Y' for detailed output.

DGAP_MMAF Number of minor frames within a MMAF that are missing due to a data gap.

DI_DSV_COMPONENT Part of the K_STAR record in the L2PC file; key name of component whose derivative is in the file; a character-string.

DTL_FILE_LID Name of file for detailed diagnostic output. This must be the file name only, the disk and directory are given by the logical AUX_DIRECTORY. An input to MLS_RETRIV via the program params (i.e. PGINIT).

E-E-E-E-E-E-E-E-E-E-E-E-E-E-E-E-E-E-E-E-E-E-E-E-E-E-E-E-E-E-E-E-E-E-E-E-E-E-E-E-E

EARTH_GEOD_RAD(32) The geodetic Earth's radius in km at the sub-tangent point location at start of each MMIF.

EARTH_RAD_SDEV Standard deviation of the Earth's ellipsoidal radius in km. A Level 2 constant parameter.

EARTH_VEL_Z Earth velocity along the line of sight (63 GHz radiometer boresight) at REF_TIME. Positive velocities are away from MLS.

ELEV Elevation offset of 63 GHz radiometer FOV with respect to PTG_FOV_ELEV_REF(1) corresponding to encoder count in ENCR. Used to interpolate encoder counts to degrees. Part of structure PTG_FOV_TABLE. A user input to the Level 1 program.

ENCODER_AT_HOME Nominal value of ENCODER_STEP when ACTUATOR_POS equals zero.

ENCODER_COUNTS Encoder counts obtained from MLS engineering data words 107 and 108.

ENCODER_STEP Scale factor between encoder counts and actuator position; one encoder count equals ENCODER_STEP actuator steps!

ENCR A user input to the Level 1 program. Encoder counts corresponding to tabulated azimuth and elevation angles in AZIM and ELEV. Used to interpolate encoder counts to degrees. Part of structure PTG_FOV_TABLE

END_TIME For this version, equal to UTIME2. Should be the MMAF_TIME corresponding to UTIME2. The UDTF time at the start of the last MMAF.

EQUATOR_CROSS_FLAG A character flag in the Level 1 Log file set to:

E	equator crossed South to North
e	equator crossed North to South
blank	equator not crossed during MMAF. Internal to Level 1 this flag is called EQUATOR.

ERRORS A 16 bit word in which each bit represents an error flag.

- Bit 0 MLS and UARS out of synch. at EMAF synch. pulse time, or at expected EMAF time.
- Bit 1 The end-of-integration interrupt handler failed to re-initialize the filter banks before the start of an integration.
- Bit 2 Attempted overflow of instrument serial command receiver buffer.
- Bit 3 Parity error in direct command opcode.
- Bit 4 Non-recognizable direct command opcode.
- Bit 5 Parity error in scan program primary copy.
- Bit 6 Parity error in scan program backup copy.
- Bit 7 Illegal scan program opcode.
- Bit 8 Attempted scan program stack underflow.
- Bit 9 Attempted scan program stack overflow.
- Bit A Command handler for unused command with index=8 activated.
- Bit B Command handler for unused command with index=9 activated.
- Bit C Command handler for unused command with index=10 activated.
- Bit D Unused error flag.
- Bit E Illegal command opcode detected.
- Bit F Unused error flag.

F-F-F-F-F-F-F-F-F-F-F-F-F-F-F-F-F-F-F-F-F-F-F-F-F-F-F-F-F-F

FBSW A four digit Hex number indicating the Filter Bank Switch command and position readback.

FBSW_CRPT A logical flag specifying whether the Filter Bank Switch has been corrupted. Set to true if engineering word 102 contains fill data or has been marked at Level 0 as having bad quality. It is also set to true if more than one bit has been set for filter bank 3.

FC(90,2) A user input to the Level 1 program. Breakpoint frequency in Hz for '1/f' noise spectrum for each channel and Filter Bank Switch setting. For the second index, the first column is used for a nominal Filter Bank Switch setting, the second column is used for cases when filter bank 3 is connected to each of the other bands and bank 6 is connected to band 3. For example FC(1,2) is used for the first channel of bank 3 when bank 3 is connected to band 1.

FILE_COMMENT A user input to the Level 1 program. This comment becomes a data base attribute of Level 1 output files when they are cataloged. It is meant to describe the purpose of special processing runs.

FILE_COMMENT_L2 A user input to the RETRIV program. This comment becomes a data base attribute of Level 2 output files when they are cataloged. It is meant to describe the purpose of special processing runs.

FIRST_CHANNEL_INDEX In the K_STAR record of the L2PC file, this quantity is equal to 15*(BAND-1).

FLAG_AP(45,2) Set to TRUE if the difference between the estimate and the a priori exceeds SIGMA_CRITERION times the standard deviation of the estimate, for at least one pressure level. Order of state vector component is given by SV_INFO, order of processing direction is forward, backward.

FLAG_AP_FST_CHAN(45,2) First channel for which the difference between the estimate and the a priori exceeds SIGMA_CRITERION times the standard deviation, for each state vector component and processing direction.

FLAG_AP_FST_ELMNT(45,2) First state vector element for which the difference between the estimate and the a priori exceeds SIGMA_CRITERION times the standard deviation, for each state vector component and processing direction.

FLAG_AP_FST_MMIF(45,2) First MMIF for which the difference between the estimate and the a priori exceeds SIGMA_CRITERION times the standard deviation, for each state vector component and processing direction.

FLAG_AP_FST_REF_TIME(45,2) Reference time in UDTF format of the first MMAF for which FLAG_AP was set for each state vector component and each direction.

FLAG_AP_NUMMMIF(45,2) Number of MMIF's for which FLAG_AP was set.

FLAG_ASCEND Flag set to TRUE if SAT_VEL(3) is positive for the MMAF mid-point. Physically, this means that the MMAF occurs on the ascending part of the orbit.

FLAG_CHISQ_SPIKE(32,2) Set to TRUE if Chi-square test for at least one channel within a MMIF fails (the chi-square test value is greater than SIGMA_CRITERION squared. The Chi-square test is the radiance residual squared divided by the projected state vector covariance to radiance space, evaluated prior to each update.

FLAG_CHISQ_SPIKE_NUM(32,2) Number of channels for which the Chi-square test failed for each MMIF and processing direction. See FLAG_AP and FLAG_CHISQ_SPIKE

FLAG_CHISQ_SPIKE_NUM_FST_CHAN(32,2) First channel for which the Chi-square test failed for each MMIF and processing direction. See FLAG_AP and FLAG_CHISQ_SPIKE

FLAG_CLI(45,2) Set to TRUE if the difference between the estimate and the climatology exceeds a criterion as defined below. For each state vector component and processing direction.
for temperature: criterion limit is CLI_OFFSET_TEMP
for mixing ratios: criterion limit is CLI_FACTOR.

FLAG_FIRST_DAY A flag set to 'T' if processing is to start 'fresh' without knowledge from the previous day, or if there is not a PMFQ file for input. Otherwise, set to 'F' which will cause the Last Major Frame Quantities File from the previous day to be read. An input to MLS_RETRIV via the program params (i.e. PGINIT).

FLAG_NEG(45,2) Flag indicating whether or not a negative mixing ratio or temperature estimate occurred for each state vector component and processing direction, as follows:

0 = no negative estimates during whole MMAF

1 = at least one element of the state vector had a negative value at some time during MMAF, but all elements are positive at the end of MMAF.

2 = at least one element of the state vector was negative at some time during MMAF, and not all elements are positive at the end of MMAF.

FLAG_NEG_FST_CHAN(45,2) First channel where a negative estimate appeared, for each state vector component and processing direction. Order of state vector component is given by SV_INFO, order of processing direction is forward, backward.

FLAG_NEG_FST_ELMNT(45,2) Element number where a negative estimate first appeared, for each state vector component and processing direction. Order of state vector component is given by SV_INFO, order of processing direction is forward, backward.

FLAG_NEG_FST_MMIF(45,2) First MMIF where a negative estimate appeared, for each state vector component and processing direction. Order of state vector component is given by SV_INFO, order of processing direction is forward, backward.

FLAG_NEG_FST_REF_TIME(45,2) The reference time for the MMAF where a negative value first appeared. For each state vector component and processing direction. Order of state vector component is given by SV_INFO, order of processing direction is forward, backward.

FLAG_NEG_NUMMMAF(45,2) Number of MMAFs in day where a negative estimate appeared, for each state vector component and processing direction. Order of state vector component is given by SV_INFO, order of processing direction is forward, backward.

FLAG_NEG_NUMMMIF(45,2) Number of MMIFs in MMAF where a negative estimate appeared, for each state vector component and processing direction. Order of state vector component is given by SV_INFO, order of processing direction is forward, backward.

FLAG_PTAN(32,2) Number of times tangent pressure was not within bounds for any channel (plus 100 if the a priori for the MMIF was also out of bounds), for every MMIF and processing direction. Bounds are PTAN_LOWER_LIMIT and PTAN_UPPER_LIMIT (Parameters in the Level 2 Constants include file).

FST_ELE_INDX Pointer to first element in the Level 2 state vector of the state vector component identified by the corresponding IDSV field of SV_INFO. Part of structure SV_INFO which is an array containing information for each state vector component.

G-G-G-G-G-G-G-G-G-G-G-G-G-G-G-G-G-G-G-G-G-G-G-G-G-G-G-G-G-G-G

GAIN_BAD_FLAG(90) Warning flags set to TRUE when the calculated gain is outside limits specified by GAIN_RNG.

GAIN_COEFF_A(90) Same as QUAD_FIT_TYPES.GAIN(90).COEFF_A.

GAIN_COEFF_B(90) Same as QUAD_FIT_TYPES.GAIN(90).COEFF_B.

GAIN_COEFF_C(90) Same as QUAD_FIT_TYPES.GAIN(90).COEFF_C.

GAIN_DELTA(4,90) Difference between measured gain and interpolated gain (measured minus interpolated) for each channel and each (up to 4) Target view. Units on gain are counts per Kelvin. Set to -9999 when gain is not calculated, i.e. when less than four target views in a MMAF.

GAIN_RNG(2) A user input to the Level 1 program. Lower(1) and upper(2) limits on acceptable values for instrument gain. Used to set GAIN_BAD_FLAG. Units on gain are counts per Kelvin.

GAIN_SIGMA Estimated standard deviation of interpolated gain at center of MMAF. Units of gain are counts per Kelvin. Set to -1.0 when gain is not calculated.

GRNW_SID_TIME Greenwich apparent Sidereal Time in degrees.

H-H-H-H-H-H-H-H-H-H-H-H-H-H-H-H-H-H-H-H-H-H-H-H-H-H-H-H-H-H-H-H-H-H

HGA_INTERFER A logical flag set to TRUE when HGA interference occurs during a MMAF. HGA interference is defined to occur whenever the HGA gimbal angles lie within a polygon described by HGA_INTERFER_RNG.

HGA_INTERFER_RNG(2,40) A user input to the Level 1 program. Coordinates of vertices (in HGA gimbal angle space) of the HGA interference polygon. When the HGA gimbal angle is inside this polygon, HGA interference occurs. Units are degrees.

HGA_INTERFER_RNG_NUM A user input to the Level 1 program. Number of vertices in the HGA interference polygon. HGA interference will be checked if this value is three or greater.

HT_CORR(CORR_GRID) Geopotential height in km from (NMC) correlative data.

I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I-I

IDSV A user input to the TANTRAK and RETRIV programs. 8-character string identifier of state vector component. Part of structure SV_INFO which is an array containing information for each state vector component.

Parameter	IDSV
Clorine Monoxide	CLO
Elevation offset of 183 GHz radiometer	ELEV_183
Elevation offset of 205 GHz radiometer	ELEV_205
Geocentric orbital radius	GEOCSRAD
Geodetic Earth radius at tangent point	GEOCERAD
Line of sight velocity	VEL_Z
Ozone from 183 GHz radiometer	O3_I83
Ozone from 205 GHz radiometer	O3_205
Tangent Pressure	PTAN63
Temperature	TEMP
Water Vapor	H2O

INST_ON Instrument on flag, True means its on. Determined from C&DH power code and Band 2 power code. Both must be on for the instrument to be considered on. Note, the instrument does not need to be fully on for this flag to be true since this flag only guarantees communication (data and commands) with the instrument. This definition is chosen since we may operate with some subsystems turned off, but we still wish the software to process the instrument data stream.

INST_SOLAR_AZIM Azimuth angle between Sun and 63 GHz radiometer boresight in degrees at start of MMAF.

INST_SOLAR_ELEV Elevation angle between Sun and 63 GHz radiometer boresight in degrees at start of MMAF.

J-J-J-J-J-J-J-J-J-J-J-J-J-J-J-J-J-J-J-J-J-J-J-J-J-J-J-J-J-J-J-J-J-J-J-J-J-J-J-J-J

K-K-K-K-K-K-K-K-K-K-K-K-K-K-K-K-K-K-K-K-K-K-K-K-K-K-K-K-K-K-K-K-K-K-K-K-K

KMR(43) Relaxation factor for the coefficients of each state vector component. In the general formulation of a priori estimates, the a priori is set to the current auxiliary value plus KMR times the difference between the previous retrieval and the previous auxiliary value. Part of structure SV_INFO which is an array containing information for each state vector component.

K_CUT_OFF A user input to the RETRIV program. Fractional value of the maximum weighting function (K_STAR_ALL values in RETRIV program) used to determine vertical range for profile retrievals at each pointing (and for each band) A given channel is considered sensitive to a given state vector element if the absolute value of K_STAR_ALL is greater than K_CUT_OFF * K_STAR_MAX.

K_STAR Data structure containing derivatives of radiances in SPECTRAL POWER data structure.

K_STAR_ALL(203,90,43) A matrix of partial derivatives for each state vector element obtained from DERIVATIVES in the L2PCQ file. Indices are state vector index, channel, pointing pressure.

K_STAR_MAX Absolute value of the maximum in K_STAR_ALL over all coefficients and channels (in each band).

L-L-L-L-L-L-L-L-L-L-L-L-L-L-L-L-L-L-L-L-L-L-L-L-L-L-L-L-L-L-L-L-L-L-L-L-L

L2PCQ_CALID User specified part of the Calibration ID for Level 2 Processing Coefficient file. The complete Calibration ID is formed by concatenation of 'L2PC' + L2PCQ_PNUM + L2PCQ_DIREC + band to bank indicator (N for nominal and A for alternate) + L2PCQ_CALID.

L2PCQ_DIRECT Part of the calibration identifier of the Level 2 Processing Coefficient (L2PCQ) File specifying whether the spacecraft is flying forward or backward ('F' for forward, 'B' for backward). Direction is important because the north-south global coverage is different and the L2PCQ file carries the minimum latitude bins for each case.

L2PCQ_HEADER1 The first record of the header record of the L2PC file. Contains:

AVAIL_KEYS	NO_POINTINGS
B_FIELDS	NO_SV_COMPONENTS
L2PCQ_LINE1	POINTINGS
L2PCQ_LINE2	SV_COMPONENTS
NO_AVAIL_KEYS	SV_RTRVL_BY_BAND
NO_MAG_FIELDS	

L2PCQ_HEADER2 The second record of the header record of the L2PC file. Contains:

L2PCQ_LINE3
NO_SV_COMPONENTS
NO_SV_ELMNTS
NO_ELMNTS_PER_SV_COMPONENT
SV_COMPONENT_FIRST_ELMNT_INDEX
TRI_BASIS_VERT_GRID

L2PCQ_LINEn,n=1,2,3 The three comment lines at the beginning of the L2PC file used to comment on or to describe the file. The first two lines appear in the first header record, the third in the second header record.

L2PCQ_PNUM Part of the calibration identifier of the Level 2 Processing Coefficient (L2PCQ) File specifying the yaw around period number. There are ten yaw around periods per year and a different L2PCQ file is use for each. The following table identifies the typical yaw around periods with a date. L2PCQ_PNUM increments at yaw arounds, it is not determined from the date except by user input to MLS_RETRIV via UARS_YAW_PERIOD when FLAG_FIRST_DAY is True.

L2PCQ_PNUM	Approx Yaw Around Period
1	13 Jan 92 - 16 Feb 92
2	16 Feb 92 - 25 Mar 92
3	25 Mar 92 - 3 May 92
4	3 May 92 - 3 Jun 92
5	3 Jun 92 - 15 Jul 92
6	15 Jul 92 - 16 Aug 92
7	21 Sep 91 - 26 Sep 91
8	26 Sep 91 - 4 Nov 91
9	4 Nov 91 - 5 Dec 91
10	5 Dec 91 - 13 Jan 92

L2PC_KEY Key to which set of coefficients are being referenced in the L2PC file.

LAT_DMAX A user input to the RETRIV program. Maximum latitude difference between REF_LAT and an element of GRID3_AL for a 'grid crossing' to occur. Normally, grid crossings occur when successive values of REF_LAT bracket an element of GRID3_AL. For these normal crossings, the Level 3AL retrievals are interpolated to the grid from the two retrievals. It sometime happens that a grid value is almost crossed but the tangent path turns before crossing the grid. If two successive values of REF_LAT are within LAT_MAX of an element of GRID3_AL, a grid crossing is defined to have occurred. In this case the average of the retrievals is used for LEVEL 3AL.

LIMB_RAD_GOOD Fraction of "good" and used radiances from the total number of radiances available. A Level 2 diagnostic.

LIMB_RAD_LIMIT Fraction of limb radiances used to calculate the quality_n fields in BAND_INFO_MMAF. Because some data is used to calibrate radiances and cannot be used for retrievals, the fraction of 'good' limb radiances is in the range of 0.78 to 0.81 at best.

LOG_BUFF The buffer containing the quantities to be written to the Level 1 LOG file.

LOG_FILE_LID Part of the file name of the Level 1 Log. The full file name will have _"UARS_DAY"' appended to the end. An input to MLS_RETRIV via the program params (i.e. PGINIT).

LVL1_DATA Structure of the Level 1 Radiance File Data record. See section 9.1.

LVL1_HDR Structure that contains all but the user input part of the standard Level 1 file header. See section 7.

LVL1_UIP Structure containing all the Level 1 User inputs. See section 7.

LVL1_VERSIONNO Version number of the Level 1 program. This 4-character string,for example, has the value 'V210' for Version 2.1.

LVL2_DATA Structure of the Level 2 Output Product File Data record. See section 24.3

LVL2_UIP Structure containing all the Level 1 User inputs. See section 24.1.

M-M-M-M-M-M-M-M-M-M-M-M-M-M-M-M-M-M-M-M-M-M-M-M-M-M-M-M-M-M-M-M-M-M-M-M-M

MAFA A user input to the Level 1 program. Number of MMAFs to process past the nominal processing stop time. This is the number of 'extra' MMAFs needed by Level 2 to perform the backward processing step. It has a nominal value of 10.

MAG_FIELD_NOM Strength of tangent point magnetic field in GAUSS given by the IGRF model at REF_MMIF.

MAG_UNIT_VEC(3) Unit vector along the direction of the tangent point magnetic field in Earth Centered Inertial (ECI) coordinates.

MANEUVER_NUM_ORB Number of MMAFs with an Orbit maneuver.

MANEUVER_NUM_ROLL Number of MMAFs with a Roll maneuver.

MANEUVER_NUM_UNDEF Number of MMAFs with an undefined maneuver.

MANEUVER_NUM_YAW Number of MMAFs with a Yaw maneuver.

MANEUVER_NUM_ZERO Number of MMAFs with no maneuver.

MANEUVER_STAT Maneuver status number indicating whether or not a UARS maneuver is in progress as follows:

0 = no maneuver in progress
1 = orbit adjust in progress
2 = yaw maneuver in progress
3 = roll maneuver in progress
4 = other maneuver type in progress
5 = maneuver status is unknown

MIN_FIT_SIGMA A user input to the Level 1 program. The minimum standard deviation allowed for the quadratic fit for the purpose of data rejection. Counts for target and space views are rejected as bad data (unless a 'wall' condition exist) if they differ from their expected value by more than five sigma. The expected values and their uncertainties are determined from a quadratic fit. If the standard deviation of the fit is less than MIN_FIT_SIGMA, it is reset to that value. A 'wall' condition exist when their is a step or jump to a new trend in space or target counts.

MIN_GAIN_PTS A user input to the Level 1 program. Minimum number of Target views used within a window necessary to make a new quadratic fit to GAIN. When this condition is not satisfied the last quadratic fit will be used to interpolate (extrapolate) new GAIN values.

MIXER_BIAS(2,32) Echo of Mixer bias commands for 183 and 205 GHz radiometers (in that order). This is obtained from Level 0 data every MMIF.

MLS_STATUS A status word whose bits give information on the state of the MLS instrument. Under normal conditions this is equal to 77003000 hex (1996537856 decimal). If Level 0 data that is use to determine MLS_STATUS is thought to be corrupted (parity errors of fill data), then the field of MLS_STATUS for the corrupted data is not changed from the previous value. For further discussion see Appendix C.

MLS_STATUS_DAY The value of MLS_STATUS at the end of the day's data set.

MLS_VIEW_ANGLE(32) View angle for each MMIF. Equal to the complement of (ROLL_UARS + PTG_FOV_ELEV_REF + PTG_INS2MACS_ELEV + PTG_FOV_ELEV_THM + PTG_FOV_ELEV_OFFSET). See the entry under each of these for their definitions. Calculated only for GOOD major frames.

MMAFNO Assigned MMAF number. The MMAF numbers, as used in the processing software, do not come from telemetry. Although a similar number is contained in telemetry, it is not unique. The MMAF number used in software is incremented every major frame starting from a value contained in the Defaults file read in at the start of processing. For Version 3.2 and later, MMAFNO = one corresponds to July 5, 1991 at 1920 hours.

MMAFNO_TIME(2) The MMAF_TIME in the Defaults file that is used to relate MMAF_TIME and MMAFNO.

MMAF_NUM1 A user input to MLS_RETRIV used to specify the starting major frame number for detailed output.

MMAF_NUM2 A user input to MLS_RETRIV used to specify the ending major frame number for detailed output.

MMAF_STAT A Character flag set at Level 1 to indicate the status of a major frame of data:
'G' if the major frame contains some good limb data and pointing information is also good.
'B' if the major frame does not contain some good limb data.
'P' Set at Level 2 if a pointing error occurred during the MMAF.

Level 2 may reset this value. If more than MMIF_BAD_MAX minor frames are not GOOD. Note MMIF_STAT is also set to BAD for bright body interference by body 2 (i.e. the Moon).

MMAF_TIME(2) Time and date of start of major frame (in UDTF format).

MMIF_BAD_MAX A user input to the RETRIV program. Maximum number of 'bad' MMIFs the MMAF can contain and still be considered 'good' for Level 2 retrievals.

MMIF_STAT(32) A 32 character array of flags set at Level 1 to indicate the status of a major frame of data:
'P' If the major frame contains some good limb data but instrument pointing could not be determined.
'G' If the major frame contains some good limb data and pointing information is also good.
'B' If the major frame does not contain some good limb data.

MOST_RECENT_Z(90) The counts of the most recent Zero view for each channel. Used to calculate the gain error term for major frames without a zero view. In the Defaults file, most recent means during or before the major frame with date/time given by MMAFNO_TIME.

MU(90,2) A user input to the Level 1 program. One plus slope of '1/f' noise spectrum for each channel and Filter Bank Switch setting. Allowed values lie in the closed interval [1.1, 3.9]. For the second index, the first column is used for a nominal Filter Bank Switch setting, the second column is used for cases when filter bank 3 is connected to each of the other bands and bank 6 is connected to band 3. For example MU(1,2) is used for the first channel of bank 3 when bank 3 is connected to band 1.

MULT_BIAS(2,32) Echo of Multiplier bias commands for 183 and 205 GHz radiometers (in that order). This is obtained from Level 0 data every MMIF.

MUX_DATA(6,32) Multiplexed data converted to engineering units. Data from the six words 96, 98, 99, 101, 103, 104, for each MMIF. First index selects engineering word in above order, second index selects which set of measurements the word is loaded with (a different set every MMIF). For example MUX_DATA(2,3) is the temperature of Primary Reflector 3. See reference 3.

MUX_PSU A byte that specifies the indexing scheme for the Sensor Engineering Data Assembly multiplexer address. If 0, the address is the MMIF value (here MMIF values range from 0 to 31). If the most significant bit is 1, then the low 5 bits are the address of the quantity being measured.

MUX_SENS A byte that specifies the indexing scheme for the Spectrometer Engineering Data Assembly multiplexer address. If 0, the address is the MMIF value (here MMIF values range from 0 to 31). If the most significant bit is 1, then the low 5 bits are the address of the quantity being measured.

MUX_SPECT A byte that specifies the Power Supply Engineering Data Assembly multiplexer address. If 0, the address is the MMIF value (here MMIF values range from 0 to 31). If the most significant bit is 1, then the low 5 bits are the address of the quantity being measured.

N-N-N-N-N-N-N-N-N-N-N-N-N-N-N-N-N-N-N-N-N-N-N-N-N-N-N-N-N-N-N-N-N-N-N

NDATA Number of data points used in computing CHISQ. Part of structure BAND_INFO_MMAF.

NO_AVAIL_KEYS Number of keys used in the L2PC file.

NO_ELMNTS_PER_SV_COMPONENT(32) In the L2PC file, number of elements in each state vector component.

NO_MAG_FIELDS Number of magnetic field linearization bins in the L2PCQ file.

NO_POINTINGS Number of pointings recorded in the L2PC file.

NO_SV_COEFF Number of state vector coefficients (or elements) for the state vector component associated with IDSV. Part of structure SV_INFO which is an array containing information for each state vector component.

NO_SV_COMPONENTS Number of state vector components in the L2PC file.

NO_SV_ELMNTS Total number of state vector elements (sum over all components) in the L2PC file.

NPRFL Number of atmospheric profiles in Level 2R Output Product File.

NPRFL_ELE Number of state vector elements corresponding to atmospheric profiles.

NMC_H2O_ERR_FACTOR Factor by which the water vapor mixing ration profile obtained from the NMC relative humidity data are multiplied to obtain the estimated standard deviation.

NSV A user input to the TANTRAK program. Number of state vector components.

NUMMMAF Number of MMAFs covered in the file.

NUMMMAF_GOOD_STATUS Number of MMAFs with a good status, as defined by MMAF_STAT.

NUM_BAD_MMAF Number of MMAFs (during the day) for a particular band which did not pass the Chi-squared test i.e. with BAND_INFO_MMAF.CHISQ larger than CHISQ_LIMIT. Those MMAF's that were declared as 'bad' because of poor or missing data are not included in this count. Part of structure BAND_INFO_DAY.

NUM_CHAN(32) Number of 'good' channels, for each MMIF and for a particular band. Used in retrievals. Part of structure BAND_INFO_MMIF.

NUM_D_MMAF(90) Number of DISCARD views in a MMAF. One value for each channel.

NUM_D_VIEWS Minimum of NUM_D_MMAF, i.e. minimum number of DISCARD views over all channels in a MMAF.

NUM_ELE Number of retrieval state vector elements (sum over all retrieved state vector components) for a particular band. Note that tangent pressure really makes up as many as 32 (max) independent elements during an MMAF. Part of structure BAND_INFO_MMAF.

NUM_ENCODER_HITS Number of encoder data "hits". These are defined as cases where ABS(ENCODER_COUNTS - ACTUATOR_POS * ENCODER_STEP - ENCODER_AT_HOME) > 40 counts.

NUM_CORR_PARAMS Number of parameters accessed from correlative data. Set to zero if correlative data is not available or desired. Maximum allowed value is three. If set to n then CORR_SUBTYPE1 through CORR_SUBTYPEn are used.

NUM_L_MMAF(90) Number of LIMB views in a MMAF for each channel.

NUM_L_VIEWS Maximum of NUM_L_MMAF, i.e. maximum number of LIMB views over all channels in a MMAF.

NUM_PRD_HITS Number of data "hits" in PRD_TEMP. Where a hit is defined as a measured value differing from the average of the last 10 readings by more than the maximum of 1.0 E-5 and 5 times the standard deviation of the last 10 readings. Data gaps are not considered.

NUM_RANGE_HITS Number of data "hits" detected in target, or space views. A hit occurs when the measured value differs from its expected value by more than 5 standard deviations. The expected value is determined by quadratic extrapolation from the preceding WINDOW_SZ MMAF's. Extrapolation is not performed over 'walls' (i.e. step jumps in the measure value). For data gaps, the expected value is extrapolated one and a half MMAF's then held constant.

NUM_S_MMAF(90) Number of SPACE views in a MMAF for each channel.

NUM_S_VIEWS Maximum of NUM_S_MMAF, i.e. maximum number of SPACE views over all channels in a MMAF.

NUM_TGT_TEMP_HITS Number of data "hits" in the target temperature. A hit is defined as a case where the MLS Level 0 Quality data indicates a parity error for the target temperature measurement.

NUM_T_MMAF(90) Number of TARGET views in a MMAF for each channel.

NUM_T_VIEWS Maximum of NUM_T_MMAF, i.e. maximum number of TARGET views over all channels in a MMAF.

NUM_UNFORCED_WALLS Number of walls caused by unexpected step jumps in target, or space views. A jump is detected when more than REJECT_LK_AHEAD data hits occur in a row.

NUM_Z_MMAF(90) Number of ZERO views in a MMAF for each channel.

NUM_Z_VIEWS Maximum of NUM_Z_MMAF, i.e. maximum number of ZERO views over all channels in a MMAF.

O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O

OA_ATT_RETRN Type of raw attitude data used in O/A Services. See reference 2. Part of structure OA_BUFFER

OA_BUFFER Ephemeris record; part of limb radiance buffer. Contains:

EARTH_GEOD_RAD(32)
GRNW_SID_TIME
OA_ATT_RETRN
OA_EPHEM_STATUS
OA_LIMB_CALC_STATUS(32)
OA_ORB_RETRN
OA_SAT_ATT_STATUS(32)
OA_SAT_ORB_STATUS(32)
PTG_FOV_AZIM_OFFSET(32)
PTG_FOV_AZIM_THM(2)
PTG_FOV_BO_DIAG_AZIMDIF
PTG_FOV_BO_DIAG_ELEVDIF
PTG_FOV_BO_DIAG_MAP(7)
PTG_FOV_BO_DIAG_MMAF(7)
PTG_FOV_BO_DIAG_MMIF_FST
PTG_FOV_BO_DIAG_MMIF_LST
PTG_FOV_BO_DIAG_MMIF_NUM
PTG_FOV_ELEV_OFFSET(32)
PTG_FOV_ELEV_THM(2)
PTG_INST2MACS_ELEV(2)
PTG_LIMB_PT(3)
REF_EARTH_RADIUS
REF_LAT
REF_LONG
REF_MMIF
REF_SOLAR_ILLUM
REF_SOLAR_TIME
REF_SOLAR_ZEN
REF_TIME(2)
ROLLRATE_UARS(32)
ROLL_UARS(32)
SAT_GCRAD(32)
SAT_GEOD_ALT
SAT_GEOD_LAT
SAT_GEOD_STATUS
SAT_LONG
SAT_VEL(3)
TNGT_GEOD_ALT(32)
TNGT_GEOD_LAT(32)
TNGT_LONG(32)
TRANS_INST2ECI(3,3)
YPR(3)
YPR_RATE(3)

OA_EPHEM_STATUS Status of call to O/A routine that provides ephemeris data.

OA_LIMB_CALC_STATUS(32) Status of call to O/A routine that provides tangent longitude, latitude, altitude for each MMIF.

OA_ORB_RETRN Type of orbit data returned from O/A Services. See reference 2.

OA_SAT_ATT_STATUS(32) Status of call to O/A routine that provides YPR, YPR_RATE for each MMIF.

OA_SAT_ORB_STATUS(32) Status of call to O/A routine that provides SAT_POS and SAT_VEL for each MMIF.

OA_STATUS1 Summary status for UOAS data quality at Level 1 (calculated at Level 2 from information passed from Level 1). Value gives the number of bad (but non fatal) status returns from all combined calls to UOAS in a major frame.

OA_STATUS2 Summary status for UOAS data quality at Level 2. Value gives the number of bad (but non fatal) status returns from all combined calls to UOAS in a major frame.

OBJECT_FOV A user input to the Level 1 program. An angle used for making a coarse check for bright object interference. If no bright object is within this angle of the 63 GHz FOV pointing direction at the start of a MMAF, then bright object interference will not be checked at the individual MMIF's within that MMAF.

OBJECT_SPV A user input to the Level 1 program. An angle used for making a coarse check for bright object interference with the space port. If no bright object is within this angle of the space port at the start of a MMAF, then bright object interference will not be checked at the individual MMIF's within that MMAF.

OB_ENABLE A logical flag indicating whether or not Oblateness commands are being processed by the C&DH.

OB_INV A logical flag indicating whether or not the Oblateness commands are being inverted before being processed by the C&DH.

OLD_FILT_BANK_SWTCH Value of the MLS Filter Bank Switch Network at the end of the previous MMAF. Used to check for changes in this quantity when qualifying data.

OLD_MIX_BIAS(2) Value of MIXER_BIAS at the end of the previous MMAF. Used to check for changes in this quantity when qualifying data.

OLD_MULT_BIAS(2) Value of MULT_BIAS. Used to check for changes in this quantity when qualifying data.

OLD_RECEIVER_GAIN(6) Value of RECEIVER_GAIN at the end of the previous MMAF. Used to check for changes in this quantity when qualifying data.

OPT_CAL_USED(90) A flag set to true if optimal calibration was performed in Level 1. When the Level 1 program is performing optimal calibration, and a near singular condition occurs, processing reverts to quadratic calibration. This flag specifies whether optimal calibration was really done.

OPT_DEPTH_LIN_MAX A user input to the RETRIV program. Optical depth above which the correction of model radiances (for mixing ratio changes) is done linearly rather than non-linearly for bands 2 through 6. Valid range is OPT_DEPTH_LIN_MIN to 100.0.

OPT_DEPTH_LIN_MIN A user input to the RETRIV program. Optical depth below which the correction of model radiances (for mixing ratio changes)is done linearly rather than non-linearly for bands 2 through 6. Valid range is 0.0 to OPT_DEPTH_LIN_MAX.

OPT_DEPTH_MAX A user input to the RETRIV program. Maximum optical depth for which to do retrievals for bands 2 through 6. Valid range is 0.0 to 100.0.

ORB_TYP_VER Type or specific version of orbit data to be used. See reference 2. This quantity is a user input to Level 1 through both the Program Parameters and the Level 1 User Input File. The value in the Users Input File is overwritten by the value obtained from the Program Parameters.

OVERRIDE(32) A user input to the Level 1 program. View type override. Allows user to set view type. Allowed values are ' ', 'D', 'L', 'S', 'T', 'W', AND 'Z'. Any non-blank entries in this array will override the view type obtained from the Level 0 data, while blank entries cause no override.

P-P-P-P-P-P-P-P-P-P-P-P-P-P-P-P-P-P-P-P-P-P-P-P-P-P-P-P-P-P-P-P-P-P

PAD A spare field in data records use to reserve space for possible enhancements, make record/fields within records start on word boundaries, or the make records a multiple of 512 bytes for optimum data transfer. Also called SPARE.

PARAM_COUNT Number of parameters loaded into PARAM_TABLE_TANTRAK.

PARAM_TABLE_LEVEL1(2,20) User input table via command file for TANTRAK. First column contains name of variable, second contains the value. A character array. Source of values for:

- ATT_TYP_VER
- DEFLT_CALID
- LOG_FILE_LID
- ORB_TYP_VER
- QUALIFIER
- USER_CALID
- VERSION_MLS_LEVEL1

PARAM_TABLE_RETRIV(2,20) User input table via command file for RETRIV. First column contains name of variable, second contains the value. A character array. Source of values for:

- CONTROL_AUTH
- DTL_FILE_LID
- FLAG_FIRST_DAY
- L2PCQ_CALID
- LOG_FILE_LID
- SFDU_NUM
- SPACE_RAD_CALID
- UARS_FLYING_DIR
- UARS_YAW_PERIOD
- UIPR_CALID
- VERSION_MLS_RETRIV

PARAM_TABLE_TANTRAK(2,20) User input table via command file for TANTRAK. First column contains name of variable, second contains the value. A character array. Source of values for:

- ATT_TYP_VER
- CLI_PROF_CALID
- CORR_CALID
- CORR_ERROR_FACTOR
- CORR_SUBTYPE1
- CORR_SUBTYPE2
- CORR_SUBTYPE3
- L2PCQ_CALID
- NMC_HZO_ERR_FACTOR
- NUM_CORR_PARAMS
- ORB_TYP_VER
- SOURCE
- UARS_CLI_CALID
- UARS_CLI_ERRORS
- UIPT_CALID
- VERSION_MLS_TANTRAK

PHASE_LOCK(32) The phase lock bits for each MMIF of telemetry. Obtained from word 100 of the MLS Level 0 data frame. See reference 3.

PH_LOCK(9) Nine characters, one for each phase-lock monitor output, indicating the number of times that each particular output indicated a loss of lock during a MMAF. Encoded as

0123456789ABCDEFGHIJKLMNOPQRSTUVW

to represent a count of 0 to 32.

POINTINGS(43) Negative Log of tangent pressure on antenna pointing pressure grid in the L2PC file.

POWER_RELAY_STATUS Twenty flags (0 or 1) indicating the power status for all 20 MLS power blocks. A '1' indicates that a particular power block is turned on for the entire MMAF. These flags occur as twenty bits (1-20) within one four byte integer word.

PRD_TEMPS(16) Platinum resistance device calibrated temperatures. For Version 3.3 units are Kelvin. This needs to be changed so that the units will be Celsius. Order is:

1 Primary Reflector 1
2 Primary Reflector 2
3 Primary Reflector 3
4 Primary Reflector 4
5 Primary Reflector 5
6 Secondary Reflector 1
7 Secondary Reflector 2
8 Secondary Reflector 3
9 Tertiary Reflector
10 Bipod Bearing
11 Scan Encoder
12 Scan Actuator
13 Attachment Point A
14 Attachment Point B
15 Attachment Point C
16 Switching Mirror Actuator

PREF . Actual reference pressure from correlative (NMC) pressure grid (P_CORR) used for geometric altitude reference (i. e. ZREF) that is closest to PREF_NOMINAL. NOT for use with REF-quantities. Valid range is -4.0 to 4.0; units are -log(mb).

PREF_NOMINAL Nominal reference pressure (-log(mb)) for which a reference height is sought (from NMC data).

PREF_REFRACT A RETRIV program parameter. Reference pressure below which refraction correction is applied for a priori tangent pressure determination. In -log(units).

PROBLTY For a particular band, the probability that the sum of the squares of (NDATA - NUM_ELE) random normal variables of unit variance will be greater that CHISQ (observed). A value close to 1.0 indicates a good fit of the model to the data and their assumed random errors. A value close to 0.0 indicates a poor fit. Part of structure BAND_INFO_MMAF.

PROC_DIR_OPT A user input to the RETRIV program. Processing direction option. Set to FORWARD_ONLY (0) for forward only processing. Set to FORWARD_AND_BACKWARD (1) for forward and backward processing.

PROFILE(NPRFL_ELE) Array of atmospheric profiles to be written to the Level 2 output. Units are Kelvin for temperature; volume mixing ratio for specie abundance; and m/s for wind velocity.

PROFILE_ERRRED(NPRFL_ELE) Array of profile error reduction factors (ratio of estimated error to a priori error).

PROFILE_INDX Pointer to first element in the Level 2 output profile vector (PROFILE) of the profile vector component identified by the corresponding IDSV field of SV_INFO. This differs from FST_ELE_INDX only because not all components in the state vector are atmospheric profiles. Part of structure SV_INFO which is an array containing information for each state vector component.

PROFILE_SDEV(NPRFL_ELE) Array of estimated uncertainties (standard deviations) for retrieved PROFILE.

PR_STATUS The MLS power relay status readback from the RIU. This consists of 20 bits, one for each power relay, indicating whether or not the relay is in the ON position.

PTAN63(32) Array of Level 2 tangent pressures for each MMIF. Units are -log(mb).

PTAN63_L2 Combined Forward and Backward estimated tangent pressure weighted by their uncertainties.

PTAN63_L2_VAR Main diagonal of the covariance of PTAN63_L2.

PTAN63_APR_METHOD Method used to obtain the a priori tangent pressure as follows:

= 1 -> use the previous good MMIF's tangent pressure estimate to get the a priori for current MMIF.

= 2 -> use the previous MMAF's tangent pressure estimates around 40 Km tangent height, where good retrievals are expected, to obtain the a priori tangent pressure for all MMIFs within the current MMAF, at once.

= 3 -> use the reference pressure and its associated height (from NMC) to obtain from geometry the a priori tangent pressure for all MMIFs within the current MMAF, at once.

PTAN63_FRD(32) Array of Level 2 tangent pressures for each MMIF as retrieved using forward only method. Units are -log(mb).

PTAN63_FRD_VAR(32) Main diagonal of covariance of PTAN63_FRD.

PTAN63_SAV(32) Array of a priori tangent pressures for each minor frame. Units are -log(mb). Written to the FRD scratch file if PROC_DIR_OPT is FORWARD_AND_BACKWARD.

PTAN63_SAV_COV(32) Array whose elements are the variances of PTAN63_SAV. Units are log(mb) square.

PTAN63_SDEV(32) Array of estimated uncertainties (standard deviations) for retrieved PTAN63 values for each minor frame; Valid range is 0.0 to 10.0; units are negative log(mb).

PTAN_CHISQ_THRESHOLD Tangent pressure threshold below which the Level 2 Chi-square test is not performed. Also, level above which column ozone is evaluated.

PTG_FOV_AZIM_183(2) Offset to be added to the 63 GHz radiometer azimuth pointing angle to determine the azimuth pointing angle for the 183 GHz radiometer, and its uncertainty. If not retrieved, as determined by SV_INFO, then values of -0.016, 0.0012 will be used.

PTG_FOV_AZIM_205(2) Offset to be added to the 63 GHz radiometer azimuth pointing angle to determine the azimuth pointing angle for the 205 GHz radiometer, and its uncertainty. If not retrieved, as determined by SV_INFO, then values of 0.025, 0.0014 will be used.

PTG_FOV_AZIM_OFFSET(32) Offset to be added to the reference azimuth pointing angle for scan positions at each MMIF. This value is obtained from interpolation in PTG_FOV_TABLE.

PTG_FOV_AZIM_REF(2) A user input to the Level 1 program. Reference boresight azimuth angle and uncertainty. Valid range is 0.0 to 360.0 degrees.

PTG_FOV_AZIM_THM(2) Thermal correction to be applied to the azimuth pointing angle of each radiometer FOV, with associated uncertainty. Calculated by MLS_LEVEL1 (or MLS_TANTRAK if attitude update option is used) by GET_EPHEMERIS using PRD_TEMPS and THERMAL_H_MATRIX. (Note, MLS_TANTRAK will not change the thermal correction since the factors used to calculate it are only Level 1 inputs and come to MLS_TANTRAK via the Radiance File).

PTG_FOV_AZIM_WDTH A user input to the Level 1 program. Full width (at half maximum) for 63 GHz FOV in azimuth direction. Used for determining bright object interference. Valid range is 0.0 to 180.0 degrees.

PTG_FOV_BO_DIAG_AZIMDIF Minimum (during MMAF) absolute azimuth difference in degrees between 63 GHz boresight and brightest object in 63 GHz FOV.

PTG_FOV_BO_DIAG_ELEVDIF Minimum (during MMAF) absolute elevation difference in degrees between 63 GHz boresight and brightest object in 63 GHz FOV.

PTG_FOV_BO_DIAG_MAP(7) Logical flags specifying whether bright object(s) were in the 63 GHz FOV at any MMIF during MMAF. Order of objects is given in PTG_FOV_BO_MAP.

PTG_FOV_BO_DIAG_MMAF(7) Minimum angles between the 63 GHz boresight and bright objects during MMAF. Order of objects is given in PTG_FOV_BO_MAP.

PTG_FOV_BO_DIAG_MMIF_FST Number of first MMIF contaminated by bright object(s) during a MMAF. Range 0 to 32, where a value of zero means that there is no bright object contamination.

PTG_FOV_BO_DIAG_MMIF_LST Number of last MMIF contaminated by bright object(s) during a MMAF. Range 0 to 32, where a value of zero means that there is no bright object contamination.

PTG_FOV_BO_DIAG_MMIF_NUM Number of MMIF's contaminated by bright objects in a MMAF. Range 0 to 32, where a value of zero means that there is no bright object contamination.

PTG_FOV_BO_MAP(7) A user input to the Level 1 program. Index values specifying which bright objects to check for contamination in antenna FOV. Bright objects are specified by values in range 1 to 7 as follows:

1 - Sun
2 - Moon
3 - Mercury Note: for OASIM only
4 - Venus values of 1, 2 are
5 - Mars allowed due to UCSS
6 - Jupiter constraints.
7 - Saturn

PTG_FOV_BO_NUM A user input to the Level 1 program. Number of bright objects to check for contamination in antenna FOV. Valid values are between 0 and 7 Note, For use with OASIM the range is 0 to 2.

PTG_FOV_ELEV_183(2) Offset to be added to the 63 GHz radiometer elevation pointing angle to determine the elevation pointing angle for the 183 GHz radiometer, and its uncertainty. If not retrieved, as determined by SV_INFO, then values of -0.001, 0.0007 will be used.

PTG_FOV_ELEV_205(2) Offset to be added to the 63 GHz radiometer elevation pointing angle to determine the elevation pointing angle for the 205 GHz radiometer, and its uncertainty. If not retrieved, as determined by SV_INFO, then values of 0.006, 0.0006 will be used.

PTG_FOV_ELEV_OFFSET(32) Offset to be added to the reference elevation pointing angle for scan positions at each MMIF. This value is obtained from interpolation in PTG_FOV_TABLE.

PTG_FOV_ELEV_REF(2) A user input to the Level 1 program. Reference boresight elevation and uncertainty (in degrees). Valid range is 0.0 to 360.0 degrees.

PTG_FOV_ELEV_THM(2) Thermal correction to be applied to the elevation pointing angle of each radiometer FOV, with associated uncertainty. Calculated by MLS_LEVEL1 by GET_EPHEMERIS using PRD_TEMPS and THERMAL_H_MATRIX.

PTG_FOV_ELEV_WDTH A user input to the Level 1 program. Full width (at half maximum) for 63 GHz FOV in elevation direction. Used for determining bright object interference. Valid range is 0.0 to 180.0 degrees. 0.206°

PTG_FOV_TABLE(5) A user input to the Level 1 program. Structure containing table of coefficients used to convert ENCODER counts to encoder angle without thermal correction by linear interpolation. Contains:

AZIM azimuth angle in degrees
ELEV elevation angle in degrees
ENCR encoder counts corresponding to AZIM and ELEV.

PTG_INST2MACS_ELEV(2) Elevation offset between the MLS instrument reference and the UARS Master Attitude Control System (MACS) reference frame, with associated uncertainty (PTG_INST2MACS_ELEV_ERR). Positive if MACS Y axis is at a larger elevation than the MLS instrument reference Y axis.

PTG_INST2MACS_ELEV_ERR A user input to the Level 1 program. Uncertainty in elevation offset between the MLS instrument reference and the UARS Master Attitude Control System (MACS) reference frames. Units are degrees.

PTG_LIMB_PT(3) Earth Centered Inertial (ECI) coordinates of limb tangent point at minor frame REF_MMIF.

PTG_SPV_AZIM A user input to the Level 1 program. Azimuth pointing angle for space port. Valid range is 0.0 to 180.0 degrees.

PTG_SPV_AZIM_WDTH A user input to the Level 1 program. Space view width in azimuth. Valid range is 0.0 to 360.0 degrees.

PTG_SPV_BO_MAP(7) A user input to the Level 1 program. Index values for which bright objects to check for contamination in space view FOV. Valid values are between 0 and 7. See PTG_FOV_BO_MAP.

PTG_SPV_BO_NUM A user input to the Level 1 program. Number of bright objects to check for contamination in the space view FOV. Valid values are between 0 and 7.

PTG_SPV_ELEV A user input to the Level 1 program. Elevation pointing angle for space port. Valid range is 0.0 to 360.0 degrees.

PTG_SPV_ELEV_WDTH   A user input to the Level 1 program. Space view width in elevation. Valid range is 0.0 to 180.0 degrees.

P_CORR(18)   Pressure values on correlative (NMC) grid.

Q-Q-Q-Q-Q-Q-Q-Q-Q-Q-Q-Q-Q-Q-Q-Q-Q-Q-Q-Q-Q-Q-Q-Q-Q-Q-Q-Q-Q-Q-Q

QUAD_FIT(90)   A structure that contains the quadratic coefficients and their standard deviations for each channel.

Contains:

AVE_X	VAR_A
AVE_X2	VAR_B
AVE_Y	VAR_C
COEFF_A	VAR_D
COEFF_B	VAR_Y
COEFF_C	QUAD_TYPE
QUAD_MMAF	WALL_ON_LEFT
QUAD_MMIF	

These parameters are used as follows:

To find the interpolated value (valid only if WALL_ON_LEFT is FALSE), Y, at minor frame number FrMin of major frame number FrMaj for a parameter of type QUAD_TYPE, Set:

X = (FrMaj - QUAD_MMAF)*32 +
    FrMin - QUAD_MMIF

Y = COEFF_A + COEFF_B*(X) +
    COEFF_C*(X2)

Variance of Y = [VAR_A +
    VAR_B*(X-AVE_X) + VAR_C*(X2-AVE_X2) +
    VAR_D*(X_AVE_X)*(X2-AVE_X2)]*VAR_*Y

QUAD_FIT_TYPES   Contains the 4 QUAD_FIT records for gain, space view, target view and zero view. These structures are referred to as:

QUAD_FIT_TYPES.GAIN(90)
QUAD_FIT_TYPES.SPV(90)
QUAD_FIT_TYPES.TAR(90)
QUAD_FIT_TYPES.ZER(90)

QUAD_MMAF   Part of structure QUAD_FIT. Specifies the MMAF number that corresponds to a X value of zero.

QUAD_MMIF   Part of structure QUAD_FIT. Specifies the MMIF number that corresponds to a X value of zero.

QUAD_TYPE A single character specifying the data type.

G = Gain
S = Space
T = Target
Z = Zero

QUALIFIER A user input to the Level 1 program to indicate the source of Level 0 data. Note, since this is a user input, it may not be reliable. Level 0 data type:
'N'="real" data;
'S'=SIDS data;
'T'=dummy test data
'U'=unknown data type.

QUALITY A quality indicator (Part of structure BAND_INFO_MMAF) defined as follows:

4 = LIMB_RAD_GOOD > LIMB_RAD_LIMIT and
CHISQ <= CHISQ_LIMIT

3 = LIMB_RAD_GOOD <= LIMB_RAD_LIMIT and
CHISQ <= CHISQ_LIMIT

2 = LIMB_RAD_GOOD > LIMB_RAD_LIMIT and
CHISQ > CHISQ_LIMIT

1 = LIMB_RAD_GOOD <= LIMB_RAD_LIMIT and
CHISQ > CHISQ_LIMIT

QUALITY1 Percentage of major frames having QUALITY equal to 1 in Level 2 output. Part of structure BAND_INFO_DAY.

QUALITY2 Percentage of major frames having QUALITY equal to 2 in Level 2 output. Part of structure BAND_INFO_DAY.

QUALITY3 Percentage of major frames having QUALITY equal to 3 in Level 2 output. Part of structure BAND_INFO_DAY.

QUALITY4 Percentage of major frames having QUALITY equal to 4 in Level 2 output. Part of structure BAND_INFO_DAY.

QUALITY4_DAY Average of QUALITY4 over all bands.

QUALITY_1_MMAF Fractional amount (percents, rounded to the nearest integer) of data in MMAF of QUALITY equal to 1.

QUALITY_2_MMAF Fractional amount (percents, rounded to the nearest integer) of data in MMAF of QUALITY equal to 2.

QUALITY_3_MMAF Fractional amount (percents, rounded to the nearest integer) of data in MMAF of QUALITY equal to 3.

QUALITY_4_MMAF Fractional amount (percents, rounded to the nearest integer) of data in MMAF of QUALITY equal to 4.

QUALITY_CLO Quality indicator for ClO in Level 3A. Same as BAND_INFO_MMAF(2).QUALITY. i.e. the band 2 quality value.

QUALITY_H2O Quality indicator for H2)in Level 3A. Same as BAND_INFO_MMAF(5).QUALITY. i.e. the band 5 quality value.

QUALITY_O3 Quality indicator for O3 in Level 3A. The maximum of QUALITY_O3_183 and QUALITY_O3_205if ozone (see COMB_O3) is combined else set to -99.99

QUALITY_O3_183 Quality indicator for Ozone (retrieved from band 4) in Level 3A. Same as BAND_INFO_MMAF(4).QUALITY. i.e. the band 4 quality value. Set to -99.99 of not retrieved.

QUALITY_O3_205 Quality indicator for Ozone (retrieved from band 6) in Level 3A. Same as BAND_INFO_MMAF(6).QUALITY. i.e. the band 6 quality value. Set to -99.99 of not retrieved.

QUALITY_TEMP Quality indicator for Temperature in Level 3A. Same as BAND_INFO_MMAF(1).QUALITY. i.e. the band 1 quality value.

R-R-R-R-R-R-R-R-R-R-R-R-R-R-R-R-R-R-R-R-R-R-R-R-R-R-R-R-R-R-R

RADIANCES(90) Model radiances corresponding to state vector elements found in SV_ELMNTS. Part of structure X_I_STAR.

RAD_CNTL(16) Sixteen, four digit, Hex numbers indicating the contents of each Radiometer Control register. These govern the mixer, multiplier and Gunn biases, the IF gains, and Gunn loop closures. See reference 3 for details.

RAD_ERR_FACTOR Fraction of the radiance error derived from non linear effects in the forward model.

RAD_L1(90,2,32) The calibrated Limb radiance and estimated error for each MMIF and each filter channel.
Index 1 => channel number.
Index 2 => selects radiance or estimated error.
Index 3 => MMIF number.

Calculated in units of Kelvin, output to the Limb Radiance file in units of 0.01 K and sigma units of 0.001 K.

RAD_L1_MINMAX(2,6) Minimum and maximum limb brightness temperature (in that order) for a MMAF for each filter bank, in units of Kelvin.

RAD_PARAMS_REC A data structure containing the following antenna radiance offset and transmission factors:

.ANT_OHMIC_RAD
.ANT_OHMIC_REF
.ANT_SCAT_EFF
.BAFFLE_RAD_LIM
.BAFFLE_RAD_SPV
.BAFFLE_RAD_TAR
.BAFFLE_XMIT_LIM
.BAFFLE_XMIT_SPV
.BAFFLE_XMIT_TAR

RECEIVER_GAIN(6) IF Gain for the six filter banks. Obtained from Level 0 words 116 through 121 every MMIF.

RECORDNO Sequence number of logical record in a file.

RECORDNO_TTD Sequence number of logical record in a Tangent Track Data file. A value that may be different from RECORDNO since a Tangent Track Data file contains header information from Level1 which also contains a value for RECORDNO.

REC_NOISE_BAD_FLAG(90) Flags to indicate that the system noise temperature (REC_NOISE_TEMP) for a particular channel is outside the range given by REC_NOISE_RNG(2). TRUE if outside the fixed values. Written to diagnostics file.

REC_NOISE_RNG(2,90) A user input to the Level 1 program. Lower and upper limits (in that order) for nominal system temperature noise for each channel. In units of Kelvin. Values that occur outside this range will be flagged by REC_NOISE_FLAG.

REC_NOISE_TEMP(90) System temperature noise for each channel. In units of Kelvin.

REC_SZ Record size, in units of longwords, for files with fixed length records.

REC_TYPE Record type; 'H' = header; 'D' = data; 'T' = trailer.

REF_EARTH_RADIUS Value of EARTH_GEOD_RAD (geodetic Earth's radius at tangent point) at minor frame number REF_MMIF.

REF_LAT Tangent point geodetic latitude at REF_MMIF.

REF_LONG Tangent point longitude at REF_MMIF.

REF_MMIF A user input to the Level 1 program. Minor frame number used for reference longitude and latitude, nominally set to 17; valid values are between 1 and 32.

REF_SOLAR_ILLUM Solar illumination conditions at limb tangent point of minor frame number REF_MMIF;

0 = Unable to determine condition from O/A Services.
1 = Day (exclusive of twilight)
2 = Night (exclusive of twilight)
3 = Twilight, sunrise. Local solar zenith angle is between DAY_ZENITH and NIGHT_ZENITH (MLS data base parameters nominally set to 87 and 93 degrees) and REF_SOLAR_TIME is less than 12.
4 = Twilight, sunset. Local solar zenith angle is between DAY_ZENITH and NIGHT_ZENITH and REF_SOLAR_TIME is greater than 12.

REF_SOLAR_TIME Local solar time at limb tangent point at minor frame number REF_MMIF.

REF_SOLAR_ZEN Local solar zenith angle at tangent point at minor frame number REF_MMIF.

REF_TIME(2) Time in UDTF of reference minor frame REF_MMIF. Acts as a time tag for a MMAF.

REF_TIME_FIRST(2) Reference time of first MMAF in processing interval. Equal to REF_TIME of first MMAF in file.

REJECT_LK_AHEAD A user input to the Level 1 program. Number of minor frames to look ahead to check if out-of-range Level 0 data should be considered as 'bad' data or the start of some new condition. For view types which appear only once per MMAF, this number is also the number of MMAFs of data that must be

read past the end of the window in order to resolve the bad data question. Valid values are between 1 and 5.

RETRIV The logical OR of all the STATE_CHAN_RETRIV values. When TRUE, this flag indicates that a particular state vector component is being retrieved for at least one channel. Part of structure SV_INFO which is an array containing information for each state vector component.

ROLLRATE_MLS(32) Roll rate in degrees/sec. for each MMIF, either retrieved or set to ROLLRATE_UARS if constrained or ignored as specified by SV_INFO.

ROLLRATE_MLS_VAR(32) Variance of each element of ROLLRATE_MLS.

ROLLRATE_UARS(32) UARS roll rate in degrees/second for each MMIF.

ROLLRATE_UARS_VAR UARS roll rate variance in degrees/second. A hardcoded parameter in MLS_RETRIV.

ROLLRATE_VAR_MULT A user input to the Level 2 program. Multiplier used to obtain ROLLRATE_MLS_VAR from ROLLRATE_UARS_VAR.

ROLL_MLS(32) Retrieved roll angle in degrees from local vertical for each MMIF.

ROLL_MLS_VAR(32) Variance of each element of ROLL_MLS.

ROLL_UARS(32) UARS roll angle in degrees from local vertical for each MMIF, as returned by O/A services.

S-S-S-S-S-S-S-S-S-S-S-S-S-S-S-S-S-S-S-S-S-S-S-S-S-S-S-S-S-S-S-S-S-S-S-S-S

SAT_GCRAD(32) UARS geocentric orbital radius for each MMIF.

SAT_GEOD_ALT UARS altitude in km at minor frame number REF_MMIF.

SAT_GEOD_LAT UARS latitude in degrees at minor frame number REF_MMIF.

SAT_GEOD_STATUS Status return from O/A Services in call to get SAT_GEOD_LAT. See reference 2.

SAT_LONG UARS longitude at minor frame number REF_MMIF. Range 0.0 to 360.0 degrees. However, if tangent point is located along the polar axis, then it is assigned the value of -9999999.0.

SAT_VEL(3) UARS velocity (m/s) in Earth Centered Inertial (ECI) coordinates at minor frame number REF_MMIF.

SAT_VEL_Z UARS velocity along the line of sight (63GHZ radiometer boresight) at REF_MMIF.

SCAN_BIAS A four digit HEX number indicating the current Antenna Scan Bias in units of motor steps obtained from word 134 in Level 0 data.

SCAN_BIAS_ENABLE A logical flag indicating whether or not the Antenna Scan Bias word is being used to offset the Antenna pointing.

SCAN_CHANGE Set to true if a scan pattern changed occurred during the MMAF. Same as SCAN_PATTERN_CHANGE.

SCAN_CHANGE_NUM Number of MMAFs with scan pattern changes during period processed by MLS_RETRIV.

SCAN_PATTERN_CHANGE Set to true if a scan pattern changed occurred during the MMAF. Scan pattern changes are determined from MLS_STATUS. Same as SCAN_CHANGE.

SFDU1 First TYPE field of Standard Formatted Data Unit construct in the Level 2 product header; the string always contains 'CCSD1Z000001'. Identifies form of Standard Formatted Data Units used.

SFDU2 Second TYPE field of Standard Formatted Data Unit construct in the Level 2 product header; the string always has the form CONTROL_AUTH//'1I00'//SFDU_NUM, where CONTROL_AUTH and SFDU_NUM come from PARAM_TABLE_RETRIV. The string is 12 characters long. Identifies the document, and its controlling authority, which describes the file in Standard Formatted Data Units.

SFDU_NUM A user input to the RETRIV program through PARAM_TABLE_RETRIV. Standard Formatted Data Unit DDRI field; specifies document number describing the Level 2 output file.

SIGMA_CRITERION Uncertainty multiplicative factor used to compare the a priori and climatology. See FLAG_AP.

SOURCE Source of correlative data. Must be 'NMC'.

SPACE_RAD_CALID Version portion of Calibration ID for Level 2 Space Radiance Offset File. See section 6.3.1.7. An input to MLS_RETRIV via the program params (i.e. PGINIT).

SPARE See PAD.

SPV_BAD_FLAG(90) Flags set to TRUE to indicate that the Chi_squared statistic of Space counts using the quadratic fit was outside prescribed fixed values specified by STD_SPV_RNG during a MMAF, else FALSE. Written to Level 1 diagnostics.

SPV_COEFF_A(90) Same as QUAD_FIT_TYPES.SPV(90).COEFF_A.

SPV_COEFF_B(90) Same as QUAD_FIT_TYPES.SPV(90).COEFF_B.

SPV_COEFF_C(90) Same as QUAD_FIT_TYPES.SPV(90).COEFF_C.

START_TIME(2) Time in UDTF format of first data record.

STATE(203) The state vector. Array of the current best estimate of the retrieved parameters. Ordered according to the order given in SV_INFO.

STATE_AUX(203) Auxiliary version of state vector. This contains real-time information and/or climatological data.

STATE_AUX_VAR(203) Main diagonal of the covariance of STATE_AUX.

STATE_CHAN_CNSTRN(90) Flags indicating, for each channel, whether or not state vector component (identified by the corresponding SV_INFO field IDSV) is constrained. TRUE means constrained; FALSE means not constrained. Part of structure SV_INFO which is an array containing information for each state vector component.

STATE_CHAN_RETRIV(90) Flags indicating, for each channel, whether or not state vector component (identified by the corresponding SV_INFO field IDSV) is retrieved. TRUE means retrieved; FALSE means that it was not retrieved. Part of structure SV_INFO which is an array containing information for each state vector component.

STATE_CORR(203) Array with correlative (e.g. real-time NMC) data interpolated.

STATE_CORR_VAR(203) Main diagonal of the covariance of STATE_CORR.

STATE_COV(203,203) Estimated error covariance of STATE.

STATE_COV_TRI(20706) Upper triangular potion of STATE_COV.

STATE_FRD(203) The state vector during the first (ie forward) pass through the Level 1 data.

STATE_SIZE Maximum number of elements in state vector. Currently (V330) set at 203.

STD_SPV_RNG(2) A user input to the Level 1 program. Lower(1) and upper(2) acceptable values for Space count standard deviation.

STD_TAR_RNG(2) A user input to the Level 1 program. Lower(1) and upper(2) acceptable values for Target count standard deviation.

STD_ZER_RNG(2) A user input to the Level 1 program. Lower(1) and upper(2) acceptable values for Zero count standard deviation.

STOP_TIME(2) Time in UDTF format of the start of the last mmaf data record.

SURVIVAL_DATA(10) Nine temperatures measured directly by the RIU, available even if the MLS is unpowered. These are intended to provide survival telemetry. The tenth parameter is the Quiet Bus voltage, not monitored directly by the instrument, but required to determine power consumption.

SV_COMPONENTS(24) Name identifier (character) for each state vector in L2PC file.

SV_COMPONENT_FIRST_ELMNT_INDEX(32) Pointer to each component's first element in the state vector in L2PC file.

SV_ELMNTS(242) Values of state vector elements in L2PC file.

SV_INFO Structure containing information for each state vetor component and is used to decode the state vector (STATE). NSV gives the number of components in the STATE vector and in SV_INFO. The SV_INFO field IDSV identifies the state vector component and FST_ELE_INDX (PROFILE_INDX in the case of PROFILE) gives the starting location in STATE of that component, while NO_SV_COEFF gives the number of elements for that component. The complete list of fields of SV_INFO are:

CNSTRN	PROFILE_INDX
FST_ELE_INDX	RETRIV
IDSV	STATE_CHAN_CNSTRN
KMR	STATE_CHAN_RETRI
NO_SV_COEFF	TRI_BASE_PSG

SV_RTRVL_BY_BAND(250,6) Flag in L2PC file indicating whether or not a given state vector element can be retrieved for a given band (i.e. if derivatives exist for that band and that element). TRUE means yes.

SW_MIRROR(32) Switching mirror status/position for each MMIF.
0 = unknown
1 = target
2 = space
3 = limb

Unknown mirror status occurs when fill or parity errors occur in the MLS engineering data that is used to determine this quantity.

S_TEMP A user input to the Level 1 program. Space black body background temperature. Valid range is 2.5 to 3.5 K.

T-T-T-T-T-T-T-T-T-T-T-T-T-T-T-T-T-T-T-T-T-T-T-T-T-T-T-T-T-T-T-T-T-T-T-T-T

TAR_BAD_FLAG(90) Flag set to TRUE to indicate that the standard deviation of Target counts is outside prescribed fixed values.

TAR_COEFF_A(90) Same as QUAD_FIT_TYPES.TAR(90).COEFF_A.

TAR_COEFF_B(90) Same as QUAD_FIT_TYPES.TAR(90).COEFF_B.

TAR_COEFF_C(90) Same as QUAD_FIT_TYPES.TAR(90).COEFF_C.

TGT_TEMP The average Calibration Target temperature in units of degrees Kelvin.

TAU Integration time in seconds, obtained from Level 0 data. Usually 1.792 seconds. Part of structure DEFAULTS_BUFF.

TEST_FLAG A user input to MLS_RETRIV for diagnostic output. Set to 'Y' for diagnostic output. 'N' otherwise.

THEORETIC_ZERO_VAR A user input to the Level 1 program. Theoretical variance of zero view counts. Used in determining uncertainty in interpolated zero view counts. The uncertainty in the interpolate is used in generating diagnostic quantities and in data hit detection.

THERMAL_H_MATRIX(2,16) A matrix which when post multiplied by the PRD_TEMPS temperature vector gives the thermal correction to the azimuth and elevation encoder angles. Units of degrees per degree Celsius. Note that in Version 3.3 the PRD_TEMPS are in Kelvin so the units do not match. Therefore, in Version 3.3 this matrix must always be zero.

THRESHOLD_K_PTAN Pressure threshold (in -log(mb) units) below which no retrievals of tangent pressure are attempted because of poor sensitivity.

THRESHOLD_K_TEMP Pressure threshold (in -log(mb) units) below which retrieval of temperature is not attempted due to poor sensitivity.

TNGT_GEOD_ALT(32) Estimated tangent point geodetic altitude at start of each MMIF. Obtained from O/A services using a FOV boresight vector derived from encoder readings and pre-launch measured instrument offsets.

TNGT_GEOD_ALT_MLS(32) Retrieved tangent point geodetic altitude for each MMIF.

TNGT_GEOD_ALT_MLS_VAR(32) Variance of each element of TNGT_GEOD_ALT_MLS.

TNGT_GEOD_ALT_REFR(32) TNGT_GEOD_ALT corrected for the refraction effect for each MMIF.

TNGT_GEOD_ALT_REFR_MAX Maximum of TNGT_GEOD_ALT_REFR over all MMIF's in a MMAF.

TNGT_GEOD_ALT_REFR_MIN Minimum of TNGT_GEOD_ALT_REFR over all MMIF's in a MMAF.

TNGT_GEOD_LAT(32) Estimated tangent point geodetic latitude at start of each MMIF. Obtained from O/A services using a FOV boresight vector derived from encoder readings and pre-launch measured instrument offsets.

TNGT_LONG(32) Estimated tangent point longitude in degrees at start of each MMIF. Obtained from O/A services using a FOV boresight vector derived from encoder readings and pre-launch measured instrument offsets.

TRAILER_TIME Time for which trailer record was written. In UDTF format.

TRANS_INST2ECI(3,3) Matrix product of five rotation matrices (ABCDE) transforming from Earth Centered Inertial (ECI) Frame to Instrument Reference Frame, at minor frame REF_MMIF. During data gaps it is assumed that the attitude and the encoder angles remain constant, only the orbit data changes.

TRANS_INST2OBS(3,3) A user input to the Level 1 program. Rotation matrix from Instrument Reference Frame to Observatory Frame . (Sometimes called the E matrix).

TRANS_OBS2MACS(3,3) A user input to the Level 1 program. Rotation matrix from Observatory Frame to the UARS Master Attitude Control System (MACS) Frame. (Sometimes called the D matrix.)

TRI_BASE_PSG(43) Triangular basis pressure grid for the state vector component identified by the corresponding IDSV field of SV_INFO. Part of structure SV_INFO.

TRI_BASIS_VERT_GRID(242) Array of negative log pressure values that are used to construct the profile representation basis set for all the state vector components strung together in one vector. The order is given by SV_COMPONENTS, with the number of pressure values per component given by NO_ELEMNTS_PER_SV_COMPONENT.

TTD_LST_REC Number of last data record in TTDA and TTDR files.

TYPE Record type: header ('H'), data ('D'), trailer ('T'), or supplemental ('S').

TYPE_L2 Hardcoded as 'S'.

U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U-U

UIPT_CALID Calibration ID for the MLS_TANTRAK user input file.

UARS_CLI_CALID UARS Climatological file Calibration ID. Set to 'NONE' if the UARS Climatology file is not available or desired.

UARS_CLI_ERRORS A flag specifying whether the UARS Climatology uncertainties ('errors') are to be used ('YES') or the MLS default Climatology uncertainties ('errors') are to be used ('NO').

UARS_DAY Day number since start of mission.

UARS_FLYING_DIR Used only if FLAG_FIRST_DAY is set to 'T'. This parameter is concatenated with other parameters to select a file from a set of Level 2 Processing Coefficient files which are dependent on flying direction. This is the parameter which specifies that direction, either 'F' for forward, or 'B' for backward. An input to MLS_RETRIV via the program params (i.e. PGINIT).

UARS_YAW_PERIOD Used only if FLAG_FIRST_DAY is set to 'T'. An input to MLS_RETRIV via the program params (i.e. PGINIT). This parameter is concatenated with other parameters to select a file from a set of Level 2 Processing Coefficient files. This is the parameter which specifies the yaw period. There will be ten UARS yaw arounds per year. These will occur at approximately the same date each year, and can be used to define the start of a 'UARS month'. The following give the UARS_YAW_PERIOD number.

Date	UARS YAW PERIOD
16 Aug - 26 Sep	7
26 Sep - 4 Nov	8
4 Nov - 5 Dec	9
5 Dec - 13 Jan	10
13 Jan - 16 Feb	1
16 Feb - 25 Mar	2
25 Mar - 3 May	3
3 May - 3 Jun	4
3 Jun - 15 Jul	5
15 Jul - 16 Aug	6

UDFT Standard date time format used by UARS. Two integers words, first is year and day in form YYDDD. Second word is milliseconds from start of day.

UIP User inputs via the Level 1 User Input File. See File Contents in section 6.

UIPR_CALID Calibration ID for the MLS_RETRIV user input file. Note, some user input files will be incompatible with some L2PC files. An input to MLS_RETRIV via the program params (i.e. PGINIT).

UPDATE_OA_OPTION Character type flag specifying whether TANTRAK shall update OA data by calling GET_EPHEMERIS to obtain Orbit/Attitude data or shall use the Orbit/Attitude data provided by Level 1. 'Y' means to update, otherwise do not update.

USER_CALID Calibration ID for the User Input File.

UTIME1(2) Processing start time for Level 2 programs in terms of written output. UDTF format.

UTIME2(2) Processing stop time for Level 2 programs in term of written output (data past this time may be used to generate the output). UDTF format.

V-V-V-V-V-V-V-V-V-V-V-V-V-V-V-V-V-V-V-V-V-V-V-V-V-V-V-V-V-V-V-V-V-V-V-V-V-V-V-V-V

VAR_A Constant term coefficient used to determine variance of quadratic interpolated quantities. Part of structure QUAD_FIT.

VAR_B Linear term coefficient used to determine variance of quadratic interpolated quantities. Part of structure QUAD_FIT.

VAR_C Second order term coefficient used to determine variance of quadratic interpolated quantities. Part of structure QUAD_FIT.

VAR_D Cross term coefficient to determine variance of quadratic interpolated quantities. Part of structure QUAD_FIT.

VAR_Y Estimated variance in the dependent variable used in quadratic fit. Part of structure QUAD_FIT.

VERSION_MLS_LEVEL1 The Version number of the program i.e. 'V330'. If this number does not match the Version number of the program actually executed, the program will terminate with an error message in the PROGRAM COMMENTS field of the job log printout. An input to MLS_LEVEL1 via the program params (i.e. PGINIT).

VERSION_MLS_TANTRAK Version number of program as input to MLS_TANTRAK via program params in command file (PGINIT). Should be set to 'V330'. The version number is checked against the an internal version number (VERSION_TTD), if they do not agree the program will terminate with an error message.

VERSION_MLS_RETRIV The Version number of the program. If this number does not match the Version number of the program actually executed (VERSIONNO_RETRIV), the program will terminate with an error message in the PROGRAM COMMENTS field of the job log printout. An input to MLS_RETRIV via the program params (i.e. PGINIT).

VERSIONNO_RETRIV MLS_RETRIV program version number.

VERSION_TTD MLS_TANTRAK program version number.

W-W-W-W-W-W-W-W-W-W-W-W-W-W-W-W-W-W-W-W-W-W-W-W-W-W-W-W-W-W-W

WALL_MMAF(90) Number of uncommanded walls which occurred in the window while calibrating the Current MMAF for each channel. A 'wall' is a MMIF where some system parameter has changed.

WALL_ON_LEFT A logical flag indicating that a 'wall' occurs between the present frame being calibrated and the last quadratic fit. The fit should not be across 'walls'. Part of structure QUAD_FIT.

WD_100_MASK(2) A user input to the Level 1 program. Masks for clearing and setting bits of engineering word 100 bits: 1 = AND mask (for clearing); 2 = OR mask (for setting).

WD_101_QUAL(32) A user input to the Level 1 program. Array indicating if quality of multiplexed data for word 101 is good or bad. TRUE = good.

WD_102_MASK(2) A user input to the Level 1 program. Masks for clearing and setting bits of engineering word 102 bits: 1 = AND mask (for clearing); 2 = OR mask (for setting).

WD_103_QUAL(32) A user input to the Level 1 program. Array indicating if quality of multiplexed data for word 103 is good or bad. TRUE = good.

WD_104_QUAL(32) A user input to the Level 1 program. Array indicating if quality of multiplexed data for word 104 is good or bad. TRUE = good.

WD_96_QUAL(32) A user input to the Level 1 program.Array indicating if quality of multiplexed data for word 96 is good or bad. TRUE = good.

WD_98_QUAL(32) A user input to the Level 1 program. Array indicating if quality of multiplexed data for word 98 is good or bad. TRUE = good.

WD_99_QUAL(32) A user input to the Level 1 program. Array indicating if quality of multiplexed data for word 99 is good or bad. TRUE = good.

WINDOW_RED_REFS(90) Number of reference views in reduced window for each channel.

WINDOW_RED_SZ(90) Size of reduced window in MMIFs for each channel.

WINDOW_SZ A user input to the Level 1 program. Size of current window in MMAFs. Valid values are 3, 5, 7, 9, 11. A window is a set of time ordered data centered on the MMAF being calibrated.

WRITE_TIME(2) Time at which header was written (to various files) in UDTF format.

WRITE_TIME_TTD(2) Time at which TTD files were written.

X-X-X-X-X-X-X-X-X-X-X-X-X-X-X-X-X-X-X-X-X-X-X-X-X-X-X-X-X-X-X

X_I_STAR Structure containing NO_SV_ELMNTS, SV_ELMNTS and RADIANCES

Y-Y-Y-Y-Y-Y-Y-Y-Y-Y-Y-Y-Y-Y-Y-Y-Y-Y-Y-Y-Y-Y-Y-Y-Y-Y-Y-Y-Y-Y-Y

YPR(3) UARS yaw, pitch, and roll in degrees for the reference MMIF (i.e REF_MMIF)

Index 1 = 1 => yaw.
Index 1 = 2 => pitch.
Index 1 = 3 => roll.

YPR_RATE(3) UARS yaw, pitch, and roll rates in degrees per second for the reference MMIF(i.e REF_MMIF)

Index 1 = 1 => yaw.
Index 1 = 2 => pitch.
Index 1 = 3 => roll.

Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z-Z

ZER_BAD_FLAG(90) Flag set to TRUE indicating that the standard deviation of Zero counts is outside prescribed fixed values given by STD_ZER_RNG.

ZREF_GEOM Geometric height in km at pressure PREF.

ZREF_GEOPOT Geopotential height in km at pressure PREF obtained from HT_CORR.

Appendix B. CROSS REFERENCE

This appendix is the alphabetized list of all quantities that appear in the MLS files, plus some quantities that do not appear in any MLS files. Typically, quantities listed here that do not appear in MLS files are constant quantities in an include block. When an entire structure, such as OA_BUFFER, is in a file, the file name will appear for the structure and next to the indivudule fields of the structure. A file name will appear for a structure only when the entire structure is writen to the file as a structure.

The following is a list of the acronyms used for the file names:

DEFLTS	Level 1 Defalut Data File
DIAG	Level 1 Diagnostics File
ENG	Level 1 Engineering Output File
L2SCR	Level 2R Forward Scratch File
L1LOG	Level 1 Log File
L2OUT	Level 2R Output Product File
L3AP	Level 3APT Parameter File
LMFQ	Level 2 Last Major Frame Quantities File
PP_1	Level 1 Program Parameters
PP_TTD	TANTRAK Program Parameters
PP_2	RETRIV Program Parameters
RAD	Level 1 Limb Radiance File
TTDA	Level 2T TTDA File
TTDR	Level 2T TTDR File
TTDU	Level 2T TTDU File
UIP	Level 1 User Input File
UIPR	Level 2T User Input File
UIPT	Level 2R User Input FIle

ANT_OHMIC_RAD	DEFLTS
ANT_OHMIC_REF	DEFLTS
ANT_POS	ENG
ANT_RAD_OFFSET	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
ANT_SCAT_EFF	DEFLTS
ANT_SCAT_RAD	DEFLTS
ANT_XMISSION	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
ATT_TYP_VER	DEFLTS, DIAG, ENG, L1LOG, L2OUT, PP_1, PP_TTD, RAD, TTDU, UIP
AUX_DIR	
AVAIL_KEYS	TTDU

AVE_X	DEFLTS
AVE_X2	DEFLTS
AVE_Y	DEFLTS
AVG_PROBLTY	L2OUT
AZIM	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
A_PRIORI_TYPE	L2OUT, UIPR
BAD_CHANNEL_L1	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
BAD_CHANNEL_L2	L2OUT, UIPR
BAD_FRACTION	L2OUT
BAFFLE_RAD_LIM	DEFLTS
BAFFLE_RAD_SPV	DEFLTS
BAFFLE_RAD_TAR	DEFLTS
BAFFLE_XMIT_LIM	DEFLTS
BAFFLE_XMIT_SPV	DEFLTS
BAFFLE_XMIT_TAR	DEFLTS
BAND_AVG_CHI_SQ	DIAG, L1LOG
BAND_AVG_GAIN	DIAG, L1LOG
BAND_AVG_REC_NOISE	DIAG, L1LOG
BAND_BANK	DIAG, ENG, LMFQ, L2OUT, L2SCR, RAD, TTDR
BAND_INFO_DAY	L2OUT
BAND_INFO_MMAF	L2OUT, L2SCR
BAND_INFO_MMIF	L2OUT, L2SCR
BAND_WING_CHAN	L2OUT, UIPR
BANK	L2OUT, L2SCR
BANK3_NUM_SWITCH	L2OUT
BANK3_SWITCH_TIMES	L2OUT
BANK6_NUM_SWITCH	L2OUT
BANK6_SWITCH_TIMES	L2OUT
BANK_SWITCH_NOMINAL	L2OUT, UIPR
BSL_APR_METHOD	UIPR
BSL_LNTI	L2OUT, L2SCR
BSL_LNT1_SDEV	L2OUT, L2SCR
BSL_LNT2	L2OUT, L2SCR
BSL_LNT2_SDEV	L2OUT, L2SCR
BSL_LNT3	L2OUT, L2SCR
BSL_LNT3_SDEV	L2OUT, L2SCR
BSL_LNT4	L2OUT, L2SCR
BSL_LNT4_SDEV	L2OUT, L2SCR
BSL_LNT5	L2OUT, L2SCR
BSL_LNT5_SDEV	L2OUT, L2SCR
BSL_LNT6	L2OUT, L2SCR
BSL_LNT6_SDEV	L2OUT, L2SCR
BSL_LNT_VAR	L2OUT, UIPR
BSL_LNT_VAR_M3	L2OUT, UIPR
BSL_OFFI	L2OUT, L2SCR
BSL_OFF1_SDEV	L2OUT, L2SCR
BSL_OFF2	L2OUT, L2SCR
BSL_OFF2_SDEV	L2OUT, L2SCR
BSL_OFF3	L2OUT, L2SCR

BSL_OFF3_SDEV	L2OUT, L2SCR
BSL_OFF4	L2OUT, L2SCR
BSL_OFF4_SDEV	L2OUT, L2SCR
BSL_OFF5	L2OUT, L2SCR
BSL_OFF5_SDEV	L2OUT, L2SCR
BSL_OFF6	L2OUT, L2SCR
BSL_OFF6_SDEV	L2OUT, L2SCR
BSL_OFF_VAR	L2OUT, UIPR
BSL_OFF_VAR_M3	L2OUT, UIPR
BSL_QDT1	L2OUT, L2SCR
BSL_QDT1_SDEV	L2OUT, L2SCR
BSL_QDT2	L2OUT, L2SCR
BSL_QDT2_SDEV	L2OUT, L2SCR
BSL_QDT3	L2OUT, L2SCR
BSL_QDT3_SDEV	L2OUT, L2SCR
BSL_QDT4	L2OUT, L2SCR
BSL_QDT4_SDEV	L2OUT, L2SCR
BSL_QDT5	L2OUT, L2SCR
BSL_QDT5_SDEV	L2OUT, L2SCR
BSL_QDT6	L2OUT, L2SCR
BSL_QDT6_SDEV	L2OUT, L2SCR
BSL_QDT_VAR	L2OUT, UIPR
B_FIELDS	TTDU
CAL_RADIANCE_RNG	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
CAL_REF	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
CAL_TYPE	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
CHAN_STAT	L2OUT, L2SCR
CHISQ	L2OUT, L2SCR
CHISQ_APR_BRD	L2OUT, L2SCR
CHISQ_APR_FRD	L2OUT, L2SCR
CHISQ_LIMIT	L2OUT, UIPR
CHISQ_MMIF	L2OUT, L2SCR
CHI_SQUARE_REF	DIAG
CLI_FACTOR	UIPR
CLI_OFFSET_TEMP	L2OUT, UIPR
CLI_PRESS_THRESHOLD	L2OUT, UIPR
CLI_PROF_CALID	PP_TTD
CLOUT	TTDA
CLOUT_VAR	TTDA
CNSTRN	L2OUT
COEFF_A	DEFLTS
COEFF_B	DEFLTS
COEFF_C	DEFLTS
COLUMN_O3	L3AP
COLUMN_O3_183	L3AP
COLUMN_O3_183_SDEV	L3AP
COLUMN_O3_205	L3AP
COLUMN_O3_205_SDEV	L3AP
COLUMN_O3_SDEV	L3AP

COMB_COV	LMFQ
COMB_EST	LMFQ
COMB_O3	L2OUT, UIPR
CONSTRAINT_ORDER	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
CONTROL_AUTH	PP_2
CORR_CALID	PP_TTD
CORR_ERROR_FACTOR	PP_TTD
CORR_GRID	TTDA
CORR_SUBTYPE1	PP_TTD
CORR_SUBTYPE2	PP_TTD
CORR_SUBTYPE3	PP_TTD
CSFDU1	L2OUT
CSFDU2	L2OUT
CURR_PREV	L1LOG
C_ORDER	L2OUT, UIPR
DATA_GAP_TIMES	L2OUT
DATA_PRESENT	ENG
DEFAULTS_BUFF	DEFLTS
DEFLT_CALID	PP_1
DELTA_W	L2OUT, UIPR
DERIVATIVES	
DETAIL_OUTPUT	UIPR
DGAP_MMAF	DIAG, L2OUT, L2SCR, RAD, TTDR
DI_DSV_COMPONENT	
DTL_FILE_LID	PP_2
EARTH_GEOD_RAD	RAD, TTDR
EARTH_VEL_Z	L2OUT, L2SCR
ELEV	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
ENCODER_AT_HOME	
ENCODER_COUNTS	
ENCODER_STEP	
ENCR	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
END_TIME	L2OUT
EQUATOR_CROSS_FLAG	L1LOG
ERRORS	L1LOG
FBSW	L1LOG
FC	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
FILE_COMMENT	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
FILE_COMMENT_L2	L2OUT, UIPR
FLAG_AP	L2OUT, L2SCR
FLAG_AP_FST_CHAN	L2OUT, L2SCR
FLAG_AP_FST_ELMNT	L2OUT, L2SCR
FLAG_AP_FST_MMIF	L2OUT, L2SCR

FLAG_AP_FST_REF_TIME	L2OUT
FLAG_AP_NUMMMIF	L2OUT, L2SCR
FLAG_ASCEND	L2OUT, L2SCR, L3AP
FLAG_CHISQ_SPIKE	L2OUT, L2SCR
FLAG_CHISQ_SPIKE_NUM	L2OUT, L2SCR
FLAG_CHISQ_SPIKE_NUM_FST_CHAN	L2OUT, L2SCR
FLAG_CLI	L2OUT, L2SCR
FLAG_CLI_NUMMMAF	L2OUT
FLAG_FIRST_DAY	PP_2
FLAG_NEG	L2OUT, L2SCR
FLAG_NEG_FST_CHAN	L2OUT, L2SCR
FLAG_NEG_FST_ELMNT	L2OUT, L2SCR
FLAG_NEG_FST_MMIF	L2OUT, L2SCR
FLAG_NEG_FST_REF_TIME	L2OUT
FLAG_NEG_NUMMMAF	L2OUT
FLAG_NEG_NUMMMIF	L2OUT, L2SCR
FLAG_PTAN	L2OUT, L2SCR
FST_ELE_INDX	L2OUT, TTDA, TTDR, TTDU
GAIN	DEFLTS
GAIN_BAD_FLAG	DIAG
GAIN_COEFF_A	DIAG
GAIN_COEFF_B	DIAG
GAIN_COEFF_C	DIAG
GAIN_DELTA	DIAG
GAIN_RNG	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
GAIN_SIGMA	DIAG
GRNW_SID_TIME	L2SCR, RAD, TTDR
HGA_INTERFER	DEFLTS, DIAG, ENG, L1LOG, RAD, TTDR, TTDU, UIP
HGA_INTERFER_RNG	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
HGA_INTERFER_RNG_NUM	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
HT_CORR	TTDA
IDSV	L2OUT, TTDA, TTDR, TTDU, UIPR, UIPT
INST_ON	ENG
INST_SOLAR_AZIM	DIAG, ENG
INST_SOLAR_ELEV	DIAG, ENG
KMR	L2OUT, UIPR
K_CUT_OFF	L2OUT, UIPR
L2PCQ_CALID	PP_2, PP_TTD
L2PCQ_HEADER1	TTDU

L2PCQ_HEADER2	TTDU
L2PCQ_LINE1	L2OUT, TTDU
L2PCQ_LINE2	L2OUT, TTDU
L2PCQ_LINE3	L2OUT, TTDU
L2PCQ_PNUM	
LAT_DMAX	UIPR
LIMB_RAD_GOOD	L2OUT, L2SCR
LIMB_RAD_LIMIT	L2OUT, UIPR
LOG_FILE_LID	PP_1
LOG_FILE_LID	PP_2
LVL1_DATA	TTDR
LVL1_HDR	DEFLTS, DIAG, ENG, L1LOG, RAD, TTDU, UIP
LVL1_UIP	L2OUT, TTDU
LVL1_VERSIONNO	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
LVL2_DATA	L2OUT, L2SCR
LVL2_UIP	L2OUT
MAFA	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
MAG_FIELD_NOM	L2OUT, L2SCR
MAG_UNIT_VEC	L2OUT, L2SCR
MANEUVER_NUM_ORB	L2OUT
MANEUVER_NUM_ROLL	L2OUT
MANEUVER_NUM_UNDEF	L2OUT
MANEUVER_NUM_YAW	L2OUT
MANEUVER_NUM_ZERO	L2OUT
MANEUVER_STAT	L2OUT, L2SCR, L3AP, RAD, TTDR
MIN_FIT_SIGMA	DEFLTS, DIAG, ENG, L1LOG, L2OUT RAD, TTDU, UIP
MIN_GAIN_PTS	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
MLS_STATUS	DEFLTS, DIAG, L2OUT, L2SCR, RAD, TTDR
MLS_STATUS_DAY	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
MLS_VIEW_ANGLE	LMFQ
MMAFNO	DEFLTS, DIAG, ENG, L1LOG, L2OUT, L2SCR, L3AP, RAD, TTDR
MMAFNO_TIME	DEFLTS
MMAF_STAT	LMFQ, L2OUT, L2SCR, L3AP, RAD, TTDR
MMAF_TIME	DIAG, ENG, LMFQ, L1LOG, L2OUT, L2SCR, RAD, TTDA, TTDR
MMIF_BAD_MAX	L2OUT, UIPR
MMIF_STAT	LMFQ, L2OUT, L2SCR, RAD, TTDR
MOST_RECENT_Z	DEFLTS
MU	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
MUX_DATA	ENG
MUX_PSU	L1LOG
MUX_SENS	L1LOG

MUX_SPECT	L1LOG
NDATA	L2OUT, L2SCR
NMC_H2O_ERR_FACTOR	PP_TTD
NO_AVAIL_KEYS	TTDU
NO_ELMNTS_PER_SV_COMPONENT	TTDU
NO_MAG_FIELDS	TTDU
NO_POINTINGS	TTDU
NO_SV_COEFF	L2OUT, TTDA, TTDR, TTDU
NO_SV_COMPONENTS	TTDU
NO_SV_ELMNTS	TTDU
NPRFL	L2OUT
NPRFL_ELE	L2OUT
NSV	L2OUT, TTDA, TTDR, TTDU, UIPT
NUMMMAF	DEFLTS, DIAG, ENG, L1LOG, RAD, TTDU, UIP
NUMMMAF_GOOD_STATUS	L2OUT
NUM_BAD_MMAF	L2OUT
NUM_CHAN	L2OUT, L2SCR
NUM_CORR_PARAMS	PP_TTD
NUM_D_MMAF	DIAG
NUM_D_VIEWS	L1LOG
NUM_ELE	L2OUT, L2SCR
NUM_ENCODER_HITS	L1LOG
NUM_L_MMAF	DIAG
NUM_L_VIEWS	L1LOG
NUM_PRD_HITS	L1LOG
NUM_RANGE_HITS	L1LOG
NUM_S_MMAF	DIAG
NUM_S_VIEWS	L1LOG
NUM_TGT_TEMP_HITS	L1LOG
NUM_T_MMAF	DIAG
NUM_T_VIEWS	L1LOG
NUM_UNFORCED_WALLS	L1LOG
NUM_Z_MMAF	DIAG, L1LOG
NUM_Z_VIEWS	L1LOG
OA_ATT_RETRN	L2OUT, L2SCR, RAD, TTDR
OA_BUFFER	RAD, TTDR
OA_EPHEM_STATUS	RAD, TTDR
OA_LIMB_CALC_STATUS	RAD, TTDR
OA_ORB_RETRN	L2OUT, L2SCR, RAD, TTDR
OA_SAT_ATT_STATUS	RAD, TTDR
OA_SAT_ORB_STATUS	RAD, TTDR
OA_STATUS1	L2OUT, L2SCR, TTDR
OA_STATUS2	L2OUT, L2SCR, TTDR
OBJECT_FOV	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
OBJECT_SPV	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
OB_ENABLE	L1LOG
OB_INV	L1LOG

OLD_FILT_BANK_SWTCH	DEFLTS
OLD_MIX_BIAS	DEFLTS
OLD_MULT_BIAS	DEFLTS
OLD_RECEIVER_GAIN	DEFLTS
OPT_CAL_USED	DIAG
OPT_DEPTH_LIN_MAX	L2OUT, UIPR
OPT_DEPTH_LIN_MIN	L2OUT, UIPR
OPT_DEPTH_MAX	L2OUT,UIPR
ORB_TYP_VER	DEFLTS, DIAG, ENG, L1LOG, L2OUT, PP_1, PP_TTD, RAD, TTDU, UIP
OVERRIDE	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
PARAM_COUNT	TTDU
PARAM_TABLE_RETRIV	L2OUT
PARAM_TABLE_TANTRAK	L2OUT, TTDU
PHASE_LOCK	ENG
PH_LOCK	L1LOG
POINTINGS	TTDU
POWER_RELAY_STATUS	L1LOG
PRD_TEMPS	RAD, TTDR
PREF	L2OUT, L2SCR, L3AP
PREF_NOMINAL	L2OUT, UIPR
PROBLTY	L2OUT, L2SCR
PROC_DIR_OPT	L2OUT, UIPR
PROFILE	L2OUT, L2SCR
PROFILE_ERRRED	L2OUT, L2SCR
PROFILE_INDX	L2OUT
PROFILE_SDEV	L2OUT, L2SCR
PR_STATUS	ENG
PTAN63	L2OUT, L2SCR
PTAN63_APR_METHOD	L2OUT, UIPR
PTAN63_FRD	LMFQ
PTAN63_FRD_VAR	LMFQ
PTAN63_L2	LMFQ
PTAN63_L2_VAR	LMFQ
PTAN63_SAV	L2SCR
PTAN63_SAV_COV	L2SCR
PTAN63_SDEV	L2OUT, L2SCR
PTAN_CHISQ_THRESHOLD	L2OUT, UIPR
PTG_FOV_AZIM_183	L2OUT, L2SCR
PTG_FOV_AZIM_205	L2OUT, L2SCR
PTG_FOV_AZIM_OFFSET	L2OUT, L2SCR, RAD, TTDR
PTG_FOV_AZIM_REF	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
PTG_FOV_AZIM_THM	L2OUT, L2SCR, RAD, TTDR
PTG_FOV_AZIM_WDTH	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
PTG_FOV_BO_DIAG_AZIMDIF	L2OUT, L2SCR, RAD, TTDR
PTG_FOV_BO_DIAG_ELEVDIF	L2OUT, L2SCR, RAD, TTDR
PTG_FOV_BO_DIAG_MAP	L2OUT, L2SCR, RAD, TTDR
PTG_FOV_BO_DIAG_MMAF	L2OUT, L2SCR, RAD, TTDR
PTG_FOV_BO_DIAG_MMIF_FST	L2OUT, L2SCR, RAD, TTDR

PTG_FOV_BO_DIAG_MMIF_LST	L2OUT, L2SCR, RAD, TTDR
PTG_FOV_BO_DIAG_MMIF_NUM	L2OUT, L2SCR, RAD, TTDR
PTG_FOV_BO_MAP	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
PTG_FOV_BO_NUM	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
PTG_FOV_ELEV_183	L2OUT, L2SCR
PTG_FOV_ELEV_205	L2OUT, L2SCR
PTG_FOV_ELEV_OFFSET	LMFQ, L1LOG, L2OUT, L2SCR, RAD, TTDR
PTG_FOV_ELEV_REF	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
PTG_FOV_ELEV_THM	DEFLTS, DIAG, ENG, L1LOG, L2OUT, L2SCR, RAD, TTDR, TTDU, UIP
PTG_FOV_ELEV_WDTH	L2OUT
PTG_FOV_TABLE	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
PTG_INST2MACS_ELEV	L2OUT, L2SCR, RAD, TTDR
PTG_INST2MACS_ELEV_ERR	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
PTG_LIMB_PT	L2OUT, L2SCR, RAD, TTDR
PTG_SPV_AZIM	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
PTG_SPV_AZIM_WDTH	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
PTG_SPV_BO_MAP	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
PTG_SPV_BO_NUM	DEFLTS, DIAG, ENG, L1LOG, L2OUT,RAD, TTDU, UIP
PTG_SPV_ELEV	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
PTG_SPV_ELEV_WDTH	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
P_CORR	TTDA
QUAD_FIT_TYPES	DEFLTS
QUAD_MMAF	DEFLTS
QUAD_MMIF	DEFLTS
QUAD_TYPE	DEFLTS
QUALIFIER	DEFLTS, DIAG, ENG, L1LOG, L2OUT, PP_1, RAD, TTDA, TTDR, TTDU, UIP
QUALITY	L2OUT, L2SCR
QUALITY1	L2OUT
QUALITY2	L2OUT
QUALITY3	L2OUT
QUALITY4	L2OUT
QUALITY4_DAY	L2OUT
QUALITY_1_MMAF	L2OUT, L2SCR
QUALITY_2_MMAF	L2OUT, L2SCR
QUALITY_3_MMAF	L2OUT, L2SCR
QUALITY_4_MMAF	L2OUT, L2SCR
QUALITY_CLO	L3AP

QUALITY_H2O	L3AP
QUALITY_O3	L3AP
QUALITY_O3_183	L3AP
QUALITY_O3_205	L3AP
QUALITY_TEMP	L3AP
RAD_CNTL	ENG, L1LOG
RAD_ERR_FACTOR	L2OUT, UIPR
RAD_L1	RAD, TTDR
RAD_L1_MINMAX	DIAG, L1LOG
RAD_PARAMS_REC	DEFLTS
RECORDNO	DEFLTS, DIAG, ENG, L1LOG, L2OUT, L2SCR, RAD, TTDR, TTDU, UIP
RECORDNO_TTD	TTDA, TTDR
REC_NOISE_BAD_FLAG	DIAG
REC_NOISE_RNG	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
REC_NOISE_TEMP	DEFLTS, DIAG
REC_SZ	L2OUT
REC_TYPE	DIAG, ENG, L1LOG, RAD, TTDR, TTDU
REF_EARTH_RADIUS	L2OUT, L2SCR, RAD, TTDR
REF_LAT	DIAG, ENG, RAD, TTDR
REF_LONG	DIAG, L2OUT, L2SCR, RAD, TTDR
REF_MMIF	DEFLTS, DIAG, ENG, L1LOG, L2OUT, L2SCR, RAD, TTDR, TTDU, UIP
REF_SOLAR_ILLUM	DIAG, ENG, L2OUT, L2SCR, L3AP, RAD, TTDR
REF_SOLAR_TIME	L2OUT, L2SCR, RAD, TTDR
REF_SOLAR_ZEN	L2OUT, L2SCR, RAD, TTDR
REF_TIME	DEFLTS, DIAG, ENG, L1LOG, L2OUT, L2SCR, RAD, TTDA, TTDU, UIP
REF_TIME_FIRST	L2OUT
REJECT_LK_AHEAD	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
RETRIV	L2OUT
ROLLRATE_MLS	L2OUT, L2SCR
ROLLRATE_MLS_VAR	L2OUT, L2SCR
ROLLRATE_UARS	L2OUT, L2SCR, RAD, TTDR
ROLLRATE_VAR_MULT	L2OUT, UIPR
ROLL_MLS	L2OUT, L2SCR
ROLL_MLS_VAR	L2OUT, L2SCR
ROLL_UARS	L2OUT, L2SCR, RAD, TTDR
SAT_GCRAD	L2OUT, L2SCR, RAD, TTDR
SAT_GEOD_ALT	L2OUT, L2SCR, RAD, TTDR
SAT_GEOD_LAT	DIAG, ENG, L2OUT, L2SCR, RAD, TTDR
SAT_GEOD_STATUS	RAD, TTDR
SAT_LONG	DIAG, ENG, L2OUT, L2SCR, RAD, TTDR
SAT_VEL	RAD, TTDR

SAT_VEL_Z	L2OUT, L2SCR
SCAN_BIAS	L1LOG
SCAN_BIAS_ENABLE	L1LOG
SCAN_CHANGE	L3AP
SCAN_CHANGE_NUM	L2OUT
SCAN_PATTERN_CHANGE	L2OUT, L2SCR
SFDU1	L2OUT
SFDU2	L2OUT
SFDU_NUM	PP_2
SIGMA_CRITERION	L2OUT, UIPR
SPACE_RAD_CALID	PP_2
SPV	DEFLTS
SOURCE	PP_TTD
SPV_BAD_FLAG	DIAG
SPV_COEFF_A	DIAG
SPV_COEFF_B	DIAG
SPV_COEFF_C	DIAG
START_TIME	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
STATE	L2SCR
STATE_AUX	
STATE_CHAN_CNSTRN	L2OUT, UIPR
STATE_CHAN_RETRIV	L2OUT, UIPR
STATE_CORR	TTDA
STATE_CORR_VAR	TTDA
STATE_COV	
STATE_COV_TRI	L2SCR
STATE_FRD	LMFQ
STATE_FRD_COV	LMFQ
STD_SPV_RNG	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
STD_TAR_RNG	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
STD_ZER_RNG	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
STOP_TIME	DEFLTS, DIAG, ENG, L1LOG, RAD, TTDU, UIP
SURVIVAL_DATA	ENG
SV_COMPONENTS	TTDU
SV_COMPONENT_FST_ELMNT_INDEX	TTDU
SV_INFO	LMFQ, L2OUT
SV_RTRVL_BY_BAND	TTDU
SW_MIRROR	ENG
S_TEMP	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
TAR	DEFLTS
TAR_BAD_FLAG	DIAG
TAR_COEFF_A	DIAG
TAR_COEFF_B	DIAG
TAR_COEFF_C	DIAG
TAU	DEFLTS
TEST_FLAG	UIPR

TGT_TEMP	L1LOG
THEORETIC_ZERO_VAR	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
THERMAL_H_MATRIX	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
THRESHOLD_K_PTAN	L2OUT, UIPR
THRESHOLD_K_TEMP	L2OUT, UIPR
TNGT_GEOD_ALT	L2OUT, L2SCR, RAD, TTDR
TNGT_GEOD_ALT_MLS	L2OUT, L2SCR
TNGT_GEOD_ALT_MLS_VAR	L2OUT, L2SCR
TNGT_GEOD_ALT_REFR	LMFQ, L2OUT, L2SCR
TNGT_GEOD_ALT_REFR_MAX	L2OUT, L2SCR, L3AP
TNGT_GEOD_ALT_REFR_MIN	L2OUT, L2SCR, L3AP
TNGT_GEOD_LAT	RAD, TTDR
TNGT_LONG	RAD, TTDR
TRAILER_TIME	DIAG, ENG, RAD
TRANS_INST2ECI	DEFLTS, RAD, L2OUT, L2SCR, TTDR
TRANS_INST2OBS	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
TRANS_OBS2MACS	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
TRI_BASE_PSG	L2OUT, TTDA, TTDR, TTDU
TRI_BASIS_VERT_GRID	TTDU
TTD_LST_REC	TTDA, TTDR
TYPE	L2OUT, L2SCR, TTDA
TYPE_L2	L2OUT
UARS_CLI_CALID	PP_TTD
UARS_CLI_ERRORS	PP_TTD
UARS_DAY	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDA, TTDR, TTDU, UIP
UARS_FLYING_DIR	LMFQ, PP_2
UARS_YAW_PERIOD	LMFQ, PP_2
UIPR_CALID	PP_2
UIPT_CALID	PP_TTD
UPDATE_OA_OPTION	L2OUT, TTDU, UIPT
USER_CALID	PP_1
UTIME1	TTDA, TTDR, TTDU
UTIME2	TTDA, TTDR, TTDU
VAR_A	DEFLTS
VAR_B	DEFLTS
VAR_C	DEFLTS
VAR_D	DEFLTS
VAR_Y	DEFLTS
VERSIONNO_RETRIV	L2OUT, PP_2
VERSIONNO_TANTRAK	L2OUT, PP_TTD
VERSION_MLS_LEVEL1	PP_1
VERSION_TTD	TTDA, TTDR, TTDU
WALL_MMAF	DIAG, L2OUT, L2SCR, RAD, TTDR

WALL_ON_LEFT	DEFLTS
WD_100_MASK	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
WD_101_QUAL	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
WD_102_MASK	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
WD_103_QUAL	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
WD_104_QUAL	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
WD_96_QUAL	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
WD_98_QUAL	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
WD_99_QUAL	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
WINDOW_RED_REFS	DIAG, L2OUT, L2SCR, RAD, TTDR
WINDOW_RED_SZ	DIAG, RAD, TTDR
WINDOW_SZ	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
WRITE_TIME	DEFLTS, DIAG, ENG, L1LOG, L2OUT, RAD, TTDU, UIP
WRITE_TIME_TTD	TTDA, TTDR, TTDU
YPR	L2OUT, L2SCR, RAD, TTDR
YPR_RATE	L2OUT, L2SCR, RAD, TTDR
ZER	DEFLTS
ZER_BAD_FLAG	DIAG
ZREF_GEOM	L2OUT, L2SCR, L3AP
ZREF_GEOPOT	L2OUT, L2SCR, L3AP

Appendix C. MLS_STATUS

MLS_STATUS is a 4-byte integer word summarizing the UARS MLS instrument status. It is generated for each major frame from Level 0 data. A negative value indicates its value has changed since last generated. Note that an uninitialized value defaults to zero, so the first non-zero MLS_STATUS will be negative if it has not been initialized by a defaults input parameter. If engineering data used to determin MLS_STATUS is flagged as bad, the value of MLS_STATUS is not changed from its previous value. Bad engineering data is determined by parity and fill flags set at Level 0.

MLS_STATUS can be considered as the concatenation of the following words:

Word	Field Size	Indication	Bit Pattern
IL	5	Instrument oscillator out-of-lock.	0-4
IV	3	Voltage or current out-of-range.	5-7
IT	4	Instrument temperature out-of-range.	8-11
IF	4	Position of the filter bank switch.	12-15
IG	6	Commanded IF gain change.	16-21
IS	2	Commanded scan pattern change.	22-23
IP0	4	Instrument ANY power off/on status.	24-27
IP1	3	Instrument ALL power off/on status.	28-30
{sign}	1	Change in MLS_STATUS	31

Thus:

```
                    msb                                       lsb
MLS_STATUS = {sign}|IP1|IP0|IS|IG|IF|IT|IV|IL|
```

The following status words are evaluated as TRUE/FALSE. When the condition is TRUE, the associated bit is set.

IL: Instrument oscillator out-of-lock.

Any oscillator connected to BAND	IL bit
1	0
2	1
3	2
4	3
5 and 6	4

IV: Instrument voltage or current out-of-range.

Instrument	IV bit
Power supply assembly	0
Spectrometer assembly	1
Radiometer box	2

IT: Instrument temperature out-of-range.

Instrument	IT bit
Power supply assembly	0
Spectrometer assembly	1
Radiometer box	2
Antenna system	3

IG: Commanded IF gain change.

Band	IG bit	Band	IG bit
1	0	4	3
2	1	5	4
3	2	6	5

IP0: Instrument power on at any time for any subsystems. Bit 3 is unused.

Connected to	IP0 bit
R1	0
R2	1
R3	2

IP1: Instrument power on at all times for for all subsystems:

Connected to	IP1 bit
R1	0
R2	1
R3	2

The following words are evaluated in a different manner:

IS: Commanded scan pattern.

These 2 bits identify the current scan pattern by the 2 low order bits which will be loaded into word 144 of the LEVEL 0 data. This is an operational constraint which will implemented in the upload software.

IF: Position of the filter bank switch is set as follows.

The bits (0-2) of IF contain the octal representation of the band to which filter bank 3 is connected.

Bit (3) is set if filter bank 6 is connected to band 3.

If there is an unrecognized situation, all bits are set.

NOTE: Under normal operating conditions, MLS_STATUS = 77003000 hex (1996537856 decimal)