(2)

PL-TR-91-2190

DMSP SSIES-2 Data Processing Program: User's Guide

J. Robert Cornelius
Kevin P. Larson
Andrew J. Mazzella, Jr.

RDP Incorporated
486 Totten Pond Road
Waltham, Massachusetts 02154

11 July 1991

Scientific Report No. 3

Approved for public release; distribution unlimited

Phillips Laboratory
Air Force Systems Command
Hanscom AFB, Massachusetts 01731-5000

"This technical report has been reviewed and is approved for publication"

EDWARD C. ROBINSON
Contract Manager
Data Systems Branch
Aerospace Engineering Division

ROBERT E. McINERNEY, Chief
Data Systems Branch
Aerospace Engineering Division

C. NEALON STARK, Director
Aerospace Engineering Division

This report has been reviewed by the ESD Public Affairs Office (PA) and is releasable to the National Technical Information Service (NTIS).

Qualified requestors may obtain additional copies from the Defense Technical Information Center. All others should apply to the National Technical Information Service.

If your address has changed, or if you wish to be removed from the mailing list, or if the addressee is no longer employed by your organization, please notify GL/IMA, Hanscom AFB, MA 01731. This will assist us in maintaining a current mailing list.

Do not return copies of this report unless contractual obligations or notices on a specific document requires that it be returned.

Unclassified
SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION Unclassified	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3 DISTRIBUTION / AVAILABILITY OF REPORT Approved for public release distribution unlimited
2b DECLASSIFICATION / DOWNGRADING SCHEDULE	
4 PERFORMING ORGANIZATION REPORT NUMBER(S)	5 MONITORING ORGANIZATION REPORT NUMBER(S) PL-TR-91-2190
6a NAME OF PERFORMING ORGANIZATION RDP, Incorporated 6b OFFICE SYMBOL (If applicable)	7a NAME OF MONITORING ORGANIZATION Phillips Laboratory
6c. ADDRESS (City, State, and ZIP Code) 486 Totten Pond Road Waltham, MA 02154	7b ADDRESS (City, State, and ZIP Code) Hanscom Air Force Base Massachusetts 01731-5000
8a NAME OF FUNDING / SPONSORING ORGANIZATION 8b OFFICE SYMBOL (If applicable)	9 PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER F19628-89-C-0079
8c ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS

PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO	WORK UNIT ACCESSION NO
35160F	7659	05	AC

11 TITLE (Include Security Classification)
DMSP SSIES-2 Data Processing Program: User's Guide

12 PERSONAL AUTHOR(S)
Cornelius, J. Robert; Larson, Kevin P.; Mazzella, Andrew J., Jr.

13a TYPE OF REPORT	13b TIME COVERED	14 DATE OF REPORT (Year, Month, Day)	15 PAGE COUNT
Scientific Report #3	FROM 90/6/1 TO 91/6/28	1991 July 11	60

16 SUPPLEMENTARY NOTATION

17 COSATI CODES			18 SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	Ionosphere Particle detectors
04	01		

19 ABSTRACT (Continue on reverse if necessary and identify by block number)

This is a basic utilization guide for the SSIES-2 (Special sensor for Ions, Electrons, and Scintillation) data processing, reflecting the operational aspects of the SSIES-2 program.

20. DISTRIBUTION / AVAILABILITY OF ABSTRACT	21 ABSTRACT SECURITY CLASSIFICATION
☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ DTIC USERS	Unclassified

22a NAME OF RESPONSIBLE INDIVIDUAL	22b TELEPHONE (Include Area Code)	22c OFFICE SYMBOL
Edward C. Robinson	(617) 377-3840	LCY

DD FORM 1473, 84 MAR 83 APR edition may be used until exhausted
All other editions are obsolete.

SECURITY CLASSIFICATION OF THIS PAGE
Unclassified

Table of Contents

Tables

Figures

Preface

This document is a basic utilization guide for the SSIES-2 data processing, reflecting the operational aspects of the SSIES2 program, rather than the differences between the SSIES and SSIES2 data processing programs. Thus, the parameters and procedures described here mainly consist of an update of the SSIES procedures, particularly those described in Reference 5, with further information derived from References 1 and 4. Our reliance upon these reports, for both the procedural and analysis aspects of the SSIES2 development, was significant, and they greatly facilitated the development effort.

This effort was performed by the Data Analysis Services group of RDP Incorporated for the Data Systems branch of Phillips Laboratory, under contract F19628-89-C-0079, with technical information being provided by Frederick Rich. Besides the authors, other RDP participants in the software analysis, development, data synthesis, and testing were John Casserly, Michael Delorey, and John Palys. Much of the report preparation was performed by Sharon Poisson.

Introduction

The SSIES-2 system is a composite sensor for thermal plasma measurements which has been developed as a successor to the SSIES (Special Sensor for Ions, Electrons, and Scintillation) instrument flown on several Defense Meterological Satellite Program vehicles. This report describes the utilization of the software program SSIES2, which was developed at Phillips Laboratory from the original Air Force Global Weather Center SSIES processing program.

The major components of the SSIES-2 system, as shown in Figure 1, are:
a) The Main Electronics Package (MEP,MP),
b) The Drift Scintillation Meter Electronics Package (DSM,DM/SM),
c) The Electron Sensor Assembly (EP),
d) The Electron Electrometer Package (EL/AMP), and
e) The Ion Sensor Array Assembly (RPA).
The ion sensor array assembly consists of three planar ion sensors with an electrostatic ground plane. The electron sensor assembly consists of a spherical sensor and a boom. Control grids within the sensors are electrostatically biased in order to separate and characterize the components of the plasma entering the sensor apertures. The bias voltages on the grids are held at fixed or varying potentials with respect to the system ground depending on the sensor function. The sensor system ground is floated from the spacecraft ground in order to maintain the sensors at an electrostatic potential near that of the external plasma. The bias potential for the sensor system ground may be determined by analysis of the data on the ground and set by ground command, but normally the electronics package will automatically determine and set the bias potential.[1]

The parameters measured by the SSIES-2 system include the temperature and density of the ions and electrons. These measurements are determined at intervals of 4 seconds or 30 km of travel. The ion density is also sampled/detected for a series of scale size variations from 1.5 kHz (approximately five meters of travel) to several seconds (tens of kilometers of travel). In addition, the arrival angle and speed of the ions are determined in order to find the "wind speed" or drift of the ions in the environment. The ions are separated to determine the percentages of the major components (O^+, H^+ and He^+) in the section of the ionosphere the spacecraft travels through. On command, grid biases can be adjusted to separate the drift of the light components (H^+ and He^+) from the drift of the heavy components. Also, several scale sizes of variations in the drift can be

[1] For a more detailed report of the SSIES-2 instruments and operation, see Reference 1.

detected from approximately 5 meters to several thousands of kilometers.

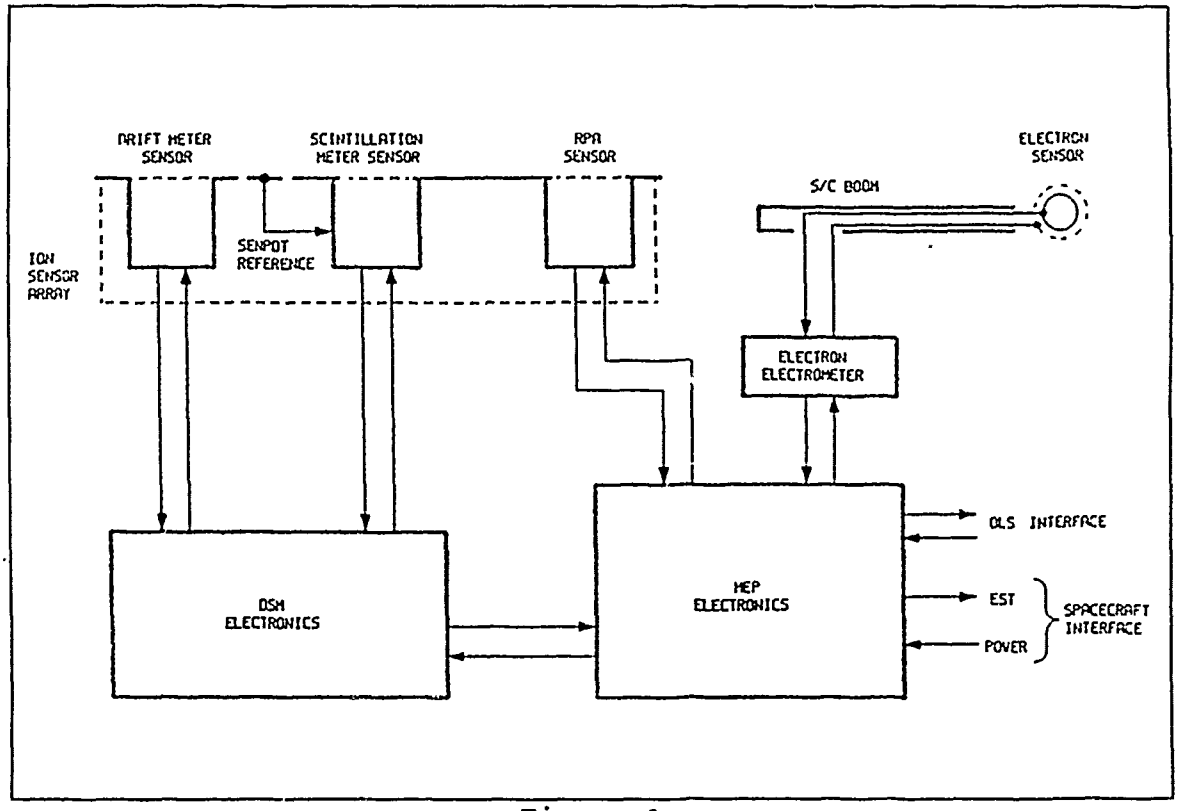

Figure 1

SSIES-2 Block Diagram

SSIES2 Program - Structural Hierarchy

The following outline describes the structural module hierarchy for the SSIES2 program, with a brief description of each routine. Because of conditional execution provisions, the routines are not necessarily invoked in the order presented.

Routines indicated by "[RDP]" were developed by RDP Incorporated to replace system-dependent routines in the original SSIES program, which was implemented for a 36-bit UNIVAC system with a specialized data access interface. With the exception of Q36BIT, none of these routines were intrinsically part of the original SSIES program, so that source code was not available for their development, and, consequently, their functional roles could be determined only by examination of the existing SSIES code.

```
SSIES:          Top-level program, calling other main modules
.DSSIES:        Block data

.TIMES:         report clock and CP time
..ADATE:        report date and time from system [RDP]
..CPU:          report CPU time from system [RDP]

.INIT:          initialize reference variables and data files
..CDATE:        reformat date and time for program use
...ADATE:       date and time report from system [RDP]
...TIMCON:      convert between UT and IES reference minutes
..VSWEEP:       initialize reference EP and RPA sweep voltages
..OPNPRP:       initialize IESPREPFILE
...SPFDIR:      obtain file directory header [RDP]
...BITS:        extract value from designated bits [RDP]
...COPY:        initialize array or transfer values between arrays
                    [RDP]
...FILERR:      determine and report file error status
..OPNEDR:       initialize IESEDRFILE
...SPFPFN:      substitute for UNIVAC file routine (no-op) [RDP]
...PRNTON:      set PRINTAWAY status for conclusion of processing
...FILERR:      determine and report file error status
..OPNAPX:       acquire APEX conversion table from IESAPEXTABLE
...FILERR:      determine and report file error status
..OPNXFR:       initialize IESAGDBXFR1 or IESAGDBXFR2
...PRNTON:      set PRINTAWAY status for conclusion of processing
...FILERR:      determine and report file error status
..OPNSTF:       initialize IESSTATFILE
...PRNTON:      set PRINTAWAY status for conclusion of processing
...FILERR:      determine and report file error status
..FILERR:       determine and report file error status

.INPUT:         acquire and distribute SSIES-2 data
..FETCH:        acquire and distribute one minute of data
...SPFDAT:      acquire one minute of data, with header, from
                    IESPREPFILE [RDP]
```

```
...SPFROR:    acquire Read-Out Rev information, using IESHDRDATA
                  [RDP]
...SPFUDT:    substitute for update of Read-Out Rev status
                  (no-op) [RDP]
...FFDASC:    translate Read-Out Rev format [RDP]
...PRNTON:    set PRINTAWAY status for conclusion of processing
..EPHEM:      prepare ephemeris information for processing
...TIMCON:    convert between UT and IES reference minutes
...LATLON:    calculate latitude and longitude from orbit
                  parameters
...APXTAB:    convert to APEX latitude and longitude
....OFFSET:   convert between geographic and magnetic dipole
                  coordinates
....INTERP:   interpolate from a list of values
...PRNTON:    set PRINTAWAY status for conclusion of processing
..VEHPAR:     acquire processing parameter values for current
                  satellite
...COPY:      initialize array or transfer values between arrays
                  [RDP]
..PRNTON:     set PRINTAWAY status for conclusion of processing
..COPY:       initialize array or transfer values between arrays
                  [RDP]
..Q36BIT:     acquire one second of instrument data for
                  processing [RDP]
..CHEKIT:     assess validity of one-second data frame
..DECODE:     distribute data frame values for processing, in
                  proper units
...DSMSTT:    determine instrument status from DSM subcom
...DECDMP:    print data frame information, for diagnostics
..HSKPNG:     acquire and assess sensor housekeeping data

.PROCES:      process one data frame
..SMPRC:      process scintillation meter (SM) data
...RANGE:     interpret electrometer/SM-wideband range setting
                  value
....SMCMD:    interpret SM command value
...PRNTON:    set PRINTAWAY status for conclusion of processing
...ELAMP:     convert electrometer/SM-wideband values to ion
                  density
....COPY:     initialize array or transfer values between arrays
                  [RDP]
....FND511:   search for range change flag in SM data sequence
....PRMRNG:   check environment parameters against allowed
                  ranges
...COPY:      initialize array or transfer values between arrays
                  [RDP]
...FILTER:    convert SM filter band values to power spectral
                  density values
...SMDIAG:    report SM processing diagnostics
....OPNDOF:   initialize diagnostic output file
.....BITON:   test for bit setting
.....FILERR:  determine and report file error status
```

```
.....PRNTON:   set PRINTAWAY status for conclusion of processing
....FILERR:    determine and report file error status
..EPPRC:       process electron probe (EP) data
...SWPCOL:     accumulate data for a complete sweep analysis
....COPY:      initialize array or transfer values between arrays
                    [RDP]
...EPSWP:      process EP sweep data for density, temperature,
                    and potential
....COPY:      initialize array or transfer values between arrays
                    [RDP]
....EPDIAG:    report EP processing diagnostics
.....OPNDOF:   initialize diagnostic output file
......BITON:   test for bit setting
......FILERR:  determine and report file error status
......PRNTON:  set PRINTAWAY status for conclusion of processing
.....LOGLIN:   transform tabulated values between standard and
                    log10 form
.....FILERR:   determine and report file error status
....FITLIN:    perform linear least-squares fit for tabulated
                    values
....NTRP:      perform two-point interpolation
....PRMRNG:    check environment parameters against allowed
                    ranges
...SELNRM:     select normalization density or temperature for EP
                    DC analysis
...EPDC:       process EP DC (dwell) data for electron density
....PRMRNG:    check environment parameters against allowed
                    ranges
..RPAPRC:      process retarding potential analyzer (RPA) data
...SWPCOL:     accumulate data for a complete sweep analysis
...RPAALG:     process RPA sweep data for density, temperature,
                    and potential
....COPY:      initialize array or transfer values between arrays
                    [RDP]
....LOGLIN:    transform tabulated values between standard and
                    log10 form
....CHKSWP:    pre-process and validate RPA sweep data
.....RPDIAG:   report RPA processing diagnostics
......OPNDOF:  initialize diagnostic output file
.......BITON:  test for bit setting
.......FILERR: determine and report file error status
.......PRNTON: set PRINTAWAY status for conclusion of processing
......FILERR:  determine and report file error status
.....MEANSD:   calculate mead and standard deviation for list of
                    values
....XPOS:      determine voltages for specified sweep currents
.....COPY:     initialize array or transfer values between arrays
                    [RDP]
....RPDIAG:    report RPA processing diagnostics
....SSLOPE:    find local minimum in slope of sweep profile
.....COPY:     initialize array or transfer values between arrays
                    [RDP]
```

```
.....FITLIN:   perform linear least-squares fit for tabulated
                    values
....PLASMA:    determine environmental parameters from
                    engineering data
.....ERF:      error function for normal (Gaussian) distribution
....PRMRNG:    check environment parameters against allowed
                    ranges
....RPASWP:    calculate instrument response to specified plasma
                    environment
.....ERF:      error function for normal (Gaussian) distribution
....COMPAR:    determine variance between measured and
                    theoretical sweeps
....ANLSAV:    store RPA sweep solution
....FITLIN:    perform linear least-squares fit for tabulated
                    values
..DMPRC:       proc ss driftmeter (DM) data
...DMINFO:     determine current state of DM sensor
....DMCMD:     interpret DM command value
.....DMSWCH:   set processing status for DM mode change
.....PRNTON:   set PRINTAWAY status for conclusion of processing
....PRNTON:    set PRINTAWAY status for conclusion of processing
...PRNTON:     set PRINTAWAY status for conclusion of processing
...DMVEL:      convert DM voltages to ion drift velocity and
                    angle of arrival
...PRMRNG:     check environment parameters against allowed
                    ranges
...DMDEN:      calculate ion density for DM log level data
...DMFIBA:     convert DM filter band values to power spectral
                    density values
....OPNDOF:    initialize diagnostic output file
.....BITON:    test for bit setting
.....FILERR:   determine and report file error status
.....PRNTON:   set PRINTAWAY status for conclusion of processing
...HPMODE:     report DM H+ mode data
....OPNDOF:    initialize diagnostic output file
.....BITON:    test for bit setting
.....FILERR:   determine and report file error status
.....PRNTON:   set PRINTAWAY status for conclusion of processing
...DMDIAG:     report DM processing diagnostics
....OPNDOF:    initialize diagnostic output file
.....BITON:    test for bit setting
.....FILERR:   determine and report file error status
.....PRNTON:   set PRINTAWAY status for conclusion of processing
....FILERR:    determine and report file error status
..MPPRC:       process microprocessor (MP) data
...BITON:      test for bit setting
...MPEP:       process MP data for EP
....COPY:      initialize array or transfer values between arrays
                    [RDP]
....UPBITS:    unpack bits from a word into an array
....PRMRNG:    check environment parameters against allowed
                    ranges
```

```
...MPRPA:      process MP data for RPA
....COPY:      initialize array or transfer values between arrays
                   [RDP]
....UPBITS:    unpack bits from a word into an array
....PRMRNG:    check environment parameters against allowed
                   ranges
...MPDIAG:     report MP diagnostics, and EPPRC/RPAPRC comparison
....BITON:     test for bit setting
....OPNDOF:    initialize diagnostic output file
.....BITON:    test for bit setting
.....FILERR:   determine and report file error status
.....PRNTON:   set PRINTAWAY status for conclusion of processing
....LATLON:    calculate latitude and longitude from orbit
                   parameters
..CKLPRC:      perform calculations for CKL analysis
...BITON:      test for bit setting
...CKLSAV:     collect density and SM filter data
....COPY:      initialize array or transfer values between arrays
                   [RDP]
...PRNTON:     set PRINTAWAY status for conclusion of processing
...COPY:       initialize array or transfer values between arrays
                   [RDP]
...CKLPRP:     prepare plasma density data for CKL calculation
....DENFIX:    interpolate for missing density data values
....DETRND:    detrend data and compute absolute and relative RMS
.....COPY:     initialize array or transfer values between arrays
                   [RDP]
...ENVMOD:     calculate ionospheric model irregularity
                   parameters
....ERF:       error function for normal (Gaussian) distribution
...BLDPDS:     calculate power spectrum from density and filter
                   values
....DENPDS:    compute FFT of detrended density data
.....WINDOW:   calculate FFT windowing weight factors
......COPY:    initialize array or transfer values between arrays
                   [RDP]
.....FFT:      interface to IEEE FFT routines
......FR2TR:   IEEE radix 2 iteration routine
......FR4TR:   IEEE radix 4 iteration routine
......FORD1:   IEEE in-place reordering routine
......FORD2:   IEEE in-place reordering routine
.....BSMOO:    perform binomial weight smoothing for data
.....COPY:     initialize array or transfer values between arrays
                   [RDP]
....FILPDS:    compute power spectrum from SM filter data
...TANDP:      calculate T1 and P1 parameters from power spectrum
....LSF:       perform linear least-squares fit for data
...PRMRNG:     check environment parameters against allowed
                   ranges
...DVAVE:      compute average values of ion drift velocity
...CVEFF:      calculate effective spacecraft velocity relative
                   to irregularities
```

```
....CTRANS:    transform between spacecraft and geographic
                    coordinates
....MAGFLD:    calculate magnetic field from model
.....IGRF80:   initialize coefficients for IGRF-80 model
....CMAT:      construct transformation matrix for irregularity
                    coordinates
...CK:         compute the CK irregularity parameter estimate
...CKDIAG:     report CKL processing diagnostics
....OPNDOF:    initialize diagnostic output file
.....BITON:    test for bit setting
.....FILERR:   determine and report file error status
.....PRNTON:   set PRINTAWAY status for conclusion of processing
....FILERR:    determine and report file error status
..QCPRC:       perform and report intercomparisons of processor
                    results
...SCDIAG:     report spacecraft and processing diagnostics
....BITON:     test for bit setting
...IAVRGE:     compute an integer average for specified sum
...AVRAGE:     compute a floating point average for specified sum
...LDSTF:      prepare IESSTATFILE for new status report
....TIMCON:    convert between UT and IES reference minutes
....PRNTON:    set PRINTAWAY status for conclusion of processing
....COPY:      initialize array or transfer values between arrays
                    [RDP]
....SFSUM:     report summary records
....FILERR:    determine and report file error status
...COPY:       initialize array or transfer values between arrays
                    [RDP]
...QCRPA:      obtain ion data from RPAPRC or MPPRC results
...QCEP:       obtain electron data from EPPRC or MPPRC results

.OUTPUT:       generate IESEDRFILE and IESAGDBXFR records
..WRTEDR:      process the Environmental Data Records (EDRs) for
                    output
...TIMCON:     convert between UT and IES reference minutes
...PRNTON:     set PRINTAWAY status for conclusion of processing
...COPY:       initialize array or transfer values between arrays
                    [RDP]
...EDRPRT:     generate an EDR summary text report
....OPNDOF:    initialize diagnostic output file
.....BITON:    test for bit setting
.....FILERR:   determine and report file error status
.....PRNTON:   set PRINTAWAY status for conclusion of processing
...FILERR:     determine and report file error status
..WRTXFR:      process AGDB summary records
...LDXFR:      generate AGDB record from EDR
...XFRPRT:     generate an AGDB record text report
....OPNDOF:    initialize diagnostic output file
.....BITON:    test for bit setting
.....FILERR:   determine and report file error status
.....PRNTON:   set PRINTAWAY status for conclusion of processing
```

```
...COPY:        initialize array or transfer values between arrays
                    [RDP]
...PRNTON:      set PRINTAWAY status for conclusion of processing
...FILERR:      determine and report file error status
..SETEDR:       initialize EDR segments for IESEDRFILE
...PRNTON:      set PRINTAWAY status for conclusion of processing
...TIMCON:      convert between UT and IES reference minutes
...COPY:        initialize array or transfer values between arrays
                    [RDP]
...FILERR:      determine and report file error status
..LDEDR:        store processed data into EDR output arrays
...COPY:        initialize array or transfer values between arrays
                    [RDP]
...LDSWPS:      acquire EP or RPA results for EDR

.SUMOUT:        generate summaries at end of processing
..PRNTON:       set PRINTAWAY status for conclusion of processing
..SFSUM:        report summary records
..IESPRT:       transfer information from diagnostic file to
                    summary file
..FILERR:       determine and report file error status

.QUIT:          prepare printing status and data file transfer
..FSETC:        substitute for UNIVAC control of PRINTAWAY
                    processor (no-op) [RDP]
..CONWT:        communicate to operator's console [RDP]
```

LDCON/IESCNTRLFILE Parameters

The following lists contain identifications for the operating parameters for the SSIES2 program, as provided in the file IESCNTRLFILE. The associated SSIES2 program variables for these parameters are also identified, as are the mnemonics used in the LDCON program, which translates the user input specifications into the binary format IESCNTRLFILE.

The LDCON program utilized for this format translation was developed for SSIES2 based on an operational emulation of the original AFGWC LDCON program for SSIES. However, the SSIES2 program version does not contain all of the performance capabilities of the original AFGWC LDCON version, including the DISPLAY option.

The particular values listed are appropriate to the test input data for the SSIES2 program, which consisted of DMSP F8 SSIES data edited, reformatted, and augmented to represent SSIES-2 data. These values are also the default values supplied within LDCON. However, many of these values will not be appropriate for the first actual SSIES-2 instrument.

Satellite Identifiers

LDCON	Value	SSIES2	Description
NUMVEH	1	NUMSAT	Number of DMSP satellites in data set
MID01	9543	MISSN(1)	Mission ID for satellite 1
MID02		MISSN(2)	Mission ID for satellite 2
MID03		MISSN(3)	Mission ID for satellite 3
FID01	08	IDFLT(1)	Flight ID for satellite 1
FID02		IDFLT(2)	Flight ID for satellite 2
FID03		IDFLT(3)	Flight ID for satellite 3

Program Information Parameters

LDCON	Value	SSIES2	Description
IPPCF	0	IPAWAY	PRINTAWAY processor control: IPAWAY = 0 for internal determination; IPAWAY = 1 for no PRINTAWAY execution
ISPINT	12	INTSUM	Statistics file summary print interval, in hours (PRINTAWAY disabled for non-zero ISPINT)
ICDMF	0	ICNWRT	Console message control: ICMDF = 0 in operational mode; ICMDF = 1 for messages in listing
IPCDPF	0	ISSDGP	Diagnostic print control: IPCDPF = 0 in operational mode; IPCDPF = (1,2,3,4) for increasing amounts of diagnostic reporting

Ionospheric Irregularity Model Parameters

LDCON	Value	SSIES2	Description
AEQLAT	50.0	SCNPAR(1): AE	Equatorial value for "a"
AMALAT	8.0	SCNPAR(2): AA	Mid/Auroral latitude value for "a"
BALAT	0.75	SCNPAR(3): BH	Auroral latitude value for "b"
EQBLAT	20.0	SCNPAR(4): GMLA	Equatorial latitude boundary location
EQBWDT	3.0	SCNPAR(5): GMLAW	Width of transition across equatorial boundary
AUBLAT	71.8	SCNPAR(6): GML1	Latitude of auroral boundary for K_p = 0
AUBKPV	1.5	SCNPAR(7): CK	Variation of auroral boundary with K_p
AUBTMV	5.5	SCNPAR(8): CBT	Variation of auroral boundary with time
AUBTMO	2.0	SCNPAR(9): DBT	Local time offset of the auroral boundary
AUBWDT	0.15	SCNPAR(10): CHB	Width of transition across auroral boundary
DELTA	0.0	SCNPAR(11): DELTA0	Angle between irregularity sheets and L-shell
EFFLEQ	1.5E6	SCNPAR(12): LE	Equatorial value for effective layer thickness
EFFLML	4.5E6	SCNPAR(13): LM	Mid-latitude value for effective layer thickness
EFFLAU	3.5E7	SCNPAR(14): LA	Auroral value for effective layer thickness
P1MOD	1.5	SCNPAR(15): Q	Value for "p_1"

Processing Control Parameters

LDCON	Value	SSIES2	Description
IPCRPA	1	INFOPR(1): IDORP	RPA process control (0 = off; 1 = on)
IPCEP	1	INFOPR(2): IDOEP	EP process control (0 = off; 1 = on)
IPCDM	7	INFOPR(3): IDODM	Driftmeter process control: Bit 1 (LSB) controls Normal processing (0 = off; 1 = on); bit 2 controls H+ processing; bit 3 controls FIBA processing

Processing Control Parameters

LDCON	Value	SSIES2	Description
IPCSM	3	INFOPR(4): IDOSM	Scintillation Meter process control: Bit 1 (LSB) controls EL/AMP data (0 = off; 1 = on); bit 2 controls filter data
IPCMP	3	INFOPR(5): IDOMP	Microprocessor process control: Bit 1 (LSB) controls EP report (0 = off; 1 = on); bit 2 controls RPA report
IPCCKL	1	INFOPR(6): IDOCK	CKL process control (0 = off; 1 = on; N > 1 = process every N'th CKL period)
IPCQC	1	INFOPR(7): IDOQC	Quality Control report control (0 = off, with no summary status records; 1 = on)
IPCBEP	1	INFOPR(8): IDBEP	EP sweep analysis source designation (1 = EP; 2 = microprocessor)
IPCBRP	1	INFOPR(9): IDBRP	RPA sweep analysis source designation (1 = RPA; 2 = microprocessor)
IPCDEN	1	INFOPR(10): ISWNE	Plasma density source designation (1 = SM [EL/AMP]; 2 = DM [LLA/LLB]; 3 = EP [modes C, D, DS]
IPCXXX	1	INFOPR(11): ISWVP	Spare
IPCDCK	2	INFOPR(12): ISWCKL	Plasma density source designation for CKL (1 = SM [EL/AMP]; 2 = SM [EL/AMP and filters]; 3 = EP [modes C, D, DS]
IDEFRE	0	INFOPR(13): IDEFRE	Default setting for RPA or EP currents in telemetry (0 = RPA; 1 = EP)

Diagnostic Control Parameters

LDCON	Value	SSIES2	Description
IDPRPA	0	INFODG(1): IRPDGP	RPA diagnostic report control: (0 = no diagnostic output; 1 = binary diagnostic output; 2 = text diagnostic output; 3 = both binary and text diagnostic output; (-2,-3) = text diagnostic output in standard print file)

Diagnostic Control Parameters

LDCON	Value	SSIES2	Description
IDPEP	0	INFODG(2): IEPDGP	EP diagnostic report control: (0 = no diagnostic output; 1 = binary diagnostic output; 2 = text diagnostic output; 3 = both binary and text diagnostic output; (-2,-3) = text diagnostic output in standard print file)
IDPDM	0	INFODG(3): IDMDGP	DM diagnostic report control: (0 = no diagnostic output; 1 = binary diagnostic output; 2 = text diagnostic output; 3 = both binary and text diagnostic output; (-2,-3) = text diagnostic output in standard print file)
IDPSM	0	INFODG(4): ISMDGP	SM diagnostic report control: (0 = no diagnostic output; 1 = binary diagnostic output; 2 = text diagnostic output; 3 = both binary and text diagnostic output; (-2,-3) = text diagnostic output in standard print file)
IDPMP	3	INFODG(5): IMPDGP	MP diagnostic report control: (0 = no diagnostic output; 1 = EP analysis text output; 2 = RPA analysis text output; 3 = both EP and RPA analysis text output; (-1,-2,-3) = text analysis output in standard print file, with PRINTAWAY disabled)
IDPCKL	0	INFODG(6): ICKDGP	CKL diagnostic report control: (0 = no diagnostic output; 1 = binary diagnostic output; 2 = text diagnostic output; 3 = both binary and text diagnostic output; (-2,-3) = text diagnostic output in standard print file)
IDPQC	0	INFODG(7): IQCDGP	QC diagnostic report control: (0 = no diagnostic output; 1 = text diagnostic output in standard print file)
IDPEDR	0	INFODG(8): IEDDGP	EDR diagnostic report control: (0 = no diagnostic output; 1 = text diagnostic output; N > 1 = text diagnostic output every N'th Environmental Data Record)

Diagnostic Control Parameters

LDCON	Value	SSIES2	Description
IDPXFR	0	INFODG(9): IAGDGP	AGDB diagnostic report control: (0 = no diagnostic output; 1 = text diagnostic output; -1 = text diagnostic output in standard print file)
IDPXXX	0	INFODG(10): IXXDGP	Spare

Data Frame Conversion Factors

Each associated telemetry quantity (T) is converted to a physical or engineering value (V) according to:

$$V = Ann1*T + Ann0$$

LDCON	Value	SSIES2	Description
A011	0.01202	FCONV(1,1)	EP log current
A010	-10.0009	FCONV(2,1)	
A021	0.01	FCONV(1,2)	SM EL/AMP voltage
A020	0.0	FCONV(2,2)	
A031	0.01005	FCONV(1,3)	RPA log current
A030	-11.30128	FCONV(2,3)	
A041	0.01	FCONV(1,4)	RPA thermistor voltage
A040	0.00	FCONV(2,4)	
A051	0.01	FCONV(1,5)	EP thermistor voltage
A050	0.00	FCONV(2,5)	
A061	0.01	FCONV(1,6)	DM offset voltage
A060	0.0	FCONV(2,6)	
A071	0.01	FCONV(1,7)	SM/DM filter and range voltages
A070	0.0	FCONV(2,7)	
A081	0.01	FCONV(1,8)	DM LLA/LLB voltage
A080	0.0	FCONV(2,8)	
A091	0.01	FCONV(1,9)	DM signal level voltage
A090	0.0	FCONV(2,9)	
A101	0.01	FCONV(1,10)	Electronics temperature voltage
A100	0.0	FCONV(2,10)	
A111	0.16	FCONV(1,11)	VAPER voltage (VBIAS + VIP)
A110	-40.96	FCONV(2,11)	
A121	1.00	FCONV(1,12)	VBIAS voltage
A120	-3.0	FCONV(2,12)	
A131	-1.00	FCONV(1,13)	VIP voltage
A130	0.0	FCONV(2,13)	
A141	0.25	FCONV(1,14)	Temperature monitor voltage
A140	-35.0	FCONV(2,14)	
A151	20.00	FCONV(1,15)	MP electron temperature
A150	0.0	FCONV(2,15)	
A161	0.012	FCONV(1,16)	MP electron density
A160	-10.0	FCONV(2,16)	
A171	20.00	FCONV(1,17)	MP H^+ temperature

Data Frame Conversion Factors

LDCON	Value	SSIES2	Description
A170	0.0	FCONV(2,17)	
A181	0.01	FCONV(1,18)	MP H^+ density
A180	1.0	FCONV(2,18)	
A191	20.00	FCONV(1,19)	MP O^+ temperature
A190	0.0	FCONV(2,19)	
A201	0.01	FCONV(1,20)	MP O^+ density
A200	1.0	FCONV(2,20)	
A211	1.33	FCONV(1,21)	MP input current
A210	0.0	FCONV(2,21)	
A221	40.0	FCONV(1,22)	MP ram ion drift velocity
A220	-1.0E4	FCONV(2,22)	
A231	0.10	FCONV(1,23)	MP EP analysis sensor potential
A230	-10.0	FCONV(2,23)	
A241	0.02	FCONV(1,24)	MP RPA analysis sensor potential
A240	-6.0	FCONV(2,24)	
A251	0.01	FCONV(1,25)	Sensor temperature voltage
A250	0.00	FCONV(2,25)	

RPA Processing Parameters

LDCON	Value	SSIES2	Description
DSPOTD	-2.0	INFORP(1): RPDSPD	Default sensor potential value in darkness, in volts
DSPOTS	-0.5	INFORP(2): RPDSPS	Default sensor potential value in sunlight, in volts
DVOLAT	70.0	INFORP(3): RPLMAX	Apex latitude, in degrees, below which ion ram drift velocity is assumed to be zero
RPARVR	3.0	INFORP(4): RPVRNG	Sweep voltage range required for two-ion analysis
IRPAMP	20	INFORP(5): IRPMIN	Minimum number of data points required for a sweep analysis
MAXDV	11	INFORP(6): IRPMDV	Maximum number of points allowed for RPA analysis derivative determination
INITDV	3	INFORP(7): IRPSDV	Initial number of points used for RPA analysis derivative determination
ICMWDT	6	INFORP(8): IRPWID	Minimum number of sweep data points between RPA sweep minima for two-component analysis
RPASMN	-4.0	INFORP(9): RPMINV	Minimum voltage in RPA sweep
RPASMX	12.0	INFORP(10): RPMAXV	Maximum voltage in RPA sweep
RCRNGE	0.8	INFORP(11): RPCRNG	Minimum log current range, in log amperes, required for RPA sweep analysis

RPA Processing Parameters

LDCON	Value	SSIES2	Description
RPASEN	-11.2	INFORP(12): RPSENS	Minimum reportable log current, in log amperes
RPAA	5.067E-4	INFORP(13): RPAREA	Aperture area of the RPA sensor, in square centimeters
RPATRN	0.59	INFORP(14): RPTRAN	RPA sensor transparency factor (RPAA*RPATRN should equal effective DM/SM aperture areas)
CNILIM	-0.15	INFORP(15): RPNSUP	Incremental sweep noise parameter, in log amperes, for amount by which a log current value can exceed the previous good log current value
CNDL01	0.30	INFORP(16): RPNSD1	Incremental sweep noise parameter, in log amperes, for amount by which a log current value can fall below the previous good log current value, during the flat portion of the RPA sweep
CNDL02	0.60	INFORP(17): RPNSD2	Incremental sweep noise parameter, in log amperes, for amount by which a log current value can fall below the previous good log current value, during the steep portion of the RPA sweep
VINLIM	0.05	INFORP(18): DVLIM	Voltage increment limit, in volts, for termination of the iterative RPA solution, based on the difference between the maximum slope points of successive O^+ sweep fits
RPAFIT	1.00E-22	INFORP(19): VARLIM	Threshold for variance between the RPA sweep solution and the observed sweep, which cannot be exceeded for an acceptable solution
RPACOR	1.13E-10	INFORP(20): RPCPLG	Coupling correction term for RPA currents, due to inadvertent coupling between swept grids and sensor case (known to apply only to first three SSIES sensors)
HEBVLT	0.6	INFORP(21): RPXVB	Additional bias voltage for He^+ testing, in volts, used to differentiate between H^+ and He^+ ions for light ions present in sweep analysis
RPASVU	0.0	INFORP(22): RPSVUP	Voltage used to test start of UP sweep, in volts (obsolete)
RPASVD	8.0	INFORP(23): RPSVDN	Voltage used to test start of DOWN sweep, in volts (obsolete)

RPA Processing Parameters

LDCON	Value	SSIES2	Description
CURLIM	0.85	INFORP(24): RPMPCT	Factor for specifying low-current rejection threshold for a sweep analysis (sweeps with maximum log current less than CURLIM*RPASEN are not processed)

EP Processing Parameters

LDCON	Value	SSIES2	Description
EPA	1.026E-2	INFOEP(1): EPARE	Area of outer sphere of EP sensor, in square centimeters
EPTRAN	0.800	INFOEP(2): EPTRAN	EP sensor transparency factor
EPRVR	1.5	INFOEP(3): EPCRN	Minimum log current range, in log amperes, required for EP sweep analysis
SNPUP	-1.3	INFOEP(4): EPNSUP	Incremental upsweep noise parameter, in log amperes, for amount by which a log current value can exceed the previous good log current value
SNPDWN	0.7	INFOEP(5): EPNSDN	Incremental downsweep noise parameter, in log amperes, for amount by which the previous log current value can exceed the present log current value
SNSTRT	0.5	INFOEP(6): EPMDEL	Noise parameter for search for maximum current in saturation region of EP sweep curve, in log amperes
ETPARM	5047.0	INFOEP(7): EPTPAR	Constant used for calculation of electron temperature from maximum slope in EP sweep
EPSMN	-4.0	INFOEP(8): EPVMIN	Minimum voltage in normal EP sweep
EPSMX	4.0	INFOEP(9): EPVMAX	Maximum voltage in normal EP sweep
IEPMP	20	INFOEP(10): IEPMIN	Minimum number of data points required for a sweep analysis
IPPCOR	1	INFOEP(11): IEPCOR	Flag for empirical quadratic correction to calculated plasma potential (0 = no correction; 1 or greater = apply correction)
PPCOR1	6.720E-2	INFOEP(12): EPCCC1	Constant term in empirical correction for plasma potential
PPCOR2	1.946E-4	INFOEP(13): EPCCC2	Linear term in empirical correction for plasma potential
PPCOR3	-1.546E-7	INFOEP(14): EPCCC3	Quadratic term in empirical correction for plasma potential

EP Processing Parameters

LDCON	Value	SSIES2	Description
EPCSU	-1.0	INFOEP(15): EPCVUP	Voltage used to test start of calibration sweep, in volts (obsolete)
EPSVU	-2.0	INFOEP(16): EPNVUP	Voltage used to test start of UP sweep, in volts (obsolete)
EPSVD	2.0	INFOEP(17): EPNVDN	Voltage used to test start of DOWN sweep, in volts (obsolete)
DCMET0	2000.0	INFOEP(18): EPDTMP	Default electron temperature for DC mode density calculations, in degrees Kelvin
IDCSM	1	INFOEP(19): NEPSM	Flag to allow use of SM density data for EP DC mode normalization (0 = disallow use; 1 = allow use)
IDCRPA	0	INFOEP(20): NEPRP	Flag to allow use of RPA density data for EP DC mode normalization (0 = disallow use; 1 = allow use)
IDCDM	0	INFOEP(21): NEPDM	Flag to allow use of DM density data for EP DC mode normalization (0 = disallow use; 1 = allow use)
			Note: If all three of IDCSM, IDCRPA, and IDCDM are zero, then normalization will be based on the previously derived EP sweep density

DM Processing Parameters

LDCON	Value	SSIES2	Description
DMDVC	0.1438	INFODM(1): DMK1	Drift velocity calculation constant, in inverse volts
DMEA	4.215E-4	INFODM(2): DMAEFF	Effective aperture area of the DM sensor, in square centimeters, as the product of the actual area and the transparency factor
DMDC	1.364	INFODM(3): DMK2	Ion density calculation constant
DMNOV	2.56	INFODM(4): DMOOFF	Nominal offset voltage of the offset amplifier, in volts
AGLLA	1.027	INFODM(5): DMAG	Gain of the log-level A (LLA) amplifier
AOLLA	10.85	INFODM(6): DMAOFF	Offset of the log-level A (LLA) amplifier
AGLLB	1.027	INFODM(7): DMBG	Gain of the log-level B (LLB) amplifier
AOLLB	10.82	INFODM(8): DMBOFF	Offset of the log-level B (LLB) amplifier

DM Processing Parameters

LDCON	Value	SSIES2	Description
ANGMAX	45.0	INFODM(9): ANGMAX	Maximum angle between velocity vector of spacecraft and that of ions for which DM sensor calculations are valid
HVSIGN	-1.0	INFODM(10): DMSH	Sign of positive horizontal DM axis in spacecraft coordinate system (+1.0, -1.0)
VVSIGN	-1.0	INFODM(11): DMSV	Sign of positive vertical DM axis in spacecraft coordinate system (+1.0, -1.0)
IHVORD	1	INFODM(12): IDMH	Sequence flag for horizontal/vertical measurements in telemetry (0 = first, 1 = second; must be complementary to IVVORD)
IVVORD	0	INFODM(13): IDMV	Sequence flag for horizontal/vertical measurements in telemetry (0 = first, 1 = second; must be complementary to IHVORD)
ILLUSE	0	INFODM(14): NOLL	Flag for use of LLA/LLB for density calculations (0 = use LLA/LLB; 1 = ignore LLA/LLB)
IHPUSE	0	INFODM(15): NOHP	Flag for use of H^+ mode data (0 = ignore H^+ data; 1 = use H^+ data)
DSMTC0	64.1	INFODM(16): DSMTG	Offset parameter for converting DSM SENSTEMP voltages into temperatures
DSMTC1	1.9337	INFODM(17): DSMTO	Gain parameter for converting DSM SENSTEMP voltages into temperatures
IRVUSE	0	INFODM(18): IDMUR	Flag for use of ram ion drift velocity from ion RPA analysis for DM sensor (0 = do not use RPA result; 1 = use RPA result)
DMFG	0.653	INFODM(19): DMFG	Effective filter gain for DM filters
NDMFLT	6	INFODM(20): NDMFLT	Number of active DM filters
DMVTB1	0.00	INFODM(21): DMVTAB(1)	WIBAN2 Range 1 threshold
DMVTB2	0.27	INFODM(22): DMVTAB(2)	WIBAN2 Range 2 threshold
DMVTB3	0.54	INFODM(23): DMVTAB(3)	WIBAN2 Range 3 threshold
DMVTB4	0.80	INFODM(24): DMVTAB(4)	WIBAN2 Range 4 threshold
DMVTB5	1.08	INFODM(25): DMVTAB(5)	WIBAN2 Range 5 threshold
DMFOF1	0.05	INFODM(26): DMFOFF(1)	DM Filter 1 offset

DM Processing Parameters

LDCON	Value	SSIES2	Description
DMFOF2	0.05	INFODM(27): DMFOFF(2)	DM Filter 2 offset
DMFOF3	0.05	INFODM(28): DMFOFF(3)	DM Filter 3 offset
DMFOF4	0.05	INFODM(29): DMFOFF(4)	DM Filter 4 offset
DMFOF5	0.05	INFODM(30): DMFOFF(5)	DM Filter 5 offset
DMFOF6	0.05	INFODM(31): DMFOFF(6)	DM Filter 6 offset
DMFRQ1	18.0	INFODM(32): DMFFRQ(1)	DM filter 1 center frequency
DMFRQ2	39.0	INFODM(33): DMFFRQ(2)	DM filter 2 center frequency
DMFRQ3	85.0	INFODM(34): DMFFRQ(3)	DM filter 3 center frequency
DMFRQ4	390.0	INFODM(35): DMFFRQ(4)	DM filter 4 center frequency
DMFRQ5	850.0	INFODM(36): DMFFRQ(5)	DM filter 5 center frequency
DMFRQ6	1800.0	INFODM(37): DMFFRQ(6)	DM filter 6 center frequency
DMFBW1	14.0	INFODM(38): DMFBW(1)	DM filter 1 bandwidth
DMFRW2	31.0	INFODM(39): DMFBW(2)	DM filter 2 bandwidth
DMFRW3	64.0	INFODM(40): DMFBW(3)	DM filter 3 bandwidth
DMFRW4	303.0	INFODM(41): DMFBW(4)	DM filter 4 bandwidth
DMFRW5	668.0	INFODM(42): DMFBW(5)	DM filter 5 bandwidth
DMFRW6	1360.0	INFODM(43): DMFBW(6)	DM filter 6 bandwidth

SM Processing Parameters

LDCON	Value	SSIES2	Description
SMEA	2.553E-3	INFOSM(1): SMAEFF	Effective aperture area of the SM sensor, in square centimeters, as the product of the actual area and the transparency factor
AGEL	6.27E-9	INFOSM(2): SMEG	Effective gain of the electrometer amplifier
AGAMP	10.06	INFOSM(3): SMAG	Effective gain of the differencing amplifier
AOAMP	2.703	INFOSM(4): SMAOFF	Offset voltage of the differencing amplifier, in volts

SM Processing Parameters

LDCON	Value	SSIES2	Description
RDFIT	0.015	INFOSM(5): SMRFIT	Parameter defining maximum difference between actual range flag voltage and nominal tabulated value
RT11	0.71	INFOSM(6): VTABLE(1)	Electrometer/WIBAN1 range flag voltage for EL:1, WIBAN1:1
RT12	0.61	INFOSM(7): VTABLE(2)	Electrometer/WIBAN1 range flag voltage for EL:2, WIBAN1:1
RT13	0.51	INFOSM(8): VTABLE(3)	Electrometer/WIBAN1 range flag voltage for EL:3, WIBAN1:1
RT14	0.41	INFOSM(9): VTABLE(4)	Electrometer/WIBAN1 range flag voltage for EL:4, WIBAN1:1
RT15	0.31	INFOSM(10): VTABLE(5)	Electrometer/WIBAN1 range flag voltage for EL:5, WIBAN1:1
RT21	1.52	INFOSM(11): VTABLE(6)	Electrometer/WIBAN1 range flag voltage for EL:1, WIBAN1:2
RT22	1.42	INFOSM(12): VTABLE(7)	Electrometer/WIBAN1 range flag voltage for EL:2, WIBAN1:2
RT23	1.32	INFOSM(13): VTABLE(8)	Electrometer/WIBAN1 range flag voltage for EL:3, WIBAN1:2
RT24	1.22	INFOSM(14): VTABLE(9)	Electrometer/WIBAN1 range flag voltage for EL:4, WIBAN1:2
RT25	1.12	INFOSM(15): VTABLE(10)	Electrometer/WIBAN1 range flag voltage for EL:5, WIBAN1:2
RT31	2.33	INFOSM(16): VTABLE(11)	Electrometer/WIBAN1 range flag voltage for EL:1, WIBAN1:3
RT32	2.23	INFOSM(17): VTABLE(12)	Electrometer/WIBAN1 range flag voltage for EL:2, WIBAN1:3
RT33	2.13	INFOSM(18): VTABLE(13)	Electrometer/WIBAN1 range flag voltage for EL:3, WIBAN1:3
RT34	2.03	INFOSM(19): VTABLE(14)	Electrometer/WIBAN1 range flag voltage for EL:4, WIBAN1:3
RT35	1.93	INFOSM(20): VTABLE(15)	Electrometer/WIBAN1 range flag voltage for EL:5, WIBAN1:3
RT41	3.14	INFOSM(21): VTABLE(16)	Electrometer/WIBAN1 range flag voltage for EL:1, WIBAN1:4
RT42	3.04	INFOSM(22): VTABLE(17)	Electrometer/WIBAN1 range flag voltage for EL:2, WIBAN1:4
RT43	2.94	INFOSM(23): VTABLE(18)	Electrometer/WIBAN1 range flag voltage for EL:3, WIBAN1:4
RT44	2.84	INFOSM(24): VTABLE(19)	Electrometer/WIBAN1 range flag voltage for EL:4, WIBAN1:4
RT45	2.73	INFOSM(25): VTABLE(20)	Electrometer/WIBAN1 range flag voltage for EL:5, WIBAN1:4
RT51	3.95	INFOSM(26): VTABLE(21)	Electrometer/WIBAN1 range flag voltage for EL:1, WIBAN1:5
RT52	3.84	INFOSM(27): VTABLE(22)	Electrometer/WIBAN1 range flag voltage for EL:2, WIBAN1:5

SM Processing Parameters

LDCON	Value	SSIES2	Description
RT53	3.74	INFOSM(28): VTABLE(23)	Electrometer/WIBAN1 range flag voltage for EL:3, WIBAN1:5
RT54	3.64	INFOSM(29): VTABLE(24)	Electrometer/WIBAN1 range flag voltage for EL:4, WIBAN1:5
RT55	3.54	INFOSM(30): VTABLE(25)	Electrometer/WIBAN1 range flag voltage for EL:5, WIBAN1:5
RVLT01	0.28	INFOSM(31): VTABLE(26)	Electrometer range flag voltage for range 1
RVLT02	0.24	INFOSM(32): VTABLE(27)	Electrometer range flag voltage for range 2
RVLT03	0.20	INFOSM(33): VTABLE(28)	Electrometer range flag voltage for range 3
RVLT04	0.16	INFOSM(34): VTABLE(29)	Electrometer range flag voltage for range 4
RVLT05	0.12	INFOSM(35): VTABLE(30)	Electrometer range flag voltage for range 5
AGFILT	0.653	INFOSM(36): SMFG	Effective filter gain for SM filters
AOFLT1	14.190	INFOSM(37): SMFOFF(1)	SM filter 1 offset
AOFLT2	14.189	INFOSM(38): SMFOFF(2)	SM filter 2 offset
AOFLT3	14.079	INFOSM(39): SMFOFF(3)	SM filter 3 offset
AOFLT4	14.116	INFOSM(40): SMFOFF(4)	SM filter 4 offset
AOFLT5	14.077	INFOSM(41): SMFOFF(5)	SM filter 5 offset
AOFLT6	14.009	INFOSM(42): SMFOFF(6)	SM filter 6 offset
AOFLT7	0.0	INFOSM(43): SMFOFF(7)	SM filter 7 offset (obsolete)
AOFLT8	0.0	INFOSM(44): SMFOFF(8)	SM filter 8 offset (obsolete)
AOFLT9	0.0	INFOSM(45): SMFOFF(9)	SM filter 9 offset (obsolete)
CFFLT1	18.0	INFOSM(46): SMFFRQ(1)	SM filter 1 center frequency
CFFLT2	39.0	INFOSM(47): SMFFRQ(2)	SM filter 2 center frequency
CFFLT3	85.0	INFOSM(48): SMFFRQ(3)	SM filter 3 center frequency
CFFLT4	390.0	INFOSM(49): SMFFRQ(4)	SM filter 4 center frequency
CFFLT5	850.0	INFOSM(50): SMFFRQ(5)	SM filter 5 center frequency
CFFLT6	1800.0	INFOSM(51): SMFFRQ(6)	SM filter 6 center frequency

SM Processing Parameters

LDCON	Value	SSIES2	Description
CFFLT7	0.0	INFOSM(52): SMFFRQ(7)	SM filter 7 center frequency (obsolete)
CFFLT8	0.0	INFOSM(53): SMFFRQ(8)	SM filter 8 center frequency (obsolete)
CFFLT9	0.0	INFOSM(54): SMFFRQ(9)	SM filter 9 center frequency (obsolete)
EBFLT1	14.0	INFOSM(55): SMFBW(1)	SM filter 1 bandwidth
EBFLT2	31.0	INFOSM(56): SMFBW(2)	SM filter 2 bandwidth
EBFLT3	64.0	INFOSM(57): SMFBW(3)	SM filter 3 bandwidth
EBFLT4	303.0	INFOSM(58): SMFBW(4)	SM filter 4 bandwidth
EBFLT5	668.0	INFOSM(59): SMFBW(5)	SM filter 5 bandwidth
EBFLT6	1360.0	INFOSM(60): SMFBW(6)	SM filter 6 bandwidth
EBFLT7	0.0	INFOSM(61): SMFBW(7)	SM filter 7 bandwidth (obsolete)
EBFLT8	0.0	INFOSM(62): SMFBW(8)	SM filter 8 bandwidth (obsolete)
EBFLT9	0.0	INFOSM(63): SMFBW(9)	SM filter 9 bandwidth (obsolete)
NFILTS	6	INFOSM(64): NSMFILT	Number of active SM filters
IRVUSE	0	INFOSM(65): ISMUR	Flag for use of ram ion drift velocity from ion RPA analysis for SM sensor (0 = do not use RPA result; 1 = use RPA result)

MP Processing Parameters

LDCON	Value	SSIES2	Description
IMP01	0	INFOMP(1)	Spare

CKL Processing Parameters

LDCON	Value	SSIES2	Description
RMSLIM	0.8	INFOCK(1): RMSLIM	Percentage threshold RMS variation in density required for CKL analysis
FFRQLF	0.5	INFOCK(2): FL	Low frequency limit, in Hertz, for log-linear fit to PDS to determine p_1 and T_1 (0.0468 Hz for 512-point FFT; 0.0938 Hz for 256-point FFT)

CKL Processing Parameters

LDCON	Value	SSIES2	Description
FFRQUF	10.0	INFOCK(3): FU	High frequency limit, in Hertz, for log-linear fit to PDS to determine p_1 and T_1 (11.953 Hz for FFT; 8500 Hz for filter output)
MP1USE	0	INFOCK(4): MODP1	Flag to use model value for p_1 instead of fit value (0 = use fit; 1 = use model)
SMFDAF	1.0	INFOCK(5): FILFAC	SM filter data adjustment value, to match filter data to PDS
FFTNF	1.0E-5	INFOCK(6): FFTNF	Noise floor of FFT, to exclude low values from PDS fit
IDWUSE	3	INFOCK(7): IWNDOW	Parameter for use of a split-cosine bell taper window prior to performing the FFT (0 = no window; 1 to 10 = use percent taper given by 10 times parameter value)
IDTUSE	0	INFOCK(8): IDTRND	Flag for de-trending prior to performing FFT (0 = de-trend data; 1 = de-trend data for RMS calculation only [non-de-trended data is used for FFT]). Windowing is not recommended if de-trending is disabled
IPSUSE	0	INFOCK(9): LSFPDS	Flag for use of decimated PDS for log-linear fit (0 = use full PDS; 1 = use decimated PDS)
ISMOO	3	INFOCK(10): ISMOO	Parameter for smoothing PDS (0 = no smoothing; N = 1 to 5 = use centered binomial smoother of 2*N+1 points)
IDVUSE	0	INFOCK(11): ICKLU	Flag for use of ion drift velocity from ion RPA or DM analyses for CKL analysis (0 = use only spacecraft orbital velocity; 1 = use DM drift velocities; 2 = use RPA ram drift velocity)
SMNKP	3.0	INFOCK(12): CKLKP	Nominal value of K_p, for determination of high-latitude scintillation boundary, and calculation of irregularity parameters "a" and "b" and effective layer thickness

Data Files

Numerous data files are required as input for the SSIES2 program, and several output data files are generated during normal production processing. Many additional output files can be generated as informative or diagnostic listings, based on settings provided in the file IESCNTRLFILE.

The preliminary version of the SSIES2 program was developed in an environment distinct from the standard AFGWC SSIES processing environment, and with some uncertainties remaining for the specific format and content of the SSIES-2 telemetry. Therefore, the basic input instrument data was simulated in a text format, and the associated data acquisition routine was implemented without reference to the specifics of the AFGWC file system. However, to preserve the operational structure of SSIES, some features of the AFGWC file system were emulated in the routines and reference files used for SSIES2.

The input files required by the SSIES2 program are the following:

1. IESCNTRLFILE - This file contains parameters specific to the processing of SSIES-2 data from a given set of DMSP spacecraft and for selected analysis requirements.
2. IESPREPFILE - This file contains the SSIES-2 ephemeris and instrument data to be processed.
3. IESAPEXTABLE - This file contains a table of values used for the transformation to APEX coordinates.
4. IESHDRDATA - This file was incorporated to provide header information about IESPREPFILE for the SPFROR emulation developed for the SSIES2 program, and contains information specific to the instrument data segment used and appropriate to the emulation of the AFGWC FFDASC routine.

Additionally, for testing or diagnostic purposes, a file IESPROLIMITS can be provided. This file is used by SSIES2 in a text format to select the time segment of data to be processed.

The output files generated by the SSIES2 program are the following:

1. IESEDRFILE - This file contains the Environmental Data Records (EDRs) which are the results of the SSIES2 analysis.
2. IESSTATFILE - This file contains average values of analysis results, processing statistics, and sensor status summaries.
3. IESAGDBXFR1/IESAGDBXFR2 - These files are transfer files for the Astro-Geophysical Data Base, and contain summary informations from the EDR's.
4. IESMPEPPRT - This file contains comparisons of the ground-based (SSIES2) EP analysis to the results of the EP processing performed by the on-board microprocessor.
5. IESMPRPAPRT - This file contains comparisons of the ground-based (SSIES2) RPA analysis to the results of the RPA processing performed by the on-board microprocessor.
6. IESDMHPMODE - This file contains data reports from the

driftmeter during H^+ mode operation.

7. IESFIBAMODE - This file contains data reports from the driftmeter during FIBA mode operation.

Additional output files which can be generated for diagnostic purposes are:

1. IESCKLDIAG - Binary results from the CKL processing
2. IESCKLPRT - Text report from the CKL processing
3. IESDMDIAG - Binary results from the DM processing.
4. IESDMPRT - Text report from the DM processing.
5. IESEDRPRT - Text report of the EDR's generated.
6. IESEPDIAG - Binary results from the EP processing.
7. IESEPPRT - Text report from the EP processing.
8. IESRPADIAG - Binary results from the RPA processing.
9. IESRPAPRT - Text report from the RPA processing.
10. IESSMDIAG - Binary results from the SM processing.
11. IESSMPRT - Text report from the SM processing.
12. IESXFERPRT - Text report of the transfer file records.

SSIES2 Processing Messages

The following section contains a description of the messages generated by the SSIES2 program. Much of the information and instructions contained here were adapted from the original SSIES documentation:

DMSP SSIES FLIGHT DATA PROCESSOR
System Documentation
Volume II. Users Manual
by
James A. Secan and Robert M. Bussey
Northwest Research Associates, Inc.
1 August 1987

Some of the procedures and restrictions are intrinsic to the nature of the SSIES operation at AFGWC, and may not apply to the newly-developed SSIES2 operation and processing procedures. However, the former description was retained in the absence of definite information regarding the new procedures and restrictions.

Status Messages

Routine messages. The SSIES program will generate occasional status messages to alert the user of events the processor has encountered. None of these require further actions.

STATUS(DMCMD) A NEW COMMAND HAS BEEN RECEIVED BY THE DRIFT METER

LAST COMMAND: xxx NEW COMMAND: yyy

The Drift Meter processing routine has encountered a new command in the command monitor word for the Drift Meter. The information provided is the previous command (xxx) and the new command (yyy).

---

*STATUS: WILL USE TRANSFER FILE IESAGDBXFR1

*STATUS: WILL USE TRANSFER FILE IESAGDBXFR2

This message from OPNXFR will be printed out at the start of each SSIES program run to indicate which of the two transfer files is to be used in the current run.

*** NO DATA IN FILE xxxxx (LU = nn)

This message from SUMOUT is printed out if one of the three files which can be listed at the end of a program run (IESMPEPPRT, IESMPRPAPRT, or IESDMHPMODE) is empty. The information provided is the file name (xxxxx) and unit number (nn).

Diagnostic messages. Additional diagnostic status messages can be generated by the SSIES program if this option is selected by the user. These messages are as follows:

SCDIAG NEW SATELLITE: FLIGHT ID = xx, REV # yyyy AT sssss

The latest data frame processed indicated the start of the processing for a new satellite. The information provided is the satellite flight ID (xx), the readout REV number (yyyy), and the time of the current data frame (sssss, seconds since midnight).

SCDIAG NEW REV NUMBER: REV # = yyyy AT sssss

The latest data frame processed indicated the start of processing for a new readout REV. The information provided is the new readout REV number (yyyy) and the time of the current data frame (sssss, seconds since midnight).

SCDIAG GENERAL RESET ** AT sssss

The input section of the SSIES program has encountered timing problems with the current readout REV and has issued a general reset flag to all processing modules. The information provided is the time of the current data frame (sssss, seconds since midnight).

SCDIAG END OF DATA ** AT sssss

The SSIES program has determined that there are no more data to process in file IESPREPFILE. The information provided is the time of the last data frame (sssss, seconds since midnight).

SCDIAG DUPLICATE FRAME, IDTIME = sssss

The current one-second data frame received from file IESPREPFILE was a duplicate of the preceding one. The information provided is the time of the current data frame (sssss, seconds since midnight).

SCDIAG BAD FRAME, IDTIME = sssss

The current one-second data frame received from file IESPREPFILE contained an error and was not processed. The information provided is the time of the current data frame (sssss, seconds since midnight).

SCDIAG TIME JUMP FROM xxxxx TO yyyyy

The time of the current data frame is more than one second beyond the time in the last data frame. The information provided is the time of the last data frame and the time of the current data frame (xxxxx and yyyyy respectively, seconds since

midnight).

SCDIAG SWEEP CLOCK JUMP FROM xxxx TO yyyy AT sssss

The sweep clock program counter in the current data frame is more than one count beyond the time in the last data frame. The information provided is the sweep counter value from the last frame and that from the current frame (xxxx and yyyy respectively), and the time of the current data frame (sssss, seconds since midnight).

SCDIAG CALIBRATION SWEEP, IDTIME = sssss

The EP calibration sweep flag was set in the current data frame. The information provided is the time of the current data frame (sssss, seconds since midnight).

SCDIAG EP MODE CHANGE FROM x TO y AT sssss

The EP sensor mode has changed in the current data frame. The information provided is the previous EP mode and the new EP mode (x and y respectively, 0-6 corresponding to modes A, B, BS, C, D, DS, E).

SCDIAG OLS COMMAND CHANGE FROM xxx TO yyy AT sssss

SCDIAG DSM COMMAND CHANGE FROM xxx TO yyy AT sssss

The OLS or DSM (DM and SM) sensor command reported in the current data frame is changed from the last reported command. Information provided is the previous command (xxx), the new command (yyy), and the time of the current data frame (sssss, seconds since midnight).

Recovery and Error Correction Procedures

Error Messages. Error messages are printed out to alert the user of problems encountered in processing the SSIES-2 data. These messages are usually followed by program termination. The format for all error messages is as follows:

```
*ERROR(name)* message
additional information (optional)
```

where "name" is the name of the program routine in which the error was encountered, "message" is a brief description of the problem, and "additional information (optional)" is additional information which may be of interest to the programmer responsible for the program.

ERROR(name) COULD NOT OPEN FILE xxxxxx
STATUS: yyyy

ERROR(name) COULD NOT READ FROM FILE xxxxxx
STATUS: yyyy RECORD: zzzz

ERROR(name) COULD NOT WRITE TO FILE xxxxxx
STATUS: yyyy RECORD: zzzz

An error was encountered attempting to:
1) open a file for use by the SSIES2 program,
2) read from a file, or
3) write to a file.

The information provided is the name of the routine in which the error was encountered (name), the name of the file (xxxxx), the error status received from the system (yyyy), and the record number the program was trying to read from or write to (zzzz).

ERROR(CKLPRC) SM DATA WERE NOT AVAILABLE FOR CKL CALCULATION
NUMBER OF MISSING DATA-SECONDS: xxxx

ERROR(CKLPRC) EP DATA WERE NOT AVAILABLE FOR CKL CALCULATION
NUMBER OF MISSING DATA-SECONDS: xxxx

These messages indicate that density data from the sensor designated for use by the CKL processor has not been available. The message will appear after 100 seconds of data have been missing and every 100 seconds thereafter. The information provided is the total number of data-seconds which have been missing in the current readout-REV.

ERROR(CKLPRC) THE EP SENSOR IS NOT IN DC MODE
(MODE = x, SHOULD BE 3, 4, OR 5)

The CKL processor has been directed to use density data from the EP sensor in its calculation, but the EP sensor is not in one of the DC modes (mode C, D, or DS) which is required for this calculation. If the EP data must be used for this calculation (i.e., the SM sensor is unusable), then the EP sensor should be commanded into one of the DC modes. If the SM data are usable, the software switch in file IESCNTRLFILE should be set to direct the CKL processor to use the SM density data. If the SM data are unusable and the EP sensor cannot be run in one of the DC modes, the CKL processor should be turned off via the control switch in IESCNTRLFILE for this processor. The information provided is the current mode of the EP sensor (x = 0 to 6 for modes A, B, BS, C, D, DS, and E).

```
*ERROR(DMPRC)* DM WB2 RANGE DATA ERROR
   TIME(SEC): sssss   RANGE DATA: rrrr.rrrr
   RANGE TABLE: xxxx.xx  xxxx.xx  xxxx.xx  xxxx.xx  xxxx.xx
   DMFIBA VOLTAGES: vvv.vv vvv.vv vvv.vv vvv.vv vvv.vv vvv.vv
```

The range data value which indicates the range settings for the DM wideband ranging amplifier does not correlate with a value in the range table read in from file IESCNTRLFILE. This message will be generated every five (5) minutes that the DM data processing module cannot interpret the range data. The information provided is the time (sssss, seconds since midnight), the range data value (rrrr.rrrr), the values in the range table (xxxx.xx), and the DMFIBA voltages from the DM wideband amplifier for the current second (vvv.vv). Check the range table to insure that they are correct by comparing them to the values in the LDCON specifications for the satellite being processed. If the table is incorrect, run LDCON to reload the table and reprocess the readout-REV. If the table is correct and this error message occurs only once in a readout-REV, do nothing further. If the message occurs frequently, there may be a problem with the DM electronics which calculates the range data and the values in the range table may require updating. Notify programmer personnel.

```
*ERROR(EPHEM)* BAD DATE IN EPHEMERIS RECORD
     READOUT DATE: yymmdd DOY: xxx
     EPHEMERIS DOY: yyy
     **  EPHEMERIS DATA  **
     TIME1,LAT1,LON1,ALT1,PHI1: time1 lat1 lon1 alt1 phi1
     TIME2,LAT2,LON2,ALT2,PHI2: time2 lat2 lon2 alt2 phi2
```

The day-of-year in an ephemeris record is incompatible with the readout date. The SSIES program will skip the one-minute data block associated with this ephemeris record and try the next. If 10 bad ephemeris records are found in a single readout-REV, processing of that REV will be abandoned. The information provided is the date of the ascending node of the readout-REV (yymmdd); the day-of-year corresponding to yymmdd (xxx), the day-of-year for the current ephemeris record (yyy), the time (seconds since midnight), latitude (radians), longitude (radians), altitude (km), and angular distance along the orbit from the last ascending node (radians) for the first (time1, lat1, etc.) and last (time2, lat2, etc.) points in the ephemeris record.

```
*ERROR(EPHEM)* BAD ORBITAL INCLINATION ANGLE
     NOMINAL VALUE: xxx DEG
     CALCULATED VALUE: yyy DEG
     **  EPHEMERIS DATA  **
     TIME1,LAT1,LON1,ALT1,PHI1: time1 lat1 lon1 alt1 phi1
     TIME2,LAT2,LON2,ALT2,PHI2: time2 lat2 lon2 alt2 phi2
```

There was a discrepancy of greater than 2 degrees between the orbital inclination angle calculated from the satellite locations in the ephemeris record and that calculated from the altitude of the satellite based on a sun-synchronous orbit. The information provided is the angle calculated from the altitude (xxx), the angle calculated from the locations (yyy), and the ephemeris data described above.

```
*ERROR(EPHEM)* BAD TIMES IN EPHEMERIS RECORD
     **  EPHEMERIS DATA  **
     TIME1,LAT1,LON1,ALT1,PHI1: time1 lat1 lon1 alt1 phi1
     TIME2,LAT2,LON2,ALT2,PHI2: time2 lat2 lon2 alt2 phi2
```

The times in the current ephemeris record were more than 60 seconds apart. The information provided is the ephemeris data described above.

```
*ERROR(EPHEM)* BAD ALTITUDES IN EPHEMERIS RECORD
     **  EPHEMERIS DATA  **
     TIME1,LAT1,LON1,ALT1,PHI1: time1 lat1 lon1 alt1 phi1
     TIME2,LAT2,LON2,ALT2,PHI2: time2 lat2 lon2 alt2 phi2
```

The average of the two altitudes in the ephemeris record was outside the range 795 to 875 km. The information provided is the ephemeris data described above.

```
*ERROR(EPHEM)* TOO MANY BAD EPHEMERIS RECORDS FOR THIS REV
     WILL ABANDON THIS REV
```

Ten bad ephemeris records have been found in the current readout-REV. Processing of this REV will be ended.

```
*ERROR(FETCH)* UNABLE TO PROPERLY ACCESS FILE IESPREPFILE
     NREC      =  n1
     IERR      =  n2
     ISTAT     =  n3
     JSTAT     =  n4
     KSTAT     =  n5
     IBEGIN    =  n6
     IEND      =  n7
```

An error status was encountered while attempting to read a raw data record from file IESPREPFILE. The information provided is the record number that was to be read (n1), the error status (n2), status returned from attempted access to file ACFPARAMETER (n3), status from the attempt to read the ephemeris data block (n4), status from the attempt to read the data block (n5), and the starting and ending file sector addresses of the readout-REV being processed (n6 and n7). (Note: These error statuses are returned from AFGWC system routine SPFDAT which accesses file IESPREPFILE.).

```
*ERROR(LDSTF)* FILE IESSTATFILE HAS NO ROOM FOR ANOTHER SATELLITE
     NEW SATELLITE FLIGHT ID: Fxx
     CURRENTLY IN IESSTATFILE:
          ID:  Fy1  LAST UPDATE:   date1/time1
          ID:  Fy2  LAST UPDATE:   date2/time2
          ID:  Fy3  LAST UPDATE:   date3/time3
```

There appear to be three active satellite sections in file IESSTATFILE, and data from a fourth satellite has been received. The SSIES2 program will overwrite a satellite section with data from a new satellite if the time that the section overwritten was last updated is more than 10 days in the past. If there is indeed a fourth active satellite, this is a major problem, as the SSIES2 program can handle only three active satellites. If there are three or fewer active satellites and this message appears frequently, alert programmer personnel. The information provided is the flight ID of the current satellite (xx) and the flight IDs (y1, y2, y3) and date (YYMMDD) and time (HHMM) last updated for each satellite in file IESSTATFILE.

```
*ERROR(OPNEDR)* COULD NOT READ IESEDRFILE PARAMETERS
```

File definition parameters for file IESEDRFILE could not be found on system file ACFPARAMETER. Recover this file according to standard procedures and rerun the SSIES2 program. If this does not correct the problem, contact the responsible programmer.

---

c. If the ID is for a new satellite which has not yet been entered in file IESCNTRLFILE, update this file and rerun the SSIES2 program.

Warning Messages. Warning messages are printed out to alert the user to possible problems or to events which the user should be aware of. The format is similar to error messages with the name of the program subroutine in brackets following the words *WARNING* followed by a brief note describing the problem and, in some cases, additional information which may be of interest to the programmer responsible for the program. None of these conditions will cause the SSIES2 program to terminate execution, but a few of them indicate possible errors or problems which require corrective action.

WARNING(DMCMD) THE RETARDING POTENTIAL ON THE DRIFT METER HAS CHANGED

OLD READING: xxx VOLTS NEW READING: yyy VOLTS

A command for the Drift Meter sensor has been processed which directs the sensor to place a repelling voltage on its outer grid. This will cause the ion densities calculated for the DM LLA and LLB data to be too low. If this command was actually sent to the spacecraft, nothing further can be done. If such a command was not sent, alert personnel responsible for DMSP operations that the SSIES-2 DM sensor may be in an erroneous mode of operation. Information provided is the old (xxx) and new (yyy) settings of the repeller voltage.

WARNING(DMCMD) THE DRIFT METER HAS CHANGED INTO H+ MODE
COMMAND RECEIVED: xxx OLD MODE: y NEW MODE: z

A command for the Drift Meter sensor has been processed which directs the sensor to enter H+ mode. This will limit the sensor to one horizontal and vertical drift velocity measurement per second (instead of the normal six each per second) and will disable the calculation of ion density from the DM LLA/LLB data. If this command was actually sent to the spacecraft, nothing further can be done. If such a command was not sent, alert personnel responsible for DMSP operations that the SSIES-2 DM sensor may be in an erroneous mode of operation. Information provided is the command received to place the sensor in H+ mode (xxx), the last mode the DM sensor was in and the new mode (y and z respectively, DM command - 152 - 158).

WARNING(DMCMD) DM FIBA COMMAND RECEIVED
COMMAND RECEIVED: (xxx)
DM FIBA PROCESSING IS NOT FULLY DEFINED

A command for the Drift Meter sensor has been processed which directs the sensor to enter FIBA mode. This will limit the sensor to two horizontal and vertical drift velocity measurements

---

```
*ERROR(SMPRC)* SM RANGE DATA ERROR
     TIME(SEC): xxxxx,   RANGE DATA: rrr
     RANGE TABLE:   zzzz zzzz zzzz zzzz zzzz
                    zzzz zzzz zzzz zzzz zzzz
                    zzzz zzzz zzzz zzzz zzzz
                    zzzz zzzz zzzz zzzz zzzz
                    zzzz zzzz zzzz zzzz zzzz
     SM EL/AMP VOLTAGES
     vvv  vvv  vvv  vvv  vvv  ...
     vvv  vvv  vvv  vvv  vvv  ...
     SM FILTER VOLTAGES fff fff ...
```

The range data value which indicates the range settings for the SM electrometer and wideband ranging amplifier does not correlate with a value in the range table read in from file IESCNTRLFILE. This message will be generated every five (5) minutes that the SM data processing module cannot interpret the range data. The information provided is the time (xxxxx, seconds since midnight), the range data value (rrrr), the values in the range table (zzzz), and the EL/AMP (vvv) and filter band voltages (fff) from the SM sensor for the current second. Check the range table to insure that they are correct by comparing them to the values in the LDCON specifications for the satellite being processed. If the table is incorrect, run LDCON to reload the table and reprocess the readout-REV. If the table is correct and this error message occurs only once in a readout-REV, do nothing further. If the message occurs frequently, there may be a problem with the SM electronics which calculates the range data and the values in the range table may require updating. Notify programmer personnel.

```
*ERROR(VEHPAR)* VEHICLE NOT DEFINED IN FILE IESCNTRLFILE
                MISSION ID = mmmm
```

The DMSP satellite Mission ID for the current raw DMSP SSIES data from the file IESPREPFILE is for a satellite with no entry in file IESCNTRLFILE. Actions are as follows:

a. If the ID was valid, run program LDCON in DISPLAY mode to list the parameters in file IESCNTRLFILE. If the parameters are correct, rerun the SSIES2 program. If not, reload file IESCNTRLFILE to contain the production inputs for file IESCNTRLFILE. If the SSIES2 program continues to stop with this error message, contact the responsible programmer.

b. If the ID was invalid, the readout-REV containing the erroneous ID cannot be processed. Set the processing flags using AFGWC/SDMS procedures to indicate that the erroneous readout has been processed and rerun the SSIES2 program. If the SSIES2 program continues to stop with this error message, contact the responsible programmer.

c. If the ID is for a new satellite which has not yet been entered in file IESCNTRLFILE, update this file and rerun the SSIES2 program.

Warning Messages. Warning messages are printed out to alert the user to possible problems or to events which the user should be aware of. The format is similar to error messages with the name of the program subroutine in brackets following the words *WARNING* followed by a brief note describing the problem and, in some cases, additional information which may be of interest to the programmer responsible for the program. None of these conditions will cause the SSIES2 program to terminate execution, but a few of them indicate possible errors or problems which require corrective action.

WARNING(DMCMD) THE RETARDING POTENTIAL ON THE DRIFT METER HAS CHANGED

OLD READING: xxx VOLTS NEW READING: yyy VOLTS

A command for the Drift Meter sensor has been processed which directs the sensor to place a repelling voltage on its outer grid. This will cause the ion densities calculated for the DM LLA and LLB data to be too low. If this command was actually sent to the spacecraft, nothing further can be done. If such a command was not sent, alert personnel responsible for DMSP operations that the SSIES-2 DM sensor may be in an erroneous mode of operation. Information provided is the old (xxx) and new (yyy) settings of the repeller voltage.

WARNING(DMCMD) THE DRIFT METER HAS CHANGED INTO H+ MODE
COMMAND RECEIVED: xxx OLD MODE: y NEW MODE: z

A command for the Drift Meter sensor has been processed which directs the sensor to enter H+ mode. This will limit the sensor to one horizontal and vertical drift velocity measurement per second (instead of the normal six each per second) and will disable the calculation of ion density from the DM LLA/LLB data. If this command was actually sent to the spacecraft, nothing further can be done. If such a command was not sent, alert personnel responsible for DMSP operations that the SSIES-2 DM sensor may be in an erroneous mode of operation. Information provided is the command received to place the sensor in H+ mode (xxx), the last mode the DM sensor was in and the new mode (y and z respectively, DM command - 152 - 158).

WARNING(DMCMD) DM FIBA COMMAND RECEIVED
COMMAND RECEIVED: (xxx)
DM FIBA PROCESSING IS NOT FULLY DEFINED

A command for the Drift Meter sensor has been processed which directs the sensor to enter FIBA mode. This will limit the sensor to two horizontal and vertical drift velocity measurements

every four seconds (instead of the normal six each per second) and will disable the calculation of ion density from the DM LLA/LLB data. If this command was actually sent to the spacecraft, nothing further can be done. If such a command was not sent, alert personnel responsible for DMSP operations that the SSIES-2 DM sensor may be in an erroneous mode of operation. Information provided is the command received to place the sensor in FIBA mode (xxx).

WARNING(DMCMD) H+ REPELLER VOLTAGE CMD WHILE IN FIBA MODE
COMMAND RECEIVED: xxx MODE: y

A repeller voltage command for the Drift Meter has been processed while the sensor is in FIBA mode. This is a test mode only, and would not be processed in the same manner as the standard FIBA mode. If this command was actually sent to the spacecraft, nothing further can be done. If such a command was not sent, alert personnel responsible for DMSP operations that the SSIES-2 DM sensor may be in an erroneous mode of operation. Information provided is the command received for the H+ repeller setting (xxx) and the mode the DM sensor was in (y) (DM command - 144, 146 - 150).

WARNING(DMCMD) COMMAND/SUBCOM DM MODE DISCREPANCY
SUBCOM MODE: xxx
CURRENT COMMAND MODE: yyy
NEXT COMMAND MODE: zzz

The status of the Drift Meter sensor as derived from the DSM subcom is different from the status as derived from the command monitor. Possible causes for this circumstance are:

a. A DM command has been missed, due to a lost second of data or by reporting of an immediately succeeding SM command in the same command monitor word.

b. A DM command has been received within the last 16 seconds, and the status derived from the subcom has not yet been updated to report the new command. The status change for the Drift Meter will occur after the next cycle count evenly divisible by 16.

In either case, the message should not recur unless further commands are actually sent to the Drift Meter. If the problem recurs, alert the responsible programmer.

WARNING(DMCMD) DM COMMAND ERROR
COMMAND RECEIVED: (xxx)
THIS IS A "SPARES" COMMAND

The last command reported from the DM sensor is identified as a "spare" command in the DM command table. Information provided is the DM command in the last data frame (xxx).

WARNING(DMINFO) DM SENSOR PROCESSING HAS BEEN WAITING FOR xxxxx SECONDS
TIME OF CURRENT DATA BLOCK = sssss SECONDS

Processing of data from the DM sensor has been placed in a wait status due to problems interpreting whether the sensor is in H+ mode, normal mode, or FIBA mode. This message will be generated every 10 minutes of data that the processor is in a wait status. If this occurs for the majority of a readout REV there may be a problem with the data from the DM sensor, the command monitor, or the subcom readouts. Information provided is the length of time the processor has been in a wait status (xxxxx seconds) and the time of the latest data frame (sssss, seconds since midnight).

WARNING(DMPRC) OFFSET VOLTAGE ON DM SENSOR MAY BE DRIFTING
NOMINAL VALUE: xx.xx LATEST VALUE: yy.yy

The offset voltage (yy.yy) of the DM offset amplifier reported in the current data frame is more than 0.3 volts from the nominal value for this offset (xx.xx) stored in file IESCNTRLFILE. If this message shows up more than once in a given readout-REV, alert personnel responsible for DMSP operations that the SSIES-2 DM sensor may be having problems with the offset amplifier zero voltage.

WARNING(HPMODE) NO DRIFT METER H+ MODE FILE BUILT

The SSIES program encountered problems in attempting to output raw DM H+ mode data to file IESDMHPMODE. As this is not an operationally used file, nothing need be done beyond notifying the responsible programmer on the next duty day.

WARNING(LDSTF) A NEW ENTRY HAS BEEN MADE TO FILE IESSTATFILE
SATELLITE: Fxx MISSION ID: WXyyyy

The SSIES2 program has determined that a new vehicle needs to be added to file IESSTATFILE and has done so. The information provided is the flight ID (xx) and mission ID (yyyy) of the new satellite.

WARNING NO MP/EP DIAGNOSTIC FILE BUILT
WARNING NO MP/RPA DIAGNOSTIC FILE BUILT

These messages are from MPDIAG. The SSIES2 program encountered problems in attempting to output comparisons of EP or RPA analyses from the on-board microprocessor to the ground processing results to either file IESMPEPPRT or IESMPRPAPRT. As these are not operationally used files, nothing need be done beyond notifying the responsible programmer on the next duty day.

WARNING(OPNEDR) FILE IESEDRFILE IS BEING REINITIALIZED

The SSIES2 program has determined that file IESEDRFILE needed to be reinitialized and has done so. This will occur if the program discovers that a vehicle has been added to or deleted from file IESCNTRLFILE, or if word number 2 in the file is a zero (0). If this reinitialization was expected, no further action is required. If it was not, and subsequent runs of the SSIES2 program also reinitialize the file, alert the responsible programmer.

WARNING(OPNSTF) FILE IESSTATFILE HAS BEEN INITIALIZED

The SSIES2 program has determined that file IESSTATFILE needed to be reinitialized and has done so. This will occur if the program discovers that a vehicle has been added to or deleted from file IESCNTRLFILE, or if word number 2 in the file is a zero (0). If this reinitialization was expected, no further action is required. If it was not, and subsequent runs of the SSIES2 program also reinitialize the file, alert the responsible programmer.

WARNING(RANGE) SCINTILLATION METER RANGE DATA TOO FAR FROM NOMINAL

LATEST RANGE DATA rrrr
RANGE TABLE IS:
zzzz zzzz zzzz zzzz zzzz
zzzz zzzz zzzz zzzz zzzz
zzzz zzzz zzzz zzzz zzzz
zzzz zzzz zzzz zzzz zzzz
zzzz zzzz zzzz zzzz zzzz

The range data value which indicates the range settings for the SM electrometer and wideband ranging amplifier appears to be drifting from the nominal values in the range table read in from file IESCNTRLFILE. The SM processor was able to select a range setting by expanding the fit criteria. This message will be generated the first time the condition is encountered and every 100 times thereafter in a given readout-REV. The information provided is the range data value (rrrr) and the range table values (zzzz). If the range table values are correct, the SM electronics which calculate the range data may be drifting and the range data table may require updating. Alert programmer personnel.

WARNING(WRTEDR) EDR TOO OLD FOR CURRENT IESEDRFILE
EDR NOT WRITTEN TO FILE IESEDRFILE
SATELLITE: xx DATE/TIME: date/time

The latest EDR constructed was for a date/time older than the oldest date/time in file IESEDRFILE. The information provided is the satellite ID (xx) and the date/time of the data

(date (YYMMDD) and time HHMM)). If the dates given for the EDR and for the file are all correct, the data were just too old to store in the file; nothing further need be done. If the date/time of the EDR is correct, but the date/time values for the file are erroneous, reinitialize file IESEDRFILE and reprocess the data for the current readout-REV. If the problem recurs, alert the responsible programmer.

```
*WARNING(WRTEDR)* EDR FROM THE FUTURE
     EDR NOT WRITTEN TO FILE IESEDRFILE
     SATELLITE: xx DATE/TIME: date/time
     CALCULATED RECORD: yyyy MAX ALLOWED: zzzz
```

The latest EDR constructed was for a date/time beyond the latest date/time in file IESEDRFILE. The information provided is the satellite ID (xx), the date/time of the data (date (YYMMDD) and time (HHMM)), the file record number calculated for the date/time (yyyy), and the maximum record number allowed (zzzz). If the date/time of the EDR is correct, but the date/time values for the file are erroneous, reinitialize file IESEDRFILE and reprocess the data for the current readout-REV. If the problem recurs, alert the responsible programmer.

```
*WARNING(WRTXFR)* TRANSFER FILE IESAGDBXFRn OVERFLOWED
     A TOTAL OF nnn RECORDS WERE LOST
```

This message indicates that more than 424 minutes of data have been processed during the current program run (which should rarely, if ever, happen) and that there was no room in the transfer file for the entire set of data processed. The information provided is the number of records which were not written to the transfer file. When the overflow occurs, the program will automatically begin printing out the data which would have been stored in the transfer file.

Contents of Environmental Data Records (EDRs)

The Environmental Data Records are the fundamental results from the SSIES2 analysis, and are stored in binary form in the file IESEDRFILE, one record per minute. The specific contents of the records are dependent upon the operating mode of the instruments and specifications provided to the SSIES2 program in the file IESCNTRLFILE.

Word #	Contents
1	Satellite Flight ID (two digit integer)
2	Date (YYMMDD, integer)
3	Time (HHMM, integer)
4-21	Location information (every 20 seconds). There are three sets of location information, the first valid for time HHMM00, the second for time HHMM20, and third for time HHMM40. Each set contains the following six parameters pertaining to the spacecraft location: 1: Geographic latitude (degrees, north) 2: Geographic longitude (degrees, east) 3: Apex latitude (degrees, north) 4: Apex longitude (degrees east) 5: Apex local time (hours) 6: Satellite altitude (km)
22-36	Satellite potential $V_{bias}+V_{IP}$ (every 4 seconds) (volts)
37	Satellite potential source (integer) 1 - As set by on-board microprocessor 2 - As set by SENPOT sensor
38-97	Primary plasma density (one-second averages) (cm^3)
98	Plasma density source (SM, DM, EP) (integer) 1 - Ion density from SM sensor 2 - Ion density from DM sensor 3 - Electron density from EP sensor (DC Mode)
99-158	Horizontal ion drift velocity (m/s)
159-218	Vertical ion drift velocity (m/s)

Word #	Contents
219-338	C_tL Analyses (every 10 seconds). There are six C_tL analysis sets. The first is valid for the time period centered on HHMM05, the second for HHMM15, etc. Each analysis set contains the following parameters: 1: (RMS ΔN)/N (%) 2: T_i 3: p_i 4: C_tL 5-19: Decimated power density spectrum (PDS) 20: Analysis qualifier (integer) 0 - No analysis attempted 1 - No analysis, not enough good data. 2 - No analysis, (RMS ΔN)/N below threshold 3 - Analysis used 256 data points 4 - Analysis used 512 data points
339	Data used for C_tL calculation (integer) 1 - SM density data only 2 - SM density and filter data 3 - EP DC mode density data
340-414	EP Sweep analyses (every 4 seconds). There are 15 EP sweep analysis sets. Each is valid for either 4 (modes A, B and BS) or 2 (mode E) seconds centered on the time specified in the set. Each analysis set contains the following parameters: 1: Sweep center time (UT, seconds) (integer) 2: Electron density (el/cm^3) 3: Electron temperature ($^\circ K$) 4: Satellite potential (volts) 5: Analysis qualifier (integer)
--- or ---	
340-399	EP one-second average densities (Modes C, D and DS) (el/cm^3)
400-414	EP sweep analyses (up to three) structured as words 340-414 in sweep modes.
415	EP analysis source (integer) 1 - Ground processing analysis 2 - On-board microprocessor analysis

Word #	Contents
416-520	RPA Sweep analyses (every 4 seconds). There are 15 RPA sweep analysis sets. Each is valid for the 4 seconds centered on the time specified in the set. Each analysis set contains the following parameters: 1: Sweep center time (UT, seconds) (integer) 2: O^+ density (ion/cm^3) 3: H^+ density (ion/cm^3) 4: Light ion flag (integer) 0 - No light ion 1 - Light ion is H^+ 2 - Light ion is He^+ 5: Ion temperature ($^\circ K$) 6: Ram ion drift velocity (m/s) 7: Analysis qualifier (integer)
521	RPA analysis source (integer) 1 - Ground processing analysis 2 - On-board microprocessor analysis
522-581	DM ion density (ion/cm^3)
582-588	Engineering data 582: Electrometer temperature ($^\circ C$) 583: ADC temperature ($^\circ C$) 584: DSM temperature ($^\circ C$) 585: DM offset voltage (volts) 586: DM mode (0-9) (integer) 587: EP mode (0-6 : A,B,BS,C,D,DS,E) (integer) 588: V_{IP} at EDR start (volts)

Word Number	Word Identification											
1 - 12	Cycle 1 ID	Config 1 ID	OLS Cmd Mon	Current Monitor	RPA Therm	Vaper Monitor	RPA Ion Monitor	MP Temp:H+	MP Temp:O+	MP RPA Veh Pot	Electron Monitor	MP Temp:e
	Cycle 2 ID	Config 2 ID	DSM Cmd Mon	Temp Monitor	EP Therm	Bias Monitor	Spare	MP Dens:H+	MP Dens:O+	MP Ram Velocity	MP EP Veh Pot	MP Dens:e
13 - 24	RPA Current	-->	-->	-->	-->	-->	-->	-->	-->	-->	-->	-->
25 - 36	RPA Current	-->	-->	-->	-->	-->	-->	-->	-->	-->	-->	-->
37 - 48	DSM: ELE/AMP	-->	-->	-->	-->	-->	-->	-->	-->	-->	-->	-->
49 - 60	DSM: DRIFT	-->	-->	-->	-->	-->	-->	-->	-->	-->	-->	-->
61 - 72	DMFIBA 6	DMFIBA 4	DMFIBA 2	DMFIBA 5	DMFIBA 3	DMFIBA 1	SMFIBA 6	SMFIBA 4	SMFIBA 2	SMFIBA 5	SMFIBA 3	SMFIBA 1
	Subcom 1	Subcom 2	LLA/LLB	Drift	WIBAN1 Range	WIBAN2 Range						
73 - 84	DSM: ELE/AMP	-->	-->	-->	-->	-->	-->	-->	-->	-->	-->	-->
85 - 96	EP Current	-->	-->	-->	-->	-->	-->	-->	-->	-->	-->	-->
97 - 108	EP Current	-->	-->	-->	-->	-->	-->	-->	-->	-->	-->	-->
109 - 120	RPA Voltage	-->	-->	-->	-->	-->	EP Voltage	-->	-->	-->	-->	-->

All cycles	Identification of telemetry item appearing in both even and odd cycles
Odd Cycles	Identification of telemetry item appearing in odd cycles
Even Cycles	Identification of telemetry item appearing in even cycles
Deleted	Items excluded from telemetry before transmission from spacecraft

Telemetry Format and Identification

Notes:

1. The RPA Current and EP Current sections of the telemetry format can be exchanged, based on ground commands.
2. The SSIES2 data acquisition and verification process assumes that the 92-word format (with the excluded words not present) is the final SSIES-2 telemetry format.
3. Possible alternative operational implementations of the SSIES-2 telemetry format are:
   a. All 120 data words will be present in the transmission. This will require modifications to the SSIES2 data acquisition and verification process, and further modifications to the RPA/EP processing control and data acquisition to allow simultaneous data processing by both instruments.
   b. The last 36 words of the telemetry format (words 84 - 120) will be missing from the transmission. This will require modifications to the SSIES2 data acquisition and verification process, but the RPA/EP processing control and data acquisition will be unaffected.
   c. The last 40 words of the telemetry format (words 81 - 120) will be missing from the transmission. This will require modifications to the SSIES2 data acquisition and verification process, but the RPA/EP processing control and data acquisition will be unaffected. However, the DSM ELE/AMP processing will not be reliable, even if the data acquisition process is appropriately modified, because the missing values may contain embedded range flags. Furthermore, the missing samples will invalidate the DSM Fourier transform calculation for the CKL analysis, so that the CKL analysis will not be possible unless the EP current values are transmitted instead of the RPA values and also designated for use by the CKL processing routines.
4. The sequence of values appearing in the two subcommutator words of the telemetry are identified in the following table.

Cycle Second	Subcom 1	Subcom 2
2,18,34,50,66,...	REG3A	REG3B
4,20,36,52,68,...	REG3C	REG3D
6,22,38,54,70,...	REG2A	REG2B
8,24,40,56,72,...	REG2C	REG2D
10,26,42,58,74,...	REG1A	REG1B
12,28,44,60,76,...	REG1C	REG1D
14,30,46,62,78,...	SENSTEMP	ELECTEMP
16,32,48,64,80,...	COMDATD	RELAYFLG

Subcommutator Format

The following table displays the values of the subcom command registers, and the associated commands which set the registers. For each register, a reported zero value is derived from a nine-bit telemetry zero value, while a reported one value is derived from a nine-bit telemetry 511 value. Within the SSIES2 program, the threshold between reported zero or one values is considered to be a nine-bit telemetry 256 value. The registers are latching registers, so that the instrument status can be determined from the subcom even after the associated commands have been superseded in the telemetry DSM command monitor. However, acquiring the appropriate values for one register set (REG1, REG2, or REG3) from the subcom requires at least three seconds (two successive even cycles), and acquiring the entire subcom set requires sixteen seconds.

Command	REG1D	REG1C	REG1B	REG1A	Mnemonic	Command	REG2D	REG2C	REG2B	REG2A	Mnemonic	Command	REG3D	REG3C	REG3B	REG3A	Mnemonic
82	0	0	0	0	WB2AUTO	88	0	0	0	0	WB1AUTO	90	0	0	0	0	DREP00
	0	0	0	1	spare		0	0	0	1	spare		0	0	0	1	spare
	0	0	1	0	spare		0	0	1	0	spare	92	0	0	1	0	DREP10
	0	0	1	1	spare		0	0	1	1	spare	93	0	0	1	1	DREP15
	0	1	0	0	spare		0	1	0	0	spare	94	0	1	0	0	DREP20
	0	1	0	1	spare		0	1	0	1	spare	95	0	1	0	1	DREP25
	0	1	1	0	spare		0	1	1	0	spare	96	0	1	1	0	DREP30
	0	1	1	1	spare		0	1	1	1	spare		0	1	1	1	spare
83	1	0	0	0	WB2RNG1	89	1	0	0	0	WB1RNG1	98	1	0	0	0	0WIGLO
84	1	0	0	1	WB2RNG2	8A	1	0	0	1	WB1RNG2	99	1	0	0	1	0WIGHI
85	1	0	1	0	WB2RNG3	8B	1	0	1	0	WB1RNG3	9A	1	0	1	0	1WIGLO
86	1	0	1	1	WB2RNG4	8C	1	0	1	1	WB1RNG4	9B	1	0	1	1	1WIGHI
87	1	1	0	0	WB2RNG5	8D	1	1	0	0	WB1RNG5	9C	1	1	0	0	2WIGLO
	1	1	0	1	spare	16,19	1	1	0	1	SENPOT	9D	1	1	0	1	2WIGHI
	1	1	1	0	spare	30-4C	1	1	1	0	VBIAS	9E	1	1	1	0	3WIGLO
	1	1	1	1	spare		1	1	1	1	spare	9F	1	1	1	1	3WIGHI

Subcom Register Definitions

Appendix A: Synthesized SSIES-2 Input (for testing)

The ephemeris block is a direct copy of the SSIES ephemeris block, translated into coded format. There are 368 characters per block, to match the 1-second telemetry block size. The sequence of ephemeris values is as follows:

Word	Mnemonic	Format
1	Lat1	F15.7
2	Long1	F15.7
3	Alt1	I15
4	JulDay1	I15
5	Time1	I15
6	Lat2	F15.7
7	Long2	F15.7
8	Alt2	I15
9	JulDay2	I15
10	Time2	I15
11	X1	F15.9
12	Y1	F15.9
13	Z1	F15.9
14	X2	F15.9
15	Y2	F15.9
16	Z2	F15.9
17	Lat1A	I15
18	Long1A	I15
19	Alt1A	F15.9
20	Lat2A	I15
21	Long2A	I15
22	Alt2A	F15.9
23	Sath 1	F15.7
24	Sath 2	F15.7
25	Dummy	I2
26	Dummy	I2
27	Dummy	I2
28	Dummy	I2

The instrument block is grouped into 60-second sections with individual ephemeris block headers for each section. The 9-bit telemetry values are expressed as 3-digit integer values, with an intervening space between values. There are 20 values per record, and 92 values per block, giving a total of 368 characters (bytes) per block.

SSIES-2 word/cycle	SSIES-2 mnemonic	SSIES source word/cycle
1		
odd	CYCLE 1 ID	1:odd
even	CYCLE 2 ID	1:even
2		
odd	CONFIG 1 ID	none: value defined
even	CONFIG 2 ID	none: value defined

3			
	odd	CMD MON OLS	70:odd
	even	CMD MON DSM	70:even
4			
	odd	CURRENT MONITOR	111:odd
	even	TEMP. MONITOR	91:even
5			
	odd	RPA THERMISTOR	none: value defined
	even	EP THERMISTOR	none: value defined
6			
	odd	Vaperture MONITOR	81:odd
	even	Bias MONITOR	90:even
7			
	odd	RPA ION MONITOR	80:even
	even	SPARE	blank (zero fill)
8			
	odd	T(H+)	101:odd
	even	N(H+)	101:even
9			
	odd	T(O+)	110:odd
	even	N(O+)	110:even
10			
	odd	Vp RPA	120:next even
	even	Vsp	111:even
11			
	odd	ELECTRON MONITOR	80:odd
	even	Vp ELE	120:previous odd
12			
	odd	T(E)	100:odd
	even	N(E)	100:even
13 ≤ I ≤ 36			
	all	RPA (/EP)	K0 + 5*k (k = I - 13; 0 ≤ k ≤ 23):all K0 = 3 for RPA selection; K0 = 4 for EP selection
37 ≤ I ≤ 48			
	all	DSM (ELE/AMP)	2 + 5*k (k = I - 37; 0 ≤ k ≤ 11):all
49 ≤ I ≤ 60		NORMAL MODE (60:odd < 511)	
	all	DSM (DRIFT)	6 + 10*k (k = I - 49; 0 ≤ k ≤ 11):all
49 ≤ I ≤ 60		H+ MODE (60:odd = 511)	
49			
	1 + 4*n	Offset(V)	6:next 3 + 4*n
	2 + 4*n	Offset(V)	6:next 4 + 4*n
	3 + 4*n	Offset(H)	6:previous 1 + 4*n
	4 + 4*n	Offset(H)	6:previous 2 + 4*n
	(0 ≤ n ≤ 3)		

50		
1 + 4*n	Offset(H)	16:next 3 + 4*n
2 + 4*n	Offset(H)	16:next 4 + 4*n
3 + 4*n	Offset(V)	16:previous 1 + 4*n
4 + 4*n	Offset(V)	16:previous 2 + 4*n
(0 ≤ n ≤ 3)		
51 ≤ I ≤ 60	(k = I - 51; 0 ≤ k ≤ 9)	
1 + 4*n	H+DERIV(H)	26 + 10*k:next 3 + 4*n
2 + 4*n	H+DS(H)	26 + 10*k:next 4 + 4*n
3 + 4*n	H+DERIV(V)	26 + 10*k:previous 1 + 4*n
4 + 4*n	H+DS(V)	26 + 10*k:previous 2 + 4*n
(0 ≤ n ≤ 3)		
49 ≤ I ≤ 60	FIBA MODE (synthesized from NORMAL by programmer specification)	
49 ≤ I ≤ 52		
1 + 4*n	V(D)	none: value defined
2 + 4*n	H(D)	none: value defined
3 + 4*n	H(D)	none: value defined
4 + 4*n	V(D)	none: value defined
53 ≤ I ≤ 54		
1 + 4*n	H(R)	61:current odd (from NORMAL only)
2 + 4*n	H(D)	none: value defined
3 + 4*n	V(R)	61:current odd (from NORMAL only)
4 + 4*n	V(D)	none: value defined
55 ≤ I ≤ 56		
1 + 4*n	H(O)	16:current odd (from NORMAL only)
2 + 4*n	H(D)	none: value defined
3 + 4*n	V(O)	6:current odd (from NORMAL only)
4 + 4*n	V(D)	none: value defined
57 ≤ I ≤ 60		
1 + 4*n	H(D)	none: value defined
2 + 4*n	H(D)	none: value defined
3 + 4*n	V(D)	none: value defined
4 + 4*n	V(D)	none: value defined
61		
odd	DM FIBA 6	none: value defined
2 + 16*n	REG3A	70:current even (see table A-2)
4 + 16*n	REG3C	70:current even (see table A-2)
6 + 16*n	REG2A	70:current even (see table A-1)
8 + 16*n	REG2C	70:current even (see table A-1)
10 + 16*n	REG1A	none: value defined
12 + 16*n	REG1C	none: value defined

	14 + 16*n	SENSTEMP	none: value defined
	16 + 16*n	COMDATD	zero, unless DM FIBA (then 511)
	(0 ≤ n ≤ 63)		
62			
	odd	DM FIBA 4	none: value defined
	2 + 16*n	REG3B	70:current even (see table A-2)
	4 + 16*n	REG3D	70:current even (see table A-2)
	6 + 16*n	REG2B	70:current even (see table A-1)
	8 + 16*n	REG2D	70:current even (see table A-1)
	10 + 16*n	REG1B	none: value defined
	12 + 16*n	REG1D	none: value defined
	14 + 16*n	ELECTEMP	61:current even
	16 + 16*n	RELAYFLG	70:even (MSB*511)
	(0 ≤ n ≤ 63)		
63			
	odd	DM FIBA 2	none: value defined
	2 + 4*n	LLA	60:previous odd
	4 + 4*n	LLB	60:current even
	(0 ≤ n ≤ 255)		
64			
	odd	DM FIBA 5	none: value defined
	even	Drift Signal	61:previous odd
65			
	odd	DM FIBA 3	none: value defined
	even	EL/WIBAN1	51:previous odd
66			
	odd	DM FIBA 1	none: value defined
	even	WIBAN2	none: value defined
67			
	all	Ni FIBA 6	10:all (SMFILT 7)
68			
	all	Ni FIBA 4	11:all (SMFILT 5)
69			
	all	Ni FIBA 2	41:all (SMFILT 2)
70			
	all	Ni FIBA 5	31:all (SMFILT 6)
71			
	all	Ni FIBA 3	20:all (SMFILT 3)
72			
	all	Ni FIBA 1	21:all (SMFILT 1)
73 ≤ I ≤ 84			
	all	DSM (ELE/AMP)	62 + 5*k (k = I - 73; 0 ≤ k ≤ 11)

85 ≤ I ≤ 92 all	ELECTRON(/RPA)	K0 + 5*k (k = I - 85; 0 ≤ k ≤ 7):all K0 = 3 for RPA selection; K0 = 4 for EP selection	

The status registers of the DSM subcom are defined based on the DSM Command Monitor (DCM) (word 70 for even cycles of the SSIES format). If the value FBR is defined as (DCM .AND. F0h)/16 and the value DREP is defined as (DCM .AND. Fh), then the values for REGxx are given as follows:

Table A-1

FBR(hex)	REG2D	REG2C	REG2B	REG2A	Mnemonic
0	0	0	0	0	obsolete
1	1	1	1	0	VBIAS
2	0	0	1	0	spare
3	1	1	0	1	SENPOT
4	0	0	0	0	WB1AUTO
5	0	1	0	1	spare
6	0	1	1	0	spare
7	0	1	1	1	spare
8	1	0	0	0	WB1RNG1
9	1	0	0	1	WB1RNG2
A	1	0	1	0	WB1RNG3
B	1	0	1	1	WB1RNG4
C	1	1	0	0	WB1RNG5
D	0	0	1	1	spare
E	0	0	0	1	spare
F	1	1	1	1	spare

Table A-2

DREP(hex)	REG3D	REG3C	REG3B	REG3A	Mnemonic
0	0	0	0	0	DREP00
1	0	0	0	1	spare
2	0	0	1	0	DREP10
3	0	0	1	1	DREP15
4	0	1	0	0	DREP20
5	0	1	0	1	DREP25
6	0	1	1	0	DREP30
7	0	1	1	1	spare
8	1	0	0	0	0WIGLO
9	1	0	0	1	0WIGHI
A	1	0	1	0	1WIGLO
B	1	0	1	1	1WIGHI
C	1	1	0	0	2WIGLO
D	1	1	0	1	2WIGHI
E	1	1	1	0	3WIGLO
F	1	1	1	1	3WIGHI

References

1. Analytyx; Operations Handbook for SSIES-2 Plasma Monitor System SN005; A80805R; June 1989

2. Delorey, D.E., Pruneau, P.N., Parsons, C.M., and Donovan, B.J.; Database Development for the DMSP Experiments; GL-TR-90-0028; January 1990; ADA224346

3. Greenspan, M.E., Anderson, P.B., and Pelagatti, J.M.; Characteristics of the Thermal Plasma Monitor (SSIES) for the Defense Meteorological Satellite Program (DMSP) Spacecraft S8 Through S10; AFGL-TR-86-0227; April 1988; ADA176924

4. Holt, B.J.; R and D Equipment Information Report, Drift Scintillation Meter (DSM2) - Serial #004; UTD-EIR-DSM2-004; October 1989

5. Secan, J.A. and Bussey, R.M.; DMSP SSIES Flight Data Processor, System Documentation, Volume II. Users Manual; NWRA-87-R011; August 1987