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Produced by the NASA Center for Aerospace Information (CASI)
DETAILED DESIGN SPECIFICATION
FOR THE ALT
SHUTTLE INFORMATION EXTRACTION SUBSYSTEM
(SIES)

Job Order 86-029

Prepared By
Lockheed Electronics Company, Inc.
Aerospace Systems Division
Houston, Texas

Contract NAS 9-12200
For
INSTITUTIONAL DATA SYSTEMS DIVISION

National Aeronautics and Space Administration
LYNDON B. JOHNSON SPACE CENTER
Houston, Texas
July 1976

LEC-9104A
DETAILED DESIGN SPECIFICATION
FOR THE ALT
SHUTTLE INFORMATION EXTRACTION SUBSYSTEM
(SIES)
Job Order 86-029

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LYNDON B. JOHNSON SPACE CENTER
HOUSTON, TEXAS

July 1976

LEC-9104A
FOREWORD

The objective of the Detailed Design Specification for the ALT Shuttle Information Extraction Subsystem (SIES) is to provide a description of the software system designed to satisfy those data processing requirements originating from the need to process Computer Compatible Tapes (CCT's) containing mission related data as specified in the Data Reduction Complex Approach and Landing Test Data Processing Requirements (Level C). This document was written in response to Job Order 86-029, "Shuttle DRC Development" for the Institutional Data Systems Division (IDSD), Lyndon B. Johnson Space Center (NASA/JSC), National Aeronautics and Space Administration by Lockheed Electronics Company, Inc., Aerospace Systems Division, Houston, Texas.
### ABBREVIATIONS AND ACRONYMS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AGC</td>
<td>Automatic Gain Control</td>
</tr>
<tr>
<td>ALT</td>
<td>Approach and Landing Tests</td>
</tr>
<tr>
<td>AMU</td>
<td>Data Type Code from MMDB</td>
</tr>
<tr>
<td>APFUEL</td>
<td>Power and Propulsion APU Fuel Quantity Special Calculation Program</td>
</tr>
<tr>
<td>APPERF</td>
<td>Power and Propulsion APU Performance Special Calculation Program</td>
</tr>
<tr>
<td>APU</td>
<td>Auxiliary Power Unit</td>
</tr>
<tr>
<td>BFCS</td>
<td>Backup Flight Control System</td>
</tr>
<tr>
<td>BITE</td>
<td>Built-in Test Equipment</td>
</tr>
<tr>
<td>CCT</td>
<td>Computer Compatible Tape</td>
</tr>
<tr>
<td>CDB</td>
<td>Calibration Data Base</td>
</tr>
<tr>
<td>COS</td>
<td>Continuous Data Segment</td>
</tr>
<tr>
<td>CDT</td>
<td>Compressed Data Tape</td>
</tr>
<tr>
<td>COMTRK</td>
<td>Avionics Communication and Tracking Special Calculation Program</td>
</tr>
<tr>
<td>D/D</td>
<td>Downlink/Downlist</td>
</tr>
<tr>
<td>DAF</td>
<td>Data Availability File</td>
</tr>
<tr>
<td>DOB</td>
<td>Descriptor Data Base</td>
</tr>
<tr>
<td>DL</td>
<td>Delta Time</td>
</tr>
<tr>
<td>DRC</td>
<td>Data Reduction Complex</td>
</tr>
<tr>
<td>ECLSS</td>
<td>Environmental Control Life Support Subsystem Special Calculation Program</td>
</tr>
<tr>
<td>EPHM</td>
<td>Ephemeris/Meteorological</td>
</tr>
<tr>
<td>ET</td>
<td>Event Time</td>
</tr>
<tr>
<td>EU</td>
<td>Engineering Units</td>
</tr>
<tr>
<td>FM</td>
<td>Frequency Modulation</td>
</tr>
<tr>
<td>FR</td>
<td>Full Rate</td>
</tr>
<tr>
<td>GMT</td>
<td>Greenwich Mean Time</td>
</tr>
<tr>
<td>GPT</td>
<td>Group Processing Table</td>
</tr>
<tr>
<td>HFS</td>
<td>Data Type Code from MMDB Calibration Tape</td>
</tr>
<tr>
<td>HIPD</td>
<td>Hierarchy Plus Input-Process-Output</td>
</tr>
<tr>
<td>ICD</td>
<td>Interface Control Document</td>
</tr>
<tr>
<td>ID</td>
<td>Identification</td>
</tr>
<tr>
<td>IDSD</td>
<td>Institutional Data Systems Division</td>
</tr>
<tr>
<td>IGS</td>
<td>Integrated Graphics Software</td>
</tr>
<tr>
<td>LDGEAR</td>
<td>Structures Landing Gear Special Calculation Program</td>
</tr>
<tr>
<td>LI</td>
<td>Linearly Interpolated</td>
</tr>
<tr>
<td>MET</td>
<td>Mission Elapsed Time</td>
</tr>
<tr>
<td>MGM</td>
<td>Measurement Group Matrix</td>
</tr>
<tr>
<td>MMDB</td>
<td>Master Measurement Data Base</td>
</tr>
<tr>
<td>MPDB</td>
<td>Master Product Data Base</td>
</tr>
<tr>
<td>MSFC</td>
<td>Marshall Space Flight Center</td>
</tr>
<tr>
<td>MTU</td>
<td>Master Timing Unit</td>
</tr>
<tr>
<td>NIP</td>
<td>Network Interface Processor</td>
</tr>
<tr>
<td>OI</td>
<td>Operational Instrumentation</td>
</tr>
<tr>
<td>PFCS</td>
<td>Primary Flight Control System</td>
</tr>
<tr>
<td>PIA</td>
<td>Processing Interface Array</td>
</tr>
<tr>
<td>PIAT</td>
<td>Processing Interface Array Template</td>
</tr>
<tr>
<td>PRESSR</td>
<td>Structure Pressures Special Calculation Program</td>
</tr>
<tr>
<td>PRU</td>
<td>Physical Record Unit</td>
</tr>
<tr>
<td>QA</td>
<td>Quality Assurance</td>
</tr>
<tr>
<td>RT</td>
<td>Real Time</td>
</tr>
<tr>
<td>SAIL</td>
<td>Shuttle Avionics Integration Laboratory</td>
</tr>
<tr>
<td>SDB</td>
<td>Source Data Base</td>
</tr>
<tr>
<td>SIES</td>
<td>Shuttle Information Extraction Subsystem</td>
</tr>
<tr>
<td>STRESS</td>
<td>Structures Stress Special Calculation Program</td>
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<td>STANDARD TABULATION</td>
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<td>STANDARD TABULATION (Continued)</td>
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<td>5-3</td>
<td>DATA AVAILABILITY REPORT.</td>
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<td>5-4</td>
<td>TIME HISTORY PLOT</td>
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<tr>
<td>5-5</td>
<td>CROSS PLOT.</td>
</tr>
<tr>
<td>5-6</td>
<td>CONTINUOUS PLOT</td>
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<td>5-7</td>
<td>CONTINUOUS PLOT (Continued)</td>
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<tr>
<td>Table</td>
<td>Description</td>
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<td>ALT SIES SOFTWARE SYSTEM FILES</td>
</tr>
<tr>
<td>8-1</td>
<td>ALT SIES SOFTWARE SYSTEM ARRAYS AND TABLES</td>
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</table>
1. PURPOSE AND SCOPE

This document defines the ALT Shuttle Information Extraction Subsystem (SIES). When considering the total Shuttle Data Reduction Complex as a system, SIES is a subsystem. For the purpose of this document SIES is treated as a system and references to subsystems, modules and elements refer to the lower structure levels within SIES.

The various subsystems, modules, and elements, as well as their data interfaces, are described to the level required to insure that: (1) the requirements are satisfied; (2) no design elements are omitted; (3) no major problem areas are overlooked; (4) detailed implementation schedules and cost estimates can be made; and (5) accurate program specifications can be developed quickly.
2. SYSTEM OVERVIEW

This section describes the Approach and Landing Test (ALT) Shuttle Information Extraction System (SIES) in terms of general requirements and system characteristics, output products and processing options, output products and data sources, and system data flow.

2.1 GENERAL

The ALT Shuttle Information Extraction System (SIES) is a data reduction system designed to satisfy certain data processing requirements for the Approach and Landing Test (ALT) phase of the Space Shuttle Program.

The specific ALT SIES data processing requirements are stated in the Data Reduction Complex Approach and Landing Test Data Processing Requirements (Level C), LEC-8347. In general, ALT SIES must produce time correlated data products as a result of standardized data reduction or special purpose analytical processes.

The main characteristics of ALT SIES are:

- System operates in a batch (non-interactive) mode
- Processing is table driven
- Data base oriented
- Simple operating procedures
- Requires minimum of run time information

2.2 PRODUCTS AND PROCESSING OPTIONS

A summary of SIES output products, method of product selection and applicable processing options is shown in Table 2-1.
<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>SELECTION METHOD</th>
<th>PROCESSING OPTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>By Group</td>
<td>Band</td>
</tr>
<tr>
<td></td>
<td>Automatic</td>
<td></td>
</tr>
<tr>
<td>TABS</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>T.H. PAGE PLOT</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CONTINUOUS PLOT</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CROSS PAGE PLOT</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>LI CCT</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>FULL RATE CCT</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>DATA AVAILABILITY REPORT</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>SYSTEMS ANALYSIS TAB.</td>
<td></td>
<td>X(1)</td>
</tr>
</tbody>
</table>

**DATA BASE CONTENTS REPORTS**

- Source Data Base: X(2)
- Descriptor Data Base: X(2)
- Calibration Data Base: X(2)
- Master Products Data Base: X(2)
- Lead Card Listings: X
- Diagnostics: X

(1) NIP CCT Data Only
(2) Level of Detail is Optional
2.3 TIME CORRELATED OUTPUT PRODUCT DATA SOURCES

The allowable data sources and combination of data sources for the various SIES output products are shown in Table 2-2.
TABLE 2-2 DATA SOURCES vs PRODUCTS

<table>
<thead>
<tr>
<th>DATA SOURCES</th>
<th>TABS</th>
<th>PAGE PLOTS</th>
<th>CONT. PLOTS</th>
<th>CROSS PLOTS (4)</th>
<th>CCTS LINEARLY INTERPOLATED</th>
<th>FULL RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIP - OI/PFCS</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>NIP - BFCS</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>MSFC FM</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>EPHEMERIS</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>SAIL-CDT(1)</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMPUTED VALUES(2)</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>MERGED SOURCES(3)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

(1) SAIL data is time tagged with the latest CDT tape time preceding the measurement value.

(2) Computed values result from special calculations modules and may be merged with other data sources.

(3) Data merging results from special calculations modules and data is linearly interpolated. SAIL CDT data is not merged.

(4) All data used in cross plots is linearly interpolated.
2.4 SYSTEM DATA FLOW

Major data flow paths through SIES are shown in Figure 2-1. Also shown is the relationship of the general functional areas as well as an indication of processing sequence.
Figure 2-1 ALT SIES Data Flow
3. SYSTEM HIPO DESIGN DIAGRAMS

3.1 HIPO CONCEPTS

HIPO is an acronym for Hierarchy plus Input-Process-Output. A HIPO package consists of a set of diagrams that graphically describe functions from the general to the detail level. The major objectives of HIPO are to:

- Provide a structure by which the functions of a system can be understood.
- State the functions to be accomplished by the program rather than specify the statements to be used to perform the functions.
- Provide a visual description of input to be used and output produced by each function.

3.2 HOW TO READ HIPO

The HIPO package that follows contains three kinds of diagrams:

- Visual table of contents - These diagrams contain the names and identification numbers of all the overview and detail HIPO diagrams in the package and shows the functions in a hierarchical fashion (see page 3-3).
- Overview diagrams - These are high-level HIPO diagrams that describe the major functions and reference the detail diagrams (see page 3-21).
- Detail diagrams - These are lower-level HIPO diagrams that describe specific functions, show specific input and output items, and refer to other detail diagrams (see page 3-28).

In the HIPO diagrams that follow several conventions have been agreed upon:

- Arrows (→) show data movement
• Bullets (●) refer to arguments
• Dashes (-) refer to elements

These elements may be elements of a file, data base, argument or any other item that has elements

3.3 VISUAL TABLE OF CONTENTS FOR HIPO DESIGN DIAGRAMS
Initialization

3.1

- Edit Lead Cards
  3.1.1
- Check Source Availability
  3.1.2
- Build Local Master Products File
  3.1.3
- Build Product Descriptor File
  3.1.4
- Build Run Segment File
  3.1.5
RETRIEVAL

3.2

- Retrieve OI/PFCS Data 3.2.1
- Retrieve BFCS Data 3.2.2
- Retrieve FM Data 3.2.3
- Retrieve EPHM Data 3.2.4
- Retrieve SAIL CDT Data 3.2.5
Retrieve BFCS Data

3.2.2

- Locate BFCS Data
  3.2.1.1
- Build Unpack Array & PIAT
  3.2.1.2
- Read BFCS Data
  3.2.2.3
- Unpack BFCS Data
  3.2.1.4
- Convert BFCS Data
  3.2.1.5
3.4 OVERVIEW AND DETAIL HIPO DESIGN DIAGRAMS
Input
Source data tapes:
- NIP, MSFC FM, SAIL CDT, EPHM

Descriptor data:
- NIP Support tables
- MSFC FM header records
- EPHM descriptor cards
- SAIL CDT cal.tape

Calibration data:
- MMDB cal.tapes
- SAIL CDT cal.tapes
- Card updates
- Print formats

Ancillary data:
- Parameters for special calculations

User requests:
- Request lead cards
- Output product definition cards

Process
1. Data base maintenance programs for
   SOURCE DATA BASE
   DESCRIPTOR DATA BASE
   MASTER PRODUCTS DATA BASE
   CALIBRATION DATA BASE (2.0).

2. Standard data reduction program (3.0).

3. Special calculations programs (4.0).

4. Utility programs (5.0).

Output
Time History Tabs on printer or microfilm plot tape
- Plot Tapes for:
  - time history plots
  - cross plots
  - continuous plots

Computer Compatible Tapes

Data Base Contents Reports
Special Calculations and Plots
Lead Card Printout
Utility Reports
Data Availability Reports
### Input
- Source data tapes:
  - NIP, MSFC FM, SAIL CDT, EPHM
- Descriptor data:
  - NIP Support CCT's
  - MSFC FM header records
  - SAIL CDT cal. tape
  - EPHM descriptor cards
- Calibration data:
  - MMDB calibration tapes
  - SAIL CDT calibration tapes
  - Card updates
  - Print formats
- Output product definitions

### Process
1. Source Data Base maintenance programs (2.1).
2. Descriptor Data Base maintenance programs (2.2).
3. Calibration Data Base maintenance programs (2.3).
4. Master Products Data Base maintenance programs (2.4).

### Output
- Source Data Base Contents Report
- Systems Analysis Tabulation
- Descriptor Data Base Contents Report
- Calibration Data Base Contents Report
- Master Products Data Base Contents Reports
- Lead Card Printout for each
Diagram ID: 2.1  Name:  Description: SOURCE DATA BASE MAINTENANCE

<table>
<thead>
<tr>
<th>Input</th>
<th>Process</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIP tapes</td>
<td>1. Add NIP tape to data base.</td>
<td>Systems Analysis Tabulation</td>
</tr>
<tr>
<td>Lead cards</td>
<td></td>
<td>SOURCE DATA BASE</td>
</tr>
<tr>
<td></td>
<td>2. Add SAIL CDT to data base.</td>
<td>Lead Card Listing</td>
</tr>
<tr>
<td>SAIL CDT tapes</td>
<td></td>
<td>Change Listing</td>
</tr>
<tr>
<td>Lead cards</td>
<td>3. Add MSFC tape to data base.</td>
<td>DESCRIPTOR DATA BASE</td>
</tr>
<tr>
<td>MSFC FM tapes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lead cards</td>
<td>4. Add EPHM tape to data base.</td>
<td></td>
</tr>
<tr>
<td>EPHM tapes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lead cards</td>
<td>5. Delete source tape from data base.</td>
<td>Table of Contents Listing</td>
</tr>
<tr>
<td>SOURCE DATA BASE</td>
<td>6. List data base table of contents.</td>
<td>Lead Card Listing</td>
</tr>
<tr>
<td>Lead cards</td>
<td></td>
<td>Change Listing</td>
</tr>
</tbody>
</table>
NIP support table tapes Lead cards
1. Add NIP support tables to data base.
   DESCRIPTOR DATA BASE Lead Card Listing

EPHM descriptor cards Lead cards
2. Add EPHM descriptor cards to data base.
   Change Listing

SAIL CDT calibration tapes Lead cards
3. Add SAIL CDT tags to data base.
   Data Base Contents Report Lead Card Listing

DESCRIPTOR DATA BASE Lead cards
4. List data base contents.
Input Process Output

1. Add Rockwell MMDB cal. tape to data base.
   CALIBRATION DATA BASE
   Change Listing
   Lead Card Listing

2. Add cal. block update Lead cards
   to data base.
   Lead Card Listing

3. Add SAIL CDT cal. tape Lead cards
to data base.

4. Add print formats
   Engineering units cards
   and engineering units.
   Data Base Contents Report

5. List contents of CALIBRATION DATA BASE
   Lead cards
   Lead Card Listing

   Lead cards

Description: CALIBRATION DATA BASE MAINTENANCE
Product definition cards

1. Add product definition to data base.

Output

MASTER PRODUCTS DATA BASE
Change Listing
Lead Card Listing

Process

2. Punch product definition cards.

Lead cards

Product Definition Cards
Lead Card Listing

Input

MASTER PRODUCTS DATA BASE

3. Purge product definition from data base.

4. List data base contents.

Lead cards

Output

MASTER PRODUCTS DATA BASE
Lead Card Listing
Change Listing

Data Base Contents Report
Lead Card Listing
Input

Lead cards

MASTER PRODUCTS DATA BASE

SOURCE DATA BASE

DESCRIPTOR DATA BASE

CALIBRATION DATA BASE

Process

1. Initialize for processing (3.1).
2. Quit if any errors.
4. Retrieve data sets from SOURCE DATA BASE (3.2).
5. Create measurement groups for current data set (3.3).
6. Close Product Data Files. Write final time.
7. Build final products from Product Data Files (3.4).

Output

Lead Card Printout

Full Rate CCT's
LI CCT's

Time History and Cross Plots on IGS Plot Tape
Continuous Plot Tape

Tab groups and Data Availability Report on Print Tape
LI File
Diagram ID: 3.1  Name:  Description: INITIALIZATION

Author: __________________________  Date: __________________________

Input

Lead cards

SOURCE DATA BASE

MASTER PRODUCTS DATA BASE

CALIBRATION DATA BASE

DESCRIPTOR DATA BASE

Process

1. Read, edit, and list lead cards (3.1.1).

2. If not special calc., check source availability (3.1.2).

3. Build Local Master Products File (3.1.3).


5. Build Run Segment File (3.1.5).

Output

- event time bias
- BITE masks and nominal values
- failure return flag
- Lead Card and Error Listing
- Product Descriptor File
- Run Segment File
- pointer to PIAT location of BITE words & pseudo measurement 'BITESTATUS'

NOTE: Any step may set failure return flag if an error is encountered.
1. Read lead cards.
2. List lead card images.
3. Edit for errors.
4. List errors.
5. Set failure return flag if errors found.
6. Produce interpreted lead card listing.
7. Get today's date.

- title
- flight/test
- test date
- request number
- processing date
- Source Identification: tape #’s, file #’s, run #’s
- start/stop time
- corrective bias
- BITE masks and nominal values
- special calc. flag
- cal. block numbers
- no cal. flag for tabs
- group names
- ET bias
- MET bias
- no bandpass flag
- grid start time
- time per grid for time history plots
- time per grid for cross plots
- time per inch for continuous plots
- time delta for LI files

Lead Card Printout & Error Messages
**Input**

- Source Identification
  - tape numbers
  - file number if MSFC FM
  - run number if EPHM

- Start/stop time

**Source Data Base Index**

---

**Process**

1. Check if tapes are loaded on data base.

2. Check if file loaded for MSFC FM.

3. Check if run loaded for EPHM.

4. Check if data base contains any data within start/stop time interval.

---

**Output**

- error return flag
- error message to printer
- Source: NIP, MSFC FM, EPHM, SAIL CDT
Input

- list of requested group names
- MASTER PRODUCTS DATA BASE
- Source: NIP, MSFC FM, EPHM, SAIL CDT, Spec, Calc.
- run overrides for cal. & bandpass
- grid start time
- grid time interval
- DESCRIPTOR DATA BASE

Process

1. If family group, get group names in family.
2. Get MPDB record for requested group.
3. Incorporate overrides.
4. Check if measurements in group are in a descriptor for requested source. Save worst case sample rate. Find out NIP source.
5. Write Local Master Products File record.

Output

- error messages
- error return flag
- measurement not retrievable message
- Local Master Products File record
BUILD PRODUCT DESCRIPTOR FILE

**Input**
- Local Master Products File
- CALIBRATION DATA BASE
  - calibration identification
    - source
    - block numbers
  - processing date

**Process**
1. Sort Local Master Products File by product type: LI Files, CCT's, IGS plots, continuous plots, tabs (Don't disturb requested order).
2. Get product record.
4. Get cal.record for each measurement in group, if needed.
5. Build product descriptor with processing date, cal. information and print format, if needed.
6. If cross plot, modify first descriptor product type to LI File and make second descriptor with "L" appended to group name.
7. Write records to Product Descriptor File.
8. Build and write record to product descriptor file for Data Availability File.

**Output**
- Sorted Local Master Products File
- Product Descriptor File

- error return flag
- missing cal. message
Diagram ID: 3.1.5
Name: 
Description: BUILD RUN SEGMENT FILE

Input

Local Master Products File

Process

1. Sort Local Master Products File by source.
2. Get product descriptors for a source.
3. Get measurement names in group.
4. Accumulate list of measurement names eliminating duplicates. Add BITE status measurement names if needed.
5. Build group processing tables from local master product record.
6. Check if constraints exceeded: number of measurements, size of PIA, number and size of group processing tables.
7. Write run segment record to file.

Output

Local Master Products File

Source Data Base Index

Run Segment File - source identification - list of measurements - group processing tables

DESCRIPTOR DATA BASE

Source Identification
**Input**
- Measurement List
- Corrective Time Bias (Additive)
- Current D/D Formats
  - OI/PFCS
  - BFCS

**Descriptor Data Base**

**Process**
1. Retrieve OI/PFCS Data (3.2.1).
2. Retrieve BFCS Data (3.2.2).
3. Retrieve MSFC FM Data (3.2.3).
4. Retrieve EPHM Data (3.2.4).
5. Retrieve SAIL CDT Data.

**Output**
- Processing Interface Array Template (PIAT)
- Current Position in SDB
- Time Type: Onboard, Ground Receipt, Flywheel
- Current D/D Formats
- PFCS/BFCS Skew
- PFCS/BFCS A/B Indicator
- Status Code:
  - No data
  - Normal
  - Read error
  - Past stop time
- Unpacked Data In Processing Interface Array
- Data set time (corrected)
- Data Availability File
- Error messages

**Source Data Base**
- Source Identification
  - Tape numbers
  - Type (OI/PFCS, BFCS, MSFC FM, EPHM)
  - File number, Run number
- Start/Stop Time
- Current Position in SDB

**Source Data Base**
- Pointer to PIAT location of BITE words & pseudo measurement 'BITESTATUS'
Diagram ID: 3.2.1

Author: 
Date: 

Description: RETRIEVE OI/PFCS DATA

Input

- Source Identification - Tape #'s
- Start/stop time
- Current position in SOURCE DATA BASE
- SOURCE DATA BASE
- DESCRIPTOR DATA BASE
- Measurement List
- Corrective time bias
- BITE mask & nominal pattern
- PIAT loc. of BITE words and status

Process

1. Locate next place to read SOURCE DATA BASE (3.2.1.1).
2. On format change: 
   a. Build Unpack Array 
   b. Build Processing Interface Array Template (PIAT) (3.2.1.2).
3. Read data set (3.2.1.3)
4. Unpack data set and store in PIA (3.2.1.4)
5. Convert to CYBER format (3.2.1.5).
6. Check frame sync flags and store out-of-sync flag in meas.slots in Processing Interface Array (PIA).
7. Apply corrective time bias.
8. Store dump interrupt flags for PFCS meas.
9. Create 100 s/s bilevel "BITESTATUS" and put in PIA.
10. Output message to DAF.

Output

- Current position in SDB
- PIAT
- Time type: On board, ground receipt, or flywheel
- Current D/D formats
- OI/PFCS SKEW
- Status code: No data, ok, past stop time, read error
- Unpacked data in PIA (CYBER format)
- Data set time (corrected)
- Time backup message
- Time gap message
Input

- Start/stop time
- Current position
  - current CDS start/stop time
  - current data set time
  - current pointer to CDS index
  - current disk read address

Process

1. Determine from CDS stop time if another CDS is required.
2. If required, access next CDS index and update current pointer to CDS index.
3. Update current disk address to next data set to be read.

Output

- Updated current position
- Current formats (include flight ID)
Input

- Measurement List

- Descriptor Data Base

- Current D/D formats

- Source Identification

Process

1. Search Descriptor Data Base for next measurement ID within current source and format.

2. Extract information from Descriptor Data Base and place entry in Unpack Array.

3. Put information in PIAT.

4. Calculate PIA start address from sample per set and insert in PIAT.

5. Get BFCS data set length.

Output

- Unpack Array
  - Samples per data set
  - 1st Byte location
  - Size (in bits)
  - Start bit
  - First sample start frame
  - Preprocessing code
  - Byte increment
  - PFCS source indicator

- PIAT
  - Location of first value of measurement in PIA
  - PIA format code
  - Sample rate code
  - Delta t
INPUT

SOURCE DATA BASE

- Current position
- Requested start/stop time
- Actual start/stop time
- CDS's
- Source Identification
  - Tape #’s
  - File #’s
  - Run #

PROCESS

1. Read OI/PFCS Data Set.
2. Write Data Availability File.

OUTPUT

- Time type: Onboard, Ground Receipt, Flywheel
- PFCS Skew
- PFCS Set indicator (A or B)
- Requested start/stop time
- Actual start/stop time
- CDS's
- Source Identification
  - Type
Input
- Unpack Array
- PIAT
- Data set
- PFCS Set Indicator A or B

Process
1. From information in the Unpack Array:
   Locate first sample of current measurement to be extracted from source data set.
2. From information in PIAT:
   Locate starting word in PIA for current measurement.
3. Sequentially unpack each sample fragment of current measurement from source data set.
4. Insert each sample fragment into proper position within appropriate 60 bit word in PIA such that:
   a. Fragments are pieced together in a contiguous fashion.
   b. Resulting value is right justified.
   c. Least significant 4 bits of 64 bit values are truncated.
5. Update number of samples.

Output
- PIA
- PIAT
  - Number of samples retrieved
Input

- Unpack Array
- PIAT
- PIA

Process

1. Determine appropriate conversion algorithm.
2. Locate pointer to measurement to be converted.
3. Convert data in PIA to CYBER compatible format.

Output

- PIA
Diagram ID: 3.2.2
Name: ____________________________________________
Description: RETRIEVE BFCS DATA

Input
- Source Identification - Tape #’s
- Start/stop time
- Current position in SOURCE DATA BASE.
- DESCRIPTOR DATA BASE
- Measurement List
- Corrective time bias
- BITE mask nominal pattern
- PIAT loc.of bite words and status

Process
1. Locate next place to read SOURCE DATA BASE (3.2.1.1).
2. On format change:
   a. Build Unpack Array
   b. Build Processing Interface Array Template (PIAT)
   c. Get BFCS data set length (3.2.1.2).
3. Read data set (3.2.2.3)
4. Unpack data set and store in PIA(3.2.1.4)
5. Convert to CYBER format (3.2.1.5).
6. Check frame sync flags and store out-of-sync flags in measurement slots in PIA.
7. Apply corrective time bias.
9. Create 100 s/s bilevel "BITESTATUS" and put in PIA.
10. Output message to DAF.

Output
- Current position in SDB
- PIAT
- Time type: Onboard, ground receipt or fly-wheel
- Current D/D formats.
- Status code: No data, ok, past stop time, read error
- Unpacked data in PIA (CYBER format)
- Data set time (corrected)
- Time backup message
- Time gap message
**Diagram ID:** 3.2.2.3  
**Name:**  
**Description:** READ BFCS DATA

**Input**

- SOURCE DATA BASE
  - Current position

**Process**

1. Read OI/PFCS Data Set.
2. Deblock BFCS data.
3. Write Data Availability File.

**Output**

- Time type: Onboard, ground receipt, fly-wheel
- PFCS skew
- PFCS Set indicator (A or B)

- Requested start/stop
- Actual start/stop time
- CDS's
- Source Identification
  - Tape #'s
  - File #'s
  - Run
1. Build Unpack Array and PIAT.
2. Get block & scan length.
3. Locate next place to read Source Data Base.
4. Read data set.
5. Unpack & store in PIA.
6. Convert to Internal Format.
7. Apply corrective time bias.
8. Output message to Data Availability File if time backup or time gap.

Output

- PIAT
- Current position in SDB
- Data in PIA
- Data set time
- Status code
  - No data
  - Normal
  - Read error
  - Past stop time
  - Time backup message in DAF
  - Time Gap Message in DAF
Input:
- Measurement List
- Descriptor Data Base
- Source Identification
  - Tape Number
- Start/Stop Time
- Current Position
- Source Data Base
- Corrective Time Bias

Process:
1. Build Unpack Array and PIAT.
2. Locate next place to read.
3. Read Data Set.
4. Apply corrective time bias.
5. Output message for time backup.

Output:
- Unpack Array
- PIAT
- Current Position
- Data in PIA in CYBER format
- Status
- Data Set Time
- Time Backup Message in DAF
Diagram ID: 3.3  Name:  Description: MEASUREMENT GROUP PROCESSING

**Input**
- GPT entry for one group
- PIA
- PIAT
- Data set time (corrected)
- Time increment per line
- Max. lines per data set
- Pointer to BITESTATUS in PIAT (0 = N/A)
- PFCS/BFCS Set A/B indicator
- Time type (onboard, flywheel, ground receipt)
- Time skew (PFCS/BFCS)
- Current D/D formats (OI/PFCS/BFCS)

**Process**
1. Process Full Rate (FR) group (3.3.1).
2. Process Data Lines (DL) group (3.3.2).

**Output**
- GPT
- Bandpass status updated
- Current D/D format numbers
- Product Data File
1. On data format changes, new format records are built and output to the Product Data File. Current formats are transferred to the GPT.

2. The PFCS/BFCS time skew, time, time type, and all data values in the PIA for each measurement within the group are output to the Product Data File.

Input
- GPT
  - Previous D/D format numbers
- Current D/D format numbers (OI/PFCS/BFCS)
- PIA
- PIAT
- Data set time (corrected)
- Time skew
- PFCS/BFCS Set A/B indicator
- Time type (PFCS/BFCS)

Output
- GPT
  - Current D/D format numbers

Product Data File
Input
- GPT
- PIA
- PIAT
- Data set time (corrected)
- Time increment per line
- Max. lines per data set
- Pointer to BITESTATUS in PIAT (0 = N/A)
- PFCS/BFCS Set A/B indicator
- Time type (onboard, flywheel, ground receipt)
- Time skew (PFCS/BFCS)
- Current D/D formats (OI/PFCS/BFCS)

Process
1. Clear line indicator and MGM arrays.
2. On format change build new delta-t header record for all 12 sample Set-A measurements and O/P to Product Data File.
3. Place measurements into the MGM according to a function of the number of samples (3.3.2.1).
4. Perform parent word bilevel processing as required (3.3.2.2).
5. Perform bandpass as required per measurement (3.3.2.3).
6. When the above steps have been performed for all measurements within the group, build line time entries and output MGM line entries to the Product Data File (3.3.2.4).

Output
- GPT
  - Bandpass status updated
  - Current D/D formats
- MGM
- Current column position

Product Data File
Description: MEASUREMENT PLACEMENT IN MGM

Input
- PIAT
  - Number of samples
- PIA
- GPT
  - Meas. O/P column position
  - Meas. pointer to PIAT
- Max. lines per data set
- Current column position

Process
1. Compute start line and number of lines to skip in MGM.
   - If number of values equal 0, then start line equals 1 and line increment equals max. lines per data set.
   - If number of samples is 12, then start line in MGM is 5; otherwise, start line is 1.
   - If number of samples is 13, then number of lines to skip is 8; otherwise, number of lines to skip is max. lines per data set divided by number of samples.

2. Move data from PIA to appropriate MGM column using start line and line increment information.

Output
- Start line in MGM
- Line increment in MGM
- MGM
Input
- GPT
  - Parent word mask
  - Parent word byte number
- MGM
- Start line in MGM
- Line increment in MGM
- Current column position

Process
1. Using the parent word byte number, right justify the appropriate 8 bit parent byte in the MGM data word.
2. Perform AND function with the parent word mask and the data byte word to extract the required bilevel bits.

Output
- MGM
1. The last measurement data value is subtracted from the current data value. When the absolute difference is greater than or equal to the bandpass limit, the line indicator is set and the current data value is put into the bandpass status. Otherwise, a flag value indicating the data value was band-passed out is placed into the MGM.
**Input**
- MGM
- Data set time (corrected)
- Time increment per line
- Max. lines per data set
- Pointer to BITESTATUS in the PIAT (0 = N/A)
- Time type (onboard, flywheel, ground receipt)
- Time skew (PFCS/BFCS)
- PIA
- PIAT

**Process**
1. Check indicator for line entry.
2. Compute time for line entry.
3. Get BITESTATUS for current line.
4. Build and write logical record to Product Data File, using grp.ID as key.
5. Repeat above steps until all MGM lines have been checked.

**Output**
Product Data File

**Diagram ID:** 3.3.2.4
**Name:**
**Description:** BUILD TIME AND OUTPUT MGM LINE ENTRY
Diagram ID: 3.4

Description: OUTPUT PROCESSING

Input
- Product Descriptor File
  - Product type
  - Headings
  - Calibration information
  - Display information
- Product Data Files
  - Data Lines File
  - Full Rate File
  - Linearly Interpolated File
- Data Availability File

Process
1. Get product descriptor record.
2. 'Rewind' Product Data File.
3. Create Tab Product from Product Data File (3.4.1).
4. Create Time History Plot Product from Product Data File (3.4.2).
5. Create Cross Plot Product from Product Data File (3.4.3).
6. Create Continuous Plot Product from Product Data File (3.4.4).
7. Create Linearly Interpolated File (3.4.5).
8. Create Linearly Interpolated CCT (3.4.6).
9. Create Full Rate CCT from Product Data File (3.4.7).
10. Create Data Availability Report (3.4.8).

Output
- Time History: Tabs on Print Tape
- IGS Plot Tape
- Continuous Plot Tape
- Linearly Interpolated Tape
- Linearly Interpolated CCT
- Full Rate CCT
- Data Availability Report
Diagram ID: 3.4.1
Name: 
Description: CREATE TAB PRODUCT

Input
Product Descriptor Record
- Calibration Information
- Headings
- Event time bias
- PIA format code

Data Lines Product Data File
- Header Record (D/D format ID, sample rates, Δt's)
- Data Record (time, type of time, PFCS/BFCS skew, BITE status, data values)

Process
1. Set up for calibration.
2. Read Product Data File.
3. Check for format change.
4. Build heading and store status line.
5. Check for flags in data values.
6. Calibrate data, if necessary, and flag out of range values.
7. Store display code in tab line.
8. Convert, bias, and store time, BITE status and PFCS/BFCS skew in tab line.
9. Update new status line from tab line.
10. Check for end of page. Wrap around if possible.
11. Output page.

Output
Print Tape
**Input**

Product Descriptor Record
- Calibration information
- Headings
- Event time bias
- PIA format code

Data Lines Product Data File
- Header Record (D/D format ID, sample rates, Δt's)
- Data Record (time, type of time, PFCS/BFCS skew, BITE status, data values)

**Process**

1. Set up for calibration.
2. Read Product Data File.
3. Check for format change.
4. Eject plot page, build heading, draw and label grid.
5. Check for flags in data values.
6. Calibrate data, if necessary, and flag out of range values.
7. Collect and construct data values and build times for all data points for one grid.
8. Store BITE indicator.
9. Plot points and symbols as required.
10. Indicate points out of range, undefined, not in format, sync loss, and PFCS dump interrupt.

**Output**

IGS Plot Tape
Diagram ID: 3.4.3  Name:  Description: CREATE CROSS PLOT PRODUCT

Input

Product Descriptor Record
- Headings

Linearly Interpolated Product Data File
- Data Record (time, data values)

Process

1. Read Linearly Interpolated Data File.
2. Eject plot page, build heading, draw and label grid.
3. Label page with start/stop time for plot page.
4. Check for flags in data values.
5. Collect data points.
6. Plot points and symbols as required.
7. Indicate points undefined.

Output

IGS Plot Tape
Diagram ID: 3.4.4

Description: CREATE CONTINUOUS PLOT PRODUCT

**Input**
- Product Descriptor Record
  - Calibration information
  - Headings
  - Event time bias
  - PIA format codes
- Full Rate Product Data File
  - Header Record (D/D format ID, sample rates, Δt's)
  - Time Record (time, type of time, PFCS/BFCS skew, PFCS Set A/B indicator)
  - Data Record (data values)

**Process**
1. Set up for calibration.
2. Read Product Data File.
3. Check for format change.
4. Build heading and label ordinate scales.
5. Check for flags in data values.
6. Calibrate data, if necessary, and flag out of range values.
7. Collect and construct data values and build times for all data points.
8. Display BITE status as a bilevel.
9. Plot points and symbols.
10. Indicate points out of range, undefined, not in format, sync loss and PFCS dump interrupt.
11. Label time scale.

**Output**
Continuous Plot Tape
Input

Product Descriptor Record
- Calibration information
- Event time bias
- PIA format code
- Output time delta

Full Rate Product Data File
- Header Record (D/D format ID, sample rates, â€³s)
- Time Record (time, type of time, PFCS/BFCS skew, PFCS Set A/B indicator)
- Data Record (data values)

Process

1. Set up for calibration.
2. Read Product Data File.
3. Check for format change.
4. Check for flags in data values.
5. Calibrate data.
6. Build times for data.
   Determine interpolation time.
7. Interpolate data or obtain most current value.
8. Indicate output data undefined if one of adjacent input values is missing or out of range.
9. Block and output record.

Output

Linearly Interpolated File
Diagram ID: 3.4.6  
Name:  
Description: CREATE LINEARLY INTERPOLATED CCT

Input

Product Descriptor Record
- Calibration information
- Headings
- Event time bias
- PIA format code
- Output time delta

Full Rate Product Data File
- Header Record (D/D format ID, sample rates, At's)
- Time Record (time, type of time, PFCS/BFCS skew, PFCS Set A/B indicator)
- Data Record (data values)

Process

1. Set up for calibration.
2. Read Product Data File.
3. Check for format change.
4. Build, convert and write header record.
5. Check for flags in data.
6. Calibrate data.
7. Build time for data.
8. Interpolate data.
9. Indicate output data undefined if one of adjacent input values is missing.
10. Output scan in UNIVAC format.

Output

Linearly Interpolated CCT
**Input**

Product Descriptor Record
- Calibration information
- Headings
- Event time bias
- PIA format code

Full Rate Product Data File
- Header Record (D/D format ID, sample rates, At's)
- Time Record (time, type of time, PFCS/BFCS skew, PFCS Set A/B indicator)
- Data Record (data values)

**Process**

1. Set up for calibration.
2. Read Product Data File.
3. Check for format change.
4. Build, convert and write header record.
5. Check for flags in data values.
6. Calibrate data, if necessary, and flag out of range values.
7. Build time for data.
8. Collect scans if source is OI/PFCS.
9. Output scan in UNIVAC format.

**Output**

Full Rate CCT
Input
- Data Availability File
- Requested start/stop time
- Actual start/stop time (biased and unbiased)
- CDS's used for NIP data
- Data type
- Data source
- Request number
- Time jumps, time backups
- ET bias
- MET bias
- D/D format ID

Process
1. Read Data Availability File.
2. Format as required.
3. Output Print Tape, Plot Tape, and Printer Listing.

Output
- Print Tape
- Plot Tape
- Printer Listing
**Input**
- Lead Cards
- MASTER PRODUCTS DATA BASE
- SOURCE DATA BASE
- DESCRIPTOR DATA BASE
- CALIBRATION DATA BASE

**Process**
1. Power and Propulsion
   APU Fuel Quantity
   Special Calculation (4.1).
2. Power and Propulsion
   APU Performance Special
   Calculation (4.2).
3. Avionics Communication
   and Tracking Special
   Calculation (4.3).
4. Structures Pressures
   Special Calculation (4.4).
5. Structures Stress
   Special Calculation (4.5).
6. Structures Landing Gear
   Special Calculation (4.6).
7. Environmental Control
   Life Support Subsystem
   Special Calculation (4.7).

**Output**
- Lead Card Listing
- Tab Tape
- Page Plot Tape
- Continuous Plot Tape
- Pressure CCT
- Stress CCT
- Landing Gear CCT
Lead Cards

MASTER PRODUCTS DATA BASE

SOURCE DATA BASE

DESCRIPTOR DATA BASE

CALIBRATION DATA BASE

Input

Process

1. APFUEL Special Calc. Initialization (see sec. 4.1.1).

2. Create Linearly Interpolated Product Data Files (see sec. 4.1.2).

3. Create APFUEL Special Calc. Product Data Files (see sec. 4.1.3).

4. Build output products from Special Calc. Product Data Files using the Standard Data Reduction Output Processing Module (see sec. 3.4).

Output

Lead Card Printout

Tab Tape

Page Plot Tape
Input

- Lead Cards
- MASTER PRODUCTS DATA BASE
- SOURCE DATA BASE
- DESCRIPTOR DATA BASE
- CALIBRATION DATA BASE

Process

1. Initialize for Linearly Interpolated File products using the Std. Data Reduction Initialization (see sec. 3.1).
2. Initialize for Special Calc. products using Std. Data Reduction Initialization (see sec. 3.1).
3. Read, list, Q.A. and store APFUEL special calc. run temporary constants.

Output

- Run Segment Files
- Product Descriptor Files
- Lead Card Printout
Diagram ID: 4.1.2

**Description:** CREATE LINEARLY INTERPOLATED
PRODUCT DATA FILES

### Input
- Run Segment File
- Product Descriptor File
- DESCRIPTOR DATA BASE
- SOURCE DATA BASE

### Process
1. Retrieve data from SOURCE DATA BASE using the Std. Data Reduction Retrieval (see sec. 3.2).
2. Create Product Data Files using the Std. Data Reduction Measurement Group Processing (see sec. 3.3).
3. Create Linearly Interpolated Product Data Files using Std. Data Reduction Output Processing (see sec. 3.4).

### Output
- Linearly Interpolated Files
- Data Availability Report
<table>
<thead>
<tr>
<th>Input</th>
<th>Process</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Run Segment File</td>
<td>1. Initialize for special calc. APFUEL Product Data File.</td>
<td>Product Data Files</td>
</tr>
<tr>
<td>Product Descriptor File</td>
<td>2. Read (and merge) APFUEL data from the Linearly Interpolated</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Product Data Files and store it in the PIA.</td>
<td></td>
</tr>
<tr>
<td>Linearly Interpolated Files</td>
<td>3. Using data in the PIA perform APFUEL special calculations.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Using the Std. Data Reduction Measurement Group Processing module</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(see sec. 3.3), create appropriate Product Data Files.</td>
<td></td>
</tr>
</tbody>
</table>
Input

Lead Cards
MASTER PRODUCTS DATA BASE
SOURCE DATA BASE
DESCRIPTOR DATA BASE
CALIBRATION DATA BASE

Process

1. APPERF Special Calc Initialization (see sec. 4.2.1).
2. Create Linearly Interpolated Product Data Files (see sec. 4.1.2).
3. Create APPERF Special Calc Product Data Files (see sec. 4.2.3).
4. Build output products from Special Calc Product Data Files using the Standard Data Reduction Output Processing Module (see sec. 3.4).

Output

Lead Card Printout
Tab Tape
Page Plot Tape
Lead Cards
MASTER PRODUCTS DATA BASE
SOURCE DATA BASE
_DESCRIPTOR DATA BASE
_CALIBRATION DATA BASE

1. Initialize for Linearly Interpolated File products using the Std. Data Reduction Initialization (see sec. 3.1).
2. Initialize for Special Calc products using Std. Data Reduction Initialization (see sec. 3.1).
3. Read, list, Q.A. and store APPERF special calc. run temporary constants.

Run Segment Files
Product Descriptor Files
Lead Card Printout
CREATE APPERF SPECIAL CALC.
PRODUCT DATA FILES

Input
Run Segment File
Product Descriptor File
Linearly Interpolated Files

Process
1. Initialize for special calc. APPERF Product Data File.
2. Read (and merge) APPERF data from the Linearly Interpolated Product Data Files and store it in the PIA.
3. Using data in the PIA perform APPERF special calculations.
4. Using the Std. Data Reduction Measurement Group Processing module (see sec. 3.3) create appropriate Product Data Files.

Output
Product Data Files
Lead Cards
MASTER PRODUCTS DATA BASE
SOURCE DATA BASE
DESCRIPTOR DATA BASE
CALIBRATION DATA BASE

1. COMTRK Special Calc. Initialization (see sec. 4.3.1).
2. Create Linearly Interpolated Product Data Files (see sec. 4.1.2).
3. Create COMTRK Special Calc. Product Data Files (see sec. 4.3.3).
4. Build output products from Special Calc. Product Data Files using the Standard Data Reduction Output Processing Module (see sec. 3.4).

Lead Card Printout
Tab Tape
Continuous Plot Tape
1. Initialize for Linearly Interpolated File products using the Std. Data Reduction Initialization (see sec. 3.1).

2. Initialize for Special Calc. products using Std. Data Reduction Initialization (see sec. 3.1).

3. Read, list, Q.A. and store COMTRK special calc. run temporary constants.

Input:
- Lead Cards
- MASTER PRODUCTS DATA BASE
- SOURCE DATA BASE
- DESCRIPTOR DATA BASE
- CALIBRATION DATA BASE

Process:

Output:
- Run Segment Files
  - Product Descriptor Files
- Lead Card Printout
1. Initialize for Special calc. COMTRK Product Data File
2. Read (and merge) COMTRK data from the Linearly Interpolated Product Data Files and store it in the PIA.
3. Using data in the PIA perform COMTRK special calculations.
4. Using the Std. Data Reduction Measurement Group Processing module (see sec. 3.3) create appropriate Product Data Files.
Input

Lead Cards
MASTER PRODUCTS DATA BASE
SOURCE DATA BASE
DESCRIPTOR DATA BASE
CALIBRATION DATA BASE

Process

1. PRESSR Special Calc. Initialization (see sec. 4.4.1).
2. Create Linearly Interpolated Product Data Files (see sec. 4.1.2).
3. Create PRESSR Special Calc. Product Data Files (see sec. 4.4.3).
4. Build output products from Special Calc. Product Data Files using the Standard Data Reduction Output Processing Module (see sec. 3.4).

Output

Lead Card Printout
Page Plot Tape
Pressure CCT
Lead Cards
MASTER PRODUCTS DATA BASE
SOURCE DATA BASE
DESCRIPTOR DATA BASE
CALIBRATION DATA BASE

Input

Process
1. Initialize for Linearly Interpolated File products using the Std. Data Reduction Initialization (see sec. 3.1).
2. Initialize for Special Calc. products using Std. Data Reduction Initialization (see sec. 3.1).
3. Read, list, Q.A. and store PRESSR special calc. run temporary constants.

Output
Run Segment Files
Product Descriptor Files
Lead Card Printout
**Diagram ID: 4.4.5**

**Name:**

**Description:** CREATE PRESSR SPECIAL CALC. PRODUCT DATA FILES

**Input**
- Run Segment File
- Product Descriptor File
- Linearly Interpolated Files

**Process**
1. Initialize for special calc. PRESSR Product Data File.
2. Read (and merge) PRESSR data from the Linearly Interpolated Product Data Files and store it in the PIA.
3. Using data in the PIA perform PRESSR special calculations.
4. Using the Std. Data Reduction Measurement Group Processing module (see sec. 3.3) create appropriate Product Data Files.

**Output**
- Product Data Files
Input

Lead Cards
MASTER PRODUCTS DATA BASE
SOURCE DATA BASE
DESCRIPTOR DATA BASE
CALIBRATION DATA BASE

Process

1. STRESS Special Calc. Initialization (see sec. 4.5.1).
2. Create Linearly Interpolated Product Data Files (see sec. 4.1.2).
3. Create STRESS Special Calc. Product Data Files (see sec. 4.5.3).
4. Build output products from Special Calc. Product Data Files using the Standard Data Reduction Output Processing Module (see sec. 3.4).

Output

Lead Card Printout
Page Plot Tape
Stress CCT
1. Initialize for Linearly Interpolated File products using the Std. Data Reduction Initialization (see sec. 3.1).

2. Initialize for Special Calc. products using Std. Data Reduction Initialization (see sec. 3.1).

3. Read, list, Q.A. and store STRESS special calc. run temporary constants.

Input: Lead Cards
MASTER PRODUCTS DATA BASE
SOURCE DATA BASE
DESCRIPTOR DATA BASE
CALIBRATION DATA BASE

Process:
1. Initialize for Linearly Interpolated File products using the Std. Data Reduction Initialization (see sec. 3.1).

2. Initialize for Special Calc. products using Std. Data Reduction Initialization (see sec. 3.1).

3. Read, list, Q.A. and store STRESS special calc. run temporary constants.

Output: Run Segment Files
Product Descriptor Files
Lead Card Printout
1. Initialize for special calc. STRESS Product Data File.
2. Read (and merge) STRESS data from the Linearly Interpolated Product Data Files and store it in the PIA.
3. Using data in the PIA perform STRESS special calculations. Create non-standard plot as necessary.
4. Using the Std. Data Reduction Measurement Group Processing module (see sec. 3.3) create appropriate Product Data Files.

Input
Run Segment File
Product Descriptor File
Linearly Interpolated Files

Output
Product Data Files
Non-Standard Product CCT

Process
Input

Lead Cards

MASTER PRODUCTS DATA BASE

SOURCE DATA BASE

_DESCRIPTOR DATA BASE

CALIBRATION DATA BASE

Process

1. LDGEAR Special Calc. Initialization (see sec. 4.6.1).

2. Create Linearly Interpolated Product Data Files (see sec. 4.1.2).

3. Create LDGEAR Special Calc. Product Data Files (see sec. 4.6.3).

4. Build output products from Special Calc. Product Data Files using the Standard Data Reduction Output Processing Module (see sec. 3.4).

Output

Lead Card Printout

Page Plot Tape

Landing Gear CCT
1. Initialize for Linearly Interpolated File products using the Std. Data Reduction Initialization (see sec. 3.1).

2. Initialize for Special Calc products using Std. Data Reduction Initialization (see sec. 3.1).

3. Read, list, Q.A. and store LDGEAR special calc. run temporary constants.
Input

Run Segment File
Product Descriptor File
Linearly Interpolated Files

Process

1. Initialize for special calc. LDGEAR Product Data File.
2. Read (and merge) LDGEAR data from the Linearly Interpolated Product Data Files and store it in the PIA.
3. Using data in the PIA perform LDGEAR special calculations.
4. Using the Std. Data Reduction Measurement Group Processing module (see sec. 3.3) create appropriate Product Data Files.

Output

Product Data Files

Description: CREATE LDGEAR SPECIAL CALC. PRODUCT DATA FILES
Input

Lead Cards
MASTER PRODUCTS DATA BASE
SOURCE DATA BASE
_DESCRIPTOR DATA BASE
CALIBRATION DATA BASE

Process

1. ENVIRO Special Calc. Initialization (see sec. 4.7.1).
2. Create Linearly Interpolated Product Data Files (see sec. 4.1.2).
3. Create ENVIRO Special Calc. Product Data Files (see sec. 4.7.3).
4. Build output products from Special Calc. Product Data Files using the Standard Data Reduction Output Processing Module (see sec. 3.4).

Output

Lead Card Printout
Tab Tape
Page Plot Tape
Input

Lead Cards
MASTER PRODUCTS DATA BASE
SOURCE DATA BASE
DESCRIPTION DATA BASE
CALIBRATION DATA BASE

Process

1. Initialize for Linearly Interpolated File products using the Std. Data Reduction Initialization (see sec. 3.1).
2. Initialize for Special Calc. products using Std. Data Reduction Initialization (see sec. 3.1).
3. Read, list, Q.A. and store ENVIRO special calc. run temporary constants.

Output

Run Segment Files
Product Descriptor Files
Lead Card Printout
1. Initialize for special calc. ENVIRO Product Data File.
2. Read (and merge) ENVIRO data from the Linearly Interpolated Product Data Files and store it in the PIA.
3. Using data in the PIA perform ENVIRO special calculations.
4. Using the Std. Data Reduction Measurement Group Processing module (see sec. 3.3) create appropriate Product Data Files.
4. SYSTEM INPUTS

Inputs to SIES are via computer compatible digital tapes and punched cards. The various types of tape and punched card inputs are identified in this section.

4.1 TAPES

SIES tape input formats are described in other documents. The data types, tape names, and the document in which the detailed description can be found is shown in Table 4-1.
<table>
<thead>
<tr>
<th>TYPE OF DATA</th>
<th>TAPE NAME</th>
<th>REFERENCE DOCUMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source Data</td>
<td>NIP</td>
<td>(1)</td>
</tr>
<tr>
<td>Source Data</td>
<td>MSFC FM</td>
<td>(2)</td>
</tr>
<tr>
<td>Source Data</td>
<td>Ephemeris</td>
<td>(2)</td>
</tr>
<tr>
<td>Source Data</td>
<td>SAIL CDT</td>
<td>(2)</td>
</tr>
<tr>
<td>Source Descriptor Data</td>
<td>NIP Support Table</td>
<td>(1)</td>
</tr>
<tr>
<td>Source Descriptor Data</td>
<td>MSFC FM</td>
<td>(2)</td>
</tr>
<tr>
<td>Source Descriptor Data</td>
<td>SAIL CDT Cal.</td>
<td>(2)</td>
</tr>
<tr>
<td>Calibration</td>
<td>MMDB Cal.</td>
<td>(3)</td>
</tr>
<tr>
<td>Calibration</td>
<td>SAIL CDT Cal.</td>
<td>(2)</td>
</tr>
</tbody>
</table>

(1) GDSD/IDSD Interface Control Document, Revision 1, for the ALT Shuttle Orbiter Downlink Computer Compatible Tape. NASA, FS54-76-5, June 4, 1976.


4.2 CARDS

SIES card inputs will be described in detail as program specifications are developed. The types of data input via cards and the particular kind of data for each type are indicated in this section.

Source Descriptor Data
- Ephemeris/Meteorological (EPHM)

Product Descriptor Data
- Tabs
- Time History Page Plots
- Cross Page Plots
- Continuous Plots
- CCT's

Calibration Updates
- MMDB
- Print Formats
- Special Calculations Engineering Units

Special Calculations Variable Parameters

SIES Control Cards
- See Table 4-2
TABLE 4-2 STANDARD DATA REDUCTION/SPECIAL CALCULATION
RUN TIME CARD INPUTS

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>DEFAULT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Run Request Number</td>
<td>*</td>
</tr>
<tr>
<td>Title - for all products, where applicable</td>
<td>Blanks</td>
</tr>
<tr>
<td>Flight/Test Description for run</td>
<td>Blanks</td>
</tr>
<tr>
<td>Test Date for run</td>
<td>Blanks</td>
</tr>
<tr>
<td>Event Time Bias for run</td>
<td>* (1)</td>
</tr>
<tr>
<td>MET Time Bias for run</td>
<td>* (2)</td>
</tr>
<tr>
<td>BITE Mask for run</td>
<td>Zero (No BITE Status)(3)</td>
</tr>
<tr>
<td>BITE NOMINAL Value</td>
<td>* (4)</td>
</tr>
<tr>
<td>Data Source Specification:</td>
<td>(9)</td>
</tr>
<tr>
<td>- Tape Number(s)</td>
<td>*</td>
</tr>
<tr>
<td>- Start/Stop Time</td>
<td>*</td>
</tr>
<tr>
<td>- File Number (FM)</td>
<td>*</td>
</tr>
<tr>
<td>- Run Number (EPHM)</td>
<td>*</td>
</tr>
<tr>
<td>- Corrective Time Bias</td>
<td>Zero (No bias used)</td>
</tr>
<tr>
<td>Product Group Name(s)</td>
<td>* (at least one)</td>
</tr>
<tr>
<td>Calibration Block Number</td>
<td>Block 0 (zero)</td>
</tr>
<tr>
<td>Calibration Override, tabs only</td>
<td>Do requested cal. (5)</td>
</tr>
<tr>
<td>Bandpass Override</td>
<td>Do requested bandpass (6)</td>
</tr>
<tr>
<td>Time Delta for linearly interpolated products</td>
<td>*</td>
</tr>
<tr>
<td>Grid Start Time</td>
<td>(7)</td>
</tr>
<tr>
<td>Continuous Plot Density (time per inch)</td>
<td>TBD</td>
</tr>
<tr>
<td>Special Calculations Variable Parameters</td>
<td>* (8)</td>
</tr>
<tr>
<td>Time delta per grid for page plots</td>
<td>TBD</td>
</tr>
<tr>
<td>Time delta per grid for cross plots</td>
<td>TBD</td>
</tr>
</tbody>
</table>

* No default condition - omission is fatal to run

(1) Required only if a product group is selected for processing which specifies that Event Time is to be displayed.

(2) Required only if a product group is selected for processing which specifies that Mission Elapsed Time is to be displayed.
TABLE 4-2 STANDARD DATA REDUCTION/SPECIAL CALCULATION
RUN TIME CARD INPUTS (continued)

(3) Omission or value of zero prevents BITE status from being indicated where applicable.

(4) Required when BITE mask is input.

(5) When present, all measurement data will be output without calibrating.

(6) When present, all measurement data will be output at full rate.

(7) When omitted, the Data Source Identification Start Time applicable to the group will be used.

(8) Omission is fatal to the run for those special calculation programs requiring input parameters which may vary from run to run.

(9) Can be a flag for special calculations.
5. SYSTEM OUTPUTS

The output products are tabulations on print tape or printer, plots on IGS or Versatec plot tapes, and computer compatible tapes (CCT's).

5.1 TABULATIONS

The tabular products are the standard tabulations, the Data Availability Report, and the Systems Analysis Tabulations.

5.1.1 STANDARD TABULATIONS

An example of the Standard Tabulation is shown in Figures 5-1 and 5-2. The time column minor heading contains the corrected MET or ET, and GMT time for the first data values listed on each page. In Figure 5-1, V22T1255P is a parent bilevel measurement. The measurement names listed in lines 1, 2, 4, 5, and 8 are the five children names. Lines 3, 6, and 7 are not used. A four-line minor heading is provided for special calculations. It will take the place of the first four lines of the minor heading shown in Figure 5-1.

The first line of data is the DATA STATUS LINE. On the first page of a tab group, the DATA STATUS LINE is blank. On the succeeding pages, the DATA STATUS LINE contains the last values of the measurements listed on the previous page.

An example of the abbreviations used in the tabulations is as follows:

- The TIME DISPLAYED (Column 1) is either onboard time suffixed by a blank, flywheel time suffixed by an F, or ground receipt time suffixed by a G.
- An asterisk in the BITE status column B indicates BITE status non-compare.
- A non-blank time entry in the SKEW column indicates that the PFCS or BFCS data is skewed by that amount from the OI data. A blank entry indicates that the two are aligned.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>000:00:02:51.1370</td>
<td>B/P LIMIT</td>
<td>100</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>000:00:02:51.1470</td>
<td>DELTA T.</td>
<td>.0010</td>
<td>.0100</td>
<td>.0500</td>
<td>.0100</td>
<td>.0150</td>
<td>.0270</td>
<td>.0000</td>
<td>.0330</td>
<td>.0100</td>
<td>.0000</td>
</tr>
<tr>
<td>000:00:02:51.1570</td>
<td>GMT TIME</td>
<td>100</td>
<td>10</td>
<td>50</td>
<td>10</td>
<td>12.5</td>
<td>12.5</td>
<td>100</td>
<td>80</td>
<td>90</td>
<td>100</td>
</tr>
<tr>
<td>000:00:02:52.0170</td>
<td>SKEW</td>
<td>0.0090</td>
<td>0.0100</td>
<td>0.0100</td>
<td>0.0100</td>
<td>0.0150</td>
<td>0.0270</td>
<td>0.0000</td>
<td>0.0330</td>
<td>0.0100</td>
<td>0.0000</td>
</tr>
<tr>
<td>000:00:02:53.0260</td>
<td>SYNC.LOSS</td>
<td>0.0090</td>
<td>0.0100</td>
<td>0.0100</td>
<td>0.0100</td>
<td>0.0150</td>
<td>0.0270</td>
<td>0.0000</td>
<td>0.0330</td>
<td>0.0100</td>
<td>0.0000</td>
</tr>
<tr>
<td>000:00:02:54.0360</td>
<td>DUMP.INTR</td>
<td>0.0090</td>
<td>0.0100</td>
<td>0.0100</td>
<td>0.0100</td>
<td>0.0150</td>
<td>0.0270</td>
<td>0.0000</td>
<td>0.0330</td>
<td>0.0100</td>
<td>0.0000</td>
</tr>
<tr>
<td>000:00:02:55.0460</td>
<td>VARS</td>
<td>0.0090</td>
<td>0.0100</td>
<td>0.0100</td>
<td>0.0100</td>
<td>0.0150</td>
<td>0.0270</td>
<td>0.0000</td>
<td>0.0330</td>
<td>0.0100</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Figure 5-1 Standard Tabulation
**Figure 5-2 Standard Tabulation (con't)**
Flag values which may appear in the data columns are:

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>MEANING</th>
</tr>
</thead>
<tbody>
<tr>
<td>DUMP.INTR</td>
<td>A PFCS main memory dump is occurring.</td>
</tr>
<tr>
<td>SYNC LOSS</td>
<td>Frame synchronization lost.</td>
</tr>
<tr>
<td>UNDEF</td>
<td>Data value is undefined due to its being the result of an undefined arithmetic operation (such as division by zero) or because it is the result of computations that could not be performed because input values were not available.</td>
</tr>
<tr>
<td>N/A</td>
<td>Data not available in current D/D format.</td>
</tr>
<tr>
<td>TAPE.ERR</td>
<td>Data not available due to tape read error.</td>
</tr>
<tr>
<td>OVERFLOW</td>
<td>The overflow bit was set in HFS type measurement.</td>
</tr>
</tbody>
</table>

Out of range values are indicated as follows when data is calibrated:

<table>
<thead>
<tr>
<th>COUNT VALUE</th>
<th>DISPLAYED DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-*****</td>
</tr>
<tr>
<td>251-254</td>
<td>value with '+' as last digit</td>
</tr>
<tr>
<td>255</td>
<td>+*****</td>
</tr>
</tbody>
</table>

No out of range indication is given when data is not calibrated.

5.1.2 DATA AVAILABILITY REPORT

This report is automatically created in every standard data reduction or special calculation run. See Figure 5-3 for the contents and layout. A report is created for each source used by a run.

5.1.3 SYSTEMS ANALYSIS TABULATION

This report is created by the program that loads NIP tapes onto the Source Data Base. The report includes information from the NIP index records and status records. The following data is included.
### DATA AVAILABILITY REPORT

<table>
<thead>
<tr>
<th>DATA SOURCE</th>
<th>DATA TYPE</th>
<th>REQUESTED START/STOP TIME</th>
<th>NEW D/D FORMAT</th>
<th>DATA START TIME</th>
<th>CDS START/STOP TIME</th>
<th>TIME BACKUP</th>
<th>CDS START/STOP TIME</th>
<th>TIME GAP</th>
<th>CDS START/STOP TIME</th>
<th>DATA STOP TIME</th>
</tr>
</thead>
</table>

Figure 5-3 Data Availability Report
- Tape start and stop times
- CDS start and stop times
- Sync pattern
- Bit error tolerance
- Frame error tolerance
- Site PCM status
- AGC orbiter

The data from the status records can optionally be bandpassed. The PCM and MTU BITE status words can be obtained in standard products from the data reduction program.

5.2 PLOTS

Plot products are time history page plots, cross page plots, and continuous plots.

5.2.1 TIME HISTORY PAGE PLOTS

Time history plot major and minor headings are similar to those on Standard Tabulations. A maximum of eight analog or digital measurements can be plotted per page. A symbol and the left or right ordinate scale indicator is associated with each measurement. See Figure 5-4. Time is always represented on the abscissa.

Data for a page plot can optionally be vector connected, stair-step connected, or point plotted. One option applies to all measurements in the plot group, not to individual measurements. If the group is specified to be vector connected and a measurement in the group has a non-zero bandpass limit, then the data is plotted using stairstep connection of data values.

Non-nominal BITE status is indicated in the heading with an asterisk after the BITE STATUS label. If a D/D format change occurs, a new plot page is not started, but an asterisk is placed to the right of the D/D format numbers and an asterisk is placed to the left of the sample rate label. The D/D
Figure 5-4 Time History Page Plot
format numbers and sample rates listed are those in effect at the first time plotted on the page.

Out of range values are shown by plotting the curve or points at the top or bottom grid line, as appropriate. Data not available, for whatever reason, are shown by a gap in the curve with the end points labeled by a special symbol. The symbols are:

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>MEANING</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Measurement not in current D/D format</td>
</tr>
<tr>
<td>D</td>
<td>PFCS memory dump occurred</td>
</tr>
<tr>
<td>T</td>
<td>Data lost due to tape read error</td>
</tr>
<tr>
<td>U</td>
<td>Data value mathematically undefined or data needed to compute value is missing</td>
</tr>
<tr>
<td>S</td>
<td>Frame synchronization lost</td>
</tr>
<tr>
<td>F</td>
<td>Overflow bit set in HFS data type</td>
</tr>
</tbody>
</table>

If vector or stairstep connection is used, plot symbols for curves will be placed on the curve at regular intervals. The symbol intervals will have a small horizontal offset so that the plot symbols won't overlap when two curves are close together. If point plotting is used, the plot symbol will be centered at each point.

5.2.2 CROSS PAGE PLOTS

Cross plots are similar to time history plots with several exceptions. See Figure 5-5. Only the differences are described here. Bandpass limits and sample rates are not in the minor headings. D/D format numbers and BITB status are not in the major heading. The abscissa scale and units are defined in the product descriptor, and the first measurement in the group is always assigned to the abscissa scale. Data can be vector connected or point plotted but not stairstep connected. The only flag value used is 'U' for undefined.
Figure 5-5 Cross Page Plot
points. No out of range indication is given. Plot symbols are placed on curves at regular time intervals so that the symbol spacing is an indication of the curve velocity.

5.2.3 CONTINUOUS PLOTS

Continuous plots consist of a title block, a layout of the ordinate scales, and the plotting area. See Figures 5-6 and 5-7.

The title block includes the major headings, the measurement identification section, and the definitions for the special symbols. The major headings for continuous plots are similar to the major headings for the time history page plots. The exceptions and additions are as follows:

- The D/D formats are those in effect at the start of the plot; changes in formats will not be noted.
- Time per inch is given in the major heading.
- The GMT start time is given.
- The displayed time type is given (GMT, MET, ET).
- BITESTATUS is treated as a bilevel measurement.

The measurement identification section in the title block is a columnar listing. Each measurement has a scale and a unique plotting symbol. The ordinate scales are labeled S1-S9, SA-SZ. A total of 35 ordinate scales can be plotted at a time. Measurement symbols are the numbers 1 through 50. A measurement symbol is placed on the measurement curve at regular intervals. The listed sample rates are those in effect at the start of the plot. If the measurement is not in the starting D/D formats, the sample rate is 0.0.

Special symbols are used to label a gap in a measurement's curve. The definitions for these symbols are in the title block.

5-10
See Figure 5-7 for an example of a layout of ordinate scales for a plot group. The scales for a plot group are displayed before and after the title block. The first set of scales is output as a template to interpret the data.

An annotation line in the scale layout identifies the measurement, the scale limits, the reference point and the engineering units or the bilevel interpretation. A line is drawn under the annotation line to the scale. Since more than one measurement can be plotted on a scale, more than one annotation line can be drawn to a scale.

The plotting paper for continuous plots is 22 inches wide. The plotting area for the measurements is 20 inches wide. The placement of the scales is defined in inches from the bottom of the plotting area. In Figure 5-7, the bottom of scale SI is 0.0 inches; the top of the scale is 4.0 inches.

Scales are horizontally placed in one of ten imaginary columns that are .15 inches apart. The columns are numbered from right to left. Scale SI is placed in column 5. The placement of the annotation line is similar to that of the horizontal positioning of the scales. There are 100 rows defined in the 20 inch width. Annotation lines are placed in rows .20 inches apart. The rows are numbered from the bottom of the plotting area starting at 1. The reference point on the scale is a horizontal tic mark.

The default width of a bilevel measurement is 0.18 inch with the reference point being at the bottom of the scale.

The following parameters must be used to define and position scale SI for measurement V95H3021C in Figure 5-7.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>*1) measurement ID</td>
<td>V95H3021C</td>
</tr>
<tr>
<td>2) bottom of scale in engineering units</td>
<td>-20.0</td>
</tr>
<tr>
<td>*3) bottom of scale in inches</td>
<td>0.0</td>
</tr>
<tr>
<td>4) top of scale in engineering units</td>
<td>20.0</td>
</tr>
<tr>
<td>5) top of scale in inches</td>
<td>4.0</td>
</tr>
<tr>
<td>6) reference point in engineering units</td>
<td>0.0</td>
</tr>
<tr>
<td>*7) scale column number</td>
<td>5.0</td>
</tr>
<tr>
<td>*8) annotation row number</td>
<td>4.0</td>
</tr>
<tr>
<td>*9) scale ID</td>
<td>SI</td>
</tr>
</tbody>
</table>

*For bilevel measurements only the parameters with asterisks are defined by the user.

Time on continuous plots is represented on the abscissa. The user may specify the following options.

<table>
<thead>
<tr>
<th>Options</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displayed time type (GMT, MET, ET)</td>
<td>GMT</td>
</tr>
<tr>
<td>Seconds per inch</td>
<td>1 sec per inch</td>
</tr>
<tr>
<td>Time hacks at bottom and top of plotting area</td>
<td>1 per second</td>
</tr>
<tr>
<td>Connect and label every nth time hack</td>
<td>every 5th time hack</td>
</tr>
</tbody>
</table>

Only full rate data is plotted on continuous plots. In a plot group, all analog measurements are either vector connected or point plotted. Bilevel measurements are stair-step connected. A measurement curve may go outside the scale provided for it.

5.3 COMPUTER COMPATIBLE TAPES (CCT'S)

For a description of the standard format of an output CCT refer to Appendix G of the Data Reduction Complex Approach and Landing Test Data Processing Requirements (Level C), LEC-8347.

5-12
Figure 5-6 Continuous Plot
FIGURE 5-7 CONTINUOUS PLOT (Cont.)
The SIES Standard Data Reduction program can create full rate and linearly interpolated CCT's as standard products. These standard CCT's can contain data from OI/PFCS, data from MSFC FM tapes, data from EPHM tapes, data from BFCS, or data from a special calculation.
6. DATA BASES
### Table 6-1
**ALT SIES SOFTWARE SYSTEM DATA BASES**

<table>
<thead>
<tr>
<th>NAME</th>
<th>SOURCE</th>
<th>CREATED BY</th>
<th>USED BY</th>
<th>HOW ACCESSED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source Data Base (SDB)</td>
<td>NIP, MSFC FM, EPHM and SAIL CDT Data Tapes</td>
<td>Data Base Maintenance</td>
<td>Initialization Retrieval</td>
<td>Reel No. (Run No. - EPHM, File No. - MSFC FM) and Time</td>
</tr>
<tr>
<td>Descriptor Data Base (DDB)</td>
<td>Support Table Tapes, FM Headers, SAIL CDT Cals, EPHM Cards</td>
<td>Data Base Maintenance</td>
<td>Initialization Retrieval</td>
<td>Source, Format No. or Tape No. and Meas. Name</td>
</tr>
<tr>
<td>Calibration Data Base (CDB)</td>
<td>Master Measurement Data Base, SAIL Cal Tape, Block Update Cards, Print Format Cards</td>
<td>Data Base Maintenance</td>
<td>Initialization</td>
<td>Source, Block No. and Meas. Name</td>
</tr>
<tr>
<td>Master Products Data Base (MPDB)</td>
<td>User Supplied Info. or Data Plan</td>
<td>Data Base Maintenance</td>
<td>Initialization</td>
<td>Group Name</td>
</tr>
</tbody>
</table>
**DIAGRAM ID:** Source Data Base

**NAME:** Source Data Base

**TYPE:** DATA BASE X WORKING FILE ARRAY

**ORIGINAL SOURCE:** Source CCT's (NIP, EPHM, SAIL CDT, MSFC FM)

**CREATED BY:** Data Base Maintenance

**MODIFIED BY:** Data deleted by Data Base Maintenance

**USED BY:** Initialization, retrieval

**PURPOSE:** The Source Data Base consists of continuous data segment (CDS) entries. Each CDS contains homogeneous time history data from the following sources: OI/PFCS, BFCS, SAIL CDT, MSFC FM, and EPHM. (The CDS's for OI/PFCS are artificially created to make the data match. For MSFC FM a CDS is a file; for EPHM a CDS is a run; and for SAIL CDT a CDS is a tape.) The logical records within a CDS are called data sets. The time span of a data set depends on the source; i.e., OI/PFCS - one second, BFCS - 80 milli sec, MSFC FM - one scan, with SAIL CDT TBD.

**ACCESS METHOD:** The Source Data Base is a randomly accessed data base consisting of two levels of indexes and CDS entries. The data base is structured to provide direct access capability to any data set except for SAIL CDT. (Exception: Groups of 12 or 13 can be accessed directly for BFCS.)

6-3
<table>
<thead>
<tr>
<th>Tape</th>
<th>Data type</th>
<th>Length</th>
<th>Disk addr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tape 1</td>
<td>OI/PFCS</td>
<td>Length 1</td>
<td>Addr 1</td>
</tr>
<tr>
<td>Tape 1</td>
<td>BFCS</td>
<td>Length 2</td>
<td>Addr 2</td>
</tr>
<tr>
<td>Tape 2</td>
<td>FM</td>
<td>Length 3</td>
<td>Addr 3</td>
</tr>
<tr>
<td>Tape 3</td>
<td>EPHM</td>
<td>Length 4</td>
<td>Addr 4</td>
</tr>
<tr>
<td>Tape 4</td>
<td>SAIL</td>
<td>Length 5</td>
<td>Addr 5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CDS start time</th>
<th>CDS stop time</th>
<th>D/D format # for OI</th>
<th>D/D format # for PFCS</th>
<th>Disk addr</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>CDS start time</th>
<th>CDS stop time</th>
<th>D/D format # for BFCS</th>
<th>Data set length</th>
<th>Disk addr</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>File start time</th>
<th>File stop time</th>
<th>Scan length</th>
<th>Time per scan</th>
<th>Disk addr</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Run start time</th>
<th>Run stop time</th>
<th>Run # Time per record</th>
<th>Disk addr</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Tape start time</th>
<th>Tape stop time</th>
<th>Disk addr</th>
</tr>
</thead>
</table>
DIAGRAM ID: NAME: Source Data Base

TYPE: DATA BASE X WORKING FILE ARRAY

INDEX ELEMENT DESCRIPTIONS:

Tape index — in order by tape number
- Tape number — reel number of CCT containing the data
- Data type — type code for either OI/PFCS, BFCS, MSFC FM, EPFM or SAIL CDT
- Length — number of entries in next lower index
- Disk address — location of next lower level index on disk

OI/PFCS data index — in order by start time
- Segment start time — OI start time of first data set
- Segment stop time — OI stop time of last data set
- D/D format for OI — OI format number
- D/D format for PFCS — PFCS format number
- Disk address — location of data set on disk

BFCS data index — in order by start time
- CDS start time — OI start time of first data set
- CDS stop time — OI stop time of last data set
- D/D format number — BFCS format number
- Data set length — number of bytes per data set
- Disk address — location of data set on disk
DIAGRAM ID:  NAME: Source Data Base

<table>
<thead>
<tr>
<th>TYPE:</th>
<th>DATA BASE</th>
<th>X</th>
<th>WORKING FILE</th>
<th>ARRAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSFC FM index</td>
<td>- in order by file number</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>File start time</td>
<td>- time of first scan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>File stop time</td>
<td>- time of last scan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scan length</td>
<td>- number of words per logical record</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time per scan</td>
<td>- delta time between logical records</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disk address</td>
<td>- location of data set on disk</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| EPHM data index | - in order by run number |
| Run start time  | - time of first logical record |
| Run stop time   | - time of last logical record |
| Run number      | - logical file identifier |
| Time per record | - delta time between logical records |
| Disk address    | - location of data set on disk |

| SAIL CDT data index | - in order by start time |
| Start time          | - start time of tape |
| Stop time           | - stop time of tape |
| Disk address        | - location of data set on disk |
DIAGRAM ID:    NAME: Source Data Base

TYPE: DATA BASE X WORKING FILE ARRAY

ELEMENT DESCRIPTION: An element within a CDS is a data set.

For a detailed description of the OI/PFCS data base elements, see Interface Control Document (ICD), IDSD Computer Compatible Tape (CCT), Revision 1, June 4, 1976. For all NIP data sets (OI/PFCS and BFCS) OI time is used to identify the data sets. OI and PFCS data sets are combined as follows:

```
<table>
<thead>
<tr>
<th>Header info</th>
<th>fixed length</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 second OI data</td>
<td></td>
</tr>
<tr>
<td>Header info</td>
<td>fixed length</td>
</tr>
<tr>
<td>1 second PFCS data</td>
<td></td>
</tr>
</tbody>
</table>
```

For a detailed description of the Ephemeris/Meteorological, MSFC FM and SAIL Digital Compressed data base elements, see Data Reduction Complex Approach and Landing Test, Data Processing Requirements (Level C), LEC-8347.
DIAGRAM ID: NAME: Descriptor Data Base

TYPE: DATA BASE X WORKING FILE ARRAY

ORIGINAL SOURCE: Support table tapes, EPHM descriptor from punched cards, MSFC header records, SAIL CDT calibration tape, special calc. cards.

CREATED BY: Data Base Maintenance

MODIFIED BY: Data Base Maintenance, purge descriptor table.

USED BY: Initialization, retrieval

PURPOSE: The Descriptor Data Base (DDB) describes measurements with sufficient information that they may be retrieved from a particular source.

ACCESS METHOD: The DDB is a randomly accessed data base consisting of up to three levels of indexes. Access for this data base is by D/D format (tape # and file # for FM) and measurement name.
NAME: Descriptor Data Base

TYPE: DATA BASE X WORKING FILE ARRAY

STRUCTURE DIAGRAM:

```
<table>
<thead>
<tr>
<th>Data Type</th>
<th>Length</th>
<th>Disk Addr</th>
</tr>
</thead>
<tbody>
<tr>
<td>OI</td>
<td>Addr</td>
<td></td>
</tr>
<tr>
<td>PFCS</td>
<td>Addr</td>
<td></td>
</tr>
<tr>
<td>BFCS</td>
<td>Addr</td>
<td></td>
</tr>
<tr>
<td>NSFC FN</td>
<td>Addr</td>
<td></td>
</tr>
<tr>
<td>EPIM</td>
<td>Addr</td>
<td></td>
</tr>
<tr>
<td>SAIL</td>
<td>Addr</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Format #</th>
<th>Length</th>
<th>Disk addr</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

```
<table>
<thead>
<tr>
<th>Name</th>
<th>Measurement Data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Descriptor information</td>
</tr>
</tbody>
</table>
```

```
<table>
<thead>
<tr>
<th>Format #</th>
<th>Length</th>
<th>Disk addr</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

```
<table>
<thead>
<tr>
<th>Name</th>
<th>Measurement Data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Descriptor information</td>
</tr>
</tbody>
</table>
```

```
<table>
<thead>
<tr>
<th>Format #</th>
<th>Length</th>
<th>Disk addr</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

```
<table>
<thead>
<tr>
<th>Name</th>
<th>Measurement Data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Descriptor information</td>
</tr>
</tbody>
</table>
```

```
<table>
<thead>
<tr>
<th>Tape #</th>
<th>Length</th>
<th>Disk addr</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

```
<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

```
<table>
<thead>
<tr>
<th>File #</th>
<th>Length</th>
<th>Disk addr</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

```
<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

```
<table>
<thead>
<tr>
<th>Name</th>
<th>TAG</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

```
<table>
<thead>
<tr>
<th>Tape #</th>
<th>Length</th>
<th>Disk addr</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

```
<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

```
<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

```
<table>
<thead>
<tr>
<th>Name</th>
<th>TAG</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

```
<table>
<thead>
<tr>
<th>Tape #</th>
<th>Length</th>
<th>Disk addr</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

```
<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

```
<table>
<thead>
<tr>
<th>Name</th>
<th>Tag</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

6-9
DIAGRAM ID: NAME: Descriptor Data Base

TYPE: DATA BASE X WORKING FILE ARRAY

INDEX ELEMENT DESCRIPTIONS:

Data type index — fixed length containing one entry for each data type

- Data type — type codes for OI/PFCS, BFCS, MSFC FM and SAIL CDT
- Length — number of entries in the next lower index
- Disk address — location of next lower index on disk

OI format index — in order by format number

- Format number — OI format number
- Length — number of entries in next lower index
- Disk address — location of data on disk

OI measurement data — in order by measurement name

- Name — measurement name
- Descriptor information — see NIP descriptor elements

PFCS format index — in order by format number

- Format number — PFCS format number
- Length — number of entries in next lower index
- Disk address — location of data on disk

PFCS measurement data — in order by measurement name

- Name — measurement name
- Descriptor information — see NIP descriptor elements
Diagram ID: NAME: Descriptor Data Base

TYPE: DATA BASE X WORKING FILE ARRAY

BFCS format index — in order by format number
- Format number — BFCS format number
- Data set length — number of bytes per BFCS data set
- Length — number of entries in next lower index
- Disk address — location of data on disk

BFCS measurement data — in order by measurement name
- Name — measurement name
- Descriptor information — see NIP descriptor elements

FM tape index — in order by tape number
- Tape number — reel number of CCT containing original data
- Length — number of entries in next lower index
- Disk address — location of data on disk

FM file index — in order by file number
- File number —
- Length — number of entries in next lower index
- Disk address — location of data on disk

FM measurement data — in order by measurement name
- Name — measurement name
- Position — see MSFC FM descriptor elements
DIAGRAM ID: NAME: Descriptor Data Base

TYPE: DATA BASE X WORKING FILE ARRAY

EPHM measurement data — in order by measurement name
- Name — measurement name
- Position — see MSFC FM descriptor elements

SAIL measurement data — in order by measurement name
- Name — measurement name
- Tag — see SAIL CDT descriptor elements
DIAGRAM ID: NAME: Descriptor Data Base

TYPE: DATA BASE X WORKING FILE ARRAY

ELEMENT DESCRIPTION:

NIP descriptor elements
- Measurement name (display code)
- Sample rate (= 0 if not in format)
- Delta t (time increment)
- First byte location relative to first byte in data set
- Measurement size in bits.
- Starting bit relative to first byte
- First sample start frame
- Preprocessing code (to convert to CYBER internal code)
- Samples per data set (PFCS Set A)
- Byte increment (= 1 for NIP) - number of bytes between successive values of the same syllable.

SAIL CDT descriptor elements
- Tag - SAIL system measurement ID

EPHM descriptor elements
- Position - word location in buffer

MSFC FM descriptor elements
- Position - word position in buffer
**NAME:** Calibration Data Base

**TYPE:** DATA BASE X WORKING FILE ARRAY

**ORIGINAL SOURCE:** Rockwell calibration tape, downlink and downlist files, SAIL CDT calibration tape, block updates via cards, print formats and engineering units via cards for EPHM, MSFC FM, and special calculations.

**CREATED BY:** Data Base Maintenance

**MODIFIED BY:** Data Base Maintenance

**USED BY:** Initialization

**PURPOSE:** Conversion of count values to engineering units (floating point internal format or display characters).

**ACCESS METHOD:** Random, keys are data source, block number, and measurement name. Data source is one of the following: flight data, SAIL data via NIP, SAIL CDT data.
DIAGRAM ID: | NAME: Calibration Data Base
TYPE: DATA BASE X WORKING FILE ARRAY

ELEMENT DESCRIPTION:

The data source index is a fixed 3-entry table used to distinguish between flight cals., SAIL cals. for data via NIP tapes, and SAIL cals. via CDT's.

The block number indexes separate the cal. records by block update number. The original data from the calibration tape is always block 0.

The measurement name indexes specify locations on disk of all the measurement calibration records within a block. This index is sorted by measurement name.
A record on this data base will contain all the data of the original calibration tape record reformatted to CYBER internal format (display characters, floating point numbers, bit masks, etc., as applicable). In addition the following fields will be in each record.

- Record code - SAIL CDT cal., downlist cal., downlink cal., no cal.
- Block number
- Print formats for calibrated and uncalibrated data values
- Engineering units
- Eight-entry table for alphanumerical interpretation of discrete values
NAME: Master Products Data Base

TYPE: DATA BASE X WORKING FILE ARRAY

ORIGINAL SOURCE: User supplied information or data plan

CREATED BY: Data Base Maintenance

MODIFIED BY: Data Base Maintenance - Replace, add whole product groups

USED BY: Initialization

PURPOSE: The Master Products Data Base (MPDB) describes products, by group, which are to be generated by ALT SIBS.

ACCESS METHOD: The MPDB is a randomly accessed data base consisting of an index which contains the group name and entries describing output products by group.
Product groups are categorized by name as tab, page time history plot, page cross plot, continuous plot, linearly interpolated file, linearly interpolated CCT, full rate CCT or family group.
DIAGRAM ID:  NAME: Master Products Data Base

TYPE: DATA BASE WORKING FILE ARRAY

ELEMENT DESCRIPTION:

Measurement group name

Measurement group product type code
  • Tab
  • Page time history plot
  • Page cross plot
  • Continuous plot
  • Linearly interpolated file
  • Linearly interpolated CCT
  • Full rate CCT
  • Family group

Group source association (128 kbs or SAIL CDT, MSFC FM, EPHM, special calc.)

Group names in this family

Group scaling information
  • Connect option (vector connect, step connect, points only)
  • Scales (left, right, bottom)
  • Number of major grid divisions (ordinate and abscissa - cross plots only)
  • Thirty-five scales on continuous plots

Major heading information
  • Subsystem

Measurement specific information
  • Measurement position indicator in final product
  • Measurement name
  • Calibration information (yes or no)
• Bilevel mask
• Parent word children names
• Flag for bilevel parent word (which syllable to use)
• Bandpass limit for each measurement
• Flag for status or interpolation for LI files
• Four-line minor heading for special calc.
• Measurement scale assignment (L, R)
7. FILES
<table>
<thead>
<tr>
<th>NAME</th>
<th>SOURCE</th>
<th>CREATED BY</th>
<th>USED BY</th>
<th>HOW ACCESSED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Descriptor File</td>
<td>Lead Cards, MPDB, CDB, and DDB</td>
<td>Initialization</td>
<td>Output Processing</td>
<td>Sequential</td>
</tr>
<tr>
<td>Run Segment File</td>
<td>Lead Cards, MPDB, SDB, DDB</td>
<td>Initialization</td>
<td>Standard Data Reduction Driver Special Calculation Driver</td>
<td>Sequential</td>
</tr>
<tr>
<td>Product Data File</td>
<td>Source Data Base via PIA, Special Calculations</td>
<td>Measurement Group Processing Output Processing</td>
<td>Output Processing Special Calculations</td>
<td>Sequential</td>
</tr>
<tr>
<td>Local Master Products File</td>
<td>Lead Cards, MPDB</td>
<td>Initialization</td>
<td>Initialization</td>
<td>Sequential</td>
</tr>
<tr>
<td>Data Availability File</td>
<td>Source Data Base</td>
<td>Retrieval</td>
<td>Output Processing</td>
<td>Sequential</td>
</tr>
</tbody>
</table>
DIAGRAM ID: NAME: Product Descriptor File

TYPE: DATA BASE WORKING FILE X ARRAY

ORIGINAL SOURCE: Lead cards, MPDB, and CDB

CREATED BY: Initialization

MODIFIED BY: N/A

USED BY: Output processing

PURPOSE: The Product Descriptor File contains information needed by output processing for building an output product.

ACCESS METHOD: Sequential
DIAGRAM ID: NAME: Product Descriptor File

TYPE: DATA BASE WORKING FILE X ARRAY

STRUCTURE DIAGRAM: Each logical record in the Product Descriptor File contains the fixed information necessary for building an output product by output processing. The file is ordered by product type and as requested within type.

```
| RECORD 1 |
| RECORD 2 |
|     ...  |
| RECORD N |

(Standard data reduction)

| RECORD 1 |
| RECORD 2 |
|     ...  |
| RECORD L |

(special calcs)

EOF
```
DIAGRAM ID:  NAME: Product Descriptor File

TYPE:  DATA BASE  WORKING FILE  X  ARRAY

ELEMENT DESCRIPTION:

Measurement group name

Group source type (OI/PFCS, SAIL CDT, MSFC FM, BFCS, EPHM, Special calc.)

Measurement group product type code
- Tab
- Page time history plot
- Page cross plot
- Continuous plot
- Linearly interpolated file
- Linearly interpolated CCT
- Full rate CCT

Output time delta for LI product

Group scaling information
- Connect option (vector connect, step connect, points only)
- Scales (left, right, bottom)
- Number of major grid divisions (ordinate and abscissa - cross plot only)
- Time per grid on time history plots
- Grid start time
- Time per grid on cross plots
• Time per inch for continuous plots
• Thirty-five scales on continuous plots

Major heading information
• Title
• Flight/test
• Test date
• Subsystem
• Request number
• Calibration block
• Data source
• Processing date

Measurement specific information
• Measurement position indicator in final product
• Measurement name
• Calibration information (yes or no, method to use, out of range indicator, high/low range - record from CDB)
• Parent word children names
• Flag for bilevel parent word (which syllable to use)
• Bandpass limit for each measurement
• Flag for status or interpolation for LI files
• Four line minor heading for special calcs.
• Display time indicator (GMT, MET, ET)
• Event time bias
• PIA format code (integer/real)
• Measurement scale assignment (L,R)
NAME: Run Segment File

TYPE: DATA BASE WORKING FILE X ARRAY

ORIGINAL SOURCE: Lead cards, MPDB, SDB, DDB

CREATED BY: Initialization

MODIFIED BY: N/A

USED BY: Standard Data Reduction Driver, Special Calculation Drivers

PURPOSE: The run segment file is for splitting a run into multiple passes over the source data. One source per pass, limits on number of measurements, samples, and groups. Each record corresponds to a pass.

ACCESS METHOD: Sequential
**DIAGRAM ID:**

**NAME:** Run Segment File

**TYPE:** DATA BASE

**WORKING FILE:** X

**ARRAY:**

**STRUCTURE DIAGRAM:**

```
RECORD 1  
RECORD 2  
       
RECORD N
       
       
EOF

RECORD 1  
RECORD 2  
       
RECORD L
       
EOF

Standard Data Reduction

Special Calcs
```
Each record contains:

- Source identification
  - Type: OI/PFCS, BFCS, MSFC FM, EPHM, SAIL CDT, special calcs
  - Tape numbers for this source
  - Number of tapes
  - File number if MSFC FM
  - Run number if EPHM
  - Start/stop time
  - Corrective time bias
- Measurement names in this run segment, duplicate names deleted
- Number of measurement names
- Group processing tables for all groups in this run segment
- Number of groups in this segment
- BITE masks and nominal values
NAME: Product Data File

TYPE: DATA BASE WORKING FILE X ARRAY

ORIGINAL SOURCE: Source Data Base via PIA, Special Calculations

CREATED BY: Measurement Group Processing, Output Processing

MODIFIED BY: N/A

USED BY: Output Processing, Special Calculations

PURPOSE: The purpose of the Product Data File is to hold all the data for a specific output product.

ACCESS METHOD: Sequential
The Product Data File is ordered by product type and as requested within type. There are three types of files.

- Data Lines (DL) File
- Full Rate (FR) File
- Linearly Interpolated (LI) File
The Data Lines (DL) File has two record types:

- Header record (length, record type, D/D format ID, sample rates, delta t's)
- Data record (length, record type, time, type of time, PFCS/BFCS skew, BITE status, data values for up to ten measurements)

The Full Rate (FR) File has three record types:

- Header record (length, record type, D/D format ID, sample rates, delta t's)
- Time record (length, record type, time, type of time, PFCS/BFCS skew, PFCS set A/B indicator)
- Data record (length, record type, all the values for each measurement - one record per measurement)

The Linearly Interpolated (LI) File has one record type:

- Header record (length, record type, time, data values)
<table>
<thead>
<tr>
<th><strong>DIAGRAM ID:</strong></th>
<th><strong>NAME:</strong> Local Master Products File</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TYPE:</strong></td>
<td><strong>DATA BASE</strong></td>
</tr>
<tr>
<td><strong>ORIGINAL SOURCE:</strong></td>
<td>Lead cards, MPDB</td>
</tr>
<tr>
<td><strong>CREATED BY:</strong></td>
<td>Initialization</td>
</tr>
<tr>
<td><strong>MODIFIED BY:</strong></td>
<td>Initialization (sorted)</td>
</tr>
<tr>
<td><strong>USED BY:</strong></td>
<td>Initialization</td>
</tr>
<tr>
<td><strong>PURPOSE:</strong></td>
<td>The Local Master Products File is for incorporating run time overrides into the MPDB.</td>
</tr>
<tr>
<td><strong>ACCESS METHOD:</strong></td>
<td>Sequential</td>
</tr>
</tbody>
</table>

7-13
<table>
<thead>
<tr>
<th>Source</th>
<th>Worst Case S.R.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPDB Record</td>
<td></td>
</tr>
</tbody>
</table>
DIAGRAM ID: NAME: Local Master Products File

TYPE: DATA BASE WORKING FILE X ARRAY

ELEMENT DESCRIPTION:

Each record contains:

- Source type (OI/PFCS, BFCS, MSFC FM, EPHM, SAIL CDT, special calc)
- Worst case sample rate for each measurement
- Record from Master Products Data Base
NAME: Data Availability File

TYPE: DATA BASE WORKING FILE ARRAY

ORIGINAL SOURCE: Source Data Base

CREATED BY: Retrieval

MODIFIED BY: N/A

USED BY: Output processing

PURPOSE: The Data Availability File contains information needed by output processing to produce the Data Availability Report.

ACCESS METHOD: Sequential
DIAGRAM ID:       NAME: Data Availability File

TYPE:  DATA BASE     WORKING FILE  X  ARRAY

STRUCTURE DIAGRAM: Each logical record in the Data Availability File contains the information necessary for building the Data Availability Report. The file is ordered by time.

| RECORD 1 |
| RECORD 2 |
| ...     |
| RECORD N |

7-17
NAME: Data Availability File

ELEMENT DESCRIPTION:

- Requested start/stop time
- Actual start/stop time
- CDS time if NIP data
- Data type (R/T, playback)
- Data source (OI, MSFC FM, EPHM, SAIL)
- Time jumps
- Time backups
- D/D format ID
- ET bias
- MET bias
8. ARRAYS AND TABLES
<table>
<thead>
<tr>
<th>NAME</th>
<th>SOURCE</th>
<th>CREATED BY</th>
<th>USED BY</th>
<th>MODIFIED BY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unpack Array</td>
<td>Descriptor Data Base</td>
<td>Retrieval</td>
<td>Retrieval</td>
<td>Retrieval</td>
</tr>
<tr>
<td>Processing Interface Array Template (PIAT)</td>
<td>Descriptor Data Base</td>
<td>Retrieval</td>
<td>Retrieval</td>
<td>Retrieval</td>
</tr>
<tr>
<td>Processing Interface Array (PIA)</td>
<td>Source Data Base</td>
<td>Retrieval</td>
<td>Measurement</td>
<td>Retrieval</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Special</td>
<td>Group Processing</td>
<td>Special</td>
</tr>
<tr>
<td>Group Processing Table (GPT)</td>
<td>Master Products Data Base</td>
<td>Initialization</td>
<td>Measurement</td>
<td>Group Processing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Source Data Base</td>
<td>Group Processing</td>
<td>Measurement</td>
</tr>
<tr>
<td>Measurement Group Matrix (MGM)</td>
<td>PIA</td>
<td>Measurement</td>
<td>Group Processing</td>
<td>Measurement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group Processing</td>
<td>Group Processing</td>
<td>Group Processing</td>
</tr>
</tbody>
</table>
PURPOSE: The Unpack Array contains information needed to unpack measurement values from a data set from the Source Data Base and to convert the values to CYBER internal format.

ACCESS METHOD: The entries in this array are parallel to the entries in the measurement list array contained in the run segment file.
Unpack Array

Structure Diagram:

- EPHM Unpack array
- MFC Unpack array
- SAL Unpack Array

Position in buffer

Diagram ID: NAME: Unpack Array

Type: DATA BASE WORKING FILE ARRAY X
NAME: Unpack Array

TYPE: DATA BASE WORKING FILE ARRAY X

ELEMENT DESCRIPTION:

- **OI/PFCS, BFCS Elements**
  - Samples per data set (PFCS Set A)
  - First byte location relative to the first byte in the data set
  - Measurement size in bits
  - Starting bit relative to first byte
  - First sample start frame
  - Preprocessing code
  - Byte increment (= 1 for NIP)
  - Source indicator

- **SAIL Elements**
  - Tag – SAIL CDT System ID

- **MSFC FM Elements**
  - Position in buffer

- **EPHM Elements**
  - Position in buffer
DIAGRAM ID:   NAME:  Processing Interface Array Template (PIAT)

TYPE:  DATA BASE  WORKING FILE  ARRAY X

ORIGINAL SOURCE:  Descriptor Data Base

CREATED BY:  Retrieval, Special Calculation Module

MODIFIED BY:  Retrieval

USED BY:  Retrieval, Measurement Group Processor

PURPOSE:  The PIAT contains information needed to locate and interpret values in the PIA.

ACCESS METHOD:  Each entry corresponds to a measurement name in a parallel measurement list array. The PIA format code indicates whether the values in the PIA are floating point or integer format.
DIAGRAM ID: Processing Interface Array Template (PIAT)

NAME: Processing Interface Array Template (PIAT)

TYPE: DATA BASE WORKING FILE ARRAY X

STRUCTURE DIAGRAM:

```
<table>
<thead>
<tr>
<th>Measurement List</th>
<th>Processing Interface Array Template</th>
<th>Processing Interface Array</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name 1</td>
<td>Samp rate code</td>
<td>Format code</td>
</tr>
<tr>
<td>Name 2</td>
<td>Samp rate code</td>
<td>Format code</td>
</tr>
<tr>
<td>Name N</td>
<td>Samp rate code</td>
<td>Format code</td>
</tr>
<tr>
<td>Sample 1</td>
<td></td>
<td>P1</td>
</tr>
<tr>
<td>Sample 2</td>
<td></td>
<td>P1</td>
</tr>
<tr>
<td>Sample M1</td>
<td></td>
<td>P2</td>
</tr>
<tr>
<td>Sample M2</td>
<td></td>
<td>P2</td>
</tr>
<tr>
<td>Sample MN</td>
<td></td>
<td>Pn</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```
<table>
<thead>
<tr>
<th>TYPE:</th>
<th>DATA BASE</th>
<th>WORKING FILE</th>
<th>ARRAY X</th>
</tr>
</thead>
</table>

**ELEMENT DESCRIPTION:**

- PIA pointer
- Number of samples retrieved
- PIA format code (integer or floating point)
- Delta t
- Sample rate code
DIAGRAM ID: NAME: Processing Interface Array (PIA)

TYPE: DATA BASE WORKING FILE ARRAY X

ORIGINAL SOURCE: Source Data Base

CREATED BY: Retrieval, Special Calculation Modules

MODIFIED BY: Retrieval, Special Calculation Modules

USED BY: Measurement Group Processing

PURPOSE: The Processing Interface Array contains data from a single source (OI/PFCS, BFCS, MSFC FM, SAIL CDT, EPHM, or special calculations). The data is in CYBER internal format on word boundaries.

ACCESS METHOD: The PIA is accessed by pointer from PIAT to PIA.
DIAGRAM ID:  
NAME: Processing Interface Array (PIA)  
TYPE: DATA BASE WORKING FILE ARRAY X  

STRUCTURE DIAGRAM:
DIAGRAM ID:  NAME: Processing Interface Array (PIA)

TYPE:  DATA BASE   WORKING FILE   ARRAY X

ELEMENT DESCRIPTION: Each element in the PIA will consist of a single measurement value in CYBER internal format in a single 60-bit word. Measurements containing more than 60 bits will be rounded to 60 bits. When a value is not available, a flag will be placed in the PIA word which would normally contain the measurement value. All samples of a measurement are contiguous.

Flags: Sync loss
Undefined
PFCS dump interrupt
Tape error
Overflow
NAME: Group Processing Table (GPT)

TYPE: DATA BASE WORKING FILE ARRAY X

ORIGINAL SOURCE: Master Products Data Base, lead card

CREATED BY: Initialization

MODIFIED BY: Measurement group processing

USED BY: Measurement group processing

PURPOSE: To provide processing and status information necessary to process a selected measurement group.

ACCESS METHOD: Starting location for current group to be processed is passed as call argument to measurement group processing. There is one GPT per measurement group. Each GPT consists of a number of fixed-size entries, the first of which contains group information and the rest of which contain measurement information for each measurement in the group.
DIAGRAM ID: NAME: Group Processing Table (GPT)

TYPE: DATA BASE WORKING FILE ARRAY X

STRUCTURE DIAGRAM:

Group information
1st measurement information
2nd measurement information
Last measurement information
DIAGRAM ID:  

NAME: Group Processing Table (GPT)

TYPE: DATA BASE WORKING FILE ARRAY X

ELEMENT DESCRIPTION:

Group information:
- Group Product Data File type
- Group name
- Number of measurements in group
- OI or BFCS D/D format number status
- PFCS D/D format number status

Measurement information:
- Pointer to the PIAT
- Bandpass status
- Bandpass limit
- Bilevel parent word indicator
- Bilevel parent word byte number
- Bilevel parent word mask
DIAGRAM ID:  
NAME: Measurement Group Matrix (MGM) and Line Indicator Array  

TYPE:  
DATA BASE WORKING FILE ARRAY X  

ORIGINAL SOURCE: Processing Interface Array  
CREATED BY: Measurement Group Processing  
MODIFIED BY: Measurement Group Processing  
USED BY: Measurement Group Processing  

PURPOSE: To provide for processing storage, line formatting, and data bandpassing of measurement groups requiring time history display.  

ACCESS METHOD: Direct access by using line number and column number.
DIAGRAM ID: NAME: Measurement Group Matrix (MGM) and Line Indicator Array

TYPE: DATA BASE WORKING FILE ARRAY X

STRUCTURE DIAGRAM:
### Measurement Group Matrix (MGM) and Line Indicator Array

**Diagram ID:**

**Type:**
- Data Base
- Working File
- ARRAY X

**Element Description:**
Lines of the MGM contain the data for data lines file records. The line indicator is set when the corresponding line in the MGM contains data to be sent to Product Data File.
9. PERFORMANCE MONITORING AND DEBUGGING FACILITIES

9.1 MONITORING

A performance monitoring module will be developed and incorporated into each ALT SIES program. The following information will be collected for each program and major subroutine:

- Number of calls
- Elapsed clock time
- Elapsed CPU time
- Number of disk PRU's read and written
- Number of tape PRU's read and written

This summary will be printed at the end of each program execution.

9.2 DEBUGGING

Each program and major subroutine will have built in coding for debugging and tracing. Output from the debugging code will consist of messages written to a trace file. A utility program will be developed to produce a formatted listing of the trace file.

Writing of messages to the trace file will be selectable by lead cards. A counter will be associated with each message, each time a message is written the counter will be decremented, and the message will cease to be written when its counter is zero. The initial values of the counters may be input by lead cards.

Each message will consist of

- The name of the routine that writes the message
- A message code to distinguish between different messages of the same routine
- The message length
- Data of the message

The message data is dependent on the originating routine. It will consist of arguments and important internal variables in internal machine format.

The utility program which prints the trace file will contain coding and formats necessary to produce a readable formatted listing. Variable names will be printed, packed words will be decomposed, and column headings will be provided for arrays and tables.

The utility program will also contain options to selectively print certain messages. These options will be useful for getting trace output on a terminal during debugging.

A certain subset of the messages will always be turned on during production runs. Standard production deck setups will contain control cards necessary to get a core dump and to list the trace file in case the run errors off.