CR 151097

JSC-11468

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

JSC-11468

DETAILED DESIGN SPECIFICATION FOR THE ALT SHUTTLE INFORMATION EXTRACTION SUBSYSTEM (SIES)

Job Order 86-029

PREPARED BY

Data Systems Development Section
Data Processing Systems Department

APPROVED BY

LEC

G.L. Clouette, Supervisor
Data Systems Development Section

W.N. Fitzpatrick, Manager
Data Processing Systems Department

9/16/76
J. Willars, Staff Engineer
Shuttle DRC Office

9/16/76
D.B. Clark, Manager
Shuttle DRC Office

NASA

J.E. Wakeland, Section Head
Applications Programming Section

F. Fulton, Chief
Data Processing Branch

J.A. Frere, Deputy Chief
Institutional Data Systems Division

9/27/76
C.R. Huss, Chief
Institutional Data Systems Division

Prepared By

Lockheed Electronics Company, Inc.

For

Institutional Data Systems Division

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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

AGC	AUTOMATIC GAIN CONTROL
ALT	APPROACH AND LANDING TESTS
AMU	DATA TYPE CODE FROM MMDB
APFUEL	POWER AND PROPULSION APU FUEL QUANTITY SPECIAL CALCULATION PROGRAM
APPERF	POWER AND PROPULSION APU PERFORMANCE SPECIAL CALCULATION PROGRAM
APU	AUXILIARY POWER UNIT
BFCS	BACKUP FLIGHT CONTROL SYSTEM
BITE	BUILTIN TEST EQUIPMENT
	CALIBRATION
	CALCULATION
CCT	COMPUTER COMPATIBLE TAPE
CDB	CALIBRATION DATA BASE
CDS	CONTINUOUS DATA SEGMENT
CDT	COMPRESSED DATA TAPE
COMTRK	AVIONICS COMMUNICATION AND TRACKING SPECIAL CALCULATION PROGRAM
D/D	DOWNLINK/DOWNLIST
DAF	DATA AVAILABILITY FILE
DDB	DESCRIPTOR DATA BASE
	DELTA TIME
DL	DATA LINES
DRC	DATA REDUCTION COMPLEX
ECLSS	ENVIRONMENTAL CONTROL LIFE SUPPORT SUBSYSTEM SPECIAL CALCULATION PROGRAM
EPHM	EPHEMERIS/METEOROLOGICAL
ET	EVENT TIME
EU	ENGINEERING UNITS
FM	FREQUENCY MODULATION
FR	FULL RATE
GMT	GREENWICH MEAN TIME
GPT	GROUP PROCESSING TABLE
HFS	DATA TYPE CODE FROM MMDB CALIBRATION TAPE
HIPO	HIERARCHY PLUS INPUT-PROCESS-OUTPUT
ICD	INTERFACE CONTROL DOCUMENT
ID	IDENTIFICATION
IDSD	INSTITUTIONAL DATA SYSTEMS DIVISION
IGS	INTEGRATED GRAPHICS SOFTWARE
LDGEAR	STRUCTURES LANDING GEAR SPECIAL CALCULATION PROGRAM
LI	LINEARLY INTERPOLATED
MET	MISSION ELAPSED TIME
MGM	MEASUREMENT GROUP MATRIX
MMDB	MASTER MEASUREMENT DATA BASE
MPDB	MASTER PRODUCT DATA BASE
MSFC	MARSHALL SPACE FLIGHT CENTER
MTU	MASTER TIMING UNIT
NIP	NETWORK INTERFACE PROCESSOR
OI	OPERATIONAL INSTRUMENTATION
PFCS	PRIMARY FLIGHT CONTROL SYSTEM
PIA	PROCESSING INTERFACE ARRAY
PIAT	PROCESSING INTERFACE ARRAY TEMPLATE
PRESSR	STRUCTURE PRESSURES SPECIAL CALCULATION PROGRAM
PRU	PHYSICAL RECORD UNIT
QA	QUALITY ASSURANCE
R/T	REAL TIME
SAIL	SHUTTLE AVIONICS INTEGRATION LABORATORY
SDB	SOURCE DATA BASE
SIES	SHUTTLE INFORMATION EXTRACTION SUBSYSTEM
STRESS	STRUCTURES STRESS SPECIAL CALCULATION PROGRAM

CONTENTS

CONTENTS

FIGURES

TABLES

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 2-1 SIES PRODUCTS AND PROCESSING OPTIONS

PRODUCT	SELECTION METHOD		PROCESSING OPTIONS	
	By Group	Automatic	Band Passing	Calibration
TABS	X		X	X
T.H. PAGE PLOT	X		X	X
CONTINUOUS PLOT	X		X	X
CROSS PAGE PLOT	X			X
LI CCT	X			X
FULL RATE CCT	X			X
DATA AVAILABILITY REPORT		X		
SYSTEMS ANALYSIS TAB.		X(1)		
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

		PLOTS			CCTS	
DATA SOURCES	TABS	T.H. PAGE PLOTS	CONT. PLOTS	CROSS PLOTS (4)	LINEARLY INTER-POLATED	FULL RATE
NIP - OI/PFCS	X	X	X	X	X	X
NIP - BFCS	X	X	X	X	X	X
MSFC FM	X	X	X	X	X	X
EPHEMERIS	X	X	X	X	X	X
SAIL-CDT(1)	X	X				
COMPUTED VALUES(2)	X	X	X	X	X	X
MERGED SOURCES(3)	X	X	X	X	X	X

(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.

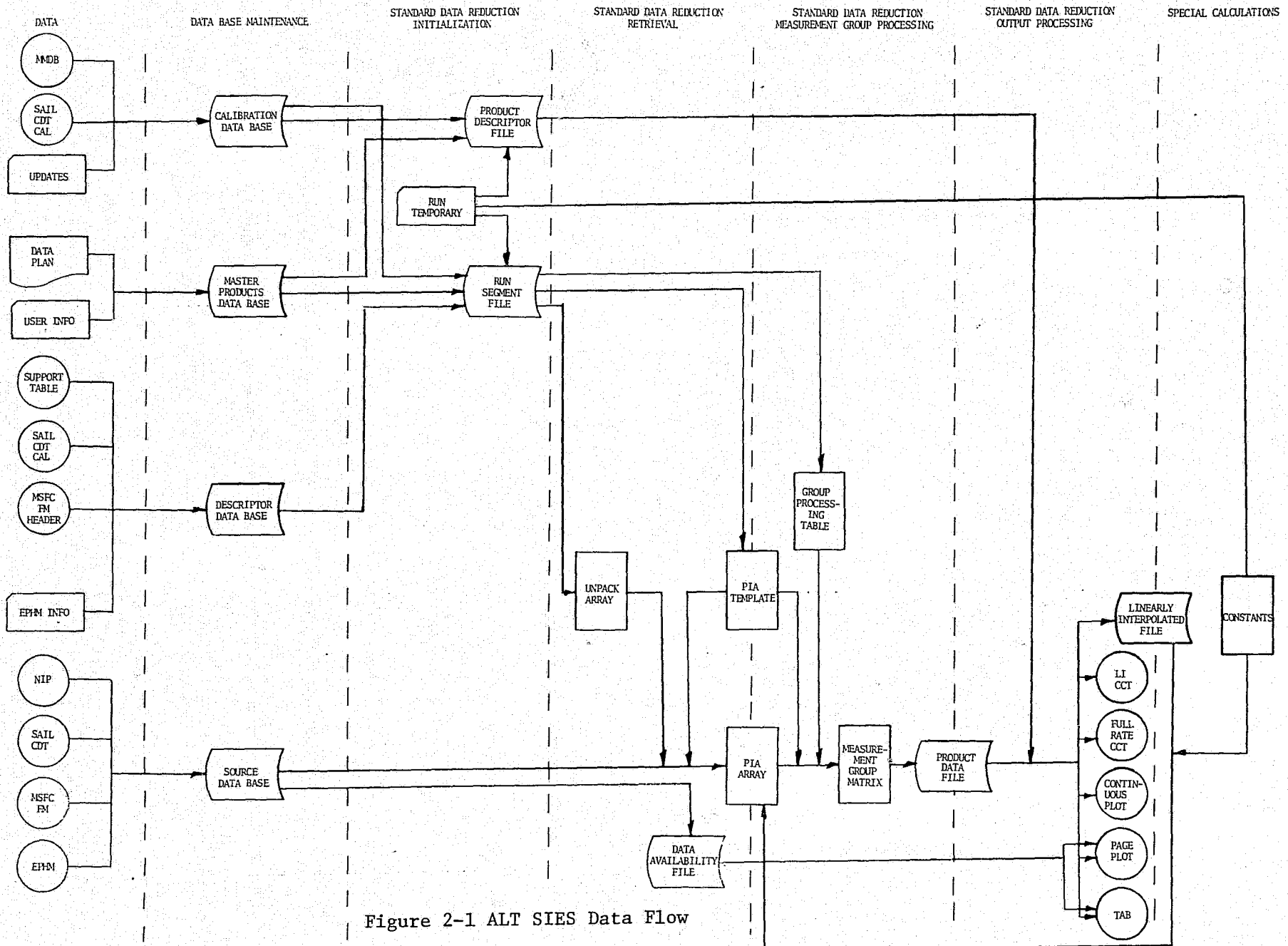


Figure 2-1 ALT SIES Data Flow

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).

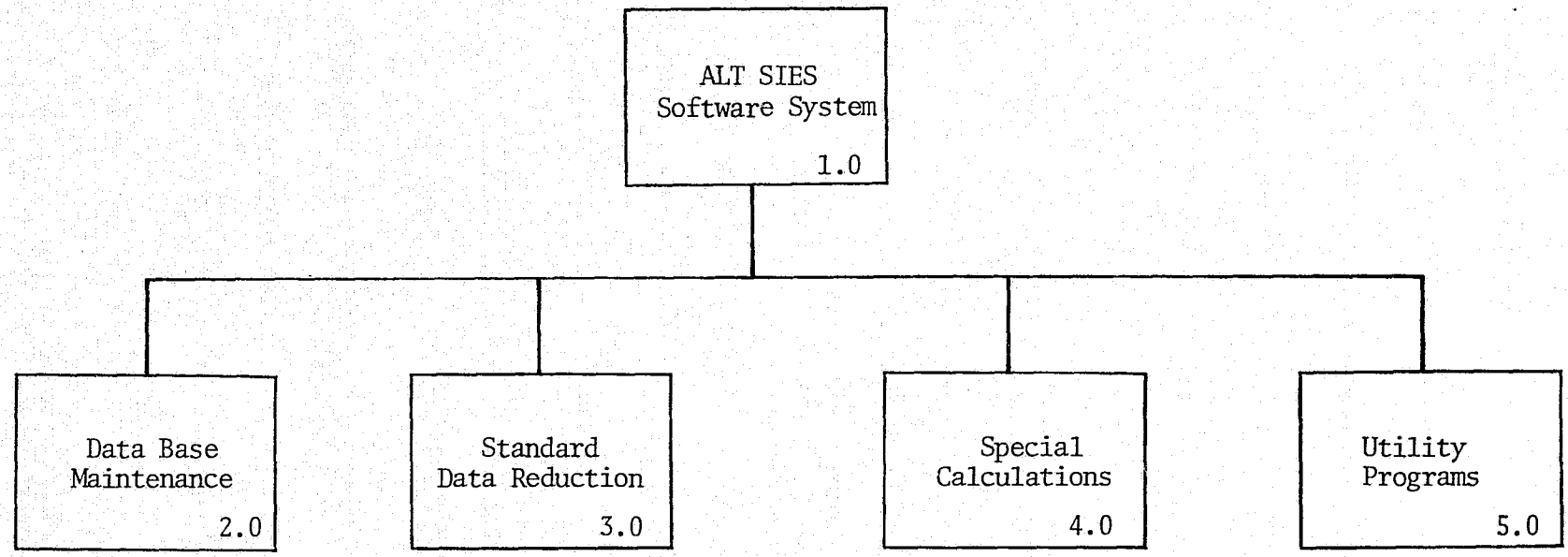
In the HIPO diagrams that follow several conventions have been agreed upon.

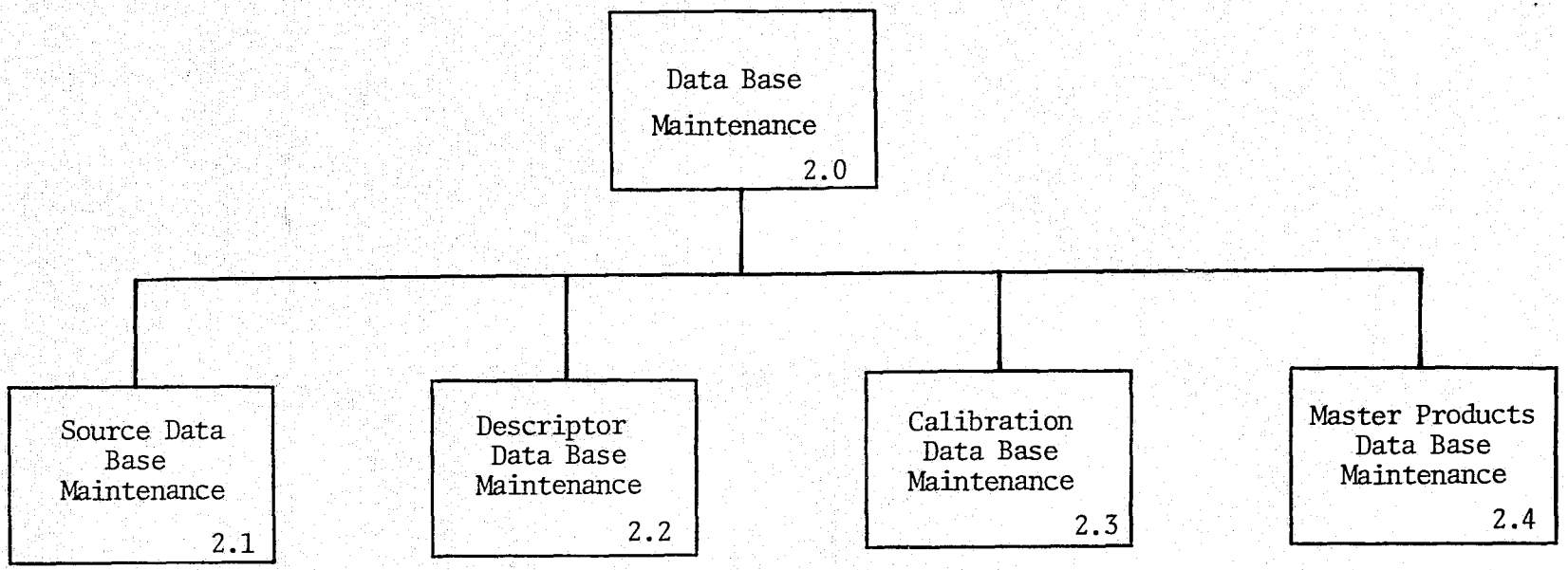
- Arrows ($\longrightarrow$) show data movement

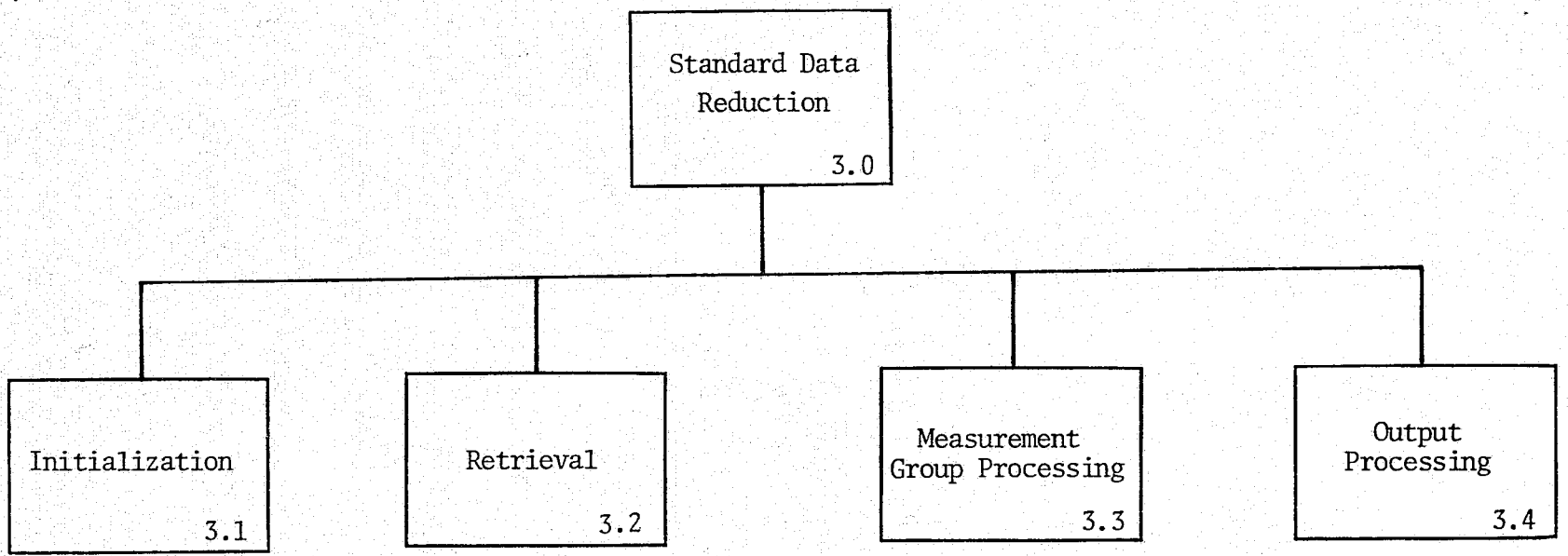
- Bullets (•) refer to arguments
- Dashes (-) refer to elements

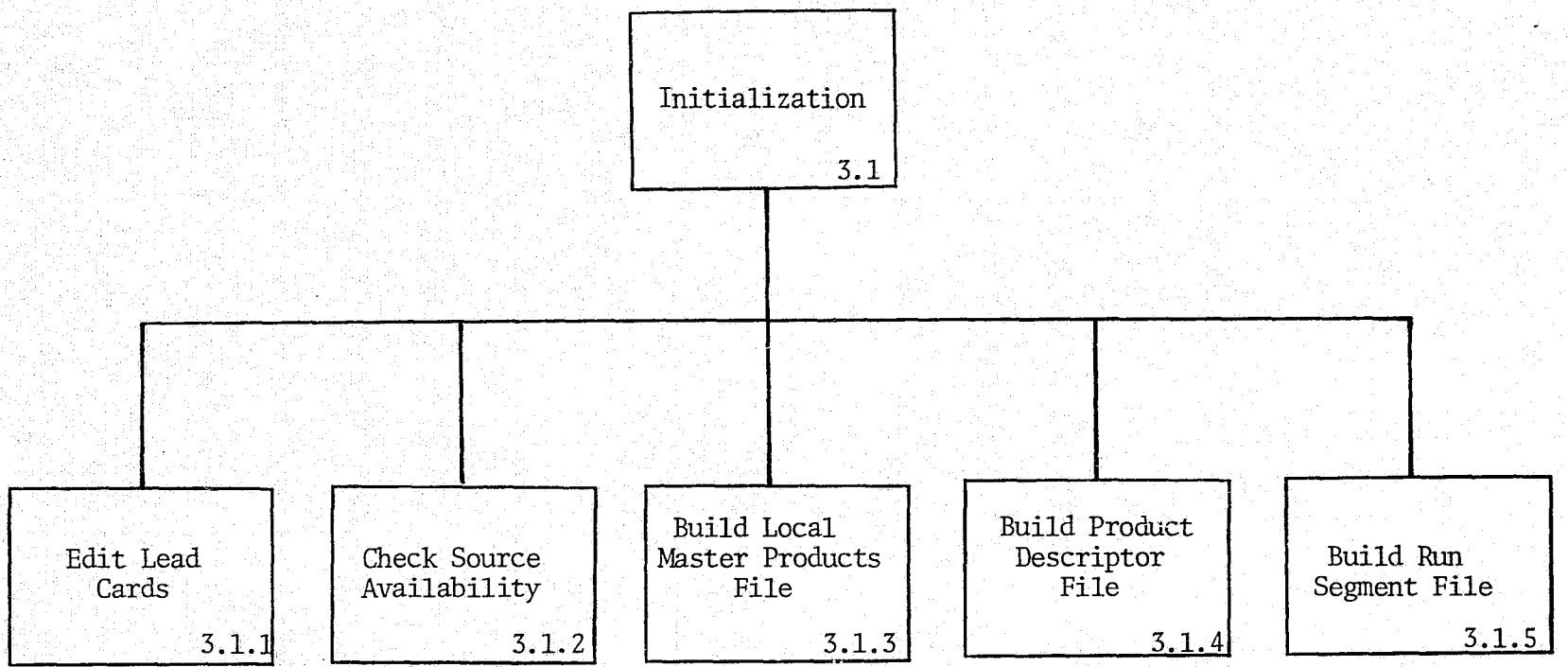
  These elements may be elements of a file, data base, argument or any other item that has elements

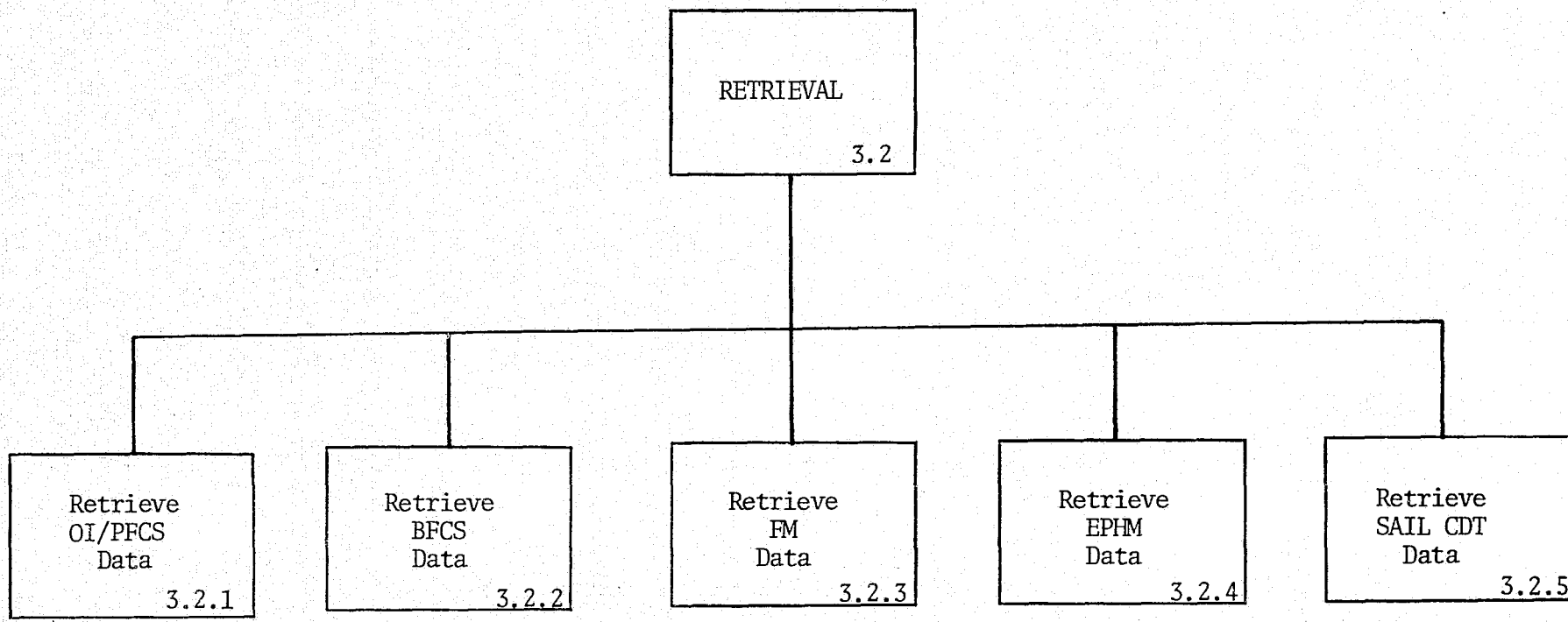
3.3 VISUAL TABLE OF CONTENTS FOR HIPO DESIGN DIAGRAMS

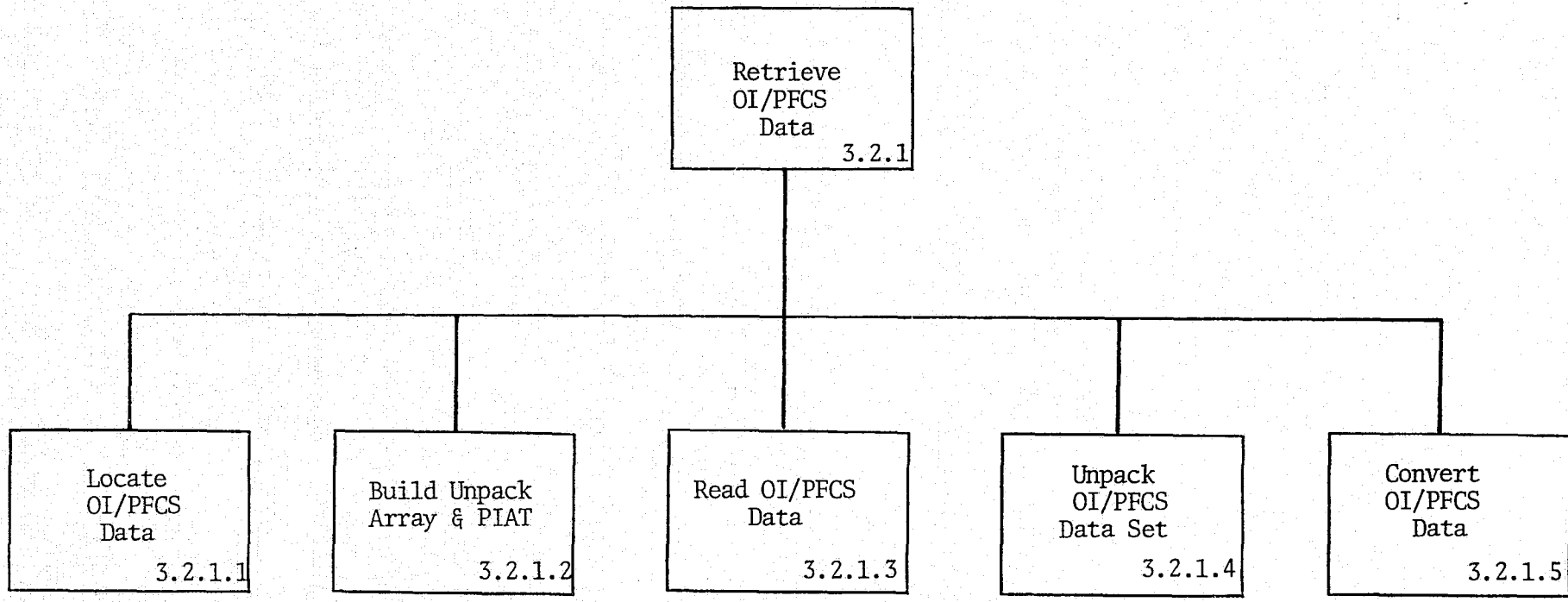

ALT SIES
Software System
1.0
Data Base
Maintenance
2.0
Standard
Data Reduction
3.0
Special
Calculations
4.0
Utility
Programs
5.0

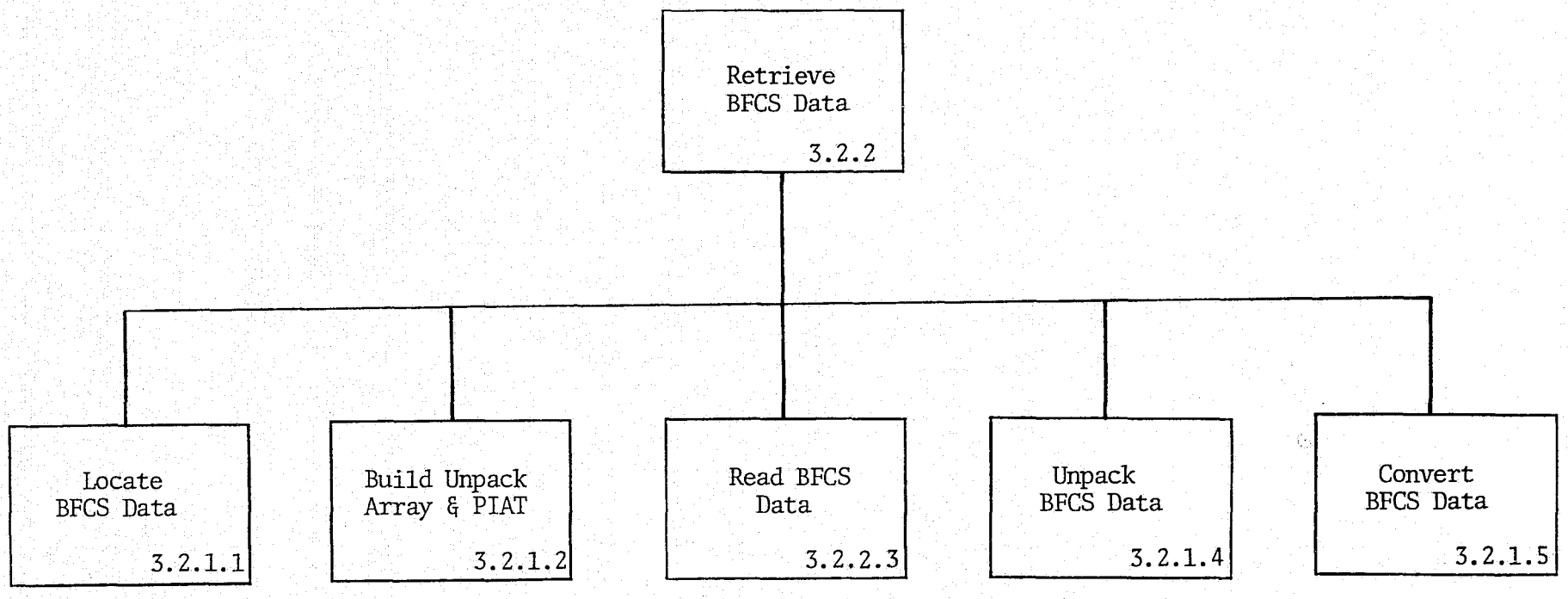

Data Base Maintenance 2.0
Source Data Base Maintenance 2.1
Descriptor Data Base Maintenance 2.2
Calibration Data Base Maintenance 2.3
Master Products Data Base Maintenance 2.4

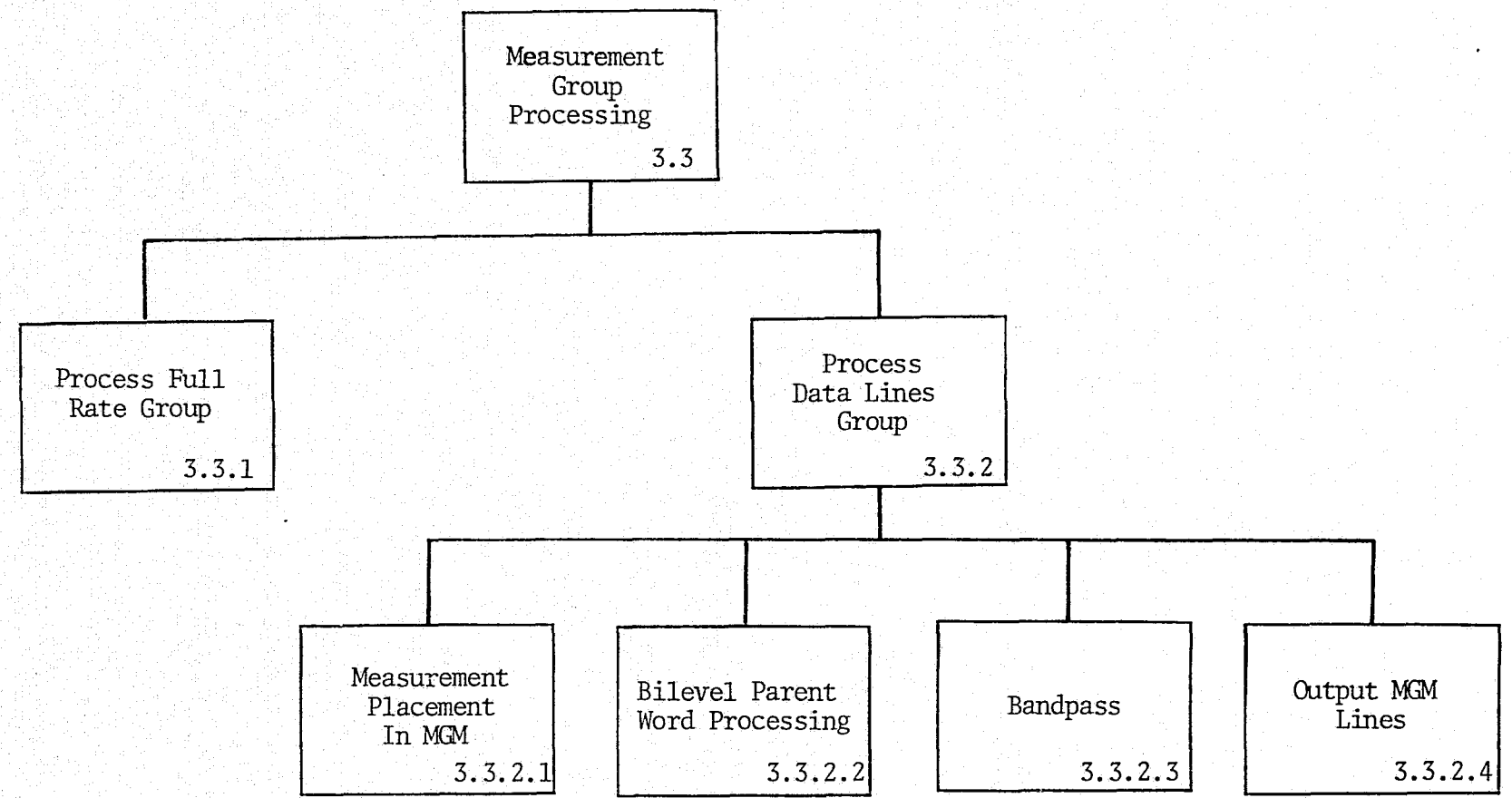

Standard Data Reduction
3.0
Initialization
3.1
Retrieval
3.2
Measurement Group Processing
3.3
Output Processing
3.4

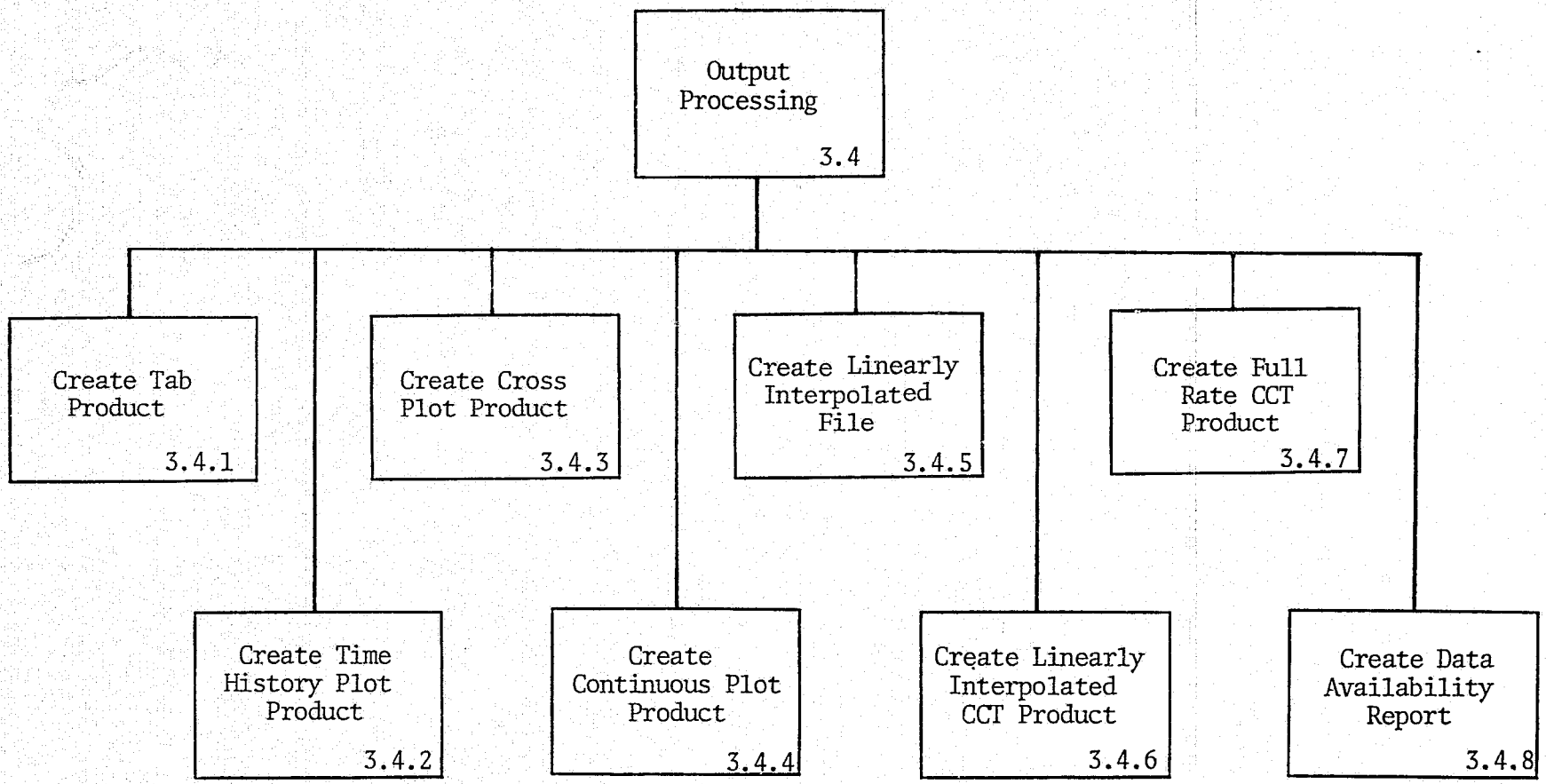

Initialization
3.1
Edit Lead Cards
3.1.1
Check Source Availability
3.1.2
Build Local Master Products File
3.1.3
Build Product Descriptor File
3.1.4
Build Run Segment File
3.1.5

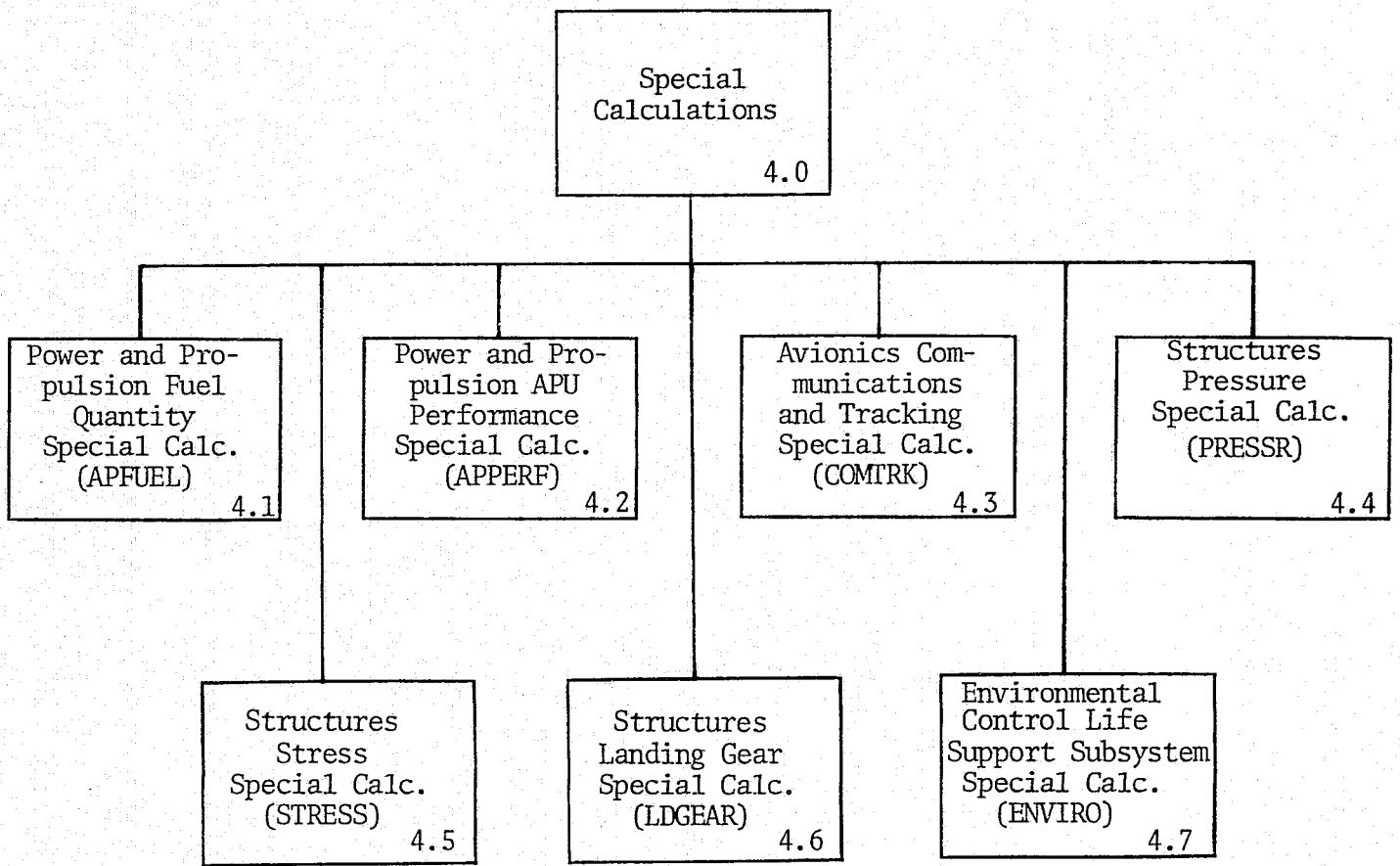

RETRIEVAL
3.2
Retrieve OI/PFCS Data
3.2.1
Retrieve BFCS Data
3.2.2
Retrieve FM Data
3.2.3
Retrieve EPHM Data
3.2.4
Retrieve SAIL CDT Data
3.2.5

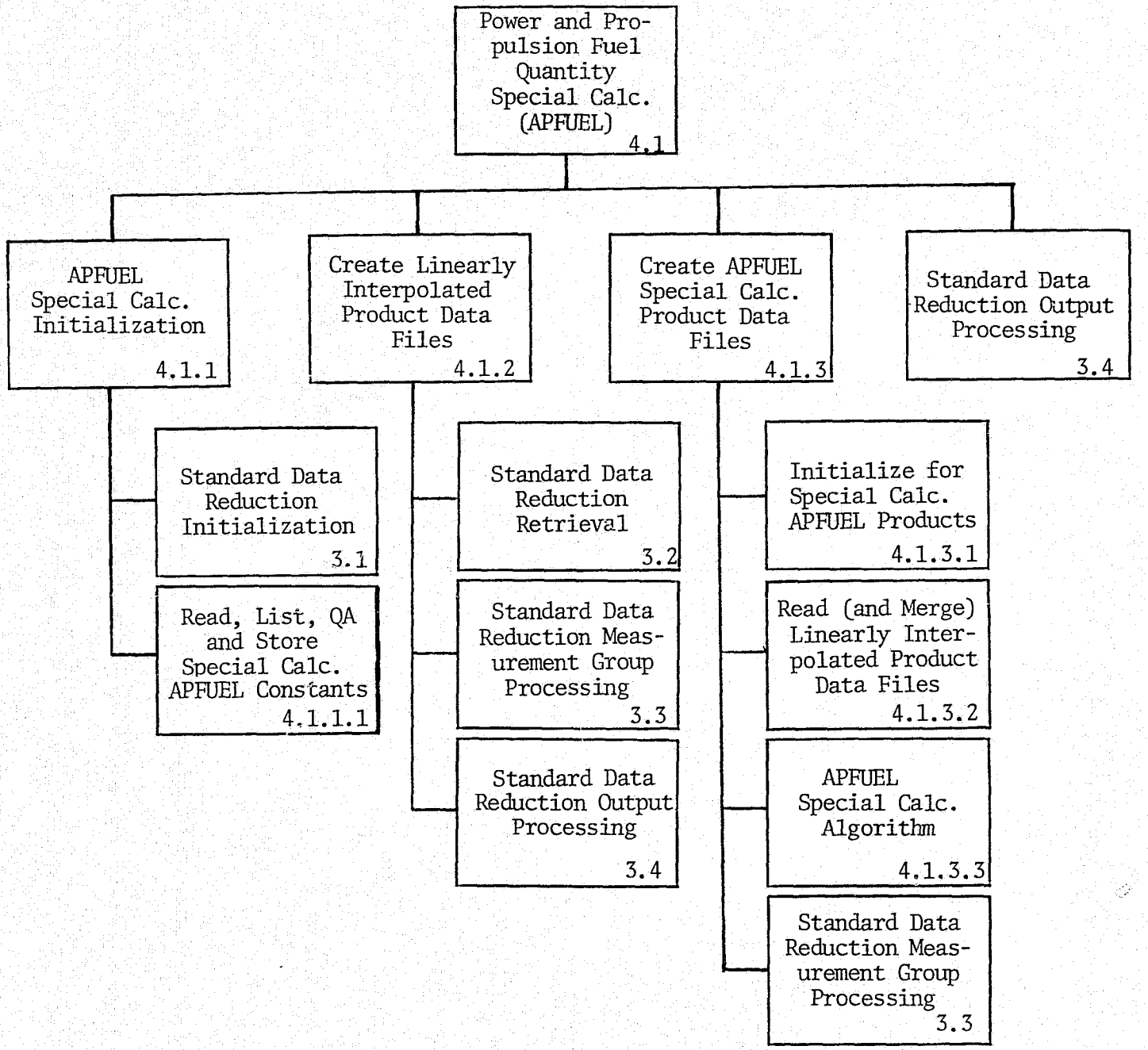

Retrieve OI/PFCS Data 3.2.1
Locate OI/PFCS Data 3.2.1.1
Build Unpack Array & PIAT 3.2.1.2
Read OI/PFCS Data 3.2.1.3
Unpack OI/PFCS Data Set 3.2.1.4
Convert OI/PFCS Data 3.2.1.5

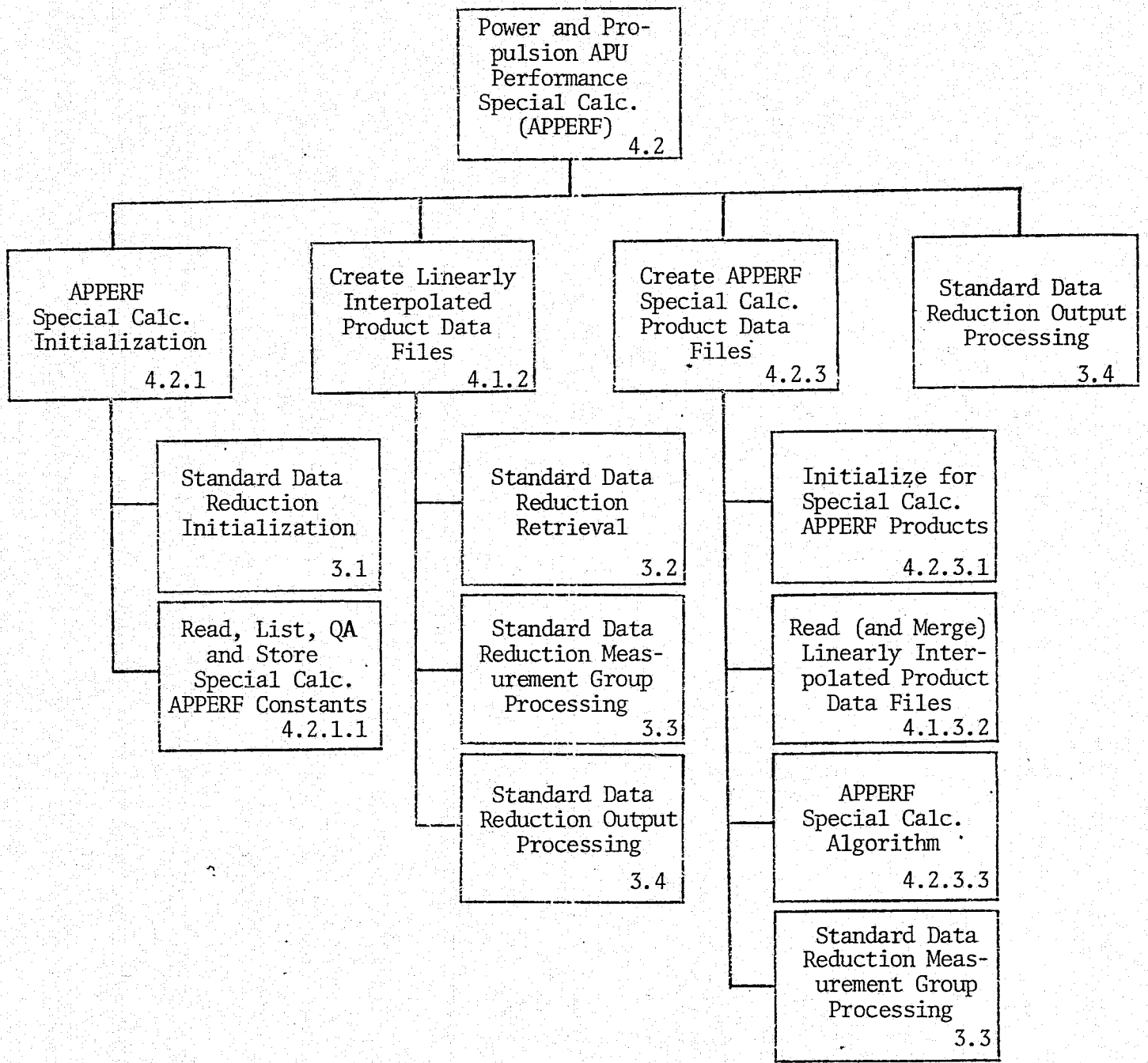

Retrieve
BFCS Data
3.2.2
Locate
BFCS Data
3.2.1.1
Build Unpack
Array & PIAT
3.2.1.2
Read BFCS
Data
3.2.2.3
Unpack
BFCS Data
3.2.1.4
Convert
BFCS Data
3.2.1.5

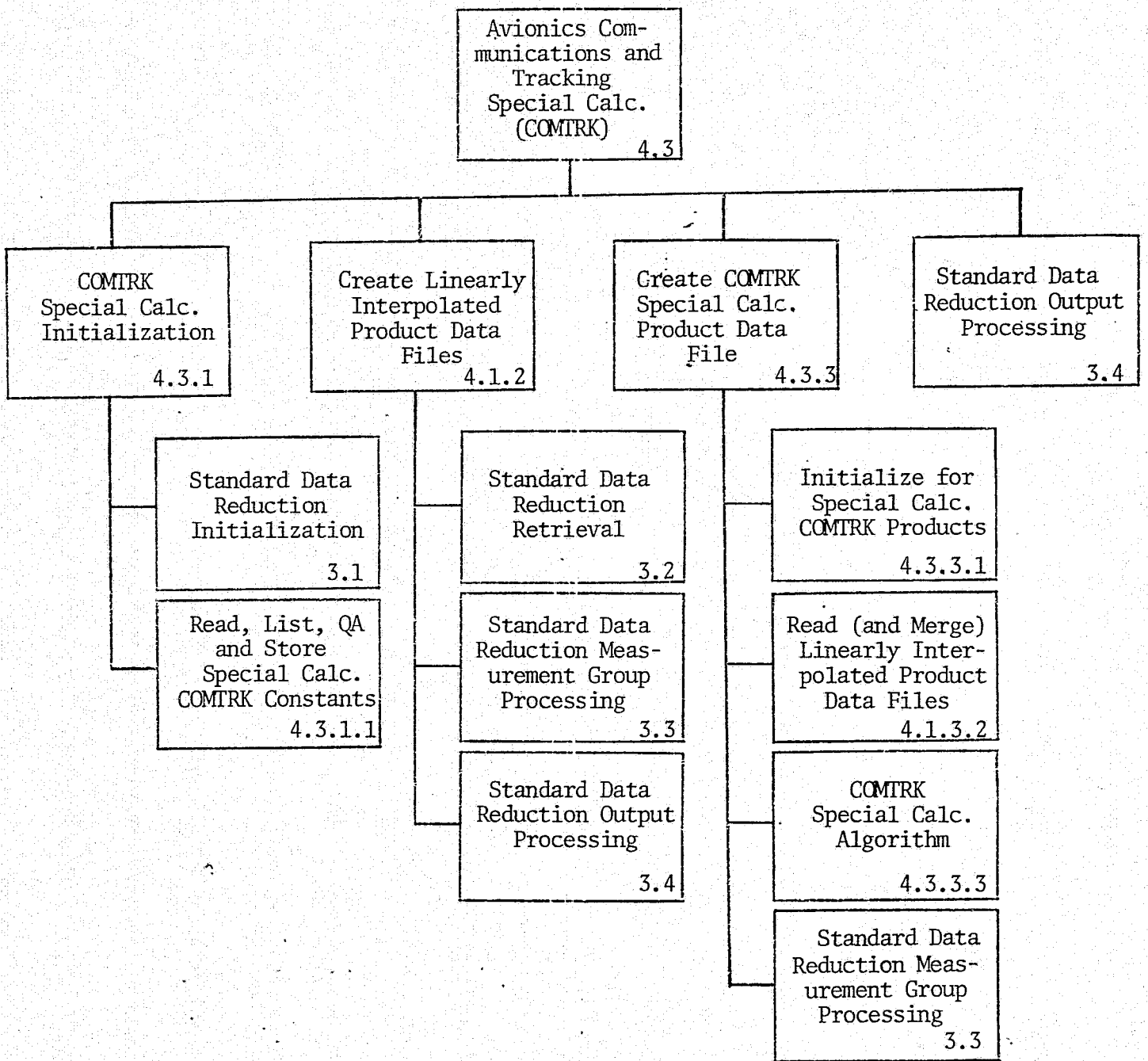

Measurement Group Processing
3.3
Process Full Rate Group
3.3.1
Process Data Lines Group
3.3.2
Measurement Placement In MGM
3.3.2.1
Bilevel Parent Word Processing
3.3.2.2
Bandpass
3.3.2.3
Output MGM Lines
3.3.2.4

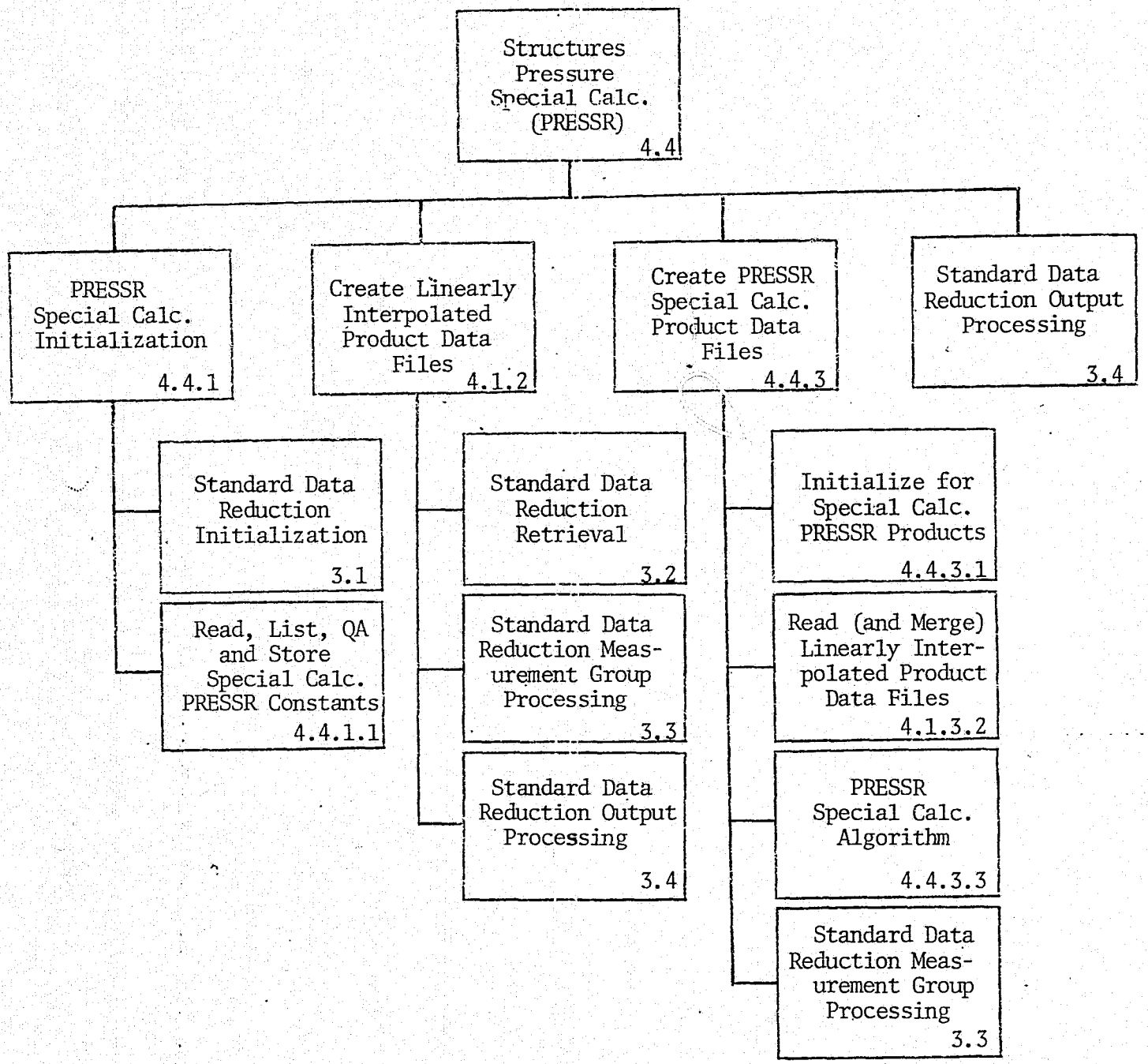

Output Processing
3.4
Create Tab Product
3.4.1
Create Time History Plot Product
3.4.2
Create Cross Plot Product
3.4.3
Create Continuous Plot Product
3.4.4
Create Linearly Interpolated File
3.4.5
Create Linearly Interpolated CCT Product
3.4.6
Create Full Rate CCT Product
3.4.7
Create Data Availability Report
3.4.8

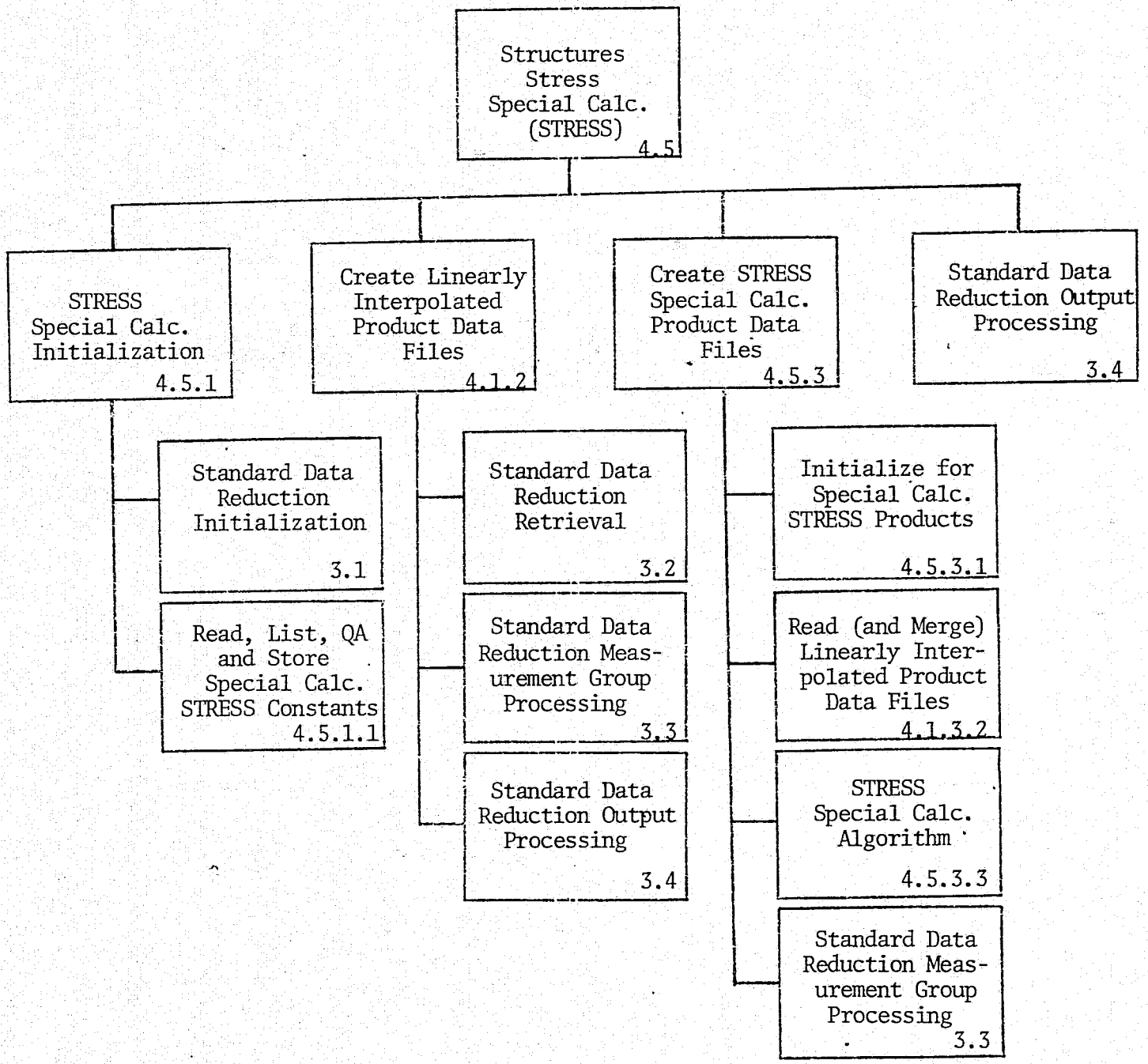

Special Calculations 4.0
Power and Propulsion Fuel Quantity Special Calc. (APFUEL) 4.1
Power and Propulsion APU Performance Special Calc. (APPERF) 4.2
Avionics Communications and Tracking Special Calc. (COMTRK) 4.3
Structures Pressure Special Calc. (PRESSR) 4.4
Structures Stress Special Calc. (STRESS) 4.5
Structures Landing Gear Special Calc. (LDGEAR) 4.6
Environmental Control Life Support Subsystem Special Calc. (ENVIRO) 4.7

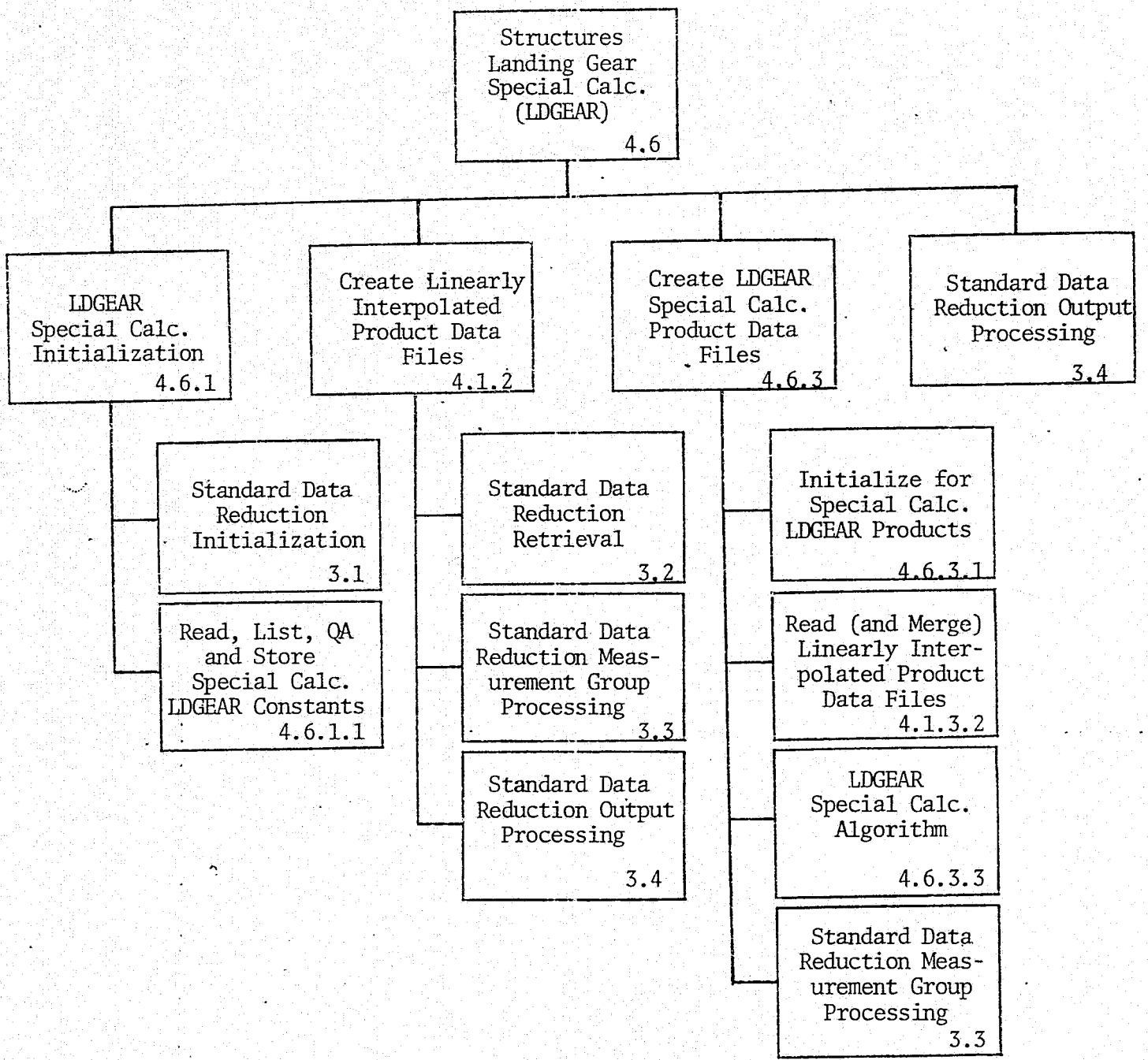

Power and Propulsion Fuel Quantity Special Calc. (APFUEL) 4.1
APFUEL Special Calc. Initialization 4.1.1
Create Linearly Interpolated Product Data Files 4.1.2
Create APFUEL Special Calc. Product Data Files 4.1.3
Standard Data Reduction Output Processing 3.4
Standard Data Reduction Initialization 3.1
Read, List, QA and Store Special Calc. APFUEL Constants 4.1.1.1
Standard Data Reduction Retrieval 3.2
Standard Data Reduction Measurement Group Processing 3.3
Standard Data Reduction Output Processing 3.4
Initialize for Special Calc. APFUEL Products 4.1.3.1
Read (and Merge) Linearly Interpolated Product Data Files 4.1.3.2
APFUEL Special Calc. Algorithm 4.1.3.3
Standard Data Reduction Measurement Group Processing 3.3

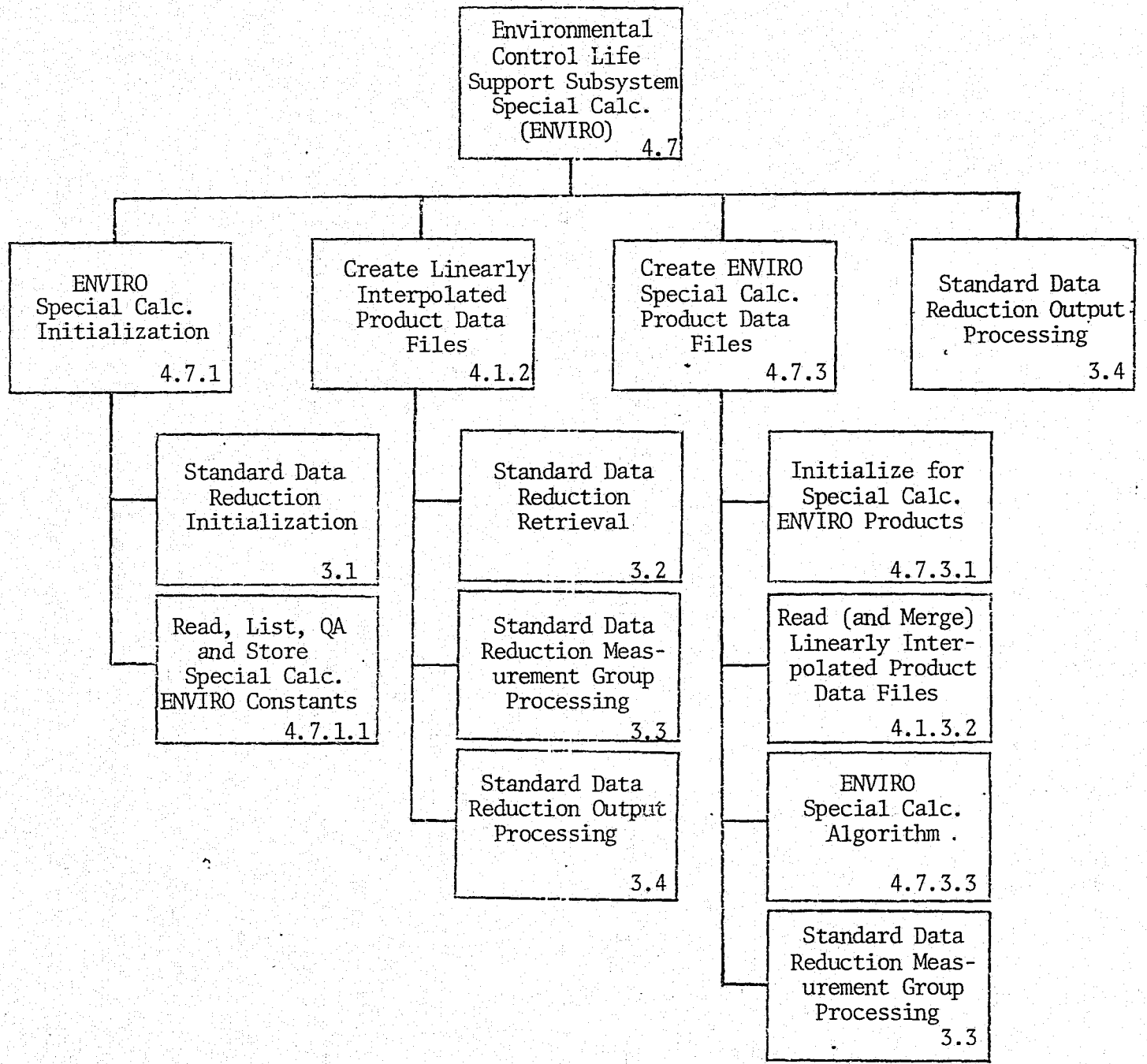

Power and Propulsion APU Performance Special Calc. (APPERF) 4.2
APPERF Special Calc. Initialization 4.2.1
Create Linearly Interpolated Product Data Files 4.1.2
Create APPERF Special Calc. Product Data Files 4.2.3
Standard Data Reduction Output Processing 3.4
Standard Data Reduction Initialization 3.1
Read, List, QA and Store Special Calc. APPERF Constants 4.2.1.1
Standard Data Reduction Retrieval 3.2
Standard Data Reduction Measurement Group Processing 3.3
Standard Data Reduction Output Processing 3.4
Initialize for Special Calc. APPERF Products 4.2.3.1
Read (and Merge) Linearly Interpolated Product Data Files 4.1.3.2
APPERF Special Calc. Algorithm 4.2.3.3
Standard Data Reduction Measurement Group Processing 3.3


Avionics Communications and Tracking Special Calc. (COMTRK) 4.3
COMTRK Special Calc. Initialization 4.3.1
Create Linearly Interpolated Product Data Files 4.1.2
Create COMTRK Special Calc. Product Data File 4.3.3
Standard Data Reduction Output Processing 3.4
Standard Data Reduction Initialization 3.1
Read, List, QA and Store Special Calc. COMTRK Constants 4.3.1.1
Standard Data Reduction Retrieval 3.2
Standard Data Reduction Measurement Group Processing 3.3
Standard Data Reduction Output Processing 3.4
Initialize for Special Calc. COMTRK Products 4.3.3.1
Read (and Merge) Linearly Interpolated Product Data Files 4.1.3.2
COMTRK Special Calc. Algorithm 4.3.3.3
Standard Data Reduction Measurement Group Processing 3.3


Structures Pressure Special Calc. (PRESSR) 4.4
PRESSR Special Calc. Initialization 4.4.1
Create Linearly Interpolated Product Data Files 4.1.2
Create PRESSR Special Calc. Product Data Files 4.4.3
Standard Data Reduction Output Processing 3.4
Standard Data Reduction Initialization 3.1
Read, List, QA and Store Special Calc. PRESSR Constants 4.4.1.1
Standard Data Reduction Retrieval 3.2
Standard Data Reduction Measurement Group Processing 3.3
Standard Data Reduction Output Processing 3.4
Initialize for Special Calc. PRESSR Products 4.4.3.1
Read (and Merge) Linearly Interpolated Product Data Files 4.1.3.2
PRESSR Special Calc. Algorithm 4.4.3.3
Standard Data Reduction Measurement Group Processing 3.3


Structures Stress Special Calc. (STRESS) 4.5
STRESS Special Calc. Initialization 4.5.1
Create Linearly Interpolated Product Data Files 4.1.2
Create STRESS Special Calc. Product Data Files 4.5.3
Standard Data Reduction Output Processing 3.4
Standard Data Reduction Initialization 3.1
Read, List, QA and Store Special Calc. STRESS Constants 4.5.1.1
Standard Data Reduction Retrieval 3.2
Standard Data Reduction Measurement Group Processing 3.3
Standard Data Reduction Output Processing 3.4
Initialize for Special Calc. STRESS Products 4.5.3.1
Read (and Merge) Linearly Interpolated Product Data Files 4.1.3.2
STRESS Special Calc. Algorithm 4.5.3.3
Standard Data Reduction Measurement Group Processing 3.3


Structures Landing Gear Special Calc. (LDGEAR) 4.6
LDGEAR Special Calc. Initialization 4.6.1
Create Linearly Interpolated Product Data Files 4.1.2
Create LDGEAR Special Calc. Product Data Files 4.6.3
Standard Data Reduction Output Processing 3.4
Standard Data Reduction Initialization 3.1
Read, List, QA and Store Special Calc. LDGEAR Constants 4.6.1.1
Standard Data Reduction Retrieval 3.2
Standard Data Reduction Measurement Group Processing 3.3
Standard Data Reduction Output Processing 3.4
Initialize for Special Calc. LDGEAR Products 4.6.3.1
Read (and Merge) Linearly Interpolated Product Data Files 4.1.3.2
LDGEAR Special Calc. Algorithm 4.6.3.3
Standard Data Reduction Measurement Group Processing 3.3


Environmental Control Life Support Subsystem Special Calc. (ENVIRO) 4.7
ENVIRO Special Calc. Initialization 4.7.1
Create Linearly Interpolated Product Data Files 4.1.2
Create ENVIRO Special Calc. Product Data Files 4.7.3
Standard Data Reduction Output Processing 3.4
Standard Data Reduction Initialization 3.1
Read, List, QA and Store Special Calc. ENVIRO Constants 4.7.1.1
Standard Data Reduction Retrieval 3.2
Standard Data Reduction Measurement Group Processing 3.3
Standard Data Reduction Output Processing 3.4
Initialize for Special Calc. ENVIRO Products 4.7.3.1
Read (and Merge) Linearly Interpolated Product Data Files 4.1.3.2
ENVIRO Special Calc. Algorithm 4.7.3.3
Standard Data Reduction Measurement Group Processing 3.3

3.4 OVERVIEW AND DETAIL HIPO DESIGN DIAGRAMS

Author: _____ Date: _____

Diagram ID: 1.0 Name: _____ Description: ALT SIES SYSTEM OVERVIEW

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

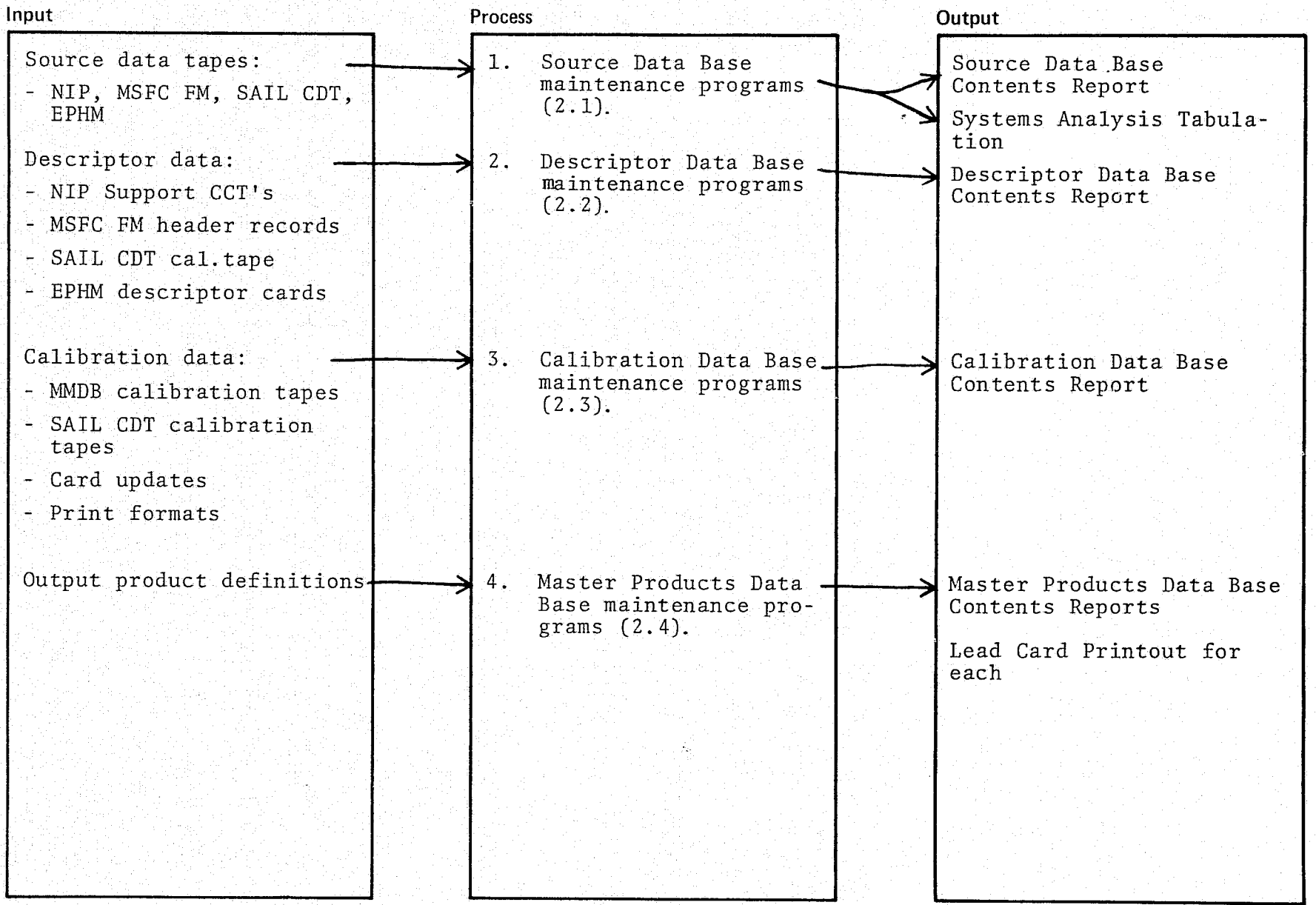
Lead Card Printout

Utility Reports

Data Availability Reports

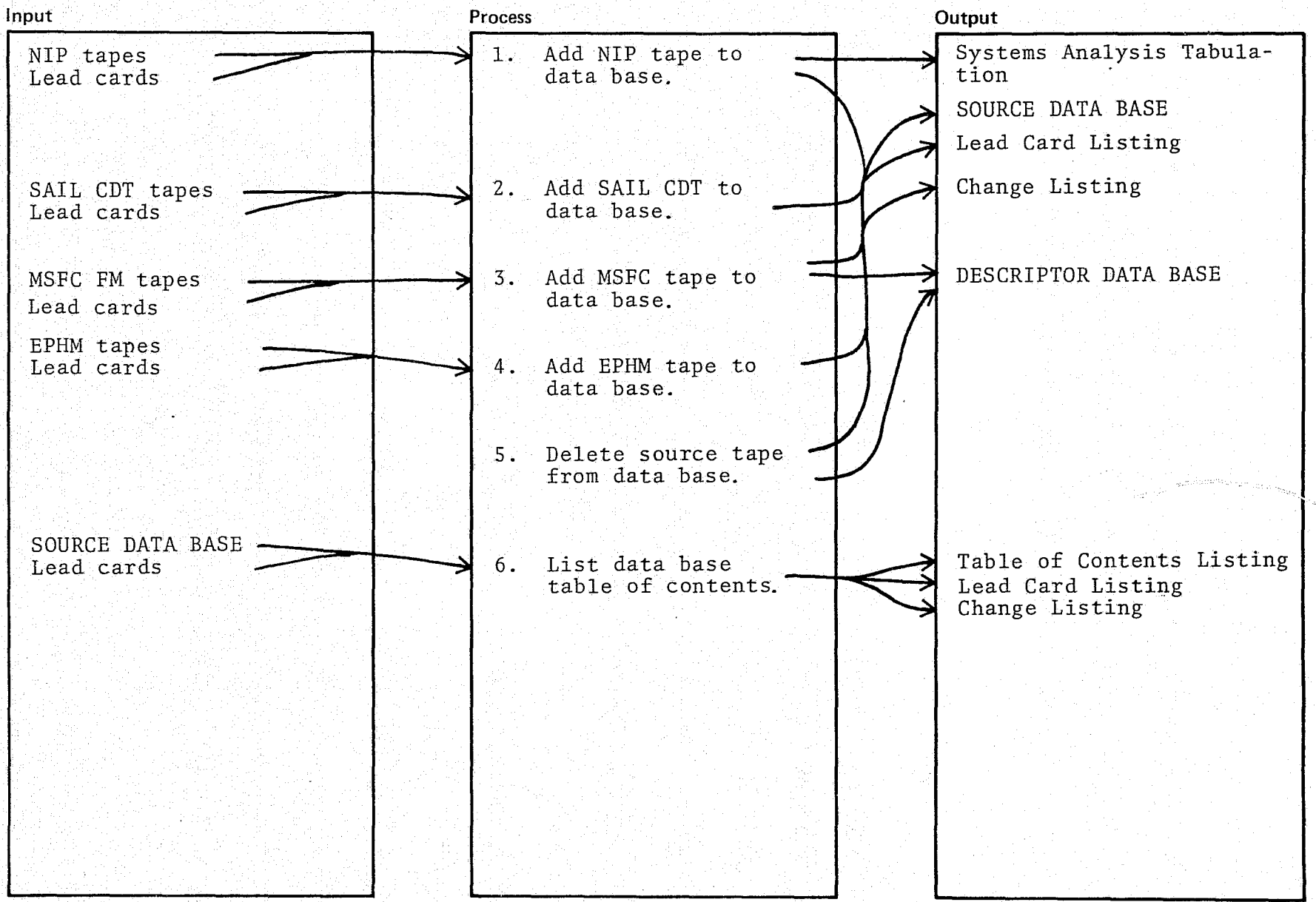
Author: _____ Date: _____

Diagram ID: 2.0 Name: _____ Description: DATA BASE MAINTENANCE OVERVIEW



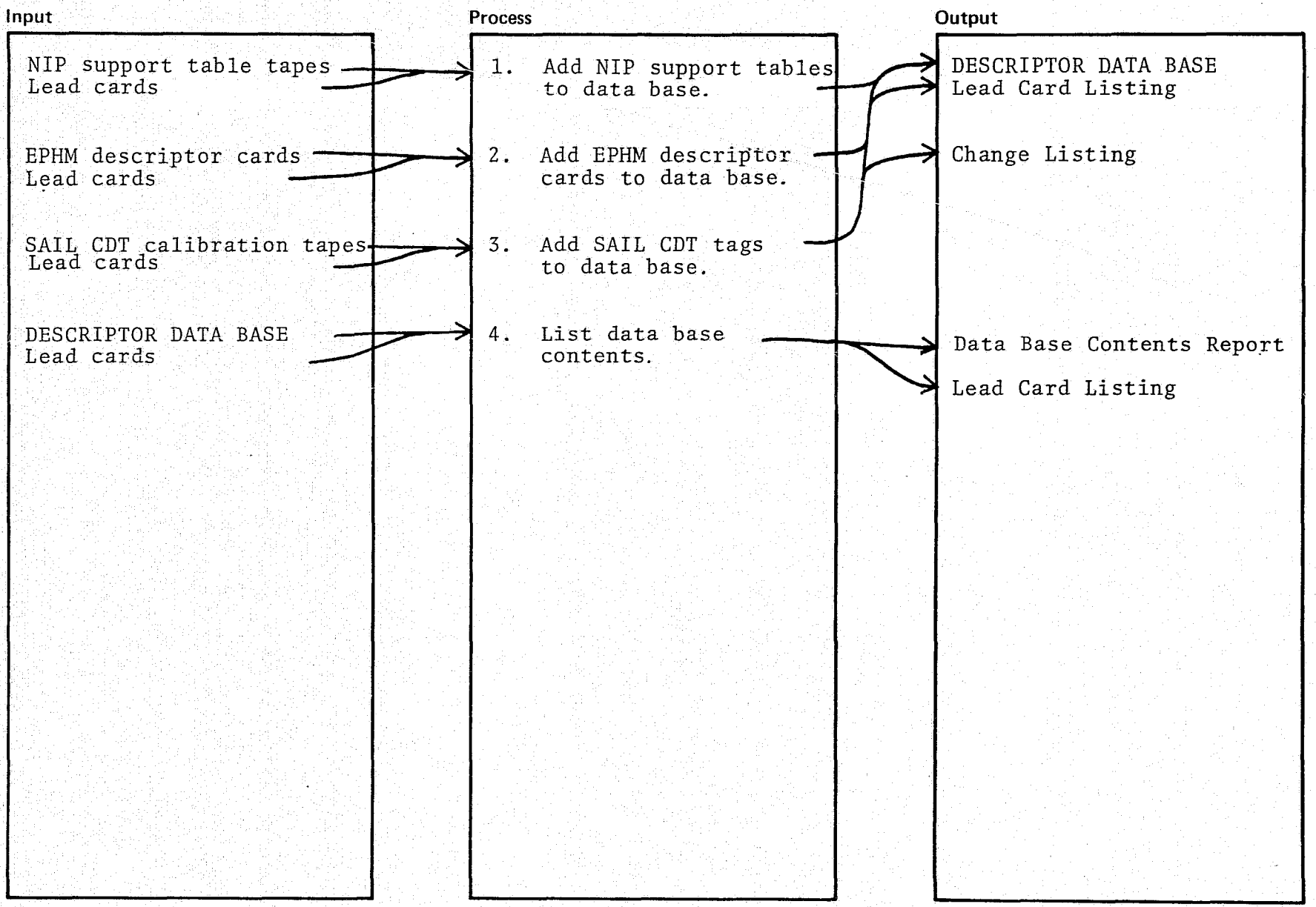
Author: _____ Date: _____

Diagram ID: 2.1 Name: _____ Description: SOURCE DATA BASE MAINTENANCE



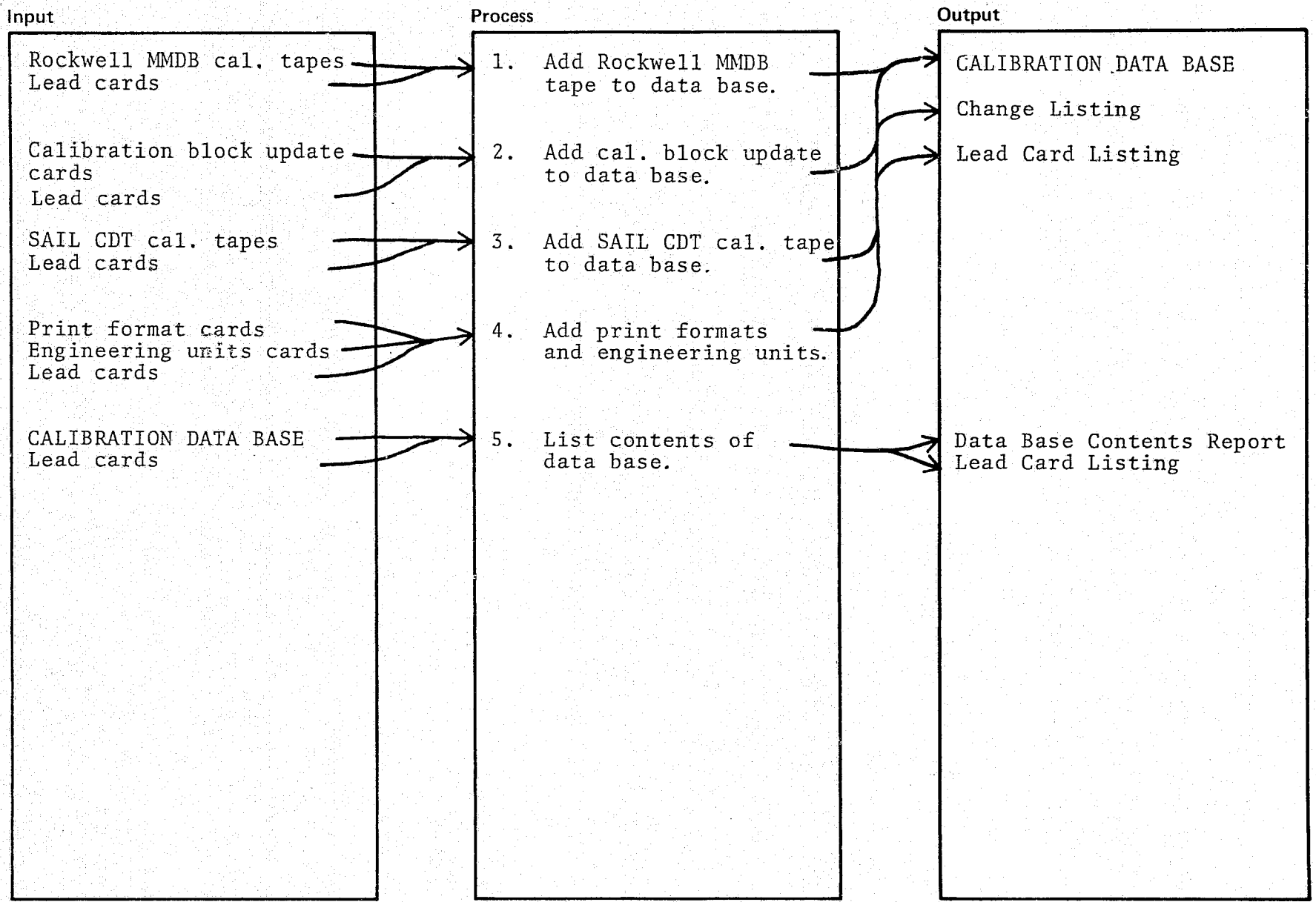
Author: _____ Date: _____

Diagram ID: 2.2 Name: _____ Description: DESCRIPTOR DATA BASE MAINTENANCE



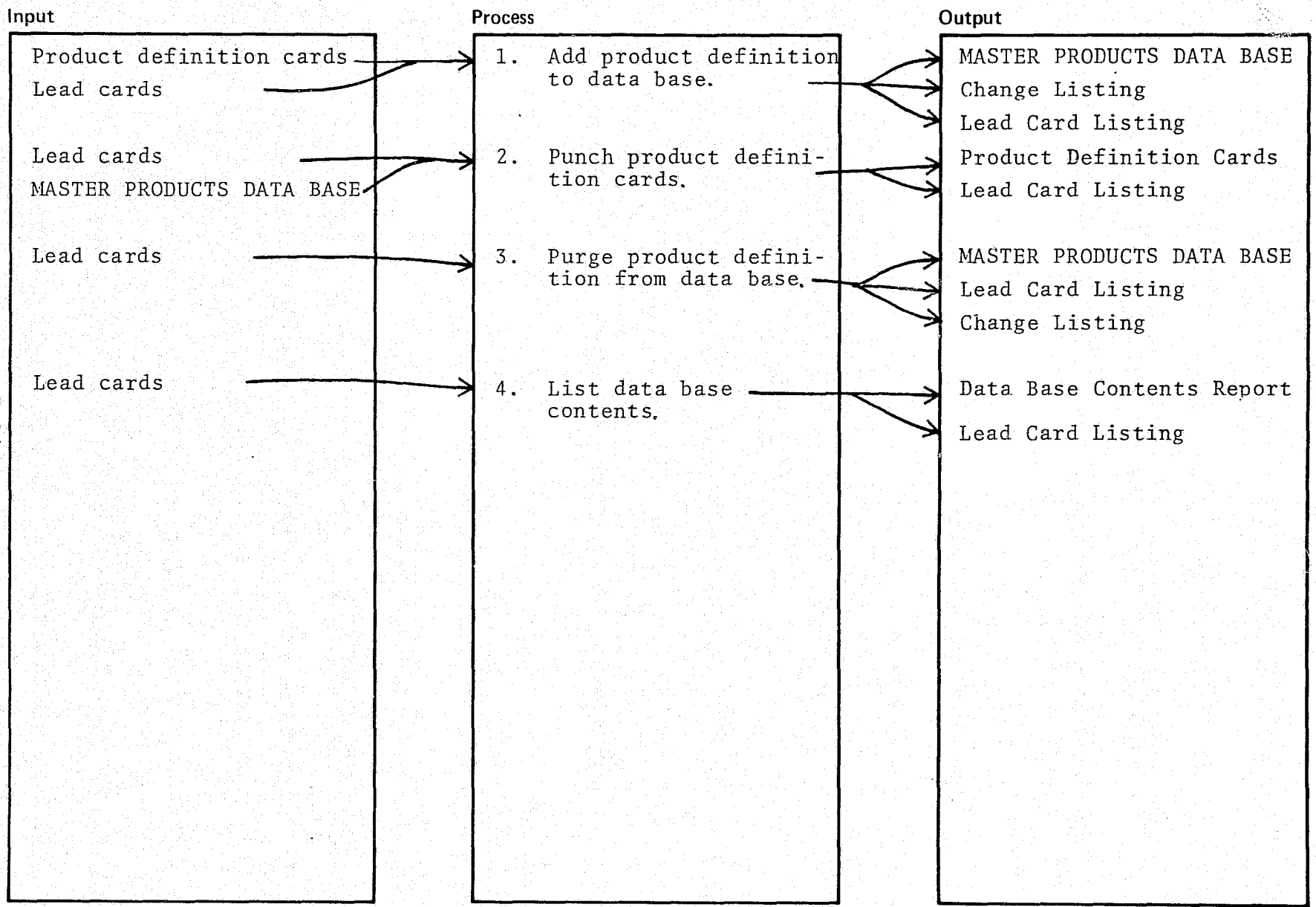
Author: _____ Date: _____

Diagram ID: 2.3 Name: _____ Description: CALIBRATION DATA BASE MAINTENANCE



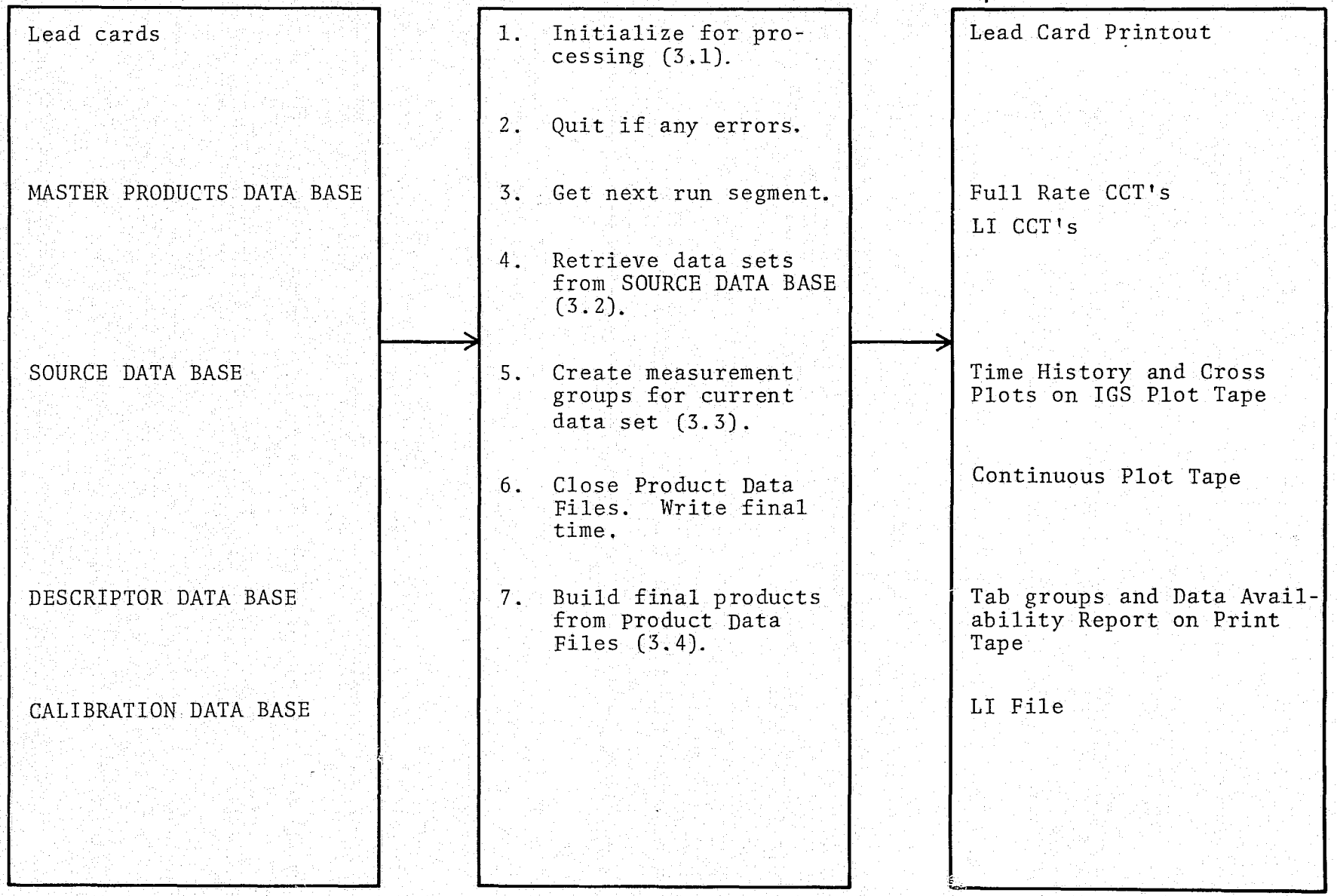
Author: _____ Date: _____

Diagram ID: 2.4 Name: _____ Description: MASTER PRODUCTS DATA BASE MAINTENANCE



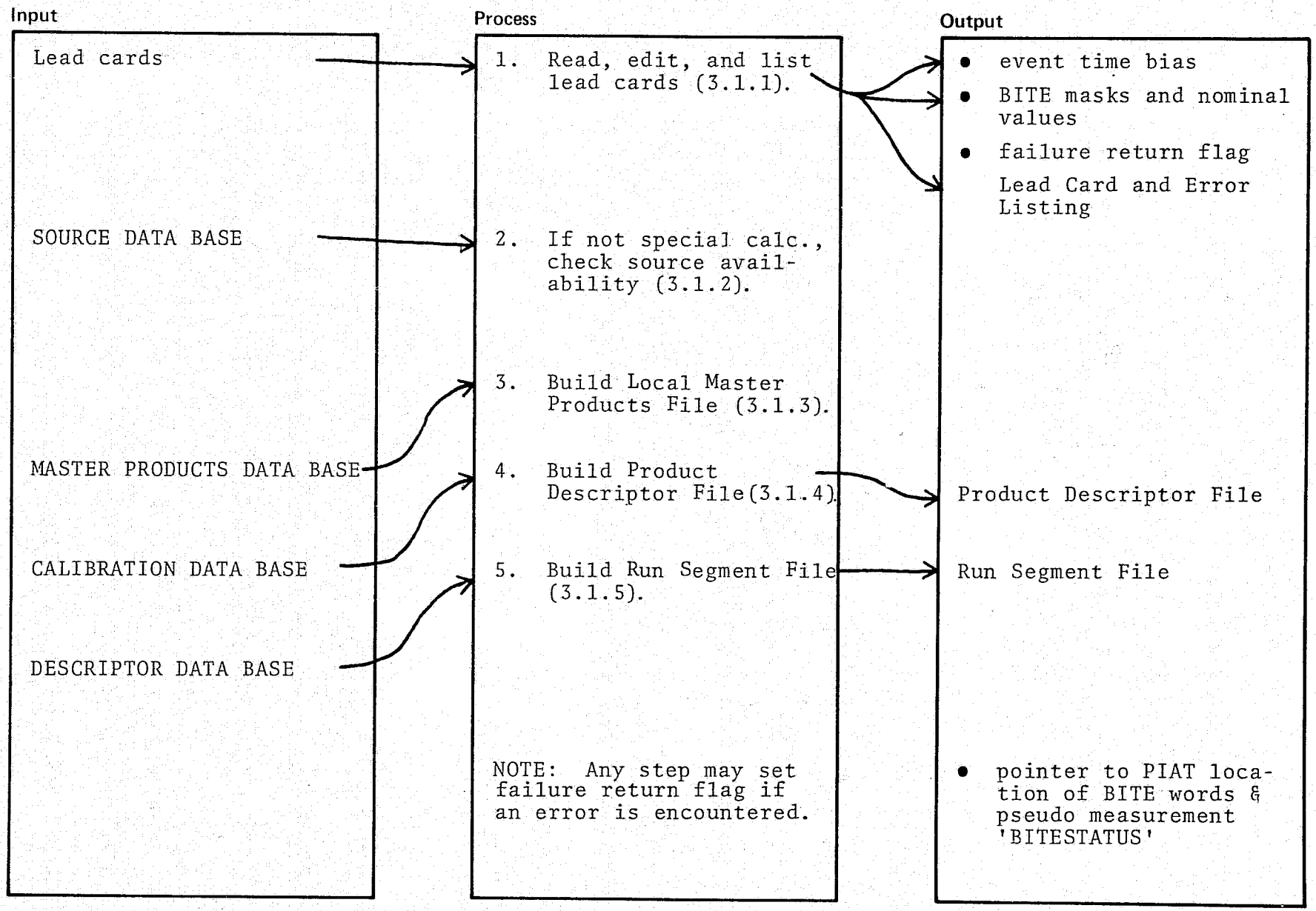
Author: _____ Date: _____

Diagram ID: 3.0 Name: _____ Description: STANDARD DATA REDUCTION OVERVIEW



Author: _____ Date: _____

Diagram ID: 3.1 Name: _____ Description: INITIALIZATION



Author: _____ Date: _____

Diagram ID: 3.1.1 Name: _____ Description: EDIT LEAD CARDS

Input

Lead cards

Process

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.

Output

- 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

Author: _____ Date: _____

Diagram ID: 3.1.2 Name: _____ Description: CHECK SOURCE AVAILABILITY

Input

- Source Identification
  - tape numbers
  - file number if MSFC FM
  - run number if EPHM
- Start/stop time

Source Data Base Index

Process

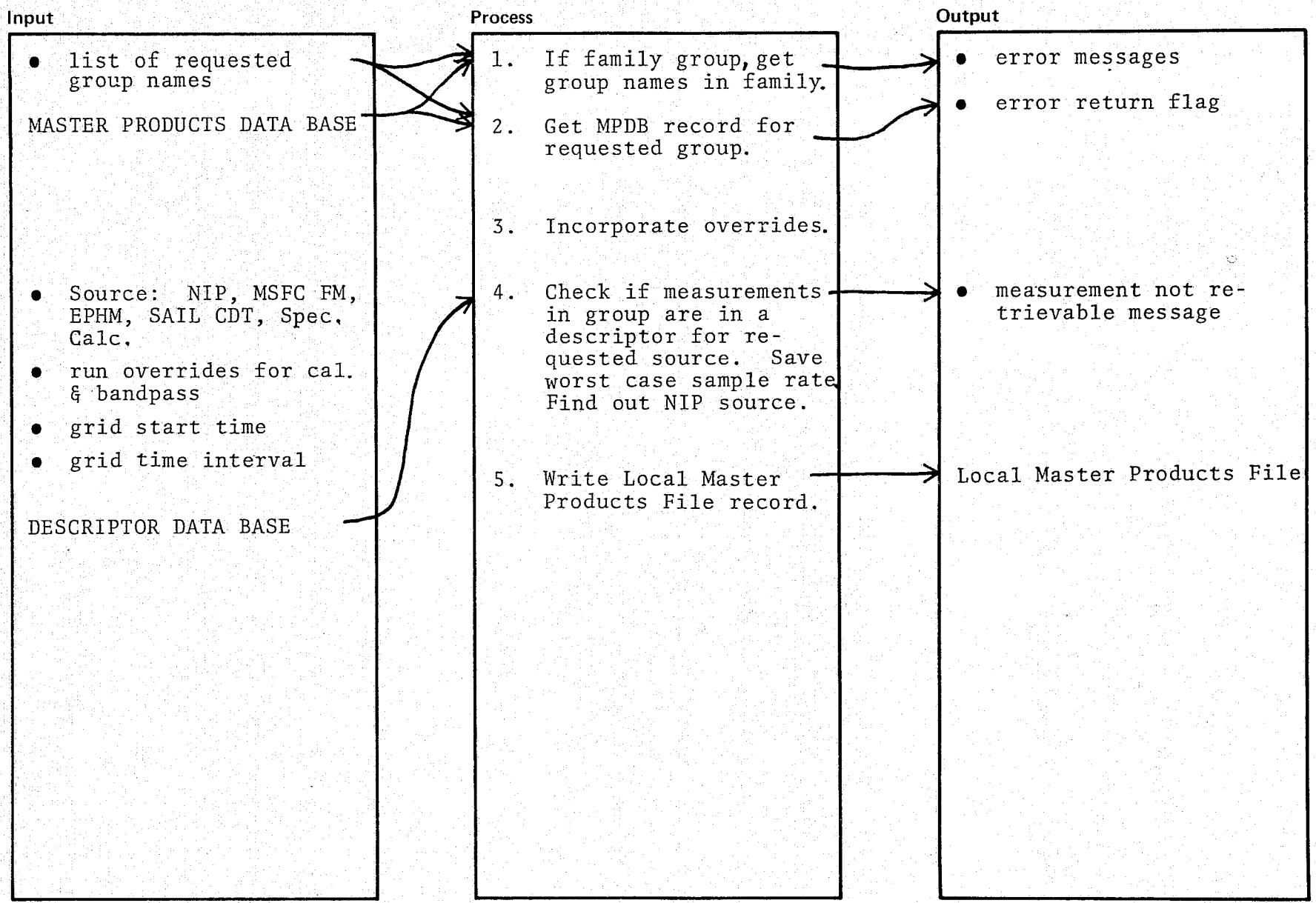
1. Check if tapes are loaded on data base.
2. Check if file loaded for MSFC FM.
3. Check if run loaded for EPHM.
4. Check if data base contains any data within start/stop time interval.

Output

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

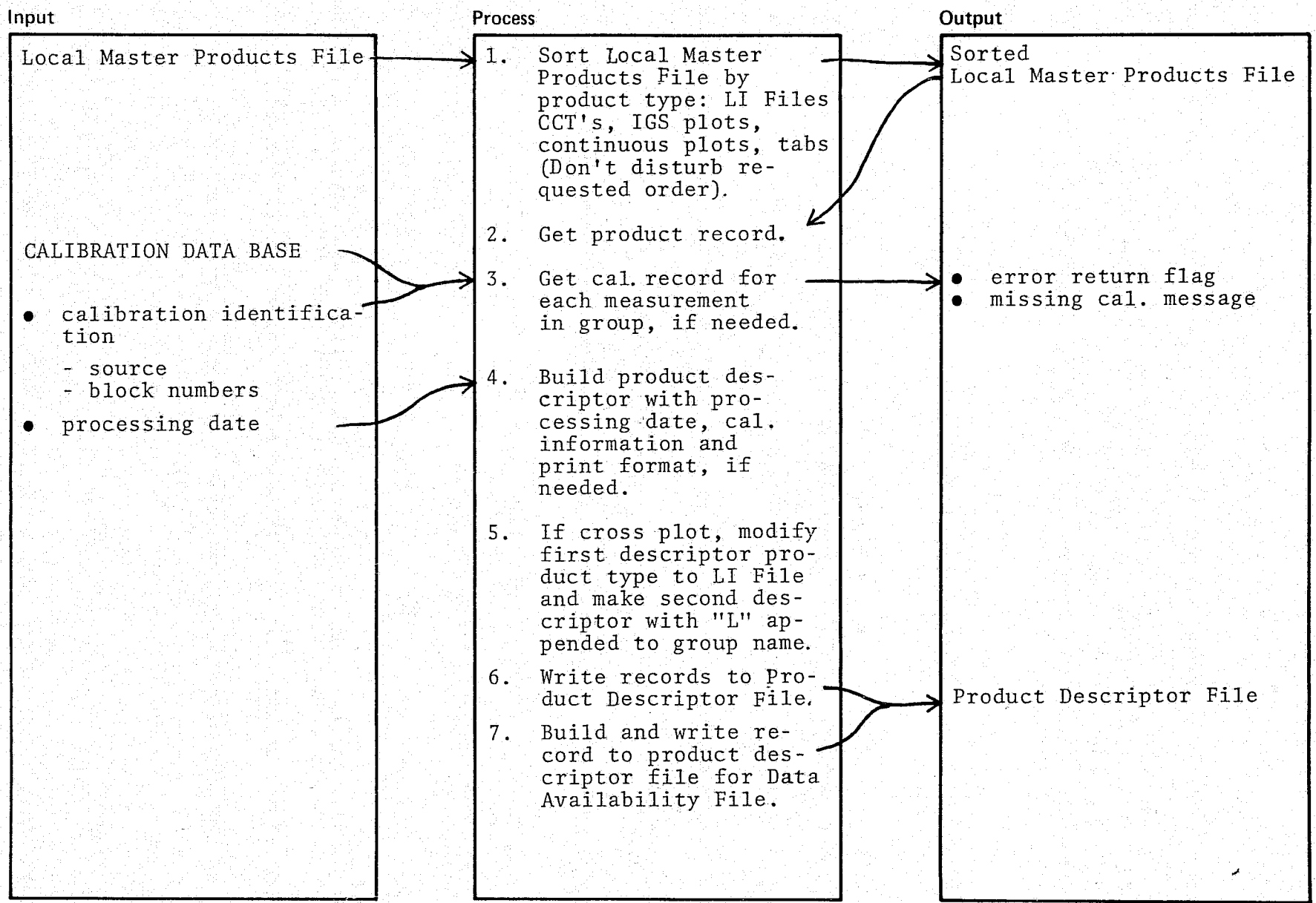
Author: _____ Date: _____

Diagram ID: 3.1.3 Name: _____ Description: BUILD LOCAL MASTER PRODUCTS FILE



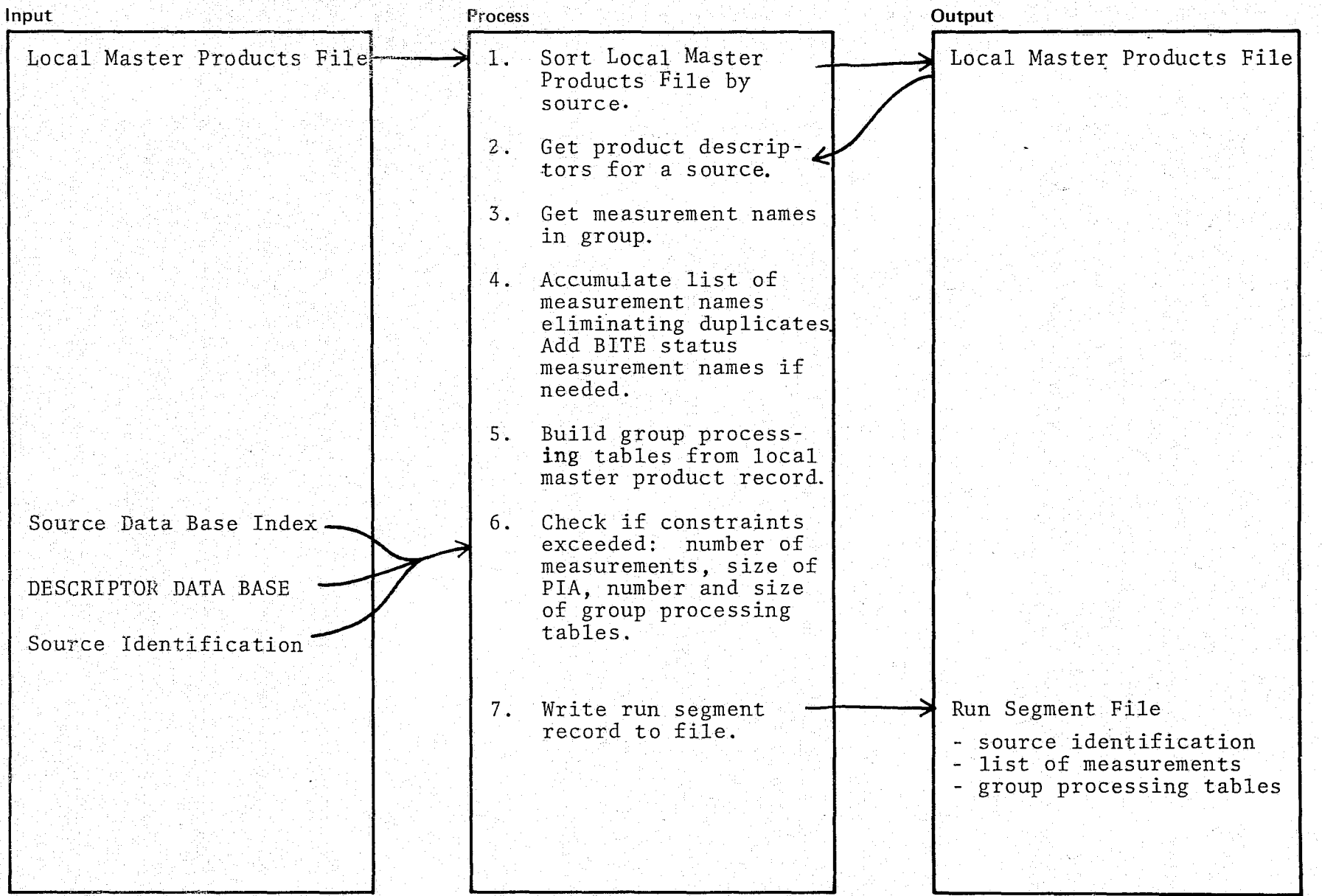
Author: _____ Date: _____

Diagram ID: 3.1.4 Name: _____ Description: BUILD PRODUCT DESCRIPTOR FILE



Author: _____ Date: _____

Diagram ID: 3.1.5 Name: _____ Description: BUILD RUN SEGMENT FILE



Author: _____ Date: _____

Diagram ID: 3.2 Name: _____ Description: RETRIEVAL

Input

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

DESCRIPTOR 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'

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

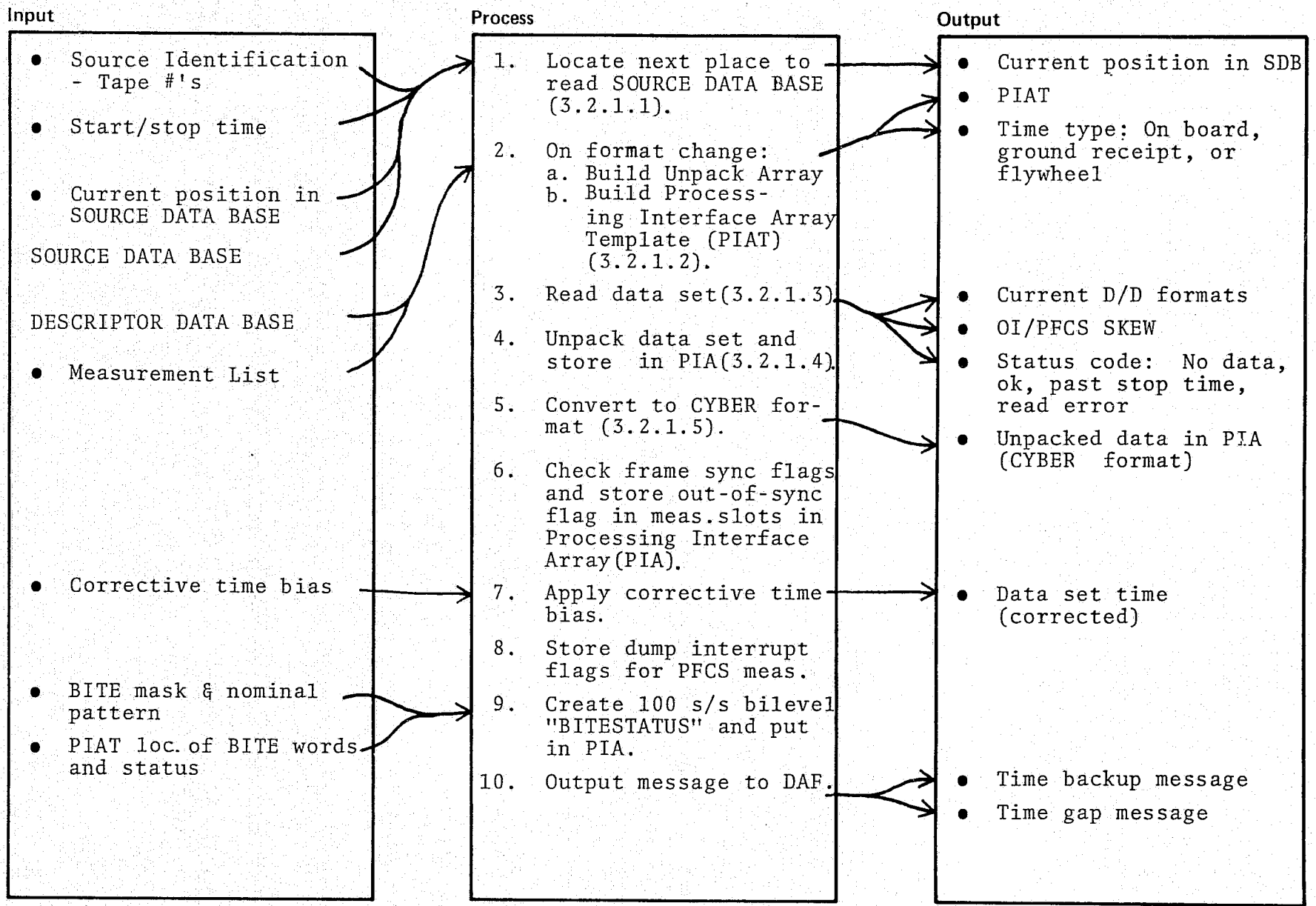
- Processing Interface Array Template (PIAT)
- Current Position in SDB
- Time Type: Onboard, Ground Receipt, Flywheel
- Current D/D Formats
- PFCS/BFCS SKEW
- PFCS/BFCS A/B Indicator
- Status Code:
  - No data
  - Normal
  - Read error
  - Past stop time
- Unpacked Data In Processing Interface Array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

Data Availability File

- Error messages

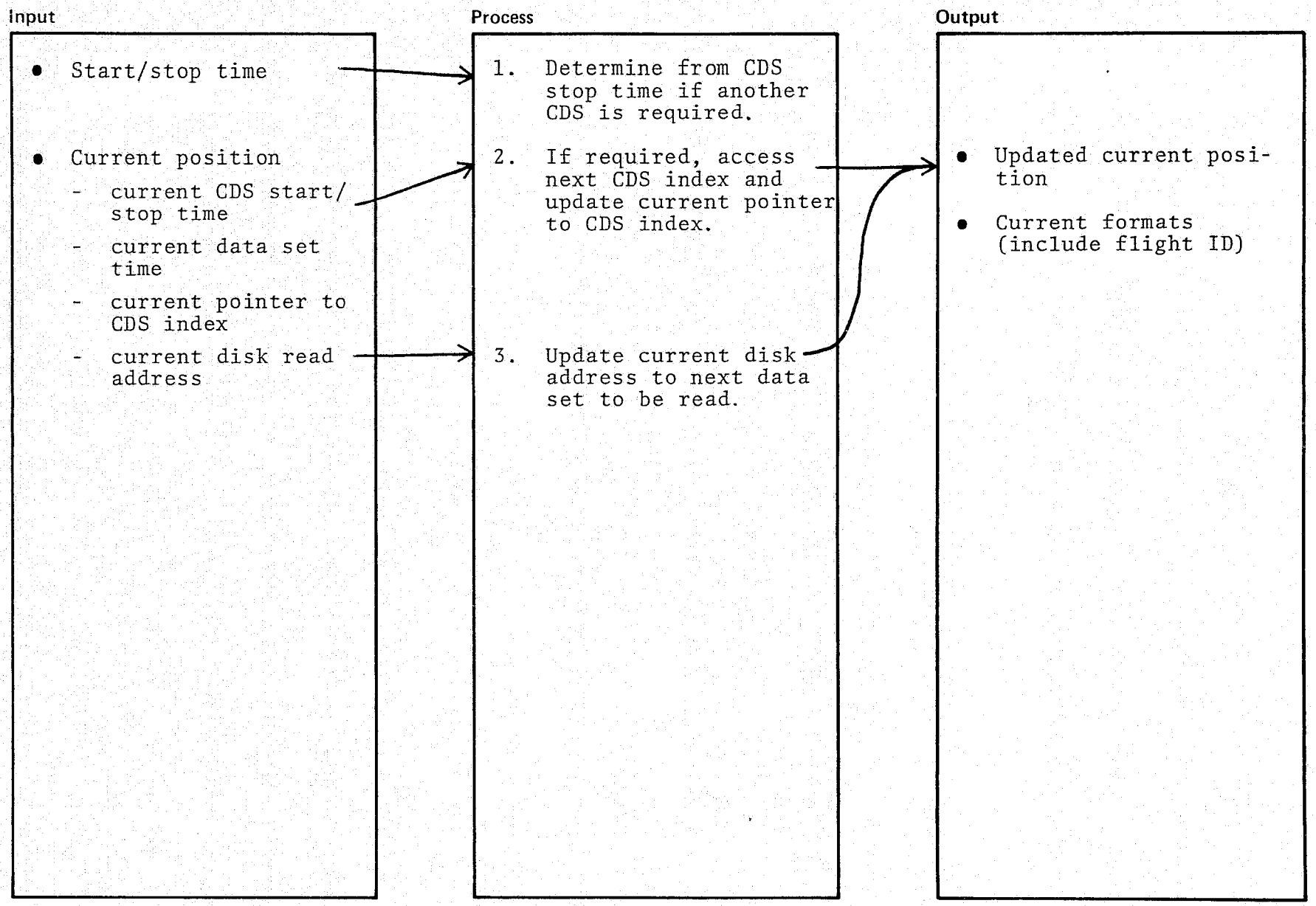
Author: _____ Date: _____

Diagram ID: 3.2.1 Name: _____ Description: RETRIEVE OI/PFCS DATA



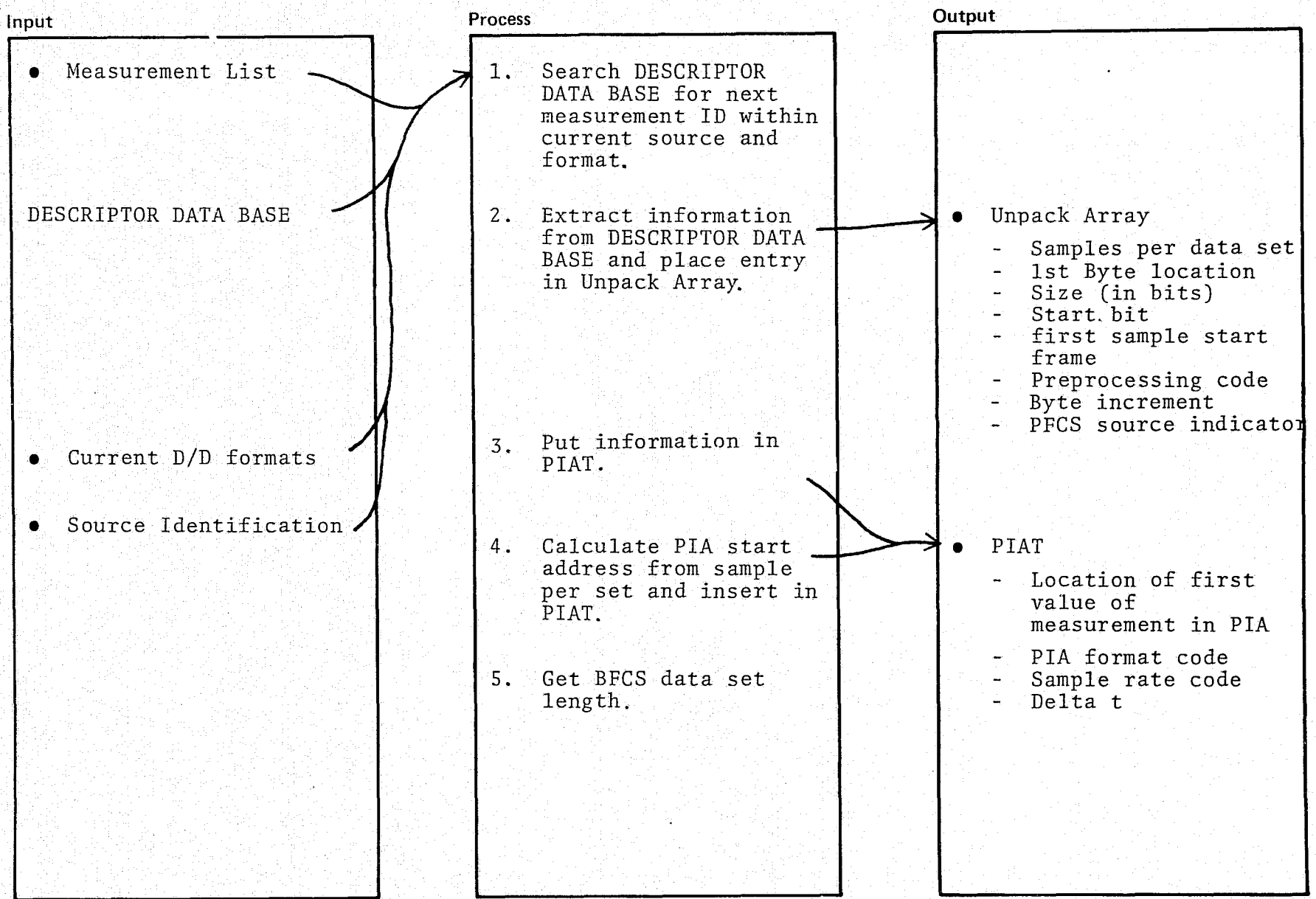
Author: _____ Date: _____

Diagram ID: 3.2.1.1 Name: ALT SIES Description: LOCATE NIP DATA



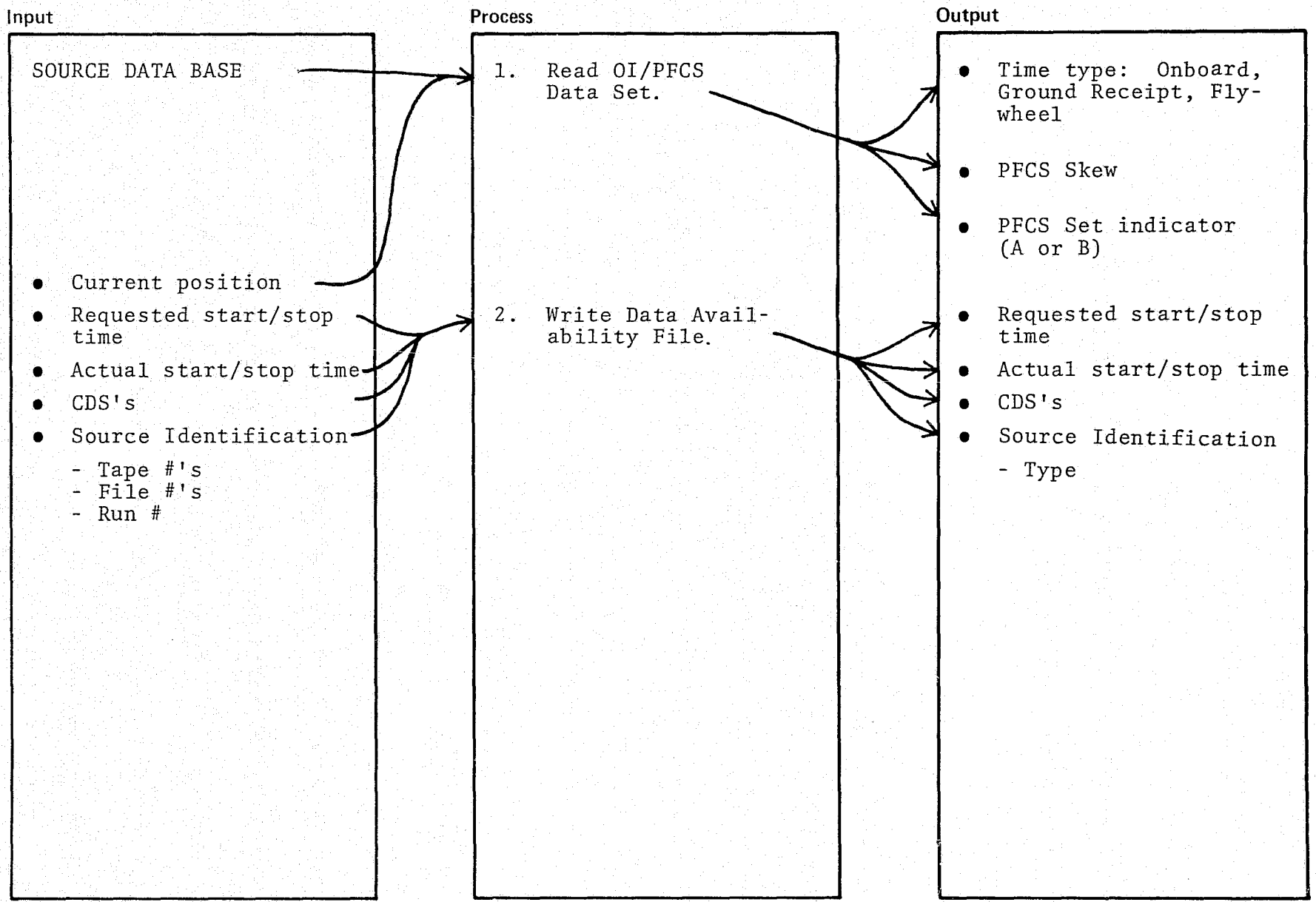
Author: _____ Date: _____

Diagram ID: 3.2.1.2 Name: _____ Description: BUILD UNPACK ARRAY AND PIAT



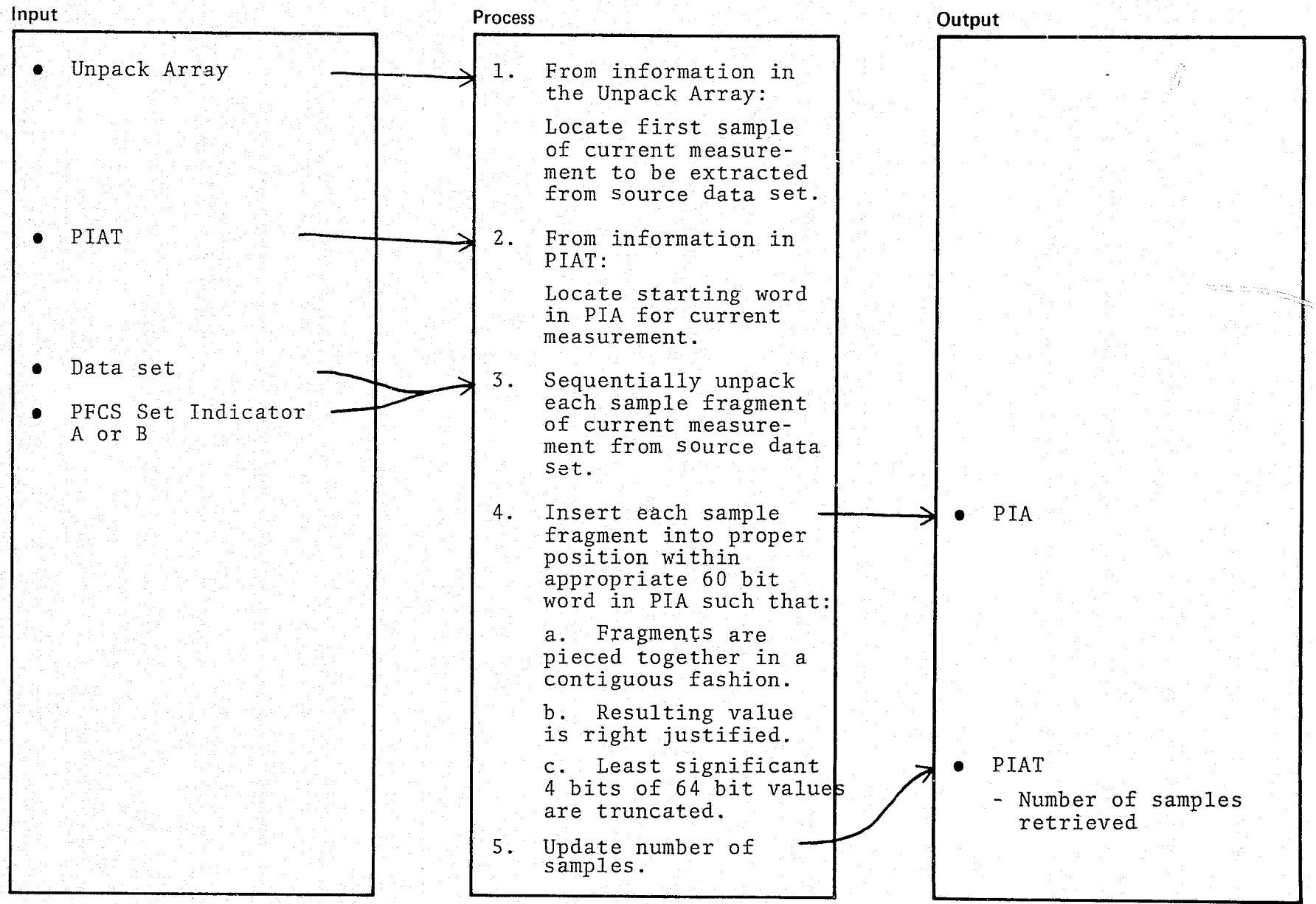
Author: _____ Date: _____

Diagram ID: 3.2.1.3 Name: _____ Description: READ OI/PFCS DATA



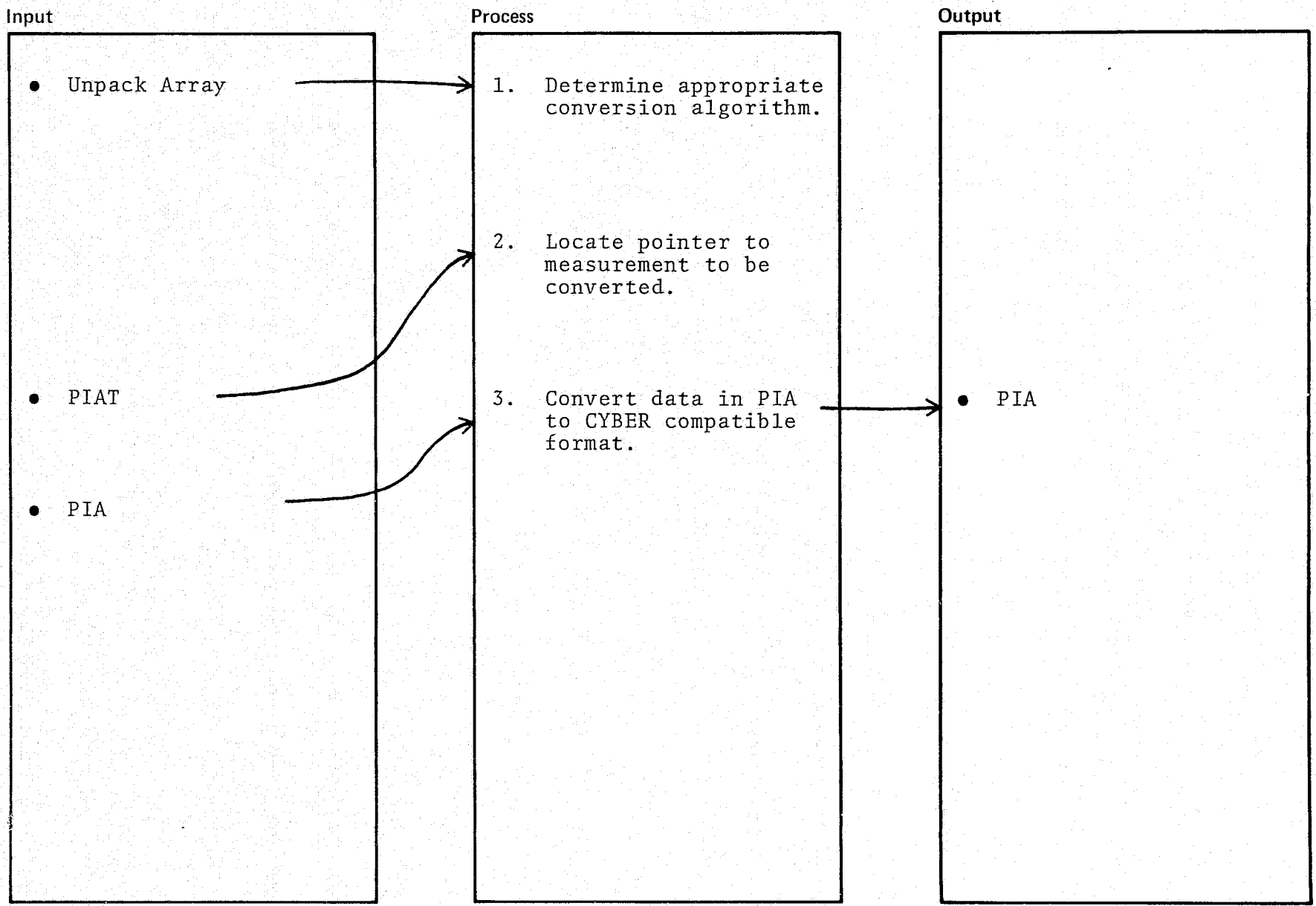
Author: _____ Date: _____

Diagram ID: 3.2.1.4 Name: _____ Description: UNPACK NIP DATA



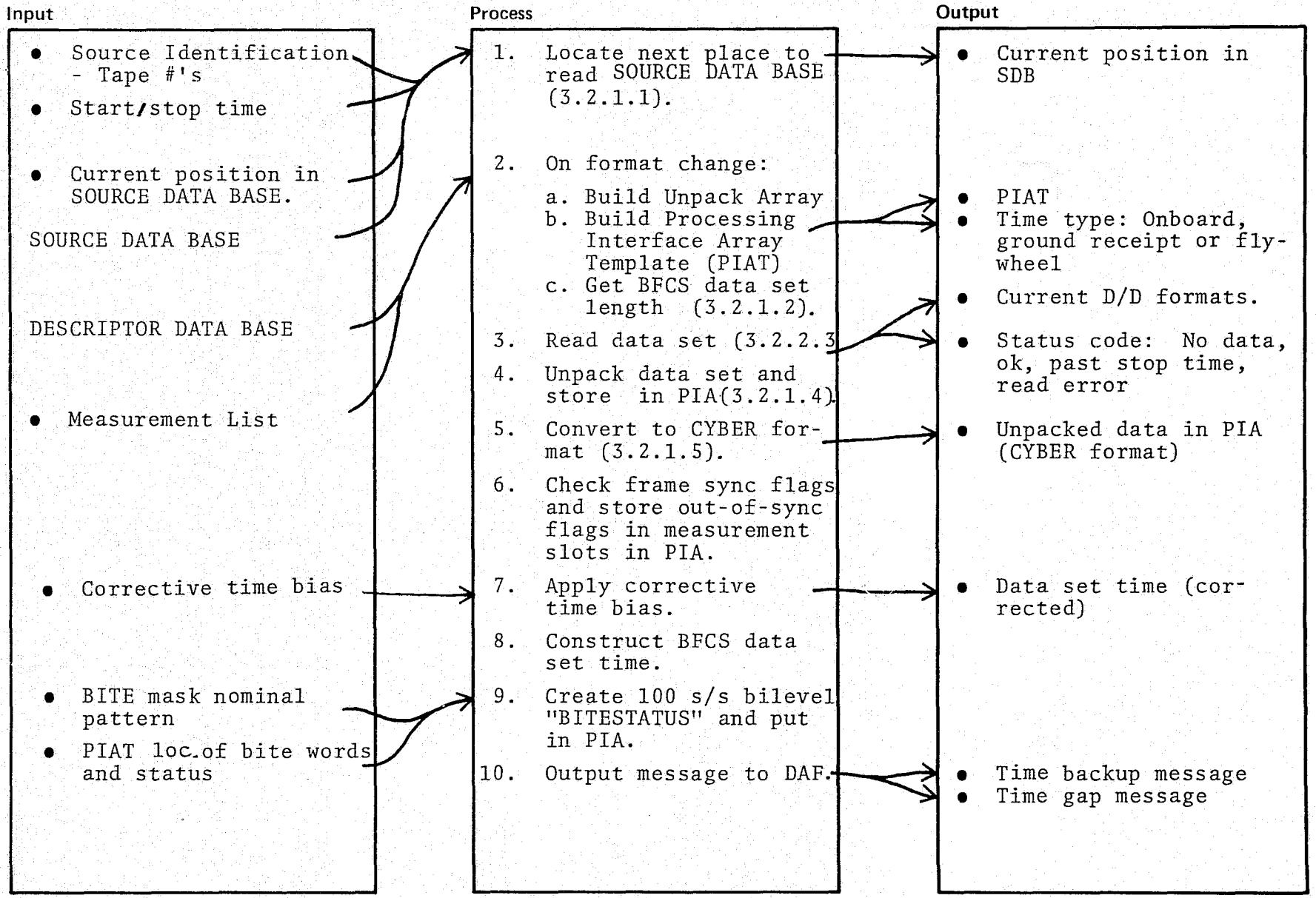
Author: _____ Date: _____

Diagram ID: 3.2.1.5 Name: _____ Description: CONVERT DATA



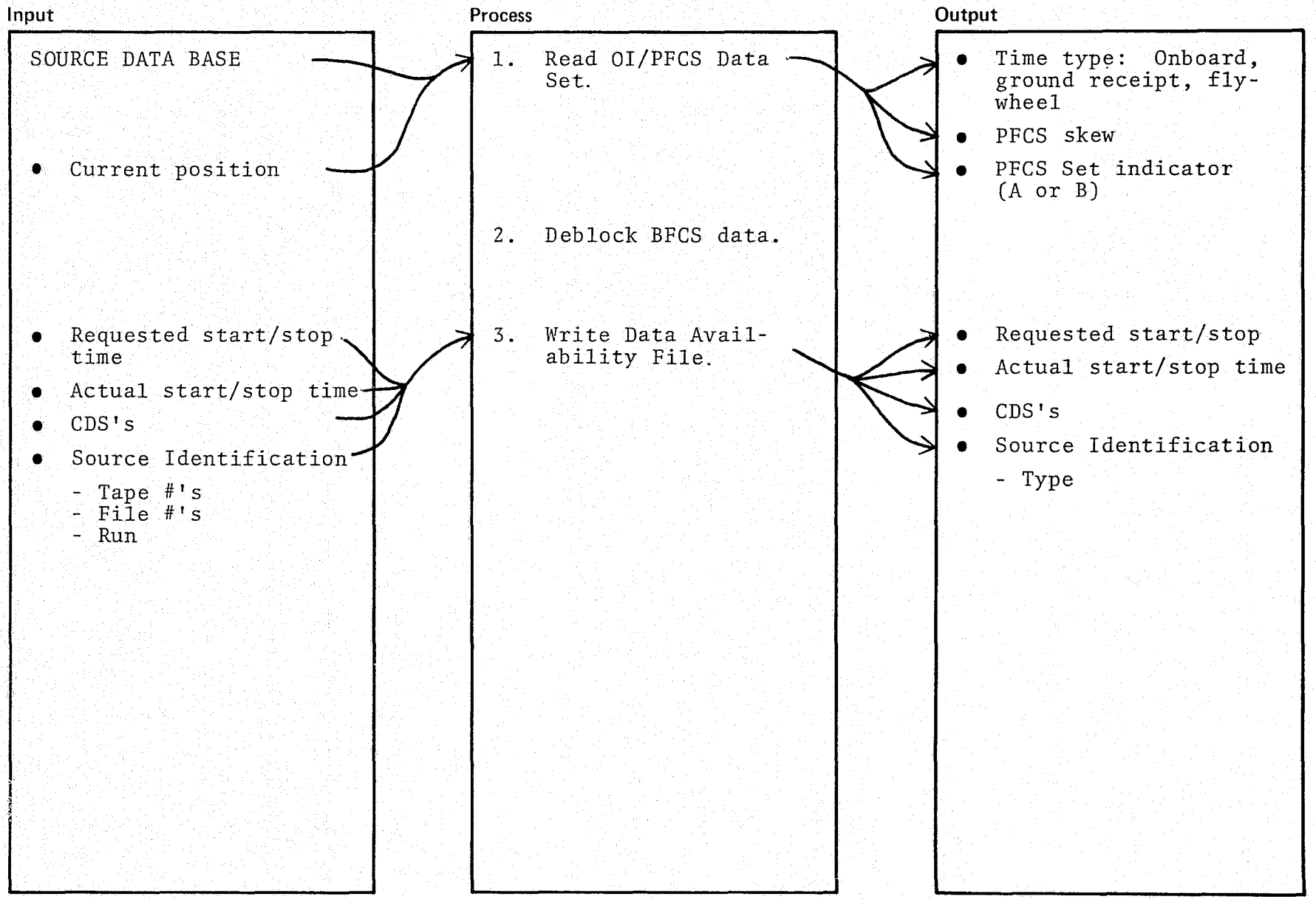
Author: _____ Date: _____

Diagram ID: 3.2.2 Name: _____ Description: RETRIEVE BFCS DATA



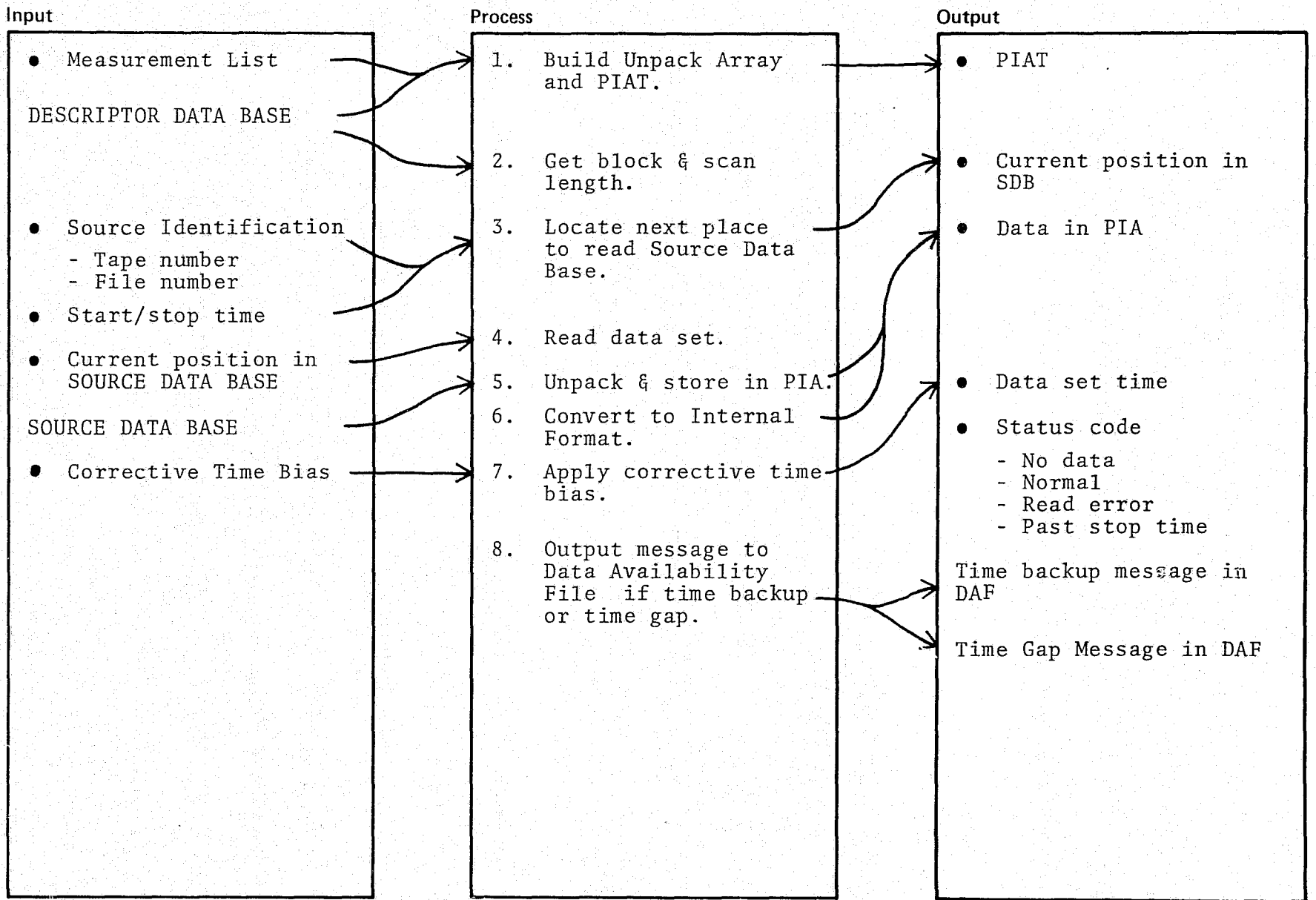
Author: _____ Date: _____

Diagram ID: 3.2.2.3 Name: _____ Description: READ BFCS DATA



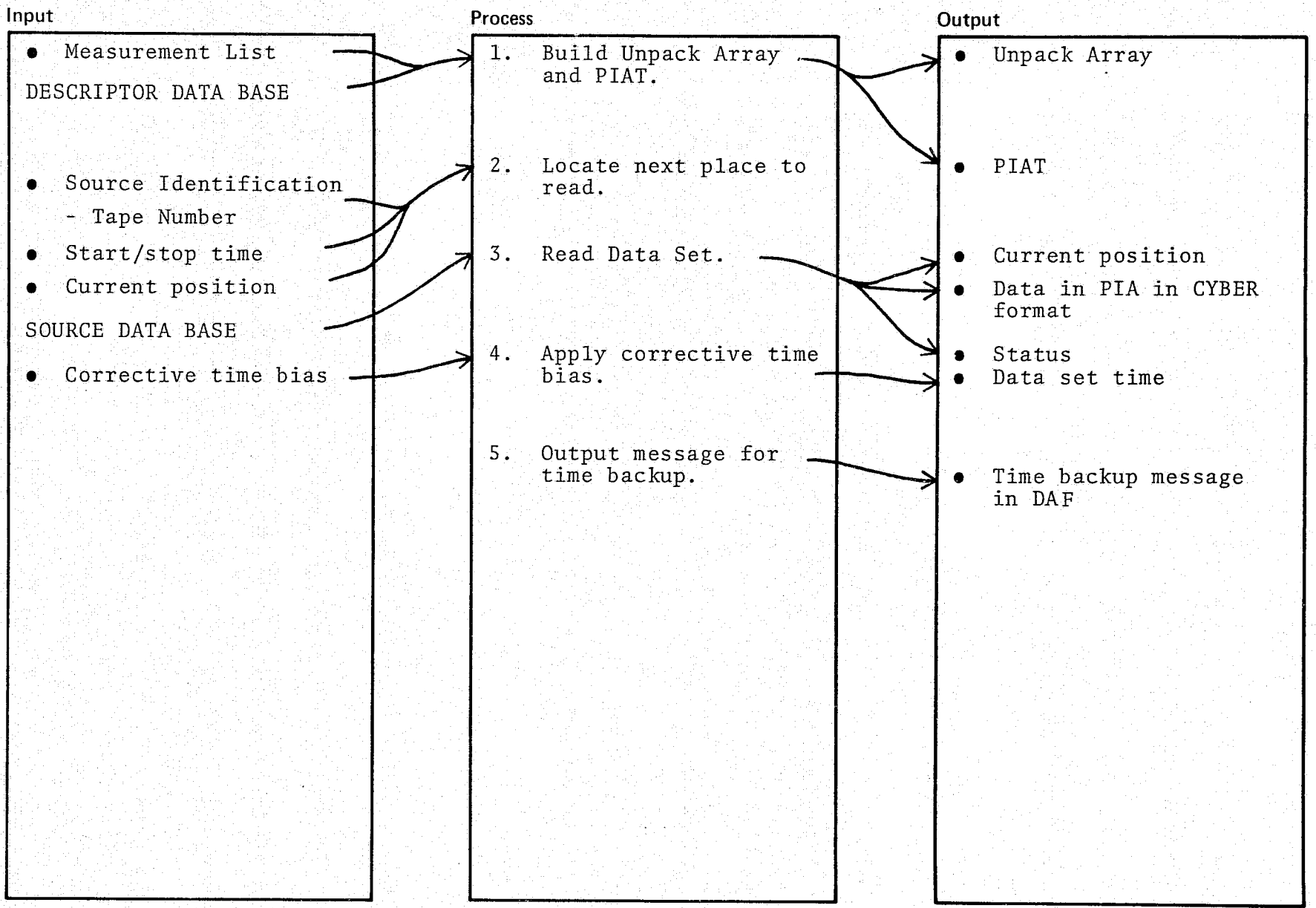
Author: _____ Date: _____

Diagram ID: 3.2.3 Name: _____ Description: RETRIEVE MSFC FM DATA



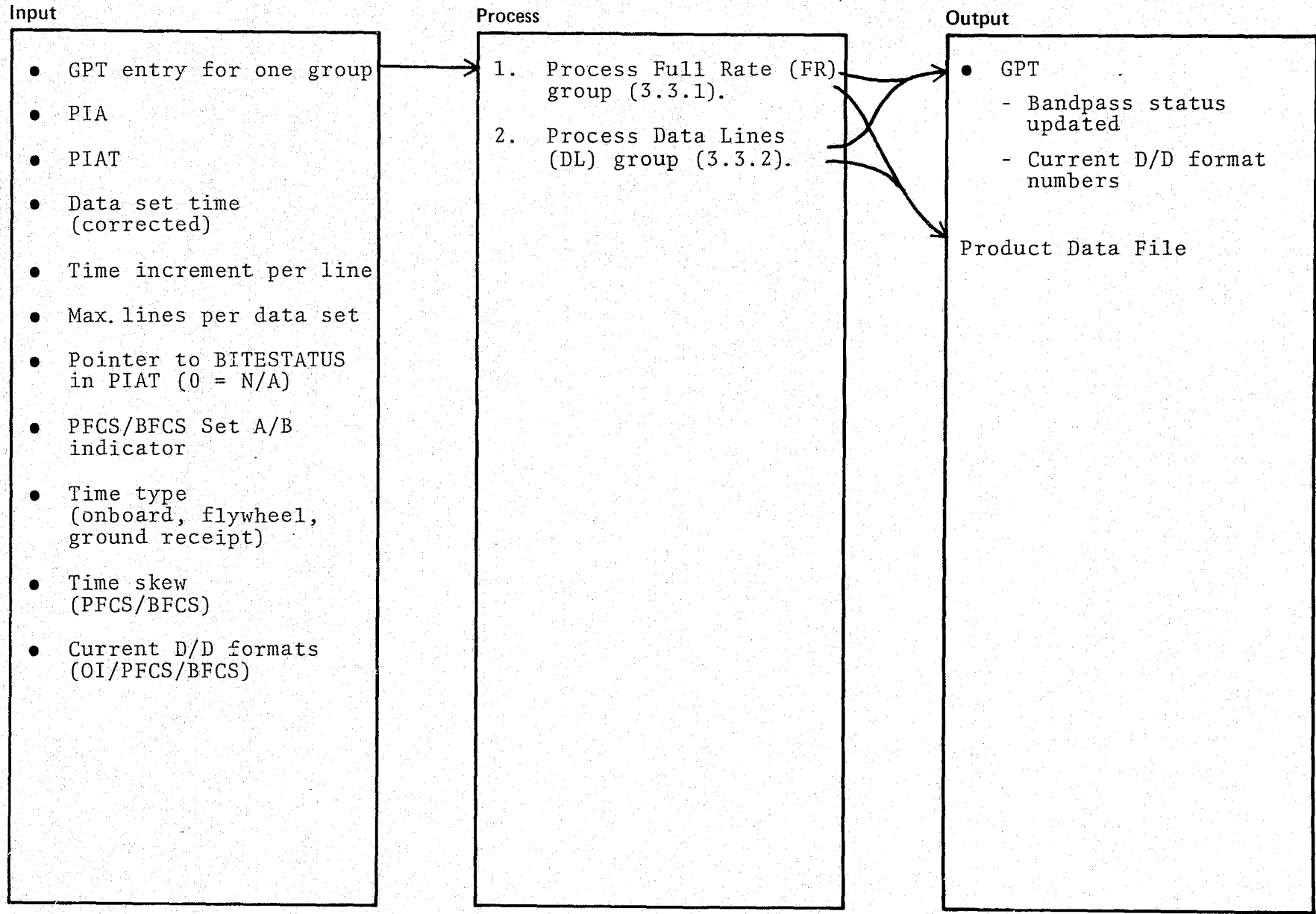
Author: _____ Date: _____

Diagram ID: 3.2.4 Name: _____ Description: RETRIEVE EPHM DATA



Author: _____ Date: _____

Diagram ID: 3.3 Name: _____ Description: MEASUREMENT GROUP PROCESSING



Author: _____ Date: _____

Diagram ID: 3.3.1 Name: _____ Description: PROCESS FULL RATE GROUP

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)

Process

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.

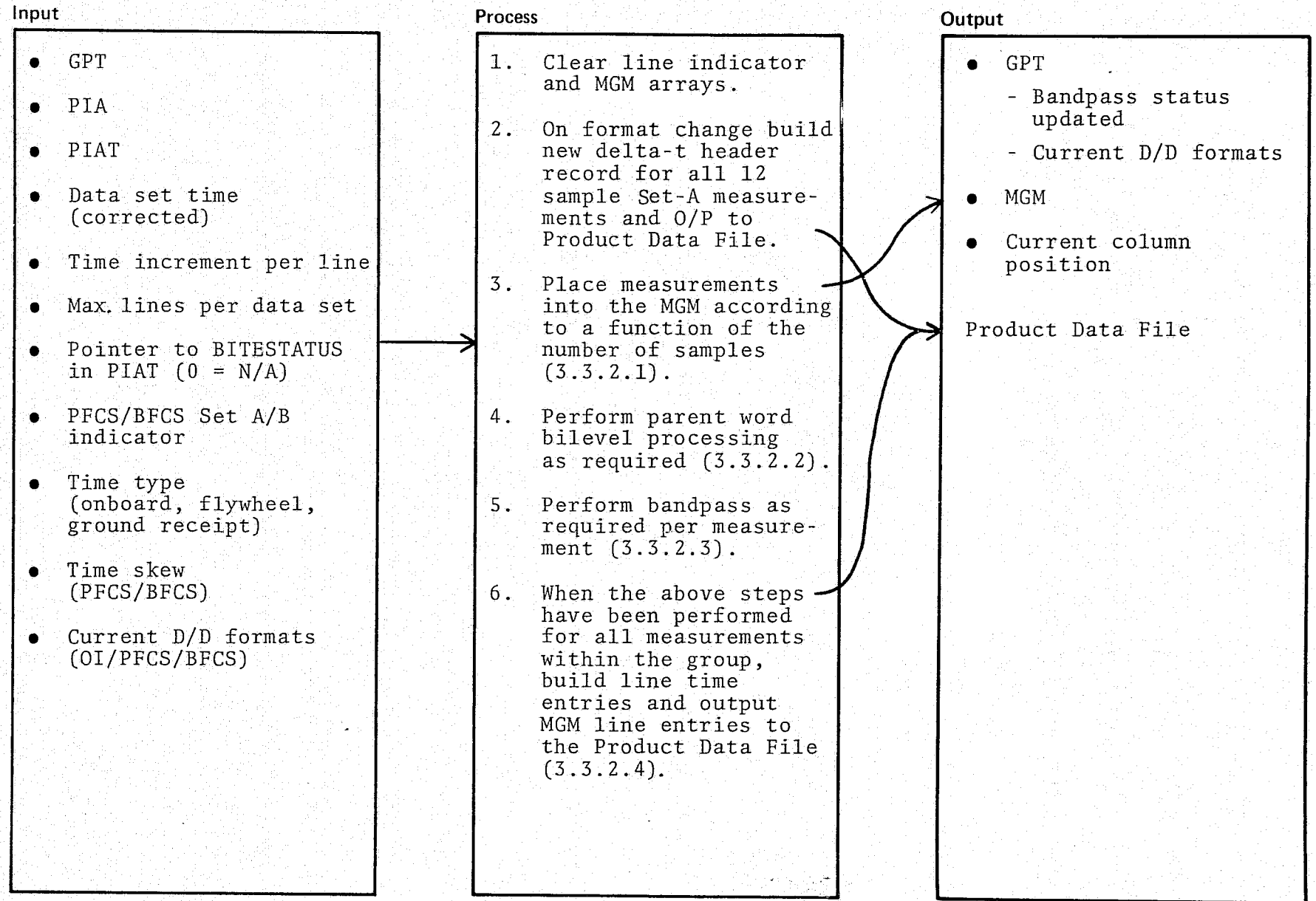
Output

- GPT
  - Current D/D format numbers

Product Data File

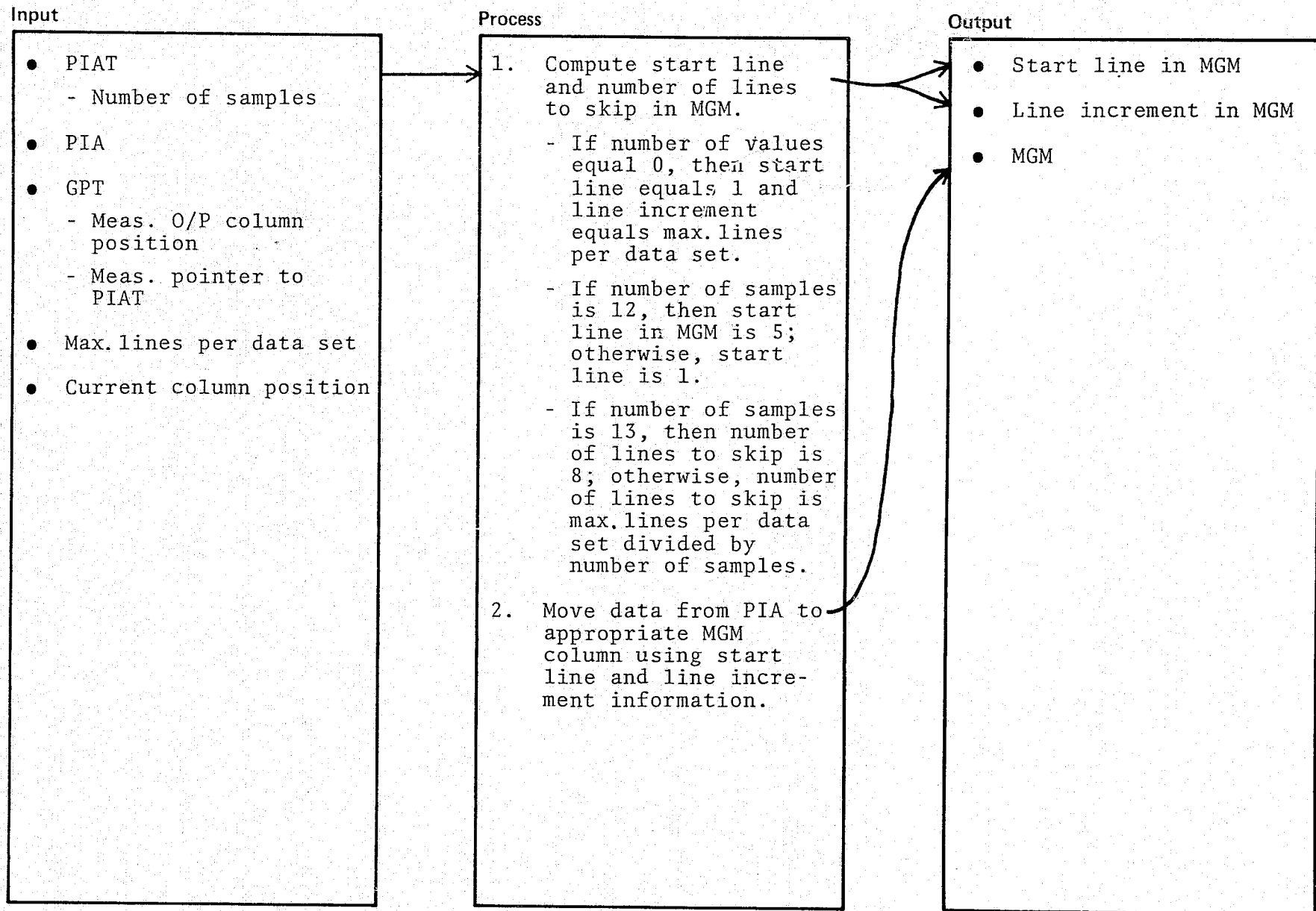
Author: _____ Date: _____

Diagram ID: 3.3.2 Name: _____ Description: PROCESS DATA LINES GROUP



Author: _____ Date: _____

Diagram ID: 3.3.2.1 Name: _____ Description: MEASUREMENT PLACEMENT IN MGM



Author: _____ Date: _____

Diagram ID: 3.3.2.2 Name: _____ Description: BILEVEL PARENT WORD PROCESSING

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

Author: _____ Date: _____

Diagram ID: 3.3.2.3 Name: _____ Description: BANDPASS

Input

- GPT
  - Bandpass status value
  - Bandpass limit value
- MGM
- Start line in MGM
- Line increment in MGM
- Current column position

Process

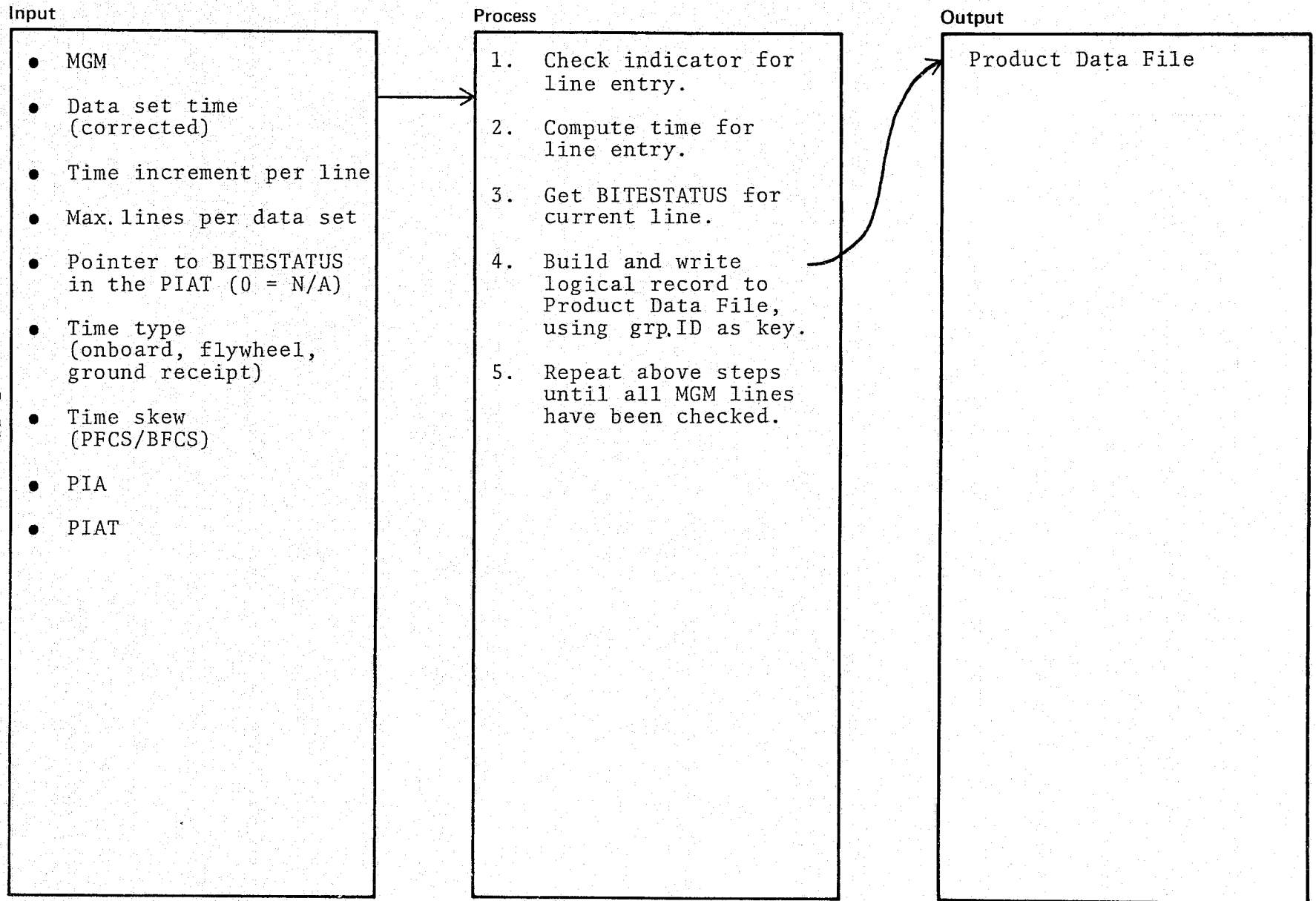
1. The last measurement data value is subtracted from the current data value. When the absolute difference is greater than or equal to the bandpass limit, the line indicator is set and the current data value is put into the bandpass status. Otherwise, a flag value indicating the data value was bandpassed out is placed into the MGM.

Output

- MGM
- GPT
  - Bandpass status value
- MGM line indicator array

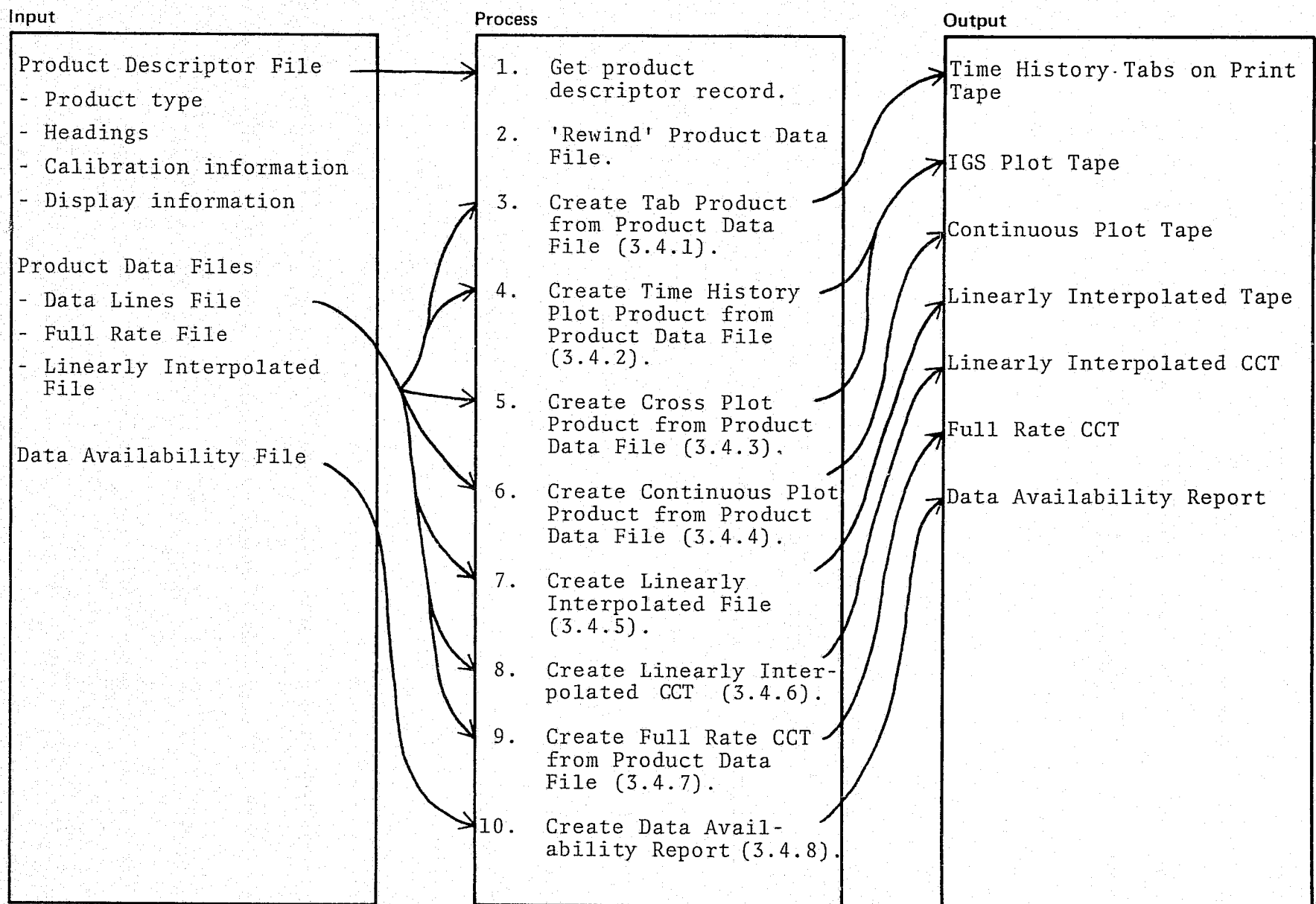
Author: _____ Date: _____

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



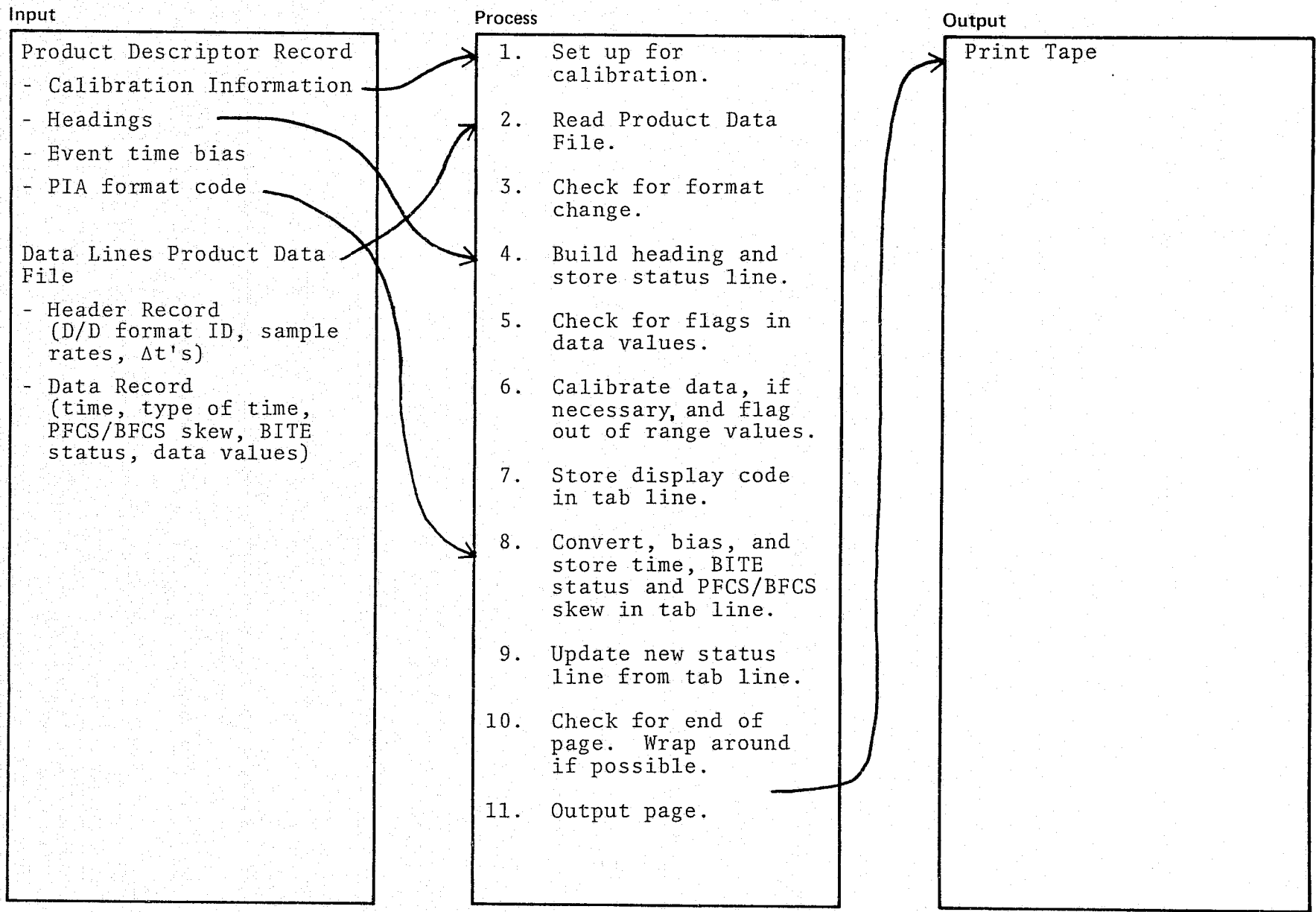
Author: _____ Date: _____

Diagram ID: 3.4 Name: _____ Description: OUTPUT PROCESSING



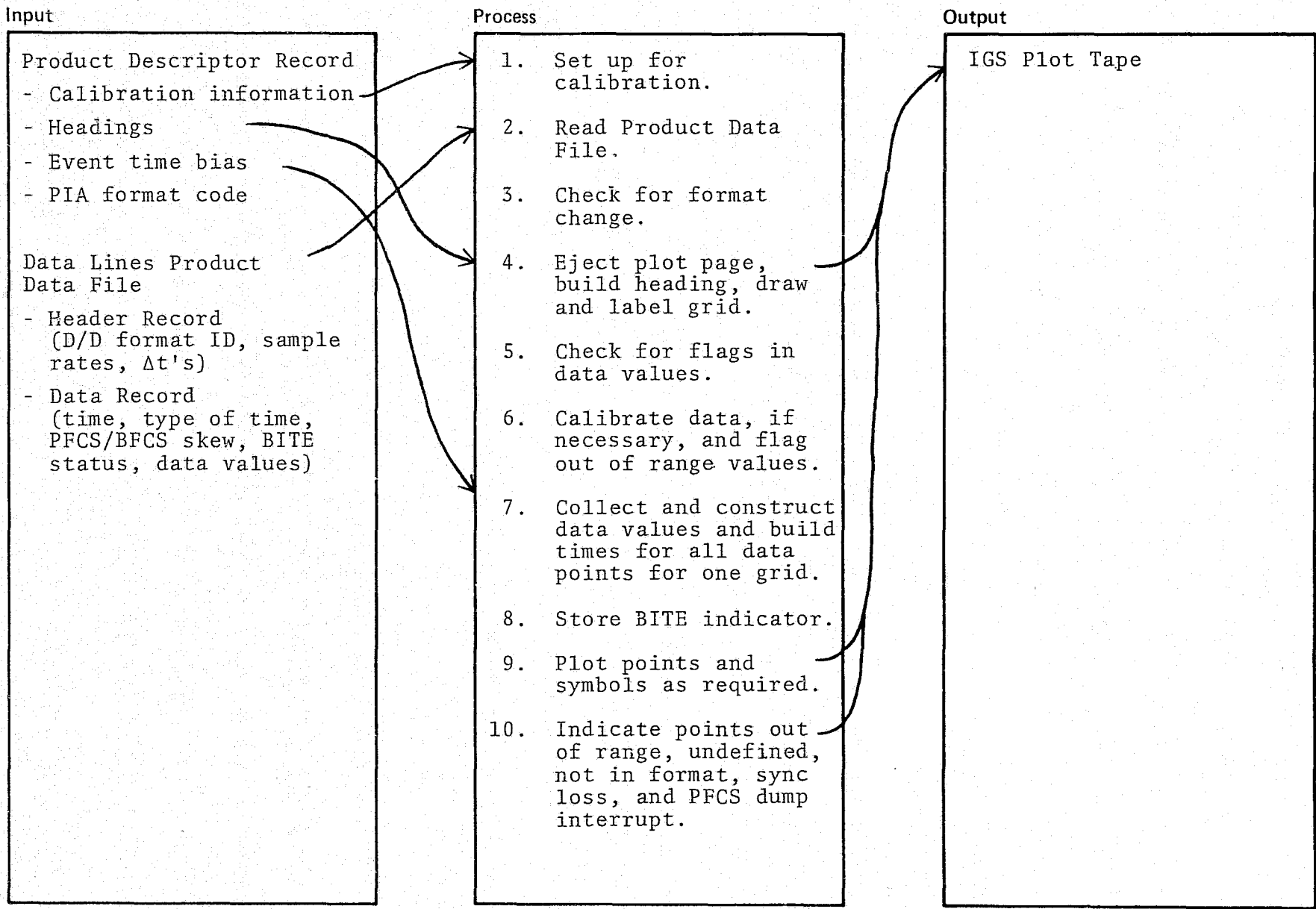
Author: _____ Date: _____

Diagram ID: 3.4.1 Name: _____ Description: CREATE TAB PRODUCT



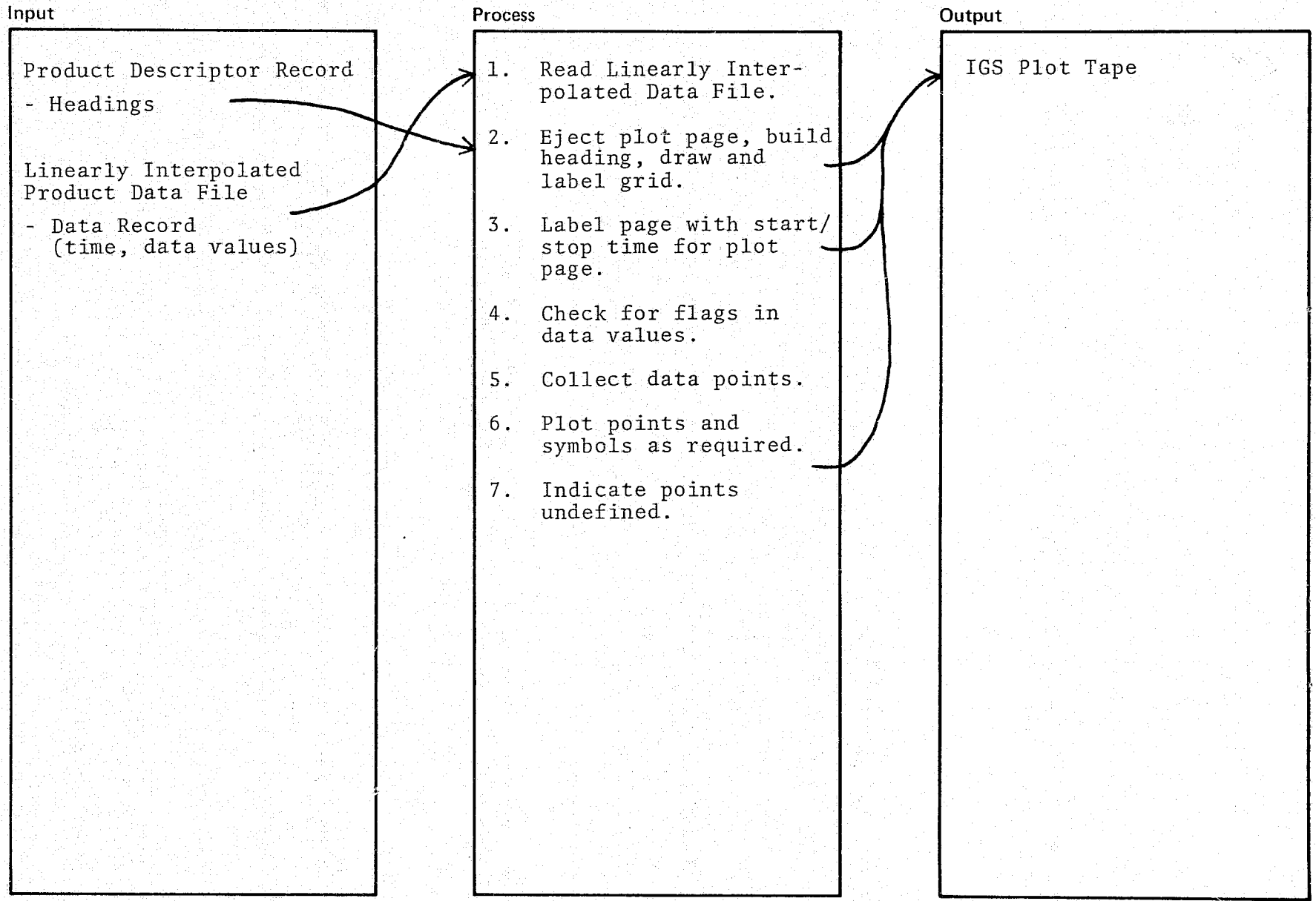
Author: _____ Date: _____

Diagram ID: 3.4.2 Name: _____ Description: CREATE TIME HISTORY PLOT PRODUCT



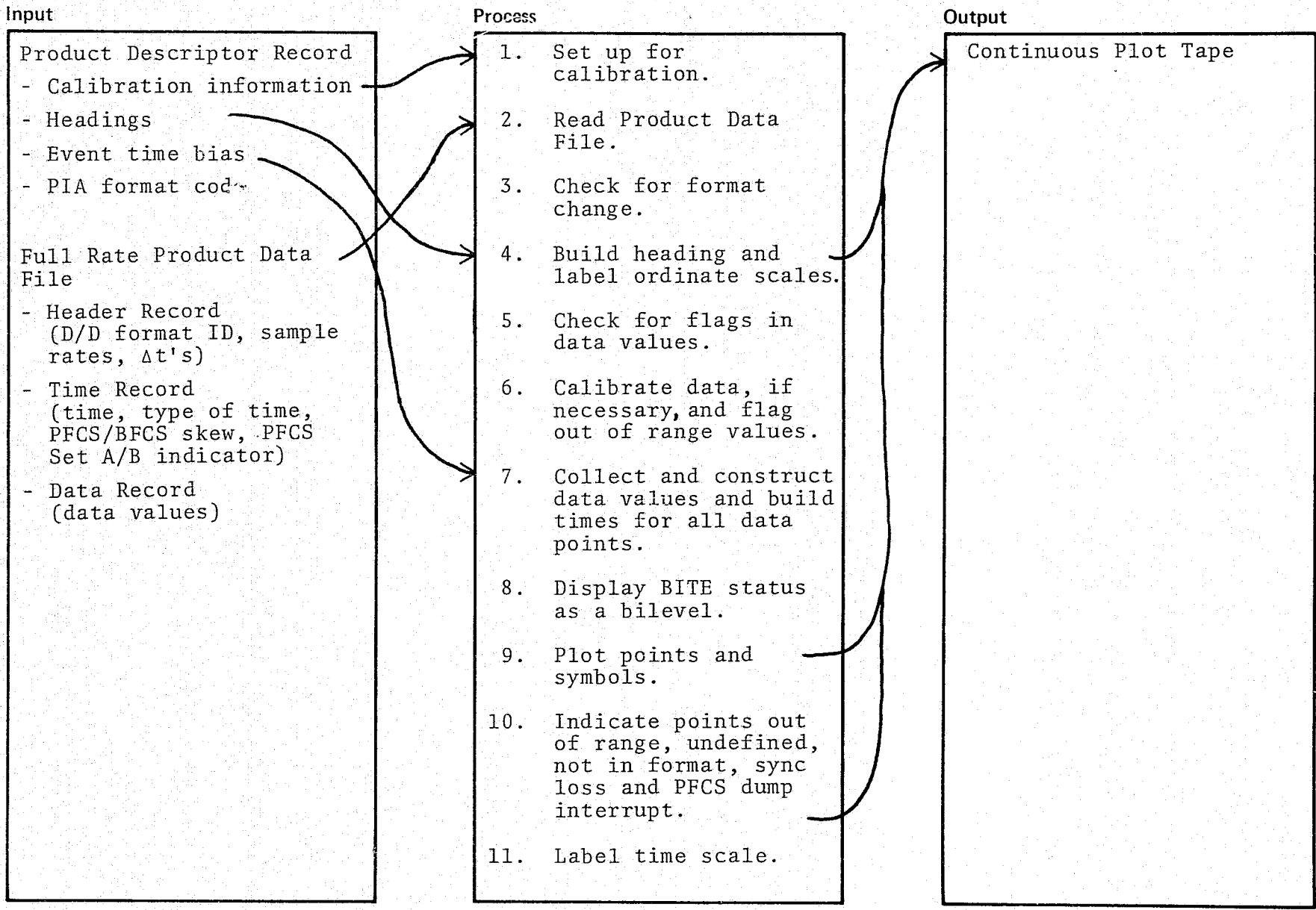
Author: _____ Date: _____

Diagram ID: 3.4.3 Name: _____ Description: CREATE CROSS PLOT PRODUCT



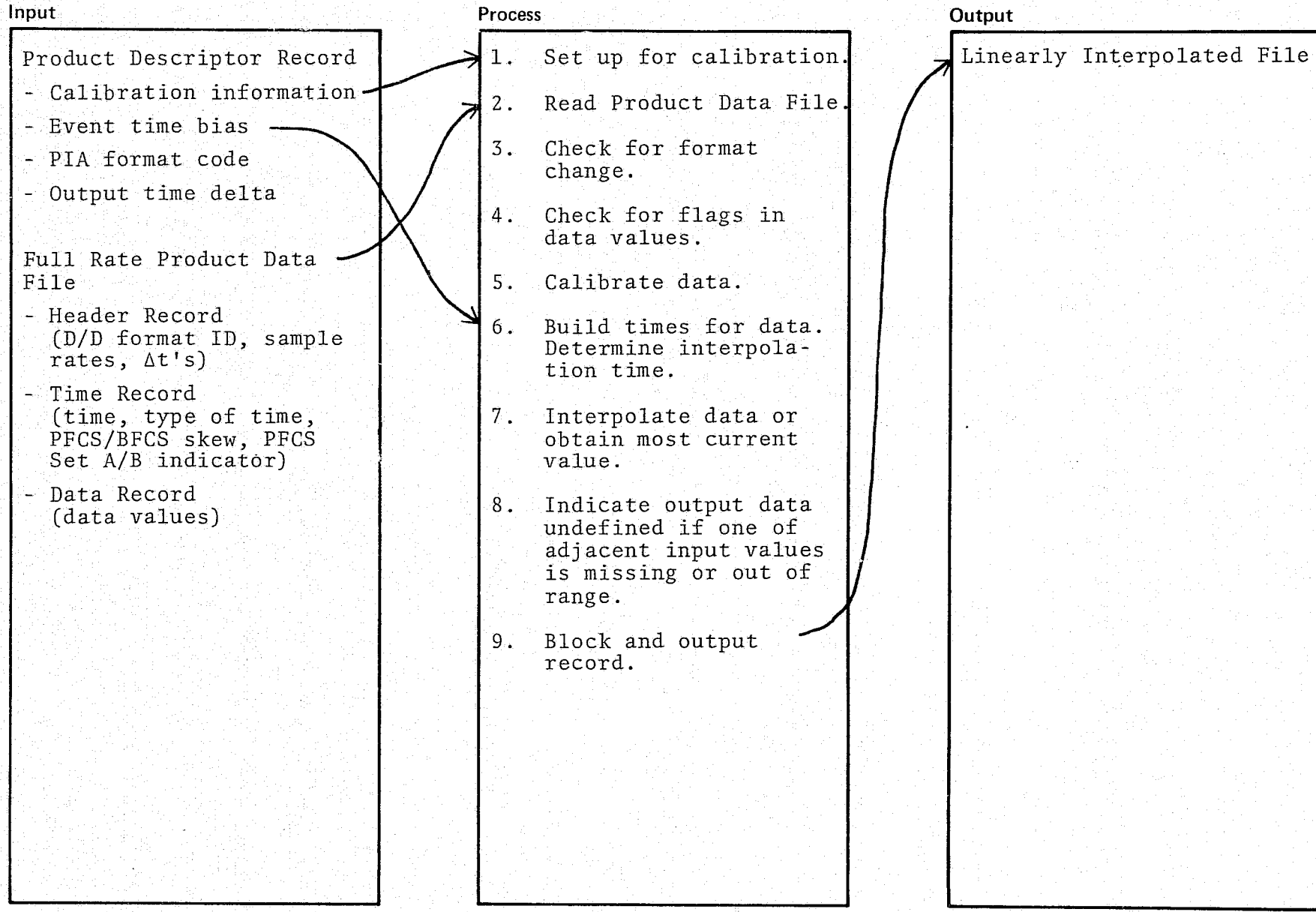
Author: _____ Date: _____

Diagram ID: 3.4.4 Name: _____ Description: CREATE CONTINUOUS PLOT PRODUCT



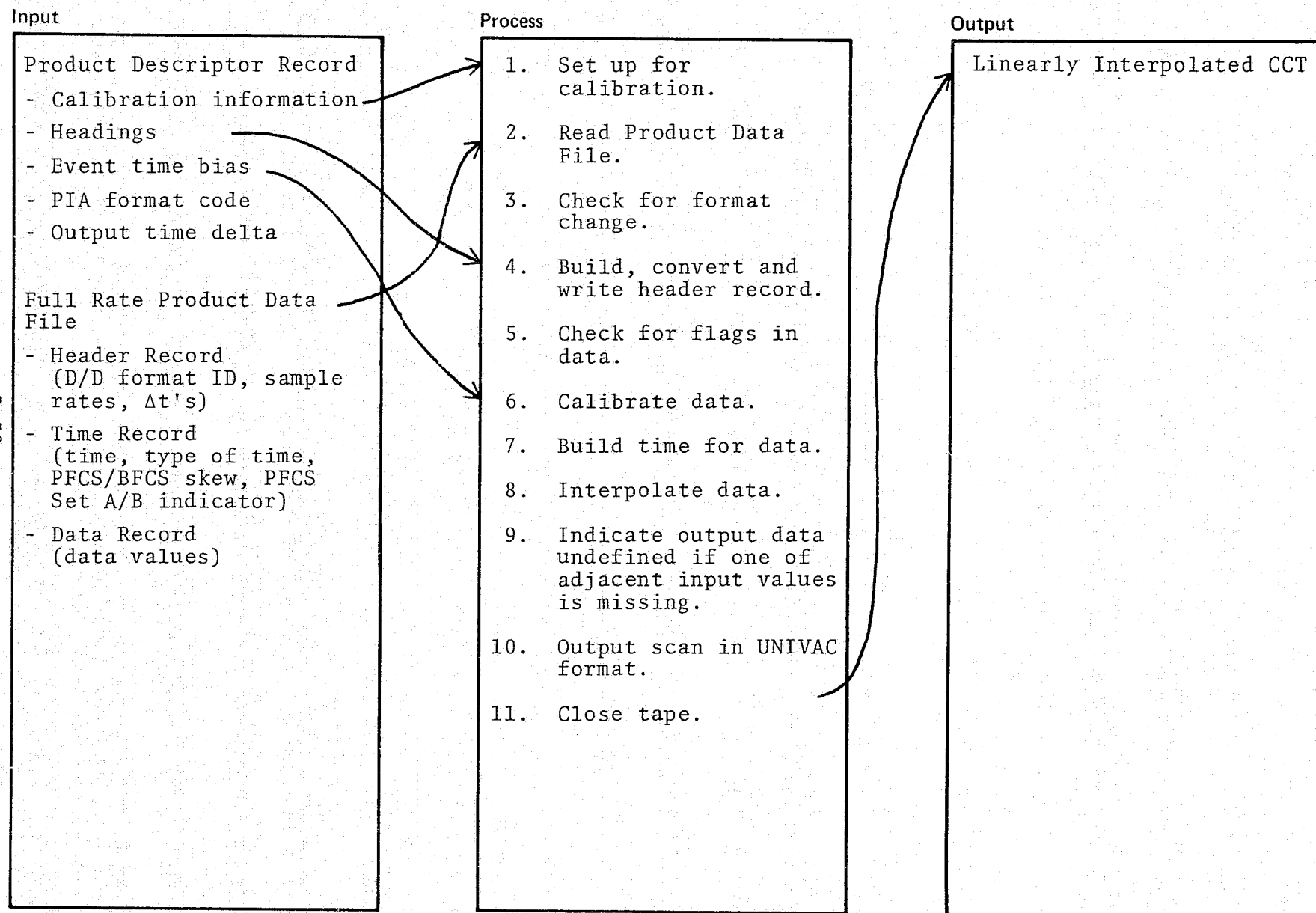
Author: _____ Date: _____

Diagram ID: 3.4.5 Name: _____ Description: CREATE LINEARLY INTERPOLATED FILE



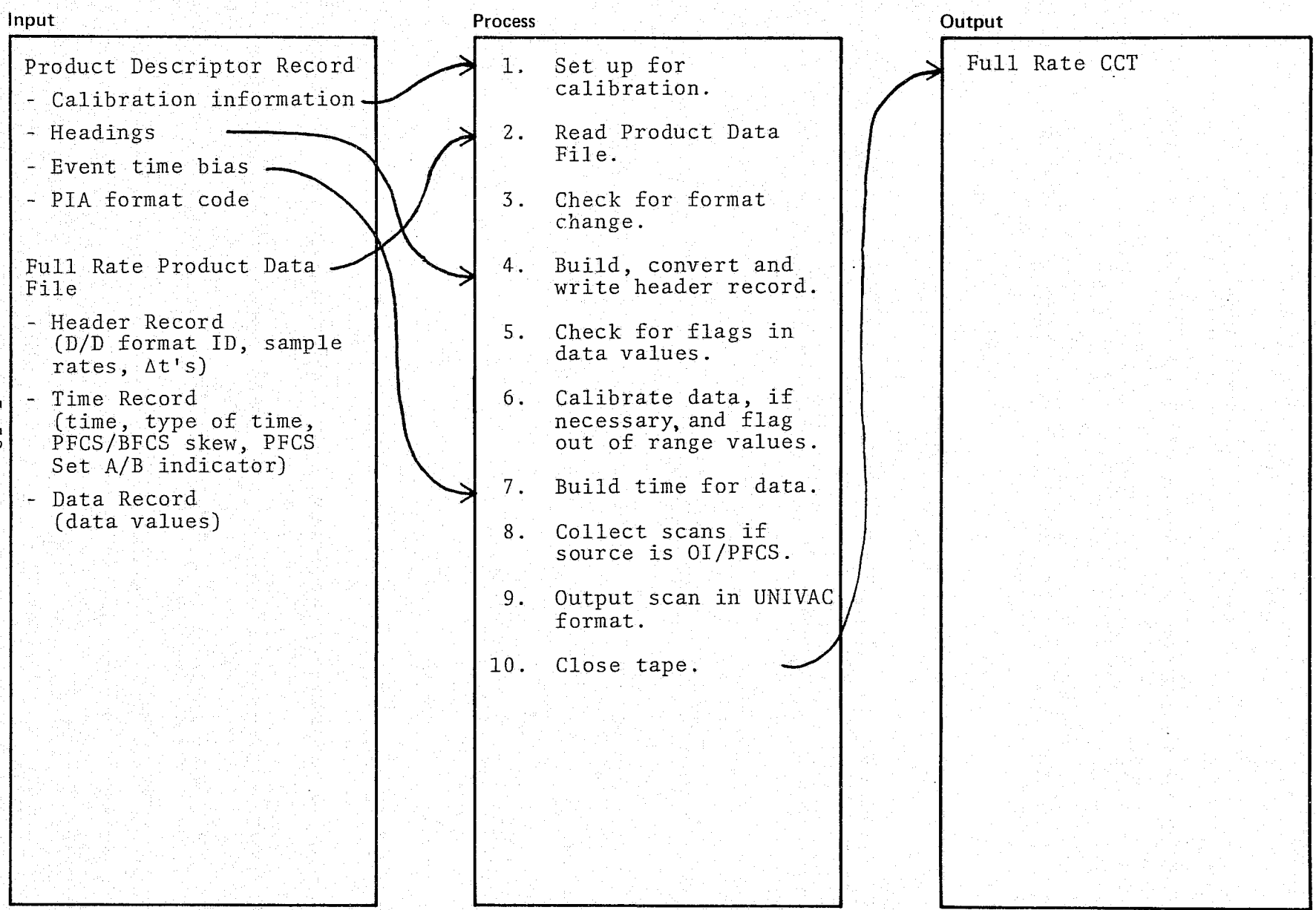
Author: _____ Date: _____

Diagram ID: 3.4.6 Name: _____ Description: CREATE LINEARLY INTERPOLATED CCT



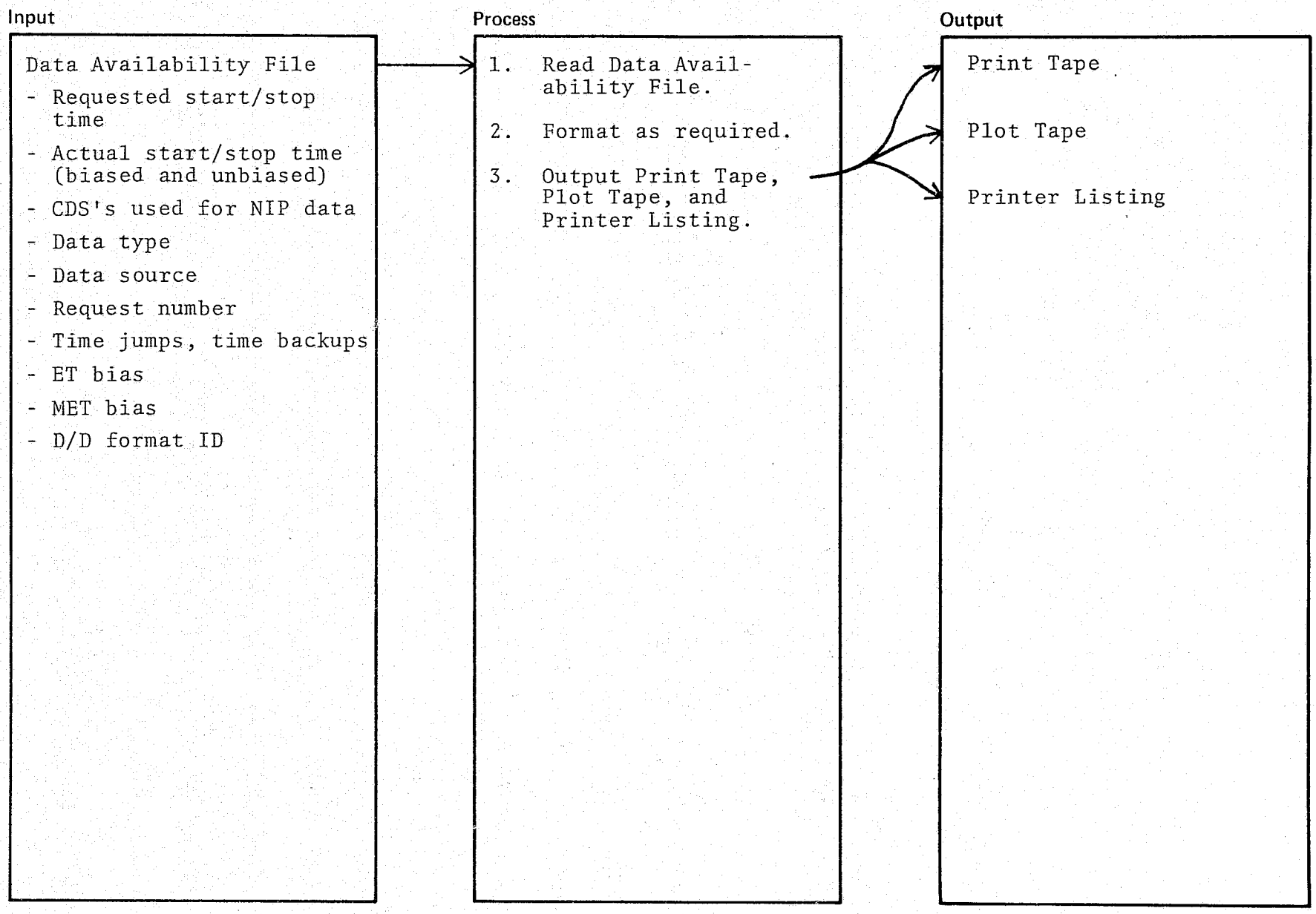
Author: _____ Date: _____

Diagram ID: 3.4.7 Name: _____ Description: CREATE FULL RATE CCT PRODUCT



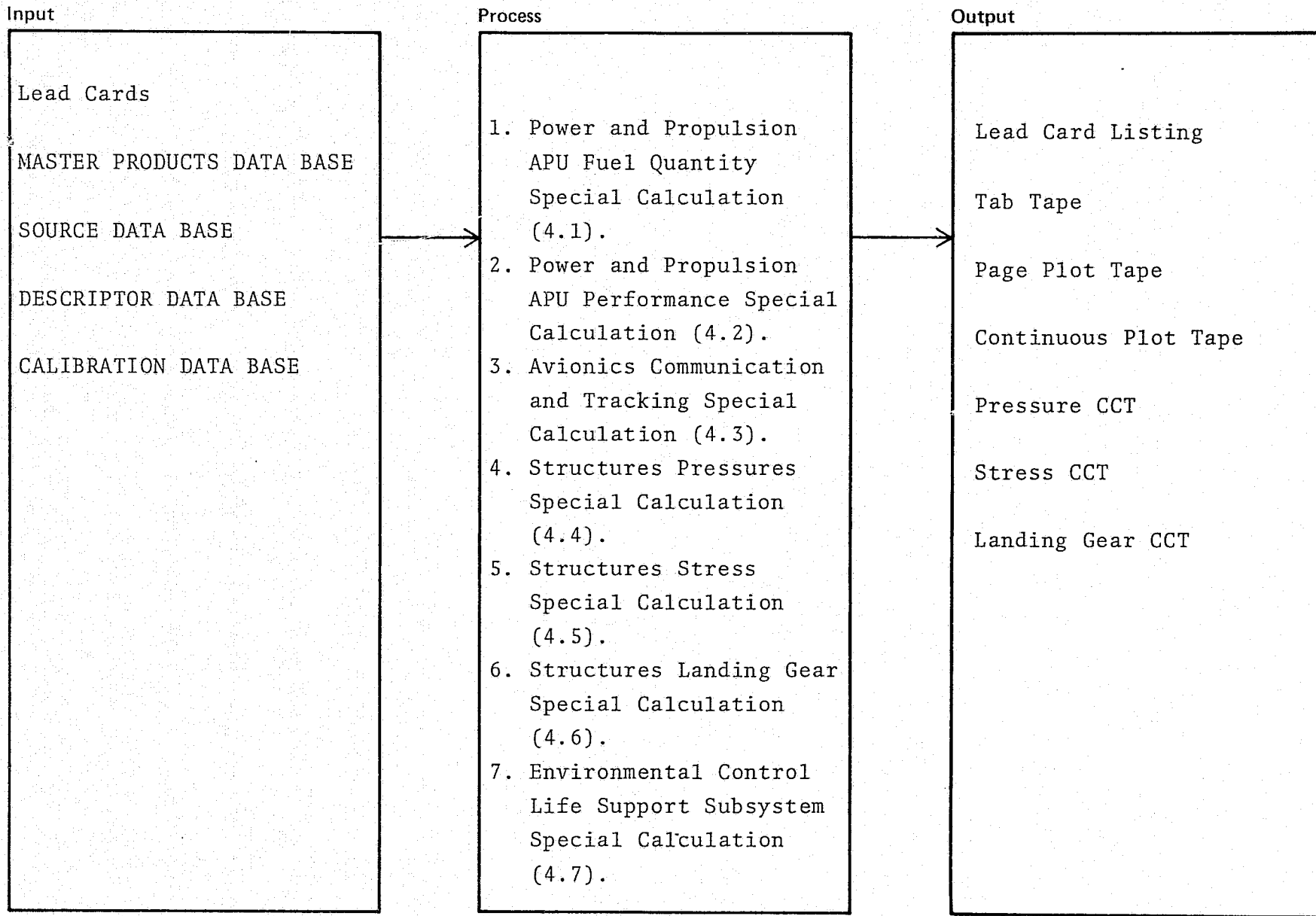
Author: _____ Date: _____

Diagram ID: 3.4.8 Name: _____ Description: CREATE DATA AVAILABILITY REPORT



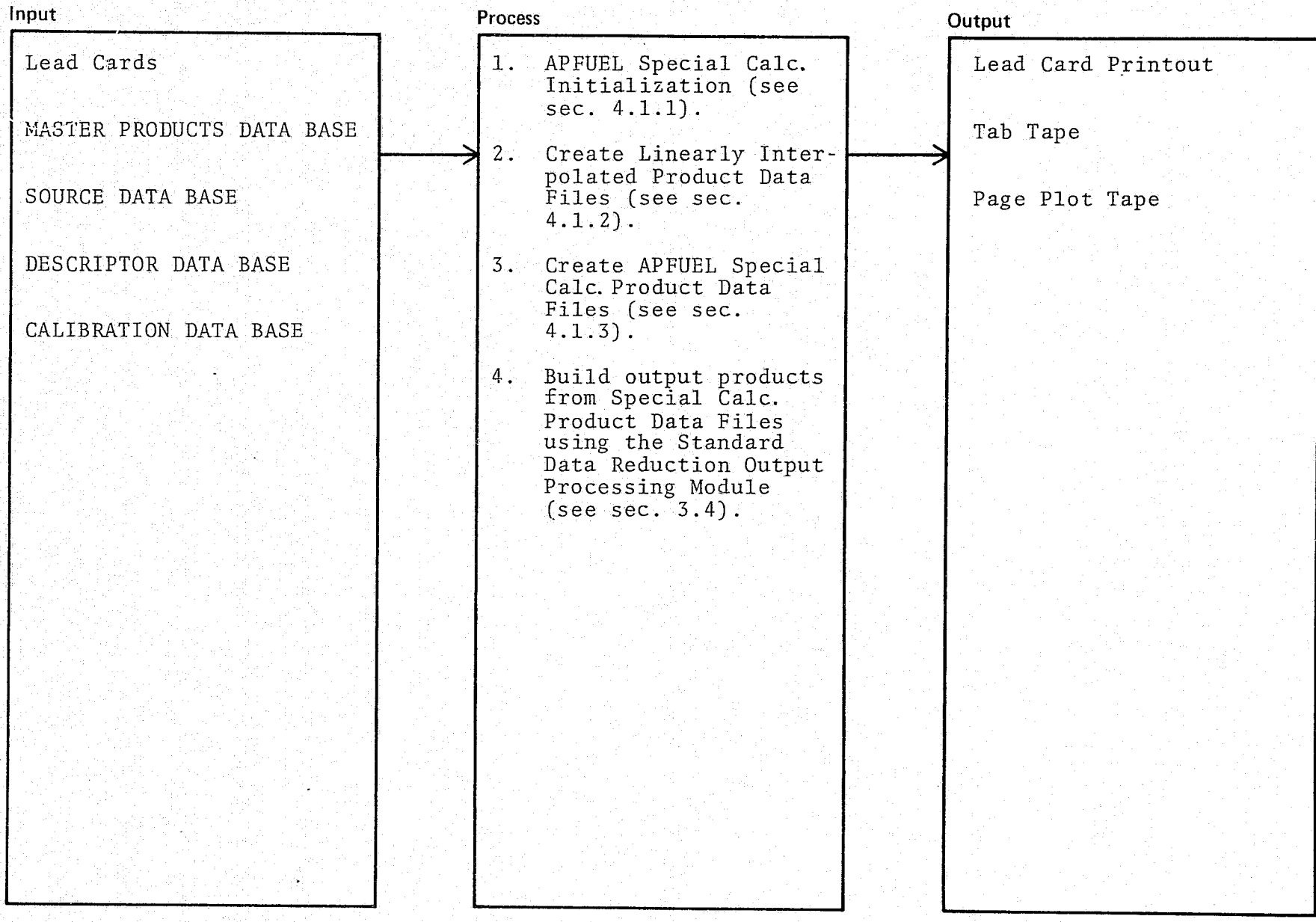
Author: _____ Date: _____

Diagram ID: 4.0 Name: _____ Description: SPECIAL CALCULATIONS



Author: _____ Date: _____

Diagram ID: 4.1 Name: _____ Description: POWER AND PROPULSION FUEL QUANTI
SPECIAL CALC. (APFUEL)



Author: _____ Date: _____

Diagram ID: 4.1.1 Name: _____ Description: APFUEL SPECIAL CALC. INITIALIZATIO

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

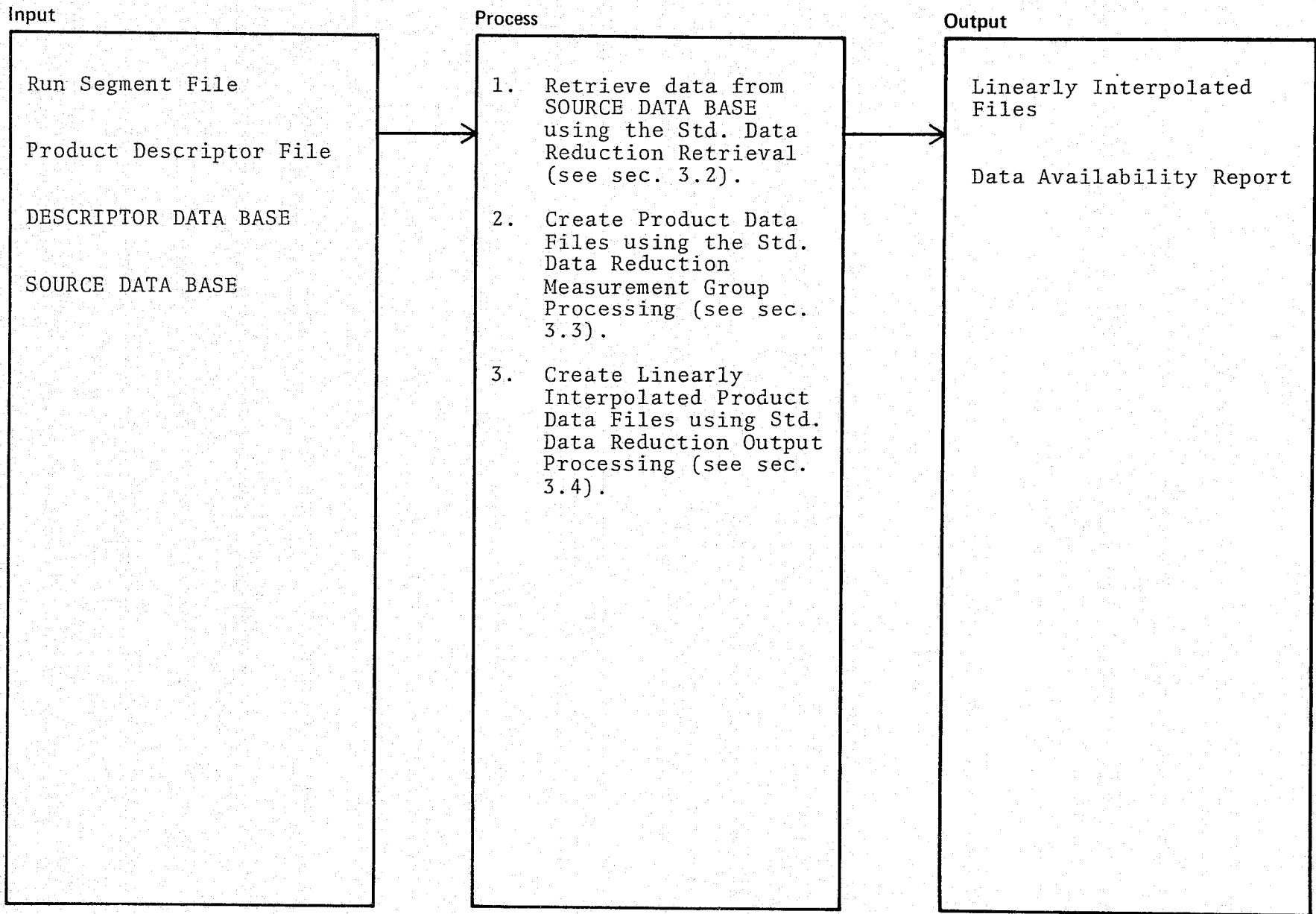
Run Segment Files

Product Descriptor Files

Lead Card Printout

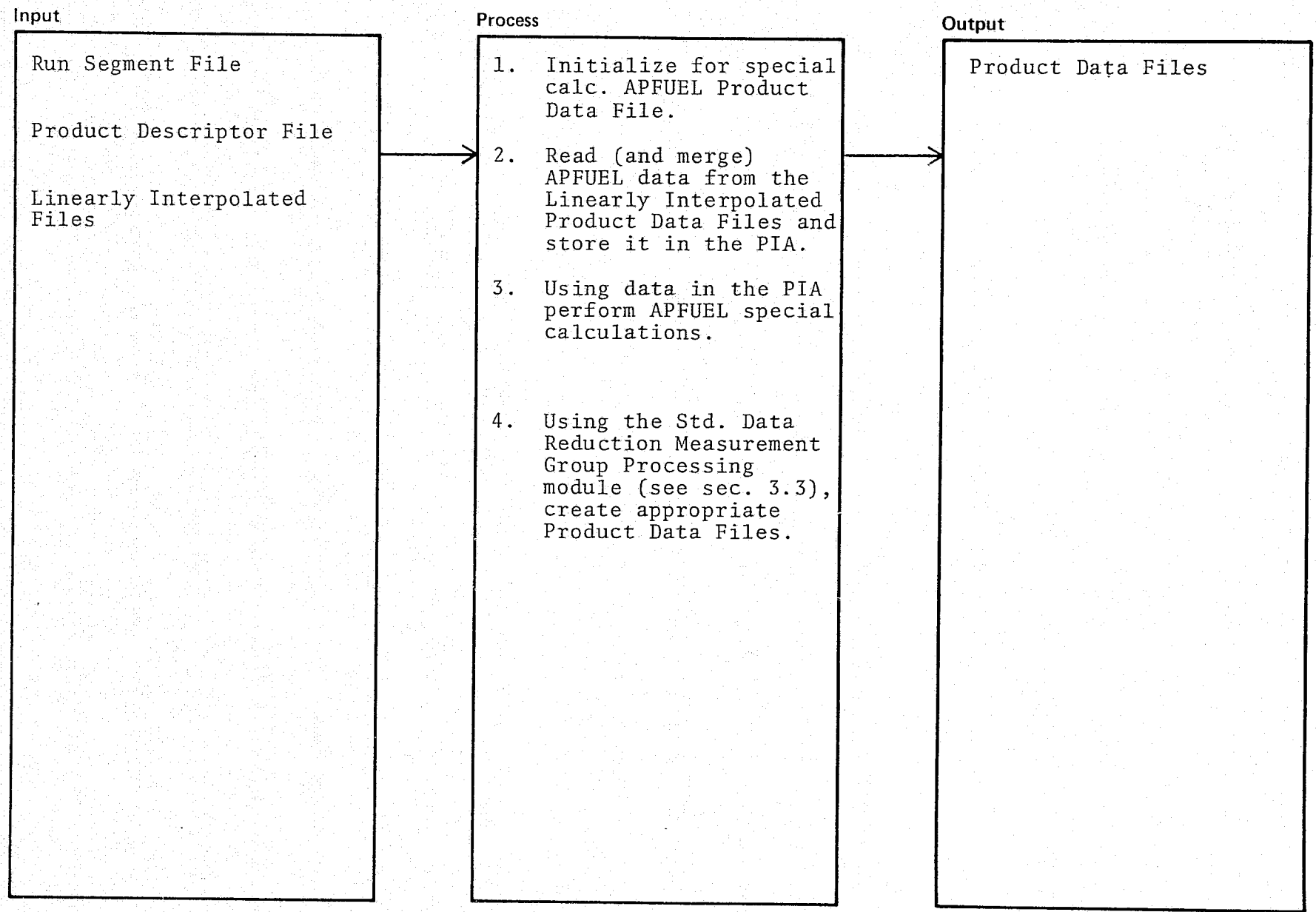
Author: _____ Date: _____

Diagram ID: 4.1.2 Name: _____ Description: CREATE LINEARLY INTERPOLATED PRODUCT DATA FILES



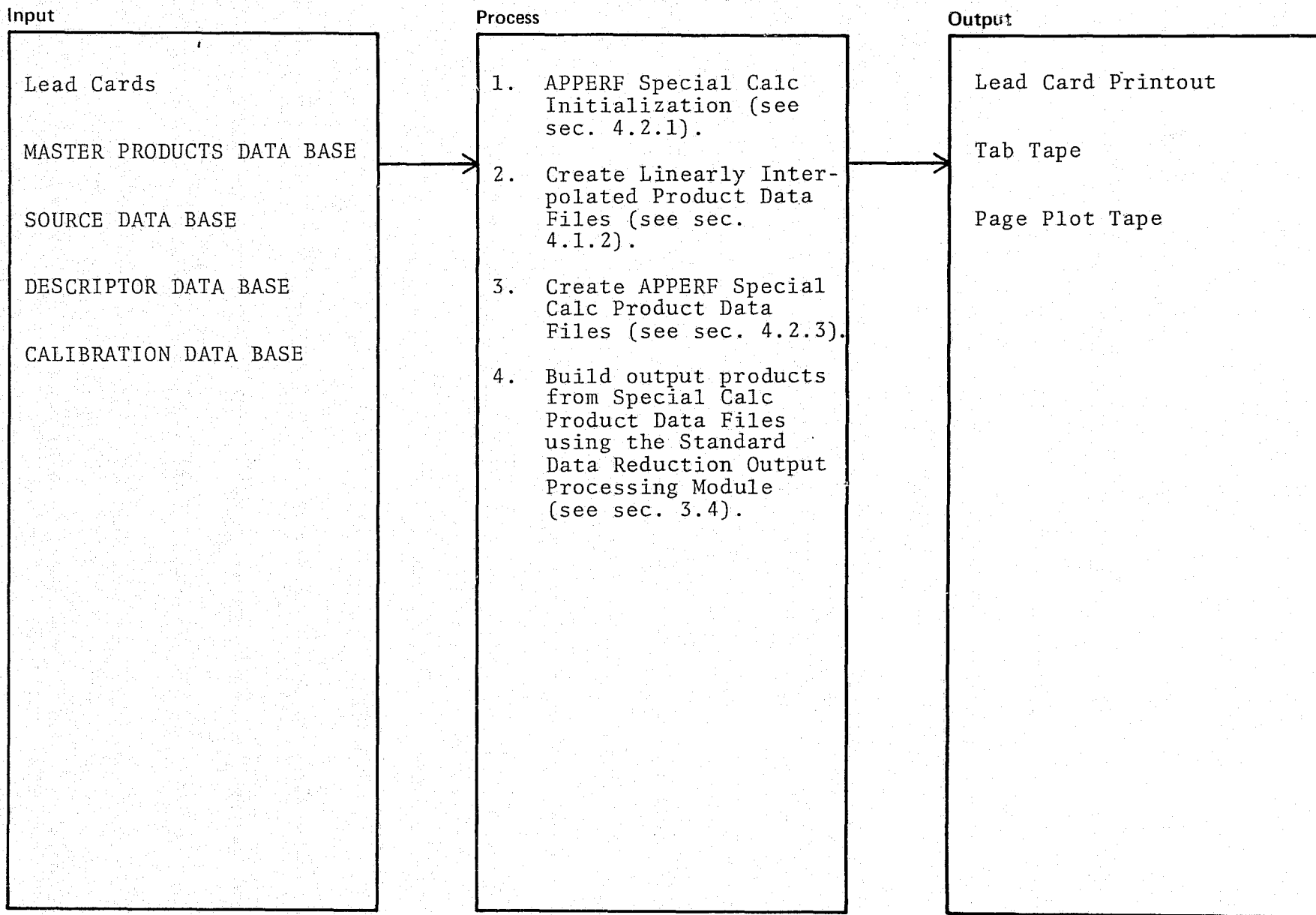
Author: _____ Date: _____

Diagram ID: 4.1.3 Name: _____ Description: CREATE APFUEL SPECIAL CALC PRODUCT DATA FILES



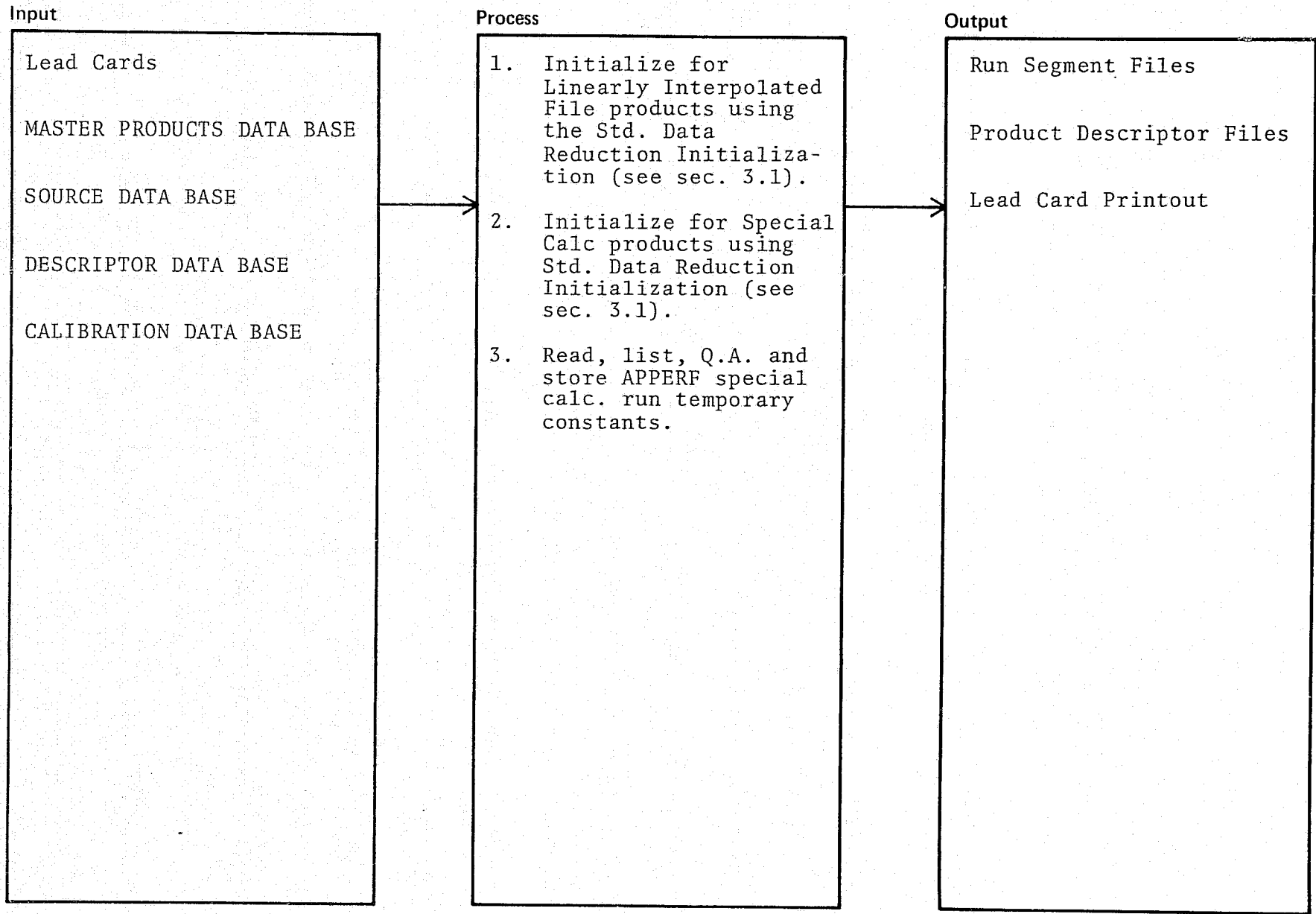
Author: _____ Date: _____

Diagram ID: 4.2 Name: _____ Description: POWER AND PROPULSION APU PERFORMANCE SPECIAL CALC. (APPERF)



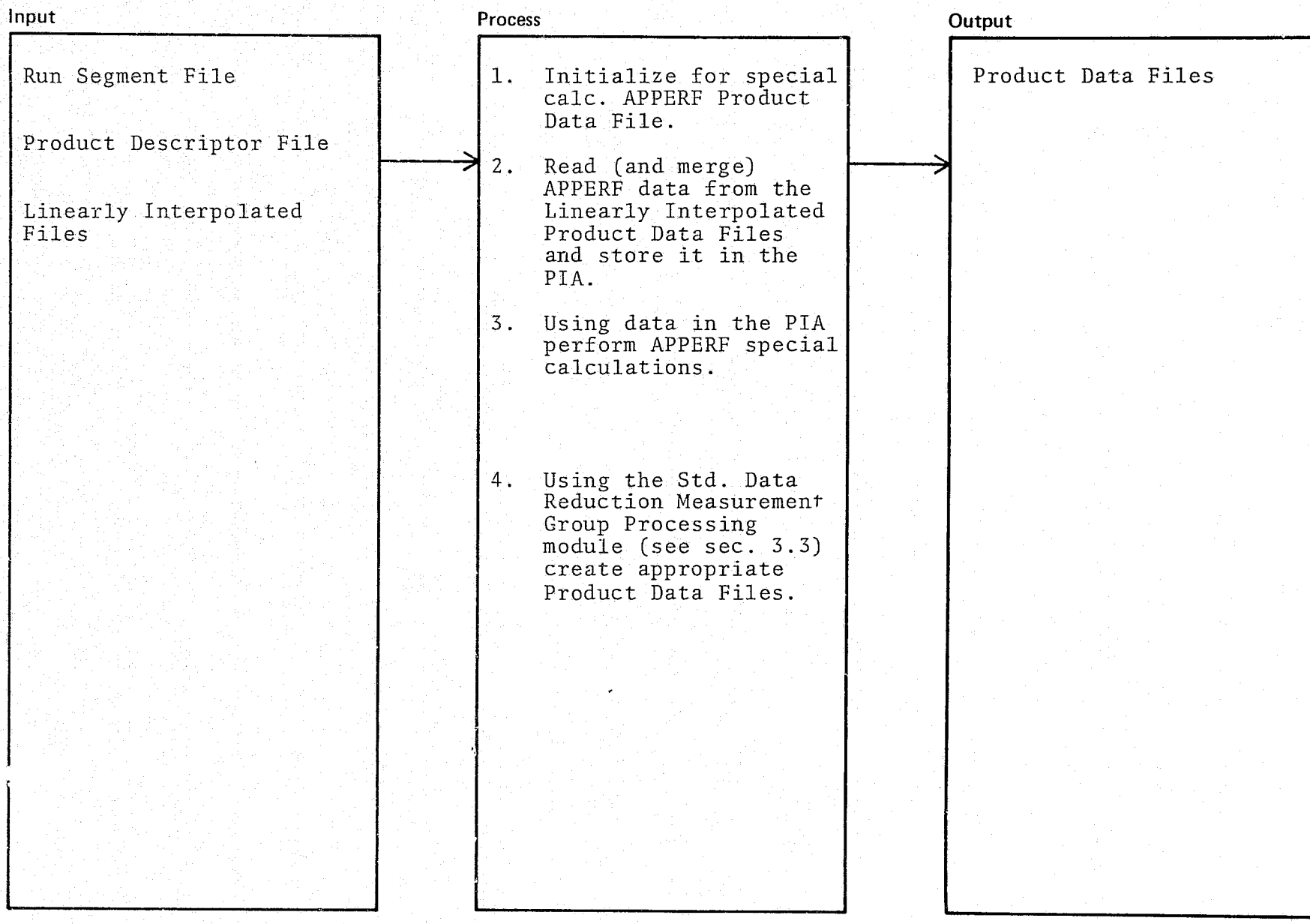
Author: _____ Date: _____

Diagram ID: 4.2.1 Name: _____ Description: APPERF SPECIAL CALC. INITIALIZATION



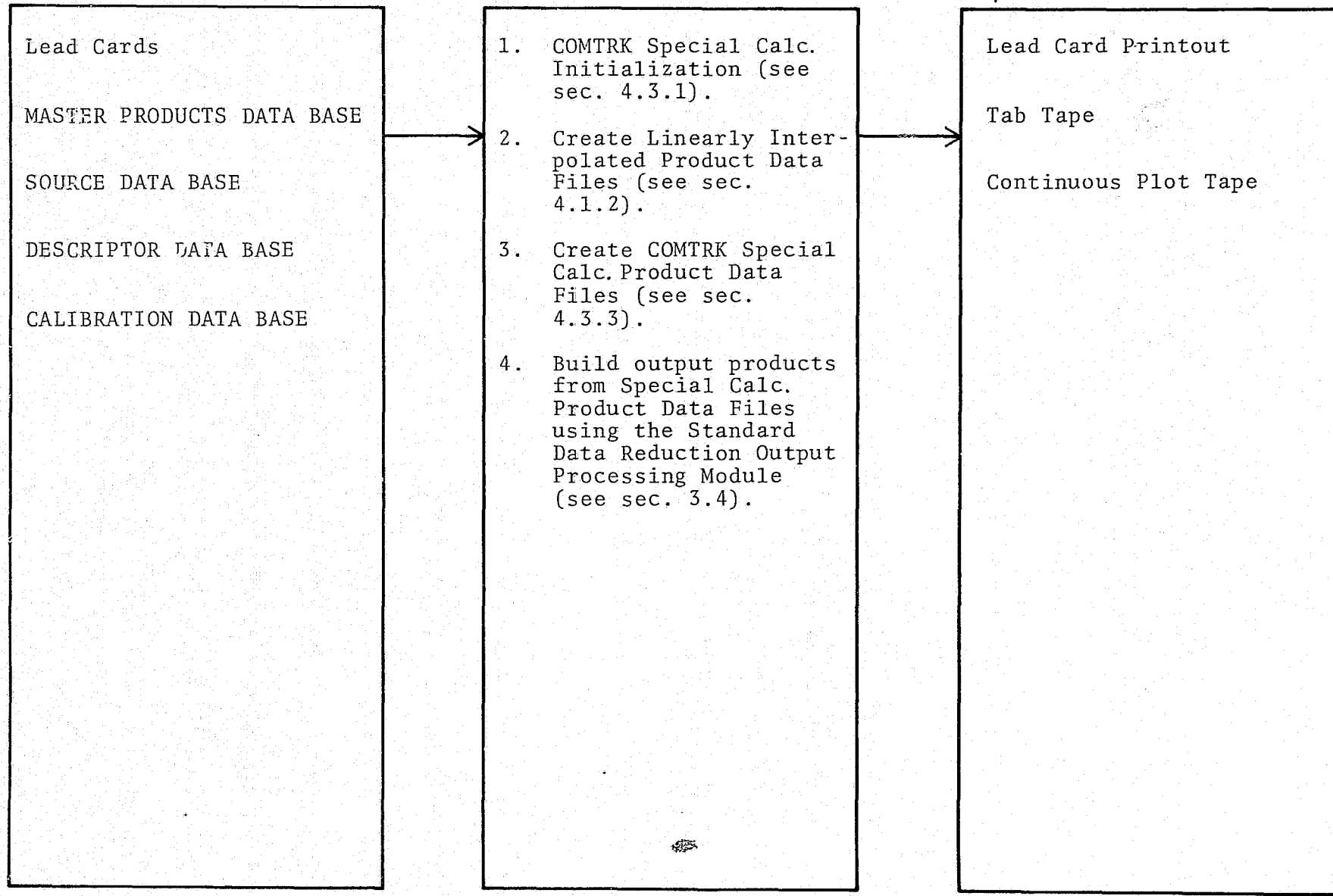
Author: _____ Date: _____

Diagram ID: 4.2.3 Name: _____ Description: CREATE APPERF SPECIAL CALC. PRODUCT DATA FILES



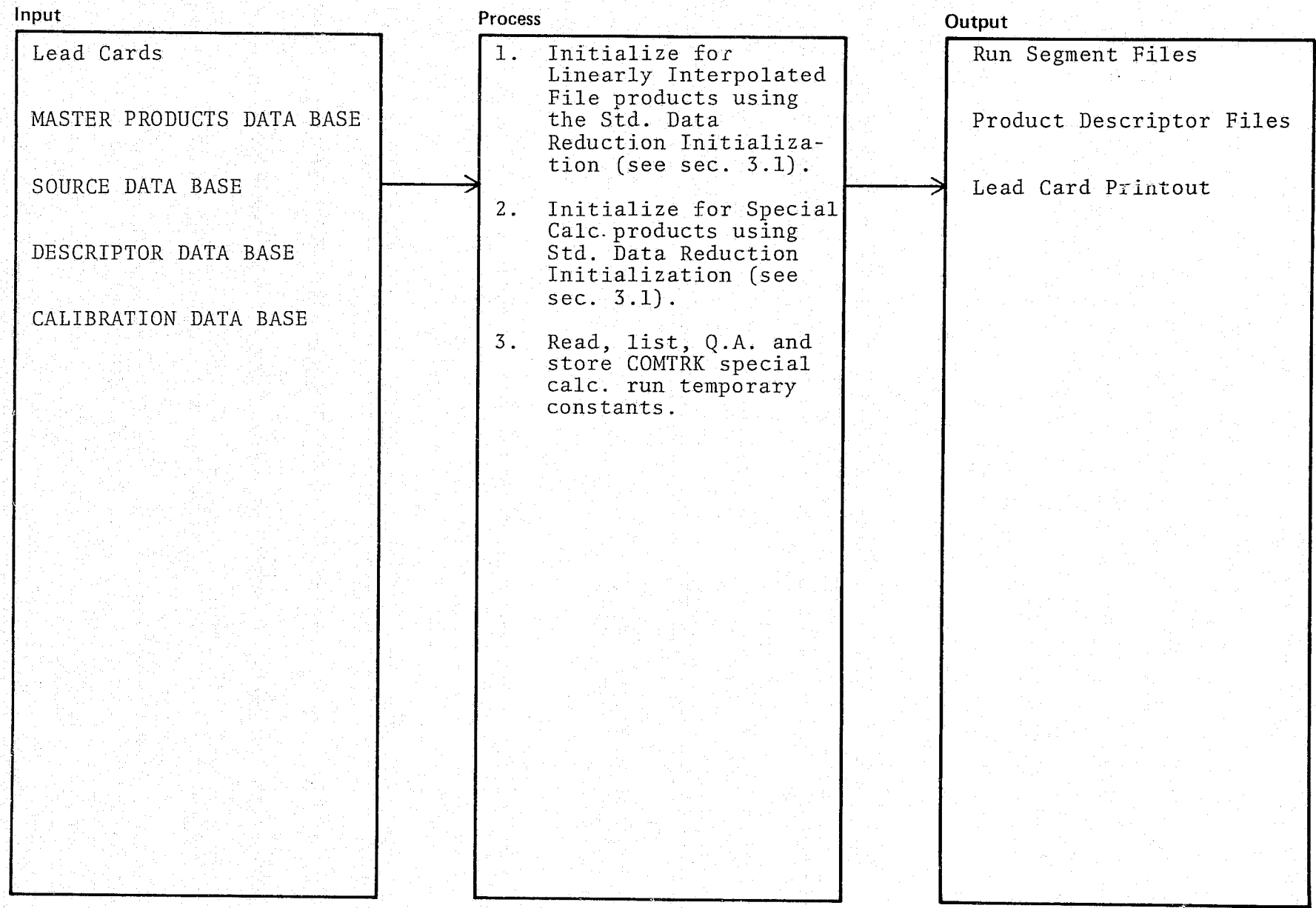
Author: _____ Date: _____

Diagram ID: 4.3 Name: _____ Description: AVIONICS COMMUNICATIONS AND TRACKING SPECIAL CALC. (COMTRK)



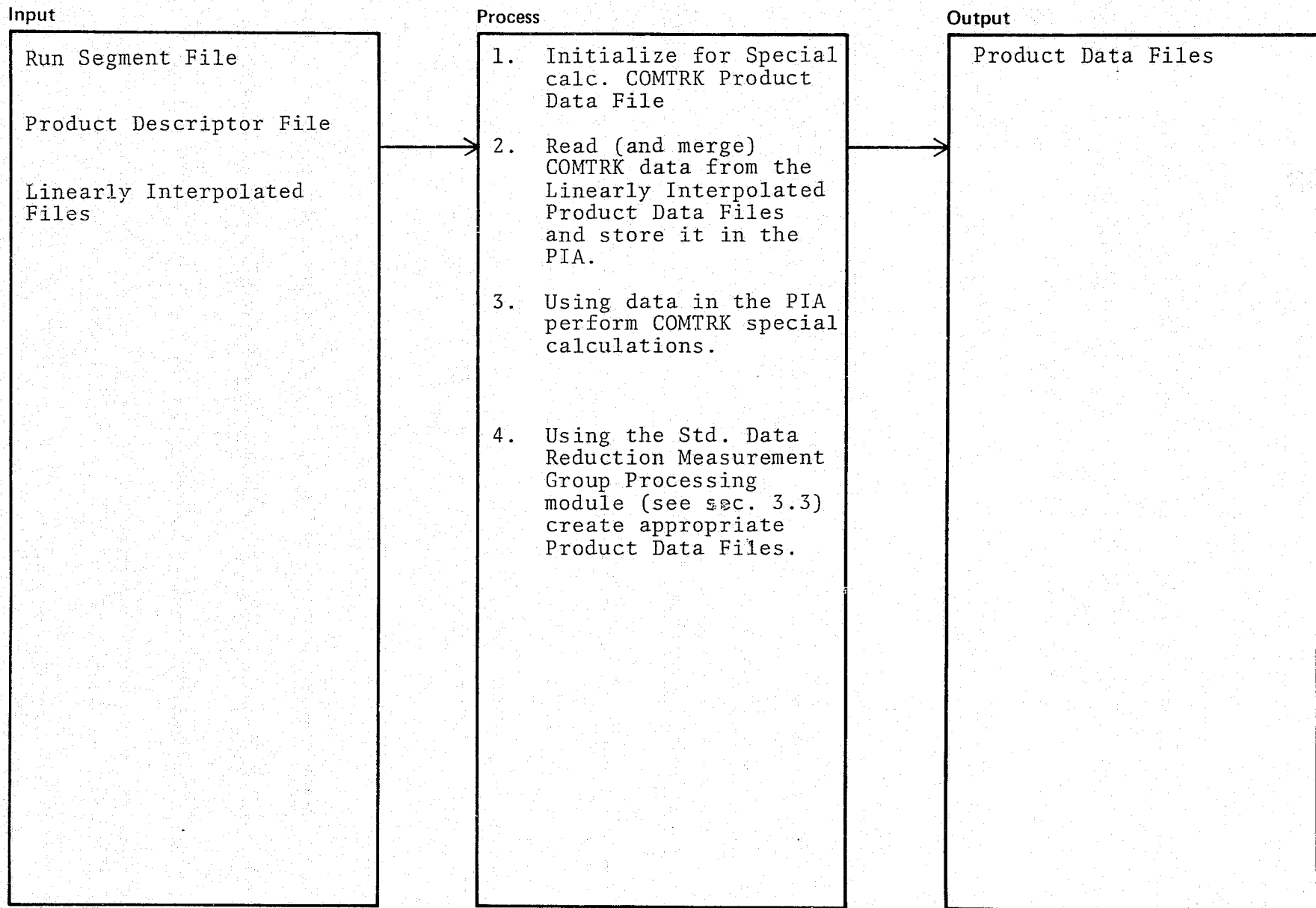
Author: _____ Date: _____

Diagram ID: 4.3.1 Name: _____ Description: COMTRK SPECIAL CALC. INITIALIZATION



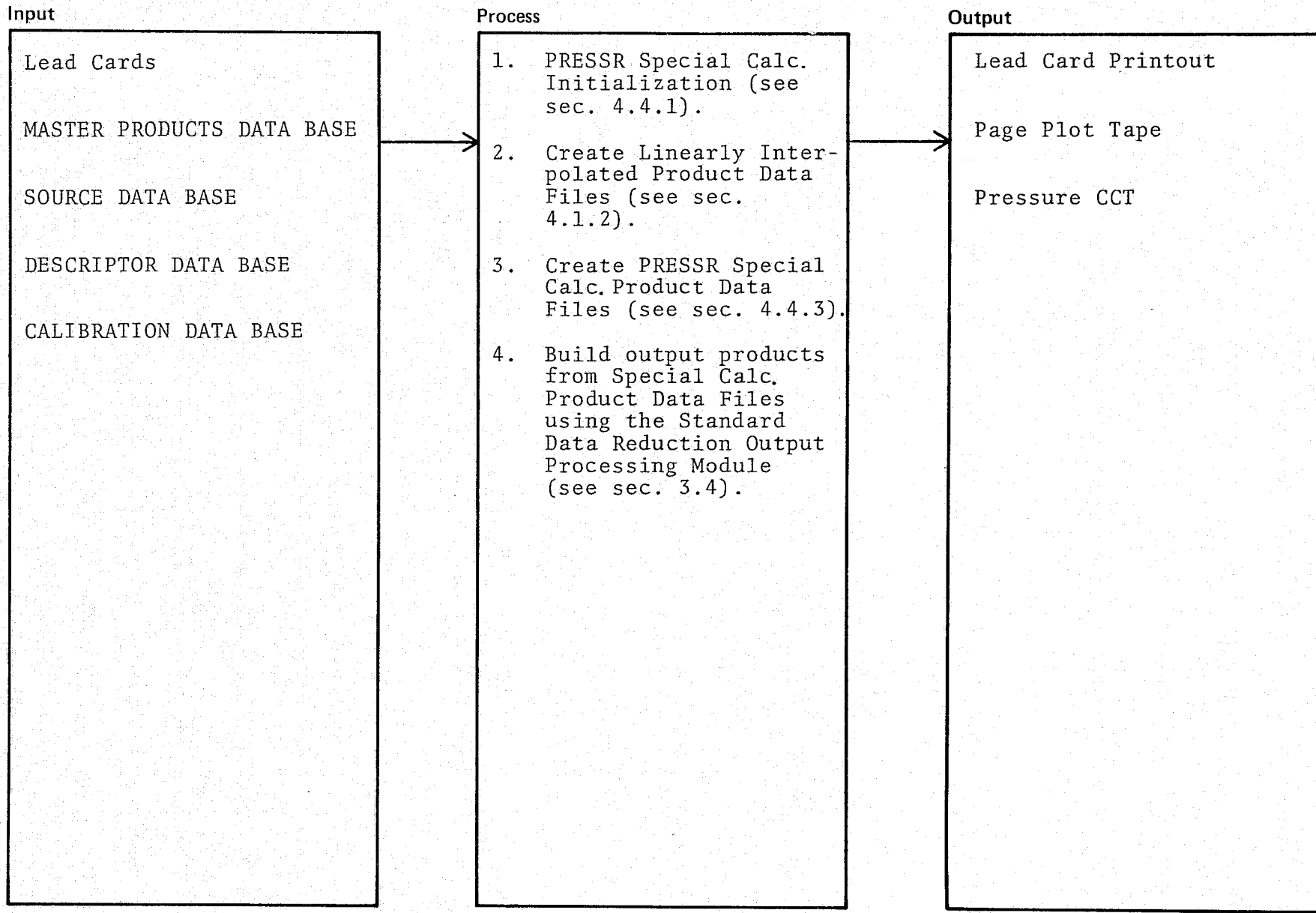
Author: _____ Date: _____

Diagram ID: 4.3.3 Name: _____ Description: CREATE COMTRK SPECIAL CALC. PRODUCT DATA FILES



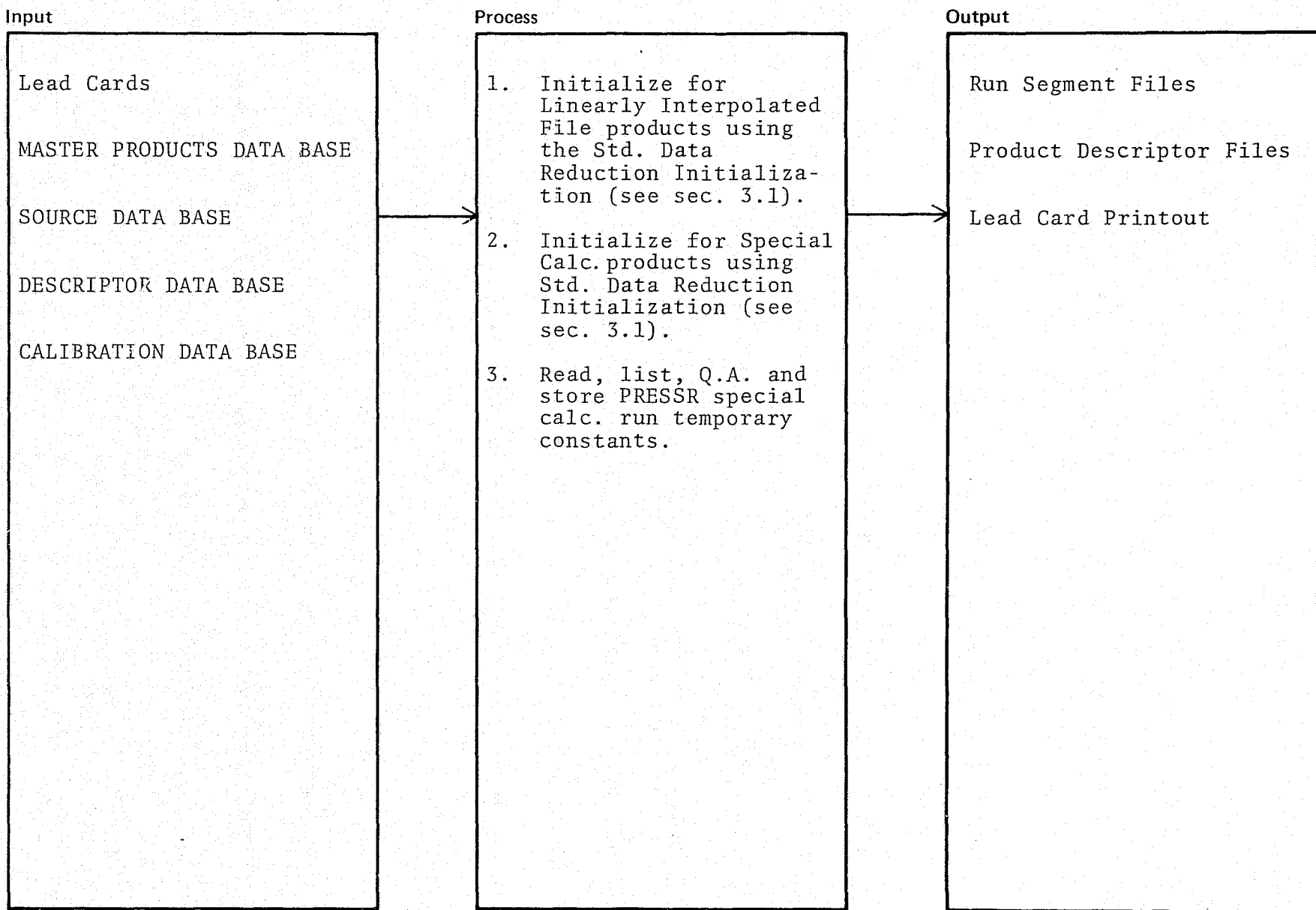
Author: _____ Date: _____

Diagram ID: 4.4 Name: _____ Description: STRUCTURES PRESSURE SPECIAL CALC.



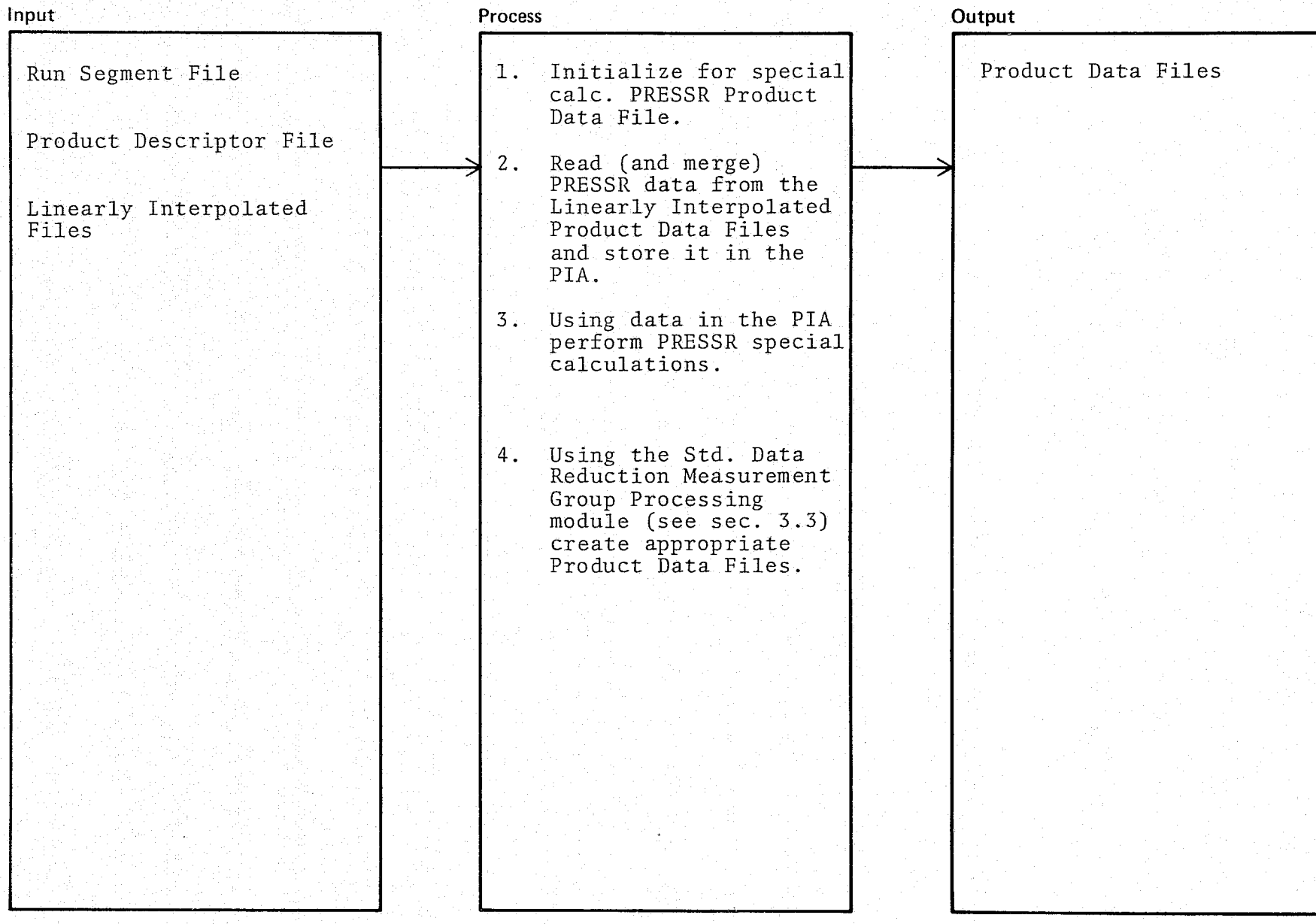
Author: _____ Date: _____

Diagram ID: 4.4.1 Name: _____ Description: PRESSR SPECIAL CALC. INITIALIZATION



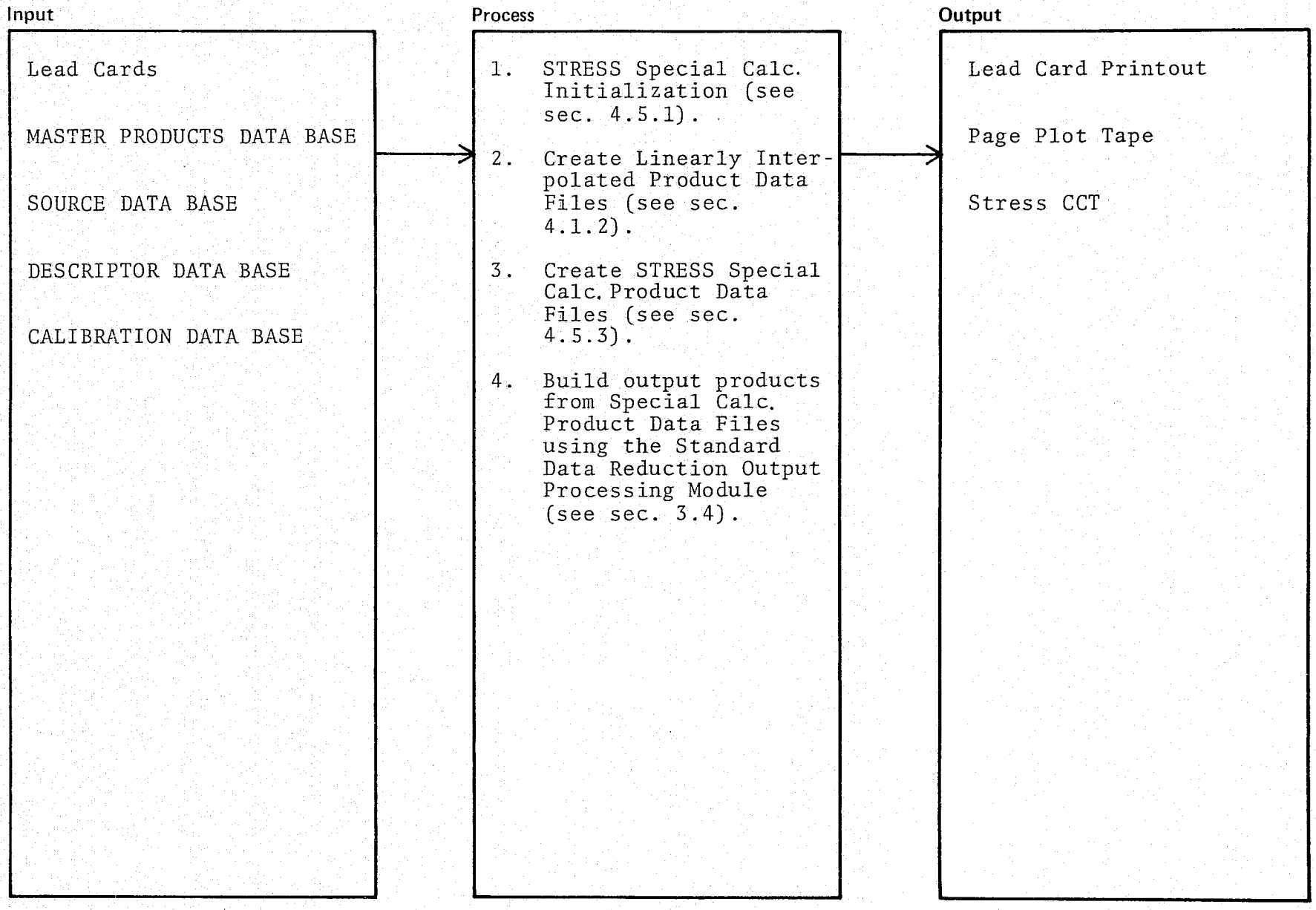
Author: _____ Date: _____

Diagram ID: 4.4.3 Name: _____ Description: CREATE PRESSR SPECIAL CALC. PRODUC DATA FILES



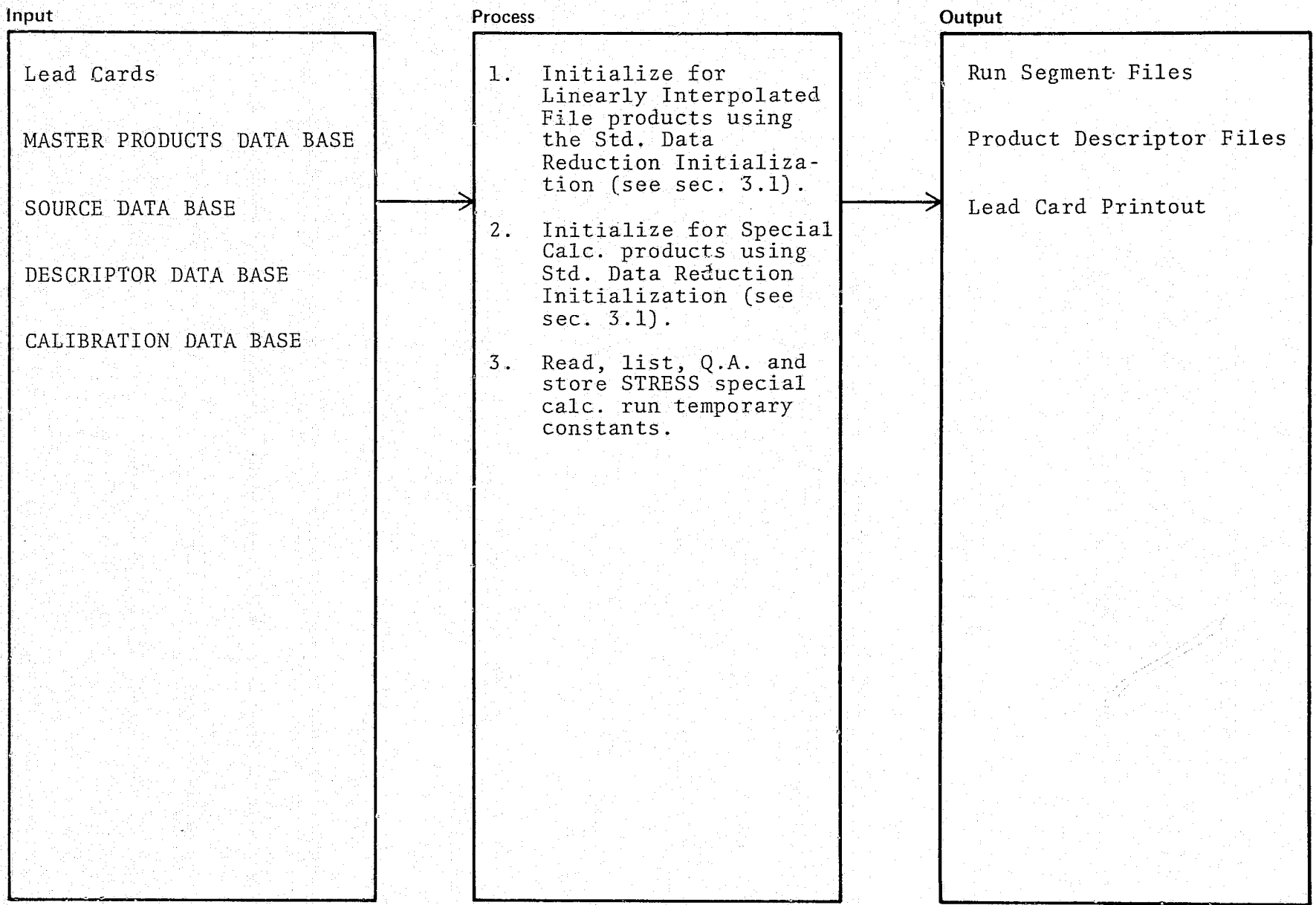
Author: _____ Date: _____

Diagram ID: 4.5 Name: _____ Description: STRUCTURES STRESS SPECIAL CALC. (STRESS)



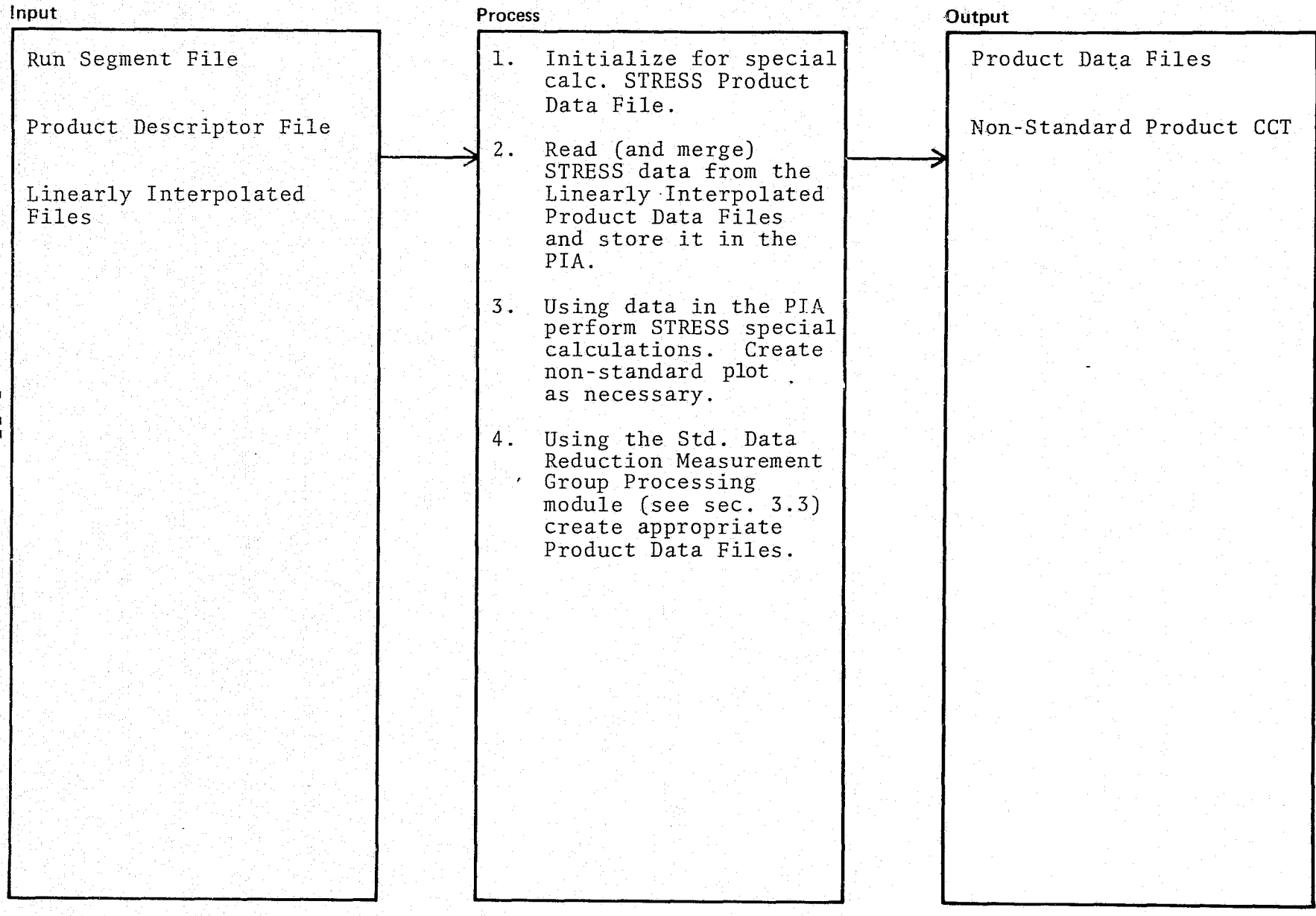
Author: _____ Date: _____

Diagram ID: 4.5.1 Name: _____ Description: STRESS SPECIAL CALC. INITIALIZATIO



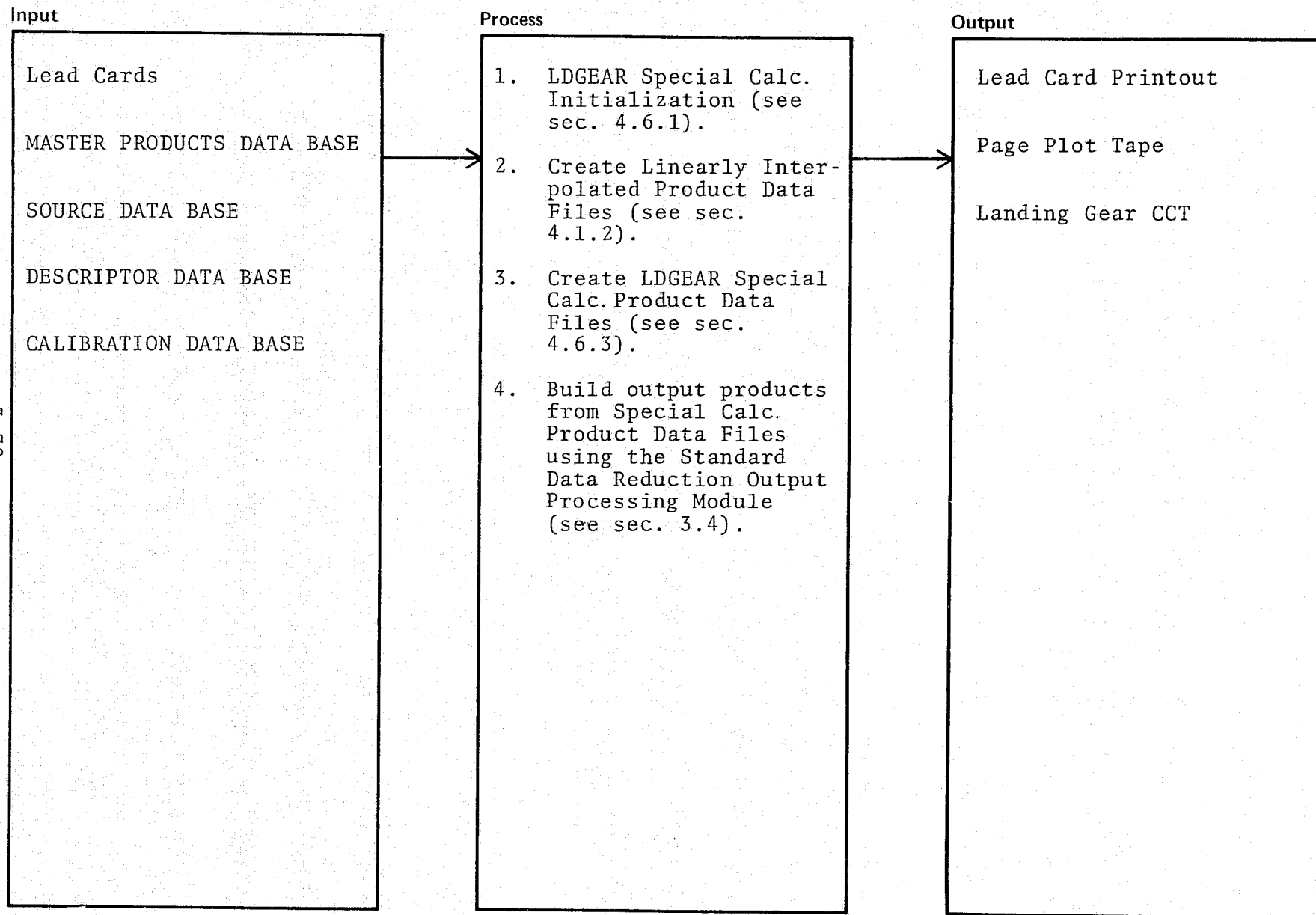
Author: _____ Date: _____

Diagram ID: 4.5.3 Name: _____ Description: CREATE STRESS SPECIAL CALC. PRODUCT DATA FILES



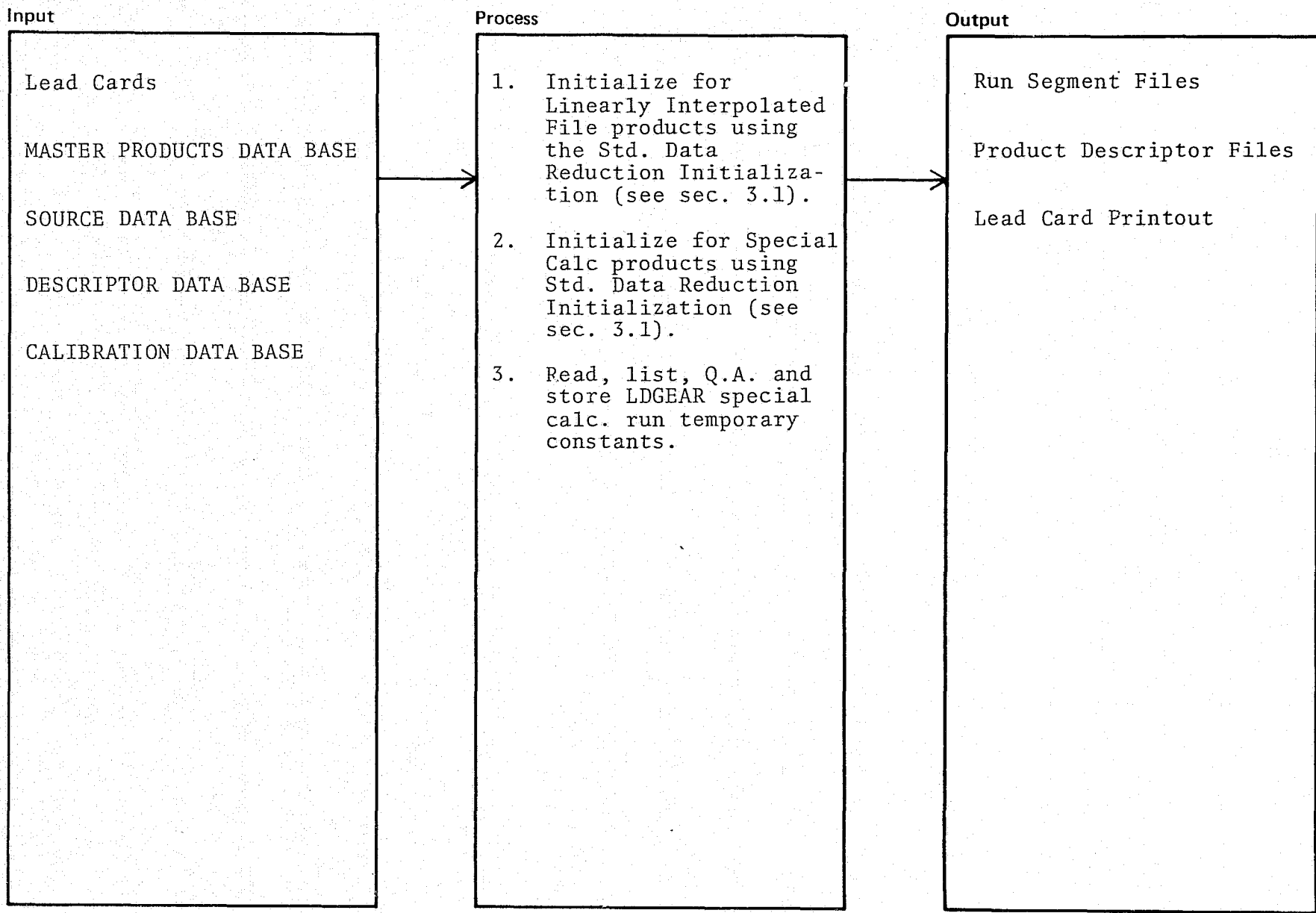
Author: _____ Date: _____

Diagram ID: 4.6 Name: _____ Description: STRUCTURES LANDING GEAR SPECIAL CALC. (LDGEAR)



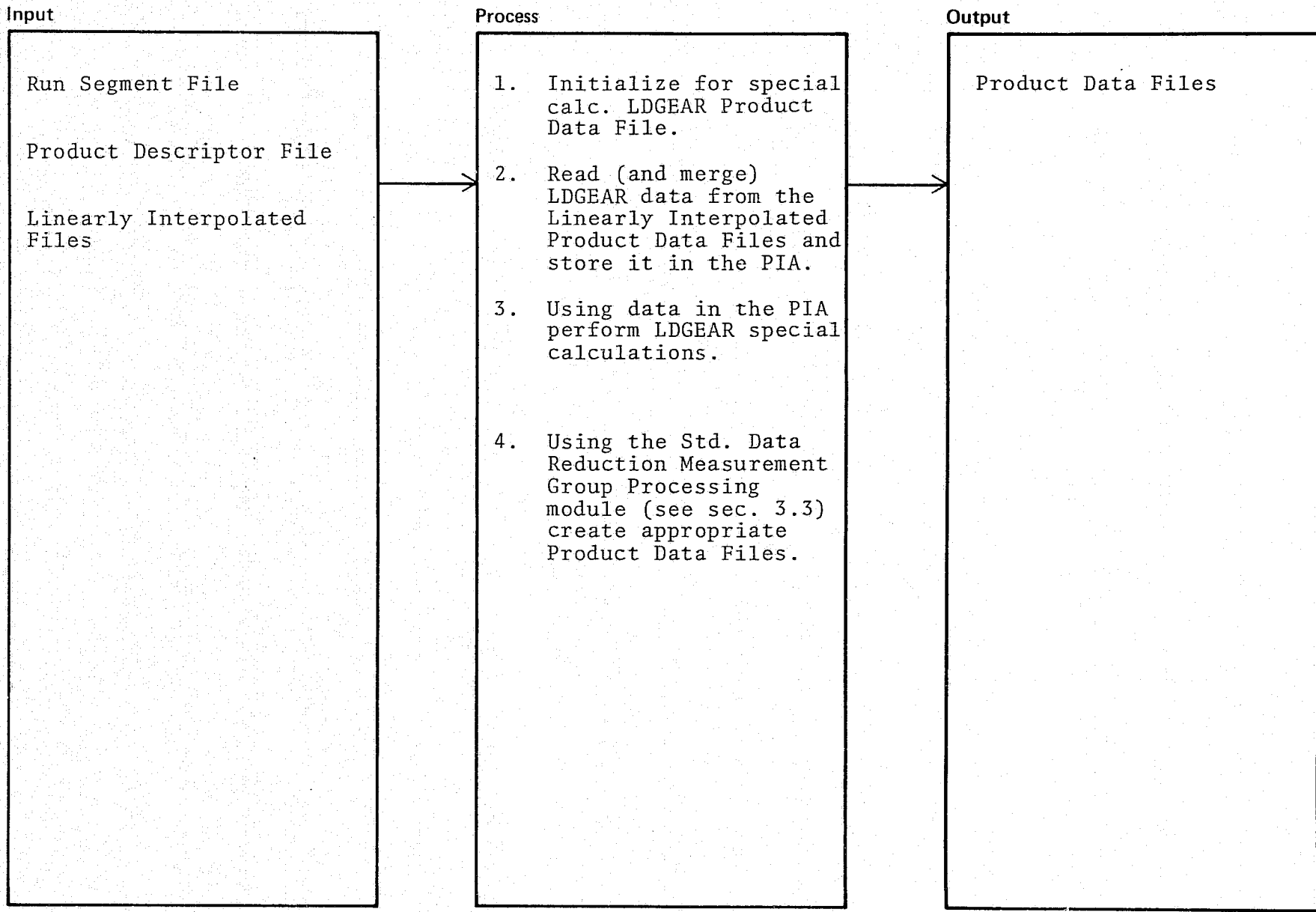
Author: _____ Date: _____

Diagram ID: 4.6.1 Name: _____ Description: LDGEAR SPECIAL CALC. INITIALIZATION



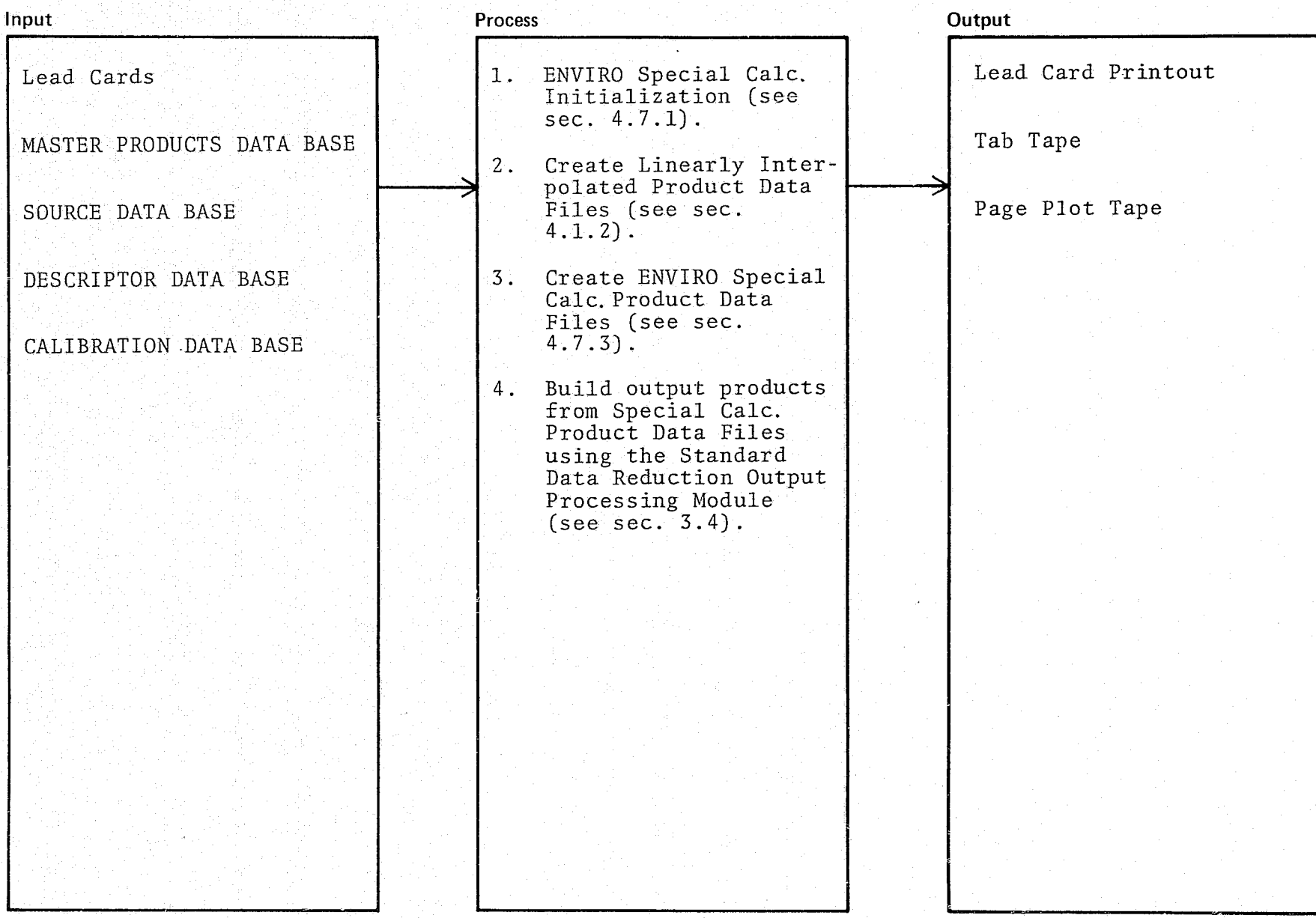
Author: _____ Date: _____

Diagram ID: 4.6.3 Name: _____ Description: CREATE LDGEAR SPECIAL CALC.PRODUCT DATA FILES



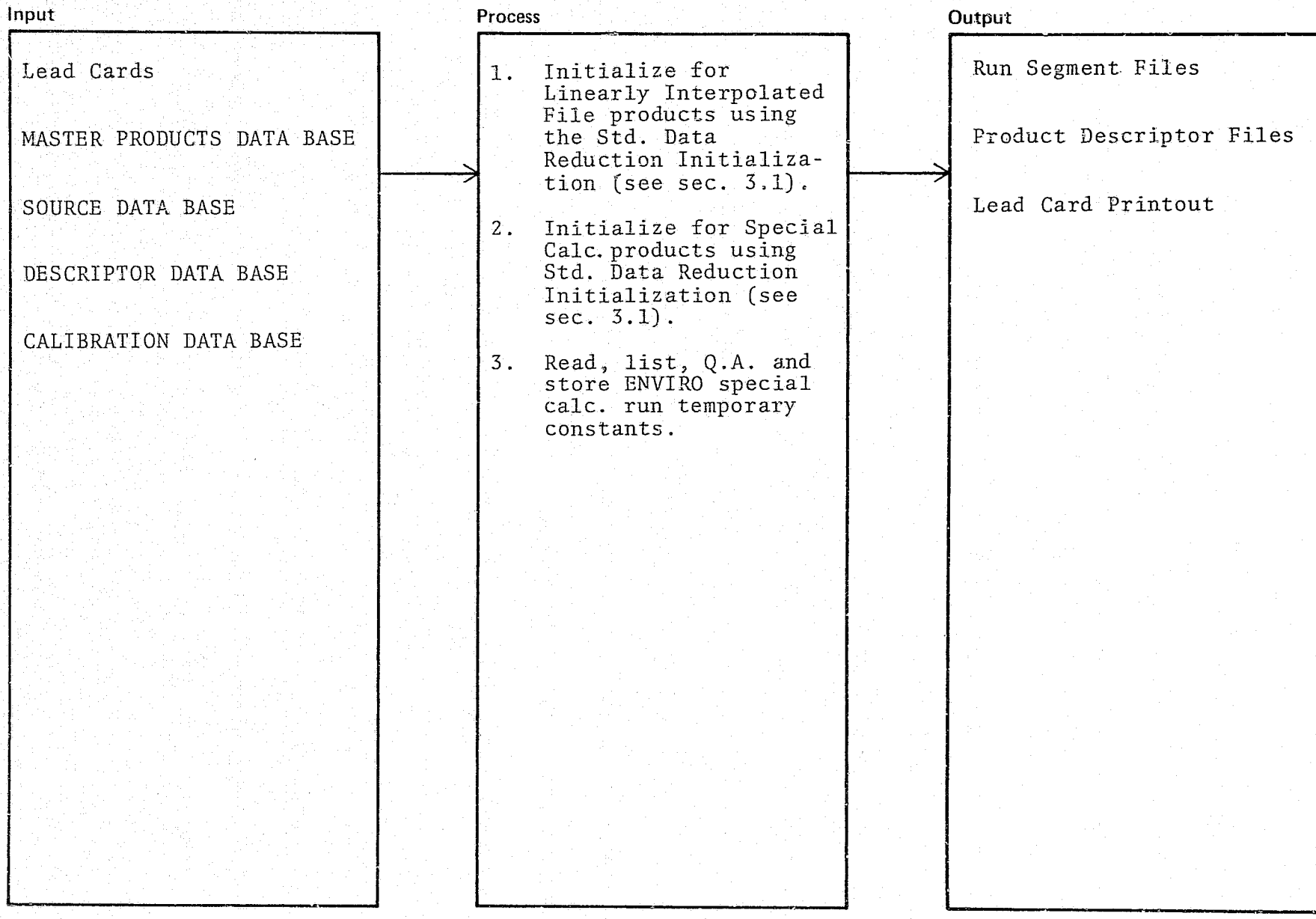
Author: _____ Date: _____

Diagram ID: 4.7 Name: _____ Description: ENVIRONMENTAL CONTROL LIFE SUPPORT SUBSYSTEM SPECIAL CALC. (ENVIRO)



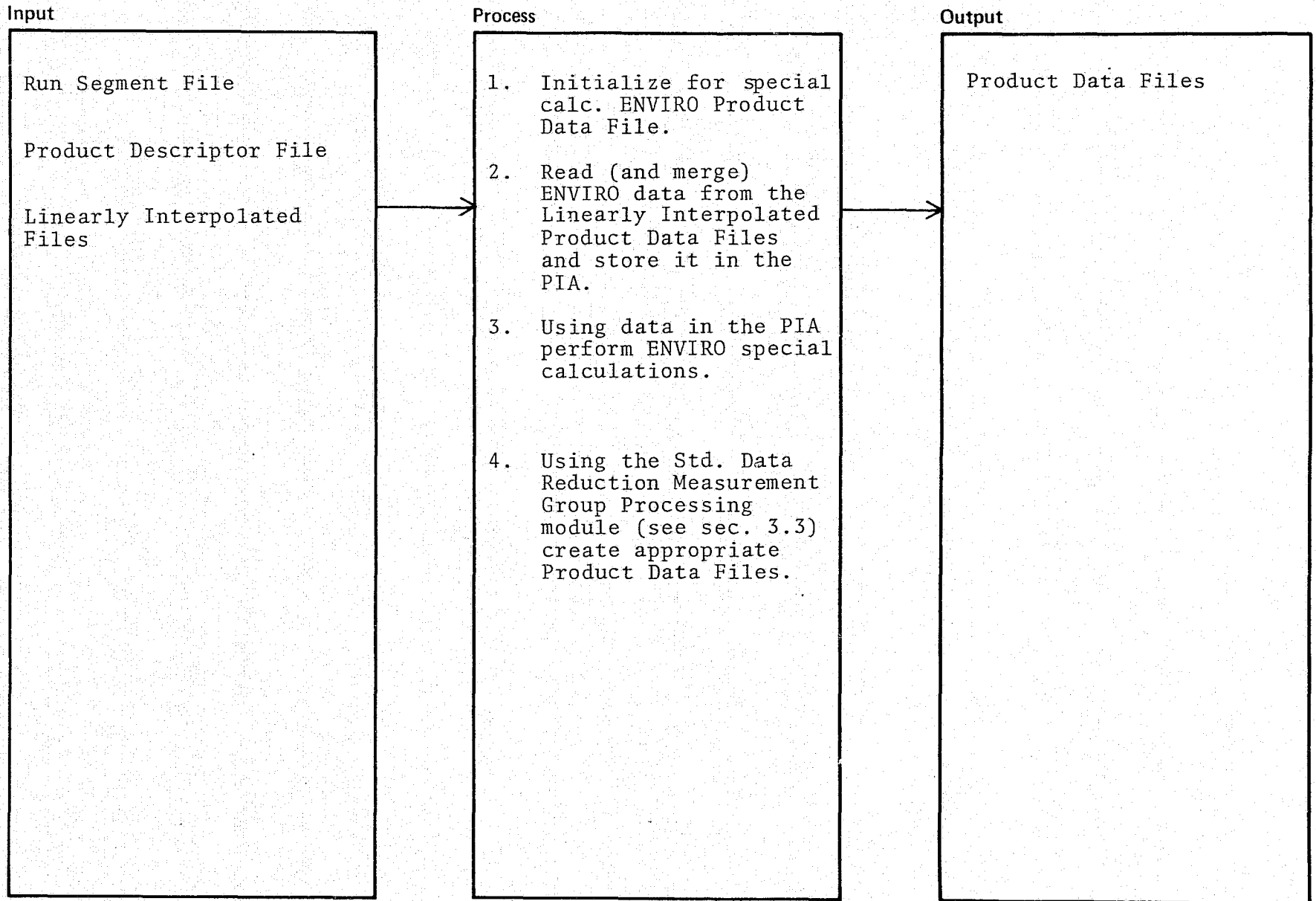
Author: _____ Date: _____

Diagram ID: 4.7.1 Name: _____ Description: ENVIRO SPECIAL CALC. INITIALIZATION



Author: _____ Date: _____

Diagram ID: 4.7.3 Name: _____ Description: CREATE ENVIRO SPECIAL CALC. 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 4-1 SIES INPUT TAPES

TYPE OF DATA	TAPE NAME	REFERENCE DOCUMENT
Source Data	NIP	(1)
Source Data	MSFC FM	(2)
Source Data	Ephemeris	(2)
Source Data	SAIL CDT	(2)
Source Descriptor Data	NIP Support Table	(1)
Source Descriptor Data	MSFC FM	(2)
Source Descriptor Data	SAIL CDT Cal.	(2)
Calibration	MMDB Cal.	(3)
Calibration	SAIL CDT Cal.	(2)

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

(2) Data Reduction Complex Approach and Landing Test Data Processing Requirements (Level C). Lockheed Electronics Company, Inc., LEC-8347, May 19, 1976.

(3) Shuttle Approach and Landing Test Calibration Data Plan. Rockwell International Space Division, SD76-SH-0056, March 16, 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

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

* 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 $\frac{B}{T}$ 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.

```
                                                                                                                    111111111111111111111111111111
          1111111111222222222233333333334444444444555555555566666666667777777777888888888899999999990000000000111111111122222222223
123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890

     TITLE       : APPROACH AND LANDING TEST                   TAB GROUP           : 22-04                                  PAGE 12345
     FLIGHT/TEST : CAPTIVE FLIGHT TEST NO. 2                   REQUEST NUMBER      : 007
     TEST DATE   : 06/23/77                                    PROCESSING DATE     : 07/21/77
     SUBSYSTEM   : AVIONICS                                    CALIBRATION BLK     : 06,02
     DATA SOURCE : R/T - MADRID                                DOWNLINK/LIST ID    : 100/003

   MET TIME             MEAS. ID  V22G9040A V22G9041A V22G9042A V22G9043A V22G9044A*V22G9045A V22G9047A            V22G9048E V22T1255P
000:00:02:51.1370       B/P LIMIT       1         0        10         1         0         1         0
   GMT TIME             SMPL RATE     100        10        50        10      12.5      12.5       100                   50        20
167:23:17:02.1370       DELTA T.    .0010     .0100     .0500     .0100     .0150     .0270     .0000                .0330     .0100
TIME DISPLAYED MET      ENG. UNIT  DEGS C      PSIA    COUNTS     VOLTS      VARS     VOLTS   DAY HR MM SECOND     BILEVEL  V63T1155E
                                                                                                                          V63T9164E
                                                                                                                              3
                                                                                                                          V63T9166E
                                                                                                                          V63T9160E
                                                                                                                              6
                                                                                                                              7
                                                                                                                          V63T9163E
                                                                                                                           12345678
  DATA STATUS LINE B               63.120     7.213       172     5.000 71348.794    28.160 167:23:17:02.1150    OPEN     00.01..0
DAY HR MN SECOND    T      SKEW
000:00:02:51.1370          .0010   64.172                                                   167:23:17:02.1370
000:00:02:51.1470          .0110                           83     5.171              17.710 167:23:17:02.1470             ...1....
000:00:02:51.1570          .0100 SYNC.LOSS                                                  SYNC.LOSS
000:00:02:51.5510F                                                                          167:23:17:02.5510
000:00:02:51.7910F         .0090                           91               +*****          167:23:17:02.7910   CLOSED    .......1
000:00:02:51.8810F         .0060   64.347                                                   167:23:17:02.8810
000:00:02:52.0010F         .0000                                                            167:23:17:03.0010
000:00:02:52.0070   *      .0100                                                            167:23:17:03.0070
000:00:02:52.0170   *      .0110   64.172     7.803                                  11.172 167:23:17:03.0170             1..0....
000:00:02:52.0260          .0090                                                            167:23:17:03.0260   OPEN
000:00:02:52.0360          .0090                                  5.711                     167:23:17:03.0360
000:00:02:52.0460          .0090                                                            167:23:17:03.0460
000:00:02:52.0560          .0100           DUMP.INTR                                        167:23:17:03.0560             .1.1...0
000:00:02:53.0060          .0100   72.223                                                   167:23:17:04.0060
000:00:02:53.0160          .1110                          180               +*****          167:23:17:04.0160
000:00:02:53.0250          .0100                                                            167:23:17:04.0250
000:00:02:53.0350          .0090                                                            167:23:17:04.0350
000:00:02:53.0450G         .0090   74.171                                             3.717 167:23:17:04.0050
000:00:02:53.0550          .0100                                                            167:23:17:04.0550
000:00:02:54.0050          .0110                                  6.011                     167:23:17:05.0050             ...00..1
000:00:02:54.0150   *      .0110   72.223                                                   167:23:17:05.0150
000:00:02:54.0250   *      .0100                                                            167:23:17:05.0250
000:00:02:54.0350   *      .0110                                                            167:23:17:05.0350   CLOSED
000:00:02:54.0450          .0090   70.718                                71334.127          167:23:17:05.0450
000:00:02:55.0050          .0090                                                            167:23:17:06.0050
000:00:02:55.0150          .0110   70.012                 192                               167:23:17:06.0150             ...1....
000:00:02:55.0240          .0100                                                  -*****    167:23:17:06.0240
000:00:02:55.0340          .0090              7.803                                         167:23:17:06.0340
```

Figure 5-1 Standard Tabulation

```
TITLE        : APPROACH AND LANDING TEST                TAB GROUP        : 22-04                                  PAGE 12346
FLIGHT/TEST  : CAPTIVE FLIGHT TEST NO. 2                REQUEST NUMBER   : 007
TEST DATE    : 06/23/77                                 PROCESSING DATE  : 07/21/77
SUBSYSTEM    : AVIONICS                                 CALIBRATION BLK  : 06,02
DATA SOURCE  : R/T - MADRID                             DOWNLINK/LIST ID : 100/002

   MET TIME        MEAS. ID  V22G9040A V22G9041A V22G9042A V22G9043A V22G9044A*V22G9045A V22G9047A          V22G9048E V22T1255P
000:00:02:56.0240  B/P LIMIT       1          0         10          1          0          1          0
   GMT TIME        SMPL RATE      50         10         50          0       12.5       12.5         50         50         20
167:23:17:07.0240  DELTA T.    .0010      .0100      .0500      .0100      .0150      .0270      .0000      .0330      .0100
TIME DISPLAYED MET ENG. UNIT  DEGS C       PSIA     COUNTS      VOLTS       VARS      VOLTS DAY HR MM SECOND    BILEVEL V63T1155E
                                                                                                                   V63T9164E
                                                                                                                           3
                                                                                                                   V63T9166E
                                                                                                                   V63T9160E
                                                                                                                           6
                                                                                                                           7
                                                                                                                   V63T9163E
                                                                                                                    12345678
  DATA STATUS LINE B          70.012     7.803       192     6.011 71334.127  -***** 167:23:17:06.0340 CLOSED    11.10..1
  DAY HR MN SECOND T   SKEW
  000:00:02:56.0240    .0110                      N/A                            167:23:17:07.0240                 N/A
  000:00:02:56.0320    .0090                                              3.126 167:23:17:07.0320
  000:00:02:56.0520    .0100  69.263                                            167:23:17:07.0520
  000:00:02:57.0120    .0100                     204                            167:23:17:08.0120
  000:00:02:57.0320    .0090        SYNC_LOSS                                   167:23:17:08.0320
  000:00:02:57.0520    .0110                                                    167:23:17:08.0520
  000:00:02:58.0120  * .0020                                 71333.234          167:23:17:09.0120
  000:00:02:58.0320    .0110            7.111                                  167:23:17:09.0320
  000:00:02:58.0520    .0030  65.785                                            167:23:17:09.0520 OPEN
  000:00:02:59.0120    .0120                                                    167:23:17:10.0120
  000:00:02:59.0320    .0000                                                    167:23:17:10.0320
```

Figure 5-2 Standard Tabulation (con't)

- Flag values which may appear in the data columns are:

SYMBOL	MEANING
DUMP.INTR	A PFCS main memory dump is occurring.
SYNC.LOSS	Frame synchronization lost.
UNDEF	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.
N/A	Data not available in current D/D format.
TAPE.ERR	Data not available due to tape read error.
OVERFLOW	The overflow bit was set in HFS type measurement.

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

COUNT VALUE	DISPLAYED DATA
0	-*****
251-254	value with '+' as last digit
255	+*****

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.

```
                                                                                                   1111111111111111111111111111111
         1111111111222222222233333333334444444444555555555566666666667777777777888888888899999999990000000000111111111122222222223
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
```

TITLE : APPROACH AND LANDING TEST
FLIGHT/TEST : CAPTIVE FLIGHT TEST NO. 2
TEST DATE : 06/23/77

REQUEST NUMBER : 007
PROCESSING DATE : 07/21/77
CALIBRATION BLK : 06,02

DATA AVAILABILITY REPORT

	GMT UNCORRECTED DAY HR MN SECOND	GMT CORRECTED DAY HR MN SECOND	ET DAY HR MN SECOND	MET DAY HR MN SECOND
DATA SOURCE R/T – MADRID				
DATA TYPE OI				
REQUESTED START/STOP TIME	167:23:05:00.0000 167:23:17:15.0000	167:23:05:05.0000 167:23:17:20.0000	-00:00:00:03.0000 000:00:12:12.0000	000:00:00:12.0000 000:00:12:27.0000
NEW D/D FORMAT 100/003				
DATA START TIME	167:23:05:01.0100	167:23:05:06.0100	-00:00:00:01.9900	000:00:00:13.0100
CDS START/STOP TIME	167:23:05:01.0100 167:23:08:25.5500	167:23:05:06.0100 167:23:08:30.5500	-00:00:00:01.9900 000:00:03:22.5500	000:00:00:13.0100 000:00:03:37.5500
TIME BACKUP OF 00.1430 SEC AT	167:23:08:12.0100	167:23:08:17.0100	000:00:03:09.0100	000:00:03:24.0100
CDS START/STOP TIME	167:23:08:25.7500 167:23:11:14.2200	167:23:08:30.7500 167:23:11:19.2200	000:00:03:22.7500 000:00:06:11.2200	000:00:03:37.7500 000:00:06:26.2200
CDS START/STOP TIME	167:23:11:14.5200 167:23:16:11.6610	167:23:11:19.5200 167:23:16:16.6610	000:00:06:11.5200 000:00:11:08.6610	000:00:06:26.5200 000:00:11:23.6610
TIME GAP OF 04.3000 SEC AT	167:23:16:15.9610	167:23:16:20.9610	000:00:11:12.9610	000:00:11:27.9610
CDS START/STOP TIME	167:23:16:15.9610 167:23:17:14.0320	167:23:16:20.9610 167:23:17:19.0320	000:00:11:12.9610 000:00:12:11.0320	000:00:11:27.9610 000:00:12:26.0320
DATA STOP TIME	167:23:17:14.0320	167:23:17:19.0320	000:00:12:11.0320	000:00:12:26.0320

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.

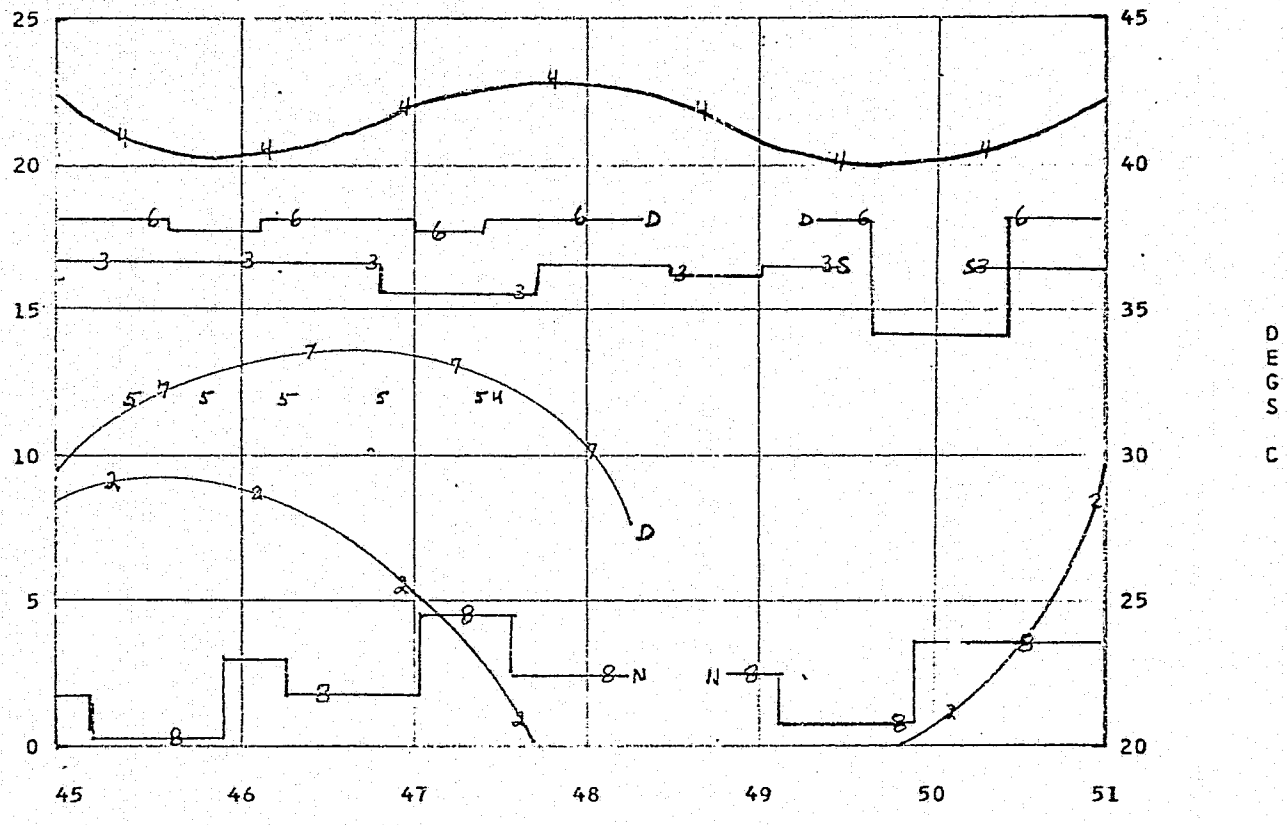
Data for a page plot can optionally be vector connected, stair-step connected, or point plotted. One option applies to all measurements in the plot group, not to individual measurements. If the group is specified to be vector connected and a measurement in the group has a non-zero bandpass limit, then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

TITLE : APPROACH AND LANDING TEST
FLIGHT/TEST : CAPTIVE FLIGHT TEST NO. 2
TEST DATE : 06/23/77
SUBSYSTEM : AVIONICS
DATA SOURCE : R/T - MADRID

PLOT GROUP : 22-04
REQUEST NUMBER : 007
PROCESSING DATE : 07/21/77
CALIBRATION BLK : 06,02
DOWNLINK/LIST ID : 100/003 *
BITE STATUS : *

MEAS ID	V22G8040A	V22G8041A	V22G8042A	V22G8043A	V22G8044A*	V22G8045A	V22G8047A	V22G8055A
B/P LIMIT	0	0	1	0	1	1	0	1
* SMPL RATE	10	10	50	5	2	5	10	10
UNITS	VOLTS	VOLTS	DEGS C	DEGS C	VOLTS	DEGS C	VOLTS	VOLTS
SYM/SCALE	1/L	2/L	3/R	4/R	5/L	6/R	7/L	8/L



START GMT 177:06:23:45.0000 STOP GMT 177:06:23:51.0000

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:

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

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.

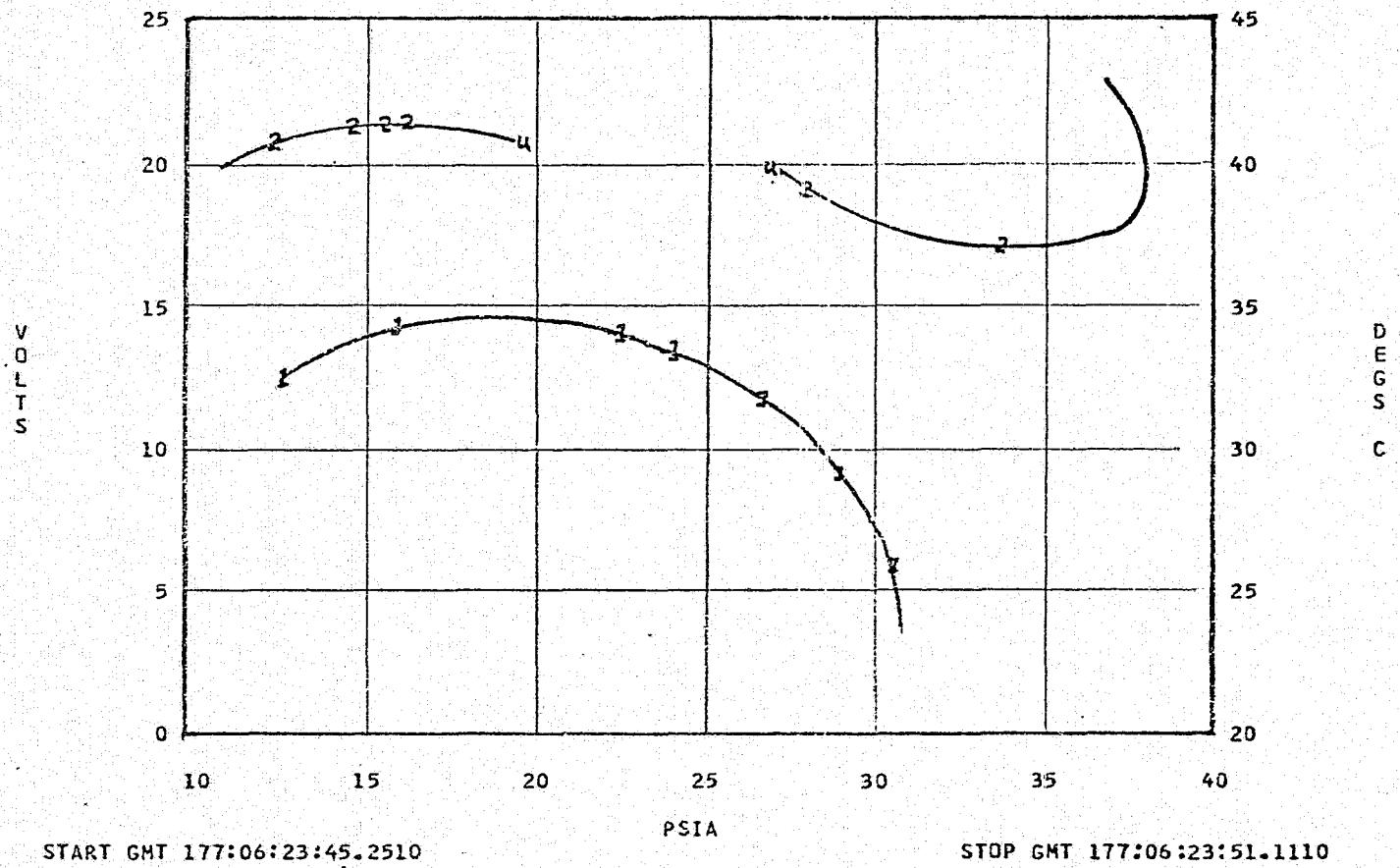
5.2.2 CROSS PAGE PLOTS

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 BITE 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

TITLE : APPROACH AND LANDING TEST
FLIGHT/TEST : CAPTIVE FLIGHT TEST NO. 2
TEST DATE : 06/23/77
SUBSYSTEM : AVIONICS
DATA SOURCE : R/T - MADRID

PLOT GROUP : 22-05
REQUEST NUMBER : 007
PROCESSING DATE : 07/21/77
CALIBRATION BLK : 06,02

MEAS ID	V22G7040A	V22G7041A	V22G7042A
UNITS	PSIA	VOLTS	DEGS C
SYM/SCALE	ABSCISSA	1/L	2/R



START GMT 177:06:23:45.2510

STOP GMT 177:06:23:51.1110

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.

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.

	Parameter	Value
*1)	measurement ID	V95H3021C
2)	bottom of scale in engineering units	-20.0
*3)	bottom of scale in inches	0.0
4)	top of scale in engineering units	20.0
5)	top of scale in inches	4.0
6)	reference point in engineering units	.0
*7)	scale column number	5.0
*8)	annotation row number	4.0
*9)	scale ID	SI

*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.

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

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.

TITLE	APPROACH AND LANDING TEST
FLIGHT/TEST	CAPTIVE FLIGHT TEST NO. 2
TEST DATE	06JUN77
SUBSYSTEM	AVIONIC
NETWORK SOURCE	R/T - DFRC
PLOT GROUP	22-12
REQUEST NUMBER	007
COMPUTER PROGRAM	XXXXXXXXXX VERSION XXX
PROCESSING DATE	21JUL77
CALIBRATION BLK	002,001
TIME PER INCH	1.0 SEC
DOWNLINK/LIST	100-01/003-02
GMT START TIME	178 06 17 36.0000
TIME DISPLAYED	GMT

SPECIAL SYMBOLS

SYMBOL	MEANING
D	PFCS MEMORY DUMP OCCURRED
F	OVERFLOW BIT SET IN HFS DATA TYPE
N	MEASUREMENT NOT IN CURRENT D/D FORMAT
S	FRAME SYNCHRONIZATION LOST
T	DATA LOST DUE TO TAPE READ ERROR
U	DATA VALUE MATHEMATICALLY UNDEFINED OR DATA NEEDED TO COMPUTE VALUE IS MISSING

SCALE/SYM ID	NO	MEAS ID	NOMENCLATURE	CALIBRATION BLK	EFF DATE	SMP RATE	DELTA T
S1/	1	V90A5381C	NORMAL ACCELEROMETER	001	23JUN77	12.5	.0010
S1/	2	V90A5361C	LATERAL ACCELEROMETER	001	23JUN77	12.5	.0010
S2/	3	V90A5321C	PITCH RATE GYRO	001	23JUN77	25.0	.0270
S2/	4	V90A5341C	YAW RATE GYRO	001	23JUN77	25.0	.0270
S2/	5	V90A5301C	ROLL RATE GYRO	001	23JUN77	25.0	.0270
S3/	6	V90H0390C	BODY ROLL ATTITUDE	001	23JUN77	5.0	.0010
S3/	7	V96X1011X	MANUAL ROLL TRIM	001	23JUN77	1.0	.0010
S4/	8	V96X1015X	MANUAL YAW TRIM	001	23JUN77	1.0	.0010
S5/	9	V90X7261X	SEL. LH YAW TRIM SWITCH +	001	23JUN77	1.0	.0100
S6/	10	V90X7271X	SEL. LH YAW TRIM SWITCH -	001	23JUN77	1.0	.0100
S7/	11	V90H6001C	SEL. LH ROLL RHC COMD	001	23JUN77	5.0	.0010
S7/	12	V90H6801C	SEL. LH SBTC COMD	001	23JUN77	5.0	.0010
S8/	13	V90H4502C	SEL. RIGHT RPTZ COMD	001	23JUN77	5.0	.0010
S9/	14	V90H4402C	SEL. LEFT RPTA COMD	001	23JUN77	5.0	.0010
SA/	15	V57Z0240C	SPBK GPC COMD	001	23JUN77	12.5	.0270
SB/	16	V90H6710C	SPBK POS FBK	001	23JUN77	5.0	.0010
SC/	17	V57Z0140C	RUDDER GPC COMD	001	23JUN77	12.5	.0270
SD/	18	V90H7010C	RUDDER POS. FBK	002	01JUL77	1.0	.0100
SE/	19	V90H6410C	BODY FLAP POS. FBK	002	01JUL77	5.0	.0100
SF/	20	V90H0810C	FLIGHT PATH ANGLE	002	01JUL77	1.0	.0010
SG/	21	V94H1502C	AILERON COMD (FC)	002	01JUL77	5.0	.0100
SH/	22	V90L0811C	VELOCITY WRT GROUND	002	01JUL77	1.0	.0100
SI/	23	V95H3021C	GNC TRUE ANGLE OF ATTACK	002	01JUL77	1.0	.0010
SJ/	24	V90R0843C	ESTIMATE ALT RATE	002	01JUL77	1.0	.0100

Figure 5-6 Continuous Plot

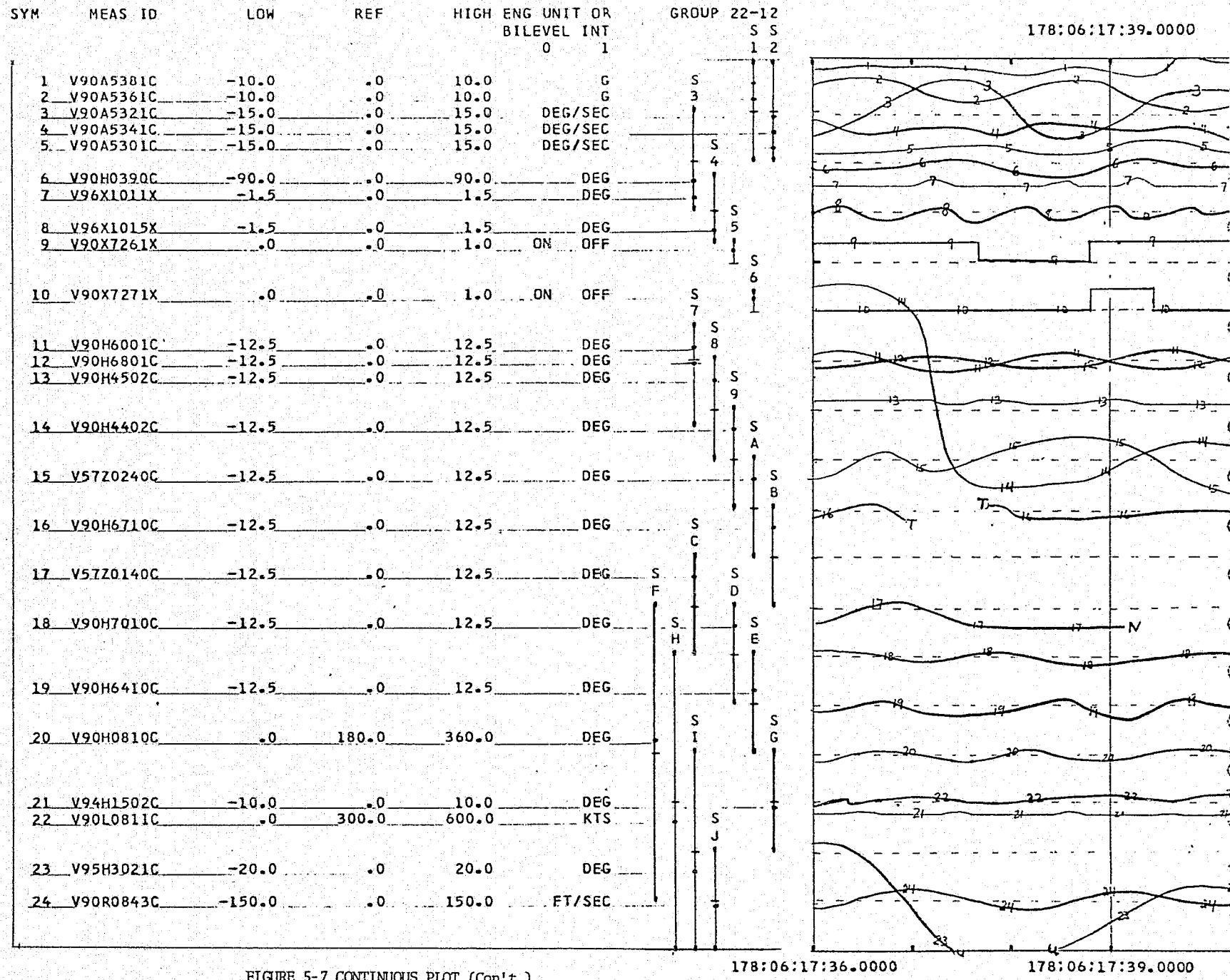


FIGURE 5-7 CONTINUOUS PLOT (Con't.)

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

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

DIAGRAM ID: 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.)

DIAGRAM ID: NAME: Source Data Base

TYPE: DATA BASE X WORKING FILE ARRAY

STRUCTURE DIAGRAM:

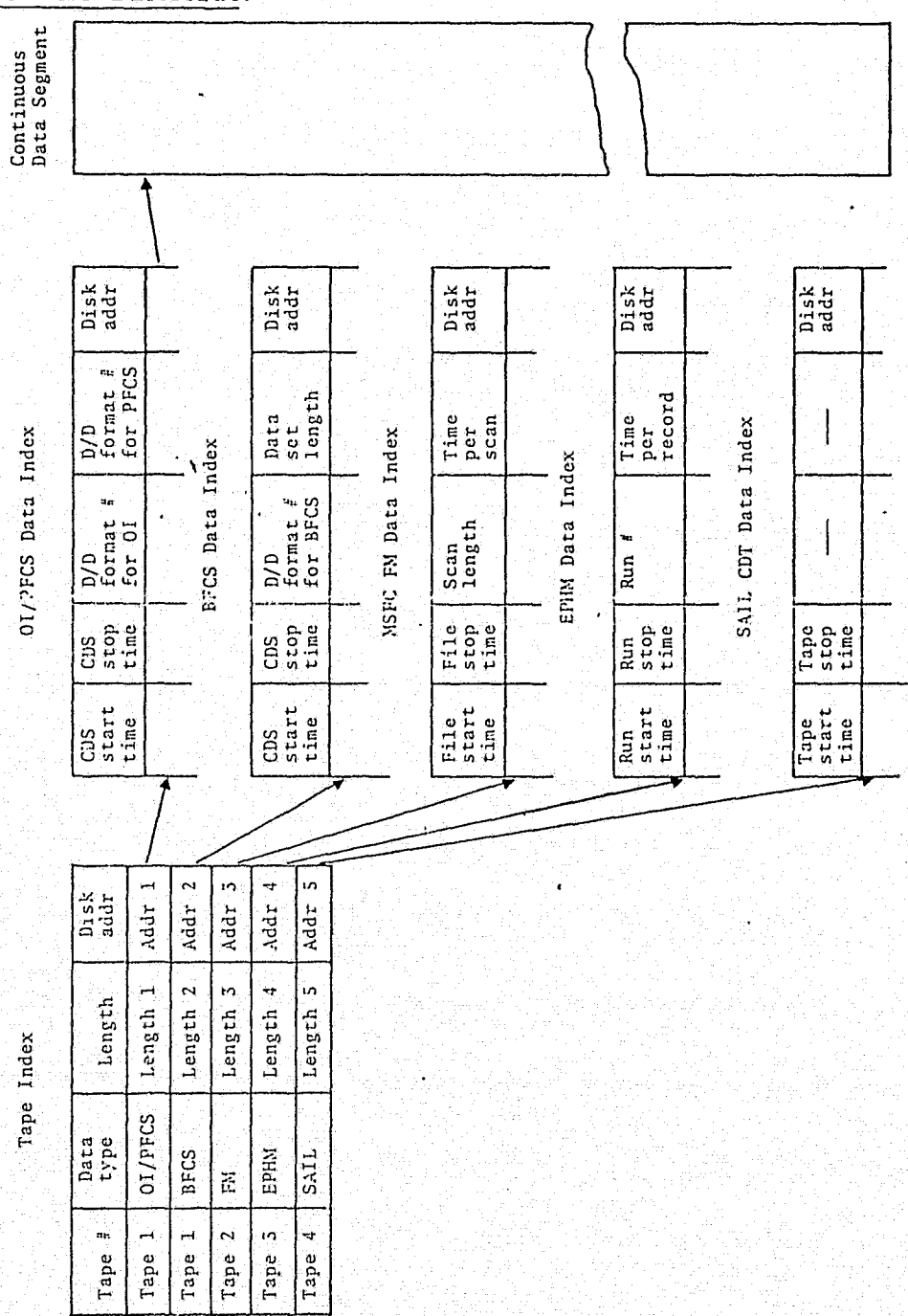


DIAGRAM ID: NAME: Source Data Base

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, EPHM 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 I.D: NAME: Source Data Base

TYPE: DATA BASE X WORKING FILE ARRAY

MSFC FM index — in order by file number

- File start time — time of first scan
- File stop time — time of last scan
- Scan length — number of words per logical record
- Time per scan — delta time between logical records
- Disk address — location of data set on disk

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

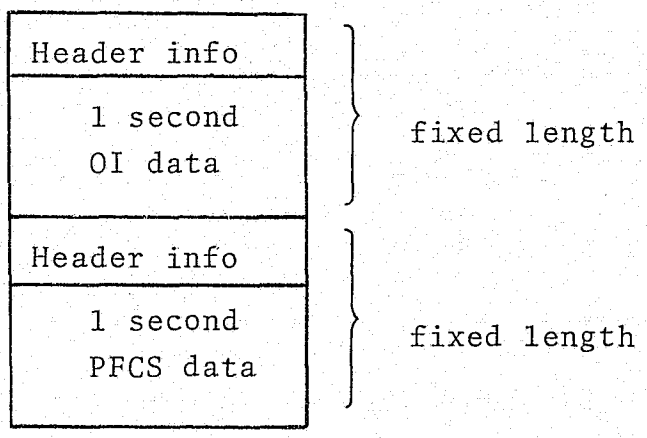
- Start time — start time of tape
- Stop time — stop time of tape
- Disk address — location of data set on disk

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:



For a detailed description of the Ephemeris/Metereological, 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 I.D: 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.

DIAGRAM ID: NAME: Descriptor Data Base

TYPE: DATA BASE X WORKING FILE ARRAY

STRUCTURE DIAGRAM:

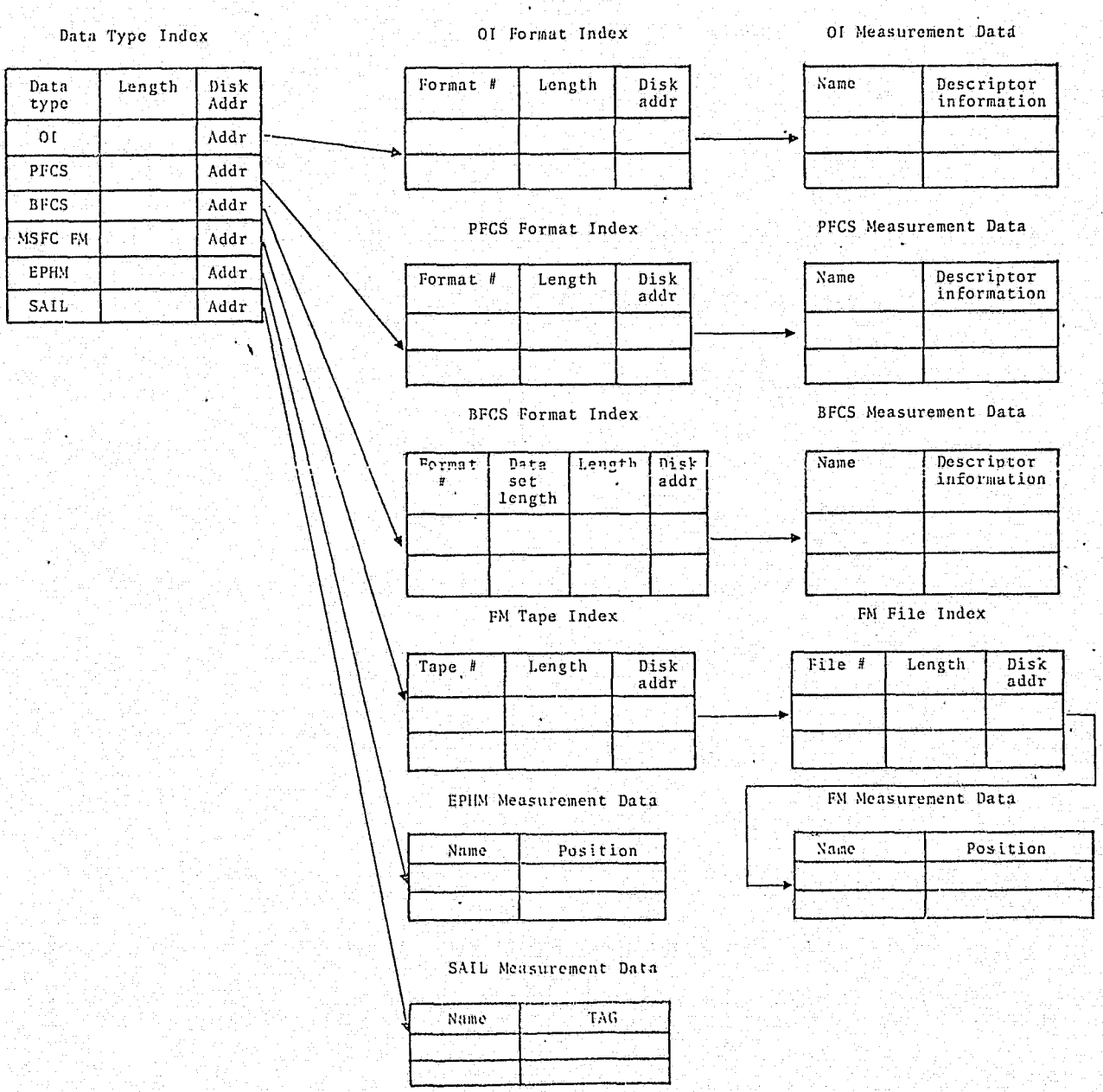


DIAGRAM ID: NAME: Descriptor Data Base

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

DIAGRAM ID: 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

STRUCTURE DIAGRAM:

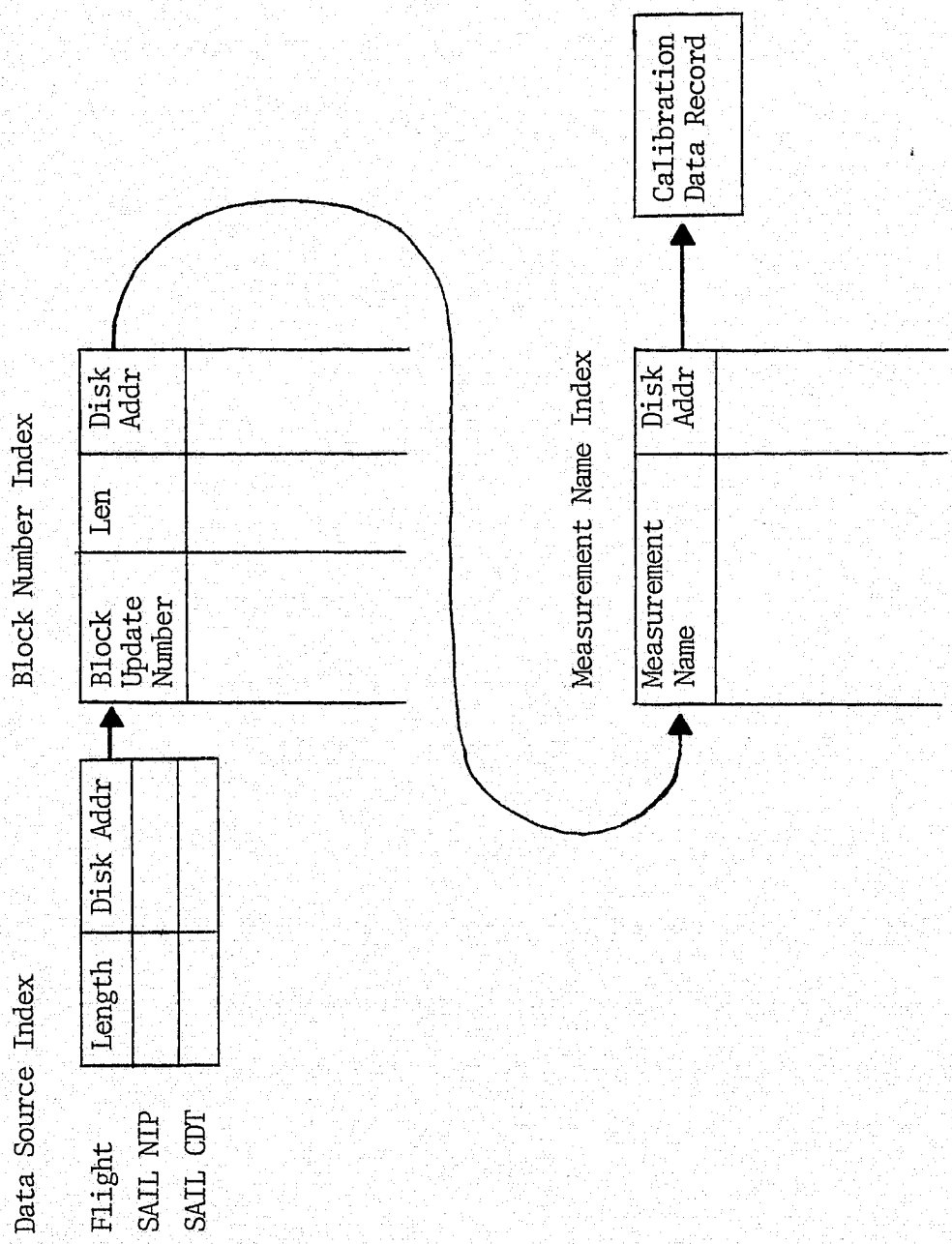


DIAGRAM ID: NAME: Calibration Data Base

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.

DIAGRAM ID: NAME: Calibration Data Base

TYPE: DATA BASE X WORKING FILE ARRAY

ELEMENT DESCRIPTION:

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 alphanumeric interpretation of discrete values

DIAGRAM ID: 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 SIES.

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.

DIAGRAM ID: NAME: Master Products Data Base

TYPE: DATA BASE X WORKING FILE ARRAY

STRUCTURE DIAGRAM:

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.

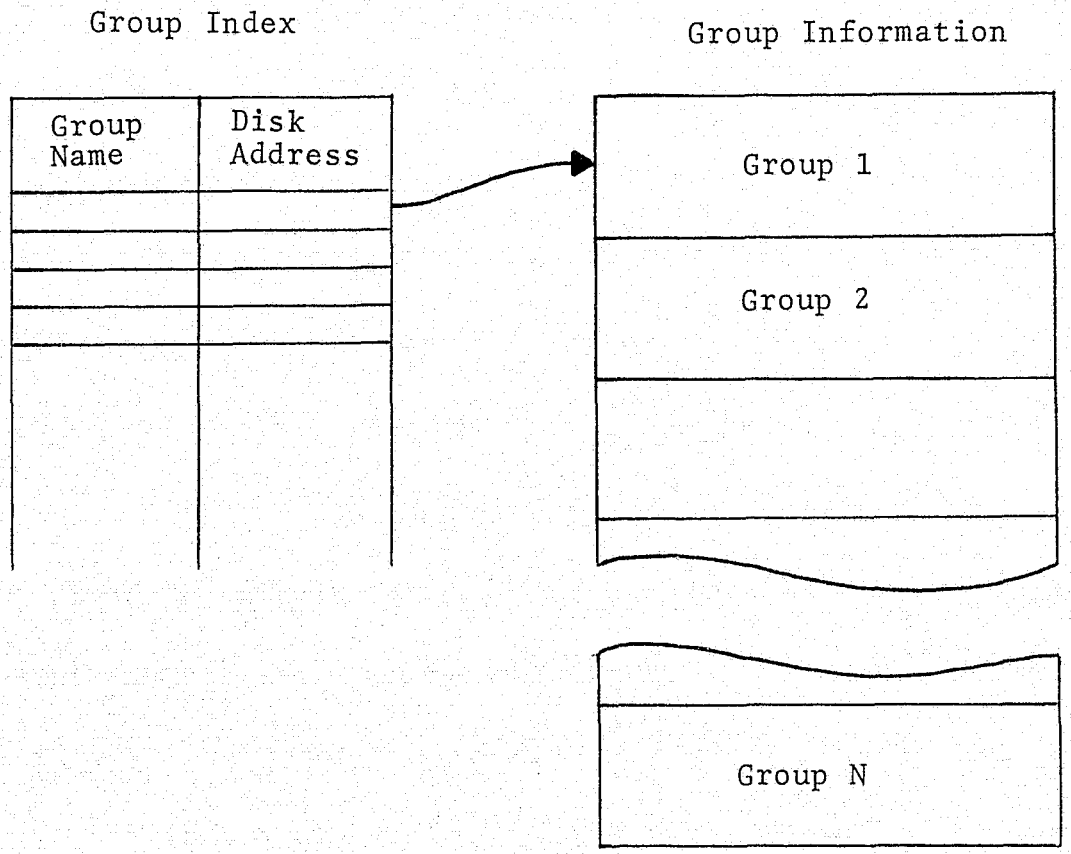


DIAGRAM ID: NAME: Master Products Data Base

TYPE: DATA BASE X 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 7-1

ALT SIES SOFTWARE SYSTEM FILES

NAME	SOURCE	CREATED BY	USED BY	HOW ACCESSED
Product Descriptor File	Lead Cards, MPDB CDB, and DDB	Initialization	Output Processing	Sequential
Run Segment File	Lead Cards, MPDB, SDB, DDB	Initialization	Standard Data Reduction Driver Special Calculation Driver	Sequential
Product Data File	Source Data Base via PIA, Special Calculations	Measurement Group Processing Output Processing	Output Processing Special Calculations	Sequential
Local Master Products File	Lead Cards, MPDB	Initialization	Initialization	Sequential
Data Availability File	Source Data Base	Retrieval	Output Processing	Sequential

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.

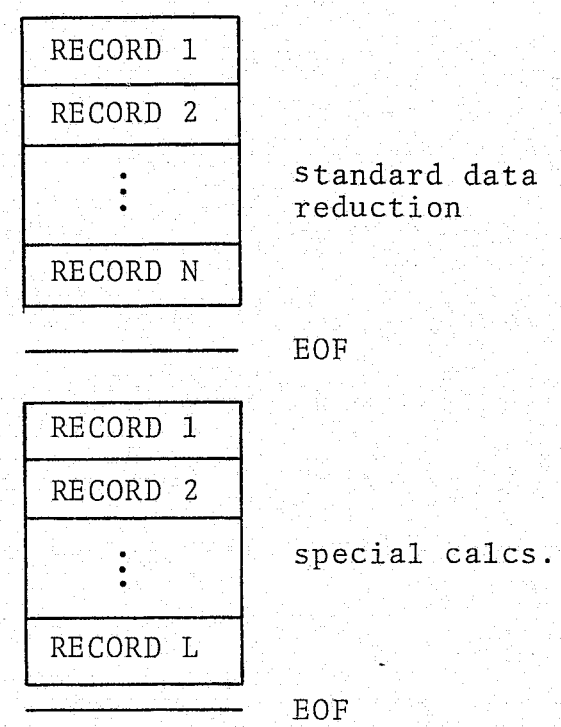


DIAGRAM ID: NAME: Product Descriptor File

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)

DIAGRAM ID: 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:

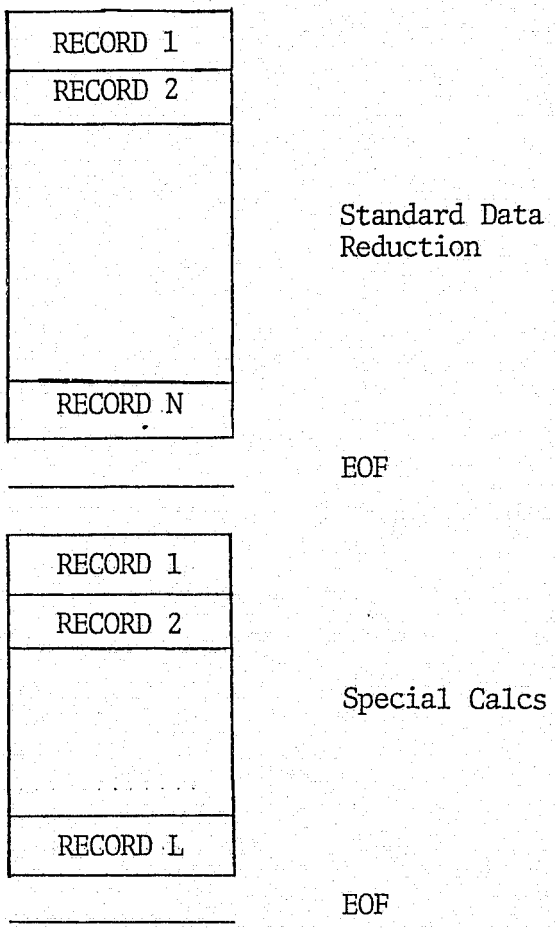


DIAGRAM ID: NAME: Run Segment File

TYPE: DATA BASE WORKING FILE X ARRAY

ELEMENT DESCRIPTION:

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

DIAGRAM ID: 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

DIAGRAM ID: NAME: Product Data File

TYPE: DATA BASE WORKING FILE X ARRAY

STRUCTURE DIAGRAM:

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

DIAGRAM ID: NAME: Product Data File

TYPE: DATA BASE WORKING FILE X ARRAY

ELEMENT DESCRIPTION:

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)

DIAGRAM ID: NAME: Local Master Products File

TYPE: DATA BASE WORKING FILE X ARRAY

ORIGINAL SOURCE: Lead cards, MPDB

CREATED BY: Initialization

MODIFIED BY: Initialization (sorted)

USED BY: Initialization

PURPOSE: The Local Master Products File is for incorporating run time overrides into the MPDB.

ACCESS METHOD: Sequential

DIAGRAM ID: NAME: Local Master Products

TYPE: DATA BASE WORKING FILE X ARRAY

STRUCTURE DIAGRAM:

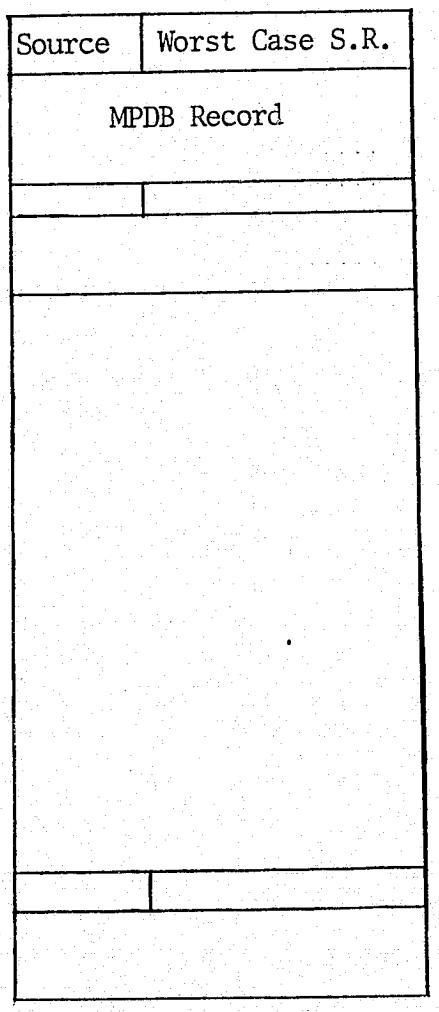


DIAGRAM ID: NAME: Local Master Products File

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

DIAGRAM ID: NAME: Data Availability File

TYPE: DATA BASE WORKING FILE X 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.

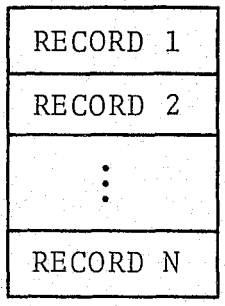


DIAGRAM ID: NAME: Data Availability File

TYPE: DATA BASE WORKING FILE X ARRAY

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 8-1

ALT SIES SOFTWARE SYSTEM ARRAYS AND TABLES

NAME	SOURCE	CREATED BY	USED BY	MODIFIED BY
Unpack Array	Descriptor Data Base	Retrieval	Retrieval	Retrieval
Processing Interface Array Template (PIAT)	Descriptor Data Base	Retrieval Special Calculations	Retrieval Measurement Group Processing	Retrieval
Processing Interface Array (PIA)	Source Data Base	Retrieval Special Calculations	Measurement Group Processing	Retrieval Special Calculation
Group Processing Table (GPT)	Master Products Data Base Source Data Base	Initialization	Measurement Group Processing	Measurement Group Processing
Measurement Group Matrix (MGM)	PIA	Measurement Group Processing	Measurement Group Processing	Measurement Group Processing

DIAGRAM ID: NAME: Unpack Array

TYPE: DATA BASE WORKING FILE ARRAY X

ORIGINAL SOURCE: Descriptor Data Base

CREATED BY: Retrieval

MODIFIED BY: Retrieval

USED BY: Retrieval

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.

DIAGRAM ID: NAME: Unpack Array

TYPE: DATA BASE WORKING FILE ARRAY X

STRUCTURE DIAGRAM:

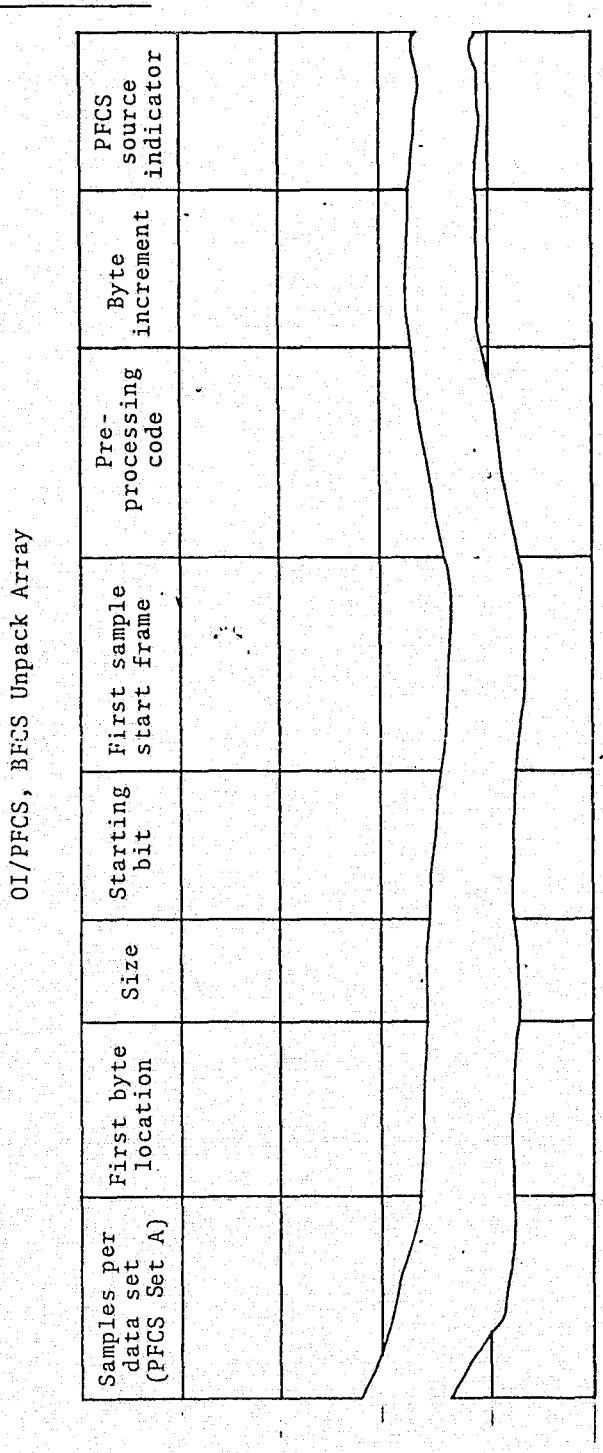


DIAGRAM ID: NAME: Unpack Array

TYPE: DATA BASE WORKING FILE ARRAY X

STRUCTURE DIAGRAM:

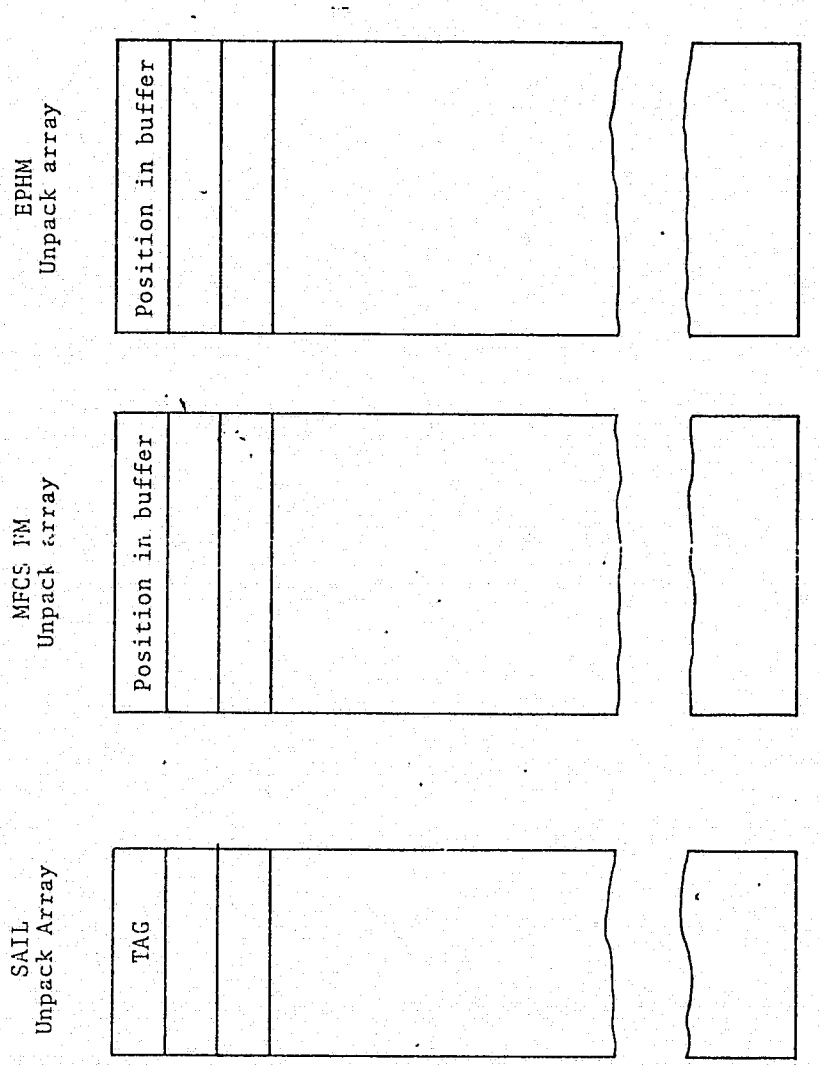


DIAGRAM ID: NAME: Unpack Array

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: NAME: Processing Interface Array Template (PIAT)

TYPE: DATA BASE WORKING FILE ARRAY X

STRUCTURE DIAGRAM:

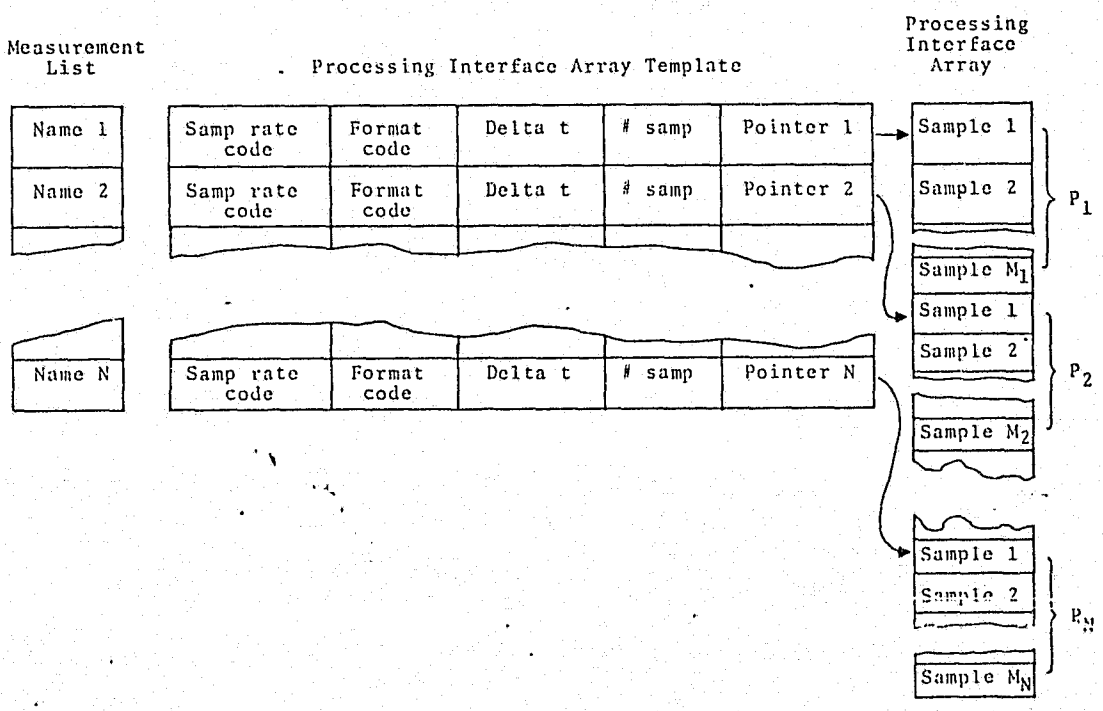


DIAGRAM ID: NAME: Processing Interface Array Template (PIAT)

TYPE: DATA BASE WORKING FILE ARRAY X

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:

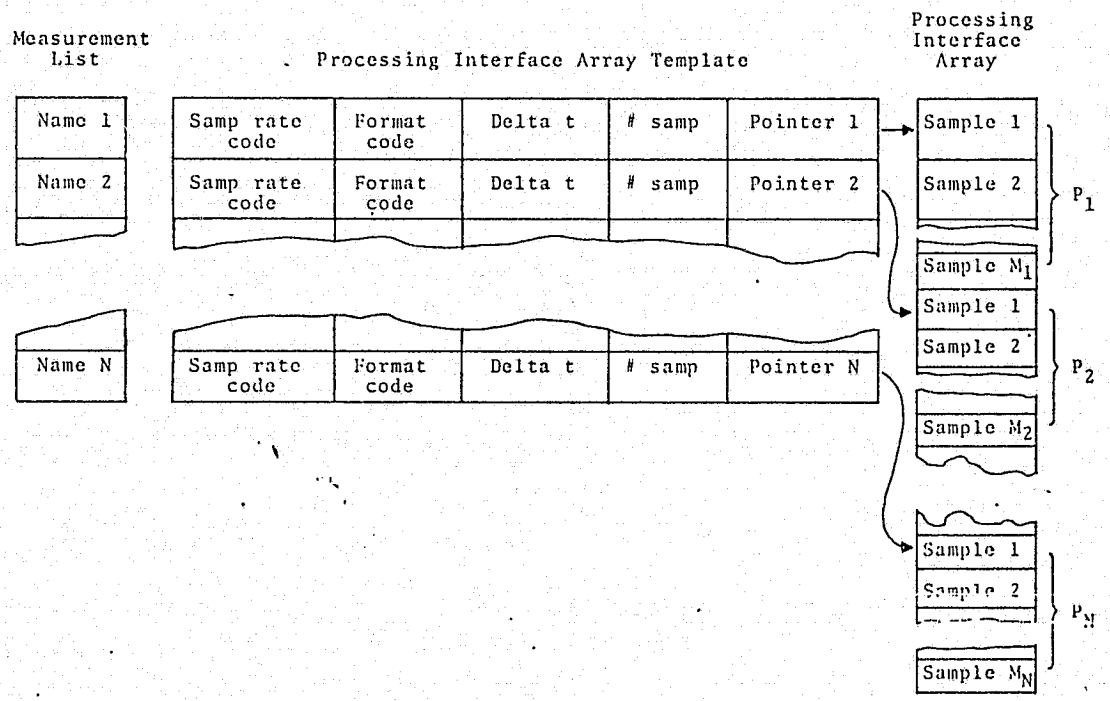


DIAGRAM ID: NAME: Processing Interface Array (PIA)

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

DIAGRAM ID: 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:

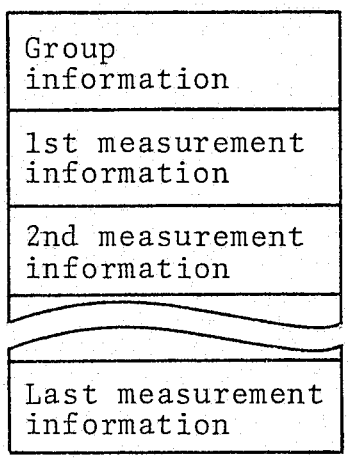


DIAGRAM ID: NAME: Group Processing Table (GPT)

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:

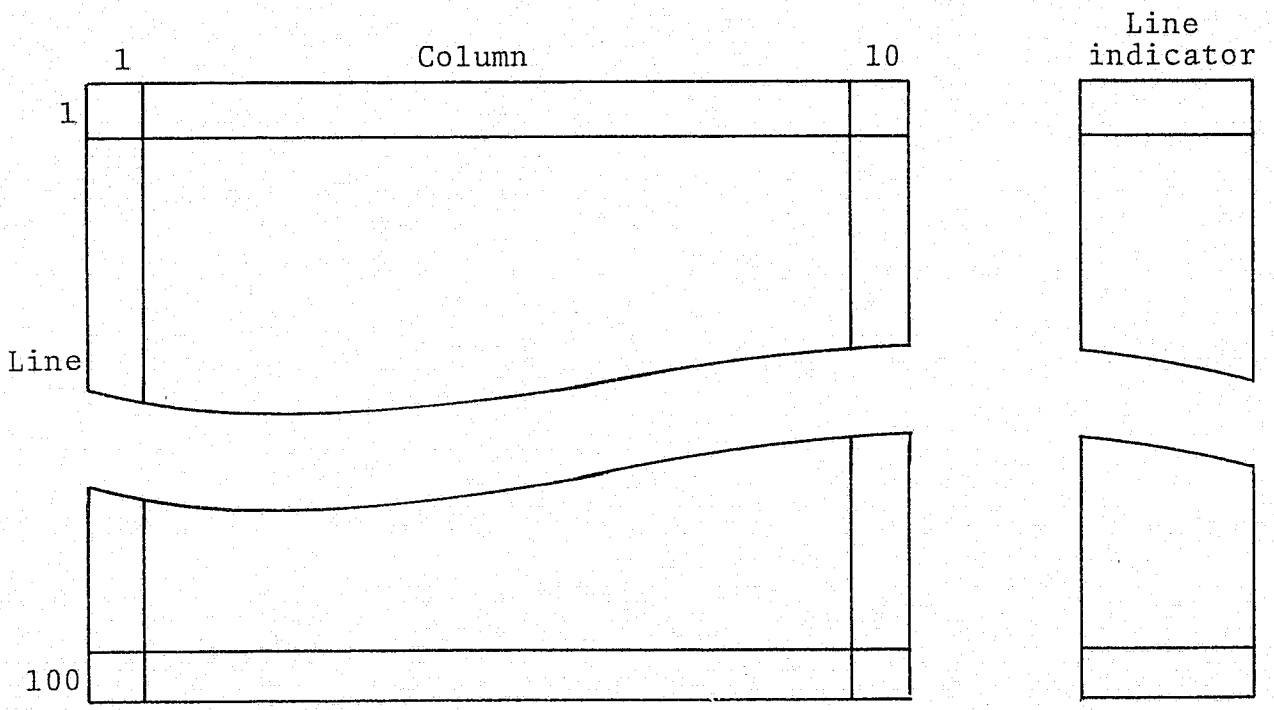


DIAGRAM ID: NAME: Measurement Group Matrix (MGM) and Line Indicator Array

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.